



How to Establish a Process Architecture and Use it for Process Improvement

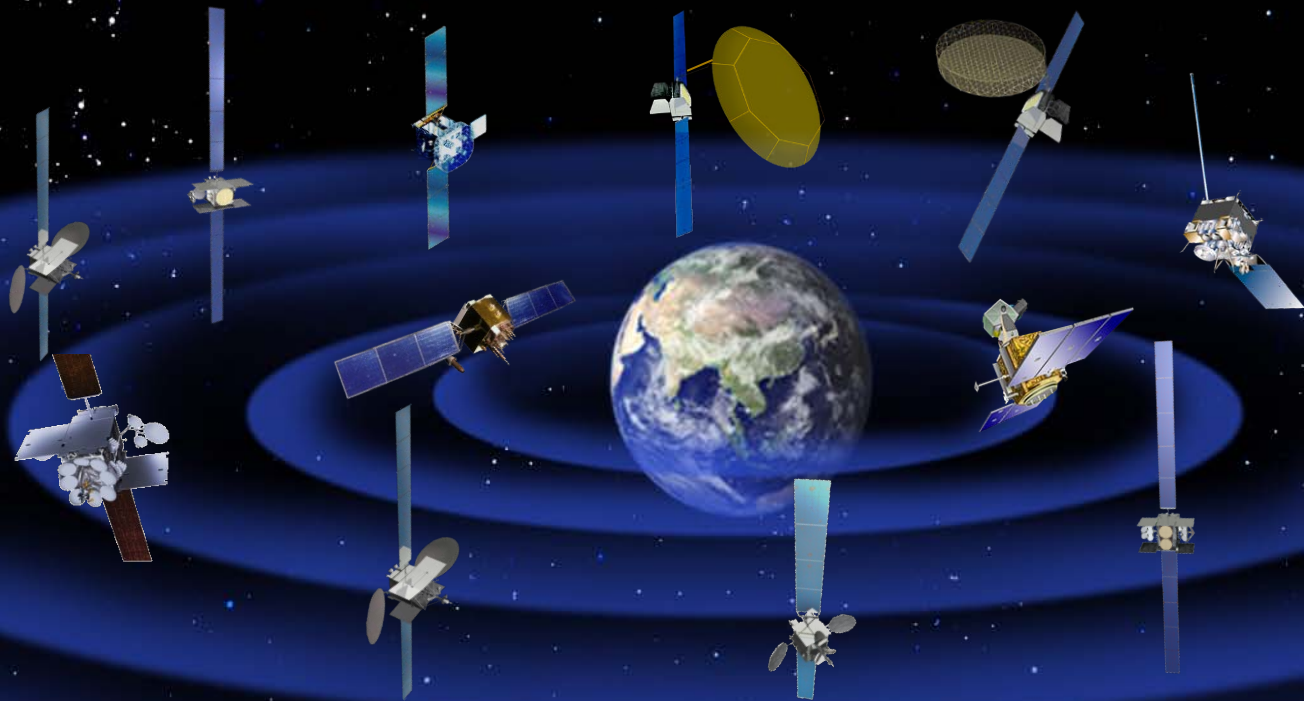
**CMMI Technology Conference & User Group
15-18 November 2010**

Gary Palosaari, Ph.D.
The Boeing Company

Gary.C.Palosaari@boeing.com
310-416-3591

Boeing Space and Intelligence Systems (S&IS)

S&IS is Boeing's center for all intelligence and government / commercial space systems. It is the world's leading manufacturer of geostationary satellites, and has the largest dedicated satellite factory in the world. S&IS' headquarters is in Seal Beach, California.



CMMI® Core Team located in El Segundo, Southern California

Agenda

- Process Management Challenges
- A well-designed Process Architecture overcomes the Challenges
- What makes up a Process Architecture?
- Steps to establish and maintain a Process Architecture
- Improving by using a Process Architecture
- Keys to success

Process Management Challenges

- **Too many processes**
 - Redundant, contradictory
- **Too many types**
- **Too many interfaces**
- **No integrated views / roadmaps**



A well-designed Process Architecture Overcomes the challenges

- **Provides a bird's eye view**

- Graphical representations establish a framework to help users find processes



- **Provides insight into interrelationships and ordering**

- Helps with process update impact analysis - fewer unintended consequences
- Helps with planning, process deployment analysis

