



# Net-Centric Collaboration and Situational Awareness with An Advanced User-Defined Operational Picture (UDOP)

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# Presentation Outline

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- User-Defined Operational Picture – Introduction
- Architecture & Key Concepts
- UDOP-Based Collaboration
- Enabling Technologies
- Summary and Road Ahead



# UDOP Introduction

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# What is a UDOP?

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- UDOP = User-Defined Operational Picture
- **Decision-focused view** of the operational environment that organizes **disparate data sources** to support accurate **situational awareness** (SA) and timely decision-making in a distributed **net-centric environment**
- Users must be able to:
  - **Create** UDOPs (identify content to be included/excluded for the picture)
  - **Visualize** UDOPs (specify how selected content should be presented)
  - **Augment** UDOPs (derive added-value based on domain knowledge)
  - **Tailor** UDOPs (adjust contents to address needs of user/echelon)
  - **Share** UDOPs (conduct rich collaboration in a net-centric enterprise)

# UDOP Template (aka Recipe)

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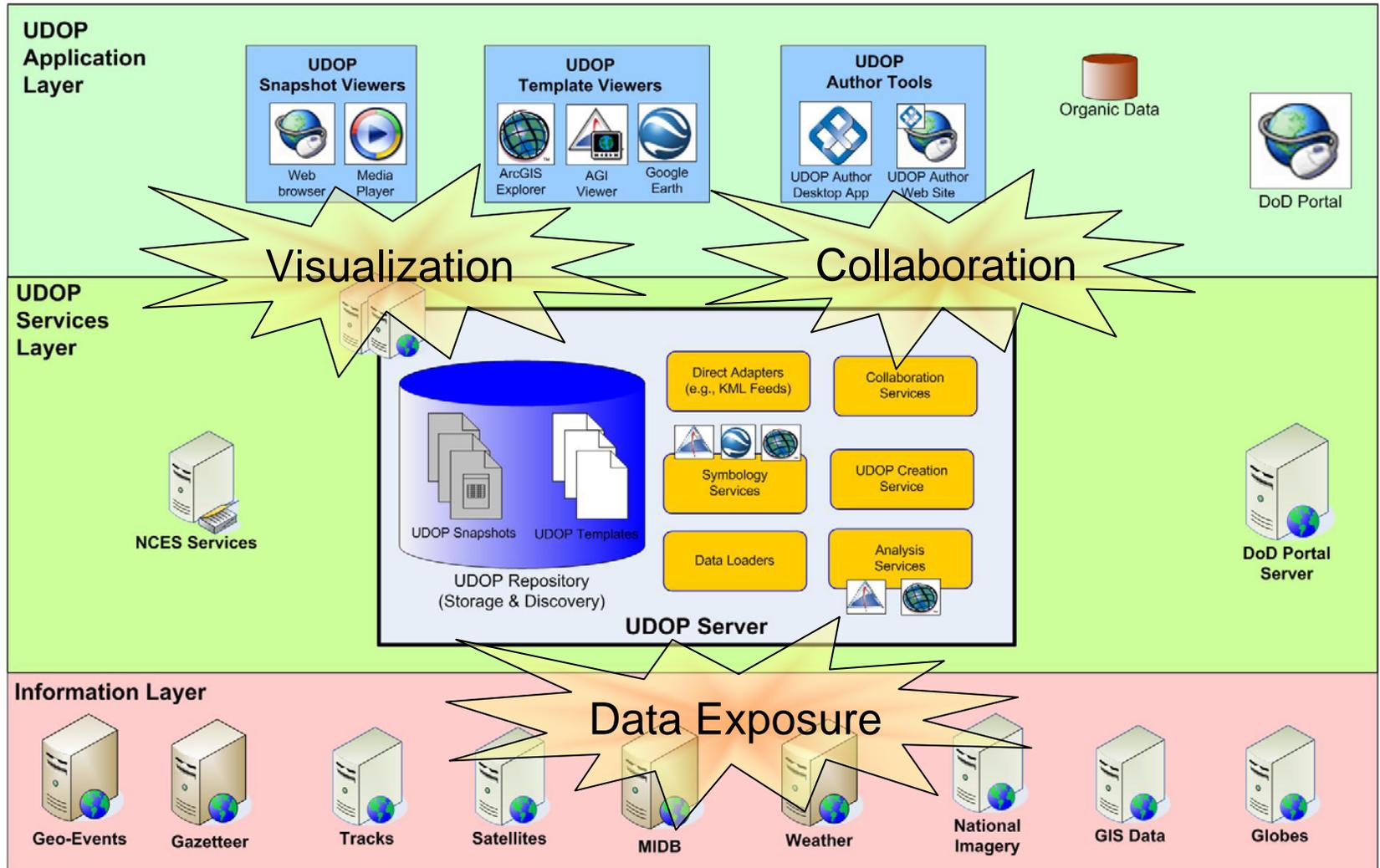
- A UDOP Template defines:
  - Base Data
  - Data Sources
  - Spatial Filters
  - Temporal Filters
  - Attribute Filters
  - Symbology
- UDOPs do not contain the data, they just refer to it
  - Contain references (URLs)
  - “Execution” of a UDOP will consume the data from the web services
- Different use cases
  - Standing vs. Ad-hoc
  - Various Time Frames
    - Planning
    - Monitoring
    - After-Action
- UDOPs can:
  - hierarchically feed other UDOPs
  - change during collaboration
  - be used in sequence during execution of a workflow



