


IST-2001-32603	Deliverable 6.2.1	
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Project Number:	IST-2001-32603
Project Title:	6NET
CEC Deliverable Number:	32603/LORIA/DS/6.2.1/A1
Contractual Date of Delivery to the CEC:	June 2002
Actual Date of Delivery to the CEC:	
Title of Deliverable:	6Net Management Tools Requirements
Work package contributing to Deliverable:	6
Type of Deliverable*:	R
Deliverable Security Class**:	RE
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* Type: P - Prototype, R - Report, D - Demonstrator, O - Other

** Security Class: PU- Public, PP – Restricted to other programme participants (including the Commission), RE – Restricted to a group defined by the consortium (including the Commission), CO – Confidential, only for members of the consortium (including the Commission)

Abstract:

This document provides a list of selected management tools and components that will be evaluated and/or developed and/or extended and/or deployed within the 6Net management project.

Keywords: management tools

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Executive Summary

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1. Introduction

Many tools exist to support the network management activity. They vary from simple scripts that facilitate some management data collection and formatting dedicated to a specific function to fully integrated platforms which rely on standard protocols and offer several advanced services such as topology management, management data storage, advanced web interfaces and APIs. Today's offer for the management of IPv4 networks is very rich but few of the proposed components do support IPv6.

This document provides the result of an initial analysis performed by WP6 members on identifying tools that are of major importance for the management of an IP network and which, if they are put together, cover all of the management functions addressed by the 6Net project. These requirements are listed in [1]. For each selected tool, an in-depth study on its applicability to IPv6 networks will be performed within the 6Net project and when necessary, they will be extended to be fully operational in an IPv6 environment. Those tools will form the basic platform that will be promoted as part of the future cookbook.

The document is organized as follows. In section 2, the tools identified within the management framework of 6Net are listed. In section 3, the template used to describe the tools is explained. Section 4 provides a set of templates for most of the tools listed in section 2. A short summary is given in section 5.

2. Tool list

Following tools have been identified as very important to fulfill the planned operations :

- Analyzer,
- AS-PATH Tree,
- BGP stability monitors,
- Cricket,
- Ethereal,
- Flowtools,
- InfoVista,

- IRRDTools,
- Java SNMP programming environments,
- Looking Glass service,
- Mping,
- MRTGv6,
- Multicast Beacon
- Multicast monitoring,
- NAGIOS,
- NetSNMP,
- Netflow,
- Rancid,
- Rover,
- SNMP session,
- SNMP Proxy
- LAN Topology discovery service,
- Polyphemus
- RIPE NCC Test Traffic toos
- Trouble-ticket software,
- Trout6,
- Tunnel Trace
- Weathermap.

In the remainder of this report, each tool or toolkit family will be summarized. Their application domain, their status (Open Source, GPL, commercial, ...), their current support for IPv6 features, the proposed extensions, and required tests will be detailed.

3. Proforma

The following proforma is used for the tools detailed in section 4.

Tool Name : <i>Name of the considered tool.</i>	6Net contact : <i>The name of the person and/or institution within 6Net that will be the correspondent for the tool.</i>
Tool location : <i>URL where the tool can be found, or if the tool is not directly downloadable, the URL where information on the tool is given.</i>	Version : <i>Initial version that will be considered within the 6Net management framework.</i>

Description <i>A short description of the tool</i>
Application domains in the 6Net management framework <i>Management function to which the tool is useful</i>
Current Ipv6 support : Yes/No
Required extensions to be operational within a native Ipv6 environment : <i>A list of already identified extensions that need to be provided to make the tool IPv6 enabled.</i>
Proposed extensions <i>A list of extensions being a subset of the previous list that will be provided to make the tool usable in the 6Net environment</i>


4. Detailed tools description

This section contains a more detailed description (which follows the template defined in the previous section) of the tools identified in section 2. Only those tools which have already undergone a first analysis and which are already used in an IPv4 environment within the 6Net community are addressed in this section. Those which will be used but which have not been used in previous experiments are not detailed here.

