PDS 2010 Project Overview

Dan Crichton

November 20, 2008

Background

Las Cruces/December 2007
>   Reviewed PDS4/PDS 2010 concepts
>   Began project planning with planning WG

Washington DC/April 2008
>   Discussed characteristics of PDS4, initial project plan and vision statement

Flagstaff/July 2008
>   Discuss core projects and timeline
>   Begin system formulation phase
>   Formulated architecture (data, system) WGs
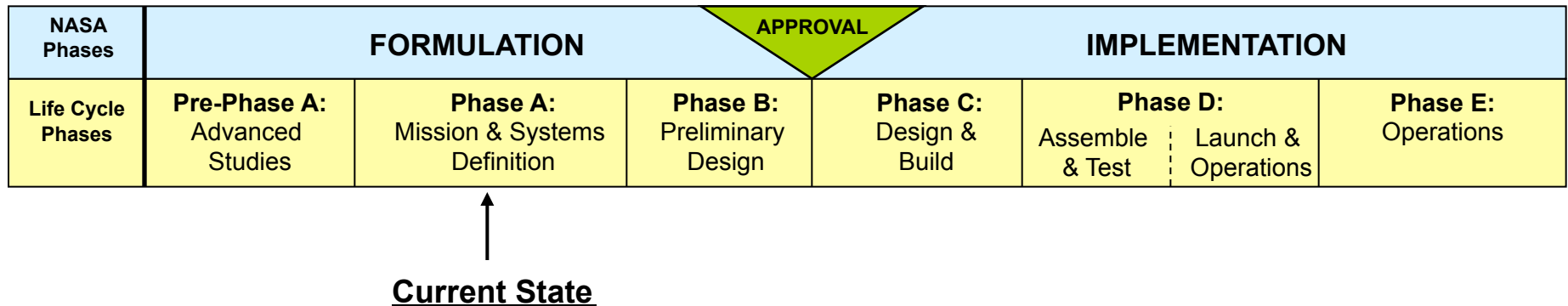
PDS Technical Session/September 2008
>   Discuss the formulation of PDS4 as a technical group

