IT Systems Stabilization Framework

Performance Management and Systems Stabilization Methodology

Design, Definitions, Architecture, Tools, and Concepts

Dominique A. Heger
DHTechnologies, Austin, TX
dheger@dhtusa.com
www.dhtusa.com

Performance Management - Methodology

- Pragmatic, Deduction Based Approach
- Clear Defined Project Steps
- Methodology is Based on:
  - Application Traces, HW Profiles, Code Path Analysis
  - Performance Data, Workload Profiles
- Analytical and Simulation Models
- Empirical Studies, Benchmarking
- Proven Methodology successfully applied at:
  - CERN, IBM, LLNL, NERSC, Boeing, AT&T

Performance Evaluation - Goals & Objectives

- Identify bottlenecks, predict future capacity shortcomings, and determine the most adequate (cost effective) way to configure, tune, and optimize computing environments to overcome performance problems and cope with increasing workload demands.
- Combination of analytical, simulation, and empirical study based approach that utilizes tracing techniques, HW profiles, actual application workload profiles, application log files, and performance data collected either in a Lab or production environment. If no data is available, performance budgets are being used (PE).

Performance Evaluation & Tuning

Steps Necessary:

- Goals & Objectives
- HW Profiles
- Workload Determination (Multi-Layered)
  - Multiple Tools have to be used!
- Workload Profiles
- Code Path Analysis
- Tuning Cycle
  - Logical verses Physical Resources

Modeling Framework

- Building-Block Based Approach
  - Structural layer describing the servers, interconnects, SAN, and infrastructure components and their relationship
  - Application layer describing the applications that are utilizing the available resources (the workload generator)
  - Resource layer describing the resource utilization in regards to the CPU, memory, IO, and network subsystems
- *Methodology incorporates both, a functional view represented by the application layer, and a performance view represented by the resource layer.*

Modeling Techniques & Tools

- Analytic
  - Advanced Queuing Networks
  - Diffusion Approximation, Complexity Theory, MVA
  - Probability Analysis, Monte Carlo
- Simulation
  - Petri Networks
  - Commercial Packages (Compass, Hyperformix)
- Empirical
  - Workload Generators (lmbench, ffsb)

Capacity, Speedup, and Scalability Studies

- Capacity Study
  - •Determine Headroom. Capture System Behavior under Increased Workload Conditions. The Physical Setup of the Environment is unchanged
- Speedup Study
  - •For a Fixed Worklaod, evaluate the Systems Behavior while adding Physical Resources (application parallelism is paramount)
- Scalability Study
  - •Evaluate the System Behavior while (1) Increasing the Workload and (2) adding Physical Resources

