IPv6 Network Management

Taipei

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- Simon Muyal, Renater
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- Munechika Sumikawa, Hitachi
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Agenda

- Introduction
- Management network
- IPv6 MIBs: current status
- Managing IPv6 networks
- IPv6 MIBs implementation
- Netflow
- SNMPv6
- Management platforms
- Management tools
  - IPv6 LAN
  - IPv6 MAN/WAN
- Examples
- Conclusion
- Demo

Introduction

- Manage a network: What is it?
  - A set of functions permitting:
    - Inventory
    - Topology
    - Security
    - Monitoring
    - Reporting
    - ...

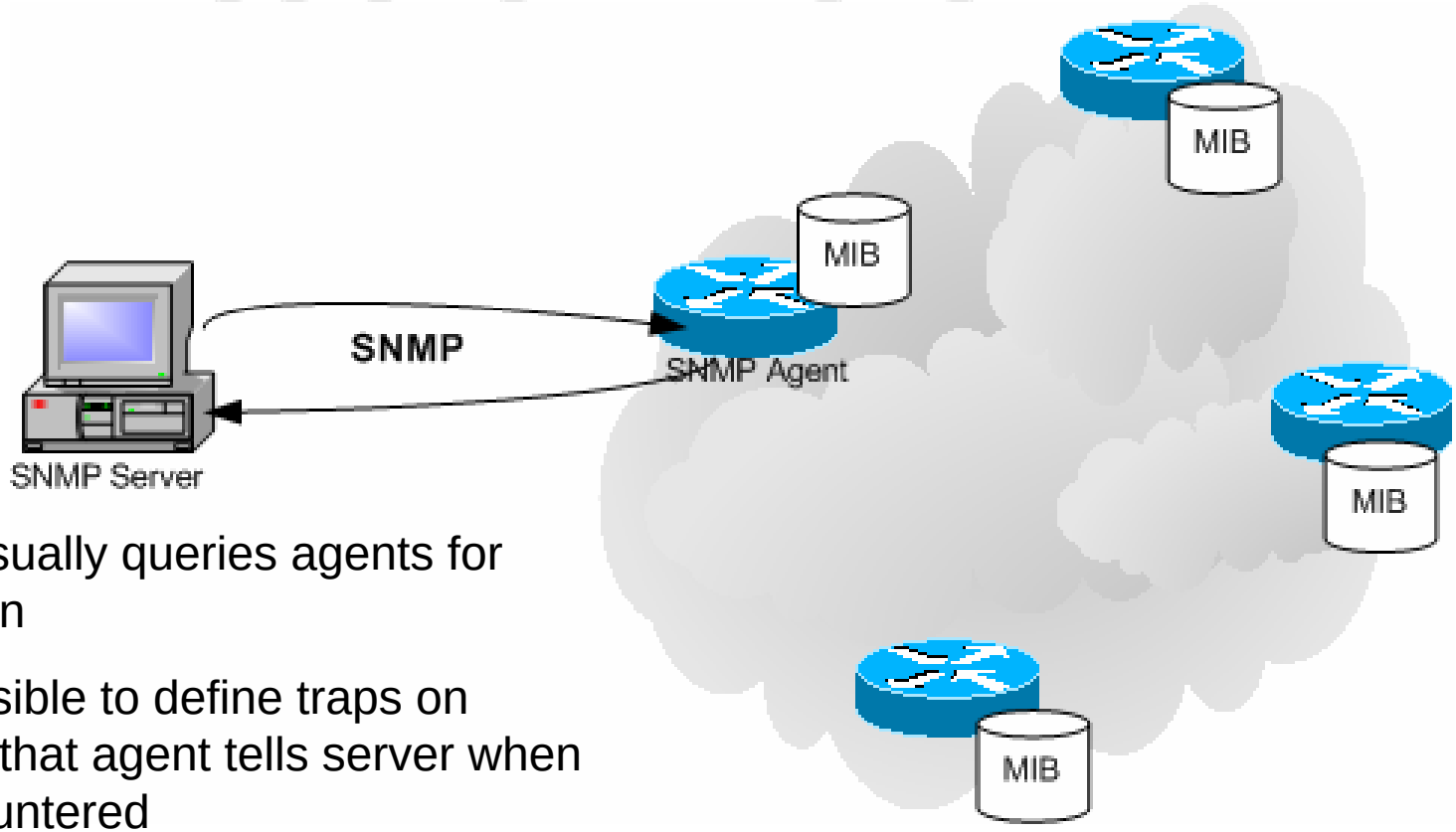
Introduction /2

- IPv6 networks deployed:
  - Most are dual stack
    - LANs (campuses, companies, …)
    - MANs
    - WANs -ISPs (Géant, NRENs, IIJ, NTT/Verio, Abilene, …)
    - IXes
- Testbeds, pilot networks, production …

  => Management tools are needed
- Which applications are available for managing these networks ?
  - Equipment, configurations, …
  - IP services (servers : DNS, FTP, HTTP, …)

Introduction /3

- SNMP Model:



•Server usually queries agents for information

•Also possible to define traps on agent, so that agent tells server when trap encountered

