Ground System Architectures Workshop

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Product Line Development Through Systematic Reuse Using Commercial Processes

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Making the Most of the Past, Present, and Future

- **Product Lines**
  - **Support multiple users**
  - **Support multiple missions**
  - **Core underlying architecture**
- **Systematic Reuse**
  - **Forward engineer legacy systems**
  - **Leverage previous investments**
- **Best Practices**
  - **Organize for focus**
  - **Demand value-added processes and products**
  - **Collaborate with a community**

Lower Cost, Decrease Schedule, and Increase Quality

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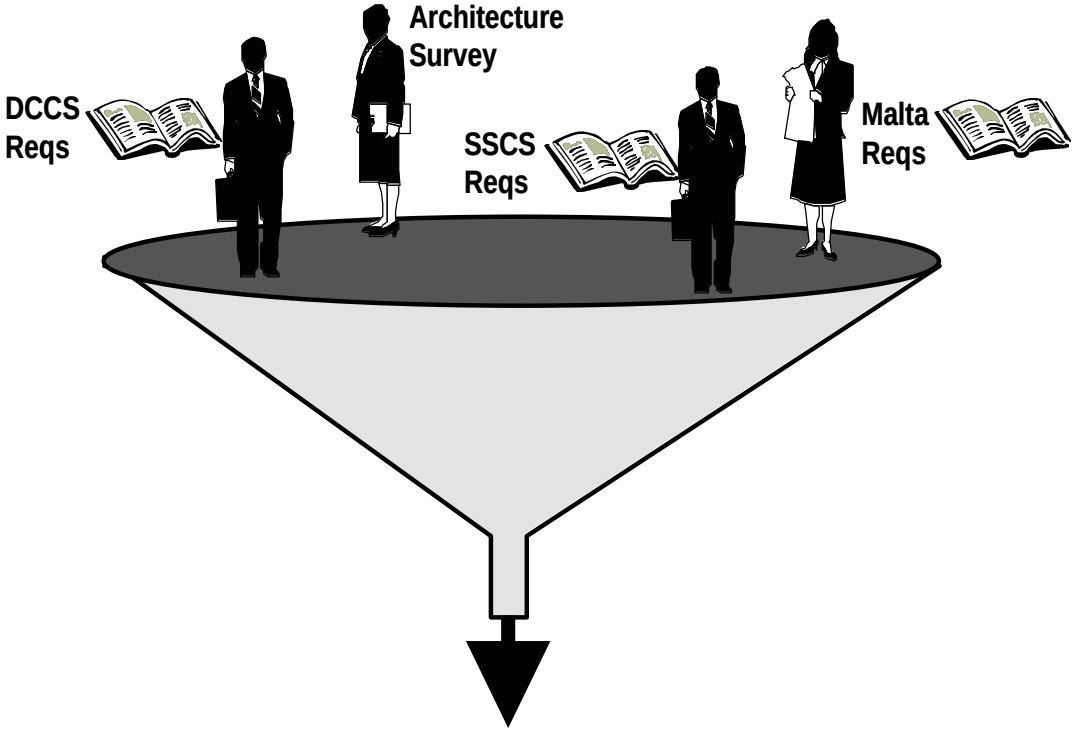
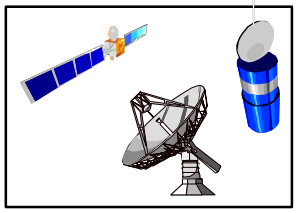
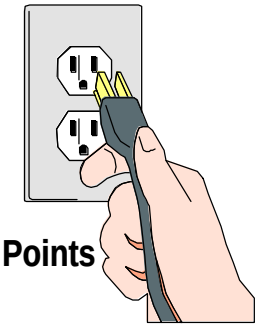
Scoping a Product Line



