



## Open CASCADE Technology and Products ver. 6.9.1

### Release Notes

#### Overview

**Open CASCADE Technology and Products version 6.9.1** is a maintenance release, which includes more than 200 improvements and bug fixes over the previous release 6.9.0.

Version 6.9.1 is binary incompatible with the previous versions of Open CASCADE Technology and Products, so applications linked against a previous version must be recompiled to run with this Version 6.9.1.



## Highlights

### Open CASCADE Technology:

- Fast shape self-intersection detector;
- Improved stability and performance of extrema and intersection algorithms;
- Offset algorithms improved to handle complex geometries;
- Support of stereoscopic formats recognized by consumer display devices;
- Possibility to fit 3d viewer to an arbitrary object rather than the whole scene;
- Extended tools to remove small wires and narrow tails on faces in Shape Healing;
- History of Boolean operations is accessible in DRAW;

### Products:

- Express Mesh improved to better handle complex geometries;
- Surface from Scattered Points now can generate closed surfaces;
- Progress indication and user break functionality in Best Fit tool
- Cross-language polymorphism enabled in C# and Java wrappers.



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## Modifications

### Foundation Classes

26144	<p><i>Summary:</i> Missing operators in gp_GTrsf.</p> <p>Multiplication operator has been enabled for class gp_GTrsf.</p>
26203	<p><i>Summary:</i> Provide method <code>::Swap()</code>.</p> <p>Methods <code>NCollection_IndexedMap::Swap()</code> and <code>NCollection_IndexedDataMap::Swap()</code> have been introduced to efficiently swap indices of two elements.</p>
26262	<p><i>Summary:</i> Mixing <code>qvector.h</code> and <code>math_Memory.hxx</code> will not compile.</p> <p>Redundant files <code>math_Memory.cxx</code> and <code>.hxx</code> have been removed as function <code>memmove()</code> is now available on all modern platforms in a standard C library.</p>
26287	<p><i>Summary:</i> <code>NCollection_AccAllocator::Free()</code> sometimes causes crash in debug mode.</p> <p>The method <code>NCollection_AccAllocator::Block</code> has been fixed to properly update the key of the memory block when the last allocation in the last block is freed.</p>
26423	<p><i>Summary:</i> Complete documentation of <code>CPnts_AbscissaPoint</code> methods.</p> <p>The methods <code>Adv</code> and <code>Perform</code> from class <code>CPnts_AbscissaPoint</code> have been properly commented in the code.</p>
26448	<p><i>Summary:</i> Method <code>Prepend()</code> of sequence breaks it if argument is empty sequence.</p> <p>Check for empty input sequence has been added in methods <code>Append()</code> and <code>Prepend()</code> of classes <code>TCollection_BaseSequence</code> and <code>NCollection_BaseSequence</code>.</p>
26453	<p><i>Summary:</i> <code>NCollection_StlIterator</code> - declare reference getters as <code>const</code>.</p> <p>Reference getters have been declared as <code>const</code> in class <code>NCollection_StlIterator</code> to allow their usage in STL algorithms on Mac OSX.</p>
26469	<p><i>Summary:</i> Methods <code>seek()</code> and <code>changeSeek()</code> are missing in class <code>NCollection_IndexedDataMap</code>.</p> <p>New method <code>NCollection_IndexedDataMap::Seek</code> returns pointer to Item by Key or NULL if the Key was not found.</p> <p>New method <code>NCollection_IndexedDataMap::ChangeSeek</code> returns a modifiable pointer to Item by Key or NULL if the Key was not found.</p>
26485	<p><i>Summary:</i> Problem with normals of a triangulated shape.</p> <p><code>gp::Resolution()</code> has been used instead of <code>Precision::SquareConfusion()</code> in method <code>Poly::ComputeNormals</code> to make normalization coherent with the implementation of <code>gp_Vec::Normalize()</code>.</p>

Modeling Data

26232	<p><i>Summary:</i> Multithreaded crash in IntAna_Int3P1n::Perform due to statics.</p> <p>Static keyword has been removed from local variable declarations in method IntAna_Int3P1n::Perform().</p>
26359	<p><i>Summary:</i> Revolution shape of Parabola Curve has no triangles.</p> <p>The method Adaptor3d_IsoCurve::Circle() has been modified to avoid checking parallel lines with NULL-vector.</p>
26369	<p><i>Summary:</i> Geom_OffsetSurface direction is wrong for indirect conical surface.</p> <p>Method Geom_OffsetSurface::Surface() has been improved to correctly determine the offset direction.</p>

Modeling Algorithms

24994	<p><i>Summary:</i> Missing implementation of constructor: BRepClass_FaceClassifier.</p> <p>Redundant constructor has been removed from class BRepClass_FaceClassifier.</p>
25048	<p><i>Summary:</i> Wrong return value of GeomLib_Tool::Parameter().</p> <p>A check for tolerance condition has been added in method GeomLib_Tool::Parameter.</p>
25613	<p><i>Summary:</i> Wrong distance found by xdistef command for attached shapes.</p> <p>Class BRepLib_CheckCurveOnSurface has been improved to provide more accurate evaluation of distances between curves, optimized and parallelized.</p>
25820	<p><i>Summary:</i> No Intersection Curves between surface of revolution and planes.</p> <p>Processing of thin shapes has been improved in method IntWalk_IWalking::TestDeflection.</p>
25981	<p><i>Summary:</i> Wrong result obtained by projection algorithm.</p> <p>Processing of V parameter periodicity has been added in method ProjLib_ProjectCurve::Load.</p>
26019	<p><i>Summary:</i> Unstable behavior of test cases with operation mkvolume.</p> <p>The maps have been replaced with indexed maps throughout BOPAlgo package to provide stability of algorithms based on the General Fuse algorithm.</p>
26022	<p><i>Summary:</i> Extrema_ExtCC gives not precise solution.</p> <p>Conditional optimization has been implemented in Newton optimization algorithm. New method math_NewtonMinimum::SetBoundary allows setting boundaries for conditional optimization.</p>
26044	<p><i>Summary:</i> Optimize math_GlobOptMin class to enter options for solutions of some specified problems.</p> <p>The possibility to search for a single optimum has been added in class math_GlobOptMin.</p>
26063	<p><i>Summary:</i> GeomAPI_ExtremaCurveSurface has inexact API.</p> <p>Method Extrema_ExtCS::NbExt() has been corrected to return correct value.</p>
26075	<p><i>Summary:</i> Make Extrema_GenExtCC return IsParallel flag in case of parallel curves.</p> <p>The algorithm math_GlobOptMin finding the minimal distance between two curves now uses new method Extrema_GenExtCC::IsParallel, which checks if the curves are parallel. Thus, this algorithm does not return redundant solutions.</p>