# Architecture & Key Concepts

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# Architecture



# UDOP Services

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- Creation
  - Assist author clients in creating/editing/tailoring UDOPs
  - Offer high-level automatic UDOP generation
- Visualization (Symbology & Rendering)
  - Enable centralized stylization and symbol generation
- Sharing (Storage & Discovery)
  - UDOP Repository stores UDOP Templates available for: browsing, previewing, loading, modifying
- Aggregation
  - Support server-side UDOP Aggregation
  - Provide transformation services for Data Source Aggregation
- Collaboration
  - Asynchronous via UDOP Repository
  - Synchronous via Peer-to-Peer mechanisms

# Peer-to-Peer Collaboration

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- Geo- and Time- enabled
- Core techniques
  - Whiteboard
  - Chat
  - Social networking
    - Presence
    - Rooms
    - Sessions
- UDOP-specific
  - Shared annotations
  - Shared templates
  - Shared organic data
  - Shared workflow
  - Dynamically linked views





# UDOP-Based Collaboration – Use Cases

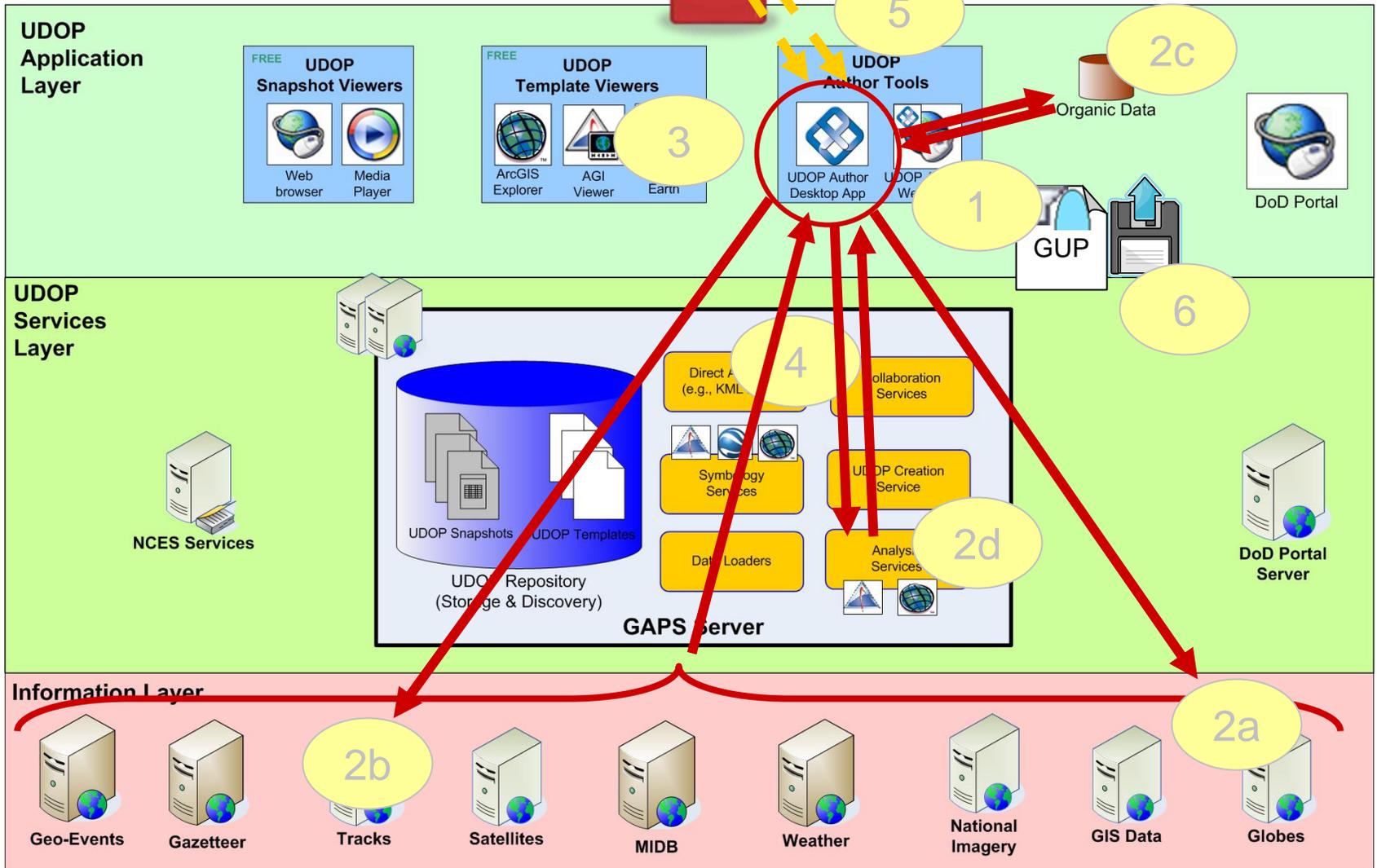
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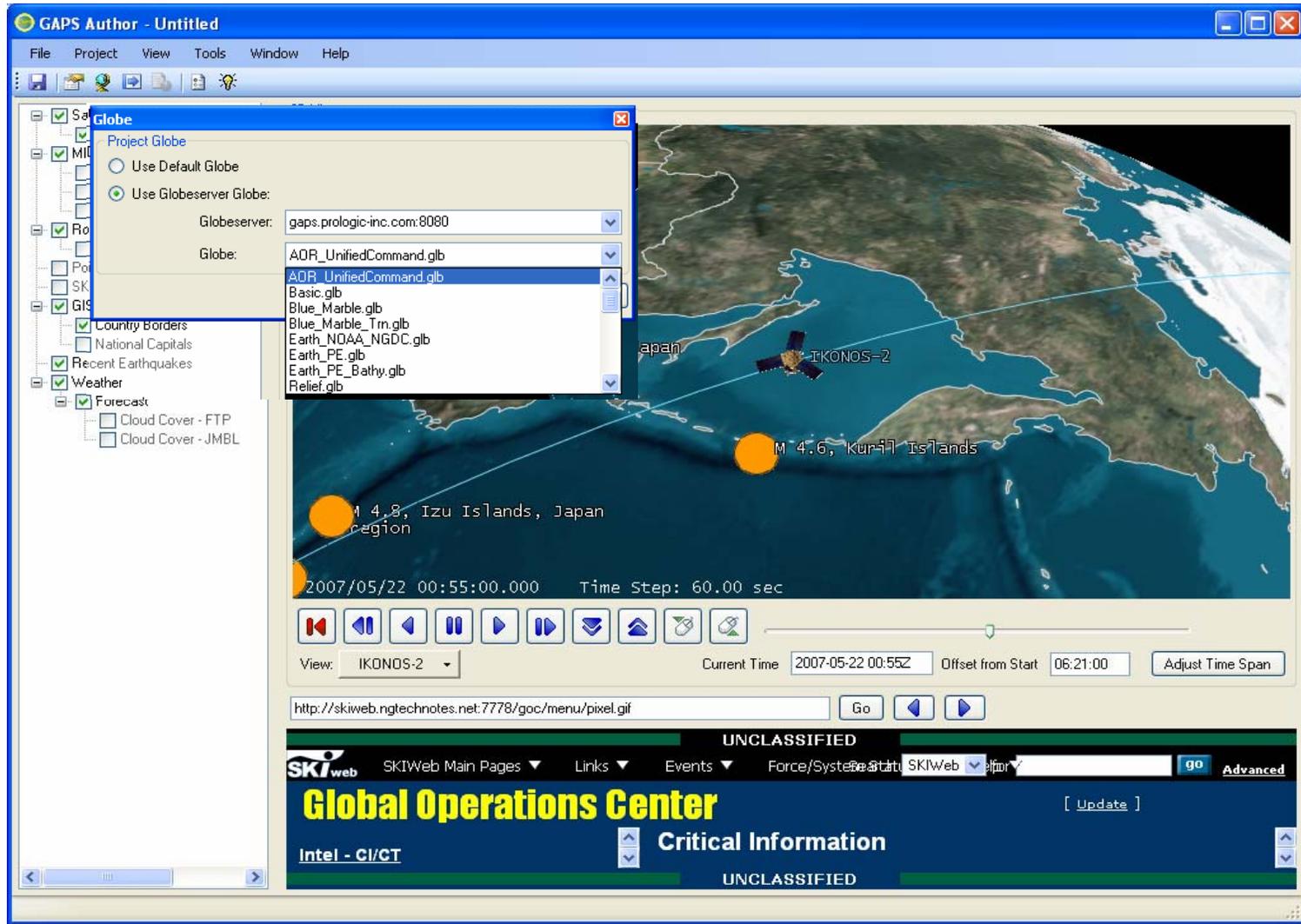
# Personal UDOP for SA