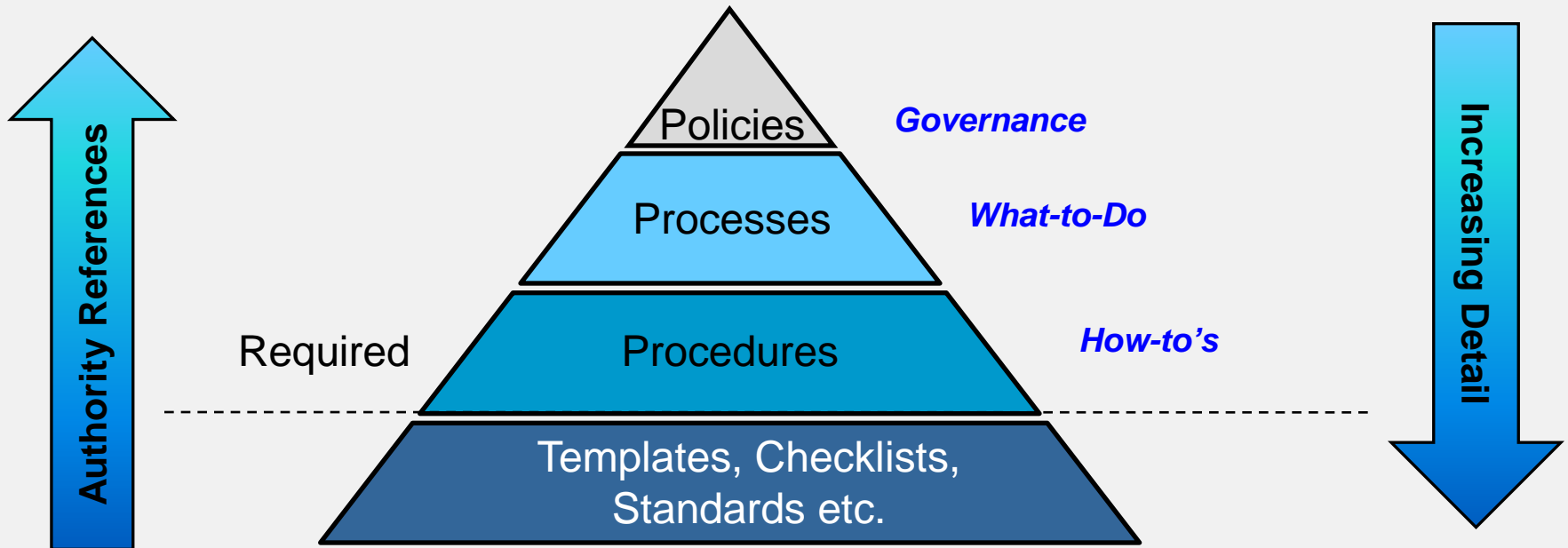


What makes up a Process Architecture?

- **Components (policies, processes, procedures, etc.) grouped in**
 - Hierarchy
 - Contextual relationships
- **Interfaces and interdependencies among the components**
- **Ordering of the components**

