

Insight: Operability Testing for High Availability Systems

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Agenda

- Background
- System Management Overview
- Case Study: Insight
- The Benefits of Insight



EXPERIENCE. RESULTS.

The Aegis Weapons System

- Aegis is the world's premier naval surface defense system. It is capable of simultaneous operation defending against air, surface, subsurface and ballistic missile threats.
- There have been 7 major releases, known as baselines, in the nearly 4 decade history of Aegis.
- Recent baselines have focused on re-engineering the weapons system to take advantage of commercially available off-the-shelf (COTS) operating environments (OE).





EXPERIENCE. RESULTS.

A Migration to Open Architecture

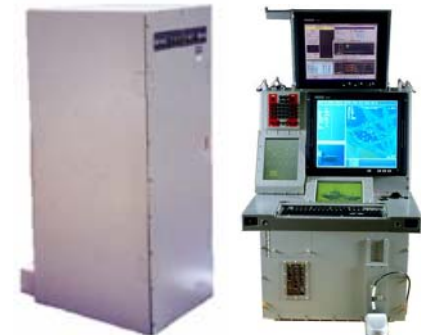
Proprietary Systems



Manufactured hardware and developed software



Open Technology



Emphasis on COTS hardware and software integration

Computing System Management functions have become more complex with the adoption of COTS technology



Open Technology



- An Aegis ship not much different from a large-scale commercial data center.
- The weapons system is comprised of a standard operating environment with unique components not seen in commercial architectures.



EXPERIENCE. RESULTS.