26099	<p><i>Summary:</i> Wrong result done by 2D intersection algorithm.</p> <p>The algorithm detecting intersection of almost parallel lines has been improved in class <code>IntCurve_IntConicConic</code>. New function <code>CheckLLCoincidence</code> returns true if the input curves are trimmed and coincide within tolerance.</p>
26151	<p><i>Summary:</i> Wrong result obtained by intersection algorithm.</p> <p>The algorithm detecting tangency of intersection shapes has been improved in class <code>IntWalk_PWalking</code>.</p> <p>New methods <code>GetMinDeflection()</code> and <code>GetMaxDeflection()</code> have been implemented in class <code>IntPolyh_MaillageAffinage</code> to get minimal and maximal distance between the array of points in the surface (<code>MaSurface1</code> and <code>MaSurface2</code> correspondingly) and triangles on it.</p>
26173	<p>Wrong result of <code>ChFi3d_ChBuilder</code> algorithm: incorrect processing of G1 junctions at vertex.</p> <p>The algorithm of fillet creation from <code>ChFi3d</code> package has been modified to avoid taking into consideration edges, which correspond to a smooth connection of adjacent faces.</p>
26180	<p><i>Summary:</i> Provide shape self-intersection detector.</p> <p>New class <code>BRepExtrema_SelfIntersection</code> has been implemented to detect potential self-intersections of the given shape.</p> <p><code>BRepExtrema_OverlapTool::OverlappedSubShapes</code> has been renamed into <code>BRepExtrema_MapOfIntegerPackedMapOfInteger</code>.</p>
26185	<p><i>Summary:</i> <code>BRepOffsetAPI_MakeOffset</code>: regressions.</p> <p>2D offset algorithms have been modified in methods <code>BRepFill_OffsetWire::PerformWithBiLo</code>, <code>Bisector_BisecAna::Distance</code> and <code>BRepFill_TrimEdgeTool::IntersectWith</code> to provide correct results for intersection join type.</p>
26193 26208	<p><i>Summary:</i> Incomplete intersection curve.</p> <p>Conditions for adjustment and processing Walking-lines have been improved in method <code>IntPatch_ImpImpIntersection</code>.</p>
26196	<p><i>Summary:</i> Wrong result obtained by projection algorithm.</p> <p>The handling of periodicity in method <code>GeomAdaptor::MakeSurface</code> now takes into account the case when trimmed parameters become unclosed or non-periodic, but the underlying geometry stays closed or periodic.</p>
26197	<p><i>Summary:</i> Incomplete intersection curve.</p> <p>The method <code>IntWalk_PWalking::PutToBoundary</code> has been modified to obtain a correct Start point for extension of the walking line.</p>





26198	<p><i>Summary:</i> ShapeConstruct_ProjectCurveOnSurface builds infinite line instead of bounded curve.</p> <p>Description of method ShapeConstruct_ProjectCurveOnSurface::Perform has been updated to the actual state.</p>
26201	<p><i>Summary:</i> Wrong processing of asymmetric chamfer: order of chords unjustly changes.</p> <p>The problem with wrong order of chords of dissymmetric chamfer has been fixed in ChFi3d_ChBuilder algorithm.</p>
26202	<p><i>Summary:</i> Wrong result of chamfer on cylindrical surface: wrong value of chord.</p> <p>The problem with computation of points on cylindrical surface in case of plane and cylinder has been fixed in ChFiKPart_MakeChamfer.</p>
26206	<p><i>Summary:</i> BRepClass_FaceClassifier returns TopAbs_OUT for internal point.</p> <p>Method BRepClass_FaceExplorer::OtherSegment() has been corrected to avoid taking into account a probing point if the probing line is tangent to the boundary at this point unless all points on the edge are tangent.</p>
26218	<p><i>Summary:</i> Wrong result done by General Fuse algorithm.</p> <p>The algorithm creating new pave blocks from intersection curves has been improved in methods BOPAlgo_PaveFiller::UpdateFaceInfo() and BOPAlgo_PaveFiller::ProcessExistingPaveBlocks().</p> <p>Method BOPAlgo_PaveFiller::MakeBlocks() has been modified to update FaceInfo IN information before filling the maps.</p>
26224	<p><i>Summary:</i> Wrong result obtained by Common operator.</p> <p>Processing of curves that need to be reversed has been corrected to take into account reversed parameter in method BOPTools_AlgoTools2D::AttachExistingPCurve.</p>
26230	<p><i>Summary:</i> Segmentation fault because a NULL curve is used without precaution in case of a projection failure.</p> <p>It has been explained in the documentation of BOPTools_AlgoTools2D class that its methods raise exception Standard_ConstructionError if algorithm fails.</p>
26233	<p><i>Summary:</i> BRepOffset_MakeOffset makes incorrect result.</p> <p>Function CorrectSolid has been implemented in class BRepOffset_MakeOffset to improve the operation results.</p>
26241	<p><i>Summary:</i> Sewing algorithm computes tolerance of joint vertex too rough.</p> <p>The algorithm computing vertex tolerance has been improved in method BRepBuilderAPI_Sewing::ComputeToleranceVertex.</p>
26243	<p><i>Summary:</i> Boolean operations failed on shapes with fillets.</p> <p>The condition providing a solution when the torus touches the plane has been changed in method IntAna_QuadQuadGeo::Perform to avoid round-off errors.</p>





26251	<p><i>Summary:</i> Section curve cannot be found.</p> <p>The intersection of triangles is now properly taken into account by <code>IntPolyh_PmaillageAffinage</code> algorithm, which can find the start point for intersection line.</p>
26253	<p><i>Summary:</i> Wrong result obtained by General Fuse operator.</p> <p>The algorithm of shell separation has been corrected in method <code>BOPAlgo_ShellSplitter::SplitBlock()</code> to always produce the same order of shells in the result.</p>
26281 26308	<p><i>Summary:</i> Segmentation fault in <code>BspLib::LocateParameter</code>.</p> <p>Detection of “jumping” knot value has been improved in method <code>BspLib::LocateParameter</code></p>
26296	<p><i>Summary:</i> Errors in <code>BRepOffsetAPI_MakeOffset</code>: failure because of wrong direction of bisector.</p> <p>The problem with wrong direction of bisector which caused failure of <code>BRepOffsetAPI_MakeOffset</code> algorithm has been eliminated in <code>Bisector_BisecAna</code> class.</p>
26305	<p><i>Summary:</i> inconsistent results of <code>BRepFeat_MakePrism</code> and <code>BRepFeat_MakeRevol</code>.</p> <p>The building algorithm, which limits faces from plane, cylindrical and conical surfaces has been fixed in method <code>BRepFeat::FaceUntil(...)</code> to provide correct boundaries.</p>
26310	<p><i>Summary:</i> Very slow Boolean cut operations on cylinders.</p> <p>The following changes have been introduced in classes <code>IntPatch_Intersection</code> to improve performance of Boolean cut operations on cylinders:</p> <ul style="list-style-type: none"> <li>▪ <code>JoinWLines</code> algorithm has been improved.</li> <li>▪ Reference to V-boundaries is now deleted when computing step.</li> <li>▪ It is now forbidden to add a boundary point if it lies on a prolongation of found points.</li> <li>▪ Processing of critical points has been improved.</li> </ul>
26313	<p><i>Summary:</i> Method <code>BRepBuilderAPI_GTransform::ModifiedShape()</code> throws an exception.</p> <p>Method <code>BRepBuilderAPI_Collect::Add</code> now provides arguments for more types of for initial shapes.</p>
26315	<p><i>Summary:</i> <code>BRepFeat_MakeRevol</code> fails to create a revol from shape.</p> <p>Processing of field <code>myJustFeat</code> has been added in class <code>BRepFeat_MakeRevol</code> to allow creating a revolution shape when the initial shape consists of only one face.</p>
26316	<p><i>Summary:</i> Infinite modification of the shapes in General Fuse operation.</p> <p>The validity of intersection point between Faces is now checked in method <code>IntTools_FaceFace::Perform</code>.</p>





