Managing the Domain Engineering Task

Presented By

Ravinn Chhut

CACI, Inc.

(703) 679-3852

rchhut@caci.com

Course Outline

- Introduction
- Management considerations
- Description of the DE process
- Summary

Course Goals

- Become aware of the process
- Get an idea of what it takes to manage the DE task
- See the need to build a knowledge-base

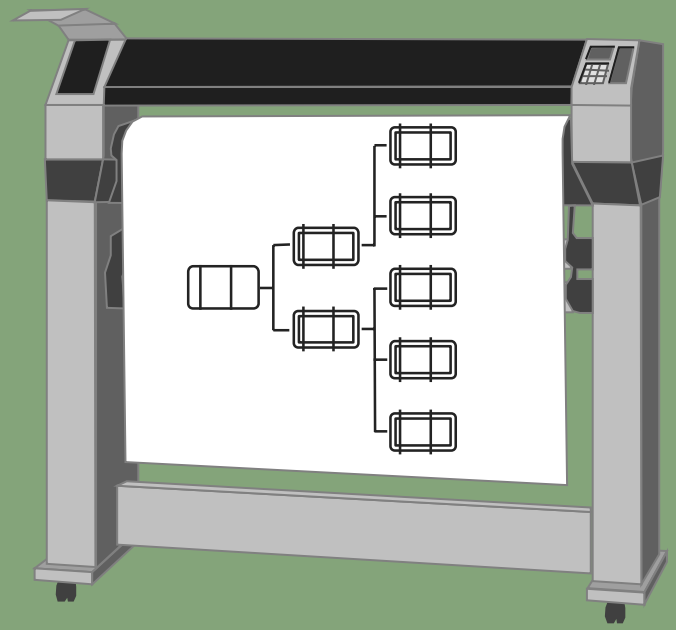
Group Profile

- Who are you?
- What organization do you work for?
- What project are you working on?
- Do you have any experience with domain engineering?
- What are your expectations of this class?

Tools of the Trade

Modeling Tools

- Support of popular modeling methods
- Code generation
- Dictionary
- Consistency checking
- Reverse engineering
- Traceability
- Test script generation



Other Tools

- The Domain Engineering Process (DEP) Document (or similar)
- Asset retrieval tool (internet browser)
- Metrics analysis
- Project management (budget, schedule)
- Domain knowledge-base

A Word About Metrics

Metrics - Help or Hindrance

- Make your equations (economic models) simple
- Make collection and reporting of metrics an easy task (automate the process where possible)
- Keep in mind that most metrics provide only a valid estimate (too many variables to count on them as exact)

What is a Reused SLOC?

- Not developed here
  - Maybe same activity, but not same team
- Usually obtained from a repository
- Only counted once (per team)
- Does <u>not</u> include comments
- Bottom-line: must be an agreed upon definition and value

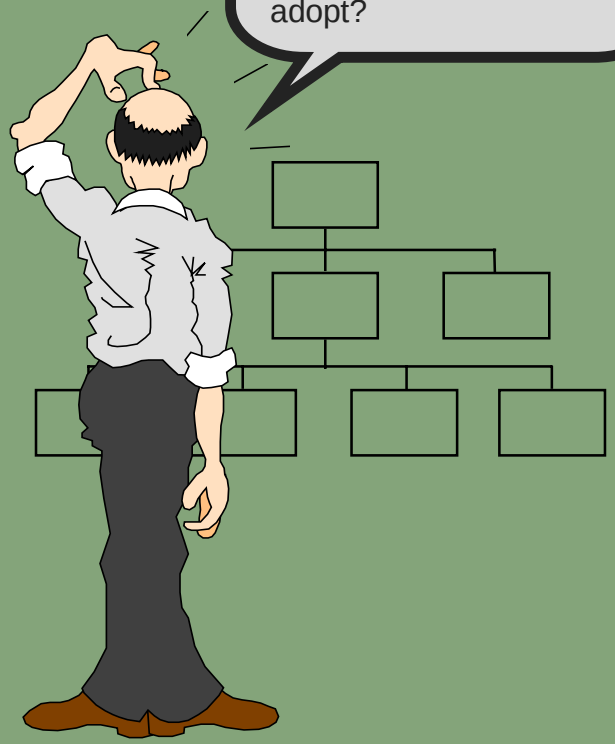
Management Activities

Is it Going to Work?

