

Compose-able and Adaptive Service-Enabled Environment (CASE)

LTC Chew Lock Pin

Hd CPoF, SCME, FSD

Division Manager (IKC2), DSTA

Mr Linus Low (Presenter)

Development Engineer

(IKC2), DSTA

LTC Mervyn Cheah

Hd SCME, FSD

Mr Jonathan Kong

Senior Technical Staff

DSO National Laboratories

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
Reusable (**SEFAR**)

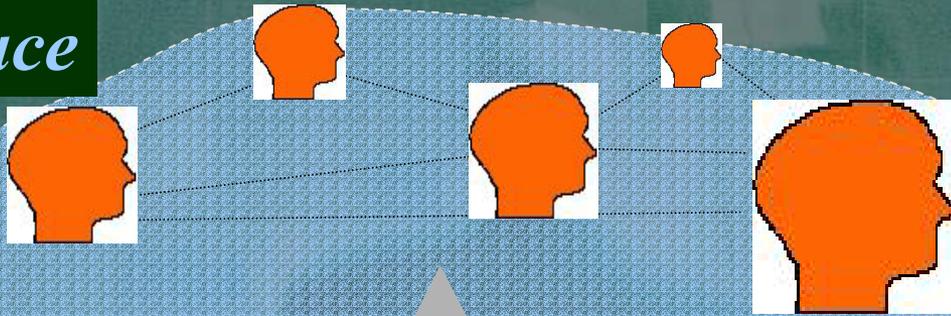
Prototype System Architecture of Organize System
– Individual & Team

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



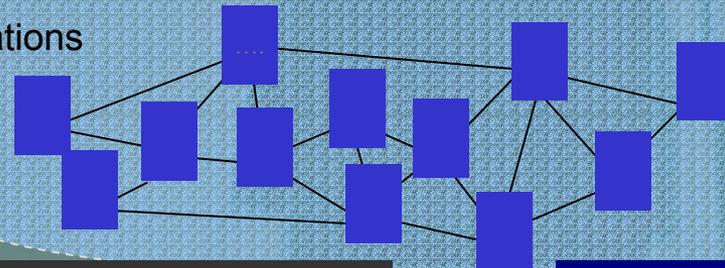
CCIS



Sensors

Communications

Intelligence Sources



Information & Data Space

“potential knowledge”

What are the functions that CCIS systems should provide?