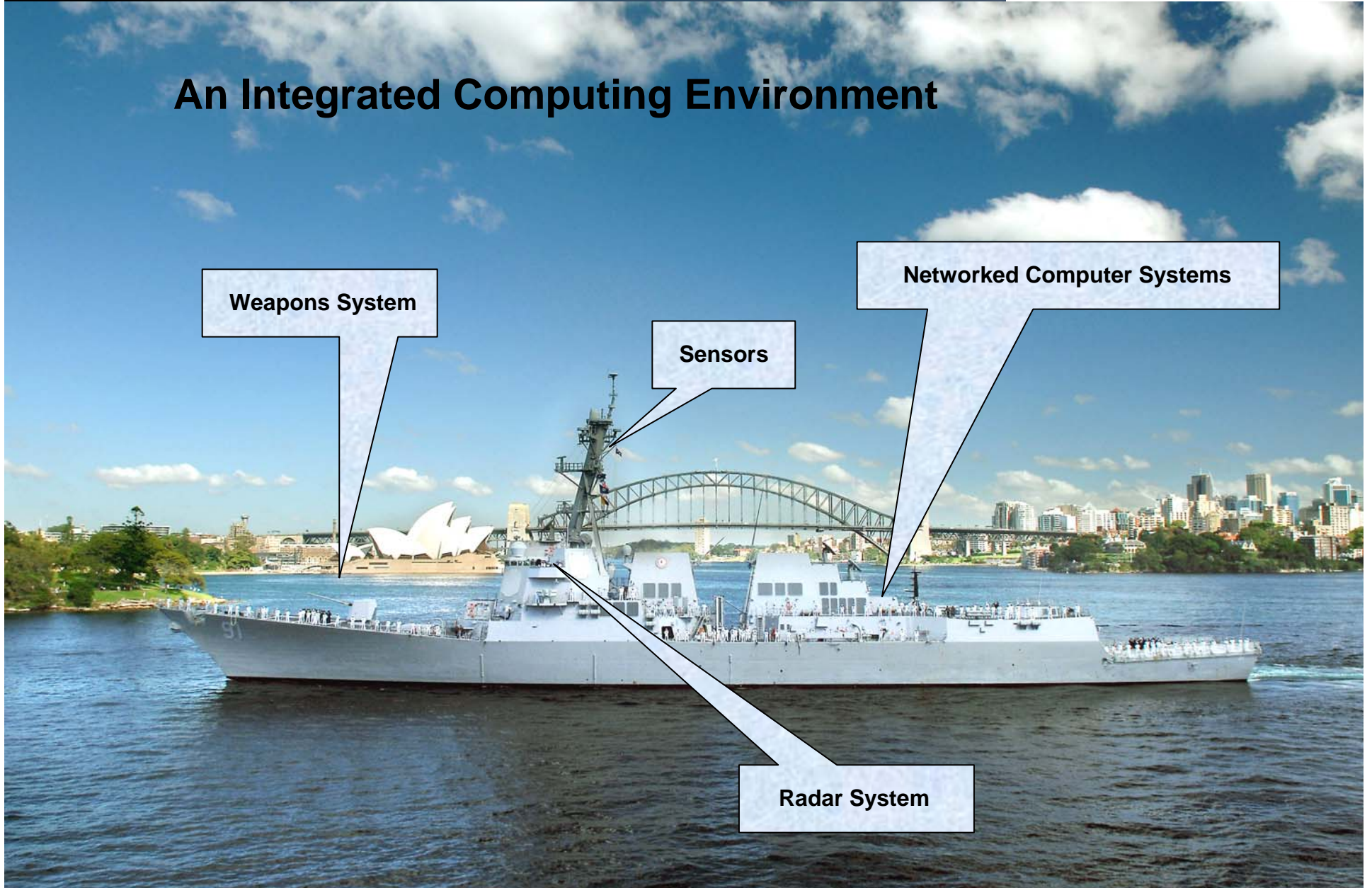
An Integrated Computing Environment

Weapons System

Sensors

Networked Computer Systems

Radar System





EXPERIENCE. RESULTS.

System Management Overview





EXPERIENCE. RESULTS.

Application Management

- Manage where applications are running
- Manage runtime state of the applications
- Manage recovery and reconfiguration
- Assess health status of the applications

Equipment Management

- Node/Server Management
 - **Diagnostics**
 - **Performance Monitoring**
- Network Management
- Asset Management
 - **Validation and Verification**
 - **Software Distribution**

Fault Detection / Fault Isolation

Root Cause Analysis



EXPERIENCE. RESULTS.

Aegis System Management

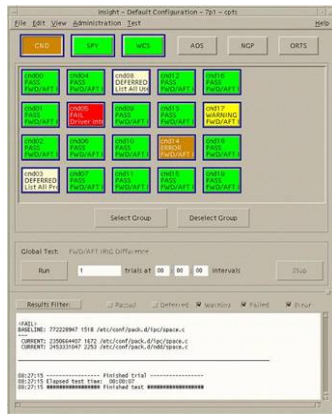
- In the current baselines, System Management for the Aegis Weapons System is comprised of multiple components.
- Each component exists as a standalone entity.
- Together, they interoperate to provide an end-to-end solution for Operational Readiness Assessment of the combat system.



Insight is a key component for managing the operating environment of the Aegis Weapons System



Case Study: Insight





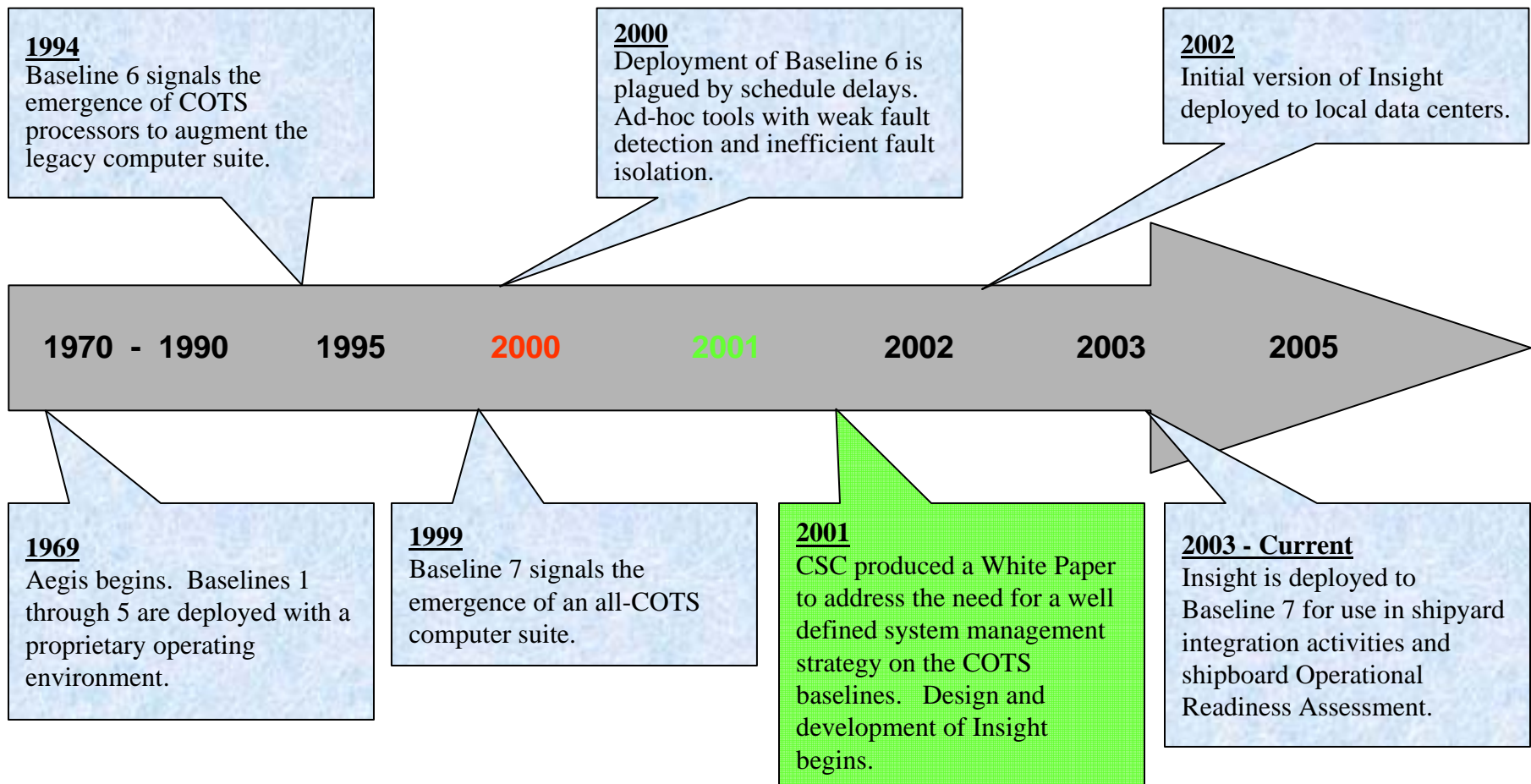
What is Insight?

