Vital Role of Intelligent Software Agents in Enabling
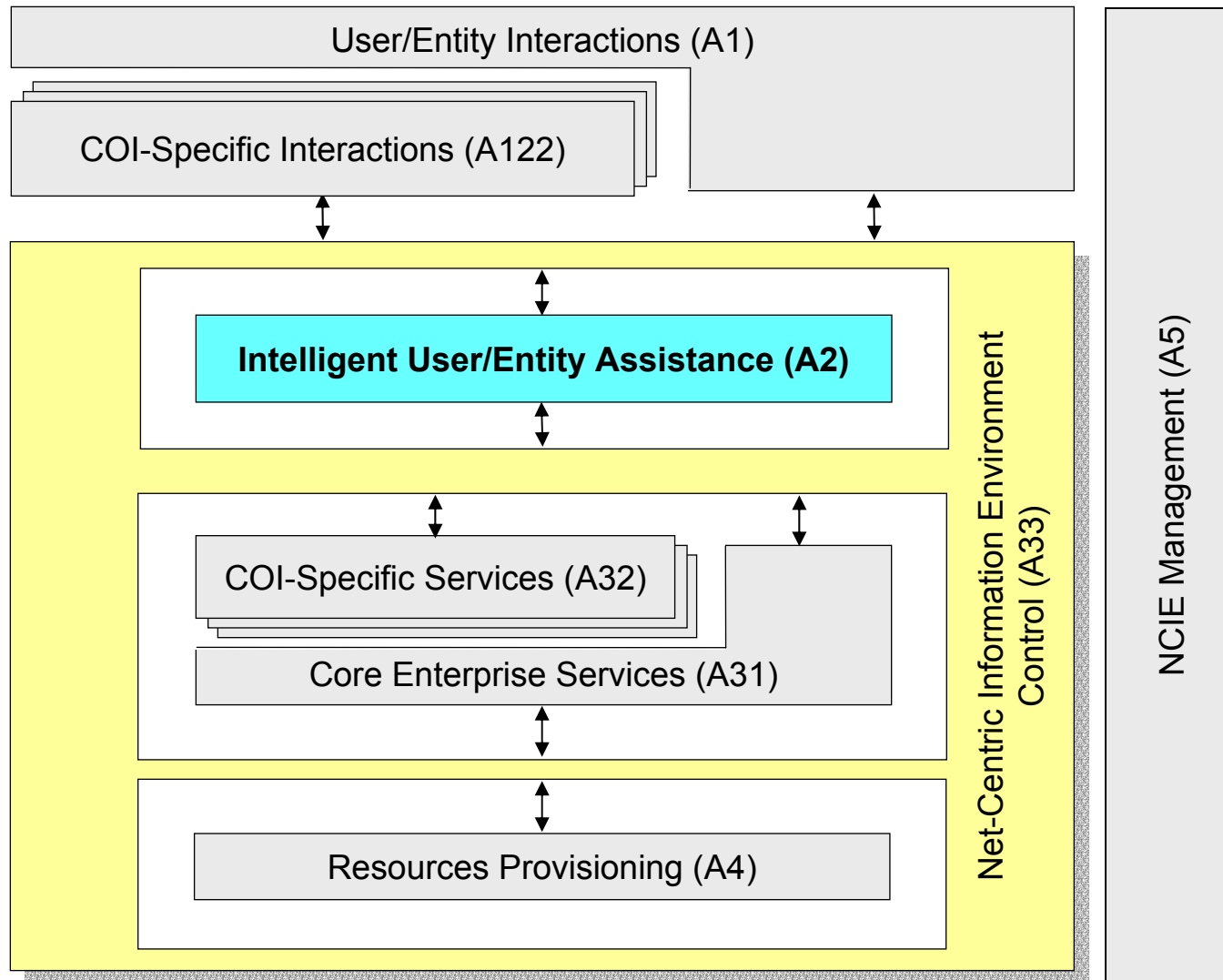# Net-Centric Command and Control

Dale E. Lichtblau

Information Technology
and Systems Division

Institute for Defense Analyses
June 15, 2004

Contention

- The net-centric GIG will require *intelligent* user assistant services—to an extent or degree not fully appreciated today

- Therefore, intelligent software agents must have a paramount role in the GIG in order to achieve a transformation to net-centric operations and warfare

Reference Model Activity Decomposition

"Provide Net-Centric Info Environment"

Interact With Net-Centric Information Environment

Provide Net-Centric Services

Resource Service Requests

Perform Net-Centric User/Entity Services

Manage Net-Centric Info Environment

NCOW Reference Model as "Stack"

User/Entity Interactions (A1)

COI-Specific Interactions (A122)

Intelligent User/Entity Assistance (A2)

COI-Specific Services (A32)

Core Enterprise Services (A31)

Resources Provisioning (A4)

Net-Centric Information Environment Control (A33)

