Importing Legacy Visio Diagrams into MBSE Models

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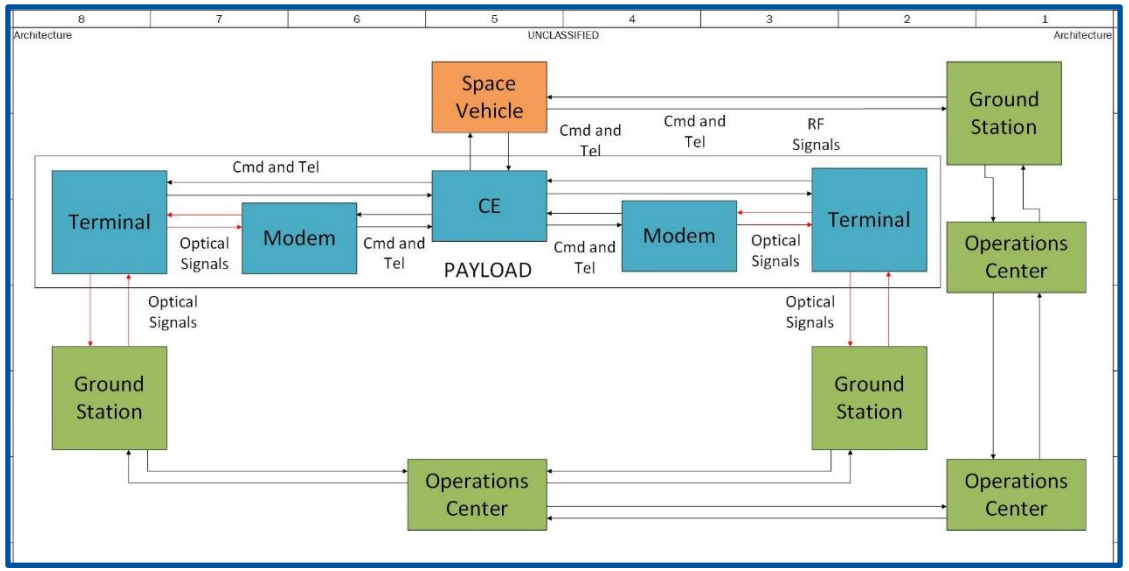
Motivation

- **A large amount of program data exists outside of MBSE that would benefit by being added to a model**
  - **e.g. requirements, block diagrams, etc.**
- **For diagrams, engineers manually re-create the data in MBSE**
- **Something is needed to expedite the process and make it simpler and more efficient for engineers**



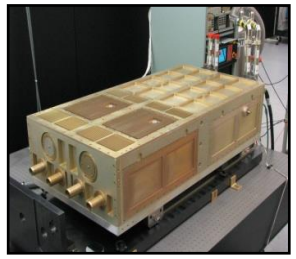
Legacy Data Importing Script quickly enables data from legacy diagrams to be imported into MBSE models

Outline

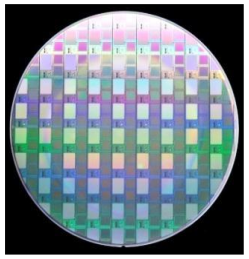
- Introduction
- Importing Process
- Diagram Results
- Summary

