AUERBACH

Guide to Time Sharing

AUERBACH GUIDE to

Time Sharing

The material contained in this publication
will be included in
AUERBACH Computer Technology Reports,
an analytic reference service that provides
comprehensive coverage of
the information processing industry.

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PREFACE

The AUERBACH Guide to Time Sharing introduces the reader to the concepts and facilities of time sharing, one of the most dynamic segments of the data processing industry. Time sharing has experienced a phenomenal growth rate in the past few years. New companies have formed and new techniques developed at such a rapid pace that a serious information gap has occurred.

By using this guide, the reader gains an overview of the industry, evaluation guidelines, plus reports describing the offerings of approximately 125 time sharing services.

The material in this guide is presented in several levels of detail. Special reports consider the comparison between using a time sharing service or an in-house computing system as the solution to his data processing needs. Other special reports explain remote processing, discuss how to evaluate a time sharing service, and present criteria for selection. Individual reports cover important and unique characteristics of each company's service. There is also a listing of the major terminals supported by each firm's system.

One search chart presents a quick reference aid to the various time sharing services — their local dialing areas and types of service. Other detailed search charts offer a fast way to find the area codes where specific time sharing services offer free local dialing. In addition, these charts list the computer that supports each company's system, and the programming languages offered by each.

Having evaluated the services and selected the ones that seem most suitable, the reader can consult the directory of suppliers for addresses and phone numbers of the companies. Since each company has its own pricing arrangement, a separate service fees section has been prepared. Finally, the index lists each company's national headquarters, separating them into two categories — those in the United States and those in Canada.

USERS' GUIDE

Information in this guide is presented in several levels of detail. Individual special reports describe the problems in choosing between a time sharing service and a small business computer. Other reports in this group explain remote processing, evaluate time sharing services, and present time sharing selection criteria. Each time sharing service is covered in a separate report.

The reader can look through the table of contents for a service with which he is familiar. If he wants the headquarters location, he can check the index, which has two breakdowns — companies in the United States and those in Canada.

If the reader wants a quick view of the differences among the approximately 125 services covered in the guide, he should check the summary search charts, which present each service's local dialing areas and type of service. Should he want an overview of a specific system, he can consult the detailed specification charts, which list free local dialing area codes by company, computer support, and programming languages. For more comprehensive information on a service, the reader should go to the individual report.

One of the user's main concerns in choosing a service will be price, so the different cost arrangements of each company have been combined into a single group of charts (Service Fees), located at the end of the reports. When the user has evaluated the services and selected the ones that seem most likely to fulfill his needs, he can consult the list of suppliers for addresses and phone numbers.

This selection guide presents the following types of information:

- Special Reports
  - Time Sharing Versus In-House Computing: helps you choose between a time sharing service and a small business computer.
  - Overview: describes remote processing.
  - Evaluation: establishes criteria for evaluating a time sharing service.
  - Selection: presents time sharing selection criteria and includes a checklist.
- Device Reports
  - Background: reflects the company's history; discusses its programming languages, type of service, applications packages, computer features, marketing area, and support assistance.
  - Local Dialing: lists the specific area codes where a company offers free local dialing.
  - Terminal Support: lists the various terminals handled by each company's computer systems.
- Charts
  - Search (summary): selectively summarize areas for local dialing and type of service (conversational, dedicated, local, remote); and distinguish between full and partial reports.
  - Search (detail): cover local dialing areas, programming languages, and computer support.
    Local Dialing Areas — shows the telephone areas from which a user can access the time sharing services toll-free. The set is made up of six charts, each encompassing a different geographic region. Five regions are in the United States (New England/Middle Atlantic, Southeastern, Midwestern, Central and Mountain, Far West); the sixth covers Canada.
    Language Offerings — tells the user which of the major programming languages are supported by each time sharing company.
    Computer System Support — indicates hardware systems supported by each time sharing service.
- Directory of Suppliers — This report gives the corporate name, address, telephone number, and a corporate contact for all firms marketing a time sharing service. Where applicable, relationships to other companies (such as franchises, network affiliations) are included.
- Index of National Headquarters — Time sharing companies are listed alphabetically under the country (United States or Canada) in which their corporate headquarters are located. Alternative company names, such as diminutives or abbreviations, are also included in the index and cross-referenced to the official corporate title.
- Service Fees — Charges for the following items are shown: initiation, monthly minimum, terminal connection, central processor usage, and storage. Special pricing considerations or special units are defined by an entry in the "Remarks" row.

CONTENTS

1. SEARCH CHARTS

SUMMARY SEARCH CHART

COMMERCIAL TIME SHARING SERVICE	LOCAL DIALING (1)					SERVICE CLASS				COVERAGE	
	NEW ENGLAND/ MIDDLE ATLANTIC	SOUTHEASTERN	MIDWESTERN	CENTRAL AND MOUNTAIN	FAR WEST	CONVERSATIONAL	DEDICATED	LOCAL	REMOTE	FULL REPORT	PARTIAL REPORT
ACTS		x	x			x		x	x	x	
APL General	x	x	x								x
APL Services	x	x				x			x	x	
Allen-Babcock Computing	x		x		x	x			x	x	
American Computer Service	x	x	x						x	x	
Applied Logic	x		x	x	x	x				x	
Avco Computer Services	x						x		x		x
Axicom	x	x				x			x	x	
Basic Timesharing					x		x				x
Beloit	x		x			x	x	x	x		x
Beverly Bank			x			x				x	
Boeing Computer Services		x		x	x	x			x	x	
Bowne Time Sharing	x		x				x		x	x	
Burlington Management Services		x				x			x	x	
Call-A-Computer	x	x	x		x	x				x	
Canadian GE						x		x			x
Central Computing				x		x				x	
Chi Corporation			x					x	x	x	
Community Computer	x					x				x	
Comp-Time					x	x					x
Computel System					x			x	x		x
The Computer Company	x	x	x		x	x		x	x	x	
Computer Complex	x	x	x	x	x	x				x	
Computer Concepts	x	x				x				x	
Computer Dynamics	x					x				x	
Computer Innovations			x			x			x	x	
Computer Network	x	x	x			x		x	x	x	
Computer Power Unlimited	x		x	x	x	x	x		x		x
Computer Sciences Canada						x		x	x		x
Computer Sciences	x	x	x	x	x	x			x	x	
Computer Sharing Services				x		x		x		x	
Computer Task Group	x		x	x	x	x			x	x	
Comp/Utility	x					x	x	x	x	x	
Compu-Time		x				x				x	
Computone Systems		x					x			x	
Comserv	x					x	x	x	x	x	
Com-Share	x	x	x	x	x	x				x	
Com-Share (Canada)						x		x	x	x	
Concap Computing Systems	x	x	x	x	x		x				x
Consolidated Computer Services						x				x	
Control Data	x	x	x	x	x	x		x	x	x	
Cyphernetics	x		x			x		x	x	x	
Dataline Systems						x		x	x	x	
Datalogics			x			x		x			x
Dedicated Computer Applications	x					x			x		x

Note:
(1) The last page of this section lists the states located in each area.

COMMERCIAL TIME SHARING SERVICE	LOCAL DIALING (1)					SERVICE CLASS				COVERAGE	
	NEW ENGLAND/ MIDDLE ATLANTIC	SOUTHEASTERN	MIDWESTERN	CENTRAL AND MOUNTAIN	FAR WEST	CONVERSATIONAL	DEDICATED	LOCAL	REMOTE	FULL REPORT	PARTIAL REPORT
Delta Time Sharing		x									x
Dialcom	x	x				x					x
Digitek							x			x	
Direct Access Computing			x			x			x	x	
Diversified Computer Applications					x	x		x	x	x	
E.P.G. Computer Services									x		
First Data	x					x		x	x	x	
GTE Information Systems	x	x	x			x	x	x	x		x
General Electric	x	x	x	x	x	x				x	
Genesee Computer Center	x					x		x	x		x
Grumman Data Systems	x					x	x	x	x		x
Hobbs Associates					x	x					x
Honeywell	x	x	x	x	x	x			x	x	
IBM Canada						x					x
ITT Data Services	x		x	x	x	x				x	
Interactive Data	x		x		x	x	x	x	x	x	
Interactive Sciences	x					x	x	x			x
International Timesharing	x		x		x	x			x	x	
Kaman Sciences				x							x
Leasco Response	x	x	x	x		x			x	x	
Macro Computer Consultants											x
MERC	x					x			x	x	
Management Information Services							x				x
Management Systems				x			x				x
Mark/Ops	x					x			x	x	
Matrix	x	x	x	x	x	x		x	x	x	
McDonnell Douglas	x			x	x	x			x	x	
Medical Information Technology	x		x								x
MegaSystems	x					x		x	x	x	
Merlin Systems	x					x		x			x
MetriData Computing		x	x			x			x	x	
Multicomp	x					x				x	
Multiple Access GCC						x		x	x	x	
National CSS	x				x	x			x	x	
On-Line Systems	x	x	x	x		x				x	
Philco-Ford	x		x			x			x	x	
Piedmont Call-A-Computer		x				x				x	
Pittsburgh National Bank						x			x		x
PolyCom Systems						x				x	
Princeton T/S Services	x					x		x	x	x	
Programs and Analysis	x		x			x			x	x	
Proprietary Computer Systems	x	x	x		x	x		x	x	x	
Pryor Computer	x		x								x
RAIR					x	x					x
Rapidata	x				x	x			x	x	

Note:
(1) The last page of this section lists the states located in each area.

COMMERCIAL TIME SHARING SERVICE	LOCAL DIALING (1)					SERVICE CLASS				COVERAGE	
	NEW ENGLAND/ MIDDLE ATLANTIC	SOUTHEASTERN	MIDWESTERN	CENTRAL AND MOUNTAIN	FAR WEST	CONVERSATIONAL	DEDICATED	LOCAL	REMOTE	FULL REPORT	PARTIAL REPORT
Realtime Systems	x					x			x	x	
Remote Computing	x				x	x			x	x	
Rydercom	x	x	x	x	x		x				x
SCL Systems						x		x	x		x
SMA						x		x	x		x
Scientific Timesharing	x			x	x	x				x	
Sci-Tek Computer Center	x							x	x		x
The Service Bureau	x	x	x	x	x	x				x	
Setak Computer Services						x		x	x	x	
I. P. Sharp Associates	x			x	x	x				x	
Stat:Com			x					x	x	x	
Structural Dynamics Research											x
System Development		x			x		x				x
Systems Analysis		x				x				x	x
Systems Dimensions	x							x	x	x	
TRW	x	x							x		x
Technical Advisors	x	x	x	x	x		x			x	
Tel-A-Data		x					x			x	
Telcomp	x					x				x	
Telstat Systems	x					x	x	x	x		x
Time Share	x					x				x	
Time Sharing Resources	x	x	x			x			x	x	
Tracor Computing				x					x	x	
Transdata				x	x	x		x	x	x	
TransNet	x					x		x	x	x	
TRAVCOM	x		x				x				x
Tymshare	x	x	x	x	x	x			x	x	x
United Computing Systems	x	x	x	x	x	x		x	x	x	
University Computing Company	x	x	x	x	x	x			x	x	
USS Engineers and Consultants	x		x			x			x		x
Venture Computer Systems			x				x		x		x
Wabash Computer						x	x			x	
Westinghouse Tele-Computer Sys	x	x	x						x	x	
World Wide Time Sharing							x	x		x	

Note:
(1) The last page of this section lists the states located in each area.

State	Area
Alabama	Southeastern
Arizona	Far West
Arkansas	Central & Mountain
California	Far West
Colorado	Central & Mountain
Connecticut	New England
Delaware	Middle Atlantic
District of Columbia	Middle Atlantic
Florida	Southeastern
Georgia	Southeastern
Idaho	Central & Mountain
Illinois	Midwestern
Indiana	Midwestern
Iowa	Central & Mountain
Kansas	Central & Mountain
Kentucky	Southeastern
Louisiana	Southeastern
Maine	New England
Maryland	Middle Atlantic
Massachusetts	New England
Michigan	Midwestern
Minnesota	Midwestern
Mississippi	Southeastern
Missouri	Central & Mountain
Montana	Central & Mountain

State	Area
Nebraska	Central & Mountain
Nevada	Far West
New Hampshire	New England
New Jersey	Middle Atlantic
New Mexico	Far West
New York	Middle Atlantic
North Carolina	Southeastern
North Dakota	Central & Mountain
Ohio	Midwestern
Oklahoma	Central & Mountain
Oregon	Far West
Pennsylvania	Middle Atlantic
Rhode Island	New England
South Carolina	Southeastern
South Dakota	Central & Mountain
Tennessee	Southeastern
Texas	Central & Mountain
Utah	Central & Mountain
Vermont	New England
Virginia	Southeastern
Washington	Far West
West Virginia	Southeastern
Wisconsin	Midwestern
Wyoming	Central & Mountain

LOCAL DIALING AREAS

NEW ENGLAND — MIDDLE ATLANTIC

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
NEW ENGLAND																				
Connecticut (203)		•			•															
Maine (207)					•															
Massachusetts																				
West (413)		•			•			•												
East (617)		•	•	•	•	•	•			•			•		•					
New Hampshire (603)		•			•			•												
Rhode Island (401)		•			•															
Vermont (802)		•			•			•												
MIDDLE ATLANTIC																				
Delaware (302)		•			•	•		•										•		
Maryland (301)					•			•							•					
New Jersey																				
North (201)		•		•	•	•		•										•		
South (609)		•	•			•		•										•		
New York																				
New York City (212)		•	•	•	•	•		•		•		•	•		•					
North Central (315)					•			•												
Long Island (516)					•															
East (518)					•			•												
South Central (607)					•			•												
West (716)					•	•		•												
South (914)					•															
Pennsylvania																				
Philadelphia (215)		•	•	•	•	•		•				•	•		•			•		
Pittsburgh (412)		•			•			•												
Northeast (717)		•			•			•												
Central (814)		•			•			•												
Washington, D.C. (202)			•	•	•	•		•		•		•	•		•					

NEW ENGLAND – MIDDLE ATLANTIC

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
NEW ENGLAND																				
Connecticut (203)		•							•							•				•
Maine (207)		•																		•
Massachusetts																				
West (413)		•																		•
East (617)	•	•		•					•		•	•				•		•		•
New Hampshire (603)		•																		•
Rhode Island (401)		•																		•
Vermont (802)		•																		•
MIDDLE ATLANTIC																				
Delaware (302)		•	•			•					•					•				•
Maryland (301)		•	•			•			•		•					•				•
New Jersey																				
North (201)		•							•		•					•				•
South (609)	•	•									•					•				•
New York																				
New York City (212)	•	•				•	•		•		•				•	•		•		•
North Central (315)		•							•											•
Long Island (516)		•							•							•				•
East (518)		•																		•
South Central (607)		•																		•
West (716)		•							•		•					•				•
South (914)		•																		•
Pennsylvania																				
Philadelphia (215)	•	•				•			•		•				•	•		•		•
Pittsburgh (412)		•							•		•					•		•		•
Northeast (717)		•														•				•
Central (814)		•														•				•
Washington, D.C. (202)	•	•	•			•	•				•									•

NEW ENGLAND – MIDDLE ATLANTIC

COMMERCIAL TIME SHARING SERVICE / LOCAL DIALING AREA	The Cybernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-Sharing Corp
NEW ENGLAND																				
Connecticut (203)						•					•	•		•				•		
Maine (207)												•								
Massachusetts																				
West (413)											•	•								
East (617)										•	•	•	•	•		•			•	
New Hampshire (603)											•	•		•						
Rhode Island (401)						•					•	•		•						
Vermont (802)											•	•		•						
MIDDLE ATLANTIC																				
Delaware (302)						•					•	•		•						
Maryland (301)						•					•	•								
New Jersey																				
North (201)				•		•					•	•		•						
South (609)				•		•					•	•		•						
New York																				
New York City (212)				•		•				•	•	•		•		•	•	•	•	•
North Central (315)						•						•	•							
Long Island (516)				•		•					•	•		•						
East (518)						•						•								
South Central (607)						•						•								
West (716)						•						•	•							
South (914)						•					•	•								
Pennsylvania																				
Philadelphia (215)						•						•	•	•		•		•		
Pittsburgh (412)	•					•						•		•			•	•	•	
Northeast (717)						•						•		•						
Central (814)						•						•		•						
Washington, D.C. (202)						•				•	•	•	•			•	•			

NEW ENGLAND – MIDDLE ATLANTIC

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Leasco Response	MERC	Management Information Services	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
NEW ENGLAND																				
Connecticut (203)							•	•						•			•			
Maine (207)								•		•										
Massachusetts																				
West (413)								•												
East (617)			•				•	•		•				•			•			
New Hampshire (603)								•												
Rhode Island (401)							•	•						•						
Vermont (802)								•												
MIDDLE ATLANTIC																				
Delaware (302)								•			•									
Maryland (301)			•					•										•		
New Jersey																				
North (201)			•					•			•						•			
South (609)								•									•			
New York																				
New York City (212)			•					•	•	•	•			•			•	•		
North Central (315)								•												
Long Island (516)			•				•	•				•								
East (518)								•												
South Central (607)								•												
West (716)								•									•	•		
South (914)								•						•						
Pennsylvania																				
Philadelphia (215)			•	•			•	•			•						•	•	•	
Pittsburgh (412)			•					•		•								•		
Northeast (717)			•	•				•			•									
Central (814)				•				•												
Washington, D.C. (202)			•					•	•	•				•					•	

NEW ENGLAND — MIDDLE ATLANTIC

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing Services	Programs & Analysis	Proprietary Computer Systems	Pryor-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	I. P. Sharp Associates	Stat:Com	System Development Corp	Systems Analysis	Systems Dimensions
NEW ENGLAND																				
Connecticut (203)		•					•			•		•		•						
Maine (207)																				
Massachusetts																				
West (413)																				
East (617)			•				•							•						•
New Hampshire (603)																				
Rhode Island (401)			•											•						
Vermont (802)																				
MIDDLE ATLANTIC																				
Delaware (302)		•												•						
Maryland (301)		•												•						
New Jersey																				
North (201)		•					•			•				•						
South (609)		•		•			•			•				•						
New York																				
New York City (212)		•		•			•	•				•	•	•		•				•
North Central (315)																•				
Long Island (516)		•					•													
East (518)					•															
South Central (607)																				
West (716)														•		•				
South (914)		•										•								
Pennsylvania																				
Philadelphia (215)		•		•			•					•	•	•		•				
Pittsburgh (412)														•						
Northeast (717)		•												•						
Central (814)																				
Washington, D.C. (202)		•		•					•			•	•	•		•				

NEW ENGLAND — MIDDLE ATLANTIC

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors	Tel-A-Data	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
NEW ENGLAND																				
Connecticut (203)		•				•	•				•	•		•						
Maine (207)		•										•								
Massachusetts													•							
West (413)		•				•						•		•						
East (617)		•		•		•	•					•	•	•			•			
New Hampshire (603)		•				•						•		•						
Rhode Island (401)		•									•	•		•						
Vermont (802)		•										•		•						
MIDDLE ATLANTIC																				
Delaware (302)		•										•	•	•						
Maryland (301)	•	•										•		•			•			
New Jersey																				
North (201)		•		•		•				•		•	•	•						
South (609)		•								•		•								
New York																				
New York City (212)		•		•	•		•			•		•	•	•			•			
North Central (315)		•										•		•			•			
Long Island (516)		•										•		•						
East (518)		•										•		•						
South Central (607)		•										•		•						
West (716)		•										•		•			•			
South (914)		•										•	•	•						
Pennsylvania																				
Philadelphia (215)		•					•				•	•	•	•			•			
Pittsburgh (412)		•										•	•	•			•			
Northeast (717)		•										•		•						
Central (814)		•										•		•						
Washington, D.C. (202)	•	•		•								•		•			•			

SOUTHEASTERN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
SOUTHEASTERN																				
Alabama (205)															•					
Florida																				
Southeast (305)			•									•			•					
Southwest (813)		•													•					
North (904)																				
Georgia																				
North (404)					•										•					
South (912)					•															
Kentucky																				
West (502)	•				•															
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Virginia (703)			•		•			•							•					
West Virginia (304)					•			•												

SOUTHEASTERN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
SOUTHEASTERN																				
Alabama (205)		•											•							•
Florida																				
Southeast (305)	•	•											•							•
Southwest (813)		•											•							•
North (904)		•											•							•
Georgia																				
North (404)		•							•				•	•						•
South (912)		•																		•
Kentucky																				
West (502)		•											•			•				•
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Louisiana																				
West (318)		•																		•
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West (704)		•											•							•
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West Virginia (304)		•	•																	•

SOUTHEASTERN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	The Cyphernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
SOUTHEASTERN																				
Alabama (205)												•								
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Southeast (305)												•								
Southwest (813)											•	•								
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West (901)												•								
Virginia (703)						•						•								
West Virginia (304)												•								

SOUTHEASTERN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Leasco Response	MERC	Management Information Services	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
SOUTHEASTERN																				
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SOUTHEASTERN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing	Programs & Analysis	Proprietary Computer Systems	Pryor-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	I. P. Sharp Associates	Stat-Com	System Development Corp	Systems Analysis	Systems Dimensions
SOUTHEASTERN																				
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Virginia (703)				•														•		
West Virginia (304)																				

SOUTHEASTERN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors	Tel-A-Data	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
SOUTHEASTERN																				
Alabama (205)		•										•	•	•						
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Virginia (703)	•	•										•	•	•			•			
West Virginia (304)		•										•								

MIDWESTERN

COMMERCIAL TIME SHARING SERVICE / LOCAL DIALING AREA	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
MIDWESTERN																				
Illinois																				
Midcentral (217)																				
Northwest (309)																				
Chicago (312)	•	•		•		•				•	•		•		•					
South (618)															•					
North Central (815)																				
Indiana																				
North (219)					•															
Central (317)	•				•	•									•					
South (812)					•															
Michigan																				
Detroit (313)	•				•															
Midcentral (517)	•				•															
West (616)	•				•										•					
Upper Peninsula (906)	•				•															
Minnesota																				
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Northeast (216)	•				•												•			
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Southeast (614)	•				•															
Wisconsin																				
Southeast (414)																				
Southwest (608)										•										
North (715)																				

MIDWESTERN

COMMERCIAL TIME SHARING SERVICE / LOCAL DIALING AREA	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
MIDWESTERN																				
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Midcentral (217)		•																		•
Northwest (309)		•							•							•				•
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MIDWESTERN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	The Cyphernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
MIDWESTERN																				
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MIDWESTERN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Leasco Response	MERC	Management Information Services	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
MIDWESTERN																				
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MIDWESTERN

COMMERCIAL TIME SHARING SERVICE / LOCAL DIALING AREA	PolyCom Systems	Princeton Time Sharing Services	Programs & Analysis	Proprietary Computer Systems	Pryor-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	I. P. Sharp Associates	Stat-Com	System Development Corp	Systems Analysis	Systems Dimensions
MIDWESTERN																				
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Southwest (608)																				
North (715)																				

MIDWESTERN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors	Tel-A-Data	Telecomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
MIDWESTERN																				
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Midcentral (217)		•										•		•						
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CENTRAL AND MOUNTAIN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
CENTRAL AND MOUNTAIN																				
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Utah (801)						•														
Wyoming (307)																				

CENTRAL AND MOUNTAIN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
CENTRAL AND MOUNTAIN																				
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CENTRAL AND MOUNTAIN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	The Cyphernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
CENTRAL AND MOUNTAIN																				
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CENTRAL AND MOUNTAIN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Lenasco Response	MERC	Management Information Services	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
CENTRAL AND MOUNTAIN																				
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CENTRAL AND MOUNTAIN

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing Services	Programs & Analysis	Proprietary Computer Systems	Pryor-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	I. P. Sharp Associates	Stat-Com	System Development Corp	Systems Analysis	Systems Dimensions
CENTRAL AND MOUNTAIN																				
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CENTRAL AND MOUNTAIN

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors	Tel-A-Data	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
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West (308)		•										•		•						
East (402)		•										•		•						
North Dakota (701)		•										•								
Oklahoma													•							
West (405)		•										•	•							
Northeast (918)		•										•	•	•						
South Dakota (605)		•										•		•						
Texas																				
Northeast (214)		•										•	•	•						
South (512)		•						•				•	•							
Southeast (713)		•										•	•	•						
Northwest (806)		•										•								
Midnorth (817)		•										•	•							
West (915)		•							•			•	•							
Utah (801)		•							•			•		•						
Wyoming (307)		•												•						

FAR WEST

COMMERCIAL TIME SHARING SERVICE / LOCAL DIALING AREA	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
FAR WEST																				
Arizona (602)						•									•					
California																				
Central (209)						•														
Los Angeles (213)				•		•									•					
Midwest (408)						•			•											
San Francisco (415)				•		•			•											•
Northwest (707)						•														
Southeast (714)				•		•													•	
Southwest (805)						•									•					
Northeast (916)						•														
Nevada (702)						•														
New Mexico (505)																				
Oregon (503)				•		•														
Washington																				
West (206)				•								•								
East (509)																				

FAR WEST

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
FAR WEST																				
Arizona (602)		•									•									•
California																				
Central (209)		•							•		•									•
Los Angeles (213)	•	•					•		•		•					•		•		•
Midwest (408)		•									•									•
San Francisco (415)	•	•							•		•					•		•		•
Northwest (707)		•									•									•
Southeast (714)	•	•							•		•									•
Southwest (805)		•									•					•				•
Northeast (916)		•									•							•		•
Nevada (702)		•									•									•
New Mexico (505)		•																		•
Oregon (503)		•									•							•		
Washington																				•
West (206)		•																•		•
East (509)		•																		

FAR WEST

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	The Cyphernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
FAR WEST																				
Arizona (602)												•								
California																				
Central (209)												•								
Los Angeles (213)												•				•	•	•		•
Midwest (408)												•								
San Francisco (415)									•			•				•		•		•
Northwest (707)																				
Southeast (714)												•			•					
Southwest (805)												•								
Northeast (916)												•								
Nevada (702)												•								
New Mexico (505)												•								
Oregon (503)												•								
Washington																				
West (206)												•								
East (509)												•								

FAR WEST

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Leasco Response	MERC	Management Information Services	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
FAR WEST																				
Arizona (602)								•									•			
California																				
Central (209)								•												
Los Angeles (213)								•	•								•			
Midwest (408)								•									•			
San Francisco (415)								•									•			
Northwest (707)								•												
Southeast (714)								•												
Southwest (805)								•												
Northeast (916)								•												
Nevada (702)								•												
New Mexico (505)								•												
Oregon (503)								•												
Washington																				
West (206)								•												
East (509)								•												

FAR WEST

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing Services	Programs & Analysis	Proprietary Computer Systems	Pryor-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	I. P. Sharp Associates	Stat-Com	System Development Corp	Systems Analysis	Systems Dimensions
FAR WEST																				
Arizona (602)										•										
California																				
Central (209)																				
Los Angeles (213)				•					•	•		•		•		•		•		
Midwest (408)						•								•						
San Francisco (415)				•		•	•		•	•		•		•		•				
Northwest (707)																				
Southeast (714)				•					•			•		•						
Southwest (805)																				
Northeast (916)									•											
Nevada (702)																				
New Mexico (505)																				
Oregon (503)										•										
Washington																				
West (206)														•						
East (509)																				

FAR WEST

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors	Tel-A-Data	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
FAR WEST																				
Arizona (602)		•							•			•	•			•				
California																				
Central (209)		•										•								
Los Angeles (213)		•										•	•	•						
Midwest (408)		•										•								
San Francisco (415)		•										•	•	•						
Northwest (707)		•										•								
Southeast (714)		•										•	•							
Southwest (805)		•										•	•							
Northeast (916)		•										•								
Nevada (702)		•							•			•								
New Mexico (505)		•										•	•	•						
Oregon (503)		•										•	•							
Washington																				
West (206)		•										•								
East (509)		•										•								

CANADA

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
CANADA																				
Alberta (403)																				
British Columbia (604)												•								
Manitoba (204)																				
New Brunswick (506)																				
Newfoundland (709)																				
Nova Scotia (902)																				
Ontario																				
Toronto (416)																				•
London (519)																				
Ottawa (613)																				•
Northeast (705)																				
West (807)																				
Prince Edward Is. (902)																				
Quebec																				
Quebec City (418)																				
Montreal (514)																				•
North (819)																				
Saskatchewan (306)																				

CANADA

LOCAL DIALING AREA \ COMMERCIAL TIME SHARING SERVICE	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
CANADA																				
Alberta (403)								•											•	
British Columbia (604)								•												
Manitoba (204)								•												
New Brunswick (506)																				
Newfoundland (709)																				
Nova Scotia (902)																				
Ontario																				
Toronto (416)								•								•	•		•	
London (519)																•	•		•	
Ottawa (613)																•	•		•	
Northeast (705)																				
West (807)																				
Prince Edward Is. (902)																			•	
Quebec																				
Quebec City (418)																				
Montreal (514)								•								•	•		•	
North (819)																				
Saskatchewan (306)																				

CANADA

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	The Cyphernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
CANADA																				
Alberta (403)																				
British Columbia (604)																				
Manitoba (204)																				
New Brunswick (506)																				
Newfoundland (709)																				
Nova Scotia (902)																				
Ontario																				
Toronto (416)		•											•							
London (519)																				
Ottawa (613)		•																		
Northeast (705)																				
West (807)																				
Prince Edward Is. (902)																				
Quebec																				
Quebec City (418)																				
Montreal (514)		•																		
North (819)																				
Saskatchewan (306)																				

CANADA

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Lenseo Response	MERC	Management Information Services	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
CANADA																				
Alberta (403)																				
British Columbia (604)																				
Manitoba (204)																				
New Brunswick (506)																				
Newfoundland (709)																				
Nova Scotia (902)																				
Ontario																				
Toronto (416)															•		•			
London (519)																				
Ottawa (613)															•					
Northeast (705)																				
West (807)																				
Prince Edward Is. (902)																				
Quebec																				
Quebec City (418)																				
Montreal (514)															•		•			
North (819)																				
Saskatchewan (306)																				

CANADA

LOCAL DIALING AREA / COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing Services	Programs & Analysis	Proprietary Computer Systems	Pryor-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	I. P. Sharp Associates	Stat:Com	System Development Corp	Systems Analysis	Systems Dimensions
CANADA																				
Alberta (403)																				
British Columbia (604)																				
Manitoba (204)																				
New Brunswick (506)																				
Newfoundland (709)																				
Nova Scotia (902)																				
Ontario																				
Toronto (416)	•														•	•				
London (519)																				
Ottawa (613)																•				•
Northeast (705)																				
West (807)																				
Prince Edward Is. (902)																				
Quebec																				
Quebec City (418)																				
Montreal (514)											•					•				
North (819)																				
Saskatchewan (306)																				

CANADA

COMMERCIAL TIME SHARING SERVICE / LOCAL DIALING AREA	TRW	Technical Advisors	Tel-A-Data	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
CANADA																				
Alberta (403)												•								
British Columbia (604)												•								
Manitoba (204)												•								
New Brunswick (506)												•								
Newfoundland (709)												•								
Nova Scotia (902)												•								
Ontario																				
Toronto (416)												•								
London (519)												•								
Ottawa (613)												•								
Northeast (705)												•								
West (807)												•								
Prince Edward Is. (902)												•								
Quebec																				
Quebec City (418)												•								
Montreal (514)												•								
North (819)												•								
Saskatchewan (306)												•								

LANGUAGE OFFERINGS

LANGUAGE OFFERINGS \ COMMERCIAL TIME SHARING SERVICE	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd
AID/JOSS						•														
ALGOL	•				•				•		•				•		•		•	•
APL	•	•	•																	
ASSEMBLY	•		•	•		•	•	•	•	•		•	•	•			•			•
BASIC	•				•	•			•		•	•		•	•	•	•	•	•	
COBOL	•		•	•	•	•	•	•		•		•	•	•		•	•		•	•
FORTRAN	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•
JOVIAL					•															
LISP					•	•		•												
PL/1	•		•	•			•			•		•	•							•
REPORT GENERATOR			•	•			•						•	•						•
SIMULATION						•	•	•									•			
SNOBOL					•	•		•								•				

LANGUAGE OFFERINGS / COMMERCIAL TIME SHARING SERVICE	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems (1)	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems (1)	Consolidated Computer Services Ltd	Control Data Corp
AID/JOSS				•				•			•	•								
ALGOL			•					•							•					•
APL	•				•										•					
ASSEMBLY	•	•		•		•	•		•		•	•			•	•	•			•
BASIC		•	•	•			•	•	•	•	•	•	•		•	•	•		•	•
COBOL	•			•		•	•	•	•		•				•	•	•			•
FORTRAN	•	•	•	•		•	•	•	•	•	•	•	•		•	•	•			•
JOVIAL																				
LISP				•							•									
PL/1	•						•													
REPORT GENERATOR	•					•														•
SIMULATION		•		•		•					•				•	•	•			•
SNOBOL		•		•		•					•				•	•	•			

(1) This is a dedicated service; all programming is done by the time sharing vendor.

LANGUAGE OFFERINGS \ COMMERCIAL TIME SHARING SERVICE	The Cybernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek(1)	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genosec Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
AID/JOSS		•								•									•	
ALGOL								•				•	•					•	•	
APL											•							•		
ASSEMBLY	•	•				•			•	•	•		•	•			•	•		•
BASIC	•	•	•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•
COBOL	•	•		•	•	•		•	•	•	•		•	•			•	•	•	
FORTRAN	•	•	•	•	•	•		•	•	•	•	•	•	•		•	•	•	•	•
JOVIAL																				
LISP		•											•							
PL/1											•			•				•		
REPORT GENERATOR									•				•	•						
SIMULATION													•	•		•	•	•		•
SNOBOL		•											•					•		

(1) This is a dedicated service; all programming is done by the time sharing vendor.

LANGUAGE OFFERINGS \ COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp (1)	Leasco Response	MERC	Management Information Services (1)	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology (1)	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR (1)	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
AID/JOSS																		•		
ALGOL							•	•				•					•		•	•
APL																				
ASSEMBLY	•					•			•		•						•	•		
BASIC			•	•		•	•	•	•		•	•	•	•	•		•		•	•
COBOL				•		•	•	•	•			•			•		•		•	
FORTRAN	•		•	•		•		•	•		•	•	•	•	•		•	•	•	•
JOVIAL								•												
LISP								•										•		
PL/1			•												•		•			
REPORT GENERATOR														•						
SIMULATION														•	•		•			
SNOBOL								•									•			

(1) This is a dedicated service; all programming is done by the time sharing vendor.

LANGUAGE OFFERINGS \ COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing	Programs & Analysis	Proprietary Computer Systems	PRYOR-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom (1)	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Setak Computer Services	L. P. Sharp Associates	Stat-Com	System Development Corp	Systems Analysis	Systems Dimensions
AID/JOSS																				
ALGOL		•						•	•						•				•	•
APL				•								•				•				
ASSEMBLY		•									•						•			•
BASIC	•		•		•	•	•	•	•		•			•	•				•	
COBOL		•						•	•		•		•		•		•	•		•
FORTRAN	•	•	•		•		•	•	•		•		•	•	•		•	•	•	•
JOVIAL																		•		
LISP																				
PL/1		•												•			•	•		•
REPORT GENERATOR		•									•						•			•
SIMULATION		•						•												•
SNOBOL		•																		

(1) This is a dedicated service; all programming is done by the time sharing vendor.

LANGUAGE OFFERINGS \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors (1)	Tel-A-Data (1)	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM (1)	Tymshare	United Computing Systems	University Computing	Venture Computer Systems	Wabash Computer Corp (1)	Westinghouse Tele-Computer Systems	Worldwide Time Sharing (1)
AID/JOSS																		
ALGOL	•												•	•				
APL							•			•								
ASSEMBLY	•						•		•	•		•	•		•		•	
BASIC				•	•	•	•		•	•		•	•	•				
COBOL	•				•		•	•	•	•			•	•			•	
FORTRAN	•			•	•		•	•	•	•		•	•	•			•	
JOVIAL																		
LISP																		
PL/1	•						•										•	
REPORT GENERATOR	•						•								•			
SIMULATION												•	•	•				
SNOBOL																		

(1) This is a dedicated service; all programming is done by the time sharing vendor.

COMPUTER SYSTEM SUPPORT

COMMERCIAL TIME SHARING SERVICE / COMPUTER SYSTEM SUPPORT	ACTS	APL General	APL Services	Allen-Babcock Computing	American Computer Service	Applied Logic	AVCO Computer Services	Axicom	Basic Timesharing (1)	Beloit Corp	Beverly Bank	Boeing Computer Services	Bowne Time Sharing	Burlington Management Services	Call-A-Computer	Central Computing	Chi Corp	Community Computer	Comp-Time Corp	Computel System Ltd.
Burroughs B 2500/3500																				
Burroughs B 5500/6500																				
Burroughs B 5700/6700																			•	
CDC 3100/3300/3500																				
CDC 3400/3600/3800																				
CDC 6000 Series																				
DEC PDP-8 Family																				
DEC PDP-10						•										•				
Hewlett-Packard 2100 Series																		•		
Honeywell H1640 Series																				
Honeywell/GE 200 Series	•										•				•	•				
Honeywell/GE 400 Series	•																			
Honeywell/GE 600 Series					•															
IBM 360/30																				
IBM 360/40, 360/44													•							
IBM 360/50	•	•		•						•										
IBM 360/65, 360/67												•								•
IBM 360/75							•													
IBM 360/85																				
IBM 370/155			•																	
RCA Spectra 70/46														•						
Univac 494																				
Univac 1108								•									•			•
Varian Data 620 Series																				
XDS 940																				
XDS Sigma 5																				
XDS Sigma 7																				

(1) Uses the Basic Timesharing Model 3000 computer system

COMMERCIAL TIME SHARING SERVICE / COMPUTER SYSTEM SUPPORT	The Computer Company	Computer Complex	Computer Concepts	Computer Dynamics	Computer Innovations	Computer Network	Computer Power Unlimited	Computer Sciences Canada Ltd	Computer Sciences Corp	Computer Sharing Services	Computer Task Group	Comp/Utility	Compu-Time	Computone Systems	Comserv	Com-Share	Com-Share (Canada)	Concap Computing Systems	Consolidated Computer Services Ltd	Control Data Corp
Burroughs B 2500/3500																				
Burroughs B 5500/6500																				
Burroughs B 5700/6700																				
CDC 3100/3300/3500																				•
CDC 3400/3600/3800																				
CDC 6000 Series							•													•
DEC PDP-8 Family																				
DEC PDP-10				•							•	•								
Hewlett-Packard 2100 Series																			•	
Honeywell H1640 Series																				
Honeywell/GE 200 Series			•																	
Honeywell/GE 400 Series										•			•							
Honeywell/GE 600 Series																				
IBM 360/30																				
IBM 360/40, 360/44														•						
IBM 360/50	•				•															
IBM 360/65, 360/67						•														
IBM 360/75																				
IBM 360/85							•													
IBM 370/155																				
RCA Spectra 70/46																				
Univac 494																				
Univac 1108								•	•											
Varian Data 620 Series																				
XDS 940		•														•	•	•		
XDS Sigma 5																				
XDS Sigma 7							•								•	•	•	•		

COMPUTER SYSTEM SUPPORT / COMMERCIAL TIME SHARING SERVICE	The Cyphernetics Corp	Dataline Systems Ltd	Datalogics	Dedicated Computer Applications	Delta Time Sharing	Dialcom	Digitek(1)	Direct Access Computing Corp	Diversified Computer Applications	First Data Corp	GTE Information Systems	General Electric	Genesee Computer Center	Grumman Data Systems	Hobbs Associates	Honeywell	ITT Data Services	Interactive Data Corp	Interactive Sciences	International Time-sharing Corp
Burroughs B 2500/3500									•											
Burroughs B 5500/6500								•												
Burroughs B 5700/6700																				
CDC 3100/3300/3500													•			•				•
CDC 3400/3600/3800																				
CDC 6000 Series													•	•		•				
DEC PDP-8 Family																				
DEC PDP-10	•	•		•						•										
Hewlett-Packard 2100 Series															•					
Honeywell H1640 Series						•										•				
Honeywell/GE 200 Series												•								
Honeywell/GE 400 Series																				
Honeywell/GE 600 Series												•								
IBM 360/30														•						
IBM 360/40, 360/44																				
IBM 360/50											•			•						
IBM 360/65, 360/67													•	•			•	•		
IBM 360/75													•	•						
IBM 360/85													•							
IBM 370/155														•						
RCA Spectra 70/46																				
Univac 494																				
Univac 1108													•							
Varian Data 620 Series																				
XDS 940													•							
XDS Sigma 5					•															
XDS Sigma 7			•																	

(1) Uses the Burroughs B 500 computer system

COMPUTER SYSTEM SUPPORT / COMMERCIAL TIME SHARING SERVICE	Kaman Sciences Corp	Keydata Corp	Leasco Response	MERC	Management Information Services(1)	Management Systems	Mark/Ops	The Matrix Corp	McDonnell Douglas Automation	Medical Information Technology (2)	MegaSystems	Merlin Systems Corp	MetriData Computing	Multicomp	Multiple Access GCC	NCR(3)	National CSS	On-Line Systems	Philco-Ford Corp	Piedmont C-A-C
Burroughs B 2500/3500																				
Burroughs B 5500/6500												•							•	
Burroughs B 5700/6700																				
CDC 3100/3300/3500															•					
CDC 3400/3600/3800														•						
CDC 6000 Series	•														•					
DEC PDP-8 Family																				
DEC PDP-10							•											•		
Hewlett-Packard 2100 Series			•																	
Honeywell H1640 Series																				
Honeywell/GE 200 Series							•													•
Honeywell/GE 400 Series									•				•							
Honeywell/GE 600 Series								•												
IBM 360/30																				
IBM 360/40, 360/44						•														
IBM 360/50																				
IBM 360/65, 360/67			•														•			
IBM 360/75																				
IBM 360/85																				
IBM 370/155																				
RCA Spectra 70/46				•																
Univac 494		•																		
Univac 1108																				
Varian Data 620 Series																				
XDS 940											•									
XDS Sigma 5																				
XDS Sigma 7									•											

(1) Uses the Honeywell 115/2 computer system
(2) Uses the DEC PDP-15 computer system
(3) Uses the NCR-315 and NCR Rod Memory Computer

COMPUTER SYSTEM SUPPORT / COMMERCIAL TIME SHARING SERVICE	PolyCom Systems Ltd	Princeton Time Sharing	Programs & Analysis	Proprietary Computer Systems	PRYOR-TIM	RAIR	Rapidata	Realtime Systems	Remote Computing Corp	Rydercom(1)	SMA	Scientific Time Sharing Corp	Sci-Tek Computer Center	Service Bureau Corp	Selak Computer Services	I. P. Sharp Associates	Stat:Com	System Development Corp	System Analysis	Systems Dimensions
Burroughs B 2500/3500																				
Burroughs B 5500/6500								•	•						•					
Burroughs B 5700/6700									•											
CDC 3100/3300/3500										•										
CDC 3400/3600/3800																				
CDC 6000 Series											•									
DEC PDP-8 Family																				
DEC PDP-10																				
Hewlett-Packard 2100 Series						•														
Honeywell H1640 Series																				
Honeywell/GE 200 Series																			•	
Honeywell/GE 400 Series	•		•		•		•													
Honeywell/GE 600 Series																				
IBM 360/30																				
IBM 360/40, 360/44																				
IBM 360/50		•		•								•		•		•				
IBM 360/65, 360/67																	•	•		
IBM 360/75																				
IBM 360/85																				•
IBM 370/155																				
RCA Spectra 70/46																				
Univac 494																				
Univac 1108													•							
Varian Data 620 Series																				
XDS 940																				
XDS Sigma 5																				
XDS Sigma 7																				

(1) Uses proprietary hardware, with the Burroughs B 3500 as backup

COMPUTER SYSTEM SUPPORT \ COMMERCIAL TIME SHARING SERVICE	TRW	Technical Advisors	Tel-A-Data(1)	Telcomp Corp	Telstat Systems	Time Share Corp	Time Sharing Resources	Tracor Computing Corp	Transdata Corp	TransNet Corp	TRAVCOM	Tymshare	United Computing Systems	University Computing	Venture Computer Systems(2)	Wabash Computer Corp	Westinghouse Tele-Computer Systems	Worldwide Time Sharing		
Burroughs B 2500/3500																				
Burroughs B 5500/6500																				
Burroughs B 5700/6700																				
CDC 3100/3300/3500																		•		
CDC 3400/3600/3800																				
CDC 6000 Series													•	•						
DEC PDP-8 Family				•						•										
DEC PDP-10				•																
Hewlett-Packard 2100 Series						•														
Honeywell H1640 Series																				
Honeywell/GE 200 Series																				
Honeywell/GE 400 Series										•										
Honeywell/GE 600 Series																				
IBM 360/30																				
IBM 360/40, 360/44											•					•				
IBM 360/50	•						•													
IBM 360/65, 360/67																				
IBM 360/75																	•			
IBM 360/85																				
IBM 370/155																				
RCA Spectra 70/46																				
Univac 494																				
Univac 1108								•						•						
Varian Data 620 Series		•																		
XDS 940												•								
XDS Sigma 5									•											
XDS Sigma 7					•					•										

(1) Uses the Burroughs B 500 computer system
(2) Uses the Remotshare 40 computer system

II. SPECIAL REPORTS

TIME SHARING SERVICES VERSUS IN-HOUSE COMPUTING

INTRODUCTION

Businessmen who are the objects of sales pitches by computer marketeers generally fall into two categories — those who have substantial experience with computers, and those who don't. Small businessmen, virtually without exception, fall in the latter group; typically they have had little exposure to computers and even less experience. However, this group is now being wooed by data processing salesmen who are pushing the small business computer and time sharing services as being the answer to the small businessman's data processing needs.

The businessman deciding whether to obtain an in-house computer installation or contract with a time sharing service should answer one vital question. Considering the nature and volume of his business, which approach costs less? In the following portion of this report, we discuss some of the important factors to consider in arriving at an answer.

