



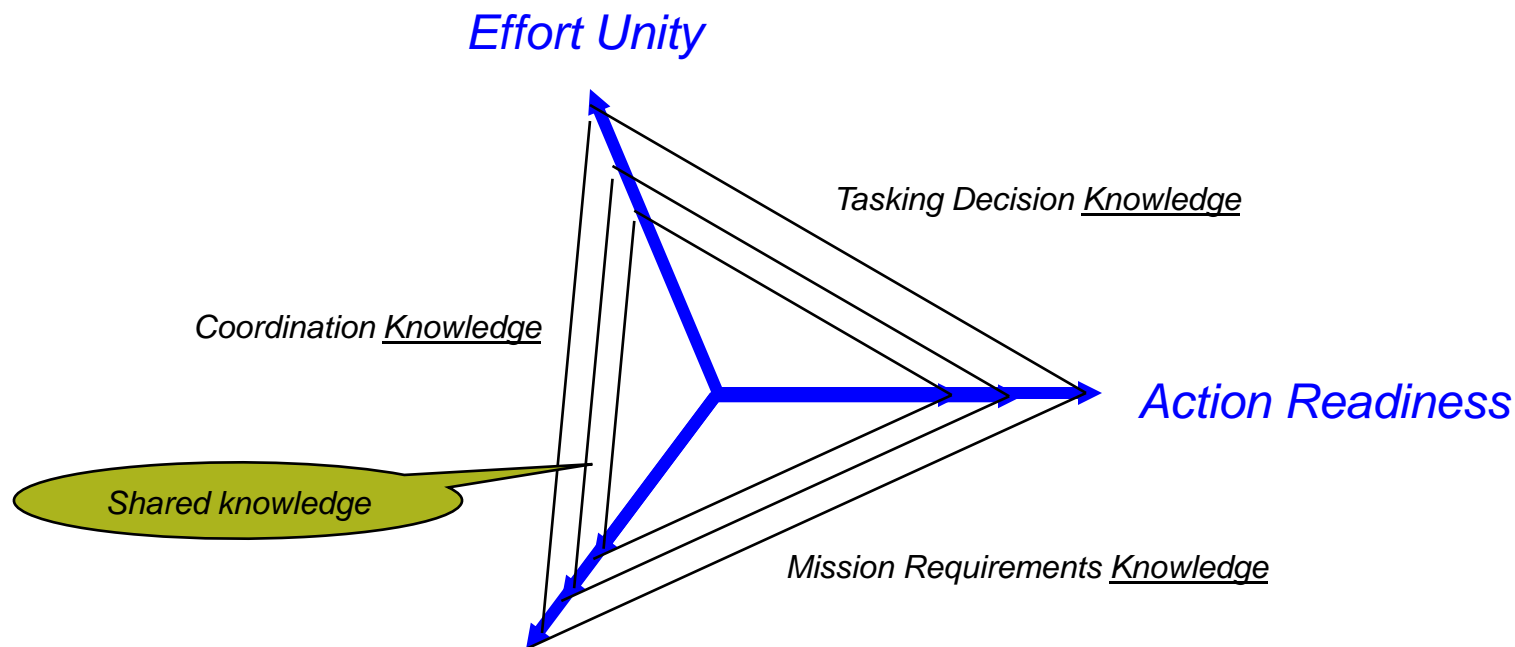
Evolutionary Shared Knowledge Architecture Perspective and Principles

(Networking enables social
evolution of knowledge.)