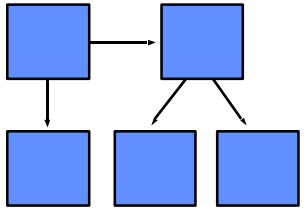


Domain Definition

Generalized System
Requirements Specification



Variation Points



Reference Architecture

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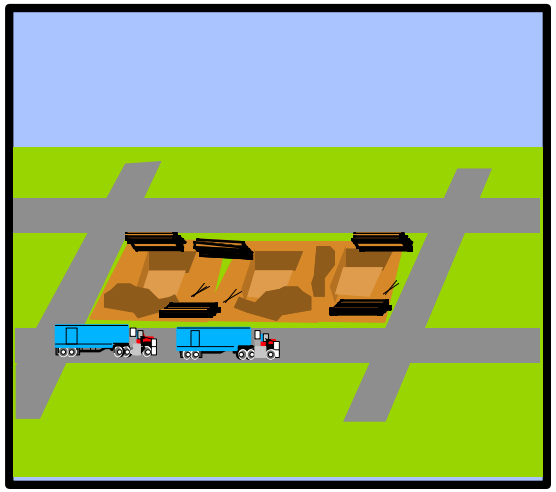
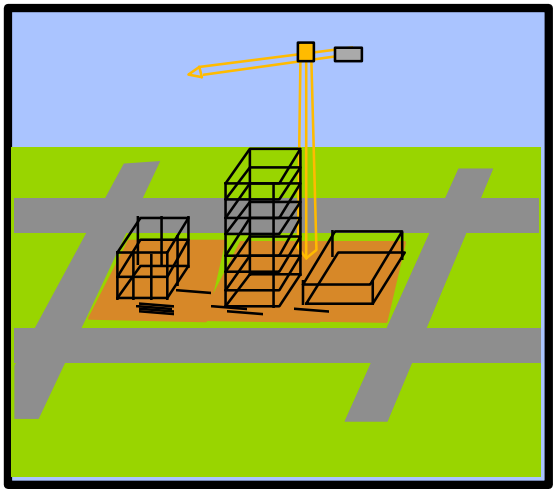
A Definition of a Product Line

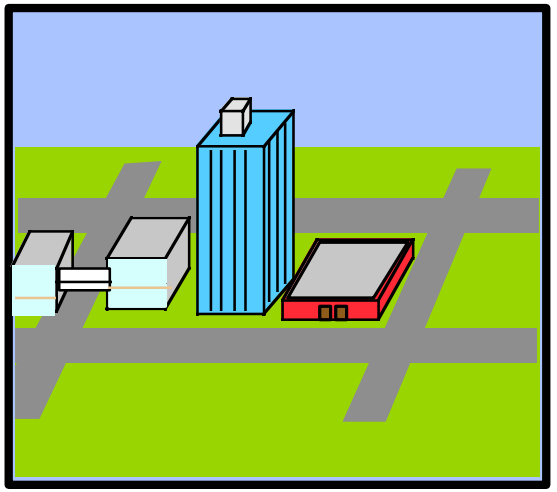
Office Building, Department Store, and Warehouse...



- Common building materials are used across different projects
- Standards ensure compatibility of building materials from competing vendors



- Each project has its own architecture
- Each project uses common design and construction processes



- Projects customize only where necessary
- Projects share benefits of common infrastructure

