Requirements Description

Interoperability Forum

AFNeT

PDES, Inc.
Connecting the Digital Enterprise

AFNeT

PDES, Inc.

prostep ivip

CAD VIEWING REQUIREMENTS

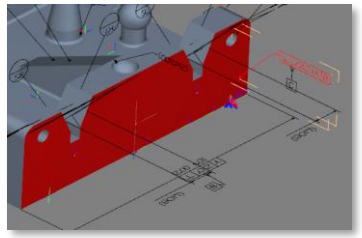
Interoperability Forum

CAD Viewing requirements / 3D Geometry

- 3D exact BREP representation
  - Ability to display exact STEP B-Rep representations
- 3D tessellated representation
  - Ability to display STEP tessellated representations
- Presentation (colors, layers, transparency, invisibility, etc.)
  - Ability to manage STEP graphic attributes
- Alternative Representation for same Shape (e.g., B-Rep / Tessellated)
  - Retrieve Tessellated and Exact B-Rep Shape of Model
    - Import both shapes, switch between them

CAD Viewing requirements / 3D PMI

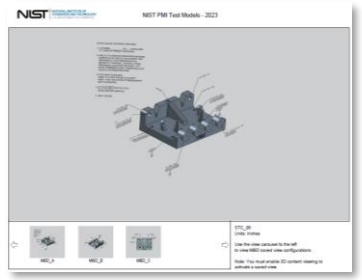
- Graphic Presentation (Part Level)
  - Display the PMI annotations with cross-highlighting



- Semantic Representation (Part Level)
  - Read and display the semantic PMI information

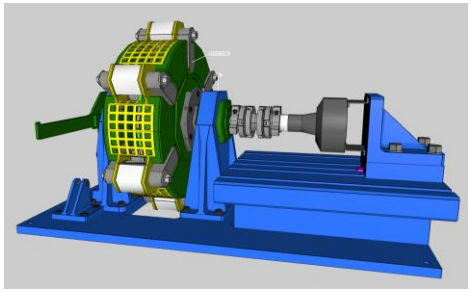
Property	Value
FDT Type	TOLERANCE
Length expressed in	INCH
Tolerance Type	Perpendicularity
Tolerance Value	0.012
[1] Value	0.012
DatumRef 1	A
DatumRef 2	B
nodeType	FDT

- Saved View (Part Level)
  - Display the Saved Views



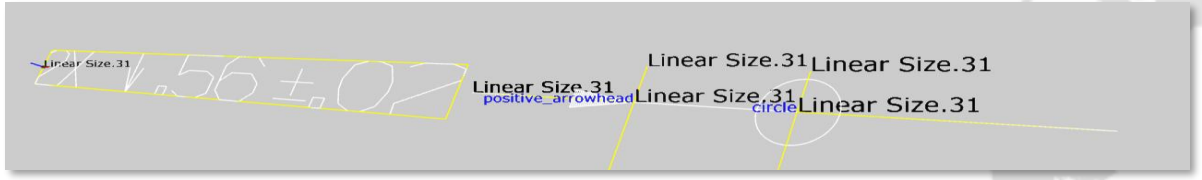
CAD Viewing requirements / 3D PMI

- Graphic Presentation (Assembly Level)
  - Display the PMI defined at assembly level



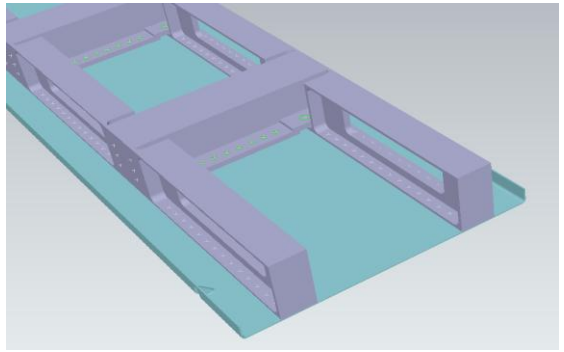
- Saved View (Assembly Level)
  - Display the Saved Views defined at assembly level

- PMI Presentation Placeholder
  - Display the PMI Placeholder Information

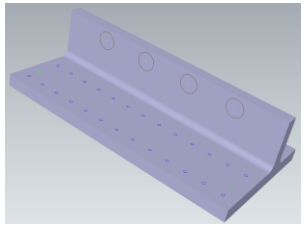


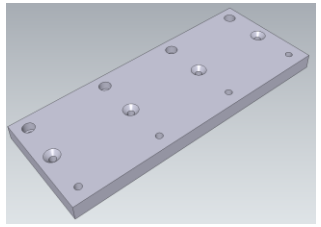
CAD Viewing requirements / Assembly and Installation