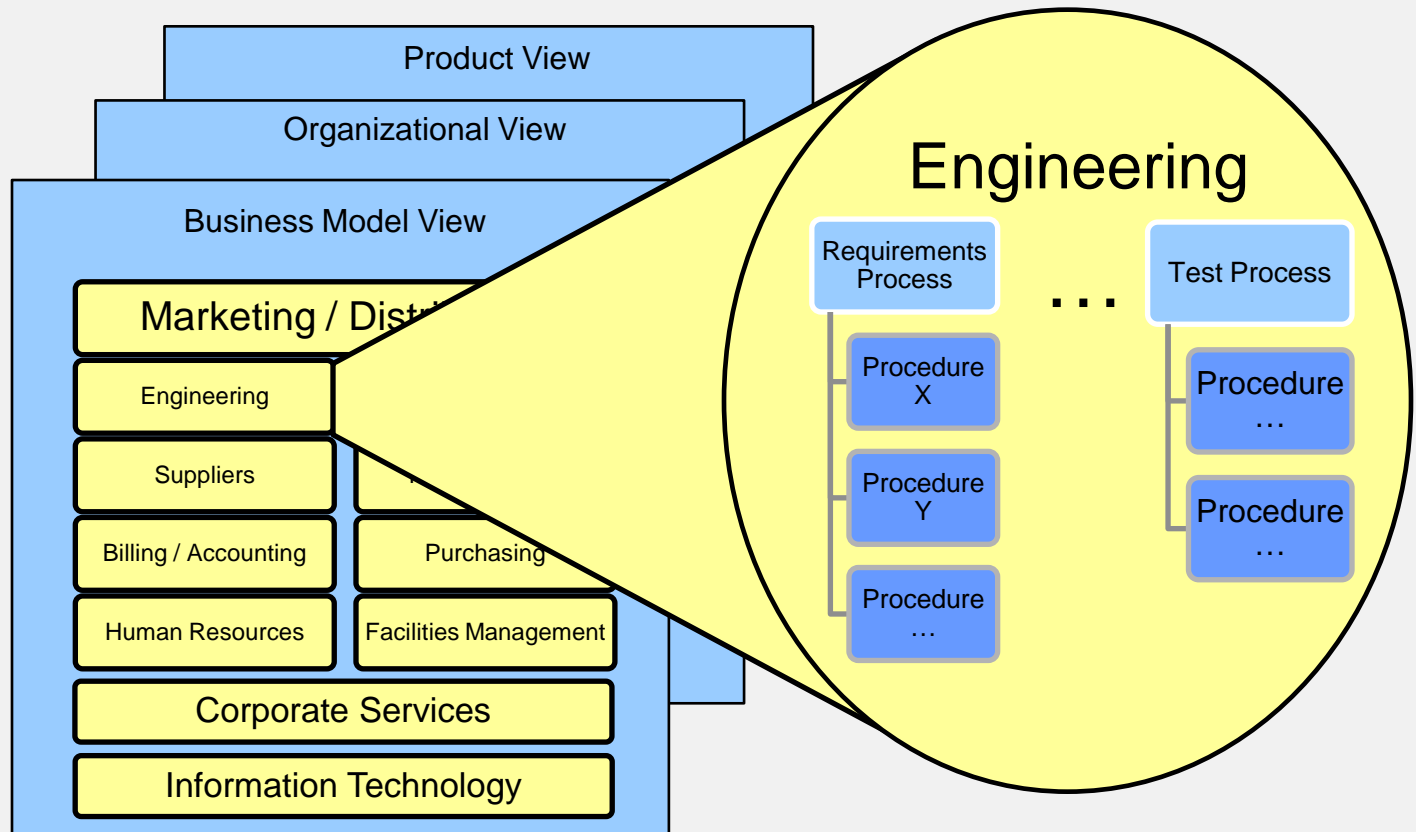
Note: For additional process architecture information see CMMI® (Ver. 1.2) – Glossary and Organizational Process