

Collaborative Data Objects

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Mission Oriented Investigation Experimentation



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Background



J. F. C. Fuller: “To establish a new invention . . . is like establishing a new religion—it usually demands the conversion or destruction of an entire priesthood.”

General Problem

- Collaborative environments (CE) are not cleanly integrated with applications or the enterprise

Observations

Improving Time-Sensitive Team Decision Making: AF MOIE, Lindsley Boiney

- Both ADOCS and chat message indicating SAR imagery on a target now available. Operator is frustrated it doesn't specify the quality of that imagery:

“Imagery of what? Is it *useful*?”

- TST Chief received information via chat regarding a Predator feed. He had to do a time-consuming back and forth on chat to find out **which of 3 Predators** it was referring to.

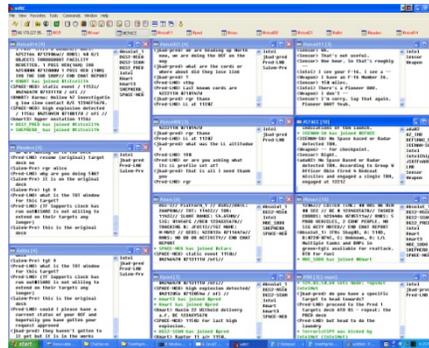
- “It is important to sort out what information **really matters** and to **verify the source** of the information before acting on it”

“Rubbish in, rubbish out – you’ve got to have a human in the loop when there’s **ambiguity**.”

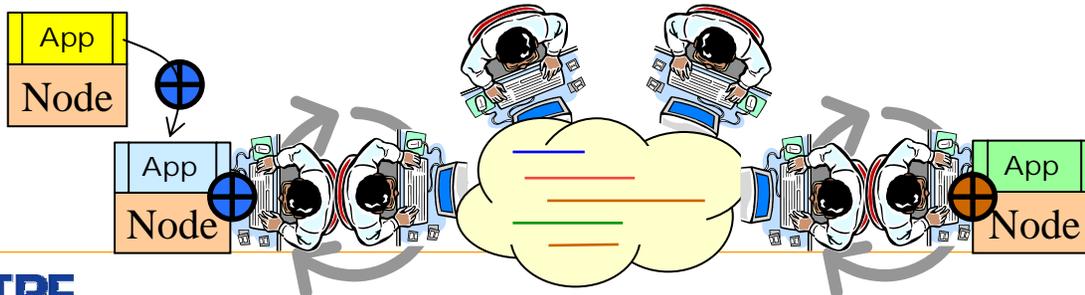
— **Humans have to sort it all out, put it in perspective, resolve inconsistencies, anticipate effects**

Specific Test Cases

- Chat and the Enterprise do not communicate
 - Enterprise has no visibility into chat spaces
 - Users spend a lot of time ‘monitoring’ chat to maintain situational awareness



- Operators lose time and focus when they leave chat to interact with mission systems and enterprise capabilities in order to support collaborative work
 - Workflows and business processes are impeded by poor integration



Approach

■ Collaborative Data Objects (CDOs) are

- Smallish data objects that can be created/manipulated
- A natural data object for many applications and systems
- A context for interacting with web services, mobile devices, and support collaborative

```
<danwinkowski>[] (en) BDA Cell  
<michael>[] (en) cdo://Engagement_Event0001  
<michael>[] (en) any overhead available?  
<danwinkowski>[] (en) yep, got some assets available  
<danwinkowski>[] (en) available  
<michael>[] (en) whats quality?
```

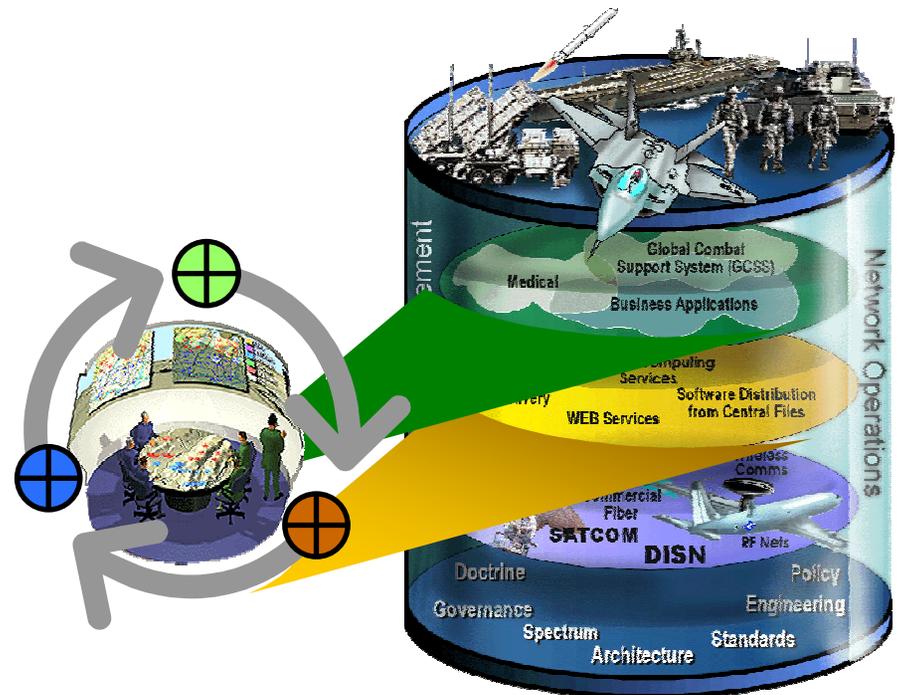
“My criteria
learn it in 3
not mimic s
it is the wr
- Lt. Gen. J
Multi-Natio