HOW MUCH DATA PROCESSING DO YOU NEED?

Sometimes, a straightforward analysis of the cost/benefit tradeoffs argue against data processing. However, special circumstances may compel a businessman to incur the additional expense. The most common special circumstance relates to his competitors: If they are using data processing, then the benefits they may be deriving from timely and comprehensive data about their operations can provide a major competitive edge. The cash value of such data as sales trends, early identification of areas of rising or declining profitability, schedule slippage forecasts, etc., is difficult to assess. Thus an analysis of the costs of data processing versus alternative techniques rarely extends beyond the obvious accounting functions, with their clearly definable capital, direct labor, and overhead expenses. Yet, the decision to convert to EDP is almost invariably made solely on the basis of the volume of accounting-type operations, and then users typically find their machines standing in costly idleness unless a company-wide program of non-accounting applications has been instituted. Users of medium and large computers have learned this fact at great cost, and users of small computers should take that lesson to heart.

A good approach is to think of all the operational problems one has ever encountered and write out a few dozen sentences beginning with the conjecture "Suppose it were practical to ..." When imagination fails, ask a data processing salesman for assistance. A computer can often make practical types of data analysis that formerly were deemed hopelessly time-consuming and costly.

Even when an analysis of company needs clearly indicates the need for a data processing capability, it may be more economical to rent the necessary time on a per-hour basis than to lease a system or buy it outright. Many time sharing services are now available, the majority of which are increasing their attention to business-data processing.

Most time sharing service companies offer such generalized accounting software as payroll, accounts receivable, accounts payable, and general ledger. For interactive processing, a time sharing user need only lease an input/output terminal, such as a teletypewriter, for about $100 per month. Access to the computer is by standard telephone line, and the cost of an hour of computer time comes to about $15 plus the phone company's regular rates for that hour's hookup. Standard (and occasionally, special) software packages are supplied without charge. The user simply types out the designation of the desired program, enters his data, and awaits the printout, all of which can occur in just a few minutes.

For jobs requiring large blocks of data transfer between a remote terminal and computer, interactive time sharing can be wasteful. A keyboard is essentially a slow input/output device that has the effect of grossly underutilizing the phone-line hookup. Remote batch processing time sharing is a far more efficient mode of operation.

In batch mode, all the data is fed to the computer in one continuous burst, typically through a card reader whose data-transmission rate fully utilizes the phone line's available bandwidth. Batch is as natural a mode for the bulk data processing requirements of business operations, as interactive is for scientific applications.

If no standard program satisfies the needs of a potential user, the same time sharing company will generally develop suitable software — for a fee. In fact, such companies frequently offer contract programming services to businesses that have specialized software needs, yet hope to avoid the expense of hiring a programmer.

Most businesses that maintain a staff accountant also frequently use an in-house electronic accounting or billing machine. A simple accounting machine accepts data entered manually through an accounting keyboard, performs a few

simple calculations, and uses a carriage printer to hardcopy the results onto such forms as bills, payroll checks, etc. Successively more elaborate models may add a modest amount of core memory, alphanumeric keyboards, check digit capability, the ability to handle magnetic-striped ledger cards, and the ability to accept punched-card data input. Interestingly, the latter capabilities resemble those of some small business computers.

The overlap in price/performance between small business computers and electronic accounting machines is broad in all categories but one — master file access. That capability is therefore critical in deciding between an accounting machine or equivalent system and a small business computer. If no more than two master records (with roughly 80 characters each) need be referred to per second, an accounting machine is the sensible choice; beyond that rate, a small business computer or unit record (tab) equipment is desirable.

Unit record equipment processes punched cards with such devices as sorters, collators, reproducers, and calculators. Installations of unit record equipment are available at lease rates of between $500 and $2,000 per month, rates comparable to those for small business computers in the minimal-to-medium-performance categories. Furthermore, staff size and salaries are also comparable for both types of equipment. However, unit record equipment has a basic speed limitation; it cannot process more than 33 records per second, since that is the maximum rate at which card readers operate. In general, a business with several thousand stock items, doing on the order of 120 transactions a day, with each transaction involving an average of five different items, is approaching the processing limit of an accounting machine. Unit record equipment can manage roughly 15 to 20 times as many comparable transactions, but to handle a volume above that level, a computer is required.

COST COMPARISONS

A direct comparison can be made between projected expenditures using a small business computer and those incurred by going the service bureau or time sharing route. A service bureau user doesn't need a data processing staff. He simply submits his raw data, and the bureau does the rest. The user of time sharing, on the other hand, does his own keypunching or keyboard data entry and pays an operator as well, even when standard software meets his needs, and he incurs no programming costs.

To illustrate the difference, suppose a service bureau user is being billed $2,500 per month, and sets that limit, $30,000 per year, for data processing expenditures using a small business computer. That user will have to hire a keypunch or keyboard operator (unless the computer is a one-station, one-operator minicomputer) and a combination programmer/operator at direct labor charges of about $6,000 per year and $12,000 per year, respectively. This is exclusive of so-called "intangibles," which may add as much as an additional $6,000 per year. That totals $24,000 leaving $500 per month for the computer lease, a figure that accords well with the general experience of computer users, who say that direct salary costs for their data processing staffs typically total two-and-a-half to three times as much as the computer lease costs.

A time sharing user must employ a keypunch or keyboard operator and someone to run the operation. However, that person is not necessarily a programmer and may only spend three-fourths of his time at data processing. Assuming the same $6,000 per year direct labor cost for the keypunch operator, but only $10,000 for the person running the operation (and only $7,500 of that $10,000 is chargeable to that operation), the time sharing user is incurring $13,500 per year in direct labor costs, or about $18,000 per year including intangibles. If he is being billed $1,000 per month, his data processing expenditures total $30,000, the same as those of the service bureau user. To convert to a computer, he would have to upgrade his operation through a full-time programmer/operator, raising labor expenditures to the $24,000 level, the same costs that the former service bureau user would incur.

Admittedly, the value of intangibles will vary from one company to another, and one-third of direct labor is on the steep side. Further, it may be possible to use fewer, more flexibly trained people to staff the operation. However, it is unrealistic, in the case of an unsophisticated user, to imagine that anything more than 25% of the total data processing budget can be allocated for small business computer lease costs. The point at which a user of time sharing services begins to seriously consider converting to an in-house system appears to lie between 45 and 70 hours of computer use per month — that is when he is being billed approximately $675 to $1,050 a month for computer time.

FOLLOW THIS PROCEDURE

If you're a businessman who plans to convert from manual or electronic accounting methods,

but you know little about data processing, first take a year to educate yourself and the staff who will eventually be assigned to run the operation. Consider carefully the possible pitfalls that can develop even if you obtain a turnkey system. Problems sometimes arise that can best be solved by one's own staff, in terms of both on-the-spot timeliness and lower cost. This education need not precede the use of data processing; in fact most of it can be acquired through gradual "hands-on" practice.

As a starting point, for about 6 months, you can contract with a service outfit to do the company's data processing. Some understanding of what is involved will sink in, if only by osmosis, and will generate enough self-confidence to enable you either to hire an operator/programmer, or to have a staff member tackle a programming course.

The next step is to get some in-house practice with a time sharing system. This has a two-fold advantage over an early commitment to a small business computer. First it permits the user to acquire some basic skills in data processing. Second it provides a realistic test of the need for an in-house small business computer installation. If, after a reasonable startup and debugging period, the user finds that with the time sharing approach he consistently incurs costs for over 50 hours of computer-connect time each month, then he should seriously consider installing a small business computer. Conversely, if computer-connect time regularly (or even on an average) falls below 50 hours per month, it will generally prove less costly to continue with the time sharing system. Interestingly, an AUERBACH survey has disclosed that half of those companies currently using time sharing are fully satisfied with the results and plan no changes, while a further 25% indicate that conversion to a small business computer is only a possibility during the next 5 years.

HISTORY

From its beginning in 1959, time sharing has grown into a significant sector of the data processing industry. Time sharing services include interactive time sharing for problem solving, remote batch processing for business applications, and data entry/inquiry for integrated operations in different locations. Originally, most time sharing firms offered generalized data processing. Today more and more of them are specializing in marketing proprietary application packages and expert service in that area.

As computers become larger and faster, keeping a steady flow of work through them becomes a problem. One solution is to have several users employ the machine at a time. When this idea was presented at the UNESCO International Conference on Information Processing in 1959, it initiated the concept of time sharing: the simultaneous utilization of a large computer by a number of users at various remote locations.

Much of the original work on time sharing evolved at MIT. Technical papers on the subject were published in 1959 and 1960, and in 1961 the first experimental system, called the Compatible Time Sharing System (CTSS), was demonstrated on an IBM 709 at the MIT Computation Center. CTSS was expanded several times, and by 1963 CTSS II had been implemented on an IBM 7094 to provide concurrent access for up to 30 remote users.

At the same time, several other experimental systems were developed at various universities and research centers, including one designed at Bolt, Beranek and Newman for a DEC PDP-1 (1962), Rand Corporation's JOSS system running under JOHNNIAC (1963), and an IBM Q-32 system from the Development Corporation (1963).

Another system evolved as a cooperative venture between General Electric and Dartmouth College. In 1964, GE gave Dartmouth a GE-225 computer and a Datanet-30 Communications Processor to develop a time sharing system with National Science Foundation funding. The resultant system, which became operational in July 1964, featured the Basic programming language.

Commercial time sharing was introduced in 1963 when Adams Associates of Cambridge, Massachusetts, applied the time sharing concept to a commercial computer service by employing a PDP-4 system to process claims of Transitron stockholders.

IBM entered the commercial time sharing field in December 1964 with the QUIKTRAN system, running on an IBM 7040/7044 multiprocessing configuration. QUIKTRAN featured an interpretive Fortran-compatible programming language and gave customers an interactive capability for mathematical problem solving.

In 1965, Keydata Corporation — now an affiliate of Adams Associates — began operating a commercial time sharing service with a Univac 491 computer. This system still provides business data processing services to subscribers.

Also in 1965, GE marked its entry into commercial time sharing with operating centers in Phoenix and New York City. The Information Services Department (ISD), formed in 1966, has become one of the largest in the commercial time sharing field.

Since 1965, over 150 companies have entered the commercial time sharing business. They market their services primarily to:

- Scientists and engineers, who require fast response and interaction with the computer to solve analytical problems.
- Small and medium-size businesses, who need a computer but not badly enough to buy one.
- Educational institutions, who use time sharing for research and teaching.

TYPES OF TIME SHARING SERVICES

To these users, time sharing firms offer three principal types of service, singly or in various combinations. The three are interactive problem-solving, remote batch processing, and on-line data entry/inquiry.

Interactive Problem Solving

With interactive or conversational time sharing, the user inputs instructions or data through a terminal such as a teletypewriter or CRT display device, and gets an immediate response from the system. The user has full interaction with his job, so that he can create and change files and programs, interrupt and restart executions, and correct errors as they occur. Because input/output is relatively slow, programs are generally short and input data base size is usually small.

In interactive time sharing, the user can access the computer system at his convenience. The development of simplified programming and command languages lets even a data processing

novice use the computer effectively. Users can also manipulate and modify problem parameters at the time of program execution to get the optimum solution. Accordingly, interactive time sharing is particularly useful in programming since it can shorten program development and running time from several days to a few hours. It is also effective for analytical and simulation problems.

Remote Batch Processing

Users perform the same functions in remote batch processing as in on-site batch processing. Batches of coded input are sent to the central computer through a relatively expensive terminal such as a card reader/line printer combination or a small computer. Output is returned to the terminal or printed at the main computer site and mailed back to the user.

The service is used primarily for business applications. It serves programs requiring large input and output or complex processing and programs that do not hinge on immediate response.

On-Line Data Entry/Inquiry

In on-line data entry/inquiry, the computer serves as a data center for a particular application. Since the data files and all programs are kept on-line at the main computer site, they can be made available to a number of users at various locations. Each user can update or query the data base from his terminal. This service accommodates the user who wants to integrate operations in different locations — for instance, an airline reservation system.

THE TIME SHARING SYSTEM

While the various time sharing companies offer different types of service, all use the same basic system components: computer hardware, operating system, terminals, and communications facilities.

Computer Hardware

The time sharing computer performs control, processing, and communications functions. It usually has a fast internal cycle speed so that it can handle input from several users simultaneously. It also needs a large memory to buffer large quantities of input and output data. Although specific characteristics of individual computers vary, every major computer manufacturer sells at least one time sharing model.

In some systems, the central processor is assisted by a communications processor. Two configurations are possible. The most common is the dual-processor, single-access file type. With this arrangement, the communications processor supports the central processor by performing simple character editing and line management tasks.

The central processor is the controlling computer; all accesses to files are made through it. In the other configuration, a dual-processor dual-access file type, the communications processor is linked to the central processor through a mutually accessible disc file. The communications processor assumes certain central processor functions such as message translation and editing, and is the controlling computer in the configuration. In either case, the communications processor relieves the central computer of communications tasks, and thus permits more processing more quickly.

Since the time sharing user needs to have his program and data files available during processing, the computer must include auxiliary storage units. These are used primarily for on-line storage, scratch, and swapping purposes. In addition, the computer system usually includes various peripheral devices, e.g., magnetic tape handlers, card readers, card punches, printers, and digital plotters. They give the user faster or more versatile methods of input/output in batch mode operations.

Operating System

Each manufacturer provides an operating system for its time sharing computers. The time sharing company can use this software as is, enhance it, or develop its own. Operating systems are difficult to compare in effectiveness because the systems are under continuing development by the computer manufacturers and the time sharing companies, and because details of implementation are often considered proprietary information. However, some differences can be seen in two critical operating system functions, the way the system distributes processor control, I/O services, and other functions over a range of users (resource allocation) and the technique used to allocate storage to the programs residing in core (storage management).

Resource Allocation. Resource allocation is accomplished via a system of queues. Most time sharing operating systems attempt to achieve a balance between service-directed and external priority queue systems.

In a service-directed queue system, external requests enter the system through the same

queue and cycle through the system and its associated services. Each request is allotted a quantum of time, which varies from 50 milliseconds to 5 seconds depending on the operating system. If a request has not finished with the service when it completes its assigned quantum, it is again placed in the queue for that service and waits until other requests have completed their turns.

In an external priority or two-level queue system, jobs entering the system are tagged as high or low priority, and cycle through the system's services at two different rates according to priority.

Storage Management. Allocation of storage is available in four common schemes: available space, paging, upper/lower memory, and memory fence.

PDP-10 uses the available space scheme. Under it the operating system allocates programs to available space, beginning at the top of the executive or resident system and continuing until available memory is exhausted. New requests for storage space are made through the queue system. During the time when a program does not have control of the system, it may be transferred to the disc or DECtape to make room for another program.

XDS 940 offers the paging scheme wherein storage is allocated through a virtual memory system in which programs are segmented into pages that are called from and swapped out to a paging drum as required. This scheme enables fixed-length core segments to be assigned to the several user programs, thereby reducing the amount of unassignable memory that results under the available space scheme. While memory may be more completely allocated under paging, there are additional system overheads; e.g., small segments must be swapped more frequently and the segments in a program must be continuously linked. The advantage of this scheme is that it permits the use of extremely large programs regardless of the physical limit of the system memory space.

The upper/lower memory scheme is typified by the Honeywell/GE-265 and GE-240 systems, which divide user memory into two compartments. The operating system swaps user programs and compilers as in the available space scheme. Since only two assignable memory compartments are available to the users, memory management is simpler than in the paging scheme. Two user programs can reside in memory simultaneously, with control given to either program for a fixed segment of time. User programs requiring more than one compartment must be physically segmented by the user; program segments can be swapped to either of the compartments.

Burroughs B 5500 features the memory fence scheme, which segments user memory into a nonswap and a swap area. The nonswap area is fixed in size and permits no swapping of programs. Although the system's command and edit language processor is permanently loaded into this area, the remaining space can be used for batch-controlled jobs; however, the batched jobs cannot be swapped before the job is completed. The swap area receives and pages program segments much as in the paging scheme.

Other Software

Besides an operating system, time sharing software contains a set of programming and programming support languages that permit the user to communicate with the system. Over 30 different programming languages are available for interactive time sharing, but about 90% of all programs are written in Fortran or Basic. In addition to the actual programming languages, the time sharing software includes support languages for system control, on-line debugging, and text editing.

Terminals

Computer hardware and software form the nucleus of the time sharing system. To gain access, users at remote locations employ various types of terminal devices. In conversational time sharing, about 90% of the terminals used today are teletypewriters (automatic send/receive devices with paper tape punches and readers). These units are slow and noisy but are also low in cost and generally satisfactory in operation.

Communications Facilities

Communications facilities connect the remote terminals to the processing center. The transmission line is usually a normal telephone circuit operating at 1,200 baud, although with conditioning, the line may have a transmission rate as high as 4,800 baud. Many time sharing companies use the public dial-switched telephone network, where the user is charged on a per-call basis. An alternative is the leased line, which gives the user exclusive use of a communications line and at a flat rate.

To enable out-of-state users to access the computer without paying long-distance charges, time sharing companies often take advantage of

the Foreign Exchange (FX) service and Wide Area Telephone Service (WATS) offered by the Bell System.

- FX — provides a permanent leased connection between a subscriber (the time sharing company) and an exchange other than his local exchange. This facility allows calls to or from the point serviced by the "foreign" exchange to be made at the local message rate for that exchange. The FX service is advantageous when clients are grouped in a particular city.

- WATS — is a form of long distance service intended for customers who originate or receive a relatively large number of calls to or from widely scattered distant locations. The WATS customer gets an access line from his location to a telephone company central office, over which he can make as many calls as desired. All calls must be either incoming or outgoing, but not both. Six areas of WATS service are available. These range from Area 1, which usually includes the states bordering on the customer's point of origin, to Area 6, which includes all other 47 states in the continental United States.

When the number of locations to be connected is large, the time sharing service can use concentrators, or switching centers. The concentrator combines or multiplexes multiple messages from a number of lines for simultaneous transmission over a single high-capacity line. Another device, the multiplexer, can also pack messages for transmission over a single line; but it has no capability for decision making or other functions of the concentrator.

Sometimes all points in the network are connected to a single switching center. This arrangement eliminates the need to interconnect each pair of locations through individual communications lines, but maintains communications between any two points in the network. The time sharing user may also need modems or data sets to convert dc pulses into signals suitable for transmission.

THE TIME SHARING COMPANY

Since time sharing companies are service organizations, they support their systems to various degrees. Some companies have staffs of full-time customer support specialists; others offer technical support through sales representatives or programmers. Support may include program development, coding assistance, training, documentation, and library programs.

Another important duty of a time sharing company is provision of security, and most companies maintain a reasonable level of protection via a password or some form of user or terminal identification, or both, for system access. Other security methods employed are the use of dedicated lines, coding of terminals, and recording of individual system accesses. However, total security is almost impossible because there is no way to verify the network hardware completely, and the time sharing software is too complex for all security levels to be examined.

Time sharing companies have two basic network schemes. In one, service is based on one or more centrally located computers. This type of network is useful where several branches of the same company need access to a pool of common data. However, such a system may be vulnerable to breakdown and delays. In the second scheme, a large time sharing company or a group of affiliated companies will have small regional processing centers which are interconnected to provide backup.

Within these two schemes, there are four main types:

- Large, nationwide (or international) operations, supporting a wide range of time sharing services.

- Small firms, which offer essentially local service but may have affiliates who expand the network facilities or furnish backup.

- Franchises or marketing agents, who supply marketing or technical support for another company.

- Companies who market an application package or a service, riding piggyback on another company's computer or network facilities.

Naturally a prime factor in choosing a time sharing service is its cost. Companies who market custom-designed applications usually charge on a contract basis. For generalized services, charges depend on the amount of system use and generally include a one-time initiation fee, a monthly minimum, terminal connect time (usually quoted by the hour), and use of on-line storage. A company may also bill the customer for off-line storage, use of peripherals, and any other service it provides. The user must pay communications and terminal costs.

THE FUTURE OF TIME SHARING

Time sharing as an industry faces many changes in both technology and direction. Predictions include technical improvements in memory

size, processor design, programming languages, terminal capabilities, and communications facilities.

The area in which technological change is most needed and most difficult to achieve is communications. Present facilities are inadequate to support flexible terminals. For future growth, the time sharing industry needs high-speed, inexpensive communications facilities available nationwide. It would take at least 10 years, however, for a major redesign or upgrading of existing telephone equipment. Nevertheless, a significant expansion of present facilities is expected, with concurrent developments in satellite, microwave, and wideband two-way communications.

A change of direction is also taking place in the industry. Time sharing services were initially designed primarily for scientists and engineers, who wanted interactive computing. High costs and competitive pressure made this market unprofitable for most vendors. Consequently, more and more companies are turning to specialized business applications directed to a specific industry. They offer access to a proprietary program, and build their market by competence of service rather than price. This type of operation is believed to be the most promising for the industry, particularly in numerical control programming, petrochemicals, electronic circuit design, and banking. Other common business applications are sales forecasting, management information systems, order entry, inventory control, and automated text processing.

EVALUATION OF TIME SHARING SERVICES

INTRODUCTION

A major element to be considered in the evaluation of any commercial time sharing service is the way in which it satisfies the specific computational requirements of the user. In addition to the quantitative aspects, such as the service fees and the number of programming languages supported, the evaluator must also examine qualitative considerations such as pricing techniques and programming language characteristics. This section is designed to provide the evaluator with tools to make his selection of a specific time sharing service both quantitatively and qualitatively.

In this report, the following features of commercial time sharing services will be discussed: service operation, programming languages, program control and data modification techniques, application services, user assistance, and service fees.

SERVICE OPERATION

When selecting a time sharing service, one of the important factors, from an economic point of view, is the telephone line cost. Most services stipulate that the customer must pay telephone charges to the nearest free local dialing point. If a time sharing service located in New York City offers free local dialing service to Philadelphia and the prospective customer is located in Baltimore, the customer must pay telephone charges for his calls from Baltimore to Philadelphia. This cost could be the most significant price factor.

A less tangible aspect of service operation is the orientation of the system. Some services direct their operation towards one specific discipline, such as civil engineering or text processing. Although in some cases the customer may have to pay a premium, he is usually willing to do so in order to gain the specialized skills and services.

It can be seen then that the two considerations, local dialing service area and system specialization, can counteract each other depending upon the needs of the prospective customer. A user may decide in favor of a general-purpose time sharing service rather than one specializing in a particular area because the general-purpose service offers free local dialing service in his area and the other does not. On the other hand if the specialized service provides some unique capability that the customer requires, he might be willing to pay substantial telephone charges simply to access that service.

PROGRAMMING LANGUAGES

An evaluation of programming languages involves both the selection of a language and its particular implementation. Factors involved in the choice of a language include:

- Suitability of the language for a given problem area
- Suitability of the language for prospective users
- Availability of the language
- History and evaluation of previous use of the language
- Compatibility of the language and its potential for growth

Languages available through time sharing services in both the conversational and remote batch modes include almost all of the programming languages available to the standard data processing user. The selection of a specific language depends upon which of the preceding factors is most critical to the user.

Of primary importance is the suitability of the language for the problem area. Although most problems can be solved by several languages (e.g., a computational problem can use Basic or Fortran, a business-oriented problem can use Cobol or PL/1), some problems need a specific language. Languages such as LISP or SNOBOL (designed for list processing applications), or AED (which provides design and compiler writing facilities) might be the only means of solving a user's problem. In a situation where the customer requires one of these special languages, his choice of a time sharing service may be severely limited.

In most cases, the user may select one of several languages. His selection is frequently based upon the orientation of his company's data processing group. If his company uses PL/1 exclusively in its data processing department, Cobol would rarely be chosen for time sharing.

Another consideration when evaluating the choice of a language is the experience and ability of the prospective user. If the personnel who will use the time sharing service are data processing novices, a significant factor is the simplicity and ease of learning the language. The reverse is true when most of the prospective users are experienced programmers. Since most time sharing services offer multiple languages, the needs

of both groups can frequently be met by the same time sharing service.

Once an appropriate language has been selected, the evaluator must then choose a particular implementation of the language. Many of the language processors were originally provided by a computer manufacturer and have been modified or enhanced subsequently to meet customer requirements more closely. A definition of a language facilitates comparing the varying forms of its implementation. The definition should be quite detailed and cover virtually all of the functional characteristics of the language. An evaluator's task is to measure the extent to which a particular language implementation adheres to or deviates from the definition.

PROGRAM CONTROL AND DATA MODIFICATION SERVICES

Program control and data modification services include the language-directed capability of the system to support either the programmer or the application program user. These facilities take the form of the service's system control language, its file editing facilities, program debugging subsystems and file information retrieval capabilities.

The evaluator should be aware of the individual commands and services provided by the languages, as well as the techniques used to direct the system's operation. Ease of access and use of a time sharing system are significant factors in the evaluation process. File and system security are also important considerations. If a user needs to prevent unauthorized access to his programs and files, he must be sure that the time sharing service has adequate file security.

In addition, editing and debugging facilities are significant if the time sharing user intends to create his own programs. They become even more important when the time sharing system is used as a program development tool for in-house systems. For this, a service must provide powerful testing and debugging tools for the programmer.

APPLICATION SERVICES

Application services take the form of either a major application system offered to support a particular business or engineering activity or a general-purpose library service including complete programs or subroutines that the user may incorporate into his own program. Applications systems are generally well publicized as they are becoming one of the essential elements provided by time sharing services. Program libraries, though important, are generally not as well documented or promoted.

Perhaps the most difficult element of the time sharing services to assess is the range of offerings provided in its libraries. In general, time sharing services provide two types of libraries: (1) private libraries that are constrained as to use and (2) public libraries that are offered to any user of the system.

In using a private library, some limitation is placed upon the access of a routine in the library, such as making it available only in object code or with an additional charge. In general, the services provide documentation on the routines contained in their private libraries. Commercial time sharing services frequently do not take the time to document public library programs and routines because many of them are self-documenting. As the user calls a particular library routine, he is presented with a detailed description of the capabilities of the routine as well as its limitations. Except for the few services that provide comprehensive documentation of their public libraries, actual use is the only sure means for complete evaluation.

USER ASSISTANCE

Types of assistance provided by the commercial time sharing service range from complete, including formulation of programs and systems, to limited, i.e., an introduction to the basic facilities of the service. Between these extremes, most services provide forms of aid to users based upon their requirements.

SERVICE FEES

The wide variety of pricing schedules and techniques used by the commercial time sharing services make the evaluator's task an exceptionally difficult one in this area. As in all aspects of the appraisal, the first consideration should be given to the application. Most service charges are based upon terminal connect time, central processor time, and storage. However, the most economical system is the one that will charge least for the desired application.

If the primary use of the system requires extensive storage for data files or programs, the most important fee consideration is the storage cost. When the task to be accomplished requires large amounts of computation and, thus, much central processor utilization, that factor becomes most significant. Installations where users are learning programming or where the application is input/output bound (extensive printing at the

terminal) must give heavy consideration to the terminal connect charges.

Another dimension of fee considerations is the pricing technique, the method of determining charges. Questions such as: when and how is storage measured? and what is included in a central processor unit? should be answered before a decision is made.

The simplest means of estimating storage costs is to divide the cost for a block of storage by the number of characters in that block. However, this does not take into consideration the company pricing techniques used. A user should note when storage is to be measured. If it is measured at the end of the day only, he will not be charged for temporary storage used during the day. Some services bill the user for the maximum storage used during the month, while others bill for the average amount; the former technique usually proves costlier. Size of the elementary block of storage should be considered since in most cases a block of storage can contain only data from a single program or data file. For example, if the basic block of storage is 5,000 characters and a user stores a 6,000 character program, he requires two blocks; 4,000 characters of the second block will be wasted since they cannot be used for additional program storage. If the basic block were 1,000 characters in this case, the program would have required six blocks. This would probably have meant a significant savings for the user. It is therefore necessary to look beyond the stated schedule of fees in order to determine the actual cost of program storage.

Another basic pricing consideration is the central processor unit. This may be the most elusive and difficult factor to measure. Some services consider central processor time as that time during which a user's program is being executed, while others include the swapping time (time used to move a user's programs from core storage to disc or drum); thus, the same program execution may take many more central processor units. Terminal connect charges are usually straightforward and include only the time of active connection to the system.

All of the preceding pricing considerations can be affected by the discount policy of the time sharing service. Customers may be offered reduced rates for processing time during off hours. Customers in specific fields, notably education, are often allowed discounts. Frequently, bulk rate discounts are provided either for storage or processing. Some services will even dedicate an entire system to one user for a set fee.

The object in all of these pricing considerations is to evaluate the pricing schedule according to specific requirements. Enough variations in pricing techniques are offered by the time sharing services to facilitate this decision.

TIME SHARING SELECTION CRITERIA

INTRODUCTION

In the evaluation process, an individual considering a commercial time sharing service must operate on dual but concurrent levels. First, the evaluator must be aware of the essentially different nature of a time sharing service in its emphasis on use, practices, and service support. This is in marked contrast to the evaluation of static, measurable operations and hardware performance. Second, the evaluator must have specific guidelines or criteria and a dynamic framework against which to measure the effectiveness and applicability of a time sharing service. A checklist provides the best framework, when accompanied by a related set of criteria for completing it. This report includes a checklist to help evaluate a time sharing service in a systematic, efficient, and productive manner.

Eight criteria have been selected. No hierarchy is intended by the arrangement of these headings because a potential user's needs vary according to his application. Thus, someone contemplating remote batch processing will generally weigh his findings differently from a prospective conversational user.

The eight criteria are:

- Corporate data
- Process-oriented languages
- System control/modification facilities
- System/user security
- Problem-oriented services
- Hardware system
- User support
- Service fees

SELECTION CRITERIA

The following paragraphs describe the information an evaluator should have in order to consider a time sharing service. Each of these paragraphs is devoted to a single criterion by which a system should be measured.

- Corporate Data

  — determine location of vendor's corporate headquarters, systems center(s), nearest sales office, availability of toll-free dialing into the firm's system.

  — determine how long present system, hardware and software, has been operational.

- Corporate Data (Contd.)

  — where applicable, include name, title, and telephone number of national corporate contact, regional marketing representative, and local account representative.

- Process-Oriented Languages

  — describe all such programming languages supported by the system; note which are conversational and which are conventional batch.

  — for all these languages, determine such features as maximum allowable program length, memory extension (via CHAIN, LINK, etc.), saving object code, etc.

- System Control/Modification Facilities

  — find out what operating or monitor system is supported and whether it has been improved by the time sharing vendor or remains as delivered by the manufacturer.

  — determine what the job control language is and how it is used.

  — list the number and categories of user commands provided and the way they are initiated; know the type and general number of system directives; in particular find out how the user is informed of a system malfunction and what backup facility is available.

  — determine what modification facility is offered in editing and in debugging for users; are these separate systems like QED, SEDIT, and DDT or integral parts of the system control language as with GE?

- System/User Security

  — determine the type and number of codes for gaining access to the system; is there program and file protection in addition to validation security?

  — determine the maximum number of user codes available per account; obtain information concerning procedure and cost for changing user codes.

  — determine the techniques used to ensure privacy of customer programs and data files.

  — find out how a user who mistakenly enters his account number is answered and

how a user just dialing in is informed of a system malfunction and its probable duration.

— determine the facility for system backup of files and procedure for system RESTART.

- Problem-Oriented Services

— includes applications languages, applications systems, and proprietary library routines. Particular attention should be devoted to this aspect of a service evaluation for several reasons. Commercial services ordinarily devote a major effort to implementing and expanding this area, subscribers find an increasingly larger use for these services, and these applications services cover a wide variety of areas from business and financial (portfolio analysis) to engineering and scientific (adiabatic flash calculation or fluid-fluid heat exchanger design and optimization).

— for applications languages, determine which specific version of a system is offered in COGO, ECAP, GPSS, ICES, SIMULA, STATPACK etc; obtain a brief description of the language system features and use.

— for applications libraries, obtain a list of the routines provided, by application area, e.g., finance, engineering, mathematics.

- Hardware System

— note the central processor and auxiliary storage media available on the system, and the peripheral devices supported; determine number of simultaneous users supported.

— list the number of system malfunctions, in the last six months, which interrupted service to users. Any changes in system configuration to prevent persistent malfunctions? Has system remained unchanged since inception of service?

— list the model number, type, transmission speed (baud rate), and form size for all terminals supported by the system.

— describe the communications facilities by which your location is connected to the service's hardware system.

— determine the relative effect on response time for light (approximately 10%) and full user load; determine mean percentage of use during prime time, particularly 9 to 11 a.m. and 2 to 4 p.m.

- User Support

— describe any user assistance or coding support offered as part of the service contract.

— note the type, number, and duration of training courses available in the system's services and offerings.

— obtain a list of documentation provided by the service on its system and offerings; note whether manuals are priced separately.

- Service Fees

— obtain a price list and a copy of service contract for system use.

— note incremental or weighted charges for processor usage, terminal connection, storage, etc.; find out when and how measurements of use are taken.

— determine any special pricing arrangements for special access, guaranteed usage, volume discounts.

— obtain hours of service availability.

SUMMARY

The following checklist is intended as a complement to the evaluation tutorial reports. Using it, an evaluator can become aware of the dynamic aspects that do not ordinarily appear in presentations of a service's features. Thus, recent mean downtime, price changes, new discount policies, procedures for notifying dialed calls of a current system failure, and the accounting scheme for posting time in, time out, duration of CPU time and terminal connection time, programs executed, and cost can all be considered.

TIME SHARING EVALUATION CHECKLIST

1. Corporate Data

Headquarters _____ name
_____ address
_____
_____ city, state
_____ telephone

Date System First Operational _____ Type of Service _____

National Marketing Contact _____ name
_____ title
_____ telephone

Local Sales Office _____ name
_____ address
_____
_____ city, state
_____ telephone

Local Marketing Contact _____ name
_____ title
_____ telephone

	City	State	Area Code
Local Dialing Areas			

2. Process-Oriented Languages

Conversational Language	Extensions	Limits (program size, statements, etc.)

Batch Language	Features

3. System Control Facilities

	Name	Type
Operating System		
Job Control System		
Editor(s)		
Debugging System		

4. System/User Security

	Number	Type (alpha, nonprinting)
User or Account Codes		
Code Change Procedure		

Security validation level _____ program level _____ files _____

Types of File Security _____

System Backup _____

5. Problem-Oriented Services

	Name	Description
Applications Languages		
Applications Systems		
Applications Library		

6. Hardware System

	Time Sharing	Batch
Central Processor Manufacturer, Model No.		
Core Size, Cycle Time		

	Peak	Slack	Peak	Slack
Number of Simultaneous Users				

Number of System Malfunctions (past 6 months) _____

	Type	Model No.	Speed
Auxiliary Storage			
Peripherals			
Terminals			

7. User Support _____

Coding Assistance

	Title	Length (days)
Training Courses		

	Title	Type
Documentation		

8. Service Fees

	Conversational	Remote Batch	Local Batch
Monthly Minimum			
Initiation Fee			
Terminal Connect			
CPU Usage			
Active Storage			
Inactive Storage			
Peripherals			

How is storage measured? (peak, average, sampling)

	Type	Requirements
Discounts offered?		

9. Service Administration

	Prime Time	Off Hours
Hours of availability?		
Monday to Friday		
Saturday, Sunday		
Holidays		

III. COMMERCIAL TIME SHARING SERVICES

APPLIED COMPUTER TIME SHARE

BACKGROUND

Applied Computer Time Share, Inc. (ACTS), an affiliate of Lear Siegler, Inc., of California, was first organized in July 1968 to provide graduate students at the University of Detroit with advanced computer time sharing services for assistance in their doctoral studies. The successful association between ACTS and the University of Detroit staff gradually expanded into a commercial venture. As a result of the success in Detroit, ACTS has extended affiliation to the University of Toledo and Xavier University. Xavier University has installed a Honeywell/GE-430 system, which is supported by ACTS. ACTS will continue to provide the advanced computer facility, while professional people from these universities will provide applications expertise for ACTS customers.

In November 1968, ACTS became involved with Berkeley Computer Corporation, the manufacturer of an advanced time sharing computer system. The research underlying the design of the Berkeley Computer System was completed at the University of California under the joint auspices of the school and the Advanced Research Projects Agency of the Office of the Secretary of Defense.

ACTS formally began marketing services in January 1969 on Honeywell/GE-265 and GE-430 systems. Since that time the company has opened sales offices in Chicago, Illinois; Toledo, Dayton, and Cincinnati, Ohio; and Indianapolis, Indiana.

The firm offers conversational time shared computing services and local and remote batch computer processing. Time sharing systems are utilized for the traditional engineering applications, by educators in secondary schools and colleges and universities, and for modeling and forecasting by financial institutions. The applications being processed via ACTS' local and remote batch facilities include manufacturing control systems (production and inventory control), payroll and general accounting, and a complete bank accounting system.

Service is implemented on the following central processors: two Honeywell/GE-235s used for conversational time sharing, each with 32K 20-bit words of core; two Honeywell/GE-435s used for conversational time sharing, each with 64K 24-bit words of core; an IBM 360/30 with 64K bytes of core, used for local batch processing; and an IBM 360/50 with 512K bytes of core, used for APL conversational time sharing and for remote and local batch processing.

The company supports conversational programming in Algol, APL (a simplified interpretive language for solving scientific problems and describing algorithms), Extended Basic, and Extended Fortran II and IV; it supports batch programming in Assembly Language, Cobol, PL/1, and Fortran IV. Basic, Fortran, and Algol are implemented on the GE systems.

Communication to ACTS operating centers is over standard voice-grade lines, with multiplexers concentrating remote transmissions. There are separate communication rates for low- and high-speed data transfer (i.e., 110 baud to 2,400 baud).

ACTS also supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

Local dialing into the ACTS system is furnished from the following areas: Ohio (216, 419, 513, 614), Indianapolis IN (317), Chicago IL (312), Louisville KY (502), Lexington KY (606), and Michigan (313, 517, 616, 906).

TERMINAL SUPPORT

The following terminals can access the ACTS system: Teletype Models 33 and 35; Friden 7102 Communications Terminal; IBM 2741 Communications Terminal; Datel Thirty-21 Terminal; Itel Data Terminal; CalComp 10-inch Plotter; Data Interface Plotter; and IBM 2780, 360/20, 1130, System 3.

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APL GENERAL

LOCAL DIALING

Local dialing is available in the following areas: CT(203); MA(413,617); NH(603); RI(401); VT(802); DE(302); NJ(201, 609); New York NY (212); PA(215, 412, 717, 814); FL(813), and Chicago IL(312).

* * *

APL SERVICES

BACKGROUND

APL Services, Inc. was incorporated on July 13, 1970. At that time it became affiliated with The Computer Company (Richmond, Virginia) and initiated time sharing services in Boston, New York, Princeton, Philadelphia, Washington, and Miami. In September 1970, APL Services arranged for nationwide availability of its service and expanded its library software through two more affiliates, Computer Innovations, Inc. (Chicago) and Proprietary Computer Systems, Inc. (Van Nuys, California). For a discussion of the services provided by APL Services' affiliates, refer to the reports on those companies.

APL Services provides conversational time sharing with ACTION/APL, a version of Iverson's APL enhanced by The Computer Company. Remote batch service is also available, supported by the APL, BAL, Cobol, Fortran, PL/1, and RPG programming languages.

The firm specializes in business applications, with emphasis on inventory control, electrical engineering, management information systems, economic analysis, order entry, processing and billing, and special CPA audit routines. It offers subscribers a library of over 1,500 application programs, cataloged in the following areas: general purpose, business, engineering, mathematics and statistics, management science, and education.

APL Services implements its time sharing service through the facilities of the Computer Company, in Richmond, Virginia. Processing is performed by an IBM 370/155 having 512K 8-bit bytes of fast core storage and a cycle time of 115 nanoseconds. The system supports up to 150 users simultaneously.

Subscribers access this system through a network of 4,800-baud private lines, a WATS line covering Virginia, high-speed data modems, and time-division multiplexers.

APL Services supports its service with programming assistance, user training, and documentation. The company will also develop special applications for customers.

LOCAL DIALING

Users can dial local numbers to access the system from: Boston MA metropolitan area (617), New York City NY (212), Princeton NJ (Mercer County) (609), Philadelphia PA (215), Washington DC metropolitan area (202), Richmond VA (703), the state of Virginia (703), Miami FL (305), and Fort Lauderdale FL (305).

TERMINAL SUPPORT

Clients may access the system through the following terminals: Anderson Jacobson 841; Datel 30; IBM 2741, 1050; Itel 1021; Novar 5-41, 5-51; and TST 707.

* * *

ALLEN-BABCOCK

BACKGROUND

Allen-Babcock Computing, Inc. was formed in 1964 to provide three major types of data services: system center operations, applications packages, and systems consulting. In 1965 the corporation acquired an advanced technology contract from IBM to investigate several major areas of computer technology. These areas (bulk core storage, teleprocessing, microprogramming, and the time sharing feasibility of the PL/1 language) all received positive recommendations from Allen-Babcock.

Results of this study led Allen-Babcock to develop the RUSH (Remote Users of Shared Hardware) software/hardware system. The first RUSH time sharing system was installed in Palo Alto, California in August 1966, and billing of customers began in September of that year. A second system was installed in Los Angeles in September of 1967, and another in Union, New Jersey in February 1969. In November 1970 the corporation inaugurated its first Supercentre in Palo Alto, California, and its first Remote Data Centre in Los Angeles.

Allen-Babcock offers two RUSH services: the RUSH conversational interpretive time sharing PL/1 subset and RUSH conversational remote job entry. Both are implemented on an IBM 360/50 running under OS/MVT release 18.6. The memory configuration consists of 128K bytes of high-speed memory (2-microsecond cycle time) and an additional 2 million bytes of Ampex large-capacity core storage (1.5-microsecond access time).

RUSH includes several major departures from other time sharing systems, such as program interpretation instead of compilation and the

elimination of "swapping" (moving user programs from high-speed memory to auxiliary storage devices). To facilitate these innovations, several hardware changes have been incorporated in the computer used by Allen-Babcock. A set of 22 microprogramming extensions to the IBM 360/50 were implemented by Allen-Babcock to make interpretation economically feasible. These special operation codes assist in the evaluation and execution of PL/1 instructions. Through the use of large-capacity core storage, the swapping of users in and out of core is unnecessary since system overhead is 6%.

Another significant feature of RUSH is its use of IBM-supported direct-access file methods to facilitate use of the Allen-Babcock service as a data bank for information retrieval applications. File management and report generation software is available at no additional monthly charge.

The conversational programming language in the RUSH system is an interpretive subset of PL/1. Often, the compatibility of RUSH PL/1 with IBM PL/1 results in the use of the Allen-Babcock system as a program development tool for in-house systems.

The conversational remote job entry (RJE) feature of RUSH allows the user to develop a program conversationally as well as to change a program already stored. After the user prepares the program, he can instruct the computer to execute it and to return the results to his terminal or to print out the results at an operating center. In the RJE mode, a user can initiate background processing in any IBM-supported programming language. These languages include the assembler BA2 (F and G) Cobol (F), Fortran IV (G), PL/1 (F), and the report program generator, RPG (E).

Allen-Babcock markets the RUSH service throughout the United States.

The company supports its offering with program development, training, and documentation. Training is free of charge. Programs developed by Allen-Babcock are written in the RUSH PL/1 and PL/1 (F) languages.

LOCAL DIALING

Free local dialing into the system is provided from the following cities:

Los Angeles CA (213)
Orange County CA (714)
Palo Alto CA (415)
San Francisco CA (415)
Union NJ (201)
New York NY (212)
Philadelphia PA (215)

In addition to the free local dialing service available in these cities, Allen-Babcock charges a fixed monthly rate of $150 for local phone service from many other cities, including multiplexer service from:

San Diego CA (714)
Portland OR (503)
Seattle WA (206)
Chicago IL (312)
Boston MA (617)
Washington DC (202)

TERMINAL SUPPORT

Allen-Babcock subscribers can use the system with any of the following terminals: IBM 2741; Teletype Models 33, 35; Datel Thirty-21; Itel 1041; A. B. Dick Videojet M9601; Datapoint 3300; Novar; and A J Selectronic 841.

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AMERICAN COMPUTER SERVICE

BACKGROUND

American Computer Service Corporation (ACSC), a former subsidiary of American Computer Leasing Corporation, was formed in June 1968 and initiated its time sharing service in September 1969. In late 1971, the company was acquired by Sci-Tek and renamed Numerical Control Data Power.

ACSC specializes in marketing, maintaining, and installing numerical control applications software; parts programming; and manufacturing techniques. It currently supports a remote batch APT III capability by furnishing users with access to the large-scale Honeywell/GE-635 computer owned and operated by the Matrix Corporation of El Segundo, California. Although ACSC's primary emphasis is directed toward APT III, subscribers to the service can also use all the facilities provided by Matrix. If a subscriber is signed by ACSC, he is billed by ACSC for use of both APT III and Matrix facilities. If a company is a Matrix subscriber and elects to use APT III, he is then billed by ACSC for APT III usage and separately by Matrix for use of its facilities; i.e., a subscriber signed by ACSC is considered an ACSC customer for all facilities offered on

Matrix's Honeywell/GE-635 computer. For information concerning the services provided by Matrix, please refer to the report describing that company.

ACSC markets the APT III service in the midwestern and eastern United States as well as the Los Angeles area. The firm offers consulting and training in numerical control applications.

LOCAL DIALING

All subscribers, ACSC and Matrix, have the same local dialing capability. Currently, Matrix furnishes three Maryland Band 3 WATS numbers for all subscribers; these areas are: New England (203, 207, 401, 413, 603, 617, 802), Middle Atlantic (201, 202, 212, 215, 301, 302, 315, 412, 516, 518, 607, 716, 717, 814, 914), and portions of the Southwest (404, 615, 703, 704, 803, 901, 912, 919) and the Midwest (216, 219, 304, 313, 317, 419, 502, 513, 517, 606, 614, 616, 812, 906).