Panelist: John A. Yanosy Jr.
jayanosy@rockwellcollins.com
972-705-1807

**Rockwell
Collins**

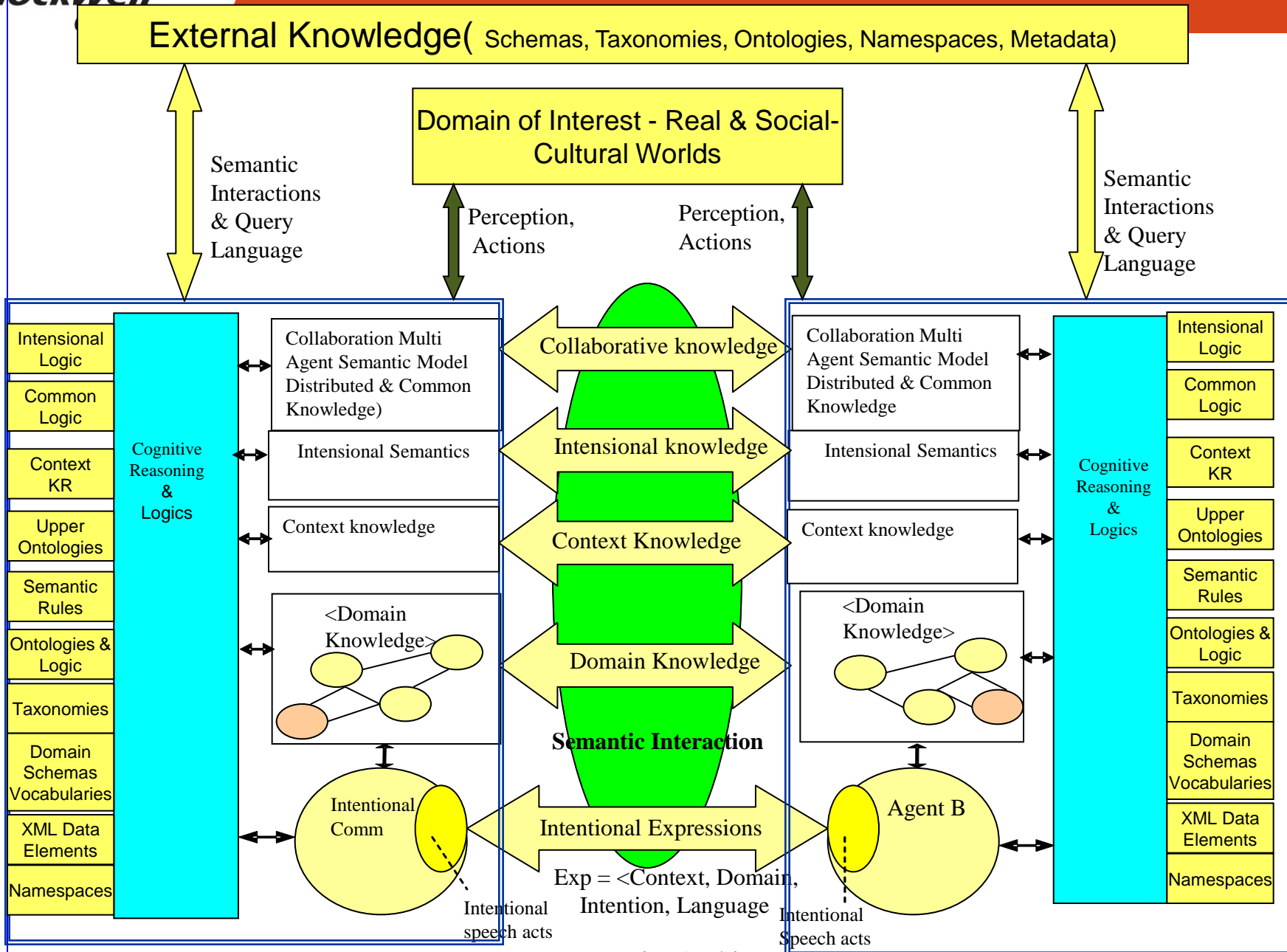
Architecture Challenge: Enabling dynamic evolution of social knowledge relevant to mission goals and needs of collaborative communities



Architecture defined capabilities to collect, fuse, discover, represent, relate, understand, and reason about knowledge

Evolutionary Shared Knowledge Architectural Perspective and Principles

1. Knowledge is dynamic and evolves with human experience and social networks
2. Social networking architecture enables evolution of community knowledge
3. Architecture must support dynamic coordination and social use of knowledge resources relevant to mission
4. An overarching knowledge perspective is required across all architecture views
 - Compatibility and Consistency of network dependencies for knowledge representation and reasoning
 - Explicit definitions versus implicit assumptions
 - Machine versus human representation and reasoning



