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

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EXPERIENCE. RESULTS.

Agenda

- Background

- Systems Integration, Test and Performance Measurement

- Summary

Background

What is Computer Program Systems 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.
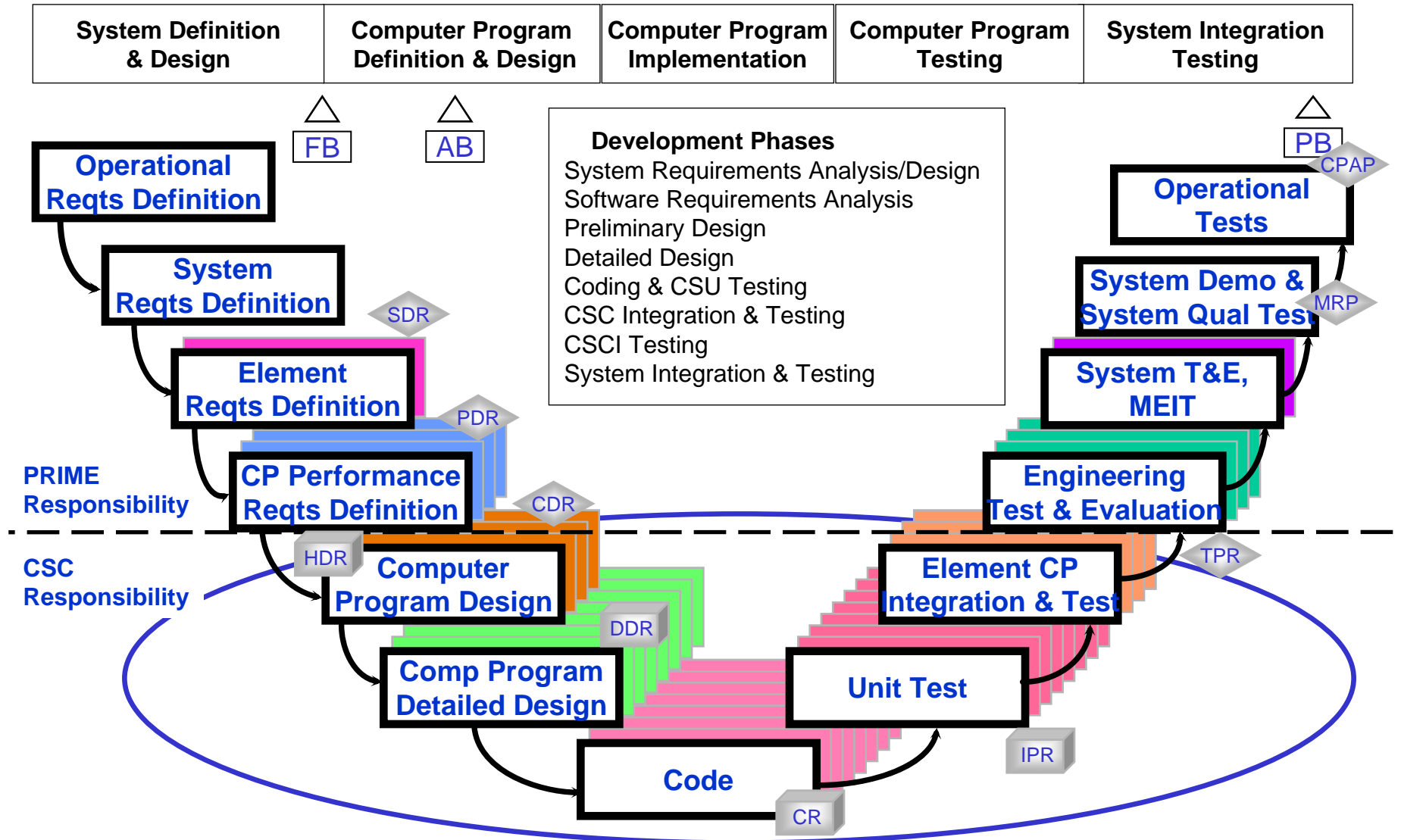
Catalyst for Early Computer Program Systems Integration, Test and Performance Measurement

- Introduction of COTS hardware

- Conversion of legacy software to new languages

- System complexity with multiple hardware and operating environments

Software Development Process

System Definition & Design	Computer Program Definition & Design	Computer Program Implementation	Computer Program Testing	System Integration Testing

