COMP 190-088: Systems Performance Analysis

Performance Analysis Methodologies

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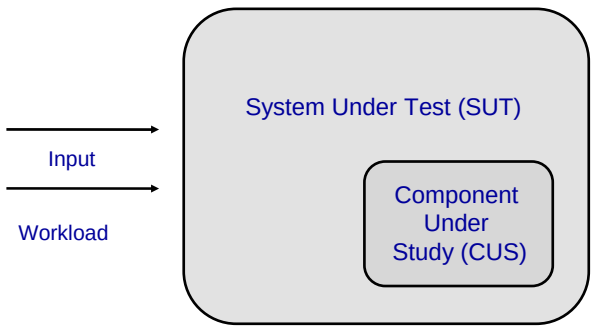
Definitions



Metrics:
Function of
- Output
- Input
- Parameters
  - Factors
  - Workload

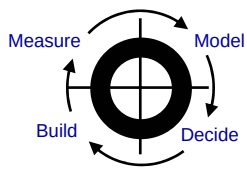
Important to clearly define all of these

Steps in Performance Analysis

- Identify and define the SUT and/or CUS.
  - State goals
  - Define system boundaries
  - List services and outcomes
- Select and define the performance metrics.
  - Related to speed, accuracy, availability of service, …
- List parameters and select factors.
  - System and workload parameters
  - Select high-impact factors
    - Consider economic, political, technological constraints
- Select appropriate evaluation techniques.
  - Use simple queuing models to analyze the performance of the system
    - Use realistic assumptions
  - Conduct performance measurements/monitoring of prototype
    - Use accurate tools
  - Design and implement simulation models
    - Use right level of detail

(More) Steps in Performance Analysis

- Select workloads.
  - Measure and characterize workload on an existing system
  - Format may depend on evaluation technique
- Design experiments to reduce the number of experiments while isolating the impact of and interaction between parameters
- Use proper statistical techniques to analyze and interpret data.
  - Output of measurements and simulations is a random quantity
  - Analysis only produces results, not conclusions
- Present the results in a clear and insightful manner.
- Cycle through all of the above
  - Redefine system boundary, include other factors and metrics, …



Course Outline

- Selection of metrics
- Performance Evaluation Methodologies
- Workload selection
- Measurements tools
- Analysis of measured data
- Visualization of results
- System Modeling
- Simulations
- Case studies
- Distributed monitoring infrastructures
- PA in the Research and Industrial communities

System Definition

- Steps:
  - Define goal
  - Specify system boundary and services
- Common mistakes:
  - No goals
    - Selection of goals may be non-trivial
    - No such thing as a general-purpose model
    - Goals impact choice of technique, metrics, and workload
  - Biased goals:
    - "To show that OUR system is better than THEIRS"
    - Analyst should be like jury

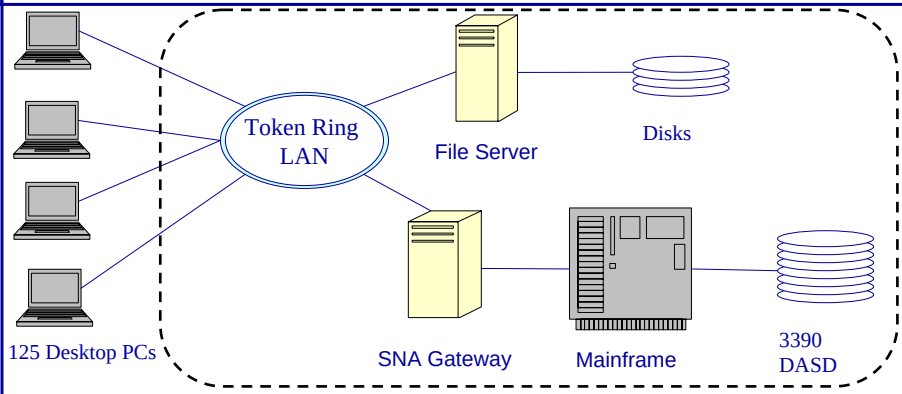
Setting Performance Goals

- **S**: specific
- **M**: measurable
- **A**: acceptable
- **R**: realizable
- **T**: thorough

Examples

- Single-CPU modeling:
  - Goal: to predict the achieved throughput of a processor in a system with compute-intensive tasks
  - System boundary and services?
- Multi-processor modeling:
  - Goal: to predict the achieved throughput of a multi-processor system with compute-intensive tasks
  - System boundary?

Example: Capacity planning of a client-server system



- Goal: which resources need to be upgraded to support an increase in number of clients from 125 to 200?
- System boundary
  - SUT
  - CUS

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