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1. Create new empty UDOP Template with Author App
2. Select Data Sources
  - a) Base Data (Maps & Imagery)
  - b) Data Services (SOAP, RSS, KML)
  - c) “Organic” Data (loaded from local files)
  - d) Value-Added Analysis Service (e.g. Weather Impacts)
3. Customize UDOP Template
  - a) Determine Appropriate Filters
  - b) Set Appropriate Symbology Options
4. Data Retrieval (Filtering, Transformation)
5. View Interactive UDOP with Author App 4D Display
6. Save UDOP Template

1. Create new empty UDOP Template with Author App



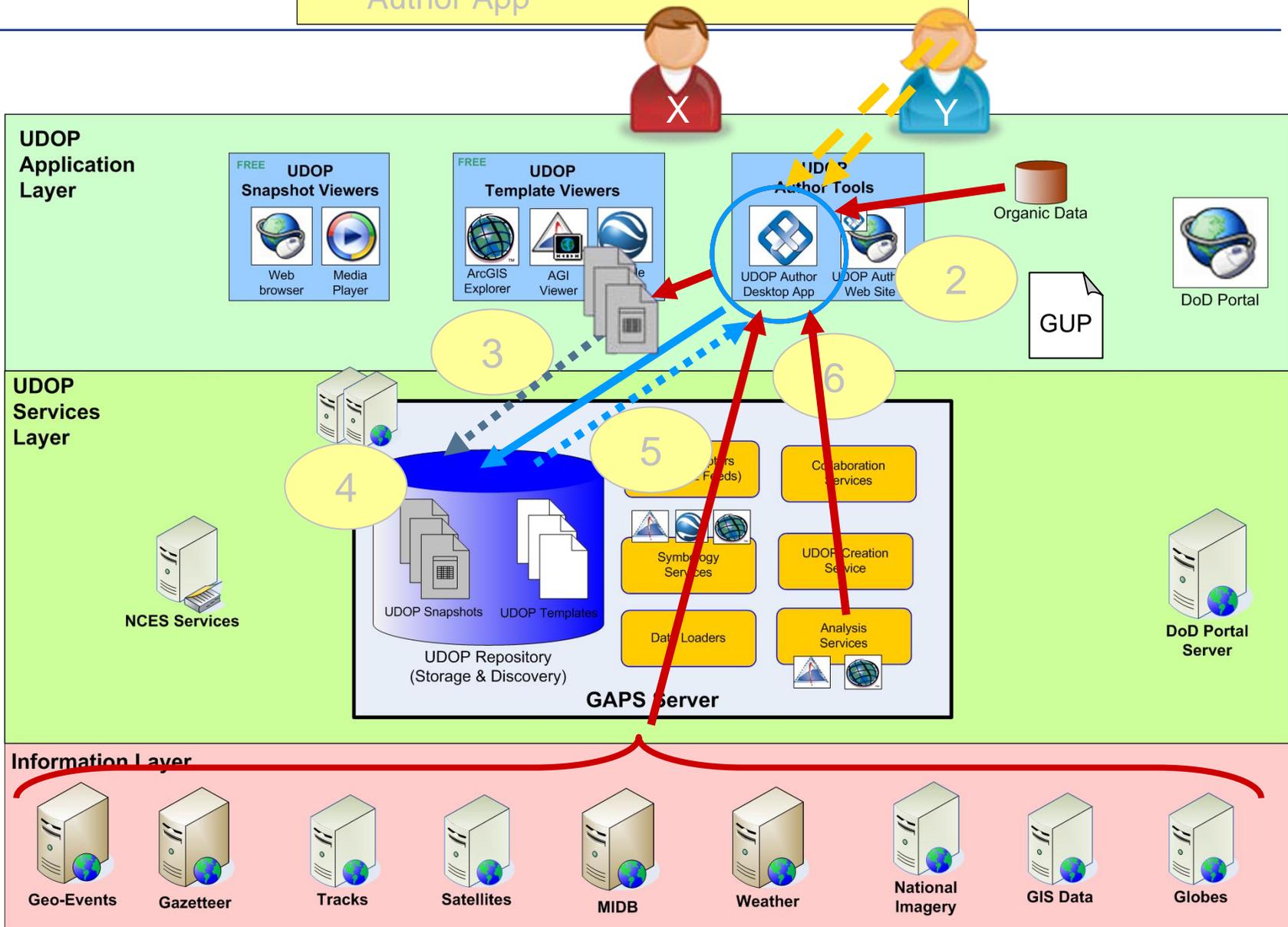


# Sharing UDOP Templates

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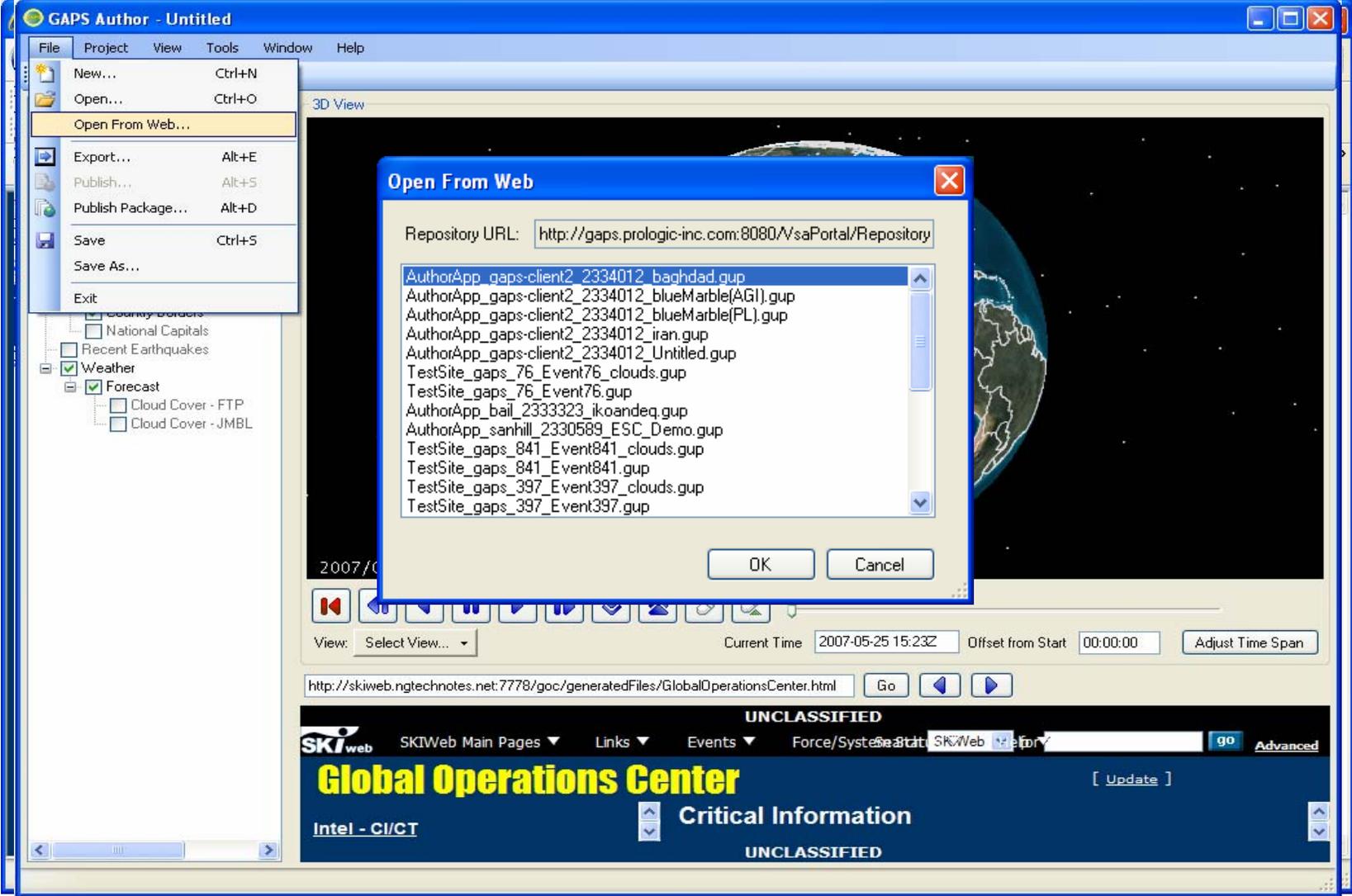
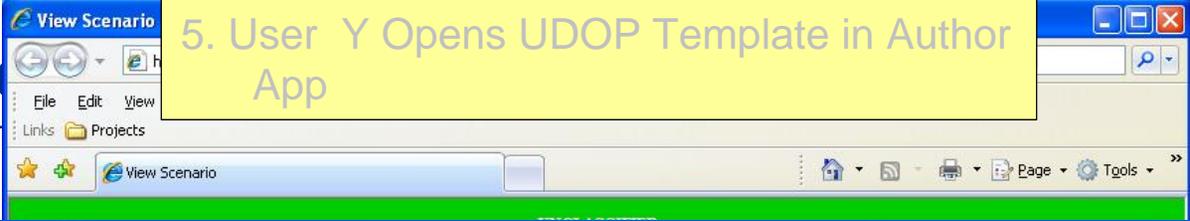
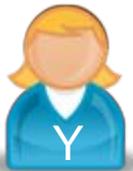
- User X Creates UDOP Template with Author App
- User X Generates UDOP Snapshots
- User X Publishes UDOP to Repository
  - Snapshots
  - Template
- User Y Browses Repository
  - Through Web Browser
  - From UDOP Author
  - Through Repository RSS Feed
- User Y Opens UDOP Template in Author App

