



Open CASCADE Technology and Products Version 7.2.0

Release Notes

Overview

Open CASCADE Technology and Products version 7.2.0 is a minor release, which includes more than **500** new features, improvements and bug fixes over minor release 7.1.0.



Highlights

Configuration

- ➔ Support of Visual Studio 2017
- ➔ CMake option to accelerate build by use of precompiled headers

Application Framework

- ➔ Dedicated attribute for storage of triangulations
- ➔ Possibility to save OCAF document in XML format compatible with OCCT 6.7+
- ➔ Restored possibility to write shapes in legacy persistence format (CSFDB, ShapeSchema)
- ➔ Support of files greater than 2 GiB in binary persistence

Modeling

- ➔ Optimization of surface intersection and other algorithms
- ➔ Specialized offset algorithm for smooth shells
- ➔ Proper setting of regularity on edges connecting smooth surfaces (e.g. seam edges)
- ➔ New algorithm `BOPAI go_Splitter` allowing to split shapes by intersection with others
- ➔ New option “Glue” in the family of Boolean algorithms
- ➔ New Error/Warning reporting system in Boolean Operations component

Visualization

- ➔ Order-independent transparency within rasterization rendering
- ➔ Extended features of color scale presentation
- ➔ Possibility to customize display of hatching and selection highlight
- ➔ Multiple improvements in Path Tracing engine
- ➔ Option for efficient display on high-density screens with low-end graphic cards

Data Exchange

- ➔ Support of annotations, saved views and clipping planes in XDE and STEP
- ➔ Optimized update of assemblies in XDE
- ➔ Support of PMI data without semantics in STEP import and export
- ➔ Support of transparency as part of color specification in XDE
- ➔ Refactored and optimized STL read / write module

Test system

- ➔ Possibility to add custom counters
- ➔ Interface to connect DRAW interpreter to user applications

Samples

- ➔ New sample for usage of 3D Viewer on iOS





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New features

Support of applications using old persistence (ShapeSchema)

The possibility to read and write shapes in old format implemented by `Storage_ShapeSchema` component in OCCT 6.9.1 and earlier has been restored in OCCT 7.2.0.

The restored functionality is provided by package `StdStorage`. `DRAW` commands `fsdread` and `fsdwri te` can be consulted as example of its usage.

See Upgrade Guide for more details and code samples.

Precompiled headers

The option to use precompiled headers for faster building is provided in CMake scripts. It is disabled by default; set CMake flag `BUILD_USE_PCH` to enable it.

Use of precompiled headers allows reducing compile time of OCCT by 20-40% depending on the compiler and hardware configuration. Note however that it also leads to considerable increase of the size of intermediate files created by compiler during the build (requiring additional 1.5-2 GiB of disk space).

Gluing operation

The Gluing mode is a new option for the algorithms in Boolean Component, such as General Fuse, Boolean, Section, Volume Maker and Cells Builder operations. This option has been designed to speed up the computation of the intersection part of the algorithms for the special cases where the arguments do not really interfere with each other, but are just touching or overlapping.

This option is intended for cases when faces of arguments do not intersect each other, but can be only touching or overlapping. Using the glue option allows skipping Face-Face intersections, one of the most time-consuming steps.

The Gluing option supports two modes of work:

- Shapes with partial coincidence. In this mode the algorithm skips Face-Face intersections.
- Shapes with full coincidence. In this mode the algorithm skips also Vertex-Face and Edge-Face interferences. The faces in this case will not be split in the result. Using this mode allows getting the most performance gain.

In some cases Gluing allows not only saving up to 90% of time but also avoiding errors in computation of intersections of tangential faces and thus improving the robustness of the algorithms.

The Gluing option has been implemented as `BOPAI go_Gl ueEnum` enumeration with the following:

- `BOPAI go_Gl ueOff` - default value for the algorithms, Gluing is switched off;
- `BOPAI go_Gl ueShi ft` - Glue option for shapes with partial coincidence (shifted shapes);
- `BOPAI go_Gl ueFul l` - Glue option for shapes with full coincidence.

To set the Gluing option for the operation it is necessary to call the method `SetGl ue(BOPAI go_Gl ueEnum)` with the needed value.

Splitting operation

The new algorithm `BOPAI go_Spl i t t e r` based on General fuse operation has been added in OCCT. The algorithm is useful when it is needed to split the group of shapes (Objects) by the other group of shapes (Tools). The algorithm will intersect and split all input shapes, but only the split parts of the shapes from the first group will be added to the result.

All options of the General Fuse, such as parallel processing mode, fuzzy mode, safe processing mode, gluing mode and history support are also available in the Splitter algorithm.



Dedicated offset algorithm for smooth shells

New algorithm to create offsets of smooth shells works in the assumption that the shell is smooth and well connected, and the offset distance is less than curvature at any point, hence the resulting offset shell has the same topology as the input one. When this condition is satisfied, the new algorithm is more robust and works faster than the default algorithm (that tries to handle possible changes of topology).

This option is available in class `BRepOffsetAPI_MakeOffsetShape` as new method `PerformBySimple()`; previously existing algorithm is available as method `PerformByJoin()`.

Improved handling of translucent objects in 3D Viewer

There are two key changes:

- Weighted Blended Order-Independent Transparency (OIT) algorithm has been implemented. Activation of the algorithm is controlled by the flag `Graphic3d_RenderingParams::TransparencyMethod`, which can be set to `Graphic3d_RTM_BLEND_OIT`.
- The viewer now automatically postpones translucent presentations to be rendered right after opaque presentations. This means, that there is no more need to manage presentation priority at application level for proper rendering of such presentations, and moreover it is now possible to combine transparent and opaque presentation groups within a single interactive object.

Weighted Blended Order-Independent Transparency algorithm eliminates most obvious artifacts of order-dependent transparency rendering approach, when blending result depends on the rendering order of transparent triangles and fragments (i.e. not just on order of objects).

Note that, while this algorithm allows getting rid of common artifacts caused by different order of display of transparent objects and their parts (individual triangles and even fragments), the resulting presentation is not correct in the sense that it does not depend on the order of displayed objects at all.

Still, this algorithm is a nice compromise between order-dependent blending (producing artifacts) and other more computationally intensive OIT algorithms (Depth Peeling, OIT using Linked Lists). Weighted Blended Order-Independent Transparency algorithm is also available for mobile hardware (OpenGL ES 3.2+).



Figure 1: Usual order-dependent transparency - see triangle artifacts



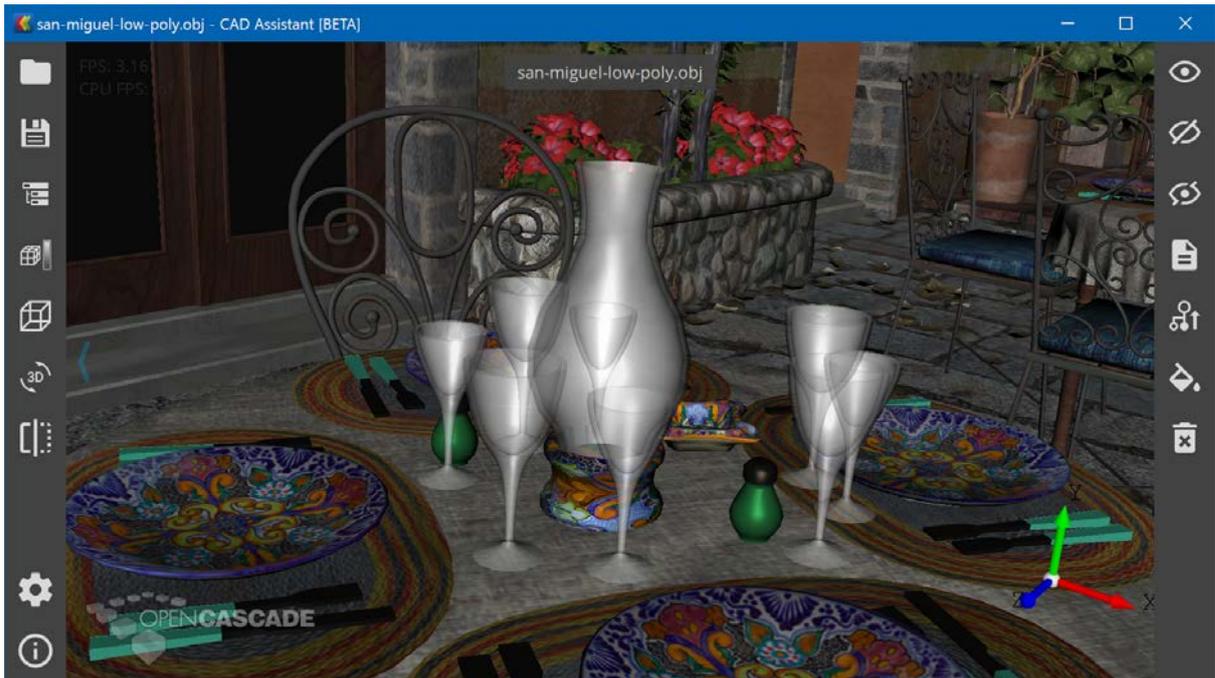


Figure 2: Weighted blended order-independent transparency

Video recording with FFmpeg

New class `Image_VideoRecorder` has been introduced within `TKService` toolkit. This tool allows saving image sequence in a video file using FFmpeg framework - the leading open source cross-platform solution for encoding and decoding video: <https://ffmpeg.org/>.

New dependency of `TKService` from FFmpeg is optional. Application distributors should pay attention to the license (FFmpeg can be configured under different license terms - including LGPL and GPL-only) and other intellectual property issues in countries with law allowing patenting algorithms.

Draw Harness command `animation` has been extended with an option `-record` saving predefined 3D Viewer animation into video file (no live capturing is provided yet).

Inspector

New Qt-based Inspector library provides functionality to interactively inspect low-level content of the OCAF data model, OCCT viewer and Modeling Data. This component is intended as debugging tool for developers of OCCT based applications, as effective means to analyze situations that occur in their applications.

The Inspector can be used in three variants:

- As standalone application `TIInspectorEXE` it allows loading arbitrary OCAF data file (in cbf, xml, or xbf format), BREP, or STEP file, and inspecting the internal structure of the contained data model and/or shape.
- An instance of the tool can be launched on demand as a plug-in attached to the OCCT-based application providing introspection to the current state of the application data model and viewer.
- There is a new `INSPECTOR` plugin to be loaded in `DRAW` (on Windows platform only). It contains command `tiinspector` allowing starting and configuring the Inspector attached to `DRAW` internal data model.





Currently three plugins are provided.

DFBrowser allows to:

- process all types of OCAF document formats: Bin, Xml, XCAF.
- show content of OCAF in tree view;
- show properties of OCAF attributes. (For the moment it covers about 75% of all OCCT attributes);
- provide search of Label (by entry) and Attribute (by type name);
- highlight reference for referencing- attributes in the tree view;
- create and visualize presentation for shape stored in attribute in 3D View;
- export shape of attribute into BREP or ShapeView (will be described below) plugin;
- show result of the Dump method of Label and Attribute in text view;
- show path to selected tree view item in navigation line with possibility to go to Previous/Next selected item;
- design and implement own attribute property panel content for a custom attribute.

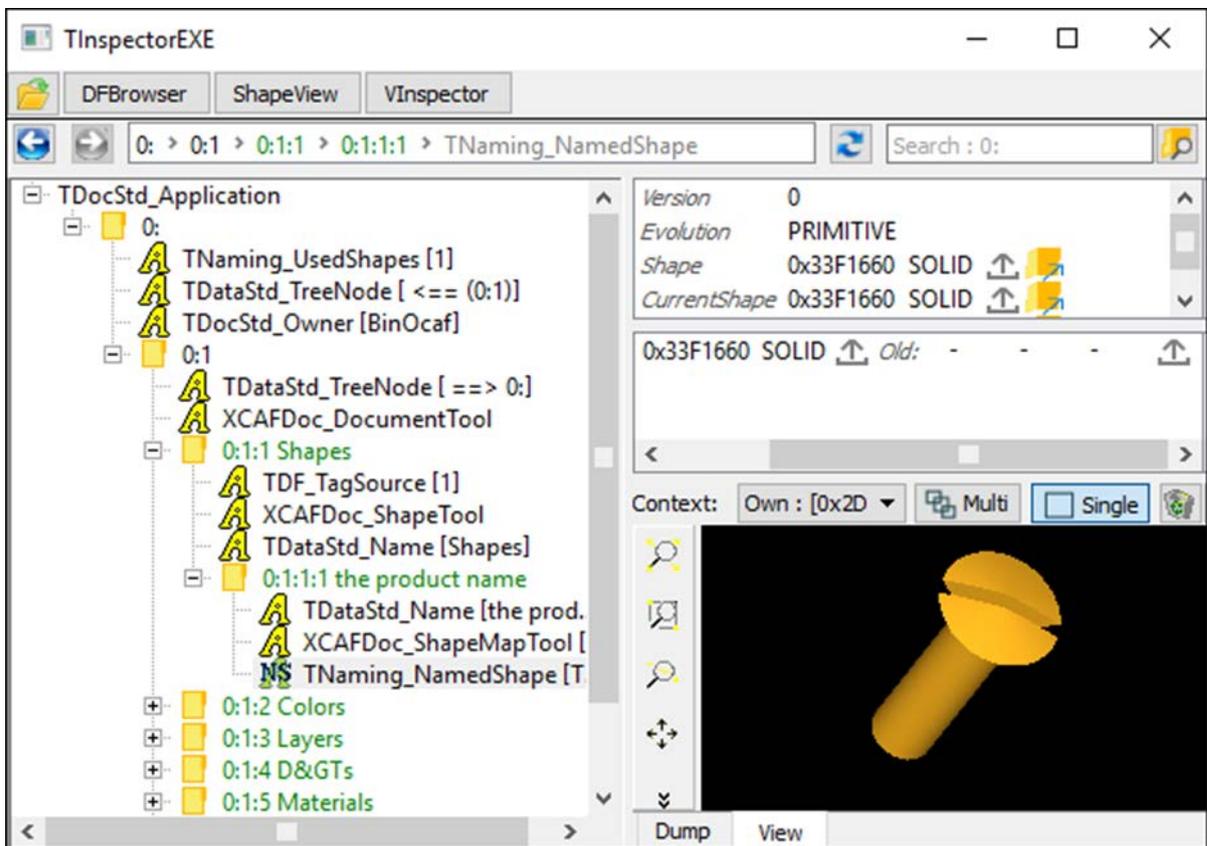


Figure 3: DFBrowser plugin





VInspector allows to:

- show list of presentations in AIS_InteractiveContext in tree view;
- show some properties of presentations;
- show selection entities of presentation and properties of the entities;
- select/deselect presentations or entities in the context using corresponding buttons;
- show the current selection in context through highlight the corresponding entities in the tree view.

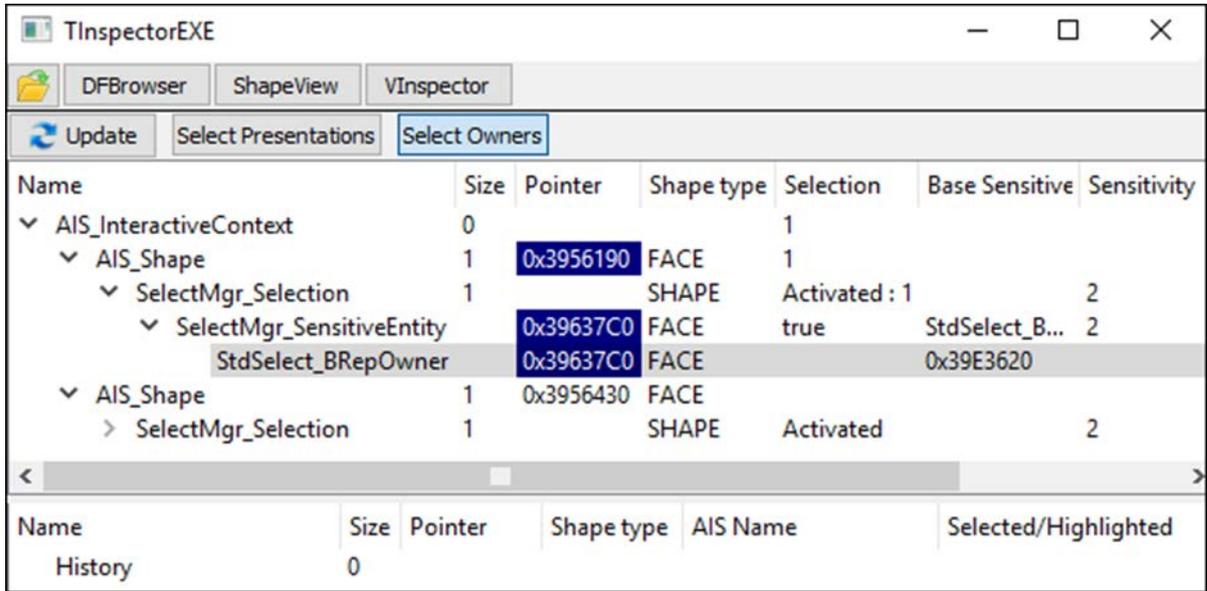


Figure 4: VInspector plugin

ShapeView allows to:

- show TopoDS_Shape component sub-shapes;
- show some properties of shape component (e.g. length for Edge, coordinates for Vertex);
- visualize each shape in View by selection it in tree view;
- export shape of selected item to BREP file.

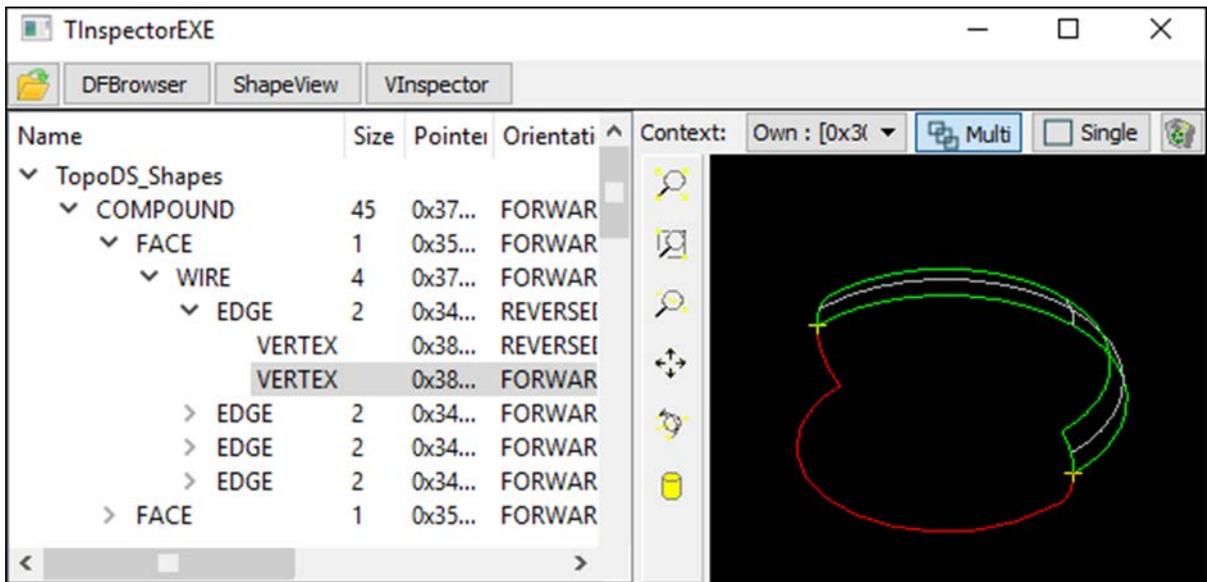


Figure 5: ShapeView plugin

Building of Inspector is disabled by default; set flag BUILD_Inspector in CMake to build it.