- Hole and Fasteners Definition based on UDA, UDF and geometric set
  - Display the fastener indications and their parameters / properties



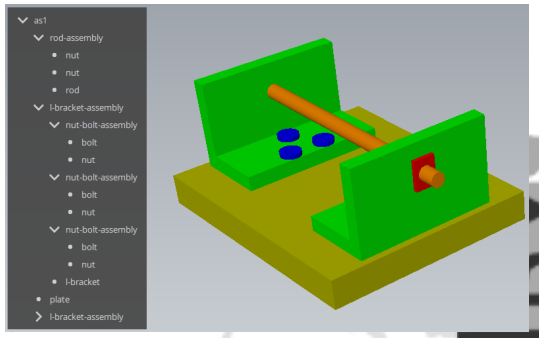
- Hole Definiton
  - View the defined holes





CAD Viewing requirements / Assembly Structure

- Single File with Assembly Structure and Geometry
  - Display the Assembly Structure and included Geometry



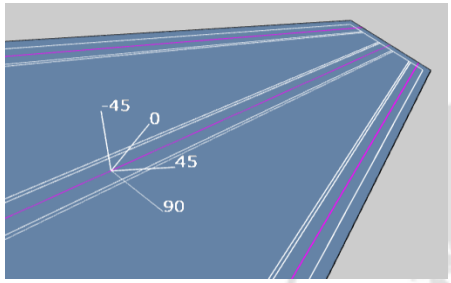
- Single File with Assembly Structure and references to CAD 3D files
  - Display the Assembly Structure and the externally referenced Geometry
    - With a P21 root assembly file
    - With an XML root assembly file

- Nested Assembly files with references to CAD 3D files
  - Display the Assembly Structure including the externally referenced sub-assemblies, and the externally referenced Geometry
    - With a P21 root assembly file
    - With an XML root assembly file

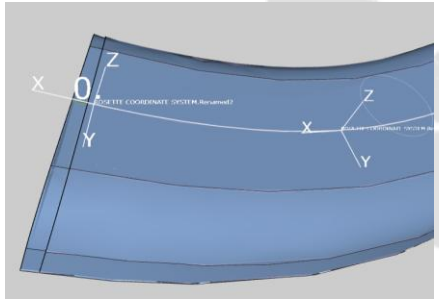
CAD Viewing requirements / Composite Design

- Basic Composite (Ply Laminate Table)
  - Display information about the Composite Material definition

- Cartesian Rosette
  - Display information about the Cartesian Rosette

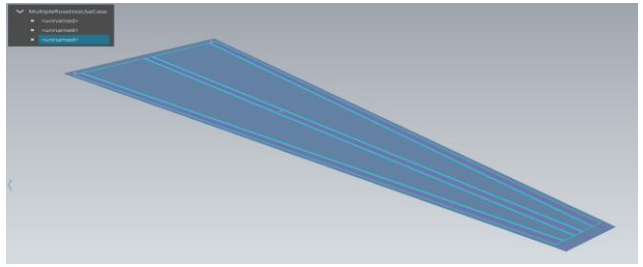


- Rosette guided by a Curve
  - Display information about the Rosette guided by a curve

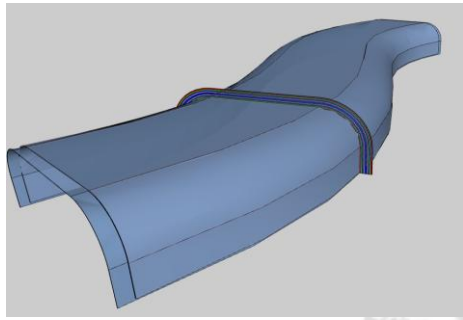


CAD Viewing requirements / Composite Design

- Ply Shape Explicit Contour
  - Display the explicitly defined contours of the ply shapes



- Ply Shape 3D Tessellated Representation
  - Display the explicitly defined 3d shape of the composite part



- Composite Material
  - Display information about the Composite Material definition