College Park/November 2008
>   Brief MC on results of the tech session and formulation of PDS4; next steps
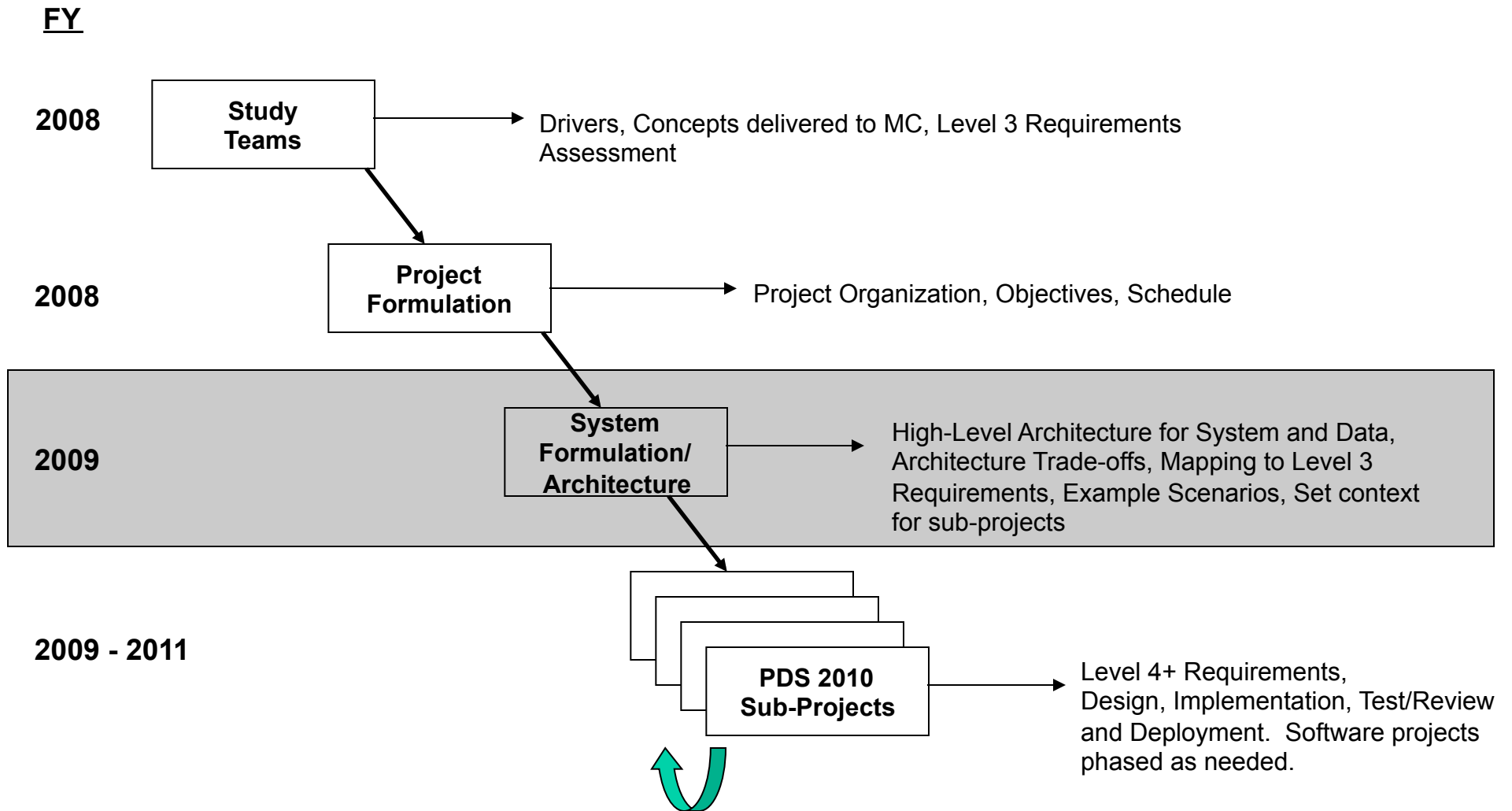
System Engineering

NASA Phases	FORMULATION			APPROVAL	IMPLEMENTATION		
Life Cycle Phases	**Pre-Phase A:** Advanced Studies	**Phase A:** Mission & Systems Definition	**Phase B:** Preliminary Design	**Phase C:** Design & Build	**Phase D:** Assemble & Test	Launch & Operations	**Phase E:** Operations

Current State

- **At the Las Cruces MC, there was a strong recommendation that we should think of "PDS-4" as a mission. We can think of our progress in terms of the NASA engineering lifecycle.**
  - *It provides a useful framework to an extent, but is H/W centric and focused on a single launch*

- **At the same time, we've been discussing the implementation as a set of projects which each have their own project definition, requirements, design, implementation and deployment**
  - *Follow an interative development model for software*

- **For PDS, I see a hybrid model where we will generate a high level design for PDS4, and then kick off projects which implement to that design**

PDS System Engineering Approach

FY

2008

```
Study
Teams
```
→ Drivers, Concepts delivered to MC, Level 3 Requirements Assessment

2008

```
Project
Formulation
```
→ Project Organization, Objectives, Schedule

2009

```
System
Formulation/
Architecture
```
→ High-Level Architecture for System and Data, Architecture Trade-offs, Mapping to Level 3 Requirements, Example Scenarios, Set context for sub-projects

2009 - 2011

```
PDS 2010
Sub-Projects
```
→ Level 4+ Requirements, Design, Implementation, Test/Review and Deployment. Software projects phased as needed.

