

# Early Application of Computer Program Systems Integration, Test and Performance Measurement

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**Computer Sciences Corporation**



**NDIA Systems Engineering Conference**  
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## Agenda

- Background
- System Integration, Test and Performance Measurement
- Summary





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# Background





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## **What is Computer Programs System Integration, Test and Performance Measurement?**

- The ability to verify the interfaces, functions and measure performance of two or more computer programs on the target hardware suite and operating environment.

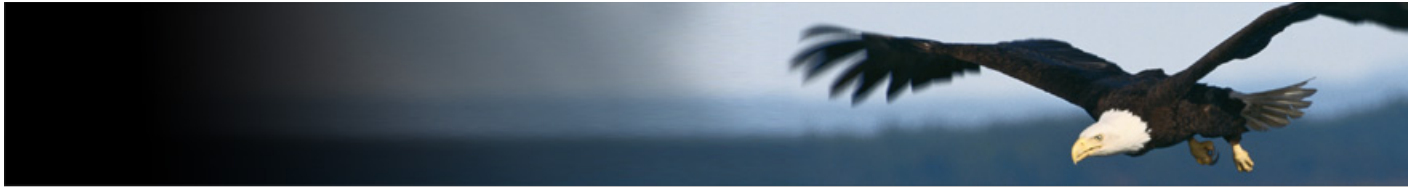


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## **Catalyst for Early Computer Program System Integration, Test and Performance Measurement**

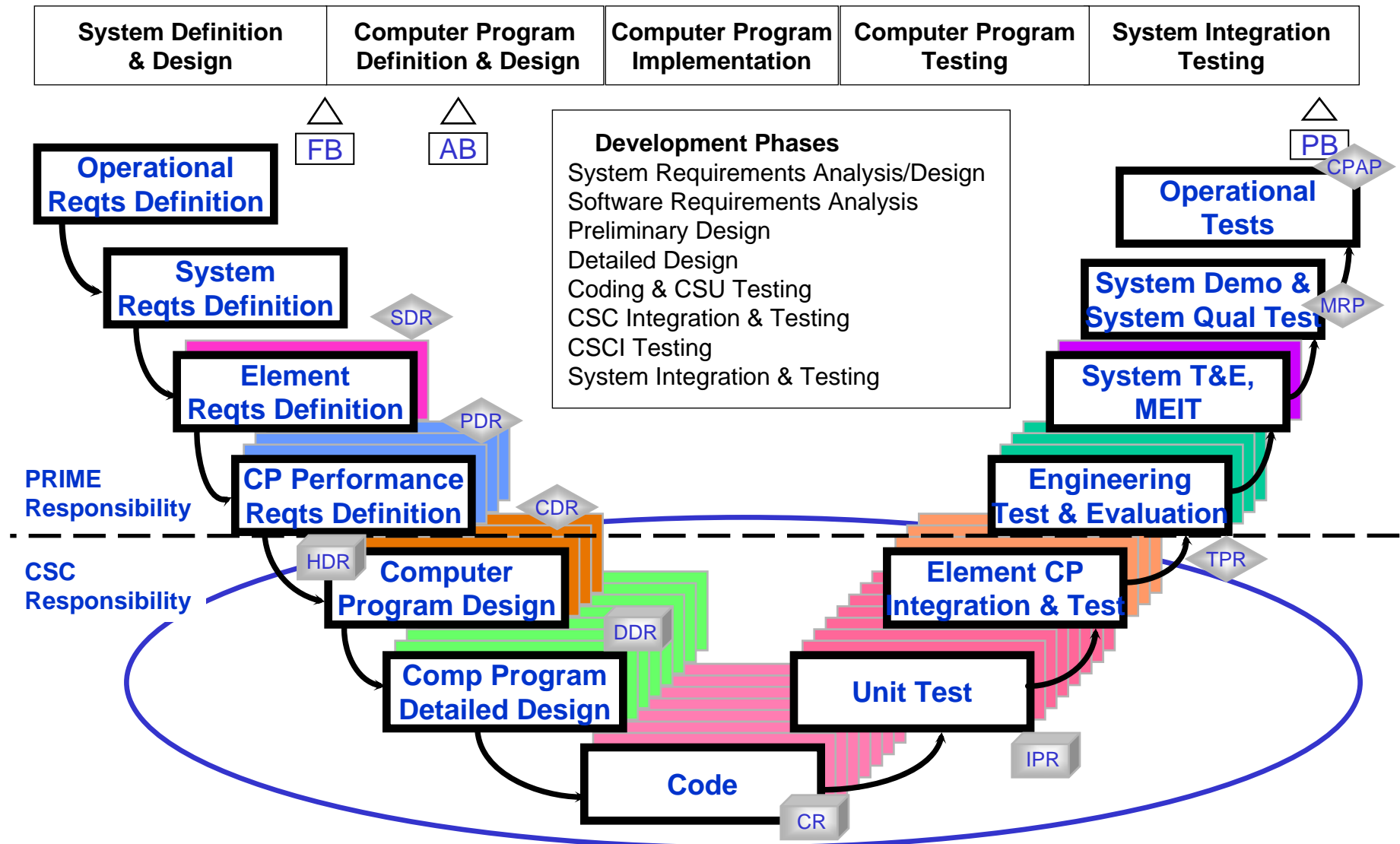
- Introduction of COTS hardware
- Conversion of legacy software to new languages
- System complexity with multiple hardware and operating environments

