Environmental Data Cube Support System

EDCSS Overview Briefing

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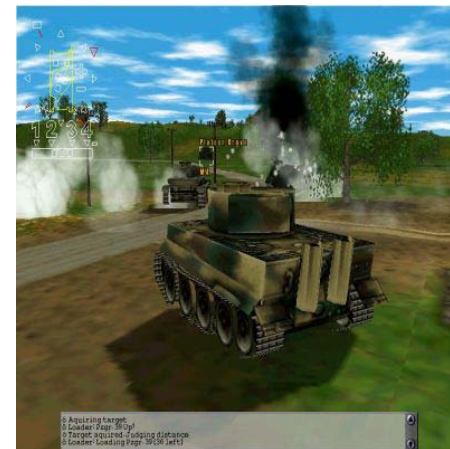**https://ine-stage.aer.com**

Why EDCSS?

**Reality:**

How we simulate Reality:

Environment Representation in Simulation

- **Sensor Stimulation**
  - Lack of environment becoming increasingly apparent
  - Consistency impossible without common environment

- **Correlated Effects (Visual | Sensor | Behavior)**
  - Underlying physically-consistent scenario provides basis in reality
  - Derive all simulation products from common representation
  - Coordinate distribution and integration of environment at runtime

- **Coordinated Support Products**
  - White Cell insight into impacts to entity behaviors
  - Data feeds to support tools for analysis / decision making
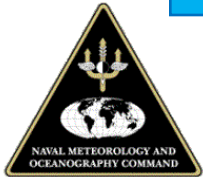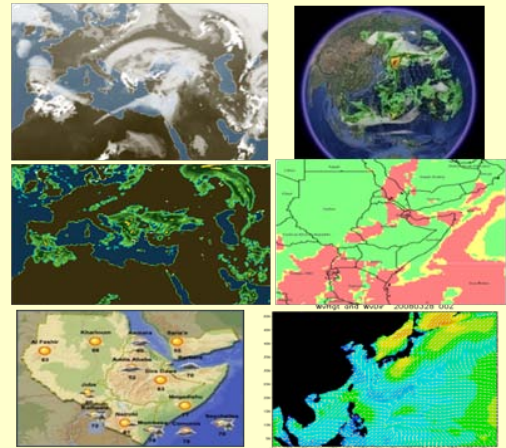
Providing Realistic Context
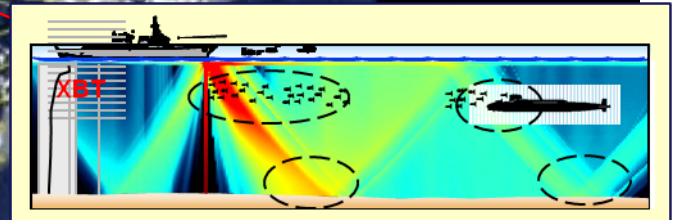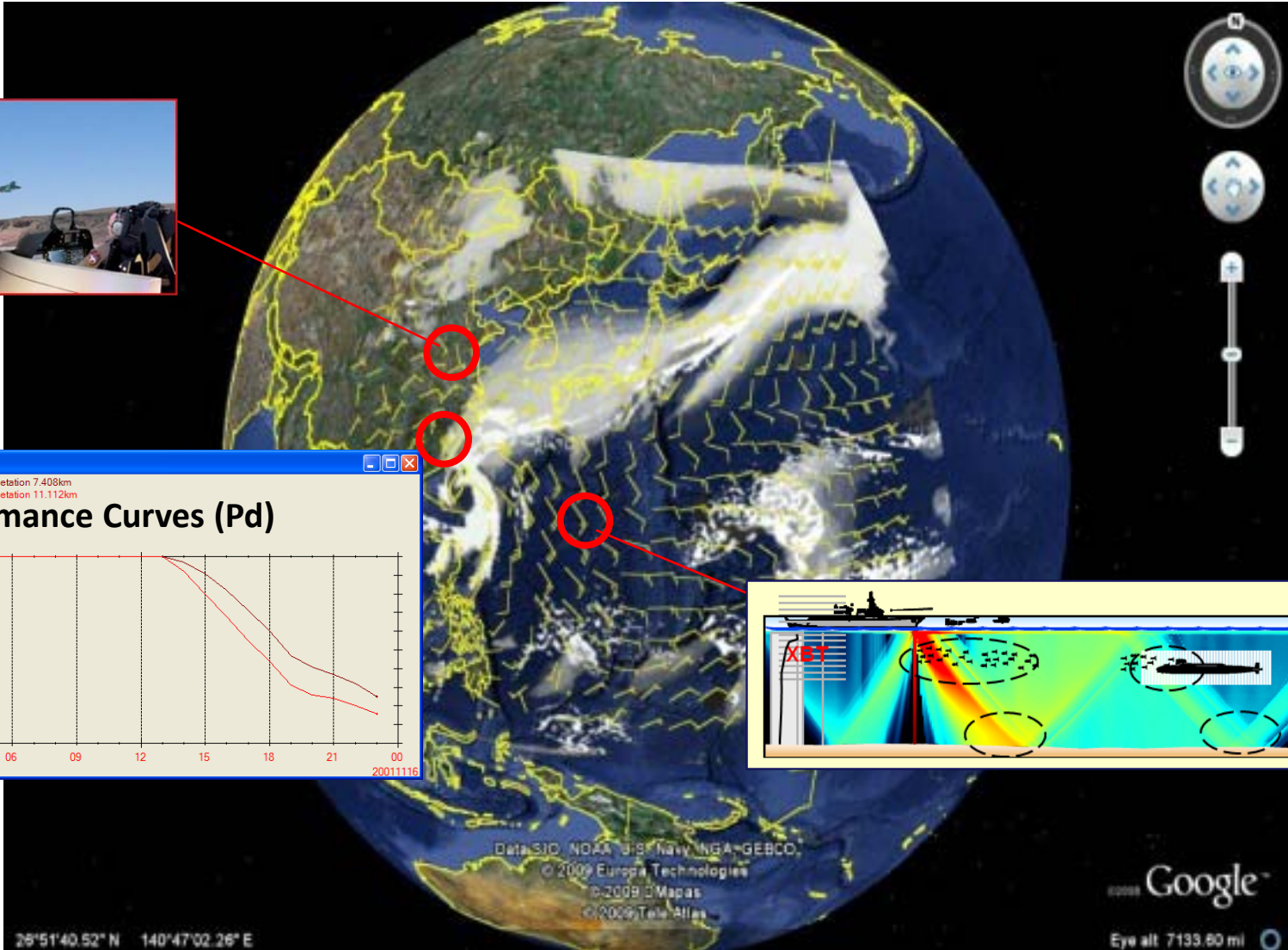
EDCSS Concept Definition

