



U.S. Army Research, Development and Engineering Command



***TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.***

Introducing IMPRINT 4.0

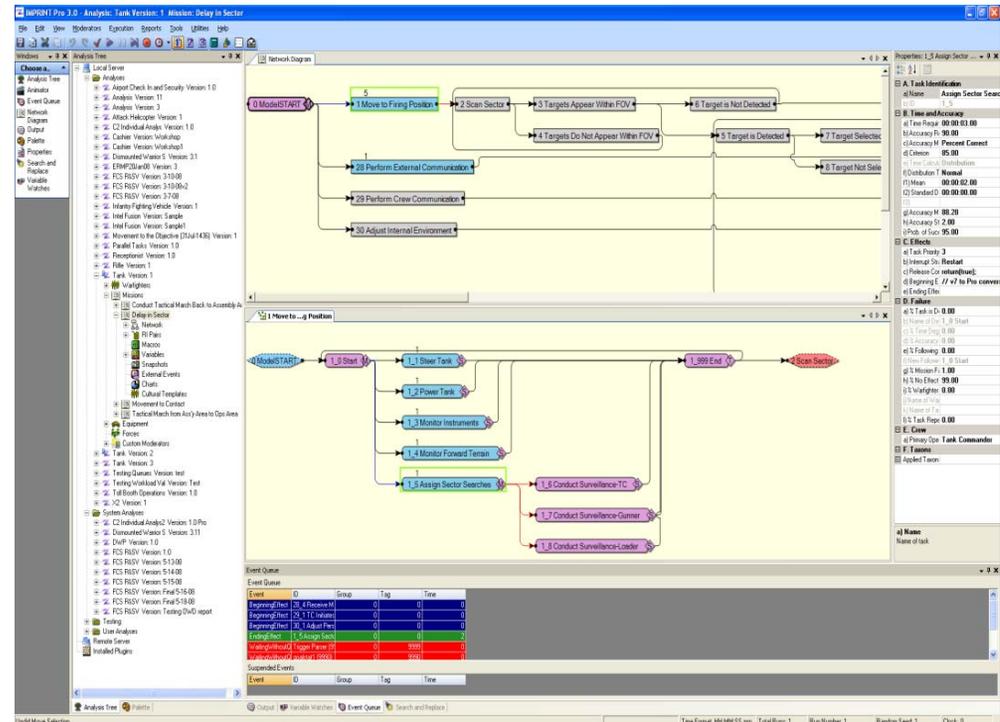
Charneta Samms

## Improved Performance Research Integration Tool

*stochastic discrete event simulation tool*



*400+ users supporting Army, Navy, Air Force, Marines, NASA, Department of Homeland Security (DHS), Department of Transportation (DoT), Joint and other organizations across the country*



<http://www.arl.army.mil/IMPRINT>

<https://km3.alionscience.com/sites/imprint>

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

- **Set realistic system requirements**
- Identify future manpower & personnel constraints
- **Evaluate operator & crew workload**
- Test alternate system-crew function allocations
- Assess required maintenance manhours
- Assess performance during extreme conditions
- Examine performance as a function of personnel characteristics and training frequency & recency
- Identify areas to focus test and evaluation resources
- **Quantify human system integration risks in mission performance terms to support milestone review**
- Represent humans in federated simulations