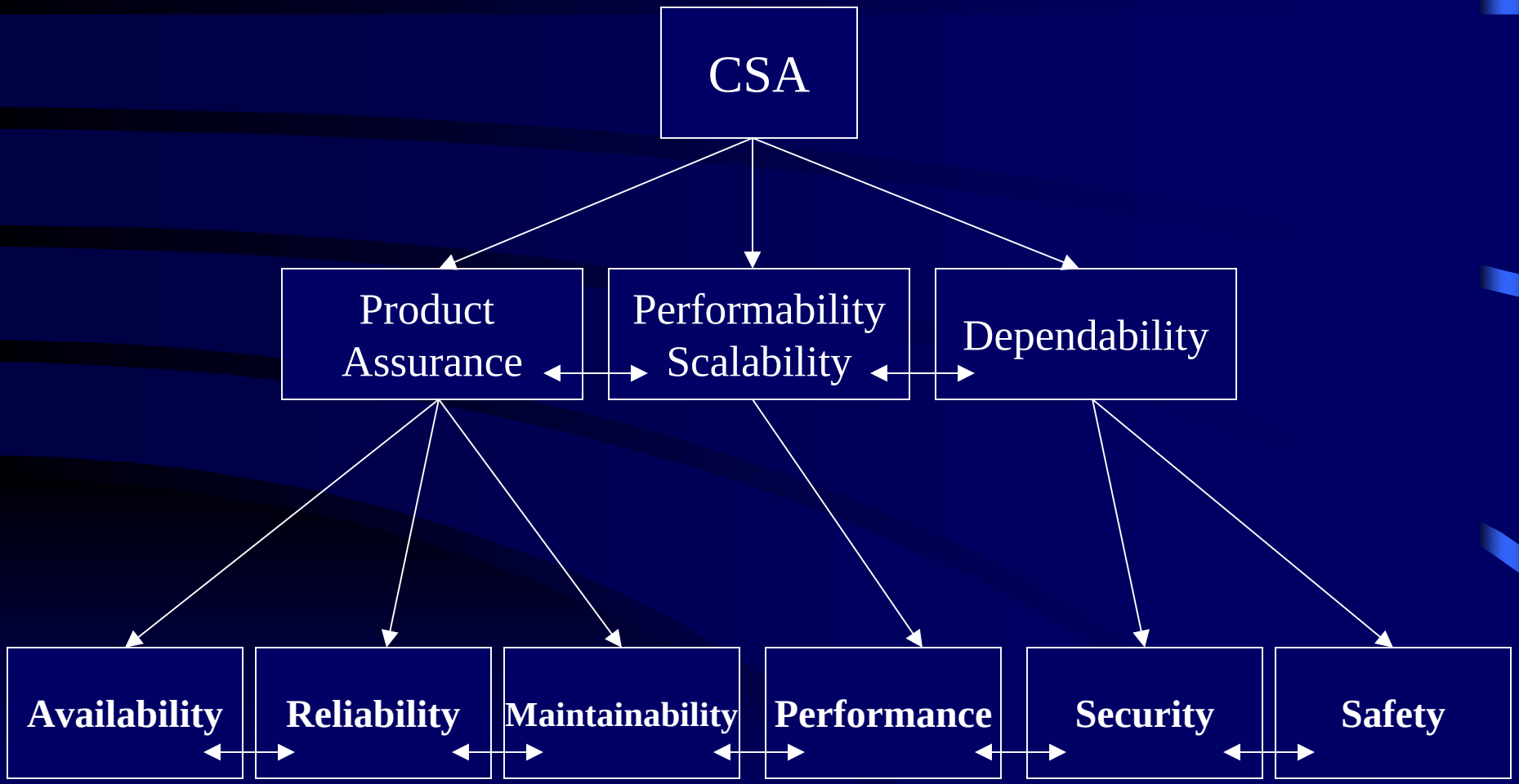
Performance Management - Building Blocks

Phase 1:	Understand Goals & Objectives		
Phase 2:	HW Profiles	Application Traces	
Phase 3:	Workload Profiles		
Phase 4:	Performance Study	CSA Study	
Phase 5:	Capacity Study	Scalability Study	Speedup Study

CSA - Motivation

- **CSA - Cohesive Systems Assurance**
- Encapsulates the concepts and methodologies of product assurance, performance & scalability, & dependability
- Represents the Quality of Service provided by an entire computing infrastructure
- Quantifies the usefulness, trustworthiness, and effectiveness of an entire computing environment

CSA - Decomposition



CSA Methodology

- Decomposition-based methodology
- Follows a divide-and-conquer based approach
- Utilizing a pragmatic approach
- Incorporates the interrelationships and trade-off's among all the aspects of the application and systems components that compose the environment

CSA - Stability Equation

- The CSA dimensions *are* the the building blocks
- The resulting stability factor can be utilized to:
  - Quantify the stability of an entire environment
  - Conduct cross comparisons
  - Evaluate design alternatives
  - Identify potential areas for improvement
  - Communicate in a simple & effective manner
- Stability = Dependability * Performability * Maintainability

CSA - Conclusions

- Synergy Effect
- Modular Design
- Addresses Relative Stability Concerns
- Efficient & Effective Business Solutions
- It Works ……

Q & A