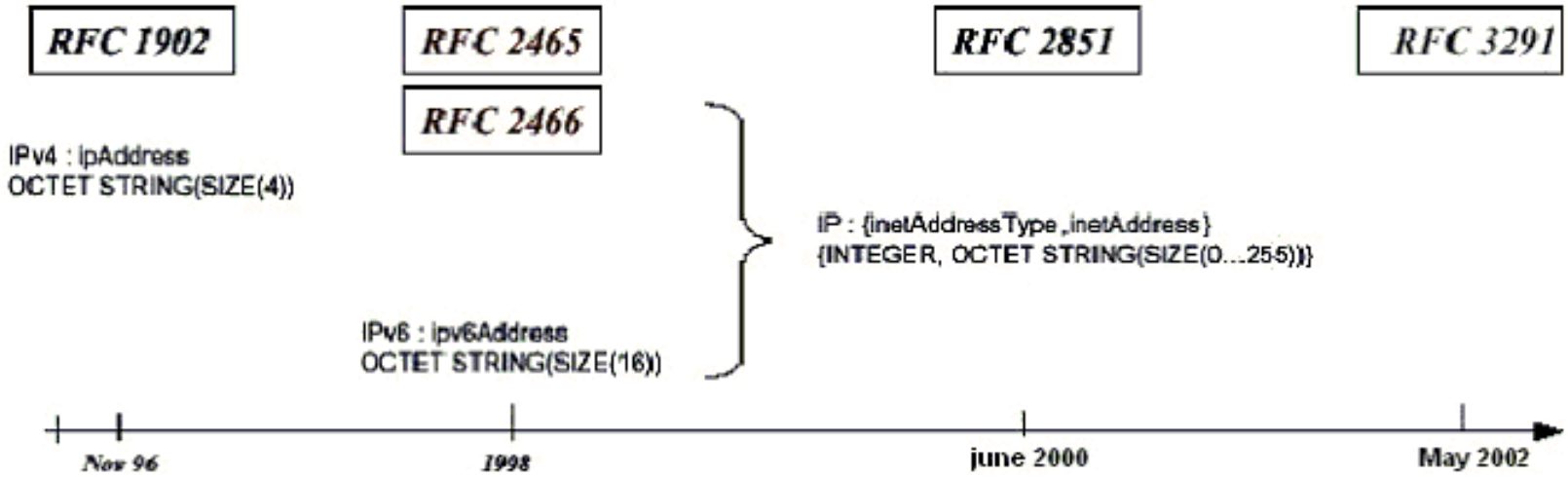
IPv6 MIBs Status

IPv6 MIBs status

- MIBs are essential for the network management
- SNMP-based applications are widely used but others exist too (NetFlow, …)
- SNMP relies upon MIBs …
  - Need to have MIBs containing IPv6 information
- Can query IPv4/IPv6 information independent of whether IPv4 or IPv6 is used for transport

IPv6 MIBs /2

- Standardization status at IETF:
  - At the beginning:
    - IPv4 and IPv6 MIBs separate
  - Today :
    - Unified MIBs are on standardization track.



IETF MIB Status /3

- RFC 4113 – UDP MIB
- RFC 4022 – TCP MIB
- draft-ietf-ipv6-rfc2011-update-10.txt – IP MIB
  - In the RFC Editor's queue, can be considered done
- draft-ietf-ipv6-rfc2096-update-07.txt
  - IP Forwarding Table MIB
  - In the RFC Editor's queue, can be considered done

→ All of these use common tables for IPv4 and IPv6

IETF MIB Status /4

- BGP IPv6 MIB: not stabilized yet.
  – The current document is draft-ietf-idr-bgp4-mibv2-05.txt (08/2005)

  Note that the same folks are working on
  – draft-ietf-idr-bgp4-mib-15.txt
  update of RFC 1657
  – In the RFC Editor's queue, can be considered done

Managing an IPv6 Network

Managing an IPv6 network

- Dual stack IPv6 networks
- IPv6 only
  - Not so common yet
- Important to keep in mind
  - DS is not forever
  - One IP stack should be removed … one day
  - No reasons for network administrators to face the amount of work twice

Dual Stack IP networks

- Part of the monitoring via IPv4
  - Connectivity to the equipment
  - Tools to manage it (inventory, configurations, «counters», routing info, …)
- Remaining part needs IPv6
  - MIBs IPv6 support
  - NetFlow (v9)

IPv6 only networks

- Topology discovery (LAN, WAN ?)
- IPv6 SNMP agent
- SNMP over IPv6 transport

=> Need to identify the missing parts

IPv6 MIBs implementations

IPv6 MIBs implementations /1

- Cisco
  - Private Cisco MIBs implement ID-00 of RFC 2011 (IP) & 2096 (IP Forwarding Table) updated drafts
  - But, no distinction between IPv4 and IPv6 traffic at the interface level from the MIBs (available when new IETF MIB get implemented)
  - Information available from CLI
    - *show interface accounting*
    - *…*

Cisco: IPv6 CLI

"show interface accounting“

- Differentiate IPv4/IPv6 counters at the interface level for all Cisco routers, except:
  - –Catalyst 6500 / Cisco 7600 supervisor engine 720:
    Counts only for packets that are software switched, not the hardware switched packets
  - –GSR:
    - • ‘show interface counters' correctly counts IPv6 traffic and separates ingress and egress traffic
    - • Engine 3:
      * OUTPUT IPv6 traffic is counted under IPv6 (correct)
      * INPUT IPv6 traffic is counted under IP (will be corrected)

