Project Number:	**IST-2001-32603**
Project Title:	**6NET**
CEC Deliverable Number:	**32603/DANTE**
Contractual Date of Delivery to CEC:	**31-December-2004**
Actual Date of Delivery to CEC:	**26 - January - 2005**
Title of Deliverable:	**Six monthly report on the Usage of 6NET**
Work Package:	**WP1**
Type of Deliverable*:	**R**
Deliverable Security Class**:	**PU**
Editors:	Ana Romero
Contributors:	David Harmelin, Tim Streater

* 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 consortiom (inclding the Commission), CO – Confidential, only for members of the consortium (including the Commission)

Abstract:

This document gives details of the usage of the 6NET network over the six-month period, and lists the activities supported.

Keywords:

IPv6, usage, 6NET, tunnel, fault report

Contents

1. INTRODUCTION

Deliverable 1.5.6. gives an overview of the usage of the 6net network during the last six months from July 2004 until December 2004. During the first year of the project, 6net participants built up the network installing backbone, national and local loops circuits. Each participant was provided with the hardware necessary for connecting to the core, and almost all NREN and Universities were connected based on native IPv6 connections or via MPLS/CCC Layer 2 solution using GEANT resources, such as GRnet or PSCN.
In the last 6 months of the project, work was mainly dedicated to the network management and daily operation and also supporting other work packages and partners in the test activity helping them to be carried out in a scheduled and co-ordinated way.

D1.5.6. starts with a Management Overview, including a network configuration map and connection overview. The Overview also contains a report on faults and other problems with the network, based on the Trouble Tickets, and an availability table. The Trouble Tickets and the Traps are used to determine the availability of the Service. Section 5 on network performance, shows various traffic graphs and charts, which gives a more in-depth view of the separate circuits.

Following D1.5.5 routing information, section 6 shows some graphs about the routing actvity in the last six months.

2. LIST OF ACTIVITIES

The test activity on the core during the last six months was focused on the use of the core for transitting multicast IPv6 traffic and to run and test different CoS flows.

Following the implementation of CoS in April 2004, test activity was on going during the second half 2004. The CoS activity in the core was centralised in Mid-November and December when tests were scheduled. As described in in the procedures for scheduling tests, read and write access in the 6net core routers was enable to the test leader during that period. The main participants of the test were Cisco, UKERNA, GRnet/CTI and University of Lancaster.

The daily maintenance and operation is being done by 6net NOC as in the last years of the project. They have had the responsibility to keep the core network stable and they have been following the procedures described in first WP1 deliverables whenever there has been a fault or trouble in the network.

6TAC (Technical Assistance Centre), Cisco help desk has provided support in case of Software and Hardware problems related to the 6NET routers provided by Cisco.

6net PMC agreed to terminate the 6net core after December 2004. The link providers have already been contacted and informed to decommision by 1st January all the circuits that compose 6net core. All NRENs 6net members have been working to swap the IPv6 traffic over GEANT during 2004, so no interruption of the IPv6 services is expected.

3. MANAGEMENT OVERVIEW

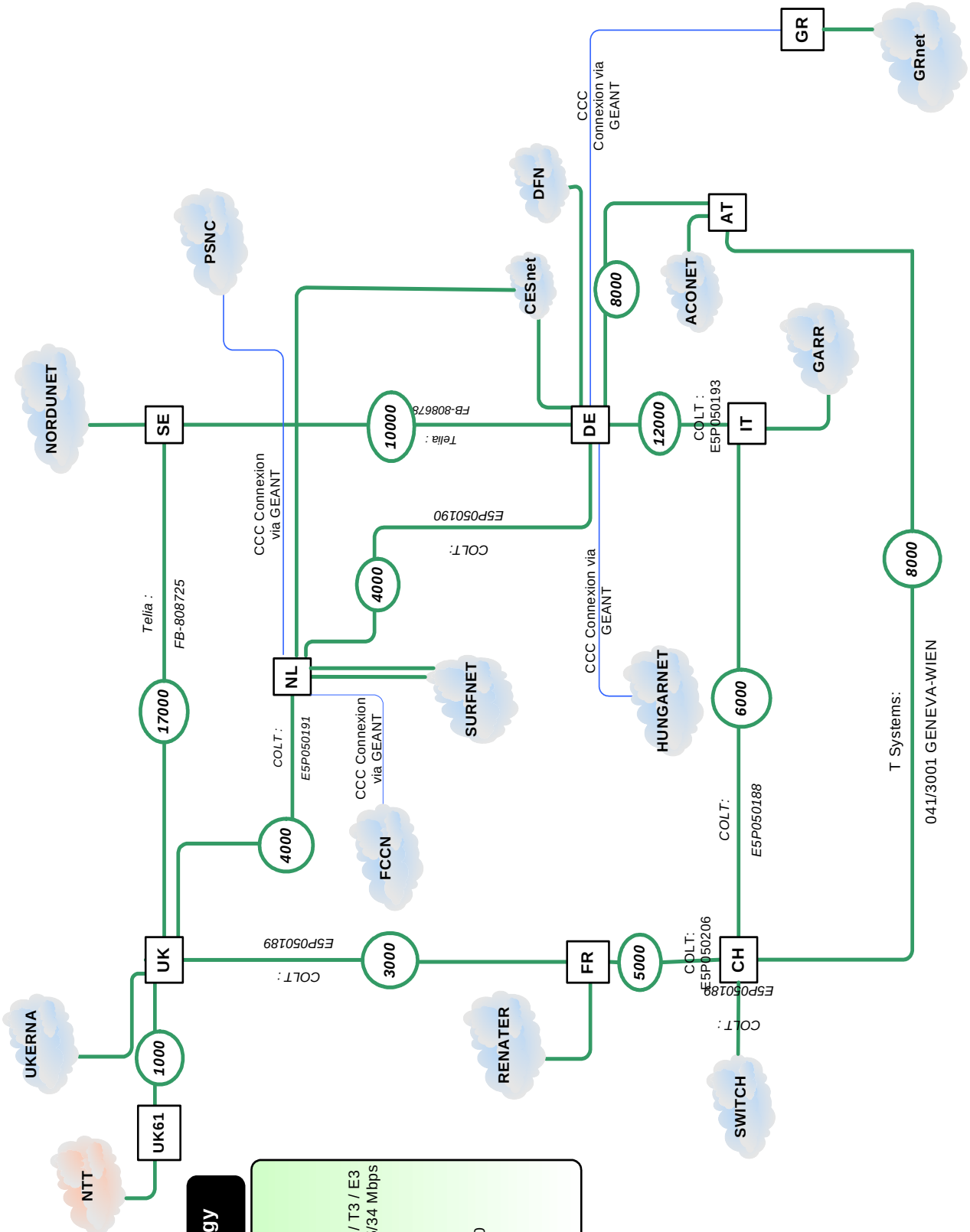
3.1. CONNECTION OVERVIEW

NRENs	Speed *Mbps*	Connected Since
ACONET	155	4-Jul-2002
CESNET	155	14-Feb-2003
CESNET MULTICAST	1,000	22-Mar-2004
DFN	155	27-Jun-2002
FCCN	155	12-Feb-2004
GARR	155	21-Jun-2002
GRNET	155	21-Jun-2002
HUNGARnet	155	30-Jan-2003
JANET/UKERNA	155	26-Jun-2002
NORDUNET	2,500	11-Jun-2002
NTT	2	28-Feb-2003
POZNAN	155	1-Jun-2003
RENATER	155	9-Aug-2002
SURFNET 1	1,000	19-Jun-2002
SURFNET 2	1,000	19-Jun-2002
SWITCH (CERN)	155	12-Jun-2002

Trunks	Speed *Mbps*	Connected Since
AT ⇔ CH	155	*2-Apr-02*
AT ⇔ DE	155	*29-May-02*
CH ⇔ FR	155	*28-May-02*
CH ⇔ IT	155	*28-May-02*
DE ⇔ GR	155	*7-Aug-02*
DE ⇔ IT	155	*28-May-02*
DE ⇔ NL	155	*29-May-02*
DE ⇔ SE	155	*28-May-02*
FR ⇔ UK	155	*28-May-02*
NL ⇔ UK	155	*28-May-02*
SE ⇔ UK	155	*29-May-02*
UK ⇔ UK61	34	*28-Feb-03*

3.2. CONNECTIONS TO OTHER IPV6 PROJECTS/NETWORKS

No further connections were set during the reported period. The connectivity was stable due to the upcoming termination of the core.


6NET Topology
12/01/2005
TUNNEL
GE / STM-1 / T3 / E3
1000/155/45/34 Mbps
ISIS Metric
6NET AS 6680
6NET PoP
GR
GRnet
DFN
CCC Connexion via GEANT
PSNC
CESnet
8000
AT
ACONET
GARR
NORDUNET
SE
10000
Telia : FB-808678
DE
12000
COLT : E5P050193
IT
CCC Connexion via GEANT
E5P050190
COLT:
4000
NL
SURFNET
HUNGARNET
6000
8000
T Systems: 041/3001 GENEVA-WIEN
Telia : FB-808725
17000
COLT : E5P050191
CCC Connexion via GEANT
FCCN
4000
COLT: E5P050188
UK
E5P050189
COLT :
3000
FR
5000
COLT: E5P050206
CH
E5P050189
COLT :
UKERNA
RENATER
SWITCH
1000
UK61
NTT

DIAGRAM

3.4. MONTHLY ACTIVITIES

JULY

Access circuits and trunks

None

The Service

Syslog logs of all 6NET routers are now collected on Stanford.
The username used for QoS tests on all 6NET routers has been suppressed.

Future Plans and other Pending Actions

None.

AUGUST

Access circuits and trunks

None.

The Service

None.

Future Plans and other Pending Actions

None.

SEPTEMBER

Access circuits and trunks

None.

The Service

None.

Future Plans and other Pending Actions

None.

OCTOBER

Access circuits and trunks

None.

The Service

None.

Future Plans and other Pending Actions

None.

NOVEMBER

Access circuits and trunks

None.

The Service

The network management was handed over to the QoS testers on 15th December. One read-write user was created in order for them to modify the QoS configuration.

Future Plans and other Pending Actions

None.

DECEMBER

Access circuits and trunks

None.

The Service

The user for QoS was suppresed.

Future Plans and other Pending Actions

The 6NET network will be decommissionned in January 2005. 6NET PMC agreed to terminate the links on the 1st January. Routers will be removed after that.

4. FAULT REPORT

4.1. TROUBLE TICKETS

This section contains the trouble ticket summary and the network availability for the reporting period. All times are in UTC.
Trouble tickets are assigned to ten categories. Bellow is the description of these categories:

Trouble Ticket Classes	Description
AC	ATM VC Configuration Problem
LF	Line Fault
RC	Routing Configuration Problem
RH	Router Hardware fault
RS	Router Software fault
SE	Security problem
SM	Scheduled Maintenance
UM	Unscheduled Maintenance
UP	Unidentified Problem
OT	Other

Géant NOC Ticket No	Problem Start *d/m h:m:s*	Problem End *d/m h:m:s*	Duration *h:m*	Class	Fixer Ticket No	Summary
474415	12/01/2004 16:52	13/01/2008 17:16	00:23	LF	COLT 0318181	Loss of Connectivity / CH6-FR6 / Colt technicians disconnected a fiber cable by mistake.
472849	13/01/2004 00:00	14/01/2008 02:00	02:00	SM	T Systems 3040024	Scheduled Maintenance / AT6 - DE6 / Maintenance successfully completed.
480910	28/01/2004 12:54	29/01/2008 13:23	00:29	RH	T Systems 1026549	Loss of Connectivity / AT6 - CH6 / Caused by power outage

Géant NOC Ticket No	Problem Start *d/m h:m:s*	Problem End *d/m h:m:s*	Duration *h:m*	Class	Fixer Ticket No	Summary
485137	06/02 16:46	06/02 20:42	03:56	LF	T-Systems 1037273	Loss of Connectivity / 6NET-AT6-DE6 / RFO: Major Outage in Austria.
488558	15/02 14:00	19/02 16:20	98:20:00	LF	Colt 331877	Loss of Connectivity / NL6 / The faulty card has been changed and two cables were switched in COLT network
480910	28/01 12:54	28/01 13:23	0:28	LF	T-Systems 1037273	Loss of Connectivity / AT6 - CH6 / RFO: Power outage in Austria
479957	10/02 00:00	10/02 04:00	0:15	SM	T-Systems 30400075	Scheduled Maintenance / 6NET AT - DE / Maintenance has occourred.
481477	03/02 04:30	03/02 04:45	0:15	SM	T-Systems 30400086	Scheduled Maintenance /6NET-DE-CESNET / Maintenance has occourred.
485885	10/02 03:18	10/02 07:49	4:30	LF	T-Systems 1039556	Loss of Connectivity / 6NET-AT-CH / RFO: Faulty Optical layer
477706	03/02 00:01	03/02 04:00	0:10	SM	Telia NMCP10182	Scheduled maintenance / SE6 - UK6 / Maintenance has occurred.
475283	03/02 03:00	03/02 03:30	0:30	SM	T-Systems 30400457	Scheduled Maintenance 6Net-AT-DE / Maintenance has occurred.
468611	28/01 00:00	28/01 06:00	0:30	SM	Telia NMCP9808	Scheduled Maintanance 6NET-SE-UK / Maintenance has occurred.
488263	15/02 15:26	15/02 15:26	0:00	SM	Colt 331378	Loss of Connectivity / 6NET-NL-UK / RFO: STM-16 card experiencing repeated crashes
487075	25/02 00:00	25/02 04:00	0:15	SM	T-Systems 30400161	Scheduled Maintenance / 6NET-AT-DE / Maintenance has occurred.

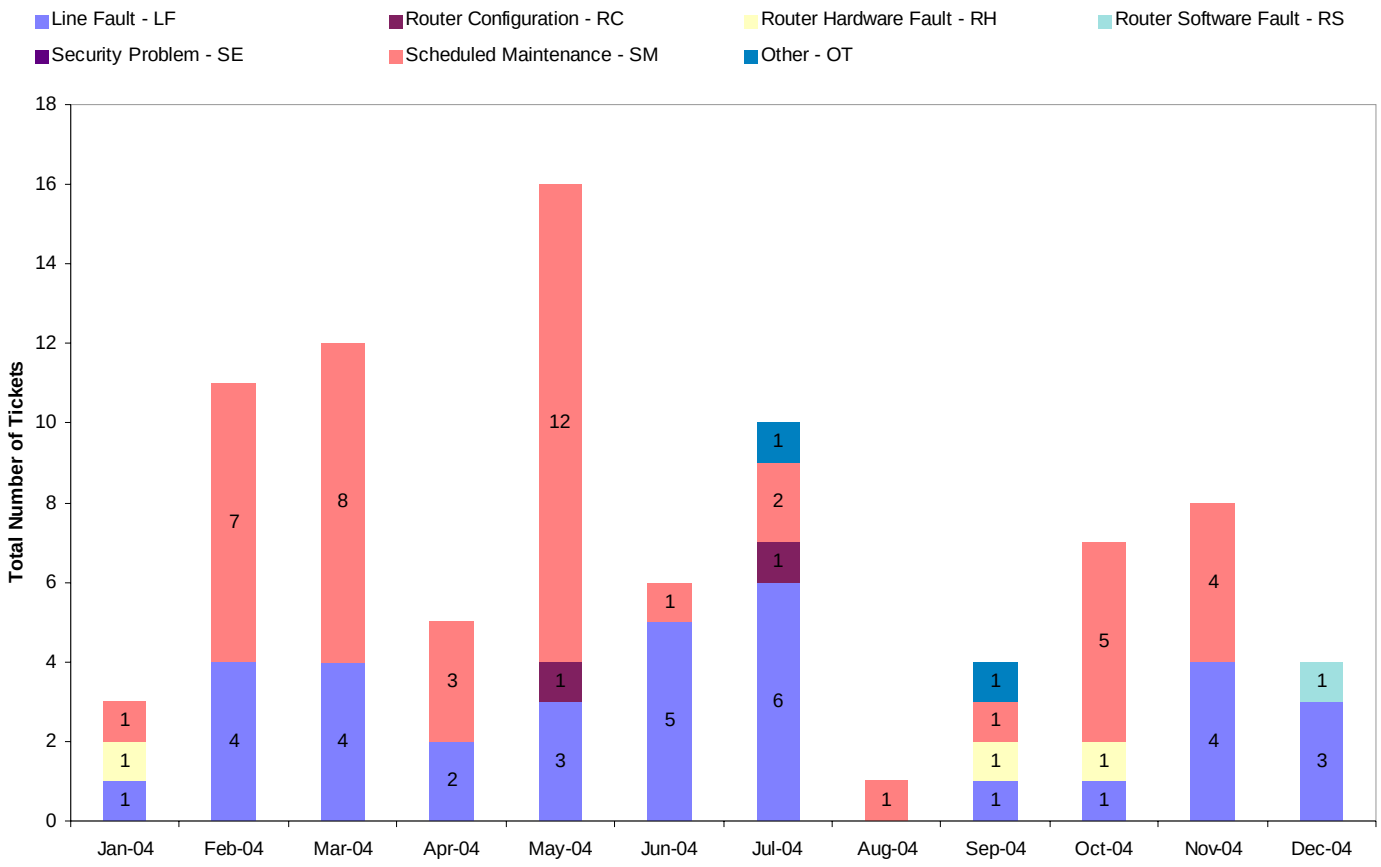
Géant NOC Ticket No	Problem Start *d/m h:m:s*	Problem End *d/m h:m:s*	Duration *h:m*	Class	Fixer Ticket No	Summary
488269	15/02 15:26	15/02 15:26	0:00	LF	Colt 331399	Loss of Connectivity / 15 Feb 2004 / 6NET-NL-DE
500567	17/03 09:50	17/03 12:00	2:10	LF	No SURFnet reference	Loss of Connectivity / 10 Feb 2004 / 6NET-AT-CH
495111	11/03 00:00	11/03 00:00	0:00	SM	T-Systems 30400366	Scheduled Maintenance / 11 Mar 2004 / 6NET-AT-DE