Range of Programs at Lincoln Laboratory

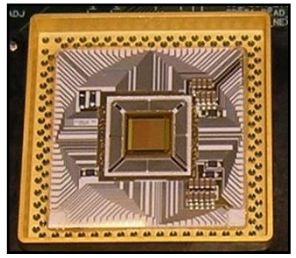
Advanced Technologies



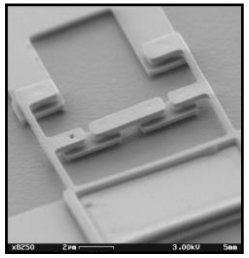
Cryogenic Yb:YAG Lasers



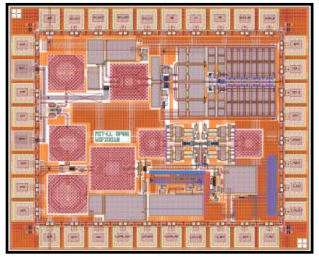
Advanced Focal Planes



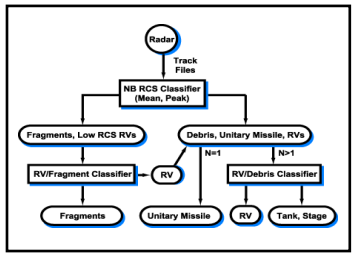
APD Arrays



Quantum Bits



Miniature Low-Power Transceivers

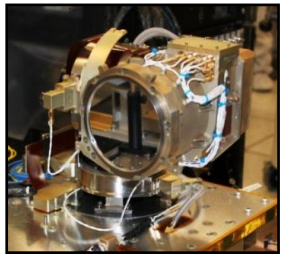


Decision Architectures

System Prototypes

Space Surveillance Telescope

HUSIR W-Band



Lunar Laser Comm. Demo

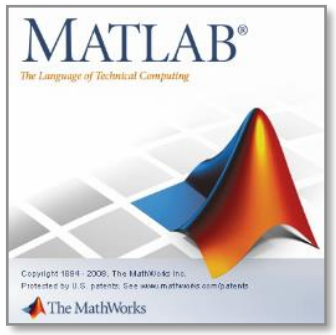
XTR-1 Radar

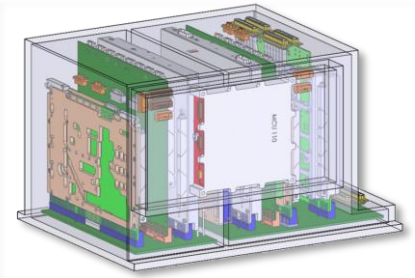
Rapid Agent Aerosol Detector

ALIRT 3-D Imaging

Using MBSE for Efficient Program Execution

Simulation/Analysis → Prototype → Testing → Technology Transfer → Fielded System

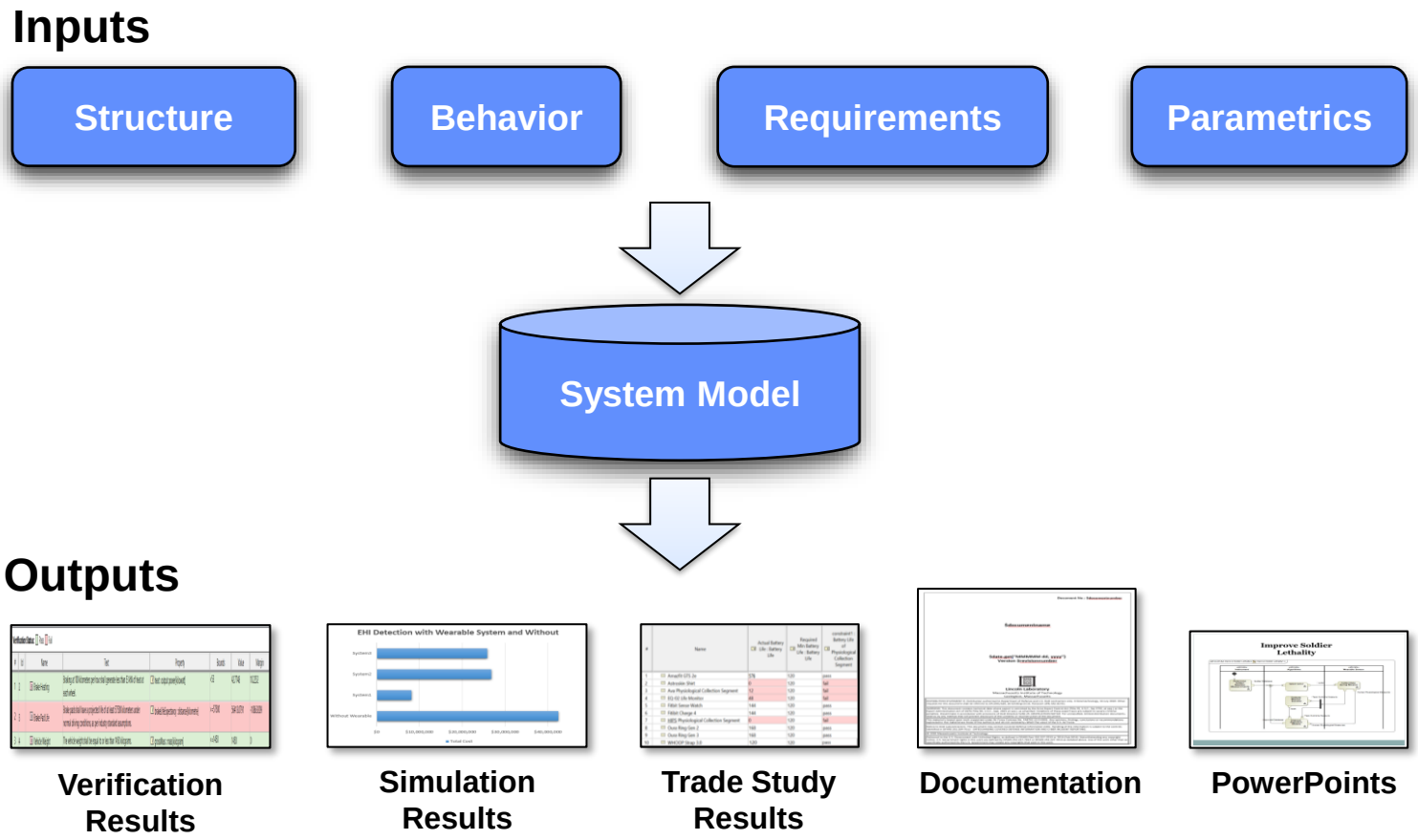




A Model-Based Systems Engineering approach enables the effective and efficient execution of programs across the Laboratory

