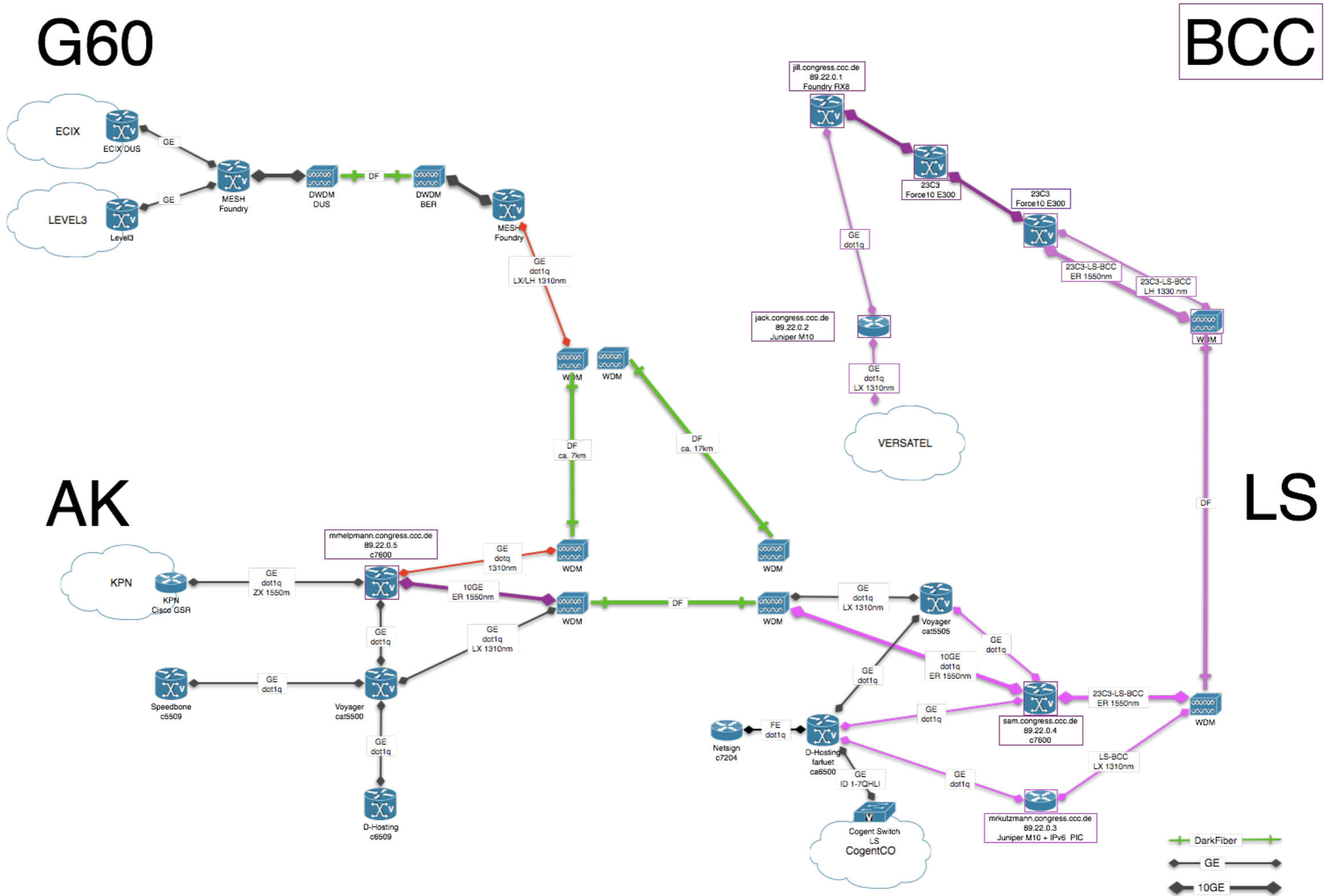




Networking @ BCC

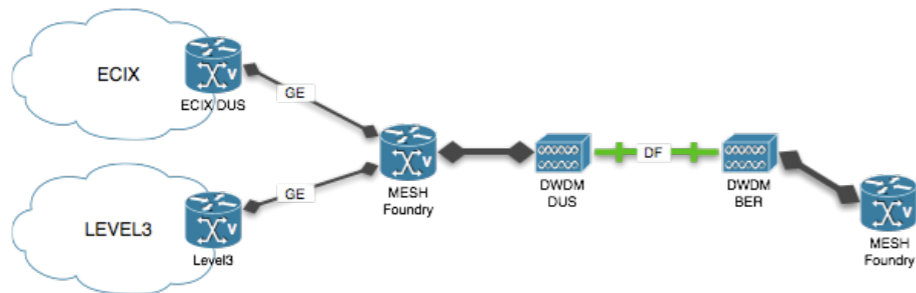
Stefan Wahl
Niels Bakker
Elisa Jasinska
Maxim Salomon