Analyzer	The NetGroup at the Politecnico di Torino
http://analyzer.polito.it	Version: 3.0
License type: BSD License	Sources: upon request
<p>Description</p> <p>Analyzer is an advanced network sniffing and monitoring tool with the following characteristics:</p> <ul style="list-style-type: none"> • Customisable protocol decoding engine • Customisable views of the decoded packets • Possibility to save captured traces in HTML • LAN Node Discovery (to discover all the hosts on the LAN) • LAN Node Activity monitoring (to detect which host are active on the LAN) • Traffic monitoring (to monitor the activity of specific hosts, specific protocols, and more) • Traffic matrix (to monitor the activity between groups of entities) • Possibility to run as a service (Win32 only) • HTML statistics generations 	
<p>Application domains in the 6Net management matrix</p> <p>Analyzer can be used mainly to monitor traffic on a local area network.</p>	
<p>Current IPv6 support:</p> <p>Full compliance in case of IPv6 packets without extension headers.</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>None.</p>	
<p>Proposed extensions</p> <p>In order to be fully compliant we need to add the support for the IPv6 extension headers.</p> <p>This feature will be available at the beginning of 2003.</p>	


ASpath-tree	Isabelle ASTIC, Olivier FESTOR, INRIA
http://carmen.ipv6.tilab.com/ipv6/tools/ASpath-tree	Version : 3.3
License type : Solaris 2.5.1 (FreeBSD, Linux with Perl interpreter ?)	Sources : Yes
<p>Description</p> <p>ASpath-tree is a tool which allow to display graphically the BGP4+ routing pathes managed by the CISCO routers of a backbone. It was created in the context of the 6Bone backbone.</p> <p>It could provide also pages for the detection of routing anomalies and for statistics.</p> <p>It is a set of Perl 5.0 scripts which used the rsh function to collect the BGP4+ information from the CISCO routers.</p>	
<p>Application domains in the 6Net management matrix</p> <p>ASpath-tree will be very useful to verify the routing tables of the backbone, to check every configuration and to have some statistics about the backbone's routers .</p>	
<p>Current IPv6 support : Not sure for a whole support. It manages IPv6 information but seems to use IPv4 transport for its rsh</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>Porting on IPv6 native protocol</p>	
<p>Proposed extensions</p> <p>Porting on IPv6 native protocol.</p> <p>Extension to allow this service to manage other backbones than the 6Bone one, if required</p> <p>Extension to be able to use a telnet call instead of a rsh call.</p>	

Cricket	Ioannis Kappas (DANTE), Simon Linen (SWITCH)
http://cricket.sourceforge.net/	Version 1.0.3
<p>Description</p> <p>Network operators require awareness of how well their network performs. Every node in the network keeps statistics on many attributes that affect its performance. The operators would like to constantly monitor these attributes over time and keep track of their intensity.</p> <p>Cricket is a tool that can periodically query network nodes for performance attribute values and plot graphs that show the variation of these values over time. One of the basic monitoring operations the tool can perform is to plot graphs of the network circuits utilisation. It provides a web user interface for graph navigation.</p>	
<p>Application domains in the 6Net management matrix</p> <p>The tool can be used by anyone who wants to monitor and plot value variations of network attributes inside their management domain.</p>	
<p>Current Ipv6 support : No</p> <p>Within Cricket the user can develop their own polling methods for retrieving network attributes. It incorporates by default an SNMP polling method, which is Ipv4 specific and does not support Ipv6.</p>	
<p>Required extensions to be operational within a native Ipv6 environment</p> <p>The SNMP polling method can be developed further to operate over a native Ipv6 network.</p>	
<p>Proposed extensions</p> <p>SNMP is the most supported protocol for accessing attributes from network nodes. It has been proposed in the context of the 6NET project to use SNMPv3 capable tools that can operate inside a native Ipv6 domain. A new polling method that interfaces with an existing Ipv6 SNMPv3 library (e.g. Net-SNMP) can be defined as an alternative to upgrading the internal SNMP polling method.</p>	

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Ethereal	Simon Leinen, SWITCH
http://www.ethereal.com/	Version: 0.9.5
License type: GPL	Sources: Yes
Description	
Ethereal is a packet analyser with a graphical (GTK) front-end that supports “drill-down”.	
Application domains in the 6Net management matrix	
Network Element troubleshooting, network fault isolation, service intrusion detection	
Current IPv6 support:	
Can decode basic IPv6 headers	
Required extensions to be operational within a native Ipv6 environment	
-	
Proposed extensions	
Protocols that are used or developed within 6NET could be supported with additional or improved “dissectors”.	