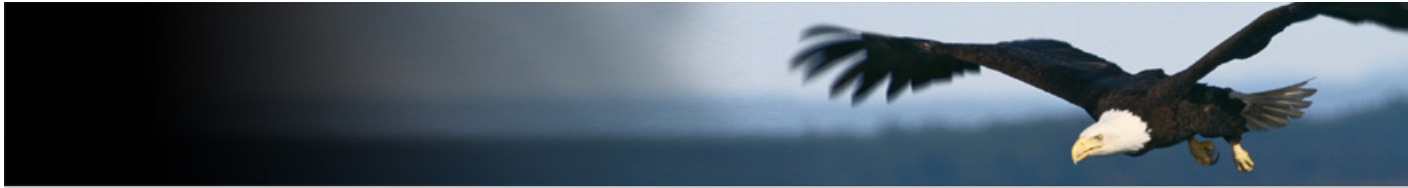




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## Software Development Process





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## Multi-Processor Environments

- Legacy
  - AN/UYKs
- COTS Processors
  - Single Board Computers (SBCs)
  - Symetric Multi-Processors (SMPs)



**COTS Processor  
Cabinet**



**Operator  
Console**



**User  
Display  
Console**



**AN/UYK-43**



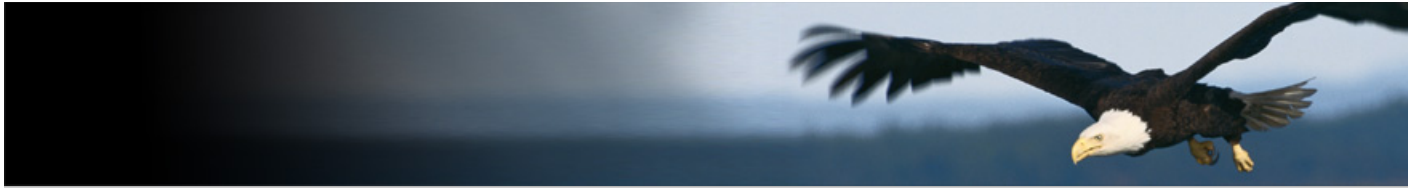
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## Multi-Operating Environments

- Legacy
  - Aegis Tactical Executive System (ATES)
- COTS
  - Concurrent Powermax
  - Sun Solaris
  - Red Hawk Linux
  - LynxOS



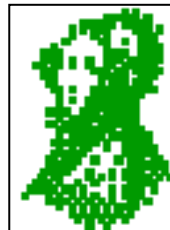




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## Multi-Computer Programming Languages

- Legacy
  - Compiler Monitor System -2 (CMS-2)
- New
  - Ada
  - C/C++
  - Java



C/C++





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# System Integration, Test and Performance Measurement





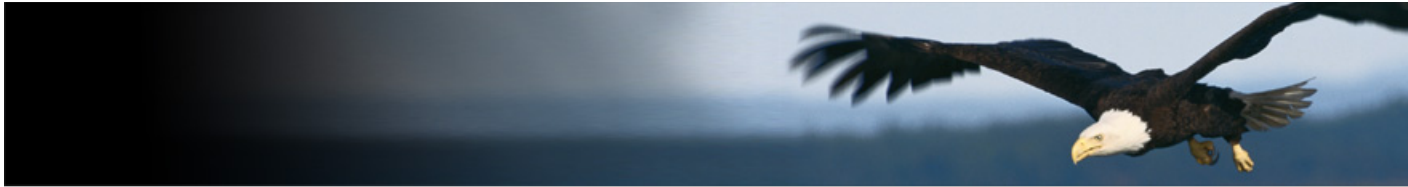
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## Process Improvement

- Incremental System Integration, Test and Performance Measurement during the software development process
  - Improve System Stability
  - Identification and Resolution of Issues and Errors
  - Significantly reduce Engineering Test & Evaluation failure rates
  - Processes and Procedures QA reviewed and approved

