



The Engineering Services Contract (ESC) at Kennedy Space Center (KSC) provides services to NASA in respect to flight and ground systems design and development. To aid this effort, the ESC Principal Engineering Technology Development Group investigates and provides the necessary tools, aid, and best practice methodologies required for efficient, optimized design and process development. The team is responsible for configuring and implementing software, along with training, documentation, and administering standards. The team—comprising of 5 members—supports over 200 engineers and design specialists with the use of Windchill, Creo Parametric, NX, AutoCAD, and a variety of other design and analysis tools.



- Design Analysis Report
  - One Per Sub-system
  - Very Large
    - 979 pages
      - 36 pages of actual report
    - Manually created in Word
    - Manually published to PDF
    - Multiple volumes
    - Example 340 Figures, 45 Tables
  - Contains All Analysis Information
    - FEM
    - Mathcad
    - Hand Calculations
    - Sketches
  - Continuous Updates
  - Difficult to find Information



- Simplify creation of the DAR
  - Utilize available Resources
    - Windchill Objects
      - Word
      - Pics/Scanned Docs
      - MathCAD
    - Work Group Manager
  - Easy Methodology
    - User Experience
    - Administration
  - Structured Implementation
    - Versioned
    - Reportable
    - Life Cycle Managed

- **Functionality OOTB**
  - Documents
  - Attachments
  - Document Structures
- **New Solutions**
  - MathCAD Objects