Flow-tools	Ioannis Kappas (DANTE)
http://www.splintered.net/sw/flow-tools/	Version 0.58
<p>Description</p> <p>Network equipment can account and report traffic statistics for the purpose of network management.</p> <p>It is normally a requirement of a network operator to keep track how much and what type of traffic the network clients send and which networks or end systems are receiving it.</p> <p>Many of the routers have the functionality of summarising traffic flows statistics and then exporting them to a server by using a proprietary exporting mechanism called Netflow Export.</p> <p>Flow-tools is a collection of tools which can manage Netflow data exported by routers.</p> <p>It can process export versions of 1, 5, 6, 7 and 8.</p>	
<p>Application domains in the 6Net management matrix</p> <p>Flow-tools can be deployed in any of the domains that need to collect flow information for traffic transiting their border routers.</p>	
<p>Current Ipv6 support : No</p>	
<p>Required extensions to be operational within a native Ipv6 environment</p> <p>The tool should be upgraded to include support for Netflow export v9, which can incorporate information about Ipv6 flows.</p> <p>It should also be upgraded to use the Ipv6 stack in addition to the only one currently supported Ipv4 stack.</p>	
<p>Proposed extensions</p>	

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Infovista	Francois-Xavier ANDREU, RENATER
http://www.infovista.com	Version: future release 3.0 in october 2002
License type: Commercial	Sources: no
<p>Description</p> <p>InfoVista software collects data from the Information Technology infrastructure and generates reports on the performance and service achievements across all system elements (networks, systems and applications). It provides traps, views (in real-time) and reports. It looks like HP Openview and Tivoli softwares.</p> <p>The Infovista (compagny) solution is based on several products (VistaMart, Infovista, VistaViews, VistaPortal, VistaNext and Vista Plug-ins: for Netflow, for server analysis and for traffic analysis). Infovista Core is a data gathering engine and a central point for managing user's report requests.</p> <p>InfoVista runs on Microsoft Windows NT 4.0 SP6a workstations & servers, Microsoft Windows 2000 SP2, SUN Solaris 2.6 & 2.7, SUN Solaris 8 (2.2 SP2) and IBM AIX 4.3. Client software runs on the same platforms, as well as Microsoft Windows 95 & 98</p>	
<p>Application domains in the 6Net management matrix</p> <p>Monitoring traffic (collecte, analyze and stores data) and reports generation.</p>	
<p>Current IPv6 support:</p> <p>None in future release (october 2002) but in the next (current 2003)</p>	
<p>Required extensions to be operational within a native Ipv6 environment</p>	
<p>Proposed extensions</p> <p>A module to Vista Plug-ins in Ipv6 (if possible implementation)</p>	

Westhawk's Java SNMP stack	Ioannis Kappas (DANTE), Robert Szuman (PSNC), Bartosz Gajda (PSNC)
http://www.westhawk.co.uk/resources/snmp/index.html	Version 4.10
<p>Description</p> <p>The Simple Network Management Protocol defines communication rules between an application and the network equipment for management purposes. In the context of the 6NET project it has been decided to only use the latest version of the SNMP which is SNMPv3. IPv6 SNMP libraries can promote the development of network management applications by providing the infrastructure where the latter can be built on. This Java SNMP stack exposes a Java API for developers to utilise, thus enabling their Java code to access network equipment. It is a lightweight Java SNMP implementation and supports SNMP up to version 3, including SNMP traps, while it provides additional interfaces to the application developers such as Java beans.</p>	
<p>Application domains in the 6Net management matrix</p> <p>The Java SNMP stack may be used by any developer inside their management domain who would like to develop network management applications using the Java programming language or by these developers who would like to enable IPv6 support on their existing Java IPv4 network management applications.</p>	
<p>Current Ipv6 support : probably not</p> <p>Currently the stack has not been tested under a native IPv6 environment and it is not expected to work within it.</p>	
<p>Required extensions to be operational within a native Ipv6 environment</p> <p>The latest Java Development Kit (JDKv1.4) has built in IPv6 support. The IPv6 interface that is exposed by the JDK is almost no different to the corresponding IPv4 interface, while both can be used interchangeably by an application without noticing the difference.</p> <p>The source code of this stack should be studied and the points, which do want IPv6 awareness, should be identified and transformed to be IPv6 aware.</p>	
Proposed extensions	