26330	<p><i>Summary:</i> BRepOffsetAPI_ThruSections creates invalid shape.</p> <p>Methods BRep_Tool::CurveOnSurface() and BRepCheck_Edge::InContext() have been corrected to properly handle parametric range on 3d curve when it is used to generate p-curve dynamically (on a planar surface) and both the surface and the 3D curve have non-null locations.</p>
26332	<p><i>Summary:</i> BRepOffsetAPI_ThruSections algorithm fails on two wires with different number of edges.</p> <p>It is now checked in method BRepFill_CompatibleWires::SameNumberByACR if all new edges are long enough.</p>
26339	<p><i>Summary:</i> Curve projection hangs.</p> <p>The algorithm computing point projection has been corrected in class ProjLib_ComputeApproxOnPolarSurface.</p>
26351 26468	<p><i>Summary:</i> Wrong result found by the projection algorithm.</p> <p>C2 continuity intervals have been replaced by Knot intervals in B-Spline curve processing to ensure correct result on complex curves.</p>
26356	<p><i>Summary:</i> Wrong result done by projection algorithm.</p> <p>The projection algorithm in class math_FunctionSetRoot has been improved to better handle curves with a fast changing parameterization.</p>
26379	<p><i>Summary:</i> Wrong result produced by the volume maker algorithm.</p> <p>Protection from INTERNAL edges has been added in method BOPAlgo_ShellSplitter::RefineShell.</p>
26387	<p><i>Summary:</i> BRepPrimAPI_MakePrism crash when extruding Paraboloid face.</p> <p>The methods BRepSweep_Translation::MakeEmptyGeneratingEdge() and BRepSweep_Translation::SetPCurve() have been improved to allow working with edges without 3D curves.</p>
26390	<p><i>Summary:</i> IntTools_Context should provide possibility to set tolerance used by PointOnSurf projector instead of using of value 1.e-12.</p> <p>New method IntTools_Context::SetPONSPROJECTIONTOLERANCE has been implemented to define projection tolerance. By default it is set to 1.e-12.</p>
26406	<p><i>Summary:</i> BRepPrimAPI_MakeRevol crash when rotating a Paraboloid face.</p> <p>The treatment of degenerated and seam edges of input shape has been improved in methods BRepSweep_Rotation::HasShape() and MakeEmptyGeneratingEdge() to avoid creating extra faces based on these edges.</p>
26408	<p><i>Summary:</i> Exception during fixshape procedure.</p> <p>ShapeFix_Shell class has been protected from solids containing a face twice. The algorithm of COMPSOLID creation has been modified to correctly process the case when shells composing a COMPSOLID have the same shared faces.</p>



26418	<p><i>Summary:</i> Unjustified limitation on tolerance of an input shape in BRepOffset_MakeOffset.</p> <p>An unjustified offset value (offset &gt; 10*tolerance) has been eliminated in class BRepOffset_MakeOffset.</p>
26420	<p><i>Summary:</i> BOPAlgo_Builder resets "Closed" flag in the result.</p> <p>Flag Closed is set for new Wires and Shells created in General Fuse algorithm if necessary.</p>
26440	<p><i>Summary:</i> Invalid shape as a result of solid construction in BRepOffset_MakeOffset.</p> <p>The algorithm building wall in thick solid mode has been fixed in class BRepOffset_MakeOffset.</p>
26444	<p><i>Summary:</i> Boolean operation bcut gives an invalid result between a solid and a half-space solid.</p> <p>The method BOPAlgo_PaveFiller::PutPaveOnCurve has been modified to avoid putting a pave on the curve if there is already a pave with the same parameter. The tolerance of the existing vertex is updated to reach the new vertex.</p>
26446	<p><i>Summary:</i> GeomConvert::ConcatC1 produces unexpected curve.</p> <p>The concatenation algorithm has been fixed in method GeomConvert::ConcatC1.</p>
26458	<p><i>Summary:</i> BRepBuilderAPI_Copy does not copy mesh structure.</p> <p>The flag copyMesh has been implemented in BRepBuilderAPI_Copy. It allows copying the triangulation associated with topology from the initial shape into the result.</p> <p>This flag is disabled by default. The triangulation is copied by reference or by value (deep copy) according to flag copyGeom.</p>
26464	<p><i>Summary:</i> BrepOffset_MakeOffset does not provide valid output.</p> <p>Handling of a degenerated case has been improved in method BrepOffset_Offset::Init().</p>
26473	<p><i>Summary:</i> Offset API fails to create offset shape.</p> <p>The offset algorithm in class BrepOffset_MakeOffset now uses tolerance of the current face to extend it instead of the general tolerance.</p> <p>It is also possible to invoke Offset with 0.0 general offset value, however, a face with non-null offset is still required to perform computations.</p>
26481	<p><i>Summary:</i> Incorrect result of BRepOffsetAPI_MakeOffset: excess hanging arcs in the open result with join type GeomAbs_Arc.</p> <p>The method BRepFill_OffsetWire::PerformWithBiLo has been improved to remove possible hanging arcs on vertices.</p>



26484	<p><i>Summary:</i> BRepExtrema_DistShapeShape hangs.</p> <p>Method <code>math_GlobOptMin::computeGlobalExtremum()</code> has been modified to stop search if the domain boundary is reached.</p>
26498	<p><i>Summary:</i> BRepOffsetAPI_MakeOffset causes segmentation fault.</p> <p>The function <code>KPartCircle</code> from method <code>BRepFill_OffsetWire</code> has been fixed to avoid exception.</p>
26515 26567	<p><i>Summary:</i> Exponential memory usage problems.</p> <p>The use of <code>NCollection_IncAllocator</code> in packages <code>BOPAlgo</code> and <code>BOPDS</code> has been improved to avoid excess memory consumption in Boolean operations.</p>
26522	<p><i>Summary:</i> Exception while copying offset on C0 surface.</p> <p>The algorithm that copies offset on C0 surface in class <code>Geom_OffsetSurface</code> now avoids checking for C0 surface.</p>
26540	<p><i>Summary:</i> Errors in BRepOffsetAPI_MakeOffset: infinite loop in method <code>FixHoles</code> for closed results.</p> <p>The method <code>BRepFill_OffsetWire::FixHoles()</code> has been corrected to avoid infinite loop in case of closed results.</p>
26553	<p><i>Summary:</i> Out of range exception in <code>BRepFill_Pipe::FindEdge</code>.</p> <p>The method <code>BRepFill_Pipe::FindEdge</code> has been corrected to avoid out-of-range exception if a pipe is built on a shell with faces that have a shared edge.</p>
26554	<p><i>Summary:</i> Error in <code>IntPatch_PrmPrmIntersection</code>: initial step for walking line is not related with actual tolerance.</p> <p>The function <code>ComputePasInit()</code> from <code>IntWalk_Pwalking.cxx</code> now uses the actual tolerance to determine the initial step for walking line.</p>
26556	<p><i>Summary:</i> Infinite calculations of <code>BRepOffset_MakeOffset</code>.</p> <p>New method <code>BRepOffset_MakeOffset::CheckInputData</code> has been implemented to analyze the possibility of offset creation. It checks for the existence of an object with a non-null offset, the connectivity in offset shell, the continuity of input surfaces and the existence of normals on the grid.</p> <p>The corresponding Draw command <code>reportOffsetState</code> returns the state of offset operation depending on the error code.</p>
26582	<p><i>Summary:</i> Wrong result obtained by Common operator.</p> <p>The processing of circles has been modified in function <code>BOPAlgo_wireSplitter::Angle2D</code> to avoid the loss of accuracy due to small differences in large values.</p>