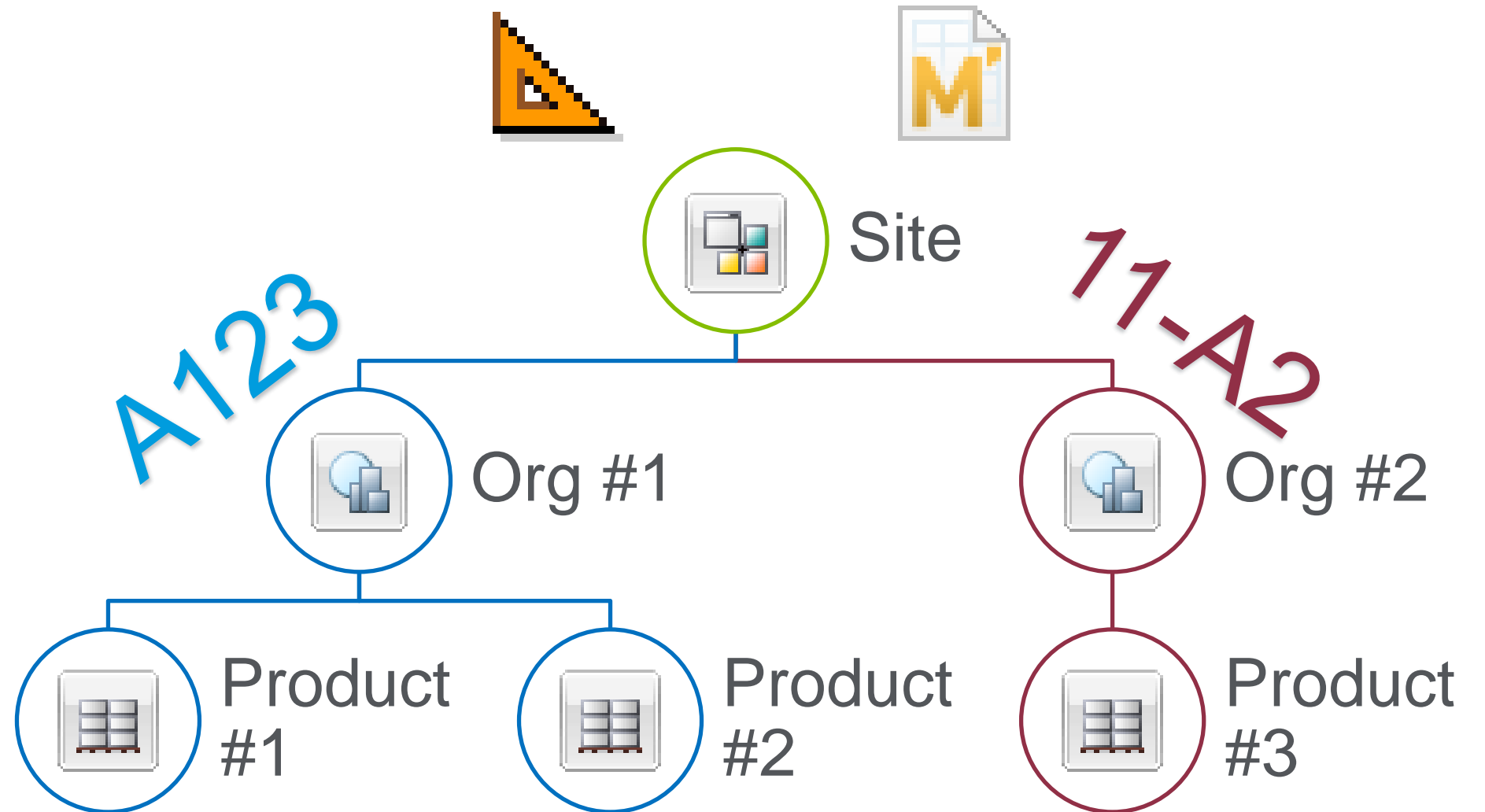
## Challenges

- Able to assign numbering scheme
- Able to assign unique workflows and Life Cycles
- Add Attributes to aid in information gathering
- Removes need of network shares and storage inconsistencies

## Solutions

- Multiple Departments w/ different schemas
  - OIR at Org Level
- Multiple Departments w/ different schemas
  - Soft Type EPM Document Objects.
- Multiple Departments w/ different schemas
  - Soft Type Specific Attributes
- Implement Integrated WGM

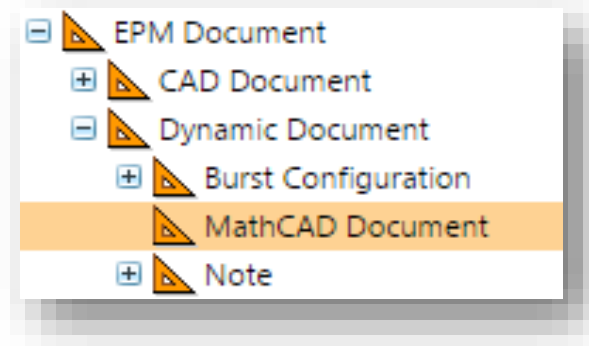
- Several Directorates with Design Functions on KSC
- Different Standards for each
- Similar Objects but not exact



# Development and Implementation



- Soft Type required in order to segregate type from “Dynamic Document”
  - Dynamic Document currently defines ALL Non-CAD objects
  - Soft type grants ability to have unique OIRs, Life Cycles, Workflows, etc
- Created MathCAD Document as child of the “Dynamic Document” at Site Level
  - Enables soft typing for all Organizations
  - Additional typing and Org-specific configurations to then be built within their specific context



Actions ▾ Type - **MathCAD Document**

Internal Name: gov.nasa.ksc.MATHCADDOC

Display Name: MathCAD Document

Description: MathCAD Document

\* Instantiable:  Yes  No

Sort Order: 1

Icon: wt/clients/images/epmdoc.gif

The Default Type of Part to Create:

The Default Classification of Part:

Subtypeable: Yes

Owning Organization: Site

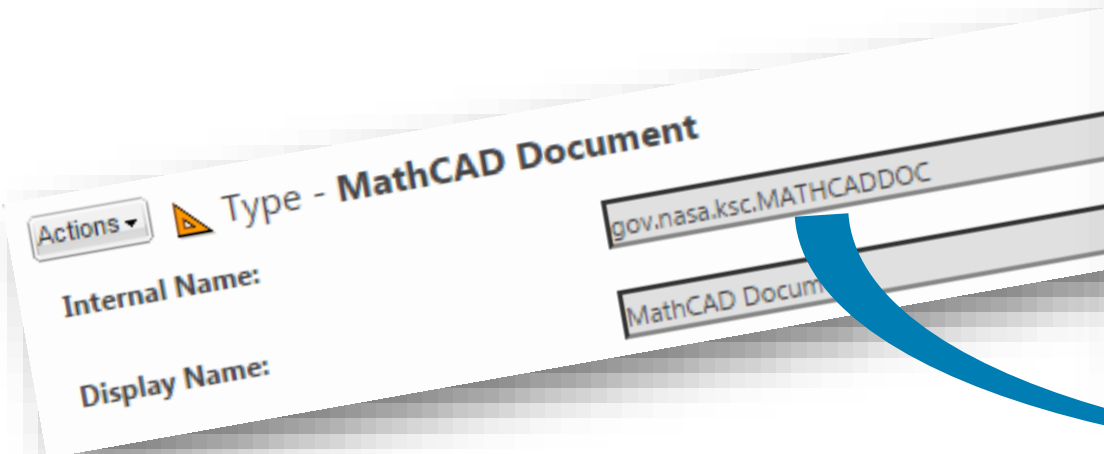
- With Soft Type created, EPMDDefaultSoftType.XML file needs to be updated
  - Creates and links Windchill “MathCAD” object (OOTB) with the newly created Soft Type
  - File found in Codebase
  - **Store in wtSafeArea**

