

The Value of a Reference Architecture GSAW 99 Workshop

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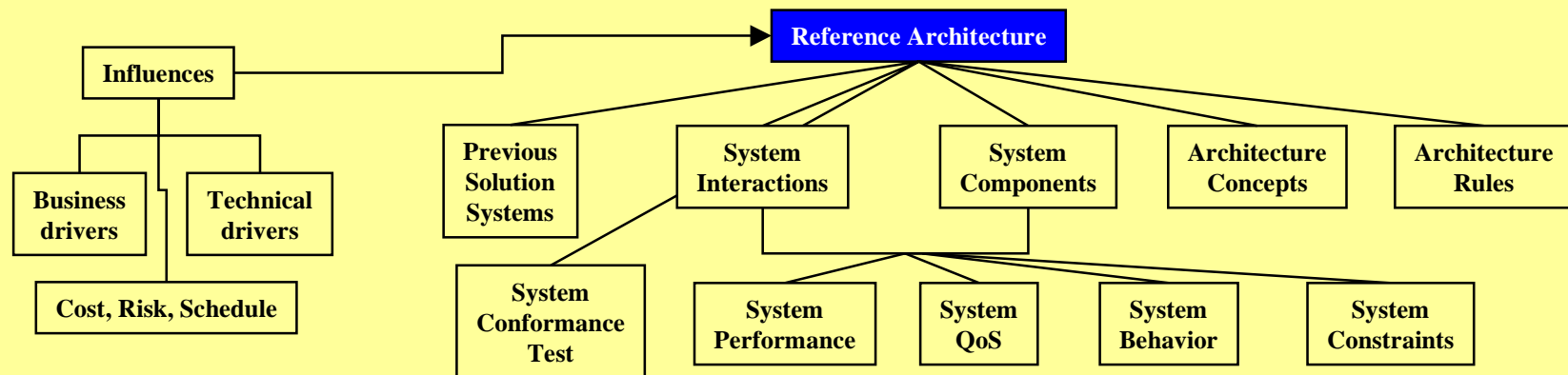
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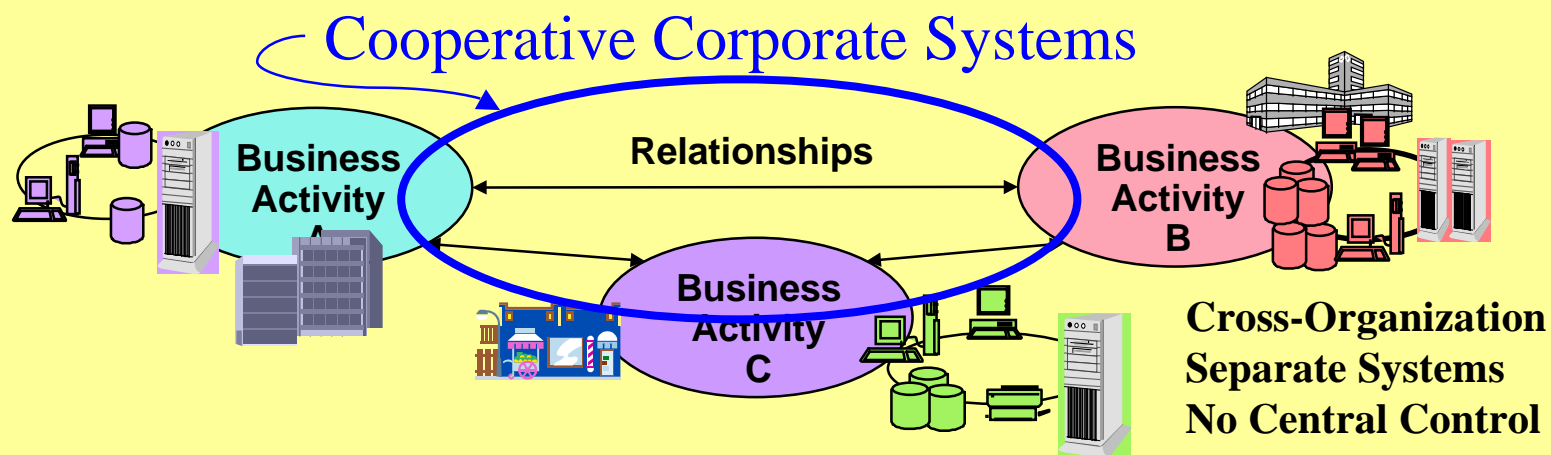
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So...Why a Reference Architecture?