The screenshot shows a web browser window titled "CDO XFORM". The form contains the following fields and sections:

- Target information**
 - Identifier: BP101
 - Description: Overpass Choke Point
- Time of engagement**
 - Date: June 12, 2012
 - Time: 13:07:00
- Point of Engagement**
 - Latitude: 42.37
 - Longitude: -71.1
 - HAE: [empty]
 - CE: [empty]
 - LE: [empty]
- Damage Assessment**
 - Significance of damage: Destroyed
 - Level of assurance: Probable (dropdown menu is open showing options: Confirmed, Possible, Probable)
 - Recommendation for coordination: [empty]
 - Notes: [empty]
- Buttons: Save Changes, Submit Changes, Cancel

Capability Demonstration Overview

- Enhanced chat augmented with structured information encapsulated in collaborative data objects
- Net-Centric query of augmented chat spaces
- Chat/Enterprise integration via information services



1) Chat Augmented With Structured Information

- **Collaborative Data Objects (CDOs) Framework**
 - Encapsulation of structured data linked to chat
 - Support for collaboration over CDOs
 - Synchronization protocol
 - Application/Chat interaction through CDOs
 - Description language for defining CDO types

- **Operational impacts**
 - Increased speed, agility, and quality of data focused collaborative decision making, SA, information production, and exploitation
 - Reduced ambiguity and operator overload

Chat Enhanced By Structured Data

The screenshot shows a chat window titled "bomb_damage_assessment" with several tabs open: "indicators_and_warning", "bomb_damage_assessment", "project_planning", and "emergency_management". The chat history includes:

- eagleeye has joined the room.
- DanO has joined the room.
- EagleEye has joined the room.
- eagleeye2 has joined the room.
- [05/18/2007 10:23 AM] DanO: [cdo://Engagement_Eventm485](#)
- [05/18/2007 10:23 AM] EagleEye: better check this one out, quick!
- [05/18/2007 10:23 AM] DanO: OK, working the collection re-tasking
- [05/18/2007 10:23 AM] EagleEye: great, checking humint
- [05/18/2007 10:23 AM] DanO: I'll start the BDA
- [05/18/2007 10:23 AM] DanO: [cdo://Battle_Damage_Assessmentn722](#)
- [05/18/2007 10:23 AM] EagleEye: Local eyes reporting now
- [05/18/2007 10:23 AM] DanO: ISR reports in 5
- [05/18/2007 10:23 AM] DanO: what does LE show?
- [05/18/2007 10:23 AM] EagleEye: probable, setting bda now

The chat interface includes a user list on the right with "DanO", "EagleEye", and "eagleeye2". At the bottom, there is a text input field with a "Send" button and a "Add CDO..." dropdown menu.

Chat conversation interspersed with links to structured (CDO) data

Collaborative Data Object Type Definition Template

<cdo:Definition>

<Metadata> label, version, de

<Schema> W3C XML schema

<Methods> Actions that can k

<Layouts> W3C XForms com

</cdo:Definition>

The screenshot shows a web browser window titled "CDO XFORM". The form contains the following fields and values:

- Task Request:** ASSESS RAW FOOTAGE OF BREAKING NEWS EVENT
- Requester:** EMERGENCY NEWS ALERT BOT
- Imagery At:** http://128.29.199.50:8080/IncidentAssessment/Images.htm
- Percent Complete:** 0
- Response Required By:**
 - Date:** April 12, 2007
 - Time:** 14:00:00
- Description:** BREAKING NEWS STORY IN LIBERTY TX
- Instruction:** REVIEW IMAGES AND ASSESS POTENTIAL EMERGENCY INCIDENT.
- Area Description:** (empty text area)
- Location Fields:**
 - Lat:** 30.277531
 - Lon:** -94.798153
 - Radius in Meters:** 10
- Status:** Actual
- Category:** Geo
- Buttons:** Insert a new category, Remove current category
- Response:** Shelter
- Buttons:** Submit Changes, Cancel

CDO structured (instance) data conforms to the type specific schema and is rendered as a form according to the layout declaration.