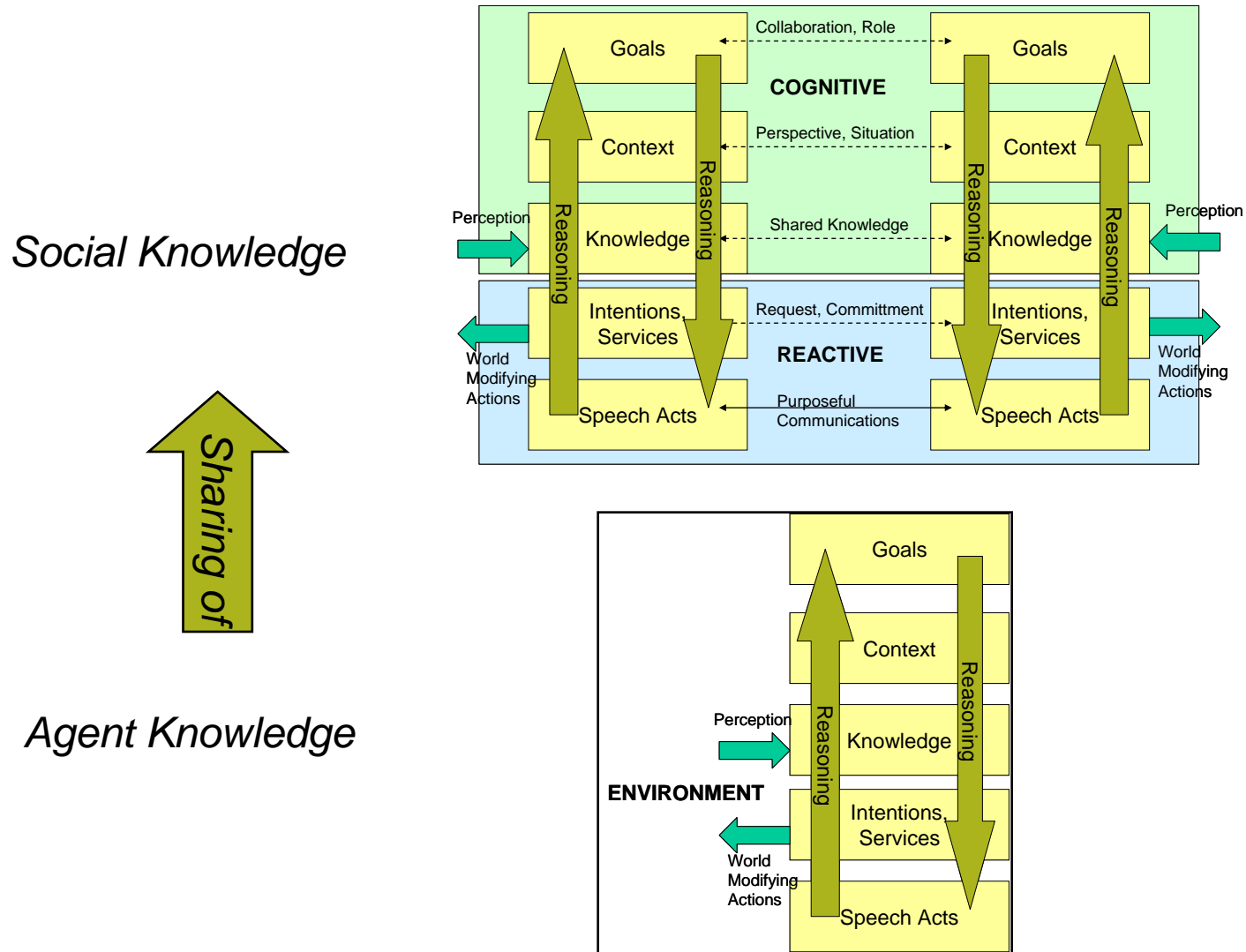
Examples of Semantic Interoperability Architectural Problems

- Semantic interpretation errors of system interactions cause significant interoperability problems
- Semantic interpretation errors occur in multiple areas and at different phases of a system's lifecycle (requirements, architecture, design, implementation, test, operation)
 - Between systems
 - Between systems and people
 - Between systems and sensors
 - Between software elements
 - Between protocols
 - Between network services and clients, users of services
 - Between information systems and creators/users of information
 - Between different organizations and expectations about the use of systems and information
 - Between definitions of concepts between people in different contexts

