Directions for Signaling (for traffic) between Application and Network

draft-eckert-int-flow-metadata-framework-<latest>
draft-choukir-tsv-flow-metadata-encoding-<latest>
draft-zamfir-tsvts-flow-metadata-rsvp-0<latest>
draft-martinsen-mmusic-malice-00
draft-wing-pcp-flowdata-<latest>

Amine Choukir, Charles Eckel, Toerless Eckert, Reinaldo Penno, Pal Martinsen, Anca Zamfir, ..

IETF87, July/Augus 2013
Agenda

• Motivation
  What: Use-cases
  How (today): Use cases via ACL…DPI (the problem)

• Proposed Solution Framework
  Metadata Signaling: Concept
  Example/Tentative Attributes
  Loose coupling options to enable services
  Support/leverage variety of transport protocols – no “one-protocol-fits-all”

• Proposed (initial) IETF goals
  Propose to start with three important ones (RSVP, ICE, PCP)
  IETF procedure to define/register attributes
  Common encoding proposal

  Open (but not considered) to include other elements of workflow (policy rules etc..)
Applications

• Best-Effort experience often far from “best”.
• Getting value added services from network is difficult and overall seldom adopted – variety of protocols/mechanisms/market-segment differences.

Operator/User

• Difficult and complex to gain visibility into traffic what uses the network and what it needs.
• No easy and ubiquitous mechanisms to provide differentiated experiences for traffic.
• Wide range of applications requiring it:
  • Pervasive Video/Collaboration
  • Applications with extensive use of rich media
  • Business critical application
Use-cases

- **Enterprise / Industrial / SMB:**
  - Operational Simplicity! “zero touch benefits”
  - Many Applications: Video (Skype, UC, Webex), Business-specific (DB, …) scavenger (social networking,..)
  - Visibility: Analysis, Planning
  - Many Actions: QoS / CAC, Routing: 3G/4G, Managed (L3VPN), OTT (IPsec), Monitoring/Performance

- **SP: enable additional revenue services … competitive/differentiated service**
  - Managed Services Edge (to enterprises) – PE, (managed) CE
    - Everything the enterprise is asking/paying for, Bandwidth on demand, load-balancing
    - Same/better as what the Enterprise would do on CE/PE - Autoconfiguration of QoS
  - “More than flat broadband access pipe” (DSL, Cable, 3/4G)
    - Prioritize Apps in 3G/4G, 3G-to-WiFi- bypass for specific applications, Hotspot service differentiation
    - Bandwidth on-demand for specific sessions
    - Low delay for gaming,
    - Differentiated assured bandwidth for TV streaming from SP or OTT
TODAY

• Toolset: ACLs/DPI
  Application/Device-User-Group visibility and control

• ACL:
  IP-address,”Port-range”/ACL management, coarseness

• DPI:
  Encryption, Authentication
  Dynamic / abesent information
  Agility of media/signaling format
  Incongruent paths for signaling and media
  Unreliability due to heuristics

• Proposal: explicit signaling of attributes
  Business-relevant == useful in policy rulesets
  and/or Visualization/OSS
Goal!

Application

- Get appropriate ("better") treatment from network by exposing characteristics of traffic.
- Use protocol independent common data model.
- Let "Operator" figure out what appropriate is.
- Request services explicitly if desired

Network operator/User

- Comprehensive visibility into traffic in the network. Presence, requirements, performance.
- Easy policies to differentiate application experience across services in the network:
  - QoS/CAC, Routing, Monitoring, Security, …
• **Application signals**
  - For traffic flows - initially 5-tuple
    (future: 4-tuple, tuple with flow-label, …)
  - Business/workflow relevant “classification” attributes
    (“metadata”)
  - attributeX=valueX, attributeY=valueY,…
  - Protocol independent semantic, well defined/registered
  - Encoding optional cross-protocol
    (one for TLV, one for textual protocols ?)

• **Tentative features**
  - Signaling for sent/received flows
  - Authentication (app to network)
  - NAT/FW traversal
  - Signaling for network feedback
  - Support for wide range of transport protocols
  - Proxy support: in-sender/in-network: home-gateway, CE/CPE/AN
    - Add/change/delete attributes (eg: authentication, network specific service-request attributes).
    - Enable Application not supporting signaling themselves (not ideal)
Example/Tentative attributes

• Bandwidth indications
  MinBandwidth, MaxBandwidth: Sustained (>> queueing time) bandwidth range for traffic flow.
  Inelastic flows MinBandwidth = MaxBandwidth.
  BandwidthPool: GUID for flows sharing same bandwidth, …

• Traffic Class “QoS” indications
  Rfc4594-dscp: “My app-developer thinks this traffic best matches this DSCP from rfc4594”
  TCL – Traffic Class Label: structured string - category.application.{adjective{adjective…}}

• Acceptable path properties
  DelayTolerance, LossTolerance

• Application Identification important! Known IETF rathole (DPI) – this is not DPI – application-self-assigned
  “AppId” (RFC6759): Eg: L4-port or vendor (PEN) specific AppID (from AppVendor or MarketVendor)
  AppURI: <appdomain>.com/<appname

• …

• Subscriber-ID, (local-significant) User-ID, Device-Name/ID

• “Session-Detail-Record” metadata (caller/calling-#/URI), Codec-information (“media-type”), …
Service instantiation through loose coupling

- **Classical approach**
  Per-service protocol/signaling, Request/reply
  Adoption/Flexibility/Support issues

- **Loose coupling can solve this problem**
  Applications can not know about all possible network services. Should only worry about describing their traffic
  Different services on different networks
  Network Services still being explored (eg: bandwidth on demand). Standardization premature.

