Enhancing 3D Capabilities for Warfighters through Joint Enterprise Solutions

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ESRI International User Conference
July 13, 2010

US Army Corps of Engineers
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Situation

- Global War on Terrorism operations :

  − often occur in immersive urban & close quarters areas

  − Require short planning and communication timelines

  − Demand a rapid and universally understood common picture, ideally a three-dimensional (3D) picture.

We <u>must</u> create/update more comprehensive GEOINT databases; we <u>must</u> support more data types, formats, and sensor systems; and, we <u>must</u> enhance legacy systems to exploit 3D products to provide our warfighters better and more comprehensive 3D Products Faster.

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The Problem

- Global War on Terrorism operations often occur in immersive, highly complex, urban & close quarters areas

- Collection/Discovery, Processing, Exploitation, and Dissemination (CPED) of high-resolution 3D products is too time consuming and costly.

- The result is that we are rarely able to deliver fully useable and accurate 3D products in time to satisfy the warfighter's urgent needs.

The Solution

Operational 3D (Op3D) JCTD

Office of the Secretary of Defense, Rapid Fielding Office Approved Initiative:

- The mission of Joint Capability Technology Demonstration (JCTD) is to find, demonstrate, transition, and transfer the best operational concepts and technology solutions for transformational, joint, and coalition warfare.

- The Joint Capability Technology Demonstrations (JCTD) Office exploits mature and maturing technologies and introduces new operational concepts to solve important military problems and facilitates transition of these new capabilities from the developers to the users.

- Op3D was approved as a FY10 JCTD new start

Op3D

Key Managers

- **Lead Service and Sponsoring Combatant Command (CoCOM):** US Special Operations Command (USSOCOM)
- **Operational Manager (OM):** USSOCOM J7T

- **Technical Manager (TM):** U.S. Army Geospatial Center (AGC)
  - Deputy TM – USSOCOM SOFPREP

- **Transition Manager (XM):** NGA
  - Deputy XM – USSOCOM
  - Deputy XM – AGC

Op3D Overarching Objectives

- Develop and transition capabilities to enhance the Collect, Process, Exploit, and Disseminate (CPED) lifecycle for 3D and 3D Derivative Products in OCONUS theaters of operation and CONUS geospatial production facilities.

- Provide CPED enhancements to ongoing in-theater capabilities as well as enhance the operational throughput of 3D products within geospatial production centers such as USSOCOM Special Operations Forces Planning, Rehearsal and Execution Preparation (SOFPREP), National Geospatial-Intelligence Agency (NGA), and US Army Geospatial Center (AGC).

Op3D Operational Objectives

Objective of the Op3D JCTD is to develop and transition capabilities to enhance the Collection, Processing, Exploitation, and Dissemination of 3D and 3D Derivative GEOINT Products in OCONUS theaters of operation and CONUS geospatial production facilities.

- **Operational Objectives Include:**
  - **Enhanced 3D Sensor Collection & In-Theater Processing Technology**
  - **Enhanced On-Board 3D Exploitation Capabilities**
  - **Enhanced Tools for In-Theater 3D Intelligence Exploitation**
  - **Enhanced Tools/Methods for Discovery of 3D GEOINT Products**
  - **New Web-based 3D GEOINT Exploitation Software**
  - **Enhanced Multi-Source Registration Technology (2D->3D; 3D->3D)**
  - **New/Approved Software for SOF Product Reuse (SOFCIB)**
  - **Improved 3D and 2D Source Feature Extraction Software**
  - **New Sharing, Collaboration, and Visualization Utilities (2D and 3D)**
  - **Hosting of LIDAR in NGA Repositories**
  - **New 3D Visualization Database Dissemination Technology**

Programmatic Strategy

JCTD Spiral 1 – Focus is on Production Centers

- **GEOINT Data Discovery & Management**
  - Enable rapid search and access of 3D GEOINT data. Near term access of NGA Web-based Access and Retrieval Portal (WARP)-Data archive for LIDAR (Buckeye, NGA sources)
  - Create Awareness of all DoD data repositories and create strategy to search more effectively. Link all data for National Expeditionary Architecture (NEA), NGA's in-theater data discovery mechanism.

- **GEOINT Data Processing**
  - Examine the 3D data technical requirements for Targeting
  - Increase Processing Speed
  - Automate geo-registration and conversion
  - Automate 3D products from Buckeye ISR Imagery
  - Integrate a near real-time downlink of Buckeye LIDAR & EO data

- **GEOINT Data Product Dissemination**
  - Create and enhance 3D data dissemination for CONUS/OCONUS users
  - Provide the capability to push database updates with little user interaction

- **GEOINT Data Exploitation**
  - Demonstrate NITF-wrapped LIDAR data for sharing of data
  - Provide and demonstrate 3D tools for analysis using web based 3D Tactical Decision Aids.

