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Remote Repair, Validation and Verification

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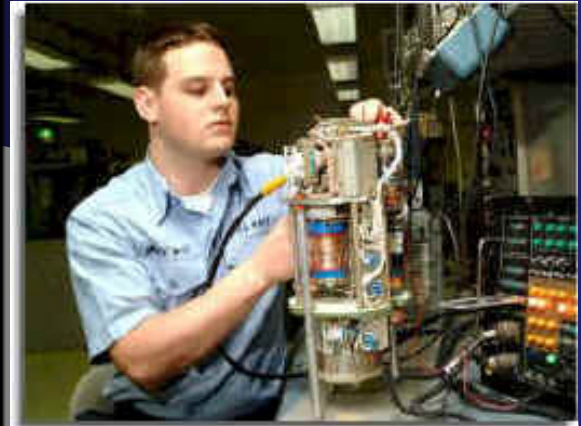
Agenda



- **Background**
- **Projected Distance Support**
- **Remote Repair / Validation / Verification**
- **Case Study**
- **Challenges**
- **Summary**

Background

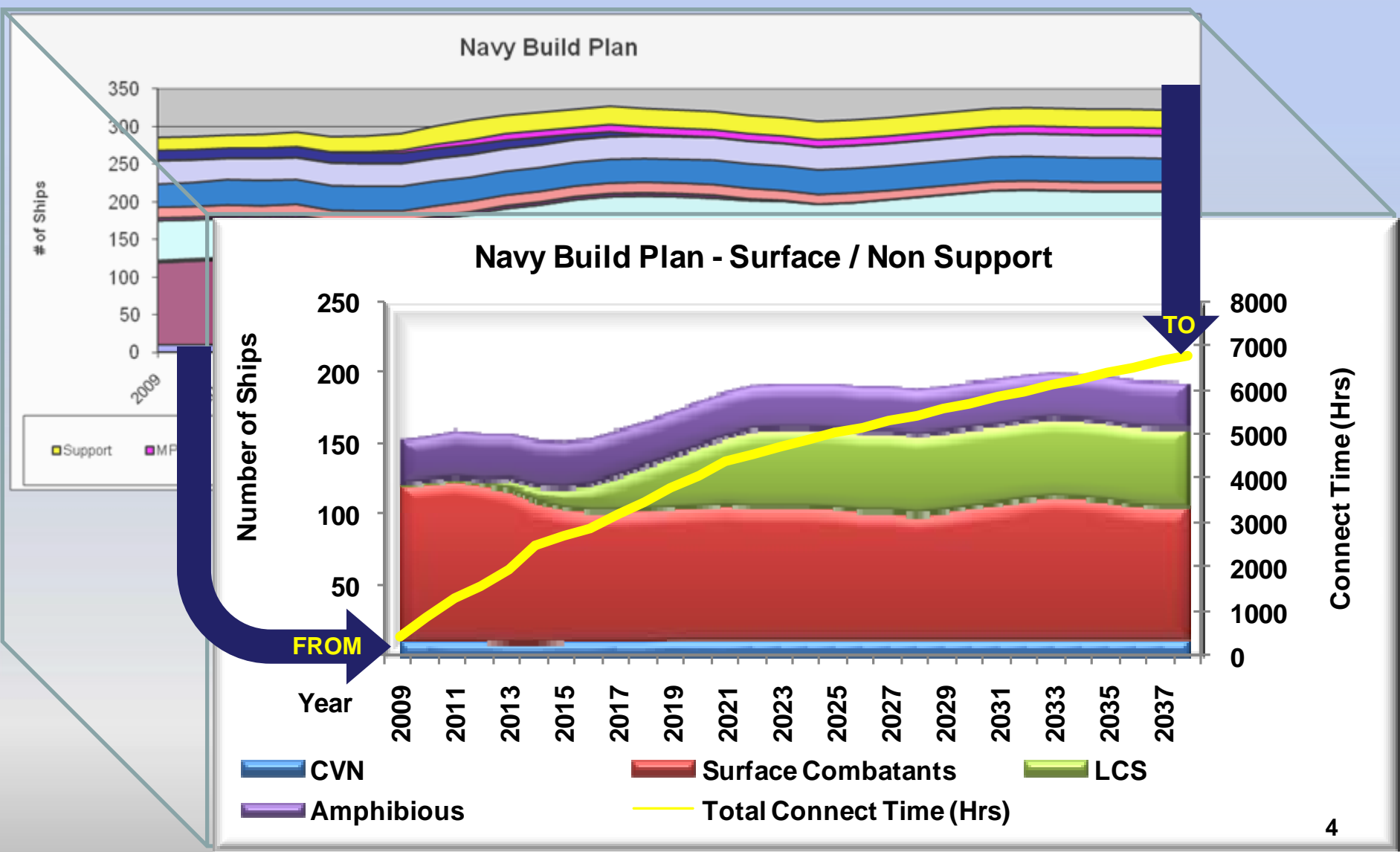
**Traditional Repair
has required Shore
Support Expertise
and a Technician to
Travel to the Ship
to Repair**