CAD Viewing requirements / Kinematics

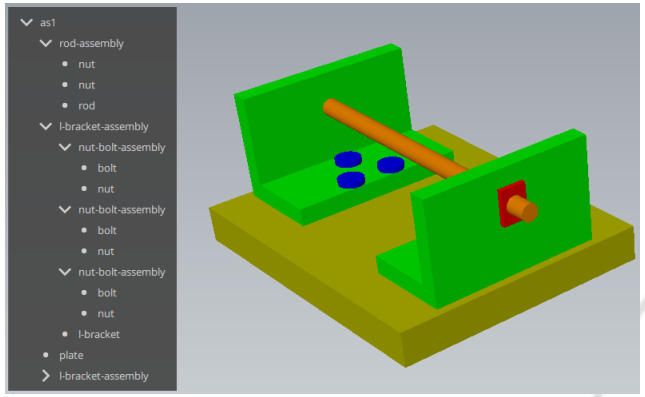
- Kinematic Mechanism
  - Display information Kinematic Pairs defined in the model

CAD Viewing requirements / Properties

- User Defined Attributes (UDA) on geometry level
  - Display the properties and parameters defined at the geometry level
- User Defined Attributes (UDA) on part level
  - Display the properties and parameters defined at the part level
- User Defined Attributes (UDA) on assembly level
  - Display the properties and parameters defined at the assembly level

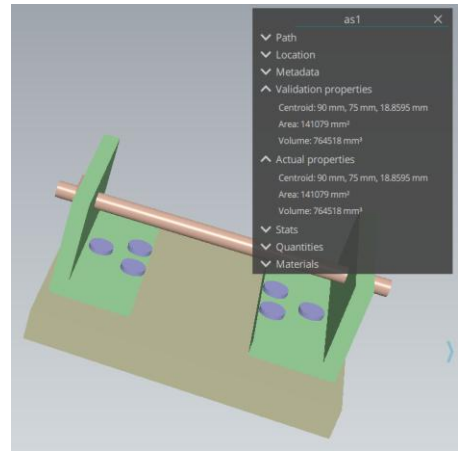
CAD Viewing requirements / STEP Compressed File

- STEP Compressed Files
  - Load and display the compressed files
    - Part 21 files .stpz
    - XML files .stpxz
- STEP Archive
  - Load and display a .stpA archive



CAD Viewing requirements / Validation Properties

- Geometric Validation Properties
  - Read the STEP Geometric Validation Properties
    - Read and display the geometric validation properties
    - Calculate the actual geometric properties in the viewing application



- PMI Validation Properties
  - Read the STEP PMI Validation Properties
    - Read the PMI validation properties
    - Display this information in the viewing application

pmi validation property : : affected area	27315.092466 mm2
pmi validation property : : equivalent unicode string	FCF\w⊥\w.012\wA\wl
pmi validation property : : number of segments	147
pmi validation property : : tessellated curve centre p...	-60.384599 -132.68740
pmi validation property : : tessellated curve length	500.059731 mm

- Kinematic Validation Properties
  - Read the Kinematic Validation Properties
    - Read and display the kinematic validation properties stored in the STEP file
    - Calculate the actual kinematic properties in the viewing application

CAD Viewing requirements / Validation Properties

- Assembly Validation Properties
  - Read the Assembly Validation Properties
    - Read and display the assembly validation properties stored in the STEP file
      - Number of Children, Notional Solids Centroid
    - Calculate the actual assembly validation properties in the viewing application
      - Number of Children, Notional Solids Centroid

- Composite Validation Properties
  - Read the Composite Validation Properties
    - Read and display the Composite validation properties stored in the STEP file
    - Calculate the actual Composite validation properties in the viewing application

- User Defined Attributes (UDA) Validation Properties
  - Read the UDA Validation Properties
    - Read and display the UDA validation properties stored in the STEP file
    - Calculate the actual UDA validation properties in the viewing application

PDM VIEWING REQUIREMENTS

Interoperability Forum

PDM Viewing requirements

- Support of STEP Part 21 (.stp) geometry files
  - the PDM usecases focus on the PDM data, but each part node shall be able to reference one or many alternative geometries as Part 21

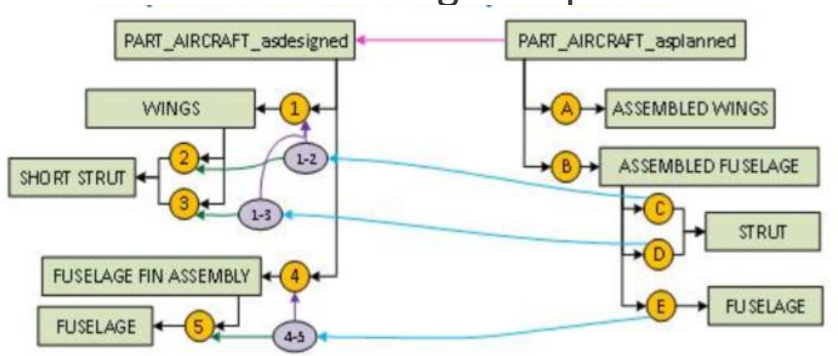
- Support of ISO 14306 JT(.jt) geometry files
  - the PDM usecases focus on the PDM data, but each part node shall be able to reference one or many alternative geometries geometry as JT