Géant NOC Ticket No	Problem Start *d/m h:m:s*	Problem End *d/m h:m:s*	Duration *h:m*	Class	Fixer Ticket No	Summary
513841	20/04 03:04	20/04 05:34	2:30	LF	T Systems 1110953	Loss of Connectivity AT6 - CH6 / This outage was due to a maintenance work
513844	20/04 04:45	20/04 05:15	0:30	LF	T-Systems 1116365	Loss of Connectivity AT6 - DE6 / This outage was due to a maintenance work
510642	28/04 01:00	28/04 05:00	4:00	SM	Telia NMCP10986	Scheduled Maintenance DE6 - SE6 / Maintenance has been completed
508190	20/04 23:00	20/04 23:00	0:00	SM	Telia NMCP11134	Scheduled Maintenance SE6 - UK6 / The maintenance didn't affect the circuit
508943	26/04 01:14	26/04 02:39	1:25	SM	Telia NMCP11174	Scheduled maintenance SE6 - UK6 / Maintenance has been completed

Géant NOC Ticket No	Problem Start *d/m h:m:s*	Problem End *d/m h:m:s*	Duration *h:m*	Class	Fixer Ticket No	Summary
520034	19/05 00:00	19/05 04:00	4:00	SM	Telia NMCP1164	Scheduled Maintenance DE6 - SE6 / Maintenance has been completed
524285	20/05 09:00	20/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance IT6 router / IOS has been upgraded successfully to version 12.0(28)S
524283	20/05 09:00	20/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance NL6 router / IOS has been upgraded successfully to version 12.0(28)S
524277	20/05 09:00	20/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance SE6 router / IOS has been upgraded successfully to version 12.0(28)S
526165	26/05 03:00	26/05 03:00	0:00	SM	T-Systems 4001183	Scheduled Maintenance AT6 - CH6 / Maintenance has been completed without any outage
524040	20/05 03:00	20/05 05:30	2:30	SM	T-Systems 4001086	Scheduled Maintenance AT6 - CH6 / Maintenance has been completed
524286	19/05 00:00	19/05 00:00	0:00	SM	GEANT NOC	Scheduled Maintenance GR6 router / IOS has been upgraded successfully to version 12.0(28)S
524284	19/05 09:00	19/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance FR6 router / IOS has been upgraded successfully to version 12.0(28)S
524282	19/05 09:00	19/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance DE6 router / IOS has been upgraded successfully to version 12.0(28)S
524278	18/05 09:00	18/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance CH6 router / IOS has been upgraded successfully to version 12.0(28)S
524269	18/05 09:00	18/05 10:00	1:00	SM	GEANT NOC	Scheduled Maintenance AT6 router / IOS has been upgraded successfully to version 12.0(28)S
515701	13/05 00:01	13/05 04:00	0:00	SM	Telia NMCP11455	Scheduled maintenance SE6 - UK6 / Maintenance did not occur / Telia reference is NMCP11455
519441	05/05 02:30	05/05 10:30	8:30	LF	T-Systems 1127537	Loss of Connectivity AT6 - CH6 / Fiber cut at Fürstenfeldbruck
526301	20/05 09:51	20/05 19:12	9:21	LF	T-Systems 1147135	Loss of Connectivity AT6 - CH6 / System Problem on the T-systems Network
518957	04/05 10:40	04/05 14:38	3:52	LF	T-Systems 1126183	Loss of connectivity AT6 - DE6 / interruption of the circuit between Bratislava and Budapest
521103	07/05 12:13	07/05 15:55	3:42	RC	GEANT NOC	Loss of connectivity DE6 - GR6 / Wrong MPLS configuration

Géant NOC Ticket No	Problem Start *d/m h:m:s*	Problem End *d/m h:m:s*	Duration *h:m*	Class	Fixer Ticket No	Summary
532281	07/06 13:10	07/06 13:20	0:10	LF	Telia 645508	Loss of connectivity DE6 - SE6 / Fiber cut between Düsseldorf - Köln
537676	19/06 01:09	19/06 05:02	3:53	LF	Telia 6505281	Loss of connectivity SE6 - UK6 / Faulty card in Oslo has been replaced
538648	29/06 05:00	29/06 05:20	0:20	SM	SURFnet 20040622-1	Scheduled Maintenance NL6 - Surfnet / The maintenance occured
538945	23/06 03:04	23/06 08:38	5:34	LF	T-Systems 11844396	Loss of connectivity AT6 - DE6 / Unscheduled maintenance
539425	23/06 12:05	23/06 12:35	0:30	LF	UKERNA	Loss of Connectivity UK6 - UKERNA / The outage disappeared after the reboot of the UKERNA router
541604	29/06 10:51	29/06 11:00	0:09	LF	Telia 6540189	Loss of connectivity SE6 - UK6 / Faulty DWDM - system between Örebro, Sweden and Oslo, Norway

4.2. TROUBLE TICKETS REPARTITION



4.3. AVAILABILITY

NRENs	Average Availability *(last 12 months)*
ACONET	100.00%
CESNET	98.44%
CESNET MULTICAST	100.00%
DFN	100.00%
FCCN	100.00%
GARR	100.00%
GRNET	99.96%
HUNGARnet	100.00%
JANET/UKERNA	99.97%
NORDUNET	100.00%
NTT	100.00%
POZNAN	94.01%
RENATER	100.00%
SURFNET 1	98.86%
SURFNET 2	98.86%
SWITCH (CERN)	100.00%

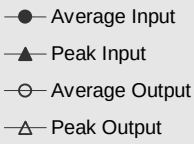
Trunks	Average Availability *(last 12 months)*
AT ⇔ CH	99.30%
AT ⇔ DE	99.59%
CH ⇔ FR	99.99%
CH ⇔ IT	100.00%
DE ⇔ GR	99.95%
DE ⇔ IT	100.00%
DE ⇔ NL	96.28%
DE ⇔ SE	99.80%
FR ⇔ UK	100.00%
NL ⇔ UK	96.28%
SE ⇔ UK	99.75%
UK ⇔ UK61	100.00%

5. PERFORMANCE REPORT

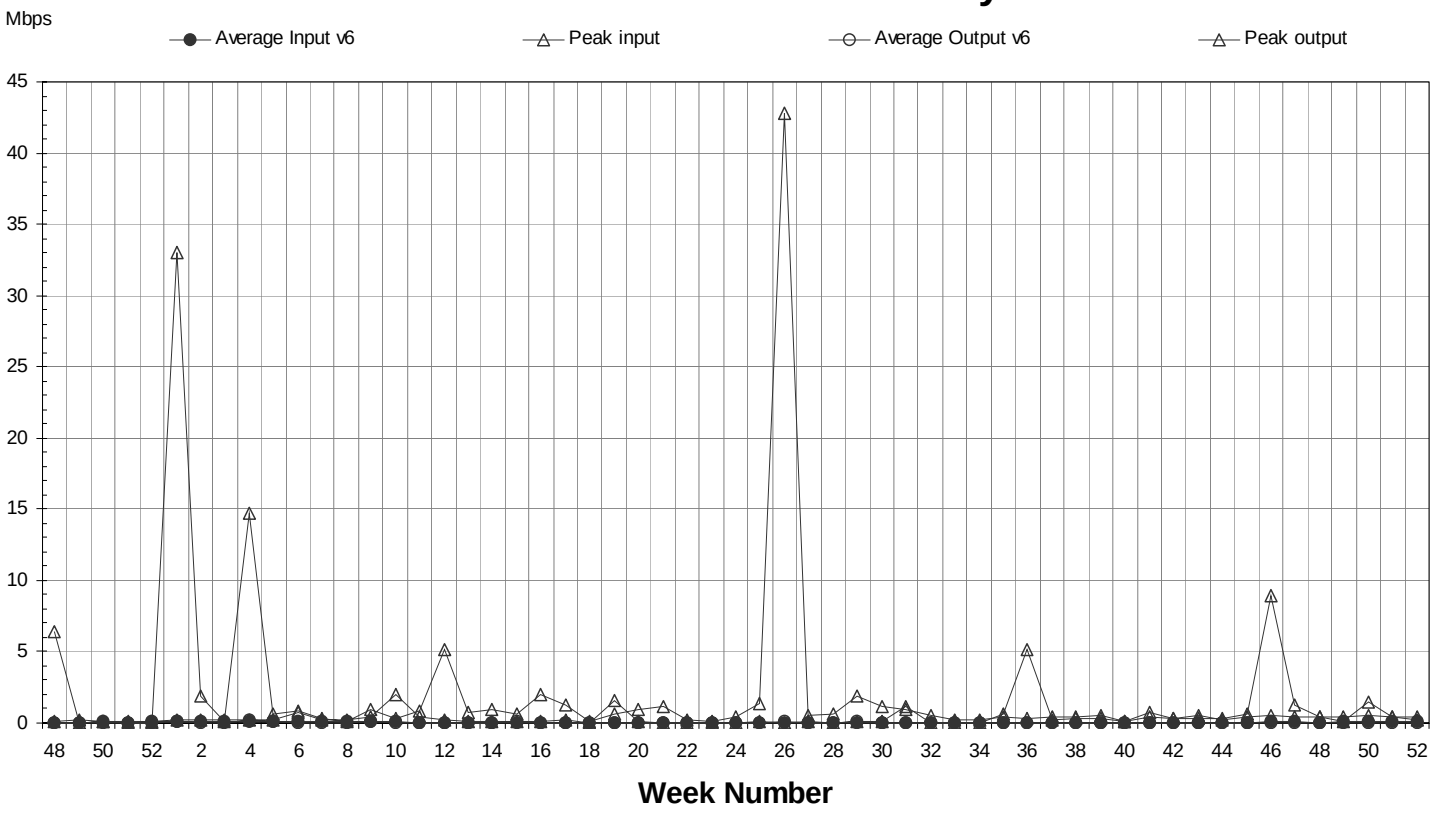
5.1. ACCESS PORTS

This section contains the traffic data for the NREN Accesses.

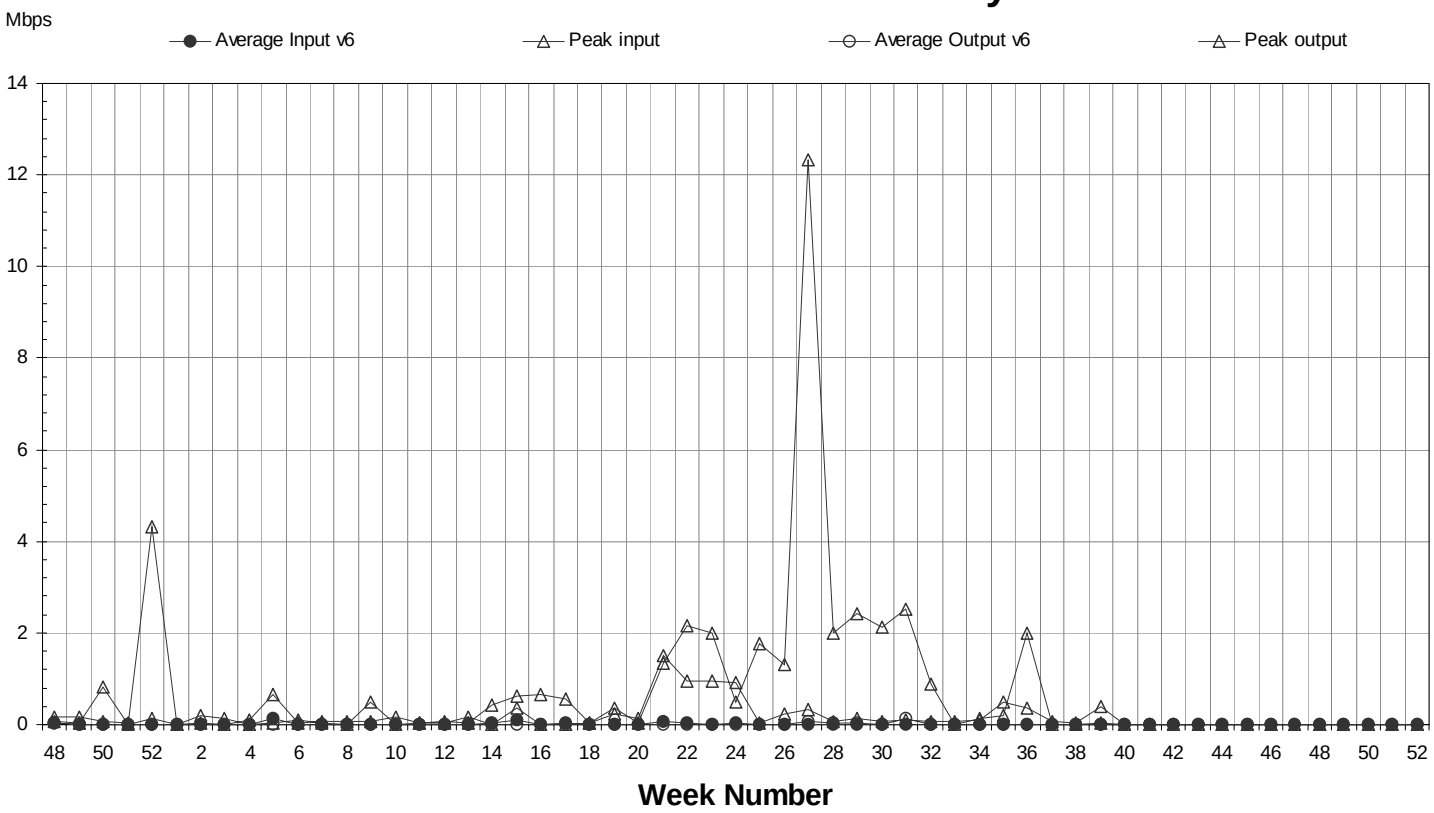
The legend is:



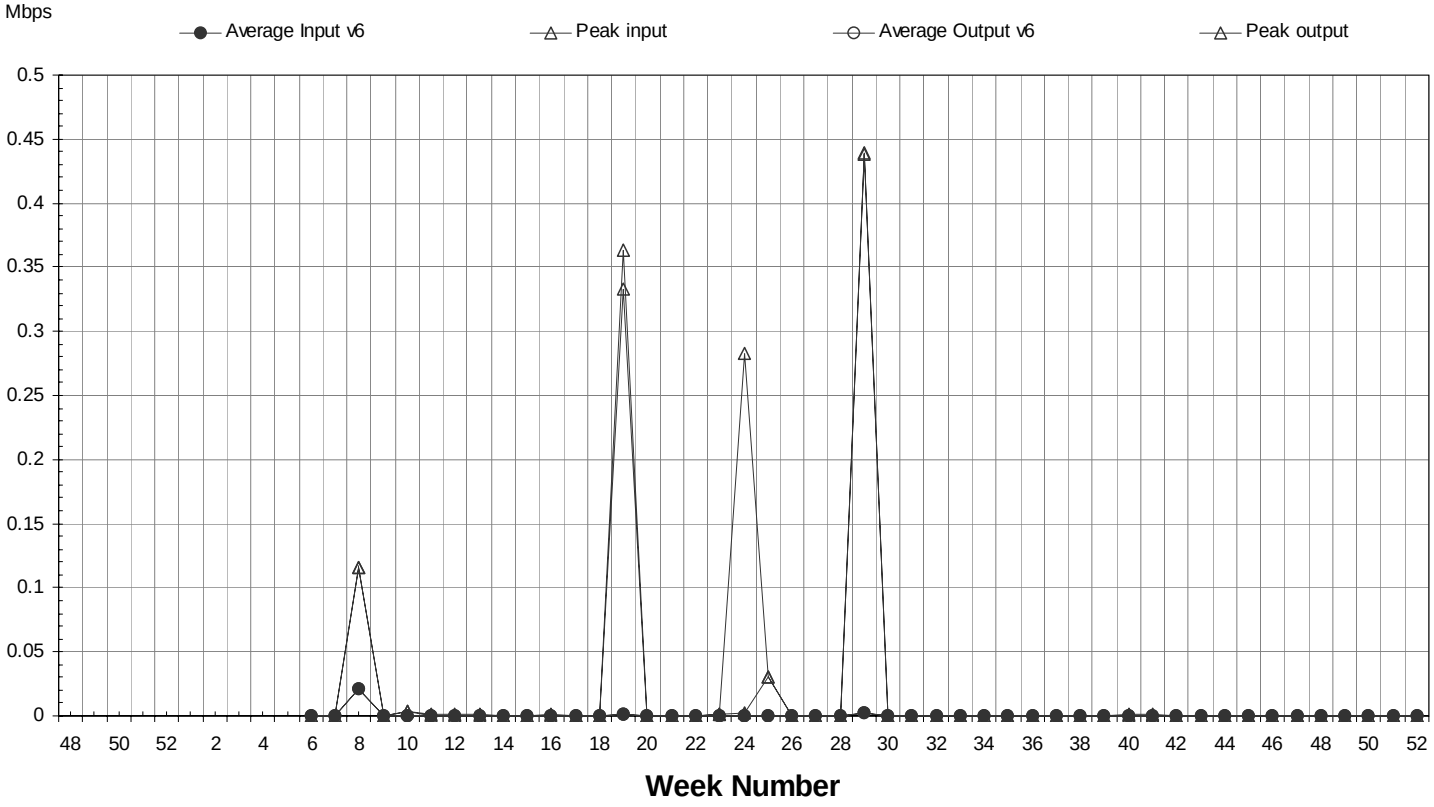
ACOnet 6NET Access History



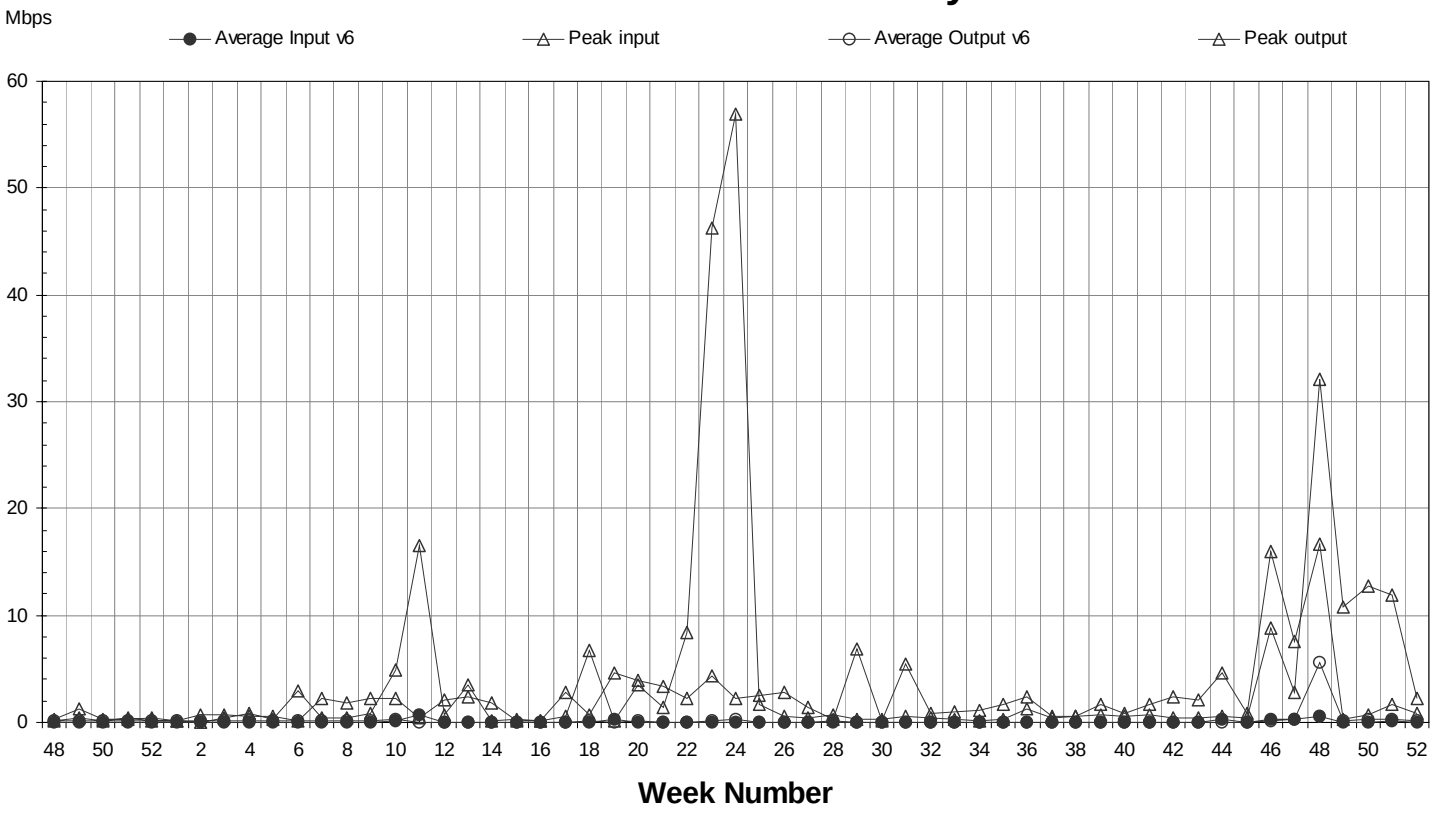
CESNET 6NET Access History



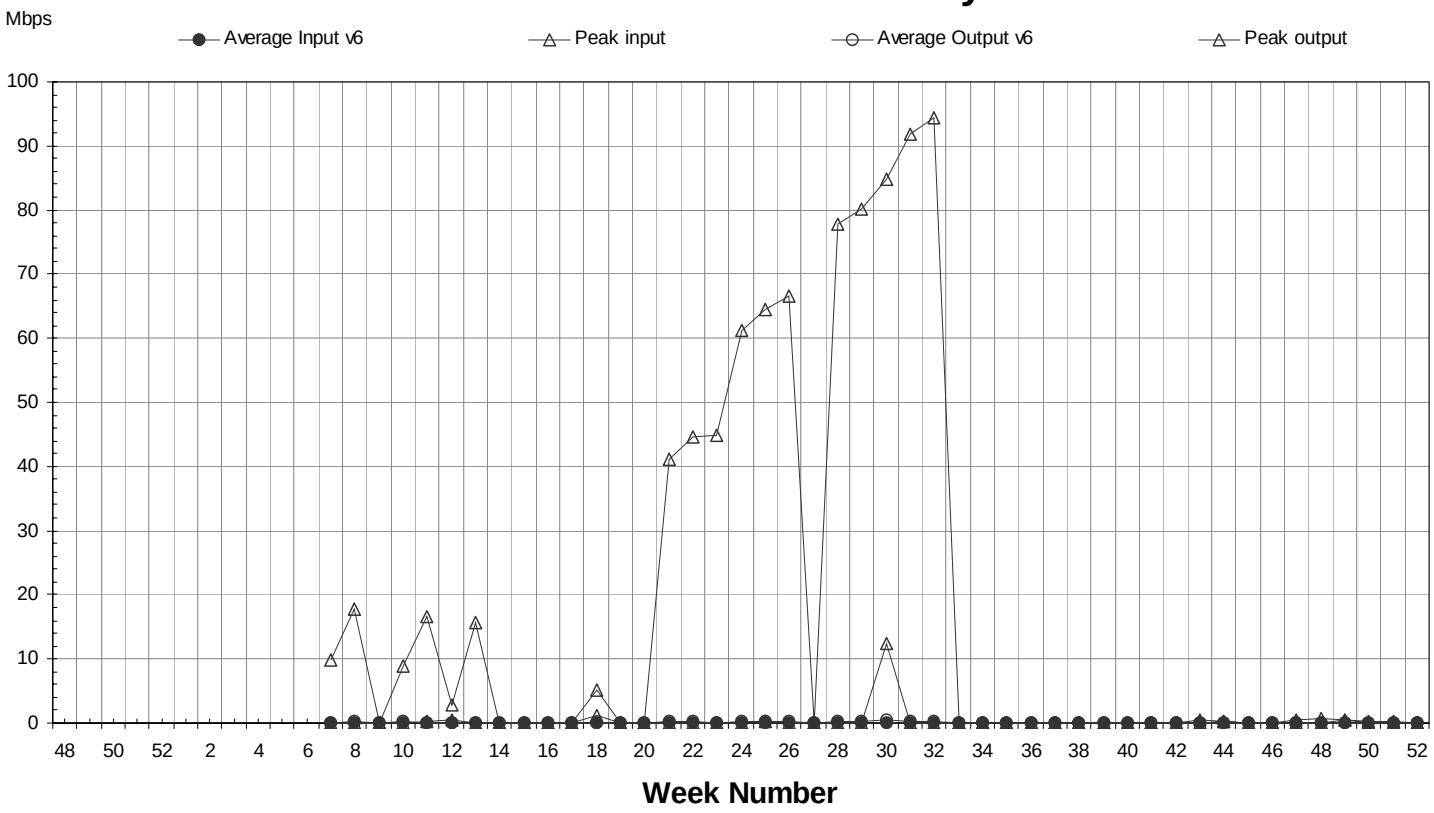
CESNET 6NET Multicast Access History



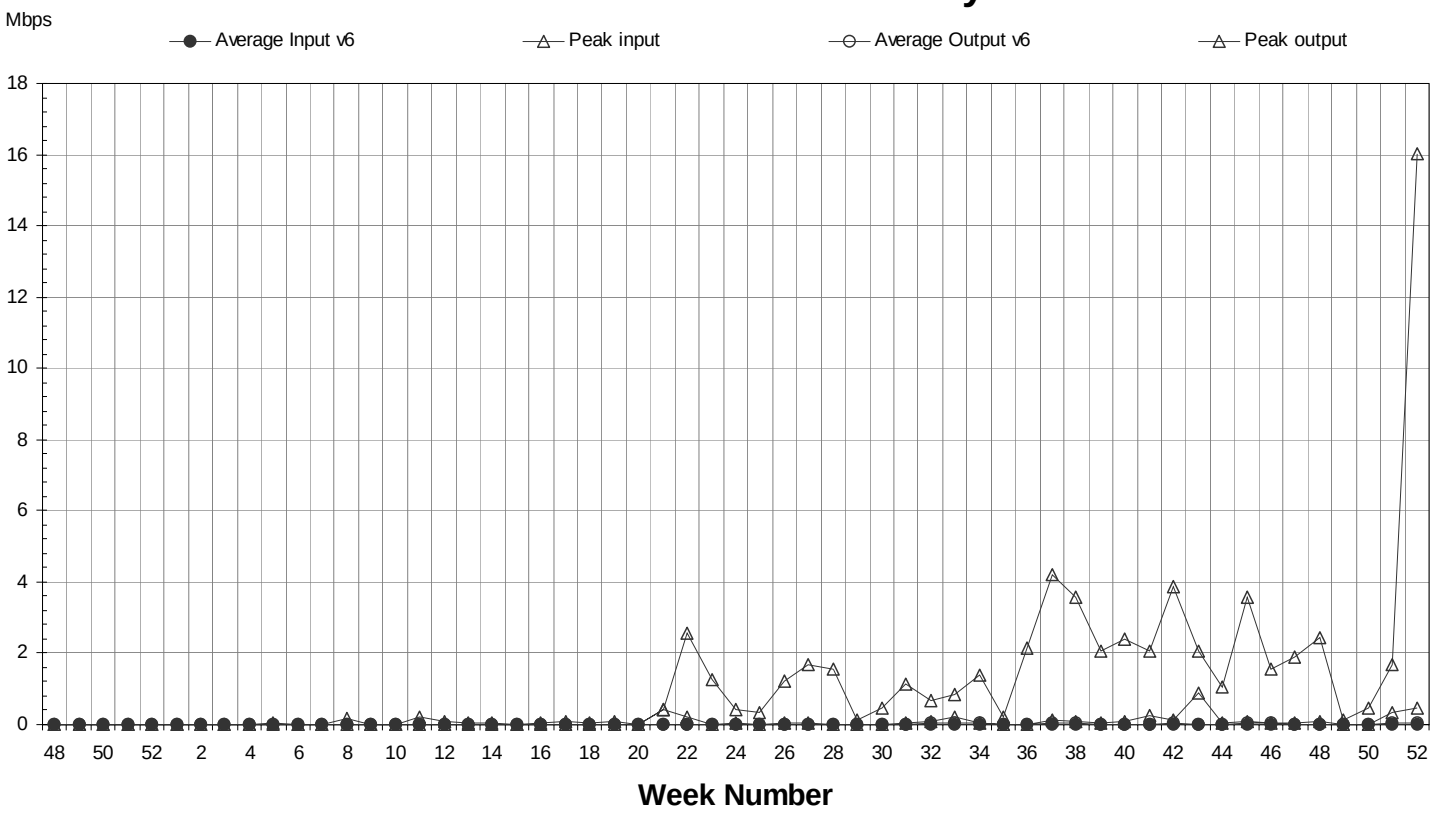
DFN 6NET Access History

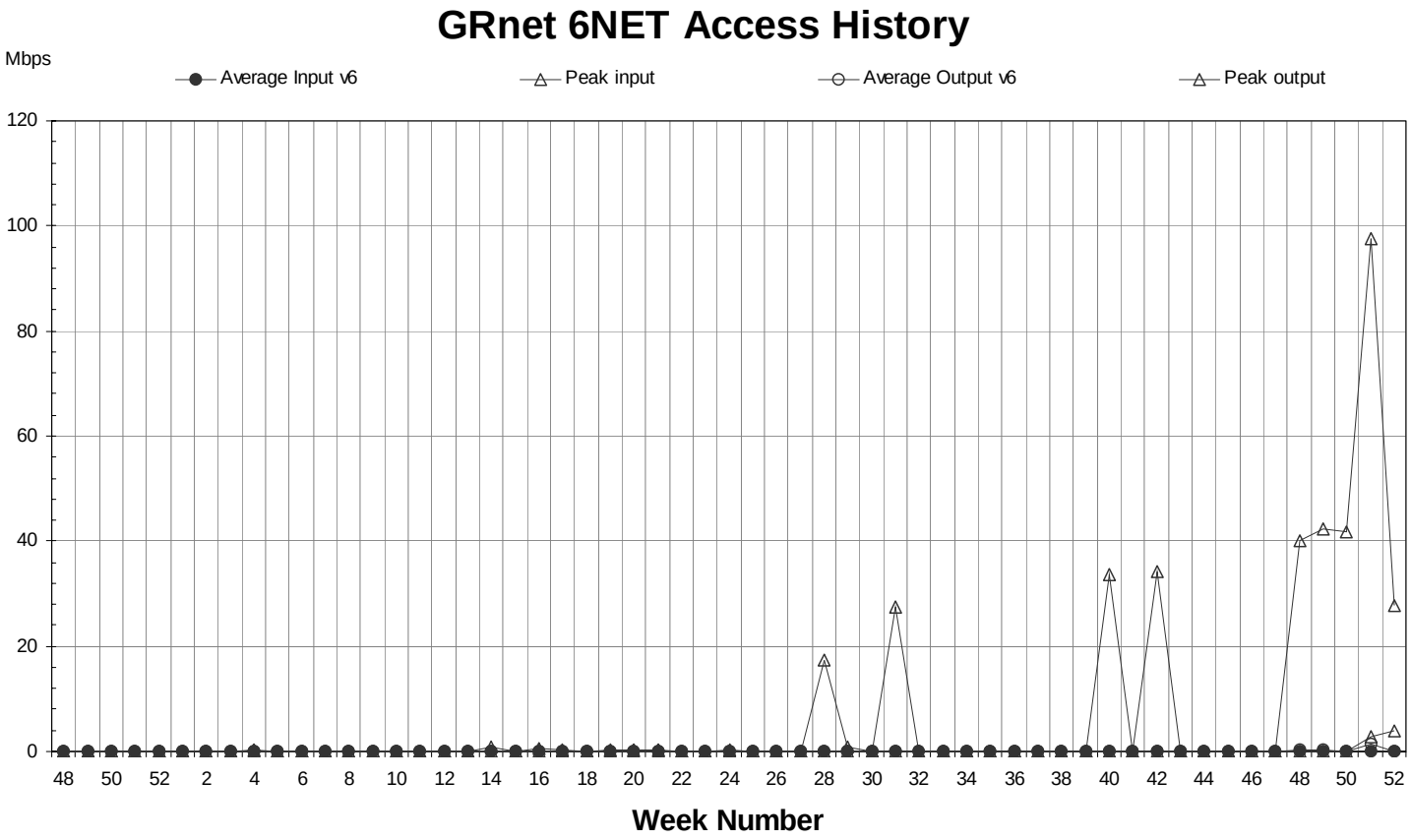


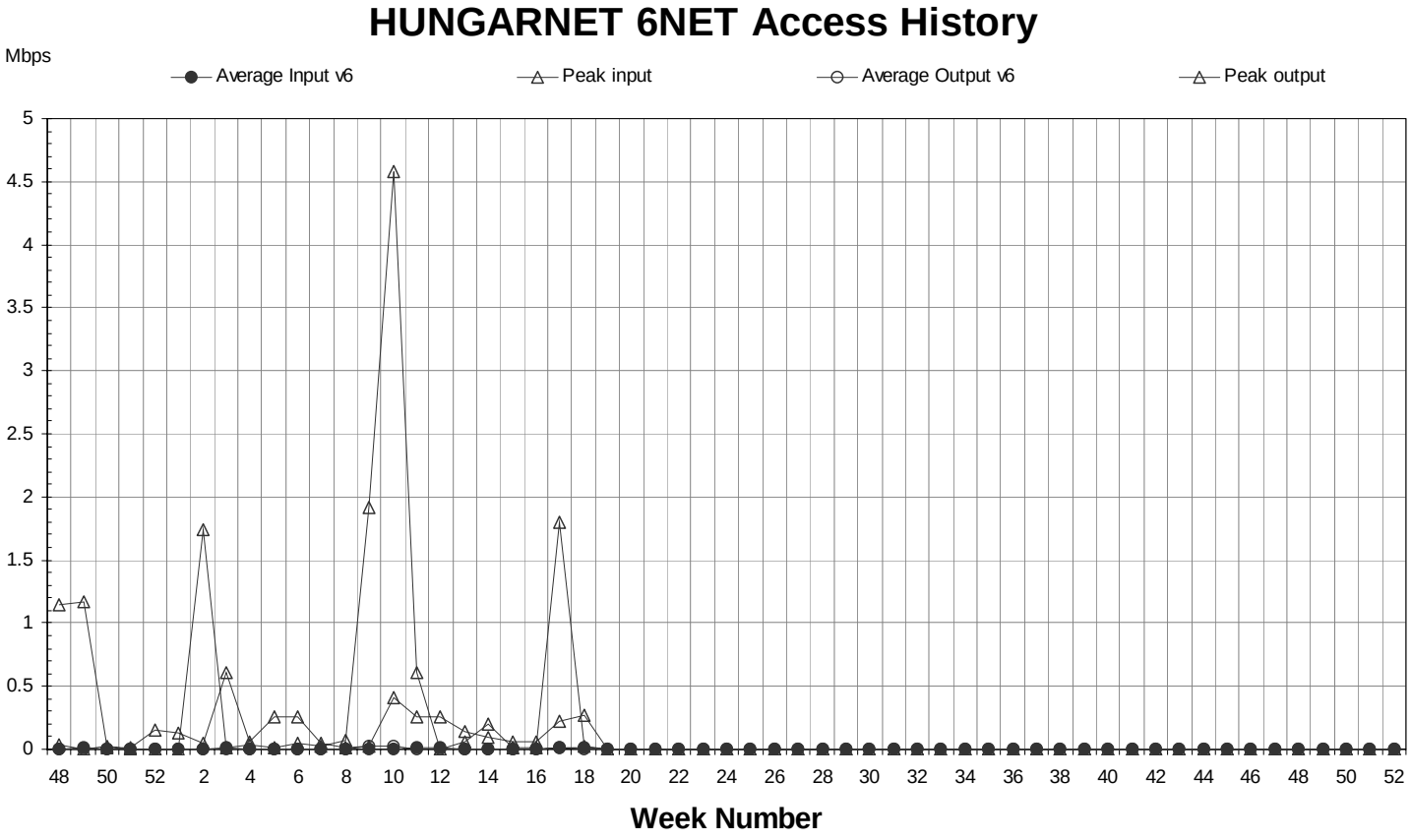