Definition (OPD-SP 1.1)...

Hierarchy



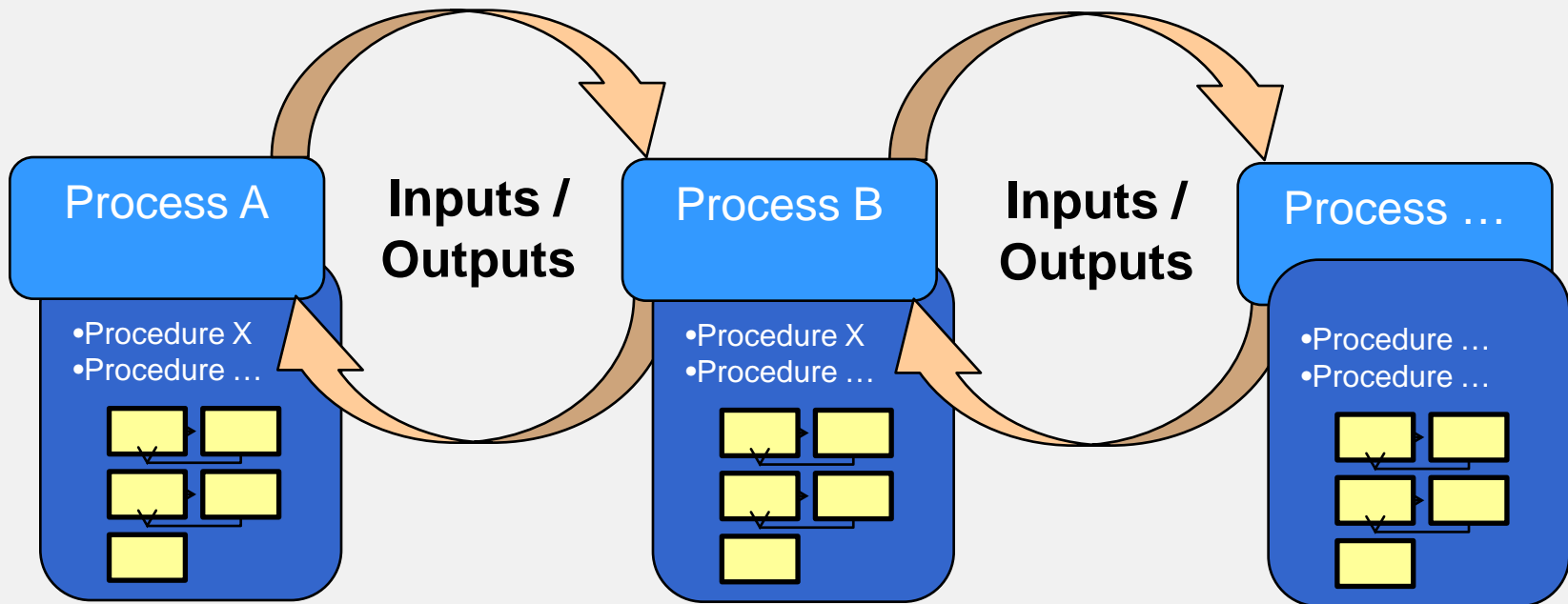
*See [Olson 1994] for additional definition and relationship information