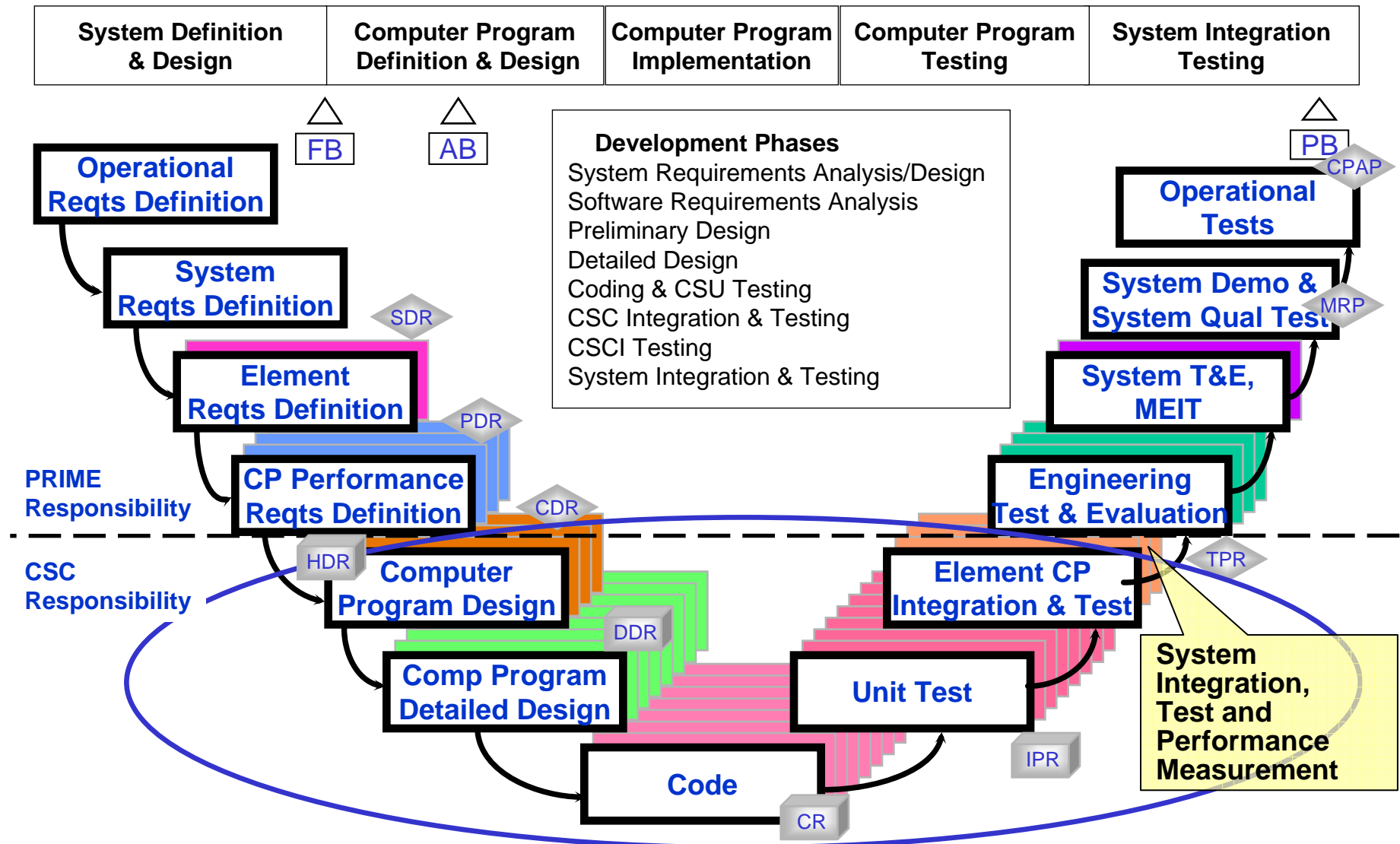


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## Software Development Process





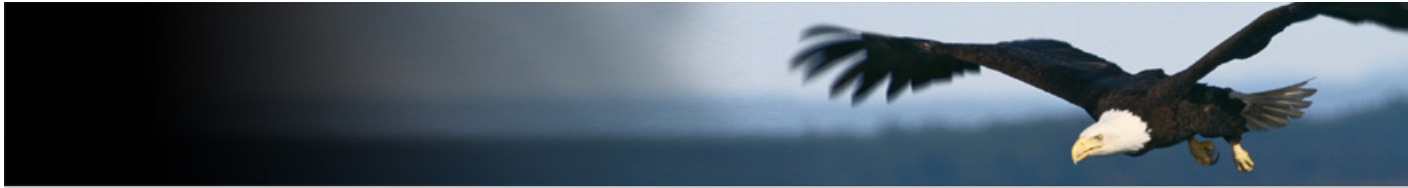


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## System Integration

- Verify Computer Program Interfaces
  - Interface Matrix
- Validate and maintain operability of system hardware and operating environments