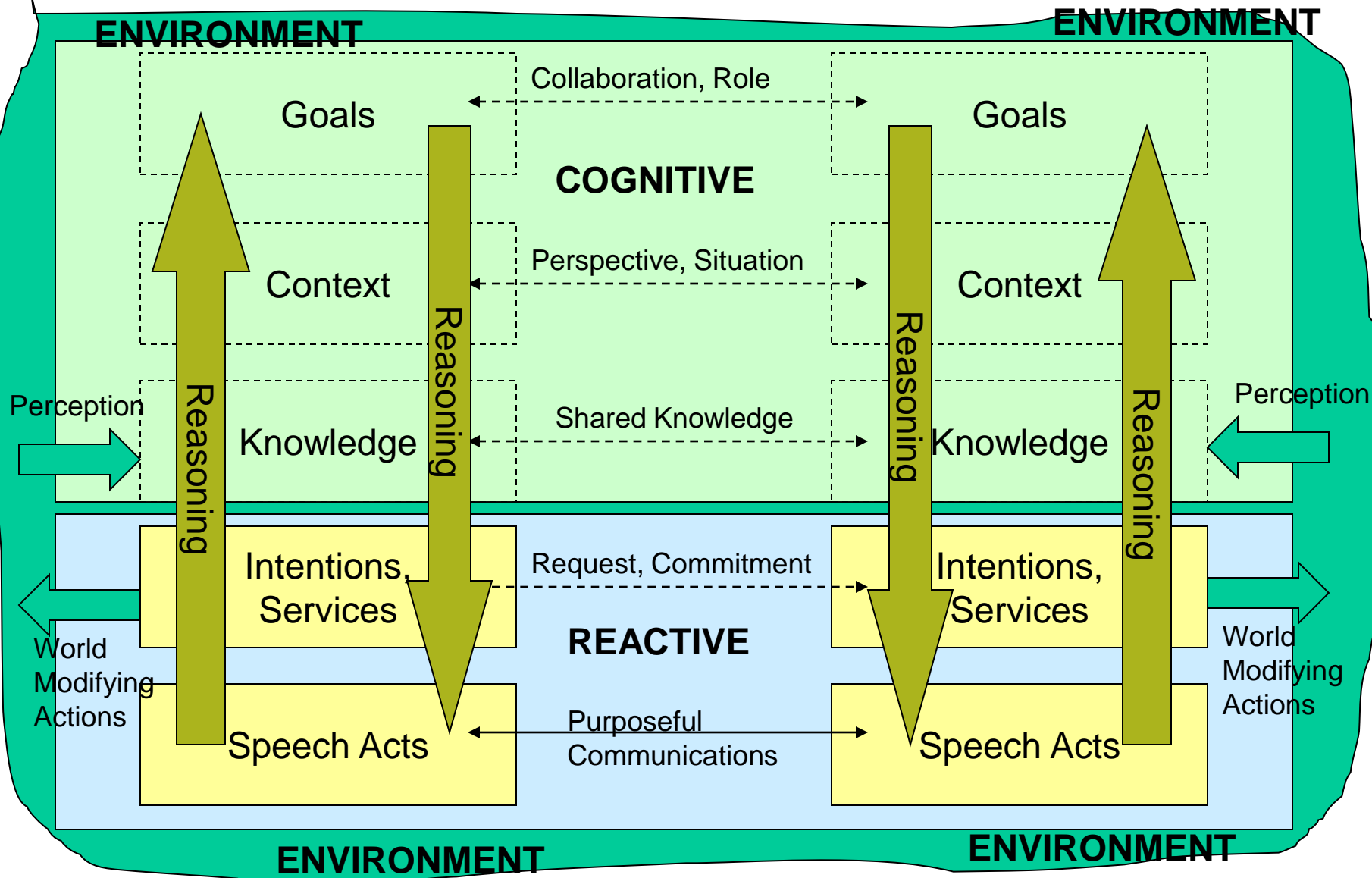
Architectural Perspective of Increasing Semantic Capability for Agents Evolving Mission relevant Social Knowledge

