PROCESSES/METHODOLOGIES

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HOW WE STAND NOW

- OK For Small Projects, Not So Good For Large Projects
- Not Good For Addressing Iterative Nature Of Requirements Resolution & Implementation (Mostly Based On Waterfall)
- Does Not Address Complexity Issues Of Requirements Stabilization (Based On Functional Decomposition)
- Does Not Explicitly Address Reuse Opportunities
- Does Not Help With People Shortages

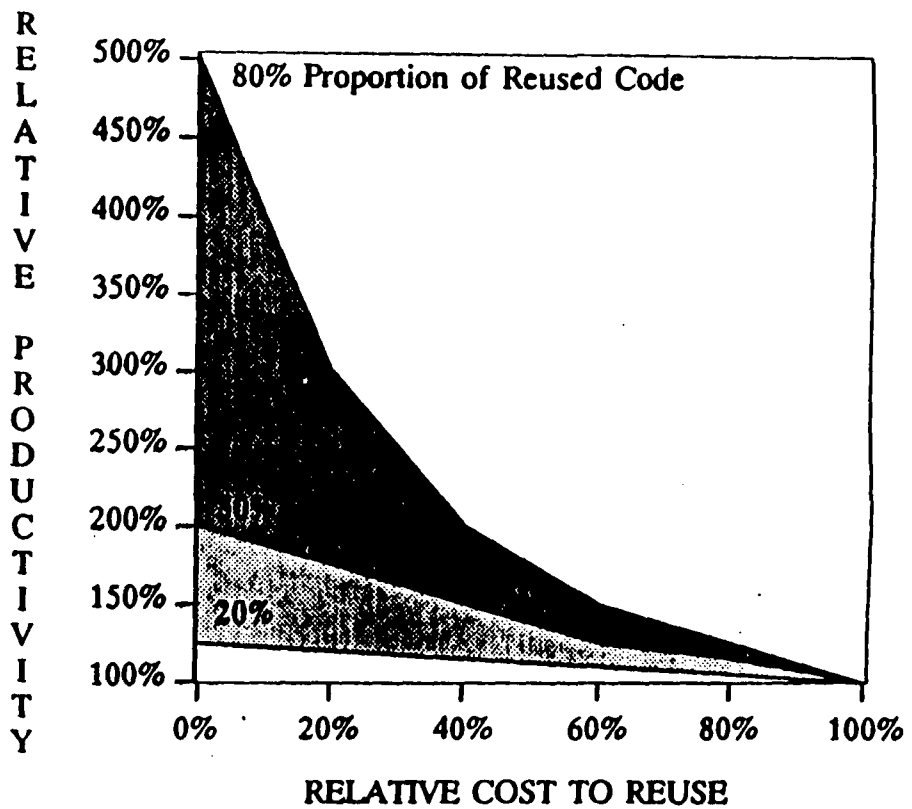
NEED TO DEFINE AND AUTOMATE IMPROVED SOFTWARE ENGINEERING PROCESSES

REUSE AND PROTOTYPING -TWO SIDES OF THE SAME COIN

- Reuse Library Parts Are Used To Generate Good Approximations To Desired Solutions, i.e., Prototypes
- Rapid Prototype Composition Implies Use Of Pre-existent Parts, I.E., Reusable Parts
  - Prototype Quality Depends On Fit Of The Available Parts
  - The Parts Will Often Require Some Adaptation
  - As The Set of Parts Available Becomes Richer The Prototypes Will Better Approximate Acceptable Pieces of Final Systems

REUSE PAY-OFF

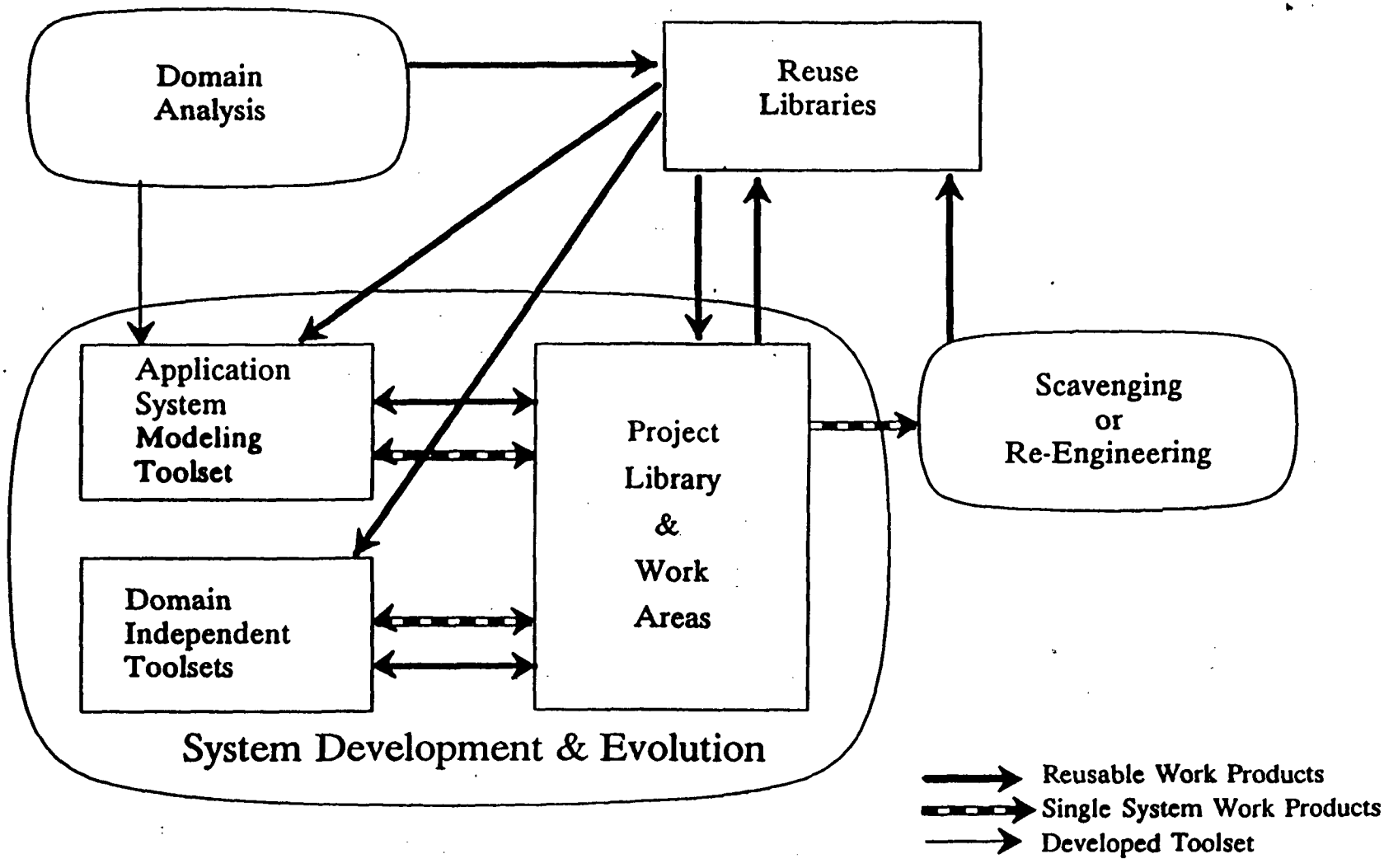
- Big Gains In Productivity Will Come From Reusing Fewer Larger Parts Or Assemblies Of Smaller Parts, Not From Many Unassembled Small Parts.
- Productivity Gain vs Cost Is Acceptable If Assemblies Of Parts Are Reused Frequently.