FB

AB

PB

Development Phases
System Requirements Analysis/Design
Software Requirements Analysis
Preliminary Design
Detailed Design
Coding & CSU Testing
CSC Integration & Testing
CSCI Testing
System Integration & Testing

Operational Reqts Definition

System Reqts Definition

SDR

Element Reqts Definition

PDR

PRIME Responsibility

CP Performance Reqts Definition

CDR

CSC Responsibility

HDR

Computer Program Design

DDR

Comp Program Detailed Design

Operational Tests

CPAP

System Demo & System Qual Test

MRP

System T&E, MEIT

Engineering Test & Evaluation

Element CP Integration & Test

TPR

Unit Test

Code

CR

IPR

Multi-Processor Environments

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

COTS Processor Cabinet

Operator Console

User Display Console

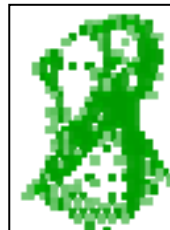**AN/UYK-43**

Multi-Operating Environments

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

Multi-Computer Programming Languages

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

C/C++

Systems Integration, Test and Performance Measurement

Process Improvement

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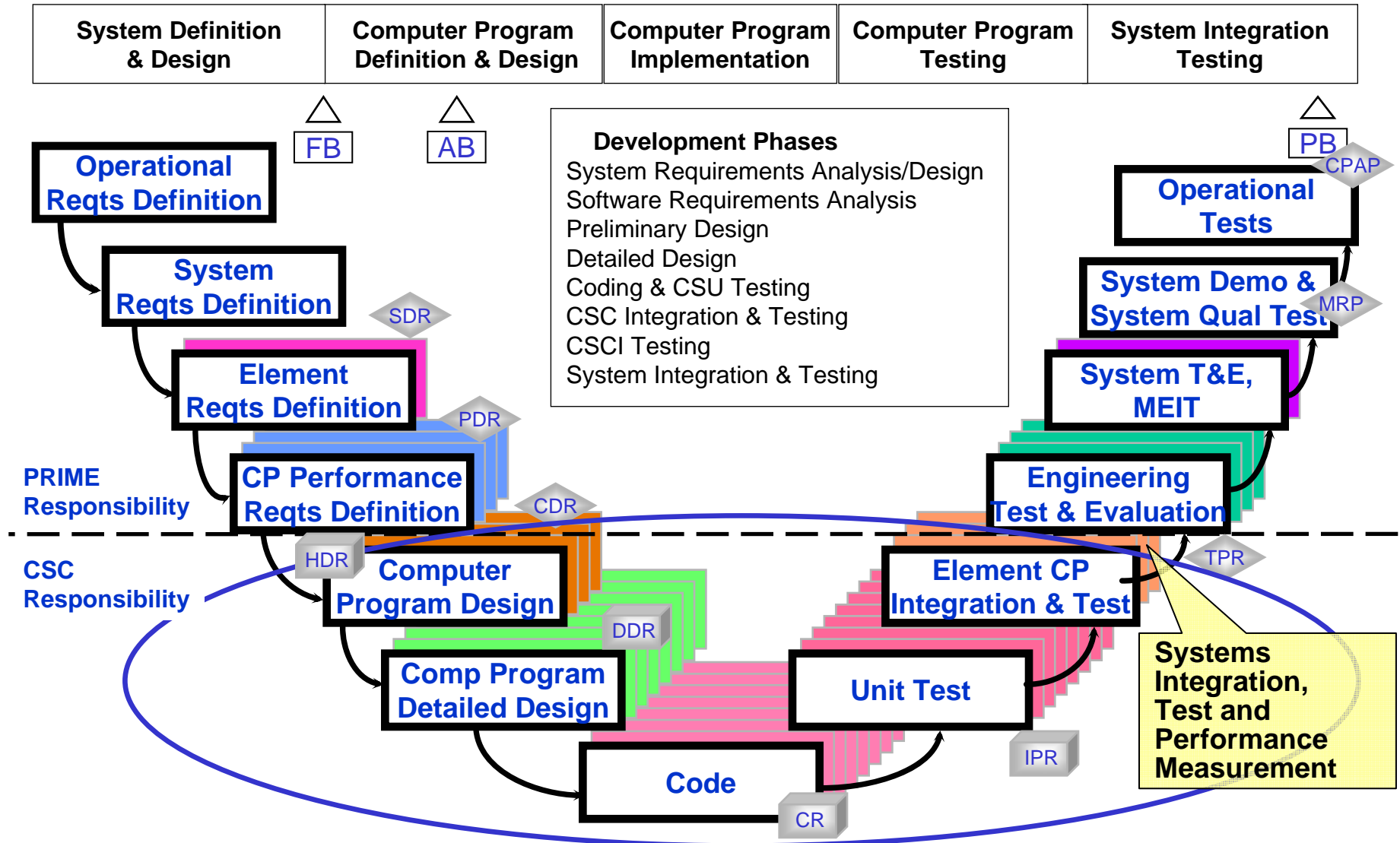 - Processes and Procedures QA reviewed and approved

