Collaborative Data Objects

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Mission Oriented Investigation Experimentation

This material was prepared under the FY07 Air Force MOIE Program. Approved for Public Release; Distribution Unlimited. 07-0974
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 as part of chat
- A natural data bridge between applications and chat
- A context for invoking actions (bots, web services, mission apps) that support collaborative tasks and decision making
- A foundation for enriched semantics that support conversational understanding, both by humans and applications (agents/bots)

"My criteria for automation tools is, if you cannot learn it in 30 minutes, it's the wrong tool ... If it does not mimic something that soldiers grew up learning, it is the wrong tool."
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

Chat conversation interspersed with links to structured (CDO) data
Collaborative Data Object Type Definition Template

```
<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>
```

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

![Image of CDO XForm](image_url)
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

- Number of rooms that can need to be actively monitored can be reduced

- Data previously locked up in chat is now available anywhere, anytime

Developed Middleware to advertise and publish CDO-enabled collaborative products

- Demonstrated by: advertisements using DDMS and subscriptions by RSS & COP

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

- Texas Area Subscription for CDOs Delivered to Google Earth (COP)

- DDMS subscription of CDOs meeting a specific geographical criteria (Texas) - subscription delivered to KML adapter for plotting onto Google Earth
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**

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.

The service returns a KML URL which launches the Google Earth application to display the identified First Responders.

Faster collaboration and self-synchronization possible.
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.
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}
Transition

CDO DA - Operational Value (A3)

BUY THIS NO MATTER HOW EXPENSIVE

1. DUMB IDEA
2. USEFUL IN CERTAIN SCENARIOS - SHORT LIFE/EASILY COUNTERED
3. USEFUL CAPABILITY - CONCEPT COMPLEX/NEEDS WORK
4. USEFUL, BUT OVERLAPPING CAPABILITY EXISTS
5. UNIQUE CAPABILITY - BUT MANY PARTS MUST BE IN PLACE
6. UNIQUE CAPABILITY, ENABLES OTHER PROGRAMS
7. GREAT CAPABILITY BUT COMPLEX CONOPS/HVA REQUIRED
8. MAJOR LEAP IN WARFIGHTER CAPABILITY
9. TREMENDOUS AUTONOMOUS CAPABILITY TO WARFIGHTER

NEED TO HAVE REQUIRED FOR OTHER PROGRAMS TO WORK

WOULD WANT THIS IN A FIGHT

MIGHT WANT THIS IN A FIGHT

MIGHT WORK ONCE SILVER BULLETS

software has ©2007 The
Collaborative Data Objects
XMPP Vendor Transition Opportunities

CDO-enabled Chat (FY06)
XMPP Client
XMPP Server
XMPP

CDO-enable Enterprise Interactions (FY07)
XMPP Server
CDO Framework
XMPP

Mission App

XMPP Client
CDO FW
XMPP Client
CDO FW

Web Browser Based Chat
Web Server
HTTP

Discover, Query, Pub/Sub - expertise, collaborative outcomes
Identify collaboration resource availability
Invoke enterprise resource - query/retrieve, task

CDO Type DB
Presence
Logs
CDO Instance DB
Rooms/Sessions
Models
CDO Adapter
Collaborative Data Objects
System Integrator Opportunities

CDO-enabled Chat (FY06)
- Mission App
- XMPP Client
- CDO FW
- XMPP Server
- Web Browser Based Chat
- HTTP

CDO-enable Enterprise Interactions (FY07)
- CDO Framework
- Discover, Query, Pub/Sub - expertise, collaborative outcomes
- Identify collaboration resource availability
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Icons:
- CDO Type DB
- Presence
- Logs
- CDO Instance DB
- Rooms/Sessions
- Models
- CDO Adapter

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Collaborative Data Objects
End User Responsibilities

CDO-enabled Chat (FY06)
- XMPP Client
- CDO FW
- Web Browser Based Chat
- Mission App

XMPP Server
- CDO Framework
- Web Server

CDO-enable Enterprise Interactions (FY07)
- Presence
- Logs
- Models
- CDO Adapter

- Discover, Query, Pub/Sub - expertise, collaborative outcomes
- Identify collaboration resource availability
- Invoke enterprise resource - query/retrieve, task

CDO Type DB
CDO Instance DB
Presence
Rooms/Sessions
Models
CDO Adapter
Collaborative Data Objects: Summary

In a nutshell, a Collaborative Data Object (CDO) is a(n)...
The End
(of the presentation)
Backups

- Technology Overview
- Interaction Patterns
- Accomplishments Summary
Collaborative Data Objects (Technology)

CDO-enabled Chat (FY06)
- Java
- XForms, XML Schema, Jive Software Spark client and Wildfire Server
- CDO Jabber Enhancement Protocol, CDO-DL

CDO-enable Enterprise Interactions (FY07)
- Java, JavaScript
- Collaborative interaction design patterns, taxonomies, binding model, REST, databases
- DDMS, Federated Search, XMPP Pub/Sub, RSS

Web Browser Based Chat

Discover, Query, Pub/Sub
- expertise, collaborative

CDO Framework

Mission App

XMPP

CDO Type DB
CDO Instance DB
Presence
Rooms/Sessions
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CDO Adapter

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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

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  <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