Contextual Relationships



*See [Olson 2008] for additional architecture examples

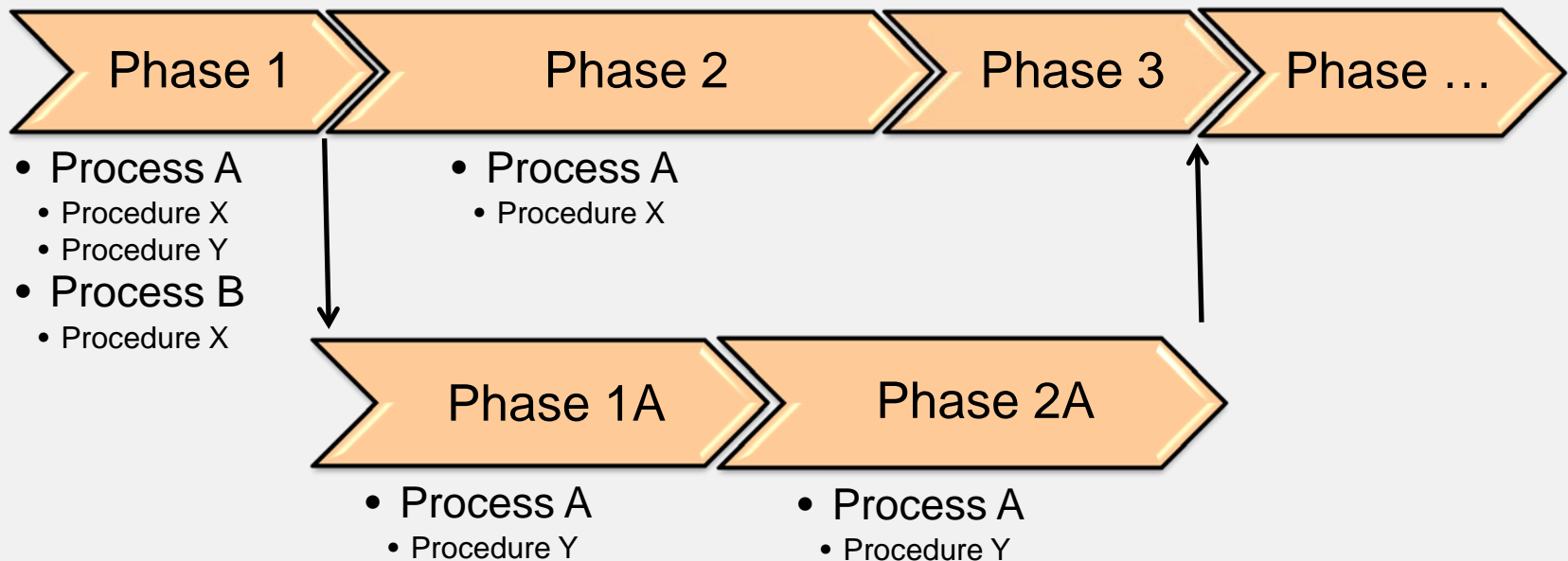
Interfaces and Interdependencies



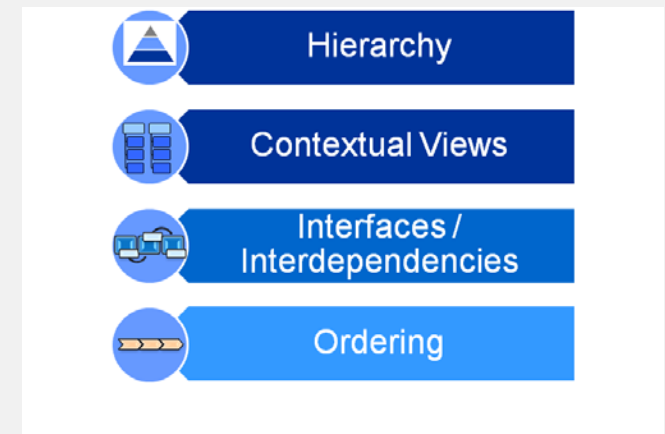
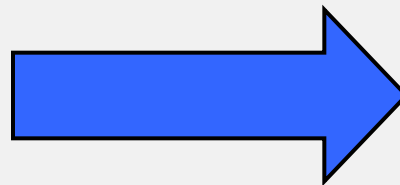
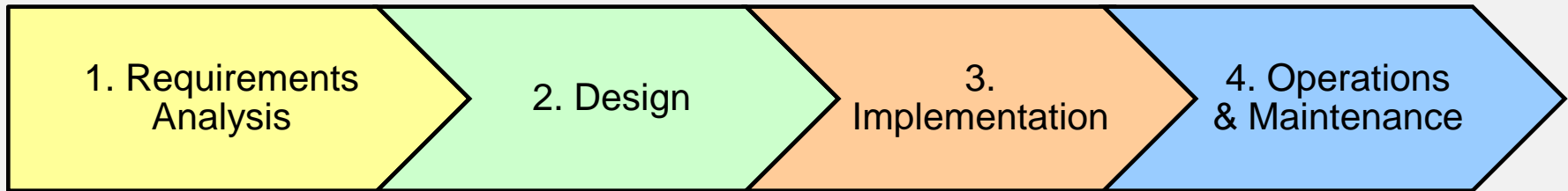
Ordering

Order (sequencing, iteration, concurrency) is captured through process mappings to lifecycles, value streams, or process flows...

Lifecycle Example



Steps to Establish and Maintain a Process Architecture*



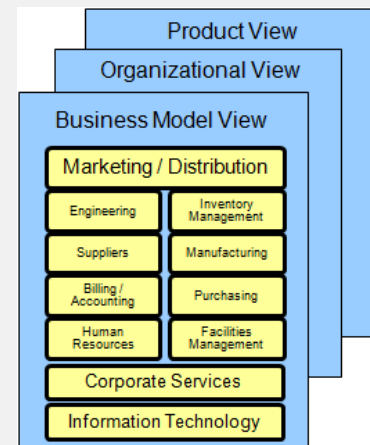
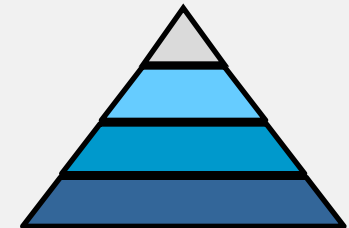
*See [Chang-Hyun, 2010] for additional information on how to build a software architecture

1. Requirements Analysis

- **Identify and analyze process architecture requirements**
 - Use cases, scenarios (finding / improving processes)
 - Existing documentation / interface standards
 - CMMI®, AS9100 compliance
 - Level of detail versus expert mode capability
 - Weak versus strong associations between processes and procedures
 - Process update impact analysis capability
- **Identify constraints**
 - Legacy processes / architectures (potential multi-site issues)
- **Identify and analyze quality attributes**
 - Simplicity / usability (processes should be easy to find)
 - Flexibility and maintainability (architecture should be easy to update)
 - Degree / levels of commonality (common processes can be to generic)
 - Extensibility, reusability (allow for future expansion, building blocks)

