



318 GROUND
SYSTEMS
ENGINEERING

IMPROVING GROUND DATA SYSTEMS (GDS) PROCEDURES USING MODELING TOOLS

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Student
Independent
Research
Internship
(SIRI) Final
Presentation

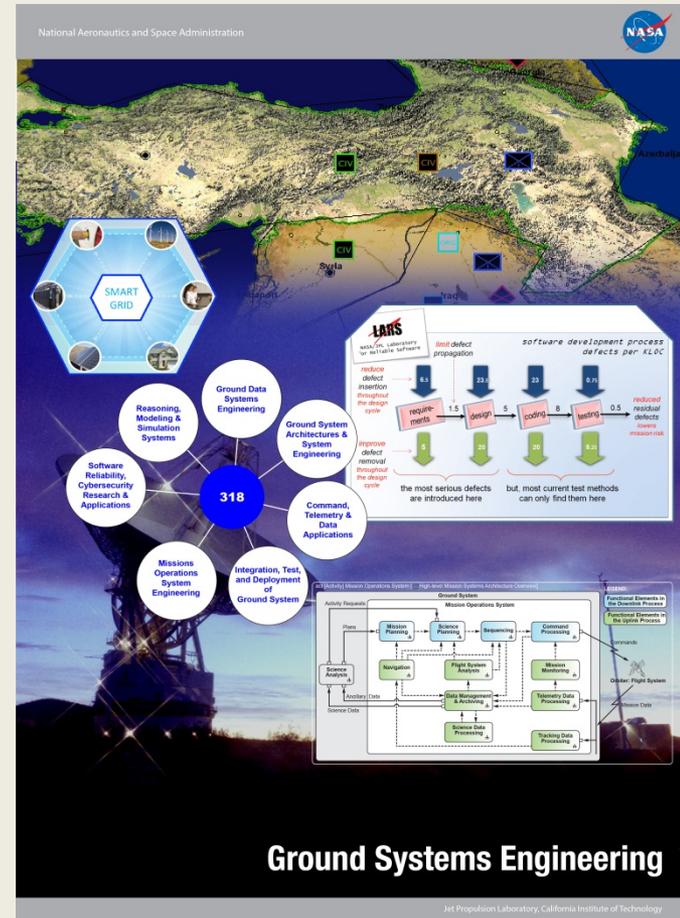
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OVERVIEW



- Background
 - Need for modeling tools
 - Objectives
- Methods
- Results
 - Diagram examples (8)
 - Wiki and Subject Matter Experts (SMEs)
- Future Work
- References
- Acknowledgements



NEED FOR MODELING TOOLS



- Ground System (GS) Engineers apply GS tools and processes to JPL flight projects.
 - Done by engineers with 15-20 years experience.
 - Gaps in subject knowledge lead to gaps in architecture design.
- Current GS procedures lack a desired level of
 - Granularity
 - Traceability
 - Clarity
 - Consistency
- A model-based approach is needed to improve these things and it better describes the role for engineers working in GS Engineering.
 - Part of the GS effort in revitalizing GS project procedures.

OBJECTIVES



- Learn MagicDraw
 - MBSE (Model Based System Engineering)
 - BPMN (Business Process Model and Notation)
- Meet with SMEs (Subject Matter Experts) and review project artifacts
 - Collect MOSE and GDSE process implementation details and examples from
 - Oleg Sindiy (GDS/MOS, CHARM)
 - Greg Welz (Formulation)
 - Robert Barry (MOSE, MSL)
- Complete the 2 system process models
 - GDS (me) and MOS (Nari)
 - Update 318L Wiki page
- Further research

METHODS



■ MagicDraw

■ MBSE

- Used for clearer description of GS processes and products.
- Improves:
 - knowledge capture, retention and dissemination among current system engineers.
 - communication between GS stakeholders.
 - reduction in overlapping efforts for GS architecture development and deployment - results in cost and schedule savings.