- An integrated computing system management toolkit.
- It is a highly configurable suite of open source, commercially available, and developed tools that perform system management functions across the enterprise.
 - Hardware and software diagnostics
 - Performance monitoring
 - Network management
 - System control
 - Validation and verification



EXPERIENCE. RESULTS.

The Catalyst For Insight

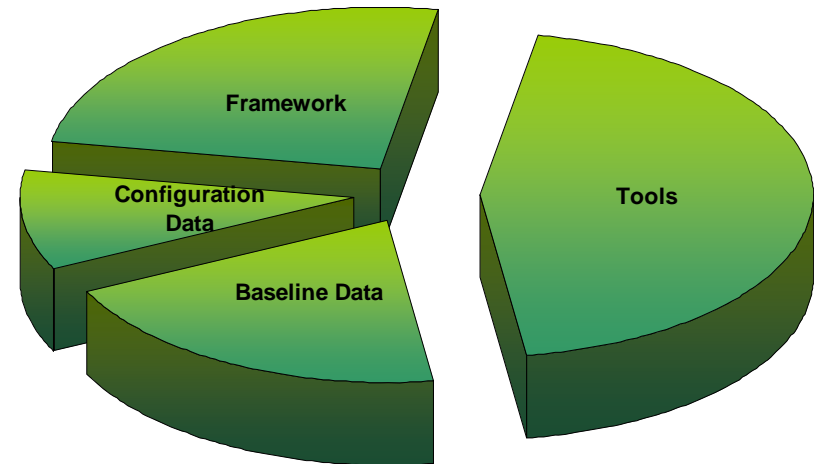




EXPERIENCE. RESULTS.

Insight Component Architecture

- Framework
 - Graphical User Interface, Network Services, and Remote Agents
- Tools
 - Configurable collection of “best-of-breed” products and utilities to perform system management functions
- Configuration Data
 - Easily tailors Insight to the needs of the open architecture enterprise being managed
- Baseline Data
 - Repository of expected OE configuration state information