1. **Build an Integrated Environment Representation …**

2. **Produce a consistent suite of support products …**
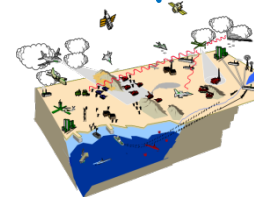
3. **Distribute during event execution**

National Providers of …

Data, Models, Effects, Expertise
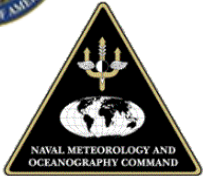
Control

Simulation

Users

EDCSS Stakeholders

DoD M&S Executive Agents

USD, AT&L

DoD Communities Enabled by M&S

Acquisition

Analysis

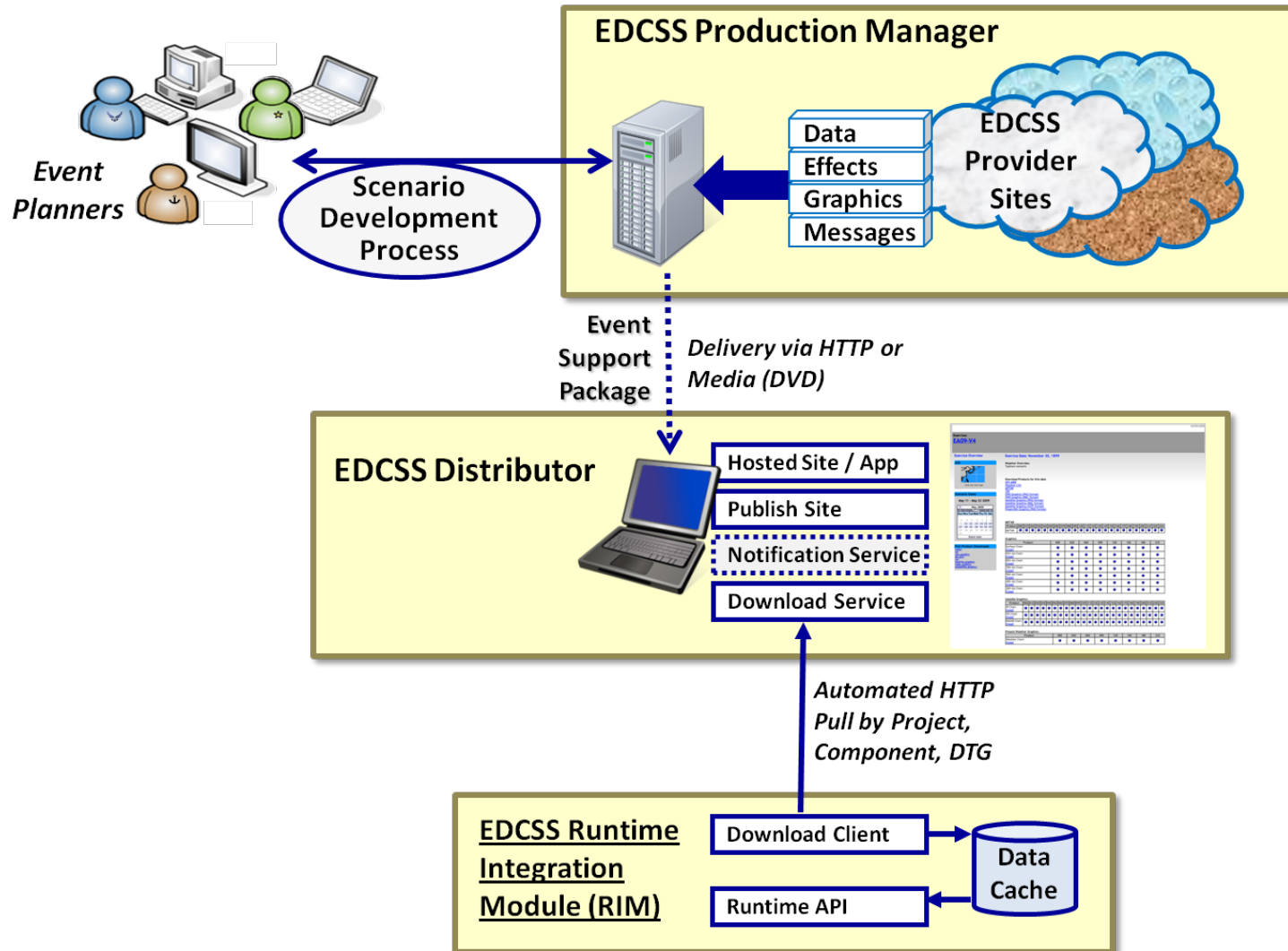*Experimentation*

Intelligence

Planning

Testing

Training

M&SSC
Modeling & Simulation Steering Committee

EDCSS

Direct Development

Support Users

EDCSS Architecture Components

EDCSS Production Manager

Event Planners

Scenario Development Process

Data
Effects
Graphics
Messages

EDCSS Provider Sites

Event Support Package

Delivery via HTTP or Media (DVD)

EDCSS Distributor

Hosted Site / App
Publish Site
Notification Service
Download Service

Automated HTTP Pull by Project, Component, DTG

EDCSS Runtime Integration Module (RIM)