**Hardware, OE, Computer Program Interface issues resolved during the computer program development phase**

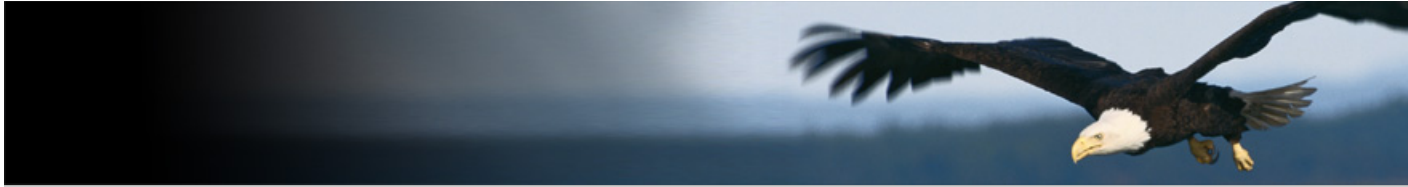


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## System Integration continued

- Integration issues tracking and reporting
  - Integration Issue resolution prior to computer program delivery

System Integration			
Build		ISSUES FOUND	ISSUES CLOSED
2		31	6
3		27	5
Totals		58	11

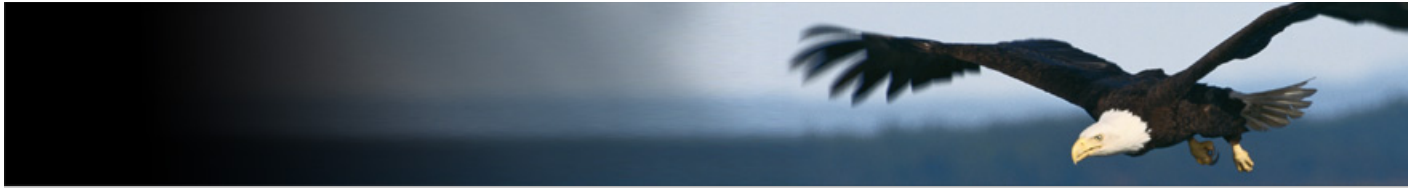


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## System Test

- Development and Regression Functional Testing
  - Documentation
    - Plans
    - Procedures
  - Execution
    - Utilizing two or more computer programs
      - Multiple hardware and operating environments