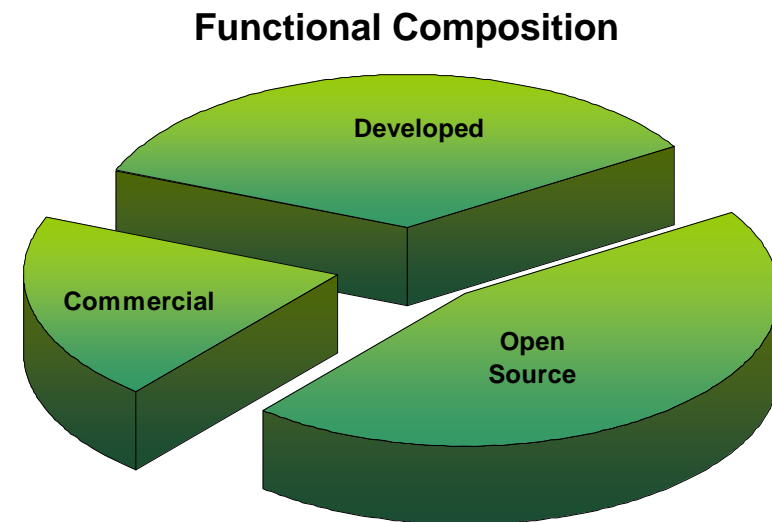




EXPERIENCE. RESULTS.

Extensive Use Of Open Source Technology

- Over 40% of Insight is comprised of Open Source software
 - Permits selection of cost effective, best-of-breed solutions
 - Reduces development time
 - Leverages intellectual resources from the world wide development community



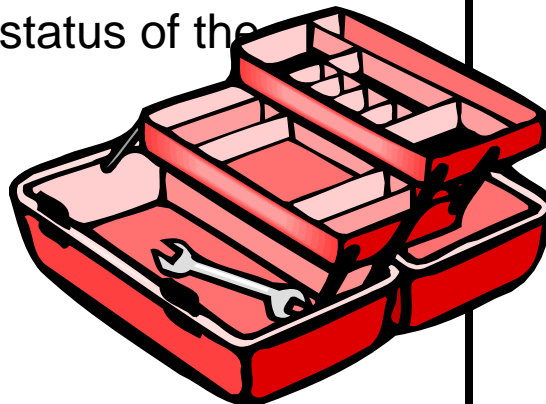
**Capitalizing on Open Source saved
approximately \$1M in development costs**



EXPERIENCE. RESULTS.

Application Management

- Manage where applications are running
- Manage runtime state of the applications
- Manage recovery and reconfiguration
- Assess health status of the applications



Insight's Toolkit

Equipment Management

- Node/Server Management
 - **Diagnostics**
 - **Performance Monitoring**
- Network Management
- Asset Management
 - **Validation and Verification**
 - **Software Distribution**

