User Defined Operational Pictures for Tailored Situation Awareness

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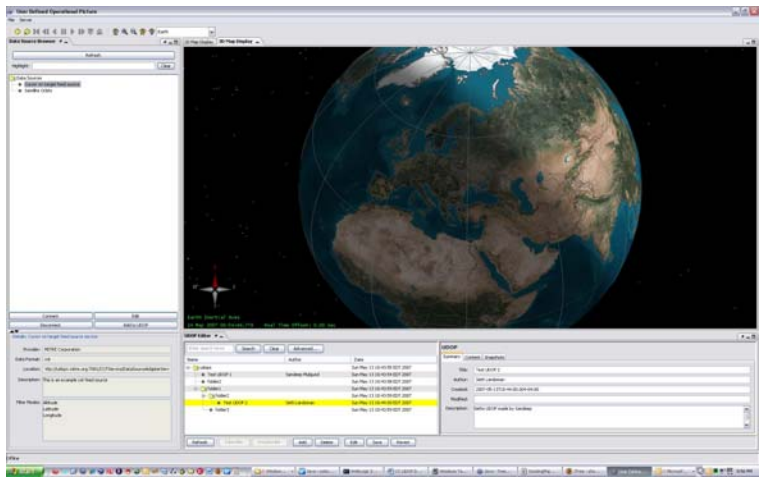


Overview

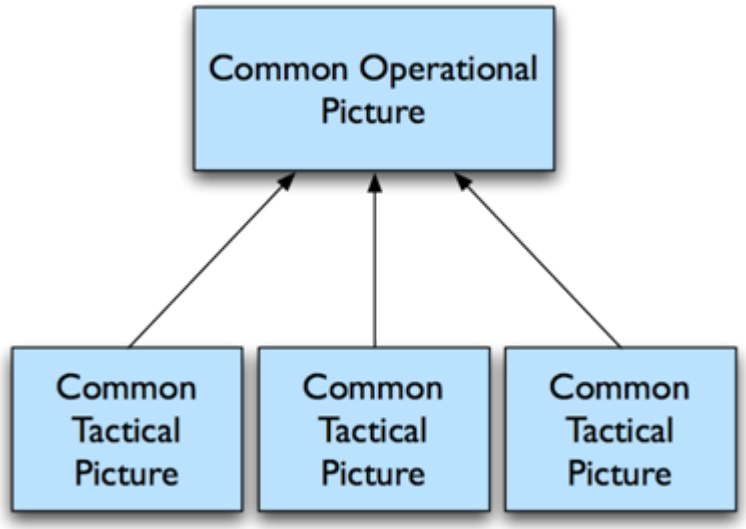
- The Common Operational Picture
- Towards the User Defined Operational Picture
  - Architectural concept
  - Content pipeline for delivery of user-specified data
  - Document model for representation of composite subscriptions
  - Client application
- Summary and Current Work

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

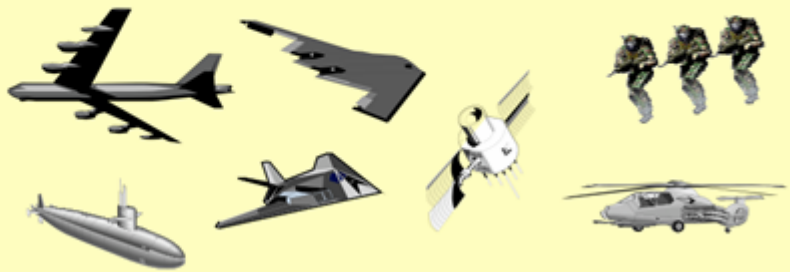
What is a "Picture" of the Battlespace?