Input into System Formulation

- ## Roadmap
    - *http://pds-engineering.jpl.nasa.gov/projects/PDS4/Exchange/PDS_Roadmap.pdf*

- ## PDS Level 1, 2, 3 (System-Level)
    - *http://pds-engineering.jpl.nasa.gov/index.cfm?pid=5&cid=72*
    - *Really, not a PDS3 set of requirements*

- ## PDS4 Concept Papers
    - *http://pds-engineering.jpl.nasa.gov/index.cfm?pid=100&cid=119* (Architecture)
    - *http://pds-engineering.jpl.nasa.gov/index.cfm?pid=100&cid=120* (Data Model)
    - *http://pds-engineering.jpl.nasa.gov/index.cfm?pid=100&cid=121* (User Support)

- ## PDS Vision and Exec Summary
    - *http://pds-engineering.jpl.nasa.gov/projects/PDS4/pds2010-execsummary20080701.pdf*

PDS Roadmap

- **Published in February 2006 by the PDS MC**
  - *http://pds-engineering.jpl.nasa.gov/projects/PDS4/Exchange/PDS_Roadmap.pdf*

- **Addresses critical upcoming challenges**
  - *Mission and Data Provider*
  - *User and Customer Challenges*
  - *Challenges Associated with International Collaborations*
  - *Operational Challenges*
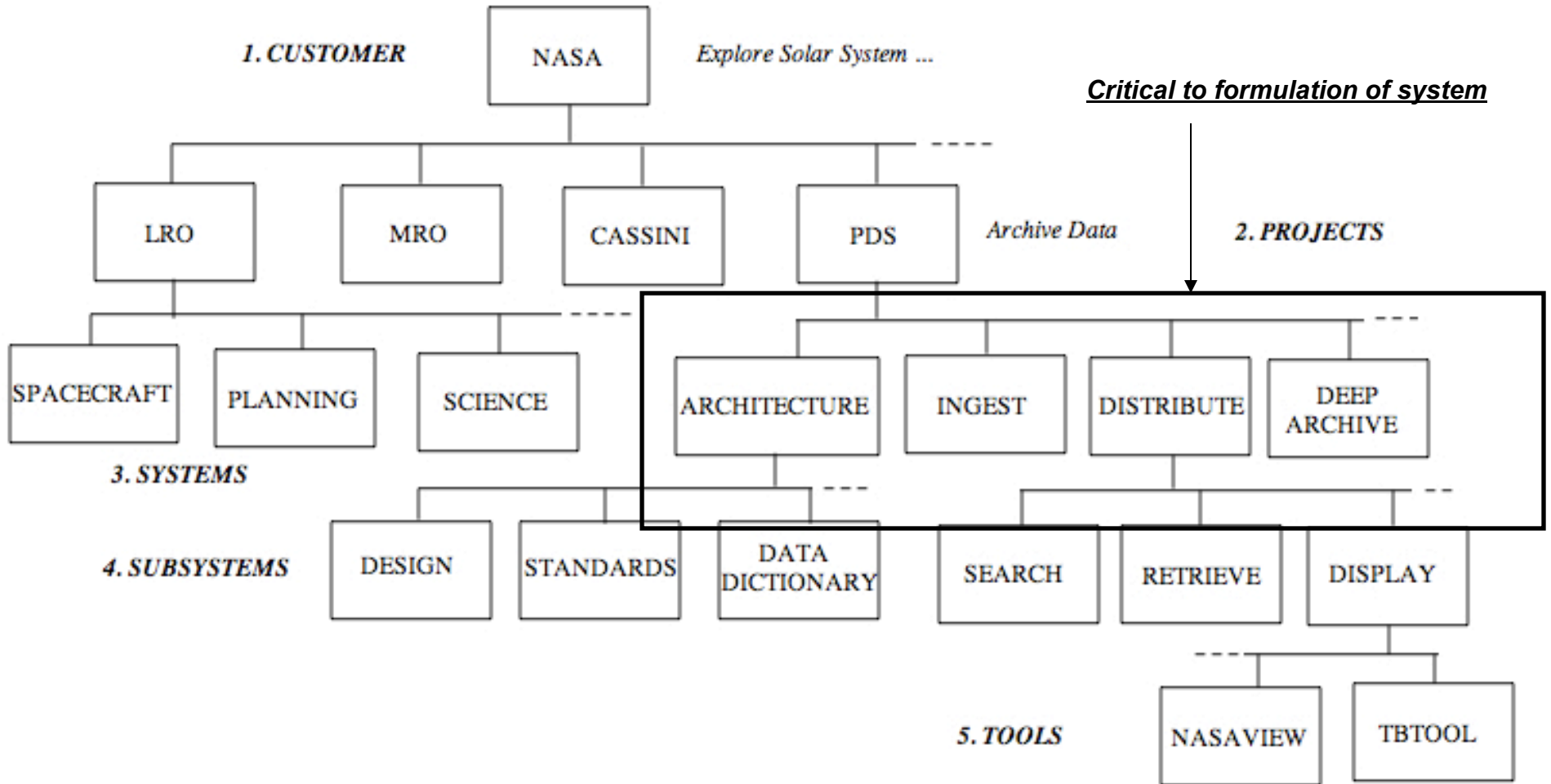 - *On-going Challenges given budget constraints*