■ BPMN

- Ideal for business procedures modeling.
- Follows JPL Rules Documentation with frequent updates from GDS group supervisor.
- Most frequently used symbols:

■ Standard Start Point		■ Sequence Flow		■ Parallel Gateway	
■ Standard Final Point		■ Data Object		■ Note Anchor	
■ Collapsed Subprocess		■ Data Store			
■ Call Activity		■ Boundary Timer			

METHODS



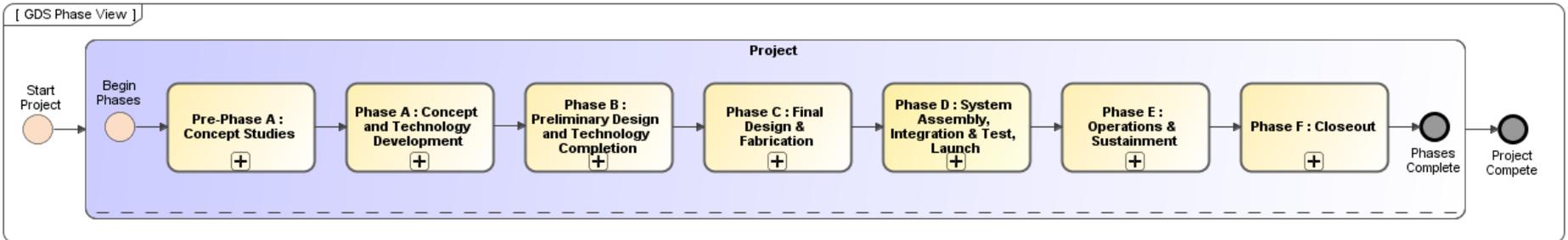
■ Translation

- Text-based procedures to visual models: **flow method** and **parallelism**.
- Call activities labeled with ID #s accordingly for document relation.
- Used Collapsible Subprocesses for sublevels, e.g. 3.1 to 3.1.1. (ex. 3).

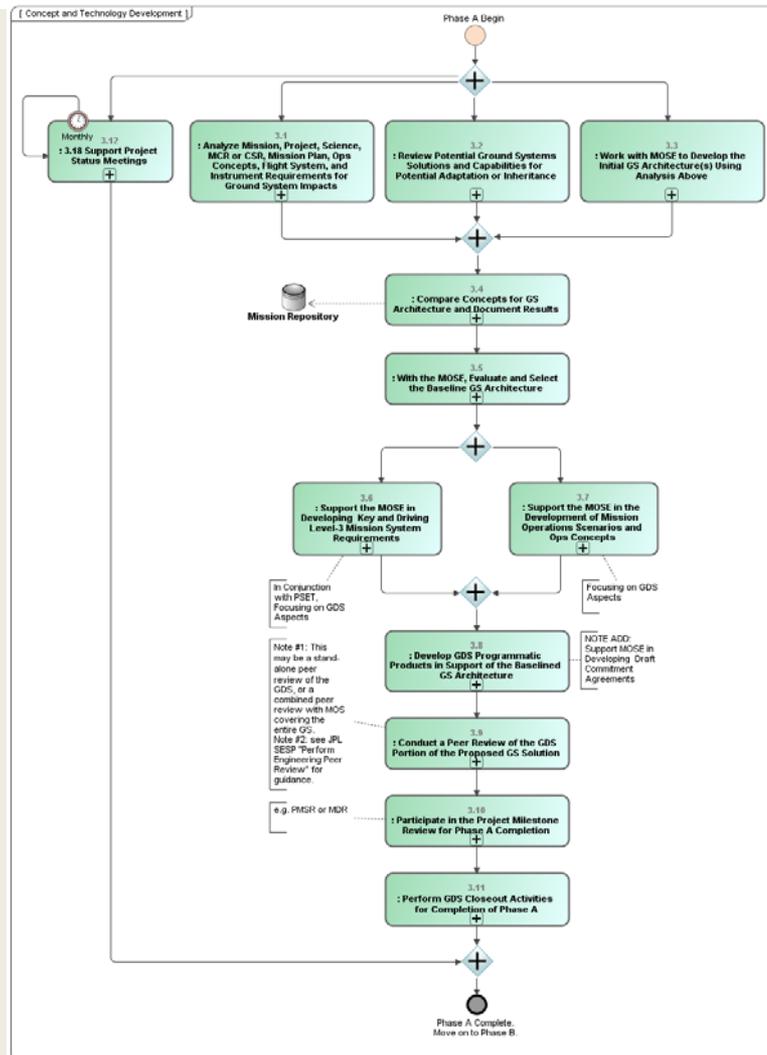
■ Appearance

- Size and alignment– simpler, space saver, printer readable.
 - Color – less distracting, consistent.
- Made similar to Mission Operations System (MOS) procedures.

