



LOTAR

LONG TERM ARCHIVING AND RETRIEVAL

LOTAR Part 132*

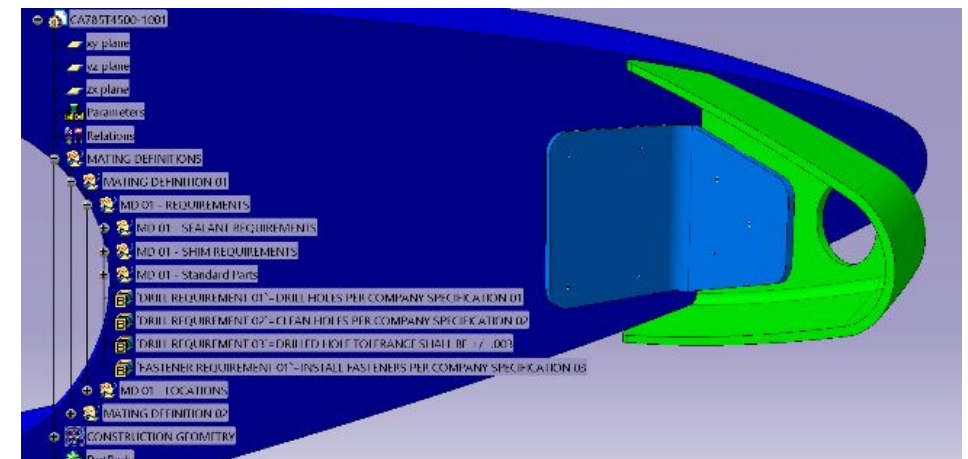
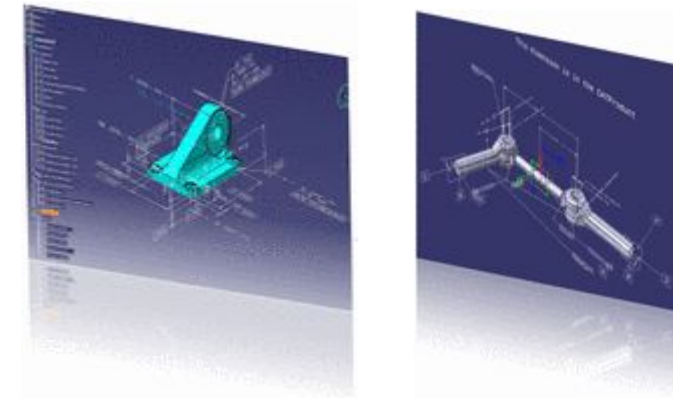
***Long Term Archiving and Retrieval of digital technical product documentation such as 3D CAD and PDM data — PART 132: Structural joins for assembly & installation**