FCCN 6NET Access History



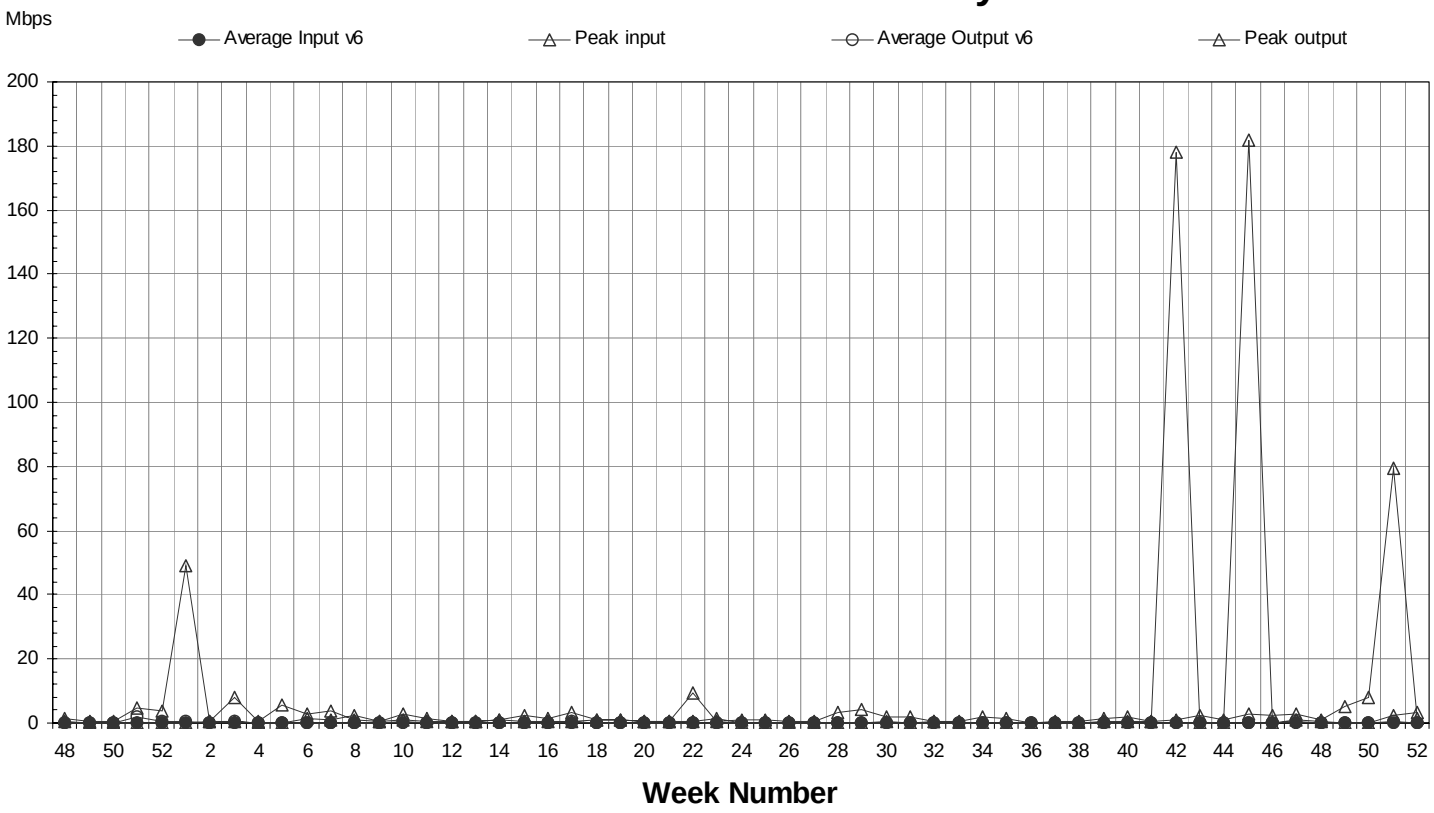
GARR 6NET Access History



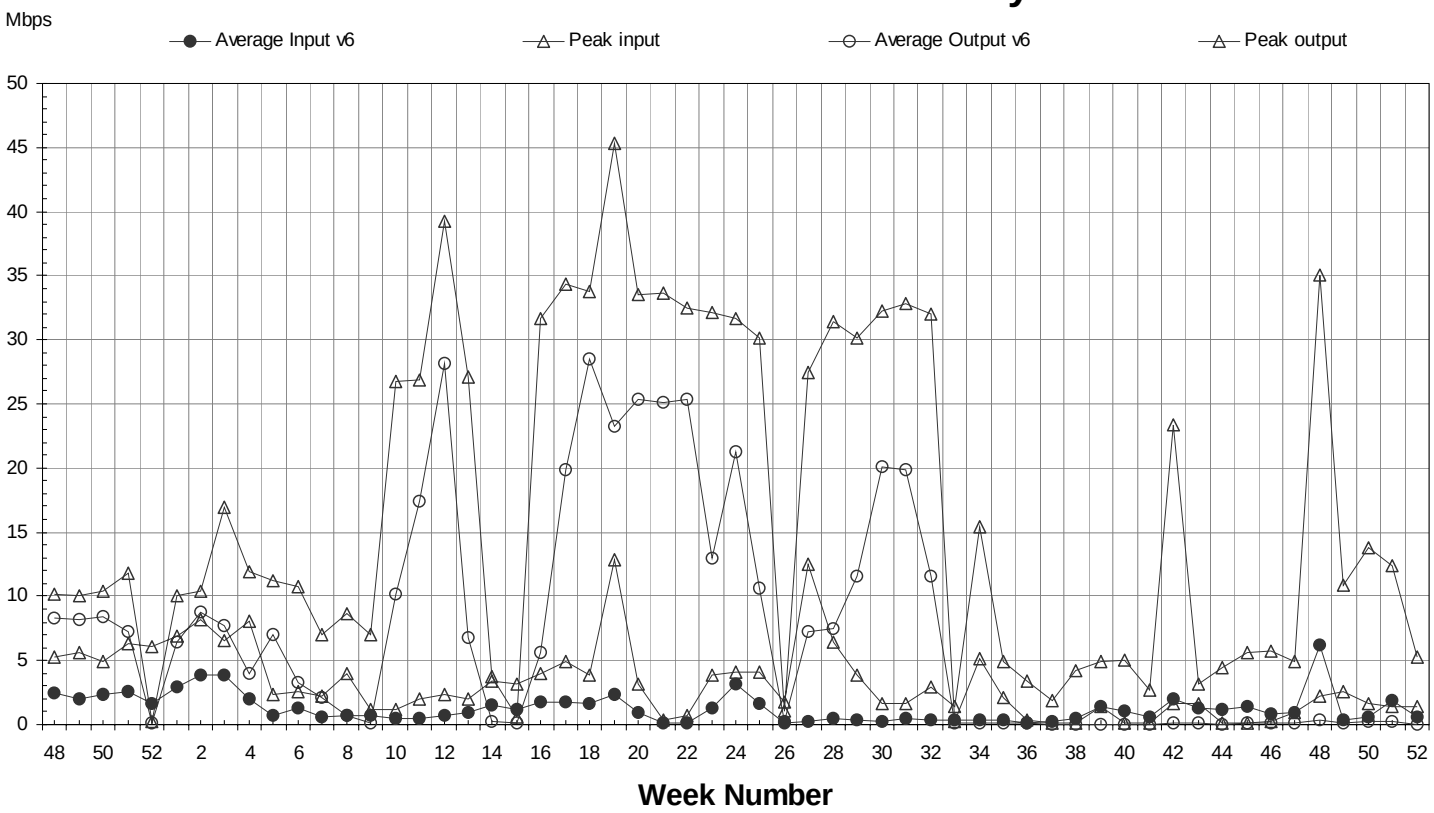

GRnet 6NET Access History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
120
100
80
60
40
20
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number


HUNGARNET 6NET Access History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number

