NetCheck: Network Diagnoses from Blackbox Traces

https://netcheck.poly.edu/

Yanyan Zhuang†‡, Eleni Gessiou†, Steven Portzer*, Fraida Fund†
Monzur Muhammad†, Ivan Beschastnikh‡, Justin Cappos†

Challenges & Contributions

Accuracy: ambiguity in reconstruction.
- Without clock sync, multiple orderings of end-host syscalls possible. An example:

(a) Two input host traces

(b) A valid ordering

(c) Another valid ordering!

(d) An invalid ordering of (a)

Network complexity: diagnosing issues in real networks.
- Host traces omit information about physical network or environment.

Efficiency: must explore an exponential space of possible orderings.

NetCheck Contributions
- Derive a plausible global ordering as an approximation for the ground truth.
- Model expected simple network behavior to identify the unexpected.
- A best-case linear time algorithm to find a plausible global ordering.

Evaluation

Accuracy
- Reproduced known bugs in multiple open source projects
  - 46 bugs from public bug trackers of 30 open source projects
  - Reproduced issue from each report: 71 traces, 24 categories
  - Correctly detected and diagnosed 95.7% of bugs considered.
- Diagnosed injected failures in a real network
  - Admin replicated and injected network-related bugs.
  - Diagnosed 80% of the injected bugs with a false positive rate of 3%.
- Diagnosed root causes of popular apps
  - FTP client
    - Client behind NAT
  - High data loss
  - Pidgin
    - IP change
    - Message loss
  - Skype
    - Data loss due to delay
    - A different thread closes socket
    - Client behind NAT
  - VirtualBox (newly discovered bug)
    - Virtualization misbehavior

Efficiency
- Runtime performance overhead.
  - Between linear and quadratic

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