NCIE Management (A5)

↕ = Interface between major NCOW RM components

Net-Centric
Core Enterprise Services

- Information discovery
- Storage
- Mediation
- Messaging
- Collaboration
- **User Assistance**
- IA/Security
- ESM
- Applications

User Assistant Services
(from DISA Workshop)

- Definition: Automated or manual capabilities that learn and apply user preferences and patterns to assist users to efficiently and effectively utilize GIG resources in the performance of tasks
- On-line help
- Language translation service
- User profile service
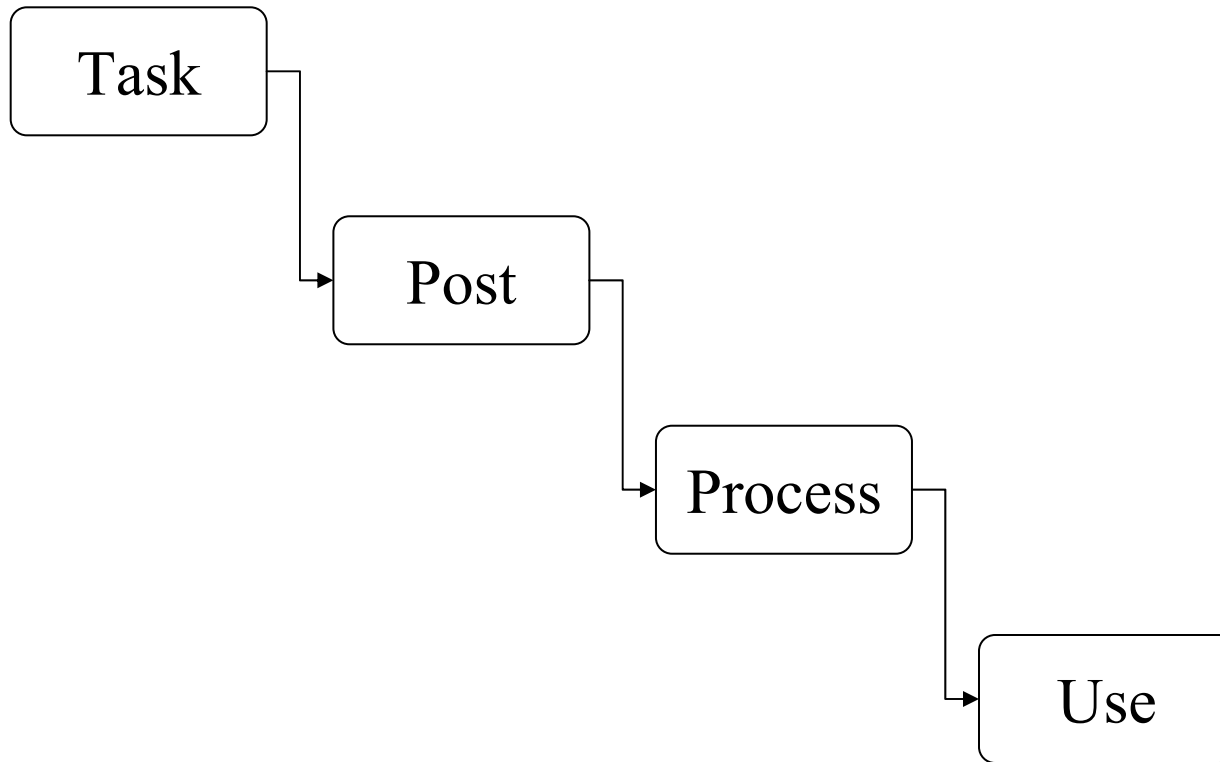- Human-Machine interface
- User training
- User surrogate

Intelligent User Assistant Roles

- Key interface between users (interacting with the NCIE (A1)) and the core of the NCIE (A3 and A4)
  - Broker or matchmaker
  - Shifts "what is of interest to whom" burden from other core services to the user assistant
  - "Centralizes" GIG intelligence