# 1. User X Creates UDOP Template with Author App



# GAPS D

## 5. User Y Opens UDOP Template in Author App

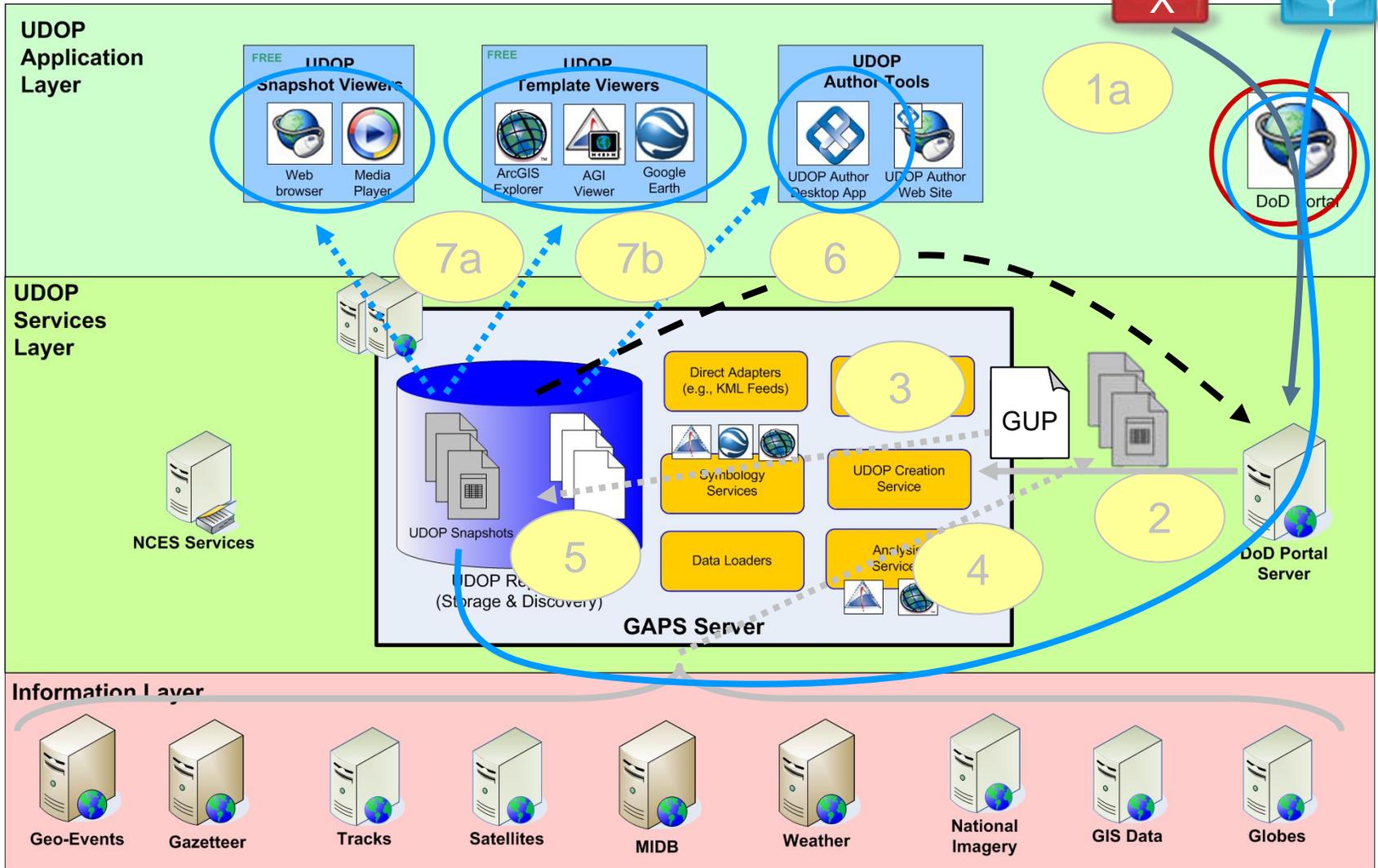
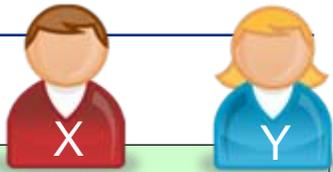