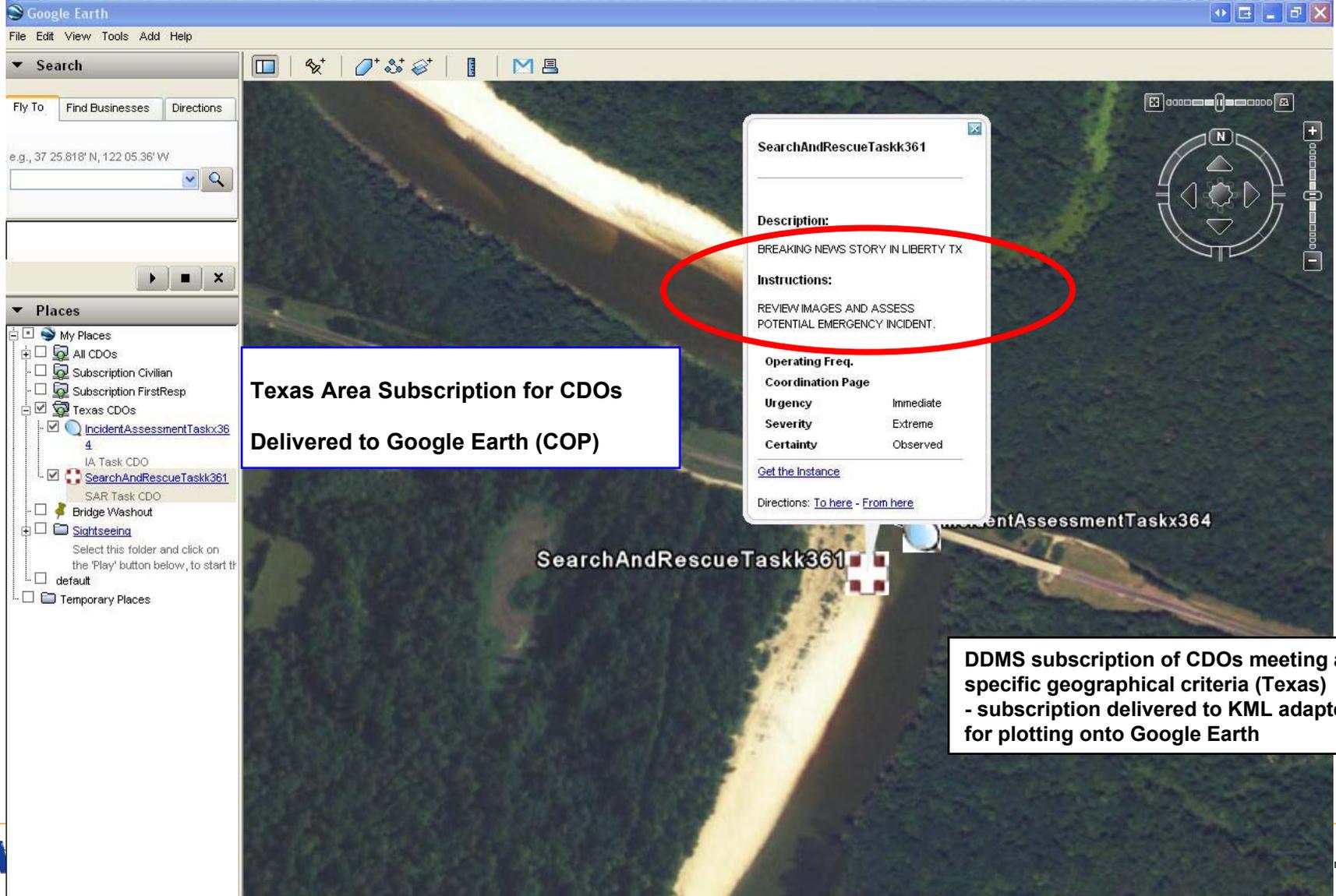
- The content can be both viewed and updated
- Updates are sent to other CDO enabled chat clients via the synchronization protocol

2) Net-Centric Content (Data) Discovery

- **Enterprise visibility into CDO augmented chat spaces**
 - CDO Advertisements (per DDMS)
 - Query over collaborative work products (NC Content Discovery proxy)
 - Link to Publication/Subscription mechanism (DDS)
 - Syndication of CDOs within chat rooms (RSS)
- **Chat user visibility of enterprise content**
 - Special “Query” CDO type
 - Supports enterprise content discovery from within chat
- **Operational impacts**
 - External users can search and monitor collaborative outcomes without lurking in chat rooms
 - Chat users can directly query enterprise information assets

Advertise & Subscribe: Provide the Enterprise With Access to Chat Products

- External users can search & monitor collaborative outcomes without lurking



3) Chat/Enterprise Integration via Information Services

- **Operators can directly access enterprise information services according to the mission context (via CDO typing)**
 - Cognitive disruptions minimized
 - Errors due to data re-keying reduced
 - Faster collaboration and self synchronization possible

Chat Operators Can Directly Access Relevant Enterprise Information

Example 1: Identify resource availability per criteria in CDO fields and bind result to another CDO field – **Find meeting rooms at date/time to accommodate N participants**