**IMPRINT is a trade-off analysis tool**

**WARFIGHTERS**  
Personnel Modeling

**MISSIONS**  
Operations Modeling



**EQUIPMENT**  
Maintenance Modeling

**FORCES**  
Manpower Modeling

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

## Army HARDMAN II

*Automated process –  
mini-computer*

## IMPRINT 7

*New output reports  
& 32 bit application*

## IMPRINT Pro 4.0

*New navigation  
structure*

**Concept  
Paper**  
Air Force

## IMPRINT & WinCrew

*Integrated analysis  
environment - Windows*

## IMPRINT Pro 3.5

*2D&3D animation*

1970

1980

1990

2000

2010

2020

## Army HARDMAN III

*MPT link to  
performance - PC*

## IMPRINT Pro 1.0

*Tri-service capabilities  
and new interface*

## Navy HARDMAN

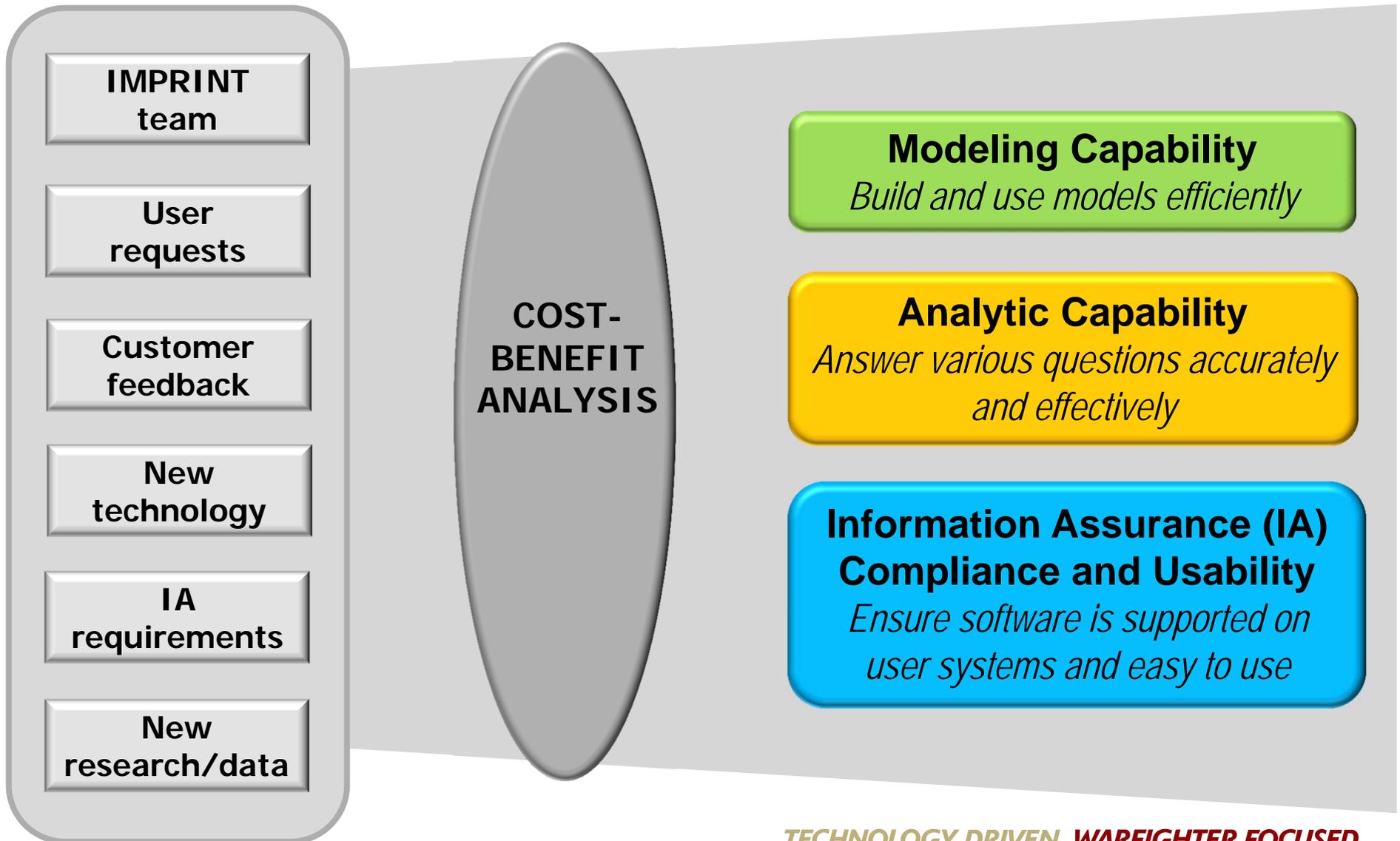
*MPT data provided –  
paper and pencil  
method*

## IMPRINT 6

*Goal Oriented Behaviors  
& HLA compliance*

## IMPRINT Pro 3.0

*New XML structure  
.NET framework*



## Modeling Capability

- Custom agencies
- Selected specialties list
- Custom library of nodes
- Custom accuracy measures