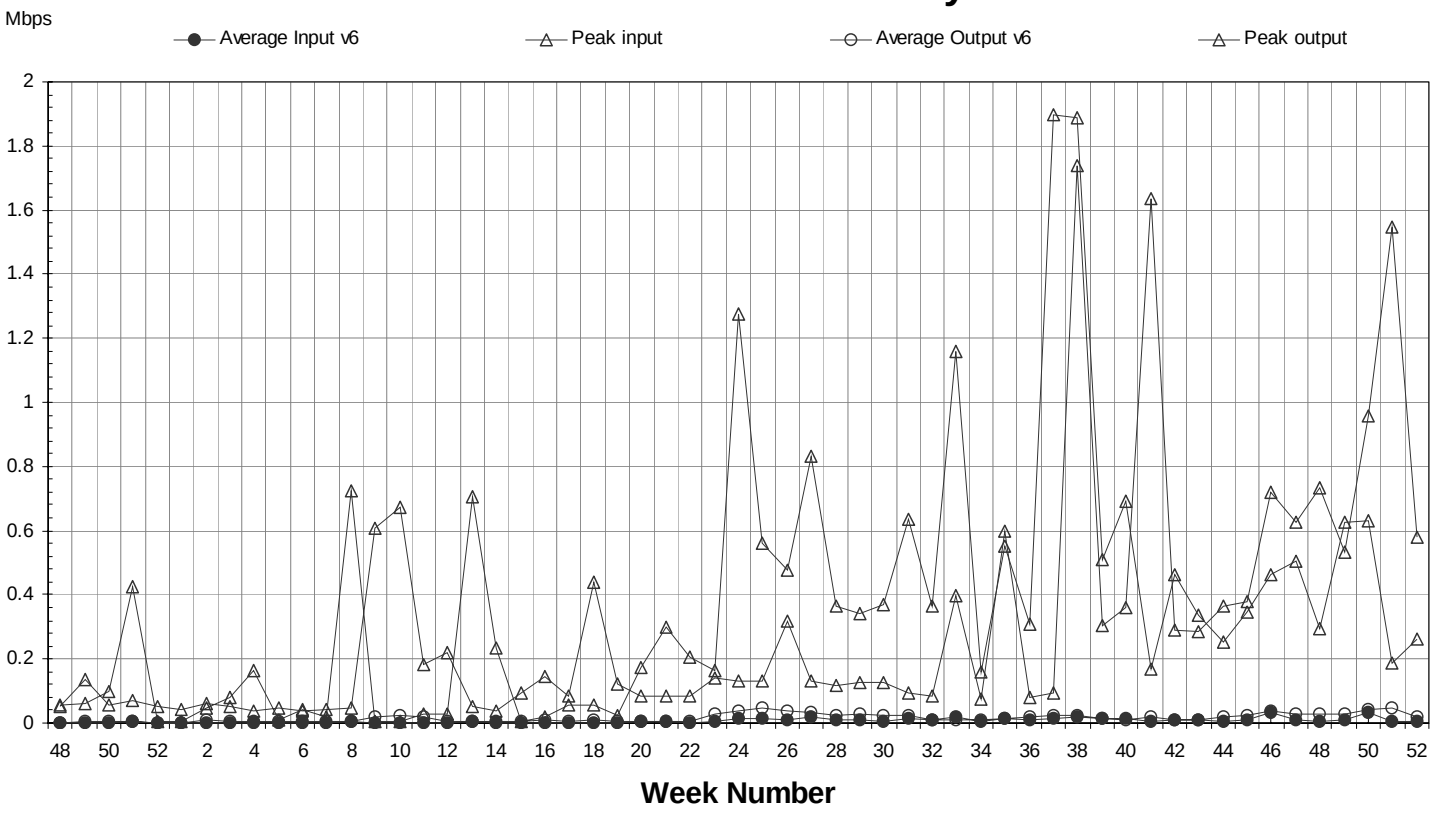
JANET 6NET Access History



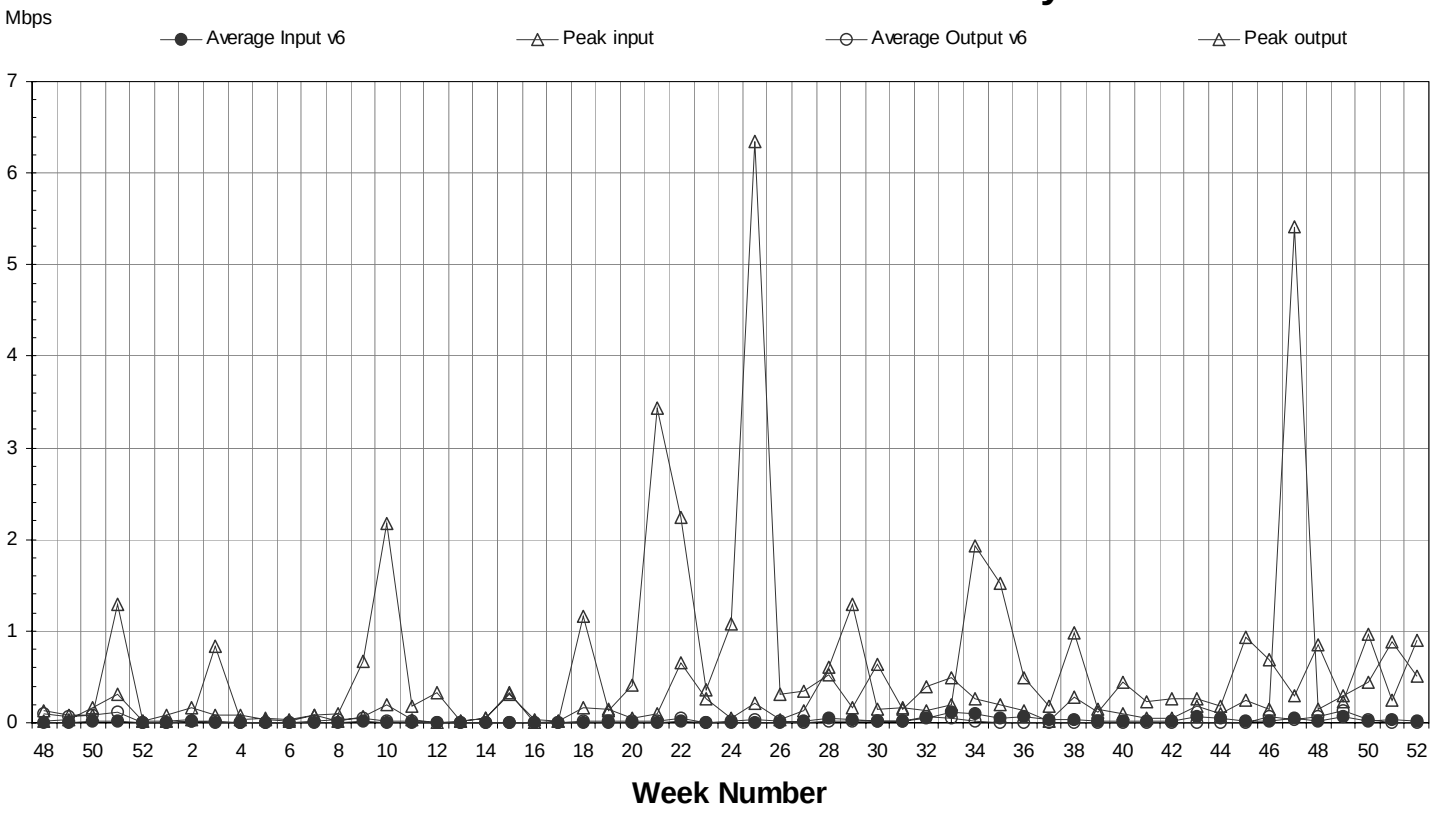
NORDUnet 6NET Access History



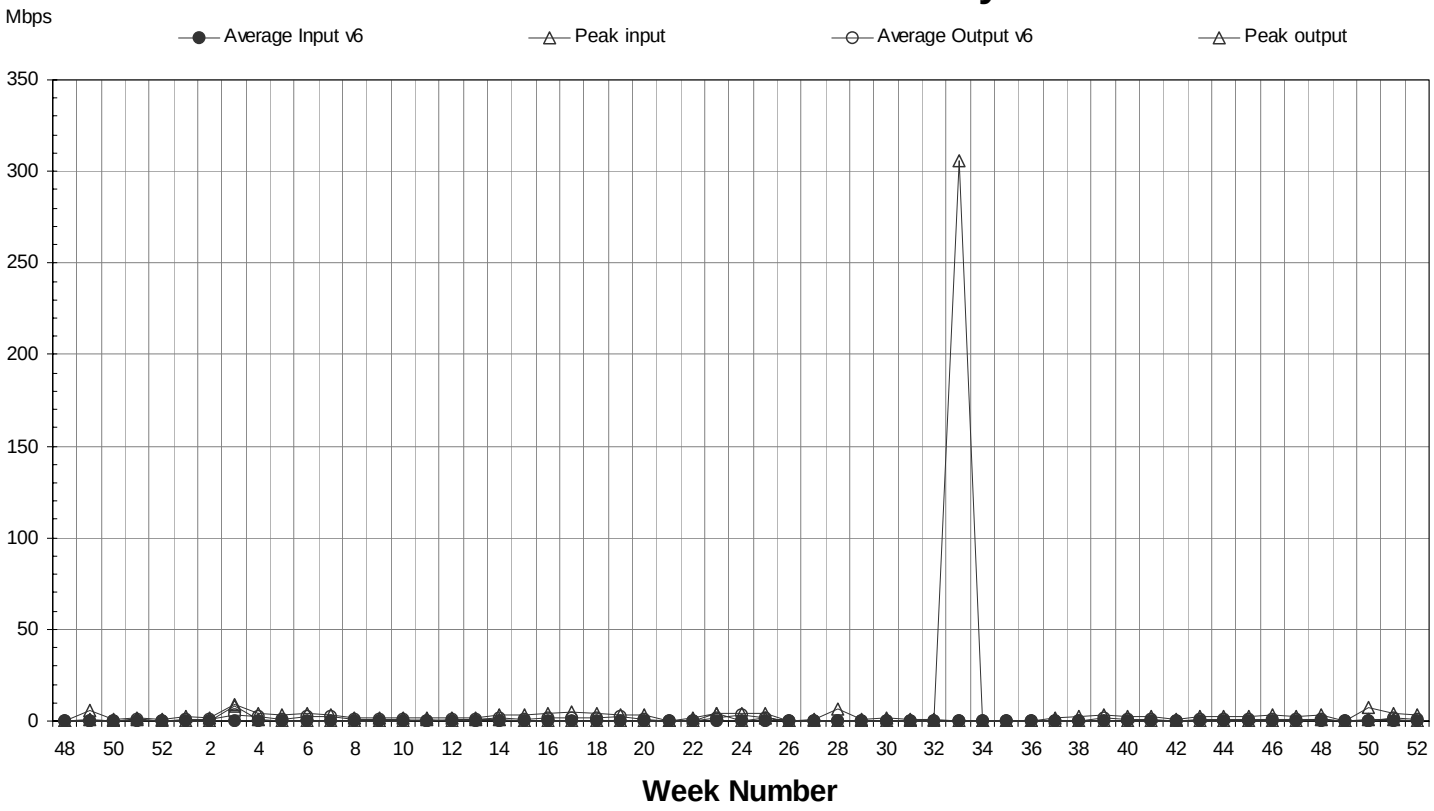
NTT 6NET Access History



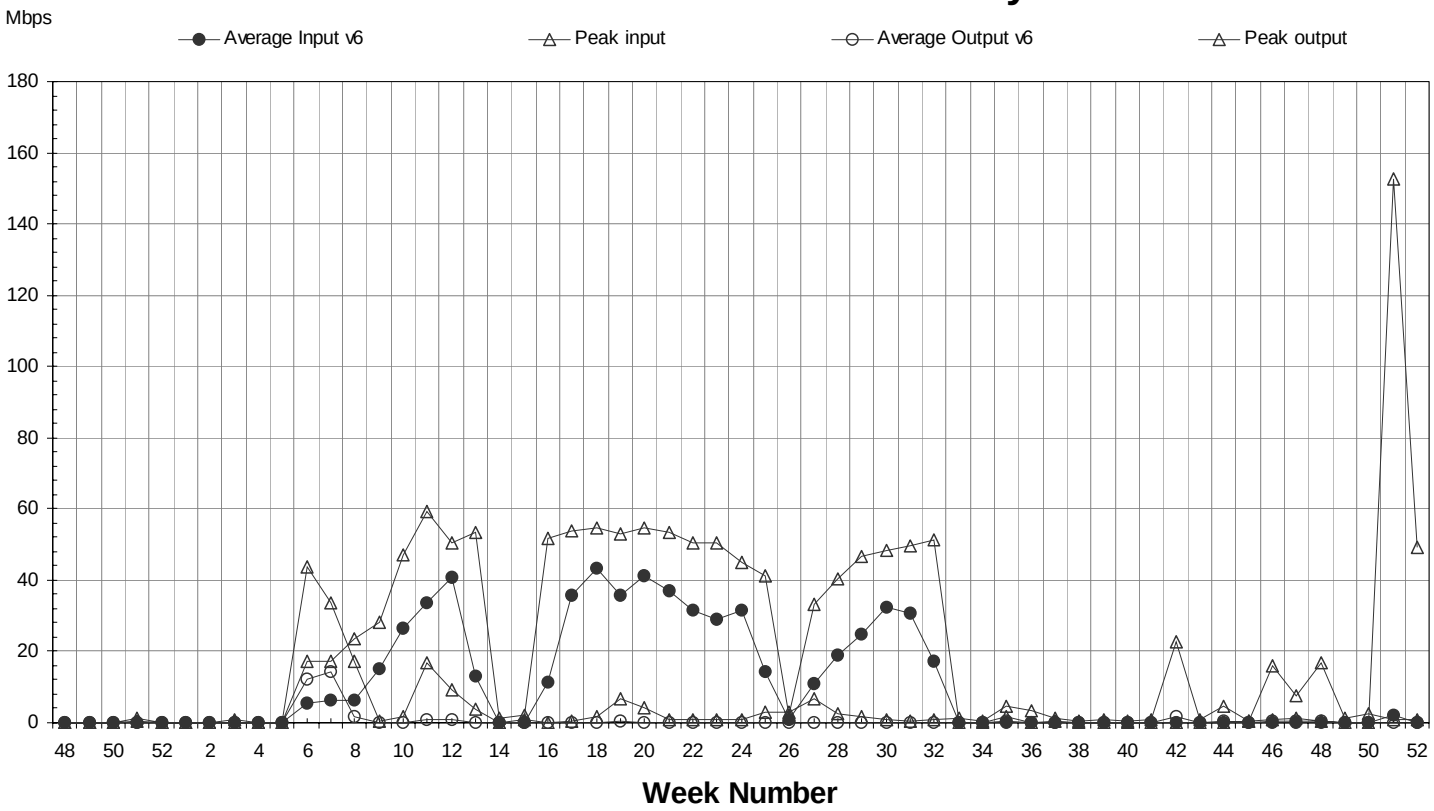
POL34 6NET Tunnel Access History



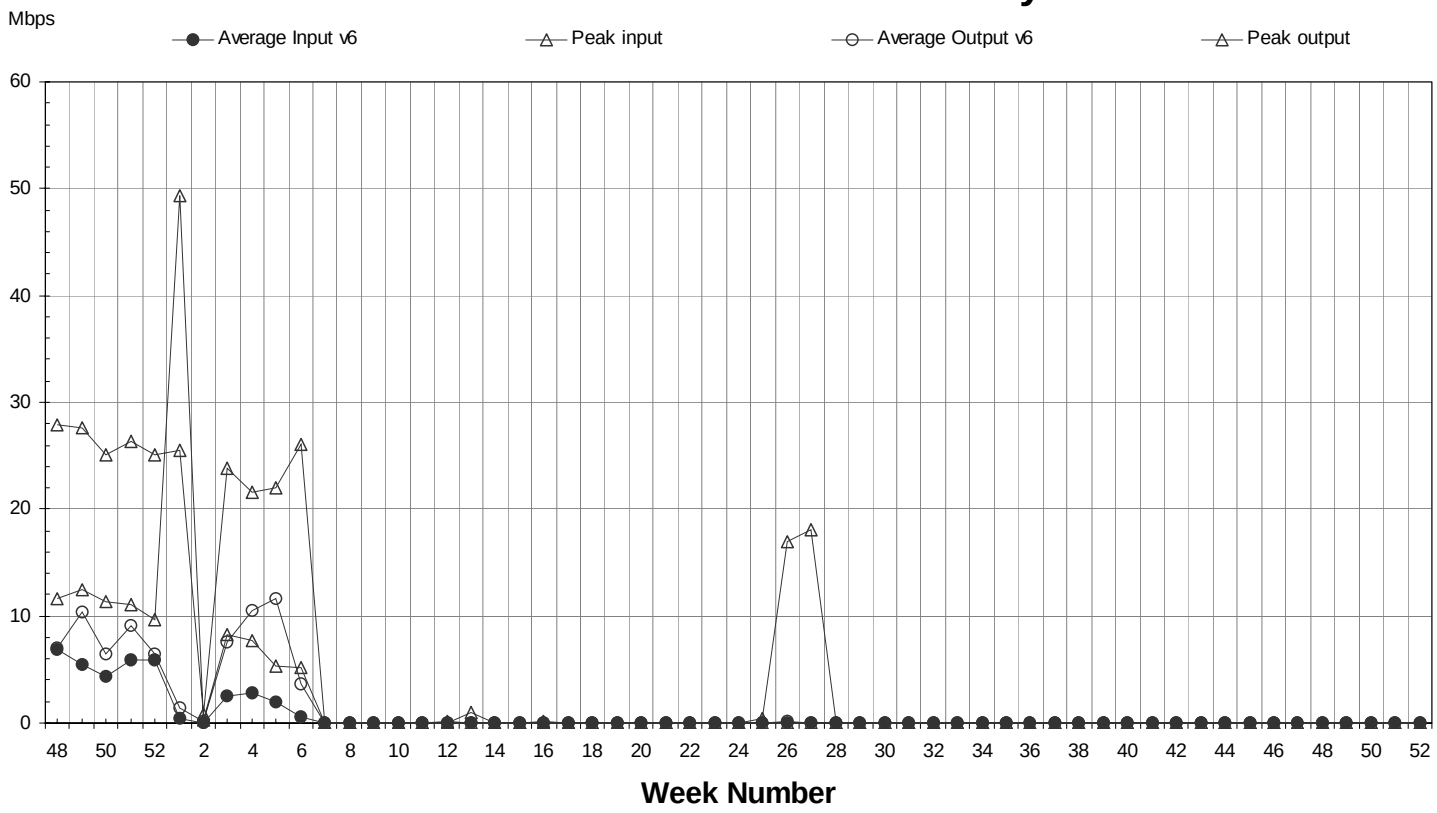
Renater 6NET Access History



