Motivation

• **Goal:** Create and document a black box e-mail availability benchmark
• Improving dependability requires that we quantify the ROC-related metrics
• Benchmarks have helped to define metrics
• **Problem:** Benchmarks are generally performance oriented
• So *performance* metrics are generally well understood, but not *dependability* metrics
• So what are the “good” dependability metrics?
Anderson’s Categories

- Eric Anderson identifies eight categories as the main axes for evaluating work on systems administration:
  1. Dependability
  2. Automation
  3. Scalability
  4. Flexibility
  5. Notification
  6. Schedulability
  7. Transparency
  8. Simplicity
Simplified Categories

- Anderson’s categories are important to ROC since the SysAdmin is often the primary recovery mechanism

- Problem: Anderson’s categories aren’t orthogonal
  - It isn’t clear how to differentiate between them in experimental measurements

- Solution: Divide the categories into three broader categories
  - Dependability
  - Scalability
  - Human Impact/Productivity
**Target Environment: E-mail**

- E-mail today is a mission critical service
  - often the critical service for many companies
- Users expect 24/7 availability of e-mail
- However: E-mail designed to be a “best effort” system
- Dependability metric neglected in most e-mail software and benchmarks today
- Gap between user expectations and systems reality results in...
- **Great chance at Making A Difference in real world systems!**
Scoping the Problem

• Focus is on measuring the dependability of the e-mail service
  - We want to focus on end user reliability, so we look at overall e-mail service rather than just a server
  - A service can comprise multiple servers in a cluster or just single server
  - We treat the service as a sink
    » E-mail is delivered to not relayed through the service
    » Emphasis on store of “store & forward”
Tentative Benchmark Structure

- Want to follow basic idea of previous availability/maintainability benchmarks
  1. Apply workload
  2. Perturb system with faults and human-driven pre-specified maintenance tasks
  3. Ramp workload to measure scalability
- Treat e-mail system as a black box for generality
Potential Metrics

• **Dependability Metrics**
  - Fault-free performance
  - Performance under failure scenarios
  - Delivery delays and errors
  - Dropped/corrupted mail

• **Scalability Metrics**
  - Changes in performance metrics as workload is increased or system configuration is modified

• **Human Impact Metrics**
  - Amount of time operator spends with system to repair and maintain system
  - Human failure rates (fatal and non-fatal)
  - Qualitative assessment by participants of task complexity and system forgivingness
Metric Measurement

• Dependability can be measured using a variety of scenarios:
  - Fault-free, during failure(s), during recovery, during failure + overload, etc.

• System Perturbation Techniques
  - Fault injection
    » hardware, system-level, network-level, etc.
  - Overload
  - Configuration Management (Humans!)
    » Move a mailbox, add server to cluster, install mail filter, etc.
Plans and Challenges

• **Plans**
  - Build a heavily-instrumented workload generator with parameterizable workload
    » Start with SPECmail benchmark and expand to cover more scenarios?
  - Start experiments with iPlanet e-mail server

• **Challenges**
  - Developing an accurate and flexible workload generator
  - Extracting useful measurements while treating e-mail service as black box
  - Developing a realistic failure model
  - Creating appropriate tasks for human admins to perform
  - Dealing with human variability
Benchmarking E-mail Dependability

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