IPv6 MIBs implementations /2

- Juniper
  - MIB based on RFC 2465 (Textual conventions for IPv6)
  - with different counters for IPv4 and IPv6 traffic?
  - Or use ACLs to count IPv6 traffic

IPv6 MIBs implementations /3

- Hitachi
  - Routers (GR2000/GR4000) and Switches (GS4000) support IPv6 standard MIBs:
    - RFC 2452: TCP/IPv6
    - RFC 2454: UDP/IPv6
    - RFC 2465: Textual conventions for IPv6
    - RFC 2466: ICMPv6
  - The unified MIBs are not implemented yet

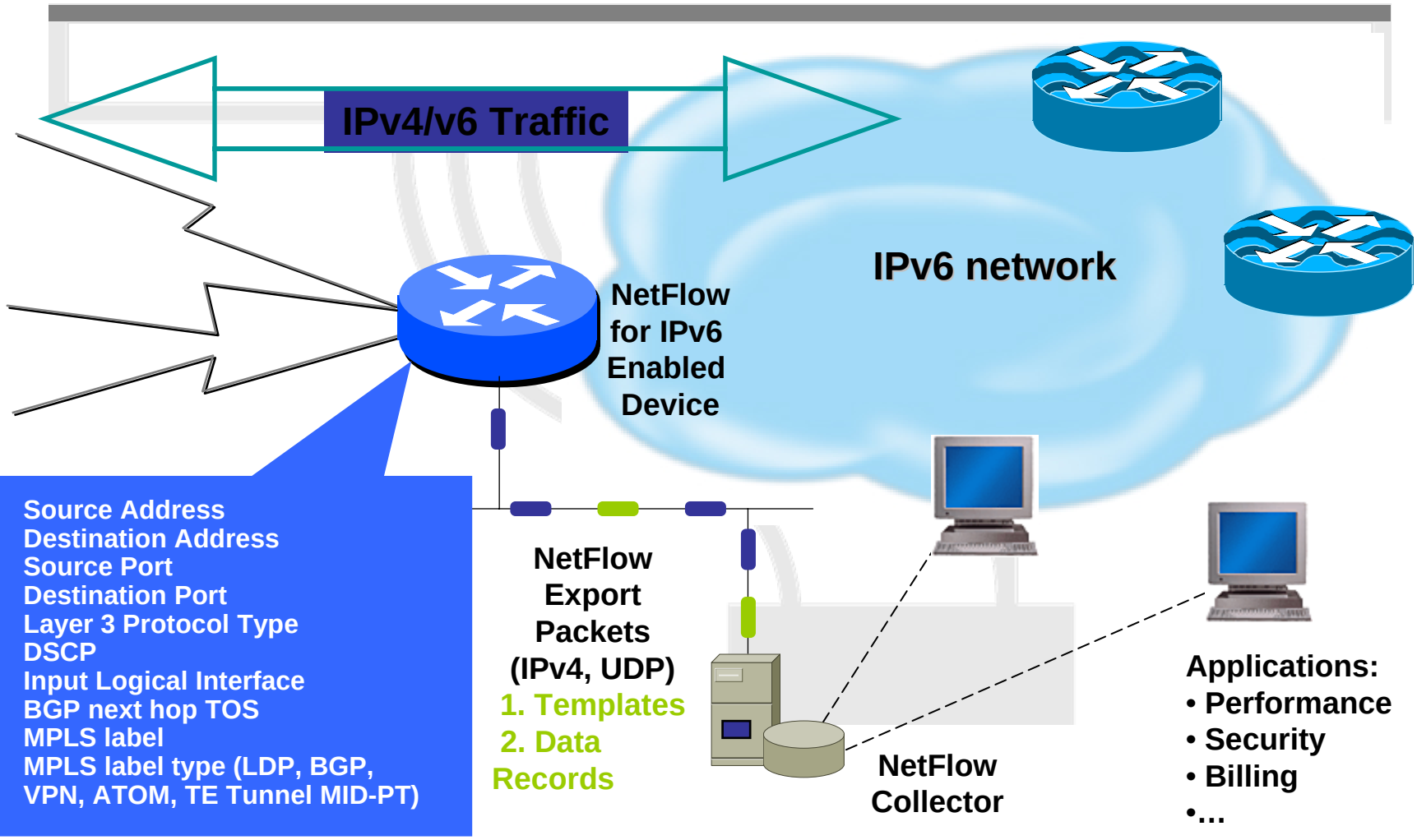
IPv6 MIBs implementations /4

- 6WIND
  - MIBs based on RFC 2465 (textual conventions) and RFC 2466 (ICMPv6)
  - To be checked at our lab …

