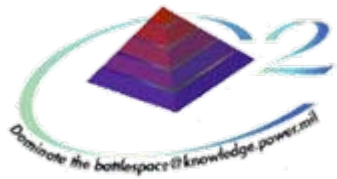
SPAWAR
Systems Center
San Diego

REALTIME EXECUTION DECISION SUPPORT (REDS)

REDS

Dynamic Decision Support For Time Critical Targeting



Nick Gizzi
Scientist
619.553.2995
nicholas.gizzi@navy.mil

John McDonnell
Scientist
619.553.5762
john.mcdonnell@navy.mil

Aaron Rice
Researcher / Developer
619.553.9597
aaron.rice@navy.mil

CCRTS 2006

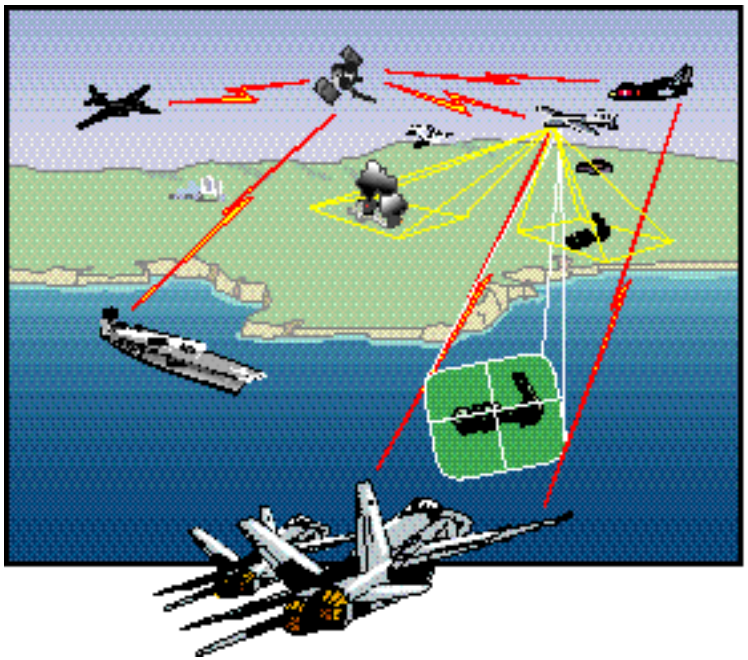
REALTIME EXECUTION DECISION SUPPORT

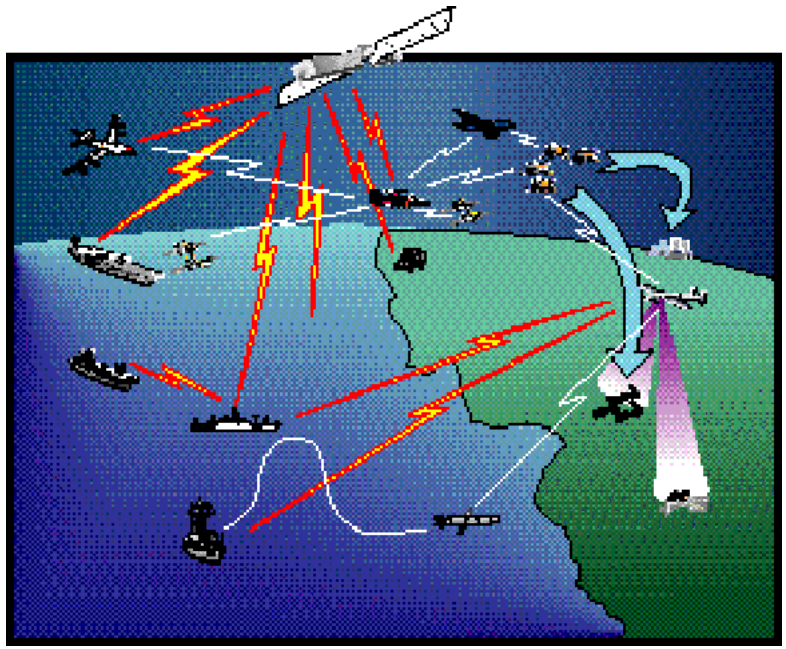
SPAWAR Systems Center San Diego

Mission Statement Objective: To respond in real time to dynamic targeting situations by providing warfighters a capability to do rapid mission replanning, mission execution, and combat assessment utilizing in-theater assets.

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego





WITHIN STRIKE AREA

(Sanctuary Planned and Defined)

BEYOND STRIKE AREA

(Strike Package Moved well beyond initially planned environment)

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

WHAT IS REDS?

Information Management

- Distributed /Collaborative Mission Planning
- Dynamic Targeting/Re-targeting
- Mission Monitoring
- Intelligence Abstracts
- Assignments/Prioritization
- Mission Management

Dynamic Decision Support

- Situation Assessment
- Risk Evaluation
- Monitor COTP
- Weather Assessment
- Dynamic Asset Allocation
- Optimal / Near Optimal Alternatives
- Trends Analysis

- Fully integrated suite of scalable applications
- Mission Management & Enhanced Situational Awareness
- Tailored Information Dissemination/Sharing/Assurance
- Predictive analysis/deconfliction/multiple weapon target pairing solutions

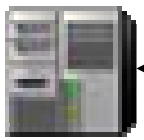
REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

JMPS

FPM

JADOCS



Publish/subscribe

GCCS-M

Publish/subscribe

TBMCS

Agent monitoring

METOC

Information Management System Server

- WLS 8.1
- Service Providers
- Synchronization
- Strike Planning
- Monitoring
- Collaboration

ELP

Mission Monitor

Loadplan

Airplan

ATO

Decision Support System Server

- WLS 8.1
- Service Providers
- Composite Track Correlator
- WinJMEM Compute Engine
- Profile Manage

ETIRMS

Mission Plans

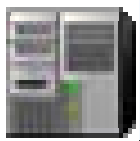
JIPTL

Blue Force C&P

Loadplan

Airplan

ATO



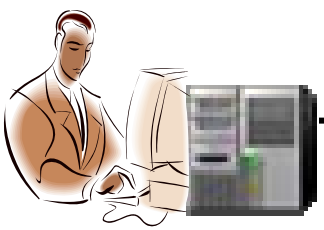
Computational Engine Server

- Situational Awareness
- Entity state awareness
- Trends Analysis
- Risk Assessment (RAVE)
- Kill Chain Analysis
- Rapid Asset Pairing Tool
- METOCAnalysis
- Autorouter
- Deconfliction
- Collateral Damage Estimate

Weapon Effectiveness

RCS Templates

REDS-ENTERPRISE

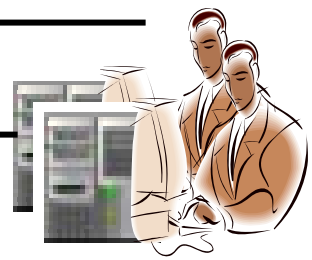


REDS-TCS Client Viewer

- JMPS integrated UPC
- ELP Strike Planning
- Realtime synchronized data
- Collaboration
- Mission Monitoring