TERMINAL SUPPORT

The following terminals can access the ACSC system: Teletype Models 33, 35, 37; Itel data terminals; Datel terminals; IBM 2741; CCI Display Unit, CRT; Honeywell/GE-105, 115; and Univac 1004.

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APPLIED LOGIC

BACKGROUND

When formed in 1962, Applied Logic Corporation directed its initial effort toward mathematical techniques and their applications to problem solving. An early need developed for simultaneous, direct computer access for large numbers of Applied Logic personnel. At that point, no time sharing operating systems were available to satisfy such a requirement; consequently, Applied Logic undertook development of its own time sharing system.

As its first step, Applied Logic sought hardware suitable for enhancement in order to provide a time shared environment. Following selection and delivery of a PDP-6 hardware system, the company devoted a major effort to designing and implementing the AL/COM time sharing service. It became operational in January 1966. Since that date, the PDP-6 has been replaced by a dual AL/10 and three additional dual AL-10 systems have been added. The dual AL-10 configuration consists of two Digital Equipment Corporation (DEC) PDP-10 processors with 128K 36-bit words of core storage. Up to eight PDP-8s per system are used as communication, distribution, and collection satellites and as various peripheral device controllers.

Applied Logic's system offers a general-purpose time sharing scientific and business computer service for conversational interactive time sharing. The AL/COM system features 32K 36-bit words of main memory available to each user of the system. In the conversational mode the AL/COM systems can support 200 simultaneous users (50 on each of four systems). The primary communications network affording access to the AL/COM service is composed of the public dial-switched system, multiplexers, and communication computers in remote cities with leased lines to Princeton.

AL/COM offers programming support in the following languages: AID (a conversational-algebraic language), Basic, Cobol, Fortran IV, LISP 1.6 (a list-processing language), MACRO-10 (the PDP-10 assembly language), and SNOBOL (a string-manipulating language).

Applied Logic markets its time sharing service through AL/COM Regional Service Centers and the AL/COM Associates network, consisting of independent consulting and software firms operating through Applied Logic franchises. The AL/COM network is represented in a number of major cities throughout the United States. Applied Logic supports its service with program development, coding assistance, training, and documentation.

LOCAL DIALING

The AL/COM network currently provides communication facilities in each of the following cities. A customer may dial into the nearest of these facilities and incur only the telephone charges between his terminal and that facility.

Boston MA (617)

Buffalo NY (716)

Chicago IL (312)

Indianapolis IN (317)

Montclair NJ (201)

New York NY (212)

Philadelphia PA (215)

Princeton NJ (609)

Washington DC (202)

Wilmington DE (302)

Additionally, customers located anywhere in Arizona (602), California (209, 213, 408, 415, 707, 714, 805, 916), Idaho (208), Nevada (702), Oregon (503), and Utah (801) may dial a toll-free number into the time sharing system.

TERMINAL SUPPORT

The AL/COM system supports many types of remote terminals such as Teletype Models 33 and 35, CalComp 10-inch and 30-inch plotters, Itel data terminals, and Datel terminals.

* * *

AVCO COMPUTER SERVICES

LOCAL DIALING

Local dialing is available in MA (617).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Data 100 Model 70 Series, IBM 2770, IBM 2780, IBM 360/20, and Remcom Systems 2780.

* * *

AXICOM

BACKGROUND

Axicom, formerly Access Systems, Inc., was formed in July 1968 to provide a remote management information systems facility. The company's marketing is aimed primarily at utilities, universities, operations research, banks, chemical concerns, manufacturers, and software developers. Both conversational and remote batch service are available. The company refers to its conversational service as Teletype (TTY) or conversational-type terminal usage.

Service is implemented on a large-scale Univac 1108 central processor, with 131K 36-bit words of main memory that can simultaneously support 20 Teletypes and 8 batch devices. Each user is allowed up to approximately 70K words for his program, which is compiled and executed in time slices.

Axicom provides conversational programming language support in extended Fortran V, and support for batch programming in Assembly Language, ANSI Cobol, extended Cobol, extended Fortran V, LISP (a list processing language), and SNOBOL (a string-handling language).

Subscriber communication is handled by commercial telephone lines and a multiplexer. Axicom's configuration can handle 20 high-speed lines (expandable when needed), 40 low-speed lines, and broadband lines.

The company also supports its services with communications-system consultation, program development, training, and documentation.

LOCAL DIALING

Users can access the system by local dialing in New York NY (212), and Washington, D. C. (202); New Jersey (201, 609) subscribers are served by intrastate WATS lines. In addition, limited inbound WATS lines are available in the area bounded by New Hampshire, Pennsylvania, and Virginia. The area codes are: 202, 203, 215, 301, 302, 304, 315, 412, 413, 518, 603, 607, 703, 716, 717, 802, and 814.

TERMINAL SUPPORT

Subscribers can access the system with the following terminals: Teletype 33 and 35, DCT 2000, Univac 1004/1005, CTC Datapoint 3300 (CRT), Univac 9200/9300, Noller DTS 112, IBM 1130, SCC-DCT 132, Friden 7100 and 7102, CCI-30, and Uniscope 300.

* * *

BASIC TIMESHARING

LOCAL DIALING

Local dialing is available in CA (408, 415).

* * *

BELOIT

LOCAL DIALING

Local dialing is available in the following areas: MA (617), New York NY (212), Washington, DC (202), Chicago IL (312), and WI (608).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Datel 30, 31; IBM 2740; Novar 5-41, 5-50, 5-51; Data Computer Systems CP-4 Series; IBM 2780; IBM 1130; and Remcom Systems 2780.

* * *

BEVERLY BANK

BACKGROUND

Beverly Bank (BB) obtained a franchise for the Chicago area in 1968 so that it could market conversational time sharing services offered by Call-A-Computer Inc. For detailed information about the facilities offered by Call-A-Computer, see the report describing that company.

In addition, BB offers its customers special data processing services, such as computer financial analysis, as well as standard banking facilities, through its Automated Business Services Department. The company adds considerable experience in business and financial application areas to these user facilities.

Service is implemented on Call-A-Computer's Honeywell/GE-255 systems, consisting of a Honeywell/GE-225 central processor, with 16K 20-bit words of core connected to a Datanet-30 communications processor also with a core size of 16K 20-bit words. This configuration can support 40 simultaneous users.

The company provides conversational programming support in the same language as Call-A-Computer, whose facilities it markets. These languages are extended versions of Algol, Basic, and Fortran.

Customers access the system through voice-grade lines. BB also supports its service with program development and user training.

LOCAL DIALING

Users can dial local numbers to access the system in Chicago (312).

TERMINAL SUPPORT

Users can access Call-A-Computer's system through Teletype Models 33 and 35, Friden 7100, Itel data terminals, the Calcomp Plotter, the Complot Plotter, and all Teletype-compatible terminals.

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BOEING COMPUTER SERVICES

BACKGROUND

Boeing Computer Services, Inc. (BCS) was formed in May 1970 as a subsidiary of the Boeing Company, to develop and market time sharing services initiated in June 1969.

BCS provides conversational and deferred processing services on two IBM 360/67's in a duplex configuration. A significant feature of the BCS service is its extensive file execution capability.

Besides the computer time sales, BCS offers the following capabilities: program services, facilities management, consulting, training, and data base service.

For its time sharing service, BCS supports the Assembler, Basic, BRUIN, Cobol (ANSI and version F), Fortran IV (version G), and PL/1 programming languages. Subscribers have access to a library of scientific subroutines, as well as to application packages in civil and electrical engineering, mathematics, statistics, and simulation, among others.

BCS implemented the first phase of its multiplexer network in the fourth quarter of 1970 and markets its service nationwide.

The company supports its service with user training and documentation. A support staff is also available to assist customers.

LOCAL DIALING

Free local dialing into the system is available from the following cities: Seattle, Kent, Renton, and Auburn WA (206), Houston TX (713), Dallas TX (214), Washington DC (202), New York NY (212), Wichita KA (316), Philadelphia PA (215), Melbourne FL (305), and Vancouver BC (604).

TERMINAL SUPPORT

Subscribers can access the system through Teletype ASR and KSR Models 33 and 35, IBM 2741, and compatible terminals.

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BOWNE TIME SHARING

BACKGROUND

Bowne Time Sharing, Inc. (BTS) was formed in February 1969 and instituted time sharing services during November of that year. The firm's major offering is Word/One, a text editing and information retrieval system that furnishes conversational word processing with advanced formatting capabilities. BTS implements its service on an IBM 360/40 computer system. In addition to supporting Word/One, the IBM 360/40 supports general remote batch data processing in the background mode; data stored on magnetic tape and punched cards can be submitted from remote locations. For background processing, users can program in the System/360 Assembler, Cobol, Fortran, PL/1, and RPG (report program generator).

BTS markets its services in the eastern United States. The firm provides customer programming and consulting related to Word/One applications as well as intensive training in the use of the Word/One system. In addition, working in conjunction with associated companies, BTS can accept single-source responsibility for printing and production of documents created on Word/One.

LOCAL DIALING

Subscribers can access the system through free local-dialing facilities from Boston MA (617), New York NY (212), Philadelphia PA (215), Chicago IL (312), and Washington DC (202).

TERMINAL SUPPORT

The system remotely supports the following terminal devices: IBM 2741, Anderson Jacobson 841, Datel 303, Itel 1021, Novar 5-41, and Novar 5-50.

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BURLINGTON MANAGEMENT SERVICES

BACKGROUND

Burlington Management Services Company (BMSC), a division of Burlington Industries, was formed in February 1968. The company installed its first computer, an RCA Spectra 70/46 in December 1968 and commenced commercial time sharing services on May 1, 1969. A second 70/46 was added in August of that year.

BMSC was originally a successful consulting firm specializing in information systems and operations research but expanded to develop time sharing facilities for support of its consulting clients. The company provides both conversational and remote batch service, with concurrent processing of batch work.

Service is implemented on two RCA Spectra 70/46 central processors, each with 262K bytes

of core and the capacity to support 48 users simultaneously.

BMSC supports conversational programming with extended Basic and extended Fortran IV (level H) and remote batch programming with Assembly Language, Cobol, extended Fortran IV (level H), and RPG, the report program generator.

Subscriber communication is primarily through the public dial-switched network. The company supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

BMSC markets its time sharing service from company headquarters in Greensboro, North Carolina, where the computer system is housed.

TERMINAL SUPPORT

The company supports the following terminals: Teletype Models 33 and 35, IBM 2741 Communication Terminal, Teletype Inktronic, RCA 70/752 Video Data Terminal, Univac DCT 2000, and Datel.

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CALL-A-COMPUTER

BACKGROUND

Call-A-Computer (CAC) started in 1966 as a joint venture of the Pillsbury Company and the Occidental Life Insurance Company of North Carolina and is currently a subsidiary of Standard Computer Corporation. CAC began offering services in July 1966, using a Honeywell/GE-265 system located in Minneapolis, Minnesota. A second center was opened in Raleigh, North Carolina, in September 1966. Centers were subsequently opened in Atlanta, Boston, New York City, Chicago, and Los Angeles.

In July 1970 CAC became a subsidiary of Standard Computer Corporation, which manufactures the IC 7000, a large-scale microprogrammed computer whose software CAC had developed. CAC has installed three IC 7000's and plans to convert its Minneapolis and Los Angeles operating centers from Honeywell/GE-265's to the new computer shortly. The company also intends to add an IC 7000 to its New York City operating center in January 1971.

Marketing of Call-A-Computer conversational time sharing service is handled from sales offices and independent franchises located throughout the United States. Most of the franchises were providing data processing services prior to affiliation with CAC, and they continue to offer the original services in conjunction with their time sharing facilities. CAC has been able to develop expertise in both business and scientific fields by marketing its system through franchises with varied interests and talents. In addition, the company has won acceptance in the educational community as a result of the special educational programs in its applications library and a special educational discount. CAC currently is expanding support of financial application areas in order to provide more comprehensive coverage.

At present, service is being implemented on five Honeywell/GE-265 systems and on one Honeywell/GE-255 system. Both systems employ the Honeywell/GE Datanet-30 as a communications processor; the 265 system uses a Honeywell/GE-235 central processor, and the 255 system uses a Honeywell/GE-225 central processor. Each computer system supported by CAC can accommodate up to 48 simultaneous users.

CAC provides conversational programming language support in extended versions of Algol, Basic, and Fortran.

A combination of the public switching network, foreign exchange lines, multiplexers, concentrators, and Datanet-30 communications processors composes the company's communication network. In some areas, the DEC PDP-8 system is used as a line concentrator and transmits over high-speed lines. The company also supports its service with program development, training, and documentation.

LOCAL DIALING

Users can access the system by local dialing from Atlanta GA (404); Baltimore MD (301); Benton Harbor MI (616); Birmingham AL (205); Boston MA (617); Burlington NC (919); Charlotte NC (704); Charlottesville VA (703); Chicago IL (312); Columbia SC (803); Evansville IL (618); Indianapolis IN (317); Los Angeles CA (213); Minneapolis MN (612); Miami FL (305); Nashville TN (615); New York NY (212); Oak Ridge TN

(615); Philadelphia PA (215); Phoenix AZ (602); Raleigh NC (919); St. Petersburg FL (813); Santa Barbara CA (805); Spartanburg SC (803); Washington DC (202); and Winston-Salem NC (919).

TERMINAL SUPPORT

Representative terminals supported by CAC's system are Teletype Models 33 and 35, Friden 7100, Itel data terminals, the CalComp Plotter, the Complot Plotter, and all Teletype-compatible terminals.

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CANADIAN GE

LOCAL DIALING

Local dialing is available in the following areas: Vancouver, Calgary, Edmonton, Hamilton, Toronto (416), Ottawa (613), and Montreal (514), Canada.

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Datanet 730; Teletype 33, 35, 37; Friden 7100, 7102; TermiNet 300; Anderson Jacobson 841; IBM 2741; Datel-30; Novar 5-41; Itel 1051; Execuport 300; Univac DCT-500; Syner-Data Beta; Texas Instruments 700; Inktronic; Hazeltine 2000; Corning 904; Video Systems VST-2000; Tektronics 4002; and Datapoint 3300.

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CENTRAL COMPUTING

BACKGROUND

Central Computing, Inc. (CCI) was founded in August 1967 and initiated its time sharing service in May 1969. The firm offers conversational time sharing service featuring a Digital Equipment Corporation PDP-10 computer system capable of supporting up to 63 simultaneous users. Along with its software services, CCI offers a government tax billing system, a feedlot management system, a transportation management system, and engineering time sharing. The firm also specializes in application and commercial time sharing and custom systems design.

The CCI system provides programming support in AID (the algebraic interpretive dialog), Basic, Cobol, Fortran IV, and SNOBOL. The company's service is marketed in the midwestern United States. Documentation and training are also furnished by CCI for users of its service.

LOCAL DIALING

The firm maintains an operating center at its Wichita, Kansas headquarters. Free local dialing is offered to subscribers in Wichita KS (316) and Amarillo TX (806).

TERMINAL SUPPORT

Users can access the CCI system via Teletype ASR 33 and 35 terminals and the following remote access processor terminals: IBM 1130; Univac 1004, 9400, 9200; Cope 30, 32, 34, 36, 38, 41, 45; and Honeywell 200. In addition, the system supports an MTD 32025 computer industry variable-speed incremental plotter.

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CHI CORPORATION

BACKGROUND

Chi Corporation was formed in January 1968 as an independent computer service organization by Case Western Reserve University and began offering time sharing services in June of that year on its Univac 1108. The company was founded to serve the needs of the business and academic communities in the Midwest. The main computer facility, located in the University Circle Research Center in Cleveland, is staffed by former members of the Andrew R. Jennings Computer Center on the university campus. This

group is responsible for computer maintenance, software development, and software support.

Chi offers remote batch and interactive processing through high-speed and low-speed terminals. Open-shop, unscheduled operation is also available. Data entry and modification is by punched cards, paper tape, keyboard, and magnetic tape. Service is implemented on a Univac 1108 central processor (batch) with 131K 36-bit words of core memory and a Honeywell/GE 430 (interactive).

The firm offers programming language support in Algol 60 (a computation-oriented language used primarily in scientific problem solving), Basic, BEEF (a subroutine library which extends the capabilities of Fortran), Cobol, Fortran V, and SLEUTH (the Univac 1108 Assembly Language).

Interdata Model 3 and Model 4 communications computers are used as concentrator/multiplexors for the 1108. The Interdata acts as a front-end computer and contains software packages that restructure messages received and sent by the 1108.

Chi also supports its services with program development, training, and documentation.

LOCAL DIALING

At the present time, users can access the system by local dialing only in Cleveland OH (216); however, Chi is installing In-WATS lines to provide additional areas with local dialing.

TERMINAL SUPPORT

The following terminals can access the Chi system: Univac 1004, 9200, 9300, and 9400; PDP-8 and -10; GE 4060; IBM 1130, 1800, and System 360/20; and Teletype (110 or 300 baud).

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COMMUNITY COMPUTER

BACKGROUND

Community Computer was established as a corporation in 1967 and in late 1968 began offering time sharing services on a Hewlett-Packard 2000A system with a 2116B Central Processor. By fall 1968, Community had begun design of an interface (designated the CCC Model 1010 Interface) that would enable an IBM 2311 Disk Drive or equivalent to plug into the processor, thereby providing adequate mass storage.

A second 2000A was delivered in early 1969. First implementation of a system with mass storage capabilities occurred in November 1969. At present both time sharing systems, with extended storage, are in operation at the Philadelphia facility.

The firm offers general-purpose, conversational time sharing in the Basic language. Service is continuous.

Proprietary applications packages are available in various areas including accounting, finance, education, and engineering. Of special significance are general ledger/trial balance, roster scheduling, a Fortran-to-Basic converter, inventory record maintenance, and investment portfolio maintenance.

Community's time sharing system operates on an HP 2116B Central Processor with 16,384 16-bit words of core storage. With its two systems the firm can support 32 simultaneous users, 16 on each system.

Users access the Community system through Teletype Model 33 or 35 terminals, or equivalent. The company uses the public switching network, with either half- or full-duplex transmission.

Community's time sharing service is marketed in the Philadelphia area, New Jersey, and Wilmington, Delaware.

To assist its customers, Community provides consultation in the areas of applications and program development, coding, debugging, terminal sale and rental, and terminal supplies sales.

LOCAL DIALING

Users can dial local numbers to access the system from: Philadelphia PA (215), Wilmington DE (302), and central New Jersey (201 and 609).

TERMINAL SUPPORT

Users may access the system through Teletype Model 33 or 35 terminals and a 110-baud telephone line coupler. For faster terminals such as CRT displays, 220- and 440-baud ports are available.

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COMP-TIME CORPORATION

LOCAL DIALING

Local dialing is available in CA(714).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: IBM 2741, Teletype Inktronic, and Teletype 33, 35, 37, 38, and 4210.

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COMPUTEL SYSTEM LIMITED

LOCAL DIALING

Local dialing is available in the following areas: Ontario (416, 613) and Montreal, Quebec (514), Canada.

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Data 100 Model 70 Series, IBM 2780, IBM 360/20, IBM 1130, Mohawk 1100 Series, Mohawk 6430, Univac 1004, and Univac 9000 Series.

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THE COMPUTER COMPANY

BACKGROUND

The Computer Company was formed in December 1968 and began offering time sharing service on an IBM 360/50 computer in September 1969. In addition to marketing its service in Virginia, Philadelphia, Boston, New York, New Jersey, Miami, and California, the company has an affiliation with APL Services, Inc., Proprietary Computer Systems, and Computer Innovations to provide APL time sharing and applications packages on a national basis.

The Computer Company offers both conversational and remote/local batch capabilities. For conversational access, the company provides interactive ACTION/APL, a modified version of APL/360 with an extensive library of programs. Using the batch processing ability of the Remote Job Entry facility, a subscriber can create programs in any System/360 Disk Operating System language, i.e., Assembler, Cobol, Fortran, PL/1, and Report Program Generator (RPG).

In July 1971, The Computer Company replaced its IBM 360/50 with an IBM System 370/155. The current system has 512K 8-bit bytes of core storage, with a 115-nanosecond cycle time and support for 150 simultaneous users.

The system can handle figures, solve problems, make projections, construct graphs, and perform various other tasks. It is used for financial analysis, statistical computation, sales analysis, payroll, surveying, inventory control, education, and science applications. In addition, there are 1,500 general programs in the program library.

The communications medium for subscriber access is the public dial-switched network plus multiplexers or In-WATS lines as required.

A support staff provides technical assistance and user training.

LOCAL DIALING

Subscribers can access the system on a toll-free basis from the following cities: Boston (617), Chicago (312), Los Angeles (213), Miami (305), New York (212), Norfolk (703), Philadelphia (215), Princeton (609), Richmond (703), San Diego (714), Santa Ana (714), Palo Alto (415), San Francisco (415), and Washington DC (202).

TERMINAL SUPPORT

Terminal support is provided by any Selectric-type terminal, for instance, IBM 2741, Itel, Datel, and Novar 5-41, 5-50, or 5-51.

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COMPUTER COMPLEX

BACKGROUND

Computer Complex, Inc. (CCI) was formed in March 1969 from a merger of its parent company Com-Share Southern, Inc., which was organized in January 1967 to market time sharing services in the South. The company offers conversational time sharing. Service is implemented on four XDS-940 central processors; each has a 64K 24-bit word capacity and can support 44 simultaneous users.

Programming language support is in CAL (a conversational algebraic language), XBasic, Fortran II, Fortran IV, XTRAN (a superset of ANSI Standard Fortran IV), SNOBOL (a string-processing language), and TAP (the XDS Assembly Language).

The primary means of subscriber communication is the public dial-switched network; access is also available over WATS lines. The multiplexers at remote locations are built by Communications Logic, now a CCI subsidiary, and can handle 5, 18, or 35 lines.

The company also supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

CCI has national incoming WATS lines and Texas incoming WATS lines. Additionally, users can dial local numbers for system access in Baton Rouge LA (504), Lafayette LA (318), Cranford NJ (201), Dallas TX (214), Denver CO (303), Tulsa OK (918), Los Angeles CA (213), Garden Grove CA (213), New Orleans LA (504), New York NY (212), Palo Alto CA (415), Oakland CA (415), San Francisco CA (415), San Antonio TX (512), Midland TX (915), St. Louis MO (314), Chicago IL (312), Tampa FL (305), Melbourne FL (305), Orlando FL (305), Lakeland FL (813), and St. Petersburg FL (813).

TERMINAL SUPPORT

Any ASCII-compatible terminal can access CCI's system. Among these terminals are the following: Teletype Models 33, 35, 37; Omnitec Strip Printer and Keyboard; CalComp Plotter; Friden 7102; Computer Display Inc. CRT Terminal; Teletype Inktronic; Univac Remote Card Reader; Hewlett-Packard Remote Card Reader; and Houston Instruments Plotter.

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COMPUTER CONCEPTS

BACKGROUND

CCI, Inc., a franchise of Call-A-Computer, originally was formed in June 1968 as Middle Atlantic Call-A-Computer. The company provides time sharing services in the Delaware, Maryland, West Virginia, northern Virginia, and Washington, D.C. areas. For detailed information about the facilities offered, see the report describing Call-A-Computer.

CCI uses its own software personnel to develop applications packages (mainly of the scientific variety) for the Call-A-Computer system; it also is developing a computer graphic display package for use both with the Call-A-Computer service and in-house systems. The firm offers conversational time sharing service.

Service is implemented on the one of three Call-A-Computer Honeywell/GE-265 systems that is closest to the customer location. Each 265 system is composed of a Honeywell/GE-235 central processor with a 16K 20-bit word core size, connected to a Datanet-30 communications processor, also with a core size of 16K 20-bit words.

CCI supports the same programming languages as Call-A-Computer, whose facilities it is marketing. These languages are conversational versions of Algol, Basic, and Fortran.

The company uses a combination of foreign exchange lines and multiplexers to provide local dialing service throughout most of its marketing area. In areas with no local dialing service, customers access the system through station-to-station dialing.

Support provided includes applications development, debugging assistance, training, and documentation.

LOCAL DIALING

Users can dial local numbers to access the system in major cities including locations and

area codes as follows: Delaware (302), Maryland (301), West Virginia (304), Virginia (703), and Washington DC (202).

TERMINAL SUPPORT

Users can access Call-A-Computer's system through the following terminals: Teletype Models 33 and 35, Friden 7100, Itel Series, CalComp Plotter, Complot Plotter, and all Teletype-compatible terminals.

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COMPUTER DYNAMICS

BACKGROUND

Computer Dynamics, Inc. is the marketing representative for the Applied Logic time sharing service in the Boston area. For detailed information about the facilities offered by Applied Logic, see the report describing that company. From its inception in 1965, Computer Dynamics has functioned as a computer consultant to the architectural-engineering community in the vicinity of Boston. As a first step in bringing engineering application programs into the AL/COM system, the company converted COGO-90, the coordinate geometry program developed at MIT, for use on the PDP-10 time sharing system.

The firm is staffed by registered professionals in civil, mechanical, electrical, and electronics engineering; thus the Computer Dynamics service is a scientific computational aid to any professional engineering firm.

Computer Dynamics has also designed several proprietary programs for use on the AL/COM system. They are: HYDNET, a generalized hydraulic network analyzer; PLANE, a plane frame analysis program; FSLAB, a concrete flat slab analysis program; and WFDZIN and RCBEAM, steel and concrete framing design programs.

Programming support is available for the same languages supported by Applied Logic. These languages are: AID (a conversational algebraic language), Basic, Cobol, Fortran IV, LISP 1.6 (a list processing language), MACRO-10 (the PDP-10 assembly language), and SNOBOL (a string-manipulating language).

LOCAL DIALING

Local dialing service is offered by Computer Dynamics in the Boston metropolitan area (617).

TERMINAL SUPPORT

The AL/COM system supports many types of remote terminals such as: Teletype Models 33, 35; CalComp 10-inch and 30-inch plotters; Itel data terminals, and Datel terminals.

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COMPUTER INNOVATIONS

BACKGROUND

Computer Innovations, an affiliate of Proprietary Computer Systems, Inc. (PCS), was organized in 1969 to offer time sharing services commercially. See the report on PCS for a description of that company's service offering.

The new company is a group of former IBM employees who are interested in and experienced with the APL/360 system as the result of several years of developing computer applications at Science Research Associates, an IBM subsidiary. Staff experience includes accounting and business applications, statistics and mathematics, computer instruction, educational application of computers, systems analysis and operations research, and engineering (technical, electrical, and industrial). The service supports an IBM 360/50 computer located at the PCS operating center in Van Nuys, California.

Computer Innovations' principal offering is conversational time sharing using APL/360, a simple interpretive language that differs from other conversational languages in that its programming is simpler to unite and faster to execute. Another offering is a text processing service called ATS/360.

Computer Innovations markets its services from its Chicago sales office. The firm provides information on special low-cost GSA Federal Telpak line rates for schools, municipalities, and other nonprofit organizations dialing outside the Chicago area.

Subscribers to Computer Innovations' service receive training and documentation.

LOCAL DIALING

Users can dial local telephone numbers to access the system from the Chicago area only.

TERMINAL SUPPORT

Subscribers may access the system through any of the following terminals: IBM 2741 Communications Terminal, IBM 2740-1 Communications Terminal, IBM 1050 Teleprocessing Terminal, Datel Series, Itel Series, and TST.

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COMPUTER NETWORK

BACKGROUND

Computer Network Corporation (COMNET) was formed in June 1967 and initiated its time sharing service in December 1967 on a Burroughs B 5500 computer system. In April 1970, the company installed a new time sharing service on an IBM 360/65 computer. This additional system, called ALPHA, became operational in September 1970. Three months later, COMNET discontinued its service on the B 5500; at the same time, the firm purchased the computer service business of U.S. Time Sharing, Inc.

On the ALPHA System, COMNET offers conversational, remote batch, and local batch service. All three services accept programs written in assembly language, Cobol (levels E and F), PL/1, Fortran IV (levels G and H), WATFOR (a compile and go version of Fortran), SNOBOL 4 (a string-manipulating language), and RPG (report program generator). In addition, subscribers have access to a library of application programs, with particular emphasis on information retrieval, simulation, engineering, mathematics, and statistics.

The remote job entry (RJE) feature of the system allows Operating System/360 (OS/360) programs to be entered from a high-speed remote terminal in a simulated batch mode. Output may be returned to the remote work station submitting the job, sent to another remote control station, or produced at the central computer site.

COMNET's IBM 360/65 processor has 512K bytes of main core storage and a cycle time of 0.75 microsecond; the memory configuration is enhanced by 2 million bytes of Ampex large-capacity core storage, with a 1.8-microsecond access time. In addition a COMCET 40 front-end processor, which handles a variety of terminal codes and speeds, provides communications facilities for the system. Up to 80 users can be serviced simultaneously.

Communication with the system is primarily through the public dial-switched network; in addition, COMNET is installing a multiplexer in New York.

COMNET has a full-time technical support staff to provide technical and marketing assistance. The firm also supports its service through user training and documentation.

LOCAL DIALING

Users can dial local numbers to access the system in Washington DC (202) and New York NY (212). In addition, COMNET furnishes Band 1 WATS service for Maryland (301), Virginia (703), Delaware (302), and southern Pennsylvania (215).

TERMINAL SUPPORT

COMNET subscribers can use any of the following terminals: Teletype Models 33, 35, 37; IBM 2741 and compatible terminals; IBM 1130 (2,000, 2,400, 3,600, 4,800 baud); IBM 2780 and compatible terminals (2,000, 2,400, 3,600, 4,800 baud); and ASCII terminals (30, 60, 120 characters per second).

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COMPUTER POWER UNLIMITED

LOCAL DIALING

Local dialing is available in the following areas: New York NY (212); Washington DC (202); Chicago IL (312); CO (303); MO (314); and Los Angeles CA (213).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Datel 30, 31; IBM 2741; Novar 5-41, 5-50, 5-51; Teletype 33, 35; Data 100 Model 70 Series; IBM 2780; IBM 360/20; IBM 1130; and Remcom Systems 2780.

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COMPUTER SCIENCES CANADA

LOCAL DIALING

Local dialing is available in the following areas: Alberta (403); British Columbia (604); Manitoba (204); Toronto, Ontario (416); and Montreal, Quebec (514).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Univac DCT 500, IBM 2780, IBM 1130, Remcom Systems 2780, Univac 1004, Univac 9000 Series, and University Computing COPE Series.

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COMPUTER SCIENCES

BACKGROUND

Computer Sciences Corporation (CSC) was formed in 1959 and initiated its time sharing service in January 1970 through the Information Network Division (INFONET). The company furnishes a complete range of applications programs for problems dealing with mathematics, business, statistics, engineering, and finance.

CSC offers three time sharing services: Basic, Conversational Remote Job Entry (CRJE), and Remote Job Entry (RJE). The company's services are supported by five Univac 1108 computers; each has 196K 36-bit words of core storage, a cycle time of 750 nanoseconds, and overlap capability.

The Basic service offers conversational interactive time sharing utilizing the Basic language. It supports Teletype and IBM 2741 compatible terminals at 10, 15, and 30 characters per second.

CRJE service allows the user to develop a program conversationally from a low-speed terminal as well as to change a program already stored by calling back any statement and adding, deleting, or moving statements. After the user prepares the program, he can instruct the computer to execute it and to return the results to his terminal or to print out the results at the INFONET center. Users of CRJE can construct programs in SLEUTH (the Univac 1108 Assembly Language), Cobol, and Fortran V.

RJE service is oriented toward the processing of large production jobs through a variety of high-speed terminals. The service uses the same language as CRJE: Fortran V, Cobol, and SLEUTH.

Users of the CRJE and RJE services can instruct the computer to execute programs according to one of the following priorities: express, the highest priority (jobs are normally completed within a few minutes); standard, the next highest priority (jobs are run when there are no express jobs running); and overnight, the lowest priority (jobs are run so that results will be available the following day). If an express job exceeds 30 seconds of execution time or requires magnetic tape, the job will automatically be degraded to standard priority.

Users of all services can access the computer through normal dialup lines. In addition, leased line ports are available for RJE.

The firm supports its services with program development, coding assistance, extensive documentation, and user training. A newsletter published monthly features a library program of the month and includes periodic releases of system enhancements.

LOCAL DIALING

Users can dial local numbers to access the system in the following locations:

Los Altos CA (415)
Los Angeles CA (213)
Orange County CA
San Diego CA (714)
San Fernando Valley CA
Santa Monica CA (213)
Denver CO (303)
Darien CT (203)
Greenwich CT (203)
Groton CT (203)
Hartford CT (203)
New Haven CT (203)
Norwalk CT (203)
Stamford CT (203
Stratford CT (203)
Windsor Locks CT (203)
Atlanta GA (404)
Chicago IL (312)
Oak Brook IL (312)
Peoria IL (309)
Indianapolis IN (317)
New Orleans LA (504)
Boston MA (617)
Worchester MA (617)
Silver Spring MD (301)
Detroit MI (313)
Lansing MI (517)
Minneapolis-
St Paul MN (612)
St Louis MO (314)
Bloomfield NJ (201)
Plainfield NJ (201)
Buffalo NY (716)
Hempstead NY (516)
Lindenhurst NY (516)
Manhattan NY (212)
Owego NY (315)
Rochester NY (716)
Cincinnati OH (513)
Cleveland OH (216)
Dayton OH (513)
Toledo OH (419)
Philadelphia PA (215)
Pittsburgh PA (412)
Dallas TX (214)
Houston TX (713)
Promontory UT (801)
Salt Lake City UT (801)
Richmond VA (703)

TERMINAL SUPPORT

Terminals supported by the Basic and CRJE services include all low-speed Teletype and IBM 2741-compatible terminals, Teletype 33/35, Novation, Datapoint 3300, Execuport 300, Gulton LG 10/30, IBM 2741, Itel 1021, Datel, Univac DCT 500, and others.

In addition to supporting the low-speed terminals enumerated above, the RJE service supports the following high-speed devices: Univac 9200/9300, Univac 1004, IBM 1130, Univac DCT 2000, IBM 2780, and a variety of terminals which emulate the preceding.

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COMPUTER SHARING SERVICES

BACKGROUND

Computer Sharing Services (CSS) was formed in November 1967 and that same month began offering time sharing services on a Honeywell/GE-255 system, which is a Honeywell/GE-225 central processor connected to a Datanet-30 communications processor. In June 1968 the company replaced the 255 with a Honeywell/GE-420 system, which has since been upgraded to a 430 system. Another 430 system was added in July 1970. CSS offers a conversational time sharing and also supports a local batch service. An extensive library of over 200 programs is available to subscribers.

Service currently is implemented on the two Honeywell/GE-430 systems, each of which can support 30 simultaneous users. A Honeywell/GE-430 is composed of a Honeywell/GE-425 central processor, with 32K 24-bit words of core storage, and a Datanet-30 communications processor.

CSS offers conversational language support in Basic, Super Basic, and Fortran IV.

The primary medium for subscriber communication is the public dial-switched network. Additional facilities are provided by In-WATS lines (that serve Colorado), multiplexers, and Datanet-30's.

The company also supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

Users can dial local numbers to access the system throughout Colorado (303).

TERMINAL SUPPORT

Terminals that can access the CSS time sharing system include Teletype Models 33 and 35, Friden, CalComp Plotter, IBM 2741, Itel, Datel, and Typagraph. The system can also be accessed by all 30 character-per-second ASCII terminals.

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COMPUTER TASK GROUP

BACKGROUND

Computer Task Group (CTG) was formed in 1966 to offer information processing services in the western New York State area. It began a System/360 batch service in January 1968 and entered the time sharing market by becoming an associate of the Applied Logic AL/COM network in February 1969. For detailed information about the facilities offered by Applied Logic, see the report describing that company.

CTG offers particular specialization in the areas of operations research, crystallography, statistics, circuit analysis, medical computing, and all phases of commercial systems. The company also specializes in the design of customized systems, which are then executed on the AL/COM system and delivered to the user.

Remote batch and conversational time sharing service is implemented on Applied Logic's Dual AL-10 configuration consisting of two Digital Equipment Corporation (DEC) PDP-10 processors with 128K 36-bit words of core storage. The system can support 200 simultaneous users (50 on each of four systems).

CTG provides programming support in the same languages supported by Applied Logic. These languages are: AID (a conversational algebraic language), Basic, Cobol, Fortran IV, LISP

1.6 (a list processing language), MACRO-10 (the PDP-10 assembly language), and SNOBOL (a string-manipulating language).

LOCAL DIALING

Free local dialing into the AL/COM network is provided in the following metropolitan areas, in addition to the toll-free dialing area supported by Applied Logic: Buffalo NY (716) and New York NY (212).

TERMINAL SUPPORT

The AL/COM system supports many types of remote terminals such as: Teletype Models 33 and 35; CalComp 10-inch and 30-inch plotters; Itel data terminals; and Datel terminals.

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COMP/UTILITY

BACKGROUND

Comp/Utility (C/U), a wholly owned subsidiary of the North American Computer and Communications Company, was established January 1, 1969. In June of that year, C/U began offering time sharing service on a DEC PDP-10.

The company provides a full range of time sharing facilities, which include conversational, local batch, and dedicated services. C/U's application programs and program libraries serve such industries as electronics, banking, investment, education, and accounting. The company's utility programs include: a file update system; programs that generate cross-reference listings, code translation, and source and binary comparisons; and programs that allow the user to obtain a summary of the file system's status and to save and retrieve selected disc files on a backup magnetic tape. In 1971, C/U added STATPAK, an interactive statistical system with 21 different types of analysis; this stand-alone system requires little or no computer experience.

A DEC PDP-10 system comprises the central processor configuration for the C/U network, NET/70. The central processor has a capacity of 64K 36-bit words and can support a maximum of 60 simultaneous users.

C/U provides both conversational and batch programming language support in extended Basic; extended Fortran IV (Level H); AID, a conversational algebraic language to assist scientists and engineers with complex numerical and engineering problems; and MACRO 10, an assembly language.

The primary medium of communication is over the public dialup network into a dual front-end communications system, composed of a computer-controlled DEC 680I system and hardwired DEC DC-10. The 680I is a modified PDP-8 computer designed to monitor communications with remote terminals.

Additionally, the company supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

Users can access the system from local numbers in Boston MA (617).

TERMINAL SUPPORT

All terminals that produce 8-level ASCII code at 110, 150, 130, 300, and 1,200 baud can access the C/U time sharing system. These are highlighted by the following terminals: Teletype Models 33, 35, and 37; GE TermiNet 300; Computek CRT Graphics Execuport; ARDS CRT Graphics Terminal; Execuport; CalComp Remote Digital Plotter; Houston Omnigraphic Remote Digital Plotter; Computervision INTERACT Graphic Terminal; Computervision COMPUCIRCUIT Terminal; Itel terminals; Viatron System 21 Data Communications Terminal; and Datapoint 3300.

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COMPU-TIME

BACKGROUND

Compu-Time, Inc., a subsidiary of Root Company, was formed in October 1967 and immediately began offering service using a HIS 420 (born GE-420) time sharing system. In July 1969, the system was field upgraded to a HIS 430. A year later Compu-Time started construction of new corporate headquarters, and in November 1970 opened the new building and installed its

second Honeywell/GE-430 system. Operating from its Florida headquarters, Compu-Time offers time sharing service throughout the southeastern United States via WATS lines.

At present, the company provides conversational time sharing with HIS 430 central processors (32,768 24-bit words of core), each interfaced to Datanet-30 communications processors and capable of handling 40 users simultaneously.

Programming language support includes Basic and Fortran.

Compu-Time's system offers general-purpose time sharing computation for scientific, commercial, and educational applications. Through sales support personnel and training, the company provides its subscribers with a series of courses that offer both a conceptual and practical knowledge of time sharing and its uses. Further, the company has an extensive library of applications programs in the fields of business, engineering, mathematics, education, contract programming, and system consulting. To supplement its courses, Compu-Time provides manuals on its language offerings (Basic and Fortran) and applications systems.

LOCAL DIALING

Through a network of foreign exchange lines, multiplexers, and inbound WATS service, Compu-Time offers toll-free dialing into its time sharing system in Atlanta GA (404) and throughout the states of Kentucky (606, 502), Tennessee (615, 901), Mississippi (601), Alabama (205), North Carolina (704, 919), South Carolina (803), and Florida (305, 813, 904).

TERMINAL SUPPORT

A partial list of terminals supported by the Compu-Time system follows: Teletype Models 33, 35, 37; Friden 7100 Conversational Terminal; Friden 7102 Communications Terminal; Datel Thirty-21 Data Terminal; GE TermiNet 300; Datapoint 3300; and Execuport 300.

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COMPUTONE SYSTEMS

BACKGROUND

Computone Systems, Inc. (CSI) is a pioneer manufacturing and service company in the computer time sharing industry. The firm was established as a new corporation on January 1, 1969, following the merger of two companies engaged in separate but related business activities in the dedicated communications and computer service fields. These companies were Squires-Sanders, Inc. of Liberty Corner, New Jersey, founded in 1962 as a developer of communications equipment for government and commercial markets; and Computrol Systems, Inc. of Atlanta, Georgia, a supplier since 1965 of computer hardware, software, and data processing services.

Through combination of the facilities and capabilities of these two antecedent organizations, CSI has established its base of operations in the three principal phases of the computer time sharing industry as follows.

First, the company is a major supplier of terminal equipment for an expanding number of business applications, with emphasis on volume markets. CSI terminals incorporate design features which enable the user to precompose and review his source data input prior to communicating with a computer center. Second, CSI provides the software necessary for the communications function between terminal users and a data center. The firm is noted for its expertise in linear programming techniques, which enable a computer system to serve as a management tool in the decision-making process. Lastly, the company operates one of the early computer centers established in this country (founded in 1965) to service computer terminals on a time sharing basis.

Thus CSI is a dedicated service furnishing audio applications through Computone or Touch-Tone terminals providing audio response and furnishing linear programming and scientific applications from ILP 1200 terminals.

The service supports an IBM System/360 Model 40 computer system. Because CSI is a dedicated system, rather than supporting programming languages for subscribers, all programming is done by the staff in Cobol, Fortran, or Assembler for the exclusive use of Computone subscribers. Thus in devoting attention to complete service offering and support, CSI's principal business thrust is to address those interrelated hardware/software capabilities in developing new markets. The company's customers include not only businesses without their own computer systems or computer staffs, but also those who do operate computer systems. Each user of a terminal has a computer system constantly at his

service, while the company that has its own computer system can use it more effectively by broadening its base of access through in-house or outside terminal users.

LOCAL DIALING

Local dialing into the firm's system is provided in the Atlanta metropolitan area and from In-WATS areas 1 to 5 on a prorated basis.

TERMINAL SUPPORT

Computone supports its own line of terminals and the following devices: CT 14, 55, 56 Audio Terminals; ILP 1200, 1201, 1400 Formulation Consoles; IBM 1050 Data Communication System; IBM 1070 Process Communication System; and MTK-1 Audio Terminal.

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COMSERV, A COMPUTER UTILITY

BACKGROUND

Comserv began operations in November 1968 as a limited partnership of the Computer Command & Control Company of Philadelphia and the principals of Oppenheimer and Company of New York.

The company was established to offer integrated services as a computer utility to commercial and industrial users of information processing. Comserv offers a proprietary on-line transaction system (COLT™), which is a special-purpose service designed to offer immediate access to and dynamic manipulation of a business-oriented data base.

The public dial-switched network is the most common means for interaction with the Comserv system.

Comserv also supports its services with program development, coding assistance, customer training, and documentation.

LOCAL DIALING

Local dialing into Comserv's time sharing facility is available in Philadelphia.

TERMINAL SUPPORT

Comserv supports a dual Teletype system developed for its COLT accounting service. One terminal is equipped with a keyboard, ASR Teletype (automatic send/receive), and the second terminal is an RO Teletype (receive only). Both terminals are directly connected to the Comserv XDS Sigma 7 Computer via the Bell Telephone dialup network. The ASR terminal is used to enter data into the computing system and to provide direct readout of user transactions by simultaneous printout. The RO terminal prints out the actual invoice as directed by the computer. Periodic reports, which are relatively long or which are wider than the ASR paper, are printed out by a high-speed printer at Comserv and then delivered to the applicable customer.

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COM-SHARE

BACKGROUND

Com-Share was incorporated in February 1966 and began its operations with research and development activities directed toward the building of a commercial time sharing service. During this early period, technically trained members of the corporation went to California to collaborate with Scientific Data Systems (now XDS), Tymshare, and the University of California (Berkeley) in creating the initial commercial time sharing software for the XDS 940. Com-Share's first XDS computer was fully installed in Ann Arbor, Michigan, in November 1966; and a research and development effort was then devoted to producing a reliable system. When dependability was certain, the system capability was expanded with the introduction of completely new operating system software.

As a result of the company's efforts to provide extensive coverage on an international level, Com-Share is affiliated with Com-Share Limited, a Toronto-based company serving Montreal, Ottawa, Sarnia, Windsor, and London, Ontario, as well as London, England. Com-Share Limited markets its own services, but uses the technology of its American counterpart.

Com-Share's principal offering is conversational time sharing, known as Commander I service. It is implemented on eight XDS 940 computers, each configured with 64K 24-bit words and capable of supporting 44 simultaneous users. A special COM-LINK capability allows the high-speed transfer of data files between all Com-Share computers.

In the fall of 1971, Com-Share also began marketing Commander II service, an advanced time sharing/remote batch service based on an XDS Sigma 7/Sigma 2 system. The Sigma 7 has 512K 8-bit bytes of core and is equipped with all available CPU options. The Sigma 2 acts as a front-end processor, and shares 16K bytes of core with the Sigma 7.

In Commander I service, programming language support includes NEWBASIC (an extended version of Basic), XTRAN (an ANSI Fortran superset), CAL (Conversational Algebraic Language) and SNOBOL; the company also maintains Fortran II and IV and Basic for compatibility with older systems.

In Commander II service, Com-Share currently supports Assembly language and Fortran for both conversational and batch use. Cobol support is under development.

