SIG-PMV: Scenarios

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SIG-PMV

About the SIG

• SIG-PMV = Special Interest Group for Performance Monitoring and Verification
• Driven by a Steering Committee (6 people), with two face-to-face meetings per year
• Supported by the GÉANT Community Programme (GCP)
  • https://www.geant.org/People/Community_Programme
• SIG-PMV wiki: https://wiki.geant.org/display/PMV/SIG-PMV
• Full charter: https://geant.app.box.com/s/3k57vu53mas1t17bhlnrm7gj8adsj7wd

• Focus lies on measurement and monitoring scenarios
• The scenarios come from NREN and campus community requirements
• The SIG identifies appropriate tools and best practices to support those scenarios
• SIG-PMV has some relationship to eduPERT (tbd - the subject of tomorrow’s discussion 😊)
SIG-PMV Status

How are we doing in identifying scenarios and solutions?

• Some progress made during 2018
• Current and future/emerging scenarios listed on the SIG wiki
  • [https://wiki.geant.org/display/PMV/PMV+Scenarios](https://wiki.geant.org/display/PMV/PMV+Scenarios) – “living document”
• References are to GN4-2 activities not GN4-3 tasks (GN4-2 ended in Dec 2018)
• Gaps still exist, not least in integration with OSS and monitoring of services.

• The following slides reflect the wiki content
  • RED is dated content from the wiki, GREEN is potential new content
• Which scenarios do we keep? What scenarios are missing? Where are the gaps?
• All comments welcome…
Current scenarios - 1

Data Intensive Science Transfers

• **Description:**
  • Researchers from a growing number of disciplines are moving increasingly large volumes of data between systems, locally, nationally and internationally.
  • Likely to see the Science DMZ model deployed

• **Challenges:**
  • Identifying poor performance and troubleshooting the causes, which may lie in end systems or on the network path (true end-to-end troubleshooting)

• **Solution space:**
  • perfSONAR (widely used by the WLCG, i.e., the CERN experiments)
  • In-application monitoring (e.g., FTS application reports)
  • GTS FIONA DTNs; open soon for testing (??)
  • What DTN test infrastructure might GÉANT or the NRENs provide?
Current scenarios - 2

Multi-domain monitoring

• Description:
  • Monitoring network performance between multiple administrative domains
  • Understanding in which domains issues lie
  • Focus is on the networking aspect, and network issues.

• Challenges:
  • Likely to need multiple measurement systems deployed
  • Coordination between the administrative domains
  • Understand how it can be automated (alongside provisioning)

• Solution space:
  • perfSONAR, esp. with pscheduler tests between specific nodes, and pShooter
  • GEANT T4 work heading towards solutions
  • Drawing together multiple sources of data to enhance analysis (e.g., Netsage, SAND ??)
Current scenarios - 3

Wireless Network Monitoring

• Description:
  • Measuring the utilisation and performance of a site’s local WiFi infrastructure
  • Probably providing eduroam if at an academic site
  • (At the moment not including 5G, IoT tech, but might do…)

• Challenges:
  • Difficult to run tests from an end user’s system when that is likely to be a BYOD device
  • High variability in performance depending on exact location
  • Multiple frequency channels and standards, emerging 802.11ac
  • RF interference

• Solution space:
  • Crowd-sourced measurement data (WiFiMon)
  • Hybrid approach of crowdsourced and infrastructure data?
  • What about monitoring the eduroam authentication infrastructure separately?
Current scenarios - 4

Layer 2 monitoring

- **Description:**
  - Measurement of L2 performance, below IP layer
  - Includes Ethernet, MPLS, Carrier Ethernet

- **Challenges:**
  - Variety of L2 media
  - Visualisation

- **Solution space:**
  - Work reported in GEANT JRA1/2 in 2013 (Cyan, Juniper, Ciena, Accedian equipment)
  - Embedded probes (e.g. CFM/Y.1731)
  - What about L2VPNs – or is that covered by other scenarios? (See #7 later…)
Current scenarios - 5

Virtual network environments

• **Description:**
  - Measurement of performance on VM infrastructure
  - May include measurements to/from cloud services; AWS, Azure, Google Cloud Platform
  - Increasingly important as university/research services deployed to cloud

