Use-cases for GENI Instrumentation and Measurement Architecture Design

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What is different in GENI facility measurements?

- GENI supports testbeds aimed at “clean-slate” re-design of the Internet to overcome limitations of current Internet

- Users have greater options/control on measurements
  - Measurement server software/hardware
  - Advanced open-source/commercial instrumentation
  - Measurement service providers (who may customize)
  - Measurements across wired/wireless aggregates
  - Internet-scale measurements with “interesting” cross-traffic

Scratchpad

- Goals for GENI Instrumentation and Measurement Architecture (GIMA) Design
  - Provide drill-down performance transparency of system and network resources at *hop*, *link*, *path* and *slice* levels
  - Allow and make-it-easy for users (NOC staff, experimenter) to access and control instrumentation and measurement functions involving interactions between GIMS sub-services
  - Remove burden on researcher to become a network measurement infrastructure expert so that researcher can better focus on the science in the experiments
  - Provide performance transparency of the status of the individual GIMS sub-service components and their interfaces with other sub-services
- For each sub-service (e.g., MP, MC, MAP, MO, MDA) in GIMA, following information could be specified:
  - Capabilities
  - Input, Output
  - Instrumentation components
  - Software components
  - Schemas

Scratchpad (2)

- Use cases from User point-of-view
  - Interfaces: Web-pages, Command-line options
  - Classification
    - NOC monitoring
    - Experiment monitoring
    - Measurement utilities
- NOC Monitoring
  - Capabilities: Availability, Heath Status, Diagnosis of perceived or impending problems ---- *context of the entire physical infrastructure*
    - Availability: Up/Down, Up-Good, Up-Acceptable, Up-Poor
    - Health Status: Metrics and their levels for Hop, Link, Path and Slice
  - Use cases:
    - For a physical topology of Nodes {A, … Z} show me if any slice is mis-behaving so that I can invoke “emergency shutdown” to swap it out
    - Experimenter called NOC about non-responsiveness of resources or unexpected behavior in a slice, notify status of user slice resources
    - We would like to keep meta-data of all the experiments, send us experiment meta-data after each slice expires

Scratchpad (3)

- Experiment Monitoring
  - Capabilities: Availability, Heath Status, Diagnosis of perceived or impending problems ---- *context of the experiment slice*
    - Availability: Up/Down, Up-Good, Up-Acceptable, Up-Poor
    - Health Status: Metrics and their levels for Hop, Link, Path and Slice
  - Use cases:
    - A slice has been setup for me, have I got all the resources I asked for
    - Show me a dashboard of some or all of the resource performance measurements as I run my experiments
    - My experiment data shows inconsistencies, let me query the status of user slice resources so that I can notify GMOC about it
    - Provide me with an archive of some or all of the slice resource performance measurements so that I can reference them during offline analysis of the data collected in my experiment after the slice expires

Scratchpad (4)

- Measurement Utilities
  - Capabilities: Active measurements and passive measurements ---- *context of the experiment slice pertaining to research needs*
    - Support tools that researchers of different problem domains will want to use (e.g., traffic engineering researcher will want SNMP, TCP protocol researcher would like throughput measurements from Iperf, video quality researcher would like PSNR measurements from Evalvid)
  - Use cases:
    - Setup up passive measurement taps at hops a, b, c
    - Setup up active measurements on paths x, y, z using p, q, r tools
      - On-demand or On-going (sampling patterns of periodic, random, stratified random, adaptive)
    - I am writing an event-driven simulation, at certain time points, I would like to be notified of anomalies and forecasts of system and network performance at hops a, b, c on paths x, y, z pertaining to tools p, q, r
    - I am running an experiment to deploy a novel IPTV system protocol, provide me with PSNR measurements of video quality between paths x, y, z (e.g., Evalvid tool that will need source and destination packet captures)
    - Provide me with an archive of some or all of the slice resource performance measurements that I requested as part of my experiment

Scratchpad (5)

- Use cases from measurement-services designer point-of-view
  - How will we authenticate NOC staff versus researcher and what measurement privileges can we assign to users based on roles
  - What is the workflow for a user to interface with a measurement service that manipulates the user's slice resources
  - What is the schema we will use to exchange various "messages" between the measurement sub-services
  - What is the schema we will support for users to query measurement data using web-service clients
  - What are the sorts of examples/templates of measurement service usage that should be made available
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