CDO XFORM

Meeting

Title Project CDO Budget Review

Start Time
Date May 18, 2007 Time 12:00:00

Stop Time
Date May 18, 2007 Time 12:00:00

Location LANG: CollaborationSuite

Participant dano@mitre.org

Participant eagleeye@mitre.org

Insert a new participant Remove current participant

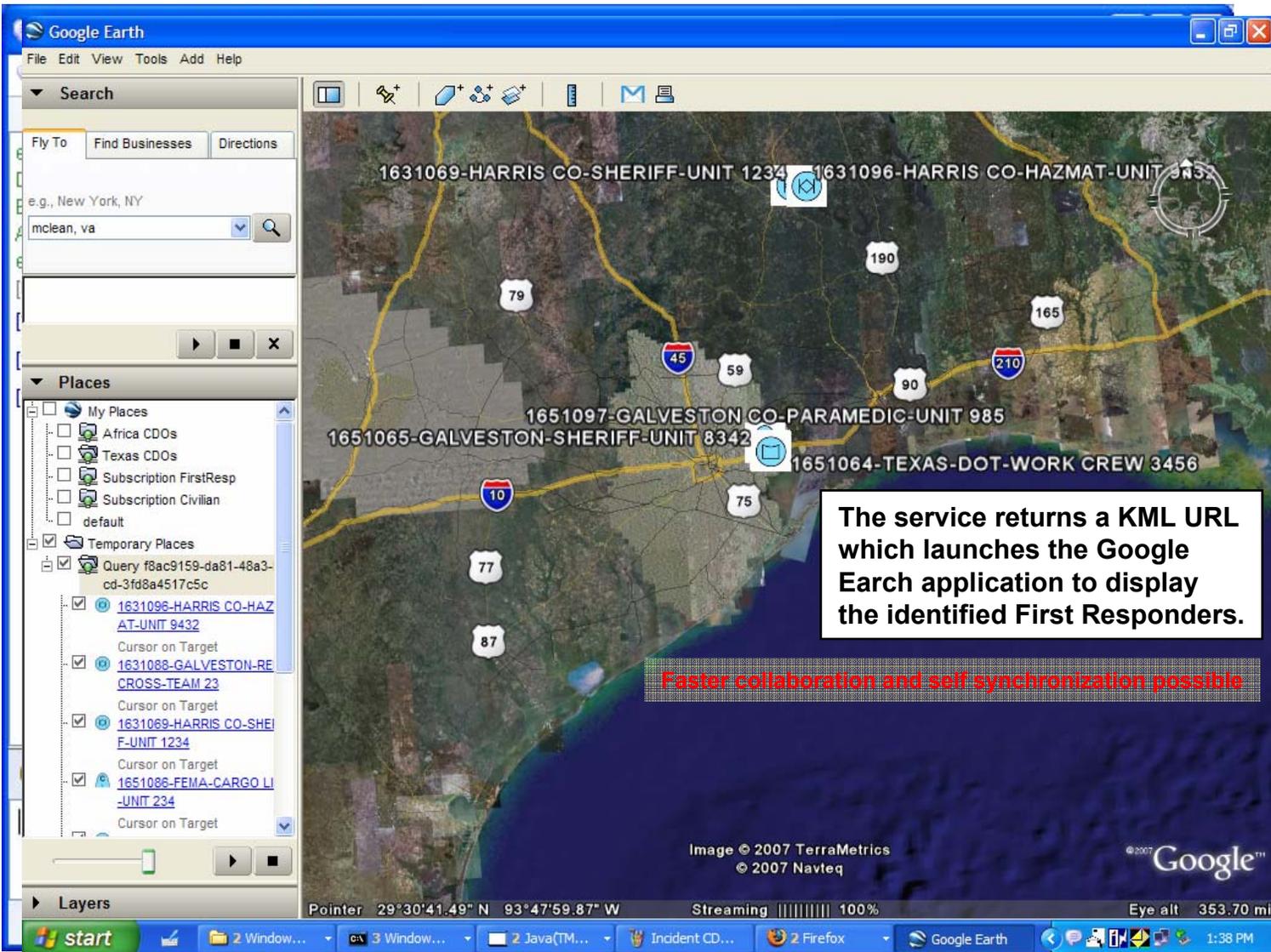
Notes review 2nd quarter uddget status and projections

Submit Changes Cancel

Errors due to data re-keying reduced

User's choice of room results in an update to the location field in The Meeting Request CDO

Chat Operators Can Directly Access Relevant Enterprise Information



Example 2:
Pass parameters to an application and request an external action to be performed –
Plot first responder units in the vicinity of a SAR location

HIT (Human Intelligence Task): Software Calls People as a Service

- Mission workflows are speeded through novel application of operator expertise and familiar tools
 - Mission services can directly request expertise resident in chat rooms
 - Chat rooms become *in effect* an enterprise information service

News Monitoring Application



► News Monitoring application injects an Incident Assessment task into the chat room.
◄ After viewing the video the form is completed and the structured data returned to the calling application.

CDO XFORM

Task Request ASSESS RAW FOOTAGE OF BREAKING NEWS EVENT

Requester EMERGENCY NEWS ALERT BOT

Imagery At <http://128.29.199.50:8080/IncidentAssessment/Images.htm>

Percent Complete 0

Response Required By

Date April 12, 2007

Time 4:00:00

Description BREAKING NEWS STORY IN LIBERTY TX

Action REVIEW IMAGES AND ASSESS POTENTIAL EMERGENCY INCIDENT.

Area Description

Lat 30.277531 Lon -94.798153 Radius in Meters 10

Status Actual

Category Geo

Insert a new category Remove current category

Cognitive disruptions minimized

Chat Operators Can Directly Access Relevant Enterprise Information

- Operators can directly access enterprise information services according to the business context (via CDO typing)
 - Cognitive disruptions minimized
 - Errors due to data re-keying reduced
 - Faster collaboration and self synchronization possible
- **New technology developed to support chat/enterprise integration**
 - **CDO method description language supports a declarative, pattern based approach for describing CDO interaction with an information service**
 - **Addresses user input, method call type, service result types, data transformation, and output handling within chat**
 - **Plug and Play - no client modifications required to add methods**
 - **Developed a CDO Method Invocation and Binding Framework enabling enterprise service invocation and response handling per the method description language**
 - **Generosity promotes loose coupling, service endpoints may vary**
 - **Chat is positioned to participate in a SOA Enterprise**

Transition Is Important {otherwise good ideas die}

The screenshot displays a complex software interface for military planning and analysis. At the top, a green bar reads "UNCLASSIFIED". Below it, a purple bar contains the word "Campaign". The main interface is divided into several sections:

- Map:** A central map of the Pacific region showing various military units and assets. A red line is drawn across the map, and several red arrows point to specific locations. The map includes a toolbar with options like "Map", "Brighter", "Darker", "Zoom In", "Zoom Out", "Background", "Layers", "Entities", "Geographic", and "Activit".
- Common Plan:** A section below the map showing a network diagram. It includes a toolbar with "Zoom", "Zoom In", "Zoom Out", "Fit", "Level", "NSO", "NMO", "CINC", "CJTF", "JFACC", "Air Tasks", "Activities", and "Feasibi". The network diagram shows connections between various entities, with labels like "CINC...", "CJTF...", "JFACC...", and "Air...".
- Left Panel:** A vertical sidebar containing a list of personnel with their names and photos: "Cmdr. Miller", "Lt. Cmdr. Hays", "Lt. Cmdr. Johnson", "Lt. Cmdr. Wallace", "Lt. Whitman", and "Peter". Above this list is a chat window with the text: "Lt. Cmdr. Kim joined conference. Cmdr. Miller says bring me the head of El Ni-no".
- Right Panel:** A vertical sidebar with a "Common Reso" header and a list of options: "Alerts", "Info Need", "Obj Edit", "O/SA", "Priority", and "Analysis".