The company supports a library of application packages, primarily in areas of business and finance, civil engineering, mechanical engineering, and mathematics. In addition, Com-Share has a "Competitor Program," designed to bring unique areas of application software expertise to Com-Share users. This program, available to industry experts, comprises brokerage, distributor, and licensing services. The broker buys bulk computer and communication resources from Com-Share, then sells and supports the use of a specialized application package on the Com-Share system. The distributor also markets and maintains a specialized application package on the Com-Share system, but Com-Share handles all administrative functions such as contracting, billing, royalty, and accounting. Finally, the licensing service has an agreement whereby Com-Share itself sells and supports application systems developed by industry experts.

Application packages available through such agreements include a circuit analysis and optimization program from Applicon, Inc.; business planning and financial forecasting programs from Applied Decision Systems; a package for the numerically controlled machine tool industry from Manufacturing Data Systems, Inc. (MDSI); one for the warehouse distribution industry from Computer Logistics Corporation; financial modeling software from Stanford Research Institute; a structural engineering library provided by Structural Dynamics Research Corporation; corporate modeling programs from On-Line Decisions; a library of engineering, land surveying and plotting programs from Concap Computing Inc.; and a package of animal nutrition programs from Maddy Associates, Inc.

Com-Share supports its service with coding assistance, training, and documentation. Program development assistance is enhanced through FOCUS, a Com-Share users group dedicated to the exchange of program ideas. The company also helps users select reliable and appropriate terminal devices through a formal Terminal Evaluation and Support program.

LOCAL DIALING

In the United States, local dialing facilities are furnished in the following areas:

Los Altos CA (415)
Santa Barbara CA (805)
Los Angeles CA (213)
Oakland CA (415)
San Francisco CA (415)
Wilmington DE (302)
Buffalo IL (217)
Chicago IL (312)
Skokie IL (312)
Indianapolis IN (317)
Davenport IA (319)
Covington KY (606)
Louisville KY (502)
Boston MA (617)
Baltimore MD (301)
Ann Arbor MI (313)
Jackson MI (517)
Kalamazoo MI (616)
Saginaw MI (517)
Detroit MI (313)
Flint MI (313)
Minneapolis MN (612)
St. Louis MO (314)
Kansas City MO (816)
Norwood NJ (201)
New York NY (212)
Columbus OH (614)
Dayton OH (513)
Cleveland OH (216)
Cincinnati OH (513)
Piketon OH (614)
North Canton OH (216)
Lordstown OH (216)
Toledo OH (419)
Mt. Vernon OH (614)
Grove City PA (412)

Edinboro PA (814)
California PA (412)
Pittsburgh PA (412)
Philadelphia PA (215)
Millersville PA (717)
Harrisburg PA (717)
Oak Ridge TN (615)
Houston TX (713)
Arlington VA (703)
Milwaukee WI (414)
Beloit WI (608)

In Canada local dialing facilities are furnished in the following areas:

Toronto (416)
Montreal (514)
Ottawa (613)
Windsor (519)
Sarnia (519)
London (519)
Hamilton (416)

TERMINAL SUPPORT

The system accommodates most terminals using ASCII codes and operating at 10, 30, or 60 characters per second. Among the terminals supported are Teletype Models 33 and 35, GE TermiNet, Datapoint 3300, Memorex 1240, and CalComp Plotter.

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COM-SHARE LIMITED

BACKGROUND

Com-Share Limited was established December 1, 1968, and began offering time sharing service 3 months later. In May 1969 the company opened two new offices, one in London, Ontario, and the other in Montreal; in July of that year the Ottawa branch opened.

Polymer Corporation is Com-Share Limited's main shareholder; the U.S. firm, Com-Share, Inc., holds a minority shareholder position and provides additional research and development and technical expertise. Based in Ontario, Com-Share Limited markets its services in Ontario and Quebec.

Com-Share Limited provides both conversational and remote/local batch processing, available in either of two services: (1) Com-Share Inc.'s 940 service and (2) a Sigma 7 service. The Sigma 7 computer has 128K (32-bit) words, a 650-nanosecond cycle time, and can support 64 simultaneous users.

Subscribers to the 940 service can program in Basic, Cobol, several versions of Fortran, CAL, SNOBOL, and TAP (assembler). With the Sigma 7 service, Basic, Cobol-65, and Fortran IV are supported. Basic, Fortran IV, and CAL are available for conversational use.

Means for subscriber communication with the system are the public dial-switched network as well as foreign exchange, multiplexer, and In-WATS lines.

Com-Share Limited supports its services with coding assistance, customer training, and documentation.

LOCAL DIALING

Users can access the system on a toll-free basis from the following cities: Hamilton (416), Kitchener-Waterloo (519), London, Ontario (519), Montreal (514), Ottawa (613), St. Catharines (416), Sarnia (519), Toronto (416), and Windsor (519).

TERMINAL SUPPORT

The 940 service supports the terminals used by Com-Share, Inc.

The Sigma 7 supports the following terminal equipment: Teletype Models 33, 35 and 37; Syner-Data Beta System; GE TermiNet 300; Datapoint 3300; XDS 7670; and Univac DCT 2000.

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CONCAP COMPUTING SYSTEMS

LOCAL DIALING

Local dialing is available in the following areas: MA (617); New York NY (212); Philadelphia PA (215); Pittsburgh PA (412); VA (703); Chicago IL (312); Detroit MI (313); OH (216, 513); MO (314); TX (214, 713); CA (213, 415, 916); OR (503); and WA (206).

TERMINAL SUPPORT

Representative terminals supported by the system are Teletype 33 and 35.

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CONSOLIDATED COMPUTER SERVICES LIMITED

BACKGROUND

Consolidated Computer Services Limited (CCS) was formed in June 1968. Their time sharing service was initiated in Toronto during February 1969. During 1969 and 1970, CCS expanded its operation throughout Canada and instituted service in England.

CCS offers a conversational time sharing service that supports the Basic programming language. The company furnishes a library of general-purpose routines and application-oriented programs for solving scientific, mathematical, business, and commercial problems. The CCS 2102 time sharing computer system supports up to 16 simultaneous users.

The company offers support in training and documentation.

LOCAL DIALING

CCS users can dial local telephone numbers in Edmonton, Alberta (403), London, Ontario (519), Ottawa, Ontario (613), Toronto, Ontario (416), Halifax, Nova Scotia (902), and Montreal, Quebec (514).

TERMINAL SUPPORT

CCS provides terminal support for Teletype ASR 33/35, KSR 33/35, Datapoint 3300, Anderson Jacobson ADT233 Portable, and any USASI terminal operating asynchronously at 10 characters per second. A Hewlett-Packard 7200A Plotter and an HP2761A Mark Sense and Punch Card Reader are also supported.

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CONTROL DATA

BACKGROUND

Control Data Corporation established its computer services organization in 1962 by forming its Data Centers Division. In September 1969, the Division changed its name to Data Services Division. In accordance with its 1970 reorganizations, Control Data's CYBERNET Service Division is now responsible for coordinating CDC's computer services activities. (CYBERNET Service Division markets computer services on CDC computers/terminals which are operated by CDC Data Services.)

CYBERNET was announced early in 1969. Based on a nationwide network of CDC CYBERNET Centers and public and private terminals, the total network (both conversational and remote batch centers plus customers' terminals) and supporting services are called CYBERNET service. The network has nine CDC 6600 computer systems, three 6400 computer systems, and one CDC 3300 computer system. In total, more than 40 CYBERNET Centers are maintained. The centers are interconnected by wideband or voice-grade lines.

The CDC 3300 used by CYBERNET Service employs the 3311 Multiprogramming Module and has a cycle time of 1.25 microseconds. It can simultaneously support 50 remote batch users.

The CDC 6600 and 6400 computer systems are characterized by a central processor that utilizes an eight-word instruction stack for register-speed program looping operations and 10 peripheral processors. The central processor functions at an internal clock-cycle rate of 100 nanoseconds. The 6600 and 6400 have a 131K-word (60 bits per word) main memory, of 10 banks interleaved. Basic cycle time of a bank is 1 microsecond per word.

Depending on the nature of the job and the kind of terminal, processing results can be printed on the terminal line printer, written on tape at the user's site, or written on central computer data files. With the CYBERNET Service, users have access to Algol, Basic, Cobol, COMPASS (CDC's assembly language) and Fortran IV.

KRONOS is a conversational service that offers interactive file maintenance, time sliced batch compilation, and time sliced execution of user programs.

In addition, a communications software package called SHADOW/SHADE has been installed at CDC 3300 CYBERNET Centers. The SHADOW program is a generalized message switching system that transfers customer jobs throughout the CYBERNET network at a user's request. The SHADE program is a CDC 3300 record management system that enables users to perform file handling, record maintenance, information retrieval, and report generation. Operating in either a batch or interactive mode, the SHADE user can add, delete, or modify information that is stored in his CDC 3300 data files. In addition, he can selectively retrieve data from his file for display or printer listing.

CDC CYBERNET Service offers major applications packages for time-series analysis, circuit network analysis, structural model problems, questionnaire analysis, solution of network problems, numerical control instructions to guide machine tools, study of electrical system performance, and evaluation of project workflow in terms of time and money.

At the company's major CYBERNET Centers, a staff is available for customer consultation in problem definition, system design, applications, and programming.

LOCAL DIALING

Local dialing is offered toll free throughout the United States.

TERMINAL SUPPORT

Subscribers may access the CYBERNET network through any of the following terminals: MARC-I (Teletype Models 33 and 35), MARC-II (CDC 200 UT), MARC-III (CDC 8130 and CDC 8090 with low-speed peripherals), MARC-IV (CDC 8090/160A with high-speed peripherals), MARC-V (CDC 1700), IBM 1130, Honeywell 200, U9200, IBM 360/25, and up, and COPE Series.

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CYPHERNETICS

BACKGROUND

The Cyphernetics Corporation was formed in February 1969 and after spending 6 months modifying Digital Equipment Corporation's (DEC) system releases, it initiated a time sharing service known as the Cyphernet system. Since then, the firm has expanded its operation to serve Michigan, Ohio, western Pennsylvania, New York City, New Jersey, and the Chicago area.

Cyphernetics offers an interactive time sharing service and deferred batch processing that also can be controlled from the user's terminal. The firm implements its service on three DEC PDP-10 computers; each has 128K 36-bit words (1-microsecond access time) and is capable of supporting 50 simultaneous users. The system is configured with modified PDP-8/I processors that serve as front-end communications processors for the PDP-10s. Users can also remotely access a wide range of peripheral devices from their own terminals. The primary method of communicating with the Cyphernet system is through multiplexers located at branch offices.

Programming language support includes extended versions of Fortran IV and Basic as well as Cobol and MACRO 10, DEC's assembly language.

In addition to a library of frequently used Basic and Fortran programs, The Cyphernetics Corporation offers software products designed to solve specific applications problems. These include a conversational statistical system, a complete text processing system, a report writing and specification writing system, a project management (CPM type) system, a business planning and reporting system, electronic circuit analysis programs, continuous system (analog) simulation packages, civil/architectural engineering design and analysis packages, contour plotting and Fortran IV flowcharting, and a variety of general-purpose graphics programs.

Cyphernetics Corporation features extensive applications development support and consulting services. Subscribers receive training through seminars, workshops, and classes. A comprehensive library of manuals and other publications

relating to systems and applications usage is also provided.

LOCAL DIALING

Local dialing with toll-free service is offered throughout Michigan (313, 517, 616, 906), throughout Ohio (216, 419, 513, 614), in Chicago IL (312) and in Pittsburgh PA (412).

TERMINAL SUPPORT

Cyphernetics supports the following terminal equipment: Teletype Models 33, 35, and 37; IBM 2741; Datel; Itel; TermiNet 300; Execuport; PortaCom; Datapoint; Tektronix; ARDS; CalComp Plotter; Zeta Plotter; DCT 500; Hazeltine; Memorex; and NCR 260.

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DATALINE SYSTEMS LIMITED

BACKGROUND

Dataline Systems Limited was formed in September 1968 and initiated its time sharing service in September 1969. During January 1970, the company opened regional offices and established local dialing service in Ottawa. In subsequent months the company added bulk disc storage capability and terminal support for the IBM 2741 Communications Terminal and 30 character-per-second operating speed.

Dataline offers conversational time sharing, remote batch service via high-speed synchronous transmission, and local batch processing services. The company has two Digital Equipment Corporation (DEC) PDP-10/50 computers. Although each system is configured to handle up to 63 simultaneous users, Dataline can support a practical maximum of 110 simultaneous users with its present environment. Applications offerings include a library of engineering, business, and management packages. Currently, Dataline markets its services primarily in eastern Canada.

The service supports the following programming languages: AID, a PDP-10 adaptation of the conversational algebraic language JOSS; Cobol; GIST, a superset of the string manipulating TRAC language that includes plotting capability; LISP 1.5, a list processing language; SNOBOL 4, a string manipulating language; and full versions of Basic and both conversational and non-conversational Fortran IV. In addition, the following assembly languages are available:

MACRO-10 for the PDP-10; PAL-10 for the PDP-8; and PAL-XII for the PDP-11.

Dataline Systems Limited furnishes user training and documentation support.

LOCAL DIALING

Users can dial local numbers to access the system in Ottawa, Ontario (613); Toronto, Ontario (416); and Montreal, Quebec (514).

TERMINAL SUPPORT

The system supports the IBM 2741 Communication Terminal and the Beta printers at 30 character-per-second operating speed, Datapoint 3300, Execuport 300, and all other terminals communicating in ASCII or compatible to the 2741.

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DATALOGICS

LOCAL DIALING

Local dialing is available in Ohio (216).

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DEDICATED COMPUTER APPLICATIONS

LOCAL DIALING

Local dialing is available in the following areas: NJ (201, 609); New York NY (212), and Long Island NY (516).

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DELTA TIME SHARING

LOCAL DIALING

Local dialing is available in Mississippi (601).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Univac DCT 500 and Univac DCT 2000.

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DIALCOM

LOCAL DIALING

Local dialing is available in the following areas: CT(203); RI(401); DE(302); MD(301); NJ(201, 609); NY(212, 315, 516, 518, 607, 716, 914), PA(215, 412, 717, 814); Washington DC (202); and VA(703).

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DIGITEK

BACKGROUND

Digitek Corporation was established in 1961 and initiated its commercial time sharing activities on May 31, 1967. Its system, called the Digitek Financial Management System, provides on-line commercial time sharing services dedicated to billing, sales and accounts receivable reporting, inventory reporting, accounts payable, payroll and labor distribution, and general ledger applications.

The Digitek service is implemented on three Burroughs B 506 computers with 19.2K characters of core storage each and an access time of 4 microseconds. Each system can handle up to 63 users simultaneously.

Digitek supplies all programs for the system; these are written in Cobol and Advanced Assembler. Programs available to a customer include those tailored to his particular requirements and "Datipak" programs generalized for use by all customers.

The company has a support staff to assist customers. In addition to program development, Digitek provides user training and documentation.

LOCAL DIALING

Subscribers communicate with the Digitek system over leased lines.

TERMINAL SUPPORT

Users may access the system through Teletype Models 28, ASR 33, or ASR 35, and Univac DCT 500 terminals. Communications are via leased telephone lines.

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DIRECT ACCESS COMPUTING

BACKGROUND

Direct Access Computing Corporation (DACC) was formed in March 1968 and initiated its time sharing service in November of that year. During December 1968, DACC's first branch office was opened in Cincinnati, Ohio. Subsequent expansion during 1969 included the acquisition of the Saginaw, Michigan, data center in January and an agreement to furnish technical support for Comsource, a time sharing company in South Africa. The firm maintains an extensive library of general applications programs.

DACC supports conversational time sharing and remote batch services on a Burroughs B 5500 computer system. The B 5500 has 32K 48-bit words of core and a memory cycle time of 4 microseconds; it can support up to 48 simultaneous users. The service's offering of programming languages consists of Algol and extended versions of Basic, Cobol, and Fortran IV.

Moreover, the service furnishes routines for converting GE time sharing Fortran programs into DACC Fortran programs.

The firm markets its service in the mid-western United States. Consulting and programming support, as well as training and documentation, are available.

LOCAL DIALING

Local dialing into the system is available from the following areas: Indianapolis IN (317); Detroit MI (313); Lansing MI (517); Southfield MI (313) and Cincinnati OH (513).

TERMINAL SUPPORT

The system supports the following terminals: Teletype 33/35, Telemate 300, Datapoint 3300, GE TermiNet 300, Acoustic Data Coupler, and Execuport. Communications support includes two ADS Model 660 Multiplexers at 110 or 300 baud.

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DIVERSIFIED COMPUTER APPLICATIONS

BACKGROUND

Diversified Computer Applications (DCA) was established in April 1965 as a data processing service center that would provide standard business data processing production capability to firms in the San Francisco Bay area. The company began to offer time sharing services during December 1969. As its business expanded, DCA upgraded from an IBM 1401 to a System 360/30. When the company moved to its new building in November 1969, it had a Burroughs B 2500 computer installed; in March 1971, it added another Burroughs B 2500 system.

DCA offers both conversational and local/remote batch service; at present, however, the firm's time sharing activity is dedicated to commercial applications, including business, financial, and statistical areas.

DCA programmers develop all application programs required by subscribers. While all these programs are written in Cobol, the Burroughs systems also support Assembly language, Fortran IV, and RPG (report program generator). If desired, a customer can write his own programs and implement them from his terminal.

DCA implements its service on two B 2500 computers, each of which has 90K bytes of storage. Cycle time is 2 microseconds for the B 2500. Each system can support 50 simultaneous users.

When communicating with the system, subscribers use the public dial-switched network.

A support staff is available to assist the subscriber with computer programming, computer and terminal operations, fiscal controls, and data entry.

LOCAL DIALING

Users can make toll-free calls into the system in Palo Alto CA (415) and Mountain View CA (415).

TERMINAL SUPPORT

The service supports the following terminals: Teletype Models 33, 35, and 37; Novar 550; Memorex 1240 and 1280; Burroughs TC 500 and B 9352; and Infoton Video Vista I and II.

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FIRST DATA

BACKGROUND

First Data Corporation was established in June 1970 when it assumed the on-going business of Codon Computer Utilities, Inc. Codon had been offering time sharing service since October 1969. Based in Waltham, Massachusetts, First Data markets its service throughout New England, New York, and Washington, D.C.

For programming support, First Data offers a conversational service using AID, Basic, Cobol, Fortran, MACRO assembly language, and PPL (an interactive language similar to APL).

First Data's computer system is a DEC PDP-10, which has 80 (36-bit) words of storage with a 1.0- and 1.6-microsecond cycle time. The system can support over 60 simultaneous users.

Besides manuscript preparation, circuit design, graphical display, and statistical packages, the firm offers a library of business, engineering, and statistical programs.

First Data supports its services with program development and technical assistance.

LOCAL DIALING

Local dialing on a toll-free basis is provided throughout greater Boston (617), New York (212), and Washington DC (202).

TERMINAL SUPPORT

The service supports the following terminals or their equivalents operating at 110, 134.5, 300, or 1,200/110 baud: Teletype Models 33 and 35, Syner-Data Beta System, GE TermiNet 300, Execuport, Novar, IBM 2741, Itel, Datapoint, Tektronix T4002, Logitron, Infoton, Computek, Datel, ARDS Display, Imlac, and Univac DCT 500.

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GTE INFORMATION SYSTEMS

LOCAL DIALING

Local dialing is available in the following areas: CT(203); MA(413, 617); NH(603); RI(401); VT(802); DE(302); MD(301); NJ(201, 609); New York NY(212); NY(516, 914); Washington, DC (202); FL(813); Chicago, IL(312); and MI(517).

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GENERAL ELECTRIC

BACKGROUND

General Electric (GE) entered the time sharing field as the result of a cooperative venture with Dartmouth College. In the spring of 1964, Dartmouth acquired a Honeywell/GE-225 computer and a Datanet-30 communications processor and began to collaborate with GE in the development of a time sharing system. A significant result of this activity was the Basic programming language, designed by Dartmouth faculty and students.

The operating system, which controls the time sharing service, was designed and developed by GE; it became operational in July 1964. Early in 1965, GE began operating time sharing centers in Phoenix and New York City. As a result of these ventures, the General Electric Information Service Department was formed on September 1, 1966, with headquarters in Bethesda, Maryland. GE presently maintains computer operating service centers in three cities in the United States.

GE offers four conversational time sharing services: BASIC I, MARK I, MARK II, and MARK DELTA.

BASIC I service is implemented on the Honeywell/GE-265 system and is co-resident with MARK I service. Described as a "service within a service," BASIC I has all the system capabilities available with MARK I as described next.

MARK I service is implemented on the Honeywell/GE-265 system, composed of a Honeywell/GE-235 central processor with 16K 20-bit words of core and connected to a Datanet-30 communications processor, also with 16K 20-bit words of core. This configuration can support up to 39 apparently simultaneous users.

MARK II service is implemented on the Honeywell/GE-635 central processor, with a core capacity of 96 to 128K 36-bit words and the ability to support up to 200 apparently simultaneous users. This system uses GEPAC-4020 communications processors and COMPAT-416 concentrators.

MARK DELTA service is implemented on the Honeywell/GE-605 system, with core capacity of 96 to 128K 36-bit words and the ability to support up to 104 apparently simultaneous users. This system uses GE Teletype multiplexers. MARK DELTA is intended for on-line data management and features extended file handling capabilities. It is limited to the Fortran language.

General Electric offers programming language support in Algol (a computational language primarily intended for scientific problem solving), extended Basic, and extended Fortran. Algol is used with MARK I service only; Basic only with BASIC I, MARK I, II; and Fortran with all services.

The normal data transmission medium for subscribers is the public telephone system, but foreign exchange (FX) and inbound WATS lines are also used. In addition, international service is provided via Satellite Communications Systems.

Network service is soon to be expanded on a regional basis for all MARK II users. A fully interconnected nationwide network for all MARK II systems will be implemented as the next step in the evolution of GE networks.

The company supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

There are over 230 cities in the United States where users can dial local numbers to access GE's time sharing systems:

Akron OH (216)
Albany NY (518)
Albuquerque NM (505)
Alcoa TN (615)
Allentown PA (412)
Amsterdam NY (518)
Anderson SC (803)
Ann Arbor MI (313)
Asheville NC (704)
Atlanta GA (404)
Augusta GA (404)
Austin TX (512)
Bakersfield CA (805)
Baltimore MD (301)
Bartow FL (813)
Baton Rouge LA (504)
Benton Harbor MI (616)
Berkeley CA (415)
Bethesda MD (301)
Binghamton NY (607)
Birmingham AL (205)
Bloomington IN (812)
Boron CA (714)
Boston MA (617)
Bowling Green OH (419)
Brattleboro VT (802)
Brevard NC (704)
Bridgeport CT (203)
Brook Park OH (216)
Buffalo NY (716)
Burlington NC (919)
Burlington VT (802)
Canton OH (216)
Casper WY (307)
Cedar Rapids IA (319)
Charlotte NC (704)
Charlottesville VA (703)
Charleston WV (304)
Chattanooga TN (615)
Chicago IL (312)
Cincinnati OH (513)
Clemson SC (803)
Cleveland OH (216)
Cocoa Beach FL (305)
Colorado Springs CO (303)
Columbia SC (803)
Columbus OH (614)
Corpus Christi TX (512)
Corning NY (607)
Cour D'Alene ID (208)
Dahlgren VA (703)
Dallas TX (214)
Davenport IA (319)
Dayton OH (513)
Deer Park NY (516)
Denver CO (303)
Des Moines IA (515)
Des Plaines IL (312)
Detroit MI (313)
Duncan OH (614)
Durham NC (919)
Eatontown NJ (201)
Eau Gallie FL (305)
Elmira NY (607)
El Monte CA (213)
El Paso TX (915)
Erie PA (814)
Evansville IN (812)
Flagstaff AZ (602)
Flint MI (313)
Florence SC (803)
Ft. Lauderdale FL (305)
Ft. Smith AR (501)
Ft. Wayne IN (219)
Gainesville FL (305)
Galveston TX (713)
Garden Grove CA (714)
Gary IN (219)
Geneva NY (315)
Glens Falls NY (518)
Grand Prairie TX (214)
Greensboro NC (919)
Greensburg PA (412)
Greenville NC (803)
Groton CT (203)
Hamilton NY (315)
Hammond IN (219)
Hampton VA (703)
Harrisburg PA (717)
Hartford CT (203)
Hartsville SC (803)
Hickory NC (704)
Highland Park NY (201)
Hollywood FL (305)
Houston TX (713)
Huntsville AL (205)
Indianapolis IN (317)
Ithaca NY (607)
Jackson MS (601)
Jacksonville FL (305)
Jamestown NY (716)
Johnson City NY (607)
Kalamazoo MI (616)
Kansas City MO (816)
Kinston NC (919)
Kittery ME (207)
Knoxville TN (615)
Lafayette LA (318)
Lake Charles LA (318)
Lancaster PA (717)
Lancaster CA (805)
Lansing MI (517)
Las Vegas NV (702)
Lima OH (419)
Little Rock AR (602)
Lompoc CA (805)
Long Beach CA (213)
Los Angeles CA (213)
Louisville KY (502)
Loveland CO (303)
Lynchburg VA (703)
Lynn MA (617)
Macon GA (912)
Madison WI (608)
Manhattan NY (212)
Memphis TN (901)
Meriden CT (203)
Miami FL (305)
Midland TX (915)
Milwaukee WI (414)
Mineola NY (516)
Minneapolis MN (612)
Modesto CA (209)
Morristown NJ (201)
Muncie IN (317)
Muskegon MI (616)
Nashua NH (603)
Nashville TN (615)
Nassau NY (518)
Needham MA (617)
New Brunswick NJ (201)
New Haven CT (203)
New London CT (203)
New Orleans LA (504)
Newport News VA (703)
Niagara NY (716)
Norfolk VA (703)
Norwalk CT (203)
Norwich CT (203)
Nyack NY (914)
Oak Park MI (313)
Oklahoma City OK (405)
Omaha NB (402)
Ontario CA (714)
Orange CA (714)
Orlando FL (305)
Oxnard CA (805)
Palo Alto CA (415)
Pasco WA (509)
Pensacola FL (305)
Peoria IL (309)
Philadelphia PA (215)
Phoenix AZ (602)
Pittsburgh PA (412)
Pittsfield MA (413)
Plymouth NC (919)
Poughkeepsie NY (914)
Princeton NJ (609)
Providence RI (401)
Provo UT (801)
Racine WI (414)
Raleigh NC (919)
Reading PA (215)
Redlands CA (714)
Redwood City CA (415)
Reseda CA (213)
Richmond VA (703)
Ridgecrest CA (714)
Riverside CA (714)
Riverton WY (307)
Rochester NY (716)
Rome NY (315)
Sacramento CA (916)
Salem OR (503)

Salt Lake City UT (801)
San Angelo TX (915)
San Diego CA (714)
San Francisco CA (415)
Santa Ana CA (714)
Santa Barbara CA (805)
Santa Fe NM (505)
Santa Monica CA (213)
Savannah GA (912)
Schenectady NY (518)
Seattle WA (206)
Shreveport LA (318)
South Bend IN (219)
Spartanburg SC (803)
Spokane WA (509)
Springfield IL (217)
Springfield MA (413)
Springfield OH (513)
Springfield VT (802)
Stamford CT (203)
St. Louis MO (314)
St. Paul MN (612)
St. Petersburg FL (813)
Sunnyvale CA (408)
Syosset NY (516)
Syracuse NY (315)
Tacoma WA (206)
Tampa FL (813)
Teaneck NJ (201)
Toledo OH (419)
Toms River NJ (201)
Troy NY (518)
Tucson AZ (602)
Tulsa OK (918)
Utica NY (315)
Waltham MA (617)
Washington DC (202)
Wellesley MA (617)
W. Palm Beach FL (305)
Wheeling WV (304)
White Plains NY (914)
Wichita KS (316)
Wilkes-Barre PA (717)
Williamsport PA (717)
Wilmington DE (302)
Wilmington NC (919)
Winston-Salem NC (919)
Worcester MA (607)
York PA (717)
Youngstown OH (216)

GE also maintains a number of distribution center cities that are equipped with GE Diginet multiplexers so that the MARK I Dedicated Access Service is available by local dialing. These cities are Atlanta GA (404); Boston MA (617); Cleveland OH (216); Chicago IL (312); Dallas TX (214); Detroit MI (313); Los Angeles CA (213); New York NY (212); Phoenix AZ (602); San Francisco CA (415); Schenectady NY (518); Seattle WA (206); and Teaneck NJ (201).

TERMINAL SUPPORT

Terminals that can access the various GE services include the following: Datanet-730; Teletype Models 33, 35, 37; Friden 7100 and 7102; TermiNet 300; Anderson Jacobson 841; IBM 2741; Datel-30; Novar 5-41; Itel 1051; Execuport 300; Univac DCT 500; Syner-Data Beta; Texas Instruments 700; Inktronic; Hazeltine 2000; Corning 904; Video Systems VST-2000; Tektronics 4002; and Datapoint 3300.

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GENESEE COMPUTER CENTER

LOCAL DIALING

Local dialing is available in the following areas: MA(617); NY (315, 716); Philadelphia PA (215) and Washington DC (202).

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GRUMMAN DATA SYSTEMS

LOCAL DIALING

Local dialing is available in the following areas: CT (203), MA (617), NH (603), RI (401), VT (802), DE (302), NJ (201, 609), New York NY (212), Long Island NY (516), and PA (215, 412, 717, 814).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: IBM 2741; Teletype 33, 35; Data 100 Model 70 Series; IBM 2780; IBM 360/20; IBM 1130; Remcom Systems 2780; Univac 9000 Series; University Computing COPE Series; and IBM 2260.

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HOBBS ASSOCIATES

LOCAL DIALING

Local dialing is available in California (714).

TERMINAL SUPPORT

Representative terminals supported by the system are Teletype 33, 35, and 37.

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HONEYWELL

BACKGROUND

Honeywell, Inc. instituted its own in-house time sharing system in 1962. The firm began offering commercial time sharing service through its Information Services Operation in January 1969. The Information Services Operation offers both conversational (Honeywell Time Sharing Service) and remote batch (Remote Access Computing Service) services.

For remote batch processing, the user can access CDC 6600 and 3300 computer systems and can process his data using such languages as Cobol and Fortran IV. This service features access to a number of packages through use of a wide variety of remote batch terminals, which may be installed at the user's site. In the conversational mode, the user accesses a multiprocessor configuration consisting of one Honeywell DDP-416 and two DDP-516 computers. The conversational service features support for up to 48 simultaneous users and a variety of applications and programming languages including Basic; Fortran IV; SOLVE, an interactive, stack-oriented language designed for conversational use to solve poorly defined problems in which human intervention can help; and TEACH, a string-processing language designed for the production of computer-aided training programs. In addition to offering a time sharing service, the company markets all the time sharing facilities for outright customer purchase, in a hardware/software package called the Honeywell H1648 Time Sharing System.

Honeywell's conversational and remote batch offerings include specially developed languages and programs with particular emphasis in the areas of business management, education, and engineering. Additionally, Honeywell's Information Services Operation offers a wide range of other information handling services including: Software Service for providing design and analysis of scientific, engineering, and business information systems; Data Service, implemented at Honeywell Data Service Centers for providing all the electronic data processing required by a customer or limited special projects on a job-by-job basis; and a Facilities Management Service for providing the customer with the procedures required to organize a technical staff and personnel necessary to implement Honeywell's recommendations.

LOCAL DIALING

Users can dial local numbers to access the system in the following cities:

Atlanta GA (404)	Houston TX (713)
Boston MA (617)	Los Angeles CA (213)
Chicago IL (312)	Minneapolis MN (612)
Cleveland OH (216)	New York NY (212)
Dallas TX (214)	Philadelphia PA (215)
Denver CO (303)	Washington DC (202)
Detroit MI (313)	San Francisco CA (415)
	St. Louis MO (314)

TERMINAL SUPPORT

The Honeywell time sharing service supports any of the following terminals: Teletype Models 33 and 35, Friden 7201, IBM 2741, GE TermiNet 300, or CalComp plotters.

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IBM CANADA

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: IBM 2741 and Teletype 33, 35, 37.

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ITT DATA SERVICES

BACKGROUND

ITT Data Services was established as a separate division of International Telephone and Telegraph Corporation in November 1965 to provide total data processing services to commercial, scientific, and government users. The division's capabilities include time sharing, computation services, batch processing, systems analysis and design, contract programming, software services, and facilities management.

Its major programming accomplishments include design and development of the Strategic Air Command Control System (SACCS) and the U. S. Navy's Tactical Data System (NTDS) project coordinating Atlantic Fleet activity. ITT Data Services also developed a computerized credit information system, in addition to automated management information systems for state and local governments and systems for logistics, information retrieval, inventory control, financial reporting, and large data banks. The division operates an on-line, real-time system to automate operations of consumer finance companies.

ITT Data Services division is part of ITT's worldwide Data Equipment Systems and Services Group. The firm presently operates centers offering a full range of data processing services in England, West Germany, France, Sweden, and Brazil.

In April 1968, ITT Data Services introduced its REACTIVE TERMINAL SERVICE* (RTS) time sharing system. One of the nation's advanced third-generation computer time sharing services, the RTS* system provides large numbers of users with simultaneous access to large-scale System/360 computers from a variety of keyboard terminal devices located remotely from the ITT Data Services' computer center.

The RTS system is a conversational time sharing service designed to support language processors and applications programs from remote terminals. In addition to writing, updating, and maintaining his own programs, the RTS system user has access to ITT Data Services' extensive programming library, which offers a wide range of commercial and scientific applications.

ITT implements its service on two IBM 360/65 central processors located in Paramus, New Jersey, each with 512K bytes of core storage. These systems are linked to concentrators and 2780's in the firm's data centers throughout the country. Every user has 64K bytes of core memory plus user overlay facilities and logical work areas of unrestricted size.

Programming language support is available for extended versions of Basic and Fortran IV (Level G), and for Cobol and Assembler (Level F).

The primary means of communications for ITT system users is the public dial-switched network, with high-speed communications over 150-baud lines also available. Each RTS system user is connected by standard communication lines to a central processor unit at company headquarters in Paramus, New Jersey.

The company also supports its service with continuing development of the time sharing system, coding and debugging assistance, training, and documentation.

*Service marks of ITT Data Services, a division of International Telephone and Telegraph Corporation.

LOCAL DIALING

Users can dial local numbers to access the system in New York NY (212), Encino CA (213), Los Angeles CA (213), Chicago IL (312), Pittsburgh PA (412), Houston TX (713), and Washington DC (202).

TERMINAL SUPPORT

Terminals that can access the ITT system are: Teletype Models 33 and 35, IBM 2741 Communications Terminal, Itel data terminals (portable), Datel terminals (portable), Datapoint 3300 (CRT), CalComp Plotter, and IBM System 360/30 central processor (for remote job entry).

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INTERACTIVE DATA

BACKGROUND

Interactive Data Corporation (Interactive) was formed as an independent company in December 1968, as the result of a merger between Computer Communications Center, Inc., then developing time sharing software for the IBM System/360 Model 67 computer, and the Interactive Data Services Division of White, Weld & Co. In 1967, White Weld's Interactive Data Services offered ANALYSTICS-940, an investment-oriented service that was time shared on the XDS 940 computer. This service consisted primarily of a large-scale, on-line data base and proprietary software for accessing the data; the on-line data base contained Standard & Poor's Compustat® file on 900 major industrial corporations, and it was accessed by FFL (First Financial Language), a report-generating language for screening and displaying the financial data.

In January 1969, Interactive began to phase out the XDS 940 and offer general-purpose time sharing services and ANALYSTICS-360, on an IBM/360 Model 67 computer. A second 360/67 was added in January 1970.

From its inception to the present, Interactive has developed its services around two major facilities: large, on-line data bases and proprietary software to access the data. Today, Interactive maintains a number of large-scale data bases and a variety of product programs to access them. In addition, Interactive also offers general-purpose time sharing services which are available in conversational, remote batch, and local batch environments.

Interactive uses two IBM 360/67 central processors, one with 512K bytes of core storage, the other with 1,204K bytes of core storage.

The company supports AED (a general-purpose language based on Algol 60), APL (an interpretive language with scientific and other uses), IBM System/360 Assembly Language (levels F and G), Basic, BRUIN (a computation-oriented language), ANSI Cobol, Cobol (level F), Fortran IV (level G), PL/1 (OS/360 Version 4), and SNOBOL (a string-manipulating language). All programming languages can be used in both conversational and batch environments. Generally, the latest OS/360 releases of these language processors are maintained. In addition to running programs in Interactive's conversational time sharing environment, users may also run programs under IBM's Operating System/360 and DOS.

Each subscriber is assigned a "virtual machine" when he logs onto the system. At the time he originally contracts for the service, the user determines the size of his virtual machine from 256K bytes to 16 million bytes of core. Smaller machine sizes are available on special request. While the user is on the system, all of the facilities of this virtual machine are available as though he was actually connected to a dedicated machine of that size.

Interactive maintains a private leased-line network with multiplexers located in each of its local dialing areas.

The firm also supports its services with program development, training, and documentation. It also has a staff of technical representatives to assist customers.

LOCAL DIALING

Subscribers can access this system from local numbers in Los Angeles CA (213), San Francisco CA (415); Chicago IL (312); Detroit MI (313); Minneapolis MN (612); Pittsburgh PA (412); Philadelphia PA (215); New York NY (212); and Hartford CT (203).

The second IBM 360/67 computer is installed at the computer center of Wellsco Data Corporation, data processing subsidiary of Wells Fargo Bank in San Francisco. Local dialing for this system is available only in San Francisco CA (415).

TERMINAL SUPPORT

Interactive's time sharing system can be accessed by 110- and 300-baud ASCII and 134.5-baud terminals. The supported terminals include: Teletype Models 33 and 35; Itel 1021; IBM 2741 and 1050; Datel; Univac DCT 500; Syner-Data Beta System; GE TermiNet 300; Execuport 300; Memorex 1240; Imlac PDS-1; and Datapoint 3300.

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INTERACTIVE SCIENCES

LOCAL DIALING

Local dialing is available in the following areas: MA (617), New York NY (212), and Pittsburgh PA (412).

TERMINAL SUPPORT

One terminal supported by the system is the IBM 2741.

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INTERNATIONAL TIMESHARING

BACKGROUND

International Time Sharing Corporation (ITS) was formed in May 1967, and began offering time sharing service in May 1968 on dual Control Data Corporation 3300 computer systems

located in Minneapolis, Minnesota. Company sales offices were opened in Los Angeles in March 1968; in San Francisco, San Diego, and New York in February 1969; in Chicago in July 1969; and in Milwaukee in September 1970.

ITS's time sharing system offers both conversational and remote batch processing service, and provides a large and flexible user file structure for data base and information retrieval applications.

Service is implemented on dual CDC 3300 central processors with 320K 24-bit words of core storage that can support a total of 130 simultaneous users.

ITS offers programming language support in ASSEMBLE; extended Basic; the conversational algebraic language, CAL; extended Fortran II; Fortran IV; and NELIAC, a language based on Algol and used for numerical computation and some logical processes. All of these languages support both conversational and remote batch applications.

The company's time sharing service is offered nationwide through a network of ITS-designed and built multiplexers that work on both time and frequency division bases.

The company also supports its services with program development, training, and documentation.

LOCAL DIALING

The system can be accessed by local numbers in Los Angeles CA (213), San Francisco CA (415), Chicago IL (312), Milwaukee WI (414), Minneapolis/St. Paul MN (612), and New York NY (212).

TERMINAL SUPPORT

Users can access the ITS system through the following terminals: Teletype Models 33 and 35, Datel 30, Itel Series, Friden 7100 and 7102, Typagraph, Datapoint 3300, COMPACE, Novar, and Computek graphics terminal, IBM 2741, Corning 904, or any Teletype- or 2741-compatible terminals.

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KAMAN SCIENCES

LOCAL DIALING

Local dialing is available in Colorado (303).

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LEASCO RESPONSE

BACKGROUND

Leasco Response Incorporated, a subsidiary of Leasco Data Processing, Inc., began investigating the possibility of entering the time sharing market in May of 1968. Results of the research were positive, and Leasco decided to initiate a full-scale, multiple-product penetration of the commercial time sharing market.

In January 1969 the first branch office was opened in Washington, D. C., to make available the Leasco Response Time Sharing Service on a Hewlett-Packard 2116 system. Subsequently, branch offices were opened in February at Lake Success, New York; in March at Boston; in June at Philadelphia; and in July at Detroit and Cleveland. The first expansion of the Washington, D. C., office took place June 15, 1969, when the Washington branch was divided into the Federal Government Branch and the Washington Commercial Branch. Area offices have been established in Baltimore and Norfolk. Additional branches are located in Englewood Cliffs, New Jersey; Pittsburgh, Pennsylvania; and Atlanta, Georgia.

Leasco introduced its Response/360 service on an IBM 360/65 computer in April 1970.

Besides supporting an applications library with programs in the fields of business, mathematics, and statistics, Leasco offers a payroll package and routines for paint, real estate, and job-order-based industries.

Currently, Leasco offers conversational interactive time sharing on HP-2116 computer systems maintained at each branch office and on an IBM 360/65 computer system housed at the Washington D. C., headquarters. Each HP-2116

computer contains 32K 16-bit words of core and can support 16 simultaneous users. Leasco markets the HP-2116 system for business and commercial applications and for use by educational institutions. The IBM 360/65 computer system is configured with 512K 8-bit bytes of core and can support 176 simultaneous users. Leasco markets service on the IBM 360/65 for general-purpose interactive time sharing and overnight remote batch service.

For HP-2116 users, Leasco provides programming support in Basic and Fortran (Leasco developed the Fortran compiler). Users of the IBM 360/65 system can program in Basic, Fortran IV, and PL/1.

Leasco users are provided a variety of pricing and contractual options, which permit them to tailor the administrative aspects of the system to their personal needs. These alternatives include the ability to lease the system on an hourly basis or to lease an entire system.

The firm supports its service with program development, coding assistance, training, and documentation.

LOCAL DIALING

Free local dialing is provided in the greater metropolitan area around each sales office. These are as follows: Washington DC (202); Atlanta GA (404); Chicago IL (312); Towson MD (301); Cambridge MA (617); Detroit MI (313); Saint Louis MO (314); Englewood Cliffs NJ (201); Long Island NY (516); New York NY (212); Parma OH (216); Akron OH (216); Allentown PA (215); Lancaster PA (717); Philadelphia PA (215); Pittsburgh PA (412); Houston TX (713); and Virginia Beach VA (703).

TERMINAL SUPPORT

Users can access the Leasco Response system via Teletype Model 33 or 35 terminals. Response/360 can also use IBM 2741 compatible terminals.

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MACRO COMPUTER CONSULTANTS

See the report on Direct Access Computing.

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MERC

BACKGROUND

Middle-Atlantic Educational and Research Center (MERC) was organized during the summer of 1969 and began offering its time sharing service January 1, 1970. The company provides both conversational and remote batch services, and places particular emphasis on educational and high school administrative systems.

MERC subscribers access an RCA Spectra 70/46G computer with 262K bytes of core storage and a 2-microsecond cycle time. The system supports Basic, Cobol, Fortran, and WATFOR (a compile and go Fortran) programming languages and can handle 48 users simultaneously. An added feature of the MERC system is operation in the calculator mode. Through this feature, users can interrupt a processing program, perform desired calculations, then return to the interrupted program. MERC also offers a library of application packages containing programs in such areas as test of hypothesis, statistics, mathematics, business and finance, as well as various secondary school administrative systems and some tutorial programs.

Subscribers communicate with the MERC system through the public switching network, through In-WATS lines, or through a multiplexer with selected drops in Pennsylvania.

To assist customers, MERC furnishes training and documentation. Its support staff provides limited program development and coding aid.

LOCAL DIALING

Customers can dial local numbers to access the system from the following localities in Pennsylvania: Wayne (215), Annville (717), Huntingdon (814), Chambersburg (717), and Lancaster (717). All of eastern and northeastern Pennsylvania (215, 717) is also covered by In-WATS service.

TERMINAL SUPPORT

Users can communicate with the system through the following terminals: Teletype Models 33 and 35, IBM 2741, and RCA 8740 batch terminal.

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MANAGEMENT INFORMATION SERVICES

TERMINAL SUPPORT

One group of terminals supported by the system is the Burroughs Series TC-700.

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MANAGEMENT SYSTEMS

LOCAL DIALING

Local dialing is available in Texas (214).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: IBM 1050, IBM 2740, and Computer Terminal Datapoint 3300.

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MARK/OPS

BACKGROUND

Mark/Ops is the new name for Marketing Operations, Inc., which was formed in March 1967 as a franchise of Call-A-Computer, Inc. to provide that company's time sharing services in New York, New England, New Jersey, and eastern Pennsylvania areas. Mark/Ops now represents several commercial time sharing services. To satisfy its customers' time-sharing requirements, the firm arranges for subscribers to implement their jobs on one of the services Mark/Ops represents. Mark/Ops sees itself as a company to which a time sharing user can turn for receiving the entire spectrum of machine, terminal, language, and communications available to him. Besides matching customer requirements with facilities offered by those commercial services it represents, Mark/Ops expands its list of representative services to meet customer needs.

Mark/Ops has broadened its base of operations through a contract programming group, which is a strong applications development force. In addition to carrying on time sharing and contract programming activities, Mark/Ops is a representative for several manufacturers of technical equipment and a wide variety of time sharing oriented terminals. Mark/Ops' customers are located from New Hampshire to Philadelphia and are among the top financial, transportation, utility, and educational organizations in their geographic area.

The firm can provide customers with access to both conversational time sharing and remote batch services. These services maintain Honeywell/GE-265, PDP-10, and dual-processor Honeywell/GE-625 computer systems. Subscribers to Mark/Ops services can obtain programming support for a variety of languages. To access the service, customers use a combination of foreign exchange lines and multiplexers.

The company also supports its services with program development and user training.