CCIS : Serving Out Functionalities

THIN CLIENT



Front End – Integrated Knowledge-Centric Interface

PDA

Lap Top

Mobile Phone

Common MMI
Svcs

Common
Ops Picture

Common GIS
Viewer

Collaboration
Space

Info &
Knowledge Nav

Svcs
Hierarchy

User Workflow
Engine

Middle-Tier

SERVER



Common CCIS Services

Common Operational Picture

LISA Apps

Inter

Own Force
Situation

ECA
S

Collaborative Decision-Making

UAV
Planner

ADAM
Agents

Inference

Near Real-Time Battle Mgmt

Hypothesis
Info Svc

Asset Mgmt
Svc

tical
Svc

Event Alert
Manager

**Any inadequacy of
Traditional C2?**

EII - Infra Services

GIS Services

LOS

X-Country
Terrain
Mobility

Deploymt
Grd
Search

VIZ SVCS

Agents Container

Composition Wrkflow

Integration

Business
Rule Engine

Info Arch
Repository &
Exchange Svcs

Directory
Svc

Security
Svcs

Collaboration
Msg Blog

Near Real-
Time Arch
Svcs

Data

Database
SERVER



Maps

GIS Data

Army Data

Navy Data

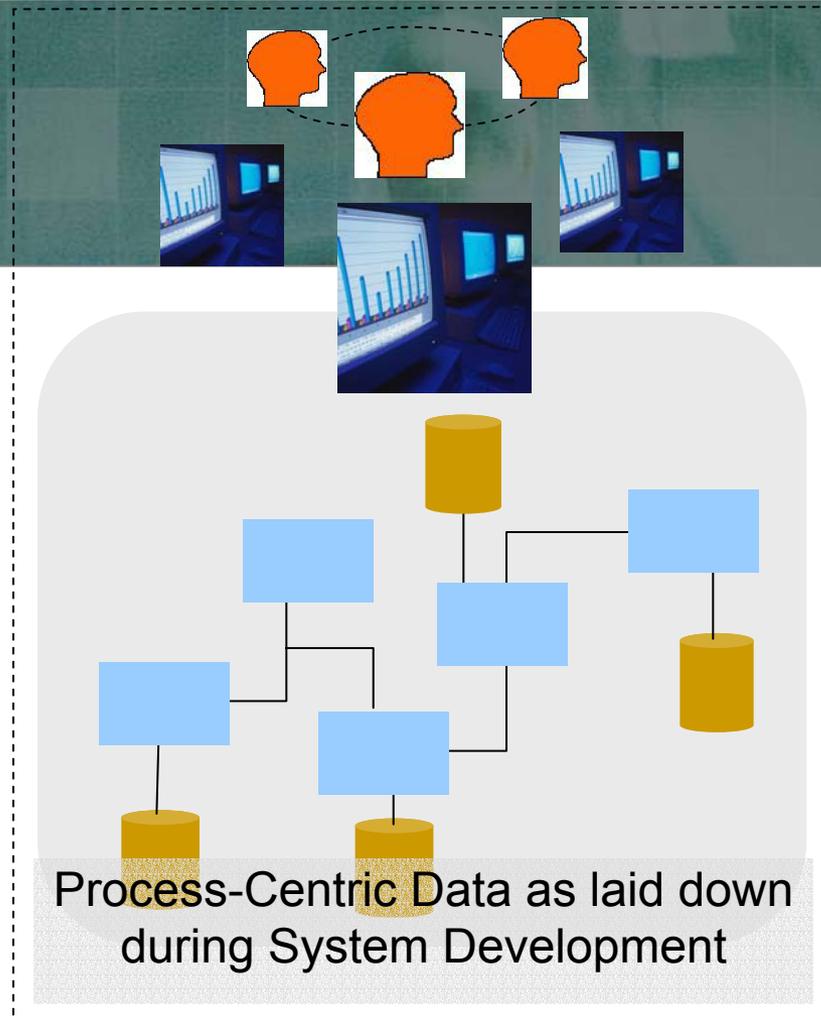
AF Data

M & S
Models

Info & Knowledge
Models & Repository

Knowledge
Models

Information Systems Sometimes **Limits** a Person's Access to the Information Space



Untapped information Space

Info / data out there which has not been tapped.

Unexploited information Space

Info / data owned by the organization but nothing is done to use it.

Total Information Space

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

Query 1

Q1

Q2

Q3

Q4

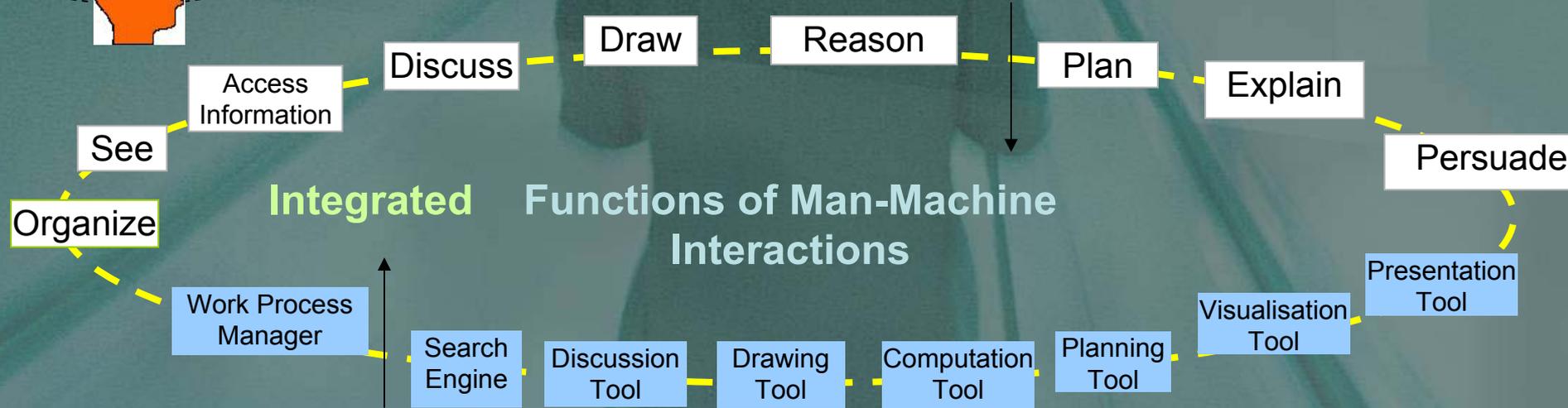
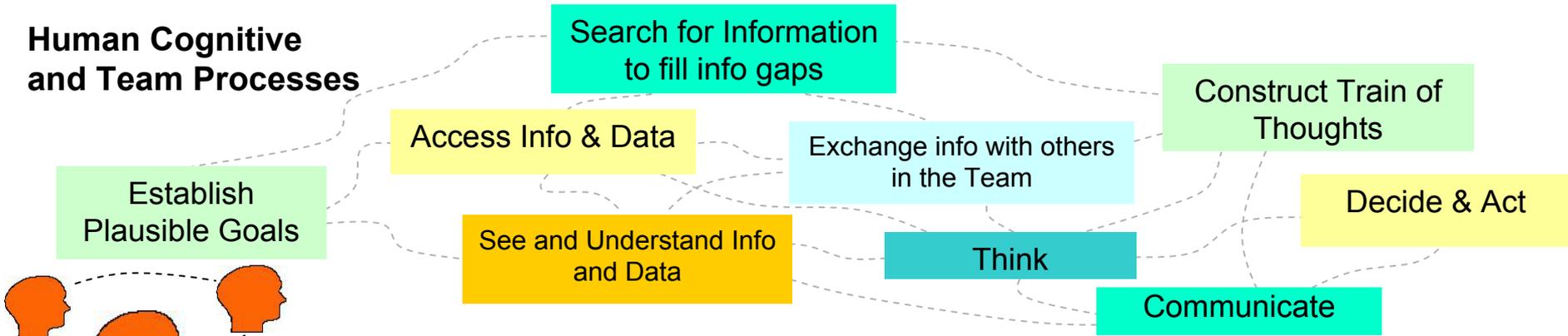
Q5



