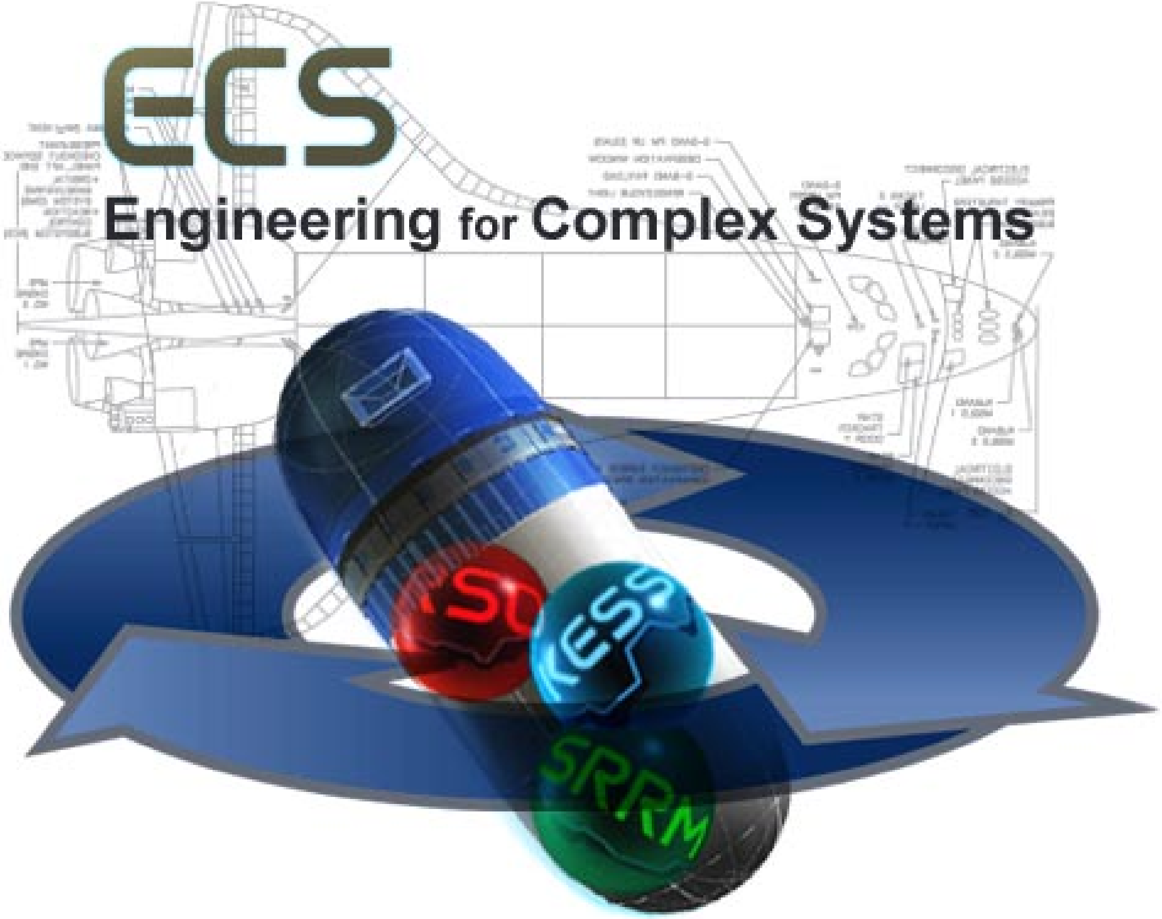


Collaborative Software Engineering Tools Workshop

Dr. John Penix

Motivation*

_ Over 10% of NASA’s civil servant and contractor workforce spend the majority of their time managing, developing, assuring, verifying, and/or maintaining software

_ NASA has in operation use (and maintains) at least 200 million lines of source code