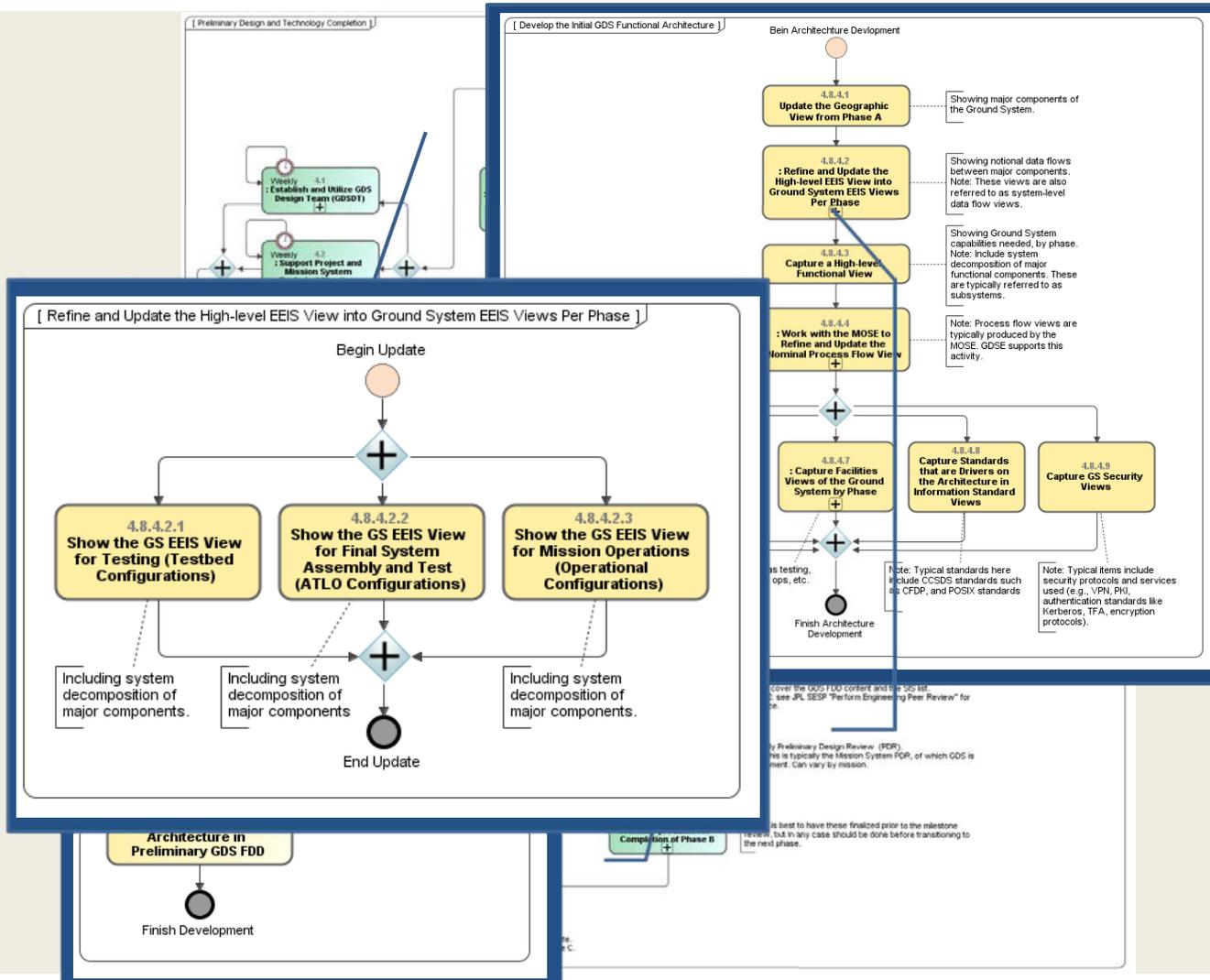
EXAMPLE #1: GDS PHASE VIEW



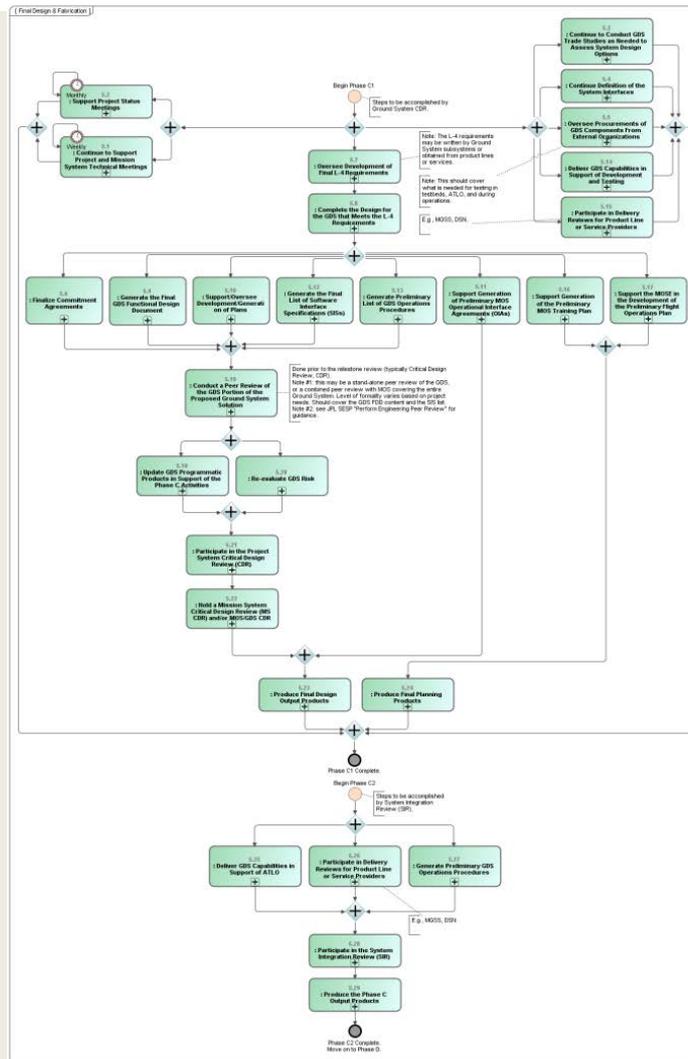
EXAMPLE #2: PHASE A



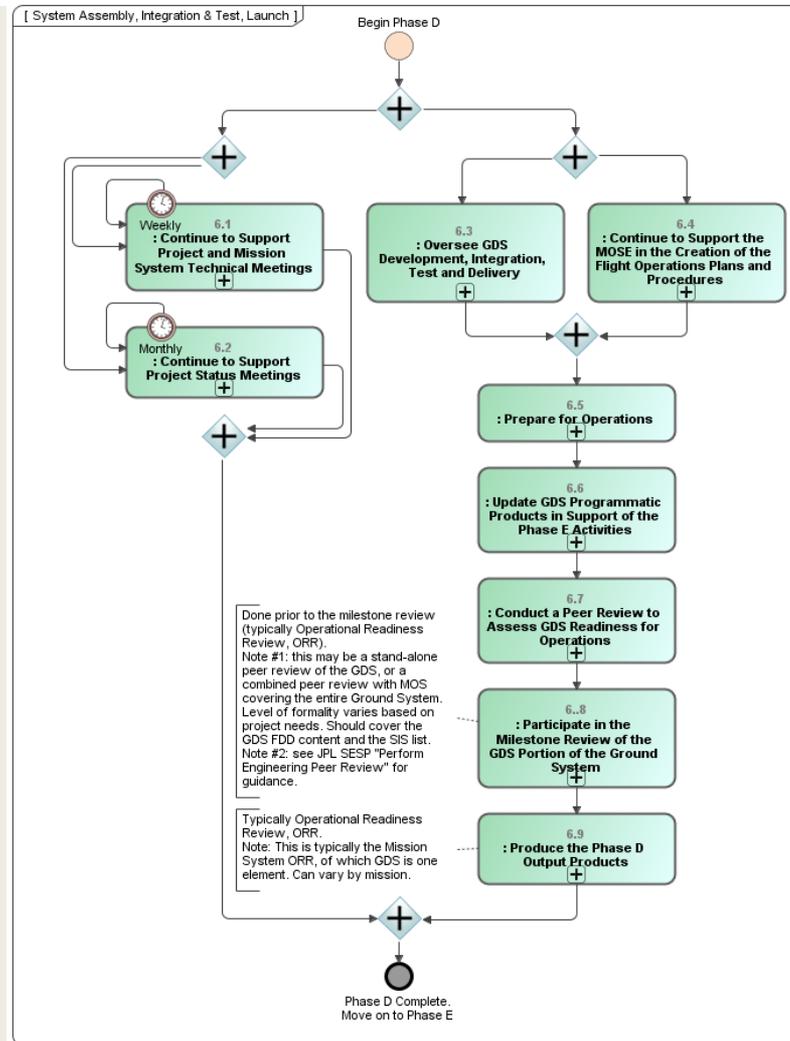
EXAMPLE #3: PHASE B



EXAMPLE #4: PHASE C



EXAMPLE #5: PHASE D



318 Wiki and SMEs



Search

- Acronyms and Abbreviations
- Activities
- Actors
- Archived Pages
- Artifacts - BEs, VPs, Views, & GTPs
- Core References, Documents, and Links
- Information Gathering
 - Interview with Greg Welz
 - Interview with Oleg Sindy
 - Interview with Robert Barry