PDS Requirements

- **System Level Requirements approved in August 2006**
  - *http://pds-engineering.jpl.nasa.gov/index.cfm?pid=5&cid=72*

- **March 2007 PDS approved requirements levels and approach**
  - *http://pds-engineering.jpl.nas.gov/system_eng/requirements-process-20070329-v2.pdf*

* Adapted from Dick Simpson (2007-03-28)

PDS4 Vision Statement*

PDS 2010 will provide the community with planetary science archiving standards that are consistent and simple to use. It will provide online services for using its data archives, allowing users to access and transform data quickly from across the federation of PDS nodes. Data providers will be given adaptable tools to design, prepare, and deliver data efficiently to PDS. PDS 2010 data and services will be managed and delivered from a highly reliable and scalable computing infrastructure that is designed to protect the integrity of the data and virtually link PDS nodes into an integrated data system.

* Approved at April 3/4 MC F2F Meeting with Simpson edits

Key goals from vision statement*

- **Simplified, but rigorous, archiving standards that are consistent, easy to learn, and easy to use**

- **Adaptable tools for designing archives, preparing data, and delivering the results efficiently to PDS**

- **On-line services allowing users to access and transform data quickly from anywhere in the system**

- **A highly reliable, scalable computing infrastructure that protects the integrity of data, links the nodes into an integrated data system, and provides the best service to both data providers and users**

* PDS 2010 Executive Summary, July 2008

Architecture…what is it?

- **Architecture: The fundamental organization of a system embodied in its <u>components</u>, their <u>relationships</u> to each other, and to the <u>environment</u>, and the <u>principles</u> guiding its design and evolution. (ANSI/IEEE Std. 1471-2000)**

- **PDS Reference System Architecture is decomposed into four core pieces:**
    - *Process Architecture*
        - Describes the core processes PDS follows for its system
        - PDS examples: archive management, preservation planning, peer review, standards management, etc
        - Don't expect major changes here

    - *Data Architecture*
        - Describes the information models and data standards PDS follows for its system
        - PDS examples: PDS data model, PDS data dictionary, ODL (Grammar), etc

    - *Application Architecture*
        - Portals, tools, etc

    - *Technology Architecture*
        - Infrastructure elements

- **We care about architecture because it sets the context for how individual parts of the system fit together for PDS 2010**