Looking Glass	Isabelle Astic, Olivier Festor, INRIA
http://w6.loria.fr	Version : 1
License type : BSD License	Sources : Yes
<p>Description</p> <p>Looking Glass is a tool available in its IPv6 version on www.traceroute.org.</p> <p>It is a CGI script which allows to connect to a remote router from a simple web page, to run some commands on the router and to show the result on another web page. Its pre-requisit is a simple user login on the router.</p> <p>The usual available commands are :</p> <ul style="list-style-type: none"> • Some commands about the BGP4+ protocol: <ul style="list-style-type: none"> ○ <code>show BGP ipv6</code> ○ <code>show BGP ipv6 neighbors</code> ○ <code>show BGP ipv6 summary</code> • Some commands about information and statistics on the IPv6 traffic: <ul style="list-style-type: none"> ○ <code>show ipv6 traffic</code> ○ <code>show ipv6 interface</code> • Some commands about the neighbors: <ul style="list-style-type: none"> ○ <code>show ipv6 neighbors</code> ○ <code>show ipv6 route</code> • Some other services : <ul style="list-style-type: none"> ○ Ping ○ Traceroute ○ Regular expressions 	
<p>Application domains in the 6Net management matrix</p> <p>Looking Glass can be used in every platform where CISCO routers are in used.</p>	
Current IPv6 support : Yes	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>None</p>	
<p>Proposed extensions</p> <p>Some extensions are needed to let the Looking Glass manage an heterogeneous environment.</p> <p>Some extensions for Juniper and 6wing routers are planned at INRIA.</p>	

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mping	Olav Kvittem, Frank Aune, UNINETT
http://drift.uninett.no/mping/index.html	Version: Ipv6 release September 2002
License type: Free	Sources: Yes
<p>Description</p> <p>mping collects ping statistics for multiple hosts at the same time. Making a mping on all the hosts from a traceroute command would give more statistical information than the traceroute itself.</p> <p>Can do percentiles and SDV statistics. Sorted reports, histograms and curves. Does accumulation over days and months.</p> <p>runs on most unix platforms, Linux, netBSD, FreeBSD, Solaris, HP-UX...</p>	
Application domains in the 6Net management matrix	
<p>Current IPv6 support:</p> <p>In future release (September 2002).</p>	
Required extensions to be operational within a native Ipv6 environment	
Proposed extensions	

MRTGv6	Roma TRE Network Research Group
http://www.dia.uniroma3.it/~compunet	Version: 0.1
License type: GNU General Public License	Sources: will be publicly available
<p>Description</p> <p>We are studying MRTG (Multi Router Traffic Grapher) with the final goal of porting it on IPv6. This activity is at a preliminary stage. We are currently estimating the effort for the porting.</p>	
<p>Application domains in the 6Net management matrix</p> <p>MRTGv6 can be useful in traffic monitoring in IPv6 networks. Observe that MRTG for IPv4 is already widely adopted.</p>	
<p>Current IPv6 support: no IPv6 support.</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <ul style="list-style-type: none"> • We are currently evaluating the issue. 	
<p>Proposed extensions</p> <p>MRTG works only on IPv4. The final target is to have it working on IPv6.</p>	

Multicast Beacon	Roman Lapacz, PSNC
http://dast.nlanr.net/ (original version)* http://noc.man.poznan.pl (additional modules)	Version: 0.63
License type: GNU General Public License	Sources: available in the Internet
<p>Description</p> <p>Multicast Beacon is a tool for monitoring traffic parameters of multicast network. Its architecture is client/server. Clients exchange data between themselves using multicast technology and measure parameters of such generated traffic. Server receives measure reports from clients and display to users current values.</p>	
<p>Application domains in the 6Net management matrix</p> <p>Beacon can be useful in multicast traffic monitoring in IPv6 networks.</p>	
<p>Current IPv6 support: Multicast Beacon is developed in Java language (Sun product) and its newest version 1.4 supports IPv6 technology.</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>None</p>	
<p>Proposed extensions</p> <p>Already existing ones, specially in PSNC version of Beacon</p>	