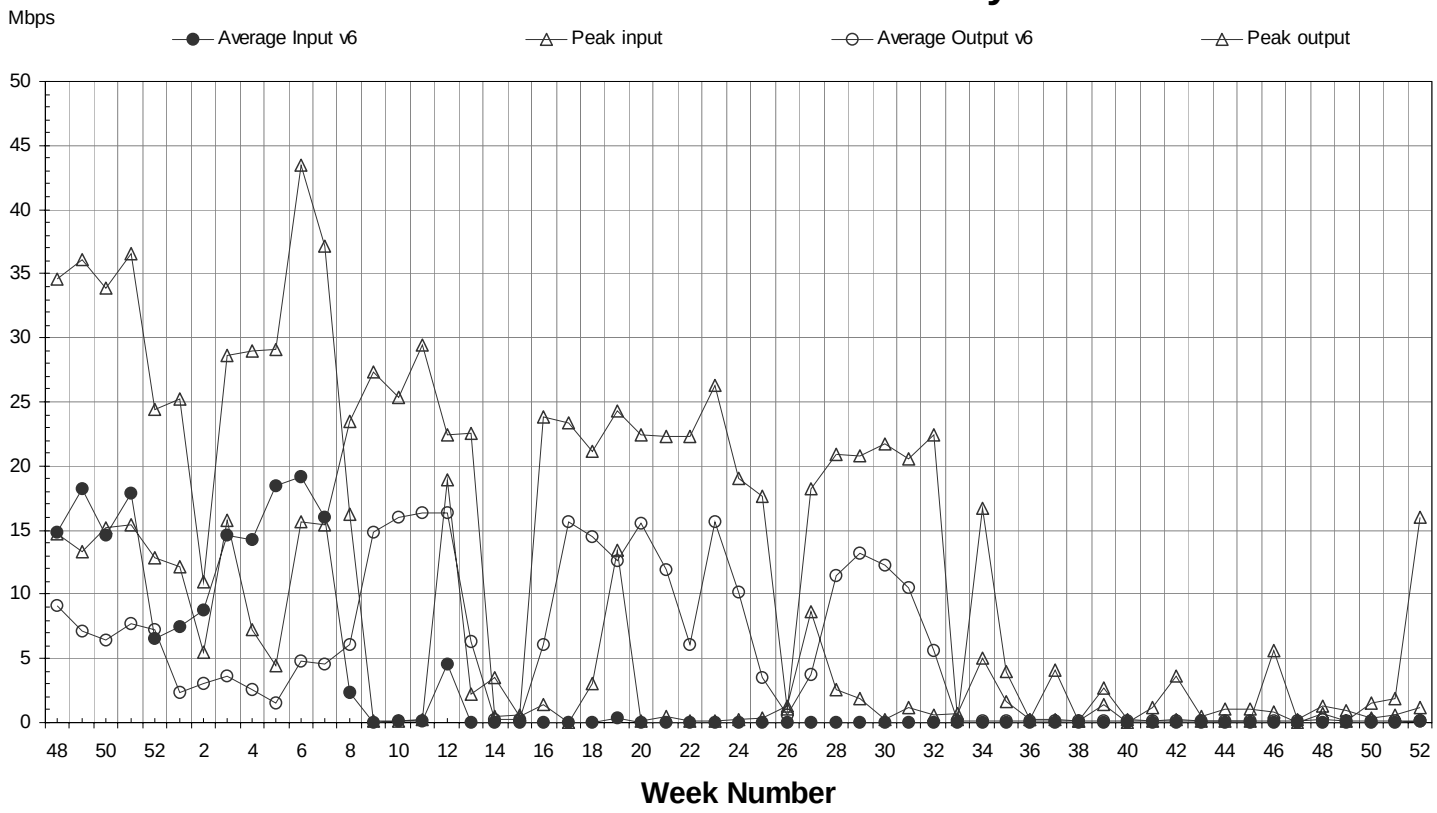
SURFnet 6NET Access 1 History



SURFNET 6NET Access 2 History



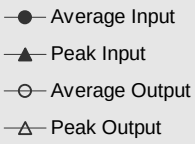
SWITCH 6NET Access History

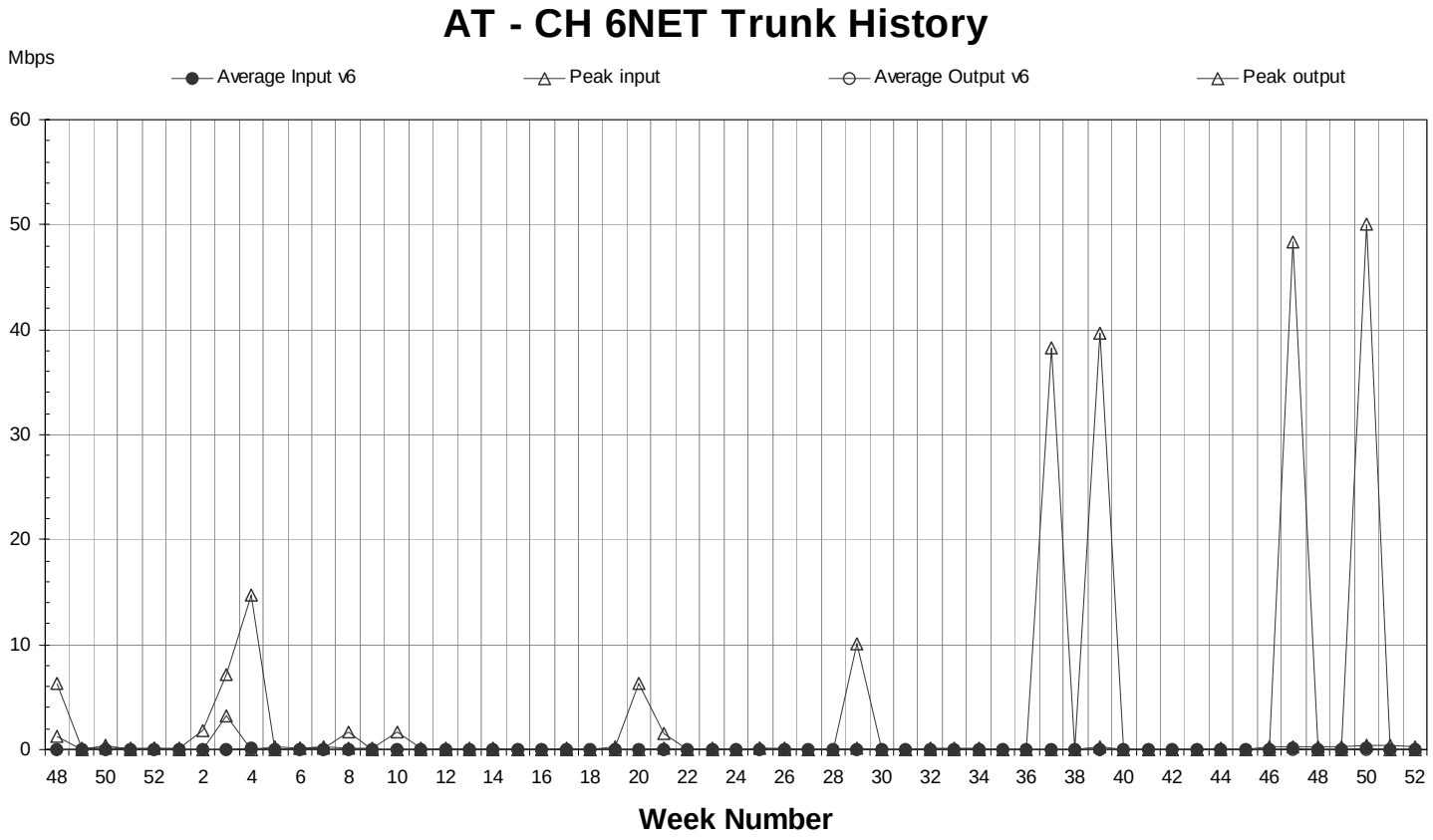


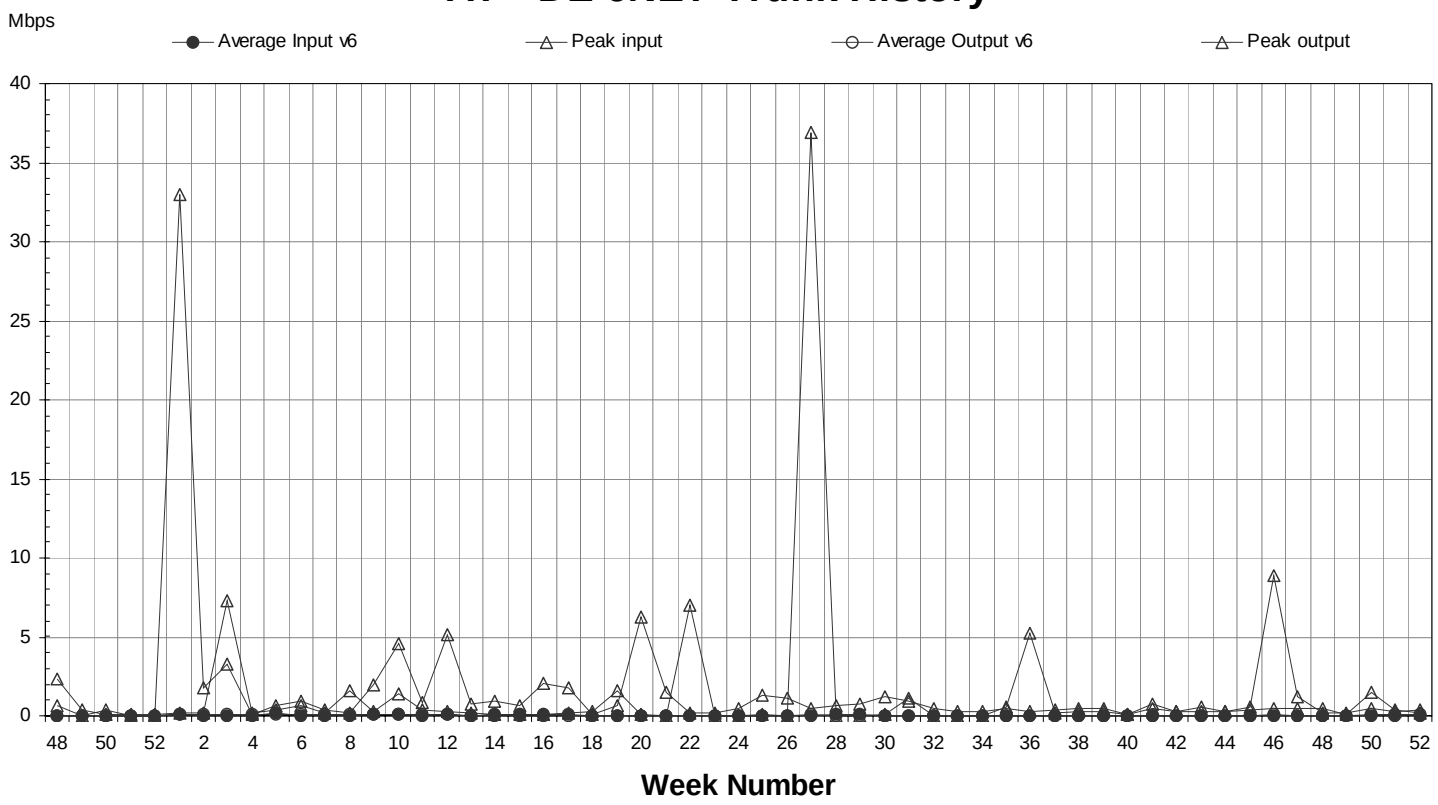
5.2. BACKBONE TRAFFIC

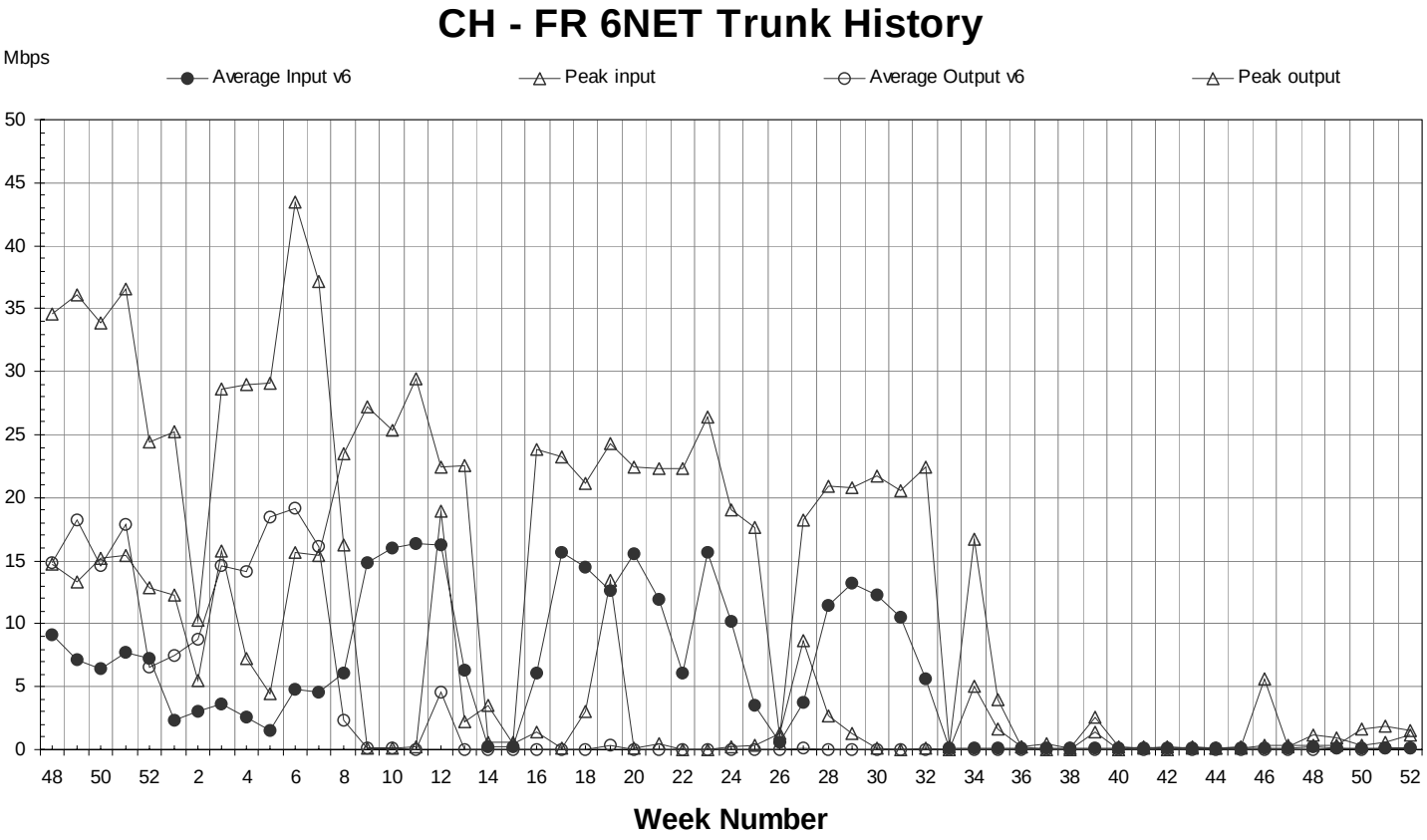
This section contains the traffic data for the backbone trunks.