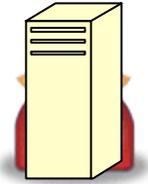
# Automatic M2M Generation

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1. DoD Portal Has New Geospatial Content
  - a) Due to Entry of new Event by User X
  - b) Due to Database Update
2. Portal Calls UDOP Creation Service with High-Level Request
3. Creation Service Creates a Detailed UDOP Template
4. Creation Service Generates UDOP Snapshots
5. UDOP Template and Snapshots are Published to Repository
6. Link to UDOP Sent Back to Calling Portal
7. User Y Reviews UDOP by Following Portal Link
  - a) Uses Snapshots
  - b) Opens Template

# 7b. User Y Reviews UDOP by Following Portal Link and Opening Template





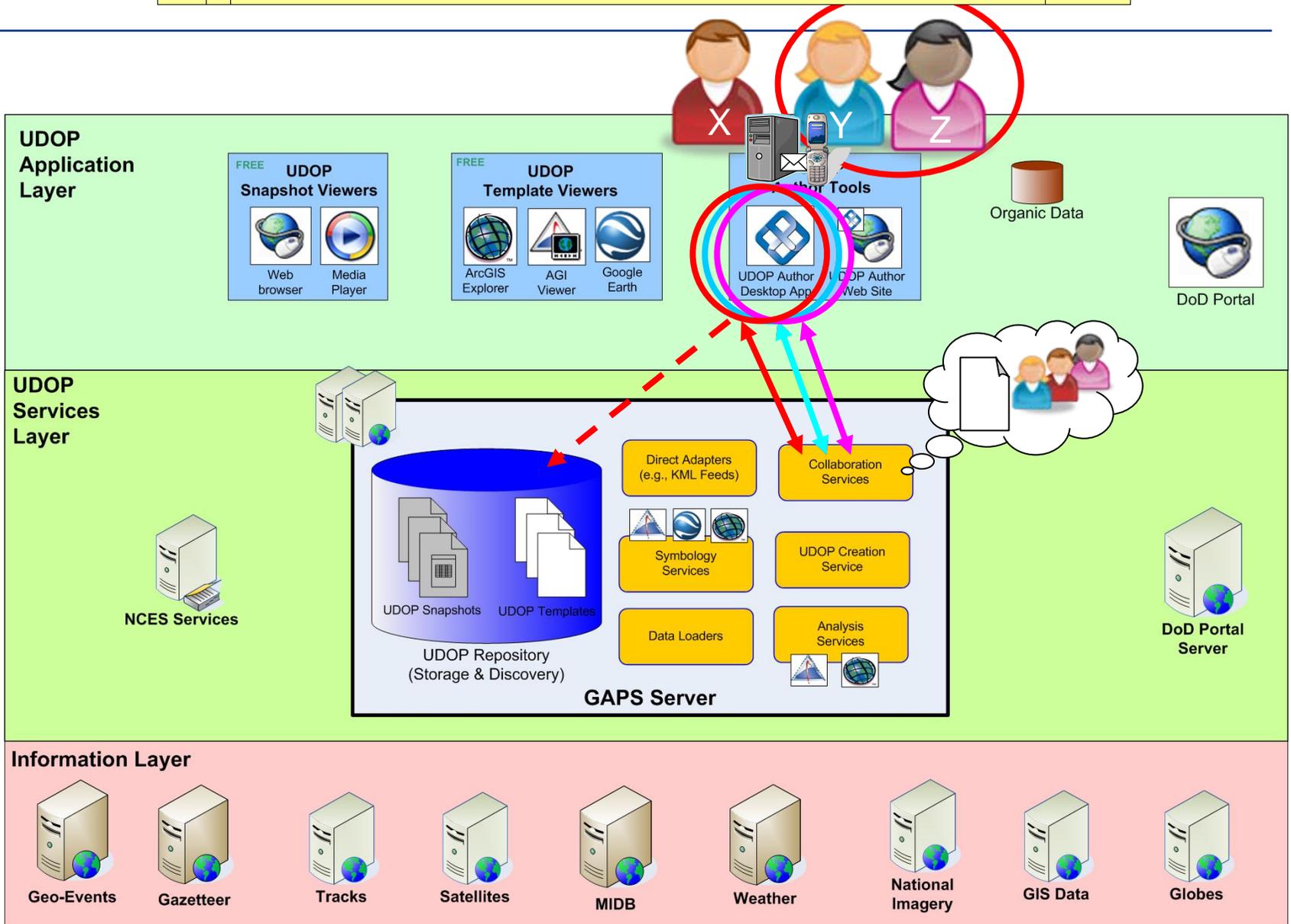
The screenshot displays the GAPS Author software interface. On the left, a sidebar lists layers:  Points of Interest,  Country Borders,  AFWA FTP\_GRIDWeather Layer, and  JMBL\_GRIDWeather Layer. A yellow box labeled "UDOP Creation Service" is overlaid on the sidebar. The main 3D view shows a satellite-style map of the Northeastern United States. A green dot on the map is labeled "Homecoming event, Summer Bash '07 scheduled June 22, 061547Z JUN 2007 Lexington, MA (Middlesex county)". Below the map is a timeline control with a slider and buttons for navigation. A red oval highlights the "Homecoming event, Summer Bash '07 scheduled June 22, 061547Z JUN 2007 Lexington, MA (Middlesex county)" text. Below the map, a news snippet is displayed with the title "Homecoming event, Summer Bash '07 scheduled June 22" and the author "(U) by J.C. Corcoran, 66th Air Base Wing Public Affairs". A red oval highlights the author information. The news snippet also includes a date "6/1/2007 - Hanscom AFB -- After the excitement and busyness of the Operational Readiness Inspection subsides," and the classification "(UNCLASSIFIED)".