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Systems Integration, Test and Performance Measurement

Systems Integration

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

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

Systems Integration continued

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

SYSTEMS INTEGRATION & TEST					
		BUILD ISSUES FOUND	ISSUES CLOSED DURING BUILD	DEFECTS WHICH BECAME TORs	ACTIVE ISSUES BEING ADDRESSED
BUILDS					
Build 4		18	15	3	0
Build 5		53	37	16	0
Totals		71	52	19	0

Systems 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

Systems Test continued

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

System Integration & Test
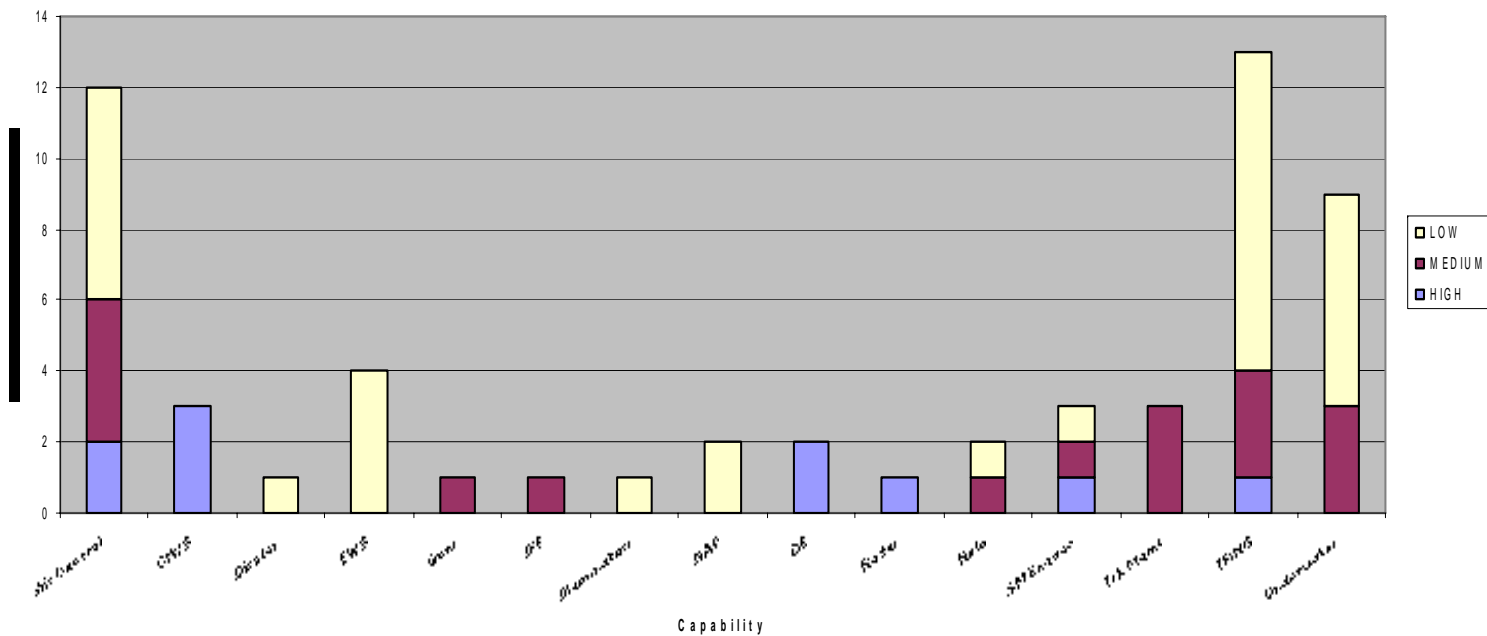
Systems Performance Measurement