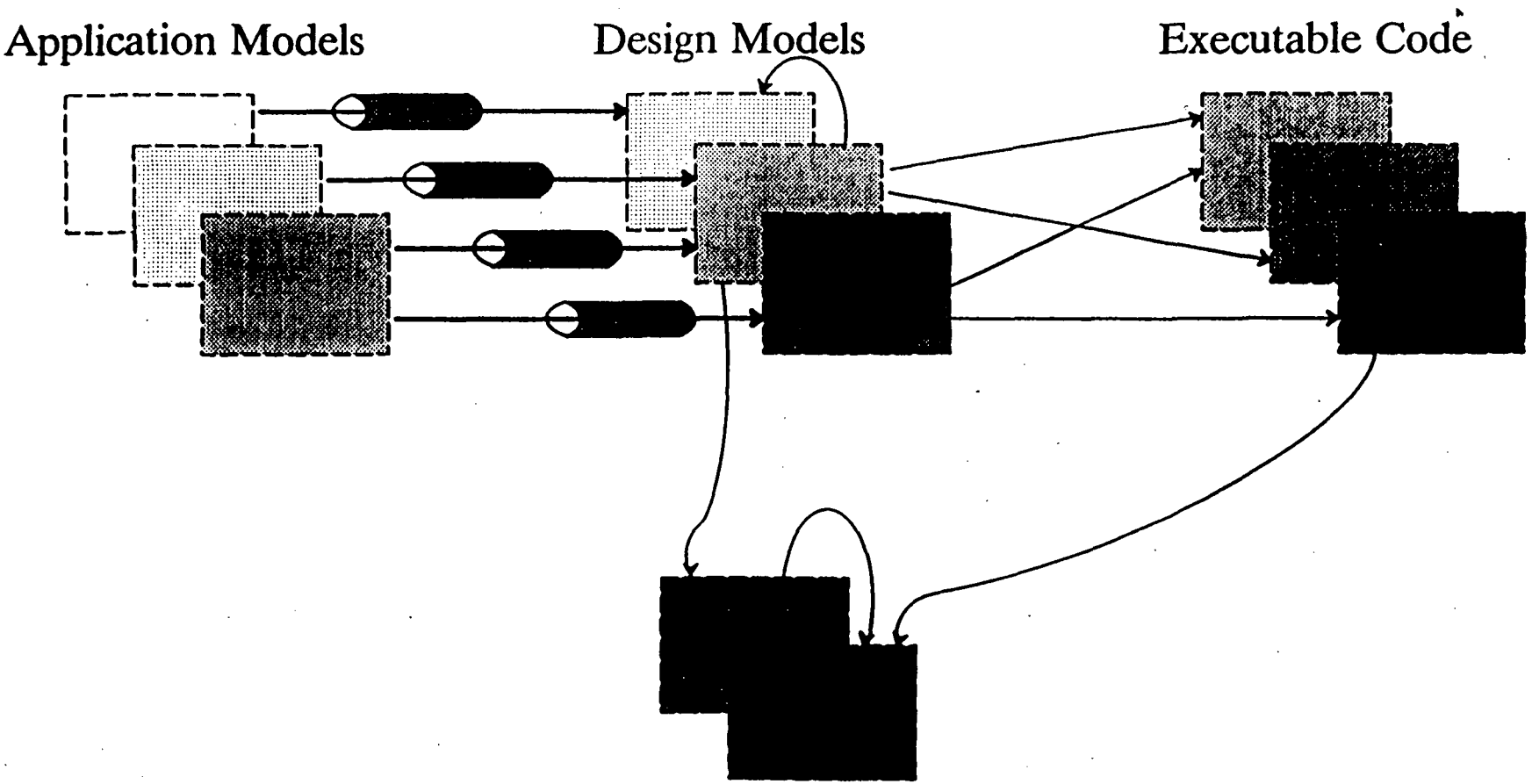
SYNTHESIS MOTIVATED BY AND ORIENTED TOWARD

- Reuse: Exploit Similarities Across Systems
- Iteration: Feedback and Enhancement
- Composition and Adaptation: Using Standard Schemes, Parts, and Designs
- Specialists: Incorporate Expertise, and Facilitating and Coordinating
- Systems View: Engineering Process
- Applying Synthesis to "Synthesizer"