Assembly/Installation with fasteners

LOTAR Mechanical

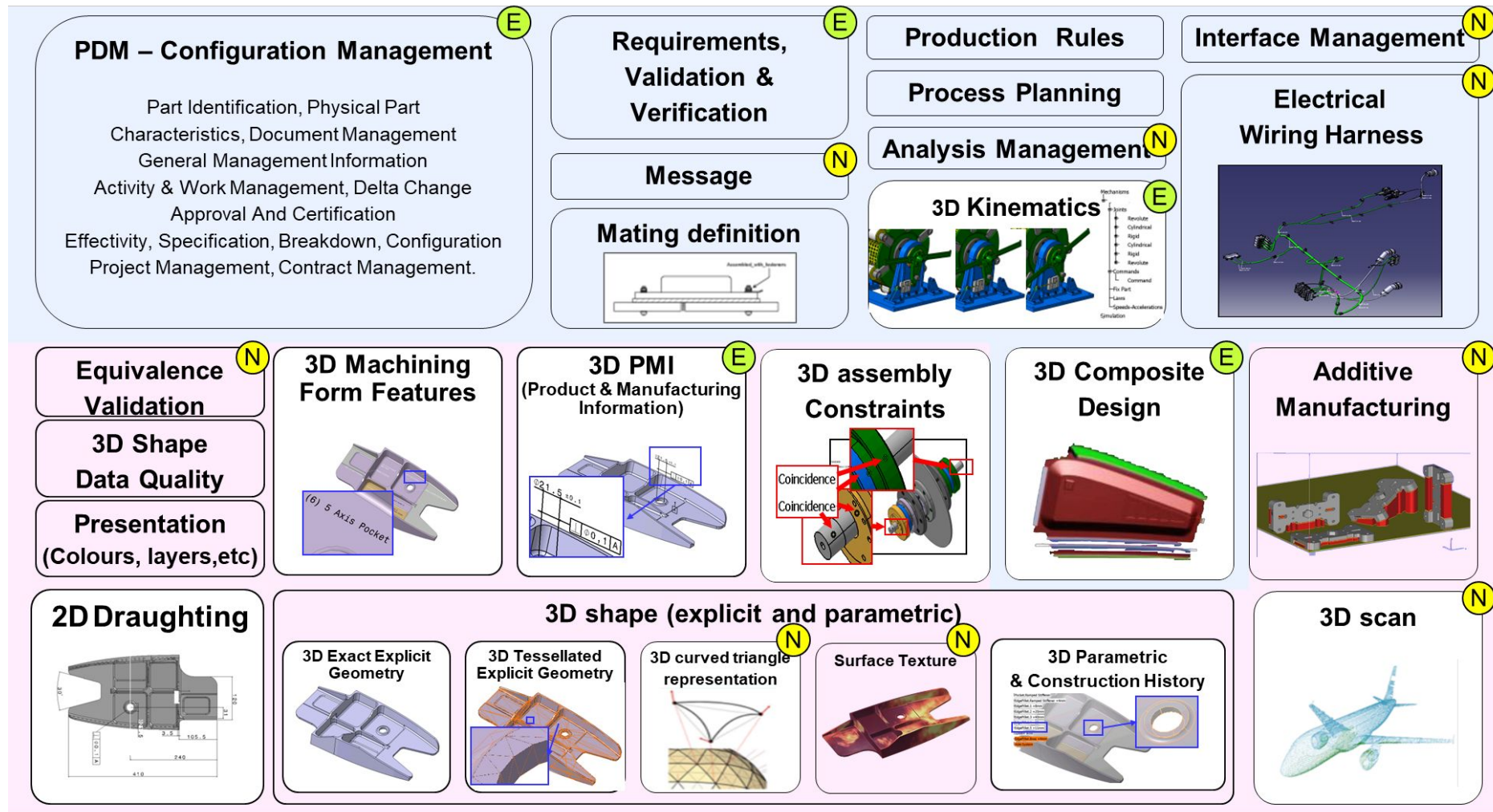
- LOTAR International objective: develop, test, publish and maintain standards for **long-term archiving** of digital data for aerospace industry . EN / NAS 9300
- LOTAR Mechanical working group
 - Already released standards for LTA of **3D, Assembly structure**, Product and Manufacturing Information (**PMI**).
 - The next objective of the Mechanical working group is the manufacturing domain.
 - It includes **Structural joins for assembly & installation**



Requirements

- Need to part numbers (identifiers) of fastener parts, e.g. fastener, washers, nutplates, nuts, etc.
- Need to represent fastener location and orientation.
- Need to identify the ordered sequence of how the fasteners are installed, e.g., the stackup of the fastener and the parts being joined either explicitly via geometry or implicitly.
- Fastener parts may be explicitly modeled or implicit by reference (need to define parameters for fasteners, e.g. library reference to a standard part)
- Hole features may be explicitly modeled or implicit.
- Need to associate requirements and/or specifications with a fastener instance (specific occurrence or location). Requirements may be applicable to the fastener or the hole.
- Requirement could be a text string, e.g., “Torque to XX N-m”,
- A reference to a specification, e.g., “Seal per Company Specification XXX”. Reference could be represented as a test string and/or a document reference such as URL.
- Where fastener instances share common requirements and/or specifications, need to group the instances together into a collection or group.
- Need to identify collector object to consume into MBOM