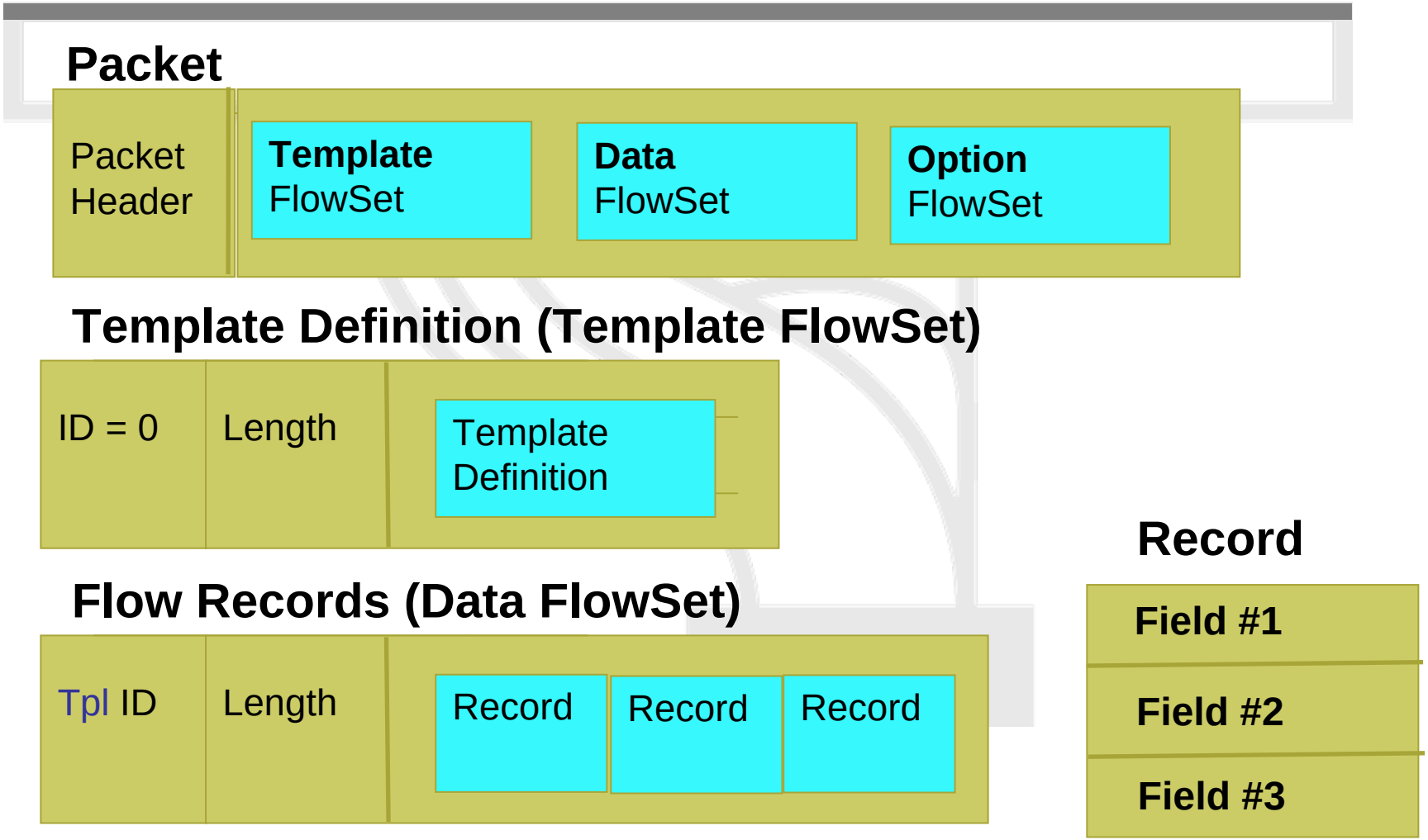
Netflow

Netflow

NetFlow for IPv6



NetFlow Version 9 – RFC 3954

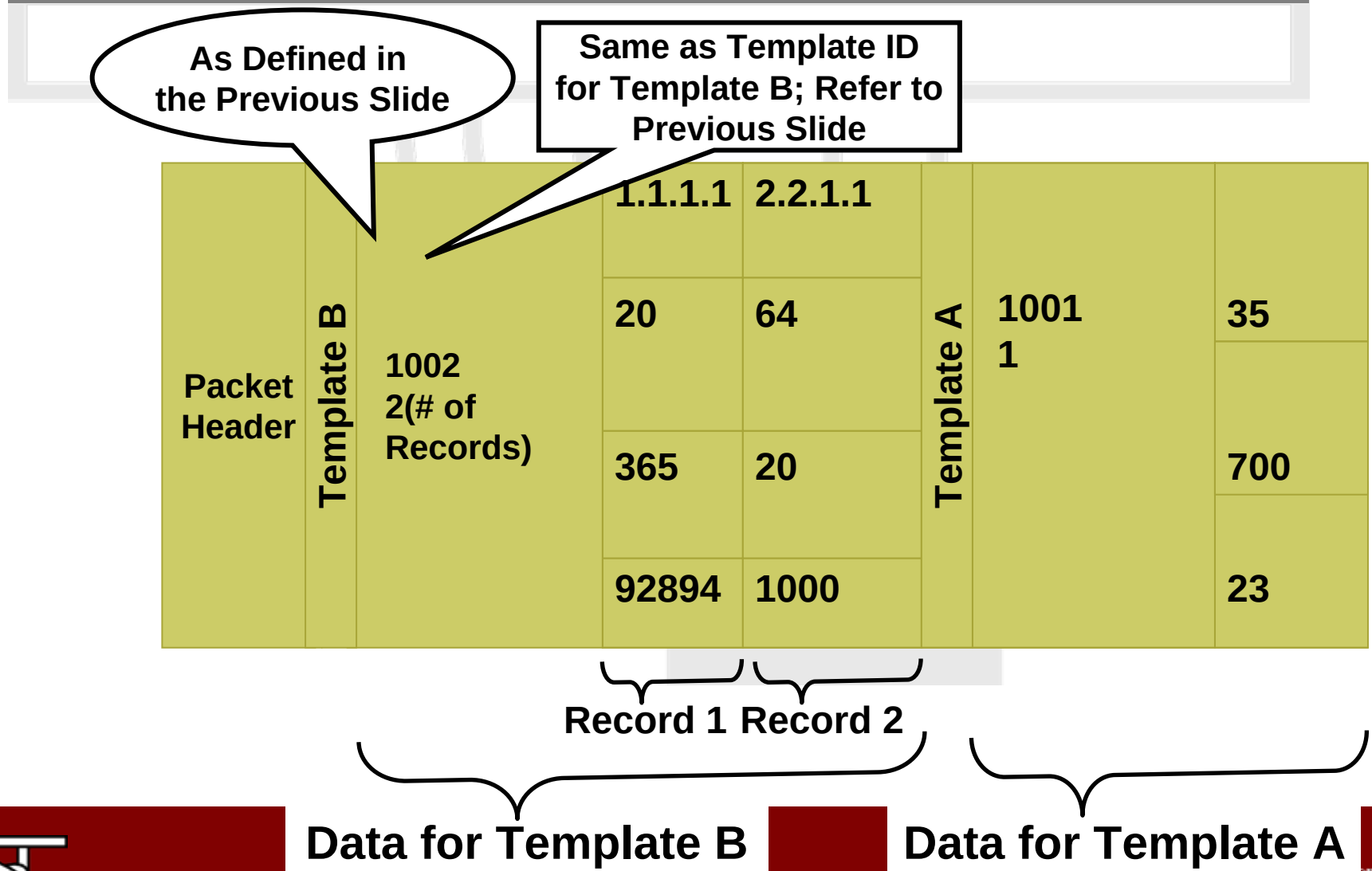


NetFlow Version 9
Example for Template Definition

Template A
Flow Set ID (0 for Template)
Length of Template Structure
1001 (Template ID)
3 (# of Fields)
SRC_AS_NUMBER
2
DST_AS_NUMBER
2
L4_PROTOCOL
2

Template B
Flow Set ID (0 for Template)
Length of Template Structure
1002 (Template ID)
4 (# of Fields)
SRC_IP_PREFIX
4
SRC_AS_NUMBER
2
PACKET_COUNT
2
BYTE_COUNT
2

Example for Export Packet



NetFlow for IPv6 /1

- IETF IPFIX WG – draft-ietf-ipfix-protocol...
- Can use IPv4 or IPv6 for transport, independent of data
  - Can be UDP or SCTP
- Cisco
  - Netflow for IPv6 on Cisco IOS 12.3(7)T
    - Compliant Netflow v9
    - Still use an IPv4 transport to export the data
    - Need v9 Netflow Collector
      - Cisco NFC v5.0 available
      - flowd (http://www.mindrot.org/flowd.html
      - Other collectors are available too …
    - You also need frontend to view collected XML data
      - Cisco NFC
      - People are working on others...

  =>Netflow is not yet there for GSRs though

NetFlow for IPv6 /2

- Hitachi
  - Support sflow (http://www.sflow.org/) and Netflow is on the roadmap.
- 6WIND:
  - Not available

SNMP over IPv6

SNMP over IPv6

- Cisco:
  - –SNMP over IPv6 is shipping in 12.0(27)S1
    - •This is the "limited" version that 6Net tested, so the transport is there, but some features (snmp proxy, infra mibs) still lack IPv6 capability)
  - –Also supported from 12.3(14)T, 12.4M and 12.4T, covering platforms from 1700 to 7500
  - –The plan is to have full SNMP over IPv6 in future releases
  - –Today, syslog messages related to IPv6 are sent over an IPv4 transport. Later, syslog will run over IPv6 as well
  - – Syslog over IPv6 will be available from 12.4(4)T
- Hitachi:
  - –SNMP over IPv6 is available
- 6WIND
  - –SNMP over IPv6 is available