What experience do we have?
Where is this domain going?
Who are my competitors and are they more experienced in this domain?

Self-assessment

What changes need to be made?
Who can help?
Which process should I adopt?



Management Activities

- Plan and organize
  - Determine business area (product-line)
    - » Based upon organizational experience
    - » Market analysis must support
  - Institute practices and procedures
    - » Adoption of process requires commitment from CM, QA, V&V as well as developers, and usually requires organizational restructure
    - » Several guides are available w/mentoring

Dual Effort

- Institutional effort
  - Vision and Strategy
  - Implementation approach
- Product-line management effort
  - Domain engineering team
  - Reusable asset repository

Key Areas to Monitor

- All planned or on-going software reuse initiatives within the organization
- High-level reuse opportunities within and across programs
- Specific training requirements
- Incorporation of developing reuse technology
- Other government & academia efforts

Team Members

- Domain Expert
  - Functionally proficient in the domain
  - Need not be familiar with OOA & OOD
- Domain Engineers
  - Knowledge of OO concepts & techniques
  - Need not be familiar with the domain
- Verification & Validation
  - Familiar with OOA & OOD

Team Members

- Certification Engineer
  - Must be knowledgeable of the language
  - Must be experienced with the reusability of assets
- Configuration Management
  - Normal CM skills necessary
- Quality Assurance
  - Normal QA skills necessary

Reuse Repository Costs

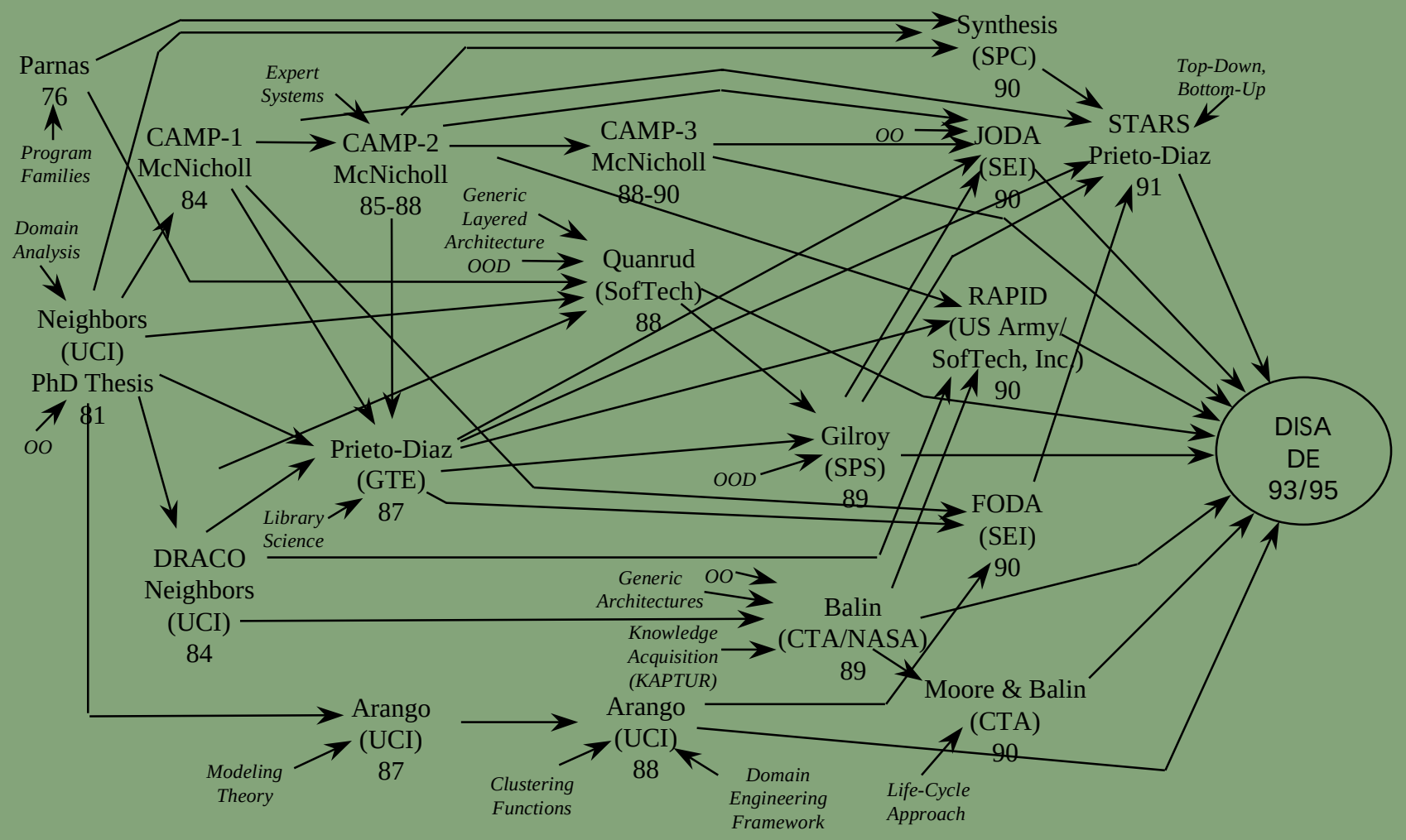
	Startup	Recurring
Facility:	$	$
Hardware:	$	$ (Maint)
Software:	$	$ (Maint)
Personnel:		
System Administrator/ Librarian	$	$
QA/CM Support	$	$
	$$	$