Planned Network

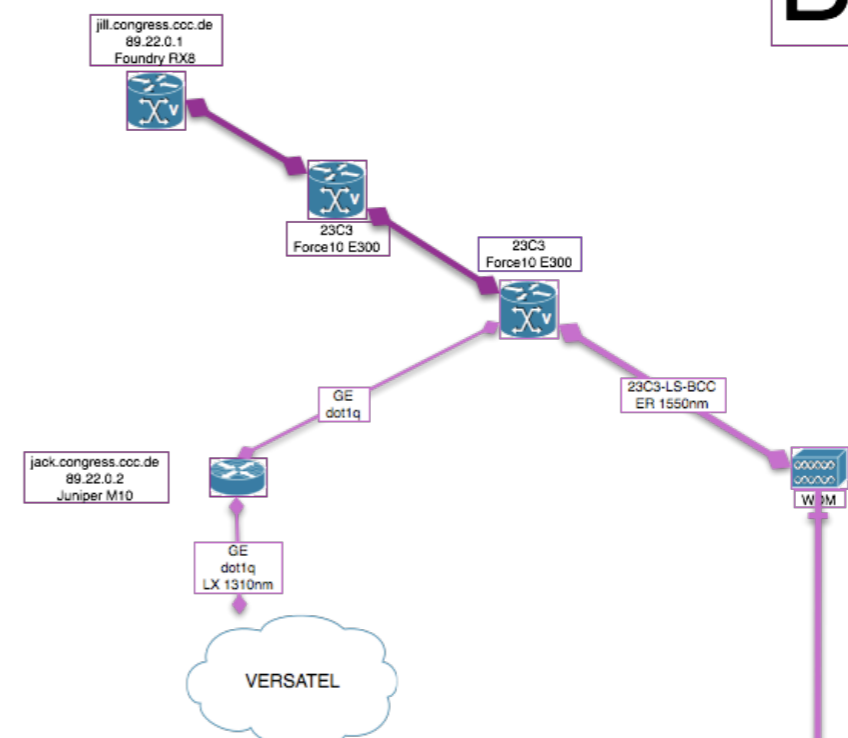


Realized Network

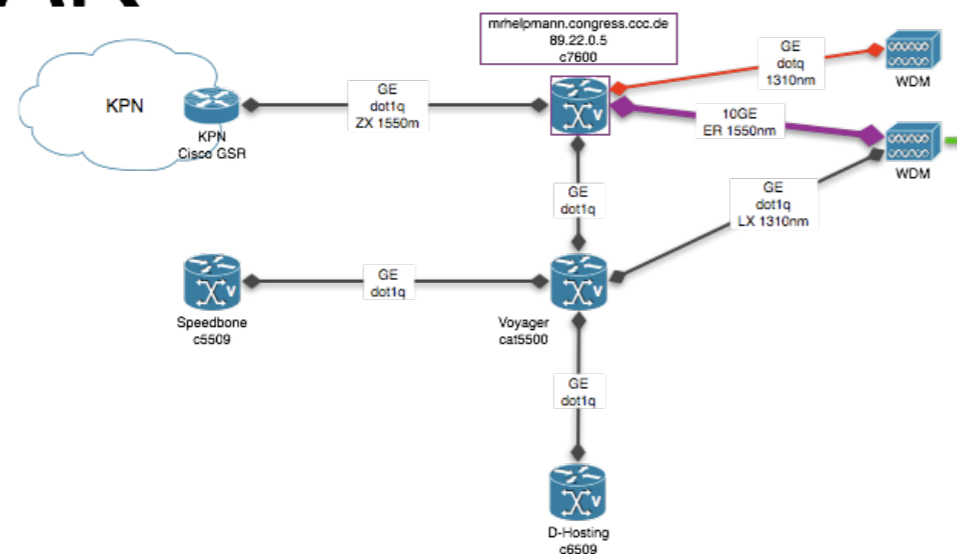
G60



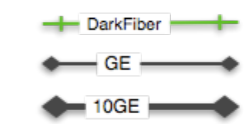
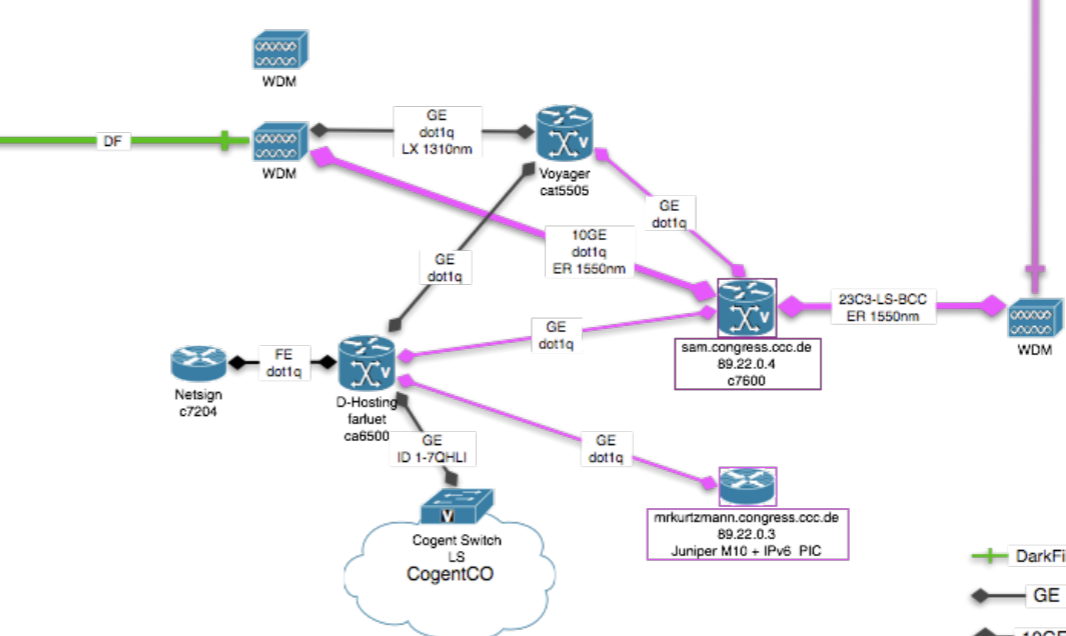
BCC