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



System

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

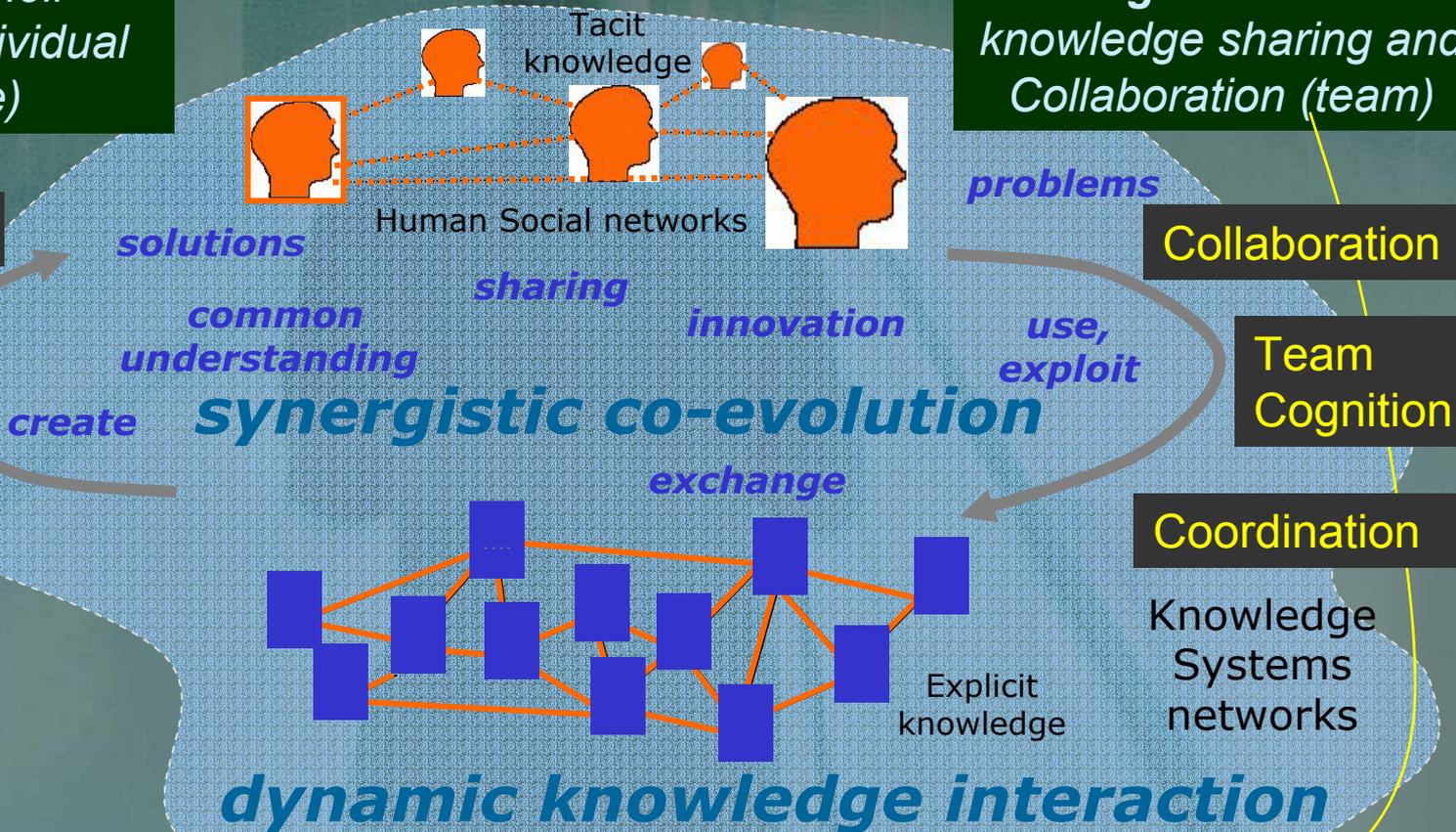


A systems architecture foundation that is highly adaptive so as to support dynamic organizations

Elements of *Organize*

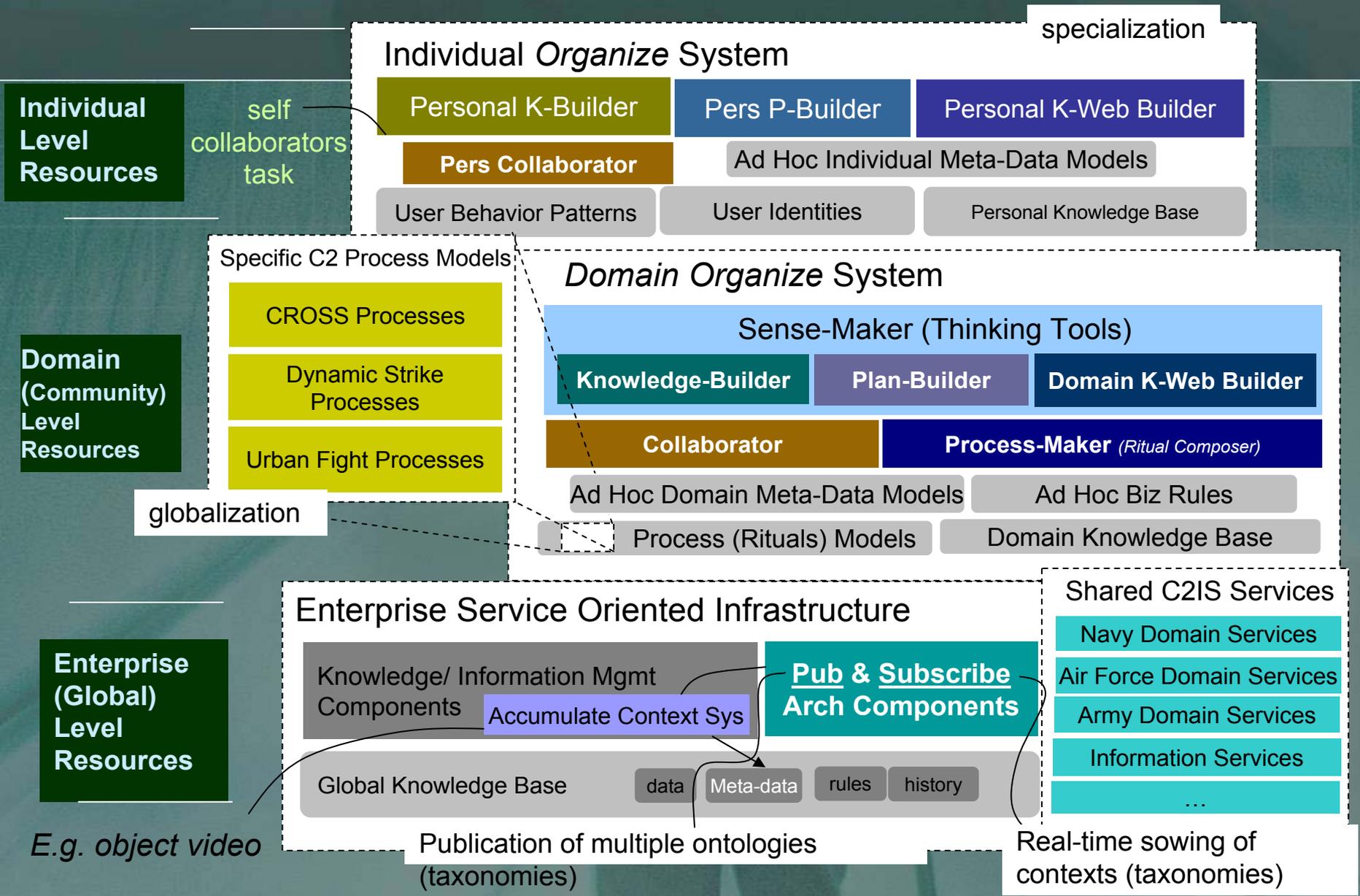
1. How Individuals Organize their Thoughts (Individual Cognitive)