Modifications

Foundation Classes

26937	<p><i>Summary:</i> Eliminate <code>NO_CXX_EXCEPTION</code> macro support.</p> <p>The following modifications have been introduced in exception handling mechanism:</p> <ul style="list-style-type: none"> ▪ Macro <code>NO_CXX_EXCEPTION</code> removed from OCCT code. ▪ Method <code>Raise()</code> replaced by explicit throw statement. ▪ Method <code>Standard_Failure::Caught()</code> replaced by normal C++ mechanism of exception transfer. ▪ Method <code>Standard_Failure::Caught()</code> became deprecated. ▪ Empty method <code>NCollection_Map::ChangeValue</code> eliminated. ▪ Non-operable methods from <code>NCollection</code> classes removed.
27345	<p><i>Summary:</i> <code>OSD_Environment</code> - use consistent way to retrieve environment variable value on Windows.</p> <p><code>OSD_Environment::Value()</code> now uses <code>GetEnvironmentVariableW()</code> instead of <code>_wgetenv()</code>, which might provide an outdated variable value cached by C runtime library.</p>
28184 28355	<p><i>Summary:</i> Stating wrong parent class in <code>DEFINE_STANDARD_RTTIEXT</code> is not recognized during compilation.</p> <p>Compile-time checks (<code>static_assert</code>) have been added in <code>DEFINE_STANDARD_RTTI*(A, B)</code> macros to check that A is actually the class being defined, and B is its base class.</p> <p>For GCC compiler version 4.7 and later on, the check ensures that B is the direct base class of A.</p>
28186	<p><i>Summary:</i> <code>NCollection_List</code> - methods <code>Remove</code> and <code>Contains</code> prevent template usage.</p> <p>Methods <code>NCollection_List::Remove()</code> and <code>NCollection_List::Contains()</code> are now defined as template methods to allow using this class with types without equality operator.</p>
28217	<p><i>Summary:</i> Error handling is not thread safe and causing memory corruption and sporadic crashes.</p> <p>Static variable holding handle to the last raised exception has become thread-local on compilers that support C++11 keyword <code>thread_local</code> (MSVC 14+, GCC 4.8+, ICC 14+, CLang).</p>
28240	<p><i>Summary:</i> Avoid redundant search for span index in evaluation of BSpline cache.</p> <p>The search for span index of BSpline is now avoided during BSpline evaluation in the cases when this index is already available</p>





28368	<p><i>Summary:</i> TKMath, BVH - Fix invalid tree height in QBVH.</p> <p>Two different and incompatible implementations are now provided in BVH_BinaryTree for 2- and 4-ary trees, since these trees are very different in usage. 4-ary tree is always produced from 2-ary tree, and is read-only. Virtual functions are avoided for performance reasons.</p>
28391	<p><i>Summary:</i> OSD_Directory returns incorrect protection flags for shared directory on Windows.</p> <p>Folder reading flags are now redirected to file reading flags if the former are not found.</p>
28470 28796	<p><i>Summary:</i> NCollection_Array1 – add Resize() method for re-allocating array with new limits.</p> <p>New method NCollection_Array1::Resize() re-allocates array to new bounds.</p>
28478	<p><i>Summary:</i> Scope names are swallowed in Message_ProgressSentry constructors.</p> <p>Update of Draw_ProgressIndicator is now based on achieved total progress (1% by default) instead of elapsed time since the last update.</p> <p>Method OSD_Chronometer::Restart() now actually resets the counter.</p> <p>DRAW command readstl shows progress indicator if configured (by command XProgress).</p>
28550	<p><i>Summary:</i> Fix empty message passed to thrown exception.</p> <p>Meaningful string messages are provided for all exceptions thrown in OCCT code.</p>
28657	<p><i>Summary:</i> OSD_Thread does not release thread resources on non-Windows platforms.</p> <p>Methods ~OSD_Thread(), OSD_Thread::SetFunction() and OSD_Thread::Run() now release thread resources on platforms using pthreads.</p> <p>OSD_Thread::Wait() now closes thread handle after joining.</p>
28673	<p><i>Summary:</i> Draw command getsourcefile returns different output on Linux and Windows platforms.</p> <p>The method Draw_Interpreter::add() has been corrected to let the command getsourcefile return the relative path starting with "src" without leading "/" on all platforms.</p>
28679	<p><i>Summary:</i> OSD_Process::UserName raises EXC_BAD_ACCESS on iPhone simulator.</p> <p>Check for a null pointer is added in OSD_Process::UserName().</p>
28923	<p><i>Summary:</i> Message_Messenger::Send() implementation is not thread-safe.</p> <p>Messenger classes now use Message_SequenceOfPrinters::Iterator instead of accessing sequence elements by index.</p>





Application Framework

25536	<p><i>Summary:</i> Xml MDataXtd_GeometryDriver doesn't support TDataXtd_SPLINE, TDataXtd_PLANE and TDataXtd_CYLINDER.</p> <p>Support of missing geometrical types has been added into the XML driver.</p>
25537	<p><i>Summary:</i> Xml MPrsStd_Positi onDri ver: : Paste runtime check crash.</p> <p>The size of buffer in array of char in methods Paste from Xml MDataXtd_Positi onDri ver and Xml MXCAFDoc_Centroi dDri ver has been increased to fit the largest possible conversion from 'double' to %. 17g string.</p>
26007	<p><i>Summary:</i> Standard attribute for surface meshes in TDataStd.</p> <p>New standard OCAF attribute TDataXtd_Tri angul ation, allowing storage of surface meshes in OCAF document, has been implemented.</p>
27585	<p><i>Summary:</i> It is not possible to store OCAF documents to paths with special characters in their names.</p> <p>Improper conversion from UTF-16 string has been fixed in TCollecti on_Asci iStri ng.</p>
27667	<p><i>Summary:</i> OCAF binary persistence hangs on reading truncated CBF file.</p> <p>The check on "end of file" has been added to the CBF file reader.</p>
27970 28446	<p><i>Summary:</i> Improvement of standard attributes usability – containers.</p> <p>It has now become possible to set on the same label more than one Attribute of the same type. The GUID identifying the attribute is kept as internal field.</p>
28058	<p><i>Summary:</i> TObj _Obj ect: : Cl one() does not copy TagSource attributes of children of second level.</p> <p>Handling of children objects located on sub-labels of the main child label has been enabled in method CopyChi ldren(). TagSource attributes for such children are copied in method Cl one().</p>
28314	<p><i>Summary:</i> Display mode is not saved within XML OCAF document.</p> <p>The procedure for storage and retrieval of display mode in XML file format has been fixed. Commands DPrsStd_AI SMode and DPrsStd_AI SSe l Mode, which manipulate the display and selection mode, have been implemented.</p>
28425	<p><i>Summary:</i> Open/save NamedShape changes order of shapes.</p> <p>The order of shapes at reading from bin and xml documents has been corrected in Bi nMNamei ng_NamedShapeDri ver and Xml MNamei ng_NamedShapeDri ver.</p>
28463	<p><i>Summary:</i> OCAF loses an interactive object after copying.</p> <p>The attribute TPrsStd_AI SPresentati on preserves interactive object after copying.</p>





28564	<p><i>Summary:</i> Support of applications using old persistence (ShapeSchema).</p> <p>Problems with support of old persistent data using FSD_File storage driver have been fixed. Persistence compatible with the legacy format has been restored for shapes:</p> <ul style="list-style-type: none"> ▪ Storage read / write wrapper has been implemented; ▪ DRAW commands to read / write files have been added;
28616	<p><i>Summary:</i> TNaming - DELETE evolution is not considered by TNaming_NewShapeIterator.</p> <p>Method TNaming_Builder::Delete has been fixed to consider DELETE evolution.</p>
28691	<p><i>Summary:</i> Storage of OCAF documents in XML file format in old document version.</p> <p>It is now possible to save the documents in older versions of OCCT to allow the applications based on them to read documents saved by a newer version of the application. For the moment only OCCT v.6.7.0 is supported.</p>
28714	<p><i>Summary:</i> Dimension of TDataStd_Real is not serialized to document</p> <p>XmlObjMgt.cxx has been modified to pass zero-tags as correct during checking of saved/retrieved tags in XML format.</p>
28736	<p><i>Summary:</i> An error to read a binary OCAF document of > 2Gb.</p> <p>The type for keeping file position within the document file on disk has been extended in FSD_BinaryFile to uint64_t. This allows supporting files greater than 2 GiB in binary persistence</p>
28842	<p><i>Summary:</i> Attribute TNaming_NamedShape is not restored from .sgd document.</p> <p>ShapePersistent_BRep.cxx has been fixed to avoid operations on null object.</p>
28852	<p><i>Summary:</i> TDF_AttributeIterator should not be marked as "handle with care".</p> <p>The usage of TDF_AttributeIterator class has been explained in comments.</p>
28853	<p><i>Summary:</i> TDF_AttributeIterator should give handles instead of pointers.</p> <p>TDF_AttributeIterator::Value method now returns Handle (instead of pointer) to unify public interfaces.</p>
28862	<p><i>Summary:</i> Unification of empty labels saving procedure.</p> <p>Improved TDocStd_Document allows saving empty labels to a persistent document.</p>
28908 28946 28973	<p><i>Summary:</i> Improvement on attachment of attributes to the label.</p> <p>The order of attributes in the label is now synchronized on copying, which can be important for presentation attributes, for example.</p>
28972	<p><i>Summary:</i> A useless message is printed on copying of data in OCAF.</p> <p>Message SAME Data has ceased to be printed in the console window if data copying is performed within the same document.</p>





Modeling Data

<p>26682</p>	<p><i>Summary:</i> <code>TopExp::MapShapesAndAncestors()</code> will build map with duplicated ancestors.</p> <p>The new method <code>TopExp::MapShapesAndUniqueAncestors</code> excludes duplication of ancestors in the list items. The optional Boolean argument <code>useOrientation</code> of this method indicates whether two same shapes with different orientation will be considered equal.</p> <p><code>MapShapesAndAncestors</code> has been replaced with <code>MapShapesAndUniqueAncestors</code> in relevant places throughout OCCT code.</p>
<p>28204</p>	<p><i>Summary:</i> <code>TopTools_ShapeSet::Dump()</code> does not show flag <code>Locked</code>.</p> <p>Command <code>dump</code> has been corrected to show flag <code>Locked</code> for shapes in <code>DRAW</code>.</p>
<p>28230</p>	<p><i>Summary:</i> Convert C0 2d curve to C1 raises exception.</p> <p>The treatment of small curves (length of curves is less than tolerance used for checking G1) has been added in <code>Geom2dConvert_CompCurveToBSplineCurve.cxx</code></p>
<p>28327</p>	<p><i>Summary:</i> <code>BSplCLib</code> can cause memory corruption in degenerated cases.</p> <p>The code of methods <code>BSplCLib::KnotForm</code> and <code>BSplCLib::MultForm</code> has been made safe by giving up using of address of array item for iteration on the <code>Array1</code>. The check has been added for degenerated case to prevent out of bounds exception.</p>
<p>28707</p>	<p><i>Summary:</i> Simplify type <code>BRepTools_ReShape</code>.</p> <p>Type <code>BRepTools_ReShape</code> has been simplified:</p> <ul style="list-style-type: none"> ▪ Unused processing of shapes different only in orientation has been removed; ▪ Method <code>Apply</code> with the build mode parameter has been moved to type <code>ShapeBuild_ReShape</code> as it is used only through the last type.
<p>28708 28709 28710</p>	<p><i>Summary:</i> Create a mechanism to serve shape history in a common way for algorithms accepting and producing shapes.</p> <p>Shape history mechanism has been implemented in the new class <code>BRepTools_History</code>. It supports history for shapes with types 'vertex', 'edge', 'face' and 'solid' and allows defining relations 'generated', 'modified' and 'removed' between the accepted and the produced shapes. It provides algorithm to merge two histories of sequentially applied algorithms. It is positioned as a replacement of widely used history methods <code>Generated</code>, <code>Modified</code>, <code>IsDeleted</code>.</p> <p>Type <code>BRepTools_ReShape</code> has been extended to support the <code>BRepTools_History</code> and correctly merge history of several shapes merged to a single one.</p> <p><code>BRepTools_History</code> history has been implemented for algorithm <code>ShapeUpgrade_UnifySameDomain</code>. The history of changes in the initial shape now considers all shapes created by the algorithm as modified instead of generated shapes.</p> <ul style="list-style-type: none"> ▪ to get the modified shapes, use <code>History()->Modified()</code> ▪ to check whether the shape has been deleted, use <code>History()->IsRemoved()</code>.





Modeling Algorithms

<p>24094 28491</p>	<p><i>Summary:</i> Incomplete section curve.</p> <p>The method <code>IntTools_Context::IsValidBlockForFaces()</code> now avoids checking if the intersection curve lies in a face (with some tolerance), if there is a 2D-intersection curve on this face. It is considered that the necessary tolerance has been computed in intersection algorithm honestly). If there is no 2D-curve on this face, then the check is done as before.</p>
<p>25730 28112 28131</p>	<p><i>Summary:</i> <code>BRepOffset_MakeOffset</code> cannot create offset with a face which created by filling 3 bspline curve.</p> <p>Methods <code>D0</code>, <code>D1</code>, <code>D2</code>, <code>D3</code> and <code>DN</code> from class <code>GeomEvaluator_OffsetSurface</code> have been extended to compensate failure of normal calculation in singular points on triangular BSpline surfaces.</p> <p>In case of failure of normal calculation from derivatives (when all derivatives are null or parallel) the probing point is shifted by iterative movement towards middle of the surface.</p>
<p>26150</p>	<p><i>Summary:</i> <code>BRepOffsetAPI_ThruSections</code> doesn't implement history method <code>Generated()</code>.</p> <p>Virtual method <code>BRepOffsetAPI_ThruSections::Generated</code> has been redefined. Now it returns:</p> <ul style="list-style-type: none"> ▪ a chain of generated faces for sub-edge of a profile; ▪ a chain of generated edges for sub-vertex of a profile; ▪ chains of generated edges for start or end vertex if it is a degenerated section.
<p>26745 26748 27221 27252 28210</p>	<p><i>Summary:</i> Implicit-implicit intersection (Cylinder-Plane) loses intersection curve.</p> <p>The algorithm of <code>IntPatch_Points</code> searching has become more precise. The previously found vertices are refined by minimizing the distance between the boundary of one intersection argument and the surface of another intersection argument.</p> <p>This allows significantly improving the robustness of Cylinder-Plane intersection.</p>
<p>26874</p>	<p><i>Summary:</i> Implementation of the Splitter operator in OCCT.</p> <p>New operation implemented in class <code>BOPAlgo_Splitter</code> allows splitting an arbitrary number of shapes of an arbitrary dimension by other arbitrary shapes. The API operator <code>Splitter</code> has been implemented in class <code>BRepAlgoAPI_Splitter</code>.</p> <p>The corresponding Draw commands <code>bsplit</code> (using <code>BOPAlgo_Splitter</code>) and <code>bapi split</code> (using <code>BRepAlgoAPI_Splitter</code>) should be used after Pave Filler is filled.</p>
<p>27079 28802</p>	<p><i>Summary:</i> Bad approximation of intersection curves with variable curvature.</p> <p>New method <code>ApproxInt_MultiLine::MakeMLOneMorePoint</code> builds a new sub-line as a part of the main line adding a new point in the middle of the longest interval between existing points.</p> <p>Method <code>ShapeConstruct_ProjectCurveOnSurface::ApproxPCurve</code> now checks if the set of initial points is close enough to each other to keep the interval between two adjacent points less than a half-period of the surface.</p>





<p>27182</p>	<p><i>Summary:</i> Wrong result of General Fuse operation for two spheres.</p> <p>The static method <code>BOPTools_AlgoTools::MinStep3D()</code> now checks if the computed 3D step is too big (relatively to UV range of the faces) for any face.</p> <p>The method <code>BOPTools_AlgoTools3D::PointInFace()</code> now allows looking for the point inside the face in the necessary direction and distance from the edge of the face.</p> <p>Methods for finding points near edges and computing normal directions on faces now return error status (0 in case of success).</p>
<p>27383</p>	<p><i>Summary:</i> Modelling – improve handling of regularity on edges.</p> <p>Calculation of all possible continuity types has been implemented for shared edges:</p> <ul style="list-style-type: none"> ▪ G1 is set if tangential planes are the same for connected faces in each control points through the edge; ▪ C1 is set in addition to G1 conditions if derivatives, orthogonal to the edge on each face, are equal vectors; ▪ G2 is set in addition to G1 if the centers of principal curvatures are the same for connected faces in each control points through the edge; ▪ C2 is set in addition to C1 and G2 if directions of principal curvatures are equal; ▪ CN continuity is set only if both connected faces are based on elementary surfaces (the conditions for this case are similar to C2 continuity). <p>Additionally:</p> <ul style="list-style-type: none"> ▪ <code>ShapeFix::EncodeRegularity()</code> is merged into <code>BRepLib::EncodeRegularity()</code>. ▪ Incorrect usage of <code>BRepLib::EncodeRegularity()</code> in <code>BRepBuilderAPI_Sewing</code> has been fixed. ▪ New method <code>EdgeRegularity()</code> calculates regularity on the given list of edges.
<p>27434</p>	<p><i>Summary:</i> Wrong result of classification of the point in "infinity".</p> <p>New method <code>BRepTools::UVBounds()</code> checks whether the point is inside the bounding box</p>
<p>27674</p>	<p><i>Summary:</i> <code>BRepOffsetAPI_ThruSections</code> make invalid shape if sections are connected at ends.</p> <p><code>BRepFill_Generator</code> has been fixed to make the edge created between same vertexes degenerated and without 3d curve.</p>
<p>27753 28261 28266</p>	<p><i>Summary:</i> Nearly plane cones should not be created by <code>BRepPrimAPI_MakeRevol</code>.</p> <p>Method <code>GeomAdaptor_SurfaceOfRevolUtilon::GetType()</code> has been modified to create a plane instead of Cone or <code>SurfaceOfRevolUtilon</code> for a "plane-like" object (within <code>Precision::Confusion()</code>).</p> <p>For infinite objects Cone with <code>semi angle = PI/2 - eps</code> is replaced by <code>SurfaceOfRevolUtilon</code> for <code>eps < Precision::Confusion()</code>.</p>





27878	<p><i>Summary:</i> Development of the Gluing operations based on the new Boolean component.</p> <p>The Gluing operation is a new additional option for the algorithms in the Boolean Component such as General Fuse, Boolean operations, Section operation, Maker Volume and Cells Builder algorithms.</p> <p>The Gluing options have been designed to speed up the computation of the interference among arguments of the operations on special cases, in which the arguments may be overlapping but do not have real intersections between their sub-shapes.</p> <p>This option cannot be used on the shapes having real intersections, such as intersection vertex between edges, or intersection vertex between edge and a face or intersection line between faces.</p> <p>The Gluing option is an enumeration implemented in <code>BOPAlgo_GlueEnum.hxx</code>. There are the following items:</p> <ul style="list-style-type: none"> ▪ <code>BOPAlgo_GlueOff</code> – default value for the algorithms, Gluing is switched off; ▪ <code>BOPAlgo_GlueShi ft</code> – glue option for shapes with partial coincidence; ▪ <code>BOPAlgo_GlueFul l</code> – glue option for shapes with full coincidence. <p>To set the Gluing options for the algorithm it is only necessary to call <code>SetGlue()</code> method with the appropriate <code>Glue</code> value.</p> <p>The corresponding DRAW command <code>bglue</code> has been implemented to set this parameter as global option:</p> <ul style="list-style-type: none"> ▪ 0 – default value, Gluing is off; ▪ 1 – for partial coincidence; ▪ 2 – for full coincidence
27954	<p><i>Summary:</i> Create topology-preserving offset computation algorithm.</p> <p>New option to make offset of smooth shells in faster and more robust way is available in the class <code>BRepOffsetAPI_MakeOffsetShape</code> as new method <code>PerformBySi mple()</code>. Previously existing offset algorithm is available as method <code>PerformByJoi n()</code>. Constructor with parameters, calling the latter algorithm at construction time, is declared as deprecated.</p>
27981	<p><i>Summary:</i> <code>BRepExtrema_Di stShapeShape</code> returns not null distance on interfered shapes.</p> <p>The number of sampling points on surfaces, which are used by algorithm searching roots, has been increased in <code>Extrema_ExtSS</code> to improve its results.</p>
27998	<p><i>Summary:</i> Self-intersection is not detected.</p> <p>New method <code>BOPAlgo_CheckerSI::CheckFaceSel fIntersection</code> finds the self-intersection of each face as well as pairs of intersecting faces.</p> <p>Method <code>IntPatch_Intersection::Perform(S1, D1, Tol Arc, Tol Tang)</code> provides more effective search of self-intersections in case of Surface Of Extrusion.</p> <p>Method <code>IntCurve_IntPol yPol yGen::Perform(C1, D1, Tol Conf, Tol, NbI ter)</code> now detects segments of intersections.</p>





<p>28017</p>	<p><i>Summary:</i> Unexpected result of General Fuse operation.</p> <p>The following improvements have been made in Boolean Operations:</p> <ul style="list-style-type: none"> ▪ Empty edge-edge interference is created if the intersection is close to an end vertex. This will help to avoid creation of unnecessary edge-face intersections. ▪ The method <code>PutPaveOnCurve()</code> joins nearly located vertices when they are put on the same section curve. ▪ Processing of same-domain vertices for section edges has been added in <code>UpdatePaveBlocks()</code> method. ▪ The method <code>CorrectWires()</code> has been improved to avoid increasing vertex tolerance if it will cover the major part of an edge. ▪ Vertices of section edges have been replaced by same-domain equivalents. ▪ Angles computation and evaluation has been corrected in the algorithm <code>BOPAlgo_WireSplitter</code> – now it takes into account periodicity. ▪ <code>PostTreatFF</code> has been modified to properly take into account the orientations of coinciding section edges. ▪ Method <code>IntTools_Context::ComputePE</code> now checks the distance from the point to vertices of the edge, if the projection to the curve fails. <p>Porting notes:</p> <ul style="list-style-type: none"> ▪ Modify <code>BopAlgo_PaveFiller</code> so that each interference refers to the new vertex that will hit in the result on output (same-domain of the initial new vertex). ▪ Make the method <code>BOPDS_DS::Index()</code> return a valid index for new shapes.
<p>28163</p>	<p><i>Summary:</i> 3D Offset algorithm produces incorrect result on attached shape in mode Complete Intersection.</p> <p>The building of the lists of intersection faces connected to the same vertex has been corrected in <code>BRepOffset_Inter3d::ConnexIntByInt</code>. Usage of edges with the same origins as invalid ones is avoided in cases with only one invalid face.</p>
<p>28165</p>	<p><i>Summary:</i> Improve performance of Boolean Operations.</p> <p>The usage of the <code>BRepAdaptor_Surface</code> in Boolean Operations algorithm has been unified. The new method <code>IntTools_Context::SurfaceAdaptor(const TopoDS_Face&)</code> initializes the adaptor only once for each face when necessary and stores it in <code>Context</code>.</p> <p>To provide the possibility to take the <code>Adaptor</code> from the context, the context has been added as a parameter in methods <code>BOPTools_AlgoTools3D::GetNormalToFaceOnEdge</code>; <code>MakePCurve()</code> and <code>Sence()</code> from <code>BOPTools_AlgoTools</code>; <code>BuildPCurveForEdgeOnFace()</code>, <code>PointOnSurface</code>, <code>CurveOnSurface</code>, <code>AdjustPCurveOnFace</code>, <code>Make2D</code> and <code>MakePCurveOnFace</code> from <code>BOPTools_AlgoTools2D</code>.</p> <p>It is also possible to pass the context into <code>BOPAlgo_WireSplitter</code> algorithm.</p> <p>The new method <code>IntTools_Context::UVBounds(const TopoDS_Face&)</code> has been implemented to get the UV bounds of a face. Additionally, a reduced intersection range is calculated during computation of Edge/Face interference only for the intersection type VERTEX.</p> <p>The methods <code>IntTools_EdgeFace::Prepare()</code> and <code>IntTools_EdgeFace::FindProjectableRoot()</code> as well as fields <code>IntTools_EdgeFace::myProjectableRanges</code> and <code>IntTools_EdgeFace::myFClass2d</code> have been removed as obsolete.</p>