STEP AP242 Managed model-based 3D engineering

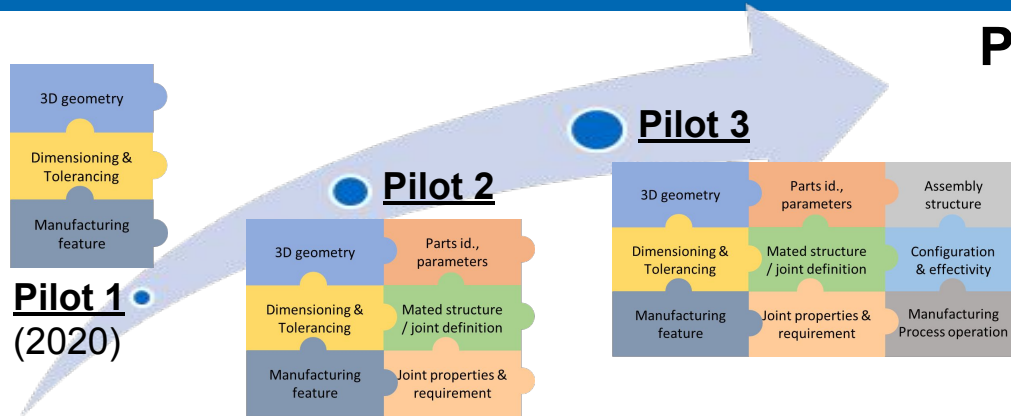


Enhancement **E**

New (Extension) **N**

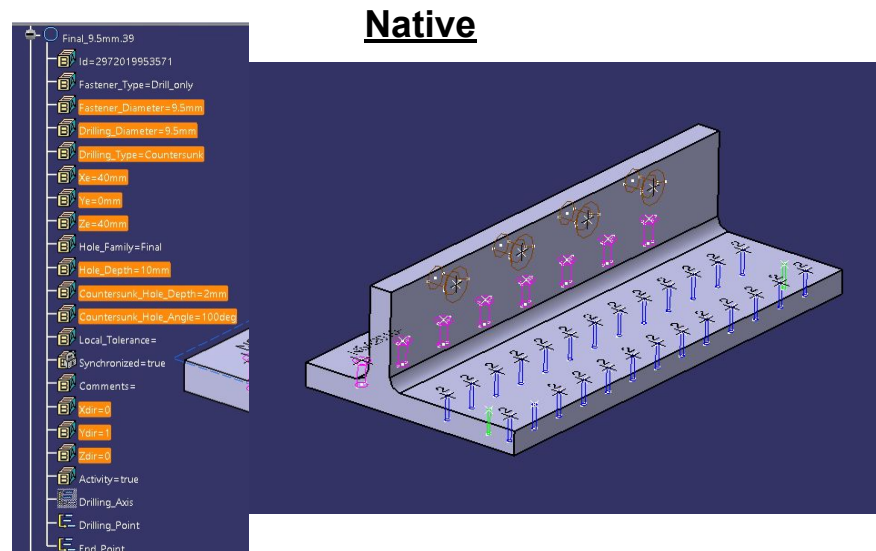
Domain model + AP module

AP Module only



Phases planned:

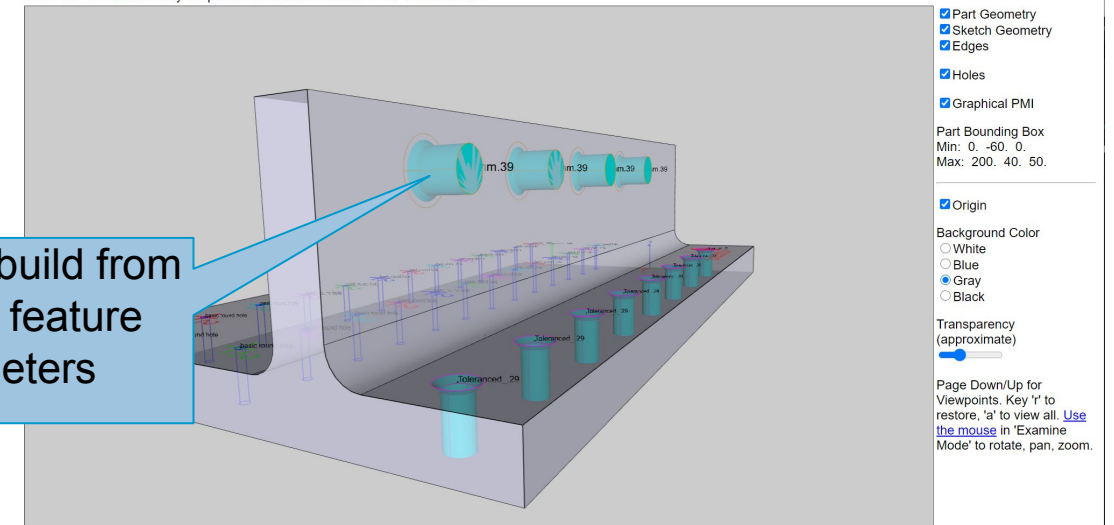
- 1) Hole definition in a part: STEP AP242 Edition 2 (on going)
- 2) Simple assembly with fastener: hole and requirement, STEP AP242 Edition 2 or +
- 3) Complex assembly structure



