User Defined Operational Pictures for Tailored Situation Awareness

Sandeep Mulgund, Ph.D.
Seth Landsman, Ph.D.
{smulgund, landsman}@mitre.org
The MITRE Corporation
Bedford, MA 01730

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Overview

- The Common Operational Picture

- Towards the User Defined Operational Picture
  - Architectural concept
  - Content pipeline for delivery of user-specified data
  - Document model for representation of composite subscriptions
  - Client application

- Summary and Current Work
Objective

- Define an architecture that makes it possible to create, visualize, and share tailored views of the operational environment
- Transform vast amounts of raw data into a decision-focused narrative of the battlespace that supports key functions of C2
  - Establish and understand command intent
  - Determine roles, responsibilities, and relationships
  - Establish rules and constraints
  - Monitor and assess the situation and progress against goals
  - Provision resources
- UDOP architecture defines processes and net-centric architectural models for defining, visualizing, and sharing battlespace views
What is a “Picture” of the Battlespace?

- **Common Operational Picture**
  - Force disposition and amplifying data from each tactical picture is combined with additional information produced by each COCOM CDR (CDR’s intent, plans, projections, overlays, etc.) at one location

- **Common Tactical Picture**
  - Current, anticipated, projected, and planned disposition of hostile, neutral, and friendly forces (including amplifying information such as JOPES, METOC, ATO, Intel, etc.) for a single operation
  - In turn, built from individual data assets

- COP embeds two key concepts: a common picture of the battlespace at a combatant commander’s viewpoint
  - Amplifies real-time data with plans, intent, and annotations

**Emphasis on information, not visualization**
# SA Perspectives across C2 Echelons

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<tr>
<th>POTUS/SECDEF/ CJCS</th>
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<tr>
<td>• Assess achievement of national strategic objectives</td>
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<td>• Anticipate and assess U.S. public support and world response</td>
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<th>COCOM C2</th>
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<td>• Maintain COCOM-level C2 SA</td>
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<td>• Brief national leadership</td>
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<td>• Translate national leadership guidance into Command Intent</td>
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<td>• Combine individual tactical pictures with amplifying information produced by CDR (Command Intent, plans, projections, etc.) to produce AOR-level view</td>
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<th>Theater C2</th>
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<td>• Develop mission-focused pictures using systems of record</td>
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<td>• Develop and share COA analyses</td>
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<td>• Produce and share force status details</td>
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<tr>
<td>• Provide current, anticipated, and planned disposition of hostile, neutral, and friendly forces as well as amplifying information (JOPES, METOC, INTEL, etc.) for each operation</td>
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From COP to UDOP

- The common picture contains many constituent products, each of which varies in its relevance to different consumers
  - Considerable manual “sausage making” to push, meld, and exploit operational pictures
  - Process results in considerable amount of information flowing through C2 information systems when only a subset is actually needed

- Motivates consideration of user-defined pictures
  - Based on a common view but tailored to individual needs (content and depiction)
  - Users pull the information they want or specify it and have it pushed to them
  - Define the resultant picture as a sharable artifact
  - Enables creation of composite, shareable, customized information products
What makes a picture user-defined?

- User identifies what content to include or exclude from the picture
- User specifies how to depict selected content
- User annotates pictures, based on own domain knowledge and understanding, augmenting data provided by systems of record
- User tailors a given set of contents to address the needs of a particular C2 echelon
  - Theater commanders may want details on airspace configurations, ATOs, sensor characteristics
  - National leadership may be more interested in questions of likelihood of mission success, population centers within range, and world response
Contents of a UDOP are based on

- Information requirements (Commander’s Information Requirements)
- Available data products (streaming feeds and database records)
UDOP Architecture

- Core functional elements decomposed into a layered architecture
- Each layer is separated by a messaging interface
- Data sources are brought into the system through a data source adapter
  - Normalize filtering and access, not format
- Presentation service aggregates data for the client
- UDOP authoring services enable specification of composite “recipes”
- Clients interact with data only through the UDOP services, which present a uniform interface to available data sources
UDOP Document Model

- A UDOP is an XML document with an associated schema. The document contains:
  - Metadata
    - Authorship information
    - Creation and modification times
  - A set of UDOP items, each defining:
    - Metadata
    - Filter parameters
    - A URI to the data source adapter
- The document is “executed” by the UDOP services into data (either polled or event-driven)
UDOP Client

- Tree browser of available data sources
- Details on selected data source
- "Treetable" view of UDOP repository
- Details on currently selected UDOP
Summary

- UDOP is a net-centric architecture for creating tailored pictures of the battlespace
  - Specify what content to include or exclude from the picture
  - Specify how to depict selected content
  - Annotate pictures to add human insight to data provided by systems of record
  - Tailor a given set of contents to address the needs of a particular C2 echelon

- Net-centric prototype architecture realizes these capabilities and illustrates their use
  - The command center benefits from allowing operators to build operational pictures and share them with other operators and decision makers
  - Decision makers benefit from having real data available to them, instead of static PowerPoint
Current Work

- Ongoing work is focused on realizing and demonstrating UDOP vision in operational use
  - Focus on off-the-shelf clients
    - Google Earth
    - Web-based clients
    - Standard C2 tools such as Falconview, C2PC, etc.
  - Capture user expertise and user defined relationships on the data, including
    - Distillation: How data is filtered
    - Annotation: Graphical and textual markings on source data
    - Transformation: Data format translations
    - Aggregation: Combining multiple units (e.g., many aircraft into a squadron)
  - Other forms of visualization and exploitation
    - Timeline-based
    - Task-based