2. Design

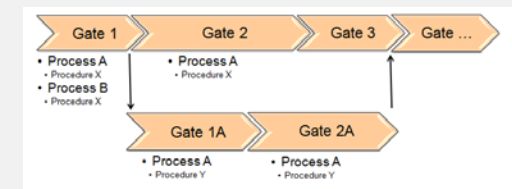
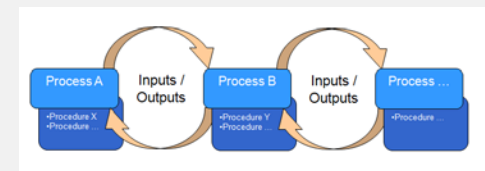
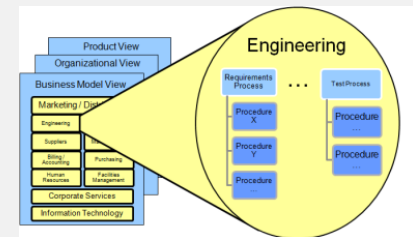
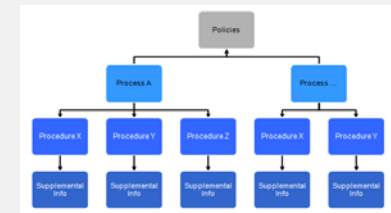
- **Analyze structural alternatives and identify solutions**
 - Identify layers of hierarchy and which components are required
 - Identify strength (level of detail) of process mappings
 - Establish process groupings and “look-and-feel” for contextual views
- **Identify process and process element interfaces (e.g. I/O data, givers /receivers)**
- **Identify lifecycle phases to be process mapped**
- **Standardize process templates / definitions**
- **Evaluate tools / methods to build / populate the process architecture**
 - Process Modeling Tools
 - Wiki’s
 - Process Flow Diagrams



Note: See [Clements 2005] and [Clements 2010] for additional information on design principles and view selection criteria

3. Implementation

- **Collect and catalogue components**
 - Map procedures (How-to-Do's) to processes (What-to-Do's)
- **Group processes and procedures into contextual views**
- **Identify interfaces**
- **Map to lifecycles**



4. Operations and Maintenance

- **Establish change control mechanisms, tools, methods**
- **Monitor implementation / updates to ensure that architecture is maintained**
- **Integrate updates of your process architecture into your process management activities**
- **Re-factor as necessary, in response to process creep, acquisitions, or expanded functionality needs**

Improving Operations with a Process Architecture

- **Navigation tool to find the right process at the right time**
 - Views provide process context, “What-to-do” and “How-to-do” it
 - Lifecycle process mappings tell the user when to execute the “What-to-do’s” and “How-to-do’s”



Improving Process Management with a Process Architecture

- **Use interface information to identify potential impact of process updates**
 - Follow I/O threads to eliminate unintended consequences
- **Use contextual views to identify and eliminate areas of redundancy**
- **Identify high leverage areas (e.g. common tasks)**
- **Improve process deployment by identifying gaps / hidden areas**
- **Improve alignment with Business Objectives**
 - Maintain compliance to CMMI®, AS9100



Keys to Success

- **Understand the benefits of a well-designed Process Architecture**
- **Align your Process Architecture with your business needs and objectives**
- **Develop contextual views to**
 - Find the right process at the right time
 - Efficiently improve processes
- **Maintain your Process Architecture...Avoid the creep!!!**



References

- [Clements 2005] Clements, Paul. *Comparing the SEI's Views and Beyond Approach for Documenting Software Architectures with ANSI-IEEE 1471-2000*, CMU/SEI-2005-TN-017, 2005.
 - <http://www.sei.cmu.edu/reports/05tn017.pdf>
- [Clements 2010] Clements, Paul and Len Bass. *Relating Business Goals to Architecturally Significant Requirements for Software Systems*, CMU/SEI-2010-TN-018, 2010.
 - <http://www.sei.cmu.edu/reports/10tn018.pdf>
- [Chang-Hyun 2010] Chang-Hyun, Jo. *Software Architecture: 5W-1H*, Presentation, Software Process Improvement Network, 2010, El Segundo, CA.
 - http://www.ccpe.csulb.edu/spin/media/pdf/jo_SPIN-20100212_SW_Arch_5W1H_.pdf
- [Olson 1994] Olson, Timothy G., Reizer, Neal R., et al. *A Software Process Framework for the Capability Maturity Model*, CMU/SEI-94-HB-01, 1994.
 - <http://www.sei.cmu.edu/reports/94hb001.pdf>
- [Olson 1995] Olson, Timothy G. *How to Define CMMI Based Processes that Short & Usable*, Presentation, NDIA CMMI Technology Conference, 2005, Denver, CO.
 - <http://www.dtic.mil/ndia/2005cmmi/monday/olson.pdf>.
- [Olson 2008] Olson, Timothy G. and Chris Armstrong. *Architecture and Model Based Systems Engineering for Lean Results*, Presentation, NDIA CMMI Technology Conference, 2008, Denver, CO.
 - <http://www.dtic.mil/ndia/2008cmmi/Track3/WED/PM/7058Olson.pdf>