<p>28175 28183</p>	<p><i>Summary:</i> Bad result of curve-curve extrema.</p> <p>The algorithm finding extrema between curves now produces correct results even when the solution is located near bounds.</p> <ul style="list-style-type: none"> Class <code>math_GlobOptMin</code> has been improved to use lower order methods of local optimization when high-order methods fail. Support of conditional optimization (in bounds) has been added in classes <code>math_BFGS</code> and <code>math_BracketMinimum</code>. Conditional optimization is turned on in case of usage of <code>math_BFGS</code> in class <code>math_GlobOptMin</code>. The mistake in <code>distmini</code> command, which caused incorrect reading of deflection parameter, has been corrected. Initialization of fields in the class <code>math_BracketMinimum</code> avoids possible FPE signals. It is now taken into account in algorithms <code>math_BFGS</code>, <code>math_Powell</code> and <code>math_FRPR</code> that the function <code>math_MultipleVarFunction</code> can return failure status (e.g. when computing D0 out of bounds). <p><code>SetSingleSolutionFlag</code> is disabled when calling algorithm of curve-curve Extrema. Now <code>DistShapeShape</code> will find all solutions, even if they are located on the same pair of edges.</p>
<p>28187</p>	<p><i>Summary:</i> Add possibility to avoid creation of Internal parts in the result of Volume maker algorithm.</p> <p>The possibility to prevent addition of internal parts has been added into the following algorithms:</p> <ul style="list-style-type: none"> <code>BOPAI go_BuilderFace</code>; <code>BOPAI go_BuilderSolid</code>; <code>BOPAI go_MakerVolume</code>. <p>Setting the option to avoid internal parts for <code>MakerVolume</code> algorithm guarantees that the result solids will be manifold and not contain any internal parts, but it does not prevent the occurrence of internal edges or vertices in faces.</p> <p><code>Set/Get</code> methods of the <code>BOPAI go_BuilderArea</code> class have been made inline.</p> <p><code>Draw</code> command <code>mkvolume</code> has been updated to take into account the new option.</p> <p><code>BRepOffset_MakeOffset::BuildShellsCompleteInter()</code> has been modified to use the new option of <code>BOPAI go_MakerVolume</code> to speed up the construction of the final result solid.</p>
<p>28189</p>	<p><i>Summary:</i> Result of Boolean operation is non-manifold wire.</p> <p>The new method <code>BOPTools_AlgoTools::OrientEdgesOnWire(TopoDS_Shape&)</code> reorients edges for correct ordering in the containers of type WIRE included into result Boolean operation, as such containers should now also have a coherent orientation of sub-shapes. The duplicating containers, whose contents are completely included in other containers, are now avoided in the result of BOP.</p> <p>The result of Fuse operation on Compsolids now will also be a Compsolid.</p>





28191	<p><i>Summary:</i> Inefficient implementation of <code>BRepOffset_Tool::HasCommonShapes()</code> method.</p> <p>The method <code>BRepOffset_Tool::HasCommonShapes()</code>, which finds common Vertices and Edges between faces, has been re-implemented using maps and renamed into <code>BRepOffset_Tool::FindCommonShapes()</code>.</p>
28193	<p><i>Summary:</i> Missing <code>Standard_EXPORT</code>.</p> <p>Missing <code>Standard_EXPORT</code> has been added for methods <code>SetFuzzyValue</code> and <code>FuzzyValue</code> in class <code>IntTools_FaceFace</code>.</p>
28195	<p><i>Summary:</i> Boolean common returns empty result for a solid where some surfaces of revolution touch the axis.</p>
28207	<p><i>Summary:</i> Unexpected result of unify same domain algorithm.</p> <p>Now <code>ShapeUpgrade_UnifySameDomain</code> algorithm merging edges uses angular tolerance.</p>
28214	<p><i>Summary:</i> Make the class <code>GeomPlate_BuildPlateSurface</code> accept <code>Adaptor3d_HCurve</code> instead of <code>Adaptor3d_HCurveOnSurface</code>.</p> <p>Now, <code>GeomPlate_BuildPlateSurface</code> accepts base class <code>Adaptor3d_HCurve</code> and array of <code>Adaptor3d_HCurve</code>.</p> <p>Classes <code>GeomPlate_Array10fHCurveOnSurface</code> and <code>GeomPlate_HArray10fHCurveOnSurface</code> have been renamed to <code>GeomPlate_Array10fHCurve</code> and <code>GeomPlate_HArray10fHCurve</code> correspondingly.</p>
28221	<p><i>Summary:</i> General Fuse operation error.</p> <p>The method <code>BOPTools_AlgoTools2D::AttachExistingPCurve()</code> has been corrected to call <code>BRepLib::SameParameter()</code> not on the target edge with the whole set of pcurves, but rather on a temporary edge with 3D curve and copied pcurve only. After that the updated pcurve is transferred to the target edge.</p>
28222 28706	<p><i>Summary:</i> Intersection of two cylinders fails.</p> <p>The number of arguments in the interface of <code>IntPatch_WLineTool::JoinLines()</code> method has been reduced. This algorithm has been modified to forbid joining curves in the point, where more than two intersection lines meet. Moreover, joining is forbidden if the local curvature in the connection point is too big (see function <code>CheckArgumentsToJoin()</code> from <code>IntPatch_WLineTool</code>).</p> <p>It is now checked in <code>IsSeamOrBound()</code> function if two boundaries are in the same period region but are too far from each other.</p>
28223	<p><i>Summary:</i> Projection of closed curve onto cylinder is wrong.</p> <p>The algorithm of UV bounds calculation for a curve projected on periodic surfaces has been improved in <code>ProjLib_ComputeApprox.cxx</code>.</p>





<p>28226</p>	<p><i>Summary:</i> Incorrect history support in <code>ShapeUpgrade_UnifySameDomain</code> algorithm.</p> <p>New methods <code>Modified()</code> and <code>IsDeleted()</code> provide history support in <code>ShapeUpgrade_UnifySameDomain</code> class.</p> <p>The corresponding Draw commands <code>unifySameDomainMod</code> and <code>unifySameDomainSdel</code> have been added.</p>
<p>28227</p>	<p><i>Summary:</i> <code>ShapeUpgrade_UnifySameDomain</code> modifies the edges even if it is not requested.</p> <p>The option <code>SafeInputMode</code> has been added in class <code>ShapeUpgrade_UnifySameDomain</code>. If it is set, then the input shape is protected against modifications of any aspects of its sub-shapes. Default value is true.</p> <p>The option <code>-nosafe</code> has been added in draw command <code>unifySameDomain</code>. If it is not set, the algorithm is run with <code>SafeInputMode</code> switched off.</p>
<p>28228</p>	<p><i>Summary:</i> Provide possibility to keep the given edges during unification of faces in <code>ShapeUpgrade_UnifySameDomain</code> algorithm.</p> <p>New methods <code>KeepShape</code> and <code>KeepShapes</code> from <code>ShapeUpgrade_UnifySameDomain</code> class set one or several shapes (vertices or edges), where merging of faces is avoided. If the shape is a vertex, the method forbids merging of connected edges. If the shape is an edge, it forbids merging of connected faces.</p> <p>Draw command <code>unifySameDomain</code> has been updated.</p>
<p>28259</p>	<p><i>Summary:</i> Method <code>MakeBlocksCnx</code> is duplicated in two different places in <code>BOPAlgo</code>.</p> <p>The methods <code>BOPAlgo_Tools::MakeBlocksCnx()</code>, <code>BOPAlgo_Tools::MakeBlocks()</code> and static method <code>MakeBlocksCnx()</code> from <code>BOPAlgo_Builder_2.cxx</code> have been replaced with the new template method <code>BOPAlgo_Tools::MakeBlocks()</code>. The blocks of connected elements are now stored in the list instead of data map.</p> <p>All methods <code>BOPAlgo_Tools::FillMap()</code> have been replaced with the new template method <code>BOPAlgo_Tools::FillMap()</code>.</p> <p>The Pave Block with the smallest index of original edge is now the first in the Common Block (i.e. the representing Pave Block).</p> <p>The following improvements have been made in Boolean Operations algorithm to avoid regressions:</p> <ul style="list-style-type: none"> ▪ When the existing common block is updated, its pave blocks are also updated to make the parameters of the paves valid for the original edge. ▪ When trying to reduce the tolerance of the section edge, the tolerance of all Face/Face interferences that created this edge is checked. ▪ Producing the different Pave Blocks for the same section edge is avoided.





<p>28273</p>	<p><i>Summary:</i> Inefficient implementation of function <code>BRepOffset_MakeOffset::BuildSplitsOfFace</code>.</p> <p>The method for building splits of the face <code>BRepOffset_MakeOffset::BuildSplitsOfFace()</code> has been redesigned to use <code>BOPAI go_BuildDerFace</code> algorithm directly.</p> <p>The methods <code>FindInvalidFaces()</code> and <code>TrimNewIntersectionEdges()</code> have been corrected to avoid possible instabilities.</p> <p>The filtering of invalid edges by existing bounding edges now avoids removal of valid splits.</p> <p>The method <code>BRepOffset_Analyse::Correct2dPoint()</code> has been modified to avoid unnecessary initialization of <code>BRepAdaptor_Surface</code>.</p>
<p>28283</p>	<p><i>Summary:</i> The command <code>bopcheck</code> crashes on the given shape.</p> <p>The new flag <code>myAvoidBuildPCurve</code> has been added in <code>BOPAI go_PaveFiller</code> class (the corresponding method is <code>SetAvoidBuildPCurve</code>). This flag tells whether to avoid building pcurves, for example, if <code>BOPAI go_CheckerSI</code> crashes, because pcurve is built for an edge not lying on surface.</p>
<p>28284</p>	<p><i>Summary:</i> Avoid classification of sub-shapes of arguments of BOPs relatively solids during Intersection phase.</p> <p>The methods <code>PerformVZ</code>, <code>PerformEZ</code>, <code>PerformFZ</code> and <code>PerformZZ</code> have been transferred from <code>BOPAI go_PaveFiller</code> to <code>BOPAI go_CheckerSI</code> class to perform intersection of sub-shapes with solids only in self-intersection mode.</p> <p>The checks for solids built from the same (shared) faces have been added into methods building the result of Boolean operations: <code>BOPAI go_BOP::BuildDRC()</code> and <code>BOPAI go_BOP::BuildSolid()</code>.</p> <p>Since the <code>NonDestructive</code> mode is now natively supported by the <code>BOPAI go_PaveFiller</code>, the methods <code>BOPAI go_CheckerSI::PrepareCopy()</code> and <code>BOPAI go_CheckerSI::PostTreatCopy()</code> supporting this mode by <code>CheckerSI()</code> are not needed and have been removed.</p> <p>The pairs of sub-shapes with interfering bounding boxes are now sorted before the real intersection to guarantee the constant order of intersection of sub-shapes and produce more stable result. The class <code>BOPDS_PassKey</code> has been replaced with a simpler class <code>BOPDS_Pair</code>.</p>
<p>28326 28003</p>	<p><i>Summary:</i> Checking invariant shapes in revolve is incomplete.</p> <p>Check for B-Spline and Bezier curves coinciding with the axis of rotation has been added in method <code>BRepSweep_Rotation::HasShape</code>.</p>
<p>28343</p>	<p><i>Summary:</i> <code>ShapeUpgrade_UnifySameDomain</code> algorithm produces invalid shape.</p> <p>New function <code>GetNormalToSurface</code> from <code>ShapeUpgrade_UnifySameDomain</code> checks coincidence of normal directions of adjacent faces to understand if the merging of these faces is possible.</p>





<p>28375</p>	<p><i>Summary:</i> Regressions after enabling floating point signals handling in DRAW.</p> <p>Bi sector_Bi secCC. cxx has been modified to avoid division by zero when the variable <code>N1P2P1==0</code>.</p> <p>Bi sector_Bi secPC. cxx has been modified to avoid creation of <code>gp_Dir2d</code> with zero components.</p>
<p>28387</p>	<p><i>Summary:</i> Empty result of 3D Offset operation in mode Complete JoinType Intersection.</p> <p>Smarter conditions for removing the invalid faces with inverted edges have been implemented in <code>BRepOffset_MakeOffset::RemoveInvalidSplitsByInvertedEdges</code> method.</p> <p>Removed (completely inside) edges are now avoided in the filtering of invalid faces in <code>BRepOffset_MakeOffset::FilterInvalidFaces</code>.</p>
<p>28388</p>	<p><i>Summary:</i> Boolean common of simple face and solid results in empty compound.</p>
<p>28394</p>	<p><i>Summary:</i> Not precise extrema solution of line and circle lying in the same plane.</p> <p>The search for extrema and intersections in 2D-space is now applied in <code>Extrema_ExtElCalgori thm</code> if the line lies completely in the circle-plane (or is parallel to it). These cases are purely analytical and the solutions will be found precisely.</p>
<p>28426</p>	<p><i>Summary:</i> Implementation of the EdgesToFaces function.</p> <p>Two new methods have been implemented:</p> <ul style="list-style-type: none"> ▪ <code>BOPAI go_Tools::EdgesToWires</code> allows creating planar wires from edges. The input edges may be not shared, but the output wires will share the coinciding vertices and edges. It is possible to skip sharing if the input edges are already shared by passing the corresponding flag into the method. The input edges are expected to be planar, but the method does not check it. Thus, if the input edges are not planar, the output wires will also be not planar. In general, the output wires will be non-manifold and may contain free vertices. ▪ <code>BOPAI go_Tools::WiresToFaces</code> allows creating planar faces from the planar wires. In general, the input wires are non-manifold and may be not closed, but should share the coinciding parts. The wires located in the same plane and completely included into other wires will create holes in the faces built from bigger wires. <p>These two methods combined allow building faces from set of a edges randomly located in 3D space.</p> <p>The corresponding DRAW command <code>edgestofaces</code> has been implemented.</p>
<p>28442</p>	<p><i>Summary:</i> Incorrect result of 3D offset operation in mode Complete, Join type – Intersection.</p> <p>The new function <code>FindFacesInsideHoleWires</code> from <code>BRepOffset_MakeOffset_1</code> looks for the splits of the offset face located inside the new hole wire built from offset edges of hole wires of the original face. All found splits are simply removed.</p> <p>This is helpful for processing shapes containing the faces with holes, which grow during offset operation and sometimes (depending on the offset value) become greater than the faces themselves.</p>





28456	<p><i>Summary:</i> <code>BRepBuilderAPI_MakeFace</code> modifies the input shape.</p> <p><code>BRepLib::UpdateTolerances()</code> and <code>BRepLib::SameParameter()</code> functions now support non-mutable input feature. <code>BRepTools_ReShape</code> tool is used to store modified copies of subshapes of original (input) shape(s) as substitutions.</p> <p>New method <code>BRepTools_ReShape::IsNewShape()</code> checks if the given shape has been recorded as value.</p>
28468	<p><i>Summary:</i> Sweep with different sections raises <code>Standard_NoSuchObject: BRep_Tool::no parameter on edge</code>.</p> <p>Method <code>BRepFill_SectionPlacement::Perform()</code> has been modified to correctly process vertices and edges of path.</p>
28473	<p><i>Summary:</i> Incorrect result of 3D offset operation in mode Complete, Join type Intersection (spike is created).</p> <p>The algorithm <code>BRepOffset_MakeOffset_1::FindInvalidEdges</code>, which checks the validity of offset edges, now looks for inverted edges among the neutral ones.</p>
28474	<p><i>Summary:</i> General Fuse operator breaks validity of resulting shape.</p> <p>Method <code>BOPAlgo_ShellSplitter::MakeShell</code> has been fixed to reorient the shell before making a solid from it. The implementation of method <code>BOPTools_AlgoTools::IsSplitToReverse()</code> has been changed to use <code>Hatcher</code> to look for the point in the default face.</p>
28486	<p><i>Summary:</i> Fuse of several solids fails due to presence of common zones between faces.</p> <p>The following tweaks have been introduced in Boolean algorithms:</p> <ul style="list-style-type: none"> ▪ Exception in intersection of two analytical faces has been fixed by adding a simple check of the number of vertices in the resulting analytical curve. ▪ Projection of the Circle on the Cone now checks if the Circle's normal direction is parallel to the Cone direction. If it is not, a more advanced <code>ProjLib_ComputeApprox</code> algorithm will be used for projection. ▪ Intersection of the Edge with the Face by <code>IntTools_EdgeFace</code> algorithm in <code>QuickCoincidenceCheck</code> mode now avoids checking the type of the intersection result if the coincidence check gives the positive result. ▪ All common IN edges of the intersecting faces are now added for intersection with section edges to avoid self-intersection in the result. ▪ New function <code>BOPAlgo_PaveFiller::PutSEInOtherFaces()</code> provides processing for the section edges: possible common zones between faces are searched for by intersecting each section edge with all faces not participated in its creation. In case of coincidence it is put as IN edge into <code>FaceInfo</code> structure of the face. ▪ Checking for the <code>SameDomain</code> splits of faces in Boolean Operations processes the pairs of faces, where both section curves and common zones are present.
28490	<p><i>Summary:</i> Point located outside the solid is classified as inside.</p> <p>New algorithm <code>IntCurvesFace_Intersection</code> takes into account the intervals of surface discontinuity. It is used for building a surface polyhedron in class <code>IntCurveSurface_Polyhedron</code>.</p>





28492	<p><i>Summary:</i> Boolean common does not produce expected result.</p> <p>Previously 3D-steps could be generated shorter than 3D tolerance during the construction of a Walking-line. Now 3D-step is limited by Precision: Confusion value.</p>
28496	<p><i>Summary:</i> BOP Cut failed on two attached faces with error "ErrorStatus: 191".</p> <p>The closeness check of SurfaceOfExtrusion (GeomLib: IsClosed()) now takes into account that the basis curve may be not trimmed.</p>
28501	<p><i>Summary:</i> Incomplete result of offset operation in mode Complete with Join type intersection.</p> <p>The algorithm BOPAIgo_ShellSplitter now produces as many shells as possible from the given input faces even in cases with multi-connected edges</p> <p>Building of tool prism in BRepFeat_MakePrism avoids self-intersections in cases when the limiting faces are intersecting.</p>
28508	<p><i>Summary:</i> Use CellsBuilder algorithm with multi-dimensional arguments.</p> <p>CellsBuilder algorithm has been extended to work with multi-dimensional arguments. It has become possible to not only simulate Boolean expressions, but also perform non-supported Boolean operations, such as cutting face from solid or fusing face with edge.</p>
28535	<p><i>Summary:</i> BOP Fuse reports "ErrorStatus: 11" on two attached faces.</p> <p>Exception caused by Fuse operation has been fixed in IntWalk_Pwalki ng. cxx.</p>
28551 28553	<p><i>Summary:</i> Incorrect result ShapeUpgrade_ShapeDivideConti nui ty algorithm.</p> <p>The computation of a box for a 2D curve in the method ShapeAnalysis_Curve: :FillBndBox() has been improved to take into account intervals of C2 continuity.</p> <p>The fix also extends bounds to create the new surface so that all p-curves were located fully inside ShapeUpgrade_FaceDivide: :SplitSurface().</p>
28556	<p><i>Summary:</i> Invalid result of Fuse operation in the test case bugs moddata_2 bug469.</p> <p>The appropriate intersection tolerance has been implemented in BOPAIgo_PaveFiller: :FillPaves() for splitting degenerated edges in Boolean operations.</p> <p>Creation of wires consisting of degenerated edges only is avoided in BOPAIgo_WireSplitter.</p>
28558	<p><i>Summary:</i> Test bugs modalg_6 bug26150_17 is failed with FPE switched on.</p> <p>Division by zero is now avoided in method BRepFill_CompatibleWires: :SameNumberByACR.</p>