- **MOTIVATION:** Need an overarching architecture strategy to accommodate cross-organization incremental system level solutions for a shared environment: frame incremental solution choices to ensure consistent concepts and rules of structure are incorporated into all intermediate solutions.
- **PURPOSE:** Provide the basis for making incremental specific design decisions and product choices later on in the system building process.
- **DEFINITION:** A high-level parameterized system framework for a 'system' that defines its overall target structure (components and relationships among them) in a systematic consistent manner



Objectives



● System-wide Properties (example)

- Quality of Service
- Policies (permissions, prohibitions, obligations)
- Autonomy
- Cooperation - Execute tasks jointly,
- Shared environment - Interoperate, Information Sharing
- Scalability - Addition of resources (users, system)
- Interoperability - Mutual understanding of exchanged messages
- Connectivity - Ability of systems to exchange messages

Current Challenges

- **Cross-Enterprise Endeavor with:**

- Incomplete Requirements
- Heterogeneous Legacy Systems
- Lack of Interaction Specification
- Severe Constraints:
 - Politics, Resource Constraints, Independent Organization Mandates

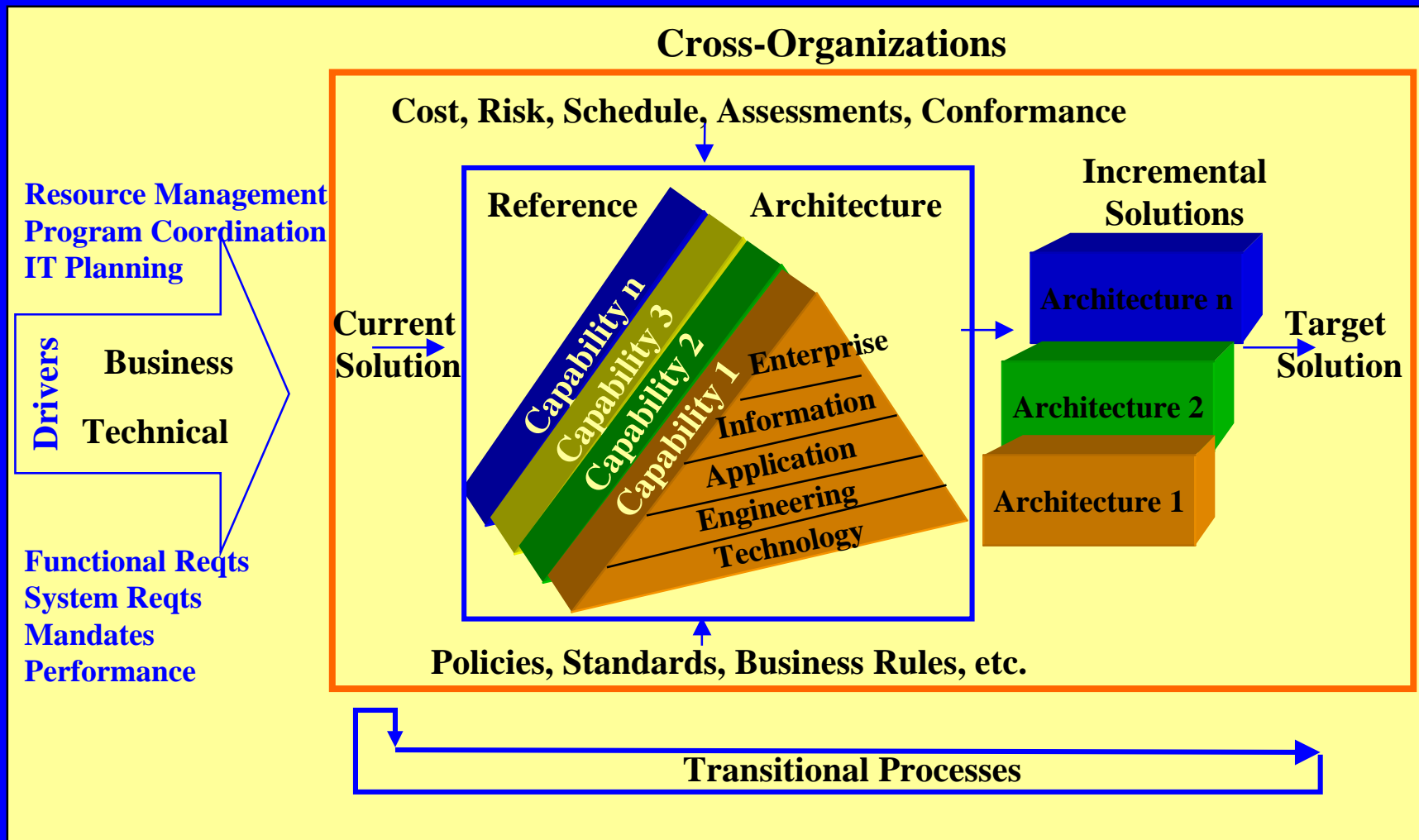
- **COTS Middleware Complexity**

- **Architecture 'tools' Complexity, Inconsistency, Incompleteness**

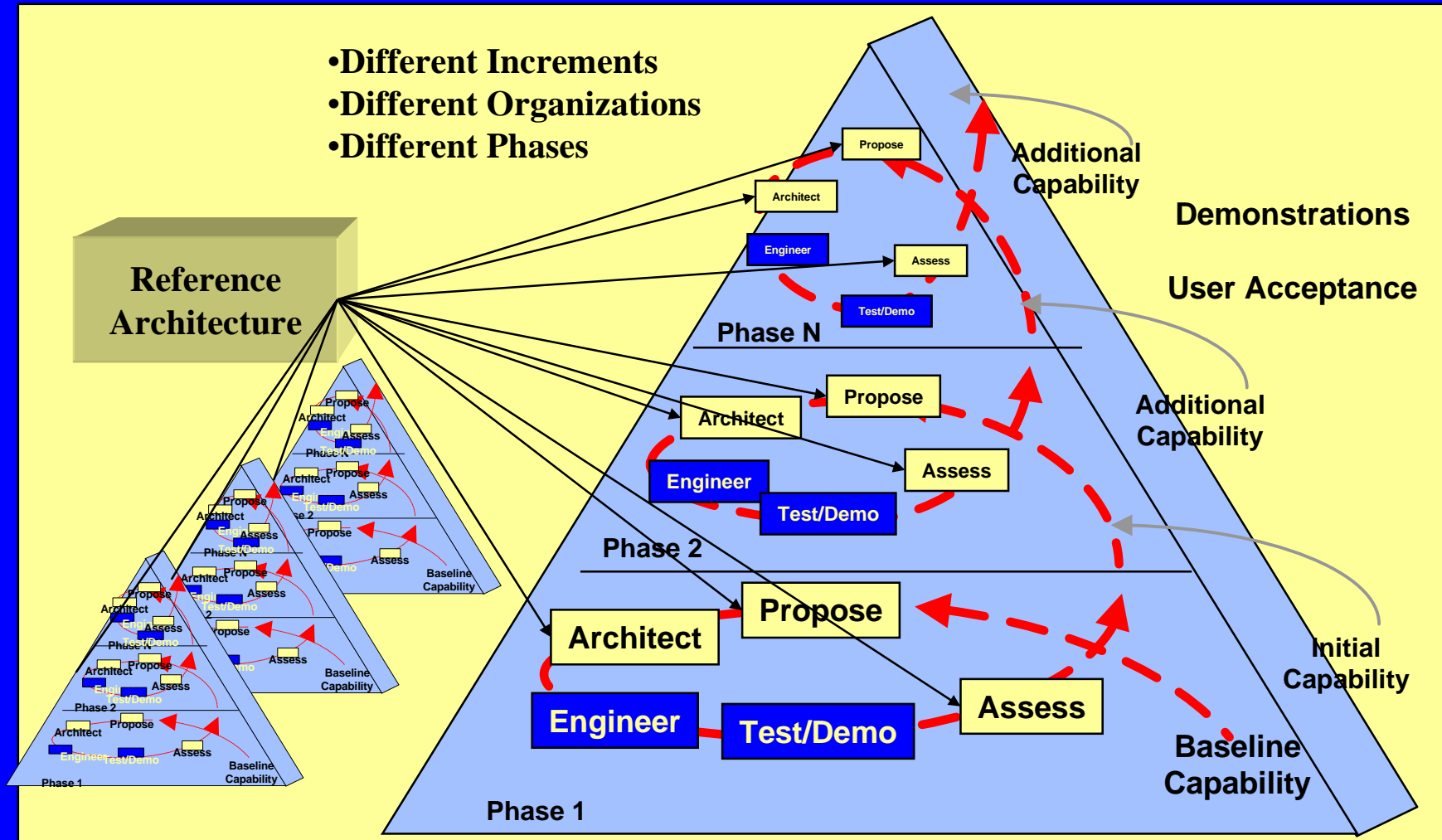
- **Inadequate and Complex Software Architecture**