## Analytic Capability

- Custom reports
- Human Error Taxonomy Plug-in
- Forces module

## Information Assurance (IA) Compliance and Usability

- Supporting Windows 7 and testing Mac OS running virtual windows

## Custom Agencies

*Users can define agencies (similar to existing services such as the Army) to group their customized specialties (MOS, ratings – job categories of services)*

Agency	Specialty Count	Selected Specialties
Army	352	0
Navy	100	0
Air Force	163	0
Marine Corps	454	0
Agency	0	0

## Selected Specialties List

*Users can create own master list of specialties to appear in analysis*

Select the Specialties to be used in this Analysis. Select Agency: **Army**

**Agency Specialties**

- 13S-Field Artillery Surveyor
- 13W-Field Artillery Meteorological Crewmember
- 13Z-Field Artillery Senior Sergeant
- 14E-Patriot F.C Operator/Maintainer
- 14J-Early Warning System Operator
- 14M-Man Portable Air Defense System Crewmember (R)
- 14S-Avenger Crewmember
- 14T-Patriot Launching Stn. Operator/Maintainer
- 14Z-Air Defense Artillery Senior Sergeant
- 15D-Aircraft Powertrain Repairer
- 15F-Aircraft Electrician
- 15G-Aircraft Structural Repairer
- 15H-Aircraft Pneudraulics Repairer
- 15J-OH-58D Armament/Electrical/Avionics Syste
- 15K-Aircraft Components Repair Supervisor
- 15M-UH-1 Helicopter Repairer
- 15N-Avionic Mechanic
- 15P-Aviation Operations Specialist