28562	<p><i>Summary:</i> Replacement of old Boolean operations (BRepAlgo) with new ones (BRepAlgoAPI) in BRepAlgo_Normal Projection.</p> <p>The new Boolean operations (implemented in class BRepAlgoAPI_BooleanOperations) are now used in BRepAlgo_Normal Projection algorithm instead of the old Boolean operations (implemented in class BRepAlgo_BooleanOperations).</p>
28567	<p><i>Summary:</i> Get rid of DRAW commands based on old Boolean Operations (BRepAlgo).</p> <p>The traces of usage of old Boolean operations have been removed from BRepFeat package.</p> <ul style="list-style-type: none"> ▪ DRAW commands ksection, fubl and cubl based on old Boolean operations have been correspondingly replaced with commands bsection, bfuseblend and bcutblend based on the modern Boolean operations. ▪ Class QANewBRepNaming_BooleanOperation has been modified to use modern Boolean operations. ▪ Unused class QANewBRepNaming_BooleanOperation has been removed. ▪ Class QANewBRepNaming_BooleanOperationFeat has been renamed to QANewBRepNaming_BooleanOperation as it has nothing to do with Feat algorithm.
28573	<p><i>Summary:</i> Get rid of the old Boolean Operations in QA commands.</p> <p>The QA commands have been modified to use new Boolean operations instead of old.</p>
28574	<p><i>Summary:</i> Get rid of the TestTopOpe* packages.</p> <p>In view of the removal of the old Boolean operations (BRepAlgo_BooleanOperation), the TestTopOpe* packages used for testing and debugging of the old algorithm have been removed as well.</p> <p>Commands compare, issubshape and projponf have been moved to BRepTest package.</p>
28576 28577	<p><i>Summary:</i> Get rid of the TopOpeBRep* algorithms in TKOffset toolkit.</p> <p>The toolkits TKOffset and TKFeat have been cleaned from the obsolete TopOpeBRep* classes.</p>
28579	<p><i>Summary:</i> Get rid of the obsolete QANewModTopOpe_* and QANewBRepNaming_* algorithms.</p> <p>The packages QANewModTopOpe, QANewBRepNaming and QANewDBRepNaming have been removed as containing obsolete features.</p>
28591	<p><i>Summary:</i> BOP Cut creates wrong result.</p> <p>The Face/Face intersection procedure has been changed in Boolean Operations algorithm. Previously, the intersection tolerance for all section curves between a pair of faces was calculated as the maximal tolerance among all curves. Now each curve has its own valid tolerance calculated as the maximal deviation of the 3D curve from its 2D curves on faces or surfaces in case there are no 2D curves.</p>





28591	<p>Thus, such methods of <code>IntTools_FaceFace</code> algorithm as <code>TolReached3d()</code>, <code>TolReal()</code> and <code>TolReached2d()</code> have been removed.</p> <p>Now the tolerances of the curve can be obtained from the curve itself:</p> <ul style="list-style-type: none"> ▪ <code>IntTools_Curve::Tolerance()</code> – returns the valid tolerance for the curve; ▪ <code>IntTools_Curve::TangentialTolerance()</code> – returns the tangential tolerance, which depends on the size of the common between faces. Currently, this tolerance is computed for Plane/Plane cases only. In other cases the value of the tangential tolerance is the maximal face tolerance. <p>2D intersection tolerance <code>IntTools_FaceFace::TolReached2d()</code> has been completely removed from the algorithm as unused.</p>
28594	<p><i>Summary:</i> <code>Geom2dAPI_Interpolate</code> generated curve is not the same as proe.</p> <p>Boolean flag <code>Scale</code> has been added for methods <code>Geom2dAPI_Interpolate::Load</code>.</p>
28600	<p><i>Summary:</i> Bad performance of the <code>checkshape</code> command.</p> <p>Shell check algorithm <code>BRepCheck_Shell</code> has been improved to use well-known width-first search. It significantly reduces computation time on the big shells.</p>
28605	<p><i>Summary:</i> Improve the algorithm of calculation of valid intersection range of an edge.</p> <p>New method <code>BRepLib::FindValidRange()</code> computes the range of the edge not covered by boundary vertices. This method is now used by the algorithm of calculation of valid intersection range in the class <code>IntTools_ShrunkRange</code>.</p> <p>The method <code>BOPTools_AlgoTools::MakeSplitEdge()</code> has been protected against errors in the case of reversed orientation of the input edge.</p> <p>Two new Draw commands have been added:</p> <ul style="list-style-type: none"> ▪ <code>validrange</code> – calls the new method <code>BRepLib::FindValidRange()</code>. ▪ <code>tol sphere</code> – shows tolerances of vertices by drawing a sphere around each vertex of the shape.
28626	<p><i>Summary:</i> Boolean CUT operation fails due to exception while intersecting two conical faces.</p> <p>Small offset in function <code>IntersectWithAnArc</code> from <code>IntPatch_ImpImpIntersection</code> is now adapted to parametric step.</p>
28631	<p><i>Summary:</i> Crash while building a 2D circle tangent to another circle and passing through its center.</p> <p><code>GccEnt</code> now provides <code>GccEnt_Position</code> conversion to string value and backwards.</p> <p>New DRAW object <code>GeometryTest_DrawableQualifiedCurve2d</code> wraps <code>GccEnt_QualifiedCircle/GccEnt_QualifiedLine</code>.</p> <p>It is <code>DrawTrSurf_Curve2d</code> with <code>GccEnt_Position</code> visualized in orange color.</p> <ul style="list-style-type: none"> ▪ <code>qcircle/qline</code> command creates instance of <code>GeometryTest_DrawableQualifiedCurve2d</code>; ▪ <code>circle2d3tan</code> command wraps <code>GccAna_Circle2d3Tan</code> taking <code>qcircle/qline/point</code> arguments.





28637	<p><i>Summary:</i> Extrema curve-curve cannot find correct solution between edge based on the line and B-spline edge.</p> <p>The condition preventing a decrease of Lipschitz constant if the derivatives are too small has been added in <code>Extrema_GenExtCC</code> algorithm.</p>
28639	<p><i>Summary:</i> Improve performance of the <code>IntPol yh</code> algorithm.</p> <p>The following tweaks have been introduced:</p> <ul style="list-style-type: none"> ▪ The array of couples of intersecting triangles is replaced with the list to avoid unnecessary memory allocations. ▪ Search for pairs of interfering triangles with unbalanced binary tree. ▪ Bounding boxes for the triangles are built only once and then reused. ▪ Simple methods of <code>IntPol yh_Poi nt</code>, <code>IntPol yh_Edge</code>, <code>IntPol yh_Tri angl e</code> and <code>IntPol yh_Coupl e</code> classes have become inline. ▪ The methods <code>CheckCommonEdge</code>, <code>SetEdgeandOri entati on</code> and <code>Mul ti pl eMi ddl eRefi nement2</code> have been removed from <code>IntPol yh_Tri angl e</code> class as unused. ▪ The method <code>IntPol yh_Tri angl e::Tri angl eDefl ecti on</code> has been replaced with <code>IntPol yh_Tri angl e::Compu teDefl ecti on</code>. ▪ The methods <code>Li nkEdges2Tri angl es</code>, <code>Tri angl eEdgeContact2</code>, <code>Starti ngPoi ntsResearch2</code>, <code>NextStarti ngPoi ntsResearch2*</code>, <code>Tri angl eComparePSP</code> and <code>StartPoi ntsCal cul</code> have been removed from <code>IntPol yh_Mai ll ageAffi nage</code> class as unused.
28652	<p><i>Summary:</i> Improve performance of the 3D offset algorithm for the planar cases.</p> <p>Now the intersection of planar untrimmed faces is performed in <code>BRepOffset_Tool</code> using <code>IntTools_FaceFace</code> algorithm directly.</p>
28661	<p><i>Summary:</i> <code>BRepOffsetAPI_MakePi peShell</code> throws an exception <code>Standard_NoSuchObj ect: NCol l ecti on_DataMap::Fi nd</code>.</p> <p>Class fields are now cleared in method <code>BRepFi ll_Pi peShell::Prep are()</code>.</p> <p>Calculation of error on surfaces has been corrected in method <code>GeomFi ll_Sweep::Bui l dKPart()</code>.</p> <p>New Draw command errorsweep checks the error reached on surfaces built by <code>BRepOffsetAPI_MakePi peShell</code> algorithm.</p>
28675	<p><i>Summary:</i> Invalid result of Boolean Cut operation when running with fuzzy value.</p> <p>Small edges with an empty list of <code>PaveBl ocks</code> (removed edges) are now avoided in the result of <code>BOPAl go_Bui l der::Fi ll I magesEdges()</code> algorithm.</p>
28677	<p><i>Summary:</i> Avoid change of wire orientation in <code>BRepLi b_MakeFace</code> if the wire is open.</p> <p>Method <code>BRepLi b_MakeFace::CheckI nsi de()</code> now cannot be called for an open wire. If the input wire is open, its orientation is not changed in the result face.</p>
28683	<p><i>Summary:</i> Wrong result of CUT operation.</p> <p><code>BOPAl go_PaveFi ll er</code> has been improved to avoid creation of small section edges.</p>





<p>28690 28775</p>	<p><i>Summary:</i> Code duplication removal across the BOPAI go_PaveFiller algorithm.</p> <p>The methods PerformVerticesEE() and PerformVerticesEF() of class BOPAI go_PaveFiller have been replaced with the new PerformNewVertices() method.</p> <p>It is checked that these new Pave Blocks have a valid intersection range during splitting of Pave Blocks with extra paves. If a new Pave Block does not have such range, it is not created and its vertices are unified in an SD vertex.</p> <p>The new method BOPDS_DS: : IsValidShrunkData() checks that the Shrunk Data of the Pave Block is still valid during re-computation of the shrunk data for the modified Pave Block. The shrunk may become invalid if the tolerance values of vertices of the Pave Block have been modified.</p>
<p>28692</p>	<p><i>Summary:</i> Projection failed (proj ponf).</p> <p>Tolerance criterion has been improved in Extrema_ExtPEIS algorithm.</p>
<p>28724</p>	<p><i>Summary:</i> Extrema between circle and plane cannot be found.</p> <p>New algorithm of Geom(2d) Adaptor_Curve: : IsPeriodic() method return the information about periodicity of the curve itself (independently of the first and the last parameter of adaptor).</p>
<p>28771</p>	<p><i>Summary:</i> BRepOffset_MakeOffset incorrect result.</p> <p>Tolerance of new edges, which belong to planar faces, has been corrected in BRepOffset_MakeOffset.cxx.</p>
<p>28776</p>	<p><i>Summary:</i> Extend the field BOPAI go_Builder: : myOrigins so that the shape could have multiple origins.</p> <p>The type of field BOPAI go_Builder: : myOrigins now allows a new shape to have multiple origins in case of overlapping.</p>
<p>28780</p>	<p><i>Summary:</i> HLR with focus does not seem to work.</p> <p>Method HLRBRep_Curve: : D1() has been corrected to apply transformation to a point according to current projection parameters.</p>
<p>28782</p>	<p><i>Summary:</i> Shape sewing behavior not consistent for the same CAD file.</p> <p>The iterations on maps with shape key are now avoided by replacing simple maps with indexed maps. So iteration is done on integer key. The map containers have been updated to hold type definitions of key and value.</p> <p>New methods RemoveKey() and RemoveFromIndex() have been added to indexed [data] maps to remove an arbitrary key from the map.</p> <p>OCCT code has been updated with RemoveLast() and Substitute() methods used to remove a key from indexed [data] map.</p>



28784	<p><i>Summary:</i> [HLR] Crash while getting hidden lines for a compound.</p> <p>Method <code>HLRBRRep_PolyHLRToShape::InternalCompound</code> has been modified to avoid creation of an edge with null length.</p>
28786 28956 29000	<p><i>Summary:</i> Refactoring of the Warning/Error reporting system of Boolean Operations Algorithm.</p> <p>Basic tools for defining classes representing alerts (errors, warnings etc.) and collecting them during execution of algorithms have been added in <code>Message</code> package.</p> <p>Correspondingly, the Error/Warning reporting system of the algorithms in Boolean Component has been refactored and the new checks across the algorithms have been added to detect and to report errors and warnings.</p> <p>The new class <code>BOPAlgo_Options</code> unifies the options of <code>BOPAlgo_*</code> and <code>BRepAlgoAPI*</code> algorithms and serves as base class for all Boolean Operations algorithms. It provides the methods to consult alerts generated by the algorithm:</p> <ul style="list-style-type: none"> ▪ Methods <code>HasErrors()</code> and <code>HasWarnings()</code> can be used to check for the presence of error and warning alerts, respectively; ▪ <code>DumpErrors/DumpWarnings</code> methods can be used to dump the error and warning messages as text. ▪ Method <code>GetReport()</code> provides access to all alerts; see class <code>Message_Report</code> for details.
28795	<p><i>Summary:</i> Boolean operations corrupt the p-curve of the source planar face if "non-destructive" option is switched off.</p> <p><code>BRep_Builder</code> algorithm has been improved to update the range of <code>BRep_CurveRepresentation</code> of the edge if at least one of its boundaries is not infinite (earlier, it was updated only if both boundaries were not infinite).</p>
28812	<p><i>Summary:</i> Rest case is crashed if <code>CSF_FPE</code> set to 1.</p> <p>The possibility of line creation is now checked in <code>GCPnts_DistFunction.cxx</code>.</p>
28830	<p><i>Summary:</i> <code>HalfSpace</code> command chooses the wrong side of the given shell.</p> <p>The algorithm <code>BRepPrimAPI_MakeHalfSpace</code> now searches for projection on edges and vertices, which makes it usable for half spaces with boundaries. Earlier it could project point only on faces.</p>
28856	<p><i>Summary:</i> Extrema between two curves gives wrong result.</p> <p>Processing for large Lipschitz constant has been added in method <code>Extrema_GenExtCC::Perform()</code>.</p>
28884	<p><i>Summary:</i> Add <code>Standard_EXPORT</code> macro to methods of <code>BRepExtrema_TriangleSet</code>.</p> <p><code>Standard_EXPORT</code> macro has been added to some methods of <code>BRepExtrema_TriangleSet</code>.</p>



<p>28892 28893</p>	<p><i>Summary:</i> BOPAI go_PaveFiller returns status "error: 11" or raises exception.</p> <p>Processing of untouched edges (without edge set) has been added in BOPAI go_PaveFiller: : UpdatePaveBlocks method.</p> <p>Calculation of the number of sample points is now avoided on surfaces with too small UV ranges in IntCurvesFace_Intersection algorithm.</p>
<p>28913 29027</p>	<p><i>Summary:</i> Uni fySameDomain crashes with error.</p> <p>Filling of shape modifications history has been corrected in ShapeUpgrade_Uni fySameDomain algorithm.</p>
<p>28968</p>	<p><i>Summary:</i> Incorrect offset for faces with singularities.</p> <p>Simple offset algorithm (BRepOffset_MakeSimpleOffset) is improved to handle the case when B-Spline surface has imprecise singularity at one of its sides (when the side is degenerated but not exactly to one point). In this case, the algorithm tries to collapse all poles of a singular side of the surface into the same point; this avoids flapping of the normal due to small fluctuations of surface.</p> <p>If the offset face contains degenerated edges, then check for singularity is done using position and tolerance of the corresponding vertices.</p> <p>In addition, each side is checked with a user-defined parameter Tolerance from BRepOffset_MakeSimpleOffset (by default Precision: : Confusion() is used). This helps to process cases when no edge is located at that side or such edge is not encoded as degenerated.</p>
<p>28982</p>	<p><i>Summary:</i> 2D offset creates faulty result from wire.</p> <p>Edge/Edge intersection algorithm (IntTools_EdgeEdge) has been protected from incomplete type conversion caused by Trimmed curves by using Adaptors to get typed curves instead of direct casting.</p>
<p>28995</p>	<p><i>Summary:</i> Uni fySameDomain produces invalid shape.</p> <p>ShapeAnalysis_Edge behavior has been synchronized with BRepCheck_Edge by adding check for 2d curves on planes.</p> <p>New method BRep_Tool: : CurveOnPlane() generates PCurve of the edge on planar face.</p>





Shape Healing

27358	<p><i>Summary:</i> ShapeAnalysis_Curve::GetSamplePoints iteration logic isn't robust.</p> <p>The iterating logic in ShapeAnalysis_Curve::GetSamplePoints() has become more robust: instead of iteratively incrementing the parameter by adding step, at each point the parameter is calculated independently from index. This avoids possible accumulation of numeric errors, and ensures that generated points are equally spaced and their quantity is respected in all cases.</p>
27894	<p><i>Summary:</i> Crash when calling ShapeUpgrade_UnifySameDomain.</p> <p>ShapeUpgrade_UnifySameDomain has been fixed to avoid getting pcurve of edge on a non-connected face or building wire from an empty set of edges.</p>
28346	<p><i>Summary:</i> Function ProjectOnSegments from ShapeAnalysis_Curve returns only a single solution leading to projection result, which is far from optimal.</p> <p>Subdivision of curve parametric interval based on deflection criteria has been added for curve type OtherCurve in Extrema_GExtPC.gxx. The algorithm of subdivision has been implemented in Extrema_Curve(2d) Tool.cxx</p> <p>New Draw command projpcurve for projection of point on CurveOnSurface has been added in SWDRAW_ShapeAnalysis.cxx</p>
28392	<p><i>Summary:</i> Some checks have no option to switch off.</p> <p>New option ShapeFix_Solid::FixShellOrientationMode allows switching off the analysis and fixing orientations of shell(s) in solid.</p> <p>The corresponding options FixVertexToleranceMode, FixShellOrientationMode and FixFaceOrientationMode are added to Shape Processing resource file.</p>
28471	<p><i>Summary:</i> ShapeUpgrade_RemoveLocations breaks sharing of sub-shapes.</p> <p>New option remove_level has been added to the command remove loc.</p>
28529	<p><i>Summary:</i> UnifySameDomain crashes on a shape with location.</p> <p>The algorithm GlueEdgesWithPCurves from ShapeUpgrade_UnifySameDomain now considers the proper surface location when it gets the pcurve of an edge during gluing edges.</p>
28601	<p><i>Summary:</i> ShapeFix_Shape increases tolerance of sub-shapes of a valid shape.</p> <p>Increase of edge/vertex tolerance is now avoided if the distance between 3D curve and p-curve is within the old tolerance.</p>





Visualization

<p>24577 27958</p>	<p><i>Summary:</i> AIS_Trihedron - add shaded presentation option.</p> <p>New shaded presentation flag <code>SetDatumDisplayMode</code> is configured through Datum aspect.</p> <p>DRAW command <code>vtrihedron</code>, which changes trihedron parameters, now covers the whole functionality of AIS_Trihedron.</p>
<p>24999 25695 27366 28489</p>	<p><i>Summary:</i> AIS_InteractiveContext - define default <code>HighlightMode</code>.</p> <p>It is now possible to set highlight mode in the interactive context instead of each interactive object. Thus highlight mode is supported in AIS_InteractiveContext besides AIS_InteractiveObject.</p> <ul style="list-style-type: none"> ▪ The following unused properties have been removed: <code>PreSelectionColor()</code>, <code>DefaultColor()</code>, <code>WasCurrentTouched()</code> and <code>ZDetection()</code> from AIS_InteractiveContext; <code>SelectionPriority</code> from AIS_InteractiveObject; <code>HighlightStyle()</code> and <code>SelectionStyle()</code> from Prs3d_Drawer. ▪ <code>Graphi c3d_HighlightStyle</code> has been superseded by <code>Prs3d_Drawer</code> inheriting from new class <code>Graphi c3d_PresentationAttributes</code>. ▪ <code>Graphi c3d_PresentationAttributes</code> (replacement of <code>Graphi c3d_HighlightStyle</code>) has been extended with new properties: <code>ZLayer()</code> defining Z-Layer for highlighting presentation and <code>DisplayMode()</code> defining display mode for highlighting. ▪ <code>StdSelect_BRepSelectionTool</code> methods have been corrected to take <code>SelectMgr_EntityOwner</code> instead of <code>StdSelect_BRepOwner</code>. ▪ Duplicated field <code>myDrawer</code> has been dropped in <code>StdSelect_Shape</code>. ▪ <code>myDrawer->Color()</code> is now used in AIS_InteractiveObject instead of <code>myOwnColor</code>; <code>myDrawer->Transparency()</code> instead of <code>myTransparency</code> and <code>myDrawer->ZLayer()</code> instead of <code>myZLayer</code>. ▪ <code>PrsMgr_PresentationManager::Unhighlight()</code> now highlights all modes. The method taking <code>Mode</code> as argument has been marked deprecated. ▪ New enumeration <code>Prs3d_TypeOfHighlight</code> has been introduced defining different highlight types. ▪ <code>AIS_InteractiveObject::HighlightStyle()</code> now takes enumeration argument and defines different styles for Global and Local selection. ▪ <code>ComesFromDecomposition()</code> property has been moved from <code>StdSelect_BRepOwner</code> to <code>SelectMgr_EntityOwner</code>.
<p>25288 28647</p>	<p><i>Summary:</i> OpenGL_AspectMarker - invalid marker size on re-setting aspect without redraw.</p> <p>Uninitialized <code>theMarkerSize</code> has been fixed in <code>OpenGL_AspectMarker::Resources::BuildSprites()</code> in case if aspect has been already initialized for the specified marker type.</p> <p>Draw Harness command <code>vaspects</code> has been extended with new options: <code>setMarkerType</code> and <code>setMarkerSize</code>.</p>