Decomposition of the architecture
Elements derived from PDS 1,2,3 Requirements
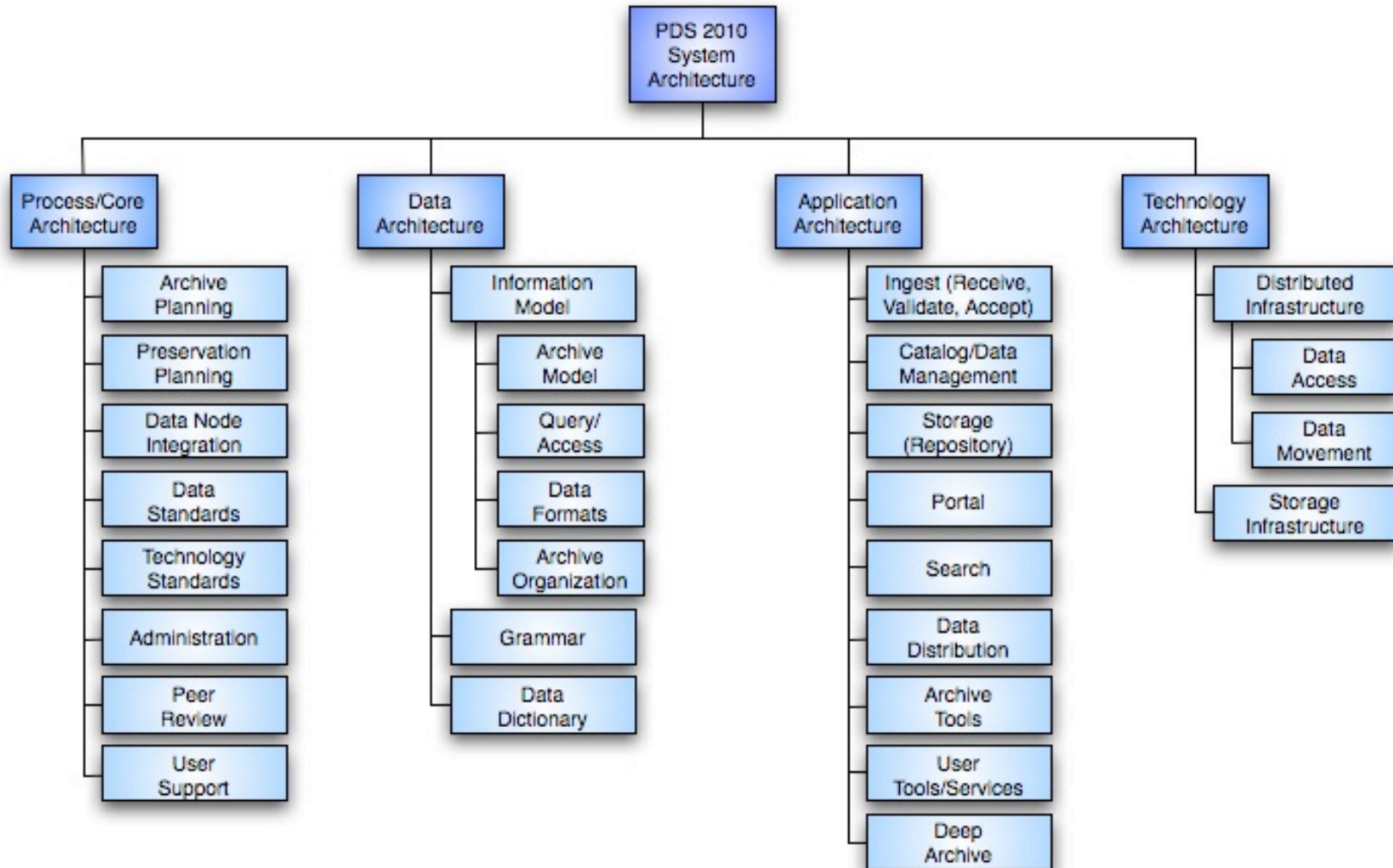
Challenge in communicating an architecture

One of the major challenges is communicating an architecture

- Determine a useful view of the system for the stakeholder
- Projects have suffered because a useful view wasn't provided

Who are the PDS stakeholders that care about the architecture?

How do we communicate their care-abouts?