Download Client
Runtime API

Data Cache

EDCSS Product Types

DATA

- **Data Formats defined by**
  - **Syntax & File Name**
  - **Content / Representation**
- **Standards-Based**
  - **GRIB, netCDF, etc.**
- **Application-Based**
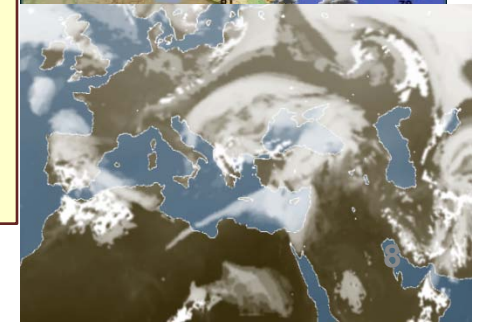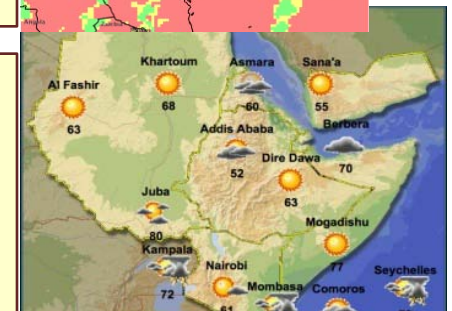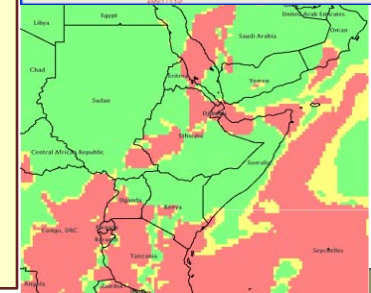 - **TAWS, AREPS, JMV, etc.**
- **Custom ASCII, Binary, CSV**

EFFECTS

- **System Performance**
  - **EO Sensors (TAWS)**
  - **EM Sensors (AREPS)**
  - **Mobility (STDMOB)**
- **System Impacts**
  - **IWEDA**
  - **SEIS**
  - **Custom**

TEXT

- **WMO Standard Messages**
  - **METAR, TAF, BT to date**
  - **Upper Air, etc.**
- **Conventions**
  - **Military vs Civilian**
  - **CONUS vs Foreign**

IMAGERY

- **GrADS-Based**
  - **Customizable**
- **"Annotated" WMS**
- **Simulated Satellite**
- **PNG/JPG/KML/TIFF/NITF**

EDCSS Resource Philosophy

- **Customers require PRODUCTS that have the content and format required to support their simulation application**
  - **In EDCSSS, Customers state requirements for *Products* and *Area of Interest* and EDCSS automatically presents the available Resources**
  - **Resources are actually Resource Networks associated with User Groups that can have multiple resources supporting each environment domain.**

- **Resource Availability**
  - **There are relatively few resources that meet the demands of M&S users**
  - **Having resources that can be searched for scenarios, and also support the range of product requirements reduces the list further still**
    - **AF Developed ACMES Regional Data Sets (atmosphere only)**
    - **Navy Developed FST Regional Data Sets (coupled atmosphere-ocean)**
    - **WRF Modeling Capability (custom data sets using NCEP/NCAR for searching)**
    - **Terrain Modeling, downstream of WRF model**