_ Over $1 billion dollars of NASA’s annual $15 billion budget is software cost

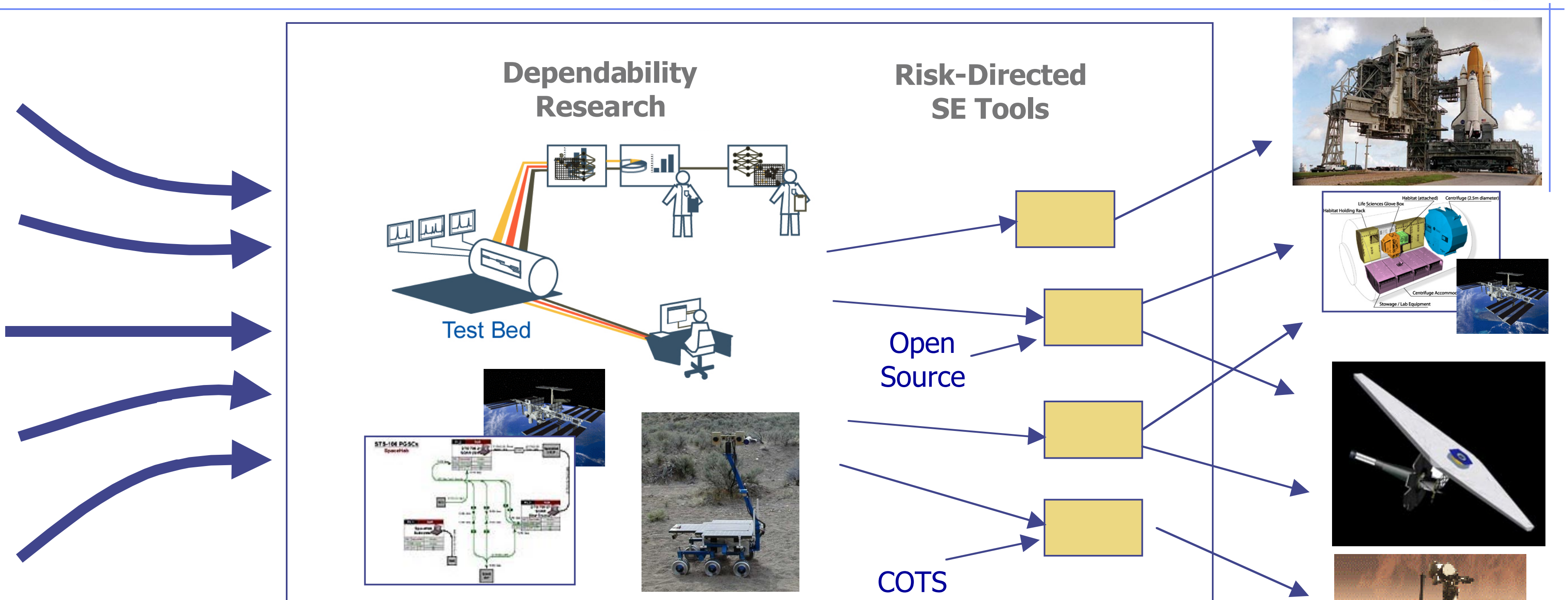
* Based on estimates extrapolated from a 1993 study – source NASA Chief Engineer’s Office

Resilient Software Engineering

Project Overview

ECS Engineering for Complex Systems

RSO



Fundamental New Technologies

Dependability Metrics and Technology Validation

Tool Development and Insertion

NASA/CICT
NSF

High Dependability Computing

Intelligent Software Engineering Tools

NASA Missions and Aerospace Industry

ECS Resilient Software Engineering

Intelligent Software Engineering Tools Goal

RSO

- Reduce mission critical risks by developing tools and methods to identify and eliminate software errors

Mishap Cause Classification: 1/3 aerospace mishaps are software related

Mars Climate Orbiter

Mars Polar Lander

Ariane 5

- Sources of critical software risk:
  - Misunderstanding requirements and hardware software interface
  - Poor communication between teams
  - Insufficient design and testing
  - Inadequate or inappropriate methods and processes

ECS
Engineering for Complex Systems
RSO

Intelligent Software Engineering Tools Approach

- Mature advanced modeling and analysis tools
  - Advanced Software Verification and Testing
  - Integrated Formal/Informal Requirements Engineering
- Integrate and leverage state of art tool technology
  - Commercial and open source tools
  - Distributed collaboration frameworks
- Work with missions to infuse tools into specific processes:
  - Add early lifecycle requirements analysis capabilities
  - Improve testing effectiveness
  - Enable tool-supported, distributed code reviews