- CPU and Memory Utilization

- Thread and Response Timing

- Measurement Tools
  - Legacy
    - ATES Data Recording
  - COTS
    - UNIX TOP and Kernel Trace
    - Concurrent Nightview
    - LynxOS Spyker

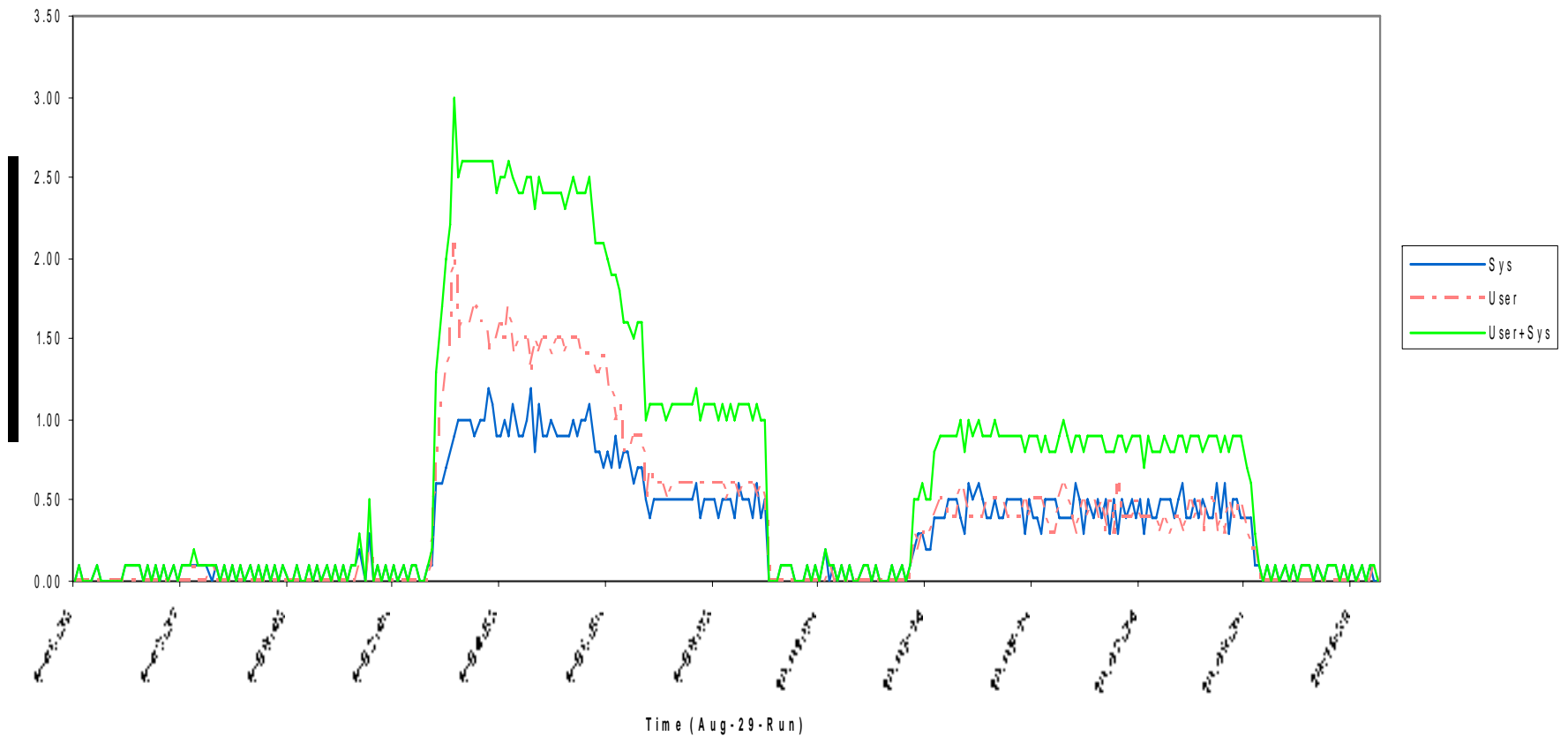- Standard scenario
  - Function and information loading
  - Repeatable