*NLANR is the author of original version of Multicast Beacon

NetFlow/IPFIX	Simon Leinen, SWITCH
	Version: NetFlow v9
License type: Open Specification	Sources: n/a
Description	
<p>NetFlow is a flow-based traffic accounting protocol defined by Cisco Systems. It is widely used to support various applications such as usage-based charging, traffic analysis, or capacity planning. The currently deployed versions 1, 5, 6, 7 and 8, are specific to Ipv4.</p>	
<p>The IETF Working Group on IP Flow Information Export (IPFIX) is currently defining requirements and evaluation criteria to select a flow-based accounting protocol as IETF standard. The new version 9 of Cisco's NetFlow has been published as an Internet-Draft as part of this process. Other likely candidates for IPFIX include LFAP (from Riverstone Networks/Enterasys) and CRANE (from Xacct).</p>	
Application domains in the 6Net management matrix	
<p>Network Element usage data collection, Network Element trend analysis, Network Element capacity planning, Traffic management, network capacity analysis, network data aggregation and trending, network usage correlation, network usage data storage, traffic pattern analysis, network security breach detection, traffic reporting, customer profiling, usage pattern analysis, service intrusion detection, feature pricing, usage charge, correlation, validation and aggregation.</p>	
Current IPv6 support:	
None in versions prior to v9, support in v9 planned but no implementation available yet.	
Required extensions to be operational within a native IPv6 environment	
Implementation of NetFlow v9 to support IPv6-based data structures	
Transport of NetFlow accounting data over IPv6	
Proposed extensions	

NET-SNMP	Isabelle Astic, Olivier Festor, INRIA
http://www.net-snmp.org	Version : 5.0.1
License type : BSD License	Sources : Yes
<p>Description</p> <p>Net-snmp is a distribution of tools, APIs and libraries dedicated to SNMP including :</p> <ul style="list-style-type: none"> • An extensible agent • An SNMP library • tools to request or set information from SNMP agents • tools to generate and handle SNMP traps • a version of the unix 'netstat' command using SNMP <p>All version of snmp are supported by the environment which is available for almost all operating systems including FreeBSD, NetBSD, Linux, Solaris, AIX.</p>	
<p>Application domains in the 6Net management matrix</p> <p>Net-snmp can be used in any of the domains that require access to snmp information.</p>	
<p>Current Ipv6 support : Yes, partially</p> <p>SNMP is available over both IPv4 and IPv6.</p> <p>MIBs managing IPv6 already available are :</p> <ul style="list-style-type: none"> • Textual conventions : RFC 2465 (IPV6-TC.TXT) • IPv6 General Group, IPv6 Interfaces Table, IPv6 Interface Statistics Table, IPv6 Address Table, IPv6 Routing objects, IPv6 Routing Table, IPv6 Address Translation Table, IPv6 Notification : RFC 2465 (IPV6-MIB.TXT) • ICMPv6 : RFC 2466 (IPV6-ICMP-MIB.TXT) • TCP over IPv6 : RFC 2452 (IPV6-TCP-MIB.TXT) • UDP over IPv6 : RFC 2454 (IPV6-UDP-MIB.TXT) 	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>As described above, the stack and all snmp commands support native IPv6 and IPv6 addresses. Thus nothing has to be done on this point.</p> <p>What should be done is to use, instead of the above MIBs, the MIBs defined by the OPS group into the following drafts or RFC:</p> <ul style="list-style-type: none"> • Textual conventions : RFC 3291 • IP General Group, IPv6 General Group, Ipv4 Interface Table, IPv6 Interface Table, IP 	

Interface Statistics, IP Address Prefix Table, Ip Address Table, Internet Address Translation Table, Ipv6 Scope Identifier Table,... : draft-ietf-ipngwg-rfc2011-update-xxx.txt

- TCP over IPv6 : draft-ietf-ipngwg-rfc2012-update-xxx.txt
- UDP over IPv6 : draft-ietf-ipngwg-rfc2013-update-xxx.txt

Once this is done, gradual update of supported MIBs will be necessary.