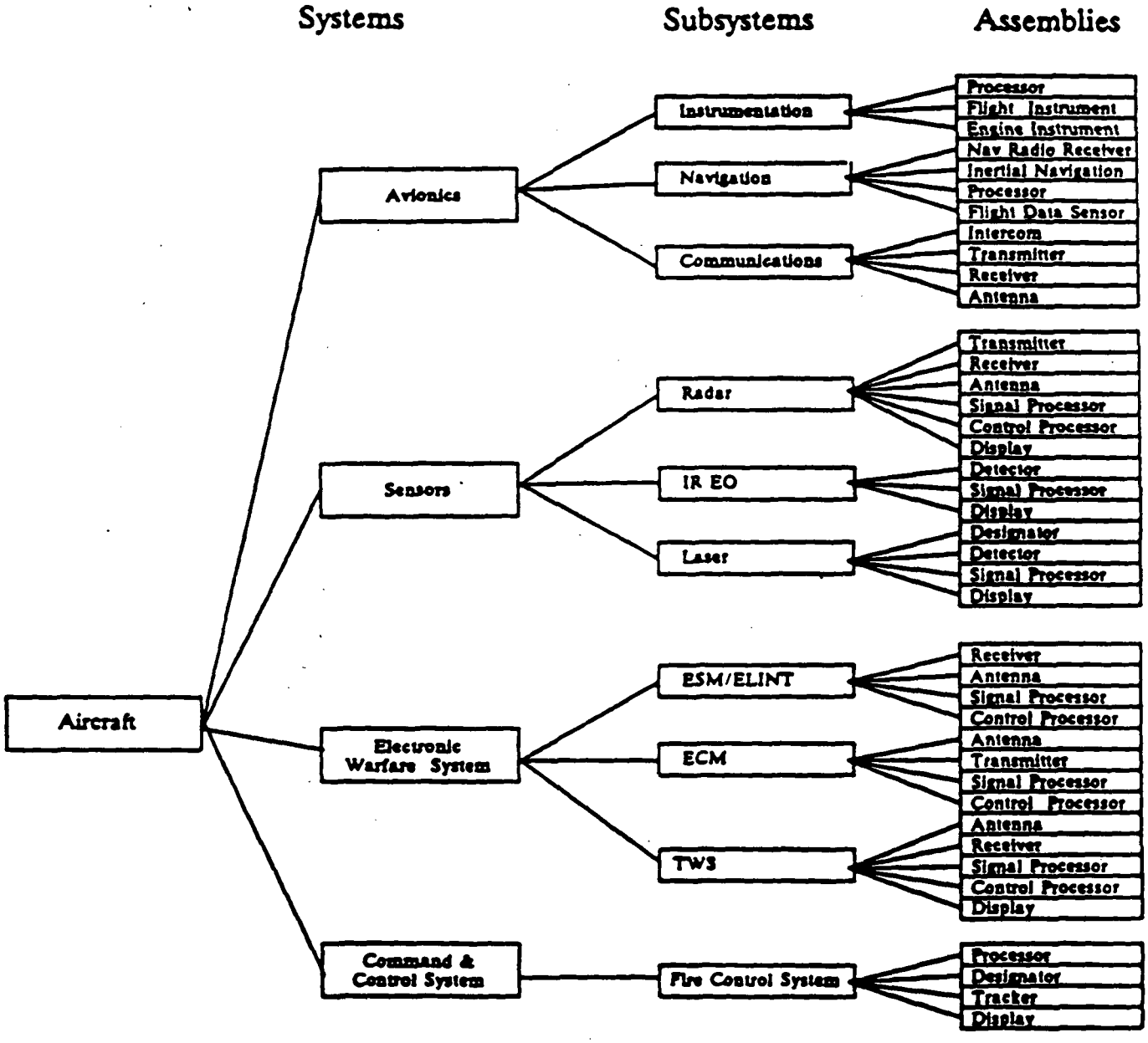
THREE MAJOR SYNTHESIS SUBPROCESSES



LIBRARY CONTENTS



TARGET APPLICATIONS FOR DOMAIN ANALYSIS – AIRPLANE EXAMPLE



ESSENCE OF DOMAIN ANALYSIS

- Each application area must be analyzed and characterized by standard *designs* or *architectures* that capture the way that many systems in that area could reasonably be built.

- The application engineer must be able to state his needs in application terms and have those needs mapped appropriately to an instance of the standard design.

- The design instance can be realized by specification of a set of parts from a reuse library and a set of rules for combining those parts.

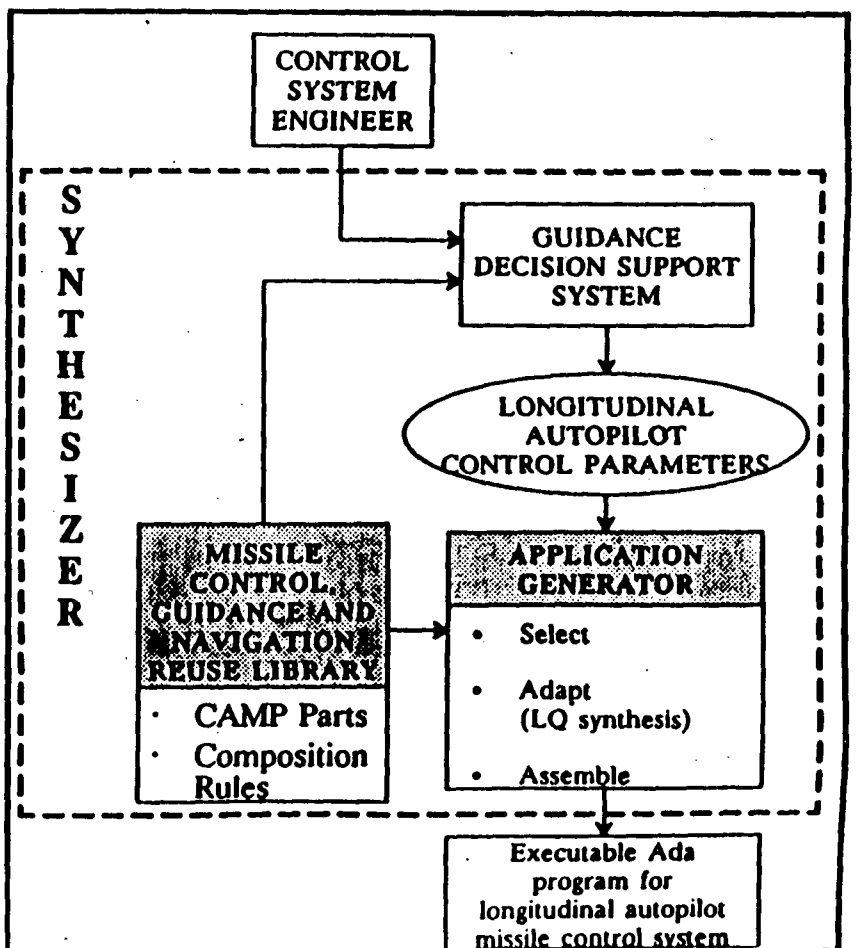
SYNTHESIS SUBPROCESS - SCAVENGING

- Many systems with software have portions amenable to adaptation for reuse.
- Scavenging these systems for reusable parts involves:
  - Extraction
  - Generalization
  - Standardization
  - Certification
  - Cataloging and storing in reuse libraries.