LOCAL DIALING

Users can dial local numbers to access the system in Boston MA (617), Hartford CT (203), Long Island NY (516), Philadelphia PA (215), and Providence RI (401).

TERMINAL SUPPORT

Users can access Mark/Ops systems through any terminals supporting ASCII or EBCDIC codes of standard bit rates up to 2,400 bits per second on the dialup network.

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MATRIX CORPORATION

BACKGROUND

The Matrix Corporation has provided data processing services in Southern California since 1963. It offers conversational, remote batch, and local batch services to business, educational, government, and military clients.

Service is implemented on an HIS 635 computer system equipped with a Datanet-30 communications processor. The computer system has 128 36-bit words of core and a 1-microsecond access time; it can handle up to 31 users simultaneously.

The Matrix computer operates under the GECOS III operating system, which allows batch, remote batch, and conversational processing in the multiprogramming mode. The system can execute up to 75 jobs concurrently from batch, remote batch, and conversational input. Matrix supports Extended Basic, Fortran IV, and LISP (a list processing language) programming languages in the conversational mode and Fortran IV, Algol, standard Cobol, Jovial (a procedure-oriented language similar to Algol), and SNOBOL (a string manipulating language) in batch mode.

For batch and remote batch users, Matrix offers a library of business, engineering, and scientific applications; these packages are primarily intended to fill the needs of small and medium sized companies. Users of the conversational service have access to a Fortran library of over 170 subroutines.

Matrix uses the public dial-switched network, high-speed 2,400 baud lines, and several WATS networks as communications facilities.

Terminals supported include Teletypes, video display terminals, and small-scale computers.

The company supports its services with program and systems development, coding assistance, training, and documentation.

LOCAL DIALING

Users can dial a local number to access the system anywhere in the United States.

TERMINAL SUPPORT

The following terminals can access Matrix's time sharing service: Teletype Models 33, 35, and 37; Itel data terminals; Datel terminals; IBM 2741 Communication Terminal; CCI Display Unit, CRT; GE-105/115; and Univac 1004.

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MC DONNELL DOUGLAS AUTOMATION

BACKGROUND

McDonnell Douglas Automation Company was formed in 1960 to offer conventional data processing services. This commercial division of McDonnell Douglas Corporation resulted from corporate experience in the application of computers and data processing equipment to large-scale problem solving. McDonnell has expanded its capabilities to encompass national and worldwide service for information processing subscribers and is now one of the largest commercial data processing and system users in the world.

The company's growth began with the acquisition of a Colorado electronic computing service, which developed as a wholly owned subsidiary. In 1964, another subsidiary was established in Columbia, Missouri, to provide EAM services; and the McDonnell Douglas Automation Company of Texas was set up in Houston. Early in 1968, McDonnell's time sharing service became operational following the acquisition of a GE-420 system.

Conversational time sharing (called Direct Access Computing) service is implemented on two XDS Sigma 7 systems and one Honeywell/GE-440 system consisting of a Honeywell/GE-435 central processor and the Honeywell/GE Datanet-30 as a communications processor. The Sigma 7 systems also support remote batch processing (called the Deferred Execution System). The Honeywell/GE-440 system has 64K 24-bit words of core storage and can support up to 50 simultaneous users. The Sigma 7 systems each have 96K 32-bit words of core and although each can support up to 128 users, each system currently supports up to 56 users.

McDonnell provides a general-purpose computational service for business, statistical, and scientific problem solving. Company policy is to apply mathematical and data processing to

problems in engineering, critical path scheduling, data management, operations research, and simulation.

Programming language support includes: extended versions of Basic and Fortran IV on the conversational GE-440 system, as well as the conversational and remote batch Sigma 7 systems; and Cobol-65 and the SYMBOL assembly language for remote batch use on the Sigma 7 system.

The primary means of subscriber communication is the public dial-switched network.

The company also supports its services with program development, coding assistance, training, and documentation.

LOCAL DIALING

Users can dial local numbers to access the system in Denver CO (303), Houston TX (713), Los Angeles CA (213), New York NY (212), and Washington DC (202).

TERMINAL SUPPORT

Terminals that can access McDonnell's conversational time-sharing system include Teletype Models 33 and 35, and Teletype-compatible terminals.

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MEDICAL INFORMATION TECHNOLOGY

LOCAL DIALING

Local dialing is available in the following areas: ME (207); MA (617); New York NY (212); Pittsburgh PA (412); Washington DC (202); Chicago IL (312); and Detroit MI (313).

TERMINAL SUPPORT

One terminal supported by the system is the Univac 1004.

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MEGASYSTEMS

BACKGROUND

MegaSystems was formed in 1970 by a merger of two time sharing services: Data Network Corporation, incorporated in 1965, and Computer Sharing, Inc., established in 1966. Both companies were active time sharing vendors prior to merging. Data Network's service supported one 360/67 and one Honeywell/GE-430, while Computer Sharing supported two XDS 940's. Motek Corporation of Valley Forge, Pennsylvania, has recently obtained controlling interest in MegaSystems and has since sold both the 360/67 and Honeywell/GE-430 portions of the business.

MegaSystems' current facilities include two XDS 940's, each having 65K 24-bit words of memory and a cycle time of 1.75 microseconds and each capable of supporting up to 52 simultaneous users.

Although the firm does not limit marketing activity to specific areas of the business community, it has developed a significant capability in the areas of computer-assisted instruction, electronic circuit analysis, and corporate accounting.

The XDS 940 computers support Super Basic, Production Fortran IV, conversational Fortran IV, the conversational algebraic language CAL, and the time sharing assembly language TAP.

MegaSystems markets its service in the eastern portion of the United States. The firm provides support for program development, as well as coding assistance, training, and documentation. Additionally, it will develop time sharing software contracts for use on its system.

LOCAL DIALING

Local dialing into the system is available from the following areas:

Allentown PA (215)	New York NY (212)
Harrisburg PA (717)	Philadelphia PA (215)
New Brunswick NJ (201)	Wilmington DE (302)

TERMINAL SUPPORT

MegaSystems supports the following terminals: Teletype Models 33/35/37, Anderson Jacobson portable, Friden 7100 Conversational Terminal, CalComp Plotter, Computer Communications Display CRT, incremental plotters, the IBM 2741, Memorex 1240, Univac DCT 500, and Datapoint 3300 (the last three at 10, 15, or 30 characters per second).

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MERLIN SYSTEMS CORPORATION

LOCAL DIALING

Local dialing is available in Long Island NY (516).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Computer Transceiver Execuport 300; GE TermiNet 300; Syner-Data Totalterm Teleprinter; Teletype 33, 35, 37; and Texas Instruments 700 Series.

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METRIDATA COMPUTING

BACKGROUND

MetriData was formed in September 1968 and initiated its time sharing operation three months later. In February 1971, it acquired the southern portion of ACTS (Applied Computer Time Share, Inc.) business covering Louisville, Cincinnati, Indianapolis, Dayton, and Columbus.

MetriData offers four types of service: (1) conversational time sharing, (2) dedicated service, which provides for port rentals, (3) systems management, which includes complete system, programming, and operations, and (4) local batch processing.

The time sharing services are implemented on a Honeywell/GE-435 computer equipped with a Datanet-30. The Honeywell/GE-435 has 32K words of core storage and a cycle time of 2.9 microseconds, while the Datanet-30 provides 16K words of core storage and has a 6-microsecond cycle time. An IBM 360/40 handles the batch service.

The Honeywell/GE-435 runs under the Extended GE-430 operating system and can handle up to 30 users simultaneously. In time sharing, the system supports the Basic, Extended Basic, and Fortran IV programming languages. Batch processing can be done in Cobol or Fortran. MetriData subscribers have access to a library of application programs covering finance, engineering, mathematics, demonstration and games, and other areas.

Subscribers communicate with the MetriData system through the public switching network, WATS lines, and multiplexers.

MetriData's customer service staff is available to assist subscribers. The firm also provides user training and documentation.

LOCAL DIALING

Users can dial local numbers to access the system from Louisville KY (502), Indianapolis IN (317), Cincinnati OH (513), Dayton OH (513), and Columbus OH (614).

TERMINAL SUPPORT

Subscribers can access the MetriData system through 10-, 15-, 30-, and 120-character per second terminals, including the following: Datapoint 3300 CRT (at 120 cps), DCT 500, Execuport, GE TermiNet 300, Portacom, Teletype Models 33 and 35, and NCR-260.

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MULTICOMP

BACKGROUND

Multicomp was formed in July 1968 and began its time sharing operation in October of that year. The company opened a New York office in April 1969 and expanded to a second computer system in December 1969. In February 1970 it opened a

Washington, D.C., office, which provides local phone service in that area.

Multicomp's service is conversational, supporting primarily the Fortran and Basic languages. It is implemented by two CDC 3600 computers, each having 65K words of core storage and 1.4-microsecond cycle time. Subscribers have access to a library of application programs on business statistics, mathematics, operations research and decision-making, general and civil engineering, and other areas. A maximum of 128 users can access the system at the same time.

Subscribers communicate with the system over the public dial-switched network, or over multiplexers and leased lines in New York City and Washington, D.C.

To support its service, Multicomp has marketing and technical staffs available to assist users. The firm also provides free user training and documentation.

LOCAL DIALING

The company provides free local dialing from the following locations: metropolitan and greater Boston MA (617), metropolitan New York NY (212), Westchester County NY (914), Worcester MA (617), Hartford CT (203), Providence and Newport RI (401), and Washington DC (202).

TERMINAL SUPPORT

Subscribers can access the Multicomp system through any of the following terminals: Teletypewriter Models 33 and 35 or equivalent, IBM 2741 or equivalent, and ASCII 30-character per second terminals.

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MULTIPLE ACCESS GENERAL COMPUTER CORPORATION LIMITED

BACKGROUND

Multiple Access General Computer Corporation Limited was formed in March 1969 and initiated time sharing service during October of that year. Now among the larger computer service bureaus in Canada, the company provides on-site processing as well as remote batch and conversational time sharing services. Service is supported by applications packages relating to the fields of engineering and management science and business data processing.

Multiple Access has two major computer systems installed in its Toronto office: a CDC 3500 and a CDC 6600. The CDC 3500 supports the company's "ACCESS/3," a time sharing system offering both interactive processing and remote job entry through a variety of low-speed terminals. The CDC 6600 is used for ACCESS/6," a high-speed remote job entry facility. Customers can submit programs or data for compilation and execution from terminals located in any Multiple Access office or at the customer's site.

ACCESS/3 users have the option of programming in any one of the following languages: FORGO (a fast in-core Fortran), Fortran IV, ANSI Fortran, ANSI Cobol, PL/1, and Basic. For users of ACCESS/6, Multiple Access supports a full Fortran and Cobol product set on the 6600.

To protect the environment in the Toronto Data Centre, Multiple Access has installed an environmental facility that is engineered to prevent abrupt failure. The environment requires both air cooling for the computer room and water chilling for the memory processor and hydraulic disc files. To remove any possibility of loss as a result of environment failure, a duplicate and redundant system was installed. An uninterruptable power supply and a twin diesel generator provide power in emergencies.

Currently Multiple Access markets its services in eastern Canada and the northeastern United States. The company's customer services include application development, contract programming, consulting, system management, education, and training.

LOCAL DIALING

Users can dial local numbers to access the system in the Toronto, Ontario area (416); Ottawa, Ontario (613); and Montreal, Quebec (514).

TERMINAL SUPPORT

Since the two computer systems provide different types of services, they also support different terminal devices. The CDC 3500 handles 110- and 300-baud terminals concurrently, and permits the use of paper tape and magnetic

tape cassette units. Acceptable terminals include: COMPACE, Datapoint 3300 and 3300 T, GE TermiNet 300, Syner-Data Beta, and Teletype 33 and 35.

The CDC 6600, on the other hand, supports 2,000- and 2400-baud terminals, including Control Data 200 UT, GCC 250, IBM 1130, Mohawk 2400, Unitech UT 1, Univac 9200, and University Computing COPE 38.

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NATIONAL CSS

BACKGROUND

National CSS, Inc. was formed in March 1967 to provide consulting and software services for the time sharing industry. In December 1968, the company began offering time sharing services on an IBM 360/67 computer located in Stamford, Connecticut. Sales offices were opened in Boston in July 1969, New York in September 1969, and Sunnyvale, California, in August 1969, with multiplexers at each location. Subsequent expansion of the service included the opening of sales offices in New Jersey in April 1970, Los Angeles in January 1970, San Francisco in May 1970, Chicago in July 1970, and Philadelphia in January 1971.

The company offers conversational time sharing, batch processing, and OS batch processing. When a user signs onto the system, he is assigned a "virtual machine." To the user working at his remote console, the virtual machine appears to be a dedicated machine configured with a card reader/punch, printer, disc devices, CPU and core, and attachable tape drives. The number of disc cylinders, after having been initially assigned when the user contracts for service, may be changed by subsequent request. The virtual core size (minimum 256K bytes) can be set by the user on-line.

National CSS supplies subscribers with a set of major application systems contained in a general-purpose applications library. The user need only attach this library to gain a number of simulation systems and access to any package desired.

In the conversational mode, users have the option of programming in any of the following languages: AED, used for developing software facilities; IBM Assembler (F); SNOBOL, a string-manipulating language; XBASIC, a highly extended Basic language; and standard IBM versions of Cobol (ANS and level F), Basic, Fortran (G) and PL/1 (F).

National CSS offers support for the user with program development and implementation, documentation and educational services.

The Professional Services Group of NCSS offers (on a contractual basis) its technical expertise in the development of software systems and interactive and batch-oriented application systems. Consulting assistance in problem definition, specification development, cost estimation, and program implementation for a specific in-house project may also be obtained. The Group has experience in data base, statistical engineering, operations research, and mathematical application areas as well as in general data processing methodology.

LOCAL DIALING

Users can dial local numbers to access the system in Phoenix AZ (602); California (408, 415, and 213); Connecticut (203); Chicago (312); eastern Massachusetts (617); New Jersey (201 and 609); New York City (212); Rochester NY (716); Philadelphia (215); Toronto, Ontario (416); and Montreal, Quebec (514).

TERMINAL SUPPORT

Access to the system can be gained through any of the following terminals or through any Teletype-compatible CRT or portable 10- and 30-character per second terminal: Teletype Models 33 and 35; IBM 2741 and 1050; Itel Series; Datel 30; Hazeltine 2000; Data 100; Memorex 1240; CalComp and TSP Plotters; GE TermiNet; Remcom; Herta; Computek; Friden 7102; IBM 1130, 2780; DCT 2000, 500; Computer Display — ARDS; Datapoint 3300; Execuport 300; and TermiNet 300.

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ON-LINE SYSTEMS

BACKGROUND

On-Line Systems, Inc. was established on July 1, 1967 and began operation with a GE-255 system, which remained in use for the first year. In April 1968, the company converted to a Digital Equipment Corporation PDP-10/8 configuration to offer expanded system access, and in January 1969, it added a second PDP-10 system. A third PDP-10 system was delivered later in 1969.

On-Line Systems is a general-purpose conversational time sharing facility offering scientific and engineering services, which include technical assistance to subscribers. In order to service the region's industrial, scientific, research, engineering, and educational community, Pittsburgh was selected as the corporate base of operations.

The company's PDP-10 system supports a maximum of 64 simultaneous users and includes a communications control interface (CCI) coupled to a PDP-10; communication between the two is on a character-at-a-time basis. The PDP-10 central processor has 128K 36-bit words of core storage. The CCI, which is also marketed by On-Line Systems, can be used to control remote transmission lines and assemble messages from the characters entered at the terminals.

Programming languages for which On-Line Systems offers support include: AID, an interactive programming language; LISP, a list processing language; MACRO, an interactive assembly language; and extended versions of Basic and Fortran IV.

The company's transmission facilities include local telephone lines, foreign exchange lines, and time-division multiplexing with maximum channel capacity of 45 channels per circuit for all areas which it serves. Three additional private voice-grade lines service major cities in the East using time-division multiplexers, each with a capacity of 20 channels.

The company also supports its service with coding assistance, training, and documentation.

LOCAL DIALING

Toll-free dialing service into the system is offered in the following areas: Pittsburgh PA (412); Atlanta GA (404); Baltimore MD (301); Buffalo NY (716); Chicago IL (302); Dallas TX (214); New York NY (212); and Philadelphia PA (215).

TERMINAL SUPPORT

The following terminals can access the company's system: Teletype Models 33, 35, and 37; IBM 2741; Itel 1021; Datel Thirty-21; Execuport 300; GE TermiNet 300; Datapoint 3300; ARDS; Complot DP-3; and PortaCom.

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PHILCO- FORD

BACKGROUND

Philco-Ford Corporation initiated its time sharing service in December 1968 with the installation of a GE-265 computer. Subsequent modification to the firm's offering took place in February 1969 with the installation of a 12-line multiplexer in Dearborn, Michigan; and in October 1969 the GE-265 was replaced by the Burroughs B 5500 currently in use.

The firm offers both conversational time sharing and remote batch service. In addition to supporting major applications and providing expertise in the areas of electrical engineering, structural design, and nuclear codes, Philco-Ford offers the Burroughs Advanced Statistical Inquiry System (BASIS), a software system that provides a comprehensive assortment of statistical analysis routines with direct user access to data files and all analysis routines in a conversational mode.

The B 5500 computer system includes 32K 48-bit words and is capable of supporting up to 48 simultaneous users. Philco-Ford furnishes conversational and remote batch programming support in Algol, Basic, Cobol, and Fortran IV. Moreover, the service furnishes routines for translating programs written in GE-265 Basic and Fortran into the corresponding B 5500 implementation.

Currently Philco-Ford markets its services in the Philadelphia, Cincinnati, Chicago, Detroit, and Washington, D.C., areas. Support includes training, on-line system tutorials, complete documentation, weekly newsletters, and an on-line mailbox.

LOCAL DIALING

Local dialing into the service is available from the Philadelphia PA (215), Cincinnati OH (513), Chicago IL (312), Detroit MI (313), and Washington DC (202) areas.

TERMINAL SUPPORT

Terminals supported by the system include Teletype Models 33/35, Typagraph Model 3R1, CalComp plotter, Teletype-compatible CRTs, Videojet 9600 and any device meeting RS32B electronic interface specifications.

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PIEDMONT CALL-A-COMPUTER

BACKGROUND

Piedmont Call-A-Computer, a franchise of Call-A-Computer, Inc., was formed in February 1968 to provide time sharing services in the states of Virginia, North Carolina, and South Carolina. For detailed information about facilities offered, see the report describing Call-A-Computer.

Piedmont offers additional expertise in the areas of research and education because of the exposure of its system and personnel to the colleges and universities that are serviced. In addition, a complete variety of supplies and terminals for purchase or lease are available to time sharing customers.

Piedmont offers conversational time sharing. Service is implemented on a Call-A-Computer Honeywell/GE-265 system, composed of a Honeywell/GE-235 central processor with 16K 20-bit words of core connected to a Datanet-30 communications processor, also with 16K 20-bit words of core.

Piedmont supports the same programming languages as Call-A-Computer, whose facilities it is marketing. These languages are conversational versions of Algol, Basic, and Fortran.

A combination of foreign exchange lines and multiplexers provides local dialing service. The company also supports its services with program development and user training.

LOCAL DIALING

Users can dial local numbers to access the system in most areas of Virginia (703), North Carolina (704, 919), and South Carolina (803).

TERMINAL SUPPORT

Users can access Call-A-Computer's system through the following terminals: Teletype Models 33 and 35; CalComp Plotter; Complot Plotter; Timeshare Devices Plotter; and all Teletype-compatible terminals.

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PITTSBURGH NATIONAL BANK

See the report on Cyphernetics.

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POLYCOM SYSTEMS LIMITED

BACKGROUND

Polycom Systems Limited was formed in August 1968 and began offering time sharing services on a Honeywell/GE-420 in February 1969. Within a year the company had upgraded to a GE-430, and by the end of 1970 it had upgraded to a Honeywell/GE-440.

Providing service from its headquarters, the firm offers conversational time sharing implemented on a Honeywell/GE-440 computer system, with 80K (24-bit) words of core and a cycle time of 2 microseconds. This system can support 60 simultaneous users.

Languages offered for subscriber use are Fortran IV (Level H) and Extended Basic. Customers can access the Polycom system through the public dial-switched network or via TWX lines.

Polycom offers major applications systems in

portfolio management, critical path methods (CPM), electronic circuit analysis programs (ECAP), analog electronic analysis, and a series of optimization programs for various types of functions.

The company has a staff for marketing and technical assistance, which supports the user through program development, coding assistance, customer training, and documentation.

LOCAL DIALING

Users may access the system on a toll-free basis in Toronto (416).

TERMINAL SUPPORT

Polycom's computer system supports the following terminals: Teletype Models 33 and 35, GE TermiNet 300, Olivetti, Syner-Data Beta Systems, Texas Instruments Series 720, and Univac DCT 500.

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PRINCETON TIME SHARING SERVICES

BACKGROUND

Princeton Time Sharing Services, Inc. (PTSS) was organized on June 14, 1968, to offer a time sharing service on IBM System/360 equipment. Delivery of an IBM 360 Model 50 was made at the beginning of 1969, and the system became operational in April 1969. In addition to furnishing time sharing services, PTSS provides customer programming services and engages in facilities management of computer installations. Further, the PTSS software system is available as a dedicated in-house system. The Systemetrics Division of PTSS specializes in computerized subscription fulfillment and list and association management services.

PTSS offers four services: interactive computing, conversational remote job entry, high-speed remote job entry, and conventional local batch processing. The company implements its service on an IBM 360/50 computer system with 512K 8-bit bytes of high-speed memory (2-microsecond cycle time) and an additional 1 million bytes of large-capacity core storage (3-microsecond access time). In addition, the system features a large data storage capacity for each user; 1 million characters of disc storage are available to each client without charge. Additional disc storage is available at nominal cost.

The conversational programming system (CPS) is a large subset of PL/1 that features program interpretation instead of compilation. Moreover, through the use of large-capacity core storage, CPS makes swapping (moving user programs from high-speed memory to auxiliary storage) unnecessary and permits every active user of CPS to be core-resident at all times. CPS users can program in CPL/1 ®, a conversational version of the multipurpose PL/1 language.

A conversational remote job entry (RJE) service allows the user to develop a program and enter data conversationally as well as to change a program and data already stored. After the user prepares the program, he can instruct the computer to execute it and to return the results to his terminal, or to print out the results at the PTSS operating center. In the RJE mode, a user can initiate background processing of programs written in any IBM-supported programming language. These languages include Assembly (F and G), Algol (F), Cobol (F), Fortran IV (G, H, and WATFOR), PL-1, RPG (the report program generator), SNOBOL IV (the string-manipulating language), GPSS, and so forth.

PTSS markets its service in the northeastern United States. To support its service, the company provides program development, coding assistance, training, and documentation. Further, clients are sent manuals and a newsletter of additions to and notes on the system.

LOCAL DIALING

Toll-free dialing into the PTSS system is available in the following locations: New Jersey (201, 609), Washington DC (202), Connecticut (203), New York NY (212), Long Island NY (516), southern New York State (914), Philadelphia PA (215), eastern Pennsylvania (717), Maryland (301), and Delaware (302).

TERMINAL SUPPORT

Terminals supported by PTSS are: Teletype Models 33, 35, and 37 (with or without paper tape); IBM 1050 Data Communication System (with or without card reader and paper tape punch and/or reader); IBM 2741; Friden 7100; Datel; Itel; Computer Display's ARDS; Computer Communications Inc. CC-30; Execuport; TST-707; Datapoint; Novar; IBM 2780; IBM 1130; IBM 360/20, 25, 30, 40, and up; Remcom 2780; Data 100 Model 70-1; Data Computer Systems CP-4; and DCT 132.

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PROGRAMS & ANALYSIS

BACKGROUND

Programs & Analysis, Inc. (P&A) was established in Waltham, Massachusetts in June 1968 and began offering its time sharing service in January 1969. A branch office was opened in Cincinnati in January 1970, and six months later the company moved its corporate headquarters to Burlington, Massachusetts.

The company furnishes programming services for commercial applications including payroll, job cost, inventory, scheduling, receivables, payables, and other accounting areas.

It implements its service on a Honeywell/GE-435 system with 32K words of core storage and a cycle time of 3.9 microseconds. Up to 40 users can be served at the same time. The system is conversational but most operations are essentially remote batch. P&A supports the Fortran, Basic, and XBasic programming languages. The firm's applications library includes the GE time sharing library as well as programs for business and engineering use.

Subscribers communicate with the system through the public switching network, multiplexers and private lines.

The firm provides marketing, technical, and programming support in all areas served.

LOCAL DIALING

Users can dial local phone numbers to access the system in Boston MA (617), Cincinnati OH (513), Dayton OH (513), and Providence RI (401).

TERMINAL SUPPORT

The GE-435 accepts input from the following terminals: GE TermiNet, Memorex, other ASCII 100- and 300-baud terminals, Syner-Data Beta Printer, and Teletype Models 33 and 35.

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PROPRIETARY COMPUTER SYSTEMS

BACKGROUND

Proprietary Computer Systems, Inc. (PCS) was first founded in 1968 under the name of APL Computing Services, a division of the Marquardt Company. The name change to Proprietary Computer Systems occurred in the early part of 1970, when both PCS and the Marquardt Company became subsidiaries of CCI-Aerospace Corporation. As of late 1970, PCS has come into its own with partial minority interest still held by CCI-Aerospace Corporation. PCS staff experience includes accounting and business applications, statistics and mathematics, computer instruction, educational application of computers, systems analysis and operations research, and engineering (technical, electrical, and industrial).

The firm currently implements conversational and batch service on an IBM 360/50 computer with 512K 8-bit bytes of core storage. In the conversational mode, the system can support 100 simultaneous users.

PCS principal offerings include a wide range of service bureau activities such as APL (A Programming Language) and ATS/360 (Administrative Terminal System) conversational time sharing, remote job entry, batch processing, systems analysis, programming, and facilities management. In addition to a variety of application packages in APL, the firm offers a number of unique off-the-shelf business systems packages that are available to batch processing both on-line (via APL or ATS) and off-line. PCS local batch processing at its Van Nuys, California operating center, is supported by programs written in Cobol E, Fortran F, and PL/1 under DOS operating mode, as well as in Cobol E and F, Fortran E, G, and H, and PL/1 under OS.

A number of offices provide "walk-in" service where customers can use on-site terminals at an hourly rate. Clients using walk-in service cannot store programs between use.

PCS markets its services in California. However, with three affiliates (Computer Innovations, Chicago, Illinois, The Computer Company, Richmond, Virginia, and APL Services, Inc., Trenton, New Jersey), all time sharing languages and application packages are available on a continental basis. A backup system for the APL service is provided by The Computer Company.

PCS supports its service with a number of user aids including program development, training, and documentation.

LOCAL DIALING

Toll-free dialing into the system is available from the following areas: Chicago IL (312), Los Angeles CA (213), Miami FL (305), New York NY (212), Norfolk VA (703), Philadelphia PA (215), Princeton NJ (609), Richmond VA (703), Santa Ana CA (714), Palo Alto CA (415), San Francisco CA (415), and Washington DC (202).

TERMINAL SUPPORT

Subscribers to the APL service may access the system through any of the following terminals: IBM 2741 Communications Terminal, IBM 2740-1 Communication Terminal, IBM 1050 Teleprocessing Terminal, Novar, Datel Series, Itel Series, and TST.

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PRYOR COMPUTER

LOCAL DIALING

Local dialing is available in the following areas: NY (518) and Chicago IL (312).

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LOCAL DIALING

Local dialing is available in California (408, 415).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Computer Transceiver Execuport 300; Data Products Portacom PC 8110; GE TermiNet 300; Memorex 1200 Series; Syner-Data Totalterm Teleprinter; Teletype 33, 35, 37; Univac DCT 500; and Computer Terminal Datapoint 3300.

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RAPIDATA

BACKGROUND

Rapidata was established in 1967 to provide time sharing services and associated consulting support. The firm first offered its time sharing service in January 1968, after installation of a Honeywell/GE-400 Series system. By early 1970 five Honeywell/GE-400 systems were online, and the company expanded its offices nationwide. The principal activities of the company now focus on general time sharing services. Company organization includes a staff for supporting marketing, technical development, and technical services. Operating from its New Jersey headquarters, the firm has sales offices on the east and west coasts. Rapidata offers general-purpose scientific and business applications. The service is characterized by strong technical support for subscribers and rapid modification of the basic system to serve particular users. Rapidata is staffed by the technical people who contributed significantly to the original design and development of the software package used by the company.

Currently, Rapidata offers both conversational time sharing and deferred batch service. The firm's hardware system consists of a Honeywell/GE-437 central processor (80K 24-bit words of core) configured with a Datanet-30 communications processor. Each configuration can support 40 simultaneous users. Rapidata is currently upgrading its systems to a dual 437 processor configuration with a Tempo-1 (replacing the Datanet-30) communications processor.

Users of the Rapidata service can program in Basic, Fortran IV, and PLEA (a language for statistical and economic analysis).

LOCAL DIALING

Users can dial local telephone numbers to access the Rapidata system from Boston MA (617), Long Island NY (516), New York NY (212), New Jersey (201, 609), Connecticut (203), Philadelphia PA (215), and San Francisco CA (415).

TERMINAL SUPPORT

The service supports terminal equipment with speeds of 10, 15, and 30 characters per second. These include Teletype Models 33 and 35; Friden 7100, 7102 Communications Terminals; IBM 2741 Communications Terminal (EBCDIC and correspondence); CalComp Remote Plotter Terminal; Typagraph; Itel, Datel terminals; Houston Complot Plotter; and Motorola OCR Reader.

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REALTIME SYSTEMS

BACKGROUND

Realtime Systems, Inc. began operation in January 1967 and offered its initial service in March of that year. The company was one of the first time sharing services in New York City. Originally, Realtime was separated into four diverse operating areas; at present it is a subsidiary of the Chemical New York Corporation and has only two operating divisions, time sharing and professional services.

Realtime features conversational time sharing and remote batch processing for banks and industrial concerns. The company's hardware system offers conversational users large-scale computing power, and remote batch users the means to load and execute multiple jobs for concurrent running in a background mode. Realtime applications programs serve the financial community, economists, corporate planners, governmental and educational institutions.

The company implements its service on dual Burroughs B 5500 central processors, each with 32K 48-bit words of core storage. The total configuration supports a maximum of 64 simultaneous users. An additional B 5500 single processor allows the user to schedule a job without being physically connected to the system and to direct output to a high-speed printer or disc.

Programming language support is available for extended versions of Algol, Basic, Cobol, and Fortran IV.

Primary transmission medium for Realtime is the public dial-switched network. The TWX and Telex networks provide some subscribers with additional transmission facilities.

The company also supports its service with program development, coding assistance, training, and documentation.

LOCAL DIALING

Local dialing into the company's time sharing service is available in New York City (212).

TERMINAL SUPPORT

Realtime provides service for the following terminals: Teletype Models 33 and 35, IBM 1050 Communication Terminal, Burroughs TC 500 Remote Terminal, and Burroughs 9352 CRT.

* * *

REMOTE COMPUTING

BACKGROUND

Remote Computing Corporation (RCC) was formed in late 1966 and, for approximately 1 year, was engaged in various activities preparatory to offering users direct access to a large-scale time sharing system. During December 1967, the firm began work on proprietary time sharing software for the Burroughs B 5500 in a joint development effort with Burroughs Corporation.

In August 1968, the company accepted delivery of two B 5500 hardware systems, one for installation at its branch in Los Angeles and one for installation at its Palo Alto branch. The company initiated time sharing and on-site batch processing services for clients at both locations in October 1968.

During December 1969 Remote Computing completed development of a data communications

preprocessor, which allows access to the B 5500 from virtually any type or speed of terminal device. One year later, the firm accepted its third computer system, a Burroughs B 5700, in Los Angeles and concurrently upgraded the B 5500 there to a B 5700.

RCC offers conversational time sharing and remote batch and local batch processing services. The remote batch service furnishes conversational job preparation. The user can initiate the execution of a program and either sign off the system, thereby saving the connect charges, or begin another time sharing task. Every time sharing user can address and assign all peripherals located at the RCC operating centers.

The company's three Burroughs computers each have 32K 48-bit words of core and a memory cycle time of 4 microseconds. The system configuration includes an Interdata Model 4 that serves as a data communications preprocessor and furnishes support for up to 60 simultaneous users.

RCC supports programming in the conversational mode for extended versions of Algol, Basic, Cobol-61, and Fortran IV (level H). The system features unlimited program size and no restrictions on the number of files. Applications programs are available in the civil, structural, and electrical engineering areas as well as in the statistical, petrochemical, business, financial, accounting, and modeling fields. Customers also have access to a stock market data base.

Remote computing markets services in the western United States and in Washington, D.C. The firm supports its service with program development, coding assistance, training, and documentation.

LOCAL DIALING

Subscribers can dial directly into the firm's time sharing system without toll charges from the following areas: Los Angeles CA (213), Van Nuys CA (213), Palo Alto CA (415), Sacramento CA (916), San Diego CA (714), San Francisco CA (415), Santa Ana CA (714), and Washington DC (202).

TERMINAL SUPPORT

The RCC system supports the following remote terminal devices: Anderson Jacobson; Beta; CalComp Plotter; Datapoint 3300; Datel terminals; Execuport 300; Friden 7100, 7102; Gulton LG 10/30; Houston Instruments Plotter; IBM 2741 Terminal; Itel terminals; Memorex 1240, 1280; Novar; Teletype Inktronics; Teletype Models 33 and 35; Texas Instruments 720, 725; Typagraph; and Univac DCT 500.

* * *

RYDERCOM

LOCAL DIALING

Local dialing is available in the following areas: CT(203), NY(201, 609), FL(305, 904), GA(404), IL(309), MN(612), OH(216), CO(303), TX(214), AZ(602), CA(213, 415), and OR(503).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Teletype 33, 35, 37, and 38.

* * *

SCL SYSTEMS

LOCAL DIALING

Local dialing is available in the following areas: Montreal (514), Quebec, Canada.

* * *

SMA

LOCAL DIALING

Local dialing is available in Montreal (514), Quebec, Canada.

TERMINAL SUPPORT

One terminal supported by the system is the CDC 200 UT.

* * *

SCIENTIFIC TIME SHARING

BACKGROUND

Scientific Time Sharing Corporation (STSC) was formed in May 1969 and began offering time sharing services in August of that year. From its base in Washington, D.C., the company operates an IBM 360/50 through a cooperative venture with the machine's owner, I.P. Sharp Associates, Ltd. of Toronto, Canada. Subscribers throughout the United States and Canada are connected to the central processor in Toronto via leased line/multiplexer facilities; communications with the machine are effected through IBM 2741-compatible terminals.

STSC's service is remote access, conversational time sharing based on the IBM-developed language called APL. The company's service offering features an extended implementation of this language, called APL PLUS. Included in the extensions are a comprehensive applications program library and proprietary enhancements to the system itself, i.e., a file subsystem for shared data base applications, powerful report formatting operators, and a modified system intended to increase program execution rate. Several members of the STSC staff have led in the development of APL since its implementation on the IBM 7090 and 360, and the company maintains a continuing systems development effort in this language. To implement its service, STSC supports an IBM 360/50 which has 393K bytes of high-speed memory with a 2-microsecond cycle time, and handles up to 70 simultaneous users.

STSC's file subsystem is a major extension to APL as released by IBM, and permits the system to be used for such applications as reservation systems, inventory management, information retrieval, quality control in real time, and other shared data base systems. Using the company's library, subscribers to the STSC service can implement 400 applications programs, covering such areas as engineering, mathematics, utilities, accounting, information retrieval, and text processing.

Program development support is provided by the in-house staff of senior systems analysts and programmers. In addition, hands-on courses in the use of APL PLUS are conducted once each month in Washington, D.C., Philadelphia, New York, and Los Angeles. Training is frequently provided at customer locations, and lasts from one to three days, depending on the background of the trainees.

LOCAL DIALING

Subscribers may dial toll-free in the following locations: Hartford CT (203), White Plains NY (914), New York NY (212), Philadelphia PA (215), Washington DC (202), Los Angeles CA (213), San Fernando Valley CA (714), Palo Alto CA (415), Oakland CA (415), San Francisco CA (415), and Dallas TX (214).

TERMINAL SUPPORT

Terminals supported by the STSC system are IBM 2741 (BCD and Selectric), IBM 2740 Model 1, IBM 1050 (with or without punched tape or cards), Datel, Itel, TST 707, and Novar.

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SCI-TEK COMPUTER CENTER

LOCAL DIALING

Local dialing is available in the following areas: New York NY (212), Philadelphia PA (215), and Washington DC (202).

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SERVICE BUREAU

BACKGROUND

The Service Bureau Corporation assumed responsibility for development, marketing, and operation of the IBM Corporation time sharing services in January 1969. IBM entered the time sharing field in August 1964 with the announcement of QUIKTRAN. In May 1966, the Information Marketing Department was formed in the IBM Data Processing Division with responsibility for QUIKTRAN and all other commercial time sharing services that were to be developed.

In June 1968, IBM announced CALL/360: BASIC, a new time sharing service operating on third-generation equipment. CALL/360: BASIC offered a computational facility to complement QUIKTRAN 2.

During January 1969, the Information Marketing Department was transferred from the Data Processing Division of IBM into Service Bureau Corporation, a wholly owned subsidiary. The addition of a new programming language, PL/1, to the CALL/360: BASIC system was announced by The Service Bureau in February 1969. Fortran was announced in January 1970 and QUIKTRAN, a Fortran-based language, was discontinued.

The Service Bureau provides programming and processing support in a conversational mode using Basic, Fortran IV, and PL/1. The company also offers a library of applications programs and systems featuring COGO II, ECAP, LP, Quality Control, and STATPACK for its technical users and MINIMIS, PROPHIT, PREDICT, RISKAN, MINI-CPM, and VALPORT for management and business applications.

Service is implemented on an IBM System 360/50 computer that features 512K bytes of core storage, a cycle time of 2 microseconds, parallel access to four bytes, and 16 high-speed registers. Storage is provided by IBM 2314 Disk Storage Drives with a capacity of over 300 million bytes per system.

Users can access the system through Teletype Models 33 and 35 terminals, the IBM 2741 Communication Terminal, and other compatible terminals as well as 30-cps ASCII II terminals. Service Bureau does not release the number of simultaneous users its system can support.

As its primary communications medium, Service Bureau uses the public switching network, with multiplexers located in key geographic areas to provide local dialing service. Foreign exchange and leased lines are also used.

A staff of marketing representatives is available to assist in the development and implementation of the user's system.

In addition to the marketing representatives who provide debugging and coding assistance, there is a telephone "trouble number" for immediate solution to problems.

Service Bureau markets its services throughout the United States. The company also has a special communications network, called the National System Network, whereby a user with offices in a number of cities can dial locally and access the system in order to pool data or share programs with other branch offices. The cities currently included in this system are as follows:

Atlanta	Kansas City
Boston	Los Angeles
Chicago	Miami
Cincinnati	Milwaukee
Cleveland	Minneapolis
Columbus	New York
Dallas	Philadelphia
Detroit	Pittsburgh
Hartford	San Francisco
Houston	St. Louis
Indianapolis	Washington, D.C.

LOCAL DIALING

Users can dial local numbers in the following locations:

Anaheim CA (714)	Minneapolis MN (612)
Los Angeles CA (213)	Kansas City MO (816)
Oakland CA (415)	St. Louis MO (314)
Palo Alto CA (415)	East Orange NJ (201)
San Diego CA (714)	Trenton NJ (609)
San Francisco CA (415)	Buffalo NY (716)
San Jose CA (408)	New York NY (212)
Van Nuys CA (213)	Akron OH (216)
Denver CO (303)	Cincinnati OH (513)
Hartford CT (203)	Cleveland OH (216)
Washington DC (202)	Columbus OH (614)
Wilmington DE (302)	Toledo OH (419)
Miami FL (305)	Bethlehem PA (215)
Atlanta GA (404)	Lancaster PA (717)
Chicago IL (312)	Philadelphia PA (215)
Indianapolis IN (317)	Pittsburgh PA (412)
Baltimore MD (301)	Providence RI (401)
Boston MA (617)	Dallas TX (214)
Detroit MI (313)	Houston TX (713)

Milwaukee WI (414)
Racine WI (414)

Seattle WA (206)
Tacoma WA (206)

TERMINAL SUPPORT

Users can access Service Bureau's time sharing system through the following terminals: Teletype Models 33 and 35, the IBM 2741, and other fully compatible equivalents, as well as 30-cps ASCII II terminals.

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SETAK COMPUTER SERVICES

BACKGROUND

Setak Computer Services Corporation Limited (Setak CSC) was formed in 1954 as part of KCS Consultants. In January 1967 the firm became independent and Canadian owned. It initiated its time sharing operation in June 1968 to offer conversational time sharing, simultaneous on-site batch operations, and a facility for remote users to schedule jobs for unattended operation whether or not they required a conversational mode.

Setak CSC implements its services on a Burroughs B 5280 processor with eight memory modules of 4K words each. The computer has a 6-microsecond cycle time and can handle up to 48 users. Because the system has unlimited virtual memory, users can run programs of unlimited size. Algol, Basic, Cobol, and Fortran programming languages are supported.

A comprehensive basic statistical package and various conversion utilities are available to Setak users on request.

Subscribers communicate with the system through the public dialing network.

Setak CSC supports its service with documentation. Guidance on the use and coding techniques of the various languages is provided free of charge. Program development is undertaken only on a contract basis, unless the application would have use among various time sharing clients.

LOCAL DIALING

Subscribers can dial into the system free in the Toronto area.

TERMINAL SUPPORT

The system supports the Teletype 33 and 35 terminals, and any terminal that provides input in the following form: ASCII eight-level code, 10 or 30 characters per second, up to 120 print positions, hard copy, or CRT.

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I. P. SHARP ASSOCIATES, LTD.

BACKGROUND

I. P. Sharp Associates, Ltd. was formed in 1964 and began its time sharing services in August 1969. The firm's principal offering is APL PLUS, an interactive language designed for use through 2741-type terminals. PLUS refers to I. P. Sharp's shared file processing and enables the construction of large data banks such as the Financial Post Data-bank and the DBS CANSIM Time Series. The system supports more than 60 simultaneous users on an IBM 360/50.

In addition to furnishing applications packages and a library of general programs in the fields of business and finance, engineering, mathematics, and statistics, the system supports packages for simulating the assemblers of Digital Equipment Corporation's PDP-8 and Hewlett-Packard's HP-2114, and Data General's Nova.

I.P. Sharp Associates, Ltd. furnishes customer-requested programming assistance, documentation, system consulting, and training to users of its time sharing service.

The company's Computer Products Division produces the 2510T Teleprinter Projector, an overhead projector customized for time sharing terminals and a communication coupler to connect a variety of peripheral devices to a central IBM 360 Series computer.

LOCAL DIALING

Currently, users can dial local telephone numbers to access the service from the following locations in the United States and Canada:

Los Angeles CA (213)
Palo Alto CA (415)
Washington, D.C. (202)
New York NY (212)
Rochester NY (716)
Syracuse NY (315)
Dallas TX (214)
Hamilton Ontario (416)
Kingston Ontario (613)
Ottawa Ontario (613)
Toronto Ontario (416)
Philadelphia PA (215)
Montreal Quebec (514)

TERMINAL SUPPORT

The service's terminal support includes IBM 1050, IBM 2741, and any 2741-compatible terminal. Communications support involves multiplexed 134.5-baud channels on voice-grade facilities. A 103A2 Data Set or equivalent is a standard user requirement.

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STAT:COM

BACKGROUND

Statistical Tabulating Corporation was formed in 1935 and initiated its time sharing service in 1969 through the STAT:COM Division. The company offers commercially oriented remote batch processing, as well as local batch service from data centers located in Chicago and St. Louis.

STAT:COM implements its service on an IBM 360/65 with 768K 8-bit bytes of core storage and a 750-nanosecond cycle time. At present, the system can handle up to eight users simultaneously.

The firm supports programming in Cobol, PL/1, RPG, BAL, Fortran (G and H) and ADPAC (a business-oriented language). In addition, the STAT:COM library contains ICES, PICS, and the standard IBM programs as well as packages to perform payroll, accounts payable, general ledger, accounts receivable, and sales analysis applications.

Time sharing users can communicate with the system over public dialup lines or private high-speed lines (2,000 baud or 2,400 to 4,800 baud).

STAT:COM's technical staff supports the time sharing service with systems design and coding assistance. The company also provides installation aid and documentation for IBM programs.

LOCAL DIALING

Subscribers can dial toll-free in the Chicago area.

TERMINAL SUPPORT

Subscribers can access the system through the following terminals: IBM 2770, IBM 2780, IBM 1130, IBM 360/20, Data 100, CP 4, Cope Series, Noller, Hetra, Remcom, and Atron.

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STRUCTURAL DYNAMICS RESEARCH

See the reports on Com-Share and Metri-Data Computing.

* * *

SYSTEM DEVELOPMENT

LOCAL DIALING

Local dialing is available in the following areas: VA (703) and Los Angeles CA (213).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: IBM 2741 and Teletype 33, 35.

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SYSTEMS ANALYSIS

BACKGROUND

Systems Analysis Company (SAC) was formed in January 1968 and two months later became affiliated with Call-A-Computer, as a marketing representative for that company's time sharing services. See the report on Call-A-Computer for detailed information about facilities offered.

In addition to offering time sharing, SAC provides consulting service for those in the mechanical engineering and management science fields and applications development for computer-aided design, statistical quality control, information systems, and mathematics.

Service is implemented on a Call-A-Computer Honeywell/GE-265 system, composed of a Honeywell/GE-235 central processor, with 16K 20-bit words of core, connected to a Datanet-30 communications processor, also with 16K 20-bit words of core.

SAC supports the same programming languages as Call-A-Computer, whose facilities it is marketing. These languages are conversational versions of Algol, Basic, and Fortran.