REDS-KSA Client Viewer

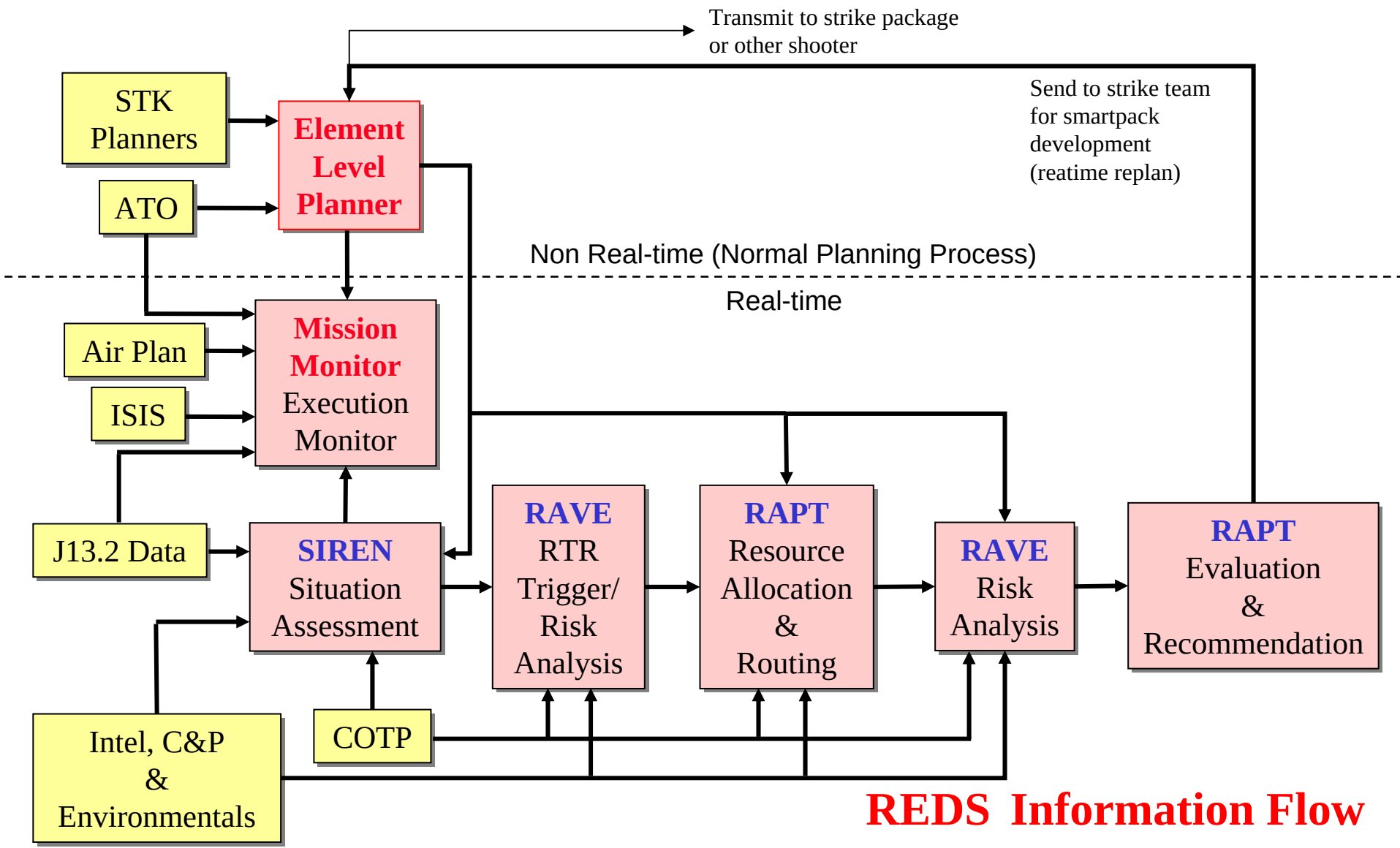
- JMPS UPC
- Map Viewer
- Asset Valuation Tool
- Target List Management
- Risk-Effectiveness Tradeoff
- Profiler



REDS Architecture

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



REDS Information Flow

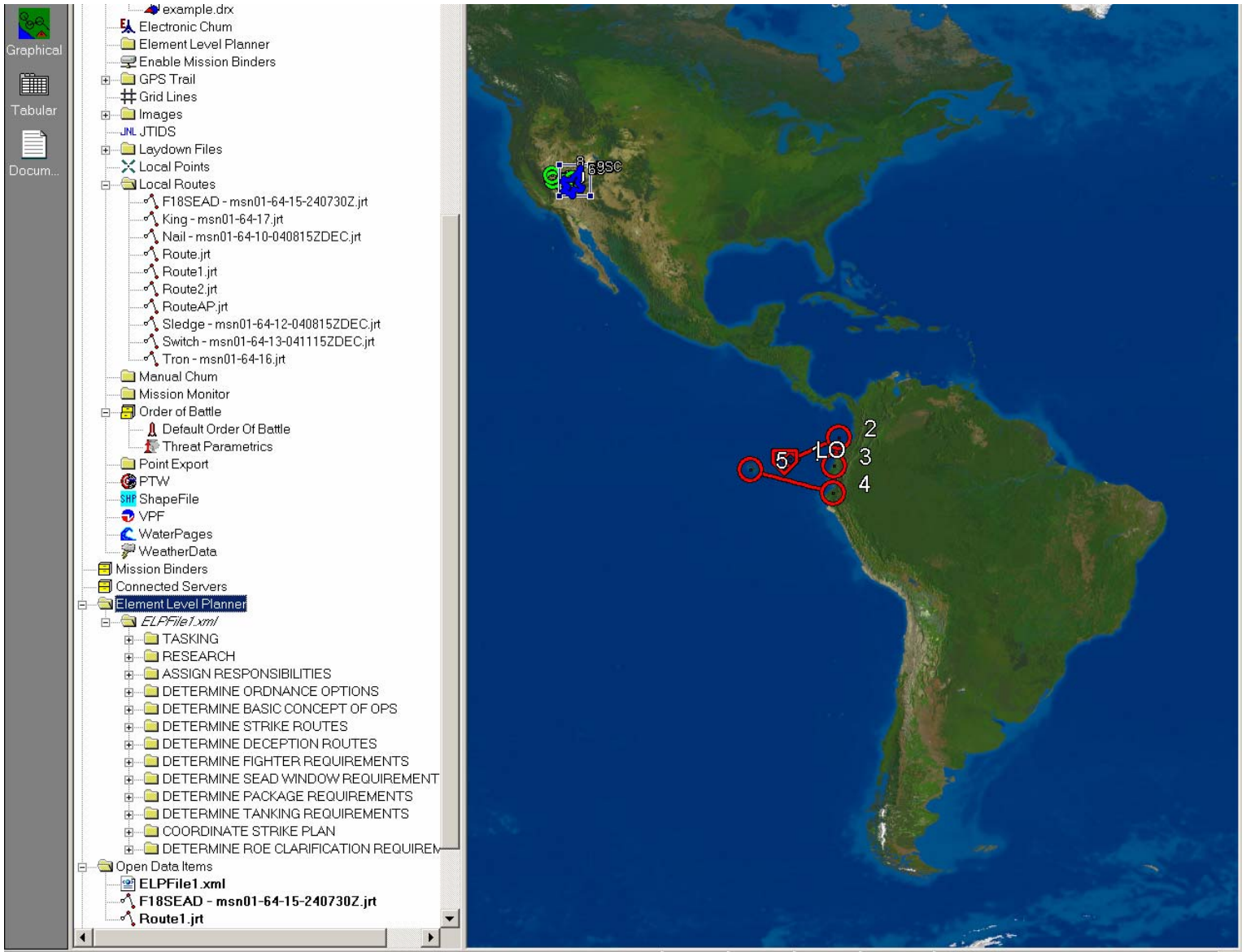
REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

- **Element Level Planner (ELP)**
  - Predicated on the Naval Strike Air Warfare Center (NSAWC) Strike Planner's Checklist and Naval Warfare Publications (NWPs).
  - Automated, knowledge-based implementation of the Strike Planner's Checklist.
  - Provides greater efficiency and flexibility for strike mission planning.
  - Provides real-time dissemination of Strike data for collaborative planning and replanning.
  - Implemented as a Unique Planning Component (UPC) of the Joint Mission Planing System (JMPS) Framework.

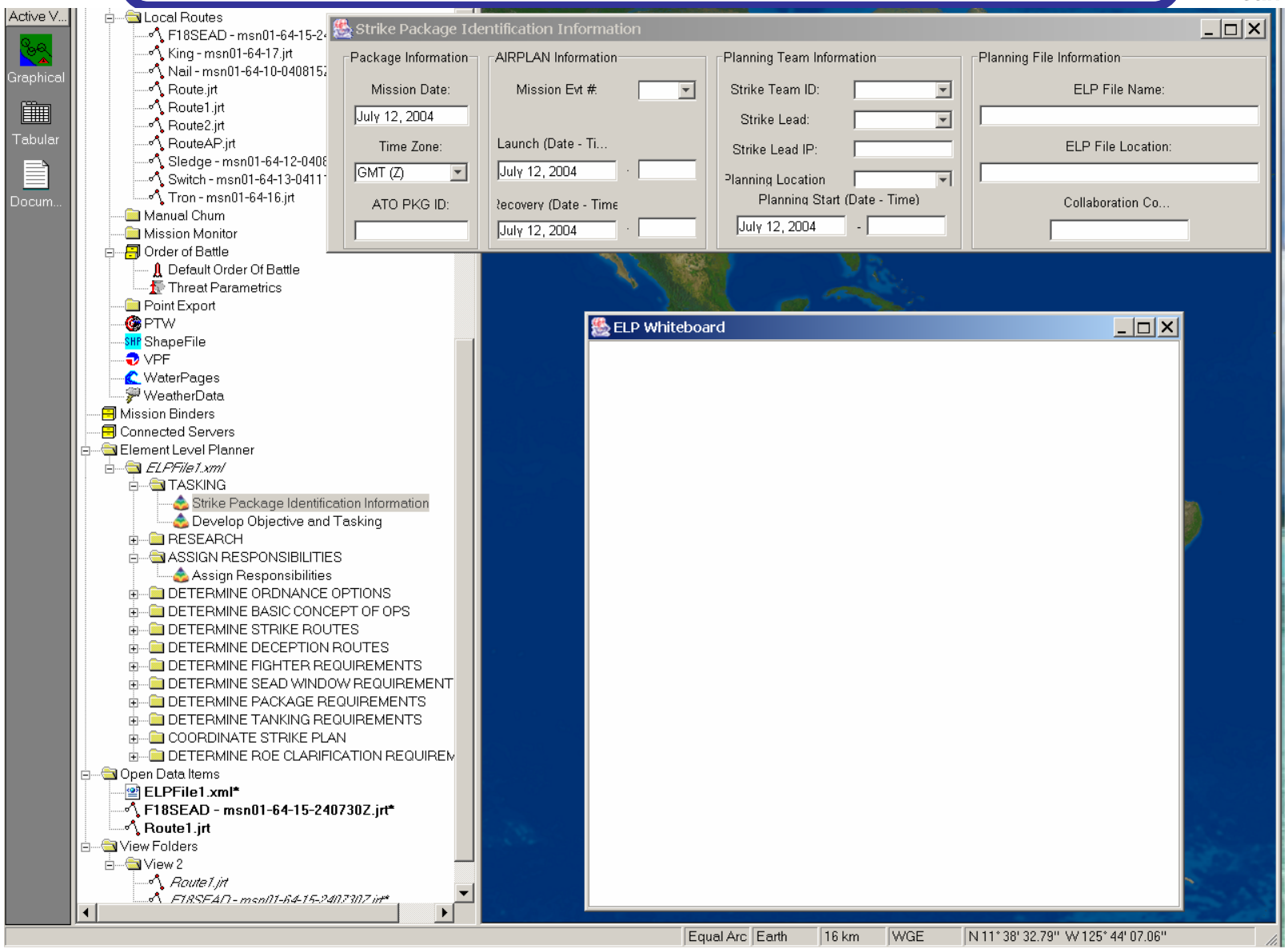
REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