Systems Performance Measurement continued

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

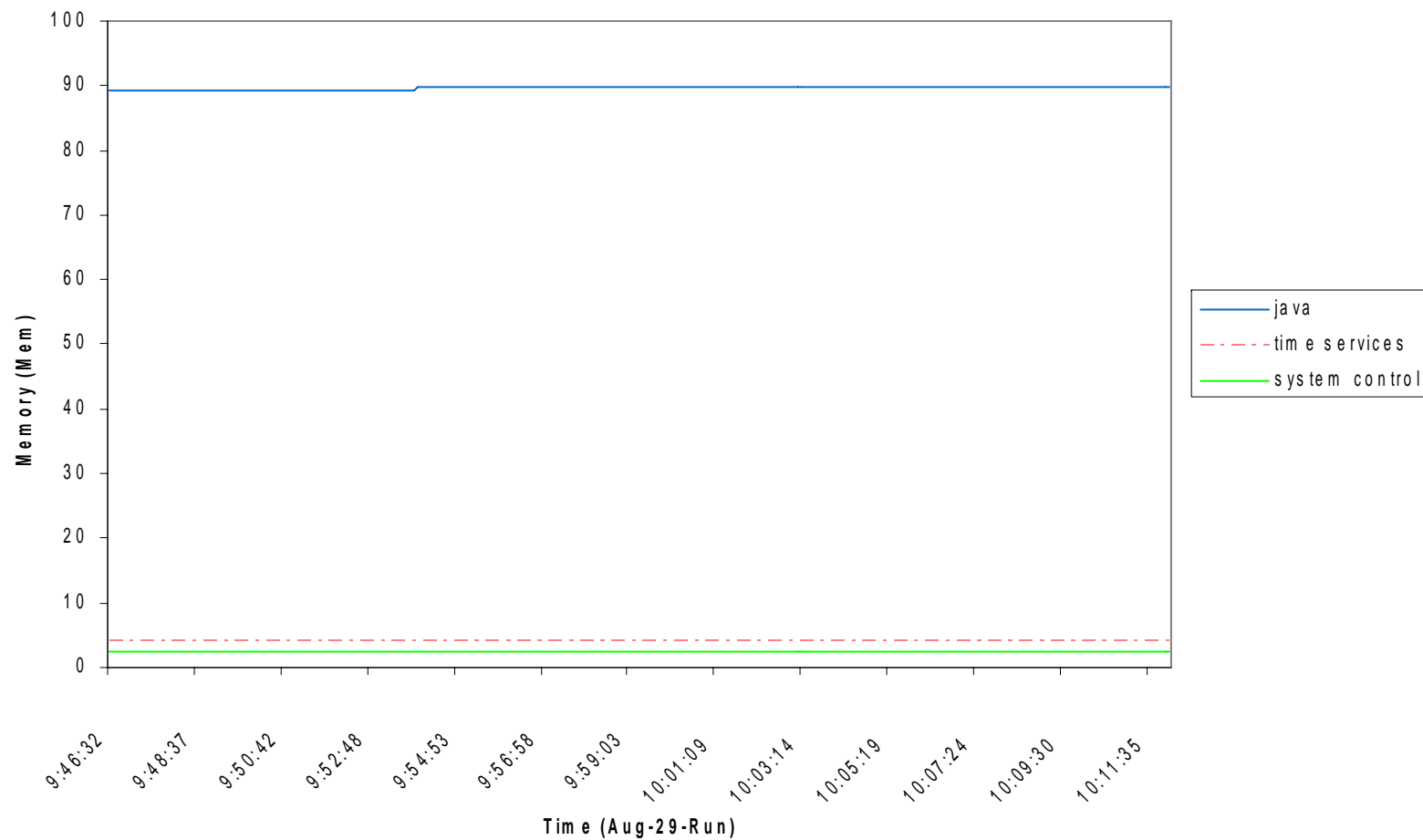# Systems Performance Measurement – CPU Utilization