Proposed extensions

INRIA is currently working on both implementing the full MIB2 based on the latest drafts related to MIB2 integration and offering an AgentX subagent facility to let snmp agents offer IPv6 MIB access to remote equipments not currently implementing the actual MIB.

These facilities will be available at the end of 2002. They will be proposed to the Net SNMP team for inclusion into the distribution.

LAN Dynamic Topology Discovery Service	Isabelle Astic, Olivier Festor, INRIA
http://w6.loria.fr	Version : 1.0
License type : BSD License	Sources : Yes
<p>Description</p> <p>The LAN Dynamic Topology Discovery Service defined by INRIA is able to find the Layer 3 topology of a routed LAN. It:</p> <ul style="list-style-type: none"> • Discovers all the nodes on a link, • Finds out how all the links are connected to each others, • Draws the entire topology of the sub-network, • Refreshes this topology as soon as there is a change on one link of that sub-network. <p>This service will be available during the last quarter of 2002.</p>	
<p>Application domains in the 6Net management matrix</p> <p>In every IPv6 LAN.</p>	
Current IPv6 support : Yes	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>None</p>	
<p>Proposed extensions</p> <p>Some modification could be made to allow this service to be used in an active network.</p>	

Polyphemus	Barbagallo Gabriele with Roma TRE Network Research Group and CASPUR
http://www.dia.uniroma3.it/~polyph	Version: 1.0
License type: BSD License	Sources: upon request
<p>Description</p> <p>Polyphemus is a system for exploring and visualizing Computer Networks. It is able to look inside an Autonomous System and to explore a network at level of routers and their physical links. Polyphemus works only on networks that use the OSPF protocol and exploits the protocol information for learning the network topology. Is is based on a two levels architecture with a client and a drawing-server.</p> <p>The main features of Polyphemus are the following:</p> <ul style="list-style-type: none"> • Inter/Intra Area Exploration <p>A user can ask for the exploration of a specific area (intra-area exploration) or for the interconnection relationships between areas (inter-area exploration). Areas are explored by directly accessing the Management Information Base (MIB) of the routers with the Simple Network Management Protocol (SNMP)</p> • Inter/Intra Area Visualization <p>The user can visualize routers, local-area networks, areas, and inter-area relationships. For each item on the map a rich set of information can be displayed.</p> 	
Application domains in the 6Net management matrix	
Polyphemus can be used to explore and manage ASes based on OSPF Routing Protocol	
Current IPv6 support: No IPv6 support	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>To extend Polyphemus to IPv6 network layer is required the implementation of:</p> <ul style="list-style-type: none"> • OSPFv3 • OSPFv3 MIB • IPv6 MIB • SNMPv6 	
<p>Proposed extensions</p> <p>In this moment the tool is fully functional in the IPv4 environment. As extension proposal, we plan to extend it, adding the IPv6 support.</p>	

RIPE NCC Test Traffic server	RIPE NCC (proposed by UoS)
http://www.ripe.net/ttm/	Version: -
License type: TT servers usually bought from RIPE NCC for approx. 3,000 Euros. RIPE NCC has suggested that 6NET partners may be able to run code for free during the project (to be confirmed).	Sources: to be determined. Sources are held by RIPE NCC at present.
<p>Description</p> <p>RIPE NCC TT servers allow estimates for properties of network links (e.g. one-way delay and packet loss) to be made, between pairs of participating TT server sites. The code is claimed to adhere to the RFC standards under the IETF IP Performance Metrics WG. The servers are already widely deployed in Europe and beyond at over 70 sites, including a number who are 6NET participants.</p> <p>A discussion was held with RIPE NCC at the March 2002 Minneapolis IETF meeting, where RIPE NCC (Henk and Mark) offered to work with 6NET to assist 6NET in porting the code to support IPv6. Since that discussion the RIPE NCC has offered to port the code itself, as the time taken to liaise with 6NET may well exceed the time taken for the port itself.</p>	
<p>Application domains in the 6Net management matrix</p> <p>IPv6-enabled TT servers could be used in all national 6NET domains to measure one-day delays in the 6NET network, between any pair of participants.</p>	
<p>Current IPv6 support:</p> <p>No IPv6 support.</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>The TT server runs on an old version of FreeBSD (2.2.8). Mods to support the GPS clock interface are required, but these should be IP independent.</p> <p>There are a number of aspects to be considered in the port:</p> <ul style="list-style-type: none"> • TT server kernel version needs to be made current – based on old version at present. New version would have IPv6 support “by default” (in FreeBSD 4.5 or later). Note the TT server has kernel mods, e.g. for the clock driver (but these may no longer be needed in the current kernel version). • The code that sends the packets between hosts to determine the network performance data needs to be modified. • The code that analyses the data needs to be modified (data is parsed at RIPE NCC when the NCC polls data to all servers). • The web interface to view the data needs to run over IPv6 (note: Apache already is IPv6-enabled). 	
<p>However, RIPE NCC is undertaking the port itself. 6NET partners can then trial the code and</p>	