26588	<p><i>Summary:</i> SIGSEGV in BRepFeat_MakeDPrism::Perform().</p> <p>The algorithm of draft prism creation has been improved in class BRepFeat_MakeDPrism.</p>
26605	<p><i>Summary:</i> Possible array out of bounds read in Extrema_GextPC.gxx.</p> <p>The code has been protected against situation aFirstUsedKnot == aLastUsedKnot.</p>
26616	<p><i>Summary:</i> Memory leak in IntTools_Context::Hatcher.</p> <p>Memory allocation is now provided using the inner allocator of the object in methods IntTools_Context::Hatcher and IntTools_Context::SurfaceData.</p>
26636	<p><i>Summary:</i> BRepOffsetAPI_ThruSections algorithm crashes on two inconsistent wires.</p> <p>The consistency of arguments is now checked to avoid possible crash in class BRepFill_Compatiblewires.</p>
26647	<p><i>Summary:</i> BRepTools::UVBounds() computes zero range by V.</p> <p>The algorithm calculating bounding box on conic 2d curves has been corrected in method BndLib_Box2dCurve::Compute to work properly if the specified parametric range is contained in negative values.</p>
26651 26702	<p><i>Summary:</i> IntTools_FC1ass2d gives incorrect result of classification.</p> <p>The number of points used to compute 2d boundaries has been increased in method Geom2dInt_Geom2dCurveTool::NbSample.</p>
26687	<p><i>Summary:</i> SIGSEGV in BRepBuilderAPI_MakeFace.</p> <p>The check for face location has been added in method BRepLib_FindSurface::Init.</p> <p>Error messages explaining various cause of failure have been added in command mkplane.</p>
26701	<p><i>Summary:</i> BOPAlgo_Builder::Perform crash.</p> <p>Data races during multi-thread calculations of PCurves have been eliminated.</p>





Visualization

<p>23028</p>	<p><i>Summary:</i> TKOpenGL – eliminate global static variables.</p> <p>All global variables from OpenGL package have been moved to fields of the class OpenGL_GraphicDriver.</p>
<p>25556 26479 26672</p>	<p><i>Summary:</i> Support stereo pair formats recognized by consumer display devices.</p> <p>OCCT stereo rendering now works on a wider range of graphic cards and consumer display devices.</p> <p>The following enumerations for stereoscopic outputs have been added in Graphic3d_StereoMode.hxx:</p> <ul style="list-style-type: none"> <li>▪ Graphic3d_StereoMode_QuadBuffer – for quad-buffer-enabled graphic hardware (only this stereo type has been supported before);</li> <li>▪ Graphic3d_StereoMode_Anaglyph – for anaglyph stereo pair;</li> <li>▪ Graphic3d_StereoMode_RowInterlaced – for row-interlaced stereo pair;</li> <li>▪ Graphic3d_StereoMode_ColumnInterlaced – for column-interlaced stereo pair;</li> <li>▪ Graphic3d_StereoMode_ChessBoard – for chess-board stereo for DLP TVs;</li> <li>▪ Graphic3d_StereoMode_SideBySide – for horizontal anamorphic stereo pair;</li> <li>▪ Graphic3d_StereoMode_OverUnder – for vertical anamorphic stereo pair.</li> </ul> <p>The following options controlling stereo output have been added to Graphic3d_RenderingParams:</p> <ul style="list-style-type: none"> <li>▪ StereoMode – activates stereoscopic output mode; Graphic3d_StereoMode_QuadBuffer is used by default</li> <li>▪ ToReverseStereo flag allows reversing the stereo pair, it is FALSE by default</li> <li>▪ AnaglyphFilter provides a filter for anaglyph output, Anaglyph_RedCyan_Optimized is used by default.</li> </ul> <p>The following modifications have been introduced in other classes and methods:</p> <ul style="list-style-type: none"> <li>▪ Predefined GLSL programs for new stereo outputs have been added in OpenGL_ShaderManager.</li> <li>▪ Method OpenGL_workspace::Redraw() now does not disable stereo implicitly to allow stereo dump.</li> <li>▪ Flag swapInterval has been added in class OpenGL_Caps to control Vsync.</li> <li>▪ Method OpenGL_workspace::BufferDump() has been implemented to handle cases with non-applicable GL_PACK_ROW_LENGTH.</li> <li>▪ Fields “left” and “top” have been added in CALL_DEF_WINDOW to reverse stereo pair for interlaced output depending on window position.</li> </ul> <p>The following modifications have been implemented in Draw commands and interface:</p> <ul style="list-style-type: none"> <li>▪ Command vstereo allows setting the stereo mode;</li> <li>▪ Command vdump has been extended to allow dump of stereoscopic pair in different formats;</li> <li>▪ Command vcaps has been extended with option vsync;</li> <li>▪ Mouse scroll can be used to zoom and adjust Zfocus in WinAPI;</li> <li>▪ Keys “/” and “*” can be used to adjust inter-ocular distance IOD.</li> </ul>





25760	<p><i>Summary:</i> Graphic3d_Camera::ZfitAll() – increase precision factor added to Znear and Zfar to eliminate erroneous clipping.</p> <p>The precision factor has been set to 0.0001. This factor is used to add a meaningful tolerance to Znear and Zfar values and to avoid equality after type conversion to ShortReal matrices type.</p>
25775	<p><i>Summary:</i> Default Gradient Background in V3d_Viewer has no effect in newly created V3d_View.</p> <p>The background viewer color is applied to underlying graphical view after window setting in method V3d_View::SetWindow.</p>
26082	<p><i>Summary:</i> The visualization is not scaled when the view is resized horizontally.</p> <p>Methods Graphic3d_Camera::ConvertView2World(), Graphic3d_Camera::UpdateProjection(), V3d_View::Scale() and V3d_View::FitMinMax() have been modified to behave properly when the width of the window is less than its height.</p>
26163	<p><i>Summary:</i> AIS_Shape::setWidth() should not overwrite free boundary color.</p> <p>Methods AIS_Shape::setColor() and AIS_Shape::setWidth() have been fixed to keep the colors of free and unfree boundaries and lines.</p>
26195	<p><i>Summary:</i> Optimize selection algorithms.</p> <p>The following improvements have been implemented in triangular and rectangular frustum build procedure:</p> <ul style="list-style-type: none"> <li>▪ initial transformation of triangulation is now applied to selecting frustum;</li> <li>▪ gp collections have superseded NCollection_Vec3 collection to avoid conversions and usage of macros;</li> <li>▪ calculation of frustum has been refactored to reduce its build time;</li> <li>▪ double pixel tolerances for selection have been replaced by integer ones;</li> <li>▪ splitting in SelectMgr BVH selection primitive sets is done along the main axis only.</li> </ul>
26199	<p><i>Summary:</i> Use NCollection_IndexedMap instead of NCollection_Sequence in OpenGL_BVHClipPrimitiveSet to improve performance.</p> <p>OpenGL_BVHClipPrimitiveSet has been redesigned to use NCollection_IndexedMap instead of NCollection_Sequence. This modification has accelerated vdisplay and vclear in several times.</p>
26209	<p><i>Summary:</i> Provide a method to fit view to the specific bounding box.</p> <p>Method V3d_View::FitAll has been enabled to overload taking an arbitrary bounding box as a parameter, which allows fitting view contents to an arbitrary object.</p> <p>In Draw, option -selected has been added to vfit command to fit only selected entities. F key press now fits the view to the selected objects, if any.</p>
26217	<p><i>Summary:</i> Select3D_SensitiveCircle – fix compilation with Clang for iOS.</p> <p>The algorithm detecting filled sensitive circles has been corrected in method Select3D_SensitiveCircle::Matches.</p>