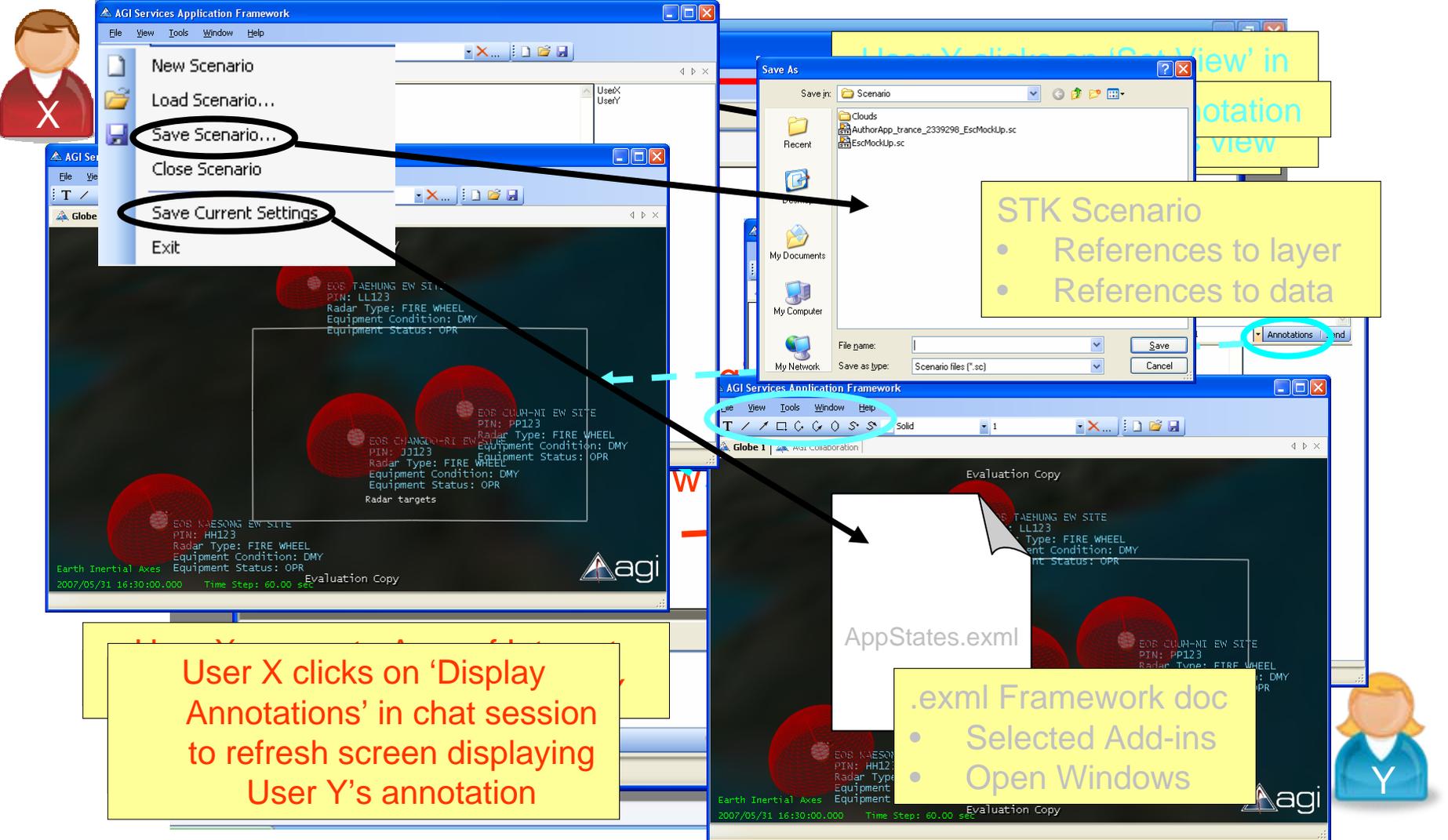
# Peer-to-Peer Collaboration

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1. User X Opens Application
2. User X Initiates a Collaboration Session
3. User X Invites Users Y and Z (via phone, email, external chat)
4. Users Y and Z Open Application and Join Session
5. User X, Y, and Z Collaborate
  - a. Text Chat
  - b. Share Data
  - c. Share Views
  - d. Shared Annotations
  - e. Shared Whiteboard
6. Optionally, Users Archive the Collaboration Session

3. 4 6. Optionally, Users Archive the Collaboration Session (that)





User X clicks on 'Display Annotations' in chat session to refresh screen displaying User Y's annotation