- **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

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

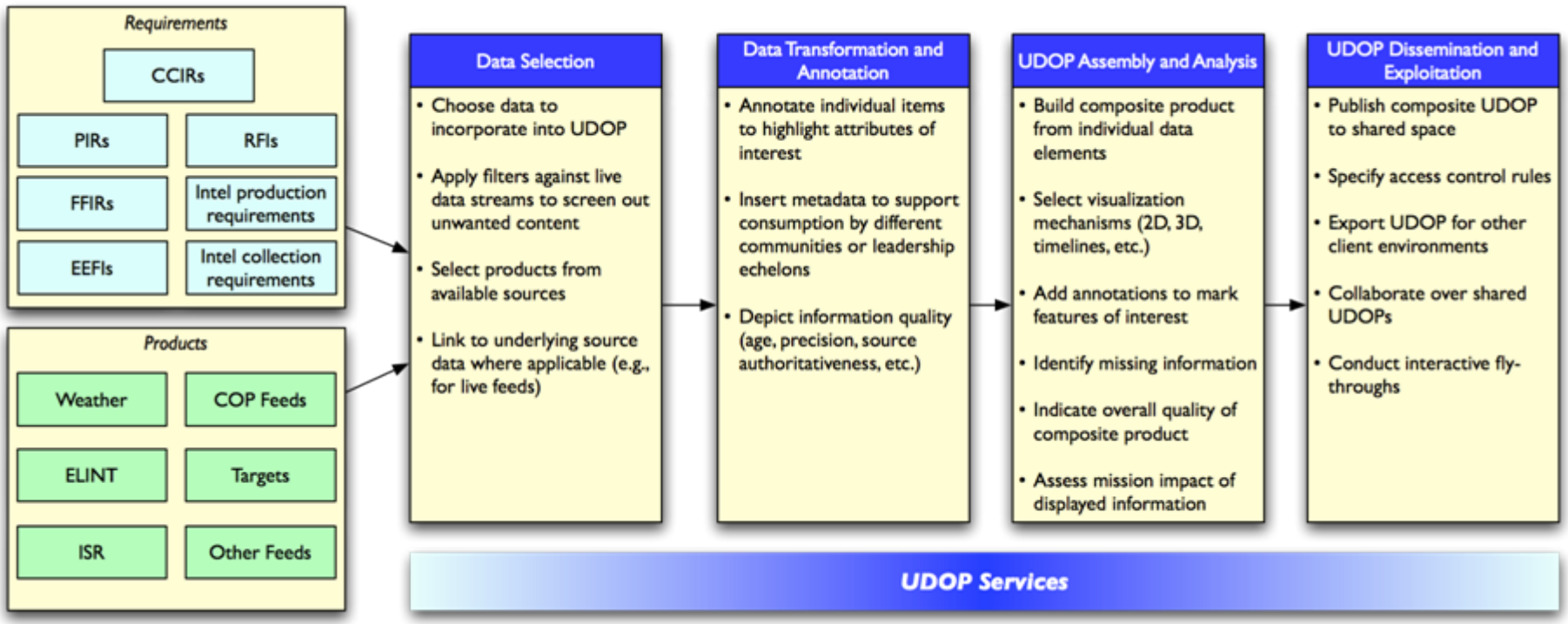
From COP to UDOP

- 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

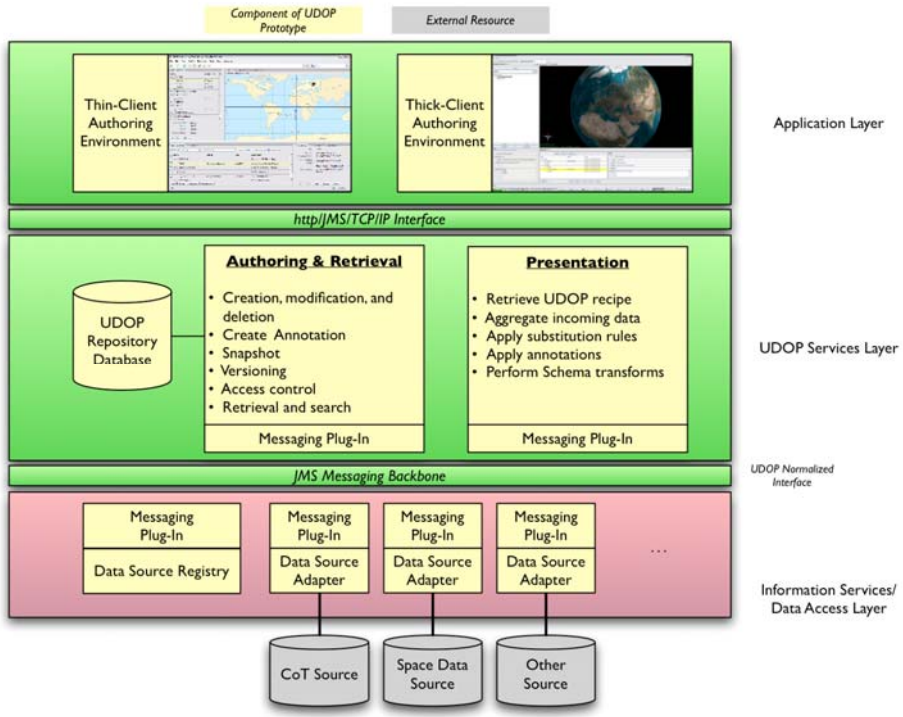
UDOP Pipeline



- Contents of a UDOP are based on
  - Information requirements (Commander's Information Requirements)
  - Available data products (streaming feeds and database records)