**Selected Specialties**

- 14R-Line of Sight-Forward-Heavy Crewmember
- 15B-Aircraft Powerplant Repairer

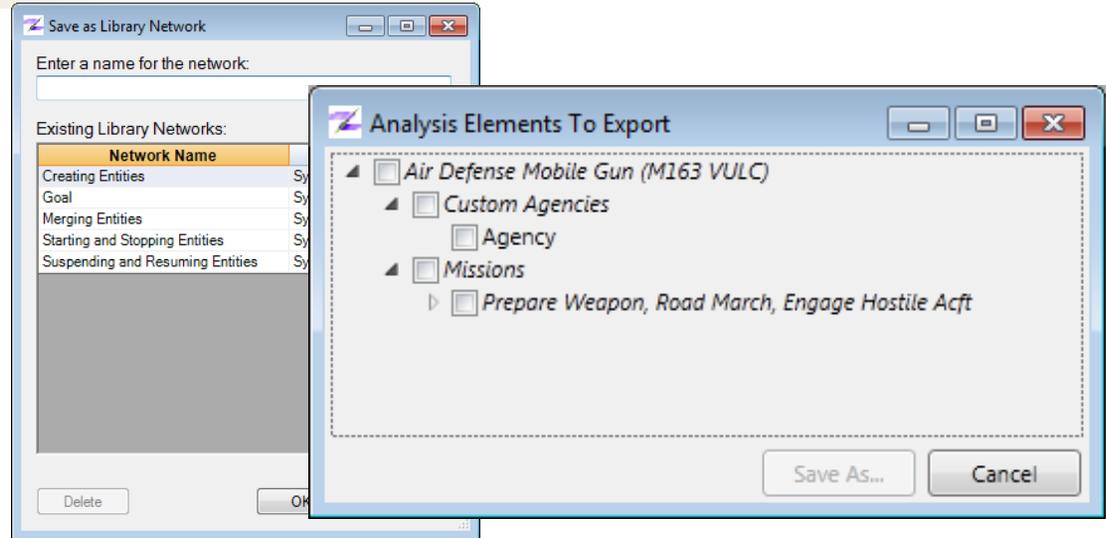
Search by: **Description**

**Modeling Capability**

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

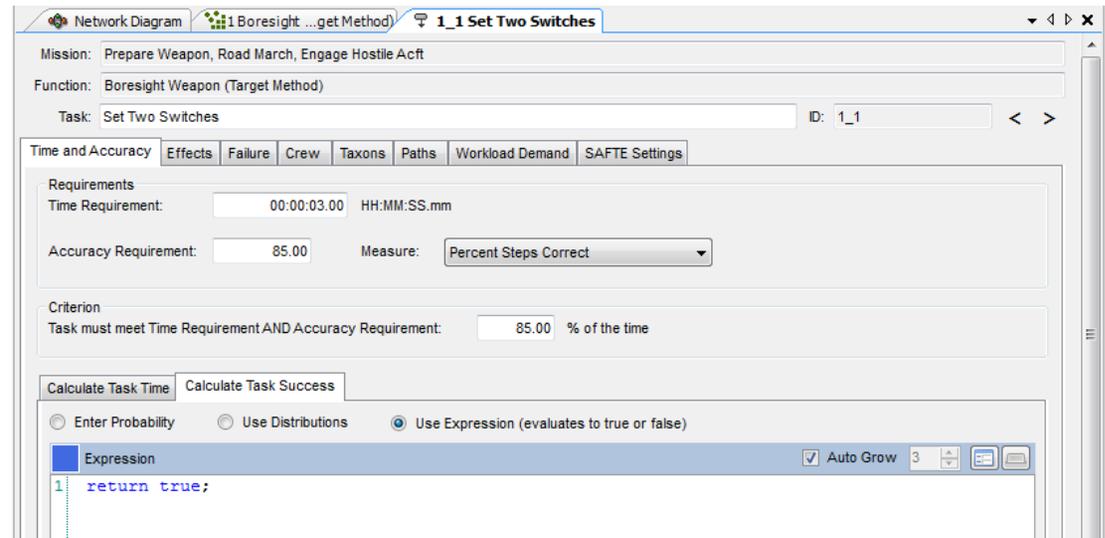
## Custom Library of Nodes

*Export individual nodes of an analysis to customized library for future use or sharing*



## Custom Accuracy Measures

*Create customized accuracy measures for defining whether a task succeeds or fails during model execution*