Fault Detection / Fault Isolation

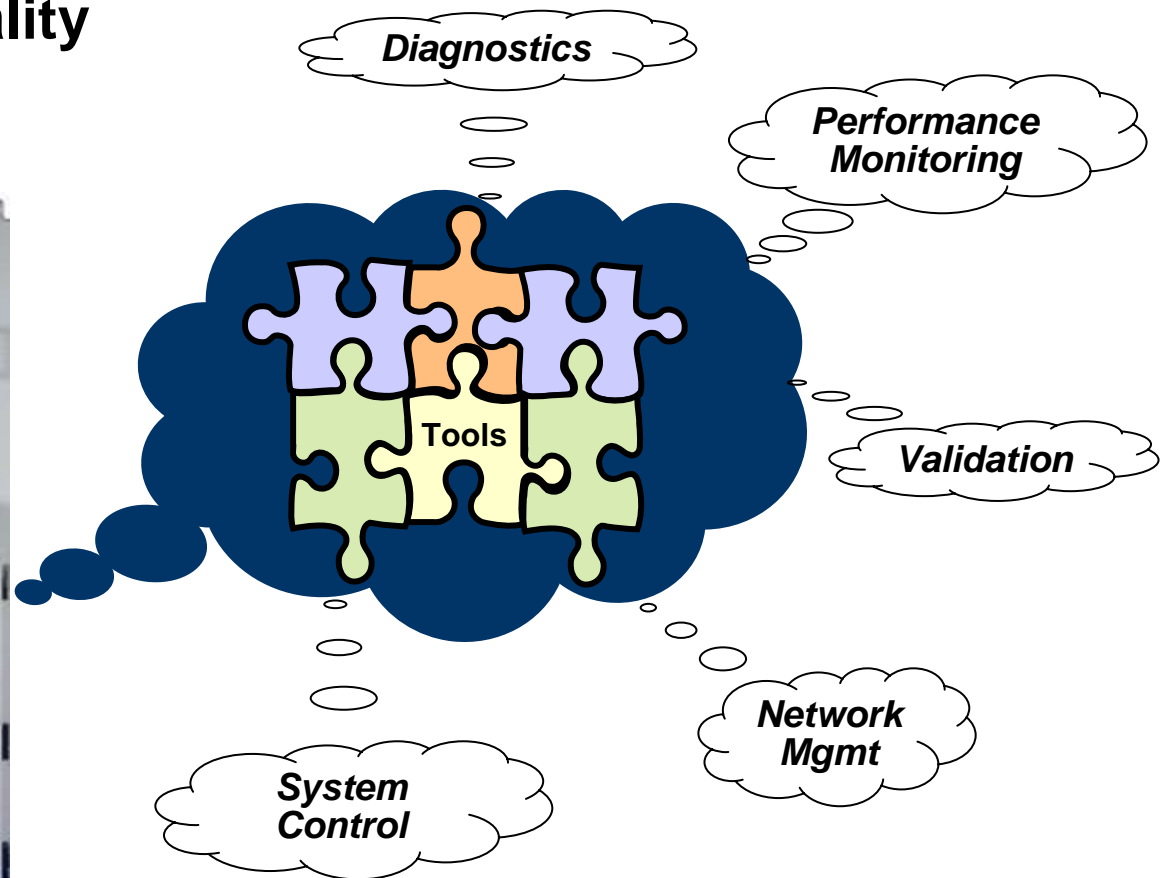
Root Cause Analysis



EXPERIENCE. RESULTS.

Insight Functionality

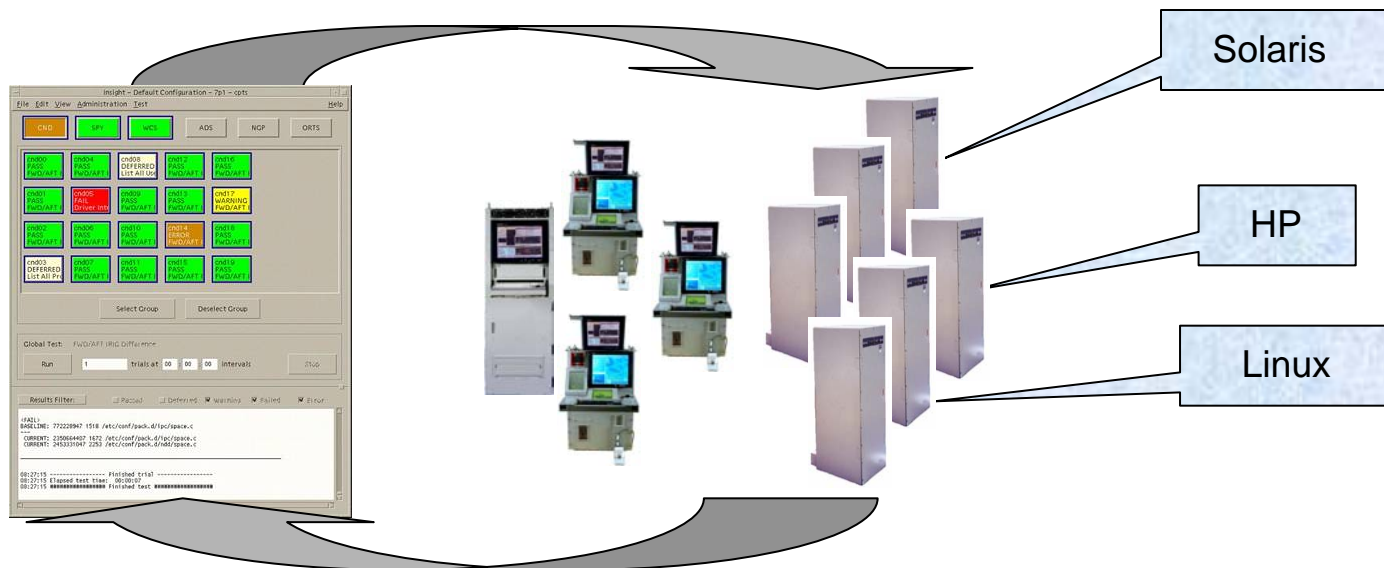
- On-demand Testing
- Runtime Monitoring
- Interactive Control





Consistent Interface for Disparate Tools

- Standardizes test execution
- Hides tool variability from the user
- Provides common results



Insight standardizes the execution and results of each tool, regardless of platform or tool origin



EXPERIENCE. RESULTS.