Customers access the service through a combination of foreign exchange lines and multiplexers. Where there is no local dialing service, customers use station-to-station dialing. The company also supports its services with program development, training, and documentation.

LOCAL DIALING

Users can dial local numbers to access the system throughout Alabama (205) and in the Florida "Panhandle" (904).

TERMINAL SUPPORT

Users can access Call-A-Computer's system through the following terminals: Teletype Models 33 and 35, Friden 7100, Itel Series, CalComp Plotter, Complot Plotter, and all Teletype-compatible terminals.

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SYSTEMS DIMENSIONS LIMITED

BACKGROUND

Systems Dimensions Limited (SDL) was formed in 1968 as a consulting organization specializing in software and systems development. The company initiated a general-purpose local and remote batch service in June 1969. At that time, the SDL SYSTEMCENTRE in Ottawa housed an IBM 360/65 computer. The system was upgraded to a full IBM 360/85 in February 1970. High-speed input/output terminals were installed in Toronto and Montreal during August 1969 and in New York and Boston in June 1970 for general use by customers in those areas. SDL is represented in the United States by EDP Resources Inc.

SDL's system operates in a multiprogramming environment with a specially developed production control system featuring dynamic scheduling during program execution. The system can accommodate up to 15 concurrent user tasks in batch mode while also servicing remote batch and keyboard terminals; both high-speed and key-driven terminals are available. Currently the IBM 360/85 supports 60 ports for high-speed batch terminals, 40 ports for remote key-driven terminals, and 16 ports for local key-driven terminals.

A user can access the system through local input/output units at the Ottawa SYSTEMCENTRE; over high-speed terminals provided for customer use in Boston, New York, Toronto, and Montreal; or by means of private terminals at customer locations. The high-speed terminals provide facilities for card reading, line printing, and card punching.

SDL supports most IBM System/360 programming languages including Fortran IV and its level H, G, and WATFOR modifications; Algol, Cobol, Cobol U, and PL/1 using the corresponding 360 F-level compiler; RPG using the 360 E-level report program generator processor; and the standard 360 F- and H-level assemblers. The firm maintains a library of general-purpose routines and offers application packages designed to solve problems in civil engineering, simulation, management science, and mathematics.

SDL supports a staff of professional technical counselors to furnish programming and applications assistance to system subscribers. The firm also provides training and documentation.

In addition, SDL employs ACCOUNTPAK, a job accounting and management information system designed by SDL programmers, to calculate charges for system usage. ACCOUNTPAK allows SDL to maintain reproducible job charges regardless of temporary configuration changes or degradations. In addition to controlling the dynamic dispatching priority for simultaneously executing jobs, ACCOUNTPAK produces detailed run information useful in optimizing job design.

LOCAL DIALING

Local dialing to access the system from the following areas is optionally available upon payment of a surcharge: Ottawa (613), Boston MA (617), and New York NY (212).

TERMINAL SUPPORT

The SDL system accommodates both high-speed batch and key-driven terminals. Currently the batch terminals supported include: Data 100; COPE 38; Badger DTS 100; Remcom 2780; IBM 2780 Data Transmission Terminal; IBM 1130 processor; IBM 360/20 processor (and up); and Univac 9000 Series. The keyboard terminals supported include the IBM 2741, 2740, and 1050 units.

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TRW

LOCAL DIALING

Local dialing is available in the following areas: MD (301); Washington DC (202); and VA (703).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: Datel 30, 31; IBM 2740; IBM 2741; Teletype 33 and 35.

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TECHNICAL ADVISORS

BACKGROUND

Technical Advisors, Inc. was established on October 5, 1954, to provide consulting services in the areas of technical, research, and management problems. Prior to 1958, Technical Advisors furnished management consulting services primarily in basic and applied research and development. Then in 1958, the company entered the information processing field. This expansion developed into a specialized, dedicated service for civil engineers and land surveyors and has become the principal activity of the firm. In 1967, Technical Advisors began providing its customers with a specialized time sharing service known as TECH-MAC™.

The particular expertise associated with Technical Advisors is the company's exclusive and unique TECH-MAC language that provides a desk-side computational and drafting facility for engineers and surveyors. TECH-MAC is a descendant of the problem-oriented language that the company first developed in 1959 for use in survey and subdivision computations. This program has undergone many changes as a result of its extensive in-house use for computing at least 500,000 lots for over 800 clients located in 49 states, Puerto Rico, the Virgin Islands, and the Bahamas. TECH-MAC will perform extensive surveying computations and plot the results from relatively convenient input familiar to civil engineers and surveyors.

Technical Advisors implements its dedicated service on dual Varian Data 620A and 620I processors configured with 8K 18-bit words of core. The system can support 11 simultaneous users, and each user can run five jobs concurrently.

The company markets its service throughout the United States and in Puerto Rico, via its own marketing staff and sales representatives. Because of TECH-MAC's similarity to standard civil engineering problem definition, the company does not offer program development and coding assistance to subscribers. However, an introductory reference manual describing the TECH-MAC system is furnished.

LOCAL DIALING

Local dialing into the Technical Advisors system is available toll-free to subscribers in the continental United States, with the exception of Michigan.

TERMINAL SUPPORT

Technical Advisors supports the Teletype ASR 33 and 35. The Gerber 622 drafting machine with 50 x 60-inch flat bed is used as the plotter.

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TEL-A-DATA

BACKGROUND

Tel-A-Data, Inc. was founded in June 1966 and immediately began offering time sharing services. Operating from its Miami headquarters, the company markets a remote access service in southern Florida. The firm is dedicated to business applications, e.g., inventory control, accounts receivable, business reports, and payroll.

Tel-A-Data's time sharing service supports Burroughs Basic Assembler Language, which is used by the company's programmers to develop the packages required by each user. At their terminals, users supply the parameters that specify a program's activity. A user cannot write his own program and implement it from his terminal.

The company uses a B 500 computer system, which has 10K words of core with a 6-microsecond cycle time; a second B 500 was ordered in October 1970. The present system will support 64 simultaneous users.

The primary means of communicating with the system is the public dial-switched network and direct line tie-in. Tel-A-Data also has two direct dedicated WATS lines to Jacksonville.

The company's programming support is highlighted by five basic applications packages in the areas of business, finance, and statistics.

LOCAL DIALING

Local dialing on a toll-free basis is provided in Miami FL (305); other Florida cities with the same area code and thus local dialing privileges are: Hollywood, Opa Loca, Fort Lauderdale, and Hialeah.

TERMINAL SUPPORT

Tel-A-Data supports the Teletype Model 35 and Burroughs TC 500 terminals.

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TELCOMP

BACKGROUND

Telcomp Corporation was formed in January 1970 as a subsidiary of Bolt Beranek and Newman Inc. (BBN), a company that was founded as a partnership in 1948 and incorporated in 1953. Originally, BBN provided consulting services in theoretical and applied acoustics; its scope has expanded to include research, development, consulting, and computational services in the physical and information sciences, as well as other scientific fields. Through its range of research and consulting services, BBN has developed significant experience in many scientific fields including the physical sciences, information sciences, and architecture.

Although BBN's Telcomp Computer Services were first offered commercially in 1965, the company had demonstrated a working time sharing system as early as 1962. The TELCOMP language, based upon Rand Corporation's JOSS language, was developed at Bolt Beranek and Newman. Telcomp services have been available in England since 1967 through the company's affiliate, Time Sharing Limited.

Telcomp Corporation supports services on two distinct types of systems: the TELCOMP II language for interactive computation on PDP-7/8 computer systems; and the Fortran IV, Advanced Basic, and TELCOMP III languages on PDP-10 systems for more extensive conversational applications. The company also offers a wide range of specialized applications packages.

TELCOMP, the language developed by BBN, is highly interactive, conversational, and computational. It is designed for rapid problem solution. The PDP-10 system offers extended

versions of the Basic language and USASI Standard Fortran IV.

Telcomp Corporation's main service area is the eastern seaboard.

The company provides support in program development, coding assistance, training, and documentation.

LOCAL DIALING

Telcomp users can dial local telephone numbers in East Orange NJ (201), Cambridge MA (617), New York NY (212), and Washington DC (202). A limited In-WATS service is also available throughout most of the eastern seaboard.

TERMINAL SUPPORT

Terminals supported by the system include Teletype Models ASR 33/35/37, Typograph III, Datapoint 3300, Execuport 300, and other 110-, 150-, and 300-baud ASCII terminals.

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TELSTAT SYSTEMS

LOCAL DIALING

Local dialing is available in New York NY (212).

TERMINAL SUPPORT

Representative terminals supported by the system are as follows: American Data Systems ADS-715; Anderson Jacobson 841 Selectronic; ADT 233; Computer Transceiver Execuport 300; Data Products Portacom PC 8110; IBM 2741; and Teletype 33, 35, 37.

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TIME SHARE

BACKGROUND

Time Share Corporation (TSC), one of the largest computer consulting firms in New England, was founded in early 1966 and began with offerings in computer-based information planning and education. Its achievements include: creation of a multicenter interconnected time sharing system; construction of a wide range of management education and career training programs by the TSC education subsidiary, Computer Environments Corporation; and specialized packages for clients in banking, manufacturing, educational, financial, and institutional areas.

The company offers conversational time sharing. Its applications packages cover the fields of business, education, mathematics, and statistics. Those programs stored in public libraries may be copied, modified if necessary, and stored in the user's private library.

Service is implemented on a Hewlett-Packard (HP) 2000A computer system, whose central processor has 16K words of core storage (16 bits each plus parity) and can support a maximum of 16 simultaneous users. Each user has 5,120 words of core storage available for program execution. TSC offers programming language support in an extended version of Basic.

Subscribers can access the company's service via the public-switching network or through a dedicated private telephone line.

The company also supports its services with program development, training, and documentation and the installation of a complete dedicated service, if desired.

LOCAL DIALING

Local dialing is available in Boston MA (617); Durham NH (603); Hanover NH (60s); Hartford CT (203); northern NJ (201); and Springfield MA (413).

TERMINAL SUPPORT

All terminals that transmit and receive using ASCII code can access the TSC system including Teletype Models 33 and 35, CRTs, card readers, and plotters.

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TIME SHARING RESOURCES

BACKGROUND

Time Sharing Resources, Inc. (TSR) was formed in January 1969 and initiated time sharing services in January 1970. The firm offers conversational (OS-Call/360) and remote batch (RJE) time sharing on an IBM 360/50 computer system capable of supporting up to 60 simultaneous users. TSR also markets a production job scheduling system designed to aid each customer in getting optimum computer system utilization.

The TSR time sharing system supports APL, Basic, Fortran, and PL/1 for conversational use and Assembler, Cobol, Fortran, PL/1, and RPG for remote batch use. Available applications packages cover business and finance, engineering, mathematics, statistics, and various miscellaneous areas.

To support its service, TSR provides user training, documentation, and assistance in program development and coding.

LOCAL DIALING

Subscribers can dial local numbers to access the system from New York NY (212), Chicago IL (312), Tampa FL (305), Hartford CT (203), Philadelphia PA (215), and Boston MA (617).

TERMINAL SUPPORT

Subscribers may access the system through the following terminals: Anderson Jacobson; CP 4 (RJE); Data 100 (RJE); Datapoint 3300; Datel; Itel; Execuport; IBM 2741; IBM 2780 (RJE); Novar; Teletype 33, 35 (Call/360 only); and CalComp Plotter.

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TRACOR COMPUTING

BACKGROUND

Tracor Computing Corporation was formed and initiated service during November 1968. The firm supports a remote batch service on a Univac 1108 computer operating under a Univac Exec II operating system. Input to the system can be from a Univac 9200/9300, IBM 1130, or COPE remote batch terminal.

In addition to furnishing a library of general-purpose routines, the service supports a software control system for analyzing sampled time functions. The service supports the Fortran, Cobol, and Univac 1108 assembly languages.

Currently, the service is marketed in the vicinity of Austin, Dallas, San Antonio, and Houston, Texas. Tracor Computing Corporation furnishes assistance to new users on the system or those with special problems. Additionally, the company furnishes documentation for enabling effective customer use of the Univac 1108 computer.

LOCAL DIALING

Subscribers can dial local telephone numbers to access the system in Austin TX (512).

TERMINAL SUPPORT

Remote access of the computer can be from a Univac 9200, 9300, or 1004; IBM 1130; or a COPE terminal.

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TRANSDATA

BACKGROUND

Transdata was formed in September 1968 to offer data processing services that include: conversational time sharing, local batch processing, and remote batch processing. In May of 1969 the company began offering conversational time sharing services on a Xerox Data Systems Sigma 5 computer; remote batch capability was added in September of that year. To provide increased geographic coverage, Transdata opened a Tucson, Arizona office in June 1969, and a Salt Lake City, Utah office in March 1970.

Currently the firm offers conversational time sharing and remote/local batch service on an XDS Sigma 5 with 80K 32-bit words of core, and a memory cycle time of 850 nanoseconds. In the

conversational mode, the system can support 32 simultaneous users while concurrently processing one batch job.

The firm's conversational time sharing service features an Extended Fortran IV-H programming language with a built-in conversational debugger, Extended Basic, and SYMBOL (the XDS assembler). Its remote/local batch processing service provides language support in Basic, Extended Fortran IV, Cobol-65, SYMBOL, and SORT/MERGE.

Transdata offers several applications systems in the conversational mode, including a structural engineering package, COGO, General Ledger, Payroll, and MANAGE.

The firm supports its offering with program development, programming assistance, training, and documentation.

LOCAL DIALING

Users may access the system on a toll-free basis from Phoenix and Tucson AZ (602), Salt Lake City UT (801), El Paso TX (915), Las Vegas NV (702) and Idaho (208).

TERMINAL SUPPORT

Subscribers can access the Transdata system via any Teletype-compatible device, at either 10 or 30 characters per second. The system also supports the IBM 2741 at 15 characters per second.

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TRANSNET

BACKGROUND

TransNet Corporation was formed in June 1969 and in November of that year began offering time sharing services on a TSS/8 system, which is a DEC PDP-8/I modified for time sharing. The firm added a Honeywell/GE-430 system in February 1970 and a Sigma 7 in May 1970. The Honeywell/GE system is classified as a medium- to large-scale time sharing system and is used mainly by engineers and businessmen in problem solving. Sigma 7 is a large-scale system and functions in the same manner as the Honeywell/GE system but has additional capabilities for the very sophisticated user.

TransNet offers both conversational time sharing and remote batch services. In addition, its staff provides consulting, systems design, programming, facilities management services, and dedicated turnkey time sharing systems.

Time sharing services are currently implemented on three computer systems. One is a Digital Equipment Corporation TSS/8 with 24K 12-bit words of core and a 680I communications front end with an access time of 1.5 microseconds; this system is capable of supporting 24 simultaneous users. The Honeywell/GE-430 system is composed of a Honeywell/GE-425 central processor with 96K 24-bit words of core storage, plus a Datanet-30 communications processor; this system is for conversational usage and can support 48 simultaneous users. The XDS Sigma 7 with 300K 36-bit words of core is used for both conversational and remote batch and can support over 100 simultaneous users.

TransNet supports programming in the following languages: Basic and Extended Basic, which are used conversationally on all three systems and in remote batch on the Sigma 7; Fortran II, which is used conversationally on the TSS/8; Fortran IV-G, which is used conversationally on the Honeywell/GE-430; Fortran IV-H, which is used either conversationally or in remote batch on the Sigma 7; Cobol, which is used conversationally or in remote batch on the Sigma 7; and APL and assembly language, which are available on the Sigma 7. PAL-D (Program Assembly Language) is used conversationally on the TSS/8 system. FOCAL (a formula calculator) is used conversationally on the TSS/8 as well as SIMBOL, a business-like language also available on the TSS/8.

Primary medium for subscriber communications with the systems is the public dial-switched network. Additional facilities are provided by foreign exchange lines and a multiplexor.

The company also supports its services with complete program development, assistance, and training.

LOCAL DIALING

Users can dial toll-free to access the system from northern, central, and southern New Jersey (201, 609) and New York City (212).

TERMINAL SUPPORT

The TSS/8 system can be accessed by all ASCII terminals that have a data transfer rate of 10 characters per second.

* * *

TRAVCOM

LOCAL DIALING

Local dialing is available in the following areas: CT(203); RI(401); Philadelphia PA (215); and OH(513).

TERMINAL SUPPORT

One terminal supported by the system is the IBM 2741.

* * *

TYMSHARE

BACKGROUND

Tymshare, Inc. was formed in May 1965 to investigate the feasibility of entering the time sharing services industry. After evaluating several university time sharing research projects, the company decided to place an order with Xerox Data Systems (formerly Scientific Data Systems) for the XDS 940 computer, as modified for the University of California at Berkeley. The first production XDS 940 ever assembled was delivered to Tymshare's Palo Alto Computer Center in May 1966, and in November of that year Tymshare began commercial operation. Tymshare has grown rapidly since its founding; it now serves markets throughout the United States, in Canada through Tymshare Canada, Ltd., and in western Europe by a joint venture with CEGOS-Tymshare. In the first quarter of 1970, Dial-Data of West Newton, Massachusetts, merged with Tymshare. The continuing firm, Tymshare, offers all the facilities and features of the former Dial-Data.

Tymshare, Inc. is a general-purpose time sharing service offering conversational and remote batch processing that encompasses several programming languages (some developed by the company) and specialized applications programs. The company has produced a conversational Fortran compiler that allows statements to be compiled in the middle of an existing program without recompiling the program; Super Basic; and EDITOR, an improved text editing language. The company's time sharing service accommodates everyone from the single-terminal user to the company requiring its own time shared computer installation and staff.

Service is implemented on the XDS 940 central processor with 64,000 24-bit words of core storage. Approximately 20 XDS 940 systems are currently installed for customer service; each can support 40 simultaneous users.

Tymshare provides the following programming languages: CAL (the conversational algebraic language), Super Basic (superset of Dartmouth Basic), Batch Fortran (remote entry Fortran II), Batch Fortran IV (remote entry Fortran IV), Super Fortran (conversational Fortran IV — a superset of H level), EASYPLOT (conversational all-purpose plotting language for digital plotters), RETRIEVE (generalized information retrieval language), and ARPAS (assembly language for the XDS 940).

The user communicates with the Tymshare system through TYMNET, Tymshare's International Telecommunications Network, by means of satellite computers, called TYMSATs, located in each district office, on customer premises, or at other sites as required. More than 60 TYMSATs are currently in use in the United States, Canada, and Europe; each TYMSAT can accommodate up to 32 simultaneous users having terminals with speeds up to 30 characters per second, plus two other 120 character-per-second peripheral devices. All customer calls to the Tymshare system are local or low-cost message unit calls using local, toll, foreign exchange, or WATS lines as appropriate. Each TYMSAT is connected to the computer by one SCHED 4 C2 Bell System line currently using 2,400 bit-per-second modems (soon to be 4,800 and 9,600 bit-per-second modems).

Each TYMSAT has 8,196 16-bit words of 1.8-microsecond core memory and is an on-site preprocessor which also relays processing assignments to and from the central computers. The TYMSAT performs error detection and correction by using retransmission to provide an error rate of less than 1 in 4 billion bits transmitted. The TYMSATs are arranged in TYMNET in a ring configuration to provide continuity of data transmission. Each TYMSAT can have at least two paths to other TYMSATs, and all can have at least two paths, different and diversely routed, to the central computers. Thus, any cut in any section of the standard TYMNET transmission path, such as between Chicago and the Cupertino, California Computer Center, will trigger an automatic reroute via an alternate path, possibly via New York or Dallas. This rerouting is without delay and unnoticed by users. The TYMNET/TYMSAT network can accommodate

multiple codes such as ASCII and correspondence; teletypewriters and CRT terminals with speeds up to 30 characters per second; and line printers, plotters, card readers, and card punches up to 120 characters per second over the same telephone line.

The company also supports its services with program and coding assistance, training, and documentation.

LOCAL DIALING

Tymshare furnishes local dialing service through TYMNET, using local, foreign exchange, toll, or WATS telephone lines as appropriate. Local call service is available in all Tymshare district office areas in the United States, Canada, and Europe. By installing a TYMSAT wherever needed, e.g., in Seattle (which serves Oregon, Idaho, and British Columbia), Tymshare offers local dialing service in all 48 adjacent states and in every Canadian province. In-WATS service varies according to need, but presently includes the states of Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Maryland, West Virginia, Virginia, Wisconsin, Michigan, Indiana, Ohio, Kentucky, Tennessee, Missouri, Iowa, Minnesota, Texas, Arizona, New Mexico, Oklahoma, Wyoming, Utah, Colorado, North Dakota, Louisiana, Nebraska, Kansas, and South Dakota.

TERMINAL SUPPORT

A partial list of terminals that are compatible with the Tymshare system is given below. Terminals distributed by Tymshare are marked with an asterisk.

Class 1 (ASCII code; 10, 15, 30 characters per second)

Printing Terminals

Teletype 33*, 35, 37	Terminet 300
Syner-Data Beta*	Gulton 10/30
Memorex 1240*	Portacom
Tymshare 1030*	Univac DCT-500
Texas Instruments 720, 725	Execuport 300

CRT Terminals

Hazeltine 2000	Datapoint 3300*
Infoton Vista Series	Delta Data
Beehive Alpha Series	Data 100
Video Systems VST	ADDS

Plotters & Graphic CRT Terminals

Zeta Plotter*	Tektronix Graphic CRT
CalComp Plotter	Houston Plotter
Omega-T Plotter	Hewlett-Packard Plotter

Card Readers

Cardliner	Republic
Hewlett-Packard	

Class 2 (IBM correspondence code, 15 characters per second)

2741	Itel
Novar	Anderson-Jacobson
Datel	Trend Data

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UNITED COMPUTING SYSTEMS

BACKGROUND

United Computing Systems, Inc. (UCS) was formed in December 1967 and began offering its commercial time sharing service in Kansas City, Missouri, on March 1, 1968. Since then the company has expanded its operations into 43 additional cities. The firm's principal product, first offered in November 1969, is a conversational and batch service called UCS VI. Developed jointly by UCS and Control Data Corporation, the operating system for UCS VI is designed to operate in three concurrent processing modes: conversational, remote, and local batch. UCS VI is aimed at the user who requires the power of a large-scale system with extensive application systems and large program libraries. Another company time sharing service, UCS II, is oriented towards the smaller user and educational institutions.

UCS VI service is implemented on CDC 6600 and CDC 6500 central processors, both with 131,072 60-bit words of core storage. The CDC 6500 system executes one instruction at a time using an internal clock cycle time of 100 nanoseconds. The CDC 6600 system has the same cycle time but uses an eight-word instruction stack. Up to 10 banks of central memory can be accessed concurrently, with a cycle time of

1 microsecond for a 60-bit word. Simulated system loading tests show that each system can support more than 350 simultaneous time sharing users.

UCS II service is implemented on a Honeywell/GE-235 central processor that has 16K 20-bit words of core storage and a Datanet-30 communications processor. It can support a maximum of 39 simultaneous users.

The UCS VI service features: a common data base (accessible nationwide); an interactive time sharing system that furnishes up to 240,000 characters of central memory storage; unlimited number of mass storage user files (up to 2,000,000 characters each); and support for concurrent processing in conversational, remote, and local batch modes. The firm also offers a special service for producing finished manuscript documentation called UNITEXT, a text language utilizing upper- and lowercase character sets with special fonting capabilities. UCS provides a large-scale general-purpose data management system called UNIDATA, which provides both interactive and batch capability for creating, modifying, and retrieving information from a national data base.

Programming languages supported by the UCS system include Algol, a scientific and engineering programming language; Cobol; COMPASS (the CDC 6000 assembler language); and extended versions of Basic and Fortran IV.

United Computing Systems has a marketing agreement with Compu-Time, Inc. of Daytona Beach, Florida, whereby Compu-Time can market UCS computer services in the southeastern states served by Compu-Time. UCS can market the services provided by Compu-Time's dual Honeywell/GE-430 computers in other parts of the country.

The primary means of communication for UCS service is through a fast multiplexing system. This system operates over leased private-line Bell System facilities and connects each remote district and branch office to the computer system, located in Kansas City, Missouri. Local access to the multiplexer system is through the Bell System dial-switched network, using 103 Series data sets.

Foreign exchange and inbound WATS lines provide additional access to the system.

The company also supports its services with program development, training, and documentation.

LOCAL DIALING

Users can dial local numbers to access the UCS systems in all the sales office cities plus Albuquerque NM (505); Bakersfield CA (805); Boston MA (617); Charlottesville VA (703); Colorado Springs CO (303); Delaware OH (614); Detroit MI (313); Ft. Worth TX (817); Grand Prairie TX (214); Lafayette LA (318); Midland TX (915); Milwaukee WI (414); Norman OK (405); Oakland CA (415); Orange County CA (714); Phoenix AZ (602); Pittsburgh PA (412); Ponca City OK (405); Portland OR (503); San Antonio TX (512); Tampa FL (813); Tucson AZ (602); Wayne NJ (201); Wichita KS (316); Wilmington DE (302); White Plains NY (914).

TERMINAL SUPPORT

UCS II service can be accessed by Teletype Models 33 and 35 and compatible terminals.

UCS VI service can be accessed by any ASCII, EBCDIC, or correspondence terminal or plotter at baud rates of 110, 134.5, 150, and 300 and by any terminal that has a CDC 200 User's Terminal interface.

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UNIVERSITY COMPUTING

BACKGROUND

University Computing Company (UCC) was founded in July 1963 to introduce the utility concept of distributing digital computer services. The company has grown into an international corporation and is active in five related sectors of the computing industry: medium- and-large-scale computer service operations, software development, computer peripheral equipment manufacturing, computer systems leasing, and data communications.

UCC offers both remote batch and conversational service through its Computer Utility Network. Service is implemented on one of eight Univac 1108 central processors; six are located at centers in the United States and two in London, England.

UCC International was established in 1968 to provide the same total range of data processing, remote batch processing, and conversational time sharing services to commercial, scientific, and governmental users abroad as well as to

international companies and their subsidiaries. Its major accomplishments include the installation in Great Britain of two Univac 1108's and a Univac 1107, the former being linked by leased telephone lines to clients in Europe who share the computer utility UCC-designed COPE® remote terminals. In May 1969, UCC International acquired Automation Center International (headquartered in Zurich, Switzerland), which operates computer service centers and remote batch processing terminals in a number of major European cities. UCC International currently markets its services in Europe, Canada, Mexico, and South America. In these same areas, UCC International markets UCC products as well as the products of other manufacturers for which it has overseas distribution rights.

The firm's hardware configuration includes a UCC-designed interface, called the FASBAC® system, that functions as a communications processor for conversational time sharing. Subscribers with conversational time sharing terminals remotely access the FASBAC system, which itself interfaces the Univac 1108 central processor via a UCC Fastrand Access and Intercomputer Coupler. A FASBAC system consists of a UCC-modified DEC PDP-8 processor interfaced to a DEC PDP-9 processor, which is configured with a high-speed swapping drum. Each Univac 1108 central processor can support up to four FASBAC systems; one FASBAC interface can support up to 25 simultaneous users. Thus, the maximum configuration of four FASBAC systems enables a single Univac 1108 to support 100 simultaneous users.

Subscribers using the remote batch service can communicate with the firm's hardware via UCC's COPE series of remote batch terminals or via suitable terminals supplied by other manufacturers. The remote batch terminals directly access the Univac 1108 central processor; the FASBAC interface can be bypassed, although all remote batch capability is available through FASBAC.

Users of the conversational service can program in the CASH language, a computational language designed by UCC specifically for user interaction with a computer from a terminal. In the remote batch mode, subscribers can write programs in Algol, Basic, Cobol, and Fortran V.

UCC's Applied Sciences Group includes programmers, systems analysts, and other computer professionals who develop software systems and perform contract consulting work in operations research, petroleum geology, petroleum reservoir management, opinion research, and other applications areas. UCC's Data Link Division offers business and commercial applications on small to medium-scale computers. In addition to these activities, UCC markets the COPE series high-speed terminals and Datel® keyboard terminals.

Computer Technology Inc., UCC's Dallas-based EDP facilities management organization, offers computer services to users in business and government, including turn-key responsibility for client EDP requirements.

UCC offers extensive assistance in programming development, coding assistance, training, and documentation. The firm also aids subscribers in obtaining terminal devices suitable for remote access to the time sharing system.

LOCAL DIALING

Local dialing service into University Computing's Utility Network is available in the following cities: Chicago IL (312), Dallas TX (214), East Brunswick NJ (201), Houston TX (713), Los Angeles CA (213), New Orleans LA (504), New York City NY (212), Philadelphia PA (215), San Francisco CA (415), and Tulsa OK (918). Local dialing service via WATS lines is available in Washington D.C. (202) and in the following states: Alabama, Arkansas, Colorado, Connecticut, Delaware, Georgia, Indiana, Illinois, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Mexico, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Dakota, Tennessee, Utah, Vermont, Virginia, Wisconsin, and Wyoming.

For network subscribers having computer terminals of their own, high-priority rapid-response service is available in the Northeast, East, South, and Midwest. The Dallas, Chicago, and East Brunswick Centers are equipped with additional drum systems to roll out running jobs for short, high-priority assignments. In these centers, when a high priority is requested, the run in progress is interrupted within 40 seconds to permit the priority assignment — which must require no more than 25 seconds — to be processed at once.

TERMINAL SUPPORT

UCC operates with two general types of terminals: conversational and remote batch. The

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conversational terminals provide access to the FASBAC system and to the 1108, and the remote batch terminal offers access to the 1108 process system.

Conversational

Teletype Models 33, 35 and 37
TermiNet 300, Memorex
DCT 500, Beta, Gulton
Datapoint 3300, Hazeltine CRT
Datel Terminal
IBM 2741

CalComp Plotter
FASPLOT Plotter

Remote Batch

Univac 1104/5 Processors
Univac 9000 Series Processors
Honeywell 200 Series Processors
COPE Series
IBM 1130 Processor
GE-400 Series Processors
IBM 360 Series

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USS ENGINEERS AND CONSULTANTS

LOCAL DIALING

Local dialing is available in the following areas: Pittsburgh PA (412); Detroit MI (313); Philadelphia PA (215); and New York NY (212).

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VENTURE COMPUTER SYSTEMS

LOCAL DIALING

Local dialing is available in Wisconsin (414).

* * *

WABASH COMPUTER

BACKGROUND

Wabash Computer Corporation, a subsidiary of Wabash Magnetics, Inc., was formed in 1968 and initiated its time sharing service in September of that year. Besides the Computer Network Division, Wabash Computer also has a Computer Equipment Division, which manufactures computer-related testing and memory equipment.

Wabash offers a time sharing operation dedicated to business-oriented applications; it provides service in both conversational and batch modes. Major applications include payroll, labor distribution, job costing, inventory, law management, accounts receivable, order processing, text editing, data collection, sales analysis, and information retrieval. The company also markets raw machine time and local batch service.

To implement its service, Wabash uses an IBM 360/44 computer with 131K bytes of memory and a cycle time of 250 nanoseconds per byte. The computer can handle up to 80 users simultaneously. It runs under control of MARCOS, a proprietary operating system. Much of this operating system plus all application programs are written in SHARP (a string-oriented interpretive language). Wabash supplies all programs for the time sharing service.

Users communicate with the system primarily through the public telephone network. To facilitate communications, the system includes a COMCET 40 Communications Processor and a COMCET 10 Multiplexor (ADS 660).

Wabash's support staff consists of an application-oriented programmer-analyst as well as

terminal and communications specialists. The company markets its services primarily in the Phoenix area but will supply nationwide service upon request.

LOCAL DIALING

Subscribers can dial local numbers to access the system in Phoenix AZ (602).

TERMINAL SUPPORT

Users can access the Wabash system through the following terminals: Courier CRT; Datel 30; GE TermiNet 300; IBM 2741; Teletype Models 33, 35; Univac DCT 500; and most 10-, 15-, or 30-character per second terminals.

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WESTINGHOUSE TELE-COMPUTER SYSTEMS

BACKGROUND

Westinghouse Tele-Computer Systems Corporation (WTSC) was formed as a subsidiary of Westinghouse Electric Corporation in early 1970 by combining the parent's corporate remote batch services facility and the headquarter's management systems consulting organization with the facilities furnished through its Tele-Computer Center and Information Systems Laboratory. In 1962 the Tele-Computer Center began operating an on-line processing network for corporate message switching. The company installed large-scale IBM 360 systems and two CDC 6600's in 1967 and 1968. Its first time sharing computer system was installed at the firm's Information Systems Laboratory.

Although the firm originally offered both conversational time sharing and remote batch service, in August 1970 Westinghouse began phasing out its conversational service and currently markets only remote batch service.

The firm offers a package of numerical control programs, designated the CAMP* Series, as well as a general library of applications programs.

Currently, the firm maintains two Univac 494's, two CDC 6600's, and one IBM 360/ASP. The Univac 494's and CDC 6600's are not presently available for commercial remote batch. The IBM computer accepts Assembler, Cobol, Fortran, and PL/1.

Westinghouse markets its service in the eastern and midwestern United States. The firm supports its service with program development, coding assistance, training, and documentation.

LOCAL DIALING

Local dialing into WTSC's time sharing facility is available for the following locations: Atlanta GA (404), Athens GA (404), Chicago IL (312), Indianapolis IN (317), Boston MA (617), Salisbury MD (301), Detroit MI (313), Buffalo NY (716), New York NY (212), Syracuse NY (315), Philadelphia PA (215), Pittsburgh PA (412), Arlington VA (703), Washington DC (202), and Memphis TN (901).

TERMINAL SUPPORT

Users can access the remote batch system through the following terminals: Teletype 33/35, IBM 2780, IBM 1130, IBM 360/20, IBM 360/30, and Westinghouse W 9000.

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WORLD WIDE TIME-SHARING

BACKGROUND

World Wide Time-Sharing, Inc. was formed in 1965 as a service bureau, offering local batch processing on two Burroughs B 500 computers. It designed its time sharing system in 1968 and initiated service in 1970 on a CDC 3100 computer. Recently, the company has gained a nationwide data communications network through affiliation with a large firm.

Basically, the World Wide time sharing system is an on-line order entry package for multi-terminal users. It is accessed over dedicated lines and creates picking tickets, invoices, perpetual inventories, and accounts receivable as by-products. All programming is done at World Wide; customers cannot create or modify programs from their terminals. Applications areas include stationery, paint manufacturing and distribution, wall paper, lumber, sporting goods,

auto parts, toys and furniture, food, and floral supplies.

To support its service, the company provides user training and documentation on the installation, operation, and use of its service.

TERMINAL SUPPORT

Users access the World Wide system over dedicated lines, through the following terminals: Beta, Datapoint 3300, Friden 7100, Infoton, Olivetti, Teletype 33, and Memorex.

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SERVICE FEES

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	ACTS	APL GENERAL, INC.	APL SERVICES	ALLEN-BABCOCK COMPUTING, INC.	AMERICAN COMPUTER SERVICE CORPORATION
Initiation	None	None	None	None	None
Monthly Minimum	$100	None	See Remarks	None	None
Terminal Connection	Prime time — GE-265: $5/hr GE-430: $9.50/hr Off hours — GE-265: $4/hr GE-430: $5/hr	$7.70/hr	$8/hr	None	Prime time: $12/hr Off hours: $9/hr
Central Processor	Prime time — GE-265: $0.04/sec GE-430: $0.05/sec Off hours — GE-265: $0.02/sec GE-430: $0.03/sec	$0.05/sec For excess of 120 sec per terminal connect hour per month: $0.07/sec	Plan A: $0.40/sec Plan B: $0.32/sec Plan C: $0.24/sec	Prime time: $225/hr Off hours: $175/hr (see Remarks)	Prime time: $0.30/sec Off hours: $0.225/sec
Storage	$1/1K char/mo	For each 7.2K bytes or fraction: $1.05/mo	$1/7,200 char/mo	1-100K char: none Over 100K char — 2314 Disk: $14/100K char/mo Single 2321 Data Cell: $6/100K char/mo Dual 2321 Data Cell: $8/100K char/mo	$1/FSU/mo (see Remarks)
Remarks			Minimum — Plan A: $100/mo Plan B: $1,000/mo Plan C: $2,000/mo	Central processor rates are for remote job entry; for conversational use, rates vary in terms of core allocated.	FSU = 1,280 char For every $15 of storage used each mo, a user is given credit for 1 FSU.

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	APPLIED LOGIC CORPORATION	AVCO COMPUTER SERVICES	AXICOM	BASIC TIMESHARING	BELOIT CORPORATION
Initiation	None	None	None	None	None
Monthly Minimum	$100 (see Remarks)	None	See Remarks	None	See Remarks
Terminal Connection	$10/hr	None (see Remarks)	Prime time: $10/hr Off hours: $5/hr	$5-8/hr depending on volume of business	2780 terminal: $15/hr Low-speed terminal: $3.50/hr
Central Processor	Regular: $0.10/CU Deferred: $0.075/CU	0.005-4.99 ACU hr: $570-990 each 5.00-9.99 ACU hr: $550-970 each 10.00-14.99 ACU hr: $530-950 each Ranges depend on region of core and whether prime or nonprime time.	Batch — Prime time: $0.14-0.19/sec Off hours: $0.08-0.12/sec Conversational — Prime time: $0.19/sec Off hours: $0.12/sec	None	2780 terminal: $95/hr Low-speed terminal: none
Storage	Active: $3.75/MSU/mo Inactive: none	Disc: $4.50/cylinder/mo Tape: $2.50/tape/mo (First 7 days are free) Tape purchase: $20/tape, including storage	Core — Prime time: $0.002/CBS Off hours: $0.0012/CBS Drum: $0.04/10,752 char/day Tape — Axicom: $0.16/ reel/day Customer: $0.04/reel/day	$0.07/128 bytes/mo	Variable, depending on customer needs
Remarks	Minimum becomes effective with third invoice. CU = computer resource usage MSU = 1,024 words Quantity discounts	Nominal terminal connect fee for dedicated line; varies depending on data set. ACU = CPU time plus internal I/O time	I/O prime-time transfer rate is $0.0008/IDT; for off hours, $0.0005/ IDT. IDT = internal data transfer CBS = use of 512 words for 1 sec Monthly minimum — Storage: $ 50 CP: $150 Volume discounts	Leased ports: $750/mo	Minimum — 2780 terminal: $500/mo Low-speed terminal: $50/mo

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	BEVERLY BANK	BOEING COMPUTER SERVICES	BOWNE TIME SHARING, INC.	BURLINGTON MANAGEMENT SERVICES COMPANY	CALL-A-COMPUTER
Initiation	$100	None	None	None	$100
Monthly Minimum	None	$33 of storage	None	See Remarks	None
Terminal Connection	Prime time: $7/hr Off hours: $4.50/hr	Prime time — Seattle: $7/hr Other areas: $9/hr Off hours — Seattle: $5.50/hr Other areas: $7.50/hr Deferred service — no connect charge	$2.15/hr	1-25 hr/mo: $12 or $20/hr 26-50 hr/mo: $11 or $19/hr 51-100 hr/mo: $10 or $18/hr Above 100 hr/mo: $9 or $17/hr	Prime time: $7/hr Off hours: $4.50/hr
Central Processor	Prime time: $0.04/sec Off hours: $0.02/sec	Prime time: $0.45/sec Off hours: $0.25/sec Deferred service: $0.25/sec	$0.008/PU	Conversational: $0.10/sec Batch: $0.17/sec	Prime time: $0.04/sec Off hours: $0.02/sec
Storage	Up to 50 SU: $2/SU Over 50 SU: $1.50/SU	First cylinder: free Additional cylinders: $33/120,000 char Minimum of 2 cylinders required	$0.24/PSR/mo	On-line — 1-50,000 bytes: none Over 50,000 bytes: $6/25,000 bytes Off-line — Disc packs: $25/mo Mag tapes: $3/mo Card files: $1/1,000 cards/mo	Up to 50 SU: $2 each Over 50 SU: $1.50 each
Remarks	SU = 1,536 char Educational discounts	Discounts for more than 9 cylinders of on-line storage and for volume of service over $6,000	PU = 120 msec of process time or 7 I/O transfers PSR = 1,550 8-bit bytes Discounts if total charges exceed $2,000/mo	Monthly minimum — Conversational: $100 Batch: $50 Educational and volume discounts	SU = 1,536 char Educational discounts

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	CENTRAL COMPUTING, INC.	CHI CORPORATION	COMMUNITY COMPUTER	COMP-TIME	COMPUTEL SYSTEM, LTD.
Initiation	None	$25/client no.	None	$25	None
Monthly Minimum	None	None	None	None	None or $1,000
Terminal Connection	$16/hr	$3/hr	110 baud — 1-100 hr: $7/hr Over 100 hr: $3.50/hr 220 baud — $12/hr	$7/hr	None
Central Processor	$0.15/sec	Prime time: $0.03/sec Off hours: $0.22/sec	None	Processing: $0.10/sec I/O: $2/min of I/O channel usage	Charges vary with time of run, location, and volume commitment
Storage	$0.75/1K char/mo	Mass: $0.10/SU/mo Mag tape: $0.10/reel/day or $2.50/mo Punched card: $0.05/box/day or $1.25/mo	1-80K bytes: $0.20/160 bytes/mo Over 80K bytes: $0.025/160 bytes/mo	Disc — 1-100 segments: $0.05/10 seg/day 101-500 segments: $0.04/10 seg/day 501-1,000 segments: $0.03/10 seg/day Above 1,000 segments: $0.02/ 10 seg/day 1 free working file Tape — $5/mo	On 1108: $10-15/Fastrand block, depending on contract On 2314: $0.65/track/day or $1,500/disc pack/ mo
Remarks		SU = 2,016 char Discounts on processor usage over 2 hr/mo		Segment = 240 char	Volume discounts are negotiable

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	THE COMPUTER COMPANY	COMPUTER COMPLEX, INC.	COMPUTER CONCEPTS, INC.	COMPUTER DYNAMICS, INC.	COMPUTER INNOVATIONS
Initiation	None	None	$100	None	$100
Monthly Minimum	None	$250	None	$100	None
Terminal Connection	$8/hr	$12/hr	Prime time: $7/hr Off hours: $4.50/hr	$10/hr	APL: $13/hr ATS: $3.25/hr
Central Processor	$0.10/sec	$0.04/sec	Prime time: $0.04/sec Off hours: $0.02/sec	Regular: $0.10/CU Deferred: $0.075/CU	APL: $0.05/sec ATS: none
Storage	$1/7,200 char/mo	$0.025/1K char/day	Up to 50 SU: $2 each Over 50 SU: $1.50 each	Active: $3.75/MSU/mo Inactive: $0.50/MSU/mo	APL workspace: 0-64K char free Each additional 32K char: $7.50/mo APL file: $2/mo/track of 7,294 char in blocks of 20 tracks ATS: $0.20/mo/1,550 bytes
Remarks			SU = 1,536 char Educational discounts	CU = computer resource usage MSU = 1,024 words Mass storage discounts	

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	COMPUTER NETWORK CORPORATION	COMPUTER POWER UNLIMITED	COMPUTER SCIENCES CANADA LTD.	COMPUTER SCIENCES CORPORATION	
				Conversational Basic and CRJE	RJE
Initiation	None	$100	$50	$50	$50
Monthly Minimum	$100/mo; $1/run	None	$25	$25	$25
Terminal Connection	Baud rate — 110: $ 7/hr 137.5: $ 7/hr 150: $10/hr 300: $12/hr 600: $15/hr 1,200: $18/hr 2,000: $20/hr 2,400: $22/hr 3,600: $28/hr	$8/hr	Terminals — 5 char/sec: $10/hr 10 char/sec: $11/hr 30 char/sec: $13/hr	Low speed: $11/hr High speed: $13/sec	$10/hr
Central Processor	$0.20/CUU	Normal processing: $0.20/sec Deferred processing: $0.10/sec	$4.50-8.50/hr depending on priority Express processing: $1/job + $0.60/sec	Conversational Basic — $0.50/sec CRJE — Conversational: $0.50/sec Background: RJE rates	Express — 0-1 sec: $1/job 1.01-30 sec: $0.50/sec Standard — $800/hr Overnight — $600/hr
Storage	On-line (disc) — $1/track/mo Off-line — Customer disc: $20/disc pack/mo COMNET disc: $30/disc pack/mo Customer tape: $5/tape/mo COMNET tape: $5/tape/mo	On-line: $0.40/1,024 char/mo	Conversational: $1.50/page/mo Batch: $0.75/day/1,000 char	Conversational Basic — $1/3K char/mo CRJE — Conversational: $1/3K char/mo On-line background: $0.05/10K char/day	On-line: $0.05/10K char/day
Remarks	CUU = computer usage unit	Fees given are for conversational service. RJE fee calculation by formula based on resources used — i.e., CPU, I/O, and core requested.	Page = approx 3,000 char Volume and educational discounts		

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	COMPUTER SHARING SERVICES	COMPUTER TASK GROUP	COMP/UTILITY, INC.	COMPU-TIME	COMPUTONE SYSTEMS, INC.
Initiation	$35	None	None	$100	None or $1,000
Monthly Minimum	$35/contract	$100	$1-25/run	$10	—
Terminal Connection	$5/hr	$10/hr	Prime time: $8/hr Off hours: $5/hr	Incremental rate: $10/hr Hourly rate: $15-30/hr based on number of hours used per month (see Remarks)	—
Central Processor	A: $0.05/CU B: $0.025/CU C: $0.01/CU (see Remarks)	Regular: $0.10/CU Deferred: $0.075/CU	$0.03/sec Core memory: $0.01/sec/1,024 words	Incremental rate: $0.06/CPU Hourly rate: included in connect charge (see Remarks)	$30-1,400/mo, depending on the application used (see Remarks)
Storage	$2/SU/mo	Active: $3.75/MSU/mo Inactive: $0.50/MSU/mo	High speed (random access): $0.50/1,280 char/mo Inactive (DECtape or industry-compatible tape): $10/reel/mo	$1.50/1,620 char/mo	—
Remarks	A = 7:30 a.m. to 4:30 p.m. B = 4:30-8:30 p.m. C = rest of time CU = use of computer resources SU = 1,800 char Discounts on yearly contracts over $1,000	CU = computer resource usage MSU = 1,024 words Mass storage discounts	Dedicated system use, special software packages, leasing and communications terminals, and consulting services available Educational, high-volume, and off-hours usage discounts	Hourly rates charged only when incremental rate is higher. CPU = 1 record of processing with 12,000 words of core memory allocation Miscellaneous charges: $5/user number or terminal validation charge; $150/hr with $75 minimum for conversational batch processing; Educational discount	Specific applications packages include: Feed LP System Meat LP System COMPUMART Payroll Life Insurance

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	COMSERV	COM-SHARE	COM-SHARE (CANADA) LIMITED		CONCAP COMPUTING SYSTEMS
			Sigma 7 Service	940 Service	
Initiation	$50	None	None	None	$50
Monthly Minimum	None	See Remarks	$0-900	$0-900	None
Terminal Connection	Conversational: $9/hr Remote batch: $9/hr (low speed) $15/hr (high speed)	$10/hr for 10 char/sec $14/hr for 30 char/sec $20/hr for 60 char/sec	Conversational — 10 cps: $5-8/hr 30 cps: $7-10/hr Remote batch — $5/hr	$12/hr	Com-Share system: $18/hr Tymshare system: $24/hr
Central Processor	Conversational: $0.12/sec Remote batch: $6.50/min	$0.03/CCU	$0.08-0.10/CCU	$0.03-0.05/CCU	Com-Share system: $0.12/sec Tymshare system: $0.18/sec
Storage	25.6K free if monthly terminal and CPU charges exceed $100 Disc: $0.50/1,024 char/mo Tape: $5/reel/mo	$0.03/MSU	$1/0 bytes minimum to $0.20/50 million bytes minimum	$1/MSU	Com-Share system: $0.05/1,024 char/day Tymshare system: $1.75/1,000 char/mo
Remarks	Educational and off-hours discounts Discount for terminal, CPU, or storage usage over $1,000/mo	Monthly minimum— Standard: $400 Introductory: none CLU = connect line unit of 1 hr CCU = 0.01 min MSU = 256 words Charges are for 10 char/sec. Educational, volume, and early payment discounts	CCU = measure of central processing time, memory utilization, and I/O	CCU = measure of central processing time, memory utilization, and I/O MSU = 512 words	Volume discounts

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	CONSOLIDATED COMPUTER SERVICES LIMITED	CONTROL DATA CORPORATION		THE CYPHERNETICS CORPORATION	DATALINE SYSTEMS LIMITED
		Cyberpak	Cybernet		
Initiation	None	None	None	$100	None
Monthly Minimum	See Remarks	Varies (see Remarks)	None	None	None
Terminal Connection	No usage contract: $7.50 and $11.50/hr 1-yr contract: $6.50 and $10.50/hr 2-yr contract: $5.75 and $9.75/hr 3-yr contract: $5 and $9/hr (see Remarks)	CDC 6400: $8/hr CDC 3300 and 6600: $10/hr	CDC 6600: $10-25/hr CDC 3300: $5-25/hr	Prime time: $10/hr Off hours: $3/hr 300-baud terminals: $15/hr	Prime time: $10/hr Off hours: $7.50/hr
Central Processor	None	$0.20/sys sec	CDC 6600: $0.20-0.40/sys sec CDC 3300: $0.05-0.10/sys sec	$0.02/CPU	Prime time: $0.11-0.40/sec Off hours: $0.10/sec
Storage	$0.12/128 bytes/mo	$0.30/1,280 char/mo	On-line: rates vary with volume needed. CDC 6600: $0 + $0.013/SDB to $52.10 + $0.007/SDB CDC 3300: $0 + $0.01/SDB to $37.10 + $0.005/SDB	Disc $1/1,000 char/mo DECtapes: $0.10/min while mounted; $1/mount; $3/mo storage Magnetic tapes: $0.20/min while mounted; $3/mount; $10/mo storage	Disc — $0.20/640 char/mo Core — 0-16K: $400/hr 17-32K: $500/hr 33-48K: $650/hr 49-64K: $1,000/hr Over 64K: $1,400/hr
Remarks	Monthly minimum — No usage contract: none Yearly usage contract: $500 Terminal connect — lower charges are for regular time sharing service; higher charges are for Application Package service. Educational discount. All prices quoted in Canadian currency.	In Cyberpak, users subscribe to machine fractions; discounts are given on all basic charges according to fraction leased. In Cybernet, guaranteed access to CDC 3300 and 6600 is available; there are no minimum job charges. Sys sec = a combination of processing time, I/O time, and memory utilization. SDB = 1,280 char Off-line rental and storage — Disc pack: $1/day Tape reel: $0.20/day Off-line purchase and storage — Disc pack: $265 + $0.75/day Tape reel: $24 + $0.10/day		CPU = central processor unit Discounts for deferred processing	Central processor and storage discounts Batch runs: $250/hr at off hours

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	DATALOGICS, INC.	DEDICATED COMPUTER APPLICATIONS, INC.	DELTA TIME SHARING	DIALCOM, INC.	DIGITEK CORPORATION
Initiation	$100	None	$50	None	—
Monthly Minimum	None	None	None	$25	—
Terminal Connection	Prime time: $9/hr Off hours: $6/hr	Prime time: $8.50/hr Off hours: $6/hr	Conversational: $9/hr Remote batch: negotiated fee	Prime time: $450/hr Off hours: $3.50/hr	—
Central Processor	Prime time: $0.08/sec Off hours: $0.04/sec	$0.02/sec	$7/min	None	—
Storage	$0.10/180 char/mo	$0.50/1,000 char/mo	$0.50/512 words/mo	$0.50/512 char/mo	—
Remarks	Quantity discount rates available on request	Volume discounts are negotiable.	Volume discounts	Prime time: 6 a.m. to 12 midnight, Monday through Friday Off hours: Saturday, Sunday, holidays	Fees are determined by contractual agreement based on customer requirements.