- **Example how loose coupling via policy-rules can solve this problem**
  Policy could be pushed into various places (Home Gateway, AN, …)

![Diagram showing loose coupling and policy ruleset](image)

**Problem:**
OTT Home Office conferencing sucks when kids use OTT TV streaming

**Policy UI:**
Give Office Conferencing App High priority

**Push policy to home gateway**
If AppUri=acme.com/vidconf && Device=OfficePC (eg: from DNS/IP)
Give High Priority

### Metadata
- AppUri=acme.com/vidconf

### (Static) Action/Policy:
- Per-flow QoS
  - If Metadata TCL="<...>.SPprio:high"
    - Queue=HighPrio-Queue
  - Else
    - Queue=BestEffort-Queue

---

**Control App**

**App Media Traffic**

**Metadata Signaling**
Target IETF goals

• Enable use-cases
• Support beneficial signaling protocols via metadata attribute signaling
  Today: No one-size fits all: RSVP, STUN/ICE, PCP, … (more possible …NSIS, XML/JSON/HTTP/…)
  Reduce protocol options in future ?!
• Evolve from protocol definition to data-model approach
  Applications should only care about the data (attributes), not (transport) protocols
  SDK, Middleware (eg: browser) can take care of the protocols!
• Offer cross-protocol common encoding of attributes (first round: for binary protocols)
• Establish rules to Define / Standardize / Register relevant attributes for traffic
• Support (ultimately) all attribute signaling options:
  Informative: application to network
  Advisory: network to application feedback
  Service-Request: via common attributes
Signaling Protocol diversity

No “One Size fits all”

- “binary”: RSVP, NSIS, PCP, STUN/ICE, … PIM/IGMP, what else?, “textual/encoding”: HTML/XML, XMPP, JSON, …

- How easy is it to send/receive for applications?
  Text better? Binary more commonly used, “over TCP” most easy? Over UDP necessary? Raw-IP sucks?

- How easy is it for the network to interact?
  Router alert is standard (but practice suxx?), simple signature inspection easy? direct/anycast addressing

- How lightweight, how high can it scale?

- How can it pass NAT/Firewall?

- Can it support TCP and UDP app traffic (maybe even multicast?)

- How much can it directly signal to routers/switches “onpath”?

- End-to-end vs. “edge-only” signaling?
Signaling Protocol diversity
No “One Size fits all” – conclusions:

• Protocol choice determined by deployment situation:
  RSVP “heavyweight” – scales to “video/media” flows but not “large” number of flows. Supports UDP/TCP, even multicast
    Good in enterprise!?  
  STUN/ICE passes through 3rd party NAT/FW, could be implemented very lightweight in routers, supports end-to-end
    General purpose “across internet” (b2c, b2b), more lightweight enterprise future option?  
    Already relied on heavily for address selection (primary ICE use-case), Can amend end-to-end session-layer signaling
  PCP supports explicit negotiations of services already, focusses on edge-signaling
    Ideal starting point for residential sub-SP signaling cases?

  *These protocols look like a good starting point!*

• Information to signal from/to network quite independent of transport protocol!
  Same metadata attributes make sense across all protocols!
Attribute registration / definition

- Registration: IPFIX (RFC5101, 5102/5102-bis)
  Best IETF available registration mechanism !?
  Supports IETF-process/ IANA registry option AND vendor specific (via PEN)
  For IETF process defined attributes,
    “draft-ietf-ipfix-ie-doctors” proposes a process/review rules for attribute definitions.

- Definition
  Attributes can be defined by any working group.
  Protocol independent working groups desirable ?
  What details are necessary/sufficient to permit app-developers to provide attributes consistently ?
Attribute Encoding Goals
draft-choukir-tsv-flow-metadata-encoding-<latest>

- Protocol independent for “binary” protocols.
- TLV-encoding for IPFIX style attributes
  - Standard and vendor specific namespaces
  - Simplified: No templating (only useful for export, not signaling)
  - Compact: (eg: every PEN only sent once)
  - Upstream and downstream (optional) signaling
  - Extensible
  - Allow tags to be secured on a per producer basis
  - Encodes the producer precedence
- Adoption of this encoding in targeted protocols in various stages (not fully embodied in latest PCP, MALICE drafts)
The End