Hardware and Software Diagnostics

- Fault Detection / Fault Isolation (FD/FI)
- Assess the operational state of hardware and software components
 - NTDS Devices
 - I/O Boards
 - Specialized Processors
 - Tactical Interfaces
 - Middleware Components

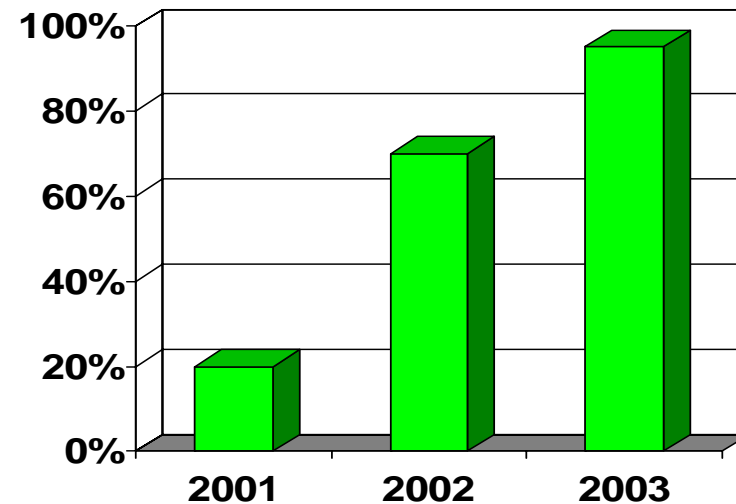


EXPERIENCE. RESULTS.

Increased Productivity

The availability of Insight has increased the productivity rate to over 90% by providing rapid identification of operating environment issues.