- ADLs, without commercial maturity and support
- Styles and connectors: how do they relate to: each other, APIs, interaction, QoS parameters, networks, actions, etc. ?
- Few (Integrated) Tools aimed at the architect's problem
- UML incomplete: semantics of interaction lacking +graphic tools do not capture all of UML (e.g., ROSE ©)
- Multiple languages, models, and frameworks for "required use", with insufficient consistency
- Conformance testing anyone?

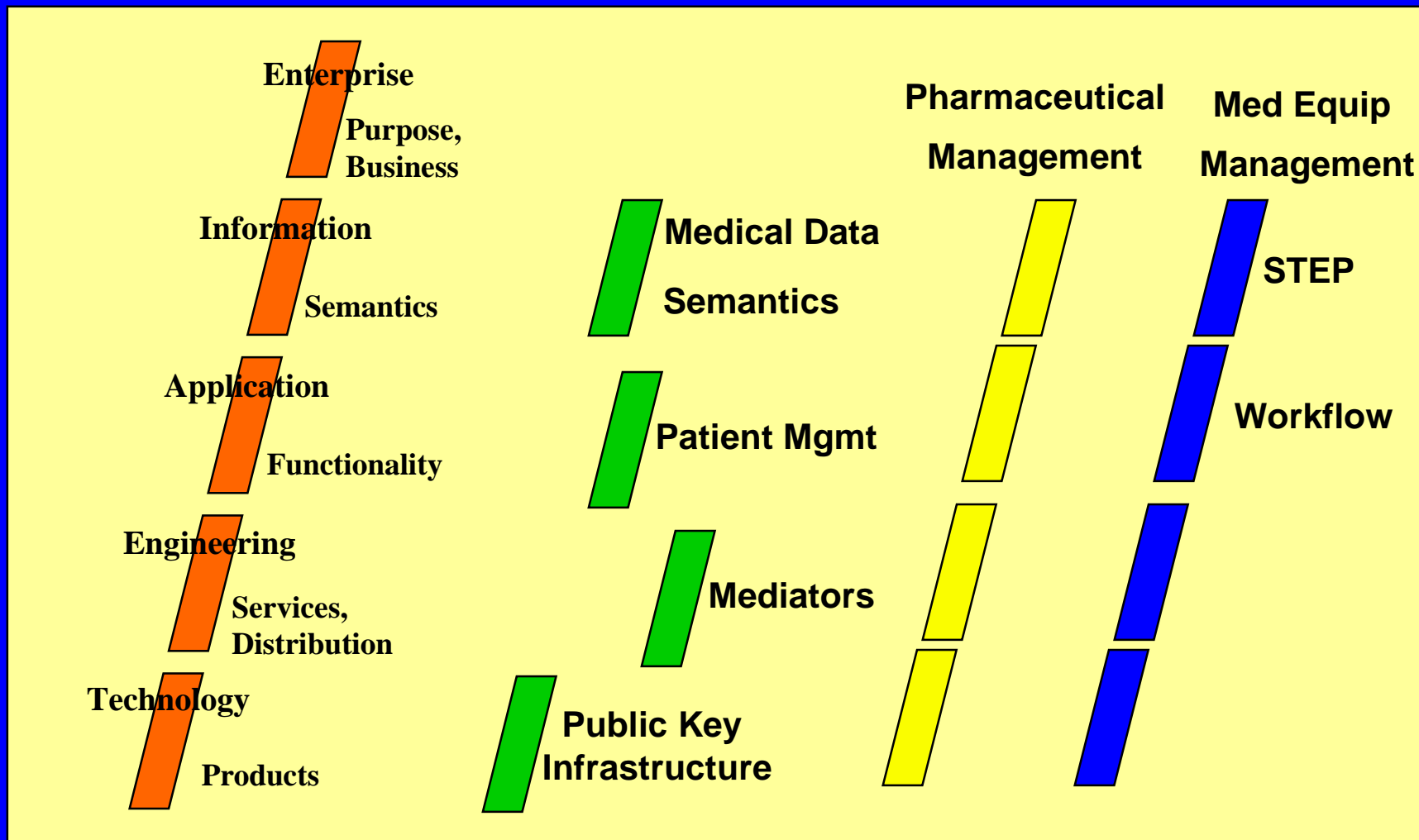
Reference Architecture Concepts



Incremental Developed Shared System of Systems Guided By A Reference Architecture