feedback to RIPE NCC – the value add for RIPE NCC is that 6NET is able to verify the patched code in a large IPv6 network.

It was suggested in Minneapolis to present the IPv6 port in the September RIPE meeting (which we believe is in Rhodes, Greece).

Proposed extensions


The goal would presumably be a TT server release that can run on IPv4, IPv6, or dual-stack (which would be useful where dual-stack deployments occur, e.g. to compare IP version performance).

Note many sites also use the TT server as an NTP server. To extend the server to run IPv6 NTP would require further analysis.

SNMP proxy	Isabelle Astic, Olivier Festor, INRIA
http://w6.loria.fr	Version : 1.0
License type : BSD License	Sources : Yes
<p>Description</p> <p>Defined as a subagent of an AgentX architecture, this proxy will allow to manage systems which do not implement IPv6 MIBs or SNMP agent.</p> <p>The systems that will be managed are CISCO routers</p> <p>A login on each managed system is mandatory.</p> <p>This service will be available at the end of 2002.</p>	
<p>Application domains in the 6Net management matrix</p> <p>In every IPv6 domain with heterogeneous environment.</p>	
Current IPv6 support : Yes	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>None</p>	
<p>Proposed extensions</p> <p>Management of Juniper routers.</p>	


SNMP_Session.pm	Simon Leinen, SWITCH
http://www.switch.ch/misc/leinen/snmp/perl/	Version: 0.93
License type: Artistic	Sources: Yes
Description	
<p>An SNMP library written entirely in Perl. There are two layers of programming interface: <code>SNMP_Session.pm/BER.pm</code> provide a low-layer interface to encoding and decoding of SNMP requests and data structures. <code>SNMP_util.pm</code> adds basic MIB parsing support and convenient interfaces to some basic SNMP operations.</p>	
Application domains in the 6Net management matrix	
<p>This is a library and cannot be used directly. However, it has been used to support applications in network capacity planning (MRTG, Cricket) network and service monitoring (devpatrol, Big Sister), inventory management and other areas.</p>	
Current IPv6 support:	
None	
Required extensions to be operational within a native Ipv6 environment	
<p>In order to communicate with managed devices over IPv6, support for INET6 address family sockets is needed. As the package currently uses the <code>IO::Socket::INET</code> class, it would be easiest to port it to an <code>IO::Socket::INET6</code> class. An implementation of this can be found on the Internet, but its functionality and level of supportedness hasn't been evaluated yet.</p>	
<p>In addition, the package should be enhanced with convenience routines to convert between Perl-internal representations and BER-encoded representations of new data types required for IPv6, and provide support for table indexes based on the new Textual Conventions for Internet Network Addresses (RFC 3291).</p>	
Proposed extensions	

TunnelTrace	Lorenzo Colitti and Roma TRE Network Research Group
http://www.dia.uniroma3.it/~compunet	Version: 0.1
License type: BSD License	Sources: upon request
<p>Description</p> <p>We aim at developing traceroute facilities that allow an administrator to find out and to monitor ipv6-on-ipv4 tunnels. We have a first prototype and we are currently experimenting it both under Cisco and under Linux platforms.</p> <p>It uses different types of "guesses" for discovering the tunnels, merging info from several sources: e.g. mtu variations, dns hints, and mib evidence.</p>	
<p>Application domains in the 6Net management matrix</p> <p>TunnelTrace can be useful in exploring and managing mixed ipv6-ipv4 networks. It can constitute the basis for developing more complex administration tools.</p>	
Current IPv6 support: full IPv6 support .	
<p>Required extensions to be operational within a native IPv6 environment</p> <ul style="list-style-type: none"> • TunnelTrace would benefit from a more stable IPv6 MIB landscape 	
<p>Proposed extensions</p> <p>In this moment the system is at a very preliminar stage. We plan to continue its implementation and experimentation.</p>	