- “As Designed” PDM product structure
- “As Planned” or further product structure (postponed, still in test phase)
  - through the support of PartView.InitialContext.LifeCycleStage=‘design’, ‘manufacturing planning’, … check ability to manage different kind of BoMs on Part level. BoMs on IndividualPart level are currently not in scope (for example “As Built” or “As Maintained”)

PDM Viewing requirements

Multi-BoM Links

- Ability to manage the cross references from the “As Planned” part nodes to the “As Designed” part nodes:
  - For the root nodes, between PartViews
  - For the subnodes, between SingleOccurrences (in orange) and/or SpecifiedOccurrences (in violet)



- Simplified positioning representation (no GeometricRepresentationRelationship)
  - Ability to manage NextAssemblyOccurrenceUsage.Placement as CartesianTransformation. This is the recommended mapping for PDM interfaces

- Nested PDM product structure
  - Ability to manage nested files (one file for each assembly/part node, referencing each other). This is the recommended mapping for large data exchange and for long-term archiving

PDM Viewing requirements

- Incremental Exchange
  - Ability to manage incremental changes in order to optimize the size of exchanged data
    - show that the changes have been incorporated into the initial product structure.
      This requires to import both files and show the cumulated result.

- Assembly Validation Properties (number of children, notional centroid based on cubes)
  - Check the data quality via local computing of the number of children and the notional centroid based on cubes for each assembly node and comparing to the supplied values

- LifeCycleManagement, (LifeCycle, ApplicationDomain, Approvals) on PartView.InitialContext and PartVersion/DocumentVersion
- PersonInOrganization on PartVersion/DocumentVersion
- DateAndTime on PartVersion/DocumentVersion
  - Ability to manage these attributes on each part/document node

PDM Viewing requirements

- Classification on Part/Document
  - Ability to manage these attributes on each part/document node
- File properties (Format, Content, ~~*Creation, Size*~~) on DigitalFile
  - Ability to manage these attributes on each document node
- PDM Representation of DocumentAssignment
  - Ability to manage the Document/DocumentVersion/DocumentDefinition/DigitalFile referenced by PartView.DocumentAssignment
- CAx Representation of DocumentAssignment
  - Ability to manage the DigitalFile referenced by PartView.DocumentAssignment

PDM Viewing requirements

- Customized PDM Properties
  - Ability to manage the customized properties defined on PartView, NextAssemblyOccurrenceUsage, DocumentDefinition
- User Defined Attributes (UDA)
  - Ability to manage the UDAs defined on PartView and NextAssemblyOccurrenceUsage
- Multi-identification
  - Ability to manage multiple identifiers (coming from different context (organization, …)) on Part.Id, PartVersion.Id, Document.Id and DocumentVersion.Id
- Change Management (WorkRequest, Activity)
  - Ability to manage WorkRequest, its associated Activities and involved PartVersions or Occurrences (as input or output of the change)

PDM Viewing requirements

- PartViewRelationship
  - Ability to manage PartViewRelationship (FindNumber as .Id)
    This is a prerequisite to support substitute parts, PDM customized properties and effectivities on PartViewRelationship

- Configuration management based on simple effectivities
  - Ability to manage Serial/Dated/Effectivities on PartVersion and on NextAssemblyOccurrenceUsage

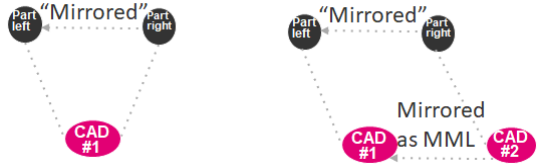
- Configuration management based on specifications
  - Ability to manage ConditionalEffectivities on PartVersion and on NextAssemblyOccurrenceUsage

- Configuration management filtering information
  - Ability to manage a ProductConfiguration defined as filter prior to the export of a product structure

PDM Viewing requirements

- Alternate and Substitute Parts
  - Ability to manage alternate parts, alternate part versions, substitute part usages and substitute part occurrences