At the bottom of the interface, a green bar reads "UNCLASSIFIED". The bottom-left corner shows a status bar with the text: "Lt. Cmdr. Wallace joined the context. Logged on as whitman".



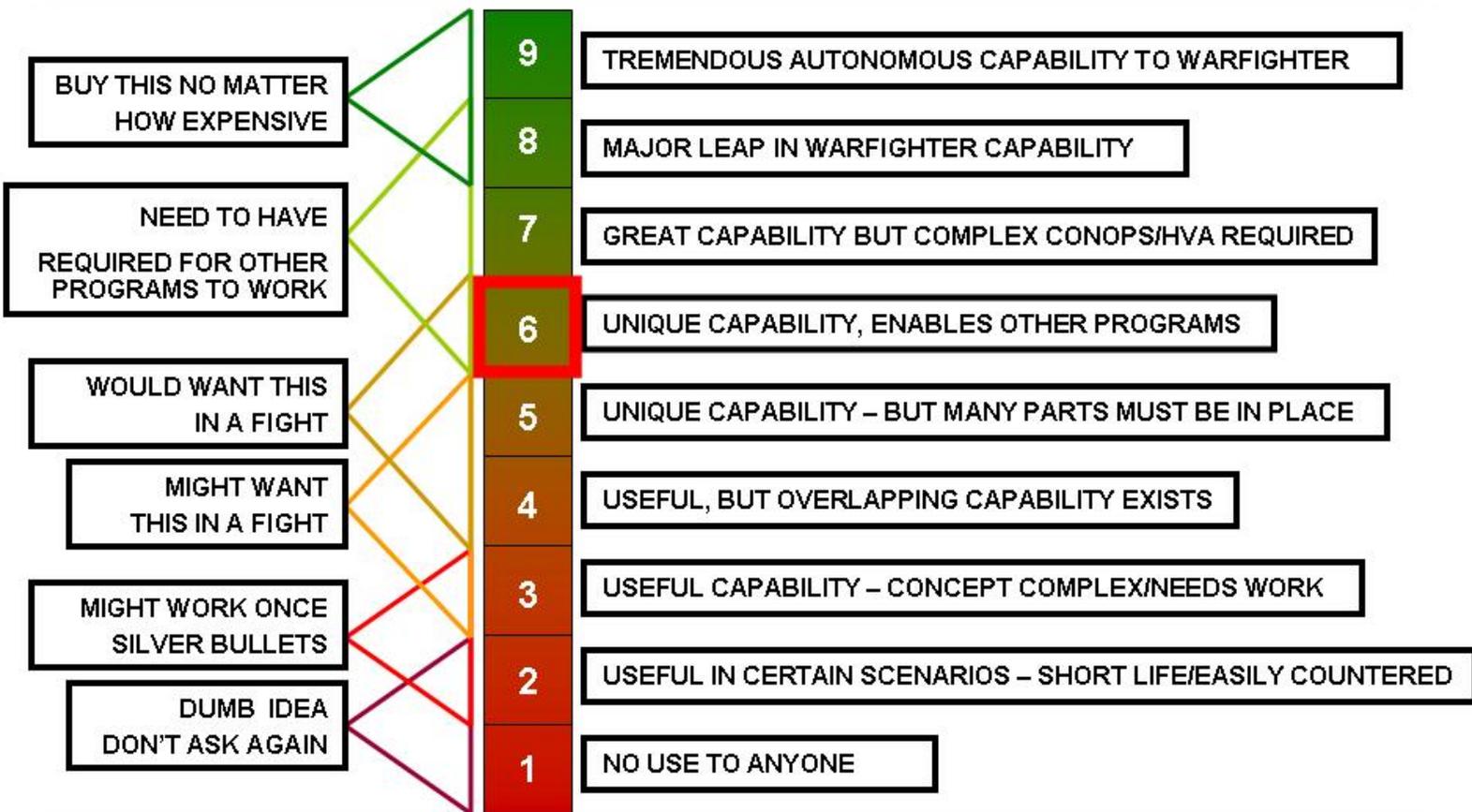
Transition



CDO DA - Operational Value (A3)