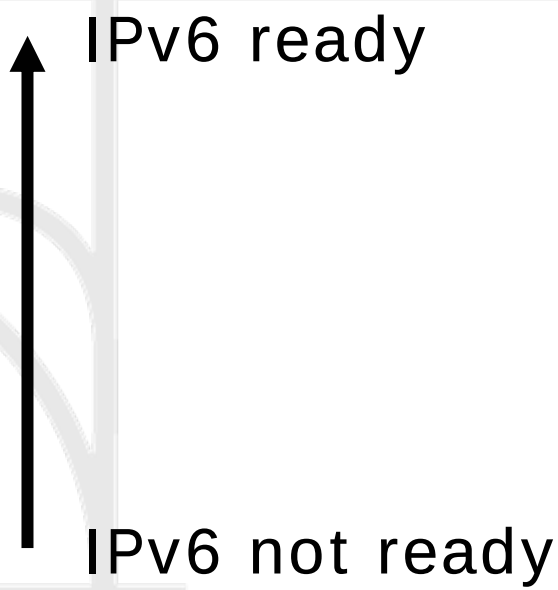
Management platforms

Management platforms

- Commercial ISPs use to have integrated management platforms (NRENs folks mostly use GPL or Home made tools)
- **HP-OV** offers a version with IPv6 features: NNM 7.0 (sept 2003).
- **Ciscoworks**: IPv6 version of Campus Manager
- **Netview** (IBM) doesn't offer any IPv6 features
- **Tivoli** : no information …
- **Infovista** : « no IPv6 plan at the moment »

« Top ten » …

- HP Openview
- Ciscoworks 2000 (Campus Manager)
- IBM Netview
- Infovista, Tivoli
- …



Monitoring tools

Monitoring tools for IPv6 networks

- For a LAN:
  - Nagios
  - Argus
  - MRTG

  ...
- For a MAN/WAN:
  - AS PATH tree
  - Weather map
  - Netflow
  - Rancid
  - Looking Glass

  ...

6Net and IPv6 monitoring tools

- 6Net wp6 : managing large scale IPv6 nets
  - Tests lot of ipv6 ready tools
  - Port many others to ipv6

6Net outcome

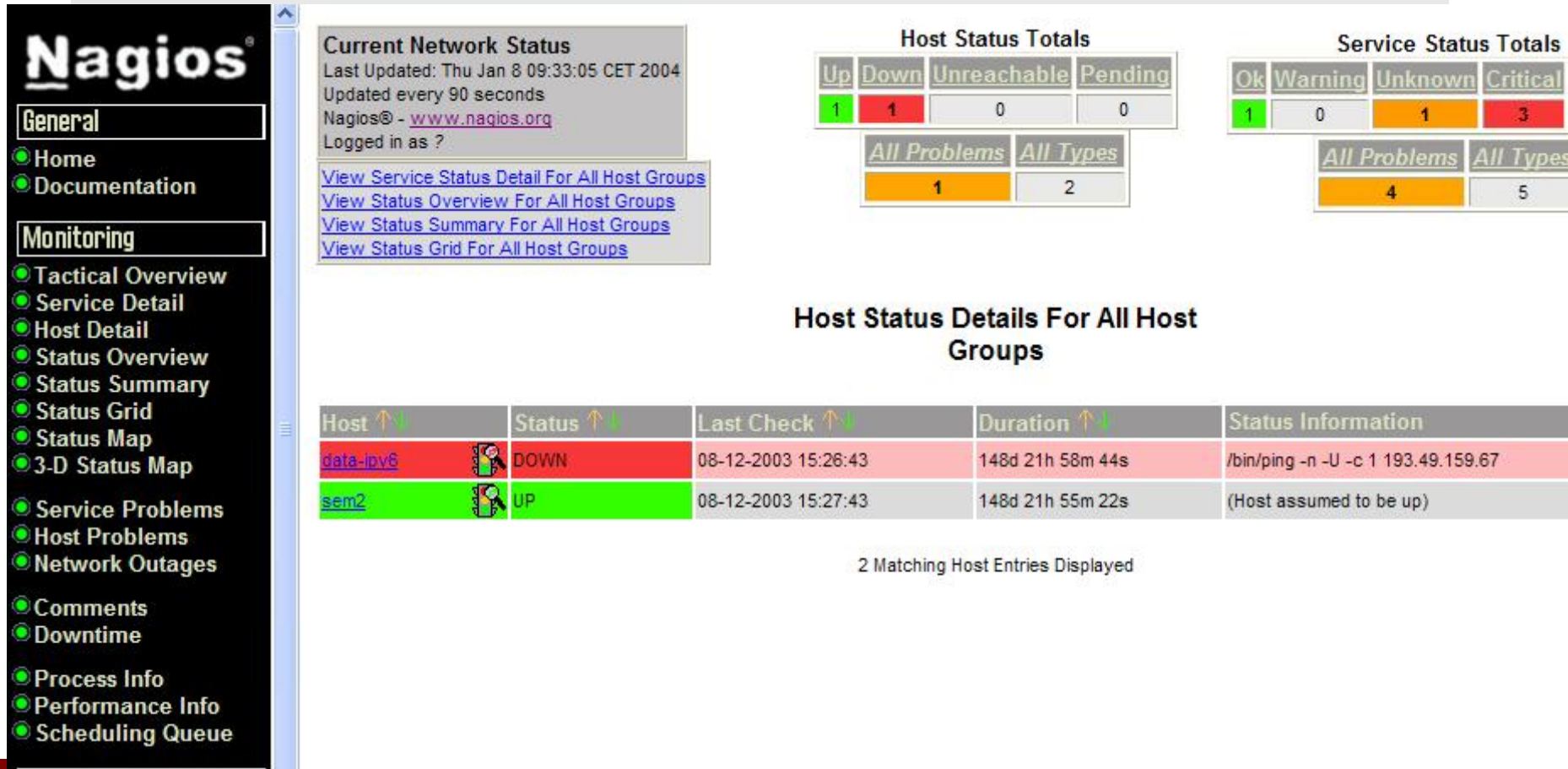
- 30+ monitoring tools for IPv6
  - Tested
  - Implemented
  - Documented
- See http://tools.6net.org/