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Programmatic Strategy (Cont.)

JCTD Spiral 2 – Focus is on Warfighter

- **GEOINT Data Discovery & Management**
  - Identify and implement GEOINT meta data Standards and Specs
- **GEOINT Data Processing**
  - Identify and demonstrate 3D Automated Feature Extraction algorithms using all-source data
  - Integrate software to fuse airborne EO/LIDAR with terrestrial EO/LIDAR
- **Exploitation Tools for the Warfighter**
  - Provide & demonstrate 3D vertical obstruction/line of sight exploitation tools
  - Demonstrate operational utility of 3D singular and fused product.
  - Identify and provide 3D GEOINT data needed to support user identified Decision Aids
  - Identify and demonstrate 3D Visualization tools
  - Identify and demonstrate 3D Exploitation & Analysis tools
  - Integrate a near real-time downlink of both Buckeye EO & LIDAR data

Technical Solution

Collect   Process   Exploit   Disseminate   Collect   Process   Exploit   Disseminate

(Discover)

(1) Time Sensitive Buckeye
  Mission Critical Processing (sub 24 hr turnaround)
  Supporting Army Brigade Combat Teams in Afghanistan
  And Iraq

(6) GEOINT Data Discovery
  Geospatial data discovery
  & retrieval. (OCONUS also)

Buckeye
Iraq, Afghanistan
Topo Engineers (2D/3D Mapping/ISR)
• LIDAR (1 m DEMs)
• EO (10cm ortho-images)

(7) 3D Geopositioning, Registration, Specs, & Standards
  Auto point cloud registration
  Improve source imagery & 3D
  Data accuracy (rel. & abs)

(2) 3D LIDAR Processing & Exploitation
  On-Board LIDAR Collect, Process, Exploit, Analyze, and Downlink
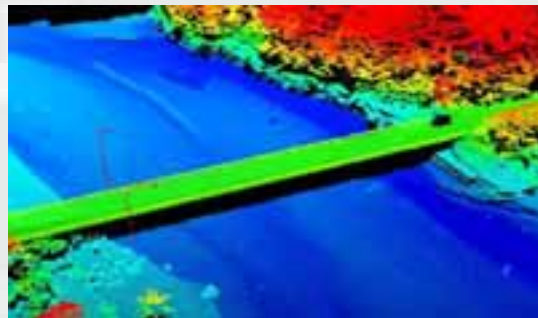 sensor adapted for multi-look Intel target mapping and foliage penetration

(8) SOFCIB
  Certification of SOFPREP
  CIB production process for
  NGA repository reuse

(3) LIDAR Asset Manager
  Google front end asset manager enabling search
  & retrieval of LIDAR point cloud archives &
  linkage to 3D viewer for geospatial analysis

(9) Semi-Automated Vector Correction
  Realign Legacy Vector GIS data to latest Imagery
  for 3D DB Production usage

(10) Auto/Assisted Feature Extraction
  Extract 3D & 2D features (Buildings, Trees,
  Vertical Obstructions, Roads, Water, etc. from
  LIDAR & EO imagery

LIDAR sensor
Afghanistan (FY10)
SOF Intel Asset (Targeting)
• LIDAR (3D 15cm Point Clouds)

(11) Geospecific 3D Modeling
  Extract & Texture 3D Buildings from
  Oblique 2D Imagery Sources

(12) OpViz
  Data sharing, collaboration
  & visualization utilities
  (OCONUS also)

(13) Host LIDAR in NSG Libraries
  NITF Wrap LIDAR
  Point Clouds. Load
  LIDAR archives into
  NGA image libraries

(4) 3D Viz DB Dissemination
  Streaming of GEOINT
  data to clients via
  WMS and on-demand
  web data conversion