26220	<p><i>Summary:</i> Use single <code>Ncollection_IndexedMap</code> instead of <code>Ncollection_DataMap</code> and <code>Ncollection_Sequence</code> in <code>Graphic3d_Structure</code>.</p> <p><code>Ncollection_IndexedMap</code> is now used instead of separate descendant/ancestor structures from <code>Graphic3d_Structure</code>.</p>
26221	<p><i>Summary:</i> Use <code>Ncollection_IndexedMap</code> instead of <code>Ncollection_Sequence</code> in <code>OpenGL_Layer</code> to improve performance.</p> <p><code>Ncollection_IndexedMap</code> has been implemented in <code>OpenGL_Layer</code> instead of <code>Ncollection_Sequence</code>. This modification has accelerated the object display and removal.</p>
26249	<p><i>Summary:</i> TKV3d – fix possible division by zero in <code>SelectMgr_RectangularFrustum</code>.</p> <p>Zero-length check for triangle normal has been added in method <code>SelectMgr_RectangularFrustum::Overlaps</code>.</p>
26275	<p><i>Summary:</i> Add public constructor for <code>OpenGL_ShaderProgram</code>.</p> <p>Public constructor has been added for <code>OpenGL_ShaderProgram</code> class to allow using it separately from <code>OpenGL_ShaderManager</code>, for example, to replace <code>QOpenGLShaderProgram</code>.</p>
26276	<p><i>Summary:</i> TKOpenGL – add missing <code>Standard_EXPORT</code> to matrix management methods in <code>OpenGL_Context</code>.</p> <p><code>Standard_EXPORT</code> has been added to methods <code>ApplyModelWorldMatrix()</code>, <code>ApplyWorldViewMatrix()</code>, <code>ApplyModelViewMatrix()</code> and <code>ApplyProjectionMatrix()</code> from <code>OpenGL_Context</code> class.</p>
26284	<p><i>Summary:</i> Eliminate recursion in <code>SelectMgr_SelectionManager</code>.</p> <p><code>SelectMgr_SelectionManager</code> has been refactored to eliminate cases when handling of objects without own presentations causes infinite loop because the function is called recursively.</p>
26304	<p><i>Summary:</i> Wrong calculation of point in <code>SelectMgr_RectangularFrustum::DetectedPoint</code>.</p> <p>The frustum direction vector has been normalized in <code>SelectMgr_RectangularFrustum::DetectedPoint</code> to properly calculate points detected on a sensitive primitive.</p>
26324	<p><i>Summary:</i> Fix iteration through corrupted memory in <code>AIS_LocalContext::FindSelectedOwnerFromShape</code>.</p> <p>The signature of <code>SelectMgr_ViewerSelector::ActiveOwners()</code> has been changed to avoid returning the list as a temporary object, which can lead to crash in case of misuse.</p>
26394	<p><i>Summary:</i> Eliminate unused variable in <code>SelectMgr_RectangularFrustum</code>.</p> <p>Unused parameter <code>aSc</code> has been removed in method <code>SelectMgr_RectangularFrustum::segmentSegmentDistance()</code>.</p>





26401	<p><i>Summary:</i> Small boxes in front of big one disappear in perspective view.</p> <p>The method <code>Graphic3d_Camera::zfitAll</code> has been improved to select the most appropriate <code>zNear</code> distance to balance between clipping (less <code>zNear</code>, more chances to observe closely small models without clipping) and resolution of depth for perspective projection.</p>
26403	<p><i>Summary:</i> Add missing <code>Standard_EXPORT</code> keyword in <code>SelectMgr</code> headers.</p> <p><code>Standard_EXPORT</code> keywords have been added in headers of some classes from <code>SelectMgr</code> to allow linking with <code>TKV3d</code> on Windows.</p>
26424	<p><i>Summary:</i> <code>TKOpenGL</code> – fix text rendering in core profile.</p> <p>The following changes have been implemented to improve text rendering in core profile:</p> <ul style="list-style-type: none"> <li>▪ <code>OpenGL_Context::init()</code> – fix condition on initializing alien OpenGL context within core profile.</li> <li>▪ <code>OpenGL_Font::renderGlyph()</code> – use <code>GL_RED</code> data format in core profile.</li> <li>▪ <code>OpenGL_Text::render()</code> – do not use <code>GL_ALPHA_TEST</code> in core profile.</li> </ul>
26430	<p><i>Summary:</i> Segmentation fault in opened local context.</p> <p>Check for an empty dataset has been added in method <code>Select3D_SensitiveSet::Matches</code>.</p>
26454	<p><i>Summary:</i> <code>TKOpenGL</code> – do not require deprecated function of <code>GL_ARB_vertex_type_2_10_10_10_rev</code> in core profile.</p> <p>Request for deprecated functions of <code>GL_ARB_vertex_type_2_10_10_10_rev</code> has been removed from the core profile.</p>
26462	<p><i>Summary:</i> Selection does not adapt to line width change.</p> <p>The interface to change sensitivity of a particular selection through both interactive and local context has been implemented in <code>SelectMgr_SelectionManager</code>, <code>SelectMgr_Selection</code> and <code>SelectBasics_SensitiveEntity</code> classes.</p> <p>The corresponding option <code>-setSensitivity</code> has been added in vaspects <code>Draw</code> command.</p>
26476	<p><i>Summary:</i> <code>TKOpenGL</code> – do not enable <code>GL_NORMALIZE</code> in core profile.</p> <p><code>GL_NORMALIZE</code> has been removed from OpenGL Core Profile.</p>
26492	<p><i>Summary:</i> <code>OpenGL_FrameBuffer</code> does not release itself correctly.</p> <p>The behavior of <code>myIsOwnBuffer</code> flag in <code>OpenGL_FrameBuffer</code> has been corrected.</p>
26533	<p><i>Summary:</i> Draw command <code>display</code> requires <code>vclear</code> to update the presentation.</p> <p>The descriptions of command <code>display</code> and others have been updated.</p>





26611	<p><i>Summary:</i> TKService – fix NULL-dereference in Font_FontMgr on broken font.</p> <p>The method FT_Face::family_name is now checked for NULL during detection. Fonts without mandatory UNICODE charset in Font_FontMgr are skipped.</p>
26665	<p><i>Summary:</i> TKOpenGL – specify precision for integer uniforms explicitly within OpenGL ES.</p> <p>The lowp integer precision is now used for enumerations and Boolean uniforms. The default precision in Fragment Shader is highp.</p>
26688	<p><i>Summary:</i> TKOpenGL - apply transparency within GLSL programs.</p> <p>OpenGL_ShaderManager has been improved to correctly display transparency if ffp is disabled on Windows.</p>
26705	<p><i>Summary:</i> OpenGL_workspace aspect setters are not exported.</p> <p>OpenGL_workspace aspect setters: SetAspectLine(), SetAspectFace(), SetAspectMarker() and SetAspectText() now can be exported and used outside TKOpenGL library in custom OpenGL elements.</p>



Data Exchange

26289	<p><i>Summary:</i> STEP import/export produces an empty shape.</p> <p>The algorithm computing pole numbers during reading of a step file containing a p-curve with the non-unique last knot has been fixed in class <code>StepToGeom_MakeBSplineCurve</code>.</p> <p>Additionally, the class <code>StepToTopoDS_TranslateEdge</code> has been protected against exception. A warning message has been added in <code>StepToTopoDS_TranslateEdgeLoop.cxx</code>.</p>
26341	<p><i>Summary:</i> Uninitialized field in <code>ShapeFix_Face</code>.</p> <p>Parameter <code>RemoveSmallAreaFaceMode</code> is now properly initialized in class <code>ShapeFix_Face</code>.</p>
26342	<p><i>Summary:</i> No materials are read from STEP.</p> <p>The number of arguments for <code>descriptive_representation_item</code> has been changed in method <code>RWStepRepr_RWDescriptiveRepresentationItem::ReadStep</code> to take into account the case when the description is absent.</p>
26376	<p><i>Summary:</i> Imported STEP shape is partially wrong.</p> <p>The class <code>StepToTopoDS_TranslateFace</code> has been modified to properly translate faces based on a toroidal surface with a negative major radius.</p>
26419	<p><i>Summary:</i> Export of a reversed face leads to crash</p> <p>The algorithm <code>BRepToIGES_BRShell::TransferFace</code> has been modified to determine centre of a pcurve correctly when a reversed face is written into IGES.</p>
26451	<p><i>Summary:</i> Crash at import of a STEP file.</p> <p>Check for NULL has been added in methods <code>StepShape_OrientedEdge::EdgeStart()</code> and <code>EdgeEnd()</code>.</p>
26573	<p><i>Summary:</i> IGES file with one entity 128 is not read.</p> <p>A workaround has been added to read IGES files containing lines shorter than standard 80.</p>
26574	<p><i>Summary:</i> Remove redundant dependence of TKIGES on TKOffset</p> <p>Redundant dependence of TKIGES on TKOffset has been removed.</p>
26683	<p><i>Summary:</i> VRML 2.0: ImageTexture not written.</p> <p>The method <code>write()</code> has been implemented in class <code>VrmlData_ImageTexture</code>. It can be called even if the parent <code>Appearance</code> node contains a default <code>Material</code>.</p>

