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Expanding Deployment Modeling into DPO (Distribution Modeling into DPO (Distribution Process Owner) Modeling

Argonne National Laboratory Argonne, IL 80439

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Expanding Deployment Modeling into DPO (Distribution Process Owner) Modeling

Dr. Chuck Van Groningen, Argonne National Laboratory
Dr. Soraya Stevens, BBN Technologies
Presentation Overview

- Modeling in the Analysis of Mobility Platform (AMP) Environment
- Tour of Present and Future Capabilities
- Expansion of Capabilities to Support DPO Modeling
- Summary/Q&A
Where are we going in ETED?

Legend

- Point Of Use/Consumption
- Distribution Node - CCP, DDC, PORT PROCESSING, STORAGE, etc.
- Port (Airport or Seaport)
- Fixed Location (GEOLOCATION)
- Dynamic Location

Add Distribution Process Models to a Global, End-to-End Transportation Modeling Federation
AMP Overview

AMP is an Integrated Federation of Modeling and Simulation Tools that...

- Enables collaborative Programmatic Analysis across the DoD
- Is a Federation of Models in a single application
- Merges GOTS and COTS tools in a common Open platform
- Answers infrastructure, process, systems, policy, and lift capability analysis questions
- Provides analytical comparisons air-sea tradeoff analysis
- Is expanding to include distribution concepts through the E2E Distribution Modeling R&D effort
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The Evolution of AMP to ETED

AMP (Classic)

1990
DART

1992
Exercise & Study support
LOGGEN, ALSP...

AMP-HLA, AMP21
Prototype, AMP-GES

 AMP 11.0
 Federation

AMP-ETED
Federation

MIDAS
ELIST
JICM federated

AMP brings together existing models to give a “best of breed” analytic answer

AMP Evolves and Adapts to Analytic Climate
AMP Modeling Functionality - 2006

TPFDD(s)

Unit Based Dynamic Sustainment Generation

INTRA CONUS

HOME STATIONS

APOE

AIR ENROUTE

INTER THEATER

APOE

SPOE

SPOD

AFLOAT PREPO

MIDAS

• Dynamic Mode and Port Selection Feature
• Linked Airlift and Sealift Scheduler
• Dynamic Sustainment Generation modeled at CCC
• Inventory Management
• Strategic Airlift and Sealift Simulations with exogenous and stochastic events
• Multi-Theater
• Intermodal Transload
• Channel/SAAM missions
• Sealift PAX ferries
• Aircraft diversions
• Aircraft slotting
• Working/parking MOG and Hot cargo

MIDAS: Detailed Strategic Airlift and Sealift
AMP Modeling Functionality - 2006

Dynamic Sustainment Generation

INTRA CONUS

HOME STATIONS  APOE

APOE

AIR ENROUTE

SPOE

AFOAT PREPO

INTER THEATER

MIDAS

MIDAS: Detailed Strategic Airlift and Sealift

TPFDD(s)

THEATER

TAAs

ASHORE PREPO

APOD

APOD

SPOD
AMP Modeling Functionality - 2006

TPFDD(s)

Dynamic Sustainment Generation

INTRA CONUS

HOME STATIONS APOE

MIDAS ELIST

THEATER

APOD A_FLOAT PREPO

ASHORE PREPO

TAA’s

∞ Marry Up

ELIST: Detailed Theater Distribution Modeling

- Performs detailed RSOI modeling
- Simulates theater distribution
- Detailed road/rail/air network data, including surface type and bridges
- Models individual trucks, trains, helicopters, theater airlift and sealift.
- Utilizes enablers arriving with unit movements
AMP Modeling Functionality - 2006

TPFDD(s)

Dynamic Sustainment Generation

INTRA CONUS

HOME STATIONS

APOE

APOD

AIR ENROUTE

INTER THEATER

MIDAS

MIDAS: Detailed Strategic Airlift and Sealift

MIDAS: Detailed Strategic Airlift and Sealift

MIDAS: Detailed Strategic Airlift and Sealift

MPD: Mid-Atlantic Precipitation Dynamics

AFLOAT PREPO

ASHORE PREPO

TAA’s
• Was a serial integration
• Strategic model requests movements to POEs based on mode selection
• CONUS ELIST provided detailed – resource constrained flow
• Provides arrivals at POE for air/sea loading