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



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

C2KS Architecture



Individual Level Resources

Domain (Community) Level Resources

Enterprise (Global) Level Resources

E.g. object video

Conceptual Front End Architecture of *Organize* System

query

Organize Work

Personal Workspaces

Task Workspace 2 - Task 2 - Role 2

Task Workspace 1 - Task 1-Role 1

Sensemaker 2

?

Data Based

Sensemaker 2

Text Based

Sensemaker 1
"Thinking Space"



GIS -Based

Co-ordination Touch-Points

Common Obj	With Whom
AO East	Navy N3
Air Asset	Army S3



Thought-Driven Info Search

Intelligent Software Agent alerts when coord boundary is breached

Comms:
Email, Chat
Messaging...

Team Performance Awareness

Fellow Collaborators



Workflow Management

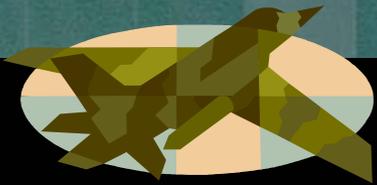
Collaboration Protocols



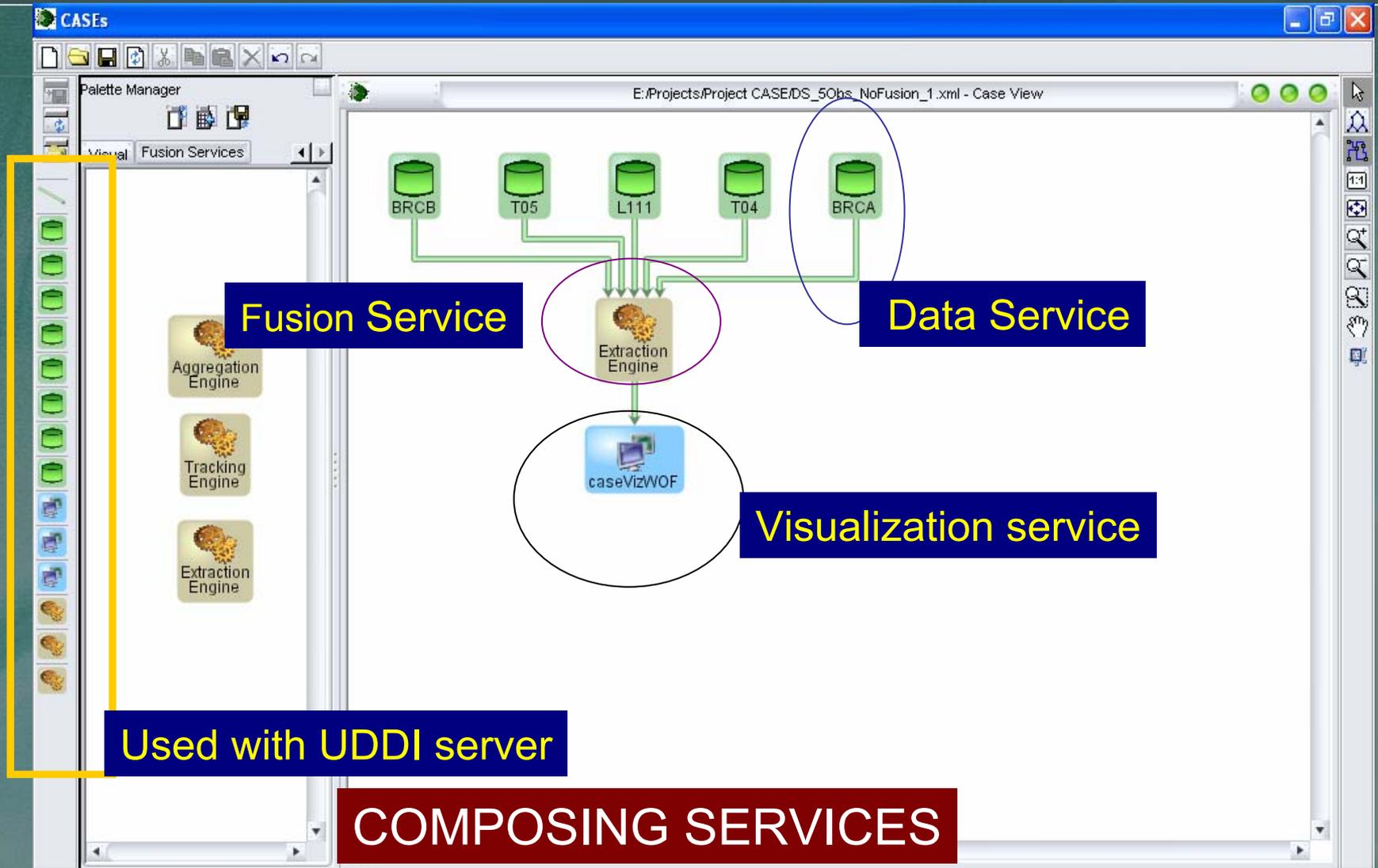
Organize Thoughts