Draw

26153	<p><i>Summary:</i> Viewer Test – verase does not remove selection highlighting for a shaded object.</p> <p>The method <code>AIS_InteractiveContext::EraseGlobal</code> has been fixed to properly remove selection highlighting for a shaded object.</p>
26259	<p><i>Summary:</i> Extend commands <code>{l s v}props</code> to output values with full precision.</p> <p>New option <code>-full</code> has been added to commands <code>lprops</code>, <code>sprops</code> and <code>vprops</code> to output values with either short or full precision.</p>
26263	<p><i>Summary:</i> Inconsistent results of <code>bopargcheck</code> and <code>checkcurveon surf</code> commands.</p> <p>The condition providing selection of faulty curves has been modified in Draw command <code>Checkcurveon surf</code> to be coherent with the same condition in command <code>bopargcheck</code>.</p>
26393	<p><i>Summary:</i> Add draw commands to evaluate history of modifications of BOP</p> <p>DRAW commands <code>bmodified</code>, <code>bisdeleted</code> and <code>bgenerated</code> have been implemented as a new class <code>BOPTest_HistoryCommands</code> to track the history of shape modifications in Boolean and General Fuse operations.</p>
26398	<p><i>Summary:</i> Extend command <code>Tricheck</code> to show free nodes and links breaking mesh consistency.</p> <p>The command <code>Tricheck</code> has been extended to show free nodes and links breaking mesh consistency.</p>
26483	<p><i>Summary:</i> Option <code>RunParallel</code> is not used by command <code>bopargcheck</code>.</p> <p>Option <code>RunParallel</code> has been fully implemented in command <code>bopargcheck</code>.</p>
26648	<p><i>Summary:</i> Help of <code>vcaps Draw</code> command mentions wrong argument.</p> <p>The description of arguments for <code>vcaps</code> command has been corrected.</p>

Mesh

26385	<p><i>Summary:</i> Prevent BRepMesh from possible crash due to pointer to local variable stored inside <code>Extrema_LocateExtPC</code>.</p> <p><code>BRepAdaptor_Curve</code> has become a member of <code>BRepMesh_EdgeParameterProvider</code> to ensure that it is created before and destroyed after the <code>Extrema_LocateExtPC</code> that uses it.</p>
26532	<p><i>Summary:</i> Meshing of edge with <code>minsize</code> parameter leads to incorrect result.</p> <p>The implementation of <code>minsize</code> parameter has been improved in method <code>BRepMesh_IncrementalMesh::discretizeFreeEdges()</code>.</p>

Shape Healing

<p>25553</p>	<p><i>Summary:</i> ShapeFix_Face::FixMissingSeam() fails to correct a face.</p> <p>Method ShapeFix_IntersectionTool::FixIntersectingWires has been fixed to correctly process the case when wires have an intersecting segment.</p> <p>Validity of orientation of open wires in the parametric space is now checked in method ShapeFix_Face::FixMissingSeam().</p>
<p>25923</p>	<p><i>Summary:</i> Remove small wires on face read from STEP.</p> <p>Small area analysis provided method ShapeAnalysis_Wire::CheckSmallArea has been improved to work as follows:</p> <ul style="list-style-type: none"> <li>▪ A rough estimation of surface area is obtained.</li> <li>▪ If the estimation is less than tolerance then the real area is evaluated and its value compared with tolerance.</li> </ul> <p>New flag RemoveSmallAreaFaceMode has been added to XSTEPResource/IGES. If the flag is true, faces with a small 3D area are removed from ShapeFix context.</p>
<p>26102 26105 26261</p>	<p><i>Summary:</i> Create a tool to remove tails from any wire.</p> <p>New method ShapeFix_wire::FixTails allows removing tails from the wires of a shape. The parameters of this method can be set using methods ShapeFix_wire::SetMaxTailAngle and ShapeFix_wire::SetMaxTailWidth. The status of the removal is accessible through method ShapeFix_wire::StatusFixTails.</p> <p>Draw command fixshape has been extended by options -maxtaila and -maxtailw to test the tool.</p>
<p>26219</p>	<p><i>Summary:</i> ShapeUpgrade_UnifySameDomain fails with StdFail_NotDone exception.</p> <p>Method ShapeUpgrade_UnifySameDomain::MergeEdges has been modified to avoid merging edges if the collapsed vertex has a third connected edge. The problem with different location of merged edges has also been fixed.</p>
<p>26306</p>	<p><i>Summary:</i> Access to deleted object in ShapeFix_FixSmallSolid.</p> <p>The method ShapeFix_FixSmallSolid::Merge has been corrected to avoid accessing element of sequence by reference after it has been removed.</p>
<p>26466</p>	<p><i>Summary:</i> UnifySameDomain creates invalid result shape from valid input shape.</p> <p>Method ShapeUpgrade_UnifySameDomain::UnifyEdges() has been improved to avoid incorrect results.</p>
<p>26627</p>	<p><i>Summary:</i> Shape Healing hangs.</p> <p>Check for orientation of the solid has been corrected in class BRepClass3d_SClassifier::PerformInfinitePoint to ensure that the cycle always finishes.</p>





26635	<p><i>Summary:</i> UnifySameDomain loses internal edges.</p> <p>New function <code>putIntWires</code> has been implemented in class <code>ShapeUpgrade_UnifySameDomain</code>. This function adds internal wires that are classified inside the face as a subshape and removes them from the sequence.</p>
26644	<p><i>Summary:</i> ShapeUpgrade_UnifySameDomain – strange behavior.</p> <p>Method <code>ShapeUpgrade_UnifySameDomain::UnifyFaces()</code> has been fixed to produce correct operation result for a non-manifold input shape.</p>
26671	<p>Infinite loop in <code>ShapeFix_wire::FixSelfIntersection()</code>.</p> <p>The method <code>ShapeFix_wire::FixSelfIntersection()</code> has been improved to avoid possible infinite loops. When needed, the fix operation is repeated once instead of going back in the loop.</p>

### Configuration

26547	<p><i>Summary:</i> Fix compilation errors on VS2015.</p> <p>The following changes have been introduced to avoid compilation errors on VS2015:</p> <ul style="list-style-type: none"> <li>▪ Local variable <code>stat</code> has been renamed to <code>myStat</code> to avoid name collision in <code>Interface_STAT.cxx</code></li> <li>▪ Correct argument is now passed to <code>va_start()</code> in <code>OSD_FileNode.cxx</code>.</li> <li>▪ Function <code>_get_timezone()</code> is used instead of a global variable <code>timezone</code> in method <code>STEPConstruct_AP203Context::DefaultDateAndTime()</code>.</li> <li>▪ The argument of <code>reinterpret_cast&lt;&gt;</code> has been fixed in method <code>Graphic3d_ArrayOfPrimitives::VertexColor()</code>.</li> </ul>
26691	<p><i>Summary:</i> CMake building procedure should support compiler of version 14.0 of Microsoft Visual C.</p> <p>"vc14" compiler name has been added to CMake building script.</p>