- Architectural knowledge dependencies can be analyzed for explicit-implicit knowledge representation for
 - Interaction Goals
 - Interaction Context
 - Shared Domain Knowledge
 - Interaction Intention
 - Communication scope for above elements
- Full Semantic interoperability enables an open world environment of multiple system types and agent purposes by having and sharing explicit semantic representations of agent, system and environment goals, context, intentions, actions, available services, domain knowledge, and speech acts have explicit semantic representations

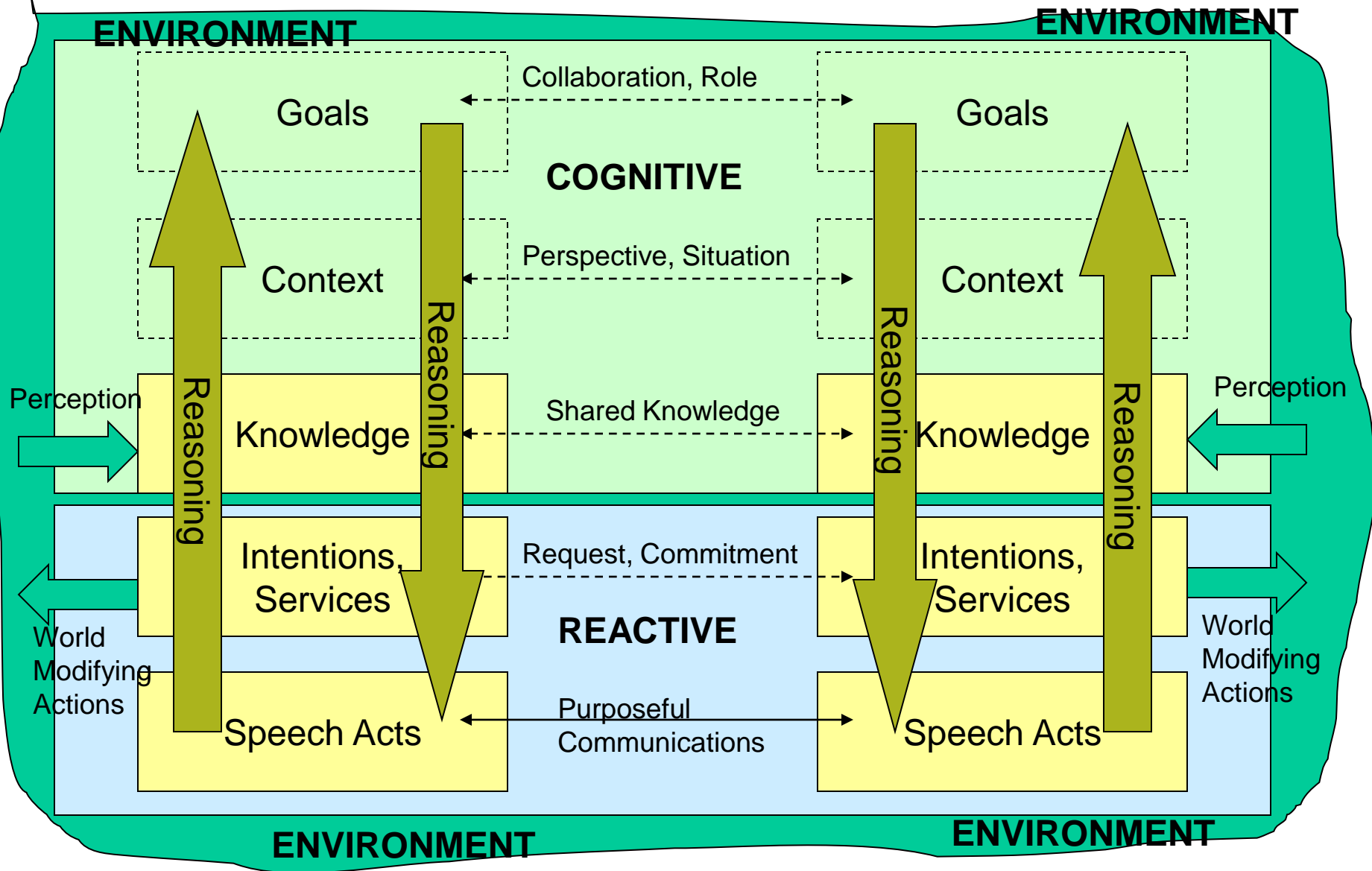
Semantic Interactions Leading to Social Knowledge Evolution