Integration Productivity Rate



Rapid Resolution = Increased Productivity = Significant Savings



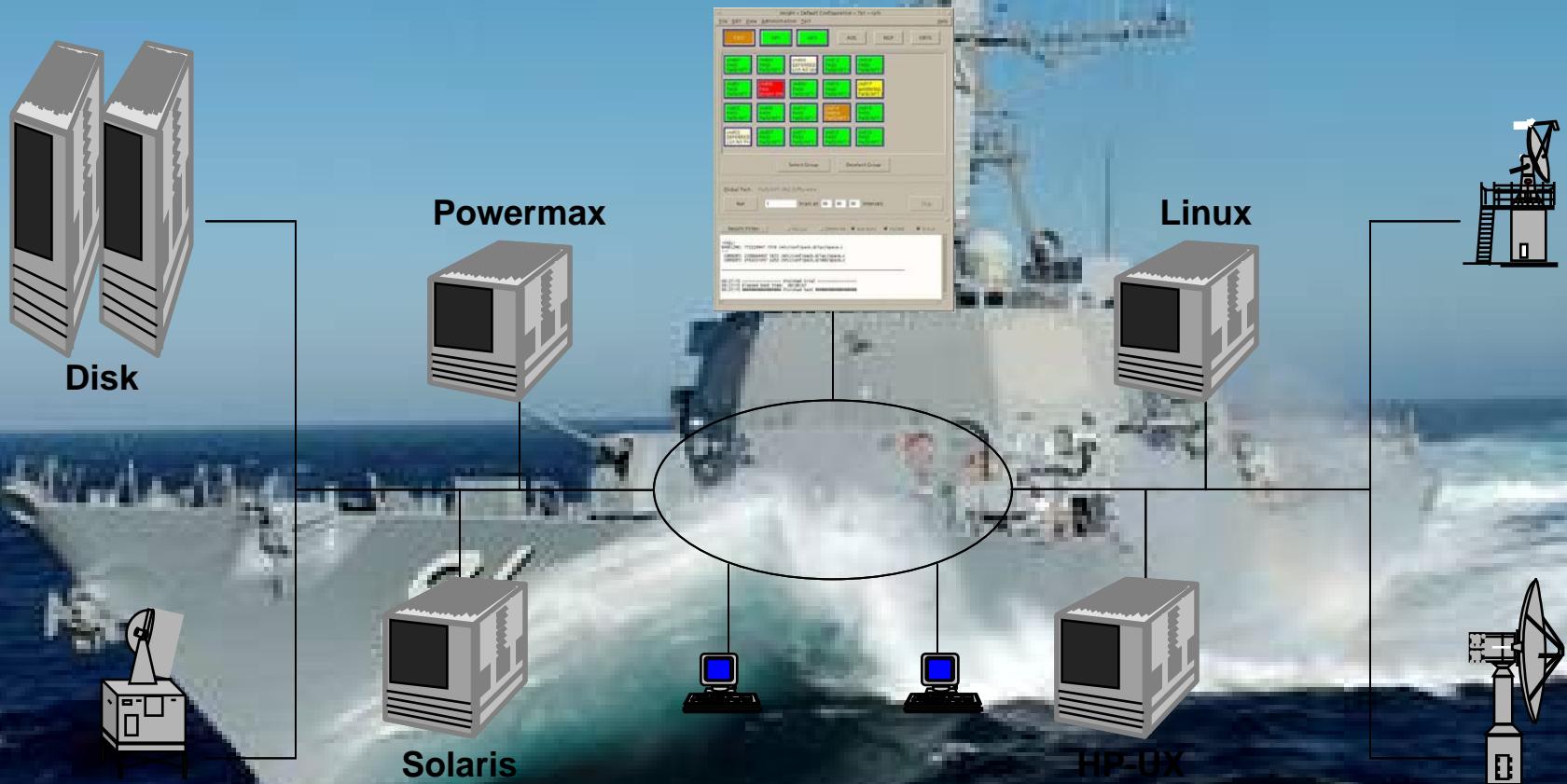
Performance Monitoring

- Assess infrastructure performance under operational conditions
 - CPU utilization
 - Memory utilization
 - Process activities
 - Disk usage
 - I/O activity
 - Kernel-level trace
- Data is represented in real-time as well as archived for statistical representation



EXPERIENCE. RESULTS.

Insight assesses operational readiness of combat system components from a single console





EXPERIENCE. RESULTS.

Validation and Verification

- System Operability Test

- Checks a number of Operating Environment configuration parameters to determine overall system operability
 - Configured Devices
 - Filesystem Integrity
 - Kernel Tunables
 - Network Tunables
 - Installed Packages
 - OS Version and Patches
 - Firmware

- Ensures that the current state of a host's OE is consistent with established baseline data



Automated Validation of the Operating Environment



Integration and Test Facility

=



Deployed System

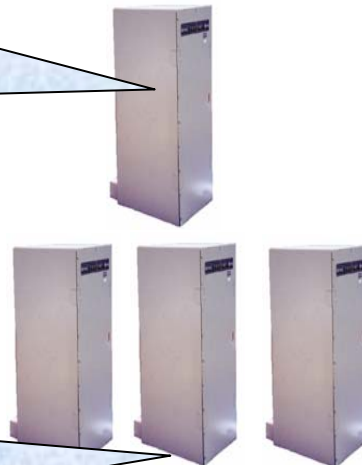
**Insight ensures that the deployed configuration
is identical to the staged environment**



EXPERIENCE. RESULTS.

Automated System Validation: Months to Minutes

There are over 6000 configuration parameters on each node that are optimized for the application



Manual validation of the configuration for the entire computer suite would take nearly 4 staff months



Insight provides accurate validation for the entire computer suite within 3 minutes



Automated validation provides complete confidence in the deployed configuration and saves significant taxpayer dollars



Network Management

- Assess health status and performance of the local area network
 - LAN operability
 - Routes
 - Network utilization

System Control

- Manage the run-time state of the tactical applications
 - System Initialization
 - Shutdown
 - Reboot



EXPERIENCE. RESULTS.

**Run-time state of the system
can be monitored and
controlled from a single console**





Concept of Operations

- Insight is used throughout the life-cycle of the combat system.

Development Data Center



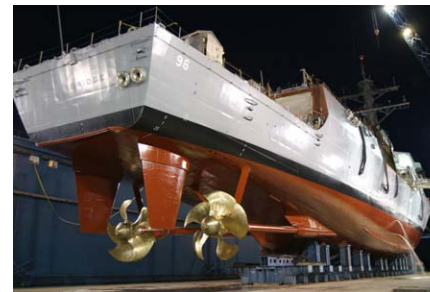
Validation of the build environment

Staging and Test Facility



System validation, diagnostics, operability tests

Shipyard Integration



Deployed Systems



Runtime status monitoring, operability tests, diagnostics

Insight has become standard operating procedure for Aegis



EXPERIENCE. RESULTS.

Safety Checks

Insight's safety agent prevents intrusive functions during tactical operations.





EXPERIENCE. RESULTS.

The Benefits of Insight





EXPERIENCE. RESULTS.

A Vital Maintenance Solution for the Aegis Weapons System



Proprietary systems had an available toolset.