## Default (Before)

```
<AuthAppSoftTypeInfo authAppName="MATHCAD">  
  <ObjectClassInfo classType="EPMDocument">  
    <ObjectTypeInfo type="*">  
      <SoftTypeInfo softTypeId="{internet_domain_name}.DynamicDocument"/>  
      <SoftTypeInfo subType="*" softTypeId="{internet_domain_name}.DynamicDocument"/>  
    </ObjectTypeInfo>  
  </ObjectClassInfo>  
</AuthAppSoftTypeInfo>
```

## After Modifications

```
<AuthAppSoftTypeInfo authAppName="MATHCAD">  
  <ObjectClassInfo classType="EPMDocument">  
    <ObjectTypeInfo type="*">  
      <SoftTypeInfo softTypeId="{internet_domain_name}.MATHCADDOC"/>  
      <SoftTypeInfo subType="*" softTypeId="{internet_domain_name}.MATHCADDOC"/>  
    </ObjectTypeInfo>  
  </ObjectClassInfo>  
</AuthAppSoftTypeInfo>
```



- MathCAD OIRs can now be created and deployed at each Organization
  - Allows unique numbering scheme
  - Can call different Life Cycle
  - Workflow can be implemented (if needed)
- Reminders
  - Create a new schema
  - Create sequence generator for automated number generator (if needed)

```
<AttributeValues objType="wt.epm.EPMDocument|gov.nasa.ksc.MATHCADDOC">  
  
  <!-- set the folder -->  
  <AttrValue id="folder.id" algorithm="com.ptc.core.foundation.folder.server.impl.FolderPathAttributeAlgorithm">  
    <Arg>/Default</Arg>  
  </AttrValue>  
  
  <!-- set the lifecycle -->  
  <AttrValue id="lifeCycle.id" algorithm="com.ptc.core.foundation.lifecycle.server.impl.LifeCycleTemplateAttributeAlgorithm">  
    <Arg>  
      <!-- Translation of the word "Basic" must be the same as the translation done in commonLifeCycles.xml -->  
      <?loc-begin key="BASIC_LIFECYCLE_NAME" maxlen="30" match="commonLifeCycles.xml:BASIC_LIFECYCLE_NAME"??>PBO<?loc-end??>  
    </Arg>  
  </AttrValue>  
  
  <!-- set the number to a generated number -->  
  <AttrValue id="number" algorithm="com.ptc.windchill.enterprise.revisionControlled.server.impl.NumberGenerator">  
    <Arg>KSITE</Arg>  
    <Arg>{GEN:wt.enterprise.SequenceGenerator:EPM_seq:10:0}</Arg>  
  </AttrValue>  
</AttributeValues>
```

UPDATE PICTURE

- Additional “children” soft types of the MathCAD object can now be created
  - Done in Organizations requiring additional/different attributes
  - Rolled out with configured layouts
    - Can remove undesired attributes
    - Can reorganize page display

**Actions** ▾ Type - **MathCAD Document**

- ✦ New Subtype
- ✎ Edit
- ✖ Delete

Create a new subtype

gov.nasa.ndc.MathCADdoc

MathCAD Document

**UPDATE PICTURES**

**General**

<b>File Name:</b>	Someseriouscalcs.mcdx	<b>Document Category:</b>	Mathcad Worksheet
<b>Version:</b>	A.1	<b>Document Subcategory:</b>	
<b>Authoring Application:</b>	Mathcad	<b>Checkin Comments:</b>	
<b>Type:</b>	Dynamic Document		

**Object Specific**

CAGE Code:

# Demo

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