AK

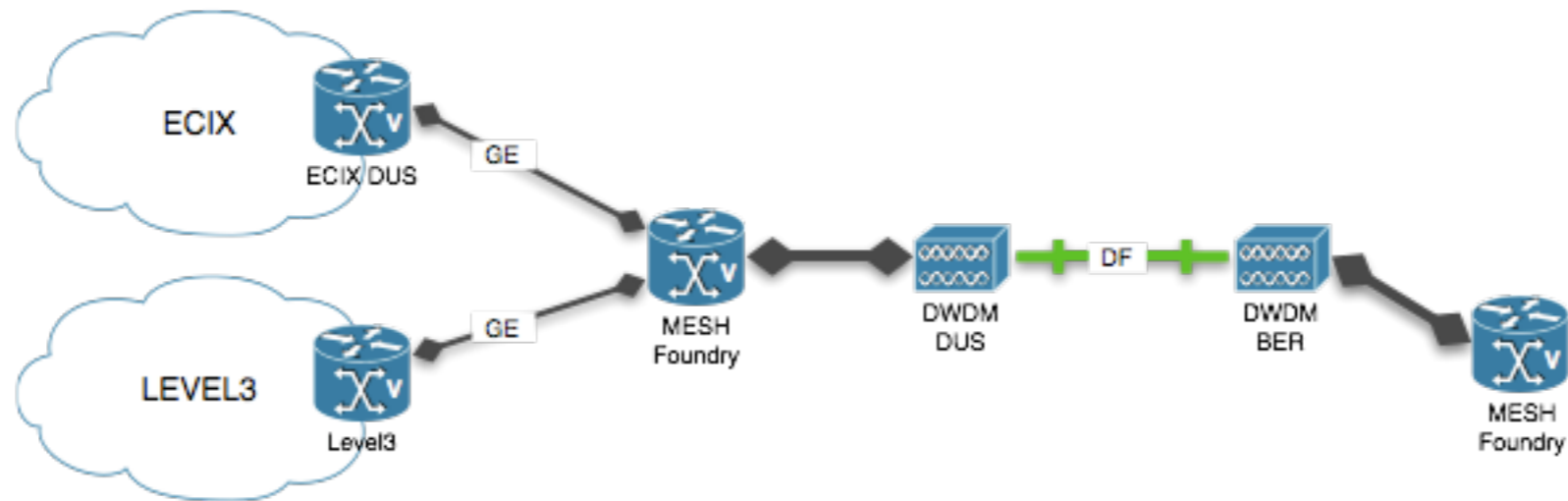


LS



Detailed Network G60

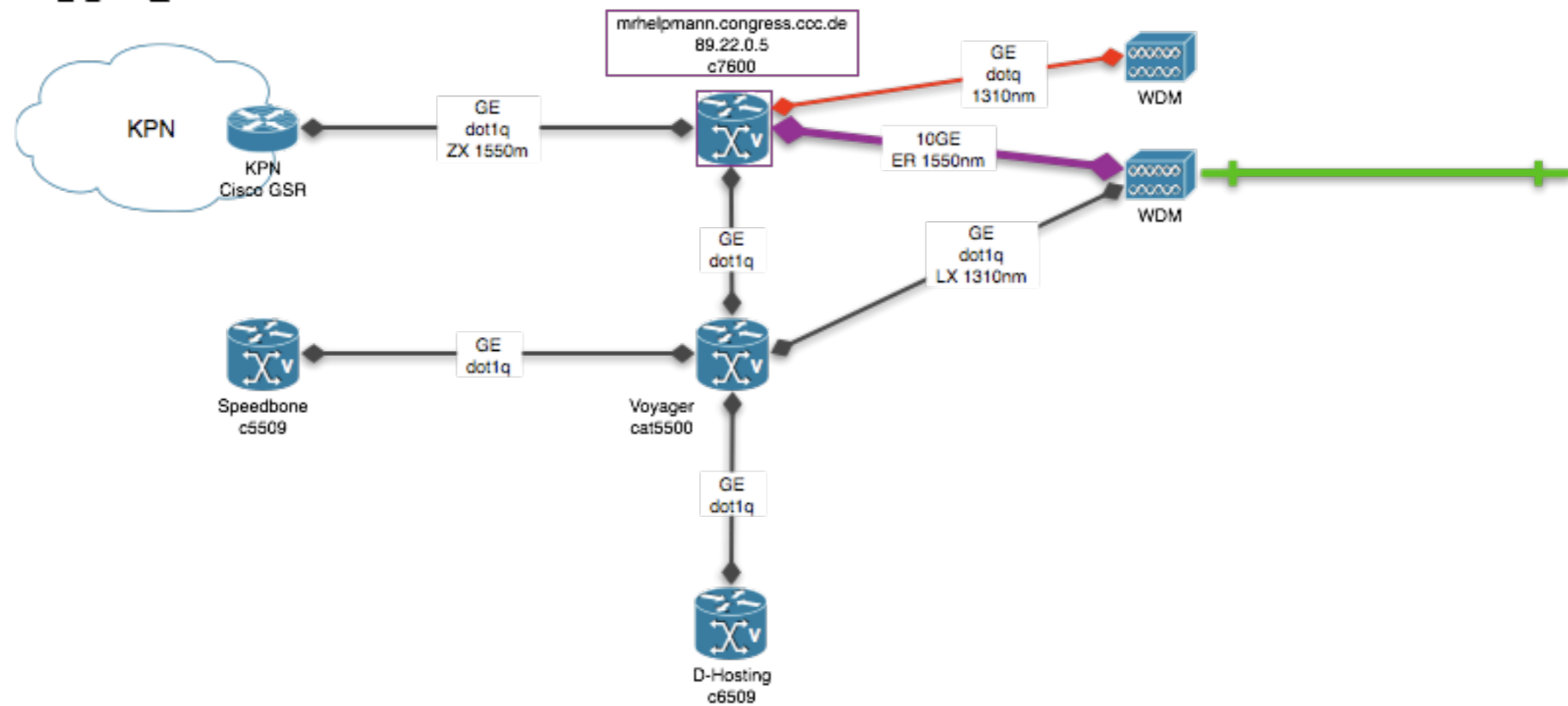