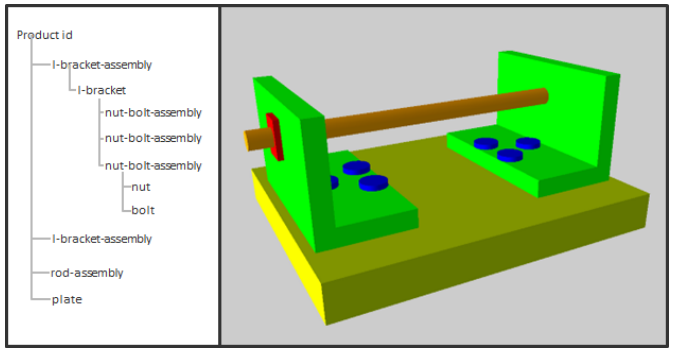
- Mirrored Parts
  - Ability to manage mirrored parts defined sharing the same geometry or built as Multi Model Link (MML) between 2 CAD models



FUNCTIONAL REQUIREMENTS

Interoperability Forum

Functional requirements / Navigation



- Tree view of the product structure
  - Ability to display the tree view of the product structure

- Apply filter to tree view on the 150% structure that have effectivities
  - Ability to filter a 150% product structure, using effectivities
    - Display effectivities defined in the model
    - Define a filter (serial number, specifications, ...)
    - Display the filtered product structure corresponding to this filter.

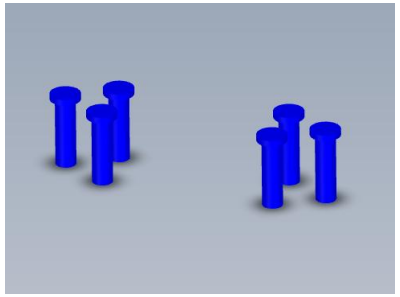
Functional requirements / Navigation

- Issue-driven tree view
  - Ability to display the sub-assembly impacted by an issue
    - Select the Work Request
    - Show the Work Request / Activity attributes
    - Identify the affected part occurrence(s) and the context geometry
    - Display the context geometry and highlight the affected part occurrence(s)

- Select
  - Ability to select an element in the tree view
    The corresponding element is highlighted in the 3D view
- Search
  - Ability to search an element by name in the tree view
    Corresponding element is highlighted in the tree view and the 3D view

Functional requirements / Navigation

- Filter
  - Ability to filter elements in the tree view
    - Open a filter command; define a filter
      - Elements having a specific attribute
      - Elements having a specific value for a specific attribute
      - Elements having a name including a specific string
    - Only the elements corresponding to this filter are displayed



Example: filter all occurrences of the product “bolt”

- Save tree attribute filter settings
  - Ability to save a filter
    - Define a filter and Save this filter settings.
    - Close the application. Re-open the model
    - Load the saved filter
    - Only the elements corresponding to this filter are displayed

Functional requirements / Navigation

- Easy access to product properties
  - Ability to access product properties
    - Select a product in the tree view
    - Display Product properties/attributes: Creation date, Update date, Creator, Editor

- Select
  - Ability to select an element in the 3D view
    - Select a face, part or sub-assembly in the 3D view
    - Corresponding element is highlighted in the tree view
- Search
  - Ability to search elements in the 3D view
    - Open a search command; define a box of sphere for the search
    - Objects inside the box/sphere are selected and highlighted in the tree view and the 3D view

Functional requirements / Viewing

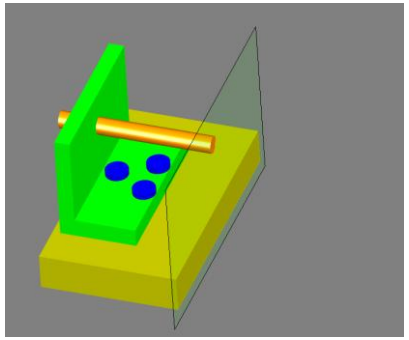
- Easy access to product properties
  - Ability to access product properties
    - Select a product in the 3D view
    - Display Product properties/attributes: Creation date, Update date, Creator, Editor

- Filter
  - Ability to filter elements in the 3D view
    - Open a filter command; define filter criteria based on graphic attributes
      - For example : objects having green color,
    - Only the elements corresponding to this filter are displayed

- Scaling/zooming, translate, rotate
  - Ability to modify the camera position

Functional requirements / Viewing

- Sectioning
  - Ability to display the result of sectioning
    - Define a cutting plane
    - Select the side to display
    - Result: the 3D view displays the model cut by the plane