DE Risk Factors

Risk Categories	Risk Weights
Personnel Shortfalls	
- Software engineering expertise	35
- Domain expertise	25
- Process expertise	15
Unrealistic Plans	
- Schedule	20
- Budget	10
- Automated support	08
Developing wrong functions	07
Developing wrong user interface	06
Gold plating	04
Continuous requirements changes	04
Externally furnished components	04
External tasks	04
Performance shortfalls	04
Straining the state-of-the-art	04

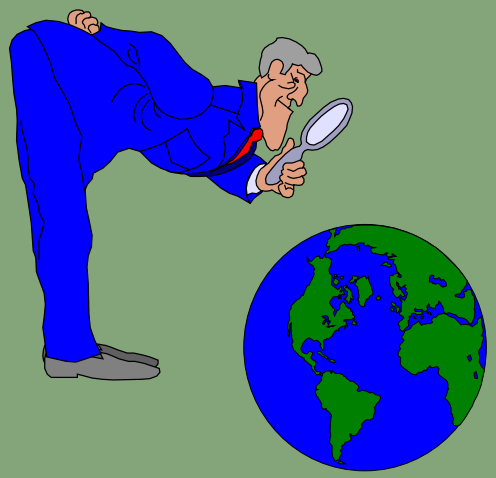
Description of the Process

Process Genealogy



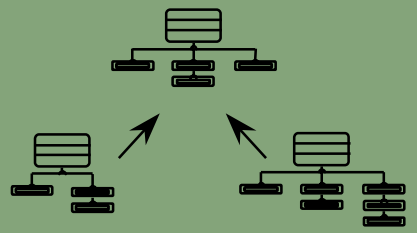
Conduct Domain Analysis

- Identify the Domain
  - Identify information sources
  - Gather initial domain knowledge
  - Describe the domain
  - Verify domain description
- Scope the Domain
  - Establish scoping criteria