<p>25382</p>	<p>Summary: TKOpenGL - improved video recording capability</p> <p>New class <code>Image_VideoRecorder</code> has been added for video recording using FFmpeg framework.</p> <p>Draw Harness command <code>vanimation</code> has been extended with new options for video recording.</p> <p>New optional dependency <code>CSF_FFmpeg</code> has been introduced.</p>
<p>25695 28323 28527</p>	<p>Summary: AIS_InteractiveContext - define default <code>HighlightMode</code>.</p> <p>In most CAD applications, it is more convenient to set highlight mode in the interactive context instead of each interactive object. Thus, now highlight mode is supported in <code>AIS_InteractiveContext</code> besides <code>AIS_InteractiveObject</code>.</p> <p>The following unused properties have been removed:</p> <ul style="list-style-type: none"> ▪ <code>PreSelectionColor()</code>, <code>DefaultColor()</code>, <code>WasCurrentTouched()</code> and <code>ZDetection()</code> from <code>AIS_InteractiveContext</code>; ▪ <code>SelectionPriority()</code> from <code>AIS_InteractiveObject</code>; ▪ <code>HighlightStyle()</code> and <code>SelectionStyle()</code> from <code>Prs3d_Drawer</code>. <p><code>Graphi c3d_HighlightStyle</code> has been superseded by <code>Prs3d_Drawer</code> inheriting from new class <code>Graphi c3d_PresentationAttributes</code>.</p> <p><code>Graphi c3d_PresentationAttributes</code> (as <code>Graphi c3d_HighlightStyle</code> replacement) has been extended with new properties:</p> <ul style="list-style-type: none"> ▪ <code>ZLayer()</code> defining Z-Layer for highlighting presentation. ▪ <code>DisplayMode()</code> defining display mode for highlighting. <p><code>StdSelect_BRepSelectionTool</code> methods have been corrected to take <code>SelectMgr_EntityOwner</code> instead of <code>StdSelect_BRepOwner</code>.</p> <p>Duplicated field <code>myDrawer</code> has been dropped from <code>StdSelect_Shape</code>.</p> <p>In <code>AIS_InteractiveObject</code>, <code>myDrawer->Color()</code> is now used instead of <code>myOwnColor</code>, <code>myDrawer->Transparency()</code> instead of <code>myTransparency</code> and <code>myDrawer->ZLayer()</code> instead of <code>myZLayer</code>.</p> <p><code>PrsMgr_PresentationManager::Unhighlight()</code> now unhighlights all modes. The method taking <code>Mode</code> as argument has been marked deprecated.</p> <p>New enumeration <code>Prs3d_TypeOfHighlight</code> defines different highlight types. <code>AIS_InteractiveObject::HighlightStyle()</code> takes it as argument and defines different styles for Global and Local selection.</p> <p><code>ComesFromDecomposition()</code> property has been moved from <code>StdSelect_BRepOwner</code> to <code>SelectMgr_EntityOwner</code>.</p>





<p>26062 27527 27925 28400 28826</p>	<p><i>Summary:</i> Implement order-independent transparency algorithm within rasterization rendering.</p> <p>Weighted Blended Order-Independent Transparency algorithm has been added to rasterization pipeline. In contrast to the classical blending transparency, new mode makes transparent objects look independent from the point of view. It also gives better depth occlusion when being used together with a weight factor based on value of a GL depth buffer. The feature supports desktop OpenGL as well as OpenGL ES 3.0; can be used together with MSAA on desktop GL.</p> <p>Its use requires:</p> <ul style="list-style-type: none"> ▪ Shaders pipeline. ▪ Floating point color format for framebuffer (<code>GL_ARB_color_buffer_float</code>). ▪ Multiple render targets (<code>GL_ARB_draw_buffers</code>). <p>The patch adds new rendering options to <code>Graphic3d_RenderingParams</code> structure: transparency method and scalar factor [0-1] controlling influence of a fragment's depth on its visibility.</p> <p>The improvement also simplifies processing of transparent objects for standard method. Now the rendering priority of transparent graphical structures is managed automatically, therefore there is no need to care about it at the application side.</p> <p>Initialization of <code>Image_Format_RGB32</code> image format on OpenGL ES 3.0+ has been fixed in <code>OpenGL_Texture</code></p>
<p>26213</p>	<p><i>Summary:</i> Replace sequence in <code>Select3D_SensitiveGroup</code>.</p> <p><code>NCollection_IndexedMap</code> is now used instead of <code>NCollection_Sequence</code> within <code>Select3D_SensitiveGroup</code>.</p>
<p>27921</p>	<p><i>Summary:</i> Add missing <code>Graphic3d_AspectText3d</code> method defining label transparency</p> <p>New method <code>AIS_TextLabel::SetTransparency</code> defines transparency within [0, 1] range.</p>
<p>28047</p>	<p><i>Summary:</i> Support objects with customized highlighting in <code>AIS_InteractiveContext</code>.</p> <p>New method <code>SelectMgr_SelectableObject::ClearHighlighted</code> allows removing dynamic highlight data in case if <code>AIS_InteractiveObject</code> does not use immediate mode for dynamic highlighting.</p> <p>Interactive context will pass processing of dynamic highlight erase to the object if the owner returns false in <code>SelectMgr_EntityOwner::IsAutoHighlight</code>. If the owner returns true in <code>SelectMgr_EntityOwner::IsForcedHighlight</code>, selection presentation will be re-highlighted at each <code>::Select</code> call.</p> <p>Redundant logic related to the old object-oriented highlight mechanism has been removed from <code>AIS_InteractiveContext::MoveTo</code>.</p>





<p>28088 28820 28895 28407 28405</p>	<p><i>Summary:</i> AIS_InteractiveContext – drop default value for Update Viewer parameter.</p> <p>The default value of UpdateViewer flag has been removed from all AIS_InteractiveContext methods to let the user always specify if the viewer needs to be updated or not.</p> <p>Most applications perform several changes in AIS_InteractiveContext at once; therefore additional Viewer updates in between can significantly impact the overall performance. The previous API with UpdateViewer flag turned ON by default complicated finding such weak places in the application code.</p> <p>Method Graphi c3d_StructureManager: : UpdateMode() has been removed.</p> <p>V3d_Viwer methods ActivateGrid, DeactivateGrid, SetRectangularGridValues, SetCircularGridValues, RectangularGridGraphicalValues, CircularGridGraphicalValues, SetPrivilegedPlane and DisplayPrivilegedPlane do not redraw viewer anymore.</p>
<p>28107 28306</p>	<p><i>Summary:</i> Provide a flexible interface to set custom hatch styles.</p> <p>New class Graphi c3d_HatchStyle provides the possibility to set up custom and predefined hatching. It is also possible to set custom hatch patterns through bitmaps.</p>
<p>28126 28241</p>	<p><i>Summary:</i> Path tracing - Provide ability to use two-sided scattering models.</p> <p>New rendering parameter TwoSidedBsdfModels has been added into Graphi c3d_RenderingParams structure. It forces path tracing to use two-sided versions of original one-sided scattering models.</p> <p>By default, it is disabled. This parameter can be also controlled via vrenderparams DRAW command: vrenderparams - twoside [on off].</p>
<p>28129</p>	<p><i>Summary:</i> Path Tracing - Improve interactivity in "steady" rendering mode.</p> <p>The important feature of adaptive screen sampling mode consists in the possibility to keep the same number of tiles for any screen resolution (e.g. 256 tiles can be used for both 512 x 512 window and 1920 x 1080 window). So, a smaller number of tiles allows to increase interactivity (FPS), but at the cost of higher per-frame variance ('noise'). On the contrary, a larger number of tiles decrease interactivity, but leads to lower per-frame variance. At the same time, the total (cumulative) time needed to produce final image is the equal for both cases.</p> <p>The improvement fixes the number of tiles independently on the window size. Setting the number of tiles to relatively small value through the new option Graphi c3d_RenderingParams: : NbRayTracingTiles allows:</p> <ul style="list-style-type: none"> ▪ Keeping interactivity at a high level (FPS), which is especially important for low-performance GPUs. ▪ Preventing freezing of application GUI and possible crashes due to driver's limit on maximum frame rendering time on complex scenes.





<p>28180 28401</p>	<p><i>Summary:</i> TKOpenGL – Performance of Shaded presentation dropped due to FFP disabled by default.</p> <p>FFP state management (light sources, matrices, clipping planes) has been moved to OpenGL_ShaderManager for consistency with Programmable Pipeline.</p> <p>OpenGL_Context::BindProgram() does not re-bind already active Program. OpenGL_PrimitiveArray::Render() does not reset active Program at the end.</p> <p>OpenGL_Context::ApplyModelViewMatrix() now checks if a matrix differs from the already set one before modifying state in Shader Manager. This avoids redundant state changes; matrix uploads onto GPU and re-computation of inverted matrices.</p> <p>NCollection_Mat4 has been extended with equality check operators for proper comparison.</p> <p>The tracking Material state has been added to OpenGL_ShaderManager.</p> <p>Unreachable states OPENGL_NS_RESMAT, OPENGL_NS_TEXTURE and OPENGL_NS_WHITEBACK have been removed.</p> <p>Resetting FFP material state after displaying GL_COLOR_ARRAY vertices has been fixed. The Material state within Shader Manager is now invalidated using OpenGL_VertexBuffer::unbindFixedColor().</p> <p>Invalidating Material State when only Highlighting style changes has been fixed in OpenGL_Workspace::ApplyAspectFace().</p>
<p>28205 28876</p>	<p><i>Summary:</i> Add functionality for dumping results of detection algorithms into image.</p> <p>New dump of detection result into image provided by method StdSelect_ViewerSelector3d::ToPixmap() has been introduced in selection tools for debugging and regression testing purposes. This algorithm prepares an image based on window size and performs picking on each pixel of the image.</p>
<p>28213</p>	<p><i>Summary:</i> StdPrs_ShadedShape – compute face edges for triangulation-only Faces.</p> <p>StdPrs_ShadedShape::FillFaceBoundaries() implementation has been extended to handle Faces without defined Edges (triangulation-only).</p>
<p>28215</p>	<p><i>Summary:</i> Define EMPTY type line consistent with Interior Style.</p> <p>New values Aspect_TOL_EMPTY (line type) and Aspect_TOM_EMPTY (marker type) have been added. Such types are useful in rare cases when specific arrays should be temporarily hidden (while preserving their presentation data).</p>
<p>28218</p>	<p><i>Summary:</i> Path Tracing - Redesign path tracing materials to support two-layered model.</p> <p>Previously OCCT path tracing engine used very simple additive material (BSDF) model, so it was possible to reproduce only the behavior of very basic materials such as metal, glass, or plastic. However, some materials important in CAD industry, such as car paint or ceramic could not be modeled well.</p>





<p>28218</p>	<p>OCCT BSDF has been significantly improved by replacing additive model with two-layered scattering model. Therefore, we have base diffuse, glossy, or transmissive layer, covered by one glossy/specular coat.</p> <p>The layers themselves have no thickness; they can simply reflect light or transmits it to the layer under it. Balancing different combinations of layer properties can produce a wide range of different effects. At the same time, disabling the first (coat) layer allows keeping full compatibility with the previously supported scattering model. All new parameters are available via <code>vbsdf</code> command.</p> <p>The new sample for a few material examples is located at <code>samples\tcl\pathtrace_materials.tcl</code>.</p>
<p>28232</p>	<p><i>Summary:</i> <code>StdPrs_ShadedShape</code> – create <code>WireFrame</code> presentation for sole <code>Vertex / Edge / Wire</code>.</p> <p>The possibility to display presentation for sole <code>TopoDS_Vertex</code>, <code>TopoDS_Edge</code> and <code>TopoDS_Wire</code> shapes has been implemented.</p>
<p>28244</p>	<p><i>Summary:</i> <code>AIS_Angl eDi mensi on</code> throws exception for 180 degree.</p> <p>A check if the given points lie on a same line has been added in <code>AIS_Angl eDi mensi on</code>.</p>
<p>28276</p>	<p><i>Summary:</i> <code>Graphi c3d_ArrayOfPri mi ti ves</code> – fix usage of 16-bit indices.</p> <p><code>Graphi c3d_ArrayOfPri mi ti ves</code> now checks the amount of vertex data rather than the amount of indices.</p>
<p>28310</p>	<p><i>Summary:</i> crash on iteration through detected interactive objects.</p> <p><code>AIS_InteractiveContext::Remove</code> has been fixed to properly increment the iterator of <code>CurrentDetectedObject</code> and reset iterator of <code>Highlighted</code> detected objects, when the object is removed from a sequence of detected owners.</p>
<p>28361</p>	<p><i>Summary:</i> <code>TKV3d</code> - buggy behavior of Transformation Persistence compiled on several Linux platforms in optimized mode.</p> <p>Transformation persistence has been fixed for various (old) GCC compilers:</p> <ul style="list-style-type: none"> ▪ Optimized template-specialized operator <code>/=</code> for division of <code>NCollection_Vec4</code> replaced with a non-specialized version. ▪ <code>NCollection_Vec4::xyz()</code> is not used since compiler uses modifiable-reference returning version, which invokes the warning about possible violation of strict-aliasing rules and leads to incorrect behavior of the reference.
<p>28365 28646</p>	<p><i>Summary:</i> Apply selection filter in <code>AddOrRemoveSelected</code> at Neutral point.</p> <p><code>AIS_InteractiveContext::AddOrRemoveSelected</code> has been fixed to correctly apply selection filter.</p> <p><code>vsel mode</code> now accepts shape type string for activating standard <code>AIS_Shape</code> selection modes.</p>





28369	<p><i>Summary:</i> Path Tracing - Expose radiance clamping setting in path tracing mode.</p> <p>It is now possible to control radiance clamping value used by path tracing engine. Smaller value allows decreasing visible noise and get final result (sometimes much) faster, but it introduces extra bias. The main drawback is that caustics may become darker or even disappear. The higher value allows keeping path tracing unbiased, but may require more time for image convergence. The default value provides a reasonable compromise between these properties, but it is not suitable for all cases.</p> <p>Now this value can be controlled by <code>-maxrad <value></code> parameter of <code>vrenderparams</code> command.</p>
28376	<p><i>Summary:</i> AIS_ColoredShape - fix endless recursion due to misprint.</p>
28390	<p><i>Summary:</i> AIS_InteractiveContext – add topmost-only picking strategy.</p> <p>New property <code>SelectMgr_PickingStrategy</code> defining picking strategy has been added in method <code>AIS_InteractiveContext::PickingStrategy()</code>. The strategy <code>SelectMgr_PickingStrategy_OnlyTopmost</code> allows picking only the topmost detected entity not rejected by Selection Filters.</p>
28460	<p><i>Summary:</i> <code>V3d_View::SetZoom()</code> performs checks which then ignored.</p> <p>Misuse of variables has been fixed in <code>V3d_View.cxx</code>.</p>
28466	<p><i>Summary:</i> <code>OpenGL_Context</code> – read GPU memory using <code>WGL_AMD_gpu_association</code> extension.</p> <p>It is now possible to fetch amount of total GPU memory size using <code>WGL_AMD_gpu_association</code>.</p>
28469	<p><i>Summary:</i> <code>StdPrs_ShadedShape</code> – do not create redundant copy of normal array.</p> <p><code>StdPrs_ShadedShape</code> has ceased to pre-allocate array of normal within processed Face as <code>Tcolgp_Array1OfDir</code> before these normal are stored into <code>Graphi c3d_ArrayOfTriangles</code> at the next step.</p>
28487	<p><i>Summary:</i> <code>TKOpenGL</code> – add option for rendering with lower resolution.</p> <p>New option <code>Graphi c3d_RenderingParams::RenderResolutionScale</code> defines scale factor for allocation of off-screen rendering buffers relative to native resolution of window buffer.</p> <p>Scale factor can be below 1.0 (lower resolution) or higher (as analog of Super Sampling), but cannot be combined with MSAA settings.</p> <p>Draw command <code>vrenderparams</code> has been extended with option <code>-rendScale</code> managing option <code>Graphi c3d_RenderingParams::RenderResolutionScale</code>.</p> <p>Draw command <code>vcaps</code> has been extended with option <code>-useWindowBuffer</code> for managing <code>OpenGL_Caps::useSystemBuffer</code> option.</p> <p>Draw command <code>vrepaint</code> has been extended with option <code>-immediate</code> for testing immediate layer redraw.</p>





28615	<p><i>Summary:</i> TKOpenGL – enabling MSAA leads to black screen on OpenGL ES.</p> <p>Redundant macros check has been removed in method <code>OpenGL_View::blitBuffers</code>.</p>
28621	<p><i>Summary:</i> AIS_ColoredShape::UnsetTransparency() is not implemented.</p> <p>The corresponding interface method has been implemented.</p>
28625	<p><i>Summary:</i> OpenGL_FrameBuffer – initialize Render Buffer with stencil.</p> <p>The stencil-based visualization algorithms (e.g. capping) have been fixed to properly work on iOS.</p>
28630	<p><i>Summary:</i> StdPrs_ShadedShape – do not create Poly_Connect without need.</p>
28644	<p><i>Summary:</i> AIS_MultipleConnectedInteractive – remove unused private class <code>SelectMgr_AssemblyEntityOwner</code>.</p>
28698	<p><i>Summary:</i> Graphi c3d_CView – mark methods <code>MinMaxValues()</code> and <code>NumberOfDisplayedStructures()</code> virtual.</p>
28727	<p><i>Summary:</i> AIS_RadiusDimension - fix misprint in <code>AIS_RadiusDimension::IsValidAnchor()</code> check.</p>
28734	<p><i>Summary:</i> OpenGL_Texture - fix initialization of 1D texture.</p> <p>Proxy check for 1D textures has been fixed in method <code>OpenGL_Texture::Init()</code>. In <code>Declarations.glsl</code>, <code>occTexture1D/3D</code> aliases are now defined similarly to <code>occTexture2D</code>.</p>
28740	<p><i>Summary:</i> AIS_RubberBand - add the option to create or not a closing boundary line.</p> <p>New flag <code>IsFilling()</code> from class <code>AIS_RubberBand</code> allows choosing whether it is necessary to automatically create the closing boundary line connecting the first and the last screen points for a rubber-band.</p>
28741	<p><i>Summary:</i> TKOpenGL - eliminate GL errors within Core Profile in <code>OpenGL_View::copyBackToFront()</code>.</p>
28744	<p><i>Summary:</i> OpenGL_FrameBuffer missing GL_RGB8 format.</p> <p>Missing GL_RGB8 and GL_RGB formats have been added to <code>getColorDataFormat</code> function.</p>
28758	<p><i>Summary:</i> Implement exporting generated image to HRD/EXR images.</p> <p>Support for dumping RayTracing HDR buffers has been added in method <code>OpenGL_View::BufferDump()</code>. New buffer type <code>Graphi c3d_BT_RGB_RayTraceHdrLeft</code> has been implemented.</p>





28762	<p><i>Summary:</i> Ray tracing - Implement depth-of-field effect.</p> <p>New parameters <code>CameraFocalPlaneDist</code> and <code>CameraApertureRadius</code> managing DOF effect have been introduced in <code>Graphi c3d_RenderingParams</code>.</p> <p>New ray generation logic to <code>RaytraceBase.fs</code> has been added in <code>TKOpenGL</code>.</p> <p>The parameters <code>-focal</code> and <code>-aperture</code> have been added in <code>vrenderparams</code> command.</p> <p><code>OpenGL_View.hxx</code> function for ray generating has been split into two functions (ray tracing and path tracing).</p> <p>Interaction between adaptive sampling and stereo camera has been fixed in <code>OpenGL_Vi ew_Raytrace.cxx</code>.</p>
28495 28778 28789	<p><i>Summary:</i> <code>TKV3d</code> - extend API for accessing and assigning BVH builders.</p> <p>The following changes have been implemented:</p> <ul style="list-style-type: none"> ▪ Several methods in Selection classes have been moved to header files for better inlining. ▪ <code>BVH_Constants</code> - added new enumeration defining common constant values used with BVH trees, including <code>BVH_Constants_MaxTreeDepth</code> defining the maximum tree depth expected by OCCT algorithms. ▪ <code>NCollection_Handle</code> has been replaced with <code>Standard_Transient</code> handle in classes <code>BVH_Properties</code>, <code>BVH_Builder</code>, <code>BVH_Tree</code>, <code>BVH_Object</code>. ▪ Global BVH-builders are defined instead of allocating a new builder for each object set. ▪ New method <code>SelectMgr_ViewerSelector::SetEntitySetBuilder()</code> defines default BVH Tree builder for <code>SelectMgr_SensitiveEntitySet</code>. ▪ New method <code>SelectMgr_SensitiveEntitySet::SetBuilder()</code> overrides default BVH tree builder.
28788 28815	<p><i>Summary:</i> <code>StdPrs_WFShape</code> - Add option to compute Isolines using multiple threads.</p> <p><code>StdPrs_WFShape::Add()</code> now accepts new argument <code>theIsParallel</code> (<code>FALSE</code> by default), which enables computing Isolines using multiple threads (if there is more than 1 Face).</p>
28793	<p><i>Summary:</i> <code>TKV3d</code> - make <code>BVH_Builder::Build()</code> <code>const</code> for propagating builder by value.</p> <p>Temporary context <code>BVH_Builder::Build()</code> has ceased to be stored as class field(s) to make it so that a single <code>BVH_Builder</code> instance could be safely shared for building many trees.</p>
28794	<p><i>Summary:</i> Ray tracing - Implement tone mapping.</p> <p>The enumeration <code>Graphi c3d_ToneMappingMethod</code> has been added for choosing tone mapping mode.</p>