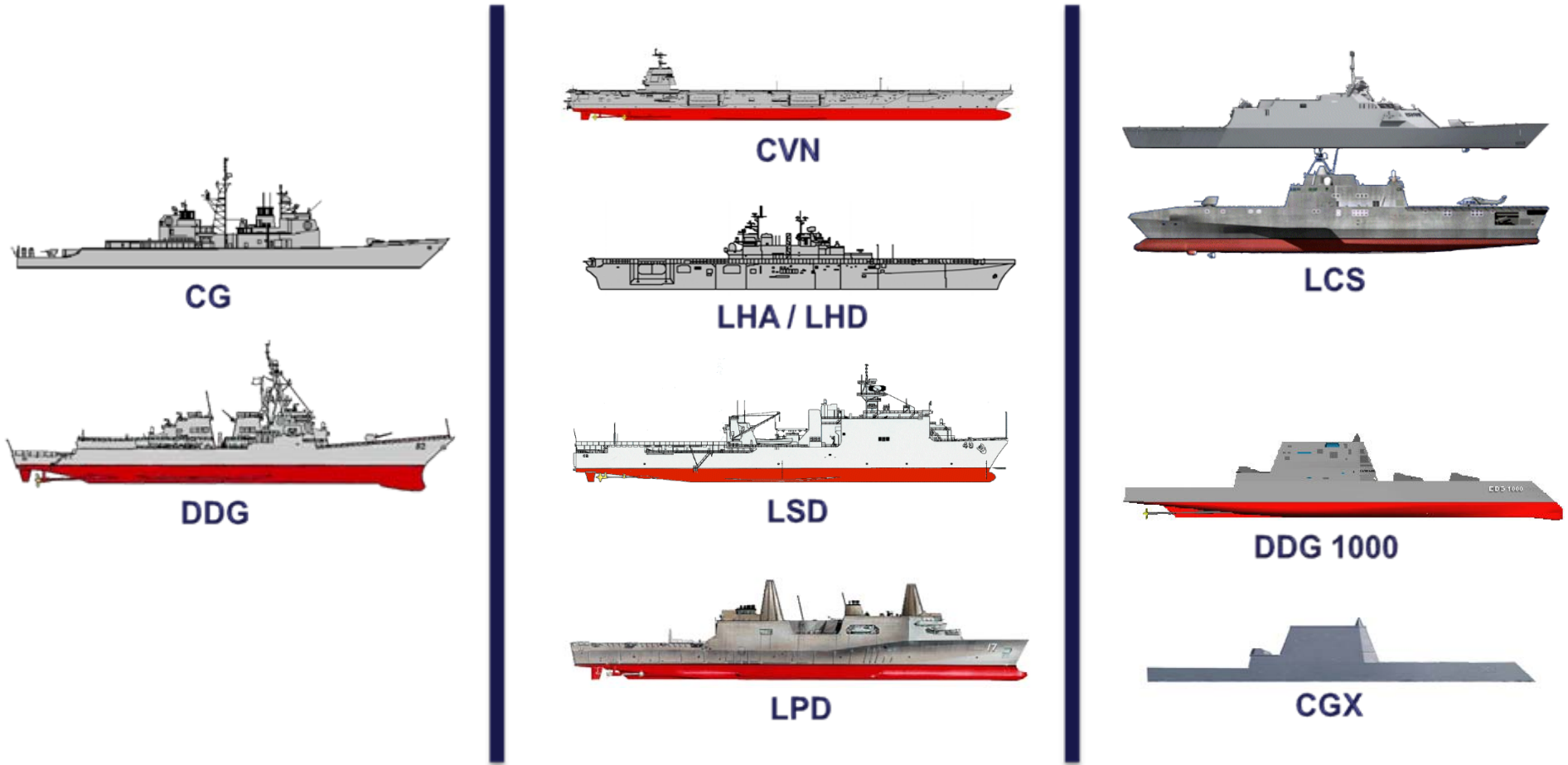
**“Open and Inspect”
has been the
Traditional Method
for Regularly
Scheduled
Maintenance**



Projected Distance Support



Projected Distance Support



Remote Repair, Validation and Verification is Applicable Across Multiple Platforms

- **Remote**
 - Acting, acted on, or controlled indirectly or from a distance [remote computer operation] ; also
 - Relating to the acquisition of information about a distant object [as by radar or photography] without coming into physical contact with it (remote sensing)
- **Repair**
 - Restore by replacing a part or putting together what is torn or broken [fix - repair a shoe]
 - Restore to a sound or healthy state [renew – repair strength]
- **Validation**
 - Act, process, or instance of validating [especially the determination of the degree of validity of a measuring device]