EDCSS Scenario Storyboard

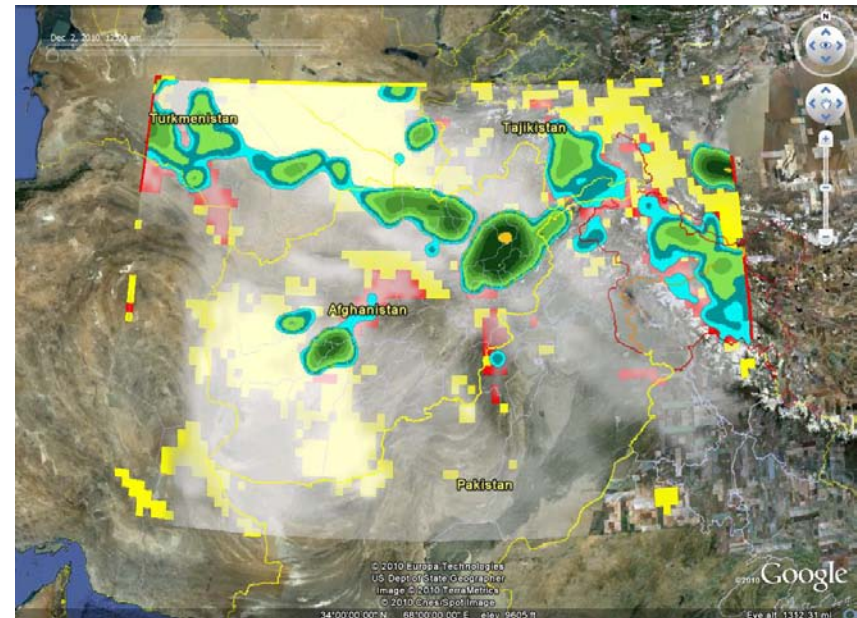| Mission Area	11/29	11/30	12/01	12/02	12/03
UAV	🟩	🟩	🟨	🟨	🟥
Fixed Wing	🟩	🟩	🟩	🟨	🟩
Convoy	🟩	🟩	🟩	🟩	🟩

Google Earth overlays (KML) provide scenario context.

- **Simulated Satellite (IR)**
- **Simulated Radar**
- **UAV Mission Area Impacts**

UAV Ops

Time-Series View provides actual / resulting UAV impacts over 5-day scenario

EDCSS Support Site

EDCSS Integration Options

