Research Methodology

NSFCloud breakout session

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Participants

- 21+ people
- Many doing systems research
- A few applications research
- NSFCloud builders

Research Experiment Phases

- Prepare
- Execute
- Monitor and measure
- Data storage & analysis
- Traces & workloads
- Sharing

Prepare Experiments

- A lot of work to prepare an experiment
  - Evolve an environment
  - Scale the environment
  - Prepare the real experiment
- Make this process as convenient as possible
  - On-demand access to small-scale resources
    - Longer wait times are acceptable for larger experiments
  - Easy and quick access to resources (e.g. virtual machines)
  - Easily transition from virtual to physical
    - VM image -> node image?
    - Encourage use of ansible/puppet/chef or similar
    - Container technologies?

Execute Experiments - Describe Environment

- Level of detail?
  - From a class of resources
  - Detailed characteristics
  - Exact nodes
- Detailed information is important
  - E.g. hardware changes

Execute Experiments - Verify Environment

- Much more interest from testbed builders than from users!
  - Users interested in the end (the environment they ask for)
- Level of detail to verify
  - Tradeoff thoroughness vs time to execute
  - Verify what the user asked for, at least (# cores, memory, disk, etc.)
  - Could verify much deeper (e.g. performance benchmarks)
- Standardize benchmarks/tests?

Execute Experiments - Modify Environment

- Load injection, fault injection
- Users have their own tools
- (very brief discussion)

Monitor and Measure

- Important to do this throughout the systems
  - Include tools in standard OS images
  - Access to data gathered outside of the OS
    - Network, power, heat
- Availability of data?
  - To the user of the relevant components
  - To other users and publicly?
    - Useful data
    - Potential concerns about making data public before the user can publish
      - Mitigated by some amount of anonymity (public won't know who was using what components when)

Data Storage and Analysis

- Store experimental data for analysis
- Users plan to use their own scripts/tools & experts to analyze
  - Interest in sharing
- (brief discussion)

Traces and Workloads

- Traces and workloads from production environments would be very useful
  - Use to drive experiments
  - Must describe in detail the configuration of the system they were gathered from
  - Such workloads from non-production environments can be misleading
- Traces from the NSFCloud testbeds also useful
  - Provide detailed information about experiments
  - Compare extended or related work

Sharing

- Lots of interest in being able to share information and collaborate
- Repeatability, extensibility
  - Experiment configurations
  - Experimental data
- Publishing results
  - Refer to config/data in paper
- Community building
  - Publications & project information
  - Tips and tricks
  - Data analysis tools