<p>28801</p>	<p><i>Summary:</i> <code>Select3D_SensitivePrimitiveArray</code> - add option to keep index map of detected elements.</p> <p>New option <code>theToCheckOverlapAll</code> has been added in <code>Select3D_SensitiveGroup</code> to force overlap check for all entities in the group. The interface for accessing the last detected entity in the group has been implemented.</p> <p>New options to keep the index map of detected elements and to split array into groups for faster initialization of extra-large arrays have been added in <code>Select3D_SensitivePrimitiveArray</code>.</p> <p>Missing accessor <code>::IsDirty()</code> has been added in <code>BVH_Geometry</code> and <code>BVH_Object</code> for checking BVH tree state.</p>
<p>28004</p>	<p><i>Summary:</i> <code>AIS_ColorScale</code> - allow defining labels list not equal to intervals list.</p> <p><code>AIS_ColorScale</code> now draws labels using <code>Graphic3d_VTA_CENTER</code> vertical alignment flag. The color bar now adds margin on the top symmetrical to the bottom.</p> <p>New property <code>IsSmooth</code> has been added in <code>AIS_ColorScale::SetSmoothTransition()</code> for displaying <code>colorscale</code> with smooth transition between color intervals.</p> <p>New properties <code>theMinAngle</code> and <code>theMaxAngle</code> from <code>AIS_ColorScale::SetHueRange()</code> define the hue angles corresponding to minimal and maximum values on the color scale.</p> <p><code>AIS_ColorScale::SetLabels()</code> now allows setting the sequence of free labels, whose number does not match the number of intervals. In this case the labels will be displayed at the positions of virtual intervals corresponding to the number of labels.</p>
<p>28811</p>	<p><i>Summary:</i> Merge texturing support into <code>AIS_Shape</code> class and get rid of <code>AIS_TexturedShape</code>.</p> <p><code>AIS_Shape</code> and <code>AIS_ColoredShape</code> now compute Shaded presentation with UV coordinates if texture mapping is enabled in Drawer. <code>AIS_TexturedShape</code> has been marked deprecated - texture mapping can be handled now using <code>AIS_Shape</code> directly making dedicated sub-class redundant.</p> <p>Inconsistent handling of texture coordinates translation vector has been fixed in <code>OpenGL_Context::SetTextureMatrix()</code>.</p> <p>Draw command <code>vtexture</code> has been extended to handle new arguments:</p> <ul style="list-style-type: none"> ▪ <code>-trsfTrans</code>, <code>-trsfScale</code> and <code>-trsfAngle</code> define transformation matrix; ▪ <code>-setFilter</code> and <code>-setAnisoFilter</code> setup texture filtering.
<p>28850</p>	<p><i>Summary:</i> Length dimension along Horizontal/Vertical axes</p> <p><code>AIS_LengthDimension</code> interface now allows setting a custom dimension direction. The value of dimension is equal to projection of the distance between dimension attributes (points) in this direction.</p> <p>New <code>vlengthparam</code> command sets custom length direction in DRAW.</p>





28888	<p><i>Summary:</i> AIS_InteractiveContext should not hold V3d_View handle which will cause accessing invalid removed V3d_View.</p>
28889 28927	<p><i>Summary:</i> V3d_View - View specific Graphic3d_Structure should be removed if the view is removed.</p> <p>New method V3d_View::Remove() erases trihedron and grid structures from structure manager.</p>
28890	<p><i>Summary:</i> After closing all views and then display the view again, just the first view has object(s) displayed.</p> <p>DeviceLost flag has been moved from Graphic3d_GraphicDriver to Graphic3d_StructureManager, so that all Viewers sharing the same Driver instance could be properly invalidated.</p>
28895	<p><i>Summary:</i> V3d_View::SetComputedMode() - HLR calculation is performed multiple times when hlr_on has been called.</p> <p>Implicit view update has been removed from method V3d_View::SetComputedMode().</p> <p>Uninitialized bounding box of Computed structure has been fixed in methods Graphic3d_CView::SetComputedMode() and ::ReCompute().</p> <p>Computation of Computed structure with transformation within Connected presentation has been fixed in PrsMgr_Presentation::Compute().</p>
28912	<p><i>Summary:</i> TKOpenGL - multi-texture support.</p> <p>The following modifications have been implemented to provide multi-texture support:</p> <ul style="list-style-type: none"> ▪ Graphic3d_AspectFillArea3d now stores array of textures. ▪ Graphic3d_TextureParams stores texture unit for mapping texture. ▪ OpenGL_Context::BindTextures() context now manages the set of active textures. The related code has been removed from OpenGL_Workspace. ▪ OpenGL_Sampler has been extended to hold texture parameters structure. ▪ OpenGL_Texture now holds OpenGL_Sampler instance as class field. ▪ OpenGL_Texture inherits new class OpenGL_NamedResource and holds texture identifier used for sharing resource in OpenGL_Context. ▪ OpenGL_RaytraceGeometry now creates bindless textures taking Sampler object directly from OpenGL_Texture. ▪ OpenGL_Context::BindTextures() automatically recreates immutable Sampler Object on change of texture parameters. ▪ New structure OpenGL_ArbSamplerObject is declared for platform-neutral usage of related functionality. Related functions are now loaded within OpenGL ES 3.0+. ▪ In Declarations.glsl, occActiveSampler has been renamed to occSampler with aliases occSamplerBaseColor (main) and occActiveSampler (for compatibility). Additional texture samplers should be declared explicitly within specific GLSL program as occSampler1, occSampler2, etc. ▪ AIS_Shape and AIS_ColoredShape now compute Shaded presentation with UV coordinates if texture mapping is enabled in Drawer. ▪ vshaderprog now accepts Shader source code as parameter.





<p>28945</p>	<p><i>Summary:</i> StdPrs_ToolTriangulatedShape::ComputeNormals() is extremely slow for triangulation-only surface.</p> <p>StdPrs_ToolTriangulatedShape::ComputeNormals() now calls Poly::ComputeNormals() for triangulation-only surfaces.</p> <p>Poly::ComputeNormals() now averages normal considering triangle size.</p>
<p>29007</p>	<p><i>Summary:</i> AIS_InteractiveContext - the method for accessing Detected owners iterator is missing.</p> <p>New method AIS_InteractiveContext::DetectedCurrentOwner() has been added.</p> <p>AIS_InteractiveContext header has been restructured (methods moved into groups) and description has been cleaned up.</p>
<p>29031</p>	<p><i>Summary:</i> Prs3d_Drawer::SetShaderProgram() has no effect.</p> <p>Prs3d_Drawer::SetShaderProgram() now takes into account HasOwn*** flags.</p>
<p>29051</p>	<p><i>Summary:</i> TKOpenGL - wrong color of transparent dynamic highlight with OIT tuned ON</p> <p>Obsolete code has been removed from OpenGL_PrimitiveArray::Render().</p>
<p>29055</p>	<p><i>Summary:</i> Image_AlienPixmap - fallback using Wincodex.</p> <p>The possibility to read and write images in BMP, PNG, JPEG formats without using FreeImage library is provided on Windows using system image library.</p>





Data Exchange

<p>24729 25388 28680 28840</p>	<p><i>Summary:</i> Data Exchange - rewrite the STL Reader/Writer.</p> <p>Performance and usability STL Reader and Writer tools have been improved:</p> <ul style="list-style-type: none"> ▪ Basic reading of STL file is separated to abstract class <code>RWStl_Reader</code>, which is not bound to particular data structures; the target data model can be bound via inheritance. ▪ <code>RWStl</code> package uses <code>Poly_Triangulation</code> to represent triangular mesh. ▪ Obsolete data structures and tools (packages <code>StlMesh</code> and <code>StlTransfer</code>) are removed. ▪ Method <code>RWStl::Read()</code> supports reading multi-domain STL files.
<p>27561</p>	<p><i>Summary:</i> Since OCCT 7.0.0, exporting a curve to STL creates a file that results in an endless loop when read.</p> <p>New check for empty triangulation when writing STL file has been added so that now it reports error instead of creation of an empty file.</p> <p>STL reader has been improved to properly handle case of empty or small files, and ASCII files without EOL at the end.</p>
<p>28044 28389 28444</p>	<p><i>Summary:</i> Implement data structures for Saved Views and Clipping Planes.</p> <p>Data structures for Saved Views have been implemented in OCAF and STEP. New tool <code>ClippingPlaneToolDriver</code> allows storing and processing Clipping Planes.</p>
<p>28055 28082</p>	<p><i>Summary:</i> Add <code>UpdateAssemblies()</code> method for top-down update of assembly compounds.</p> <p>Top-down update has been implemented for assemblies in <code>XCAFDoc_ShapeTool</code>. <code>UpdateAssembly()</code> method used for partial (parent-only) update is now avoided. STEP and IGES translators now use the top-down update after filling OCAF.</p> <p>The corresponding Draw command <code>XUpdateAssemblies</code> has been added.</p>
<p>28235 28317</p>	<p><i>Summary:</i> DG&T datum XCAF object has incomplete list of shape references.</p> <p>The export and import of datums from/to STEP has been fixed.</p>
<p>28250</p>	<p><i>Summary:</i> Wrong number of geometric tolerance modifiers.</p> <p>Some geometric tolerance modifiers have been fixed in STEP.</p>
<p>28257</p>	<p><i>Summary:</i> <code>XCAFPrs_Style</code> – uninitialized memory usage within <code>::HashCode()</code>.</p> <p><code>XCAFPrs_Style::HashCode()</code> function has been corrected to avoid casting structure address to array of integers used for computing hash code.</p> <p><code>XCAFPrs_Style::SetVisibility()</code> does not reset assigned colors anymore.</p>
<p>28315 28356</p>	<p><i>Summary:</i> Import/Export GD&Ts without semantic.</p> <p>STEP AP242 import and export of GD&Ts have been implemented with only presentation with or without connecting to shapes.</p>





28445	<p><i>Summary:</i> Opening specific STEP file leads to application crash.</p> <p>Check for null vertex during translation from STEP has been added in <code>StepToTopoDS_TranslateVertex</code>.</p>
28449	<p><i>Summary:</i> Wrong orientation of Annotation Plane in GD&T.</p> <p>The orientation of Annotation Plane during reading from STEP has been fixed.</p>
28589	<p><i>Summary:</i> Writing face with Natural Restriction flag to IGES.</p> <p>Additional check for infinite surfaces has been added in method <code>BRepToIGES_BRShell::TransferFace</code>.</p>
28641 28738	<p><i>Summary:</i> Support alpha-channel of color.</p> <p><code>Quantity_ColorRGBA</code> is now used instead of <code>Quantity_Color</code> in <code>XCAFDoc_Color</code> attribute and as a surface color storing transparency in <code>XCAFPrs_Style</code>. Methods for processing RGBA have been added to color tool.</p>
28715	<p><i>Summary:</i> Invalid shape produced by reading of attached STEP file.</p> <p>The use of <code>nonManifold</code> flag has been added to Shape Processing.</p>
28732 28985	<p><i>Summary:</i> Integrate Annotations mechanism to XDE.</p> <p>New tool <code>XCAFDoc_ViewTool</code> is able to store note/annotation labels attached to items in the hierarchical product structure. The tool is located under fixed label 0:1:9. It operates two basic entities: notes and annotations located under 0:1:9:1 and 0:1:9:2 hives correspondingly.</p> <p>A note is an attribute derived from base class <code>XCAFDoc_Note</code> attached to a separate label under the notes hive. Annotated item is represented by <code>XCAFDoc_AssemblyItemRef</code> attribute attached to a separate label under the annotated items hive. Notes are linked to annotated items by <code>CAFDoc_GraphNode</code> attribute, where notes play parent roles and annotated items - child roles.</p> <p><code>XCAFDoc_AssemblyItemRef</code> defines a weak reference to a label with optional attribute GUID or sub-shape index.</p>
28748	<p><i>Summary:</i> <code>XCAFDoc_GraphNode</code> does not restore child on Undo.</p> <p><code>XCAFDoc_GraphNode</code> has been fixed to call <code>Backup</code> method only when the data is really changed.</p>
28790	<p><i>Summary:</i> Wrong orientation of Annotation Plane in GD&T (Writing).</p> <p>Building of <code>Axi s2Pl acement3d</code> in STEP has been fixed.</p>
28797	<p><i>Summary:</i> Exception is raised during reading attached STEP file.</p> <p>Protection against null handle has been added in method <code>RWStepVisual_RWPresentationStyleAssignment::ReadStep</code>.</p>





Draw

<p>25209</p>	<p><i>Summary:</i> Draw command <code>normal s</code> should be extended to show a variable number of normals.</p> <p>New <code>normal s</code> command shows a variable number of normals. It is possible to specify the number of normals along U and V axes of a face in parametric space of its surface as well as the length of displayed normals. Option <code>-UseMesh</code> also displays normals at each node of mesh associated to a shape.</p> <p>Additionally, command <code>vnormal s</code> has been implemented to display normals in 3D view. Syntax of <code>vnormal s</code> is similar to <code>normal s</code> command.</p>
<p>28162 28906</p>	<p><i>Summary:</i> Eliminate usage of deprecated Local Context.</p> <p>New general draw command <code>Vrelation</code> replaces the old <code>relation</code> commands.</p> <p>Two new methods: <code>Activate</code> and <code>Deactivate</code> switch the given selection mode for all displayed objects.</p> <p>Deprecated local context methods have been eliminated in <code>ObjectCommands</code> and <code>QABugs</code>.</p> <p>Deprecated local context methods have been eliminated in MFC standard sample and Qt samples.</p>
<p>28233</p>	<p><i>Summary:</i> <code>Ivarpop</code> is needed for correct work of <code>lmatch</code> defined in <code>StandardCommands.tcl</code>.</p> <p>The procedure <code>Ivarpop</code> has been implemented for correct work of <code>lmatch</code> defined in <code>StandardCommands.tcl</code></p>
<p>28281</p>	<p><i>Summary:</i> Remove unused command <code>vperf</code>.</p> <p>Unused command <code>vperf</code> has been removed.</p>
<p>28313</p>	<p><i>Summary:</i> Extend Draw functionality with some new useful commands and features.</p> <p>The following features have been added in Draw application:</p> <ul style="list-style-type: none"> ▪ The check button item "Extended view commands" has been added In Views menu. It shows/hides in the main window the set of buttons that allow manipulating view zoom/pan/rotate by mouse. ▪ New category of "Vector and measurement Commands" has been added. These commands allow simple calculations using 2D and 3D vectors, such as cross and dot products, computation of distances of points to other objects, and other functions. ▪ The new command <code>pickf</code> has been added in "DRAW Variables management" category. It allows extracting a face picked with mouse included in a shape as a new variable. ▪ New commands <code>del</code> and <code>era</code> have been added in "DRAW Variables management" category. They allow deleting (destructing) or erasing (from view) variables matched by global pattern.





28333	<p><i>Summary:</i> The command <code>what is</code> hangs when selection is activated with no opened view.</p> <p>New method <code>Draw_Window::IsMapped()</code> has been added for checking window state.</p> <p><code>Draw_Window</code> using <code>Xlib</code> now does not exit application on closing window.</p> <p>The method <code>Draw_Viewer::Select()</code> called by <code>what is</code> command has been corrected to avoid entering the loop if no views are initialized.</p>
28350 28381	<p><i>Summary:</i> <code>DRAWEXE</code> still hangs up immediately when redirecting input stream on Windows.</p> <p>In <code>Draw_Window</code> <code>fgetws()</code> is used instead of <code>ReadConsoleW()</code> for reading input from a pipe.</p>
28360	<p><i>Summary:</i> Access for <code>DRAW</code> <code>TCL</code> interpreter needed for custom applications.</p> <p>Components of <code>DRAW</code> now use interpreter with static method <code>Draw::GetInterpreter()</code> instead of shared global variable</p>
28367	<p><i>Summary:</i> <code>Xsave</code> should print an error on store failure.</p> <p><code>Xsave</code> now prints an error on store failure</p>
28404	<p><i>Summary:</i> Avoid useless preparation of display data when shape is not shown.</p> <p>Class <code>DBRep_DrawableShape</code> has been changed to postpone generation of display data until the shape is actually displayed (for the first time).</p>
28829	<p><i>Summary:</i> The command <code>dset signal</code> does not work on Linux properly.</p> <p><code>OSD::SetSignal()</code> method has been corrected to unset <code>FPE</code> exceptions on Linux if called with <code>False</code> argument</p>
28964	<p><i>Summary:</i> Command to apply <code>ShapeFix_FixSmallFace</code> tool.</p> <p>New <code>Draw</code> command <code>fixsmallfaces</code> removes small faces in the shape.</p>
29048	<p><i>Summary:</i> Avoid setting default paths to scripts and test data folders if set externally.</p> <p>Adding default paths to test scripts when <code>DRAW</code> is started is avoided if the relevant variable (<code>CSF_TestScriptsPath</code>) is already defined in the environment.</p>



Samples

<p>23551</p>	<p><i>Summary:</i> Move data models contained in samples subfolder of OCCT repository to common data folder.</p> <p>Data files of MFC samples have been moved to \$CASROOT/data directory.</p>
<p>27398 28999 29018 29025 29042</p>	<p><i>Summary:</i> Integrate Qt Browser Widget to Open CASCADE Technology</p> <p>Qt Browser Widget (Inspector) has been integrated in OCCT distribution:</p> <ul style="list-style-type: none"> ▪ CMake procedure has been extended to compile Qt tools. BUILD_Inspector CMake option switches Inspector ON/OFF. ▪ Sample of DFBrowser tool is available in samples/tools/TInspectorEXE/. To start the sample, use inspector.bat command. ▪ DFBrowser tool can be started from DRAW using INSPECTOR key for pload command.
<p>27737</p>	<p><i>Summary:</i> Remove hardcoded paths to data folders in MFC samples.</p> <p>Data shapes used in samples have been moved into CSF_OCCTDataPath location.</p>
<p>28148</p>	<p><i>Summary:</i> Add 3D Viewer sample for iOS platform.</p> <p>New samples/ios/UIKitSample sample that uses UIKit has been added. It allows importing STEP files, selecting solids, zooming, rotating and panning.</p>
<p>28225</p>	<p><i>Summary:</i> MFC sample on OCAF uses old-style definition of a Handle-class.</p> <p>Obsolete approach to definition of OCCT RTTI in sample classes generated by WOK from CDL has been replaced by usage of standard macros.</p>
<p>28353</p>	<p><i>Summary:</i> IESample cannot write files to paths with special characters</p> <p>The algorithm of charcode conversion to UTF-8 has been improved.</p>



Configuration

<p>26866 26800</p>	<p><i>Summary:</i> <code>genproj</code> – ensure consistency between <code>FILES</code> and actual content of <code>inc</code> and <code>src</code> folders.</p> <p>Check of consistency between <code>FILES</code> and actual content of <code>inc</code> and <code>src</code> folders has been added in <code>genproj</code> procedure.</p>
<p>28110</p>	<p><i>Summary:</i> Specify Unicode charset instead of multi-byte in project files for Visual Studio.</p> <p>Usage of ANSI methods has been eliminated. All Visual Studio projects generated by <code>genproj</code> or CMake now use Unicode character set.</p> <p>Tcl test scripts are now expected in UTF-8 encoding by default. Draw Harness handles Unicode input on Windows.</p>
<p>28135</p>	<p><i>Summary:</i> Adopt building script for using built-in Android cross-compiling support in CMake 3.7.</p> <p>Variable <code>CMAKE_ANDROID_STL_TYPE</code> is available for Android platform built via CMake.</p>
<p>28197 28932</p>	<p><i>Summary:</i> Support Eigen template library as external dependency.</p> <p>Support of "Eigen" third party template library has been added to CMake build procedure. This library provides a set of methods for linear algebra. It is possible to install Eigen headers to <code>/inc</code> folder if Eigen library is used. <code>INSTALL_EIGEN</code> variable has been added to <code>CMakeLists.txt</code>.</p>
<p>28198</p>	<p><i>Summary:</i> Add FPE signals enabling from CMake.</p> <p>CMake variable <code>BUILD_ENABLE_FPE_SIGNAL_HANDLER</code> has been added to enable FPE signals during runtime.</p>
<p>28285</p>	<p><i>Summary:</i> Add missing macro <code>Standard_EXPORT</code> to <code>OpenGL_StateInterface</code> subclasses.</p> <p><code>Standard_EXPORT</code> macro has been implemented for methods of inheritable classes from <code>OpenGL_StateInterface</code>.</p>
<p>28287</p>	<p><i>Summary:</i> CMake install does not copy <code>pdb</code> files in <code>RelWithDebInfo</code> mode.</p> <p>Installation of <code>.pdb</code> files with CMake has been corrected.</p>
<p>28312</p>	<p><i>Summary:</i> <code>genproj.tcl</code> – support <code>CSF_ZLIB</code> and <code>CSF_LIBLZMA</code> within project generator.</p> <p>External libraries: <code>zlib</code>, <code>lzma</code> and <code>Ffmpeg</code>, useful for a project generated by <code>genproj.tcl</code> procedure are now supported. Unused <code>CSF_Avilibs</code> has been dropped.</p>
<p>28324</p>	<p><i>Summary:</i> <code>genproj.tcl</code> – compilation error while targeting OS X 10.8 or lower in Xcode.</p> <p><code>Libc++</code> has been specified as C++ library compatible with C++11 instead of <code>Libstdc++</code>, which is no more updated within Xcode.</p>





28335	<p><i>Summary:</i> CMake – 3rdparty library names are present in two places and are not synchronized with each other.</p> <p>Library names from file <code>adm/cmake/occt_csf.cmake</code> are now used to search libraries. Hardcoded variants of tcl/tk library names for searching have been removed.</p>
28384	<p><i>Summary:</i> Add FPE signals enabling from MSVC.</p> <p>Variable <code>CSF_FPE</code> has been added to the file <code>adm/templates/DRAWEXE.vcxproj.user.in</code>.</p>
28439 28502	<p><i>Summary:</i> Compilation error when using <code>thread_local</code> within Xcode 7 or earlier.</p> <p>The check <code>__has_feature(cxx_thread_local)</code> has been added for using <code>thread_local</code> keyword within Clang.</p>
28658	<p><i>Summary:</i> Cannot execute <code>DRAW.exe</code> with <code>draw.bat</code>.</p> <p>Macro <code>THIRDPARTY_PRODUCT</code> has been updated to create a separate variable, which contains all used 3rd party <code>dll/library</code> directories (<code>custom.bat/sh</code> files).</p> <p>Names of Tcl/Tk libraries for search have been updated.</p>
28663	<p><i>Summary:</i> Integration of TortoiseGit with bug tracker.</p> <p>TortoiseGit client now will show references to OCCT Mantis issues in Git commit messages (in the form #12345) as links to the corresponding issue in the bug tracker. The necessary settings are defined in file <code>.tgitconfig</code> located in the root folder.</p>
28701	<p><i>Summary:</i> Add support of VS 2017.</p> <p>Support of Visual Studio 2017 (15) has been added in CMake build procedure. CMake 3.7.2 or above is required to generate projects for VS 2017.</p> <p>Since the version of compiler and toolset remained at 14 (now they are 14.1), and they use the same run-time, the same third-party products as for VS 2015 (14) can be used. The name of the folder for installation of OCCT binaries in OCCT-standard layout (default on Windows) also remains <code>vc14</code>.</p> <p>Support of Visual Studio 2017 is added in <code>genproj</code> generator and relevant environment, with format specifier <code>vc141</code>.</p> <p>The syntax of the <code>genproj</code> command has been revised:</p> <ul style="list-style-type: none"> ▪ UWP is considered as a separate platform (<code>uwp</code> alternative to <code>wnt</code>), not part of IDE specification; ▪ Option <code>IDE</code> is renamed to <code>Format</code>; ▪ Obsolete name of local variable <code>aWokStation</code> is replaced by equivalent <code>theFormat</code>. <p>In environment scripts, additional variables are defined (derived from <code>VCVER</code>, see <code>adm/vcver.bat</code>):</p> <ul style="list-style-type: none"> ▪ <code>VCLIB</code> defines name of the subdirectory specific to VS version; it is the same as <code>VCVER</code> with a few exceptions: for <code>VCVER=vc141</code> <code>VCLIB=vc14</code> and for <code>VCVER=141-uwp</code> <code>VCLIB=vc14-uwp</code>; ▪ <code>VCFMT</code> is <code>VCVER</code> without optional suffix <code>-uwp</code>; ▪ <code>VCPROP</code> is "NativeDesktop" for normal builds or "Universal" for UWP builds.