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	DIRECT ACCESS COMPUTING CORPORATION	DIVERSIFIED COMPUTER APPLICATIONS	FIRST DATA CORPORATION	GTE INFORMATION SYSTEMS	GENERAL ELECTRIC COMPANY Mark I/Mark II
Initiation	None	—	None	None	$100
Monthly Minimum	None	—	None	None	$1/client no.
Terminal Connection	0-25 CPUT: $11/hr 26-75 CPUT: $10/hr 76-150 CPUT: $9/hr 151-300 CPUT: $7/hr Over 300 CPUT: $5/hr	—	Prime time: $7.50/hr Off hours: $5/hr	$11/hr	Mark I: $8.50/hr Mark II: $7/hr
Central Processor	Prime time: $0.15/sec Off hours: $0.12/sec	—	Core — 0-8K: $0.0125/CPU 8-16K: $0.01/CPU 16-24K: $0.0075/CPU Over 24K: $0.0050/CPU	$6/min (1 min free)	Mark I: $0.05/CRU Mark I (dedicated): $0.05/CRU Mark II: $0.33/CRU
Storage	Disc — 0-75,000 char: none Next 925,000 char: $1/1,000 char/mo Next 1.5 million char: $0.8333/1,000 char/mo Next 2.5 million char: $0.3333/1,000 char/mo All additional char: $0.25/1,000 char/mo Tape: $3/tape/mo	—	Disc: $0.50/1,000 char/mo	$1.50/7,200 char	Program — Mark I: $1.75/PSU/mo Mark I (dedicated): $1.75/PSU/mo Mark II: $1.10/PSU/mo Data — Mark II: $0.25/1,000 char
Remarks	CPUT = central processor time Educational and volume discounts	Company writes programs and sets up dedicated applications systems, so price varies according to users' needs.	K = 1,024 36-bit words of core memory CPU = 1,024 words of core memory for 1 sec of computation		CRU = computer resource unit PSU = 1,280 char $10/mo minimum for changes Educational discounts

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	GENERAL ELECTRIC COMPANY Network/Desk Side	GENESEE COMPUTER CENTER, INC.	GRUMMAN DATA SYSTEMS	HOBBS ASSOCIATES, INC.	HONEYWELL
Initiation	$100	None	None	None	$100
Monthly Minimum	$1/client no.	See Remarks	$50	None	$90
Terminal Connection	$7/hr	Conversational — CU: $11/hr RU: $9/hr Remote batch — CU: $20/hr RU: $15/hr	Conversational: $7.50/hr Remote batch: none	1-50 hr: $6 each Over 50 hrs: $5 each	Prime time — 0-10 hr: $10 each 11-50 hr: $8.50 each 51-100 hr: $7.50 each Over 100 hr: $6.50 each Off hours — $5/hr
Central Processor	Network: $0.33/CRU Desk Side: $0.30/CRU	Conversational — CU: $2.75/min RU: $2.25/min Remote batch — CU: $0.35/SS RU: $0.30/SS (see Remarks)	Conversational: $0.37/CPU Remote batch: $5.60/sys min	None	Prime time: $0.04/sec Off hours: $0.03/sec
Storage	Program — Network: $1.20/PSU/mo Data — Network: $0.50/DSU/mo File links — Desk Side: $0.40-1.10/link/mo Mag tape: $5/reel/mo	Conversational — First 20,000 char: free Each additional 1,000 char: $1/mo Remote batch — variable, depending on system used	Conversational — $12.50/cylinder Remote batch — Disc: $25/disc/mo Tape: $5/tape/mo (Grumman-supplied tape and disc) No mount or dismount charges	$0.20/128 char/mo	On-line: $1/unit/mo (see Remarks) Off-line: $0.10/unit/mo Off-line retrieval: $10/file
Remarks	Desk Side discounts after 7:00 p.m.	Minimum — Casual user (CU): none Regular user (RU): $2,000/mo Remote batch fees vary depending on priority. SS = processing time, unit record, and fraction of memory used	CPU = measure of processing time, memory utilization, and I/O time Sys min = measure of use calculated internally by computer	Discounts for educational institutions and volume use	400 units of on-line storage provided free for each dedicated port. Unit = 1,024 char Discounts for volume use and fixed commitments

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	ITT DATA SERVICES	INTERACTIVE DATA CORPORATION		INTERACTIVE SCIENCES CORPORATION	INTERNATIONAL TIMESHARING CORPORATION
		Conversational	Batch		
Initiation	None	None	None	None	None
Monthly Minimum	None	None	None	None	$5/run
Terminal Connection	$10/hr	Prime time: $13/hr Second shift: $8/hr Third shift: none	None	$7.50/hr (maximum of $300/terminal)	$10/hr
Central Processor	$0.30/CWU	Prime time: $1,000/hr Second shift: $1,000/hr Third shift: $400/hr	Prime time: $1,000/hr Second shift: $1,000/hr Third shift: $300/hr	$0.01/interaction	Normal: $0.12/sec Background: $0.09/sec
Storage	$0.10/day/SU	Disc Permanent files — 1-25 cylinders: $25/mo each 26-75 cylinders: $20/mo each 76-125 cylinders: $15/mo each 126-200 cylinders: $10/mo each Scratch files — Prime time or second shift: $40/disc pack; $10 minimum Third shift: none		$1/3,200 char/mo	Characters — 0-75K: $1/SU/mo 76-175K: $0.50/SU/mo 176-300K: $0.40/SU/mo 301-1,000K: $0.30/SU/mo Over 1,000K: $0.25/SU/mo
Remarks	CWU = weighted measure of system resources used SU = 1K bytes on a 2311 Disk or 1,500 bytes on a 2314 Disk Pack Information on discounts available from ITT.	Prime shift time = 8:00 a.m. to 6:00 p.m. Monday through Friday Second shift = 6:00 p.m. midnight Monday through Friday and 9:00 a.m. to 4:00 p.m. Saturday Third shift = all other time Users contract for a specific number of cylinders of storage per month.		Interaction = 1,000 words of core operated on for 1 CPU sec	SU = 1,024 char

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	KAMAN SCIENCES CORPORATION	KEYDATA	LEASCO RESPONSE INC.	MERC	MANAGEMENT INFORMATION SERVICES, INC.
Initiation	None	—	None	None	See Remarks
Monthly Minimum	None	—	See Remarks	$100	$500
Terminal Connection	Full-time port — $300/mo Dial-up service — $8/connect hr TTY connect — Full time: $75/mo Dial-up: $5.50/hr Use of WATS line — $30/hr (includes connect charge)	—	IBM 360/65 — $9/hr HP-2116 — 1-99 hr/mo: $5.75 each 100-249 hr/mo: $5.50 each 250-500 hr/mo: $5.25 each Over 500 hr/mo: $5 each	110-150 baud: $5/hr 2,000 baud: $10/hr	—
Central Processor	$450/$CP_{Effective}$hr	—	IBM 360/65: $0.30/sec	$0.005/sec	Service fee on contract basis and depends on no. of accounts Average rates: $0.09/savings account/mo; $0.17/mortgage and loan account/mo
Storage	Disc — $0.15/32,000 char/day Tape — Kaman-owned tape: $2/mo Customer-owned tape: $1/mo	—	IBM 360/65: $1/3,440 char/mo HP-2116: $0.75/1,024 char/mo	On-line (disc) — $0.30/page/mo Off-line (tape) — MERC-supplied tape: $2/mo Customer-supplied tape: $1/mo	—
Remarks	$CP_{Effective}$hr = measure of central processor time, peripheral usage during I/O operations, and memory utilization	Fees are on contract basis and vary according to user requirements.	Monthly minimum – IBM 360/65: $100 HP-2116: none Discounts if contracting for a specific number of hr for a 12-mo period	Page = 2,048 char	Initiation — conversion charge depends on no. of accounts. Volume discounts

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	MANAGEMENT SYSTEMS CORPORATION	MARK/OPS	THE MATRIX CORPORATION	MCDONNELL DOUGLAS AUTOMATION COMPANY	MEDICAL INFORMATION TECHNOLOGY
Initiation	—	$100	None	$100	—
Monthly Minimum	—	None	None	None	—
Terminal Connection	—	$7-10/hr	33 or 35 Teletype: $10/hr Interface speeds of 1,200-2,400 baud: $25/hr	GE: $10/hr Sigma: $8/hr	—
Central Processor	—	Prime time: $0.02-0.16/sec Off hours: $0.01-0.12/sec	Conversational: $0.005/1K core/sec Batch: $0.0075/4K core/sec	GE: $0.05/sec Sigma: $0.20/sec conversational; $0.10/sec remote batch	—
Storage	—	$0.25-$1/1K char/mo	$1/mo/FSU/mo (see Remarks)	GE: $2.50/SU/mo Sigma: $0.40/SU/mo	—
Remarks	Fees quoted only for total business systems Monthly fees range from $3,000-25,000 depending on customer requirements.	Prices above for service up to 300 bits/sec 2-week temporary service available	FSU = 1,280 8-bit char or 1,920 6-bit char 1 file storage credit monthly for each $15 of conversational and each $25 of batch fees 25% discount for off-hour use	SU = 1,500 char on GE system and 1,024 char on Sigma system	Customers are charged a fixed monthly fee based on simultaneous access of ports to the computer.

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	MEGASYSTEMS, INC.	MERLIN SYSTEMS	METRIDATA	MULTICOMP, INC.	MULTIPLE ACCESS GENERAL COMPUTER CORPORATION
Initiation	$100	None	None	None	None
Monthly Minimum	$200	None	None	$70	None
Terminal Connection	XDS 940: $11/hr	$5/hr	0-30 hr/mo: $10 each 30.1-45 hr/mo: $9 each Over 45 hr/mo: $8 each (see Remarks)	Prime time: $10/hr Off hours: $7.50/hr	110 baud — Prime time: $8/hr Off hours: $3.50/hr 300 baud — Prime time: $12/hr Off hours: $5.25/hr 2,000 baud — $20/hr
Central Processor	XDS 940: $2.75/CPU min	Processing time: $0.10/sec I/O time: $0.05/sec	$0.04/CPU	$0.20/CPU	CDC 3500: $0.17/SS CDC 6600: $0.31/SS (see Remarks)
Storage	XDS 940: $1/1,000 char/mo (see Remarks)	First 100,000 char: none 100,000-1,000,000 char: $0.20/1,000 char 1,000,000-10,000,000 char: $0.15/1,000 char Over 10,000,000 char: $0.10/1,000 char	Program storage: 0-15 hr/mo: $1.75/1,000 char 15.1-30 hr/mo: $1/1,000 char Over 30 hr/mo: $0.75/1,000 char	$1.50/2,048 char/mo	CDC 3500: $0.25/track/mo CDC 6600: $6/block/mo
Remarks	SMU = any combination of 1 virtual CPU sec, 500 disc accesses, or 500 unit record accesses First 20K char of storage on XDS 940 furnished free	Volume discounts are negotiable.	Rates for terminal connect and program storage based on amount of connect time used during previous month CPU = includes processor time and disc accesses. Dedicated service charged according to application. Systems management service fees are on contract basis.	CPU = 1 CPU sec plus 8K words of storage, or 1.6 CPU sec plus 16K words of storage	SS = sys sec Depending on job priority, 6600 processor charges can range from $0.23 to $0.41 per SS.

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	NATIONAL CASH REGISTER CO. (NCR)	NATIONAL CSS, INC.		ON-LINE SYSTEMS, INC.	PHILCO-FORD CORPORATION
		Conversational	Batch		
Initiation	See Remarks	None	None	None	$25
Monthly Minimum	—	None	None	$5/client no.	$25
Terminal Connection	—	256-byte configuration: $10/hr Additional virtual memory: $4/256K bytes/hr	None	$10/hr	Up to 300 baud — Prime time: $9/hr Off hours: $7/hr Over 300 baud — Prime time: $25/hr Off hours: $15/hr
Central Processor	—	Compute: $0.38/chargeable sec I/O: $0.001/operation	Compute — Priority 1: $0.24/sec Priority 2: $0.16/sec I/O — Priority 1: $0.0007/operation Priority 2: $0.0005/operation	$0.05/CPU	Prime time: $0.12/sec Off hours: $0.08/sec
Storage	—	Permanent (disc) — 1-5 cylinders: $20/mo each 6-25 cylinders: $15/mo each 26-50 cylinders: $12.50/mo each Over 50 cylinders: $10/mo each Mountable — Disc: $30/hr Tape: $10/hr		$1/PSU/mo	Disc — Up to 75K char: none Over 75K char: $1/1K char/mo
Remarks	Conversion charge depends on number of accounts. Monthly fee is on contract basis and depends on system features selected.	Permanent and mountable storage both subject to I/O processing charges. Disc pack rental, $30/mo; tape drive rental, $5/mo		CPU = combination of resources used by a program PSU = 3,200 char of disc memory	Educational institutions are not charged for central processor time.

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	PIEDMONT CALL-A-COMPUTER	POLYCOM SYSTEMS	PRINCETON TIME SHARING SERVICES	PROGRAMS & ANALYSIS, INC.	PROPRIETARY COMPUTER SYSTEMS, INC.
Initiation	$100	$100	None	None	$100
Monthly Minimum	None	$100	$100	None	None
Terminal Connection	Prime time: $7/hr Off hours: $4.50/hr	Prime time: $10/hr Off hours: $7/hr	$7/hr	10 char/sec: $8/hr 30 char/sec: $15/hr (see Remarks)	APL — Los Angeles: $10/hr San Francisco: $12/hr ATS — $3.25/hr
Central Processor	Prime time: $0.04/sec Off hours: $0.02/sec	Prime time: $0.05/CPU Off hours: $0.03/CPU	Conversational: $0.25/sec Remote job entry: each PU costs $0.10 plus $0.01/10K bytes of core (see Remarks)	Central processor: $0.10/sec I/O processor: $0.04/sec (see Remarks)	APL: $0.10/sec (see Remarks) ATS: none
Storage	Up to 50 SU: $2 each Over 50 SU: $1.50 each	$0.10/100 char/mo	First million bytes: none Over 1 million bytes: $10/100K bytes	Program storage: $0.50/1,000 char/mo	APL workspace: 0-64K char free Each additional 32K char: $5/mo APL file: $1.75/mo/track of 7,294 char in blocks of 20 tracks ATS: $0.20/mo/1,550 bytes
Remarks	SU = 1,536 char Educational discounts	CPU = combination of central processor usage and input/output Educational discounts at night	Minimum of 10 PUs per job in remote job entry mode. PU = 3 sec of CPU time or 150 I/O requests	Off-hour rates are 1/2 prime time rates. Discounts if charges exceed $1,000/mo	1 CPU minute free for each connect hour

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	PRYOR-TIM, INC.	RAIR, INC.	RAPIDATA COMPANY	REALTIME SYSTEMS, INC.	REMOTE COMPUTING CORPORATION
Initiation	None	None	$100	(See Remarks)	$25
Monthly Minimum	None	None	$10/invoice/mo	$100 (see Remarks)	None
Terminal Connection	$8/hr	6 a.m. to 6 p.m.: $4.95/hr 6 p.m. to 6 a.m.: $2.95/hr	10 or 15 char/sec — 0-150 hr/mo: $11 each 150-300 hr/mo: $9 each Over 300 hr/mo: $7 each 30 char/sec — 0-150 hr/mo: $13 each 150-300 hr/mo: $11 each Over 300 hr/mo: $9 each	$0.25/min	110-156 baud — Prime time: $7/hr Off hours: $6/hr 300 baud — Prime time: $11/hr Off hours: $9.35/hr 1,200 baud — Prime time: $25/hr Off hours: $21.25/hr
Central Processor	$0.05/sec	None	$0.06/CPU	Prime time: $8.35/min Off hours: $6.65/min	Central processor — Prime time: $0.10/sec Off hours: $0.085/sec I/O — Prime time: $2/min Off hours: $1.70/min
Storage	$0.10/180 char/mo	Under 200,000 char/mo: $0.75/1,000 char/mo 200,000-1 million char/mo: $0.50/1,000 char/mo Above 1 million char: negotiable (see Remarks)	On-line: $0.60/SU/mo Off-line: $1/file/mo	On-line disc: $0.03/1,000 char/day On-call bulk files: $0.05/file/day	1-100 SEG: $0.05/10 SEG/day 101-500 SEG: $0.04/10 SEG/day 501-1,000 SEG: $0.03/10 SEG/day Above 1,000 SEG: $0.02/10 SEG/day
Remarks		Storage based on average usage during mo	CPU = compute time and nonoverhead I/O time SU = 1,000 char	Initiation — First user name: $100 Additional user names: $50/each Minimum applies after first 2 months Volume discounts	SEG = 240 6-bit char

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Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	RYDERCOM	SMA, INC.	SCIENTIFIC TIME SHARING	SCI-TEK COMPUTER CENTER, INC.	SERVICE BUREAU CORPORATION
Initiation	See Remarks	—	None	None	None
Monthly Minimum	None	—	None	None	$100
Terminal Connection	—	Slow Terminal Prime time: $4/hr Off hours: $2/hr Fast Terminal Prime time: $8/hr Off hours: $4/hr	$12/hr	$10/hr	$11/hr
Central Processor	Fees are on contract basis and consist of fixed amount for hardware plus a charge that varies according to the volume of transactions.	$850/hr	$0.10/sec	Priority — A: $0.50/sec B: $0.40/sec C: $0.30/sec D: $0.20/sec (see Remarks)	$9/min
Storage	—	$0.10/1,000 char/mo Storage is measured at 5:00 a.m.	$10/32K bytes or portion thereof	Drum — 1-100 tracks: $0.04/day each Over 100 tracks: $0.03/day each	$1.50/3,440 char/mo; $0.15/3,440 char/day
Remarks	Initiation — 1 to 1-1/2 times estimated monthly fee	Volume discounts are negotiable.	Discount — monthly terminal time rate	A: instantaneous return B: 15-min turnaround C: 1-hr turnaround D: 24-hr turnaround	National system connect time: $13.50/hr On-line stock data base: $100/mo

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	SETAK COMPUTER SERVICES	I. P. SHARP ASSOCIATES, LTD.	STAT:COM	SYSTEM DEVELOPMENT CORPORATION	SYSTEMS ANALYSIS COMPANY
Initiation	None	None	None	None	$100
Monthly Minimum	None	None	$5	See Remarks	None
Terminal Connection	$8/hr	Prime time: $10/hr Off hours: $8/hr	$10/hr or $750/mo	See Remarks	Prime time: $7/hr Off hours: $4.50/hr
Central Processor	$0.15/sec	Prime time: $0.13/sec Off hours: $0.10/sec	Core — 50K: $0.185/sec 100K: $0.195/sec 150K: $0.210/sec 200K: $0.230/sec 250K: $0.255/sec 300K: $0.285/sec 350K: $0.320/sec	Share plan: rate translates to $23/hr, all inclusive Alternate plan: $38/hr (see Remarks)	Prime time: $0.04/sec Off hours: $0.02/sec
Storage	On-line (disc): $0.005/240 char/day Off-line (tape): $5/tape/mo	On-line: $10/32K bytes/mo Off-line: $10/restoration	On-line — Track: $0.25/wk Cylinder: $3.50/wk Pack: $400/wk Private Pack — $15/hr	Included in flat charge. In Share plan, storage on an entire 2314 disc pack is provided.	Up to 50 SU: $2/SU Over 50 SU: $1.50/SU
Remarks	Discounts for particular applications or usage patterns are negotiable.	All prices quoted in Canadian currency. Educational and bulk discounts	25% discount on CPU charges to remote batch user Express processing is available at 4 times normal CPU charges. Track = 720 char Cylinder = 145,000 char	Monthly rates are based on flat charge. Share plan: Usage 4 hr/day, 5 days/week Alternate plan: 10 hr/mo minimum	SU = 1,536 char 30% discount for secondary schools 20% discount for nonsecondary schools

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	SYSTEMS DIMENSIONS LIMITED	TRW SYSTEMS GROUP	TECHNICAL ADVISORS, INC.	TEL-A-DATA, INC.	TELCOMP CORPORATION PDP-7/8
Initiation	None	None	$25	See Remarks	None
Monthly Minimum	None	None	None	$1,000	See Remarks
Terminal Connection	Service charges are divided into five categories: system activity, system occupancy, peripheral I/O, operator activity, and supplies. System Activity Processor — $1,200/task hr Channel — Disc: 2314 — $1/KB + $0.15/Mb Spool — $0.50/KR Drum: $1/KB + $0.05/Mb Tape: 2420 — $0.15/KB + $0.15/Mb 2401 — $0.15/KB + $0.25/Mb System Occupancy Core — $2/1,024 bytes/step hr Disc — Public use: $5/Mb/step hr Private use: $20/drive/step hr Drum — $100/Mb/step hr Tape — 2420: $25/drive/step hr 2401: $15/drive/step hr	$8/hr	Prime time: $20/hr minimum Off hours: $16/hr minimum (see Remarks)	Prime time: included in contract (see Remarks) Off hours: $30/hr	A: $12/hr for 8 hrs B: $15/hr
Central Processor		$108/hr	None	Included in contract (see Remarks)	None
Storage		First disc cylinder: no charge Each additional cylinder: $0.60/day	Disc: $0.50/page/OD	Included in contract (see Remarks) Additional storage: $0.20/330 char/mo	None
Remarks	KB = 1,000 blocks (block = physical record of data on storage medium) MB = million bytes KR = 1,000 records Step time = pseudo elapsed time calculated by computer		Terminal connect rates do not apply in Michigan. OD = 7:00 a.m. to 7:00 a.m. the following day	Initiation = 1 mo rental charge Service fees quoted on contract basis. Basic charge includes unlimited central processor usage, reports required, disc and tape storage, and terminal ports.	Monthly minimum — A: 8 hrs at $15/hr B: None

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	TELCOMP CORPORATION PDP-10	TELSTAT SYSTEMS	TIME SHARE CORPORATION	TIME SHARING RESOURCES, INC.	TRACOR COMPUTING CORPORATION
Initiation	None	None	See Remarks	None	None
Monthly Minimum	None	None	See Remarks	None	None
Terminal Connection	$10/hr	$10/hr	Schedule I: $8/hr Schedule II: $6/hr Schedule III: none	Conversational: $11/hr Batch: $35/hr	None
Central Processor	$0.05/CU/sec	$0.12/sec	None	Conversational: $6/min (see Remarks) Batch: Low-speed core: $60/hr High-speed core: $105/hr	Prime time: $820/hr Off hours: $710/hr
Storage	$0.40/block/mo	$0.02/2,000 char/mo	$1/1,240 char/mo	$1.50/7,200 char/mo	$0.20/block-day
Remarks	CU = 4K words Block = 640 char or 128 words	Access to data base is by subscription only	Initiation — Schedules I and II: $100 Schedule III: none Monthly minimum — Schedule I: none Schedule II: $90 Schedule III: $600	First minute of CPU free for each hr of connection Educational and national account discounts	Block-day = use of a block of 14,336 36-bit words for 1 day Central processor discounts

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	TRANSDATA CORPORATION		TRANSNET CORPORATION		
	Conversational	Batch	DEC TSS-8	GE-430	XDS Sigma 7 Commercial
Initiation	See Remarks	None	None	None	$50
Monthly Minimum	See Remarks	None	$25	None	$25
Terminal Connection	Plan A — Prime time: $8.50/hr Off hours: $6/hr Plan B — $1,200/mo/port Plan C — $5/hr Educational — Prime time: $6.80/hr Off hours: $4.25/hr	None	Device Time — Prime time: 0-25 hr/mo: $10 each 25-50 hr/mo: $9 each 50-100 hr/mo: $8 each Over 100 hr/mo: $7 each Off hours — $7.50/hr Educational rates — $6/hr	$8/hr	Conversational — $9/hr Remote Batch — Low-speed: $9/hr High-speed: $15/hr
Central Processor	Plan A — Prime time: $0.20/sec Off hours: $0.14/sec Plans B and C — $0.10/sec Educational — Prime time: $0.16/sec Off hours: $0.10/sec	Use time: $0.10/sec	None	$0.04/sec	Conversational: $7.20/min ($0.12/sec) Remote batch: $6.50/min
Storage	$1.60/2,048 char/mo	Disc: $1.60/2,048 char/mo Tape: $3/reel/mo (tape supplied by Transdata)	Disc: $0.40/segment/mo Magnetic tape: $10/mo/reel; $1/reel for mounting	On-line disc: $1/1,152 char/mo Off-line disc: $0.10/1,152 char/mo	Disc: $1/1,024 char/mo Tape: $5/reel/mo 25,600 char of disc storage are free when terminal connect and CPU charges exceed $100/mo
Remarks	Initiation — Plan A: $100 Plans B and C: none Educational: $100 Minimum — Plan A: none Plan B: $1,200/mo Plan C: 1,000/mo Educational: none	Use time = CPU execution time plus disc I/O time Card image input: $0.002 each Printer output: $0.05/page (44 lines), minimum $0.10/run Dedicated Batch Service: $200/hr, including use time, card input, printer output	Device time = terminal connect time plus peripheral time (magnetic tape, high speed paper tape punch and reader) Segment = 512 char Extended period discounts and minimum guarantee plans		Port rate: $1,500/port/mo for unlimited use of conversational terminal and CPU, and 75,000 char free storage 25% discount for off-hour usage

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	TRANSNET CORPORATION	TRAVCOM	TYMSHARE, INC.	UNITED COMPUTING SYSTEMS	
				UCS VI	UCS VI
	XDS Sigma 7 Educational			Conversational	Local/Remote Batch
Initiation	$50	See Remarks	None	None	None
Monthly Minimum	None	—	See Remarks	None	$5/run
Terminal Connection	Conversational — Prime time: $7/hr Off hours: $5/hr Remote Batch — Low-speed: $7/hr High-speed: $25/hr (see Remarks)	—	A: $16/hr B: $13/hr C: $15/hr	$10/hr	None
Central Processor	Conversational: none Remote Batch: $6.50/min cumulative monthly; $390/hr (see Remarks)	System use — 8 hr/day: $700/mo 4 hr/day: $375/mo 2 hr/day: $175/mo Overtime (on 2- and 4-hour service): $12/hr	$0.04/sec	81,921-163,840 char: $0.30/sec 163,849-245,760 char: $0.60/sec	$425/CSH
Storage	Disc: $1/1,024 char/mo Tape: $5/reel/mo 25,600 char of disc storage are free when terminal connect and CPU charges exceed $100/mo	$0.02/inventory-type record $0.03/customer-type record	Disc — 1-500,000 char: $1/1,000/mo 500,001-2M char: $0.75/1,000/mo Above 2M char: $0.50/1,000/mo	$0.50/1,280 char/mo	$0.50/1,280 char/mo
Remarks	25% discount on batch rates for off-hour usage	Initiation — $750 to $3,000 depending on application Monthly charges based on use of system for a contracted period of time Extra charge for off-line reports	Monthly minimum — A: $80/mo B: $390/mo C: $2,500/mo For educational institutions, service is $9/hr	Discount on monthly bills over $1,000	CSH = $425 x (CPU hr ÷ I/O hr) Discount on monthly bills over $1,000

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	UNITED COMPUTING SYSTEMS	UNIVERSITY COMPUTING COMPANY		VENTURE COMPUTER SYSTEMS, INC.	WABASH COMPUTER
	UCS II	Remote Batch	FASBAC		
Initiation	$100	None	$100	See Remarks	See Remarks
Monthly Minimum	None	None	None	A flat charge of $225/mo covers processing of up 9,000 input records for standard accounting programs. Additional transactions are charged at $0.01 each. For records such as inventory control, where more processing is required, charges are higher.	$100
Terminal Connection	$6.50-7.50/hr	None	Prime time: $7.50/hr ($10/hr for 30 char/sec) Off hours: $3.75/hr		$5/hr
Central Processor	$0.03/sec	Priority: $0.42/sec Standard: $0.33/sec Weekend: $0.28/sec	$1/1,000 CRU		$0.03/sec
Storage	$1.50/1,536 char/mo	Resident — Fastrand: $0.14/block/day FH432: none	On-line — Scheduled: $0.0166/page/day Demand: $0.0333/page/day Off-line — $1/reel plus $0.15/reel/day	See above	$0.10/615 bytes/mo
Remarks	Discount on monthly bills over $1,000		CRU = weighted measure of use of facilities	Customers are charged a one-time fee for applications programming, training, etc. (typically about $2,000)	Charge for most business applications has functional basis. Initiation fee averages $200/application.

Note: Unless otherwise stated, above charges are accumulated for monthly billing.

Usage Fees	COMMERCIAL TIME SHARING SERVICE				
	WESTINGHOUSE TELE-COMPUTER SYSTEMS CORPORATION	WORLD WIDE TIME SHARING, INC.			
Initiation	None	See Remarks			
Monthly Minimum	$100	$660			
Terminal Connection	Low speed: $8-12/hr High speed: $10-25/hr	World Wide service is dedicated to on-line order entry. Consequently, monthly charges depend on options selected, storage required, and computer use. Average monthly charge ranges from $1,500 to $3,000.			
Central Processor	$675/CRU I/O: $75/hr				
Storage	Data: $0.75-1.50/track/mo	—			
Remarks	CRU = computer resource unit I/O charge is only for input via IBM 360/50, 360/30, 1130, or Westinghouse W9000	Initiation — user is charged a one-time systems and programming fee, which averages 3 to 4 times monthly charges			

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DIRECTORY OF SUPPLIERS

ACTS
Applied Computer Time Share, Inc.
29200 Southfield Road
Southfield, Michigan 48075
Marketing Manager
(313) 352-6800

APL General, Inc.
433 Latona Avenue
Trenton, New Jersey 08618
President
(609) 883-2092

APL Services, Inc.
865 Lower Ferry Road
Trenton, New Jersey 08628
President
(609) 883-0050

Allen-Babcock Computing, Inc.
Century City, Gateway East
1800 Avenue of the Stars
Los Angeles, California 90067
National Marketing Manager
(212) 935-9494

American Computer Service Corp.
(renamed NCD)
14 East Fourth Street
Cincinnati, Ohio 45202
Manager, Marketing Operations
(513) 579-2090

Applied Logic Corporation
(Headquarters, AL/COM Network)
1 Palmer Square
Princeton, New Jersey 08540
Director of Marketing
(609) 924-7800

Avco Computer Services
201 Lowell Street
Wilmington, Massachusetts 01887
Director, Avco Computer Services
(617) 657-3924

Axicom
615 Winters Avenue
P.O. Box 648
Paramus, New Jersey 07625
Marketing Manager
(201) 262-8200

Basic Timesharing
415 Clyde Avenue
Mountain View, California 94040
Vice President
(415) 969-1900

Beloit Corporation
Box 567
Beloit, Wisconsin 53511
Sales Manager
(608) 365-3311

Beverly Bank
(A Call-A-Computer Franchise)
1357 West 103rd Street
Chicago, Illinois 60643
Vice President, Automated Business Services
(312) 445-2200

Boeing Computer Services, Inc.
P.O. Box 24346
Seattle, Washington 98124
Time Sales Product Manager
(206) 773-2043

Bowne Time Sharing, Inc.
345 Hudson Street
New York, New York 10014
Vice President, Marketing
(212) 989-6006

Burlington Management Services Co.
P.O. Box 21207
Greensboro, North Carolina 27420
Vice President
(919) 379-2165

Call-A-Computer
633 East Young Street
Santa Ana, California 92705
President or Director of Marketing
(714) 540-2464

Canadian General Electrical Company Limited
214 King Street West
Toronto 129, Ontario, Canada
Manager, Information Services
(416) 366-7311

Central Computing, Inc.
2627 East Central
Wichita, Kansas 67214
President
(316) 685-9207

Chi Corporation
11000 Cedar Avenue
Cleveland, Ohio 44106
Manager, Marketing
(216) 229-6400

Community Computer Corporation
185 West School House Lane
Philadelphia, Pennsylvania 19144
Board Chairman
(215) 894-1200

Comp-Time Corporation
1150 Anchorage Lane
Suite 207
San Diego, California 92106
Marketing Manager
(714) 224-3139

Computel System Limited
1200 St. Laurent Boulevard
Ottawa, Ontario, Canada K1K3B8
General Sales Manager
(613) 746-4353 Ext. #50

The Computer Company
Seventh and Franklin Streets
Richmond, Virginia 23219
Director, APL Marketing
(703) 648-5823

Computer Complex, Inc.
6400 Southwest Freeway
Houston, Texas 77036
National Sales Manager
(713) 785-8100

Computer Concepts, Inc.
(A Call-A-Computer Franchise)
5865 Robert Oliver Place
Oakland Mills Village Center
Columbia, Maryland 21043
President
(301) 730-5950 or (301) 587-2287

Computer Dynamics, Inc.
(An AL/COM Associate)
112 Shawmut Avenue
Boston, Massachusetts 02118
Vice President, Marketing
(617) 357-8170

Computer Innovations
10225 South Western Avenue
Chicago, Illinois 60643
President
(312) 445-0626

Computer Network Corporation
5185 MacArthur Boulevard
Washington, D.C. 20016
Vice President, Marketing and Operations
(202) 244-9250

Computer Power Unlimited
820 Park Avenue
Bloomfield, Connecticut 06002
President
(203) 242-0723

Computer Sciences Canada, Ltd
Place du Canada
Montreal 101, Quebec, Canada
Director of Marketing
(416) 449-0500

Computer Sciences Corporation
Information Network Division
650 North Sepulveda Boulevard
El Segundo, California 90245
Vice President, Marketing
(213) 678-0311

Computer Sharing Services
2492 West Second Avenue
Denver, Colorado 80223
Vice President
(303) 934-5747

Computer Task Group, Inc.
(An AL/COM Associate)
5586 Main Street
Buffalo, New York 14221
Manager, Marketing
(716) 634-9090

Comp/Utility, Inc.
1 Center Plaza
60 State Street
Boston, Massachusetts 02108
Manager
(617) 227-4640

Compu-Time, Inc.
P.O. Box 960, 327 Orange Avenue
Daytona Beach, Florida 32014
President
(305) 563-4311

Computone Systems, Inc.
361 East Paces Ferry Road, N.E.
Atlanta, Georgia 30305
President
(405) 261-0071

Comserv, A Computer Utility
1 University City
4025 Chestnut Street
Philadelphia, Pennsylvania 19104
Director, Marketing
(215) 387-3600

Com-Share, Inc.
P.O. Box 1588
Ann Arbor, Michigan 48106
Vice President, Marketing
(313) 761-4040

Com-Share (Canada) Limited
41 Voyager Court North
Rexdale 605, Ontario, Canada
Director, Marketing
(416) 678-1363

Concap Computing Systems
303 Hegenberger Road
Oakland, California 94621
Director of Marketing
(415) 635-5750

Consolidated Computer Services Limited
48 Young Street
Toronto 215, Ontario, Canada
Group Vice President, Marketing
(416) 366-7643

Control Data Corporation
Cybernet Service Division
4550 West 77th Street, Edina,
Minneapolis, Minnesota 55435
General Manager Data Services —
Eastern Operations or Data Services —
Western Operations
(612) 920-8600

The Cyphernetics Corporation
175 Jackson Plaza
Ann Arbor, Michigan 48103
Vice President
(313) 769-6800

Dataline Systems Limited
40 St. Clair Avenue West
Toronto, Ontario, Canada
Vice President
(416) 964-9515

Datalogics, Inc.
12025 Shaker Boulevard
Cleveland, Ohio 44120
Vice President, Sales
(216) 721-9035

Dedicated Computer Applications, Inc.
234 Washington Avenue
Belleville, New Jersey 07109
President
(201) 751-6200

Delta Time Sharing, Inc.
Drawer BN
State College, Mississippi 39762
President
(601) 323-5714

Dialcom, Inc.
1104 Spring Street
Silver Spring, Maryland 20910
President
(301) 588-1572

Digitek Corporation
4818 Lincoln Boulevard
Marina Del Rey, California 90291
Vice President, Marketing
(213) 823-6379

Direct Access Computing Corp.
984 Livernois Avenue
Troy, Michigan 48084
Vice President, Sales
(313) 585-7000

Diversified Computer Applications
2525 E. Bayshore Road
Palo Alto, California 94303
Vice President
(415) 324-2524

E.P.G. Computer Services
345 Park Avenue
New York, New York 10022

First Data Corporation
400 Totten Pond Road
Waltham, Massachusetts 02154
Vice President, Marketing
(617) 890-6701

GTE Information Systems
Data Services Division
Two Corporate Park Drive
White Plains, New York 10604
Marketing Manager
(914) 694-8850

General Electric Company
Information Service Department
7735 Old Georgetown Road
Bethesda, Maryland 20014
Marketing Manager, Information
Service Department
(301) 654-9360

Genesee Computer Center, Inc.
(Agent for Megasystems, Inc., and
Multiple Access General Computer
Corporation)
20 University Avenue
Rochester, New York 14605
(716) 232-7050

Grumman Data Systems Corp.
1111 Stewart Avenue
Bethpage, New York 11714
Director, Computer Services Marketing
(516) 575-3282

Hobbs Associates, Inc.
P.O. Box 686
Corona del Mar, California 92625
President
(714) 675-1757

Honeywell, Inc.
Information Services Division
2701 Fourth Avenue, South
Minneapolis, Minnesota 55408
Vice President and General Manager,
Information Services Division
(612) 332-5200

IBM Canada Limited
1150 Eglinton Avenue E.
Don Mills 402, Ontario, Canada
DCS Product Marketing Manager
(416) 433-2111 Ext. 3077

ITT Data Services
P.O. Box 402
Route 17 and Garden State Parkway
Paramus, New Jersey 07652
Director, Computer Service Sales
(201) 262-8700

Interactive Data Corporation
486 Totten Pond Road
Waltham, Massachusetts 02154
Vice President, Marketing
(617) 891-6250

Interactive Sciences Corporation
60 Brooks Drive
Braintree, Massachusetts 02184
Marketing Manager
(617) 848-2660

International Timesharing Corp.
ITS Building, Jonathan Industrex
Chaska, Minnesota 55318
Vice President, Marketing
(612) 448-3061

Kaman Sciences Corporation
1700 Garden of the Gods Road
Colorado Springs, Colorado 80907
Director, Computer Marketing
(303) 473-5880

Leasco Response Inc.
5401 Westbard Avenue
Washington, D.C. 20016
Director, Marketing
(301) 657-1840

Macro Computer Consultants, Inc.
(Agent for Direct Access Computing)
4600 West Saginaw
GDM Building
Lansing, Michigan 48917
(517) 372-5975

MERC
Middle-Atlantic Educational & Research Co.
P.O. Box 1372
Lancaster, Pennsylvania 17604
Manager, Development and
Advanced Planning
(717) 393-0132

Management Information Services, Inc.
42 East Gay Street
Columbus, Ohio 43215
President
(614) 443-9487

Management Systems Corporation
7007 Preston Road
Dallas, Texas 75205
Vice President, Marketing
(214) 521-0370

Mark/Ops
Northeastern Systems Associates, Inc.
475 Commonwealth Avenue
Boston, Massachusetts 02215
President
(617) 266-1930

Matrix Corporation
931 South Douglas Street
El Segundo, California 90245
Executive Vice President
(213) 679-8211

McDonnell Douglas Automation Company
P.O. Box 516
St. Louis, Missouri 63166
Manager, Marketing
(314) 232-8021

Medical Information Technology
65 Rogers Street
Cambridge, Massachusetts 02142
President
(617) 354-3000

MegaSystems, Inc.
460 Twelfth Avenue
New York, New York 10018
Vice President, Marketing
(212) 594-2500

Merlin Systems Corporation
1044 Northern Boulevard
Roslyn, New York 11576
Marketing Director
(516) 484-4545

MetriData Computing, Inc.
P.O. Box 21099
6600 Grade Lane
Louisville, Kentucky 40221
Executive Vice President
(502) 361-7161

Multicomp Inc.
36 Washington Street
Wellesley Hills, Massachusetts 02181
Marketing Vice President
(617) 237-2910

Multiple Access General
Computer Corporation Limited
Head Office and Toronto Data Centre
885 Don Mills Road
Don Mills 403, Ontario, Canada
Vice President, Marketing
(416) 443-3914

National CSS, Inc.
460 Summer Street
Stamford, Connecticut 06901
Vice President Marketing
(203) 327-9100

On-Line Systems, Inc.
4721 McKnight Road
Pittsburgh, Pennsylvania 15237
Executive Vice President, Marketing
(412) 931-7600

Philco-Ford Corporation
Computer Services Network
Tioga & C Streets
Philadelphia, Pennsylvania 19134
Manager, Computer Services Network
(215) 443-5625

Piedmont Call-A-Computer
(A Call-A-Computer Franchise)
1001 Wade Avenue
Raleigh, North Carolina 27605
President
(919) 834-0751

Pittsburgh National Bank
(Agent for the Cyphernetics Corporation)
960 Fort Duquesne Boulevard
Pittsburgh, Pennsylvania 15230
Assistant Vice President
(412) 355-2867

PolyCom Systems, Ltd.
1300 Don Mills Road
Don Mills, Ontario, Canada
Director, Marketing
(416) 449-3400

Princeton Time Sharing Services, Inc.
U.S. Highway Number 1
Princeton, New Jersey 08540
Vice President, Marketing
(609) 452-7877

Programs & Analysis, Inc.
21 Ray Avenue
Burlington, Massachusetts 01803
Applications Specialist
(617) 272-7723

Proprietary Computer Systems, Inc.
16625 Saticoy Street
Van Nuys, California 91406
President
(213) 781-8221

Pryor Computer
400 North Michigan Avenue, Suite 1500
Chicago, Illinois 60611
President
(312) 828-0846

RAIR, Inc.
465 Castro Street
Mountain View, California 94040
President
(415) 964-0413

Rapidata Company
Empire State Building
350 Fifth Avenue
New York, New York 10001
Vice President, Marketing
(212) 594-0120

Realtime Systems, Inc.
866 Third Avenue
New York, New York 10022
Director, Sales
(212) 421-2250

Remote Computing Corporation
Suite A40, 525 University Avenue
Palo Alto, California 94301
Chairman
(415) 328-5230

Rydercom
2701 South Bayshore Drive
Miami, Florida 33133
Director
(305) 445-9321

SCL Systems Corporation Limited
16700 Trans Canada Highway
Kirkland, Quebec, Canada
President
697-4080

SMA, Inc.
700 Ouest, rue Lagauchetiere
Montreal, Quebec, Canada
President
(514) 875-6000

Scientific Time Sharing Corp.
2101 S. Street NW
Washington, D.C. 20008
Vice President
(202) 462-4620

Sci-Tek Computer Center, Inc.
1707 Gilpin Street
Wilmington, Delaware 19806
Marketing Manager
(302) 658-2431

Service Bureau Corporation
600 Mamaroneck Avenue
Harrison, New York 10528
Director, Marketing
(914) 696-3678

Setak Computer Services Corporation, Ltd.
20 Spadina Road
Toronto, Ontario, Canada
Marketing Director
(416) 962-1633

I. P. Sharp Associates, Limited
Box 71
Toronto Dominion Centre
Toronto, Ontario, Canada
Manager
(613) 236-9942

Stat:Com (R, L)
104 South Michigan
Chicago, Illinois 60603
National Director
(312) 346-7300

Structural Dynamics Research Corp.
(Agent for Com-Share, MetriData,
and U.S. Steel)
5729 Dragon Way
Cincinnati, Ohio 45227
Director of Computer Operations
(513) 272-1100

System Development Corporation
2500 Colorado Avenue
Santa Monica, California 90406
Director of Marketing
(213) 393-9411

Systems Analysis Company
9 Office Park Circle, Suite 7
Birmingham, Alabama 35223
Director, Marketing
(205) 871-9554

Systems Dimensions Limited
770 Brookfield Road
Ottawa 8, Ontario, Canada
Vice President, Sales
(416) 864-1511

TRW
Systems Group
7600 Colshire Drive
McLean, Virginia 22101
Department Manager, Systems and Operation
(703) 893-2000 Ext. 2041, 2, 3, 4

Technical Advisors, Inc.
4455 Fletcher Street
Wayne, Michigan 48184
Marketing Manager
(313) 722-5010

Tele-A-Data, Inc.
1110 Northeast 163rd Street
North Miami Beach, Florida 33162
President
(305) 949-4334

Telecomp Corporation
Division of Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 92138
Director, Marketing
(617) 491-1850

Telstat Systems, Inc.
150 E. 58th Street
New York, New York 10022
Director, Marketing
(212) 826-0640

Time Share Corporation
Lyme Road
Hanover, New Hampshire 03755
Vice President, Marketing
(603) 643-3640

Time Sharing Resources, Inc.
22 West 48th Street
New York, New York 10036
Director, Marketing
(212) 265-2600

Tracor Computing Corporation
1705 Guadalupe
Austin, Texas 78701
Branch Manager, Austin
(512) 476-7771

Transdata Corporation
4808 North Central Avenue
Phoenix, Arizona 85012
President
(602) 279-2301

TransNet Corporation
2005 Route 22
Union, New Jersey 07083
Vice President, Marketing
(201) 688-7800 or (212) 285-9793

TRAVCOM
301 City Line Avenue
Bala Cynwyd, Pennsylvania 19004
Vice President, Marketing
(215) TE-9-1320

Tymshare, Inc.
525 University Avenue, Suite 220
Palo Alto, California 94301
Director, Marketing Services
(415) 328-5990

United Computing Systems, Inc.
(A Subsidiary of United Utilities, Inc.)
3130 Broadway
Kansas City, Missouri 64111
Manager, Marketing
(816) 753-4500

University Computing Company
1500 UCC Tower, P.O. Box 6228
Dallas, Texas 75222
President, Computer Utility Network
(214) 741-5781

USS Engineers and Consultants, Inc.
(A Subsidiary of United States
Steel Corporation)
600 Grant Street
Pittsburgh, Pennsylvania 15230
Director of Sales
(412) 391-8115

Venture Computer Systems, Inc.
2305 South 170th Street
New Berlin, Wisconsin 53151
(414) 786-1320

Wabash Computer Corporation
Network Division
10202 North 19th Avenue
Phoenix, Arizona 85021
Sales Manager
(602) 943-2311

Westinghouse Tele-Computer
Systems Corporation
(A Subsidiary of Westinghouse Electric)
Westinghouse Building, Gateway Center
Pittsburgh, Pennsylvania 15222
Vice President, Marketing
(412) 256-3524

World Wide Time Sharing
180 North Michigan Avenue
Chicago, Illinois 60601
Marketing Manager
(312) 263-4270

INDEX OF NATIONAL HEADQUARTERS

This report categorizes the companies covered in reports according to the country in which each major corporate headquarters is located. Paragraph 1 contains an alphabetical listing of companies headquartered in the United States. Paragraph 2 contains an alphabetical listing of companies headquartered in Canada.