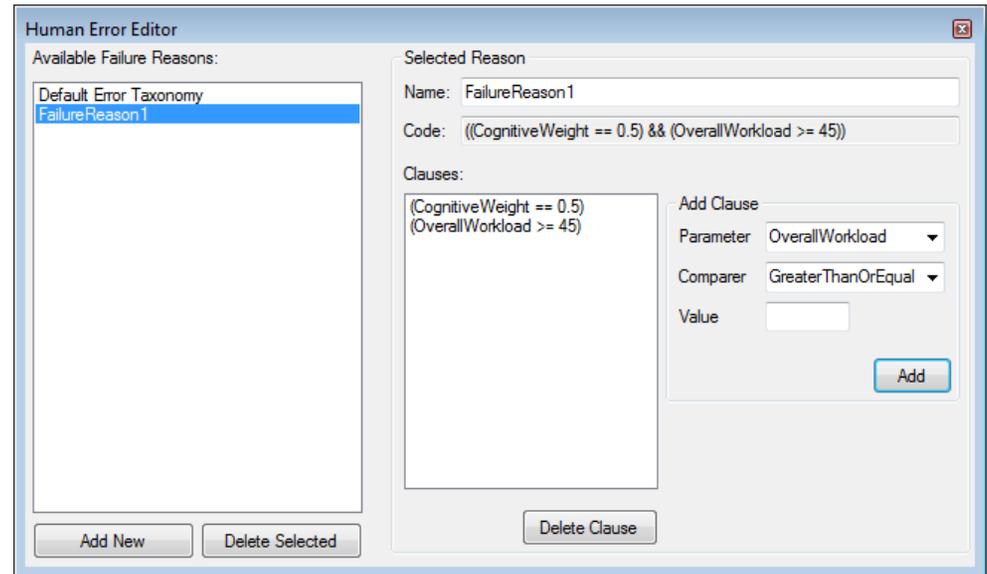


Modeling Capability

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

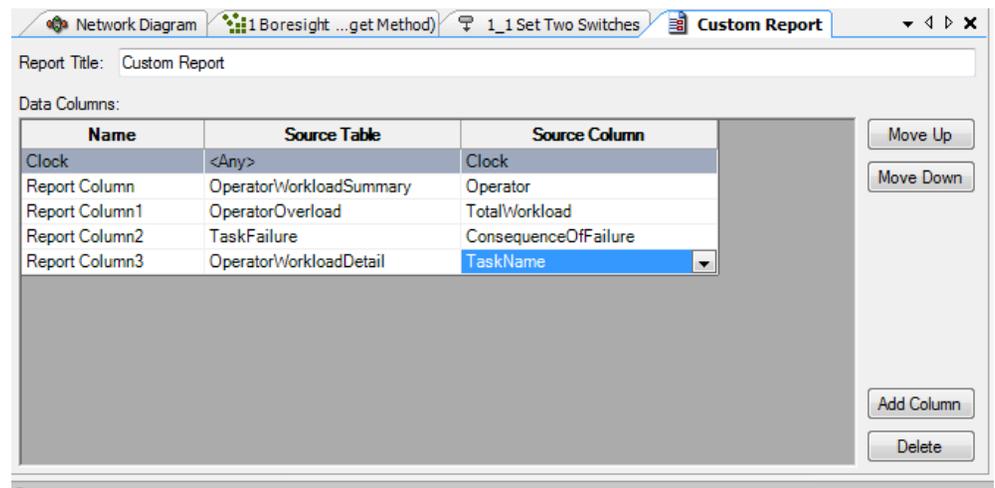
## Human Error Taxonomy Plug-in

*Plug-in that will allow a user to model the potential for human error based on workload and task taxon (task type) weights*



## Custom Reports

*Users can create customized reports to include data from built-in IMPRINT reports and user-defined snapshots*



Network Diagram | 1) Initial Terrorist call

Unit Name: Response Force  
 Activity: 1) Initial Terrorist call  
 Sleep Activity: False | Priority: 3 | Interrupt Strategy: Restart

**Job Roles**

Role	Required	Desired
Dispatcher	0	1
EMT	0	0
Fire Leader	0	0
Fire Leader (sub)	0	0
Fire Member	0	0
NBC Communicatic	0	0
NBC Decontaminat	0	0
NBC Leader	0	0

**Adding Crew Members**

has no effect  
 reduces Time Proportionally  
 reduces Time Somewhat

10 Maximum # crew members  
 10 Maximum # crew members  
 0.00 % reduction per additional

**Asset Features**

Feature	Required	Des
Ambulance	0	
Command Center	0	
Fire Mobility	0	
Ladder	0	
Mobile Command C	0	
NBC Detection	0	
NBC Mobility	0	
NBC Personnel Pro	0	

Start | Duration | Cancel | Repeat | Stop Repeat

Enter Time |  Use Distributions |  Use Expression (evaluates to hours)

Enter Time: 3 02:30 D HH:MM

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Name: Comms Op  
 Specialty: Switch Board Operator-Switch Board Operator  
 Rank: E4

**Availability:**

Schedule	Number Available
EMT	2
EMT Assets	0
EMT Shift 2	0
Fire Dept Assets 1	0
Fire Dept Assets 2	0
Fire Dept Chief	0
Fire Dept Operator	0
NBC Recon	0
NBC Recon equipr	0
Police Dept Assets	0
Police Dept Chief	0
Police Dept Officer	0
Police Dept Officer	0

**Roles:**

- Dispatcher
- EMT
- Fire Leader
- Fire Leader (sub)
- Fire Member
- NBC Communication
- NBC Decontamination
- NBC Leader
- NBC Member
- Police Leader
- Police Member
- Police Sub-Leader