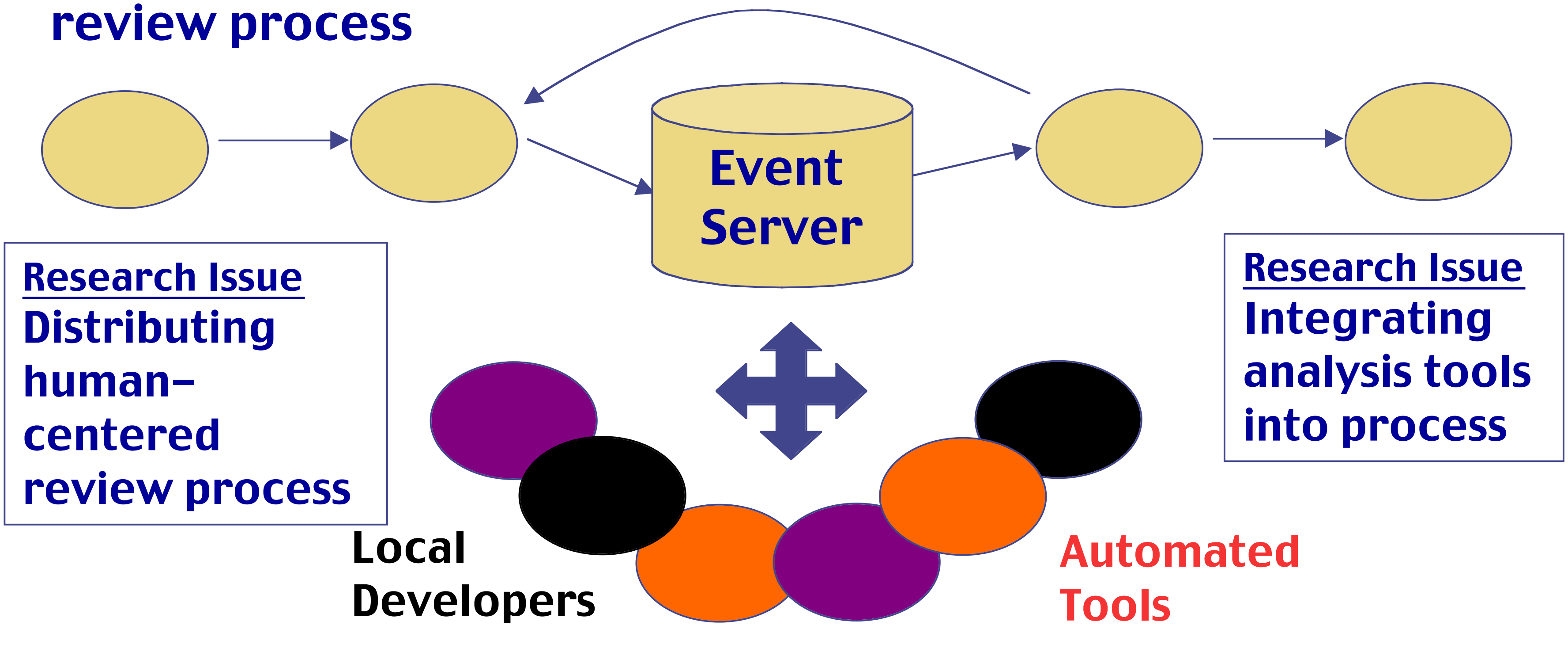
Collaborative Software Engineering Tools

RSO

- Problem: Miscommunication between teams is a common source of critical errors
  - NASA software is often developed by distributed multidisciplinary teams, compounding this problem
  - Existing software engineering tools do not provide strong support for collaboration
- Solution: Insert advanced tools into NASA mission processes by integrating with collaborative frameworks:
  - Integration of the Verification and Testing Tools into a collaborative environment to support collaborative software design and code reviews (ARC)

Distributed Collaborative Software Reviews

Workflow-driven review process



Research Issue
Distributing human-centered review process

Research Issue
Integrating analysis tools into process

Workshop Goal

RSO

- Improve this presentation!
  - What are NASA's problems?
  - What are some potential solutions?
  - What technology do we have that can play a role?
  - What research needs to be done?
  - How do we do that research?