The view is what you see

The viewpoint is where you look from
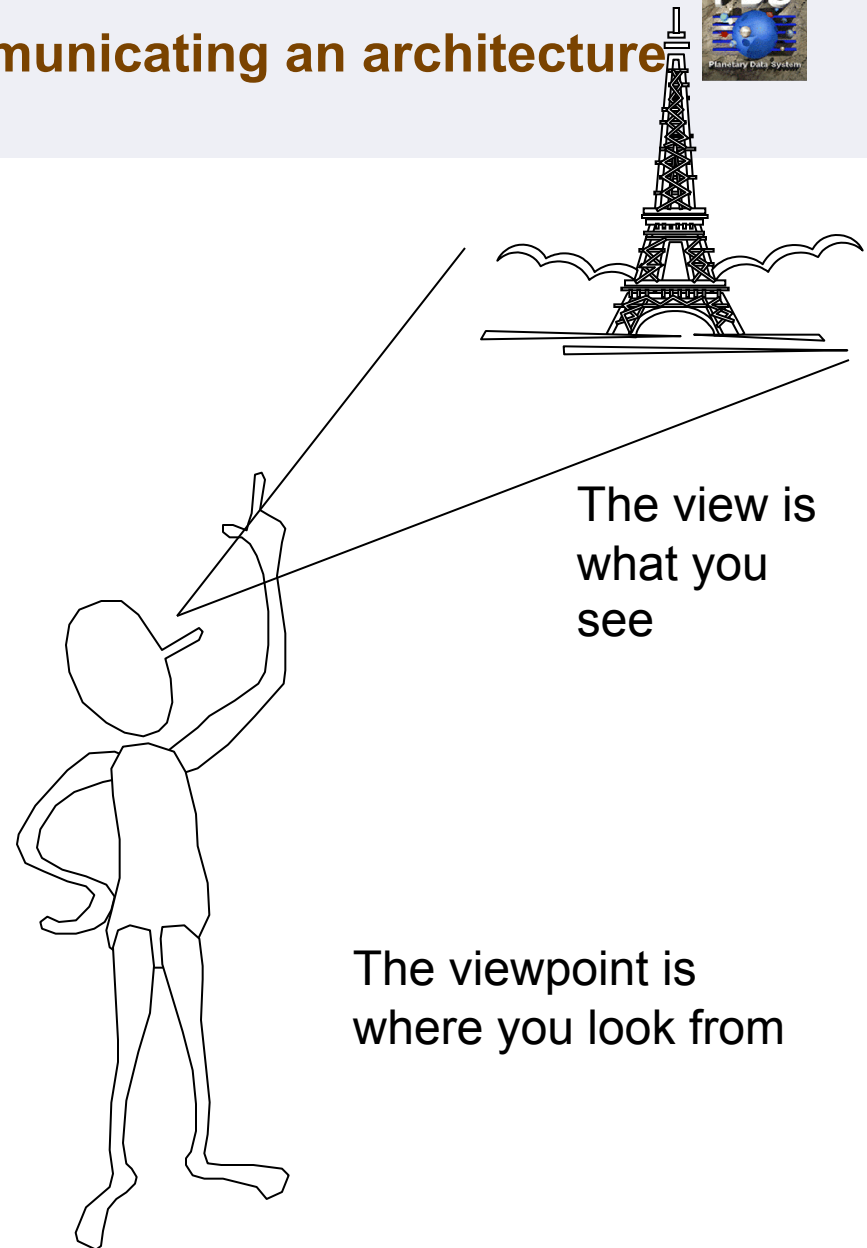
(Management Council, System Engineers, Data Engineers, etc)