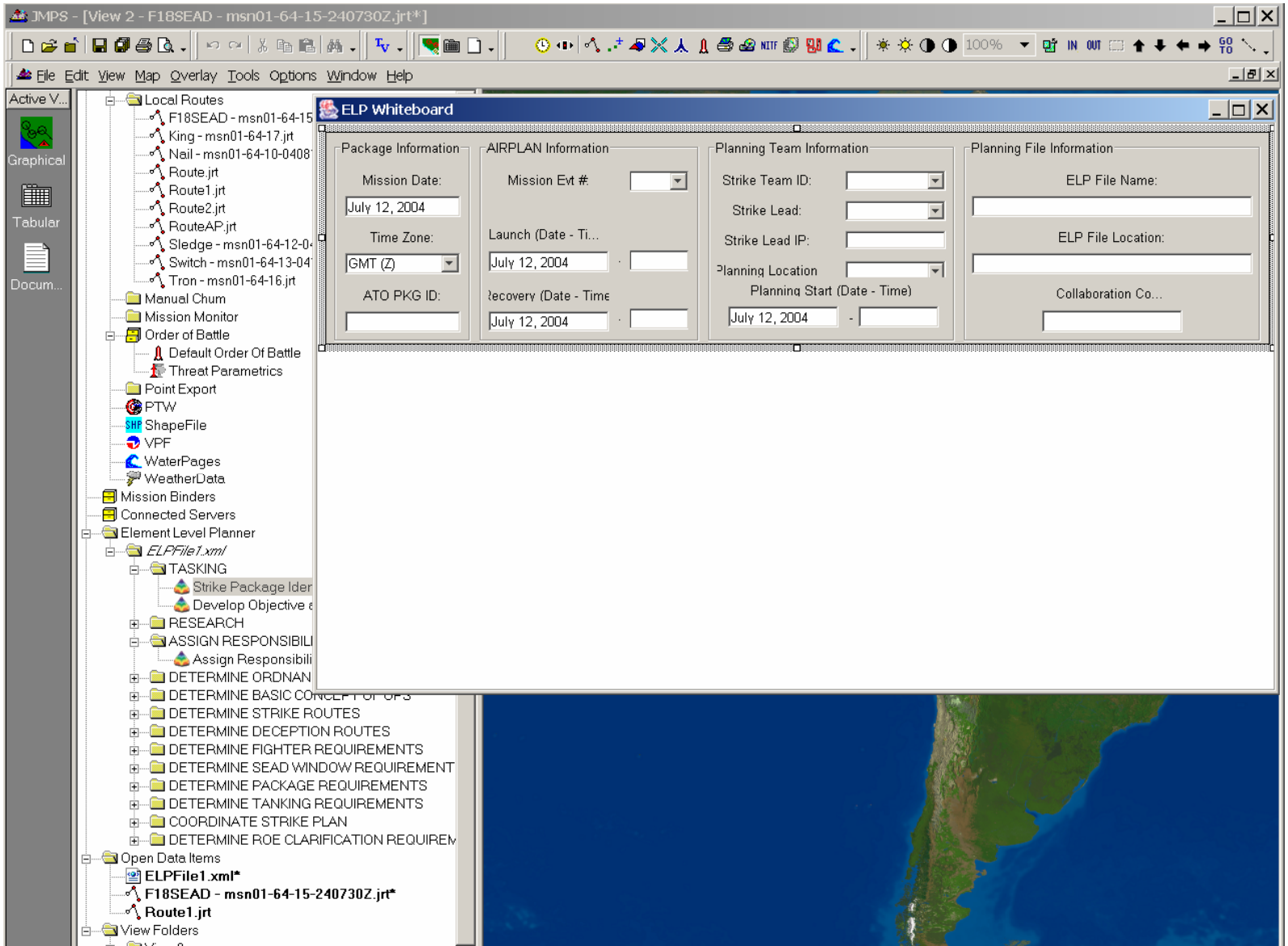
REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



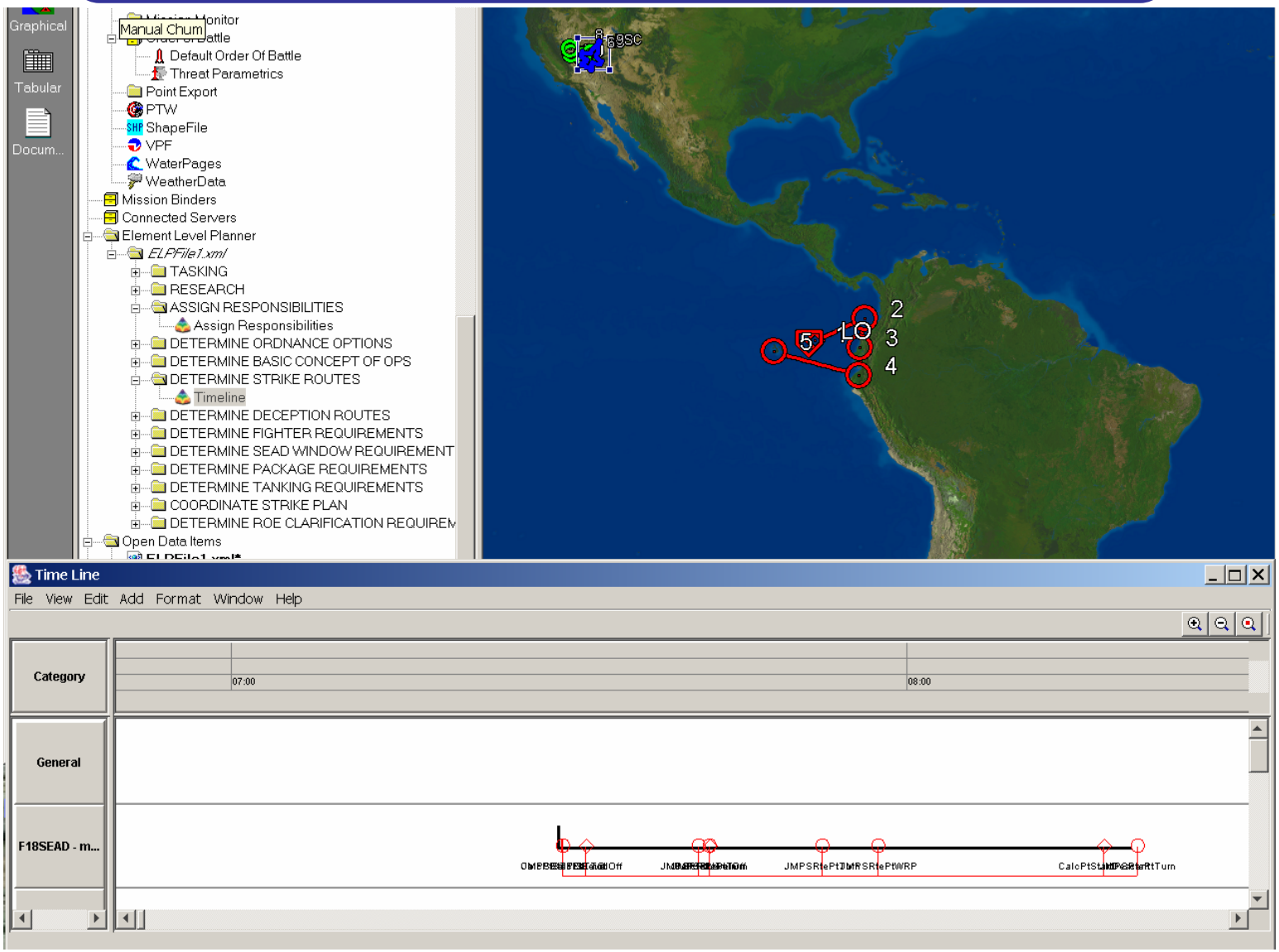
REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