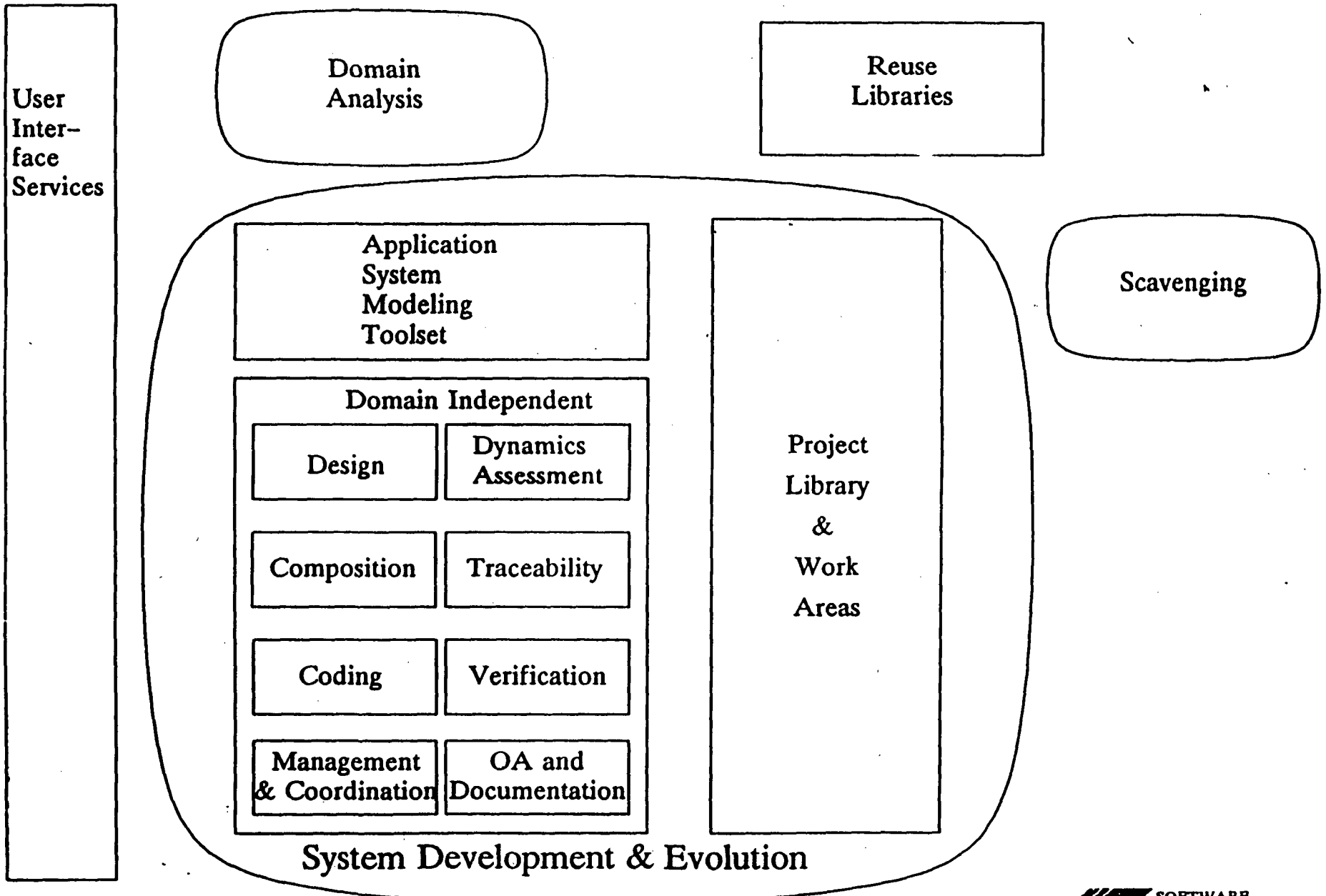
A MISSILE GUIDANCE SYNTHESIS PROTOTYPE TOOL

An example of the application of reuse, prototyping, and synthesis using a reuse library in a specific domain

- Based on U.S. Air Force "Common Ada Missile Packages" (CAMP) parts
- Initially demonstrates a longitudinal autopilot control system
- Aids understanding of the economics of reuse