G60



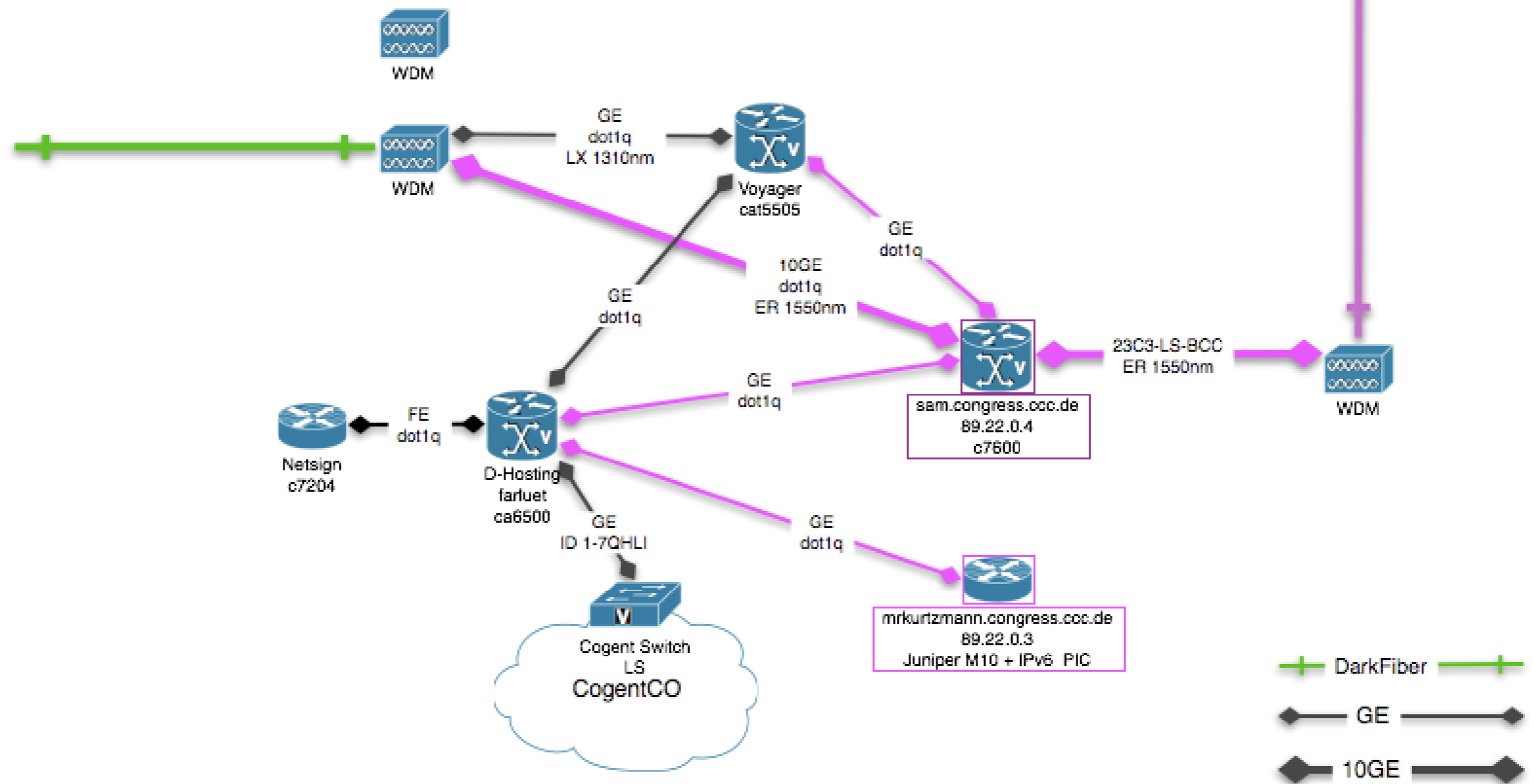
Alboinkontor

(Speedbone)