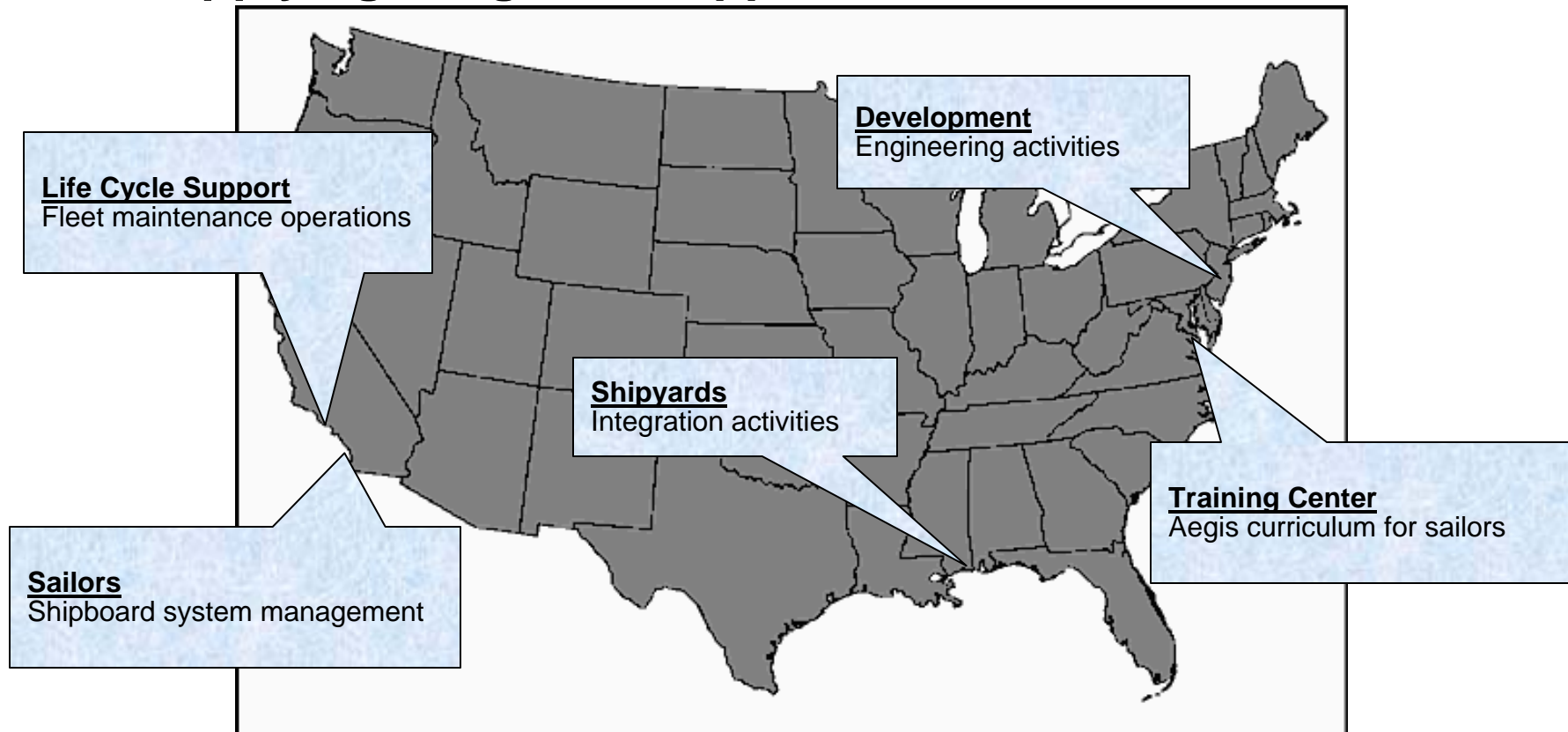


Insight provides a robust toolset for COTS systems.



EXPERIENCE. RESULTS.

Applying Insight to Support Various Activities



Insight is a key component for Aegis System Management



EXPERIENCE. RESULTS.

Enhanced Operational Readiness



Dispatching engineers to troubleshoot shipboard issues:

\$75K



Delaying a missile test due to system instability:

\$1M



Meeting deployment schedules and increasing credibility with your customer:

Priceless

Insight is playing a vital role ensuring that ships are deployed on schedule for immediate use in various theatres of operation



EXPERIENCE. RESULTS.

"Innovation: Delivered"

- **Deployed for 3 ½ years**
- **Multiple Baselines**
- **Domestic and Foreign Test Sites**
- **Domestic and Foreign War Ships**
- **Certified for Tactical Operations**



EXPERIENCE. RESULTS.

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