STK Scenario

- References to layer
- References to data

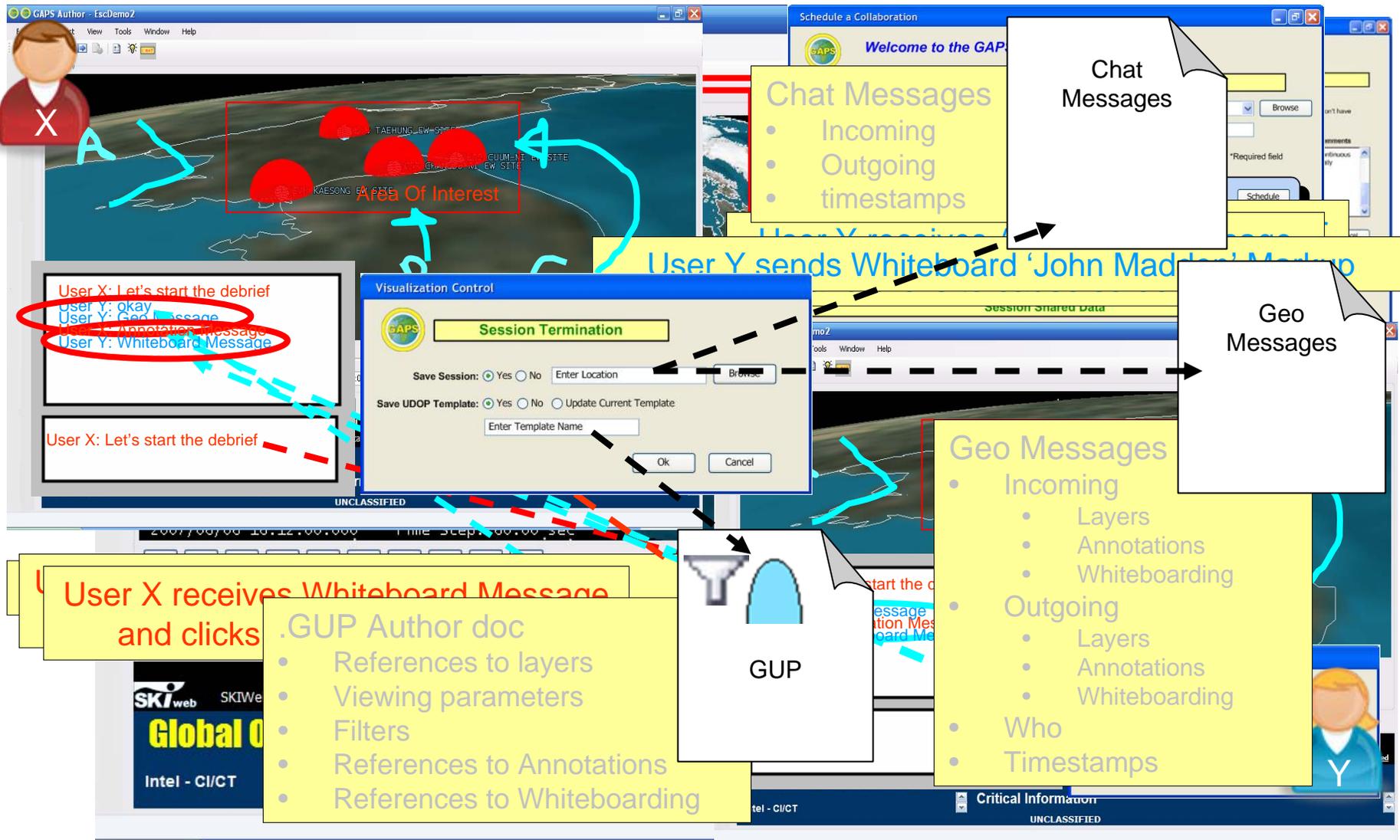
.xml Framework doc

- Selected Add-ins
- Open Windows



# GAPS Storyboards

## 6. Optionally, Users Archive the Collaboration Session (at)





# Enabling Technologies

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# Geospatial Visualization and Analysis

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- ArcGIS and CJMTK
  - Powerful Geographic Data Management, Visualization, and Analysis
  - DoD MCG&I Standard for C2I applications
  - Provides ArcGIS Desktop and ArcGIS Server Technologies
- AGI Technologies
  - Geodynamic Analysis and Visualization functionality
  - Includes performance models for Space, Air, Ground, and Water moving objects
  - Supports dynamic intervisibility, coverage, performance analysis
- Google Earth
  - Powerful, easy-to-use Net-Centric earth visualization
  - Based on KML which is now a more widely used standard
  - Supports visualization of imagery, terrain, 3D buildings
  - Supports search of locations based on name or address

# Web and SOA Infrastructure, Messaging Technologies

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- Web and SOA Infrastructure
  - .NET
    - Supports building, deploying, and running Web Services and applications
    - Standards-based, multi-language environment that is very widely deployed and used
  - J2EE
    - Specification for developing and deploying multi-tiered business applications
    - It differs from .NET in that it is a standard, rather than a implementation
- Messaging Technologies
  - eXtensible Messaging and Presence Protocol (XMPP) supports real-time communication amongst applications
  - XMPP supports instant messaging, session management, whiteboarding, collaboration, etc.



# Summary and Road Ahead

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# Summary

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- UDOP Concept is a natural evolution of Shared Situation Awareness paradigms within a highly networked environments
- The proposed UDOP Concept is valid for many operational paradigms including Air, Ground, and Space C2, Homeland Security, Cyber Security, Event Management, etc.
- UDOP System supports operations by providing Net-Centric collaboration amongst systems as well as end-users
- The Authors have conducted R&D partially instantiating the UDOP Concept with software that supports Creation, Visualization, Augmentation, Tailoring, and Sharing of UDOPs
- Global Awareness Presentation Service (GAPS) project has operationally deployed significant portions of this UDOP R&D to USSTRATCOM
- This UDOP R&D can be applied and deployed to other domains including Space and Cyberspace applications.