**5% to 10% Improvement of Engineering Test & Evaluation**

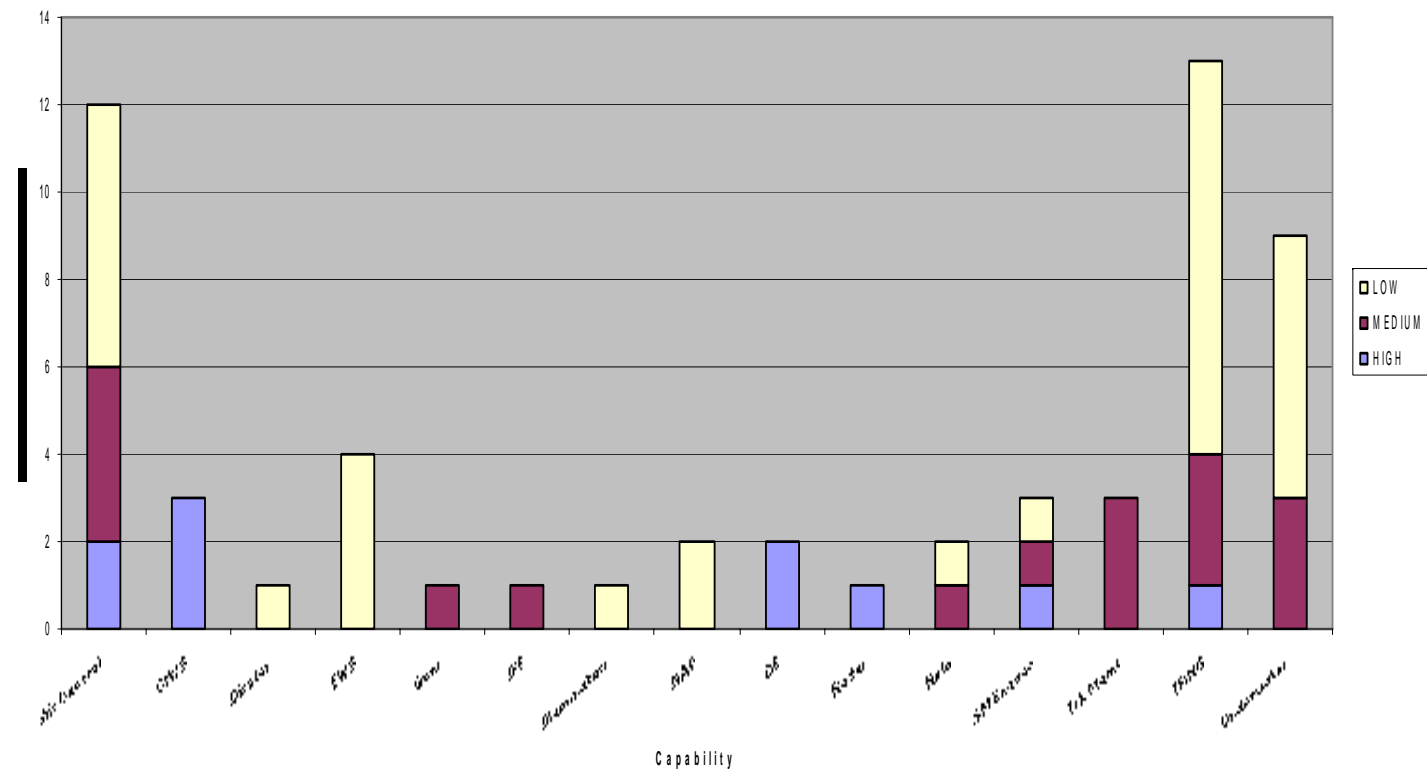


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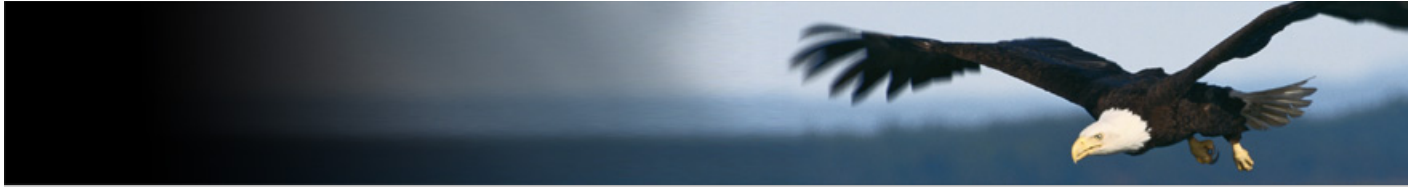
## System Test continued

- Test error reporting and tracking
  - Test error resolution prior to computer program delivery

System Test Issues



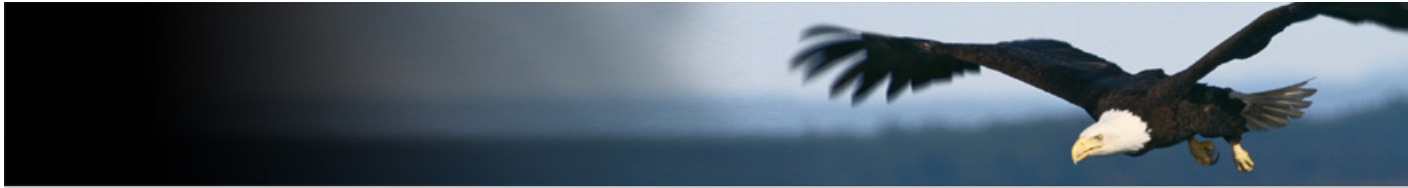




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## System Performance Measurement

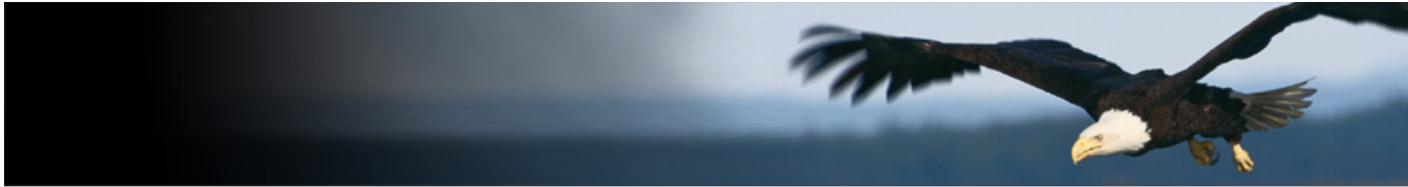
- CPU and Memory Utilization
- Thread and Response Timing
- Measurement Tools
  - Legacy
    - ATES Data Recording
  - COTS
    - UNIX TOP and Kernel Trace
    - Concurrent Nightview
    - LynxOS Spyker
- Standard scenario
  - Function and information loading
  - Repeatable