U.S. AIR FORCE

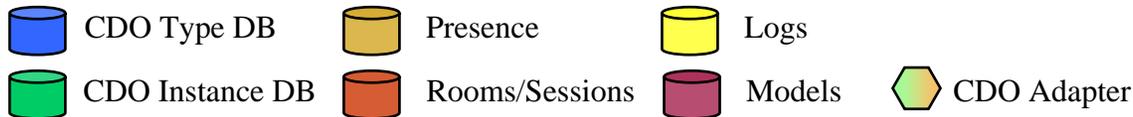
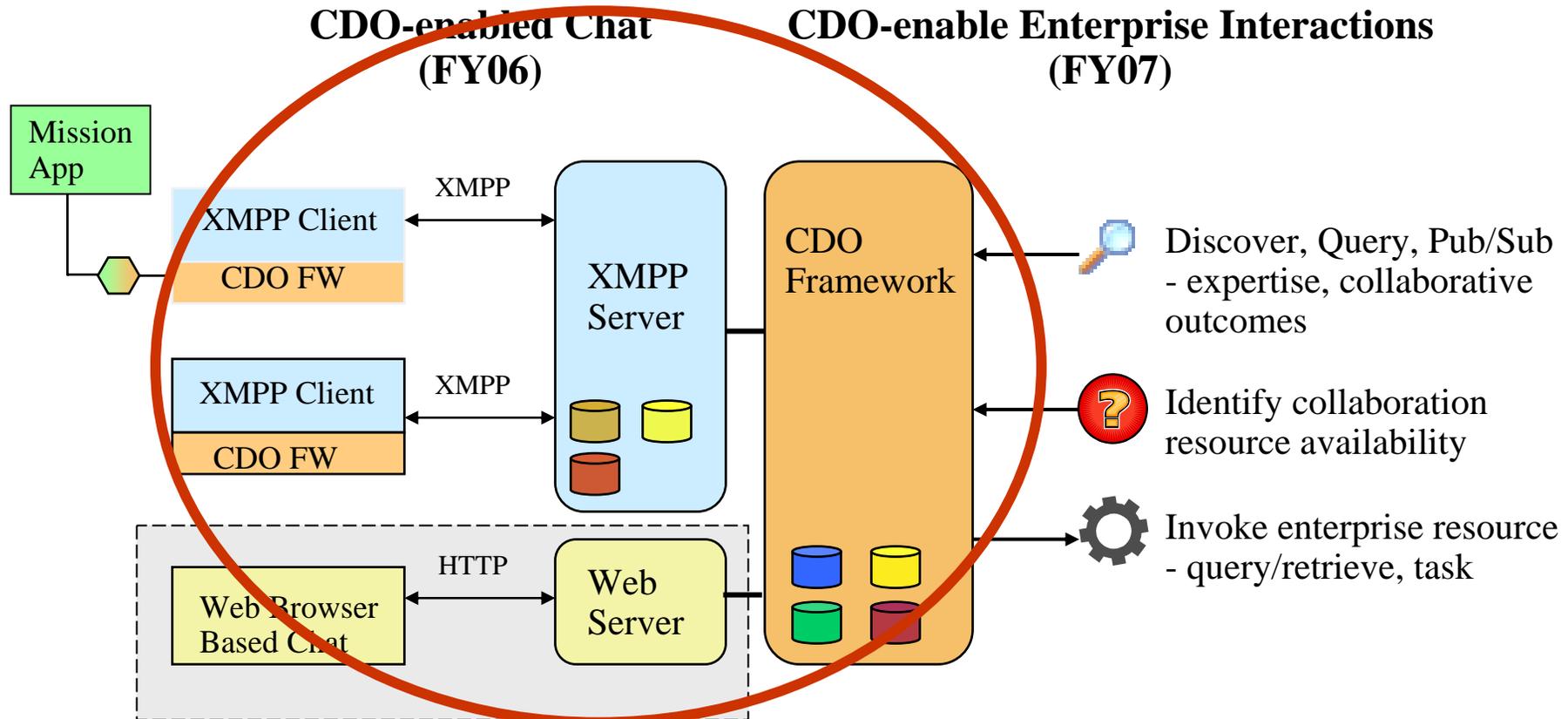
Tasks ▾



software has
s ©2007 The

Collaborative Data Objects

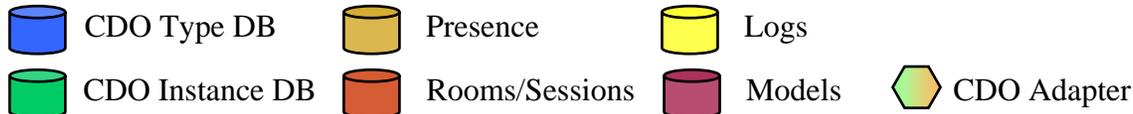
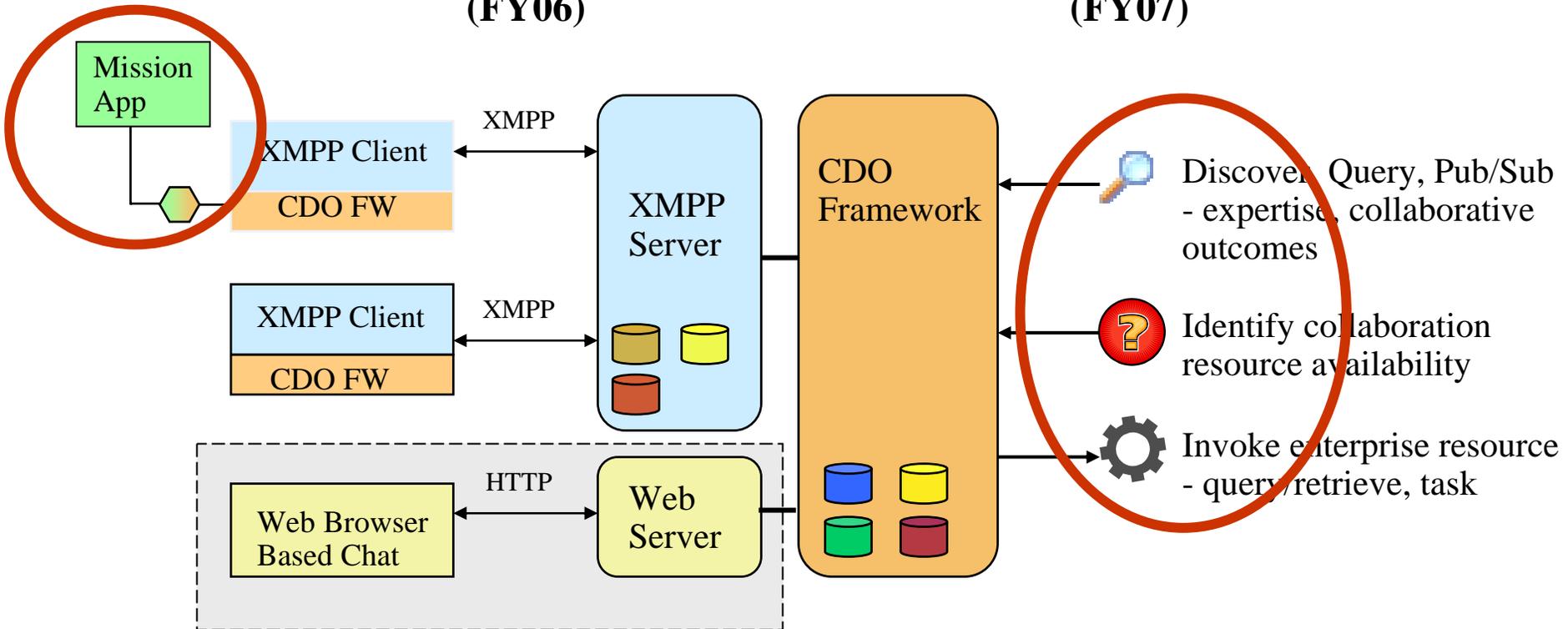
XMPP Vendor Transition Opportunities