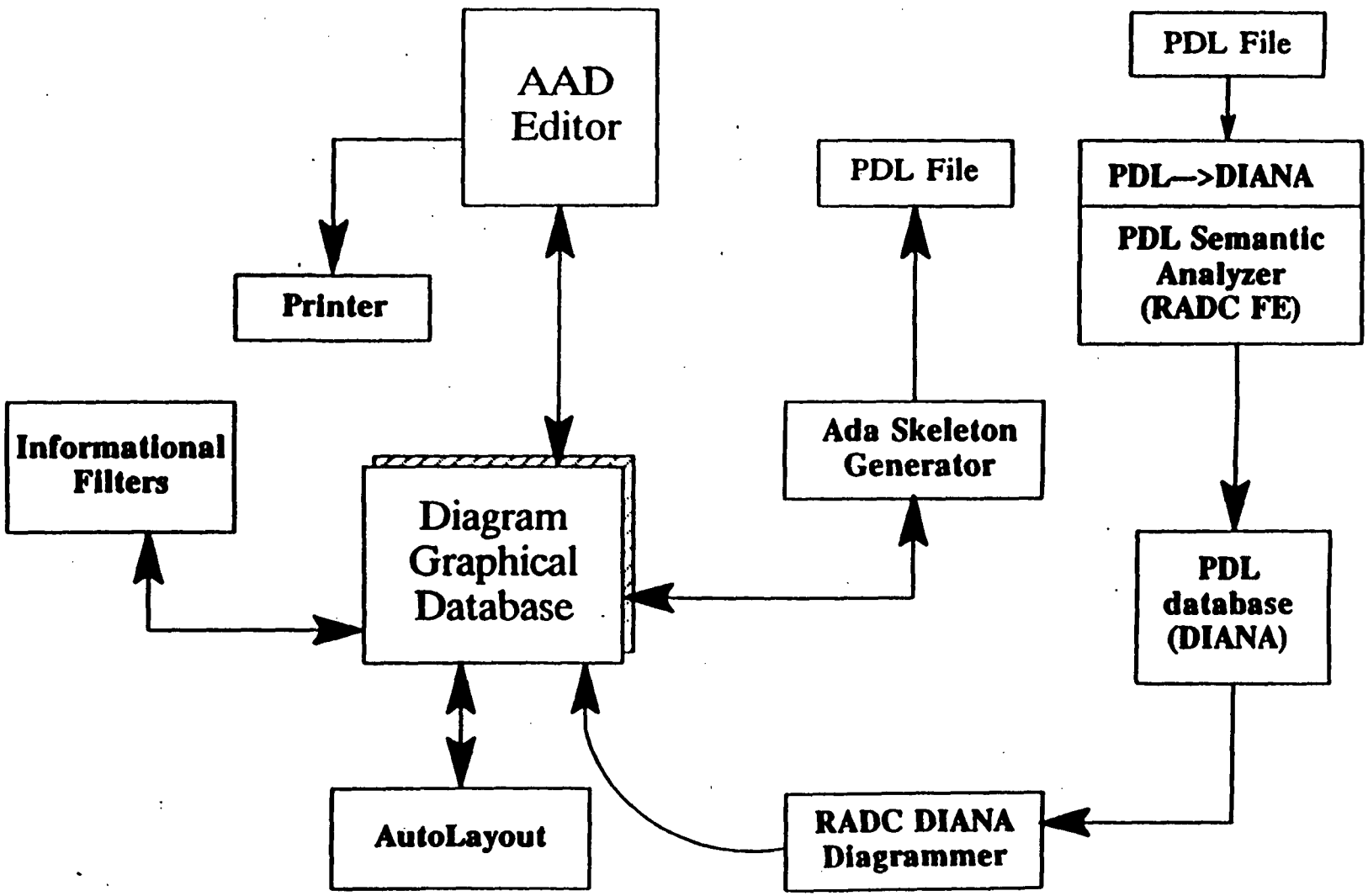
PARTS OF SYNTHESIS/SYNTHESIZER



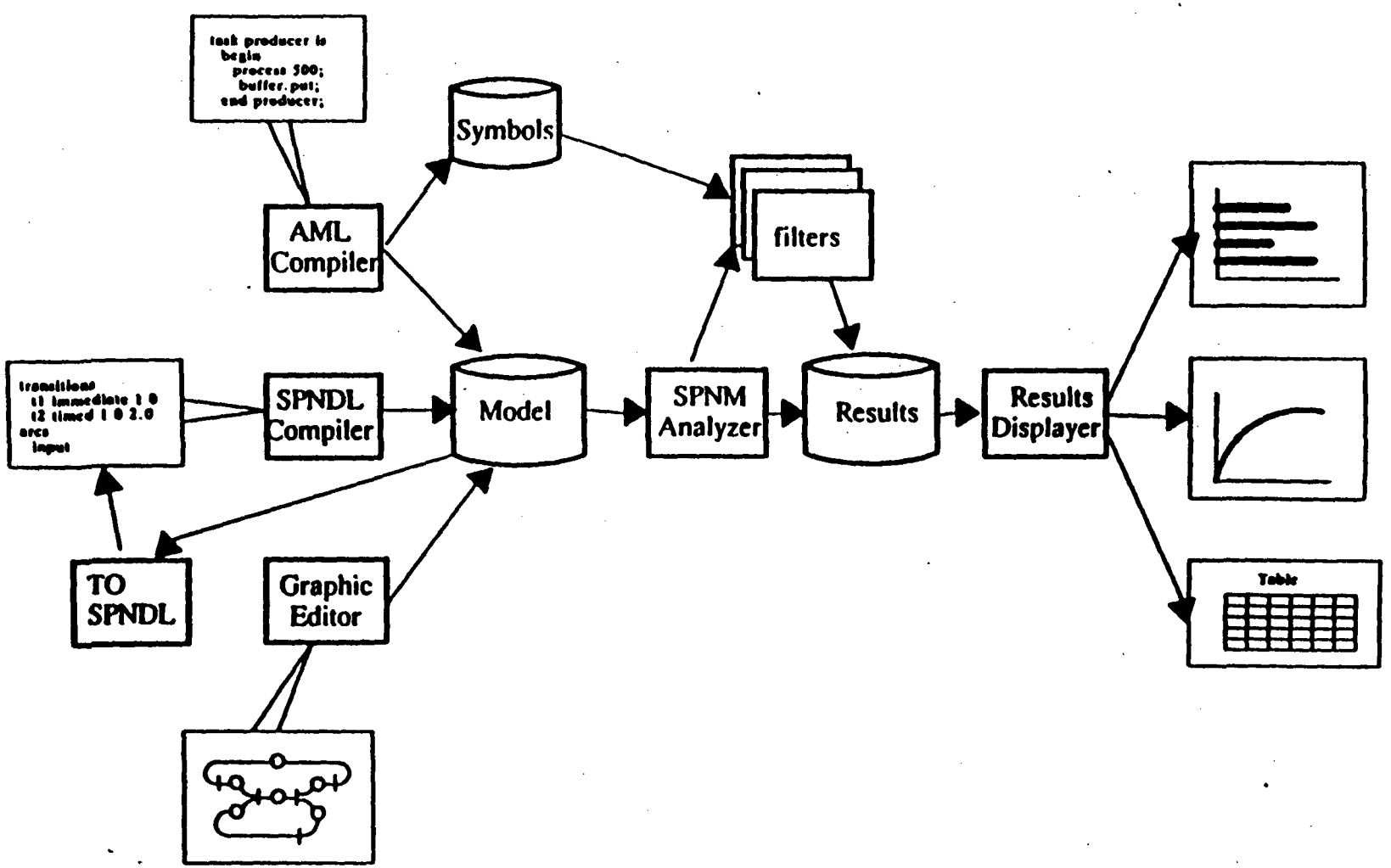
A METHODOLOGY FOR PARTS SPECIFICATION AND MODEL ASSEMBLY IS EVOLVING

- Based On NRL Software Cost Reduction Methodology
  - Information Hiding Module Families
  - Abstract Interfaces
- Accommodates Ada Packaging And Tasking Concepts
  - Tasking Guidelines Evolved (ADARTS)
- Initial Guidebooks Written And In Use

