Premium IP on GÉANT

Report from the SEQUIN Project

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SEQUIN Project Overview

*Se*rvice *Qu*ality across *I*ndependently Managed *N*etworks

IST Project, duration 11/2000-05/2002

Partners: DANTE (coordinator), DFN/FhG FOKUS, GARR, GRNET, POL-34, RENATER, SWITCH, UKERNA

"The objective of SEQUIN is to define and implement an end-to-end approach to Quality of Service (QoS) that will operate across multiple management domains and will exploit a combination of IP and ATM technology."

SEQUIN Project Overview

Background

TEN-155 (GÉANT's predecessor) had a Managed Bandwidth Service ("MBS") based on ATM PVPCs/PVCCs.

This has advantages:

- Operational experience with a QoS offering spanning many domains.
- MBS usage hints at the potential for new service.

But also disadvantages:

- Tends to bias design towards connection-oriented services
  $\Rightarrow$ may prevent full potential of diffserv from being realised.

Requirements Analysis

Interviews with 10 user groups from GÉANT community

Extensive questionnaire about target applications and coverage,
qualitative and quantitative QoS expectations, current connectivity.

QoS-Enhanced Services Considered

“Premium IP” service: low-jitter and strictly rate-limited.
“IP+” (assured rate) left for further study.

References

SEQUIN Deliverable 2.1 “Quality of Service Definition”[a]

[a] http://www.dante.net/sequin/deliverables/SEQ-01-030.pdf

Implementation Concepts

Different requirements levels (must/should/may) to allow for variation between domains.

Within a domain: classical EF-based implementation.

Specify different policing granularities at core/edge domains.

For easier implementation, be lenient with respect to bursts.

References

GÉANT Deliverable 9.1 “Specification and implementation plan for a Premium IP service”[a] and SEQUIN Deliverable 2.1 Addendum 1 “Implementation architecture specification for the Premium IP service”[b]

[a] http://www.dante.net/tf-ngn/GEA-01-032.pdf

[b] http://www.dante.net/sequin/deliverables/SEQ-01-044.pdf

Early Tests and Measurements

- Laboratory testing at high data rates
- Synthetic tests Poland/Switzerland
- International tests with H.323 and synthetic traffic

References

SEQUIN Deliverable 3.1 “Definition of Testbed”[a]

SEQUIN Deliverable 5.1 “Proof of Concept Testbed”[b]

[a] http://www.dante.net/sequin/deliverables/SEQ-01-031v2.pdf

[b] http://www.dante.net/sequin/deliverables/SEQ-01-055.pdf

Early Tests and Measurements

Laboratory testing at high data rates

Tested policing and scheduling (WRR/MDRR, WRED) behaviour of core router platforms (Juniper M160 and Cisco 12400 with “Engine 3” line cards) at STM-16 (2.4 Gb/s) and STM-64 (9.6 Gb/s) line rates.

- Commercial packet generators and loggers (Smartbits)
- QoS features found to work as advertised and without noticeable impact on performance

Early Tests and Measurements

International tests with H.323 and synthetic traffic (1)

Given that videoconferencing, and H.323 in particular:

- was frequently mentioned as an application in the interviews,
- is actively being used in the research community,
- has traffic patterns that are fairly well understood,
- has been noted as problematic over wide-area networks,
- and should make for a nice multi-party test case,

We decided to use this as a basis for more extensive wide-area tests.

Early Tests and Measurements

International tests with H.323 and synthetic traffic (2)

Two-pronged approach:

1. Perform actual H.323 videoconferences with and without Premium IP, and have experts assess perceived quality.
2. Controlled measurements with traffic generation/capturing software, using traffic patterns similar to those seen in H.323 usage.

The goal was to learn more about:

- Performance of Premium IP under realistic conditions.
- Adding Premium IP capability to various types of networks.
- Provisioning Premium IP service instances.

Early Tests and Measurements

International tests with H.323 and synthetic traffic (3)

Other results:

- Packet reordering (even where IPDV was very low).
- It's useful to have a modified traceroute[a] that reports DSCP changes.

[a] ftp://ftp.login.com/pub/software/traceroute/beta/

Initial Deployment (1)

"Beta test" phase with several research groups:

- AQUILA (April 2002): Warsaw-Vienna
- MOICANE (ongoing as of early May 2002): Bucarest (via Athens), Pisa, Lisbon

Initial Deployment (2)

First results from “beta testing”

- Implementing Premium IP is still non-obvious on most networks.
- If application is an overlay network (as in AQUILA and MOICANE), configuration and monitoring becomes hairier.
- User satisfaction and the performance of the underlying mechanisms are not that directly related.
- The “provisioning” process needs to be streamlined
  $\Rightarrow$ work on SLA/SLSs; decoupling from EF implementation

Next Steps

1. Get MOICANE up and running, including diffserv implementation of Premium IP on (parts of) RoEduNet.
2. Finish outstanding documents and wind down SEQUIN.
3. Turn Premium IP into a “production service” (DANTE)
4. Study other diffserv applications for GÉANT (IP^{+}, LBE, ABE?)

Outlook

Focus shifting from QoS mechanisms and SLAs to a more holistic view of the “end-to-end performance problem”.

- Performance monitoring and problem diagnosis
  - Continuous monitoring (QoS “beacon” matrix)
  - End-to-end QoS trace similar to traceroute?
- PERT (“Performance Emergency and Response Team”)—build expertise across several areas that are traditionally separate, but whose interaction determines end-to-end performance: network performance proper (core/campus), computer/OS architecture, transport and higher-layer protocols, distributed algorithm design…

Somewhat orthogonal to whether networks provide differentiated QoS.