AK

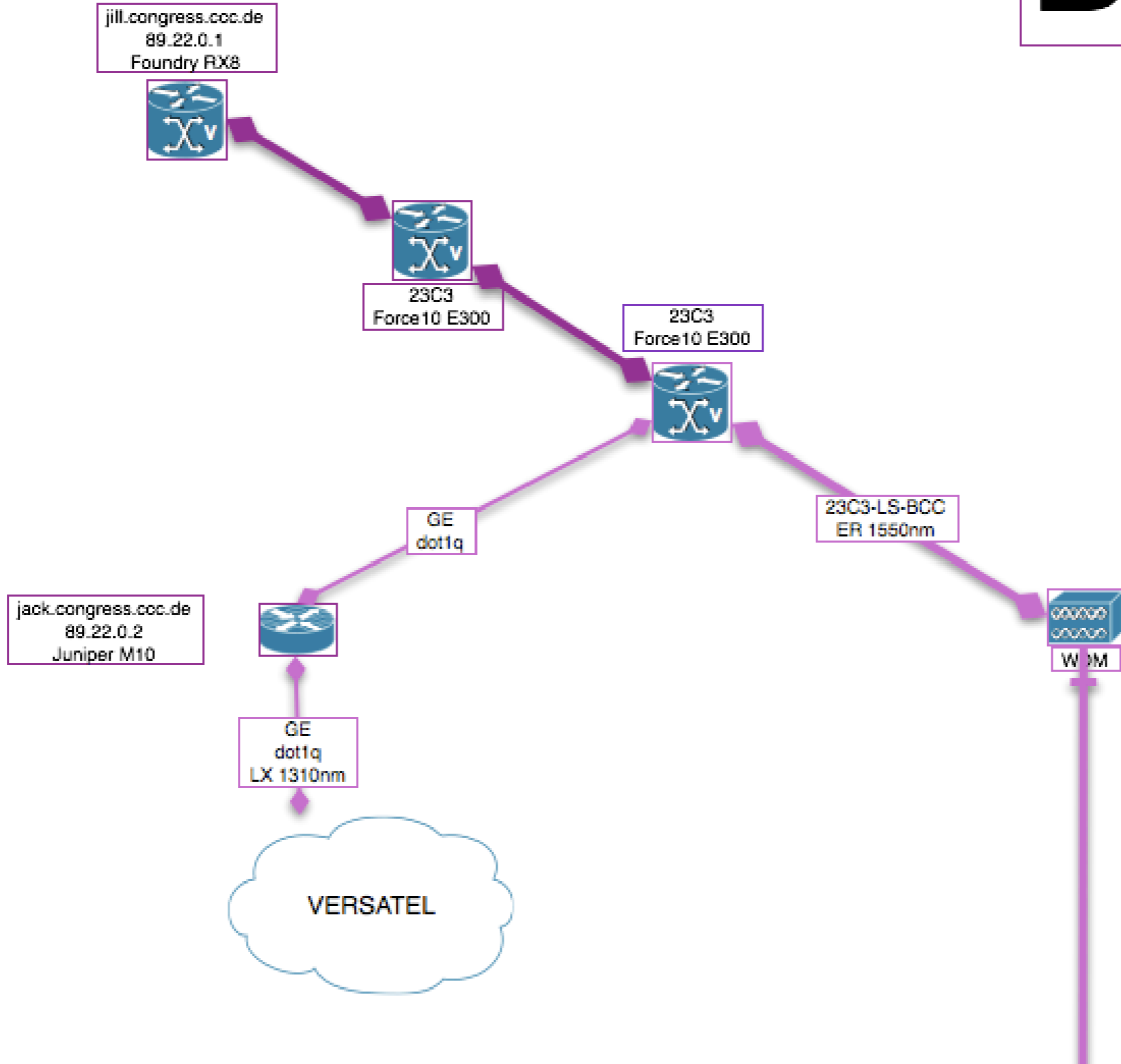


Lützowstrasse 105/106



BCC

BCC





BGP Uplinks



- Used Uplinks
 - AS174 CogentCo
 - AS248 23C3
 - AS286 KPN Eurorings
 - AS5430 Freenet (IPv6)
 - AS8881 Versatel
 - AS9033 ECIX DUS
 - AS12732 D-Hosting
 - AS25074 Mesh



BGP Changes during Congress



- RIPE Tools
<http://www.ris.ripe.net/bgplay/>
- Marks für 89.22.0.0/16
 - Starting announcement
 - Versatel 2006-12-24 22:21
 - KPN 2006-12-25 21:29
 - CogentCo 2006-12-26 15:00
 - Prepending as 174 2006-12-27 14:42



Bandwidth

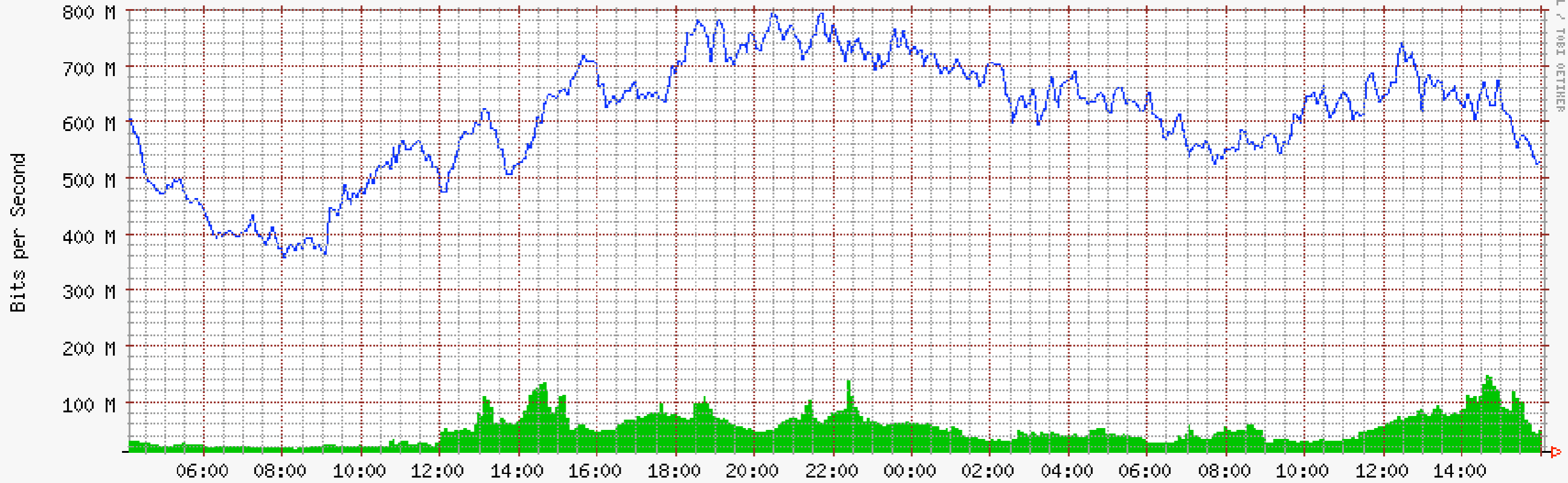
- Real Bandwidth
 - CogentCo 0400Mbps
 - KPN Eurorings 1000Mbps
 - Versatel 1000Mbps
 - D-Hosting 0600Mbps
- Average
 - Out 1.6Gbps (>50%)
 - In 0.6Gbps (<20%)