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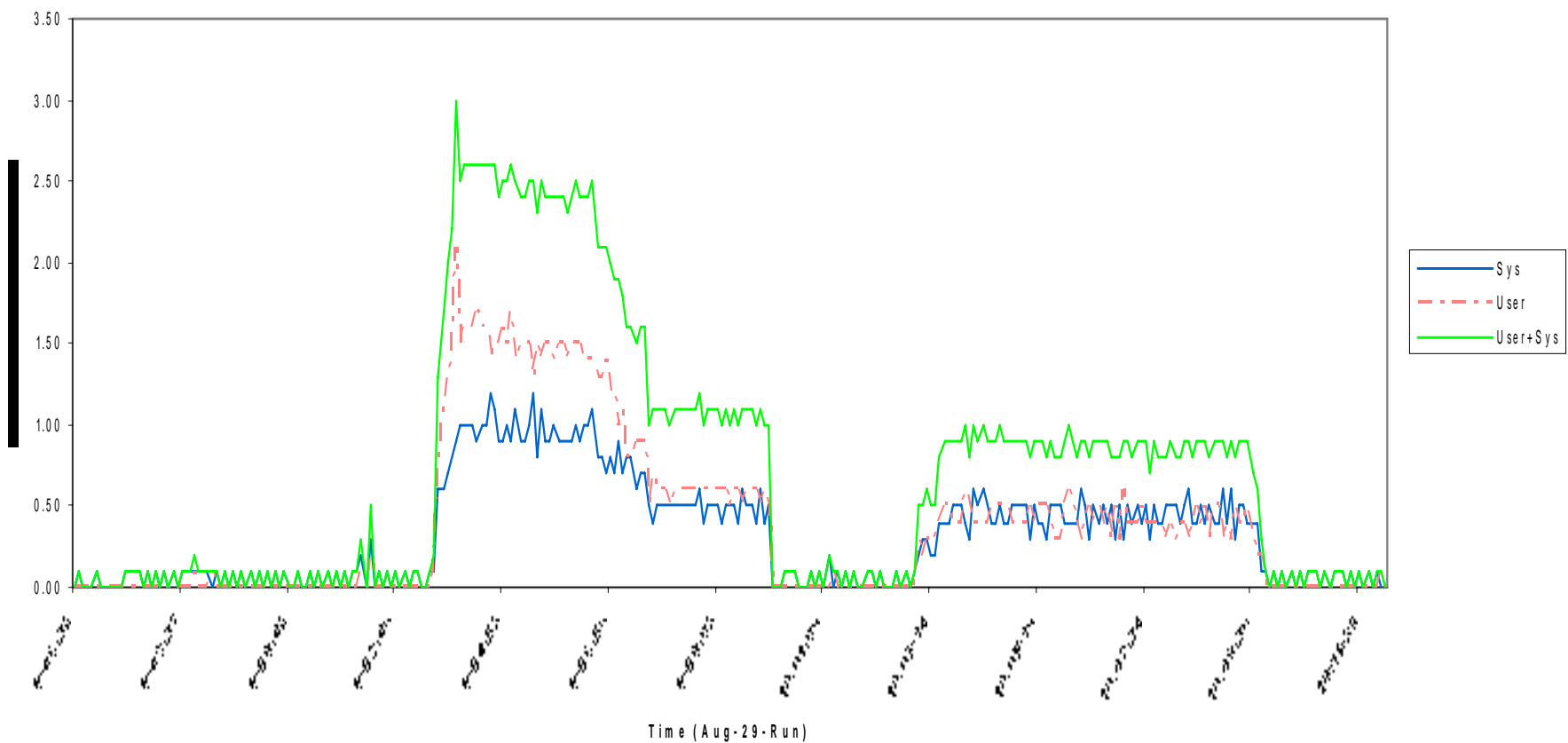
## System Performance Measurement continued

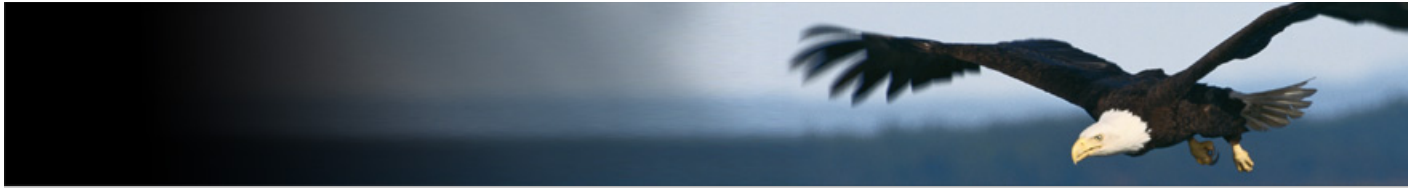
- Performance Measurement Abnormalities
  - CPU and Memory Utilization Increase
  - CPU Utilization Spikes
  - Memory Leaks
  - Slow Thread or Response



