Current Standardization of Packet and Flow Monitoring Technology

Jürgen Quittek
NEC Europe Ltd., Network Laboratories, Heidelberg, Germany
quittek@ccrle.nec.de
Outline

• **IETF IPFIX and PSAMP**
  – missing: IPPM (IP performance metrics)

• 3GPP IP flow-based bearer-level charging

• ITU SG3 International Internet Connectivity
IETF IPFIX Working Group

• IP Flow Information eXport (IPFIX)
  – BoF sessions 12/00 and 08/01
  – active since 10/01
• Successor of RTFM (Real-Time Flow Measurement) working group
• Target (official): standardizing current practice
  – Target (unofficial): standardizing (something like) Cisco NetFlow
• Chairs
  – Nevil Brownlee, CAIDA / University of Auckland
  – David Plonka, University of Wisconsin
**Goal:** Find or develop a basic common IP Traffic Flow measurement technology to be available on (almost) all future routers
- Fulfilling requirements of many applications
- Low hardware/software costs
- Simple and scalable
- Metering to be integrated in general purpose IP routers and other devices (probes, middleboxes)
- Data processing to be integrated into various applications
- Interoperability by openness or standardization
IPFIX Architecture

Flow Information Export

Exporting Process

Collecting Process

Metering Process

Flow Record

Observation Point

Application

Specify Protocol transporting flow properties

Specify Semantics: flow properties measurement procedure
IPFIX Devices

Probe

Simple Router

Complex Router

Multiple Exporters

Protocol Converter

Concentrator

Proxy

O - Observation point
M - Metering process
E - Exporting process
C - Collecting process

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IPFIX WG: Expected Output

• Planned documents
  – Requirements RFC (completed?)
  – Architecture RFC (in progress)
  – Protocol specification (in progress)
  – Information model RFC (in progress)
  – Applicability RFC (just started)

• No new protocol development in working group
• Instead: protocol selection and refinement
• Selected protocol: NetFlow version 9
• Configuration of measurements will not (yet?) be standardized
IPFIX WG: Current Status

• Major design decision:
  – protocol based on NetFlow version 9
  – SCTP will be the mandatory transport protocol.
    • different to NFv9
  – TCP and UDP are optional.
• Protocol design (refinement of NFv9) still needs a lot of work
  – discussed simplifications of the NFv9 approach
    • 6 binary message formats defined by NFv9
      – 4 template records, 2 data records
    • probably no more than 2 required: 1 template & 1 data
• Completion of most documents expected in 2004
• NetFlow version 9 implementation report would probably be very welcome input
• More information at http://ipfix.doit.wisc.edu
IETF PSAMP Working Group

• Packet SAMPling (PSAMP)
  – BoF session 03/02
  – active since 07/02
• Initiated by Nick Duffield, AT&T
• Target: standardizing new technology for sampling, filtering and exporting packets
  – can be interpreted as a component of the IPFIX measurement process
  – but different to IPFIX, there is no (or very little) current practice
• Chairs
  – Andy Bierman, Cisco
  – Juergen Quittek, NEC
Goal: Develop effective but low-cost packet sampling technology
- Allowing measurements at high-speed links
- Fulfilling requirements of applications using per packet measurement
  - QoS analysis, traffic profiling
- Very low hardware/software costs
- Much simpler than IPFIX
- Will use subset of IPFIX protocol
- Sampling to be integrated in general purpose IP routers and other devices (probes, middleboxes)
- Configuration of sampling included (different to IPFIX)
PSAMP Architecture

Packet Information Export

Exporting Process

Collecting Process

Sampling & Filtering Process

Application

Observation Point

Specifiy Protocol transporting flow properties

Specifiy Semantics: flow properties measurement procedure

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PSAMP WG: Expected Output

• Planned documents
  – Framework RFC (almost completed)
  – Packet Sampling and Filtering Spec. RFC (progressed far)
  – Report Format and Protocol specification (first versions)
  – PSMAP MIB RFC (in progress)
  – Applicability RFC (not started)

• Dependencies on IPFIX protocol development
PSAMP WG: Current Status

• Packet selection methods selected
  – hash-based sampling
• Working group decided to use IPFIX protocol
  – some work has to wait for IPFIX
• Completion of most documents expected in mid 2004
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• **3GPP IP flow-based bearer-level charging**

• ITU SG3 International Internet Connectivity
Current Situation

• 3GPP has started developing a standard for charging of IP-based services
• Requirements are (almost) fixed
• The charging architecture will soon be completed
  – supports offline charging and credit-controlled online charging
• Detailed specification of functions and protocols will start soon
Goals of Standardization

- Main goal: Increase charging capability and charging flexibility compared to GPRS
- Variable charging schemes applicable to existing and new IP services
  - volume based, time-based, other
  - offline-charging, credit-based online charging
- Enabling charging per service
- Value added services may define their own charging schemes
3GPP Working Groups Involved

• SA1: Requirements for charging of IP-based services
  – done
• SA2: Architecture for IP flow-based bearer level charging
  – will be completed soon
• SA5: Specification of functions and protocols
  – just started
Architecture Overview: Online Charging

- Service specific charging rules
- Service specific credit control

Online Charging System

- CAMEL SCP
- Service Data Flow Based Credit Control
- Service Data Flow Based Charging Rules Function
- Traffic Plane Function

AF = Application Function

AF

Rx

Gy

Gx

AF

Gx

Gy
Architecture Overview: Offline Charging

- Service specific charging rules
- Service specific charging gateway functions
- Service specific (or service provider specific) charging collection functions
Work Ahead

• Definition of charging rules specification language
  – simplicity,
  – expressibility (coverage of assumed service requirements)

• Definition of functions
  – charging rules functions
  – traffic plane functions
  – credit control functions
  – charging gateway functions
  – charging collect functions

• Definition of protocols: Gx, Gy, Gz
  – candidates are
    • IETF AAA (Authentication, Authorization, Accounting)
    • IETF IPFIX (IP Flow Information eXport)
    • IPDRF IPDR (IP Detailed Record)
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• ITU SG3 International Internet Connectivity
International Internet Connectivity

- ITU Study Group 3 Rapporteur Group
- **Goal**: Give recommendations on the accounting of traffic between Internet service providers
- Just recommendations no obligation
- Highly political issue
- First version of this ITU-T Recommendation D.50 developed 1997-2000
  - recommendation part of the document consists of 4 lines of text: "...take into account the possible need for compensation between them [the ISPs] for the value of elements such as traffic flow, number of routes, geographical coverage and cost of international transmission amongst others."
- This statement was already too strong to be supported by Greece and by the USA.
International Internet Connectivity

• Next approach: Extending 4 lines to 6 including a pointer to an addendum
• Taking more properties into account
  – flow-related: service performance, ...
  – not flow-related: dedicated capacity provided, network resilience, ...
• ISP interaction
  – peering, asymmetric charging, ...
• Cost sharing of international connection
• Goal: agree on new version in autumn 2004