Model-Based Systems Engineering (MBSE) Overview

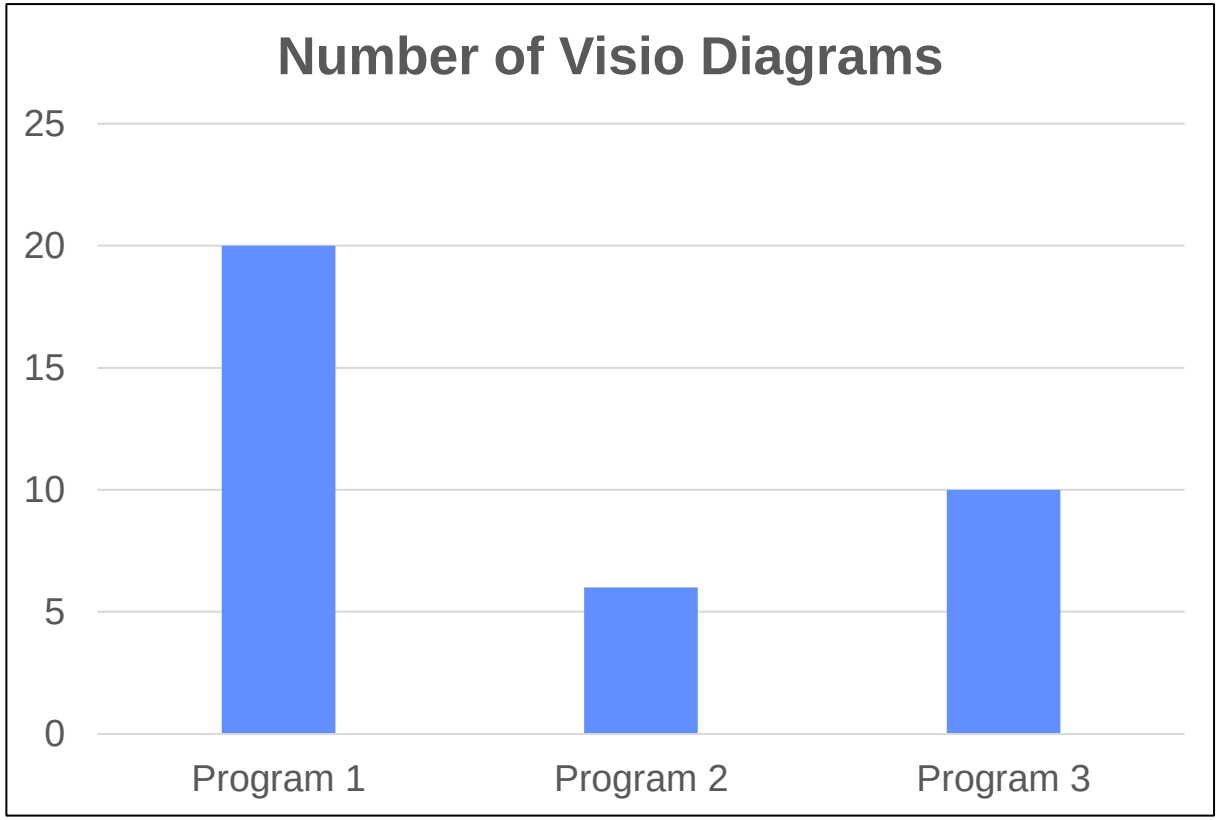
- MBSE is used to coordinate analysis, specification, design, and verification of the system being developed or analyzed
- Provides consistent and up-to-date data



MBSE models allow the engineer to focus on engineering instead of maintaining, transferring, and aligning data among multiple tools and determine implicit assumptions up front

Existing Need to Bring in Static Block Diagrams

- A need exists to import static Block Diagrams into an MBSE model
- Time required to manually re-create static Block Diagrams in MBSE hinders any effort to capture the data in a model



We developed a custom script that takes diagrams from MS Visio and creates associated Internal Blocks Diagrams (IBDs) and Block Definition Diagrams (BDDs) in No Magic's MagicDraw