EDC Distributor

- Maintains all Products in play for an event
- Supports Scenario Control , Logging, VV&A
- Consistency between products achieved by coordinated production

SOAP

Consistency via EDCSS

Product Files

Sim Y
- *JCATS*
- *AWSIM*

RIM - JBUS

RIM - JBUS

RIM API

Sim X
- *OneSAF ERC*

HLA

DIS

Consistency via FOM

- *NCTE*

Consistency via Gridded Data PDU
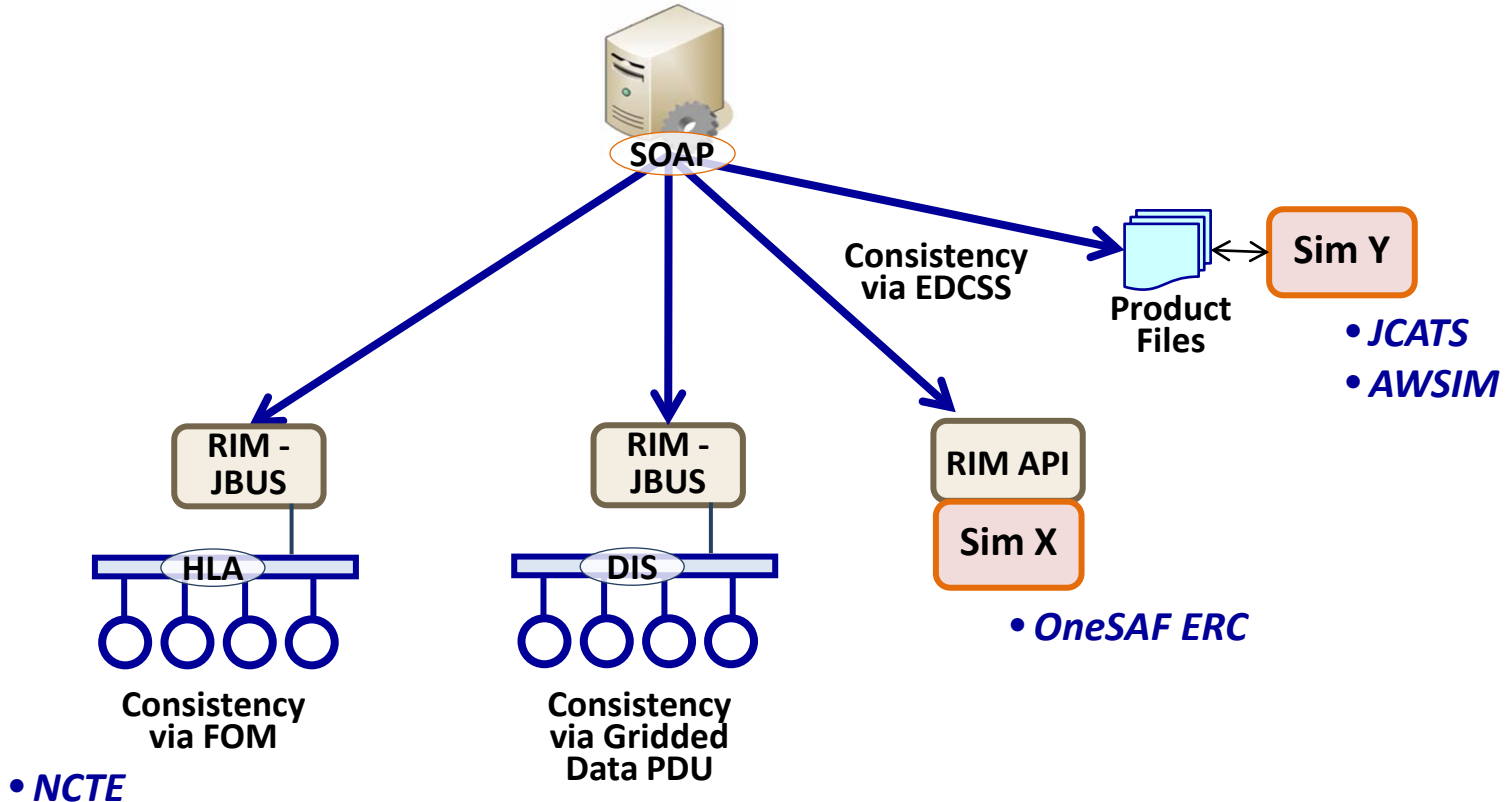
Checkpoint Summary