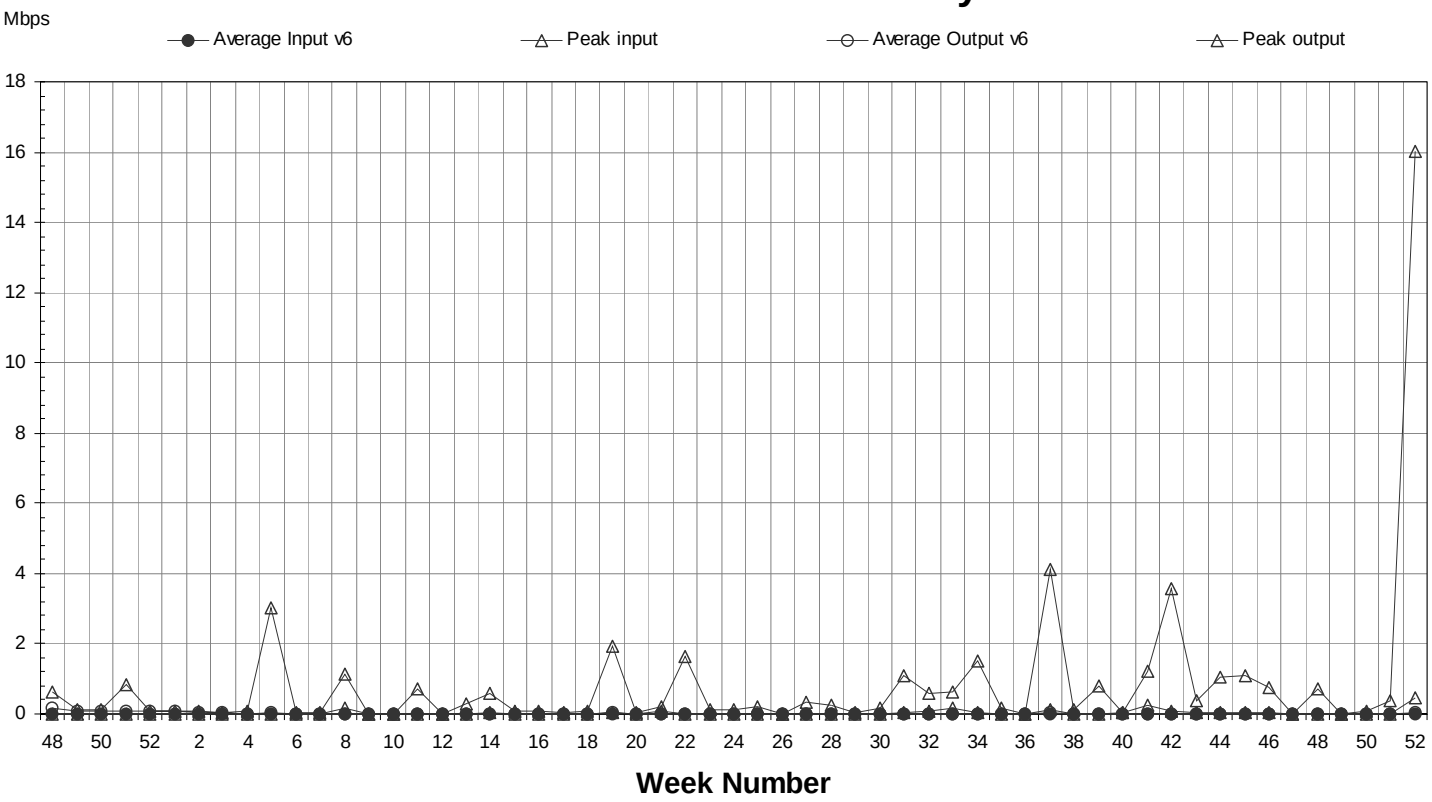
The legend is:

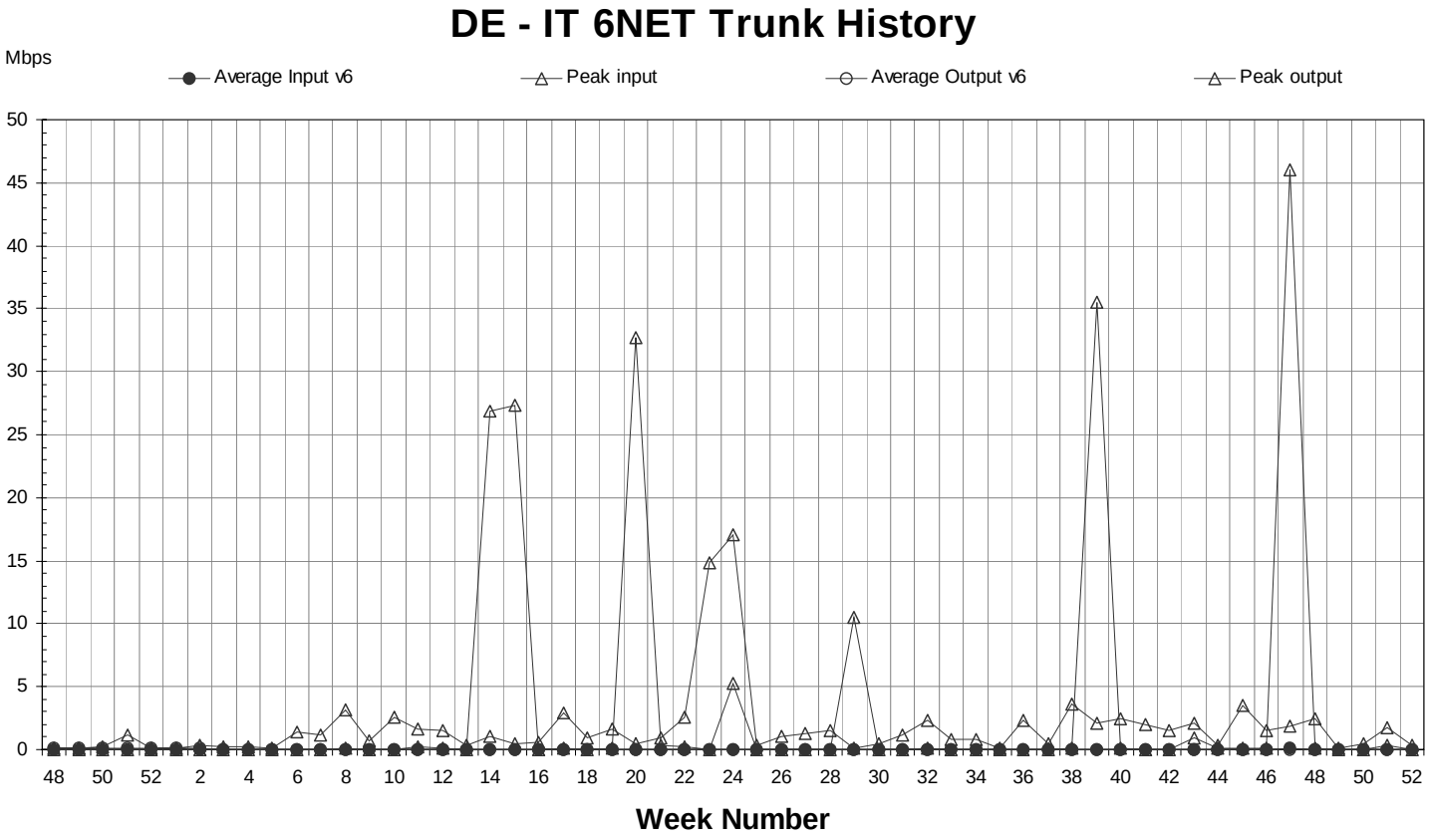


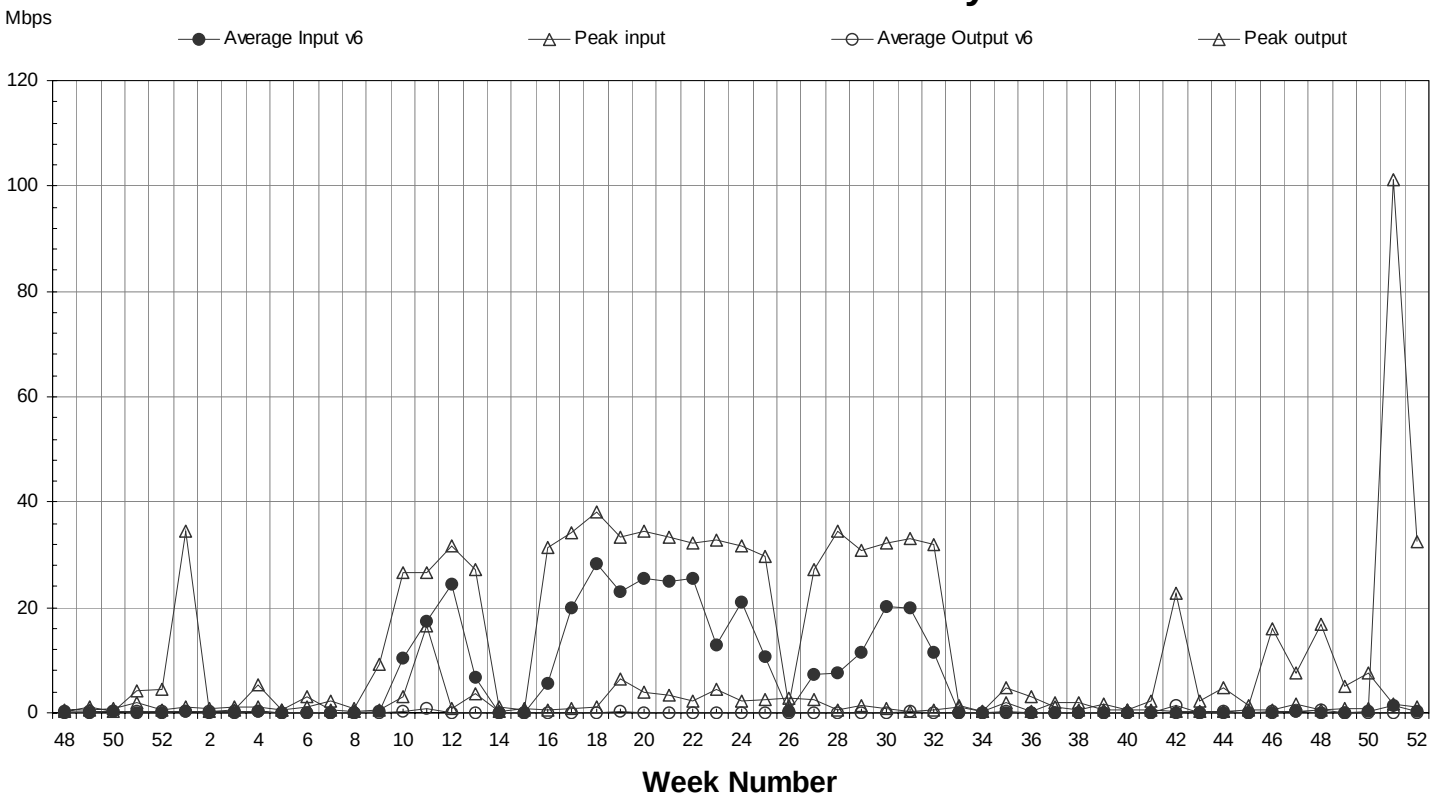

AT - CH 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
60
50
40
30
20
10
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number


AT - DE 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
40
35
30
25
20
15
10
5
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number

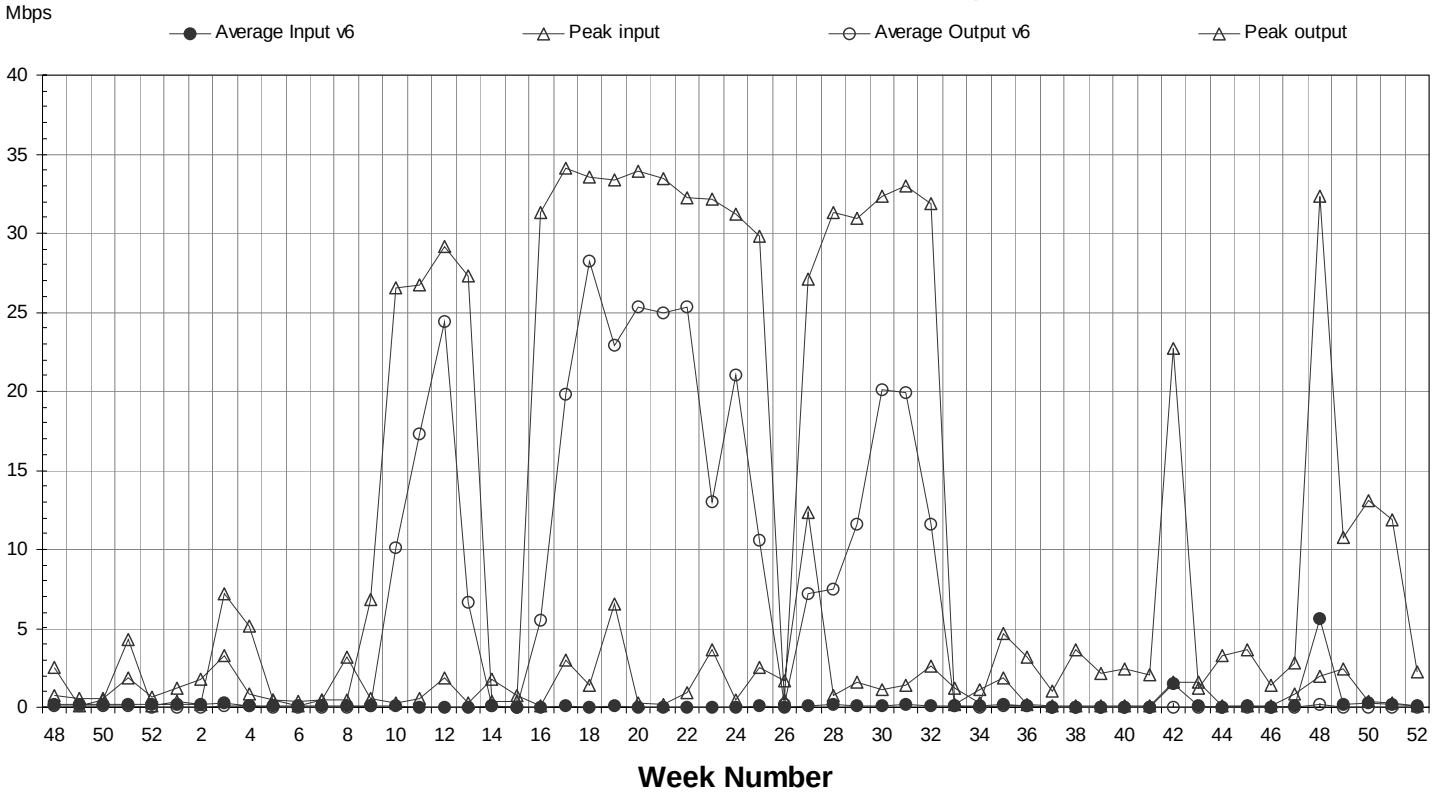

CH - FR 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
50
45
40
35
30
25
20
15
10
5
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number


CH - IT 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
18
16
14
12
10
8
6
4
2
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number

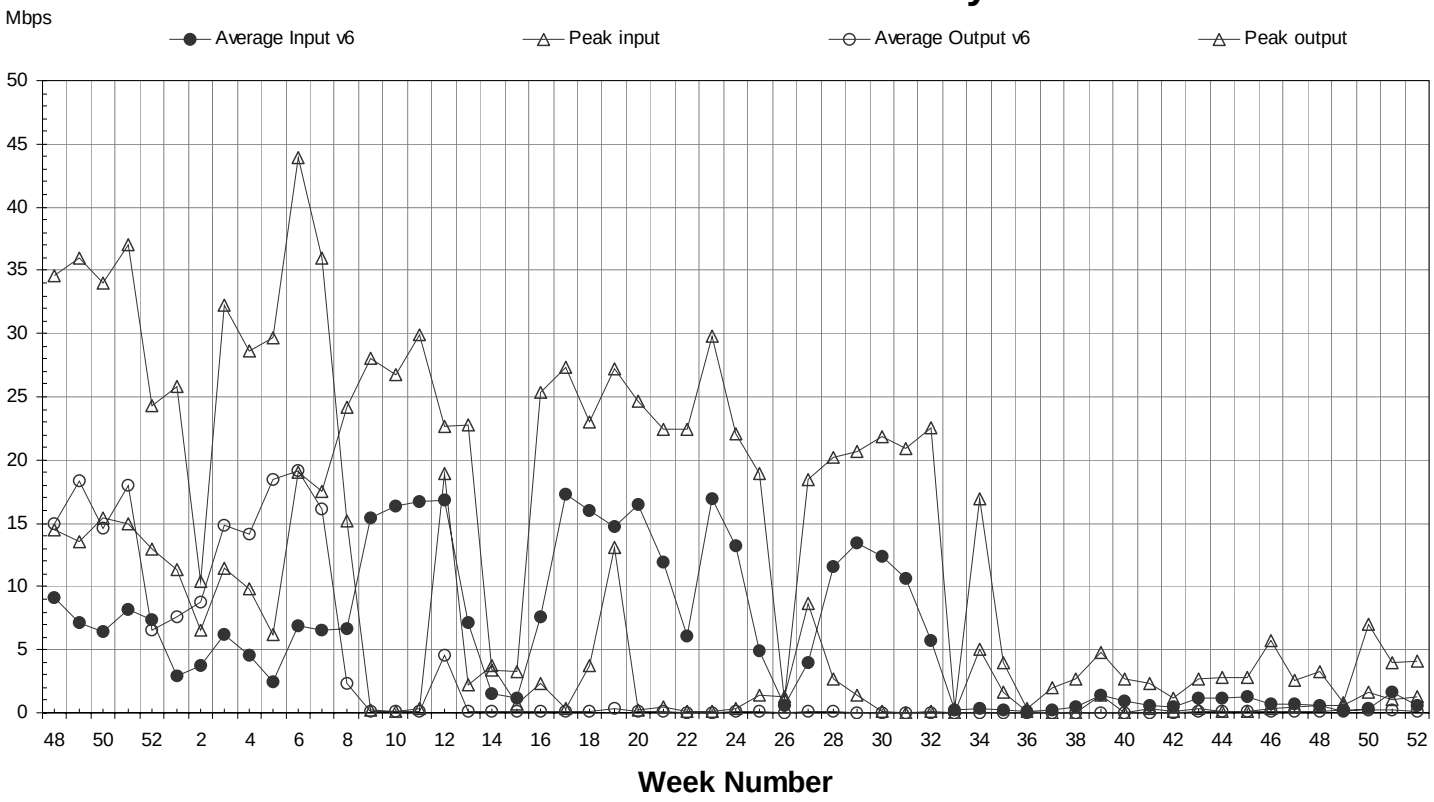

DE - IT 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
50
45
40
35
30
25
20
15
10
5
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number