REALTIME EXECUTION DECISION SUPPORT

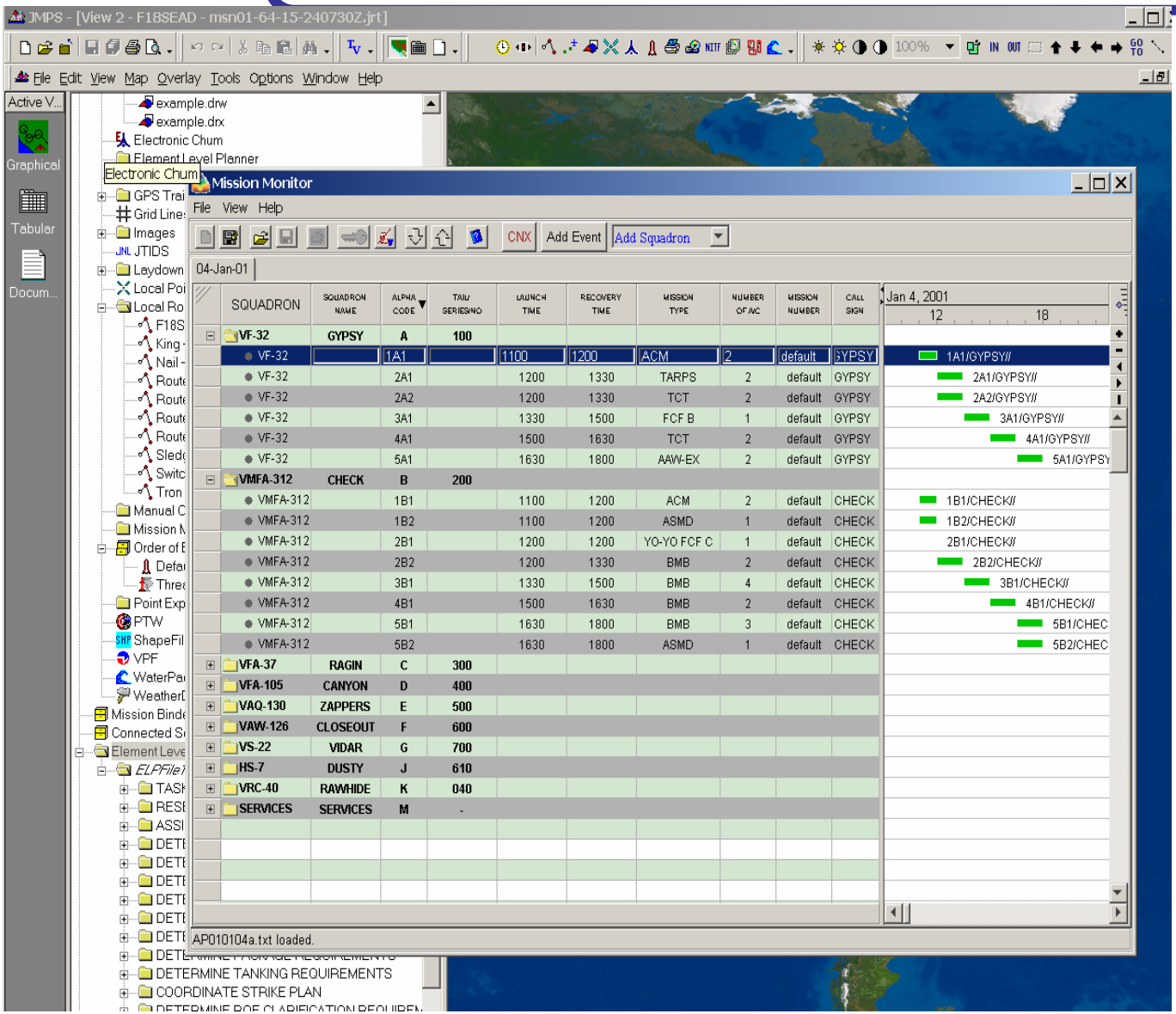
SPAWAR Systems Center San Diego

Mission Monitor

- **Execution**
  - Parse airplan, loadplan, ATO, target list
  - View ATO, airplan, loadplan, target list, cyclic ops execution
  - Monitor missions and sorties – real-time gahnt bars based on ATO and airplan
    - Planned / actual times of key events
    - Mission dependencies
    - Planning information from strike teams
    - Applicable mission data
    - Real-time status data
  - Develop Inputs to next day airplan
- **CAG Tools**
  - View ATO mission# / package designations
  - Target assignments
  - Target contention
  - Assign strike leads/teams
  - Group missions
  - Collaborate with strike personnel
- **Bravo Papa Tools**
  - Collaborate
  - Deconflict asset assignments
  - Modify airplan and disseminate changes in real time
  - Develop new strike plan

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

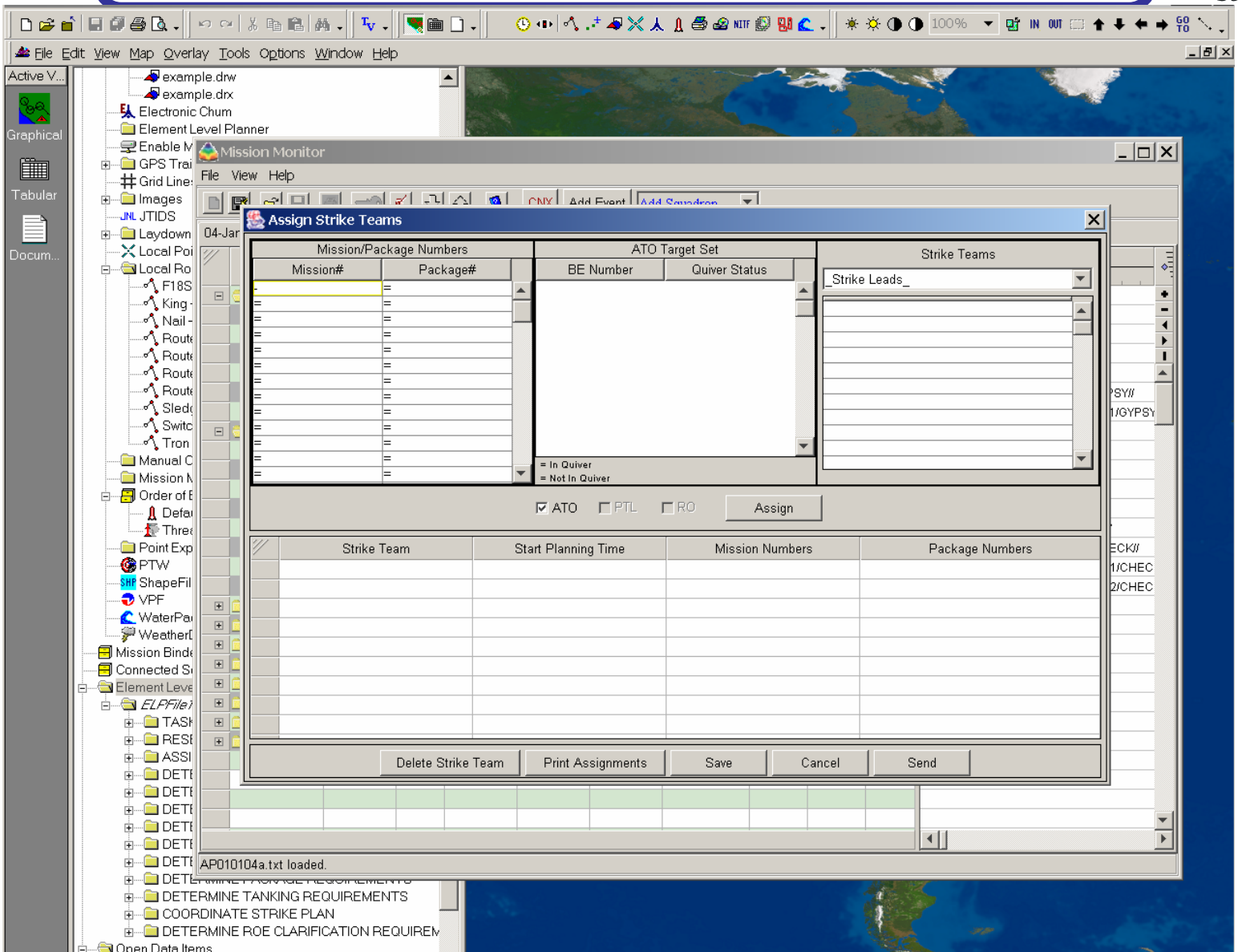


Mission Monitor

- **Parses the ATO, Airplan, Target List and distributes to ELP Server**
- **Provides for assigning aircrew to missions**
- **Displays the ATO /ACO/AirPlan/LoadPlan/ STO/SPINS/ROPE/METOC**
- **S/W Agents update the MM from the ELP**
- **Information drill down by clicking a mission.**
- **Color code displays planning and execution status**
- **Provides dynamic AirPlan change capability**
- **Embed temporal relationships and Environmental info**