• **Challenges:**
  - Abstraction of systems, impact of hypervisor, etc
  - Variability of cloud performance depending on instance; e.g. AWS performance will vary depending on specific platform/size
  - Tunnelling to cloud; MS Expressroute, etc. Extending address space to cloud

• **Solution space:**
  - JRA2 Task1 connection services might be applicable
  - Monitoring of Kubernetes and microservices?
Current scenarios - 6

IPv6 networks

• Description:
  • Measure IPv6 traffic levels
  • Desire to measure growth of IPv6 deployment and usage, and relative performance to IPv4

• Challenges:
  • Not possible to differentiate IPv4 and IPv6 in all devices given state of MIB support
  • Operation in an IPv6-only environment

• Solution space:
  • IETF moving towards YANG
  • (In theory, everything we do in SIG-PMV should be IP version agnostic, i.e., feature equivalent)
  • Where are NRENs publicly reporting these stats, if anywhere?
  • Focus of measurement seems to be on www, dns, mail IPv6 capabilities
Current scenarios - 7

Overlay network monitoring

• Description:
  • Measurement of performance of overlay networks
  • Do we mean the overlay, or the infrastructure over which it runs? (e.g. under a L2VPN) – both! Understanding which layer has issues
  • MD-VPN (used in ~20 NRENs)
  • GTS

• Challenges:
  • Separation of overlay and underlying infrastructure
  • Difficult for a network like GÉANT to “peer into” tunnels
  • User has no way to understand where the problem is

• Solution space:
  • ??
Current scenarios - 8

IP Multicast monitoring

• Description:
  • Monitor the successful performance and delivery of multicast traffic
  • May be within a site, or inter-domain

• Challenges:
  • Apparently minimal use of multicast in the NRENs?
  • Succeeded to some point by multi-point VPNs

• Solution space:
  • Multicast beacons
  • But are NRENs using multicast? IETF deprecating inter-domain ASM.
Emerging scenarios - 1

100G networking and beyond

• **Description:**
  • Performance measurement at 100Gbps +

• **Challenges:**
  • How to monitor/sniff/measure at such line rates
  • Knowing vendor-specific tricks; tuning, performance of end systems; do 10G recipes work at 100G? They may not.
  • Building a generic model; so we become service oriented rather than technology oriented
  • Transport tech may move at a different pace to CPU tech; other elements such as firewalls
  • Mixed speeds – 10G <-> 100G

• **Solution space:**
  • Existing systems, e.g. perfSONAR, with appropriate tuning / configuration?
  • Are there 100G perfSONAR platforms available?
  • ESnet using 40G / 100G cards across their infrastructure
Emerging scenarios - 2

SDN-controlled monitoring

• **Description:**
  • (Not wholly sure what was meant here)
  • Monitoring a dynamically configured network?

• **Challenges:**
  • Service differences?
  • What’s different to a standard IP service
  • Tools like traceroute in an OpenFlow network
  • Monitoring traffic may follow different paths to application traffic

• **Solution space:**
  • ??
  • Some related work in GEANT project; JRA2, maybe JRA1
  • Drop this one?
Emerging scenarios – 3

Monitoring autonomic networks

• Description:
  • Measuring performance in self-configuring networks

• Challenges:
  • Solution needs to also be self-configuring
  • Network operating systems that move flows very dynamically; flow may not have a static path

• Solution space:
  • ..?
  • Not clear this is applicable to NREN networks; possibly for campuses with IoT?
Emerging scenarios - 4

Monitoring as a Service, NMS as a Service

• Description:
  • Includes OSS, BSS with monitoring and performance verification.

• Challenges:
  • Provision, and automatically monitor

• Solution space:
  • ..?
  • JRA2 T2 is doing something in this area
  • GN4-3 exploring Campus Network Management/Monitoring as a Service (CNaaS)
But what is missing?

Additional scenarios or considerations?

• Integration with OSS / management platforms
  • Monitoring in itself is only part of the solution
  • Craig Gallen speaking today on his open NMS platform.

• Monitoring network services
  • Network protocols and their operation, such as BGP – Thomas’ talk today
  • Network services, such as DNS or HTTP(S)
  • New models – streaming telemetry, as per Sowmya and Bruce’s talk today

• Integration and analysis of results
  • Should hear more on this from Shawn today with his talk on SAND
  • How should we apply analytics / machine learning

• What else?
Thank you – any questions?

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