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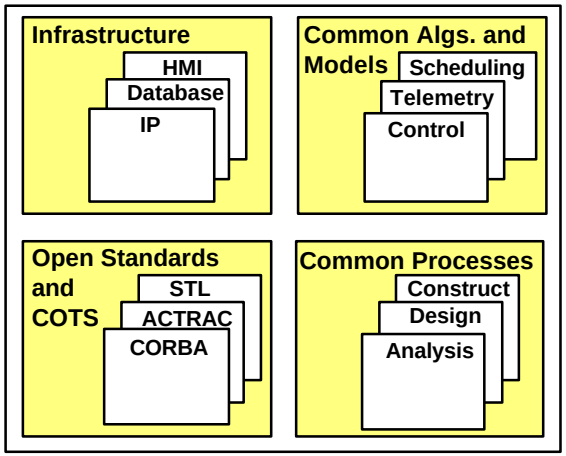
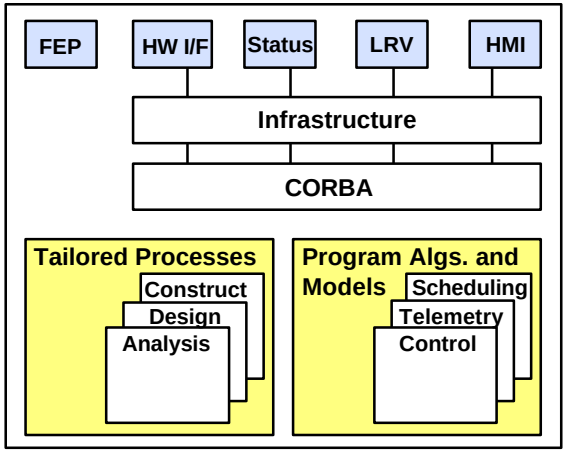
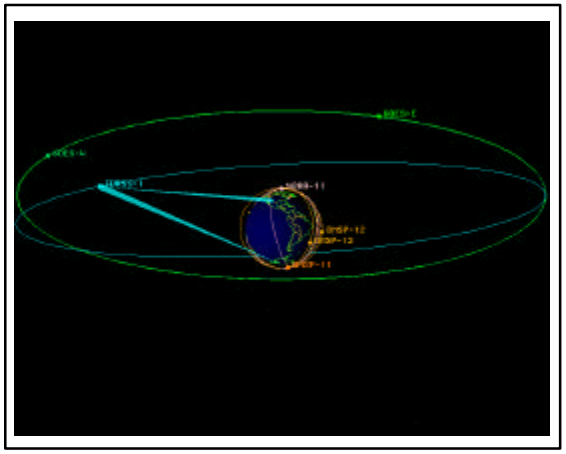
A Satellite Command and Control System Product Line



- Open standards-based common software components provide building blocks for flexible software architectures
- Well-defined interfaces between software components permit technology evolution and lessen reliance on specific vendors



- Each program defines its own system architecture using the common components
- Programs customize and extend where necessary to implement their concepts of operation
- Programs share common development processes



- Programs achieve their unique ground system solution
- Programs share in development and maintenance costs

