<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Organization</th>
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<tbody>
<tr>
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Questions

What is a system solutions architecture for a Command Control and Information System (C2IS) that helps the Commander and Staff to organize?

Who needs help? Individual, Organization

What do we want to organize?

What’s the problem?

Why now?
Overview

Command Control Knowledge System (CCKS) Model

Compose-able and Adaptive Service-Enabled Environment (CASE) – Organize system

Service-Enabled Fusion Architecture (SEFAR) – Individual & Team

Prototype System Architecture of Organize System – Individual & Team
What do we want?

• Help human *internalize* knowledge and make decisions – *beyond* data and information
• A *naturalistic* system – fundamental human processes
• Result- Increase individual *productivity* & greater organization-level *synergy*
• **Rethinking** Command Control Information Systems
• CCIS => CCKS
CCIS - An Interface/Medium

Cognitive Space

Information & Data Space

Sensors

Intelligence Sources

Communications

“potential knowledge”
What are the functions that CCIS systems should provide?
Any inadequacy of Traditional C2?
Information Systems Sometimes Limits a Person’s Access to the Information Space

Untapped information Space
Info / data out there which has not been tapped.

Process-Centric Data as laid down during System Development

Total Information Space

Unexploited information Space
Info / data owned by the organization but nothing is done to use it.
The Problem of Man & Data

• Man does not know exactly what data he wants at the onset

• What he wants changes at different junctures
Organize Thoughts - Bates model

Information Search is like Berry Picking

- Interesting information is scattered like **berries** amongst bushes
- The query is **continually** shifting
- Users may move through a variety of sources
- New information may yield **new ideas and new directions**
- The query is not satisfied by a single, final retrieved set, but rather by a **series of selections** and bits of information found along the way

A sketch of a searcher… “moving through many actions towards a general goal of satisfactory completion of research related to an information need.” (Bates 89)
CCIS : Facilitating Human Cognition

Human Cognitive and Team Processes
- Establish Plausible Goals
- Access Info & Data
- Search for Information to fill info gaps
- Exchange info with others in the Team
- See and Understand Info and Data
- Think
- Communicate
- Construct Train of Thoughts
- Decide & Act

Integrated Functions of Man-Machine Interactions
- Discuss
- Draw
- Reason
- Plan
- Explain
- Persuade

Search Engine
Discussion Tool
Drawing Tool
Computation Tool
Planning Tool
Presentation Tool
Visualization Tool

Flexible and Interactive CCIS System
CCKS Baseline Components
based on cognitive functions

- **Think** system
  Assist the human to Understand and Reason.

- **See** system
  I hear, I forget. I see, I remember, *I experience, I understand* Chinese Proverb

- **Access Information** system
  Exploit the ‘total’ info space (untapped, unexploited, obvious info)

- **Draw, Explain and Persuade** system
  Communicate.

- **Discuss** system
  Create Shared Understanding. Create Insights.

- **Plan** system
  Create effective Ideas and Actions.

- **Organize** system
  Create Synergy. The Whole > Sum of Parts.
CASE
Compose-able and Adaptive Service-Enabled Environment

CASE aims to deal with how people Organize to achieve Synergy

Organize
system

A systems architecture foundation that is highly adaptive so as to support dynamic organizations
Elements of **Organize**

1. How Individuals **Organize** their Thoughts (Individual Cognitive)

2. How people are **Organized** for knowledge sharing and Collaboration (team)

3. How information is **Organized** for the human knowledge network (system)

**synergistic co-evolution**

**dynamic knowledge interaction**

- Tacit knowledge
- Explicit knowledge

**human social networks**

**innovation**

**collaboration**

**create**, **solve**

**common understanding**

**use**, **exploit**

**team cognition**

**knowledge systems networks**

**organize work**

**organize thoughts**
Conceptual Front End Architecture of Organize System

- **Organize Work**
  - Task Workspace 1 - Task 1 - Role 1
  - Task Workspace 2 - Task 2 - Role 2

- **Organize Thoughts**
  - Sensemaker 1: "Thinking Space"
  - GIS-Based

- **Team Performance Awareness**
- **Workflow Management**

- **Fellow Collaborators**
- **Collaboration Protocols**

- **Co-ordination Touchpoints**
  - Common Obj
  - AO East
  - Air Asset
  - With Whom
    - Navy N3
    - Army S3

- **Intelligent Software Agent**
  - Alerts when coord boundary is breached

- **Query**

- **Workspace Configuration**
  - Configure Work Processes and Data Visualization (CASE-SEFAR)
CASE

Vision: Flexible composing of services (eg. data, applications, visualization,..)

Vehicle: Exploration of Service-Based Architecture (Commanders enjoy greater benefits with greater synergy between services)

Value: User-Centric Solutions (Realize users practical needs and demands, Individual cognition and team cognition)
CASE 1: Service Composition

- Fusion Service
- Data Service
- Visualization service
- Used with UDDI server

COMPOSING SERVICES
CASE 1: 5 Observers w/o Fusion

Information overload
CASE 2: Service Composition

Suite of Fusion Engines
- Correlation
- Association
- Aggregation
CASE 2: 5 Observers + Fusion

Fused Ground Picture
CASE 3: Service Composition

Additional Data Sources

Fusion Services
CASE 3: 8 Observers + Fusion

Increased Situation Awareness

Armour Columns Advancing from North to South
Service-Enabled Fusion Architecture Reusable
THANK YOU 😊
(Team) Knowledge Sharing depends on Type of Tasks

Taxonomy of Group Task (McGrath [1984])

- Generate
- Planning
- Performance / psychomotor
- Competitive Tasks
- Mixed Motive
- Conceptual Behavioral
- Cooperative
- Intelective
- Decision Making
- Choose
- Negotiate

Generate
Choose
Negotiate