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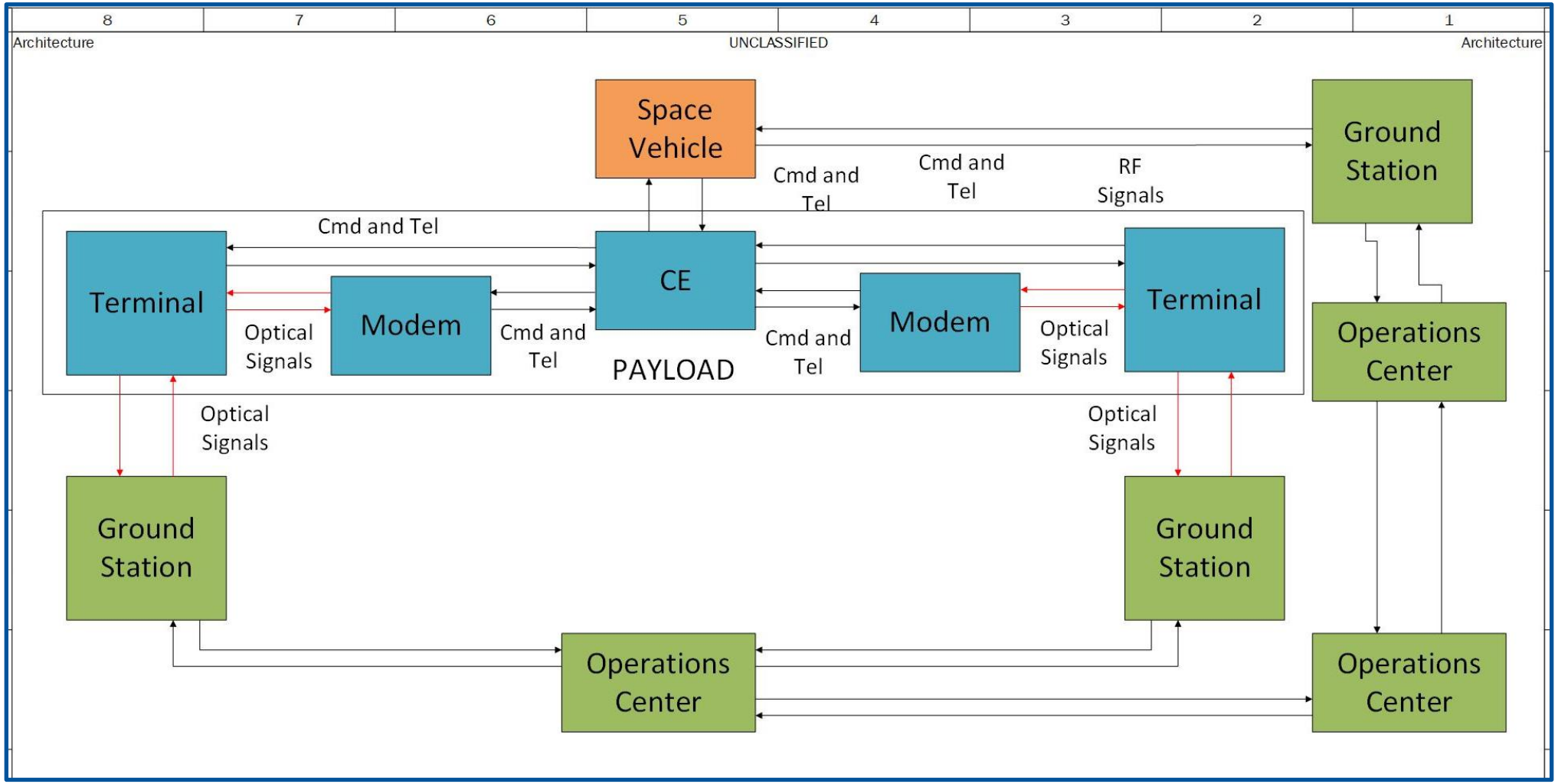
Example Visio Diagram



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Process – Options

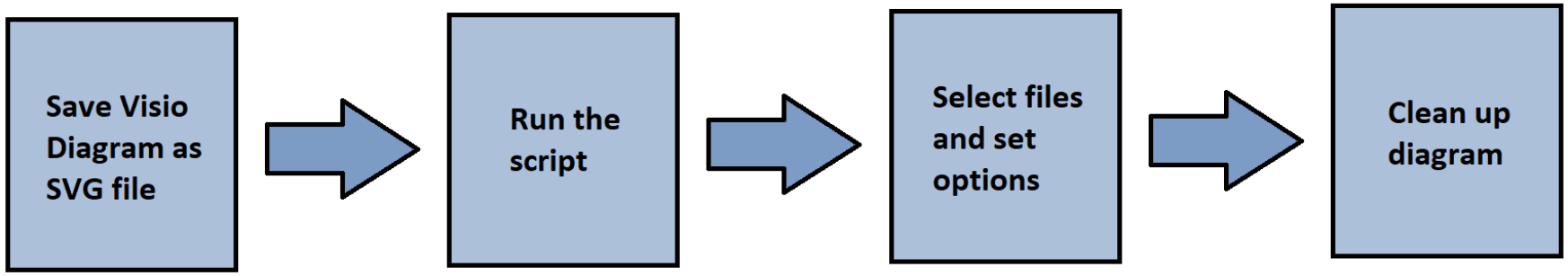
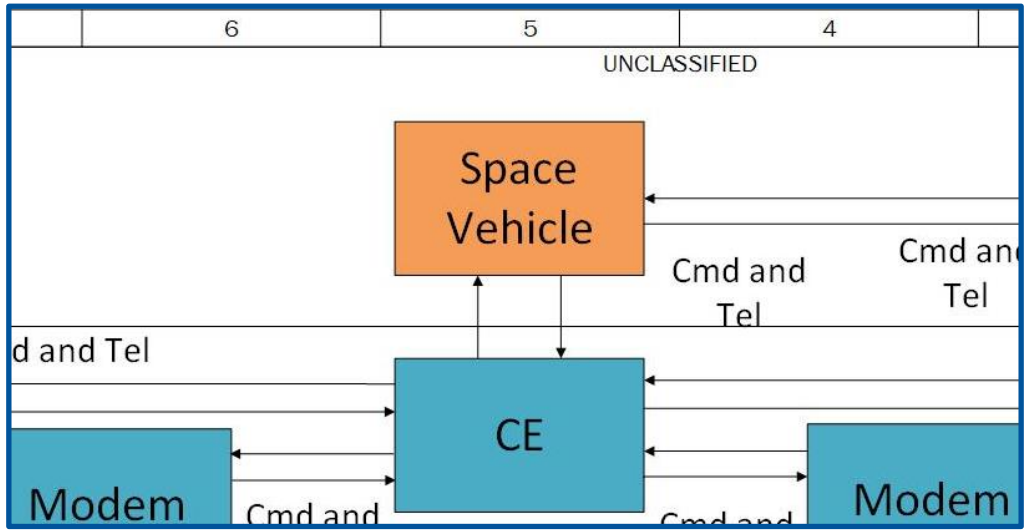