# System Performance Measurement – CPU Utilization

User/Sysem CPU Utilization

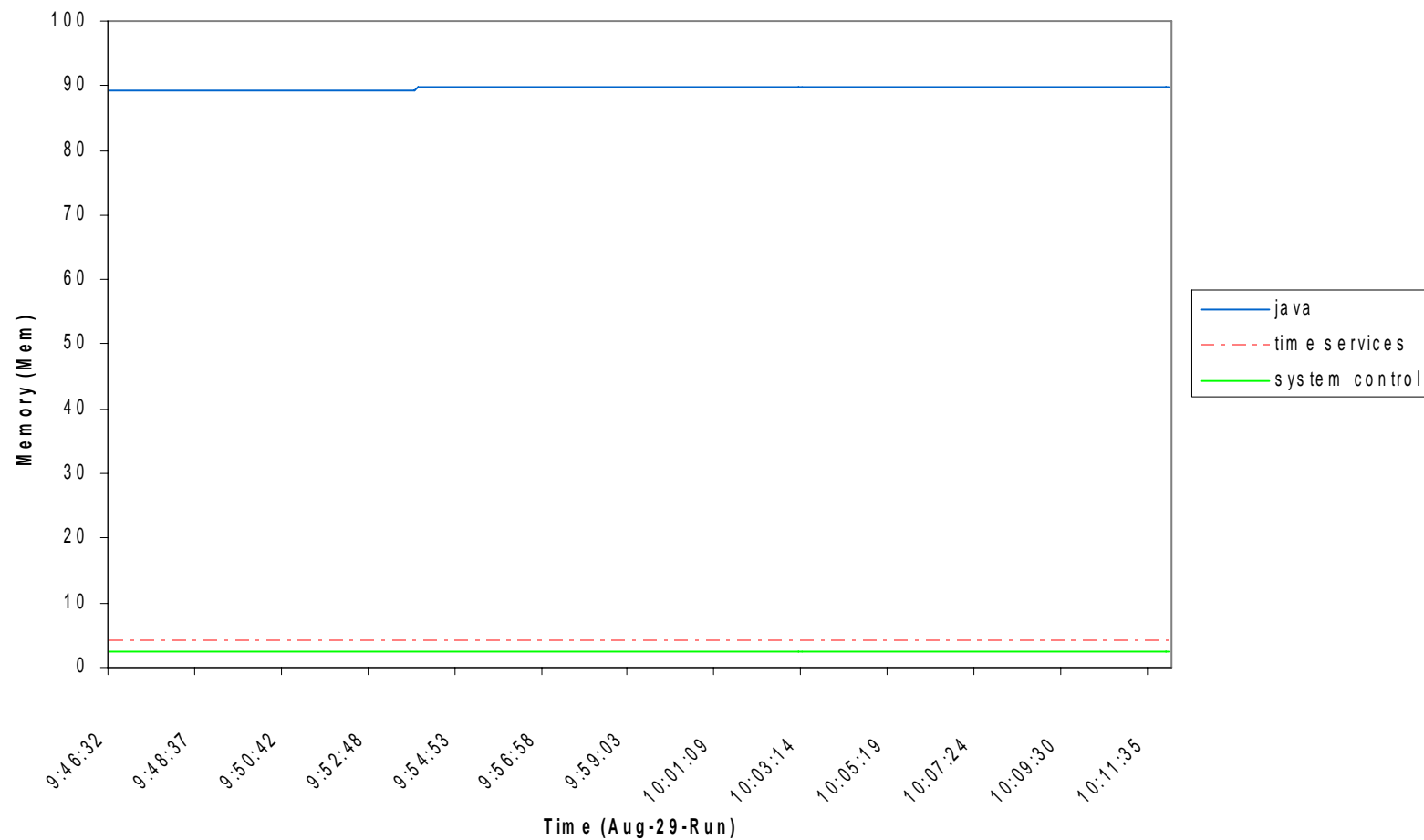




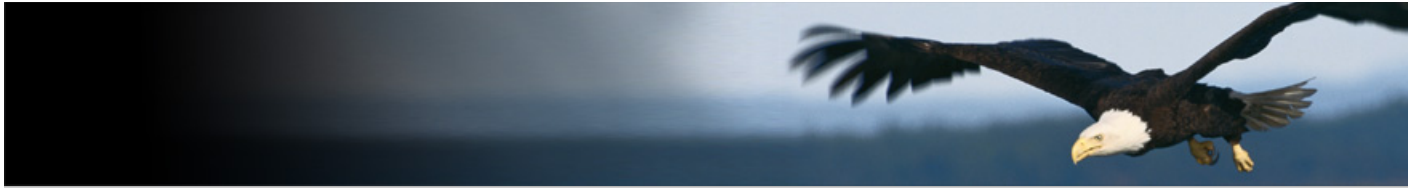
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# System Performance Measurement – Memory Utilization