Requirements Imposed by Net-Centricity

- Users must "post" (before processing)
  - Store data in accessible space
  - Describe (meta-data)
- Users will need help in deciding if new data (produced or collected) should be posted
- Users will need help in describing that data if it is to be shared
- Net-centric user assistant is ideal vehicle for ensuring that meta-data is underpinned by a common, uniform, coherent, "integrated" data dictionary
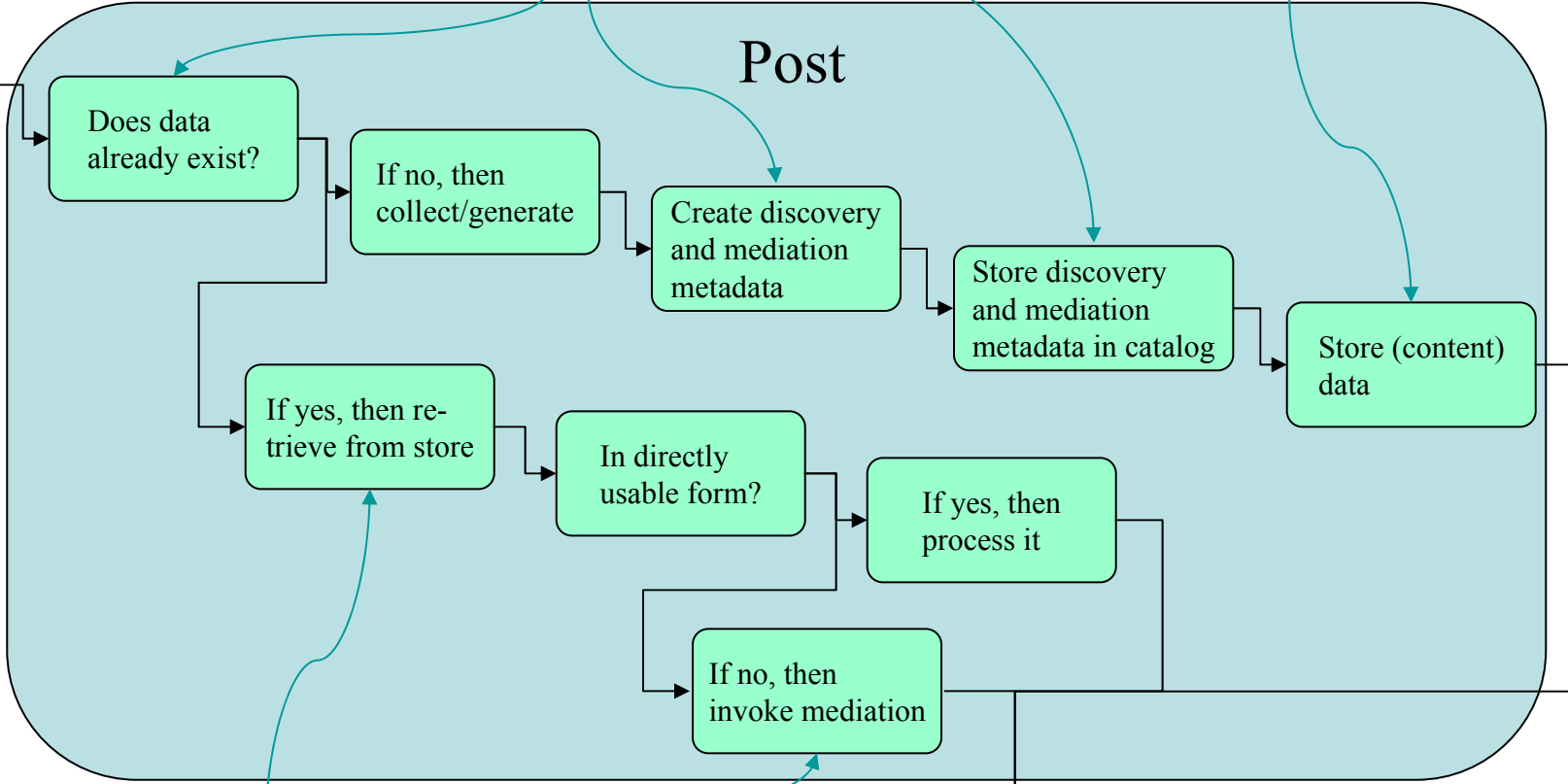
"TPPU"

Intelligent Assistance

Storage

Task

Post

Does data already exist?

If no, then collect/generate

Create discovery and mediation metadata

Store discovery and mediation metadata in catalog

Store (content) data

If yes, then re-trieve from store

In directly usable form?

If yes, then process it

If no, then invoke mediation

Discovery

Mediation

Process

Use

→ = Messaging

10

Intelligent Agents

- Software entities capable of independent (autonomous) action
  - Situation assessment
  - Problem solving
  - Inter-agent communication
  - Learning or adaptation

Types of User Assistants

- Information discovery
- Information dissemination
- Semantic mediation
- Matchmaker
- User interface assistance

Agent-to-Support Function Mapping

Intelligent Agent Type	Function Supported on Behalf of:	
	User/Entity	NCIE Service
Information Discovery	Find, access, retrieve information	
Information Dissemination		Discover and disseminate information
Semantic Mediation	Information translation and tagging	Information translation
User Interface:		
Basic User Interface	Tailor interface to user	
Personal Assistant	Enhance user interactions	
Matchmaker	Inter-agent negotiation	

Design and Development Challenges

- DoD enterprise "ontology"
- Agent reliability and "trust"
- Mobile code

Summary

- Although a "core enterprise service," the vital role of the GIG user assistant has not been appreciated

- The user assistant must be "intelligent" and requires a DoD-wide "ontology"

- Agent technology introduces technical complexity and security concerns that are not being addressed