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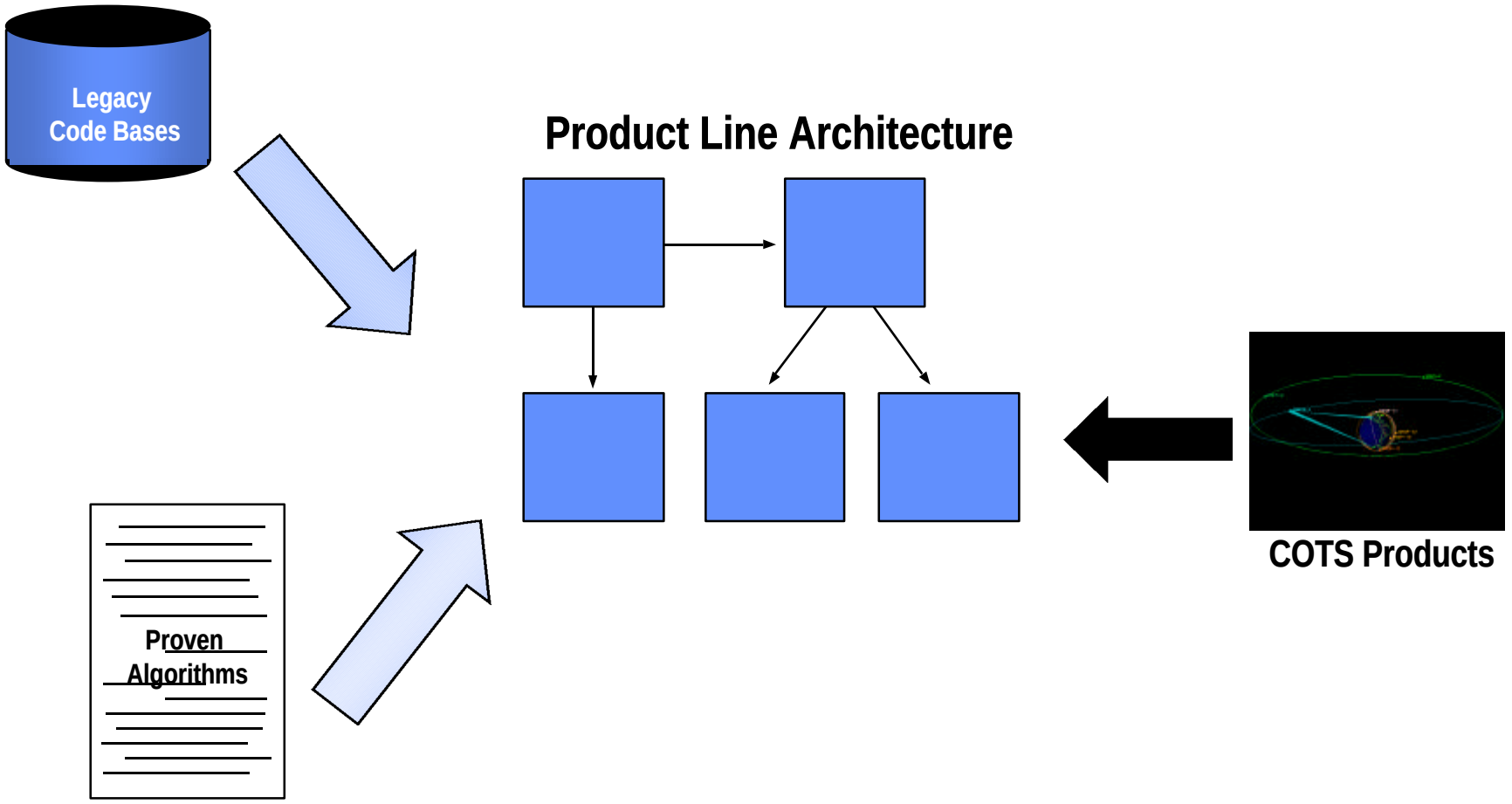
Take Advantage of What's Available



Process-Driven, Systematic Reuse

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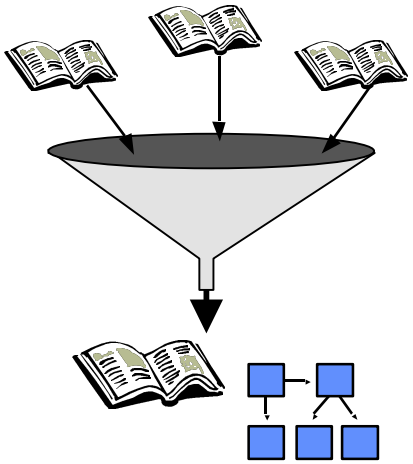
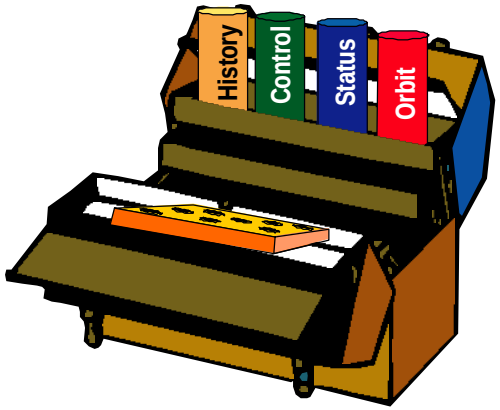
Organizing for Product Line Development