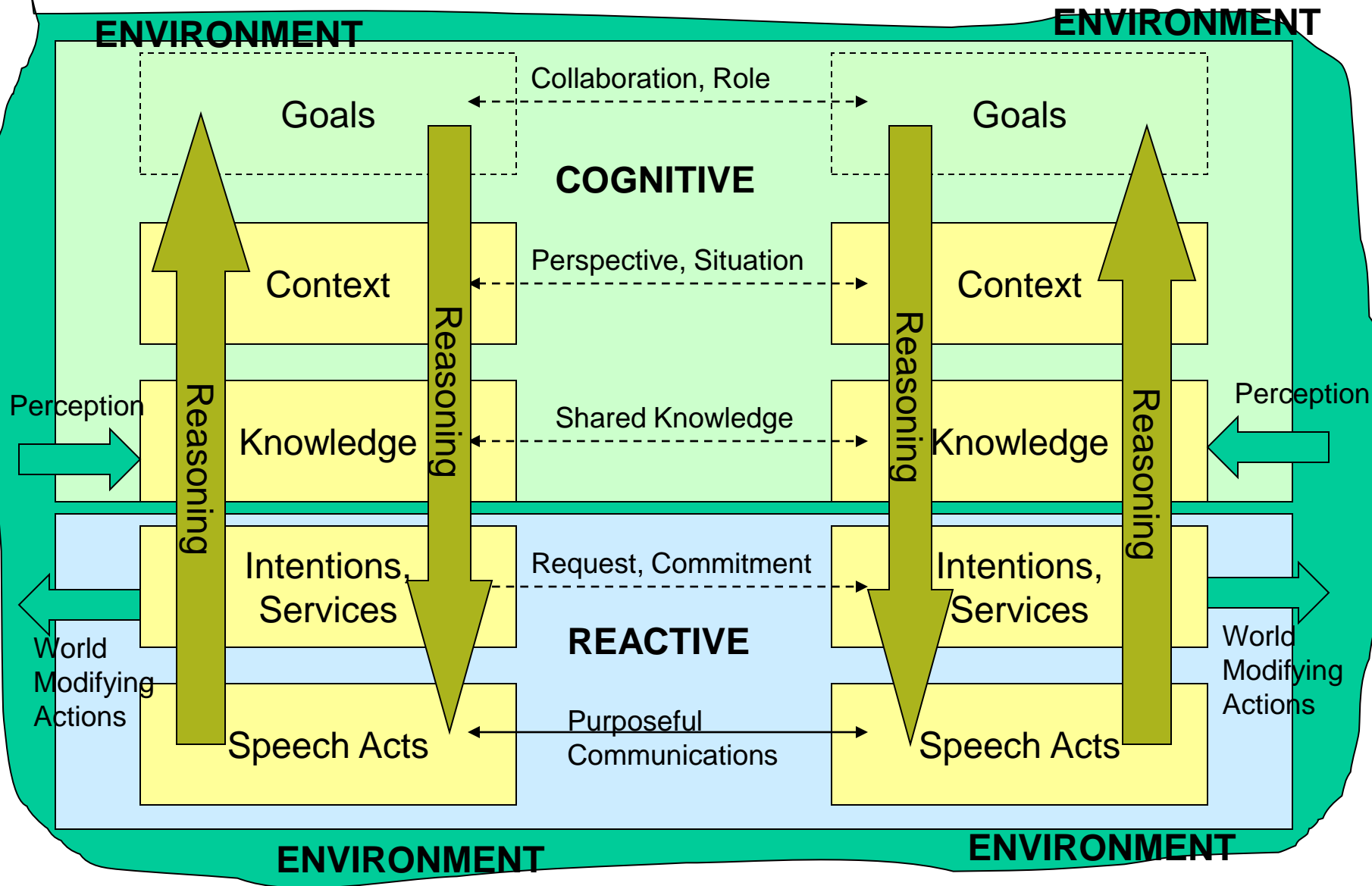
Explicit Services and Purposeful Speech Acts, No Semantics