- Light compare of geometry
  - Ability to compare two parts and show their differences
    - list and position of differences, highligth of differences

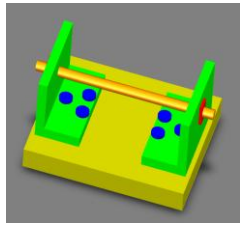
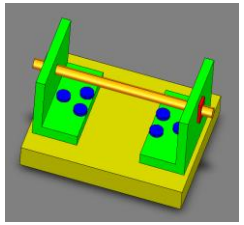
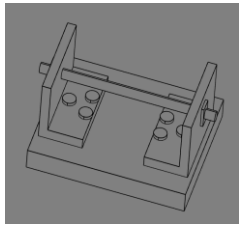
- Comparing product structure
  - Ability to compare two assemblies and show their differences
    - Display changes in the product structure: Version Ids changed, Instance removed, Instance moved, …

Functional requirements / Viewing

- Virtual Reality
  - Ability to use VR devices : 3D screen with glasses or VR headset

- Augmented Reality
  - Ability to superimpose a 3D object on a user's view of the real world

Functional requirements / Rendering

- Modes (wireframe, shading, …)
  - Ability to display models using different modes

- Colors (in addition to CAD Viewing requirement : Presentation)
  - Ability to display shells using the colors defined in the STEP model

- Colors (in addition to CAD Viewing requirement : Presentation)
  - Ability to display wires and points using the colors and types defined in the STEP model

- Colors (in addition to CAD Viewing requirement : Presentation)
  - Ability to display instances using the colors defined in the STEP model

- Colors (in addition to CAD Viewing requirement : Presentation)
  - Ability to manage overriding face colors

Functional requirements / Rendering

- Transparency
  - Ability to display transparent faces or parts as defined in STEP files

- Set Transparency
  - Ability to set or modify transparency

Functional requirements / Measuring, Analysis

- Measuring (exact)
  - Ability to measure a length

- Minimum distance
  - Ability to compute and display the minimum of distance between 2 objects. Objects are points, edges, faces or parts

- Wall thickness
  - Ability to measure and display the wall thickness of a part.

Functional requirements / Digital Mockup

- Detect collision / clash
  - Ability to detect collision between parts.
- Clearance/Separation (min. distance between neighbor parts)
  - Ability to measure clearance between parts.
- Calculation of minimum bounding box
  - Ability to compute the minimum bounding box of a part or assembly.
- Section cuts with dynamic plane
  - Ability to compute and display dynamically a sectioning of a part.

Functional requirements / Digital Mockup

- Run kinematics mechanism
  - Ability to operate a kinematics mechanism.
    - Display the list of kinematic pairs, the involved part occurrences, the kinematic parameters and if they have a driver

Functional requirements / Converter

- 3D PDF
  - Ability to save the displayed model with possible markups in a 3D PDF file.

Functional requirements / Authoring

- Annotate/Redline/Markup
  - Ability to add markups to a model.
    - Add annotations/redlining/markups.
    - Save the result in a new file (same type or not : STEP, 3D PDF, JPEG, …)

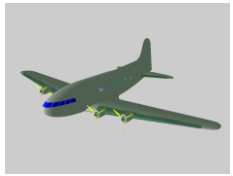
- Custom view
  - Ability to define, save and reload a view.
    - Define a view (viewpoint, hidden elements, …)
    - Save this view

NON-FUNCTIONAL REQUIREMENTS

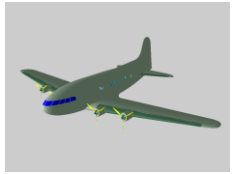
Interoperability Forum

Non functional requirements / Performance

- Response time (1000 parts with exact geometry)
  - Evaluate loading time of assembly with exact geometry.
  - Model: mbx-if_viewer-test_Performances_Stratoliner_STPX_exact.zip



- Response time (1000 parts with tessellated geometry)
  - Evaluate loading time of assembly with tessellated geometry.
  - Model: mbx-if_viewer-test_Performances_Stratoliner_STPX_tessellation.zip



- Behaviour with large assembly
  - Evaluate loading time of a large assembly with tessellated geometry.
  - Model: mbx-if_viewer-test_Performances_StratoFleet24.zip (22514 files)

- Behaviour with very large assembly
  - Evaluate loading time of a very large assembly with tessellated geometry.
  - Model: mbx-if_viewer-test_Performances_StratoFleet60.zip (58982 files)