Increment Examples



Use of Reference Architecture

The Aggregation of the Generic RM-ODP Framework and Specific Customer Requirements

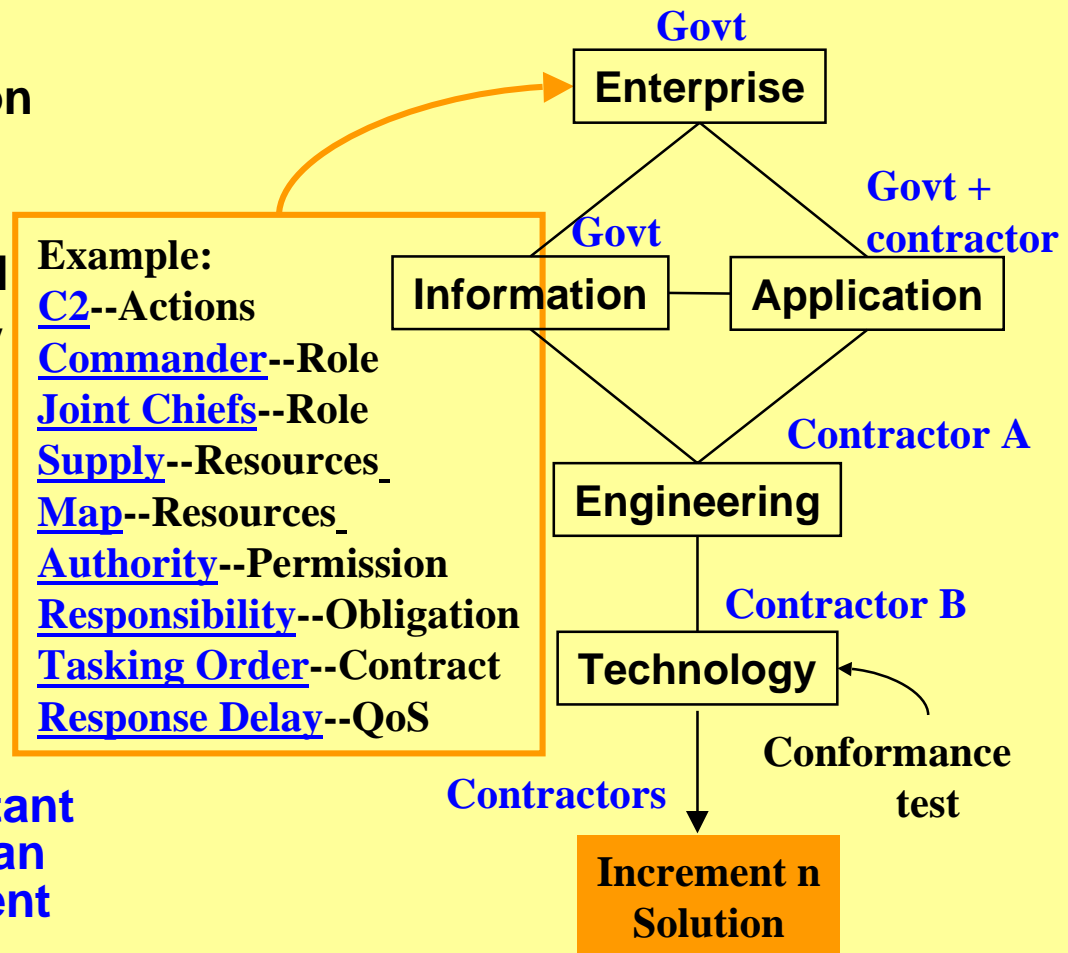
● Viewpoints

- provide abstraction
- separation of concerns
- can be incremental

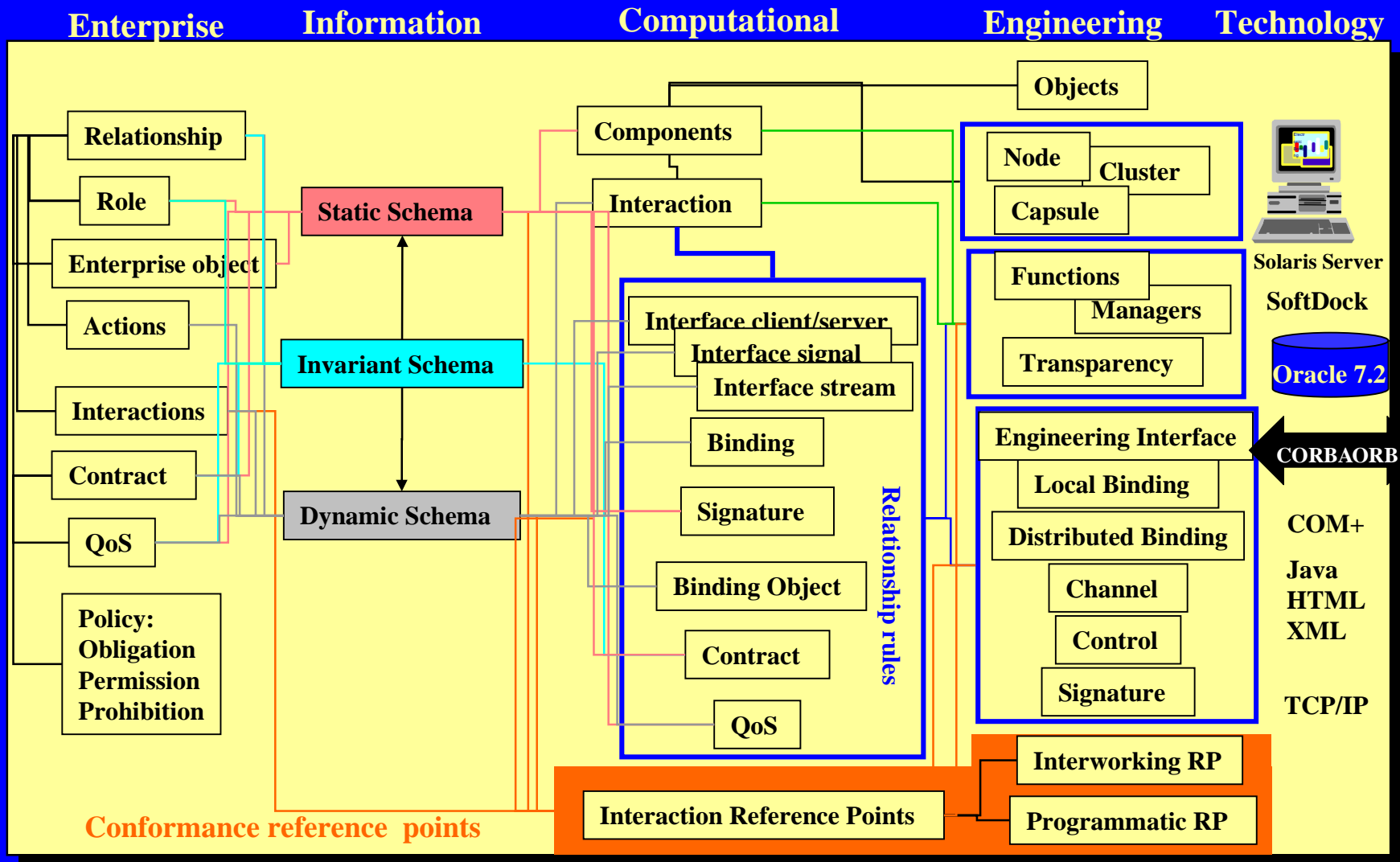
● Viewpoint Consistency

- architecture evaluation
- common understanding
- increased completeness and consistency

- geographically distant multi-organization can specify and implement separately



Relationships Across Viewpoints (Sample RM-ODP)



Summary

- **Reference Architecture is an integrated framework that only addresses "common" objectives and issues to:**
 - **Evolve towards target Corporate 'system'**
 - **Integrate legacy and evolving new solutions**
 - **Incorporate new IT as it matures**
 - **Achieve Corporate strategic goals**
 - **Integrate business processes and information technology**
 - **Enable shared environment**

References

- **RM-ODP: ISO/IEC 10746 (ITU-T/CCITT X.901-X.903)**
- **Australian C4I System: C. Herring, Z. Milosevic, S. Kaplan, “Selecting Distributed Object Technologies in the Presence of Uncertainty: an Experience Report on C4I enterprise modelling”**
- **QoS for C2: J. Aagedal, Z. Milosevic, “Enterprise Modelling and QoS for Command and Control Systems”, EDOC 98**
- **Federal ITA [Information Technology Architecture] Conceptual Model, June 1998**