Diagram Importation Process

- Script only requires the user to select the file and set some options
- Important options include:
  - Scale of imported diagram
  - Import only blocks, import blocks and connectors, or import blocks, connectors, and ports
  - Reuse existing blocks in model or create duplicates

How does the Visio Diagram Information Get Pulled in?




```
<g id="shape1157-367" v:mID="1157" v:groupContext="shape" transform="translate(16.2,-17.9002)">
    <title>MultiConBox.1157</title>
    <desc>Space Vehicle</desc>
    <v:userDefs>
        <v:ud v:nameU="visVersion" v:val="VT0(14):26"/>
    </v:userDefs>
    <v:textBlock v:margins="rect(4,4,4,4)"/>
    <v:textRect cx="36" cy="765" width="72" height="54"/>
    <rect x="0" y="738" width="72" height="54" class="st16"/>
    <text x="13.68" y="767.4" class="st13" v:langID="1033">
        <v:paragraph v:horizAlign="1"/><v:tabList/>Space Vehicle
    </text>
</g>
```

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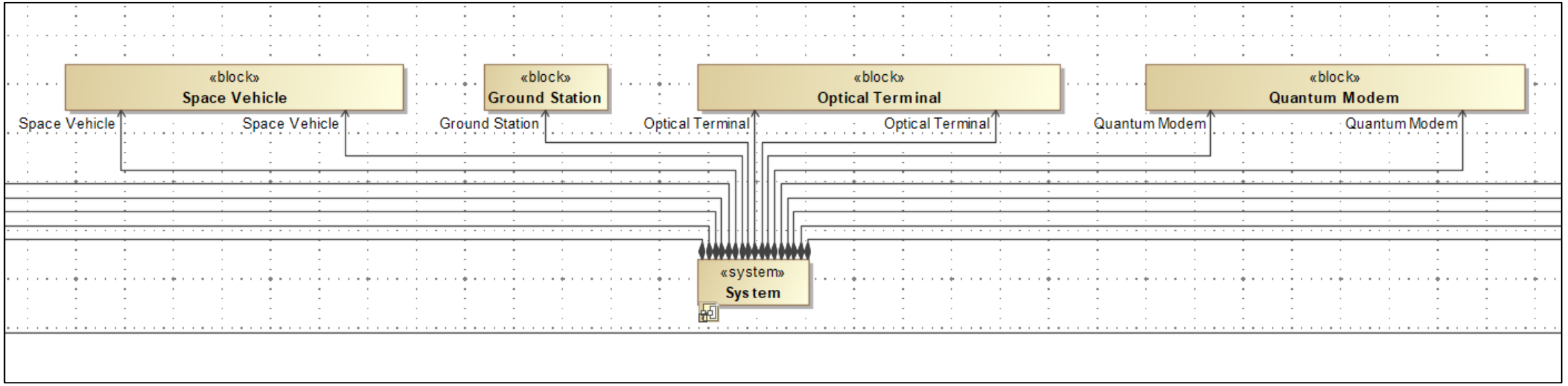
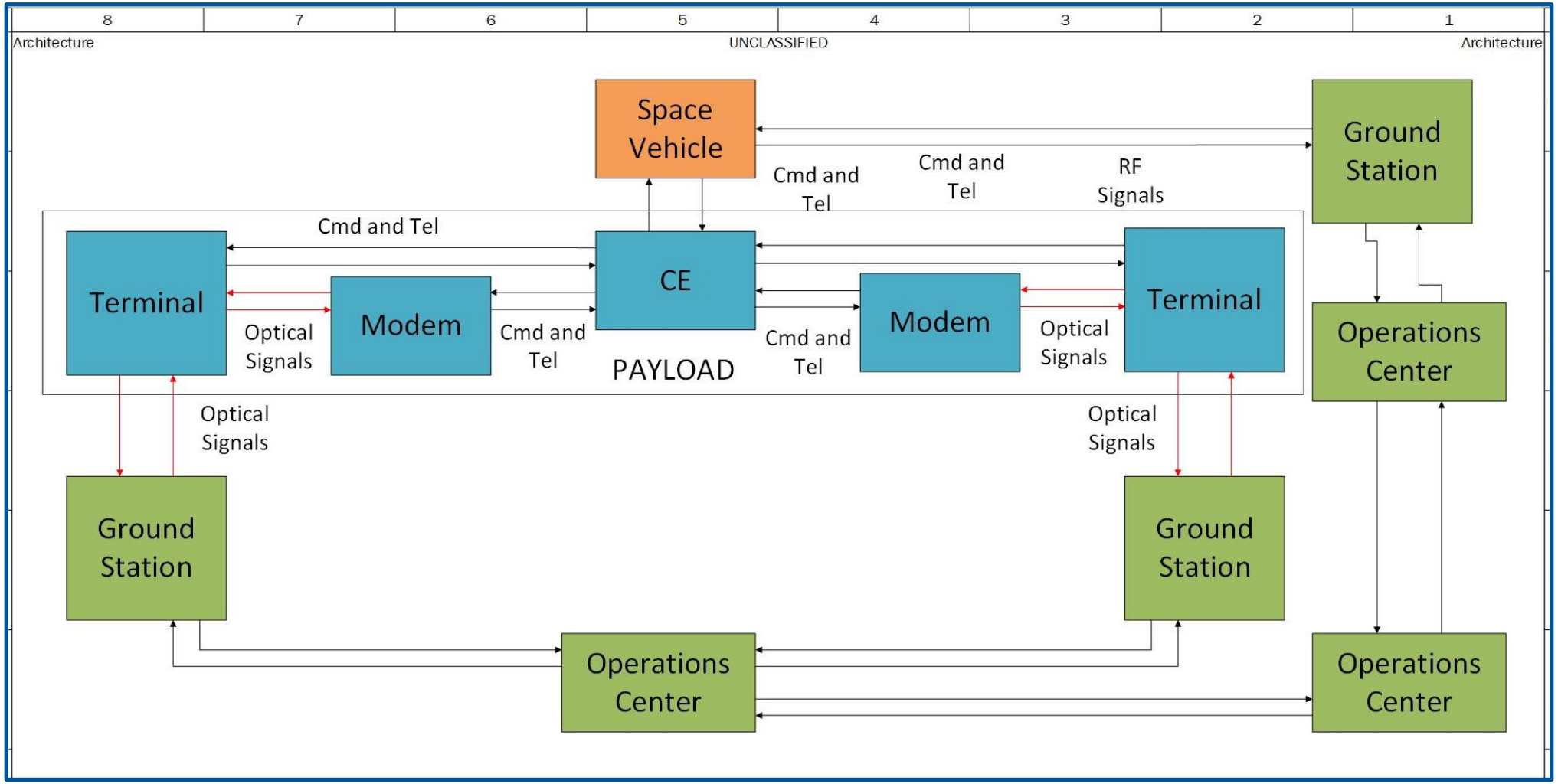
Block Definition Diagram