REALTIME EXECUTION DECISION SUPPORT

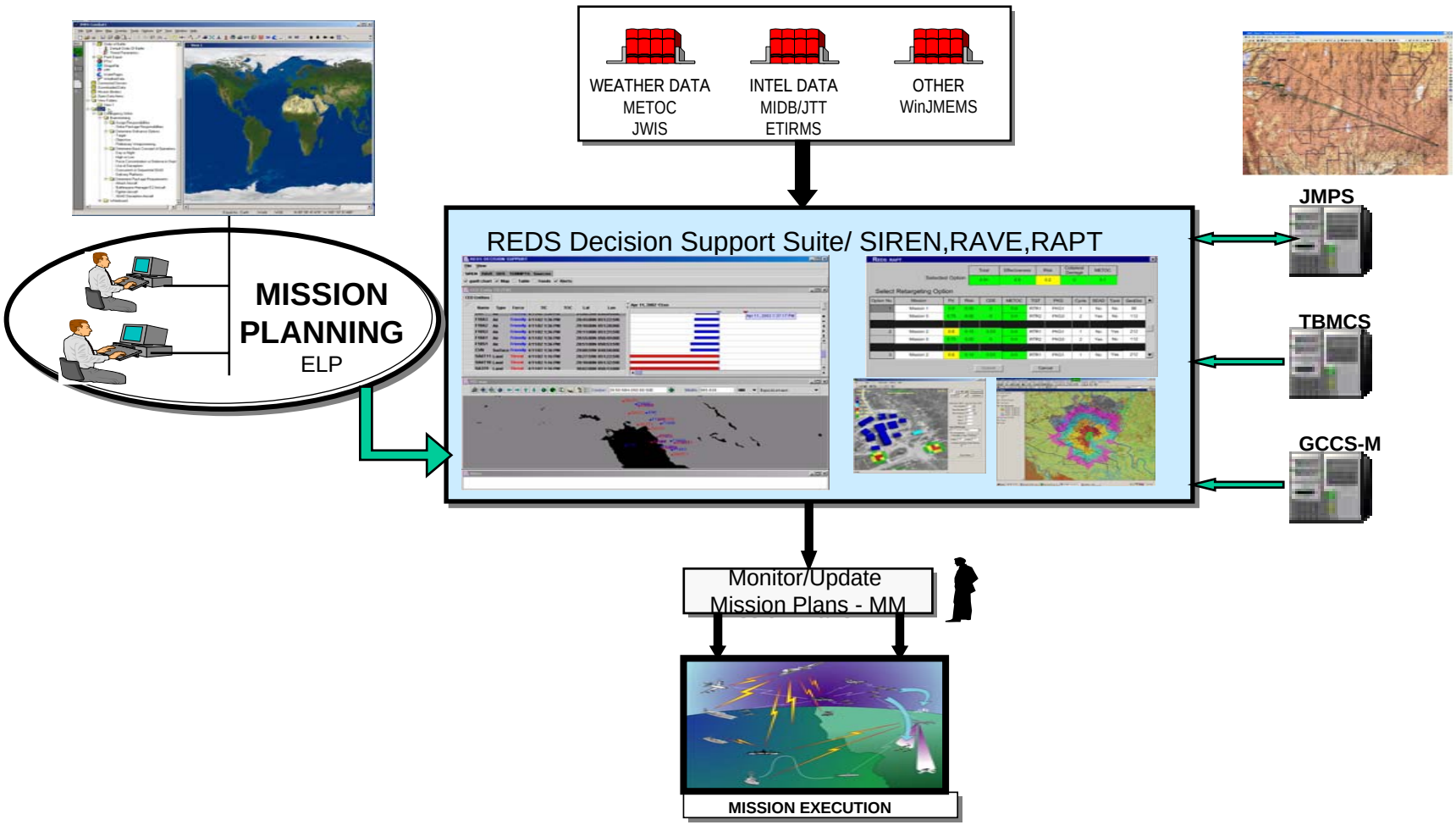
SPAWAR Systems Center San Diego



REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

Real-time Targeting and Retargeting (RTR)



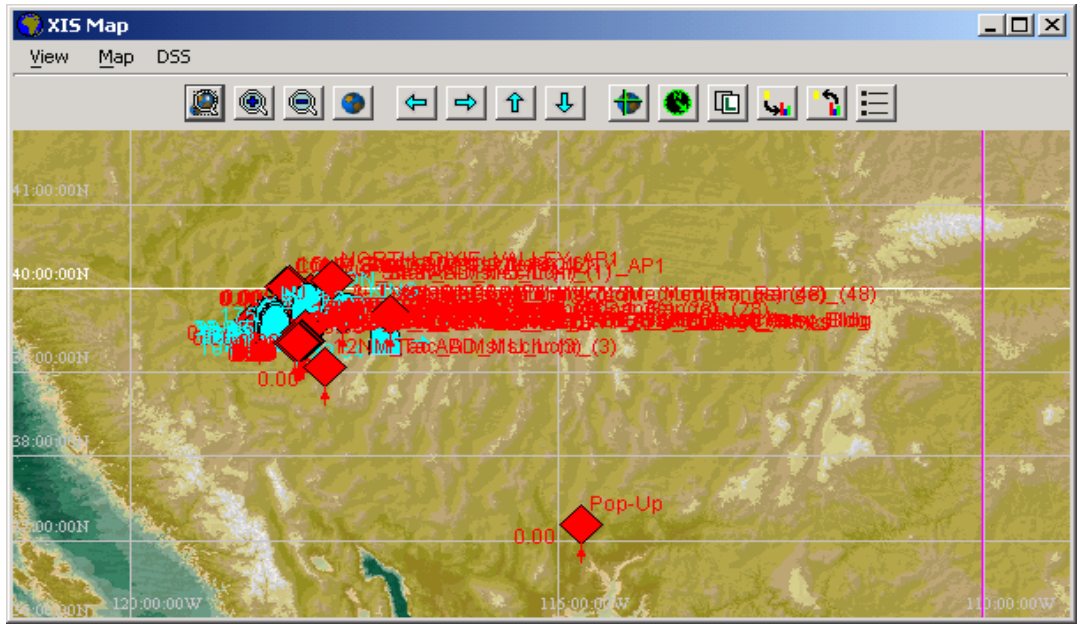
REALTIME EXECUTION DECISION SUPPORT

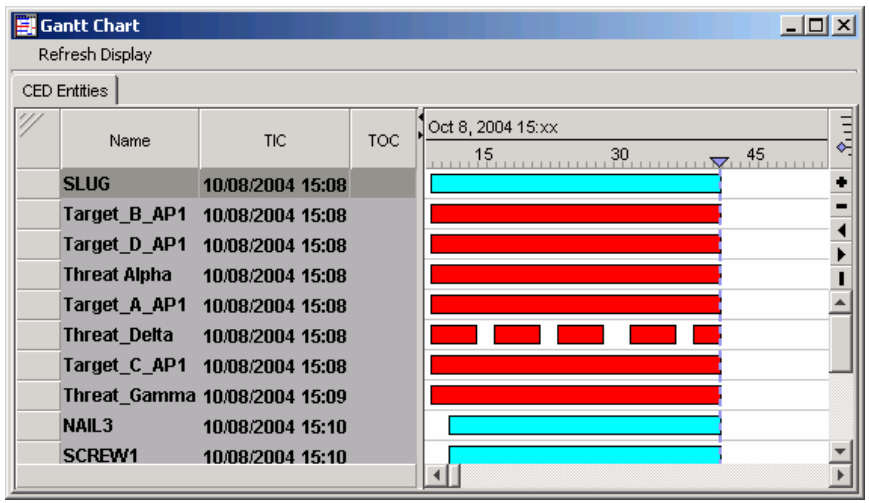
SPAWAR Systems Center San Diego

- Sensor, Intelligence, ROE, and Environment Net (SIREN)
  - Monitor environment
  - Provide watchstander profiles
  - Manage prioritized target list
  - Assess changes
  - ID entities
  - Analyze ROE, Intelligence, Collateral Damage Tiers, Weather
  - Bring together static, planned, and real-time status information