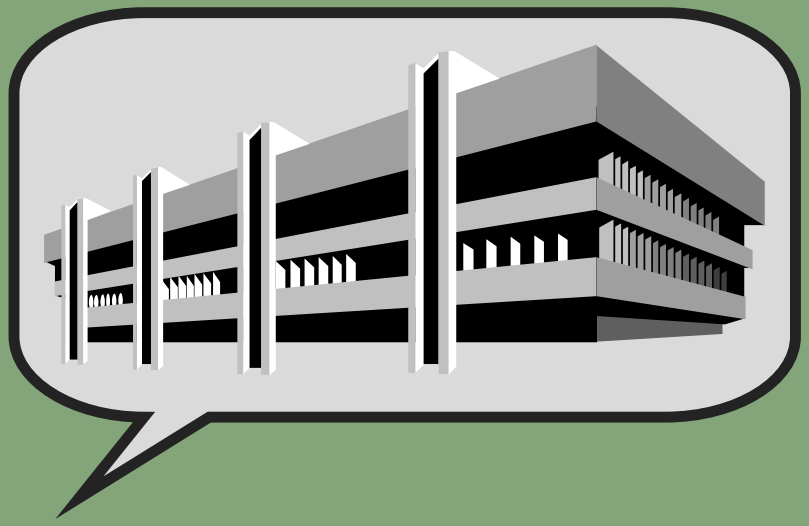
Conduct Domain Analysis

- Scope the Domain (con't)
  - Define domain boundaries
  - Verify domain scope
- Analyze the Domain
  - Organize & synthesize problem space information
  - Identify commonalties
  - Determine common objects adaptation requirements



Conduct Domain Analysis

Domain experts must independently verify the domain model



Verification can be accomplished by inspection, prototyping and simulation

Conduct Domain Design

- Identify domain constraints
- Collect and organize solution space information
- Survey domain-specific parts
  - Compare architectural components with modeled requirements
  - Assess degree of reusability
  - Capture classification information

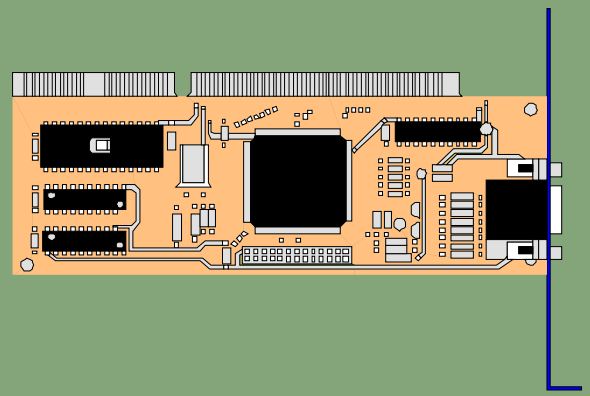
Conduct Domain Design

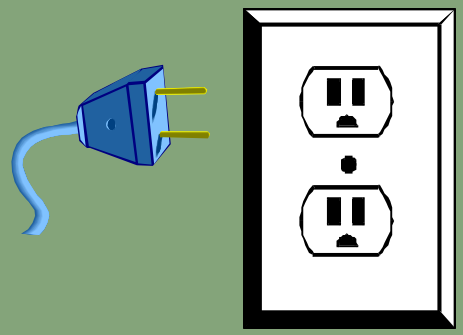
- Survey domain-specific parts (con't)
  - Decompose to next lower level of detail
- Develop Domain-Specific Software Architecture (DSSA)
  - Develop high-level DSSA(s)
  - Identify trade-offs and rationale for alternate DSSA(s)
  - Select DSSA

Conduct Domain Design

- Develop Domain-Specific Software Architecture (DSSA) (con't)
  - Develop specifications
  - Decompose to lower level
  - Develop DSSA classification terms
- Develop DSSA guidelines
- Validate DSSA

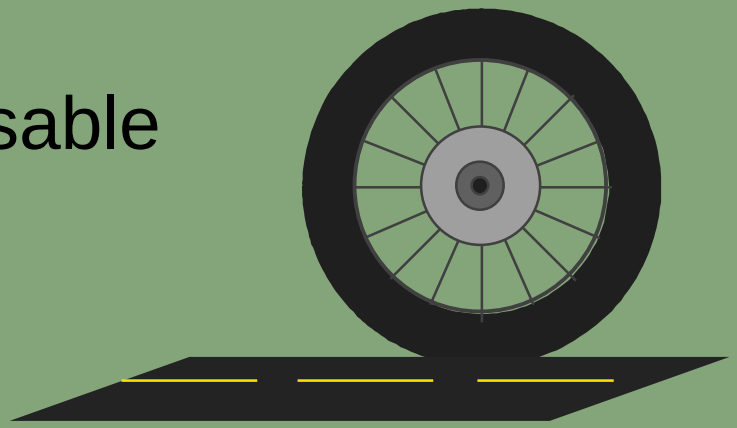
Why is an Architecture so Important?





Conduct Domain Implementation

- Borrow
  - Obtain from a reuse repository
- Buy
  - Purchasing COTS products
- Build
  - Developing a new, reusable asset



Summary

Conclusion

- Tools
- Team members
- The process