- **A BDD is created with the top-level block having a composition relation with every block used in the IBD**



Starting Visio Diagram



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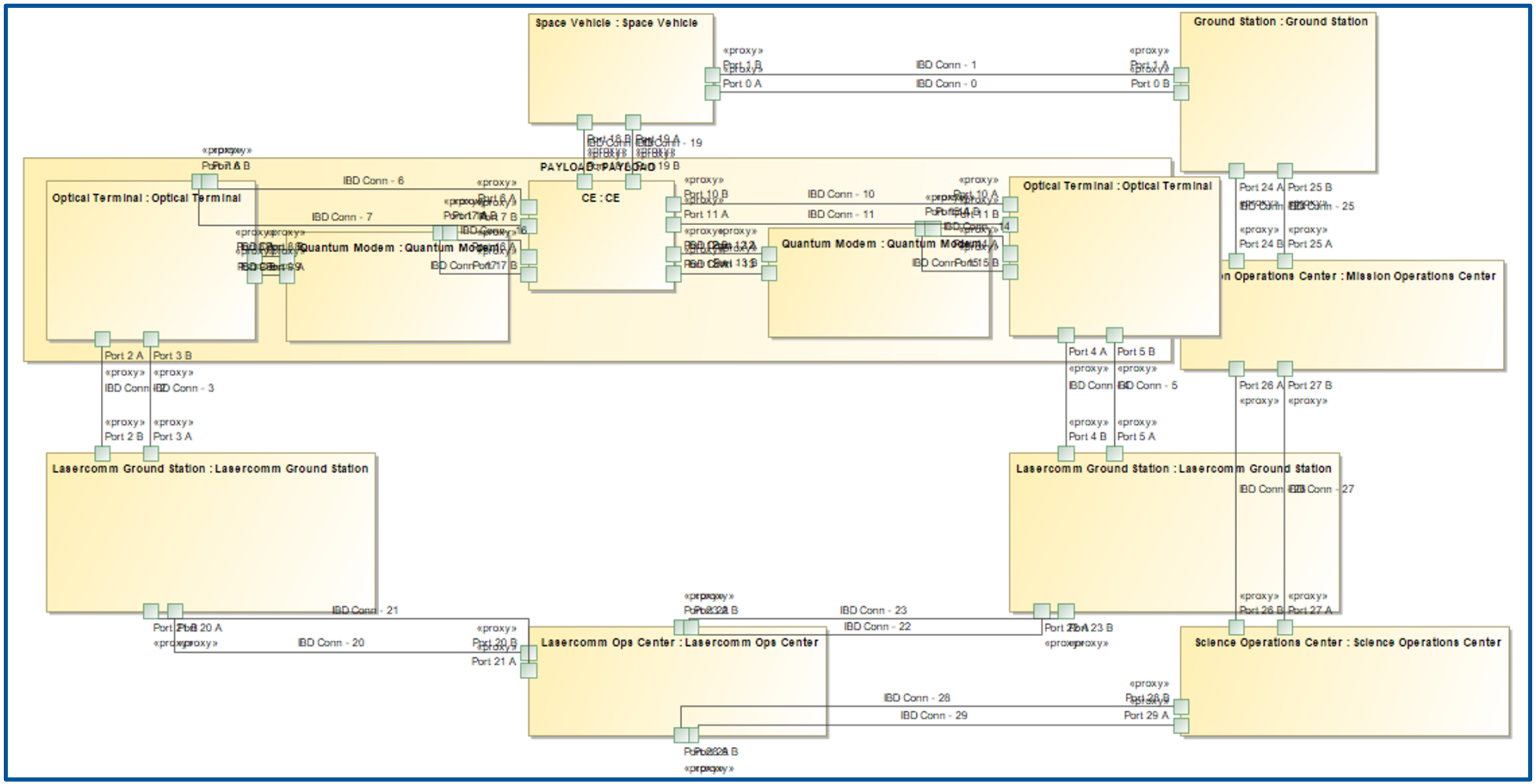
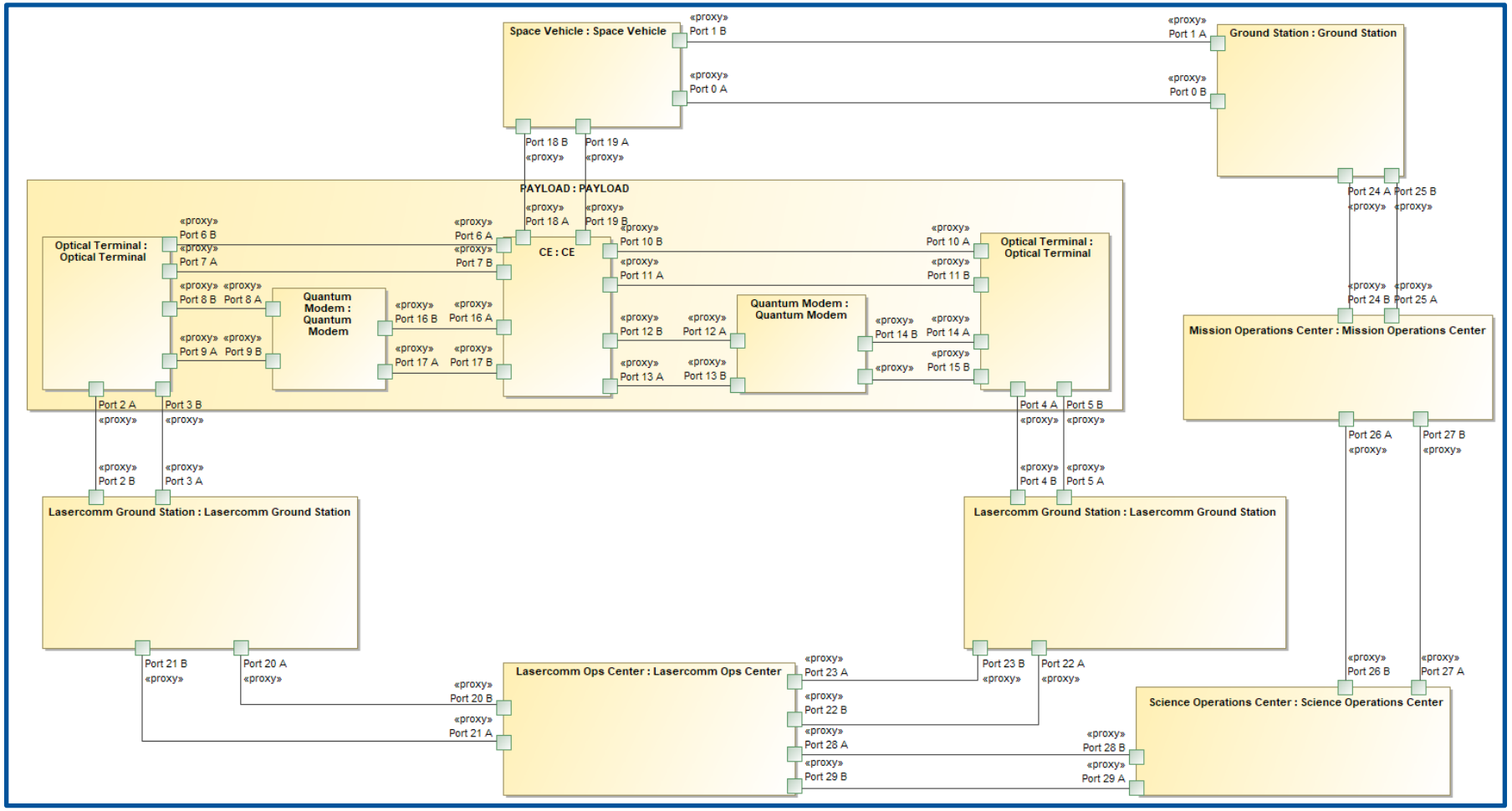
Example Transferred Diagram