REALTIME EXECUTION DECISION SUPPORT

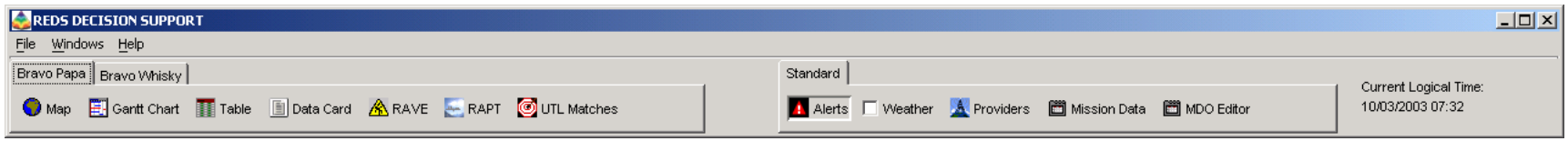
SPAWAR Systems Center San Diego

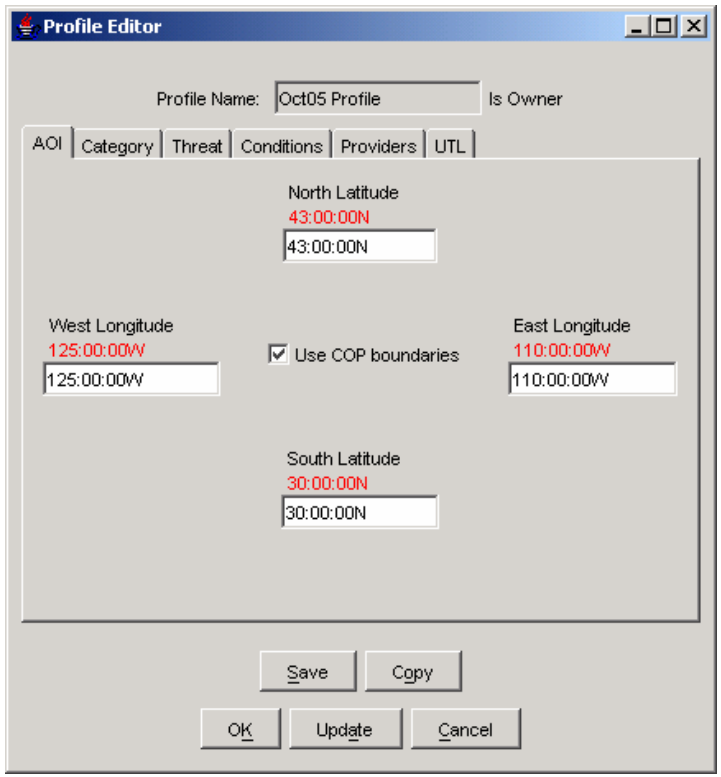


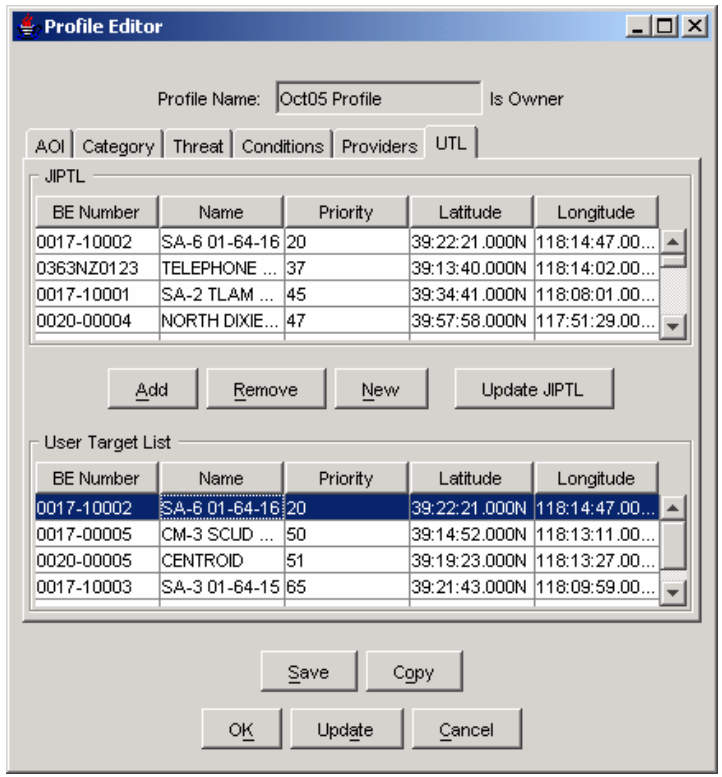


REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

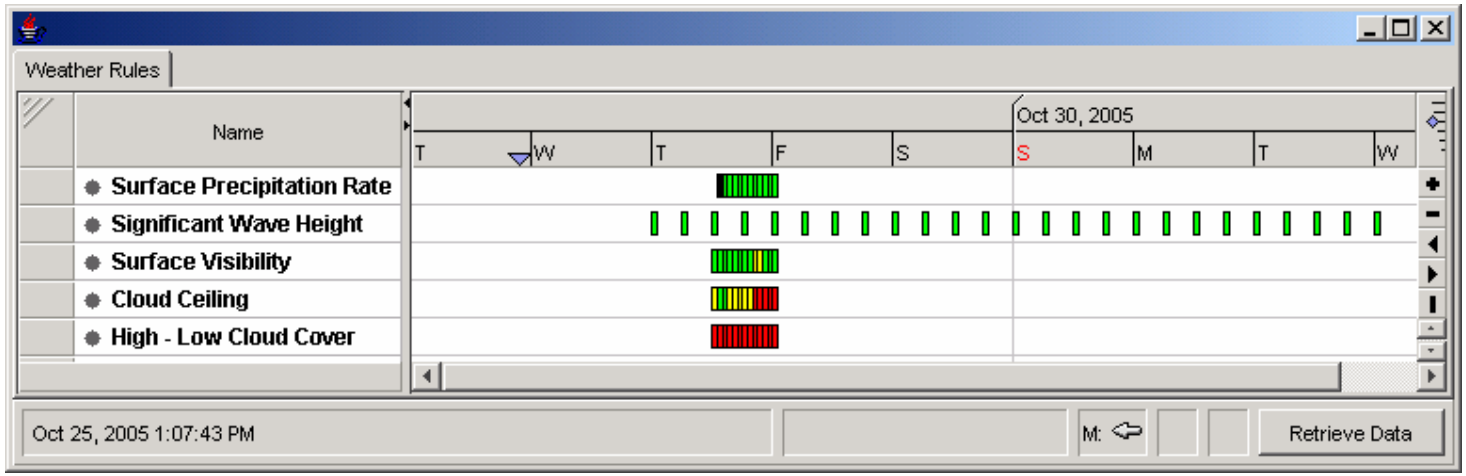


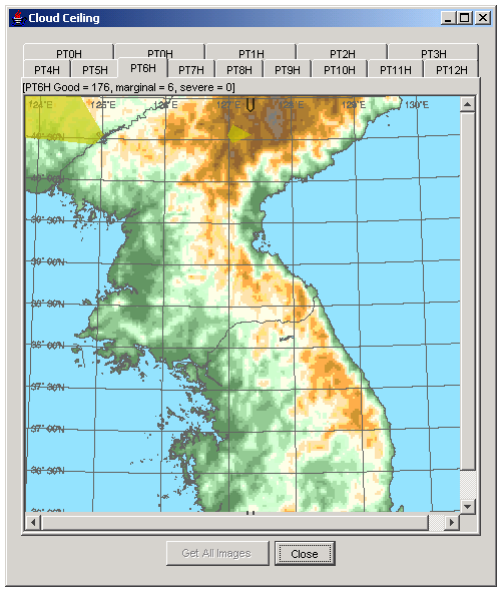


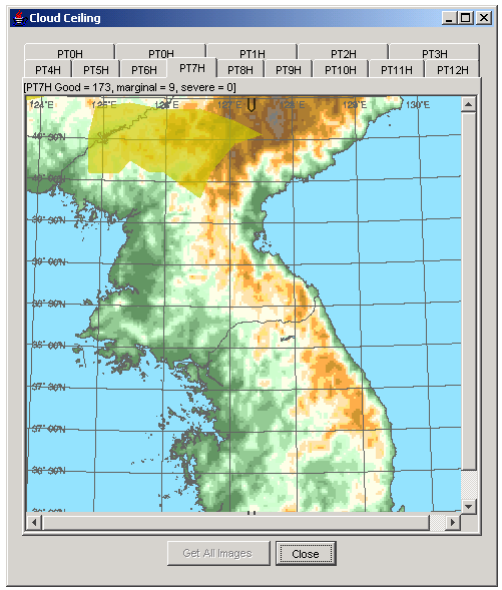


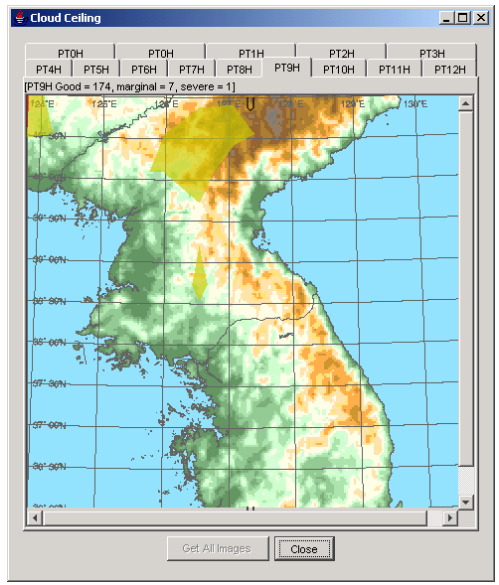
REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