Collaborative Data Objects System Integrator Opportunities

CDO-enabled Chat (FY06)

CDO-enable Enterprise Interactions (FY07)

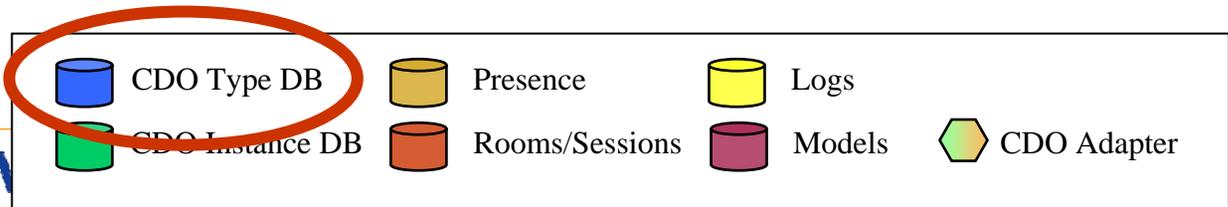
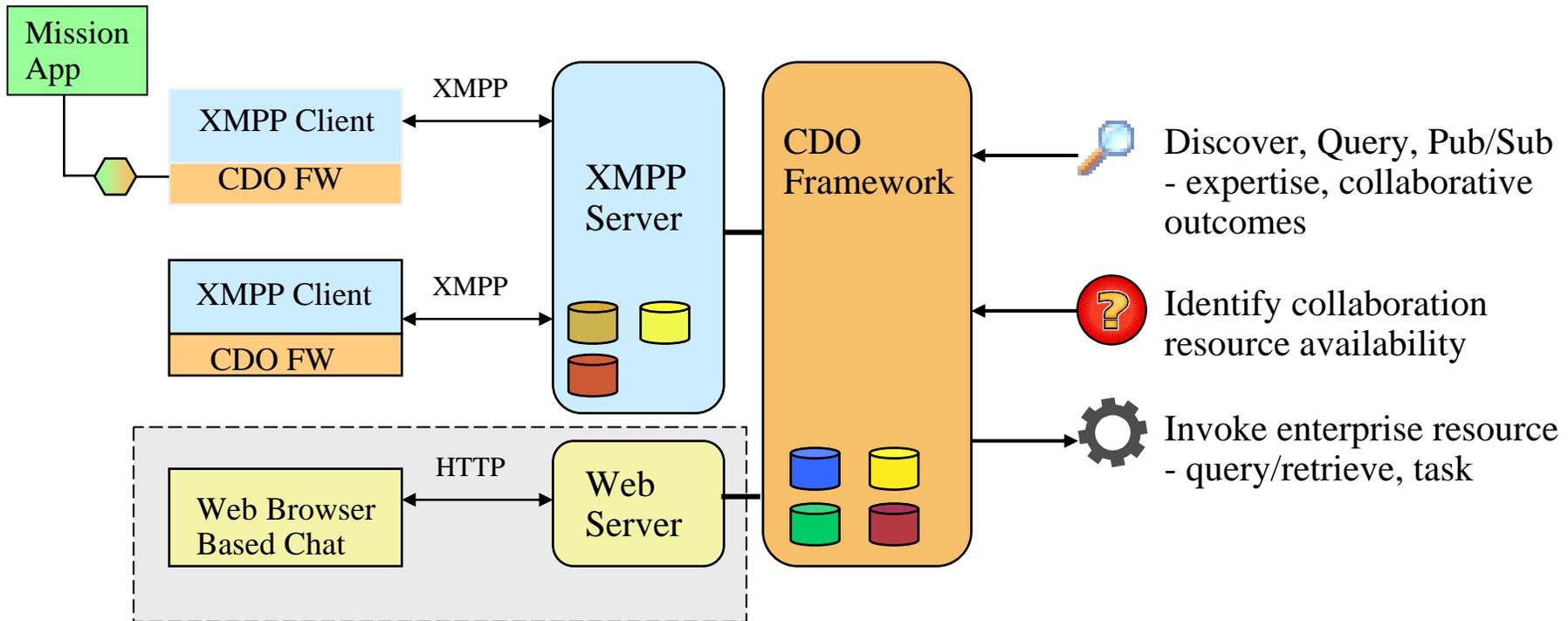


Collaborative Data Objects

End User Responsibilities

CDO-enabled Chat (FY06)

CDO-enable Enterprise Interactions (FY07)