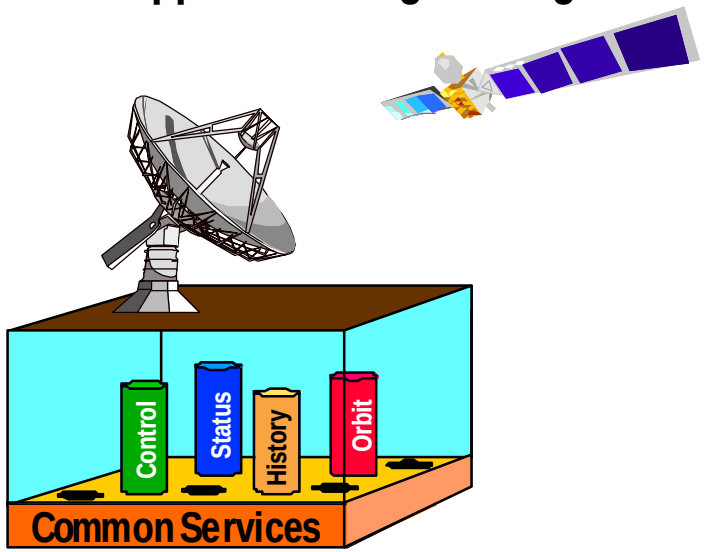
Domain Engineering



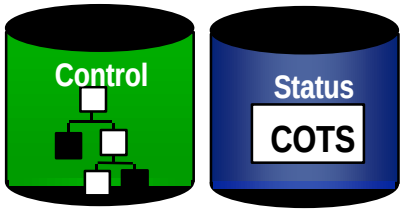
Component Engineering



Application Engineering



Sustainment Engineering



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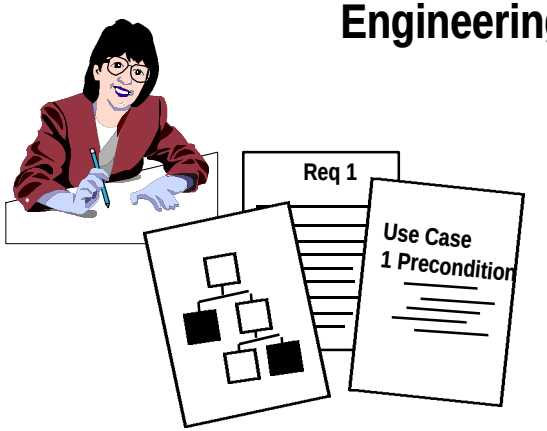
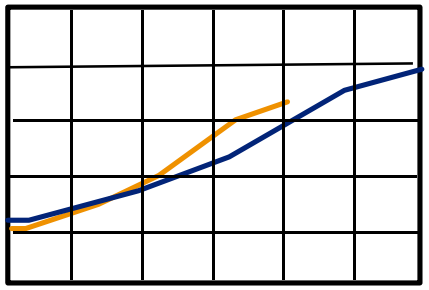
Value-Added Processes

Frequent Working TIMs

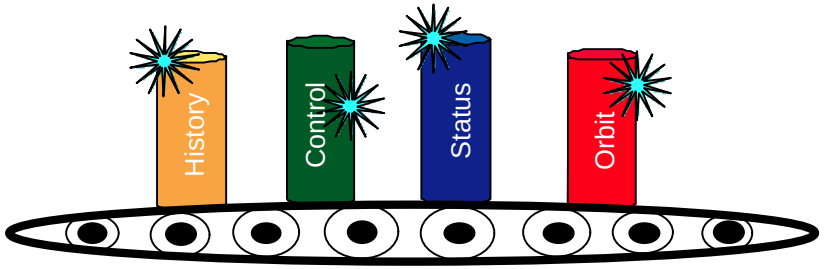
Engineering Product Focus





Accurate Progress Metrics

Quality Through Process



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Focus on Risk Reduction

- Overall system requirements and architecture are defined up front
- Detailed development follows a spiral approach
  - Create system, category, component skeletons early
  - Focus on high-risk capabilities
- Support a front-loaded integration strategy
- Allow incremental review of maturing products
  - Design artifacts
  - Developmental prototypes
  - System thread demonstrations