1. UNITED STATES

2. CANADA

GENERAL

Background

General Electric (GE) entered the time sharing field as the result of a cooperative venture with Dartmouth College. In the spring of 1964, Dartmouth acquired a GE-225 computer and a Datanet-30 communications processor and began to collaborate with GE in the development of a time sharing system. A significant result of this activity was the Basic programming language, designed by Dartmouth faculty and students.

GE designed and developed an operating system to control the time sharing service; it became operational in July 1964. Early in 1965, GE began operating time sharing centers in Phoenix and New York City. As a result of these ventures, the General Electric Information Service Department was formed on September 1, 1966, with headquarters in Bethesda, Maryland.

The firm gradually supplemented its initial offering, now called MARK I service, with various other services: BASIC I, a simplified version of MARK I available primarily as a training tool; MARK II, a conversational service with more sophisticated capabilities than MARK I; Resource, a batch processing service; and MARK DELTA, a data management service. The firm also developed an international network, giving clients local access to common data files from almost anywhere throughout North America and Western Europe.

In October 1972, GE announced MARK III service, which is essentially a consolidation of all previous services. It consists of two parts: MARK III Foreground (the former MARK II service) and MARK III Background (the former Resource service). Background service must be accessed from Foreground service. GE still maintains MARK I, BASIC I, and MARK DELTA services in the United States but does not actively market them. All services are now available through a single international network. (MARK I service is also available in Europe but is not tied into the network.)

In MARK III Foreground, the user can choose among three modes of use: Interactive, for immediate program execution; Independent Run, a deferred run where the user can designate the time and priority of execution; and Sleep/Wake, a mode in which a program is alternately "asleep" (where it suspends execution) or "awake" (where it is executing). A "sleeping" program can be activated (1) at a specified time, (2) by a WAKE command in another program, or (3) by a terminal command.

In MARK III Background, the user has three priority options: express, normal, or overnight, where processing starts in 15 minutes, 3 hours, or 24 hours, respectively.

GE supplements these data processing services with customized software development, terminal sales, and off-line data conversion services.

From the user's standpoint, what does MARK III offer?

First, the most extensive network in the industry. It gives users local dialing access to centralized data files from almost anywhere in North America and Europe.

Secondly, flexibility in use. It offers conversational time sharing capability ranging from beginners (using as few as nine commands in the Basic language) to experienced programmers (utilizing a superset of Fortran IV); it provides remote batch processing on large-scale computers for users with large jobs. Various options are available in each mode, to suit individual requirements. For applications involving large data bases, the service includes file management software and a data handling package, and permits multiple access to common files (up to 1,000 users can access the same file). It provides an extensive applications library for users who don't want to write their own programs. It allows both high- and low-speed access to the service, from a variety of terminal devices.

Thirdly, convenience of use. All of MARK III service is accessed through a single, interactive, English-type command language. Many commands can be incorporated directly into the user's program, or Foreground commands can be executed from a command file. The service provides substantial editing capabilities. It also offers extensive security measures, especially for firms with multiple users.

Despite the extensive capability provided by MARK III, the service does have some limitations (relatively few, however, compared to the overall capability of the service).

First, the high-speed access capability only accommodates speeds up to 2,000 baud, while many other companies marketing remote batch service now support communication rates up to 4,800 or even 9,600 baud. However, GE points out that higher transmission rates are generally offered only for leased lines; GE plans to support 4,800 baud rates on a dial-up basis in the near future.

Secondly, the user must access the Background system through the Foreground system and must pay connect time during access. (He doesn't have to stay connected during execution, though.) In contrast, on some competitive batch services the user pays only for use of computer resources, nothing for connect time.

We were able to contact only one user of GE's service for comments on performance. He particularly liked the service's network capability, its security and backup features, and its reliability. He mentioned that downtime occurred occasionally but generally was fixed within 15 minutes, though it sometimes lasted as long as an hour. He had never lost any files or noticed any hardware crashes, in several years of use. While his response time was generally satisfactory, there was noticeable degradation when the system was heavily loaded — but this had improved in recent months. This user was pleased with GE's support, particularly with the availability of 24-hour service desks. Costs, in his experience, were competitive.

Operations

GE markets its service in the United States from the following sales offices:

2721 North Central Avenue
Phoenix, ARIZONA 84004
(602) 264-7881

15919 Ventura Blvd, Suite 810
Encino, CALIFORNIA 91316
(213) 872-3215

3605 Long Beach Blvd, Suite 333
Long Beach, CALIFORNIA 90801
(213) 426-9345

3550 Wilshire Blvd, Suite 1410
Los Angeles, CALIFORNIA 90005
(213) 385-9411

8801 Bellanca Avenue
Los Angeles, CALIFORNIA 90045
(213) 776-8384

1120 San Antonio Road
Palo Alto, CALIFORNIA 94303
(415) 969-3722

P.O. Box 1677
Sacramento, CALIFORNIA 95808
(916) 442-3696

2560 First Avenue, Suite 110
San Diego, CALIFORNIA 92103
(714) 232-7167

425 California Street, Suite 601
San Francisco, CALIFORNIA 94104
(415) 989-1100

3887 State Street, Suite 10
Santa Barbara, CALIFORNIA 93105
(805) 687-5368

21535 Harwthorne Blvd, Suite 330
Del Amo Financial Center
Torrance, CALIFORNIA 90503
(213) 371-5595

201 University Blvd, Suite 170
Denver, COLORADO 80201
(303) 388-5751

1 Prestige Drive
Meriden, CONNECTICUT 06450
(203) 238-1201

260 Long Ridge Road, Room 365 S
Stamford, CONNECTICUT 06904
(203) 327-7700 Ext. 330

1036 Wyatt Building
777 14th Street, NW
Washington, D.C. 20005
(202) 628-4000

5950 Washington Street
Hollywood, FLORIDA 32803
(305) 621-1196

3165 McCrory Place
Orlando, FLORIDA 32803
(305) 894-6101

5440 Mariner Drive
Suite 214
Tampa, FLORIDA 33609
(813) 877-8294

1800 Peachtree Road, Suite 317
Atlanta, GEORGIA 30309
(404) 351-3400

110 North Wacker Drive
Chicago, ILLINOIS 60606
(312) 663-3900

3969 Meadows Drive, Suite 102
Indianapolis, INDIANA 46205
(317) 545-7591

2100 Gardiner Lane, Suite 120
Louisville, KENTUCKY 40205
(502) 452-4211

3525 N. Causeway Blvd, Suite 613
Metairie, LOUISIANA 70002
(504) 837-7328

208-A Beck Building
Shreveport, LOUISIANA 71109
(318) 425-2476

5100 Falls Road
The Quadrangle Building
Suite 346
Baltimore, MARYLAND 21210
(301) 323-8702

7316 Wisconsin Avenue
Bethesda, MARYLAND 20014
(301) 654-7061

395 Main Street
Dalton, MASSACHUSETTS
(413) 684-3613

400 Totten Pond Road
Waltham, MASSACHUSETTS 02154
(617) 871-0300

22150 Greenfield Road, Suite 101
Oak Park, MICHIGAN 48237
(313) 968-8100

1500 Lilac Drive South
Minneapolis, MINNESOTA 55416
(612) 544-6699

1015 Locust Street, Suite 505
St. Louis, MISSOURI 63101
(314) 436-4343

33 Evergreen Place
East Orange, NEW JERSEY 07018
(201) 672-0700

5301 Central Avenue, NE, Suite 1205
Albuquerque, NEW MEXICO 87108
(505) 265-3494

110 East 59th Street
New York, NEW YORK 10022
(212) 486-1700

Colonial Plaza
30 West State Street
Binghamton, NEW YORK 13901
(607) 772-0546

3343 Harlem Road
Buffalo, NEW YORK 14225
(716) 837-7752

3380 Monroe Avenue
Rochester, NEW YORK 14604
(716) 381-2083

650 Franklin Street
Schenectady, NEW YORK 12305
(518) 372-5471

202 Twin Oaks Drive
Syracuse, NEW YORK 13206
(315) 456-1539

175 Jericho Turnpike
Syosset, NEW YORK 11791
(516) 921-9520

P.O. Box 6773
Greensboro, NORTH CAROLINA 27405
(919) 275-2561

8620 Winton Road
Cincinnati, OHIO 45231
(513) 243-7361

5755 Granger Road
Cleveland, OHIO 44131
(216) 398-5060

1495 Morse Road, Room 206
Columbus, OHIO 43224
(614) 262-4043

Suite 115
5700 N. Portland
Oklahoma City, OKLAHOMA 73112
(405) 947-2376

3315 East 47th Place, Suite 100
Tulsa, OKLAHOMA 74135
(918) 743-9761

9154 NE Broadway, Suite 110
Portland, OREGON 97232
(503) 288-6915

2 Decker Square
Bala Cynwyd, PENNSYLVANIA 19004
(215) 839-1700

3800 Market Street, Office #5
Camp Hill, PENNSYLVANIA 17011
(717) 761-1481

Building #63-1
2901 East Lake Road

Erie, PENNSYLVANIA 16501
(814) 445-0121

400 Penn Center Blvd, Suite 318
Pittsburgh, PENNSYLVANIA 15235
(412) 243-1900

252 Pleasantburg Drive, Room 101
Greenville, SOUTH CAROLINA 29607
(803) 233-7467

8100 Carpenter Freeway
Dallas, TEXAS 75247
(214) 631-0910

6300 Hillcroft, Suite 412
Houston, TEXAS 77036
(713) 771-7292

122 North "N" Street
Midland, TEXAS 79701
(915) 682-1032

431 South 3rd Street, East
Salt Lake City, UTAH 84110
(801) 364-1891

1508 Willow Lawn Drive
P.O. Box 6974
Richmond, VIRGINIA 23230
(703) 285-3860

P.O. Box 8112
Roanoke, VIRGINIA 24014
(703) 989-0832

5900 Fourth Avenue
Seattle, WASHINGTON 98108
(206) 763-0850

615 East Michigan Street, Suite 204
Milwaukee, WISCONSIN 53202
(414) 271-7900

Outside the United States, GE's service is available through the following distributors:

Information Services
Canadian General Electric Co. Ltd.
1177 West Hastings/Suite 305
Vancouver, B. C., CANADA
(604) 681-8136
or
1420 Dupont Street
Toronto 172, Ontario, CANADA
(416) 534-6511

Honeywell Bull S. A.
Avenue Marnix 28
1050 Brussels, BELGIUM
(02) 13.68.60

Honeywell Bull GmbH
Frankfurter Strasse 21-25
6236 Eschborn/Ts, WEST GERMANY
06196-471520

Honeywell Information Systems Ltd.
114-118 Southampton Row
London, W.C. 1b 5AB ENGLAND
(01) 242-5725

Compagnie Honeywell Bull
179-181 Av. Charles De Gaulle
92 Neuilly, FRANCE
747-7042

Honeywell Information Systems Italia
Via M.Gioia, 70
20125 Milan, ITALY
688-8541

Honeywell Bull (Nederland) N.V.
Brouwersstraat 4
Amersfoort, THE NETHERLANDS
03490-1-15-45

Computer Systems of Puerto Rico, Inc.
La Ceramica Industrial Park
Bldg. 6
Calle Gildita
Carolina, PUERTO RICO
724-1472

Honeywell Bull AB
Box 23137 S-104 35
Stockholm 23, SWEDEN
24-66-20

Honeywell Bull (Schweiz) AG
Hardturmstrasse 253
CH8005 Zurich, SWITZERLAND
01-44.49.40

All GE's computers are located at a single supercenter near Cleveland, Ohio.

Users can access GE's service through local calls from over 250 cities in the United States and more than 30 cities in Europe. Primary access points in the United States are:

Birmingham AL	(205)
Huntsville AL	(205)
Mobile AL	(205)
Anchorage AK	(907)
Phoenix AZ	(602)
Tucson AZ	(602)

Little Rock AR	(501)
Agoura CA	(213)
Compton CA	(213)
Elmonte CA	(213)
Los Angeles CA	(213)
Santa Monica CA	(213)
Bakersfield, CA	(805)
Lompoc CA	(805)
Oxnard CA	(805)
Santa Barbara CA	(805)
Berkeley CA	(415)
Concord CA	(415)
Redwood City CA	(415)
San Francisco CA	(415)
San Rafael CA	(415)
Boron CA	(714)
Ontario CA	(714)
Rialto CA	(714)
San Diego CA	(714)
Santa Ana CA	(714)
Victorville CA	(714)
Modesto CA	(209)
Sacramento CA	(916)
Sunnyvale CA	(408)
Colorado Springs CO	(303)
Denver CO	(303)
Loveland CO	(303)
Fort Collins CO	(303)
Bridgeport CT	(203)
Hartford CT	(203)
Meriden CT	(203)
New Haven CT	(203)
New London CT	(203)
Norwich CT	(203)
Stamford CT	(203)
Wilmington DE	(302)
Washington DC	(301)
Eau Gallie FL	(305)
Fort Lauderdale FL	(305)
Miami FL	(305)
Orlando FL	(305)
W. Palm Beach FL	(305)
Gainesville FL	(904)
Jacksonville FL	(904)
Pensacola FL	(904)
Lakeland FL	(813)
St. Petersburg FL	(813)
Tampa FL	(813)
Athens GA	(404)
Atlanta GA	(404)
Augusta GA	(404)
Rome GA	(404)
Savannah GA	(912)
Idaho Falls ID	(208)
Kellogg ID	(208)
Bloomington IL	(309)
Peoria IL	(309)
Chicago IL	(312)
Decatur IL	(217)
Quincy IL	(217)
Morrison IL	(815)
Rockford IL	(815)
Bloomington IN	(812)
Columbus IN	(812)
Evansville IN	(812)
Terre Haute IN	(812)
Connersville IN	(317)
Indianapolis IN	(317)
Lafayette IN	(317)
Muncie IN	(317)
Elkhart IN	(219)
Fort Wayne IN	(219)
Gary IN	(219)
South Bend IN	(219)
Burlington IA	(319)
Davenport IA	(319)
Des Moines IA	(515)
Wichita KS	(316)
Coffeyville KS	(316)
Louisville KY	(502)
Owensboro KY	(502)
Baton Rouge LA	(504)
New Orleans LA	(504)
Lafayette LA	(318)
Lake Charles LA	(318)
Shreveport LA	(318)
Kittery ME	(207)
Baltimore MD	(301)
Bethesda MD	(301)
Cumberland MD	(301)
Boston MA	(617)
Fall River MA	(617)
Fitchburg MA	(617)
Lynn MA	(617)
Needham MA	(617)
Worcester MA	(617)
Pittsfield MA	(413)
Springfield MA	(413)
North Adams MA	(413)
Ann Arbor MI	(313)
Detroit MI	(313)
Flint MI	(313)
Royal Oak MI	(313)
Battle Creek MI	(616)
Benton Harbor MI	(616)
Grand Rapids MI	(616)
Kalamazoo MI	(616)
Muskegon MI	(616)
Lansing MI	(517)
Minneapolis MN	(612)
Jackson MI	(601)
Kansas City MO	(816)
St. Louis MO	(314)
Omaha NB	(402)
Las Vegas NV	(702)
Nashua NH	(603)
Eatontown NJ	(201)
Morristown NJ	(201)
New Brunswick NJ	(201)
Orange NJ	(201)

Teaneck NJ	(201)
Toms River NJ	(201)
Princeton NJ	(609)
Albuquerque NM	(505)
Santa Fe NM	(505)
Amsterdam NY	(518)
Coxsackie NY	(518)
Glen Falls NY	(518)
Schenectady NY	(518)
Big Flats NY	(607)
Binghamton NY	(607)
Corning NY	(607)
Norwich NY	(607)
Buffalo NY	(716)
Jamestown NY	(716)
Niagara Falls NY	(716)
Rochester NY	(716)
Deer Park NY	(516)
Mineola NY	(516)
Geneva NY	(315)
Syracuse NY	(315)
Utica NY	(315)
Watertown NY	(315)
New York NY	(212)
Nyack NY	(914)
Poughkeepsie NY	(914)
White Plains NY	(914)
Woodstock NY	(914)
Asheville NC	(704)
Brevard NC	(704)
Charlotte NC	(704)
Hendersonville NC	(704)
Hickory NC	(704)
Mocksville NC	(704)
Burlington NC	(919)
Durham NC	(919)
Greensboro NC	(919)
Plymouth NC	(919)
Raleigh NC	(919)
Wilmington NC	(919)
Winston-Salem NC	(919)
High Point NC	(917)
Akron OH	(216)
Canton OH	(216)
Cleveland OH	(216)
Warren OH	(216)
Youngstown OH	(216)
Cincinnati OH	(513)
Dayton OH	(513)
Springfield OH	(513)
Columbus OH	(614)
Coshocton OH	(614)
Lima OH	(419)
Toledo OH	(419)
Bartlesville OK	(918)
Tulsa OK	(918)
Duncan OK	(405)
Oklahoma City OK	(405)
Ponca City OK	(405)
Albany OR	(503)
Portland OR	(503)
Allentown PA	(215)
Coatesville PA	(215)
Philadelphia PA	(215)
Reading PA	(215)
Butler PA	(412)
Pittsburgh PA	(412)
Erie PA	(814)
Portage PA	(814)
Harrisburg PA	(717)
Hazleton PA	(717)
Williamsport PA	(717)
York PA	(717)
Providence RI	(401)
Aiken SC	(803)
Anderson SC	(803)
Columbia SC	(803)
Greenville SC	(803)
Rock Hill SC	(803)
Spartanburg SC	(803)
Chattanooga TN	(615)
Knoxville TN	(615)
Nashville TN	(615)
Memphis TN	(901)
Austin TX	(512)
Corpus Christi TX	(512)
Point Comfort TX	(512)
Dallas TX	(214)
Grand Prairie TX	(214)
Marshall TX	(214)
Sherman TX	(214)
Tyler TX	(214)
El Paso TX	(915)
Midland TX	(915)
San Angelo TX	(915)
Seminole TX	(915)
Snyder TX	(915)
Houston TX	(713)
Orange TX	(713)
Port Neches TX	(713)
Ogden UT	(801)
Salt Lake City	(801)
Brattleboro VT	(802)
Burlington VT	(802)
Springfield VT	(802)
Chester VA	(703)
Harrisonburg VA	(703)
Lynchburg VA	(703)
Martinsville VA	(703)
Newport News VA	(703)
Norfolk VA	(703)
Reston VA	(703)
Richmond VA	(703)
Roanoke VA	(703)
Waynesboro VA	(703)
Olympia WA	(206)
Seattle WA	(206)
Tacoma WA	(206)
Spokane WA	(509)
Charleston WV	(304)

Wheeling WV	(304)
Madison WI	(608)
Milwaukee WI	(414)
Racine WI	(414)
Casper WY	(307)

Internationally, the points of local access are:

Canada — Calgary and Edmonton, Alberta (403); Vancouver, British Columbia (604); Ottawa and Toronto, Ontario (613, 416); Montreal, Quebec (514).

Belgium — Brussels.

West Germany — Cologne.

Great Britain — Birmingham, Leeds, Liverpool, London, Manchester, Newcastle, and Southampton, England; Edinburgh and Glasgow, Scotland; Cardiff, Wales.

France — Nantes, Paris, Lyon.

Italy — Bologna, Florence, Milan, Naples, Padua, Rome, Turin.

Netherlands — The Hague.

Puerto Rico — San Juan.

Sweden — Stockholm, Gotteborg.

Switzerland — Zurich.

PROGRAMMING LANGUAGES

For MARK III service, GE supports Fortran IV (versions FIV and FOR) and Basic in the Foreground mode, and Fortran IV (version Y) and Cobol in the Background mode. The system permits use of other languages, including Algol and Jovial, but GE does not support these. For BASIC I service, the firm offers the Basic I language; for MARK I, Basic and Fortran are available. Special features of each language are described in the following paragraphs.

- Basic (for Basic I) — a company version with the following extensions: "image" - type formatting of Teletype output; generating of sequential binary files; automatic initialization of all variables, lists, and tables to zero; random number generator initializer; conditional branch with ON; multiple assignment with LET; optional LET; and FILE, CALL, and CHAIN capabilities. The object code limit is 3,936 words.

  The maximum number of data files that can be used is two. Major limitations created by the amount of computer storage available to each user are: file size of 255 line-numbered statements or 6,144 source characters; 75 unique constants; 13 FOR-NEXT statements imbedded in a loop; and 70 IF-THEN statements.

- Basic (for MARK I) — a company version with the following extensions: "image" - type formatting of Teletype output; random accessing and generating of binary files; automatic initialization of all variables, lists and tables to zero; random number generator initializer; conditional branch with ON; multiple assignment with LET; optional LETS; and FILE, CALL, and CHAIN capabilities (including chaining to programs stored in object form).

  Object code limit is 4,148 words. Programs can be stored in object form. Major limitations created by the amount of computer storage available to each user are: file size of 255 line-numbered statements or 6,144 source characters; 75 unique constants; 13 FOR-NEXT statements imbedded in a loop; and 79 IF-THEN statements.

- Basic (for MARK III Foreground) — a company version with the following extensions; string processing manipulation of alphanumeric data; ability to save programs in object form, to create binary files, to create scratch files, to initialize all lists, tables, variables to zero, and random number generation to one; random and sequential access of data files; unbuffered input/output; multiple assignment with LET; conditional branch with ON GOTO and OB BREAK; FILE, CALL and CHAIN capabilities; file manipulation capabilities to append data at the end of a file, handle unstructured files and variable length fields, set the length of lines and records, and specify the character used as a delimiter between file data elements; limited commands from programs; shared file access; and the option to turn off subscript checking.

  GE's Mark III version of Basic operates with no size limitation for an executable file and 5,040,000 characters for an ASCII data file (eight data files can be open simultaneously). The object code limit is 14,800 words.

- Fortran (for Mark I) — a company version with the following extensions; mixed-mode (real and integer) expressions; free-form source language that allows multiple statements per line, unlimited statement continuation through multiple lines, and imbedded commentary; monitor system that facilitates compilation and provides source program paging, program chaining, and naming of data and permanent files; up to 30 character names accepted (first character alphabetic); Fortran II/IV-style library and statement function names, statement label and number names; program saving in object form; source statement size limited only by object code size; use of multiple replacement statements to define arithmetic calculations.

  Other extensions are unformatted input, extended formatting facilities, and standard output format; unrestricted subscripting with/without checking; extended subprogram facilities; random access binary files; chain and chaining to programs stored in object form; temporary and permanent file I/O and terminal I/O using Fortran IV-style statements; alphabetic capability for short quoted literals in expressions; quoted literals of unlimited length for I/O.

  GE's Mark I version of Fortran operates under the following limitations: file size of 255 line-numbered statements or 6,144 source characters; object program code of 5,300 20-bit words; no support for Boolean statements or for slew control by first character of the output record; EQUIVALENCE does not reorder common storage; largest COMMON declaration must precede all other COMMON declarations and all DIMENSION declarations; "X" preceding arithmetic statement function (ASF) names does not imply integer function; and formatted output is subject to field expansion rather than value truncation.

- Fortran FIV (for MARK III Foreground) — a company version of Fortran IV to ANSI specifications X3.9/1966 with the following extensions: programs can be stored in object form; CHAIN and FILE commands provide for program chaining; definitions of variables and arrays include type and content specifications; specification statements allow storage allocation for arrays; and multiple replacement statements can define arithmetic or logical calculations. This version of Fortran permits a 32,000-word object code.

  Fortran FIV also includes extensive commands from programs; core image files; overlays; shared access to files; temporary or permanent files; the Symbolic On Line Debug (SOLD) package; diagnostics; NAMELIST bit manipulation routines; alphabetic character functions. Fortran FIV is a free-form source language with multiple statements per line. Unlimited continuation statements are allowed.

- Fortran FOR (for MARK III Foreground) — an earlier version of Fortran FIV, which is being temporarily retained for customer convenience.

- Fortran Y (for Mark III Background) — a batch-oriented version of Fortran IV, almost fully compatible with Fortran FIV. It handles source files of the following types: Fortran FIV ASCII file, BCD card image file, compressed deck file, formatted BCD line image file, or formatted ASCII line image file. Source file input may be in standard or free-form format. The compiler will process both ASCII and BCD character sets. If several programs have the same options, they can be stacked and compiled in one operation. The compiler provides analyses for statement- or extended-level optimization. It also includes a series of over 500 diagnostics.

  Language features include: ENCODE/DECODE for memory to memory conversion; list-directed formatted I/O; random file I/O; mixed-mode arithmetic; subscripts in any expression; DATA initialization in any type of statement; end-of-file clause in READ statements; capability for pause or stop with terminal display; capability for ENTRY, IMPLICIT, PARAMETER, and CHARACTER statements; format specifiers; quoted character constants; an error return clause in READ and WRITE statements; switch variables; type statements with size-in-byte notation; a function to provide list string and field capabilities; exclusive "or" capability; argument validation for built-in functions; and null label fields in the arithmetic IF statement.

- Cobol (for MARK III Background) — Standard ANSI Cobol (X3.23-1968), with a program linking extension.

PROGRAM CONTROL AND DATA MODIFICATION SERVICES

GE's network operating system controls the security and user accessibility to the network and its resources and schedules and monitors all central system tasks. The MARK II operating system controls Foreground processing, while the GCOS operating system handles Background processing.

System Control Language

GE provides an interactive control language of English-type commands. For Foreground processing, the following kinds of commands are available: system access, to initiate or terminate a terminal session; system control, to specify or terminate program execution or change the language used; file control, to create, modify, store, retrieve, copy, delete, or sort files, to store or retrieve files off-line, and manipulate file names; I/O control to identify or change the type or transmission rate of the terminal, to allow binary file input or output, or to redefine control characters. Other Foreground commands allow the user to perform terminal editing; obtain information about the status of files, current usage, the system, or the terminal; and control file access permission. The user can initiate many commands under control of his programs. He can also place Foreground commands in files to set up a job stream.

For Background processing, commands available to the user enable him to submit a job deck to the background stream (a library program assists him in preparing control card format); create, modify and delete background files; transfer files between Foreground and Background services; stop processing or abort a previously submitted job; inquire into job status; convert character sets; inspect and edit control card formats; and examine output. Background processing commands can be issued from the user's terminal, from a directive file on the Foreground system, or from a current file.

Editing and Debugging Facilities

For Foreground processing, GE provides three editors: EDIT, TEDIT, and RUNOFF.

EDIT is a line editor used to make large changes or major rearrangements to programs, data files, or text. It enables the user to move, combine, delete and duplicate lines; adjust line numbers, and list file contents.

TEDIT is a text or string editor primarily used for debugging programs, changing data files, or drafting text for documents and reports. It lets the user find and display a string of data; change, replace or add to it; and verify changes. Two commands, CHANGE and LOCATE, are also system commands, so the user can issue them without formally entering TEDIT.

RUNOFF is a format editor, used to prepare attractive output. Its functions include centering, spacing, justifying, inserting footnotes, and other adjusting desired.

Editing aids in Background mode consist of two system commands. The first enables the user to examine background output; the second permits him to inspect and edit job decks and control cards.

GE's debugging facilities consist of aids included in the programming languages, a tracing facility in Basic, and the Symbolic On-Line Debugging (SOLD) package.

SOLD is an interactive debugging package that operates on Fortran FIV programs. It allows the user to halt a program's execution at specified points and print values associated with program variables. It also provides tracing capability.

User Security

The basic requirement to access GE's network is a valid user number. An optional security measure is answerback checking: Although a user number is valid, it must be entered from a terminal permitting use of that number. A password system can also be set up in conjunction with user numbers.

The user number restricts a client to programs and files in his own subscription, and prevents others from listing or accessing that data. Within his subscription, the user can grant other users or user groups permission to access some or all of his files. If he wishes, he may grant general permission with only certain users in his subscription excluded. He can revoke permissions at any time. When giving permission, the user can limit the type of usage allowed to write, append, read-only, or execute-only levels.

Other network security features include:

File subsystem — This system lets clients protect their files to any extent that they choose.

It includes a feature that allows the user to lock out additional users when revising a file; this prevents two or more people from writing simultaneously on the same file record.

File names — These enable the user to prevent unauthorized use of particular files within a subscription. As a precaution against erasing a file by mistake, users cannot save two files that have the same file name.

File passwords — Passwords can be designated for files as well as user numbers. The originator can change the file password at any time and imbed nonprinting characters for additional security.

Binary files — For highly sensitive data, files can be stored in binary form, programs in compiled form.

Chain and compile safeguards — The user cannot chain from one program to another if the first is not saved; this protects him from inadvertently destroying the original program. Similarly, a program cannot be compiled unless it is first saved.

Journalization — This enables the user to back up selected files on magnetic tape and automatically recover their contents in the event of a mechanical failure or inadvertent damage to data. Journalization is particularly useful for users with highly active, transaction-oriented applications.

In addition to the security features just described, GE optionally offers a set of administrative controls that permit companies to manage and operate their own network service. One administrative user may be designated per catalog. He may create new user numbers, change passwords, monitor current usage, define the conditions of use within his catalog, and obtain usage and billing information as needed.

APPLICATIONS SERVICES

GE offers subscribers a library of over 400 programs. Major ones include AUTOFILE, FLEXIMIS, AUTOTAB, PA300, STATSYSTEM, an integrated accounting system, a set of numerical control programs, and a series of inventory control programs.

AUTOFILE allows businessmen to maintain files and create management reports. (This program is proprietary to Capex Corporation of Phoenix AZ, and a royalty fee is charged for its use.)

FLEXIMIS is a management information system that maintains and retrieves data from large data bases and performs exception reporting.

AUTOTAB helps the user prepare formatted tables from relatively small data bases, for such applications as budget preparation, financial projections, and sales analyses. It is supplemented by MINITAB, a junior version of AUTOTAB, and by AUTOGRAPH, a program to produce graphs and bar charts. (These programs are proprietary to Capex Corporation and carry a royalty charge.)

PA300 is a probability analysis system that evaluates alternatives, weighs risks and analyzes parameters, to assist managers in making decisions. (This program was developed by GE Engineering Consulting Service in Schenectady, New York, and carries a royalty charge.)

STATSYSTEM is a statistical analysis system that includes capabilities for data analysis, display, and manipulation.

The integrated accounting system consists of four program packages: GFAST$ for general ledger accounting; GEPAY$ for payroll preparation; LABOR$ for auditing of labor distribution; and CKREC$ for check reconciliation. These packages can be used individually or on an integrated basis.

The numerical control system consists of NCPPL$, for point-to-point and multi-axis contouring; ADAPT, an APT-compatible language for 2-1/2-axis contouring and 3-axis linear work; generalized or specialized Postprocessors to handle all types of equipment; and tape verification programs to check program correctness and tape accuracy.

Inventory control programs available include GIVY^2, a generalized order processing and finished inventory control system; GIVY^3, an order and inventory status system used in conjunction with GIVY^2; STORES, a condensed version of GIVY^2 that does not perform order processing; PBREK$, a program that analyzes order quantities where price-break discounts are involved; SEUST$, a program that determines optimum stock-order levels based on storage space available; NWSIS$, an inventory simulator used to analyze ordering lead times and customer demand patterns; MIEOQ$, to determine economic order quantity; and other special-purpose programs.

Other programs in GE's library cover the following areas:

- Business Management — critical path scheduling; forecasting; business analysis including budget preparation, long-range forecasts, investment requirements.

- Financial Analysis — capital investment analysis; investment management including cash flow impacts and present and future value of stocks; historical and projected financial statements (FINEX$).

- Chemical Engineering — equilibrium; physical properties; thermodynamics; pipeline calculations; chemical process design simulation; textile dye color matching.

- Civil Engineering — coordinate geometry system (COGO); box and circular culvert analysis; cut and fill; soil stability; rigid frame, truss, and continuous girder analysis; retaining wall analysis, hydraulic network analysis; concrete column and flat plate analysis; wind stress; air duct design; lighting system design; beam and column properties (AISC tables).

- Electrical Engineering — ac and dc circuit analysis (including ECAP), digital and analog simulation, linear systems analysis, stub matching, linear antenna arrays, load flow studies, fault analysis, dynamic system simulation.

- Mechanical Engineering — steam and water properties (1967 ASME), vibration analysis, finite element stress analysis, generalized area and moment of inertia calculations, heat exchanger design, stress and deflection of bodies (using thin shells of revolution approach), structural engineering solver (STRESS).

- Mathematics — functions (double precision and complex), least squares and minimum/maximum fits for curves with linear parameters, least squares fits for curves with nonlinear parameters (Marquardt algorithm), Fourier analysis, solutions of linear systems, eigenvalue-eignvector computations, matrix operations, optimization, linear programming, integer programming, differential equations, numerical integration and differentiation, polynomials (zeros, evaluation, construction), interval arithmetic, matrix inversion, plotting, geometry, zero of a function, solution of nonlinear systems.

- Statistics — regression analysis, correlation, chi square, analysis of variance, univariate statistical analysis, confidence limits, hypothesis testing, random numbers (uniform, normal, exponential, Poisson, Erlangian), integrals and fractiles of probability density functions, error and worst-case analysis of models.

- Manufacturing — a set of 26 programs used for production control, numerical control, quality control, inventory control, and industrial engineering.

- Utilities — SORT/MERGE, for sorting and merging background data files; DATOOL, a data base management system; index sequential file handling programs; bulk media conversion for Background users; system routines for string manipulation, character conversion and manipulation, bit manipulation, I/O functions, sleep/wake capability, journalization, file sharing, and various other functions.

Besides its own program library, GE offers subscribers access to a series of Network Software Services (NSS) packages, which are privately developed and marketed. These programs are available through third-party agreements with the authors, and a royalty fee is charged for their use.

Some of the NSS programs are accessible to all MARK III Foreground users through GE's library. Besides AUTOFILE, AUTOTAB, MINITAB, AUTOGRAPH, and PA300 which were described previously, these include: NGPAK*H, a chemical/petrochemical engineering program for K&H flash calculations, developed by the Natural Gas Processors Association (Tulsa, Oklahoma); and a software support package for the GE-PAC 30 process computer, supplied by GE Engineering Consulting Service (Schenectady, New York).

Other NSS programs are available to GE users through the software author's commercial library. These programs cover the following areas: real estate, cost analysis, insurance, income tax computation, financial analysis, project management, inventory control, numerical control, metalworking, electric utility, structural and civil engineering, power systems, optical system design, decision analysis and modeling, resource allocation, terminal software, petroleum evaluation, and sheet-metal estimating.

FEATURES OF THE COMPUTER SYSTEM

In MARK III service, GE implements Foreground processing on HIS G635 computers, and background processing on HIS 6070 systems. The company has a total of about 100 computer systems, including communications processors; the exact number of each kind is considered proprietary information.

The HIS G635 systems have 128K 36-bit words of core and a 1-microsecond access time. Each system has 200 million characters of disc storage; peripherals include up to five magnetic tape units, a high-speed printer, a card reader, and a card punch. Each user is allowed up to 32K of core, and unlimited storage space.

The HIS 6070 systems have 256K 36-bit words of core and a cycle time of 0.5 microsecond per two words. Disc storage capacity is 440 million characters. Other peripherals consist of up to 22 magnetic tape units (seven- and nine-track), two high-speed printers, a card reader, and a card punch. Users are allowed core partitions of up to 100K. There is no policy limit on file storage.

GE's BASIC I and MARK I services are implemented on the HIS G265 system, composed of an HIS G235 central processor, with 16K 20-bit words of core, connected to a Datanet-30 communications processor, also with 16K 20-bit words of core. This configuration has a 6-microsecond access time and can support up to 39 simultaneous users.

The MARK DELTA service uses the HIS G605 system with 96 to 128K 36-bit words of core and a 1-microsecond access time. It can support up to 104 users at the same time.

Terminals that are compatible with GE's network services include the following devices:

Impact Printing Terminals (multicopy ability)

- 30 Characters per Second (ASCII code)
  - GE TermiNet 300
  - Univac DCT-500
  - Gulton LG 10/30
  - Syner-Data Beta
  - Memorex 1240/1280
- 15 Characters per Second (ASCII code)
  - Teletype Model 37
  - Tracor TDS-1601
- 15 Characters per Second (Correspondence code)
  - IBM 2741
  - Anderson Jacobson 841
  - Novar (GT&E) 5-41, 5-50
  - Datel (UCC) 30, 31
  - Intercontinental Systems 1021, 1051
- 10 Characters per Second (ASCII code)
  - GE DataNet 730
  - Teletype Models 33, 35, 38
  - Friden 7100, 7102
  - Olivetti TE 338
  - Portacom (portable)
  - Mite 123T (portable)

Thermal Printers (single copy, special paper)

- Portable Devices (under 30 pounds)
  - Execuport 300
  - NCR 260
  - CDI 1030
- Over 30 Pounds
  - Texas Instruments 700

Video Display (CRT) Devices

- CRTs with Graphics Capability
  - Tektronics 4003, 4010
  - Sugarman Labs 4700 (T-19)
  - Computek 300
- CRTs (12-inch screen, no graphics)
  - Hazeltine 2000
  - Datapoint 3300
  - ADDS Consul 840, 880
  - Delta 1
  - Sugarman Labs 4200, 4300
  - Video Systems VST-2000
  - Infoton Vista
  - Bendix 4380
  - Beehive I, II, III
- Plotters
  - Omega-T

CalComp 500 Series

Hewlett-Packard 7200A

Zeta Research plotters 230

Other Devices

- Card Readers

  Tally Cardliner

  Bell & Howell (formerly Motorola) MDR Series

  Hewlett-Packard 2760A, 2761B

- High-Speed Devices

  IBM 2780

  Data 100

  IBM System/370 and 360 computers (with a 2701/2703/3705 communications adapter and an interface functioning like an IBM 2780)

GE's communications network starts with multiplexers throughout North America and Western Europe. These accept user messages and transmit them to one of over three dozen communications concentrators — either a COMPAT 416 remote concentrator or a DigiNet 1600 high-speed synchronous concentrator. From there, the data is sent to one of multiple GE 4020s; these communications processors also are interconnected. They steer the message to the appropriate Foreground system, where it is processed or once again passed on to a Background system. Transmission into the network from Europe is via COMSAT satellite and undersea cable.

The network equipment checks for transmission errors, converts codes, and routes data to and from the proper computer system. Interconnection of the various concentrators provides redundancy, thus increases reliability of the service. The network currently supports terminal speeds up to 30 characters per second for low-speed service, and up to 2,000 baud for high-speed service. GE plans to support high-speed service of 2,400 and 4,800 baud in the near future.

USER ASSISTANCE

GE has a staff of analysts and programmers who will develop programs for subscribers on a contract basis.

Company representatives, located at customer service desks around the country, are available during normal business hours to answer users' technical and administrative questions. Some of the service desks are manned 24 hours a day, so that assistance is always available to the user. For minor programming problems, clients can also call the nearest GE branch office.

As training, GE offers courses and seminars on system use, Basic and Fortran programming, and use of various library programs. Classes are normally held at GE's facilities, but for large groups they can be held at the user's site. There is an enrollment fee for classes, which covers all course materials and computer usage; a surcharge is added for classes held at the user's site. In addition to formal classes, on-line programmed instruction courses on Fortran and Basic are available to Basic I and MARK I users.

Documentation for GE's service includes reference manuals on system use and programming languages, and user guides to application packages. A monthly newsletter and an on-line newsletter (which can be accessed free) provide information on service changes, new features or programs, or other service-related information. Other listable files provide additional information, to support items in the newsletter, for example.

SERVICE ADMINISTRATION

Service is available 24 hours a day, 7 days a week.

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