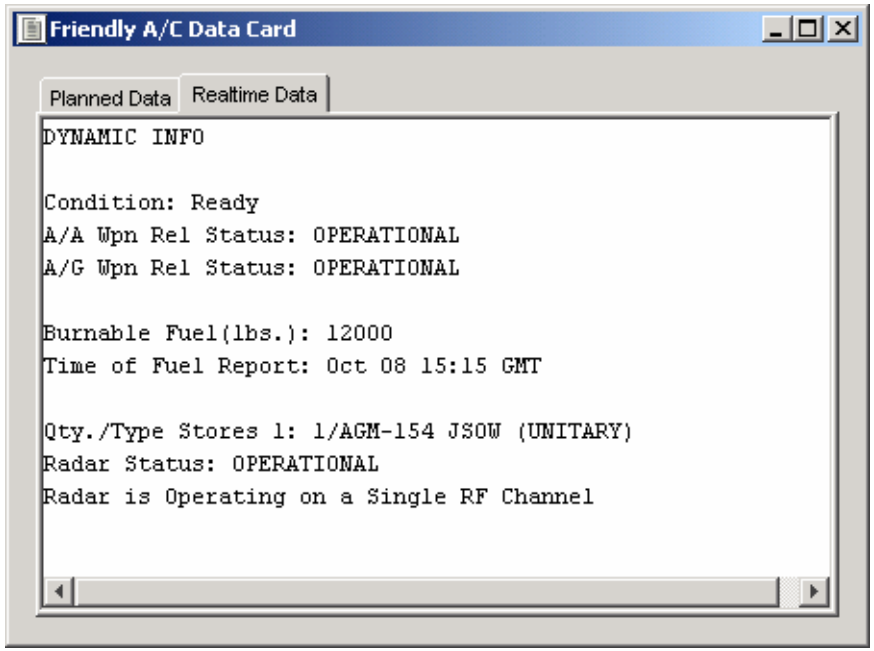


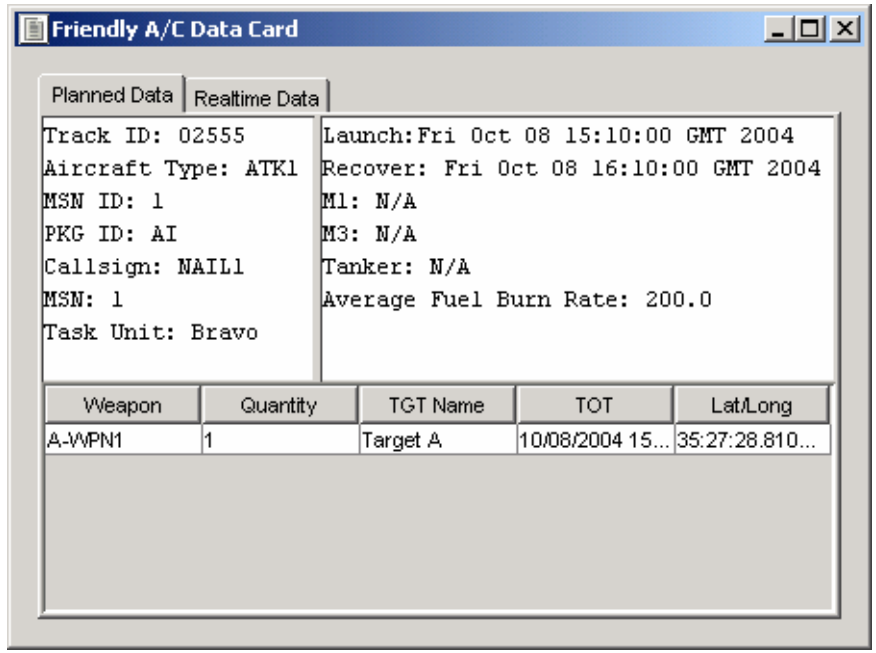




REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego





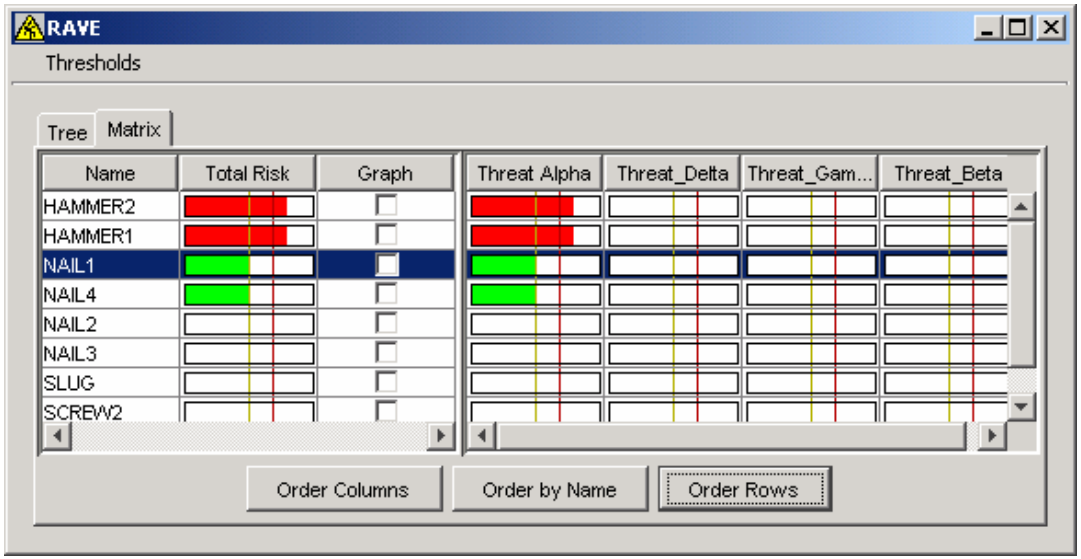
REALTIME EXECUTION DECISION SUPPORT

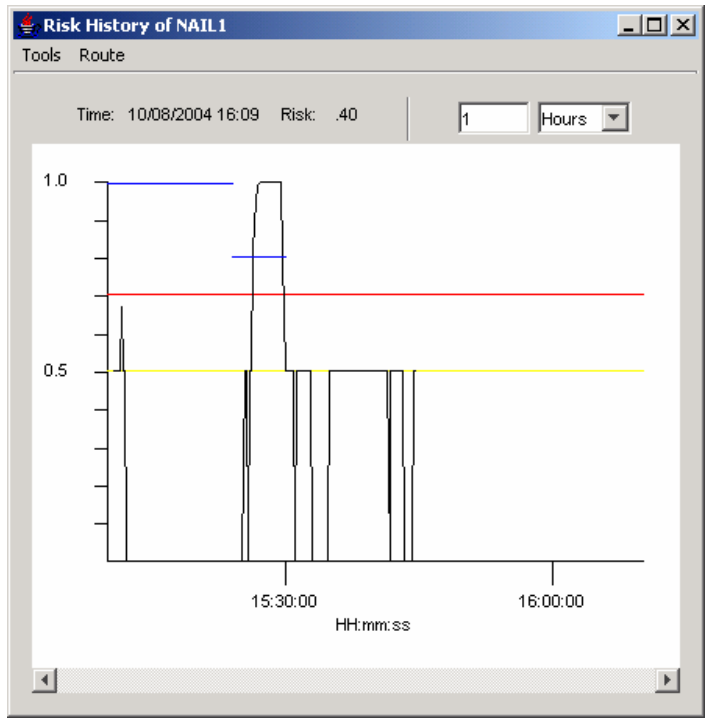
SPAWAR Systems Center San Diego

- Risk Assessment and Validation Engine (RAVE)
  - Determines risk to blue entities in the COP
  - Provides risk-based trigger function to RAPT
  - Validates threat capability based on situational and a priori information
  - Provides a mechanism for displaying risk evaluations in real time
  - Quantifies deconfliction, platform state, predicted state, and threat state
  - Analyzes risk on planned routes
  - Shows risk history for post analysis