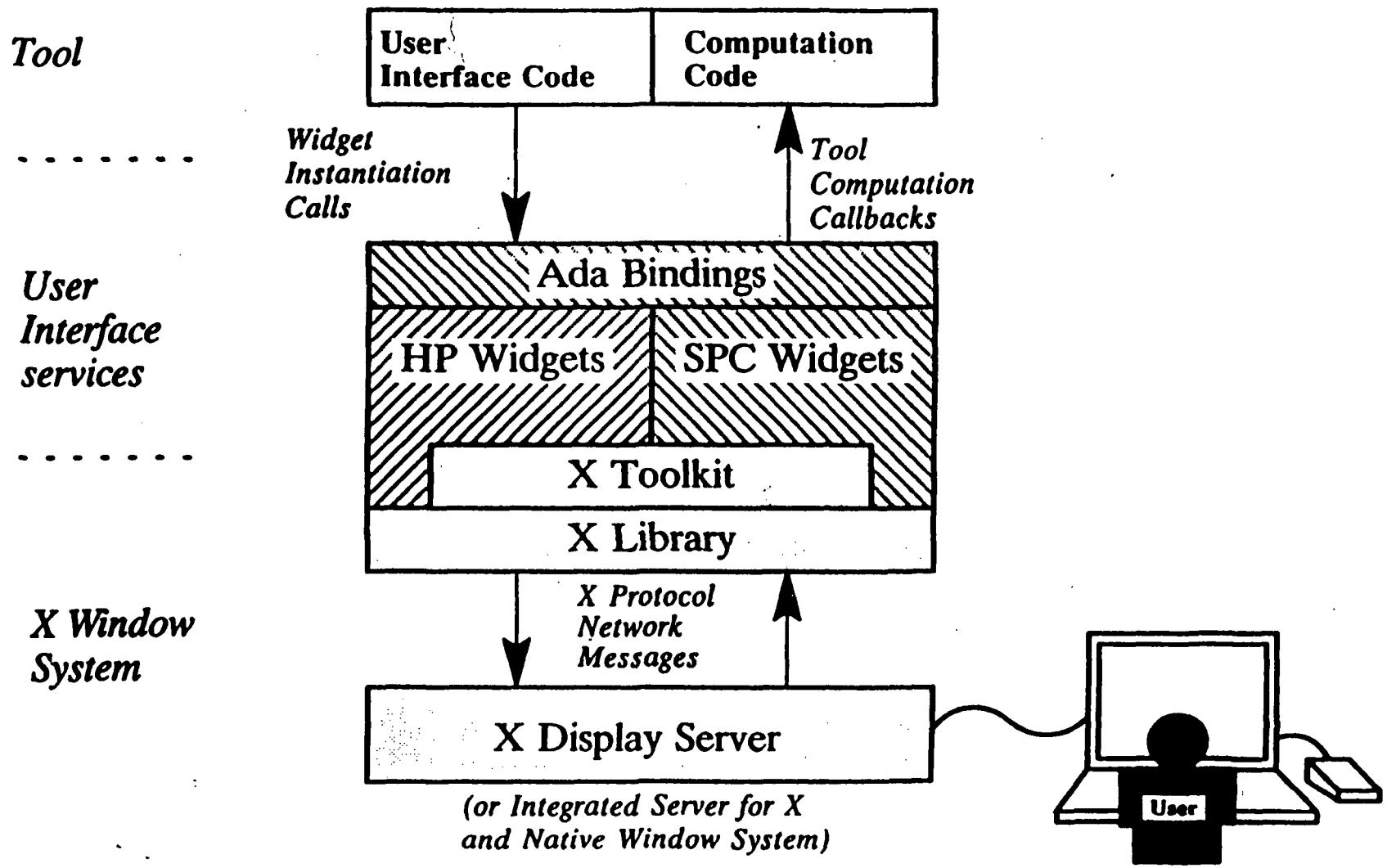
PRODUCT SET 1A STRUCTURE



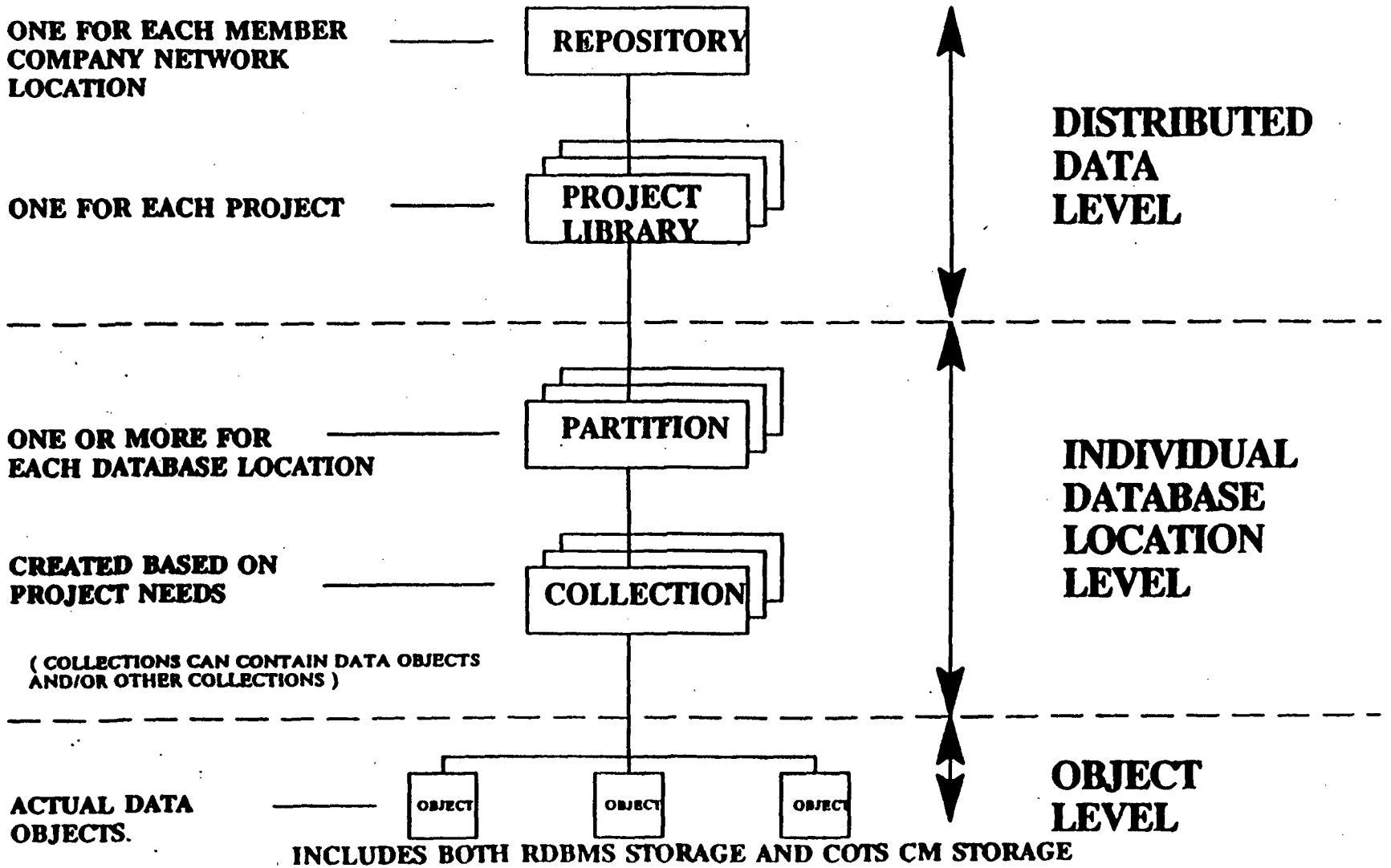
DYNAMICS ASSESSMENT TOOLSET COMPONENTS



UIS ARCHITECTURE



THE LAYERED REPOSITORY CONCEPT



TYPICAL PROJECT LIBRARY ACCESS

APPLICATIONS CODE

- DESIGN TOOL
- ASSESSMENT TOOL
- TRACEABILITY
- HARNESS TOOLS
- MC DEVELOPED TOOLS

TOOL K

TYPICAL COMMANDS

DATA OBJECT RELATED

- CREATE DATA OBJECT
- DELETE DATA OBJECT
- CHECK OUT DATA OBJECT BODY
- CHECK IN DATA OBJECT BODY
- GET ATTRIBUTE
- SET ATTRIBUTE
- GET CONTENTS LIST