KPN Eurorings



Daily Graph (5 Minutes Average)



■ Inbyte Cur : 47.0 M Avg : 50.6 M Min : 14.7 M Max : 145.5 M
■ Outbyte Cur : 529.2 M Avg : 609.0 M Min : 357.9 M Max : 793.5 M

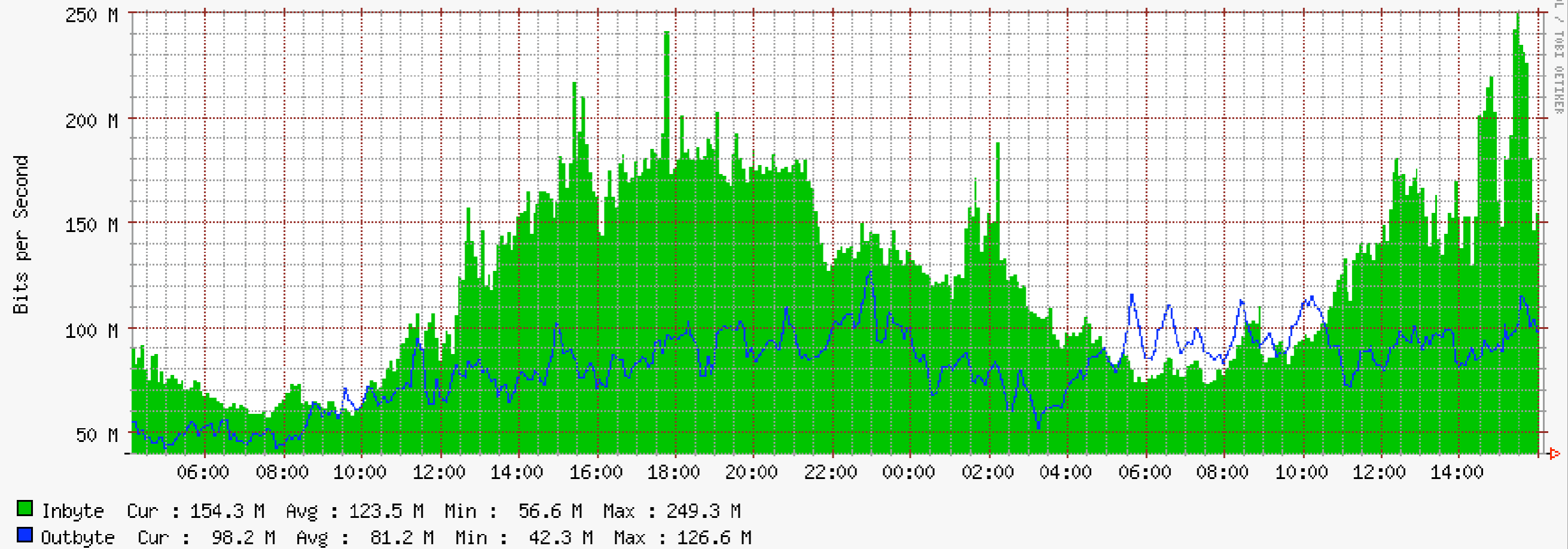
RRDTool / TARI OETTER



CogentCo



Daily Graph (5 Minutes Average)

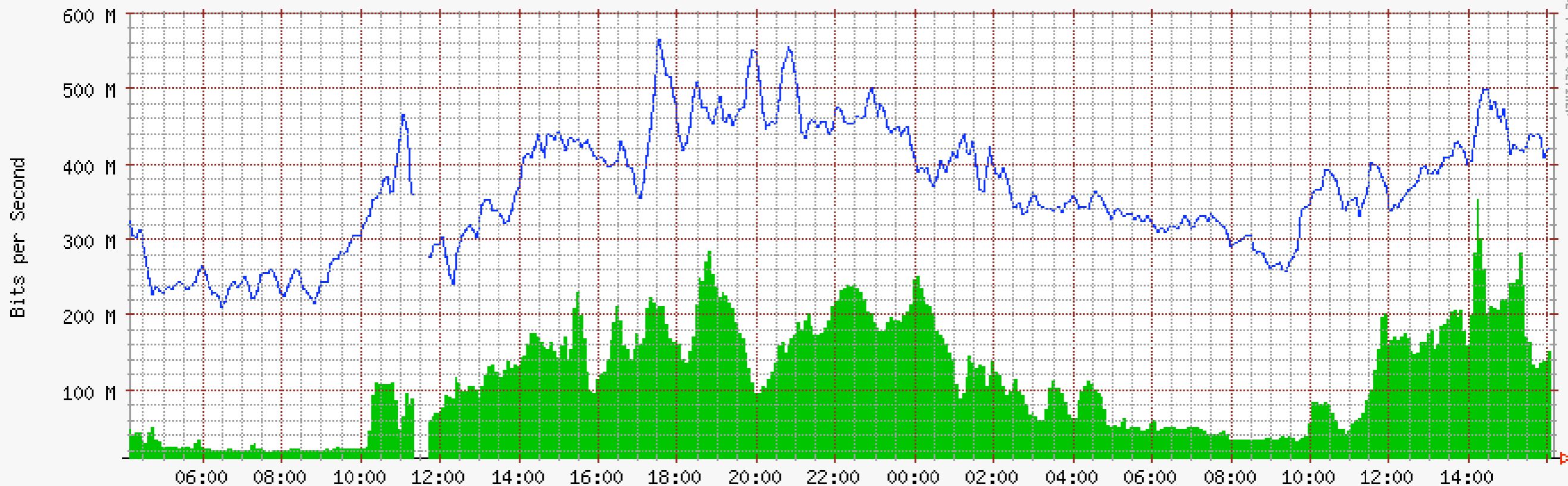




Versatel



Daily Graph (5 Minutes Average)