## Forces Module

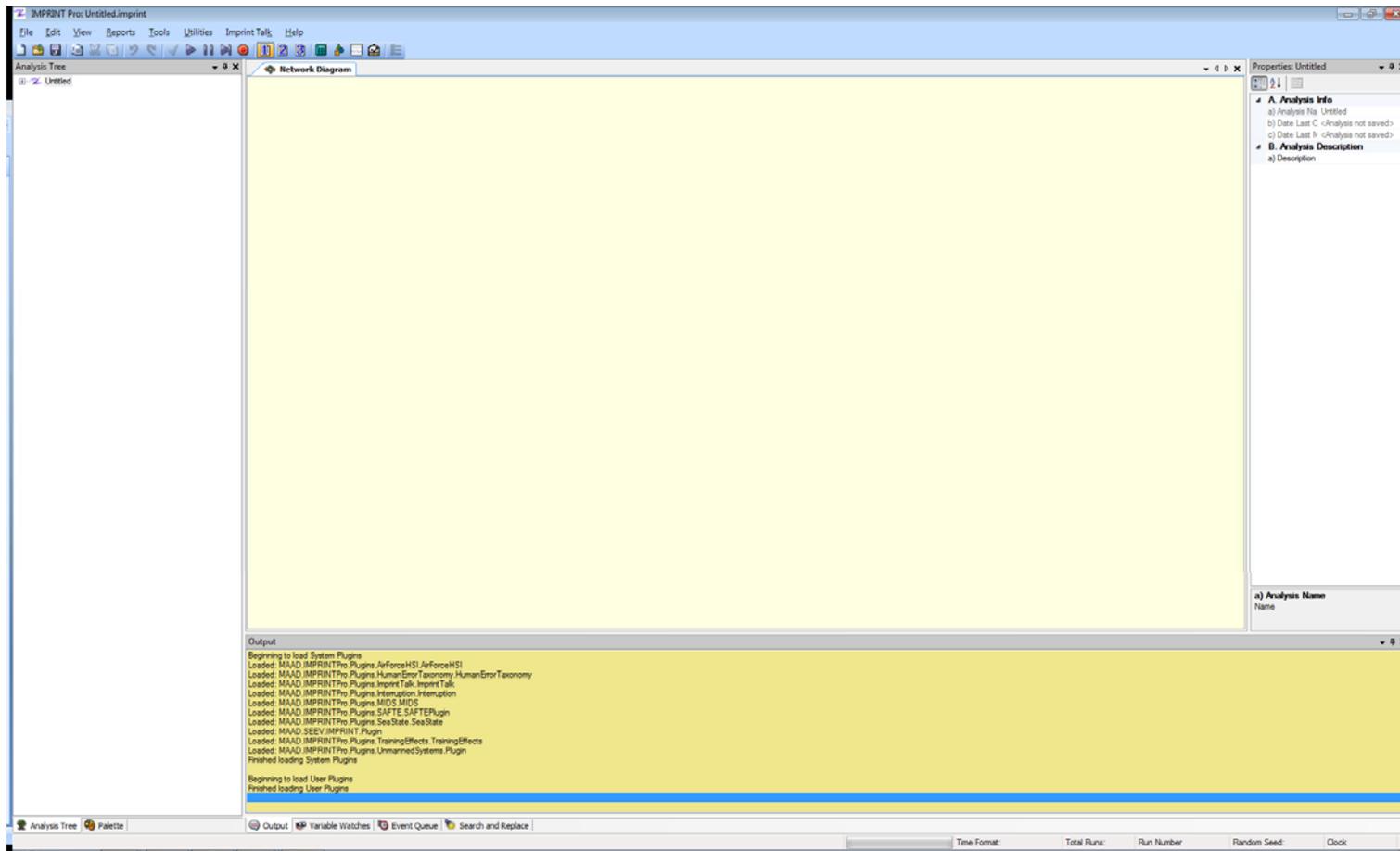
- User defined roles – *create and add customized roles*
- Abort option – *expands interrupt strategy of an unplanned activity to include abort*
- Effect of additional crew on unplanned activity – *effect task duration based on availability of additional crew*
- Time expression – *can use an expression to define the duration of an unplanned activity*
- Asset and asset features – *restrain model with need for equipment with specific features*