STEP Vlewer

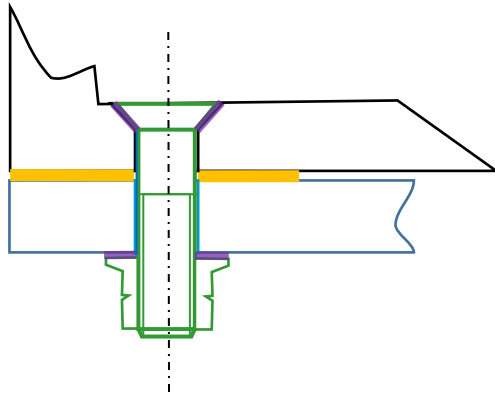
Bracket-simplified-holes-20191008.stp AP242e2 2019-10-08T14:09 CATIA

The STEP file contains only Graphical PMI and no Semantic PMI. Part: Bracket



STEP AP242 recommended practices

The working group is investigating the P21 and XML implementation for joint definition



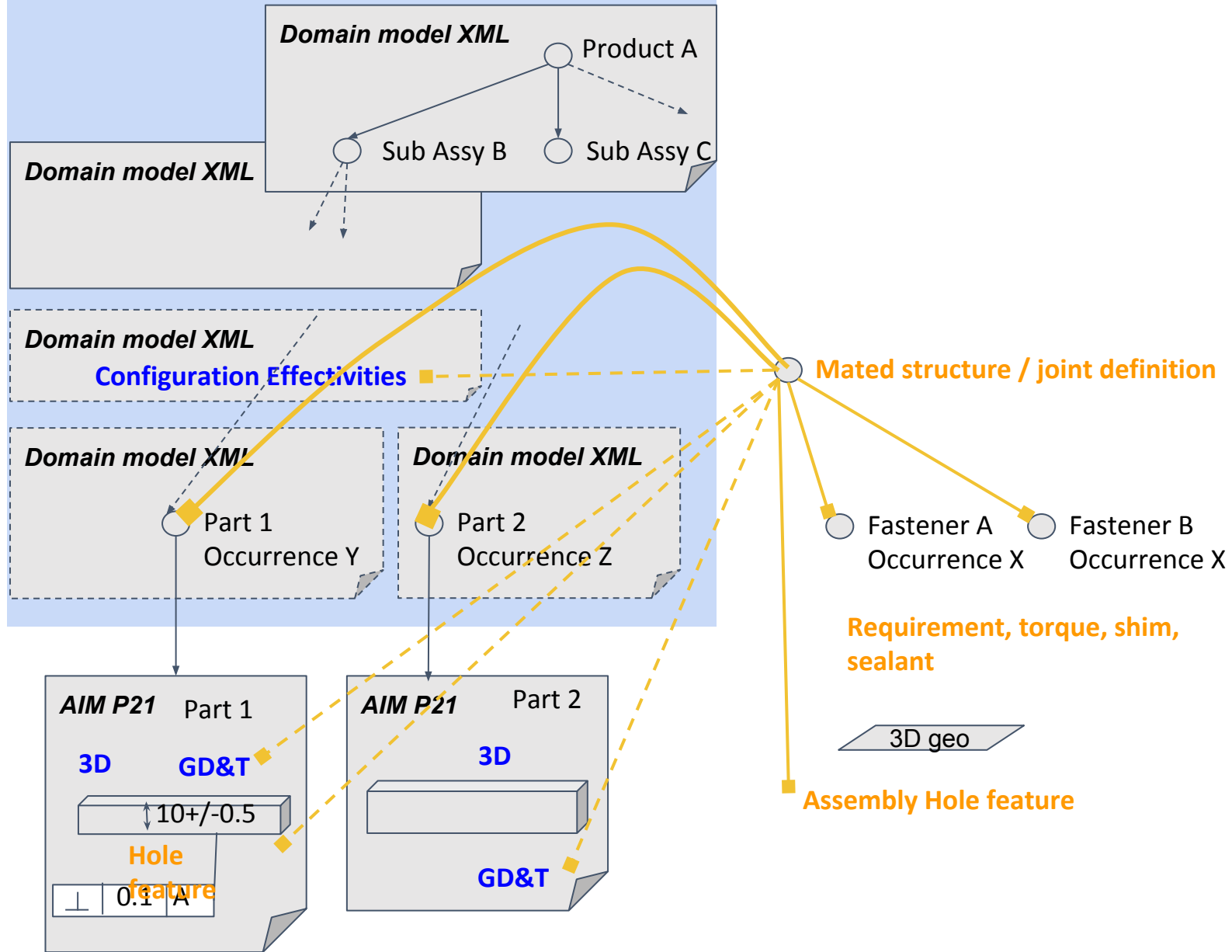
AP242 AIM P21

```
#28=PRODUCT_DEFINITION_USAGE_RELATIONSHIP($,'mated assembly occurrence relationship',$,#29,#30);
#29=MULTI_LEVEL_REFERENCE_DESIGNATOR($,$,$,$,$,(#23));
#30=MULTI_LEVEL_REFERENCE_DESIGNATOR($,$,$,$,$,(#22));
#31=PROPERTY_DEFINITION('mating types',$,#28);
#33=PROPERTY_DEFINITION_REPRESENTATION(#31,#34);
#34=REPRESENTATION('mating types',(#35),$);
#35=REPRESENTATION_ITEM('bolted joint');
#36=PRODUCT_DEFINITION_SHAPE('',$,#28);
#85=SHAPE_ASPECT('mating joints',$,#36,$);
#87=SHAPE_ASPECT_RELATIONSHIP($,$,#85,#37);
#37=ASSEMBLY_SHAPE_JOINT('','Main joint',#88,$);
#54=ASSEMBLY_SHAPE_JOINT_ITEM_RELATIONSHIP($,$,#37,#55);
#55=SHAPE_ASPECT($,$,#56,$);
#83=ASSEMBLY_SHAPE_JOINT_ITEM_RELATIONSHIP($,$,#37,#53);
#53=SHAPE_ASPECT($,$,#52,$);
```