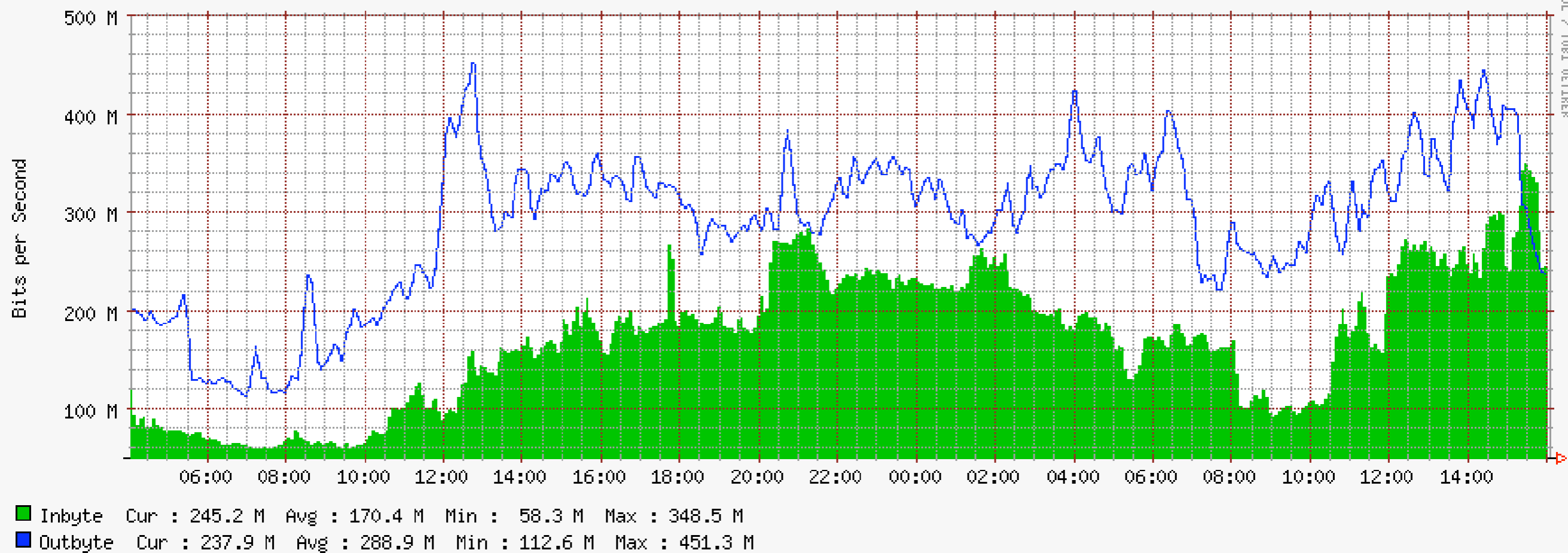
■ Inbyte Cur : 152.2 M Avg : 113.4 M Min : 17.9 M Max : 352.2 M
■ Outbyte Cur : 420.2 M Avg : 367.0 M Min : 210.1 M Max : 564.8 M



D-Hosting



Daily Graph (5 Minutes Average)