Examples

IPv6 LAN management: Nagios

- URL://www.nagios.org
- Administration of network:
  - PCs
  - Switches
  - Routers
- Administration of services:
  - http, ftp, dns...
- Evolution: new features can be added with plug-ins

Nagios

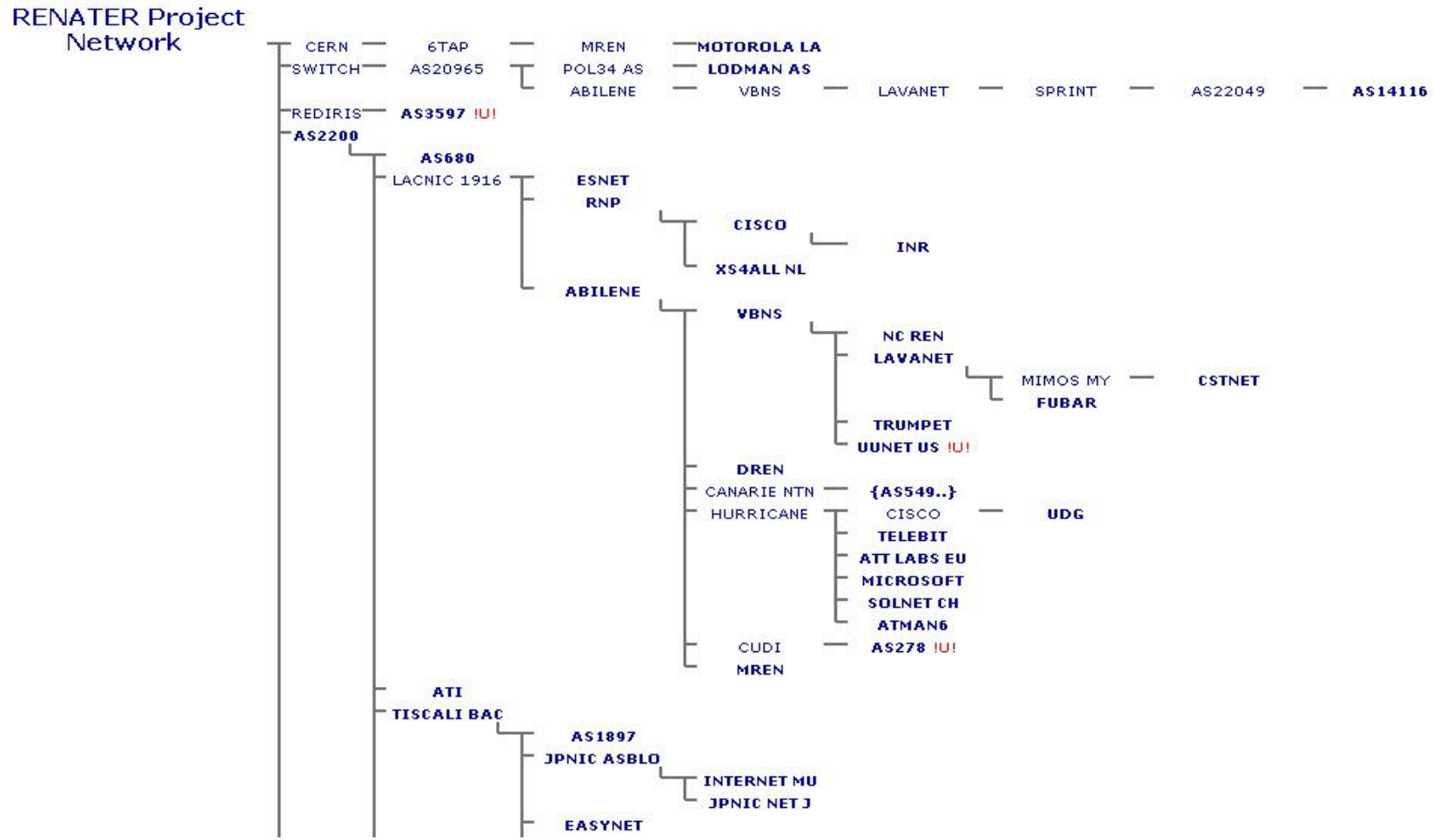

Nagios
General
Home
Documentation
Monitoring
Tactical Overview
Service Detail
Host Detail
Status Overview
Status Summary
Status Grid
Status Map
3-D Status Map
Service Problems
Host Problems
Network Outages
Comments
Downtime
Process Info
Performance Info
Scheduling Queue
Current Network Status
Last Updated: Thu Jan 8 09:33:05 CET 2004
Updated every 90 seconds
Nagios® - www.nagios.org
Logged in as ?
View Service Status Detail For All Host Groups
View Status Overview For All Host Groups
View Status Summary For All Host Groups
View Status Grid For All Host Groups
Host Status Totals
Up
Down
Unreachable
Pending
1
1
0
0
All Problems
All Types
1
2
Service Status Totals
Ok
Warning
Unknown
Critical
1
0
1
3
All Problems
All Types
4
5
Host Status Details For All Host Groups
Host
Status
Last Check
Duration
Status Information
data-ipv6
DOWN
08-12-2003 15:26:43
148d 21h 58m 44s
/bin/ping -n -U -c 1 193.49.159.67
sem2
UP
08-12-2003 15:27:43
148d 21h 55m 22s
(Host assumed to be up)
2 Matching Host Entries Displayed