User/Sysem CPU Utilization

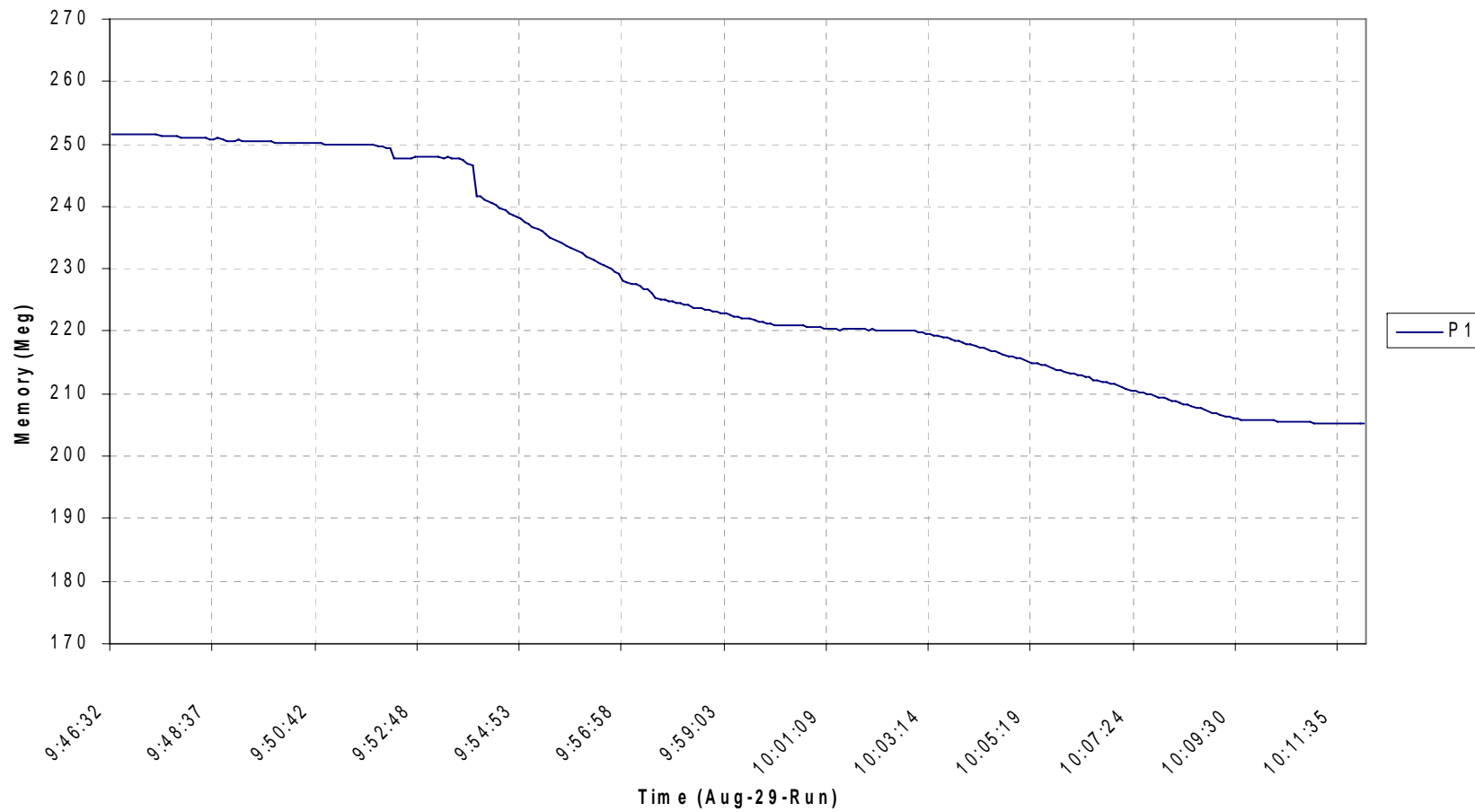# Systems Performance Measurement – Memory Utilization

User Process Memory

Systems Performance Measurement – Memory Leak

Free Memory

Systems Performance Measurement continued

- Performance Measurement issues resolved before computer program delivery

10% to 20% CPU Utilization Improvement

Summary

- Incremental Systems Integration, Test and Performance Measurement

- Integration and Test issue and defect resolution during the computer program development phase

- Improved Computer Systems Stability and Performance

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

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