AP242 Domain model XML

```
<PartView uid="_8" xsi:type="n0:MatingDefinition">
  ...
  <ShapeElement uid="_10" xsi:type="n0:AssemblyShapeJoint">
    <ShapeElementRelationship uid="_12" xsi:type="n0:AssemblyShapeJointItemRelationship">
      <Related uidRef="_13"></Related>
    </ShapeElementRelationship>
    <ShapeElementRelationship uid="_14" xsi:type="n0:AssemblyShapeJointItemRelationship">
      <Related uidRef="_15"></Related>
    </ShapeElementRelationship>
  </ShapeElement>
  <ViewOccurrenceRelationship uid="_16" xsi:type="n0:MatedPartAssociation">
    <Related uidRef="_28"/>
  </ViewOccurrenceRelationship>
  ...
  <Placement>...</Placement>
</ViewOccurrenceRelationship>
<ViewOccurrenceRelationship uid="_17" xsi:type="n0:MatedPartAssociation">
  <Related uidRef="_39"/>
  <RelationType> ...</RelationType>
  <Placement>...</Placement>
  <MatedPartRelationship uid="_100">
    <MatedShapes>
      <AssemblyShapeJoint uidRef="_10"></AssemblyShapeJoint>
    </MatedShapes>
    <MatingType>bolted_joint</MatingType>
    <Related uidRef="_16"></Related>
  </MatedPartRelationship>
</ViewOccurrenceRelationship>
<AssemblyType>...</AssemblyType>
<MatingType>
  <ClassString>bolted joint</ClassString>
</MatingType>
</PartView>
```

Assembly structure



STEP AP242 recommended practices

functionalities	STEP AP242 AIM P21	STEP AP242 Domain model XML	xMCF
Geometry	Implemented in CAD COTS	NOT In edition 2	
GD&T	Implemented in CAD COTS	NOT In edition 2	
machining feature (hole)	in the standard (AIC 522 + P113)	NOT In edition 2	
Part identification & parameters	in the standard	in the standard	
Assembly structure	Implemented in CAD COTS	Implemented in PDM tools	
Mated structure / joint definition	in the standard	in the standard	
Properties definition / requirement	in the standard	in the standard	
Configuration & effectivity	in the standard	Implemented in PDM tools	
Manufacturing Process / Plan / Operation	in the standard	in the standard	