IPv6 MAN/WAN management: AS Path Tree

- Display BGP4+ « topology » from
  - BGP4+ routing table.
- Generate HTML pages

AS Path Tree

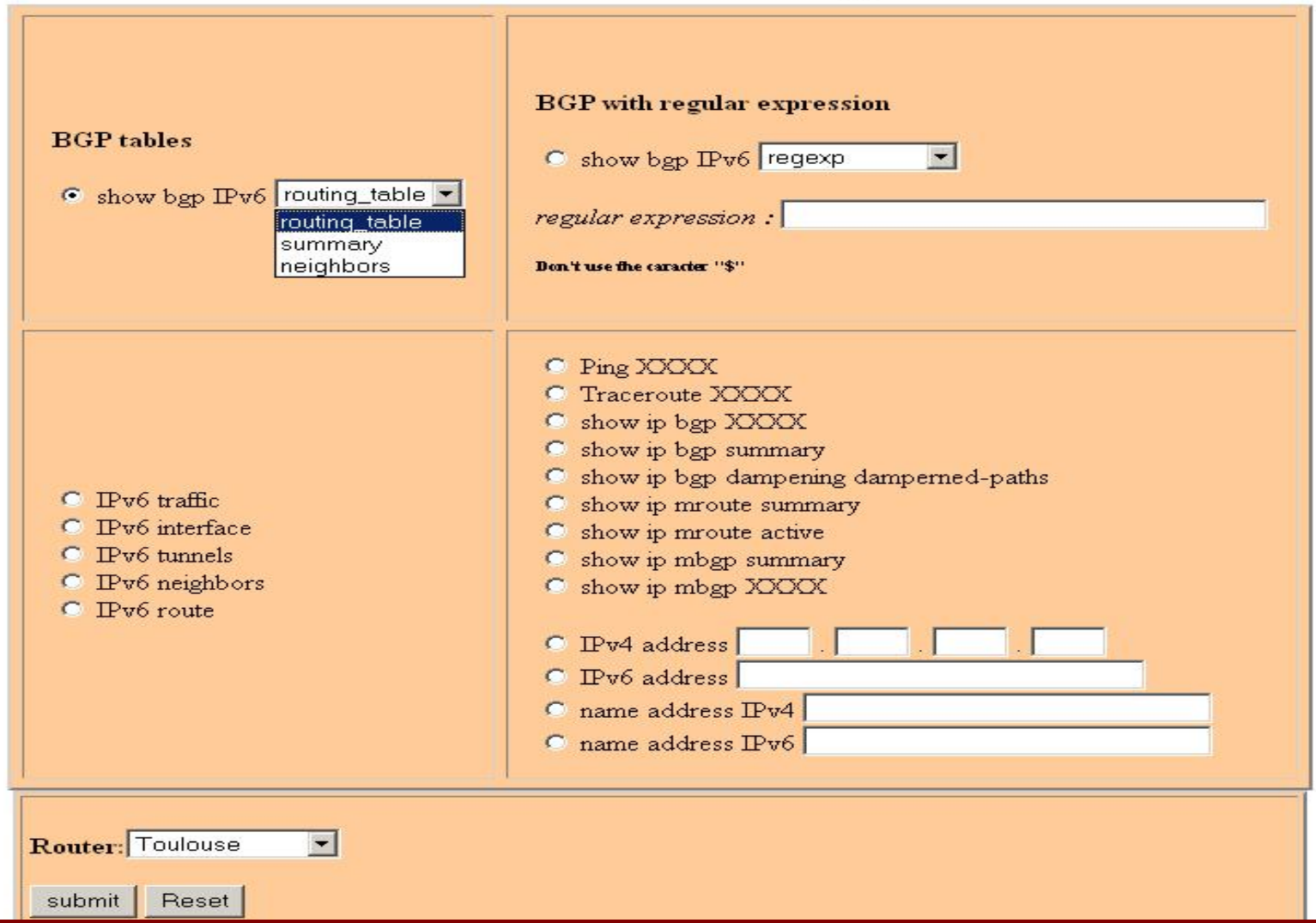
Renater The whole IPv6 BGP table



IPv6 MAN/WAN management : Looking Glass

- Get information on a router w/o direct connection
- Web Interface
- Final user don’t need a login
- Allow the user to detect causes of failures w/o asking the NOC

Looking Glass



Conclusion

- ISPs – and other organisations need monitoring tools to launch a new service/protocol into production
- Lot of monitoring tools are now ready for IPv6 networks
- But :
  - Q1: are my usual tools (used for IPv4 monitoring) available for IPv6 too ?
  - Q2: what do I need from my favourite vendor to be ready to manage my IPv6 network ?