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

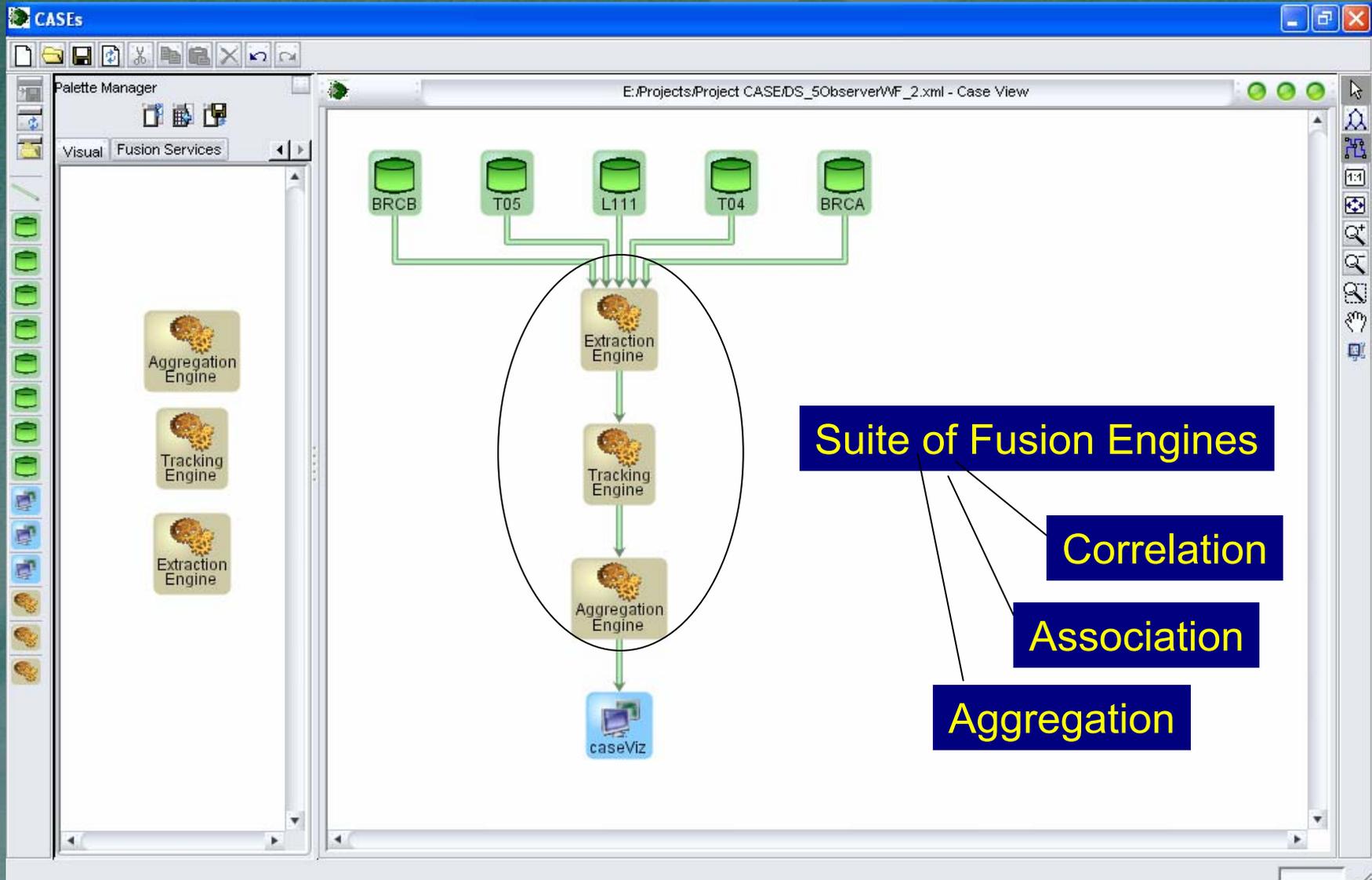


CASE 1: 5 Observers w/o Fusion

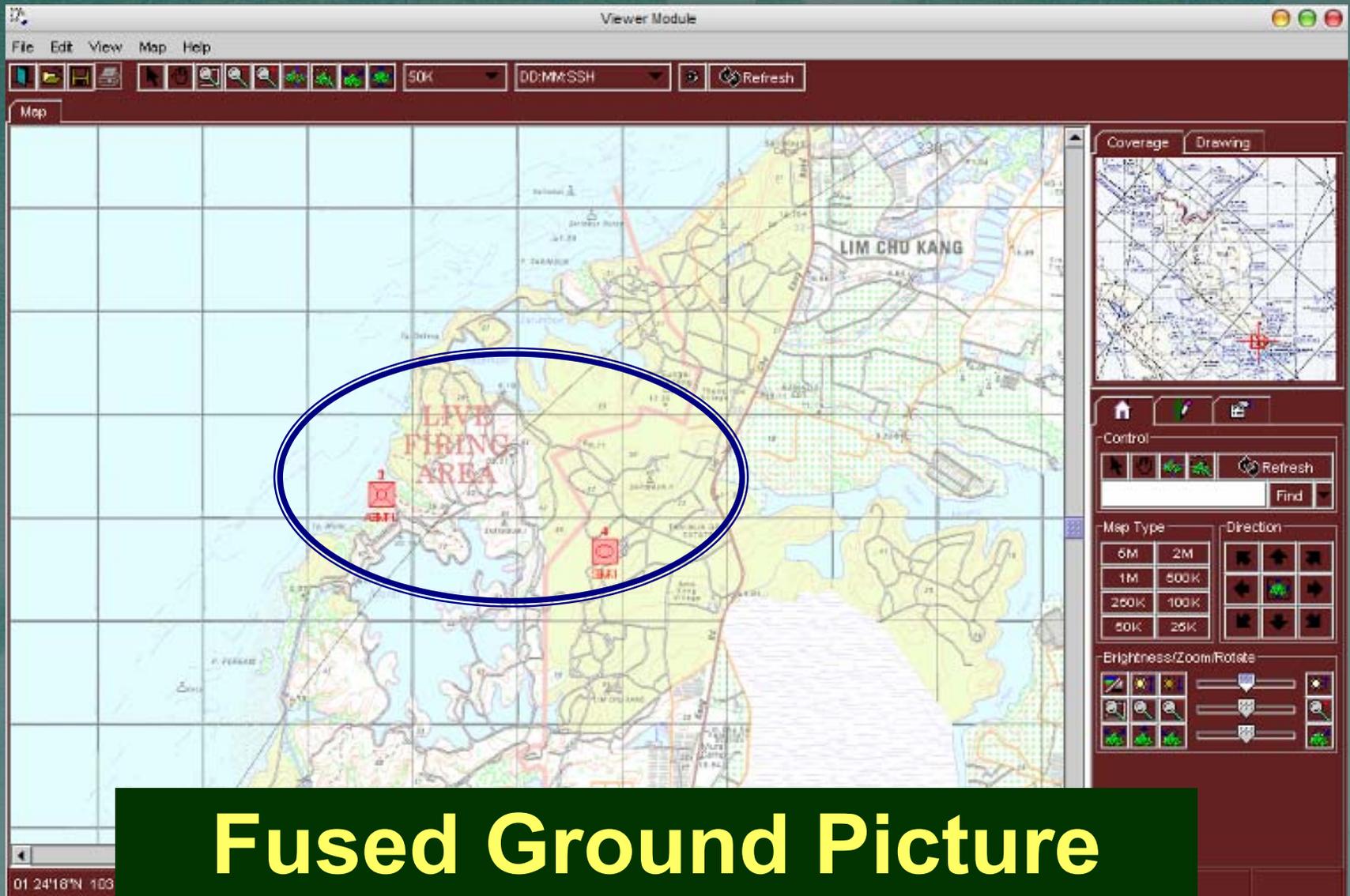
The screenshot displays a 'Viewer Module' window with a map of Lim Chu Kang. A blue circle highlights a 'LIVE FIBING AREA' containing several red square markers. The interface includes a menu bar (File, Edit, View, Map, Help), a toolbar with various icons, and a 'Refresh' button. On the right side, there are panels for 'Coverage' and 'Drawing', a 'Control' panel with a 'Refresh' button and a 'Find' input field, and a 'Map Type' panel with zoom levels (5M, 2M, 1M, 600K, 200K, 100K, 50K, 25K) and a 'Direction' panel with navigation arrows. A 'Brightness/Zoom/Rotate' panel is also visible at the bottom right. The map shows topographic features, roads, and buildings. The text 'LIM CHU KANG' is visible on the map. The status bar at the bottom left shows coordinates: 01 25'45" N 103 43'28" E.