(5) Web Enabled S/W
  Decision Aids such as Line
  of Sight and Landing Zones
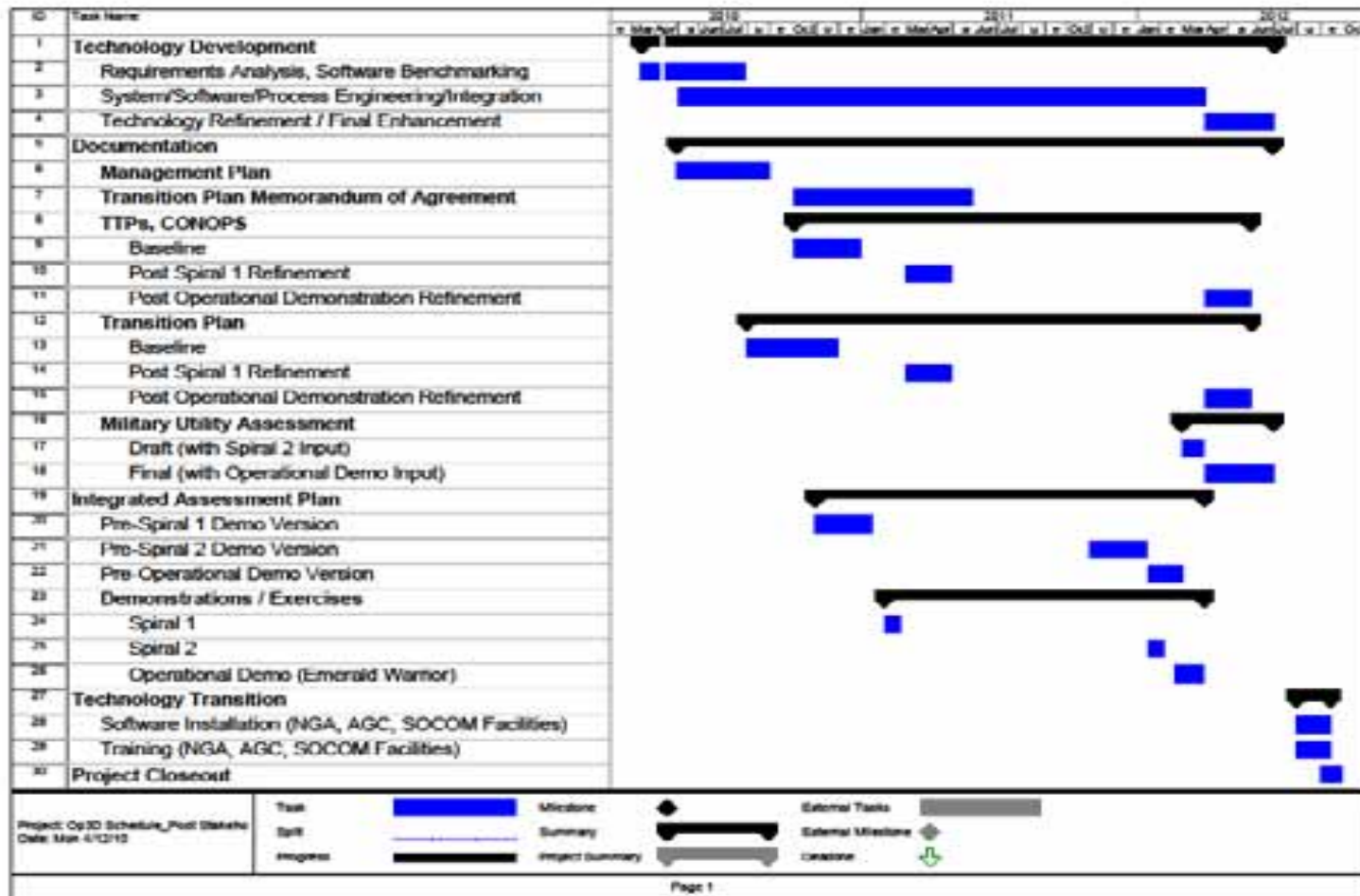 (CONUS also)

(14) GEOINT & 3D Visual DB Dissemination
  Host SOF DBs & updates in
  forward-deployed data nodes

Schedule

Summary

➢ **Warfighters need:**

- High resolution 3D GEOINT data for many military operations
- **Access and retrieval to 3D GEOINT data from emerging databases**
- Exploitation tools and devices which are effective at providing 3D geospatial information to warfighter
- Interfaces and software for 3D graphical query, mission planning, mission rehearsal and situation awareness

➢ **Op3D JCTD will:**

- Enable warfighters to rapidly search, acquire and fuse 3D GEOINT data from archived GEOINT data holdings
- Provide warfighter access to evolving 3D database technologies
- Provide significant improvements in the processing of GEOINT data to meet actionable mission planning and execution timelines
- **Provide for faster dissemination of GEOINT source data and 3D products to forward deployed low-bandwidth areas and across the DoD production facilities.**

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