### Samples

26226	<p><i>Summary:</i> Cannot compile and run OCC MFC samples.</p> <p>Files <code>Isession2D_SensitiveCurve.h</code> and <code>Isession2D_SensitiveCurve.cpp</code> have been removed from MFC Geometry sample.</p> <p>The output directory for <code>mfcSample</code> project has been changed from <code>lib/libd</code> to <code>bin/bind</code>.</p>
26628	<p><i>Summary:</i> Button Erase works incorrectly.</p> <p>Method <code>AIS_InteractiveContext::EraseSelected</code> has been updated to provide correct functionality.</p>



26632	<p><i>Summary:</i> HLR sample does not work with Algo mode.</p> <p>The problem with walking-line containing two equal walking-points has been fixed.</p>
26637	<p><i>Summary:</i> Save function works incorrectly in OCAF MFC sample.</p> <p>Format .std has been removed from OCAF MFC sample.</p>
26307	<p><i>Summary:</i> Minor improvements in Snowflake sample.</p> <p>The following improvements have been introduced in snowflake sample:</p> <ul style="list-style-type: none"> <li>▪ Background has been set to white and lines to black;</li> <li>▪ Dimension line has been added;</li> <li>▪ Category has been corrected.</li> </ul>

### Coding

25750	<p><i>Summary:</i> Eliminate GCC warning <code>-Wunused-but-set-variable</code> in <code>OSD_signal.cxx</code> for Android build.</p> <p>OCCT code has been revised to remove GCC warnings.</p>
26613	<p><i>Summary:</i> Avoid use of macros in <code>Resource_Manager.cxx</code>.</p> <p>Pre-processor macros used in <code>Resource_Manager.cxx</code> have been replaced with enumerations having specific names to avoid conflicts with other definitions during building under Windows.</p>
26650	<p><i>Summary:</i> Fix misprint in <code>Ncollection_vec3::operator/()</code>.</p> <p>Misprint has been fixed in <code>Ncollection_vec3::operator/()</code>.</p>

ProductsASIS-SAT Import / Export

26245	<p><i>Summary:</i> Unable to write SAT file by default.</p> <p>The following modifications have been introduced to allow writing SAT file even if the environment variable CSF_SATDefaults is not assigned.</p> <ul style="list-style-type: none"> <li>▪ XSAIgo_AlgoContainer has been corrected to return the original shape if Shape Processing fails.</li> <li>▪ Handling of absence of defined operator sequence has been corrected to apply DirectFaces operator on writing by default, regardless of the target format.</li> <li>▪ ShapeProcess now outputs a warning if the operator sequence is not defined in resource file.</li> <li>▪ Message names have become more meaningful.</li> </ul>
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Parasolid Import

26399	<p><i>Summary:</i> Exception at reading of X_B files.</p> <p>The following modifications have been introduced in Parasolid import product:</p> <ul style="list-style-type: none"> <li>▪ Reading of binary header has been corrected;</li> <li>▪ Return values have been corrected in XtData_Model::Read;</li> <li>▪ Support of escape sequences in strings has been introduced;</li> <li>▪ Support of incomplete real values written as '-' has been introduced.</li> </ul>
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DXF Import / Export

26325	<p><i>Summary:</i> Lost faces of imported DXF file.</p> <p>Recognition of spline surface of rotation subtype has been added for DXF versions after 21500 to provide correct translation of all faces.</p>
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Canonical Recognition

26278	<p><i>Summary:</i> Canonical recognition from time to time raises exception on the attached shape.</p> <p>Array boundaries have been corrected to avoid Standard_OutOfRange exception in BspI_SLib and BspI_SLib_Cache on the given shapes. Possible exceptions within ShapeFix_Edge::FixSameParameter() have been eliminated.</p>
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Surfaces from Scattered Points

<p>25763 25764</p>	<p><i>Summary:</i> SSP sample is unable to build the proper surface on the given cloud of points.</p> <p>It has become possible to select any face of the loaded shape as the initial surface.</p> <p>It is also possible to work with periodic surfaces.</p>
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BestFit

<p>26266</p>	<p><i>Summary:</i> Regression in BestFitAPI_Algo: incorrect initialization of BFGS tool.</p> <p>Correct sequence of arguments to math_BFGS constructor has been restored.</p>
<p>26267</p>	<p><i>Summary:</i> Automatic tests for BestFit component.</p> <p>Automatic tests have been implemented for BestFit component.</p>
<p>26349</p>	<p><i>Summary:</i> Implement progress indication for BestFit.</p> <p>Progress indication has been implemented for BestFit algorithm. MFC Progress dialog component has been created.</p>
<p>26368 26386</p>	<p>Incorrect mapping of points with non-null offset on two-sided models.</p> <p>The normal orientation of the shape in the projected point is now taken into account during BestFit calculation. The normal is now calculated in class BestFitAPI_Projector and stored in BestFitAPI_Solution.</p>

Mesh Framework

<p>26309</p>	<p><i>Summary:</i> Porting OMF QT sample to 6.9.0.</p> <p>OMF QT sample now supports use of shaders.</p>
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Mesh Framework Kernel

<p>26169</p>	<p><i>Summary:</i> Create a refiner for any triangulation.</p> <p>New class OMFTools_Refiner provides an algorithm to quickly split each element into several triangle elements for any triangulation to split each link of the triangulation approximately equally.</p>
<p>26170</p>	<p><i>Summary:</i> [BO] Analyse the time performance of the BO.</p> <p>It has become possible to measure the time taken by various Boolean operations.</p>





26227	<p><i>Summary:</i> Update the documentation.</p> <p>The product documentation has been revised to take into account recent changes.</p>
26539	<p><i>Summary:</i> Skip each face with coincident nodes during reading the mesh from any STL file.</p> <p>OMFTools_STLReader has been corrected to skip faces with at least two coincident nodes while reading the mesh from any STL file.</p>

Express Mesh

25053	<p><i>Summary:</i> Express Mesh produces invalid mesh in the apex of a cone.</p> <p>A broken enumeration has been fixed in class QMBgr_QuadNode.</p>
26032 26328	<p><i>Summary:</i> Floating point division by zero in QMBgr_QuadTree::NewNode().</p> <p>The following improvements have been introduced in Express Mesh to avoid floating point division by zero:</p> <ul style="list-style-type: none"> <li>▪ Protection against division by zero in case of "degenerative" segment has been introduced.</li> <li>▪ The exception is not raised if Classifier-&gt;Locate() does not return flag ON when the classification is performed during creation of a new node in method QMBgr_QuadNode::PostProcess.</li> <li>▪ The flag IsNearBoundary is not modified due to exact classification of node during its creation in methods QMBgr_QuadNode::PostProcess() and QMBgr_QuadNode::UpdateNearestNode().</li> <li>▪ Free links and free nodes are avoided wherever possible.</li> </ul>
26277	<p><i>Summary:</i> Express Mesh does not take into account tolerance of vertices of neighboring edges during wire correction.</p> <p>The following improvements have been introduced in classes QMBgr_FacetBuilder and QMTools_wireCorrector:</p> <ul style="list-style-type: none"> <li>▪ Knitting of edges has been permanently enabled in 3d space. The ends of edges are knit in respect to tolerance of their vertices and the discrete model is updated.</li> <li>▪ Additional protection against free nodes that appear during contour collection has been implemented.</li> </ul>
26279	<p><i>Summary:</i> Express Mesh produces mesh with gaps.</p> <p>The class QMBgr_Edge2dTree has been modified to avoid skipping the correct result if the nearest segment touches the point.</p> <p>Additionally, the links of a hole are not taken into consideration during its insertion.</p>