Information overload

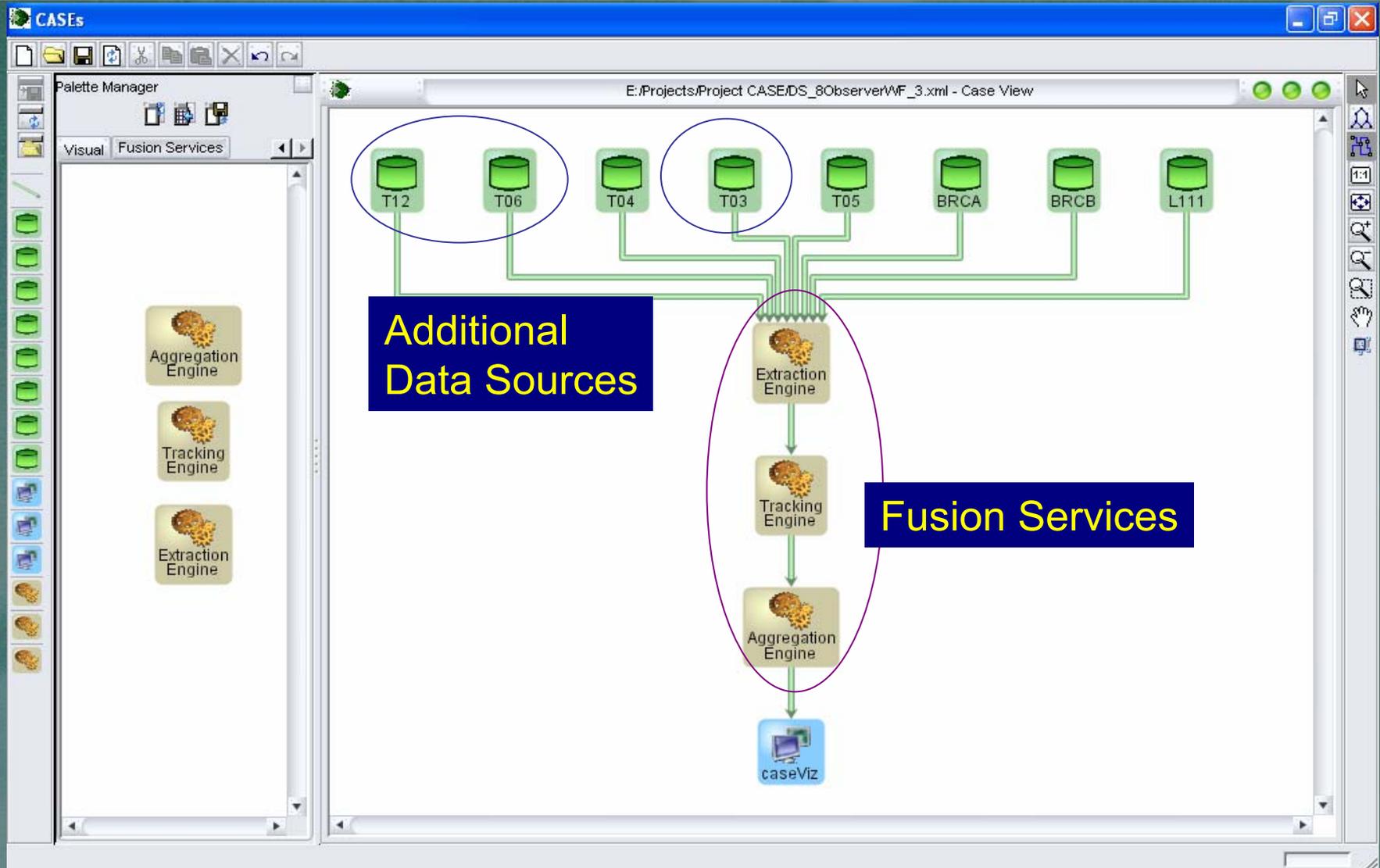
CASE 2: Service Composition



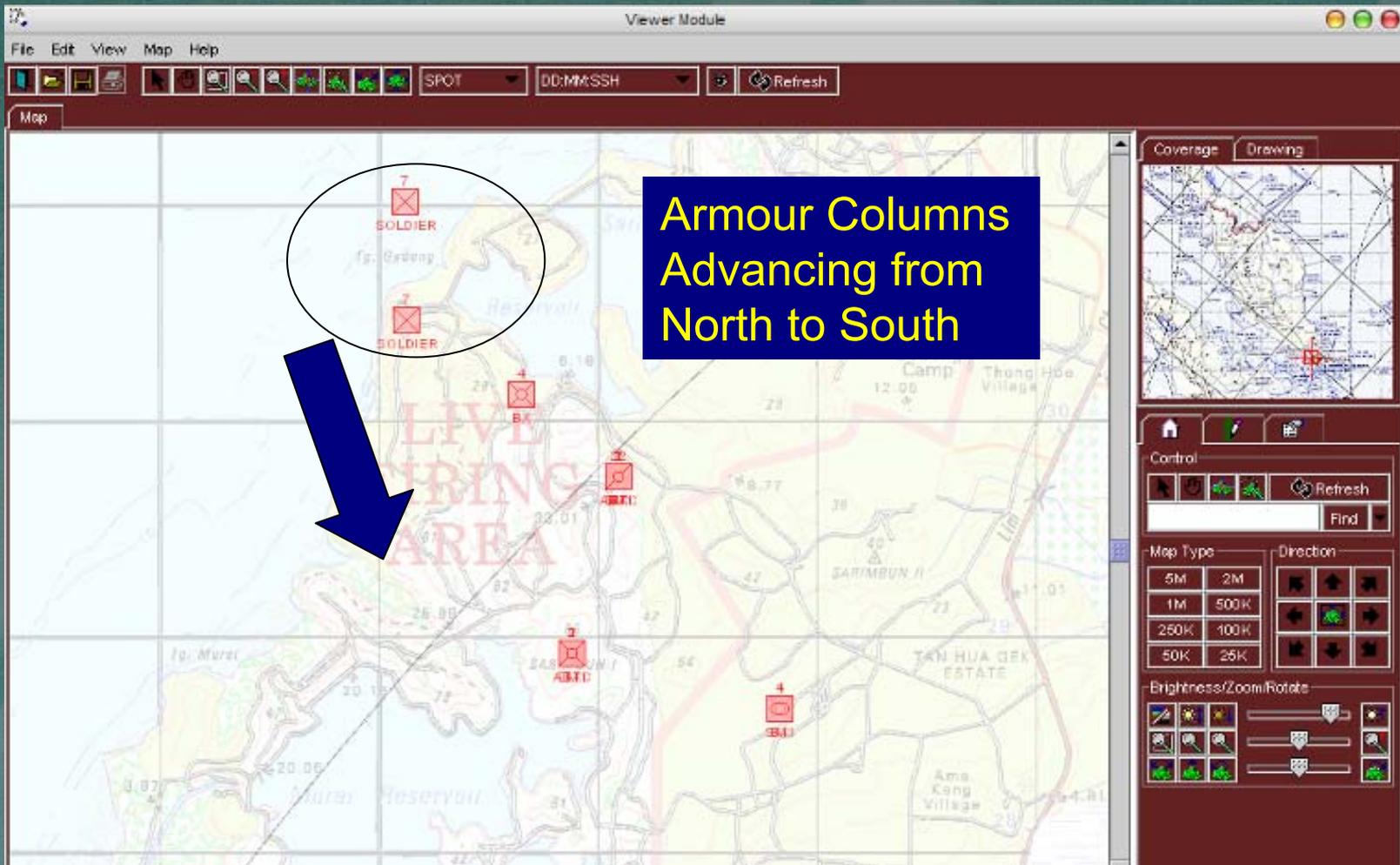
CASE 2: 5 Observers + Fusion



CASE 3: Service Composition