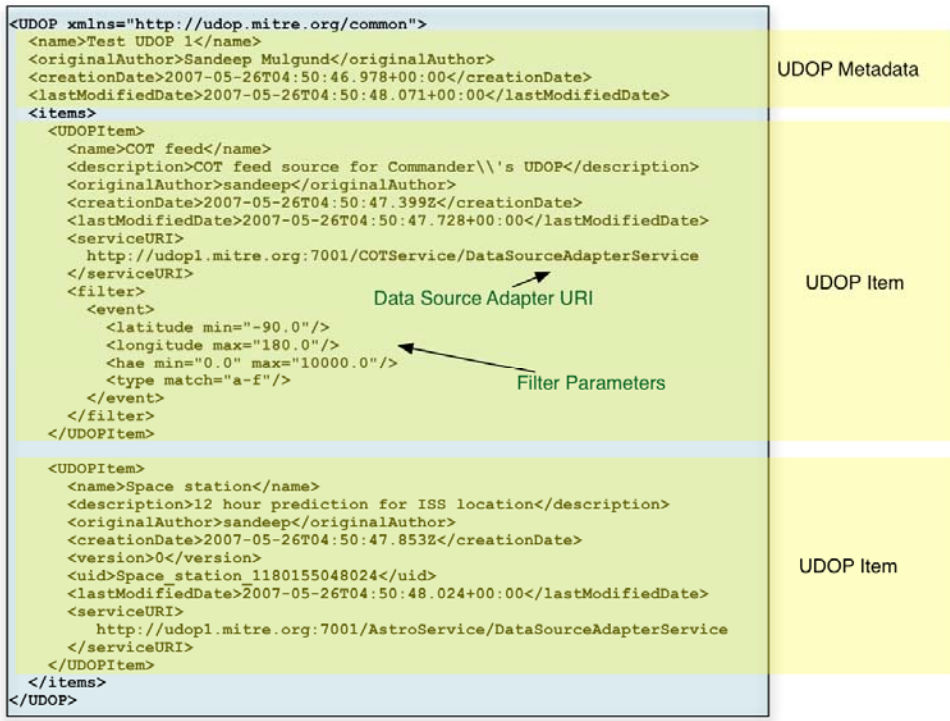
UDOP Architecture

- 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)

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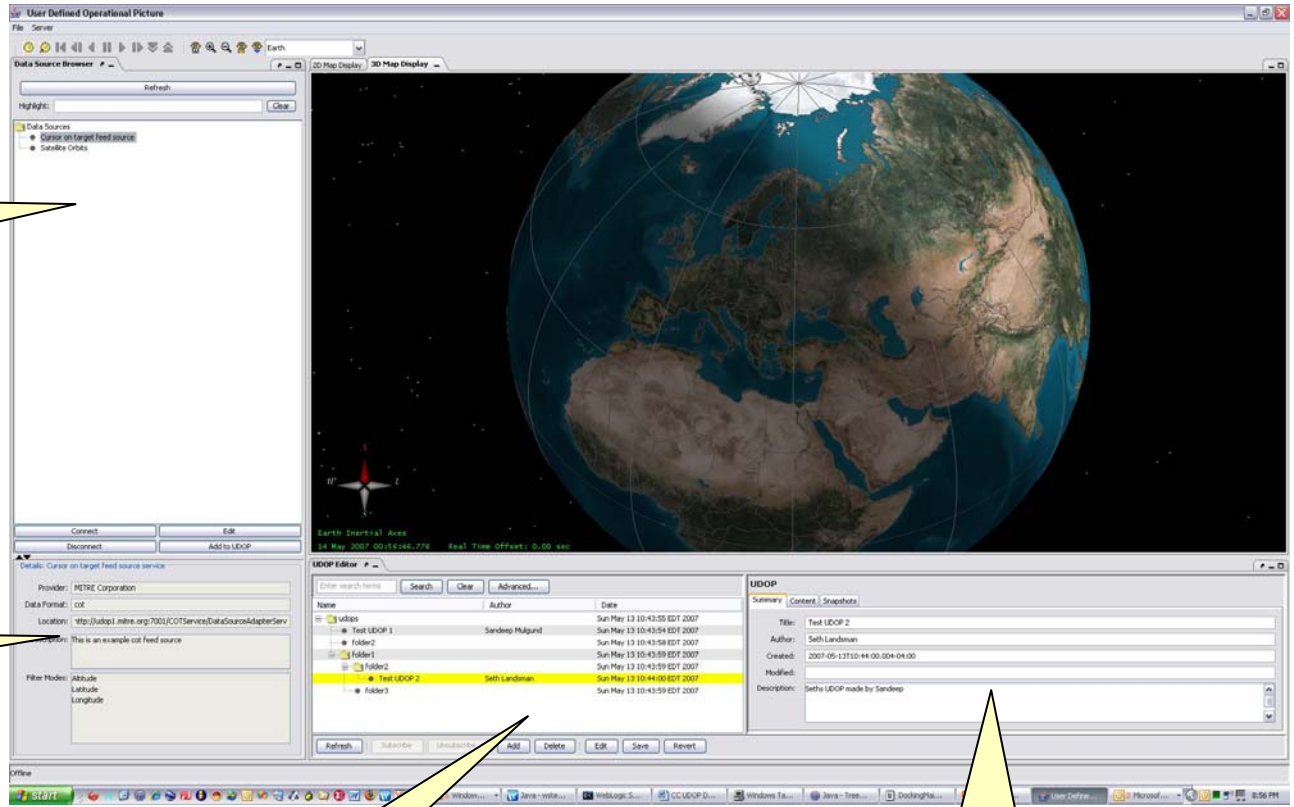
UDOP Client

Command & Control Center



Tree browser of available data sources

Details on selected data source

"Treetable" view of UDOP repository

Details on currently selected UDOP

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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