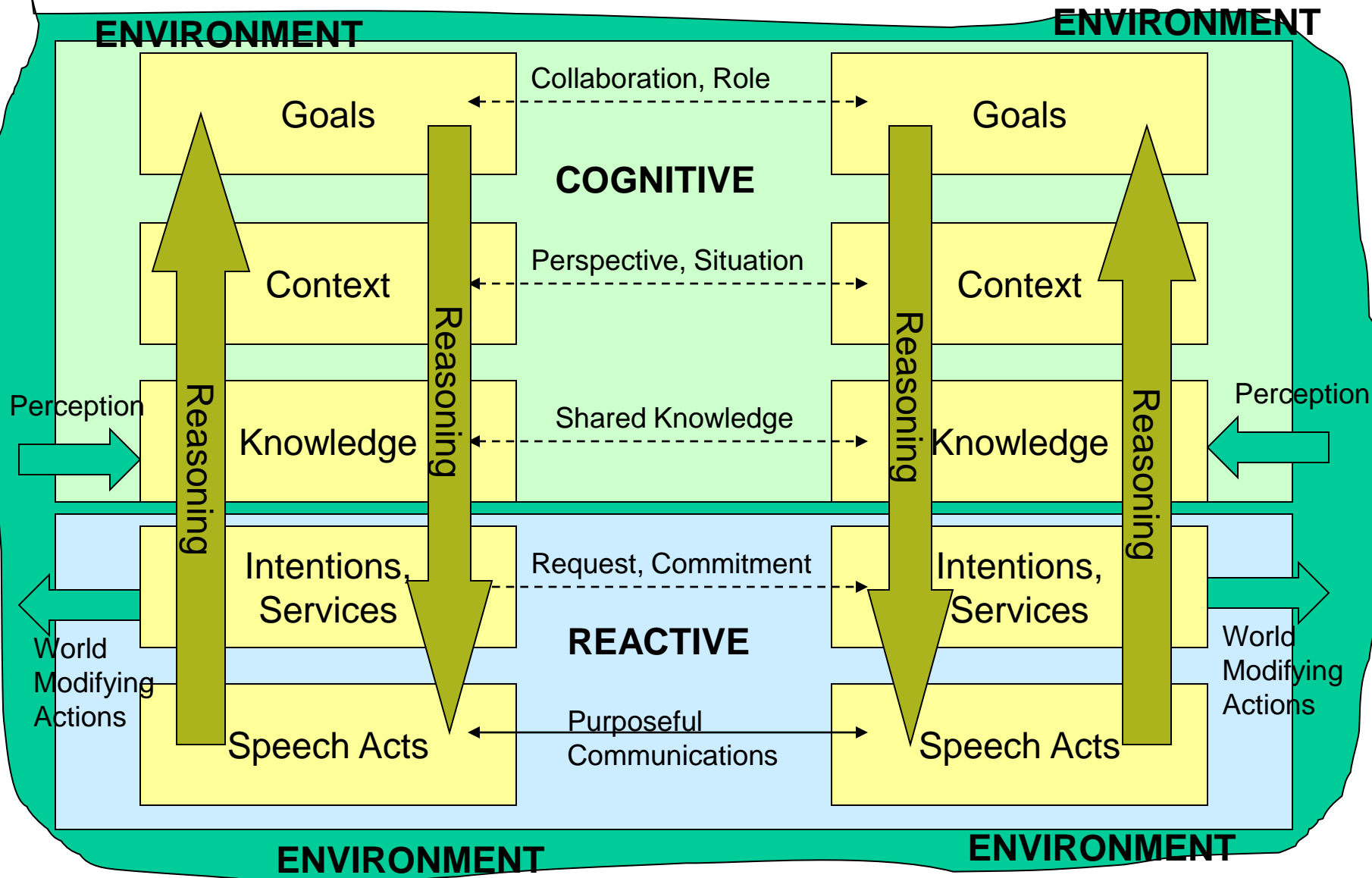
Explicit Semantic Knowledge, Services, and Speech Acts



Explicit Mission Context Knowledge Added



Comprehensive Cognitive Semantic Interoperability Model



Conclusion

- A shared knowledge architecture perspective ensures consistent semantic interoperability across all interdependent collaborating elements supporting agent knowledge sharing and evolution of social knowledge
- A semantic interaction model is defined to assist in the analysis and development of semantically consistent architecture interactions