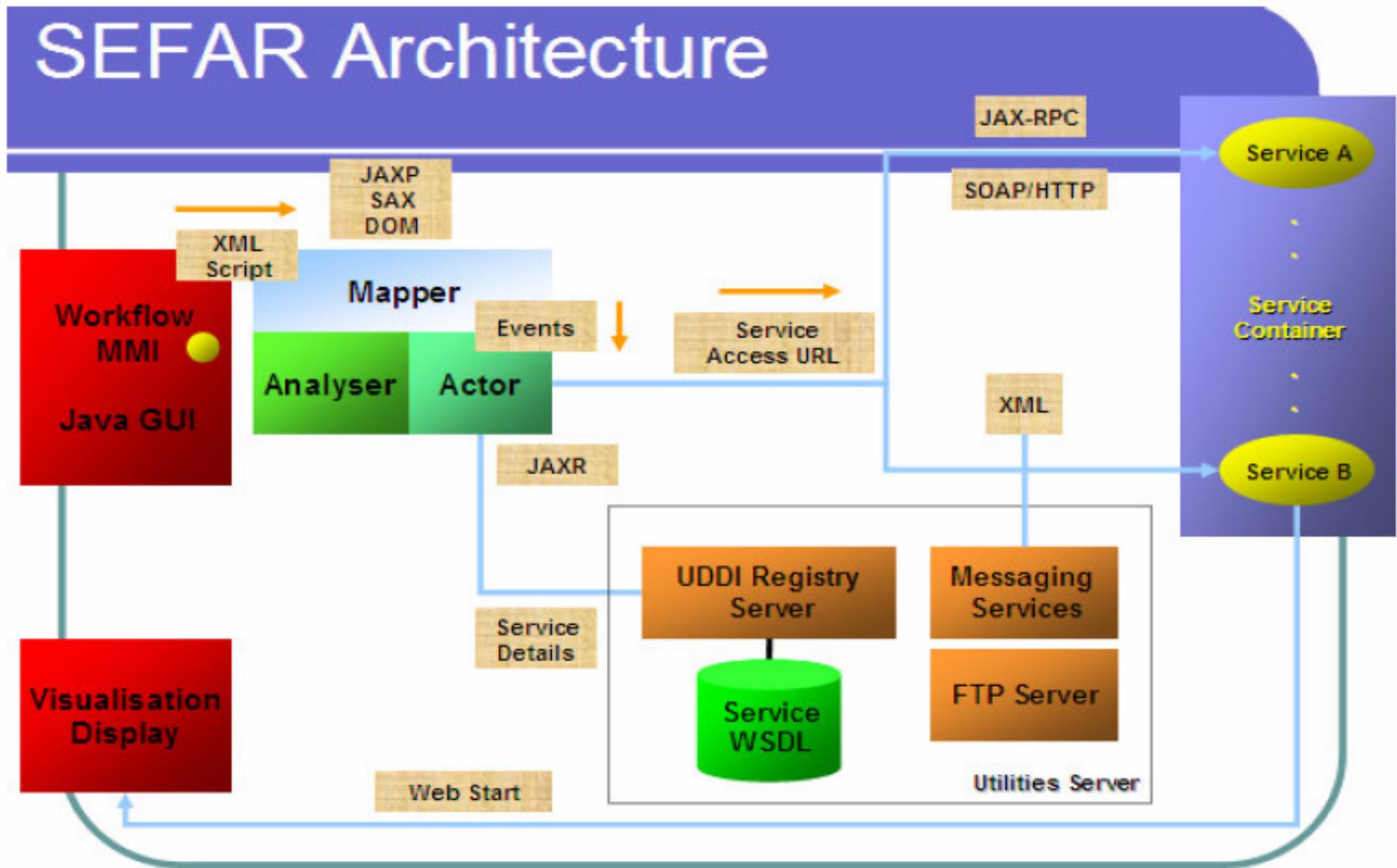


CASE 3: 8 Observers + Fusion



Increased Situation Awareness

Service-Enabled Fusion Architecture Reusable





THANK YOU 😊

(Team) Knowledge Sharing depends on Type of Tasks