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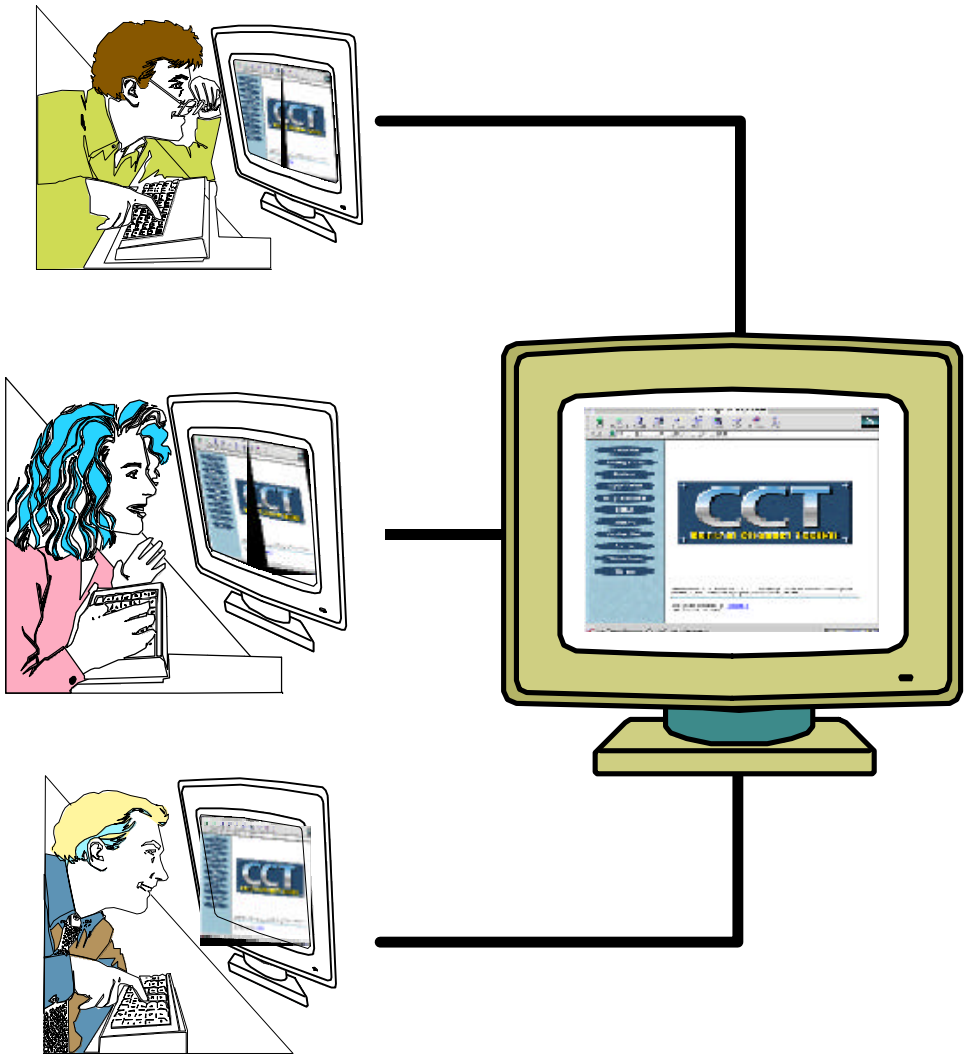
A Collaborative Development Environment



- **Utilize the expertise of all community members**
  - **Technical Support**
  - **End-users**
  - **Technologists**
  - **Developing contractor**
- **Extranet**
  - **Constant, instantaneous connectivity**

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The End Goals

- **Lower Lifecycle Costs**
  - **Product line allows sharing of development and maintenance expenses**
- **Decrease Schedule Duration**
  - **Common capabilities provided**
  - **Focus on new unique requirements**
- **Increase Quality**
  - **Large base of existing capabilities with depth and breadth of operational usage**