RELATIONSHIP RELATED

- CREATE RELATIONSHIP
- DELETE RELATIONSHIP
- GET ATTRIBUTE
- SET ATTRIBUTE

UNIQUE ID RELATED

- PATHNAME TO UID
- RELATIONSHIP TO UID

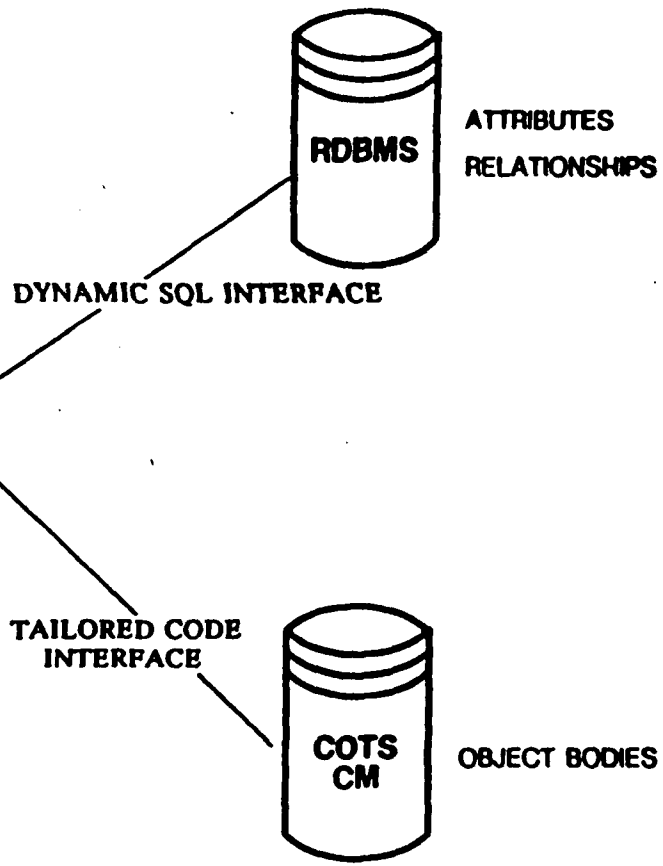
QUERY RELATED

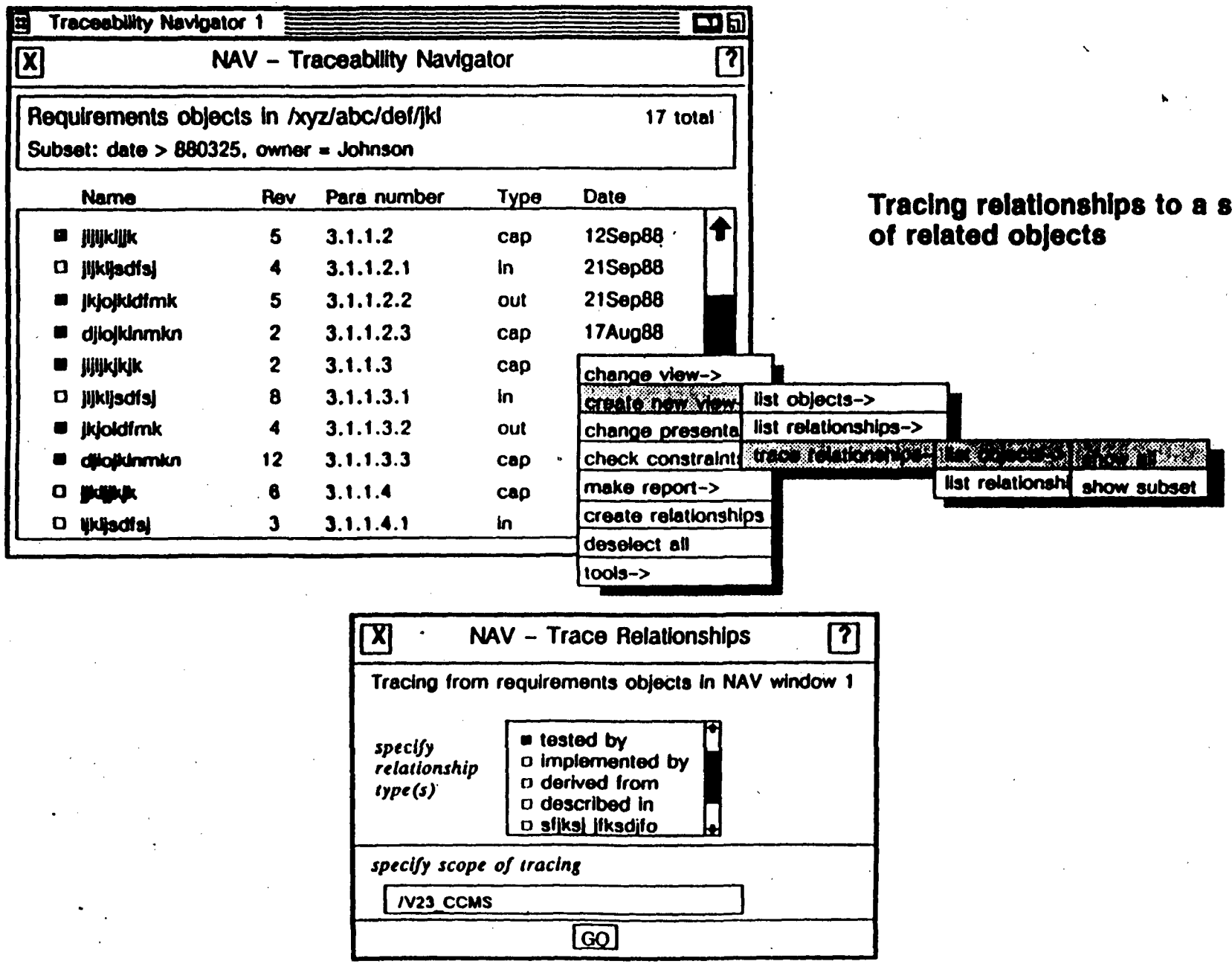
