Next Steps in Signalling (NSIS) QoS Applications

Hannes Tschofenig
Acknowledgements

• Acknowledgements belong to members of the NSIS working group.

• This slide set reuses slides from past IETF presentations (GIMPS and QSPEC).

• QSPEC slides have been contributed by Jerry Ash, Cornelia Kappler and Attila Báder.
NSIS – High-Level Overview

• IETF WG (founded 11/2001) with a strong QoS signaling focus
• Later path-coupled NAT/Firewall signaling was added to show generic applicability
• Main current work items:
  – GIMPS: General Internet Messaging Protocol for Signaling
  – NSLP for Quality-of-Service signaling
  – A NAT/Firewall NSIS Signaling Layer Protocol (NSLP)
• Finished already:
  – Requirements for Signaling Protocols (RFC 3726)
  – Requirements of a Quality of Service (QoS) Solution for Mobile IP (RFC 3583)
• In the queue:
  – Next Steps in Signaling: Framework
  – Security Threats for NSIS
  – RSVP Security Properties
  – Analysis of Existing Quality of Service Signaling Protocols
NSIS Features

• Path-coupled:
  – Signaling message follow data path
  – Separation of discovery and signaling message delivery provided
• No multicast support
• Mechanisms to deal with mobility
• Ability to reuse existing security protocols
• Support for various signaling scenarios (not only e2e)
• Two layer architecture:
  – NTLP: carries signaling messages between neighboring peers
  – NSLPs: provide signaling application functionality (e.g., QoS signaling)
• Scalability:
  – Per-flow vs. per-aggregate reservations
  – Different QoS models in different domains
  – GIMPS without establishment of reverse routing state
NSIS Layering

Data plane

- Signaling application-specific functions (packet filters/schedulers, firewall pinholes, NAT settings, etc.)

Control plane for signaling: NSIS

NSIS Layering

Data plane

- Signaling application-specific functions (packet filters/schedulers, firewall pinholes, NAT settings, etc.)

Control plane for signaling: NSIS

- NSLP for QoS
- NSLP for Metering
- NSLP for NAT/Firewall middleboxes

First supported features

GIMPS (General Internet Messaging Protocol for Signaling)

- Transport Layer Security
- IP Layer Security

IP Layer Security

- UDP (w/ w/o RAO)
- TCP
- SCTP
- DCCP

IP
QoS NSLP

• Idea: Learn from RSVP and other QoS signaling protocols
• QoS NSLP defines signaling message types and their processing
  – Sender / Receiver-initiated, bidirectional reservations
  – Various authorization aspects (might require interaction with AAA infrastructure)
  – All QoS Model specific information is encapsulated in an object: the QSPEC
• QoS NSLP can signal for any “QoS Model”
  – QoS Model is a method for achieving QoS
    • E.g. IntServ, DiffServ, Y.1541,…
• QSPEC Template Idea:
  – Define generic parameters that are understood by everyone
  – Provide generic description for QoS model
  – Support heterogeneous QoS environments
QoS NSLP signaling model

- QoS NSLP signaling results in resource reservation along the path of a packet flow
- QoS NSLP messages…
  - …are initiated by (a proxy of) the flow end point
  - …travel along the flow path
  - …are interpreted by NSIS entities on the data path
    - resulting in resource reservation
  - … are terminated by (a proxy of) the other flow end point
QoS NSLP Node Architecture

QoS-NSLP Processing

Resource Management

Policy Control

NTLP Processing

QoS Model specific functionality.

QSPEC processed here

QSPEC isolated here and passed to Resource Management Function

Input Packet Processing

Outgoing Interface Selection (Forwarding)

Packet Classifier

Packet Scheduler

Traffic Control

Admission Control

Local Applications or Management (e.g. for aggregates)

= signaling flow

= data flow (sender → receiver)

= control and configuration operations

= routing table manipulations
Structure of the QSPEC

- **QSPEC parameters include**
  - **QoS description**
    - describes actual QoS in objects
      - QoS Desired, QoS Available, QoS Reserved, & Minimum QoS
    - these objects are input/output parameters of Resource Mgmt. Fct.
    - e.g., bandwidth, token bucket
  - **QSPEC control information**
    - e.g., excess treatment

- **Control Information and QoS Description objects are composed of QSPEC param.**
The main extensibility has its origin in the extensibility of the IETF protocol itself.

Providing the above-shown extensibility is ongoing work.
Backup Slides
QSPEC Parameters

- QSPEC Parameters
  - based on DiffServ & IntServ parameters
  - SHOULD be used if applicable to underlying QOSM
  - mandatory QSPEC parameters
    - MUST be understood by any QNE if populated
  - optional QSPEC parameters
    - SHOULD be understood by any QNE if populated & applicable to QOSM(s) supported by QNE
    - QNE MAY ignore if it does not support a QOSM needing the optional QSPEC parameter
  - all QSPEC parameters mandatory except
    - <Path Latency>, <Path Jitter>, <Path BER>, <Ctot>, <Dtot>, <Csum>, & <Dsum>
    - IntServ parameters <Ctot>, <Dtot>, <Csum>, <Dsum> rarely used
  - parameters can be read-only or read-write
QSPEC Parameters

- QSPEC = <QSPEC Control Information> <QoS Description>
- <QSPEC Control Information> = <NON NSLP Hop> <NSLP Hops> <Max NSLP Hops> <Excess Treatment>
- <QoS Description> = <QoS Desired > <QoS Available> <QoS Reserved> <Minimum QoS>
  - supports both sender & receiver initiated signaling
  - provides functionality corresponding to RSVP IntServ objects (AdSpec, Tspec, RSpec)