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Tool: IRDDToolSet	6Net contact : Rob Evans
http://www.ripe.net/ripenc/pub-services/db/irrtoolset/	Version : 4.7.2
License type : BSD	Sources : Yes
<p>Description</p> <p>The IRRToolSet is a suite of tools for querying the Internet Routing Registries (IRRs) and building routing policies and configurations for devices based on that information.</p>	
<p>Application domains in the 6Net management matrix</p> <p>Configuration management</p>	
<p>Current IPv6 support</p> <p>None</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>Policies used by the IRRToolSet are expressed in a language called RPSL, as specified in RFC2622 and RFC2650. This language, and the databases it is stored in (the IRRs) need to be modified before the tool can be used for widespread configuration of IPv6 routing policies.</p>	
<p>Proposed extensions</p>	

Tool: Rancid	6Net contact : Rob Evans
	Version : 2.2.1
License type : BSD Style	Sources : Yes
<p>Description</p> <p>"Rancid" is a configuration archival tool which collects configuration from various devices (such as routers and switches) and stores them in a CVS repository, allowing changes in the configuration to be monitored.</p>	
<p>Application domains in the 6Net management matrix</p> <p>Configuration management</p>	
<p>Current IPv6 support</p> <p>The tool does not analyse the configuration, so needs no modifications to support configurations from devices that use IPv6. It relies on the tool "expect" to log into the devices which can handle IPv6 transport in the current version.</p>	
<p>Required extensions to be operational within a native IPv6 environment</p> <p>None</p>	
<p>Proposed extensions</p> <p>None</p>	

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Network Weathermap	Georgios Koutepas, Panagiotis Christias, GRNET
	Version: 0.6 (not following strict versioning so far)
Licence Type: to be released under GPL	Sources: to be released
<p>Description:</p> <p>The Network Weathermap tool is an SNMP based network traffic condition grapher. Over a geographical map the network connections are drawn in colour, according to their current load following a colour coded indexing. Placing the mouse pointer over the line presents the MRTG graphed line utilization, and double clicking on it brings up the corresponding MRTG complete traffic analysis page. The whole picture is refreshed every five minutes.</p> <p>The data needed to draw the picture is gathered through direct SNMP calls to the appropriate router interfaces and by utilizing the data logs of MRTG.</p> <p>The code currently runs on almost all UNIX architectures. It requires functional SNMP tools and operating MRTG as well as a web server to present its results.</p>	
<p>Application domains in the 6Net management matrix:</p> <p>The tool can be used complementary to the MRTG graphs either in the Core Network or the Local NRENs</p>	
<p>Current Ipv6 support: No</p> <p>It depends on IPv6 versions of SNMP and MRTG. The code also has to be tested for compatibility.</p>	
<p>Required extensions to be operational within a native Ipv6 environment:</p> <ul style="list-style-type: none"> • Interface with IPv6 versions of SNMP and MRTG • Test the code for IPv6 compatibility • Supply the line and active network device information • Check the presentation details • Load the European (or other area's) map to draw the graphs upon • Test for possible delays in data gathering and their effect in the tool's operation 	
Proposed extensions	

5. Summary

As part of the tool support needed to build an open, extensible and multi-facet management solution for IPv6 networks, 28 software components have been identified by the WP6 community. Out of those 28 components, 21 have already undergone a first analysis and plans for their adaptation within an IPv6 environment are identified. The selected tools vary from simple scripting facilities to very complete management solution development environment and/or platforms. This variety will be very useful in the future stages of the project and specially in the context of the definition of multiple management configurations that will be proposed to IPv6 network managers.

The next step will be to extend, deploy and test all these tools in the 6Net context.

6. Bibliography

- [1] 6NET Deliverable 6.1: “6Net Management Architecture”, version 1.0, july 2002.