28701	<p>Command <code>genconf</code> has been amended to:</p> <ul style="list-style-type: none"> ▪ Detect presence of VS 2017 (separately for desktop and UWP); ▪ Use only two first digits after "vc" in format specification for search of third-party libs; ▪ Have more space in user interface for VS specification; ▪ All supported variants of VCVER variable are documented in <code>devguides/building/msvc</code>.
28769 28920	<p><i>Summary:</i> Unification of <code>msvc.bat</code> files.</p> <p>MFC and Qt samples have been modified for supporting VS 2017. General <code>vcxproj</code> files have been created for all MFC samples.</p> <p><code>DevEnvDir</code> has been added to <code>env.bat</code>.</p> <p>Window title has been added to <code>start</code> command in <code>msvc.bat</code> files.</p>
28785	<p><i>Summary:</i> Cmake – handle OCCT layout within <code>3rdparty_macro.cmake</code>.</p> <p><code>3rdparty_macro.cmake</code> now can also search for a product using OCCT layout for MSVC.</p>
28787	<p><i>Summary:</i> <code>genproj</code> – add option for generating VS project files with Debug info in Release mode.</p> <p>The option <code>HAVE_RelWithDebInfo</code> has been added for generating PDB files within <code>genproj</code>. It allows analyzing user crash reports or profiling performance issues.</p>
28822 28838 28983	<p><i>Summary:</i> Undefine macros coming from X11 headers in place of collision.</p> <p>The macros <code>Status</code>, <code>Convex</code>, <code>Opposite</code> and <code>FillSolid</code> (coming from X11 headers) are now undefined in place of definition of methods with same name in OCCT headers. The usage of variables with name <code>Status</code> is now avoided.</p> <p><code>GL_GLEXT_LEGACY</code> is now defined only if not already defined.</p> <p>The macros <code>AddPrinter</code> (coming from WinAPI headers) is now undefined within <code>Message_Messenger</code> class definition having a method with the same name.</p> <p><code>CurrentDirectory</code> macro is now undefined in <code>OSD_Process.hxx</code>.</p>
28915	<p><i>Summary:</i> <code>Font_BRepFont</code> – do not include FreeType headers within OCCT headers.</p> <p>The inclusion of external headers in OCCT public API headers has been hidden to avoid redundant building/packaging issues.</p>
28922	<p><i>Summary:</i> Remove useless <code>Standard_EXPORT</code> from <code>SelectMgr_Frustum: hasOverlap()</code>.</p> <p><code>Standard_EXPORT</code> has been removed from <code>SelectMgr_Frustum: hasOverlap()</code> because that class is templated and methods <code>hasOverlap()</code> are defined in <code>lxx</code> file.</p>





28959	<p><i>Summary:</i> genproj - provide warning on update of scripts in root folder (msvc.bat, etc.).</p> <p>When updating files msvc.bat and draw.bat/sh in the root folder by copying template from adm/templates, procedure genproj will give a warning (unless the files are already the same); if the target file is newer, its copy is saved with additional extension .bak.</p>
28962	<p><i>Summary:</i> genproj.bat - add /LARGEADDRESSAWARE option to 32-bit target executables.</p> <p>The corresponding option has been added to allow testing of memory-hungry procedures in 32-bit DRAW.</p>
28971	<p><i>Summary:</i> Fix compatibility with glibc 2.26+ due to locale.h removal.</p>
29009 29011	<p><i>Summary:</i> Provide a way to get visual difference of SVG images.</p> <p>New helper script svgdiff.bat has been added in /adm folder. It can be used to show side-by-side visual difference for SVG images in TortoiseGit.</p> <p>The corresponding DRAW command diffimage now can display compared images in 3D viewer.</p> <p>DRAW commands diffimage and vinit now have a new option -exitOnClose to exit the application when the 3D View is closed.</p>
29016	<p><i>Summary:</i> genproj.tcl - add missing definition of CSF_dl.</p>
29056	<p><i>Summary:</i> It is not possible to install VTK products.</p> <p>It is now possible to install VTK products both from command line and CMake GUI.</p>





Coding

<p>25572 28832</p>	<p><i>Summary:</i> <code>Mgt_Tshared</code> can be replaced by <code>Standard_Transient</code>.</p> <p>Obsolete class <code>Mgt_Tshared</code> has been replaced by <code>Standard_Transient</code>.</p>
<p>27407 28417</p>	<p><i>Summary:</i> Using PRECOMPILED HEADER to speed up compilation time.</p> <p>Possibility to accelerate CMake builds of OCCT by usage of precompiled headers has been introduced. It is triggered by CMake option <code>BUILD_USE_PCH</code> (disabled by default).</p> <p>When precompiled headers are used, additional compiler macros are defined globally in the build system to avoid problems due to different order of included files:</p> <ul style="list-style-type: none"> ▪ <code>NOMINMAX</code> is defined on Windows to prevent defining <code>min</code> and <code>max</code> as macros by <code>windows.h</code> ▪ <code>STRSAFE_NO_DEPRECATED</code> and <code>_SCL_SECURE_NO_WARNINGS</code> are defined on Windows to prevent declaring functions of standard C library as deprecated by <code>#pragma</code>, and other warnings in system headers; ▪ <code>GL_GLEXT_LEGACY</code> and <code>GLX_GLEXT_LEGACY</code> are defined to ensure that only OCCT's own <code>glext.h</code> is used; ▪ <code>__STDC_FORMAT_MACROS</code> is defined to have standard C print format macros always defined. <p>Code has been corrected to avoid conflicts with system headers and in case of compiling together as unity builds (partially):</p> <ul style="list-style-type: none"> ▪ Some locally defined variables in <code>TKV3d</code> and <code>TKHLR</code> are renamed to be unique; ▪ Duplicated definitions of macros and global functions are eliminated in <code>TKSTEP</code>; ▪ Useless header <code>WNT_Unicode.hxx</code> is removed; ▪ Usage of local variables conflicting with <code>X11</code> macro is avoided in <code>DrawViewer.cxx</code>; ▪ Local variables in <code>AIS_ConcentricRelation.cxx</code> are renamed to avoid conflict with macros defined in <code>windows.h</code>; ▪ HXX files containing code are renamed to PXX or merged with corresponding CXX files; ▪ <code>IvtkTools</code> classes are corrected to avoid compiler warnings disabled in non-PCH builds by inclusion of VTK headers. <p>Useless pragmas disabling warnings on MSVC have been removed.</p>
<p>28201</p>	<p><i>Summary:</i> Add square <code>Pconfusion()</code> method to the Precision class.</p> <p>Method <code>SquarePConfusion</code> has been added to simplify code.</p>
<p>28202</p>	<p><i>Summary:</i> Eliminate compiler warnings on <code>HLRALgo.hxx</code>.</p> <p>Redundant forward declarations have been removed from <code>HLRALgo.hxx</code>.</p>
<p>28263</p>	<p><i>Summary:</i> Clean up definition of class <code>Graphi3d_MaterialAspect</code>.</p> <p>The following modifications have been introduced:</p> <ul style="list-style-type: none"> ▪ Uninitialized fields have been fixed; ▪ Bodies of trivial methods have been moved to class definition (header file); ▪ Non-primitive types are now returned by reference, when possible; ▪ Unused class <code>Prs3d_PlaneSet</code> has been removed.



<p>28316 28799</p>	<p><i>Summary:</i> Eliminate confusing <code>Quantity</code> aliases of <code>Standard_Real</code> type.</p> <p>Aliases to <code>Standard_Real</code> within <code>Quantity</code> package have been marked as deprecated (including <code>Quantity_Factor</code>, <code>Quantity_Parameter</code>, <code>Quantity_Ratio</code>, <code>Quantity_Coefficient</code>, <code>Quantity_PlaneAngle</code>, <code>Quantity_Length</code>, <code>V3d_Parameter</code> and <code>V3d_Coordinate</code>).</p>
<p>28403</p>	<p><i>Summary:</i> Avoid useless calls to <code>BRepTools::Write()</code>.</p> <p>Useless writes of intermediate shapes to hardcoded paths have been removed in <code>samples\mf\c\standard\02_Modeling\src\ModelingDoc.cpp</code></p> <p>Methods <code>IGESBRep::WriteShape()</code> and <code>XSCControl_Utils::WriteShape()</code> are deleted; <code>BRepTools::Write()</code> can be used instead.</p>
<p>28431</p>	<p><i>Summary:</i> <code>Graphi c3d</code> – Eliminate GCC warning <code>-Wstrict-overflow</code>.</p> <p><code>Graphi c3d_ArrayOfPrimitives</code> has been amended to avoid warning issued by GCC optimizer.</p>
<p>28441</p>	<p><i>Summary:</i> Move nested <code>Image_Pixmap::ImgFormat</code> enumeration to dedicated enum <code>Image_Format</code>.</p> <p>Enumeration <code>Image_Pixmap::ImgFormat</code>, previously declared as nested enumeration within class <code>Image_Pixmap</code>, has been moved to global namespace as <code>Image_Format</code> following OCCT coding rules.</p> <p>The enumeration values have suffix <code>Image_Format_</code> and preserve the previous name scheme for easy renaming of old values, e.g. <code>Image_Pixmap::ImgGray</code> become <code>Image_Format_Gray</code>.</p> <p>Old definitions are preserved as deprecated aliases to the new ones.</p>
<p>28580</p>	<p><i>Summary:</i> Misprint in <code>IntPatch_WireTool.cxx</code> file.</p> <p>Constant index 0 used for elements of <code>theArrPeriods</code> array has been fixed to match cycle variable(i).</p>
<p>28636</p>	<p><i>Summary:</i> Optimization of <code>gp_*</code> classes in order to avoid unnecessary calling <code>gp_Dir*</code> constructors with normalization.</p> <p>The calls to <code>gp_Dir2d(1, 0)</code> have been replaced with calls to <code>gp_Dir2d(void)</code>. Thus <code>sqr t()</code> that is called from within <code>gp_Dir2d(double, double)</code> is avoided. The same concerns the direction in 3D space.</p>
<p>28643 28930</p>	<p><i>Summary:</i> Eliminate GCC compiler warnings <code>-Wmisleading-indentation</code>.</p> <p>OCCT has been revised to eliminate GCC compiler warning <code>-Wmisleading-indentation</code>.</p>
<p>28693</p>	<p><i>Summary:</i> <code>TdataStd_ExtStringArray</code> and <code>TdataStd_IntegerArray</code> should return <code>Array()</code> with <code>const</code> reference.</p>

28726	<p><i>Summary:</i> <code>Quantity_NameOfColor</code> should be replaced by <code>Quantity_Color</code> in function input argument.</p> <p>Virtual methods <code>::SetColor()</code> and <code>::Color()</code> returning/accepting <code>Quantity_NameOfColor</code> have been removed from <code>AIS_InteractiveObject</code>. Virtual method <code>::SetMaterial()</code> accepting <code>Graphi c3d_NameOfMaterial</code> has been removed.</p> <p>Methods accepting <code>Quantity_NameOfColor</code> in classes <code>V3d_View</code>, <code>V3d_Viewer</code>, <code>V3d_AmbientLight</code>, <code>V3d_DirectionalLight</code>, <code>V3d_Light</code>, <code>V3d_PositionalLight</code>, <code>V3d_SpotLight</code> and <code>Aspect_Window</code> have been removed as duplicates of color argument(s) replaced with <code>Quantity_Color</code>.</p>
28806	<p><i>Summary:</i> Remove not implemented method <code>OpenGL_ShaderObject::Initialize()</code>.</p> <p>The method <code>OpenGL_ShaderObject::Initialize()</code> has been removed.</p>
28810	<p><i>Summary:</i> Add test scripts to <code>.gitattributes</code>.</p> <p>Test scripts were added to <code>.gitattributes</code> to provide correct end-of-line.</p>
28899 28900 28916	<p><i>Summary:</i> Eliminate Clang compiler warnings in Products.</p> <p>Clang compiler warnings have been eliminated in Products.</p>
28907	<p><i>Summary:</i> <code>OpenGL_Graphi cDriver</code> – fix class fields accidentally marked public.</p> <p>Class fields <code>myLayerIds</code>, <code>myLayerSeq</code> and <code>myMapOfZLayerSettings</code> from <code>OpenGL_Graphi cDriver</code> have ceased to be defined as public.</p>
28940	<p><i>Summary:</i> Fix building OCC Products using <code>Mingw-w64</code>.</p> <p>Missing definition for <code>CSF_netapi32</code> has been added in CMake. <code>--std=gnu++0</code> is used instead of <code>--std=c++0x</code> in case of gcc (as for OCCT).</p> <p><code>Aci sData_Aci sModel::ReadSaveFile()</code>, <code>DxfFile_WorkLibrary::ReadFile()</code> and <code>DxfFile_WorkLibrary::WriteFile()</code> now use <code>OSD_OpenStream()</code> instead of own platform-dependent code.</p>
28960 28978 28979 28980 29017	<p><i>Summary:</i> Eliminate GCC compiler warnings.</p> <p>The following warnings have been eliminated:</p> <ul style="list-style-type: none"> ▪ <code>-Warray-bounds</code> in <code>NCollection_Array1.hxx</code> and <code>AdvApp2Var_MathBase.cxx</code>. ▪ <code>-Wfor-loop-analysis</code> in <code>GCPnts_TangentialDeflection.pxx</code>. ▪ <code>-Wstrict-aliasing</code> in <code>Graphi c3d_ArrayOfPrimitives.lxx</code>. ▪ <code>-Wmisleading-indentation</code> in <code>SatControl_Controller</code>.
29021	<p><i>Summary:</i> Eliminate GCC warnings in Qt sample.</p> <p>Qt sample has been revised to eliminate GCC warnings.</p>
29058	<p><i>Summary:</i> <code>OpenGL_Window</code> - eliminate memory leak after <code>XGetVisualInfo</code>.</p> <p>Minor memory leak occurring at creation of the view is eliminated.</p>



Documentation

25187	<p><i>Summary:</i> Document the algorithms used in fixes for issues 0024915 and 0025194.</p> <p>The algorithms making transformation matrix orthogonal and finding the intersection line between two cylinders have been implemented.</p>
27018	<p><i>Summary:</i> Block-quotes are incorrectly formatted in PDF.</p> <p>A section about formatting of quotes has been added in the documentation guide.</p>
27381	<p><i>Summary:</i> Update description of method <code>AIS_InteractiveContext::SetPixelTolerance()</code>.</p> <p>The description of selection methods has been updated.</p>
27876	<p><i>Summary:</i> Draw <code>mkoffset</code> does not work.</p> <p>The documentation for Draw command <code>mkoffset</code> has been updated.</p>
28179	<p><i>Summary:</i> Update documentation of Boolean Component.</p> <p>Recent changes in the Boolean Component have been documented.</p>
28181	<p><i>Summary:</i> Update porting note with missing information.</p> <p>The information about removed classes <code>StdPrs_WFDeflectionShape</code>, <code>Prs3d_WFShape</code> and <code>StdPrs_ToolShadedShape</code> and removed property <code>AIS_InteractiveObject::SelectionMode()</code> has been added.</p>
28249	<p><i>Summary:</i> Upgrade Guide - mention need to use option <code>-std=c++0x</code> when using GCC.</p> <p>The necessity of building OCCT or dependent projects with option <code>-std=c++0x</code> (or <code>-std=c++11</code> when available) when GCC compiler is used (e.g. on Linux) has been mentioned.</p>
28362 28440	<p><i>Summary:</i> Doxygen warnings on Linux.</p> <p>Documentation sources have been corrected to avoid compilation bugs.</p>
28371	<p><i>Summary:</i> Update system requirements page.</p> <p>Table of supported operating systems with versions has been removed in favor of a more general statement with a simple list of supported OS and architectures. Outdated list of tested graphic cards has been dropped.</p>
28427	<p><i>Summary:</i> Data Exchange – Update Reference Manual for STEP format.</p> <p>STEP format user's guide has been updated.</p>





28654	<p><i>Summary:</i> gendoc.bat documentation generation tool does not take into account image size.</p> <p>The parameter defining image width has been added to all figures in the text of user's guides to improve their layout in PDF documents.</p>
28664	<p><i>Summary:</i> Documentation of Graphi c3d_CView : Activate and Deactivate does not seem correct</p> <p>The methods Graphi c3d_CView : Activate and Deactivate have been described properly.</p>
28697	<p><i>Summary:</i> PMI Vis - mistake in user guide.</p> <p>Mistakes in PMI Vis user guide have been fixed.</p>
28704	<p><i>Summary:</i> Recommend adding the class header first in its source file.</p> <p>It is now recommended in the Coding Rules to add class header first in its source file.</p>
28814	<p><i>Summary:</i> Suggest using # instead of // for temporary comments in commit description.</p> <p>The symbol # is now recommended to use for temporary comments in commit description instead of //.</p>
28854	<p><i>Summary:</i> The documentation should state where handle reference counting happens.</p> <p>The comment to class opencascade: : handle<> in Standard_Handle.hxx now explains better the features differing it from std: : shared_ptr<>.</p>
28877	<p><i>Summary:</i> Fix unclosed tag in coding_rules.md</p> <p>Unclosed tag has been fixed in the Coding rules user's guide.</p>
28950	<p><i>Summary:</i> Generation of draw_test_harness and upgrade pdf files crashes.</p> <p>Template for LaTeX header used in generation of PDF manuals has been corrected to avoid multiple error warnings during processing by LaTeX.</p> <p>The names of log files generated by gendoc command now depend on the target format and (for PDF output) document name.</p>
28997	<p><i>Summary:</i> Visual 3d_Layer removed, but still in the documentation.</p> <p>The description of obsolete features has been removed from Visualization User's Guide.</p>





Added-value components

ACIS-SAT Import/Export

28534	<p><i>Summary:</i> Export to ACIS gives file that can't be open by AutoCAD.</p> <p>The files exported to ACIS now can be correctly open with AutoCAD 2017.</p>
28676	<p><i>Summary:</i> Add support of Adesk colors to ACIS import/export.</p> <p>ACIS import/export interface has been updated to support both original color attributes (<code>colour-<i>tsl-attrib</i></code> and <code>rgb_color-st-attrib</code>) and own attributes of Adesk applications (<code>color-<i>adesk-attrib</i></code>).</p>
28861	<p><i>Summary:</i> Updating SAT Import interface for versions 2500 – 2700.</p> <p>The reading of files from versions 2500 - 2600 is now provided for ASCII files (additionally to binary files).</p>
28871	<p><i>Summary:</i> Various problems with SAT export</p> <p>The algorithms writing BSpline surfaces with uncommon geometry have been fixed.</p>

DXF Import / Export

28504	<p><i>Summary:</i> DXF Export loses colors for non-shared Solids.</p> <p>The export procedure now finds translated shapes while writing colors in case of single reference.</p>
28269	<p><i>Summary:</i> Write newer DXF versions.</p> <p>Support of the newer format versions (till AC1024) has been implemented.</p>
28816	<p><i>Summary:</i> DXF Writer transforms non-planar faces into mesh.</p> <p>Storage of non-planar faces as REGIONS has been added in DXF writer.</p>
28671	<p><i>Summary:</i> DXF Writer doesn't store colors for entities saved with ACIS format.</p> <p>The attributes of solids are now properly translated into ACIS entities.</p>
28917	<p><i>Summary:</i> DXF Import - casting to unrelated type.</p> <p>The following modifications have been introduced to eliminate warnings:</p> <ul style="list-style-type: none"> ▪ <code>Interim DownCast to DxfSection_Object</code> has been removed as unnecessary. ▪ <code>ACISLaw_Multipl eDataLaw</code> is now used instead of <code>ACISLaw</code>.