- Instructions (need to be updated)
- Ontologies
- Products Modeling Tips

JPL Information Gathering

Added by szuffita, last edited by Nari Hwang on Oct 30, 2012 (view change)

In order to improve and update the documentation for MOS and GDS, the following individuals have been identified as valuable resources in their respective areas. These people have been interviewed with a focus on ontology terms and specific process data.

- Chelsea Dutenhoffer - GDSE on Dawn Project
- Jeff Estefan-MGSS Architect
- Joe Kahr - GDSE on MSL Project
- Kathleen Crean-GDS group supervisor
- Maddalena Jackson-EM1/2 profile
- Marc Sarrel - MOSE, Spitzer and OpsRev
- Paddy Lock-MOS Group Supervisor, 318L
- Thomas McVittie-C3I/Data/Networks
- Joseph Tirona- Profile modeling for MSA and SeqRev
- Bob Wing- GDSE, specialized in Ops
- Gregory Welz- GSA & SE specializes in formulation
- Robert Barry- MOSE on MSL Project
- Oleg Sindy, GDSE on CHARM

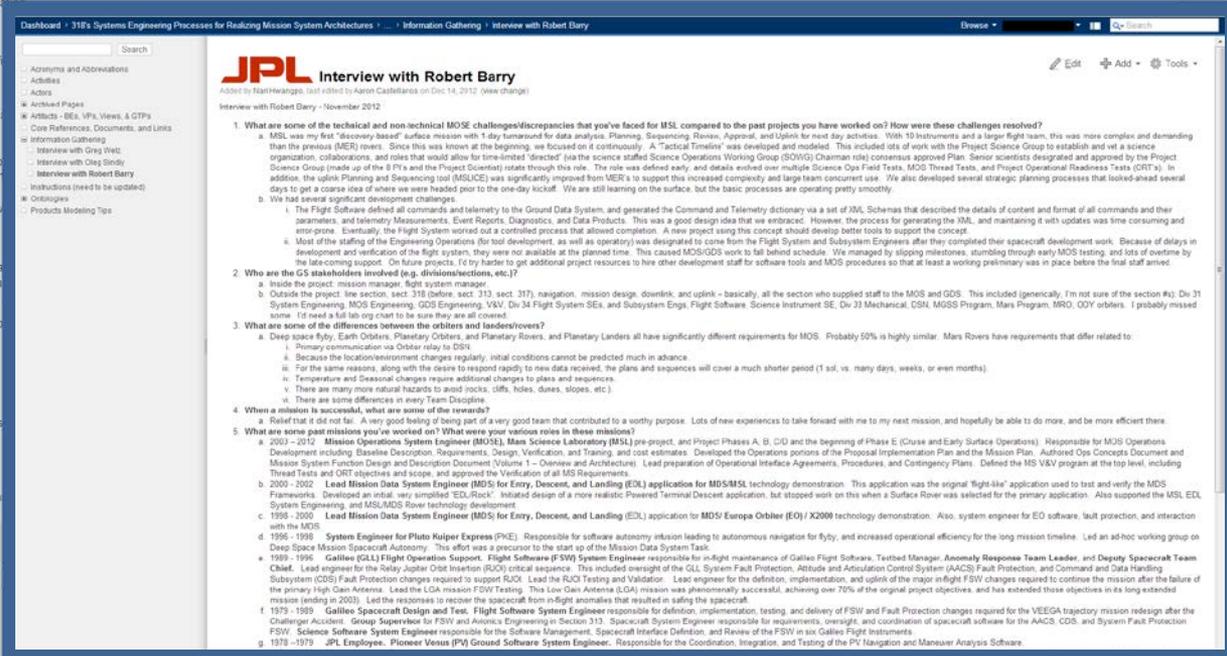
The following people were also identified as being helpful but unable to schedule interviews with these people:

- Glen Havens - MOSE (and deputy mission manager)
- Robin O'Brien - GDSE on MRO Project
- Kathryn Schimmels - MOSE on NuStar Project
- Alex Cervantes - GDS Integration, Test and Dep
- Antonio Sanders - GDSE on SMAP and Jason
- Bobby Brooks - MOSE on SMAP Project
- Brian Hammer - GDSE on SMAP, ERM, and SV
- FJ Guska - MOSE on OCCO-2 Project
- Luis Morales-Group Supervisor, 317A

During ontology based interviews, the primary focus was the primary questions asked during interviews concern either took the form of reference material which can be used in the later interviews, the focus was to consider the content of the material.

Chelsea Dutenhoffer identified the following concerns:

- the ability to see network diagrams at varying levels of detail
- high level overview
- low level details like ports, IP addresses, and protocols
- capture use cases across lifecycle
- unpredicted situations occur
- elaborate needs during ATLO, needs during Ops are more common



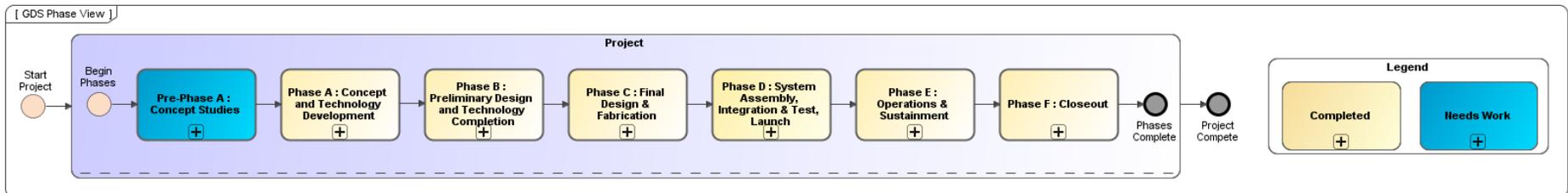
■ <https://jplwiki.jpl.nasa.gov/>

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FUTURE WORK



- Continue development, expansion, and refinement of GDS and overall GS procedures.
 - Models will incorporate more detailed information of GS design than current documents.
 - Special attention will be focused on redefining Pre-Phase A.



- Link the GDS and MOS procedures together.
- Convert models into a friendly web-based format.
 - DocWeb is currently being used, but other options are being explored.
- More SME interviews to be conducted and updated on the Wiki

REFERENCES



- Di Pasquale, Peter. “Applying Modeling Tools to Ground System Procedures.” Summer Space Grant Internship Oral Report. Jet Propulsion Laboratory, La Canada, CA. 23 Aug. 2012.
- Kathleen Crean, Oleg Sindiy, Patricia Lock, Brian Giovannoni, and Kevin Bonanne. “Evolving Ground System Engineering Practices to Meet the Needs of Future Space Missions.” Ground Systems Architecture Workshop. Jet Propulsion Laboratory, La Canada, CA. 28 Feb. 2012.

ACKNOWLEDGEMENTS



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- **Cubicle Teammate: Nari Hwangpo**
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- **Faculty Sponsors: Joseph Berk and Zekeriya Aliyazicioglu**

Thank You