User Process Memory

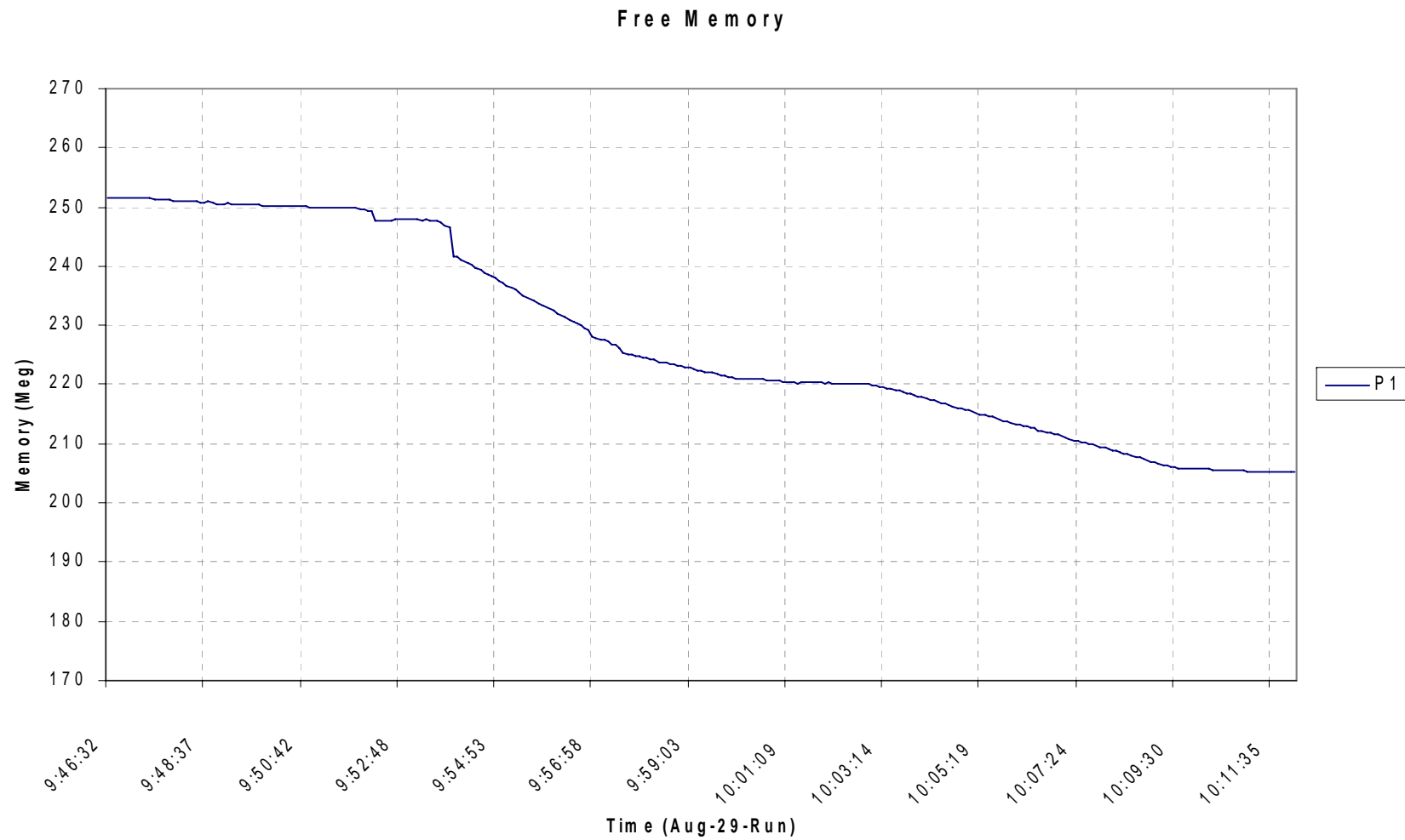






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## System Performance Measurement – Memory Leak





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## System Performance Measurement continued

- Performance Measurement issues resolved before computer program delivery

**10% to 20% CPU Utilization Improvement**



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## Summary

- Incremental System Integration, Test and Performance Measurement
- Issue and Error resolution during the computer program development phase
- Improved Computer System Stability and Performance

**Cost Effective by identifying and resolving issues during the computer program development phase**



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