**Analytic Capability**



US ARMY  
**RDECOM**

# IMPRINT 4.0



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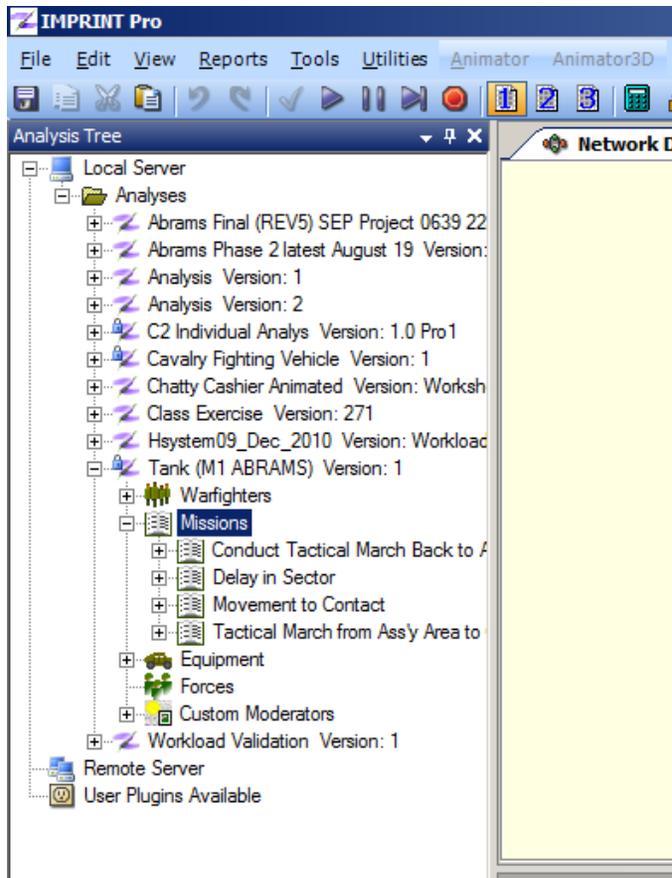


US ARMY  
**RDECOM**

New "Office-like" functionality

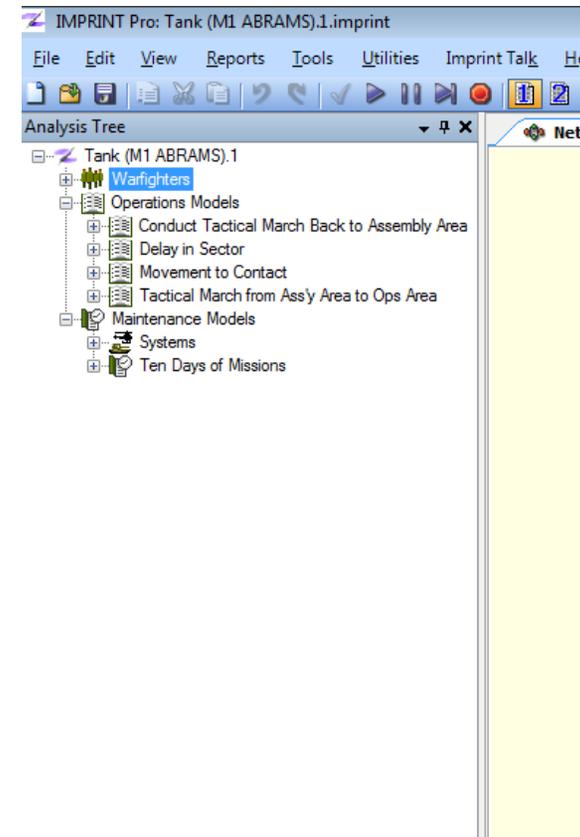


## Version 3.5



*Must import/export analyses*

## Version 4.1



*Analyses are separate files*

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

**Cross Model Comparison  
for Operator Workload**

*Automatic comparison of workload  
across multiple runs*

**Visio Data Import**

*Import data from Microsoft Visio  
flowcharts into IMPRINT*

**Disable randomness**

*Capability to turn off stochastic  
variability*

**Personalized Data  
Library**

*Save and share elements of  
your analysis; custom  
agencies, specialties, macros,  
library networks, etc.*

## **Unmanned Systems Plug-in**

*Supports examining workload associated with multitasking and unmanned systems usage; new workload strategies*

## **Interruption Plug-in**

*Set lag time and accuracy penalties for interrupted tasks*

## **IMPRINT Talk Plug-in**

*Set up two or more IMPRINT models to talk to each other*



## **Batch Model Execution and Analysis Tool**

*Separate tool to support automated batch model running and report analysis*

## **Import/Export Expansion**

*Capability to import/export data from a variety of sources; Microsoft Excel, other HPM tools*

## **Team Task**

*Create a capability to assign operators to work on a task simultaneously and develop new reports focused on team performance*

## **ONR Performance Shaping Functions Plug-in**

*Plug-in that will allow users to model  
effect of environmental stressors such  
as motion sickness, fatigue and  
motion induced interruptions*

## **NASA Plug-in**

*Add NASA specification to support  
analysis of astronaut performance in  
long-duration missions; Astronauts  
experience fatigue, and poor sleep in  
short missions*