- **Using Technology to Directly Repair**
 - View system, detect anomaly, repair files or settings [Repair corrupt Router files]
- **Using Technology to Indirectly Repair**
 - Interacting with Ships Force for manual tasks required [Replace Circuit Card assemblies]



Remote Validation / Verification

- **File Size and Checksum Matching**
 - File size parameters match
- **Software Subroutines for Validation**
 - Software performs parity check and functionality checks
- **Verification is Critical**
 - Ships Force and Engineering personnel verify functionality
 - Mission critical to Naval units that are required to be available 24/7/365

Case Study Conditions

•Experimental Test Environment

- Trident Warrior '09'

•Communications

- SHF Satellite
- Secure connection [Encrypted]

•Operational Units

- NSWC Port Hueneme, Ca
- USS Farragut [Underway (Atlantic)]

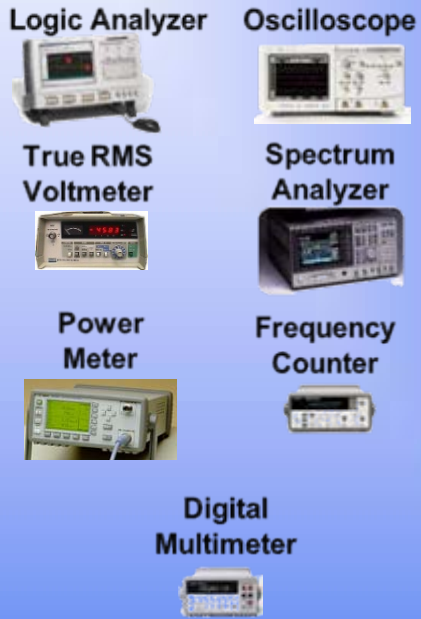
•Objectives

- Non-Real Time data transfer
- Real Time data connection



Case Study Equipment

Synthetic Instrumentation



100+ Other COTS PXI & PCI Offerings



- ✓ Maintenance Process Automation
- ✓ Baseline Data
- ✓ Historic Data
- ✓ Subject Matter Expertise
- ✓ Data Analysis

ADEPT

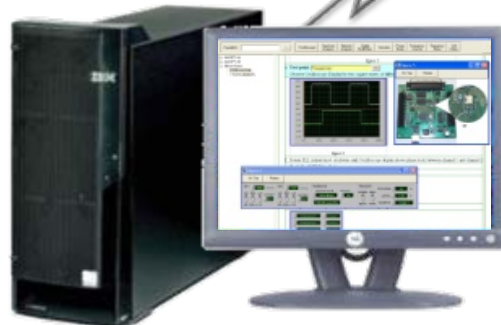


Paper & Electronic Documentation

- ✓ Planned Maintenance System (PMS)
- ✓ Maintenance Index Pages & Maintenance Requirements Cards
- ✓ Interactive Electronic Technical Manuals
- ✓ Fault Isolation & Repair Work Packages

Distance Support

- ✓ Interactive, Real-Time Views for Remote Expert Assistance
- ✓ System Readiness Information to Server for Data Collection, Combining and Analysis
- ✓ Backup, Force Revision and SW Updates



Case Study Connection (Synchronous Mode Scenario)



- **Asynchronous - Non Real Time Data Transfer**
 - Transferred 7 Mb file
 - File verified, applied and visually validated for test equipment
- **Synchronous - Real Time Data Display and Transfer**
 - 3 Days / > 2 hours per day
 - Observed Power and Oscilloscope Readings
 - Remotely operated test equipment
 - 1-2 Seconds Latency between Action and Resultant Display
- **Irregular Observation**
 - Engineering Team at NSWC Port Hueneme walks the Ship's Crew through a Step-by-Step Procedure in Real Time; viewing and operating ADEPT test equipment
 - Using ADEPT System and ORTSTARS; Group collaboration continued to resolve root cause of irregularity; incorrect labeling identified



Challenges Going Forward

- **Cultural**
 - These methodologies are a fundamental shift in the way naval electronics maintenance operations are performed
- **Funding**
 - Adequate funding for lifecycle maintenance is sometimes overlooked and the first in line for reduction when faced with a constrained budget
- **Acceptance**
 - Acceptance that remote repair verification and validation can be effective in maintaining operational availability

Summary

- **Functions of Remote Repair and Validation are Vital**
 - Crew size has decreased and the need for System Readiness has increased
- **Fleet has a Growing Requirement to Provide Distance Support Capabilities**
- **Trident Warrior '09 Testing**
 - Using Adept was a valuable Learning Experience