Parasolid Import

26026	<p><i>Summary:</i> XtControl_Reader hangs when processing specific data</p> <p>It is now checked that distances between the spine and the supporting surfaces correspond to ranges.</p>
28328 28334	<p><i>Summary:</i> Adding new schemes for Parasolid import</p> <p>Schemes 26105 and 28002 have been updated and schemes 26102, 26104 and 28101 added.</p>

JT Import / Export (TKJT)

28224 28629 28887 28896 28905 28925	<p><i>Summary:</i> TKJT Integration.</p> <p>JT interface decoding JT visualization files has been added in Open CASCADE. JT data model allows representing a wide range of engineering data. The interface allows importing of multi-resolution tessellated representations along with product structure, attributes, meta-data and PMI.</p>
28894	<p><i>Summary:</i> TKJT - provide JTCAFCControl_Reader for mapping JT data onto XDE document</p>
28905	<p><i>Summary:</i> TKJT - provide basic JT writer and XDE to JT data translator</p>
28408	<p><i>Summary:</i> TKJT - triangles order is broken for JT8 files.</p> <p>The order of triangle indices while splitting array has been fixed in JtElement_ShapeLOD_Vertex.</p>
28531	<p><i>Summary:</i> TKJT - implicit parallelization is leading to awful performance when build without TBB.</p> <p>It is now allowed to use NO_JT_MULTITHREADING macros for disabling parallelization at TKJT level.</p>

BestFit

26026	<p><i>Summary:</i> Add constraints to Best Fit</p> <p>Particle swarm optimization (PSO) has been implemented in BestFit package to ensure global convergence and robustness in complex conditions. PSO algorithm inherently supports constraints for translation and rotation part. New implementation uses discrete representations of input shape (i.e. mesh and/or polylines) and is unable to refine the solution found by calculating distances to the actual shape geometry. Therefore, the input shape should be tessellated with the deflection sufficient for optimization.</p>
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Canonical Recognition

28251	<p><i>Summary:</i> Crash in canonical recognition module when loading a specific STEP file.</p> <p>Now isoline in U or V direction is taken from trimmed surface, to avoid exception in case of infinite surface. New optional argument <code>UnifyFlag</code> defining <code>UnifyMode</code> has been added to Draw command <code>CRshapeconvert</code>.</p>
28590	<p><i>Summary:</i> Problem with <code>NaturalRestriction</code> flag.</p> <p>Check for <code>NaturalRestriction</code> flag has been added in case of infinite result surfaces.</p>
28611	<p><i>Summary:</i> Make sewing operation optional in the sample.</p> <p>Recognition parameters dialog now recalls the last set of parameters. Sewing step has been made optional.</p>

Collision Detection

28904	<p><i>Summary:</i> The algorithm reports inexistent collision.</p> <p>The problem with detection of the collision of two coplanar triangles has been fixed.</p>
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Express Mesh

27966	<p><i>Summary:</i> Mesh algorithm takes very long time on specific model.</p> <p>The processing of non-same-parameter edges in <code>QMShape_Tessellator</code> has been improved. Now edge is considered <code>non-sameparameter</code> if the distance between same-parameter points is large, but the orthogonal distance is within tolerance. Otherwise, the edge is considered <code>same-parameter</code>, but its processing tolerance is increased according to the real deflection.</p> <p>In the method <code>QMShape_Di scrCurve: : PntToCurve2d</code>, the face transformation when projecting a point on its non-transformed surface is taken into account.</p>
28458	<p><i>Summary:</i> Some faces are missing when loading a specific CAD. This is a regression from OCCT 7.0 and Express Mesh 7.0.</p> <p>Functions <code>ACos</code> and <code>ASin</code> from <code>Standard_Real</code> class have been modified to avoid exception when the argument is <code>+- (1. + Epsilon(1.))</code> because of "numerical noise".</p>
28548	<p><i>Summary:</i> Incorrect removing of small loops in Quad mode.</p> <p>The removal of small loops in Quad mode has been corrected. Draw command <code>MFmeshshape</code> has been extended to output an error message if the meshing fails.</p>





<p>28568</p>	<p><i>Summary:</i> The patterns in Quad mode produce overlapped quads.</p> <p>A new algorithm has been created to check the validity of any given 3D quad. The check of the final quad for the validity has been added for triangular patterns. The check for validity has been added for each quad produced by quadrangular pattern Grid.</p> <p>Quadrangular pattern "Extract asymmetrical rows" and triangular pattern "Extract one row" have been extended to check that:</p> <ul style="list-style-type: none"> ▪ the cut 3D quads are valid; ▪ the rows cut by 2D polylines do not intersect the bound of the polygon. <p>Triangular pattern "Split triangle-like polygon to three quads" now checks that the produced 2D quads do not overlap each other if the 2D polygon is not self-overlapped. Triangular pattern "Extract two rows" has been corrected to cut the rows by 2D segments not intersecting the bound of the 2D polygon if the polygon is not self-overlapped.</p> <p>The new algorithm rotates the quad elements of any given surface mesh so that each quad is divided by its diagonal from the first node to triangles in the best way according to a criterion. The functionality to add a quad element to a mesh was extended to optionally forbid any rotation of the element.</p>
<p>28730</p>	<p><i>Summary:</i> Express Mesh tessellation slow for specific CAD model faces</p> <p>Express Mesh tessellation algorithm has been optimized:</p> <ul style="list-style-type: none"> ▪ <code>IncAllLocator</code> is now used for allocation of temporary data in the methods of <code>QMTools_Polygon2dTool</code>. ▪ The computation of perimeter is now disabled if only area is needed. ▪ Quadratic complexity is avoided in method <code>FindShortestLink()</code> using a tree of boxes. ▪ The number of starting angles in <code>chooseBestLink()</code> has been restricted to avoid long computation caused by quadratic nature of the algorithm.
<p>28737</p>	<p><i>Summary:</i> Take edge tolerance into account for the sake of correct projection of point on curve.</p> <p>Precision: <code>Confusion()</code> is now passed as computational tolerance to projectors; edge tolerance is used to check distance between the projected and the source point.</p>
<p>28774</p>	<p><i>Summary:</i> <code>WireCorrector</code> does not check correspondence between intersection point and end points of discrete edge.</p> <p>Additional checks are now performed only if the remaining intersection point does not correspond to intersection at ends of poly-lines. The possibility to remove points in the middle of a poly-line is checked.</p>
<p>28777</p>	<p><i>Summary:</i> Express Mesh produces overlapping mesh due to invalid discretization of an edge.</p> <p>Projection cache is now used even for the first parameter to avoid snapping invalid projection to the opposite end of an edge.</p>
<p>28918</p>	<p><i>Summary:</i> Express Mesh - eliminate VC14 compiler warning 'pointer truncation'.</p> <p>Unused functions have been removed from <code>QMBgr_QuadTree.cxx</code>.</p>





Mesh Framework

28268	<p><i>Summary:</i> Extend OMF component for the hierarchical using of the split and group Boolean operation.</p> <p>Type OMFDS_Mesh has been extended by methods RemoveSubMeshes, HasSubMeshes and RemoveFaces.</p> <p>Type OMFBool_BooleanOperation has been extended by method AddGroups.</p> <p>Draw command MFsplitAndGroup has been extended to optionally perform the Boolean operation in the hierarchical manner.</p> <p>Draw command MFextractsubmesh has been extended to optionally extract all leaf sub-meshes.</p>
28395	<p><i>Summary:</i> The OMF functionality failed to project a point to a mesh.</p> <p>The projection algorithm has been fixed in OMFAlgo::ProjectPointOnMesh.</p>
28410	<p><i>Summary:</i> Create an algorithm to compute the mass center of any given surface mesh.</p> <p>New algorithm CenterOfSurfaceMass has been implemented to compute the mass center of any given surface mesh.</p>
28538	<p><i>Summary:</i> FJTS-09-009 Implementation of Principal axes of inertia for OMFDS_Mesh object.</p> <p>Calculation of volume principal inertia properties has been implemented for surface mesh object.</p>
28872	<p><i>Summary:</i> Exception during MFmeshfuse processing.</p> <p>Method OMFBool_SplitElement::addSectionElement has been corrected to avoid creating elements composed of less than 3 vertices.</p>
28942	<p><i>Summary:</i> Extend BO commands to allow producing only triangular elements in the result.</p> <p>Commands MFmeshcommon, MFmeshfuse, MFmeshcut, MFmeshcommons and MFmeshcuts have been extended to produce only triangular elements in the result.</p>

Surfaces from Scattered Points

28798	<p><i>Summary:</i> Updating SSP sample.</p> <p>The export of a cloud of points into BRep file has been added.</p>
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Unfolding Library

<p>25402 25736 25739 25888</p>	<p><i>Summary:</i> Improvement of Unfolding module.</p> <p>New unfolding algorithm is based on minimization of the strain energy deformation. It uses finite element approximation for numerical simulation of deformation process.</p> <p>Features of the algorithm:</p> <ul style="list-style-type: none"> ▪ performs unfolding process for developable or non-developable surface (TopoDS_Face or TopoDS_Shell); ▪ provides methods to calculate deformations for each point of shape; ▪ provides interface for mapping points and curves from initial shape to the planar (unfolded) shape and vice versa; ▪ provides functionality to export results to PLY or VTK formats.
<p>28447</p>	<p><i>Summary:</i> Enable use of meshed input shape without geometry.</p> <p>The following modifications have been introduced:</p> <ul style="list-style-type: none"> ▪ MAX_NODES global macro is converted to a constant variable ▪ Selection of an initial element for unfolding without referring to shape's geometry. ▪ An initial element is the most remote from the mesh boundary element. It is determined by moving layer by layer from the mesh boundary.
<p>28530</p>	<p><i>Summary:</i> Crash when mapping point to unfolded surface.</p> <p>Improper use of BVH algorithm in 3D to 2D point mapping algorithm has been fixed.</p> <p>Draw command mapping point 3D to 2D has been fixed:</p> <ul style="list-style-type: none"> ▪ Error handling has been added for the points mapping algorithm; ▪ Output of split points has been added in case of 3D to 2D mapping.
<p>28578</p>	<p><i>Summary:</i> Unfolding algorithm is crashed on OCCT compiled in 32 bit mode.</p> <p>"Out of memory" exception has been fixed in Init and Perform API functions; now these methods return Unfolding_OutOfMemory error status instead of throwing exception.</p>
<p>28818</p>	<p><i>Summary:</i> Unfolding - points mapping works incorrect.</p> <p>Unfolding_Algo has been fixed to apply the transformation from the unfolding face to underlying mesh for correct mapping.</p>
<p>28827</p>	<p><i>Summary:</i> Unfolded face is suddenly re-meshed while displaying in 3D Viewer.</p> <p>Use of BRepBuilderAPI_MakeWire is now avoided in the building of result, because it creates copies of edges without attached polygon-on-triangulation structure.</p>





Advanced Samples & Tools

<p>28037 28424</p>	<p><i>Summary:</i> Java Wrapper and VTK integration.</p> <p>IVtk toolkit has been wrapped to use it in Java with existing VTK wrapped java classes provided by VTK6.1.0 (with non-swig wrapper).</p>
<p>28396 28507</p>	<p><i>Summary:</i> C# wrapper - wrap missing classes and fix wrapping order of packages PrsMgr and Prs3d.</p> <p>The wrapping order of PrsMgr and Prs3d packages has been reversed. The directives for wrapping V3d_DirectionalLight, V3d_SpotLight, AIS_Animation, AIS_AnimationTimer, AIS_AnimationCamera and AIS_AnimationObject have been added.</p>
<p>28397</p>	<p><i>Summary:</i> C# wrapper - mark Standard_Transient methods public to allow creation of sub-modules.</p> <p>Wrapping for basic classes TObj_Object and TObj_Model has been added in TKTObj.i.</p> <p>Warning on casting Standard_Transient to itself has been suppressed in TKernel.i</p> <p>Internal methods in C# wrapper and cref.i are now marked as public to allow splitting into sub-modules.</p> <p>New macros WRAP_AS_HANDLE_INCLUDE_EXT and WRAP_AS_ENUM_INCLUDE_EXT have been added in occtypes.i for wrapping OCCT-based application classes within specified sub-path to the headers.</p> <p>Uninitialized value before throwing exception has been fixed in WRAP_AS_HANDLE().</p>
<p>28651</p>	<p><i>Summary:</i> Update User Guide of the Shape Healer advanced sample.</p> <p>User Guide of the Shape Healer advanced sample has been updated.</p>
<p>28804</p>	<p><i>Summary:</i> C# wrapper - support parsing OCCT headers from src folder.</p> <p>SWIG C# wrapper has been extended with the option to feed SWIG with paths to OCCT src folder instead of inc.</p>
<p>28808</p>	<p><i>Summary:</i> C# wrapper - propagate Standard_DEPRECATED to wrapped classes.</p> <p>In updatewrappers.tcl ObsoleteAttribute() attribute is put to C#-wrapped methods marked by Standard_DEPRECATED in C++.</p> <p>An index shift +1 has been added for constructors to skip the first constructor automatically generated by SWIG.</p>
<p>28809</p>	<p><i>Summary:</i> Add .i files to .gitattributes.</p> <p>.i file extension (SWIG wrapper declarations) has been added in .gitattributes.</p>



28851	<p><i>Summary:</i> C# wrapper - support Unicode strings.</p> <p>Unicode strings now can be passed between native C++ OCCT and C# levels through mapping <code>wchar_t*</code> strings.</p>
28865	<p><i>Summary:</i> C# wrapper - suppress warning about <code>NCollection_Array1</code> move operator.</p> <p>Warnings about <code>NCollection_Array1</code> move operator have been eliminated.</p>
28901	<p><i>Summary:</i> <code>OverlapGeom_IdentitySurfaces</code> - fix misprint while comparing <code>Geom_CylindricalSurface</code>.</p>
28906 29023 29036	<p><i>Summary:</i> eliminate usage of Local Context in samples.</p> <p>Usage of Local Context is now avoided in MFC samples, Import/Export sample and Shape Healing training sample.</p>
29010	<p><i>Summary:</i> Launch <code>custom.bat</code> in samples before calling general environment.</p> <p>The order of calling <code>custom.bat</code> and <code>general.env.bat</code> has been switched in samples.</p>
29033	<p><i>Summary:</i> Strange behavior of OCAF Sample during format changing.</p> <p>Format change is now handled properly by the sample. Unsupported storage format <code>MDTV-Standard</code> has been changed to <code>BinOCAF</code>.</p>

Geodesic

28209	<p><i>Summary:</i> Apply some improvements and performance optimizations to the distance field functionality.</p> <p>The following improvements and performance optimizations have been applied to the distance field functionality:</p> <ul style="list-style-type: none"> ▪ discarding of the windows has been replaced by their splitting for each link to refine; ▪ the straighter window are granted an advantage over the other window during the intersection of windows with similar distances; ▪ similar windows adjacent on links are merged; ▪ spiky windows are removed from links; ▪ <code>NCollection_Handle</code> has been replaced by the OCCT handle for type <code>Geodesic_MeshDistances::Window</code>; ▪ <code>NCollection_IncAllocator</code> is used for the links to refine; ▪ isoline building now produces the proper result if the isoline contains mesh nodes; producing duplicated parts of the isoline is avoided.
28231	<p><i>Summary:</i> Apply extension to the distance field functionality to straighten the field.</p> <p>The distance field algorithm has been extended to optionally straighten the isolines. The presentation of each isoline has been extended by the corresponding 3d curve and vertices.</p>



28834	<p><i>Summary:</i> Geodesic offset is not computed on closed (solid) shapes.</p> <p>The geodesic equidistant algorithm now works on closed models.</p>
28994	<p><i>Summary:</i> CAMpocket operation does not work.</p> <p>The algorithm iterating offset lines has been corrected.</p>

[Visualization tools for PMI data \(PMIVis\)](#)

28239	<p><i>Summary:</i> PMIVis - defined positions and number of places are not loaded properly in some cases.</p> <p>Positioning of dimensions and tolerances has been revised to exclude loss of custom positioning coming from XCAF.</p> <ul style="list-style-type: none"> ▪ Parsing of zone modifiers has been separated. ▪ Markers have been added to tolerance lines. ▪ Methods for importing a different type of dimensions in PMIVis_Exchange: dimensional size, dimensional location and radial dimensions have been separated. It is needed to customize attributes of dimension in every definite case. ▪ <code>myIsNeedBuildTextPosition</code> has been renamed into <code>myIsCustomTextPosition</code>. ▪ Only the middle parameter of radial dimension is now used for circular geometry.
28902	<p><i>Summary:</i> PMI Visualization - eliminate CLang compiler warnings - <code>Woverloaded-virtual</code>.</p> <p><code>PMIVis_Presentation::init()</code> has been renamed and virtual flag has been removed since the method is called from constructor.</p>
28533	<p><i>Summary:</i> PMIVis core - Remove dependency on DRAW.</p> <p>TKPMIVis dependencies on TKDCAF and other unnecessary toolkits have been eliminated.</p>
28628	<p><i>Summary:</i> PMIVis - TKPMIVis compilation fails in 'Release With Debug Information' mode</p> <p>Building of products is now skipped if OCCT was built without some necessary packages.</p> <p>The compilation procedure for 'Release With Debug Information' configuration has been fixed.</p>





Volume Rendering

<p>28742 28858</p>	<p><i>Summary:</i> Develop a package for geometry operations in distance field representation.</p> <p>New toolkit TKMeshTools allows working with distance fields.</p> <p>The new module implements:</p> <ul style="list-style-type: none"> ▪ Data structures for voxel data (sparse voxel octree, SVO). ▪ Boolean operations on voxel data sets. ▪ Operation creating voxels from shape (from triangulation). ▪ Operation creating triangulation from voxels (contouring).
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Point Cloud Rendering

<p>28023 28666</p>	<p><i>Summary:</i> Provide package for real-time rendering of massive point clouds.</p> <p>Point cloud toolkit TKPointCloud has been introduced.</p> <p>This toolkit provides a set of data structures, algorithms and customizable AIS interactive object for efficient visualization and processing large Point Sets, which do not fit into memory and processing power of usual GPU to be displayed at once.</p> <p>Toolkit includes import tools from various Point Set formats (PLY, PSL, PTX), internal file format for data efficient streaming, advanced Level of Detail (LODs) management, memory usage limits, dynamic point size management (for visual surface reconstruction), tools for picking points, Eye-Dome Lighting (EDL) post-processing shading filter.</p> <p>The dedicated version of the toolkit is available for embedding into Web-browser</p>
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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, ARM64 and x86), and iOS (ARM64) 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 <https://www.opencascade.com/content/system-requirements>.

Linux Operating System	Arch Linux, CentOS 6.4, CentOS 7.3, Fedora 22, Fedora 24, Ubuntu-1604, Debian 7.0, Debian 8.0
Windows Operating System	MS Windows 10 / 8 / 7 SP1 / Vista SP2 / XP SP3
OS X/macOS Operating System	OS X/macOS 10.10 and later
Android Operating System	Android 4.0.3 and above
iOS Operating System	iOS 7 and above
Minimum memory	512 MB, 1 GB recommended
Free disk space (complete installation)	650 MB of disk space, or 1,4 GB if installed with reference documentation
Graphic library	OpenGL 3.3+, OpenGL ES 2.0+
C++ <i>For Linux:</i> <i>For Windows:</i> <i>For Mac OS X:</i> <i>For Android:</i>	GNU gcc 4.3+ LLVM Clang 3+ Microsoft Visual Studio 2010 SP1 Microsoft Visual Studio 2012 Update 4 Microsoft Visual Studio 2013 Update 2 Microsoft Visual Studio 2015 Microsoft Visual Studio 2017 Intel C++ Composer XE 2013 SP1 GCC 4.3+ (Mingw-w64) XCode 6 or newer GCC 4.8+ (android-ndk-r12+)
TCL (for testing tools) <i>For Linux:</i> <i>For Windows:</i> <i>For OS X:</i>	Tcltk 8.6.3+ https://www.tcl.tk/software/tcltk/8.6.html Tcltk 8.6.3+ https://www.tcl.tk/software/tcltk/8.6.html or ActiveTcl 8.6 https://www.activestate.com/activetcl/downloads Built-in Tcl/Tk 8.6+
Qt (for demonstration tools)	Qt 4.8.6 https://download.qt.io/
FreeType (OCCT Text rendering)	FreeType 2.4.11-2.7.1 https://www.freetype.org/
FreeImage (Support of common graphic formats)	FreeImage 3.17.0 http://freeimage.sourceforge.net/
gl2ps (Export of OCCT viewer contents to vector graphic file, deprecated)	gl2ps-1.3.8 http://geuz.org/gl2ps/
TBB (optional tool for multithreaded algorithms)	TBB 4.x or 5.x https://www.threadingbuildingblocks.org/
Doxygen (optional for building documentation)	Doxygen 1.8.5+ https://www.stack.nl/~dimitri/doxygen/download.html
FFmpeg (multimedia framework for OCCT video recording)	ffmpeg-3.3 https://www.ffmpeg.org