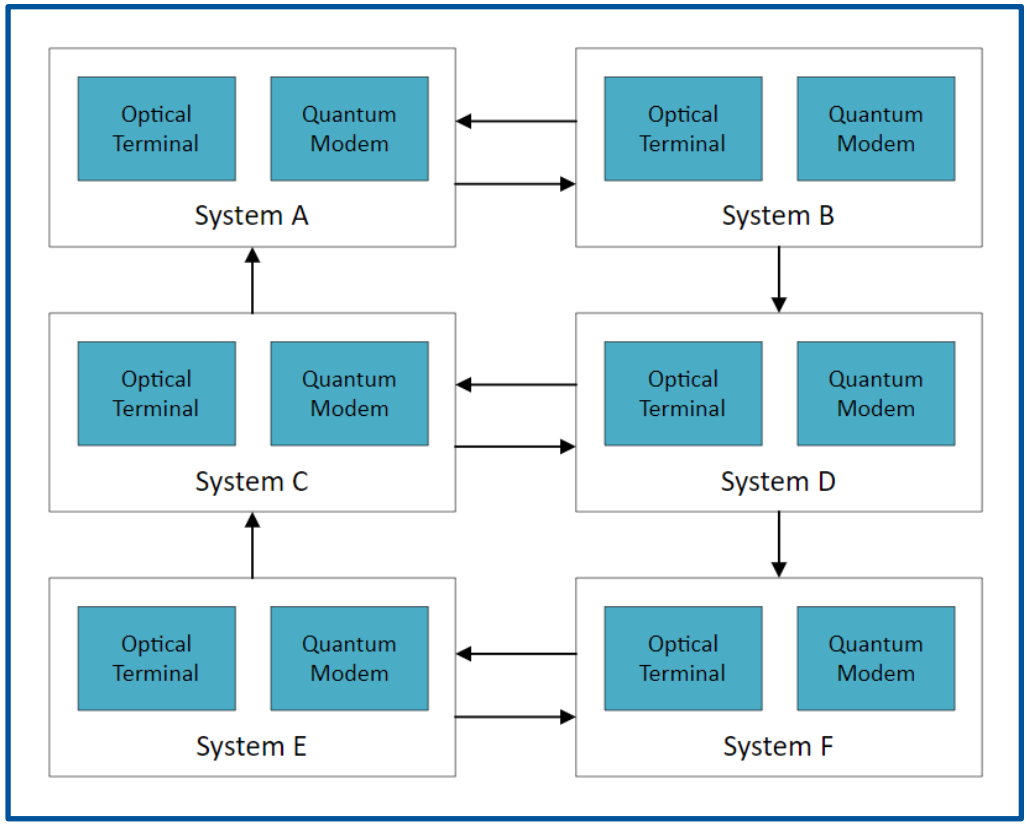
Initial Output

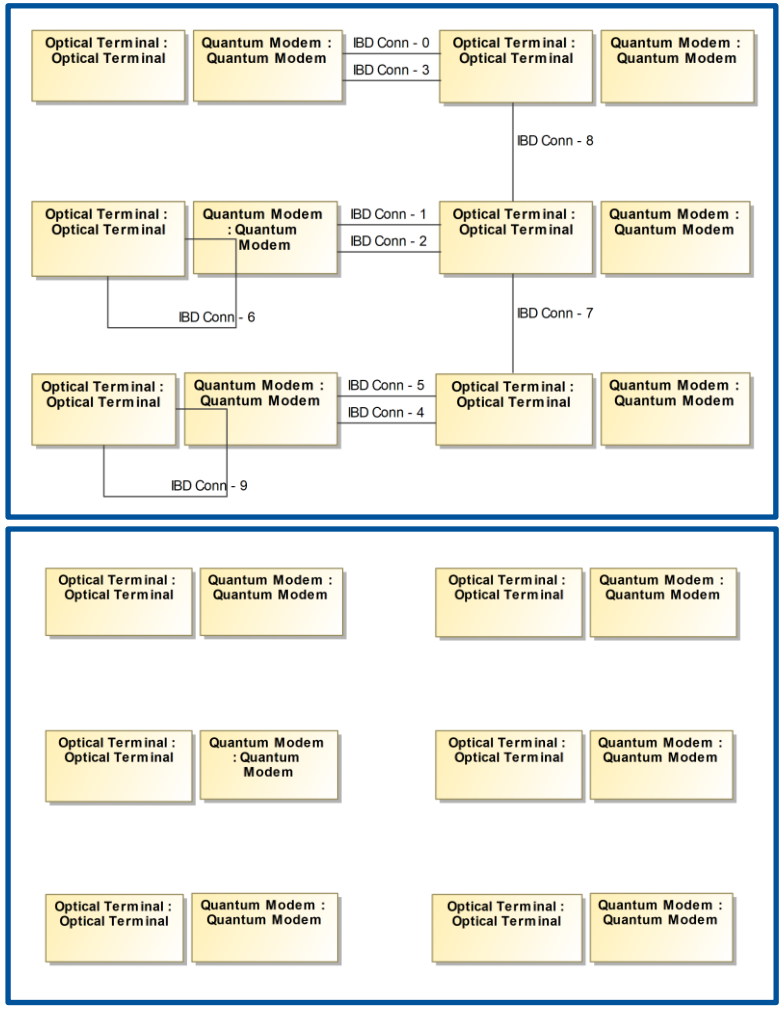
Example Transferred Diagram



On average, Engineers spend 75% less time importing legacy diagrams with this script

Limitations





Summary

- Importer script automatically pulls data contained in Visio diagrams and creates BDDs and IBDs using that data
- Importer script drastically reduces the amount of time spent on re-creating the diagram in MBSE
- Future work – allow users to import from other file formats