- **Historical Scenarios provide the right mix of realism and control**

- **Environmental Modeling capabilities readily available to downscale and couple representation across multiple domains**

- **Environmental Data Cube Support System (EDCSS)**
  - **PRODUCTION: Beyond data, to include graphic, text, effects products**
  - **DISTRIBUTION: Network-agile services for product dissemination**
  - **INTEGRATION: Local product management (caching) and API's to ensure effective use and reduce development cost**

> **The EDCSS provides a project-oriented suite of support tools for the M&S community grounded in a formalized support process emphasizing the use of a common environment representation across all consumers.**

EDCSS Project Plan

	Increment	Description
Increment 1		Proof of Concept Atmosphere Domain
Increment 2		Space Domain Support to COCOM Events Developer site active
Increment 3		Ocean and Terrain Domains Effects, Graphics, Text Products Semi-Automated user by Domain SME's
Increment 4		Hosted at DoD Site(s) Automated use by Community Representatives
Increment 5		Operational Enhancements

FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16

EDCSS Architecture Components

EDCSS Provider Sites

- Product Generation
- Data Access
- Model Execution

Logical groupings of like-kind product generation capability, independent of physical location.

← *request*

→ *product*

EDCSS Production

- *Hosted Web Application / Services*
- *Emphasis on Project-based Work Flow*
- *Manages Community Product Requirements*
- *Coordinates all Product Generation*

Upload Completed Projects

EDCSS Distribution

- *Hosted Web Application / Services*
- *Separates Distribution from Production*
- *Provides for Dynamic Scenario Management*
- *Provides SME Analysis Functions*

Automated Pull of Products

EDCSS Integration

- *Optional Software Toolkit*
- *Provides Java / C API for easy integration*
- *Manages pull of products to local box*

EDCSS Transition

```
              ┌──────────────────┐
              │      EDCSS        │    AFWA
              │  Production Site  │    Offutt AFB
              └──────────────────┘
                       │
        ┌──────────────┼──────────────┐
        ▼              ▼              ▼
┌──────────────┐ ┌──────────────┐ ┌──────────────┐
│ Provider Site│ │ Provider Site│ │ Provider Site│
│ ASNE Domain  │ │ Navy Domain  │ │ Terrain Domain│
└──────────────┘ └──────────────┘ └──────────────┘
    AFWA          NWDC M&S Lab        ?? - TBD
    Offutt AFB    Norfolk, VA (TBD)
```