Collaborative Data Objects: Summary

In a nutshell, a Collaborative Data Object (CDO) is a(n)...

way to reduce the ambiguity of chat through an increase of structure, data quality and fidelity
- follows the OHIO principle: Only Handle Information Once

basis for enterprise discovery of collaboration state, outcomes, expertise, availability, ...

invocation point to access enterprise/application functionality



way to record decision making/coordination outcomes during collaboration

context for agent participation during collaboration

means for applications and the enterprise to inject structured data into the collaborative process and receive structured data in return

The End
(of the presentation)

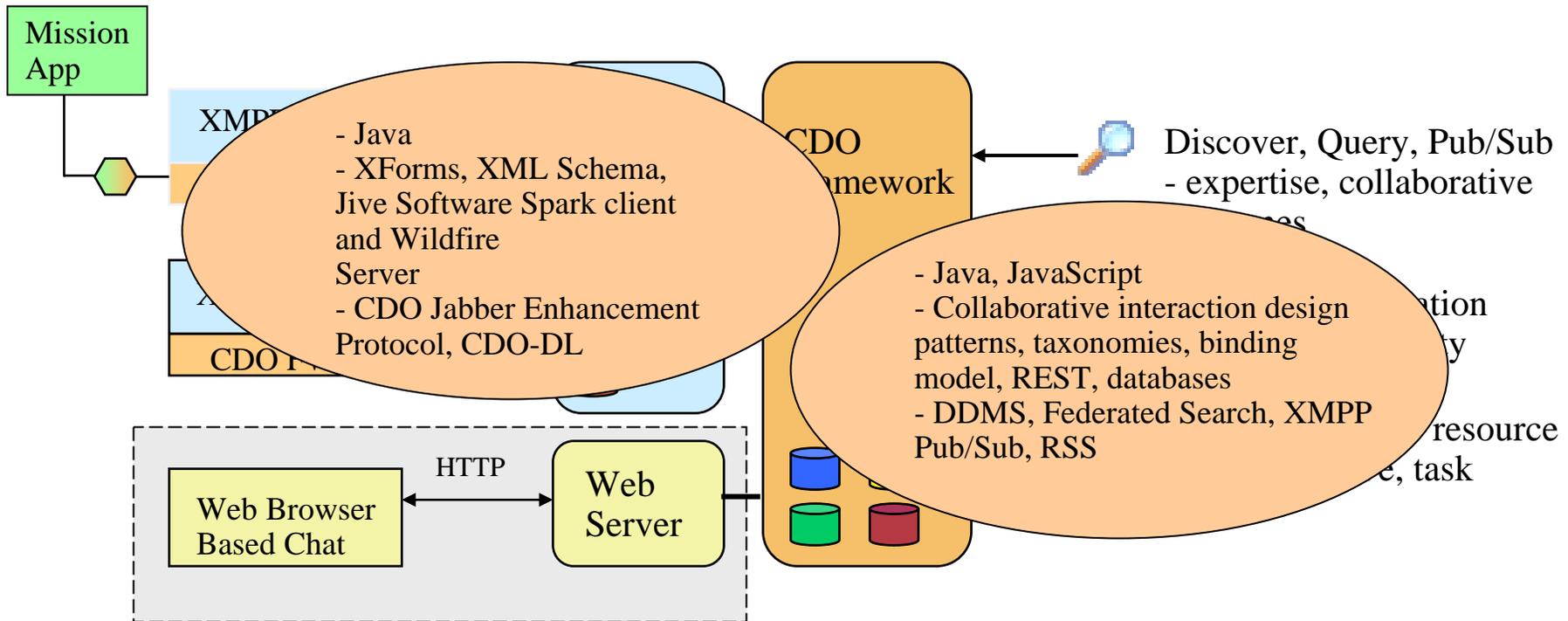
Backups

- **Technology Overview**
- **Interaction Patterns**
- **Accomplishments Summary**

Collaborative Data Objects (Technology)

CDO-enabled Chat (FY06)

CDO-enable Enterprise Interactions (FY07)



CDO Method Interaction Patterns

■ UI Input Patterns

- Menu visibility when parameter preconditions met
- Parameter prompt
- Method call or cache access

■ Result Types

- Content Reference : URL, CDO
- Discrete Primitive XSD: Simple Type
- List
- Tree
- Complex type
 - Binary (mime-type handling)
 - Structured data

■ UI Output Patterns

- Browser Display of URL
- Screen Echo
- Confirm/view dialog
- List selection (single, multiple)
- Tree navigate, select leaf
- Tree navigate, select branch
- CDO reference

■ Routing Patterns

- Transform
- Transmit - send to chat as text
- Negotiated method refinement
- CDO item update/create/delete
- Store locally to named cache
 - ID
 - methodID
 - CDO ID
 - Timestamp

■ Method Invocation Patterns

- Discover properties of identifiable resource
 - E.g. conference rooms in a facility
- Range restriction
 - Where, When (P-Cot example)
- Property value retrieval
- Property value set

Accomplishments

- Designed the CDO IM architecture and framework
- Description language to define CDO Types

```
<cdo:Definition>  
  <Metadata> label, version, description </Metadata>  
  <Schema> W3C XML schema for the CDO </Schema>  
  <Methods> Actions that can be invoke on a CDO </Methods>  
  <Layouts> W3C XForms component description </Layouts>  
</cdo:Definition>
```

- Published CDO XMPP Extension Protocol (XEP-0204)
- Enabled Net-Centric query of CDO augmented chat spaces
- Developed Chat/Enterprise interaction models
- Posted and open sourced a reference implementation
- Evaluated effectiveness through operator forums