- FETCH BY ATTRIBUTE VALUE
- GET RELATIONSHIP TYPES
- GET RELATIONSHIPS

DMS CODE

DAS/DMS

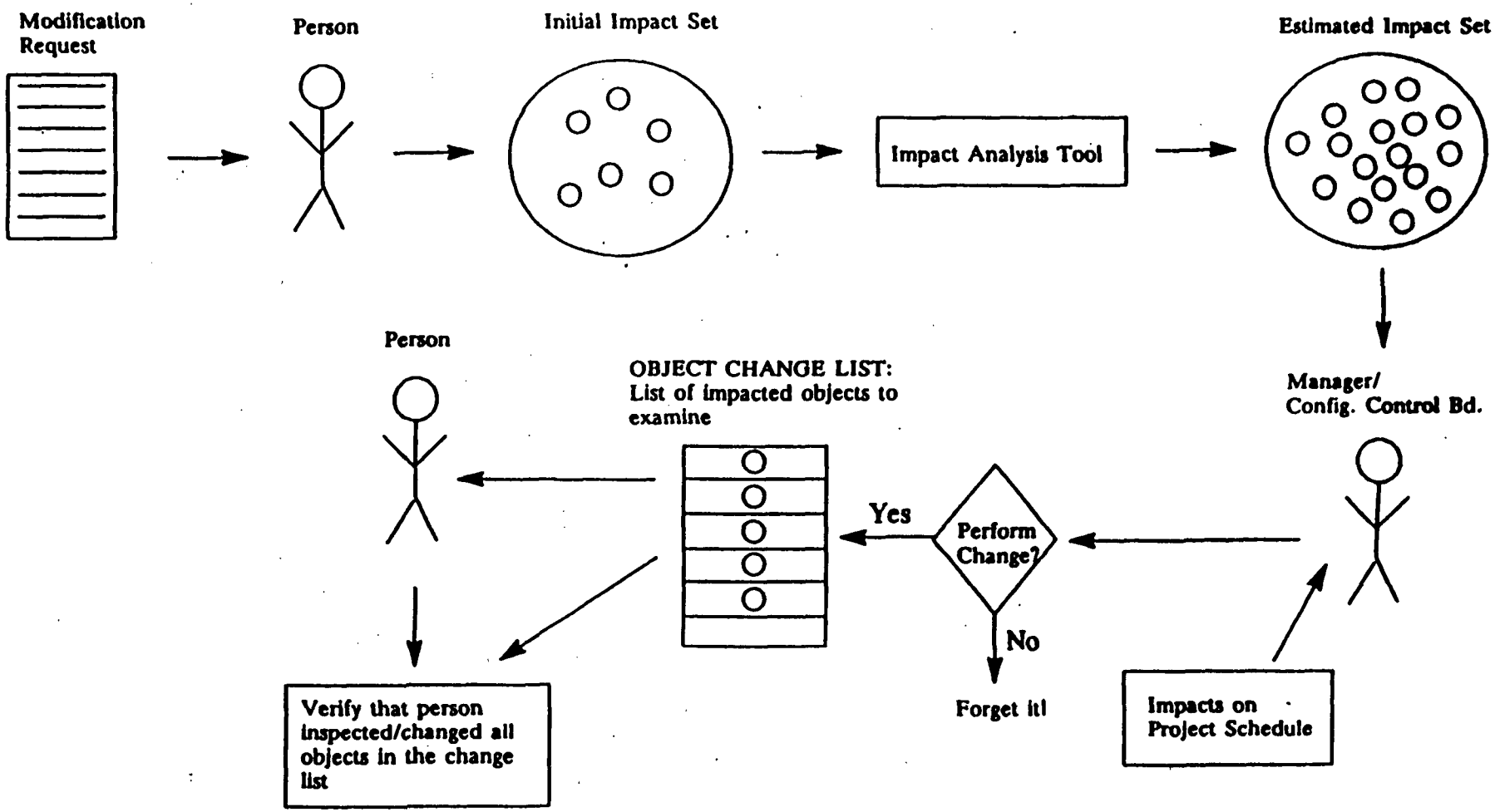
COTS PRODUCTS





Tracing relationships to a set of related objects

IMPACT ANALYSIS TOOLSET OVERVIEW



CANDIDATE USER INTERFACE FOR RLT