<p>26326</p>	<p><i>Summary:</i> Access violation in Express Mesh on attached shapes in release mode.</p> <p>The following improvements have been introduced in Express Mesh to avoid access violation:</p> <ul style="list-style-type: none"> <li>▪ Standard_ProgramError::Raise is used directly instead of a macro Standard_ProgramError_Raise_if that does nothing in release mode;</li> <li>▪ Access by null pointer in QMBgr_QuadTree::Divide is now avoided;</li> <li>▪ Try-catch protection has been added for QuadTree computation.</li> </ul>
<p>26336</p>	<p><i>Summary:</i> Express Mesh does not resolve loops on wire.</p> <p>The following improvements have been introduced to enhance functionality of QMTools_wireCorrector and resolve loops on wire:</p> <ul style="list-style-type: none"> <li>▪ A vector of pointers to edges has been replaced by an indexed map of pointers in class QMData_wire to check if an edge is present in a wire;</li> <li>▪ Wire loops functionality has been removed from QMTools_wireCorrector;</li> <li>▪ It has become possible to check P-Curves consisting of more than 2 points for intersection;</li> <li>▪ It has become possible to knit P-Curves of neighboring faces corresponding to edges starting and ending the loop;</li> <li>▪ Edges inside a loop can be synchronously removed from wires of neighboring faces.</li> </ul>
<p>26459</p>	<p><i>Summary:</i> QMBgr_FacetBuilder::ConnectThroughBoundary does not check intersection of newly added link with the list of previous links.</p> <p>The following improvements have been introduced in class QMBgr_FacetBuilder:</p> <ul style="list-style-type: none"> <li>▪ Method ConnectThroughBoundary checks intersection of a newly added link with the list of previous links using a temporary edge bounding box tree for identification of intersections between sections of a patch;</li> <li>▪ Methods ComputeArea and IsClosed have become template to allow computing parameters using various containers;</li> <li>▪ Method FindContour allows using links whose end node have been already visited if they do not form a thin loop or do not surround the hole of a face. A map of links has been added to avoid use of edges already added to the contour.</li> </ul>

Advanced Samples

<p>26205</p>	<p><i>Summary:</i> C# wrapper - activate Directors for key classes requiring inheritance.</p> <p>SWIG directors have been activated in C# and Java wrappers, and applied to classes Message_Printer and Message_ProgressIndicator. This allows creating descendants of these classes in the target language (C# or Java), properly defining virtual methods and using them in OCCT interfaces.</p>
<p>26301</p>	<p><i>Summary:</i> kernel_FileDialog dialog in Shape Healer misses some controls.</p> <p>Import menu dialogs in Shape Healer have been fixed to avoid exception on the import menu call.</p>



26318	<p><i>Summary:</i> Problem of rectangle selection in qt OMF sample.</p> <p>Drag and multi-drag selection has been improved in OMF sample.</p>
26345	<p><i>Summary:</i> Shape Healer application crashes trying to run Shape Processing.</p> <p>New method <code>Resource_Manager::GetResourcePath</code> provides full path to the resource file. If the corresponding environment variable is not set or the file does not exist, the method returns an empty string.</p>
26661	<p><i>Summary:</i> C# wrapper improvements</p> <p>The following improvements have been introduced in C# wrapper scripts:</p> <ul style="list-style-type: none"> <li>▪ <code>typemap</code> has been added for correct handling of a rare situation when the reference to a class normally operated by <code>Handle</code> is returned by a function.</li> <li>▪ Classes from <code>TKFeat</code> have been added to wrapper.</li> <li>▪ Batch scripts have been corrected to properly set the environment if they are executed multiple times in the same interpreter.</li> </ul>
26694	<p><i>Summary:</i> C# wrapper sample - License check message should provide more information</p> <p>The error message, which is shown if the license check has failed, now contains product name, workstation ID, and the path to license file.</p>

## Supported Platforms and Pre-requisites

Open CASCADE Technology is supported on Windows (IA-32 and x86-64), Linux (x86-64), Mac OS X (x86-64), Android ARMv7 and x86, and iOS ARMv7 platforms.

The table below lists the product versions used by OCCT and its system requirements.

The most up-to-date information on Supported Platforms and Pre-requisites is available at <http://www.opencascade.org/getocc/require/>.

<b>Linux Operating System</b>	Mandriva 2010, CentOS 5.5, CentOS 6.3, Fedora 18, Ubuntu-1304, Debian 6.0, Debian 7.0*
<b>Windows Operating System</b>	MS Windows 8 / 7 SP1 / Vista SP2 / XP SP3
<b>Mac OS X Operating System</b>	Mac OS X 10.9 Mavericks / 10.8 Mountain Lion / 10.7 Lion / 10.6.8 Snow Leopard
<b>Android Operating System</b>	Android 4.0.2 and above
<b>iOS Operating System</b>	iOS 7
<b>Minimum memory</b>	512 MB, 1 GB recommended
<b>Free disk space</b> (complete installation)	650 MB of disk space, or 1,4 GB if installed with reference documentation
<b>Graphic library</b>	OpenGL 3.3+, OpenGL ES 2.0+
<b>C++</b> <i>For Linux:</i>  <i>For Windows:</i>          <i>For Mac OS X:</i>	GNU gcc 4.0. - 4.7.3.  Microsoft Visual Studio 2005 SP1 with all security updates Microsoft Visual Studio 2008 SP1 Microsoft Visual Studio 2010 SP1** Microsoft Visual Studio 2012 Update 4 Microsoft Visual Studio 2013 Update 2 Intel C++ Composer XE 2013 SP1  XCode 3.2 or newer (4.x is recommended)
<b>TCL</b> (for testing tools) <i>For Linux:</i> <i>For Windows:</i> <i>For OS X:</i>	Tcltk 8.5 or 8.6 <a href="http://www.tcl.tk/software/tcltk/8.6.html">http://www.tcl.tk/software/tcltk/8.6.html</a> ActiveTcl 8.5 or 8.6 <a href="http://www.activestate.com/activetcl/downloads">http://www.activestate.com/activetcl/downloads</a> Built-in Tcl/Tk 8.5
<b>Qt</b> (for demonstration tools)	Qt 4.8.6 <a href="http://qt-project.org/downloads">http://qt-project.org/downloads</a>
<b>FreeType</b> (OCCT Text rendering)	FreeType 2.4.11-2.5.5 <a href="http://sourceforge.net/projects/freetype/files/">http://sourceforge.net/projects/freetype/files/</a>
<b>FreeImage</b> (Support of common graphic formats)	FreeImage 3.17.0 <a href="http://sourceforge.net/projects/freeimage/files/Source%20Distribution/">http://sourceforge.net/projects/freeimage/files/Source%20Distribution/</a>
<b>gl2ps</b> (Export of OCCT viewer contents to vector graphic file)	gl2ps-1.3.8 <a href="http://geuz.org/gl2ps/">http://geuz.org/gl2ps/</a>
<b>TBB</b> (optional tool for multithreaded algorithms)	TBB 3.x or 4.x <a href="http://www.threadingbuildingblocks.org/">http://www.threadingbuildingblocks.org/</a>
<b>Doxygen</b> (optional for building documentation)	Doxygen 1.8.5 <a href="http://www.stack.nl/~dimitri/doxygen/download.html">http://www.stack.nl/~dimitri/doxygen/download.html</a>

- \* Debian 7.0 64 bit is a permanently tested platform.
- \*\* The official release of OCCT for Windows contains libraries built with VC++ 2010 64 bit.