ELIST: Detailed CONUS Distribution Modeling
AMP Modeling Functionality - 2006

TPFDD(s)

Dynamic Sustainment Generation

INTRA CONUS

HOME STATIONS

APOE

AIR ENROUTE

INTER THEATER

APOE

APOD

THEATER

ASHORE PREPO

SPOE

AFLOAT PREPO

MIDAS

ELIST

ELIST: Detailed Theater Distribution Modeling

∞ Marry Up
**AMP Modeling Functionality - 2006**

**QuickLook Tools**
- Identify Limiting Factors for Airport Throughput
- TPFDD Requirements vs. Capabilities analysis

**Detailed Simulation**
- Refueling: hydrants, pipelines, fuel stands, and fuel storage
- Resource Modeling: Maintenance, Material Handling Equipment (MHE) and Personnel
- Cargo: onload/offload, cargo holds, staging areas
- Utilizes enablers arriving with unit movements
- Handoff to theater air and surface transportation

**APOD: Detailed Airport Modeling**
AMP Modeling Functionality - 2007

JICM Capabilities
- Two-Sided Theater-level campaign analysis
- Brigade-level units
- Terrain and Movement on a network

AMP to JICM
- Unit closure
- Sustainment Inventory

JICM to AMP
- Combat Intensities
- Ground movement
- Port Battle Damage

Dynamic Sustainment Generation

Dynamic Feedback from the JICM Warfight Model
ETED Configurable Location Models

- Node comprised of various functions
- Each part is optional
- Each part can be at various levels of aggregation
End-to-End Distribution Functionality 2007-2008

ETED Federation: Models Distribution Concepts
End-to-End Distribution
Plug and Play – Levels of Detail

ETED Federation: Model Granularity

TPFDD(s)

Conus ELIST
- Detailed surface loading

Midas
- Aggregate level air/sea ports
- Detailed Air and Sea models
- Mode and Route planning

ApoD
- Detailed level air/sea ports

ApoE

Shared Location

End-to-End Distribution
Plug and Play – Levels of Detail

Scripted & Dynamic Sustainment

Intra Conus

ApoE

Home stations

Vendor

Ccp

Midas

Conus ELIST

ApoD

Depot

SEABase

ApoE

SPOE

Air enroute

Air float prepo

JICM

Warfight

Nodal Model
- Detailed Surface Loading
- Detailed Inventory Control
- Production
- Consumption

Friendly Unit

Enemy Unit

Married Up

Retrograde and Redeployment
ETED Transformation of Models

- Expanding the Modeling Fidelity in Three areas to include DPO Concepts
- Expand the modularity of the Composite Federated Model to accommodate new process-focused models
ETED Transformation of Models

- **Deployment**
  - TPFDD-based deployment
  - Use of Multiple-TUCHA’s to specify configuration alternatives for Air and Sea
    - Basic load on organic vehicles
    - Loaded containers (sea) and pallets (air)
  - Extended movement schedule beyond TPFDD Destination (RSOI)
- **Transportation**
- **Distribution**

- **Non-Unit cargo requirements**
- **Simulate movement at Level 4**
ETED Transformation of Models

- Configuration Effects:
  - Surface loads are restricted by cargo dimensionality
  - Loading of airlift and sealift to include dimensionality constraints

- Platform modeling
  - E.g. pallet, container, JMIC, JMIP
  - Limited availability and retrograde flow
ETED Transformation of Models

- Unit-based Multi-Echelon Sustainment
  - Production and Consumption are modeled at the units
  - Units are not stationary during the run
- Resupply Configuration
  - Configurations defined for transportation
  - Re-configuration constraints modeled at nodes
- Inventory Management
- Stochastic Sourcing
Summary

- AMP Integrated Analysis Environment
  - Used by:
    - USTRANSCOM J5/4, JDPAC
    - SDDC-TEA
    - OSD
    - Joint Staff J4, J8
    - CAA

- E2E Distribution Modeling R&D Effort is expanding the modeling scope to DPO
  - Agile development
  - Modular and plug-and-play architecture for the Editing, Modeling, and Analysis tools.
  - E2E Distribution Model will be ready to adapt to future JDDE M&S needs.