PDS views and proposed artifacts for the architecture

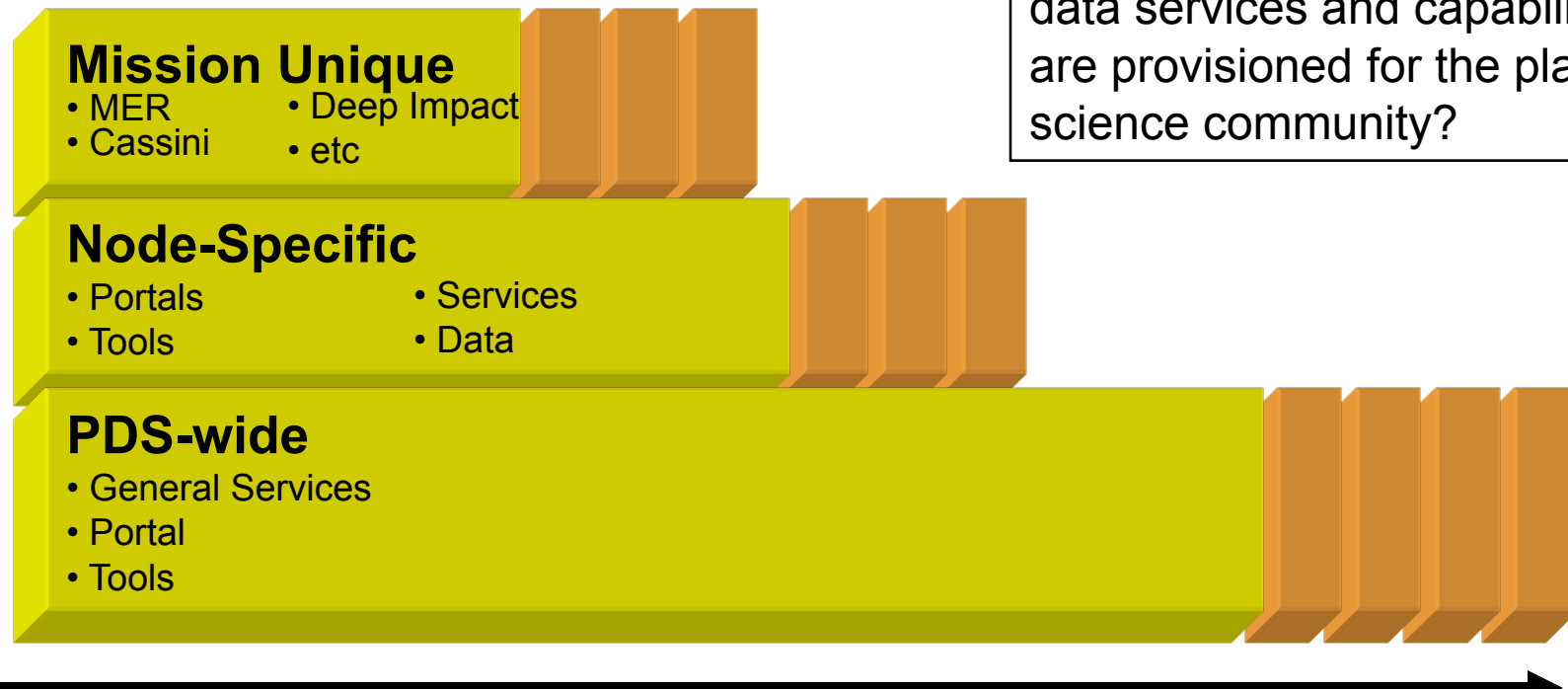| Stakeholders	System Architecture Aspects			Viewpoints
	What (Data View)	How (Functional View)	Where (Deployment View)	
NASA Program	Scoping Model (Where does PDS fit in Space Science Disciplines?)	Context (Where PDS Fits in Mission Pipeline?)	Distributed Nodes	Scope (Contextual)
Management Council	Conceptual Map	Service Identification	Service Provisioning	Project (Conceptual)
System Engineer	Logical Model (Class Diagrams, PDS Specification)	Service Definitions	Distributed Service Architecture	System (Logical)
Data Engineer / Software Engineer	Data Dictionary / Standards Reference	Service Interfaces	Deployed Service	Technology (Physical)
Data Provider	ODL Templates / XML Schema	Active Services	Service Usage	Detailed Representation (Definition)
Data Consumer	Data Instance	Active Services	Service Usage	Operations (Instance)

Derived from the Zachman Framework

Trade-offs going forward

Unique
Rqmts.

Specific

Mission Unique
• MER   • Deep Impact
• Cassini   • etc

Node-Specific
• Portals   • Services
• Tools   • Data

Common

PDS-wide
• General Services
• Portal
• Tools

More Capability

A goal is to define:

What are the tradeoffs in
determining where and what
data services and capabilities
are provisioned for the planetary
science community?

- **Addressed trade-off decisions and open questions about PDS4**
  - *Based on data architecture WG and Arvidson questions*

- **Identified initial architecture decisions**
  - *Distributed software services-based approach (as seen in various science data system communities)*
  - *Separation of critical parts of the information model as well as explicit definitions. PDS software and tools are and will be dependent on the model going forward.*

- **WGs will report out on the results**

What do we need from MC?

- **Respond to fundamental questions/policies going forward**

- **Input on design trade off/approach for data model**

- **Review and confirmation of proposed next steps**

- **Any suggestions/comments critical to moving forward on PDS 2010**

- **Support for tech staff to be involved in PDS 2010 development**