



Internet2 Measurements Working Group

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Agenda

- I2 Measurements WG charter & goals
 - ◆ Objectives for today's working meeting
- Presentations on some current work
- A proposal for gigapops
- Next steps

The I2-MWG

- Co-chair: Matt Zekauskas

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- Not a “funded project”

- ◆ Patterned after the IETF

- ◆ Primary activity is to create recommendations

- ◆ Projects & outcomes are important too ...

- Email list

wg-measurement@internet2.edu



Measurements WG Charter

The WG will include broad representation from the I2 and Internet research community to create a measurement infrastructure and methodology that will:

- ◆ lead to accurate characterization of I2 networks;
- ◆ verify QoS performance and characteristics;
- ◆ lead to viable service definitions and warranties;
- ◆ support research efforts to understand I2 dynamics;
- ◆ enable forward engineering of new infrastructure;
- ◆ aid in problem resolution for I2 enhanced services;
- ◆ and supply raw data to utilization accounting models.



“Customers”

Who are we doing this for?

- GigaPOP operators
- Research community
- Applications developers
- Ultimately the Internet in general

Why instrument the network?

■ Operational data

- ◆ Performance, trends, etc.
- ◆ Anomalies can alert you to attacks

■ Characterization

- ◆ How is the network used?
- ◆ How does it respond to various loads, etc.?
- ◆ Are “Service Level Warrantees” being met?

■ Problem resolution

Characterization

- Understand the behavior of the network as a transport medium in order to enable better forward engineering, problem resolution, and development of new services.
- Very difficult - note all the current efforts!
- Multi-dimensional
- Probably statistically based
 - ◆ What statistical analyses are relevant??

Some Issues include

- What would we like to measure?
- What can we measure?
- Measurement architecture
- Data archiving (!)
- Who's data is it?
 - ◆ Let's share as much as possible
- Analysis
 - ◆ Encourage new ways of looking at the problem

Some Measurement Types

- Size, duration, timing, and number of flows
- Within a flow, loss and retransmit behavior
- Latency and latency variation
- Logical topology and changes
- Channel capacities
 - ◆ At different service levels
- Same for multicast
- Times N for QoS/CoS

Overlap with other WG's

- QoS
- Multicast
- Network Management
- Routing
- Topology

And, of course, existing projects and activities

Goals for today's meeting

- Consensus on a basic set of platforms and measurements for GigaPOPs
 - ◆ Methodology, data sharing, etc.
- Define the next set of actions for this group
 - ◆ Identify requirements for new measurement tools
 - ◆ Document analysis and visualization tools
 - ◆ Develop a data collection and archiving recommendation
 - ◆ ...

Passive Measurements

- Non-intrusive utilization data
 - ◆ traffic volume
 - ◆ AS src/dst matrix
 - ◆ flow sizes and characteristics
 - ◆ packet loss?
- Privacy is an important issue
 - ◆ Never collect more than headers!
- Basic data for cost allocation

Active Measurements

- Can be very intrusive
 - ◆ just when you most want to do it
- End-to-end delay
 - ◆ not intrusive
 - ◆ should be one-way -- asymmetry
- Capacity
 - ◆ by inference, or ...
- They only tell you about that point in time

GigaPOP Instrumentation

■ Intra-gigapop

- ◆ performance, QoS/CoS
- ◆ Policy Constrained Routing?
- ◆ with L2 cut-through, where do you measure?

■ Inter-gigapop

- ◆ part of the end-to-end path
- ◆ more likely to hit congestion

■ Between gigapop and the “real world”

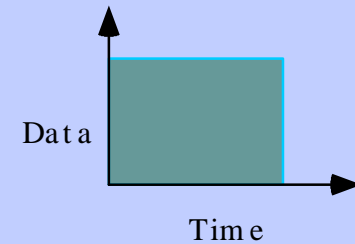


Some interesting questions

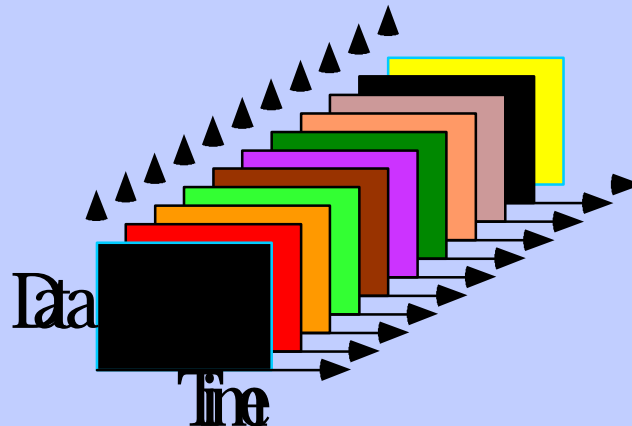
- Volume of raw data !!
 - ◆ So what is really useful?
- Where do we put probes?
 - ◆ Some designs have no obvious center...
- Heizenberg
- Multicast
- DiffServ (QoS)

Differentiated Services Problem

- With one class of transport



- With DiffServ



A Proposal for I2 GigaPOPs

- All “gigapops” and similar interconnect points should include a common set of platforms to collect a basic set of data
 - ◆ IPPM Surveyor -- one-way delay
 - ◆ OCxMON -- traffic characteristics (PoS?)
 - ◆ NetFlow? (proprietary but very useful)
- Traceroute Observatories
- Weather Stations (RTMG)
- Lat/Long in DNS records (RFC 1876)



Co-chairs

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