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego





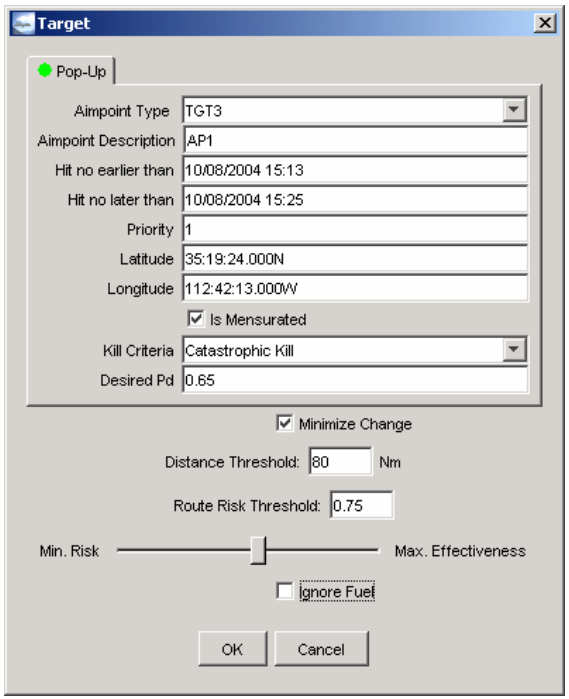
REALTIME EXECUTION DECISION SUPPORT

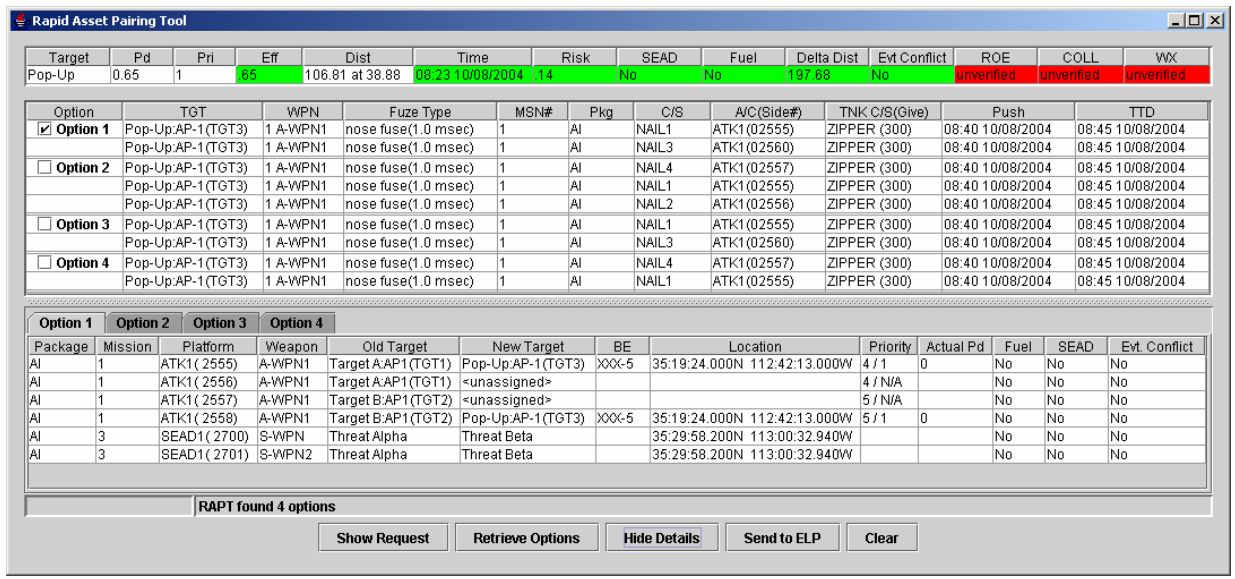
SPAWAR Systems Center San Diego

- Rapid Asset Pairing Tool (RAPT)
  - Dynamically reallocates assets based on changing environment
  - Assessment is multi modal
  - Recommends retasking options
  - Minimizes risk while maximizing effectiveness
  - Also considers target priority, target time-windows, carrier cycle persistence, fuel and distance constraints, and mission integrity
  - Incorporates a time to decide and time on target functional countdown
  - Reallocates SEAD
  - Passes options to ELP for repackaging for transmission to Aircraft

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego





REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

- REDS is built on an enterprise middleware layer
  - Distributed Transaction Management
  - High Availability
  - On Demand Scalability
  - Dynamic Workload Balancing
  - Transaction Queuing
  - Event Brokering
  - Security
  - Application Parallelization
  - Reliable Messaging
  - Platform Independance

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

- Major Benefits
  - One-of-a-kind situational assessment capability that reduces operator fatigue and provides multiple decision-makers with continuous, easily assimilated information to support operational requirements.
  - Risk analysis that provides a unique threat validation and assessment capability to continuously compare and monitor Blue force assets. Through the validation engine, users are able to adjust to emerging situations before problems arise.
  - Decision support that facilitates optimal weapon-target pairing of available, in-theatre assets. This re-planning decision aid expedites the re-planning process to dynamically allocate available strike assets based on the changing battle-space.
  - Retrieval and fusing of operational and tactical battle-space information through distributed real-time and near real-time sources.

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

- Future Work
  - Evolve to graphical representations of data provided
  - Handle complex choreography between SEAD and attack missions
  - Incorporate tanking assignments in RAPT
  - Predictive modeling

REALTIME EXECUTION DECISION SUPPORT

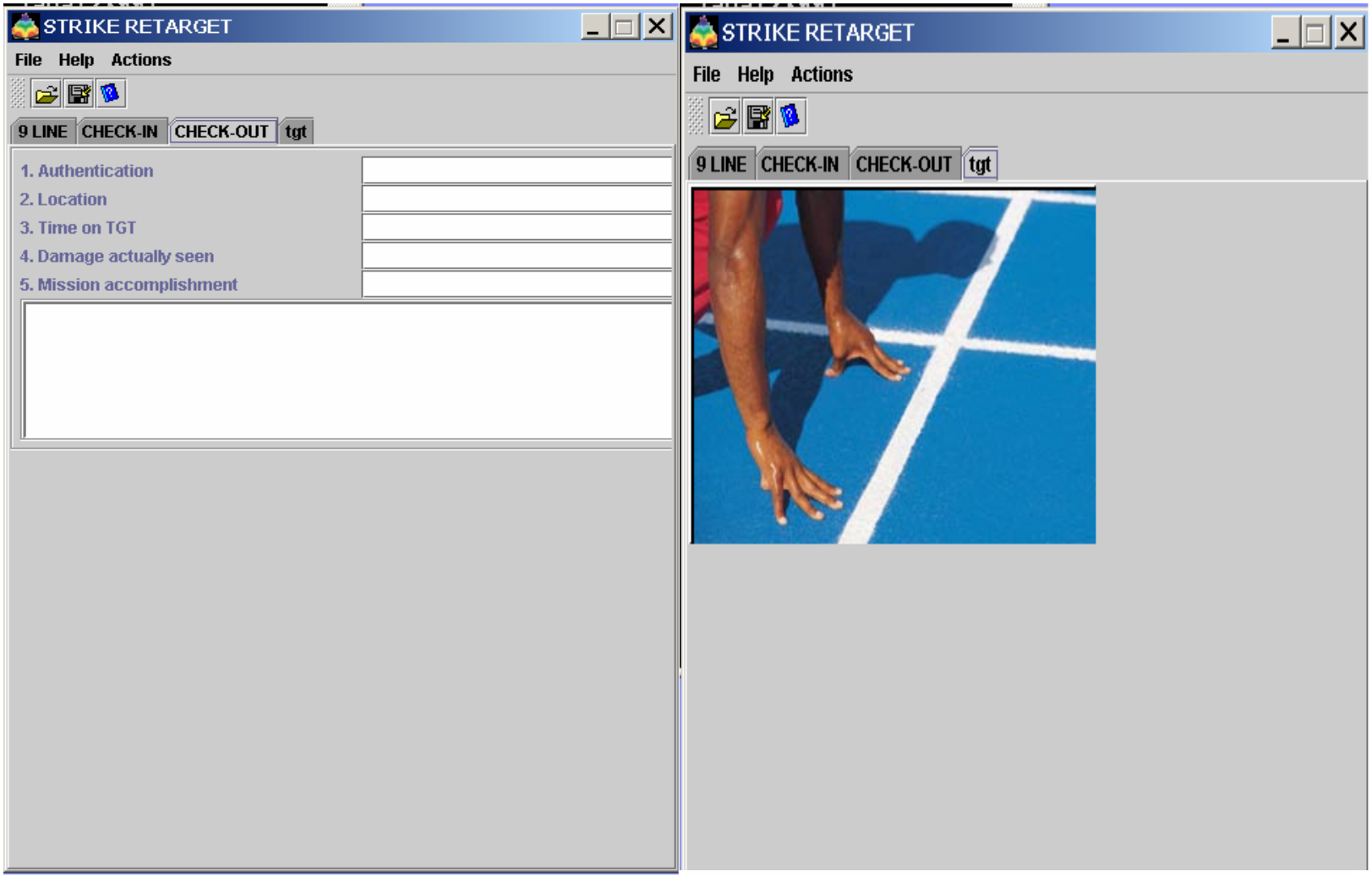
SPAWAR Systems Center San Diego

SPAWAR Systems Center San Diego

Extra Slides

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego



SmartPacks for transmission to aircraft

REALTIME EXECUTION DECISION SUPPORT

SPAWAR Systems Center San Diego

ELP & MM JMPS UPC Integration