DE - NL 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
120
100
80
60
40
20
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number

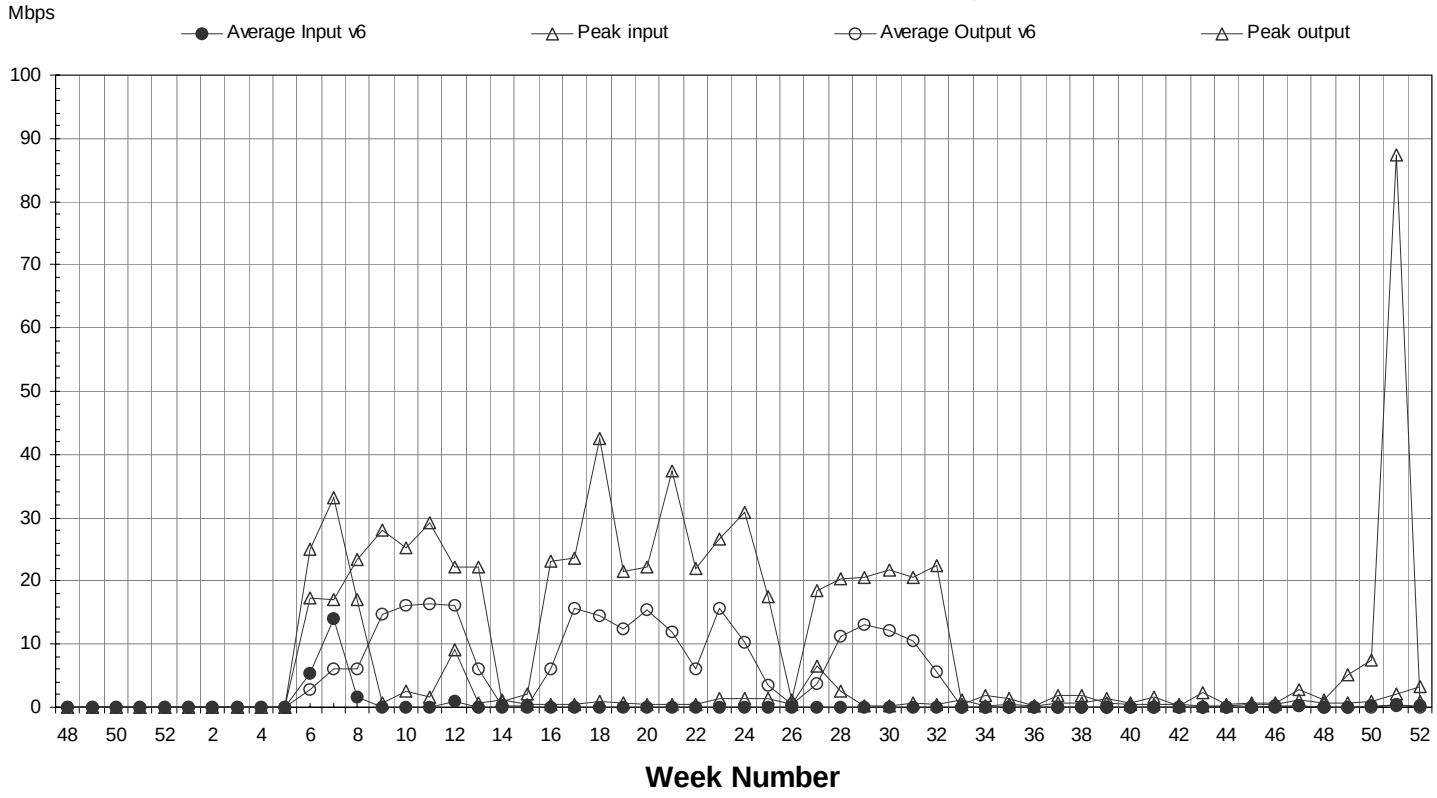
DE - SE 6NET Trunk History



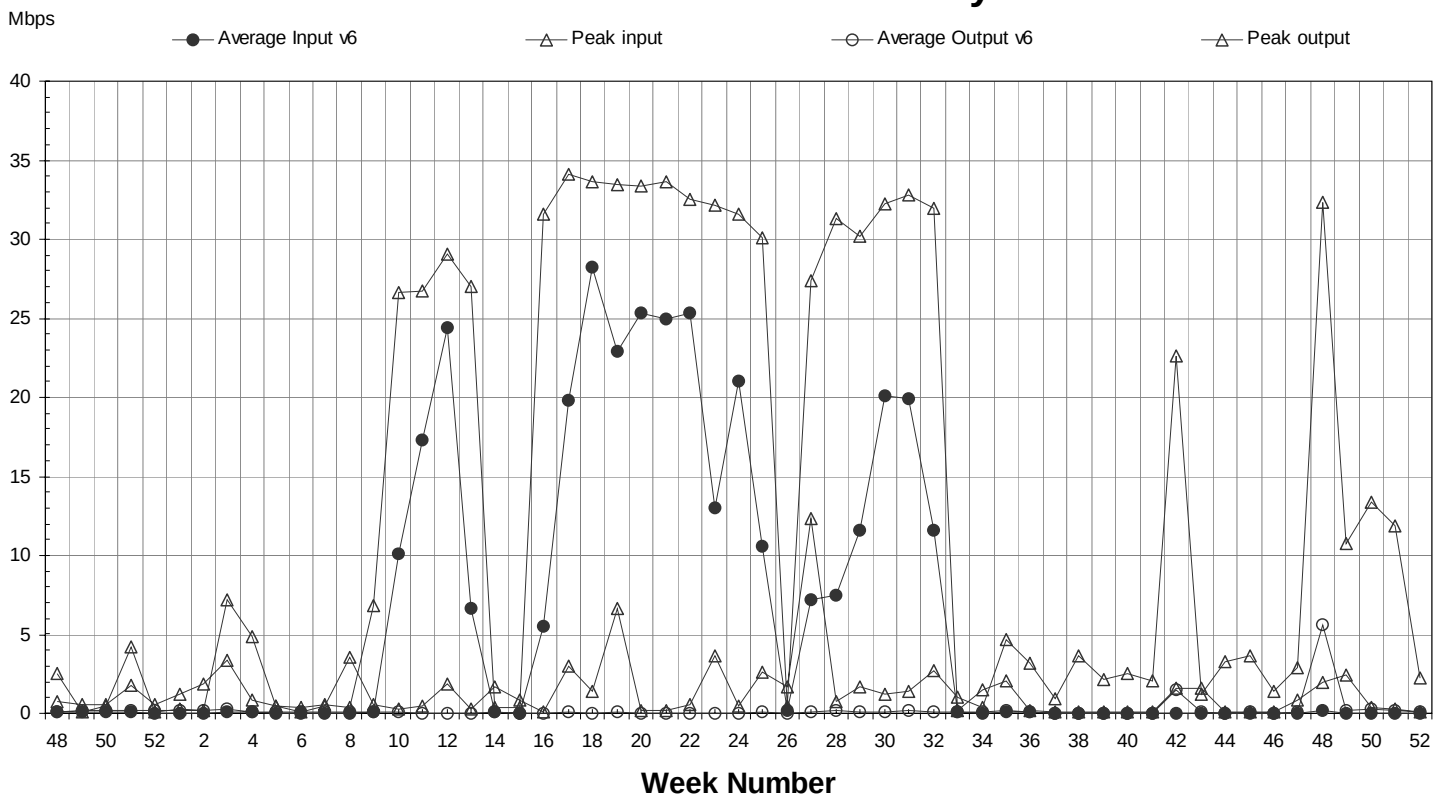
FR - UK 6NET Trunk History

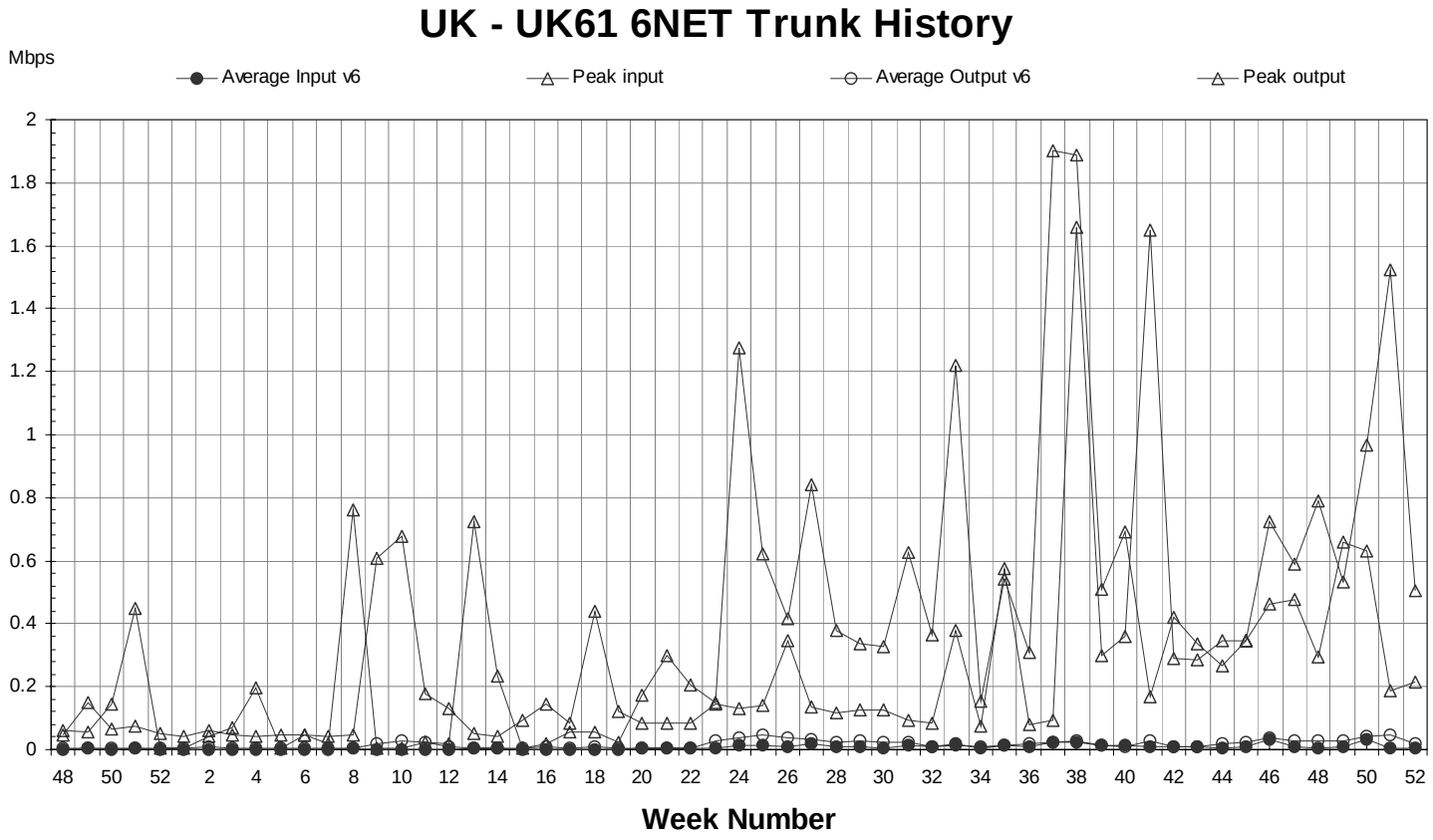


NL - UK 6NET Trunk History



SE - UK 6NET Trunk History




UK - UK61 6NET Trunk History
Mbps
Average Input v6
Peak input
Average Output v6
Peak output
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
48 50 52 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Week Number

6. ROUTING INFORMATION DISPLAY

6.1. RIS - 6NET connection

The Routing Information Service (RIS) provides information about BGP routing like “Looking Glass” services offered elsewhere on the Internet. However, the RIS can also provide historical information about Internet routing. The service collects routing information by using Remote Route Collectors at different locations around the world and integrates this information into a comprehensive view.
6net has set up a multihop eBGP peer in Amsterdam to export its IPv6 routing information to be displayed in RIS graphs. You can have a look to the following link which shows up IPv6 routing activity in Amsterdam RCC. At the time of writing this deliverable, only 6net information is collected in that router.

http://www.ris.ripe.net/ipv6-updates/rrc00/index.html

Figure 1shows graphs taken on 12 January 2005 at 17:30 CET

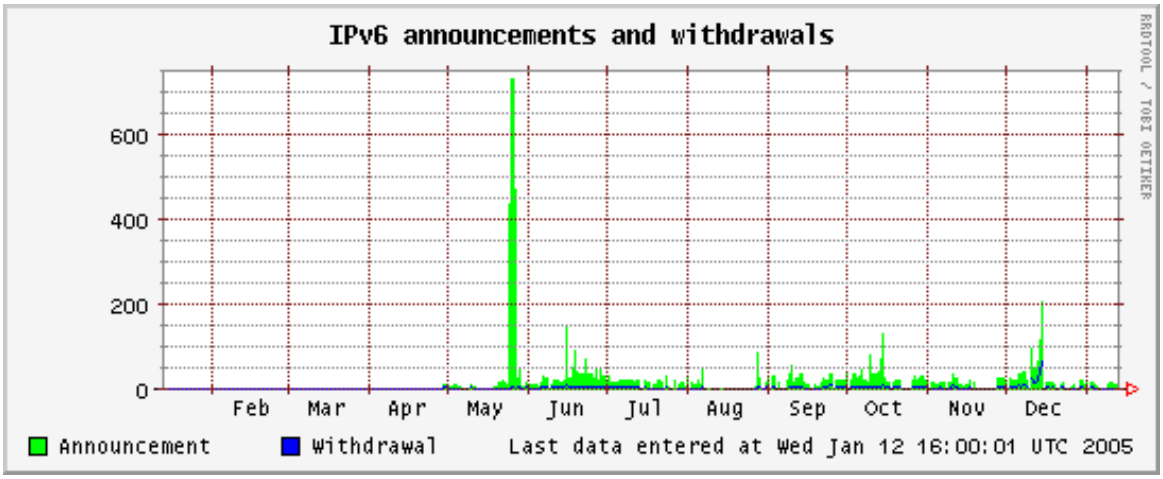


FIGURE 1

7. MONITORING AND REPORTING PROCEDURE

This section describes the tools and procedures in place at the NOC to gather the measurements for this report. It is intended to provide the reader with some in-depth information in order to provide a better understanding of the various data and graphs.

The IP performance of the 6NET Network is monitored using InfoVista, a commercial network monitoring application which is configured to gather information from all the relevant routers at regular intervals using SNMP GET-requests. In order to avoid problems with 32-bit SNMP counters wrapping during the polling cycle on high speed links, 64-bit SNMP counters are used instead. The routers are all monitored for the same information which enables the 6NET NOC to provide uniform reporting across the entire 6NET network.

The traffic measurement is based on samples of the MIB variables ifHCInOctets and ifHCOutOctets, which give traffic at the physical or logical interface level. The 6NET links are mainly POS (Packet Over Sonet) but there is still some ATM VC (Virtual Channel). Based on a 15 minutes polling interval, Infovista generates data aggregated in months or in years.

The availability measurement is based on SNMP Traps received by the HP OpenView administration server. These traps are consolidated and compared to the corresponding trouble tickets to separate outages due to schedule maintenances and outages due to actual link failures.

Currently the report includes these types of measures

Traffic history : This plot shows the history of the peak and average traffic rates for each week of the reporting period and all preceding weeks during the last year. Infovista measurement has started in June 2002.

The plots are produced for each of the following traffic categories

- NREN Access Ports
- GÉANT Trunks

Note : For access ports, the sense of Input and Output is defined from the point of view of the 6NET network so that input traffic is received by 6NET from an NREN, and output traffic is sent from 6NET to an NREN.

Definition of terms used in this report

Availability : The calculation of availability is based on the following formula.

Availability = (T - (tu + ts)) / (T - ts) x 100%

Where T is the total time in the month, tu is the total unscheduled unavailability in one month and ts is the total scheduled unavailability in one month.

Note : Link Availability is calculated based on SDH or ATM links outages between two PoPs (Trunks) or between a PoP and an NREN (Access Ports). Service Availability is calculated on an end-to-end basis including NREN equipment. It represents the NREN ability to access the service.

IfHCInOctets : The total number of octets received on the interface, including framing characters.

IfHCOutOctets : The total number of octets transmitted out of the interface, including framing characters.

MIB : In the SNMP environment, the manager can obtain information from the agent by periodically polling managed objects. The management data exchanged between managers and agents is called the Management Information Base (MIB)