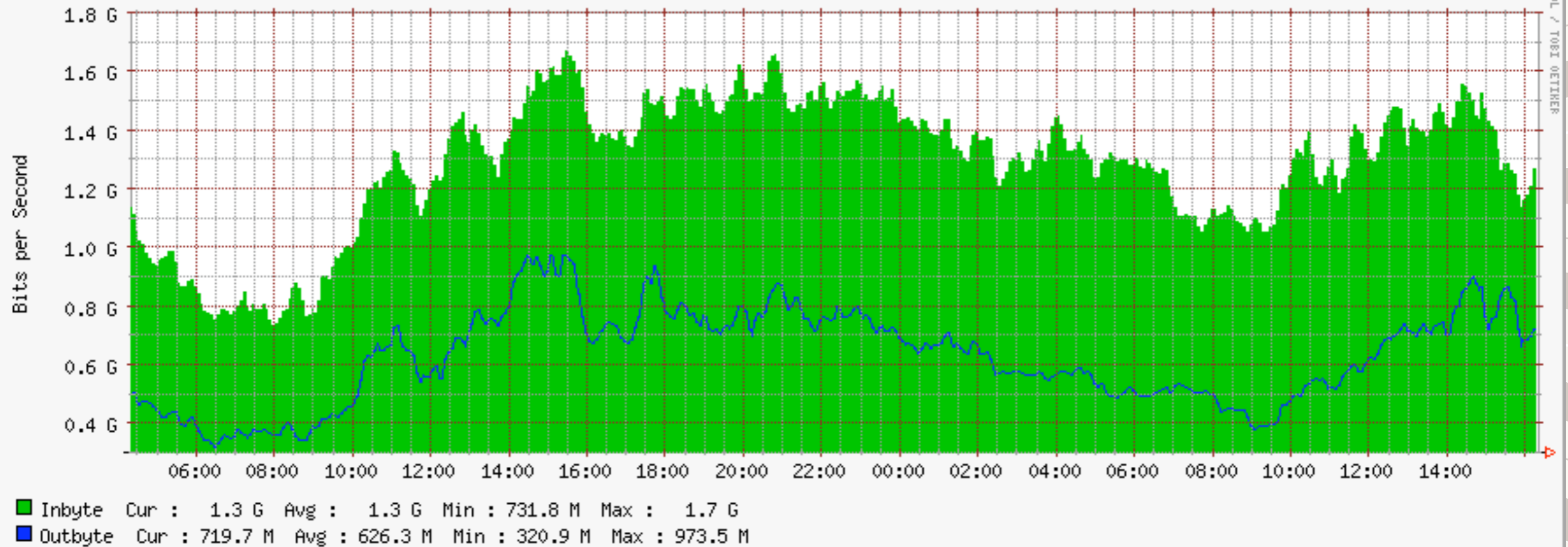




Total Uplink



Daily Graph (5 Minutes Average)





Issues

- Uplink per ISP > 1 GE physical Port
 - Balancing load over IP Uplink
 - Getting bigger Ports
- Core Router/Switch in BCC
 - No redundancy
- Core Routers Off Site
 - Simpler Setup
 - Taking down the network takes a few days
 - Insurance



Outlook



- CAMP 2007
 - Fiber to the Camp (FttC)
 - GE (10GE) IP Uplink
 - Distribution Layer





BCC Network Agenda



- Network Diagrams
- Catering for Special Interest Groups
- Hardware Used
- Outages and Other Trouble
- Pretty Graphs

<visitor>

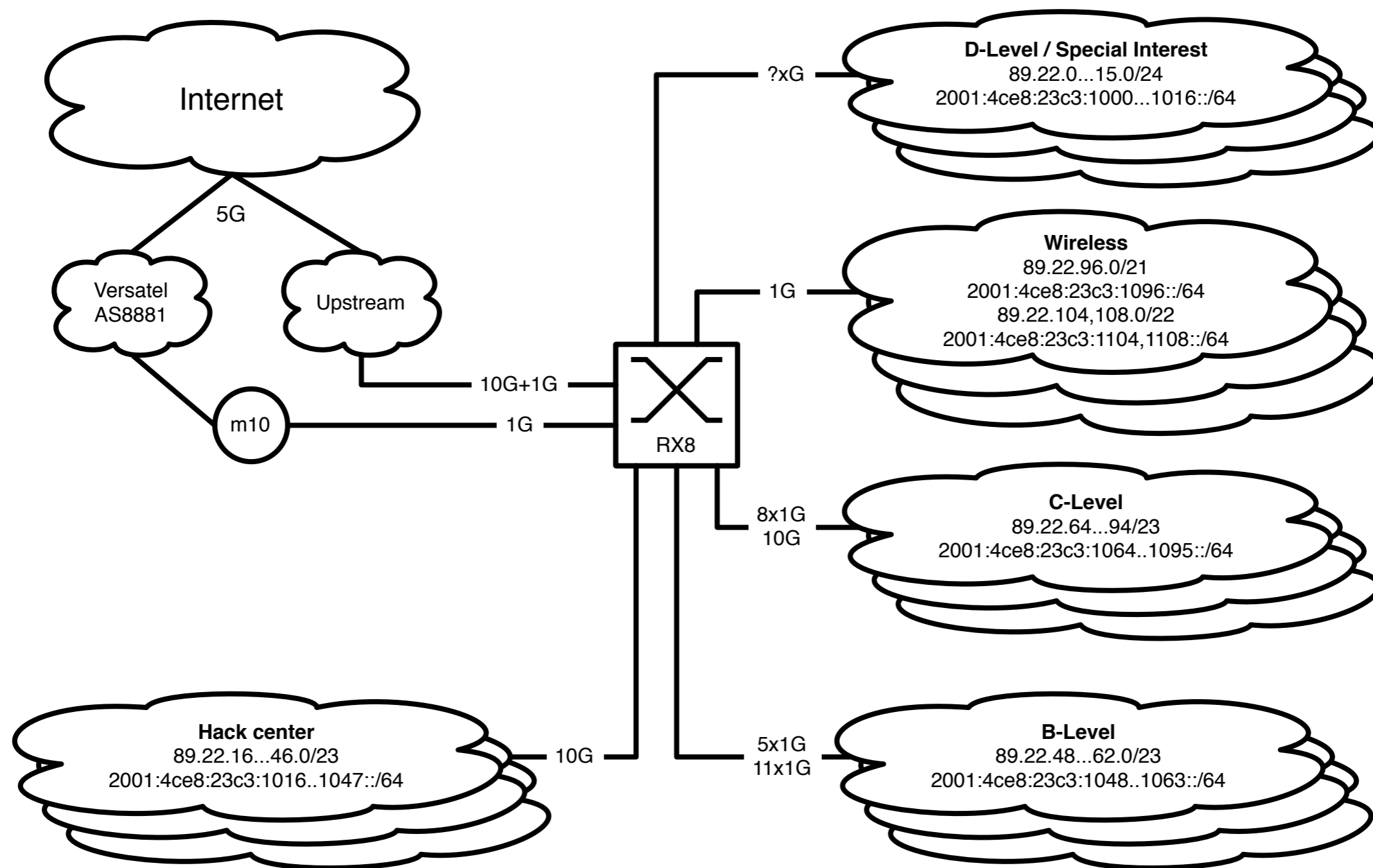


wireless or cable

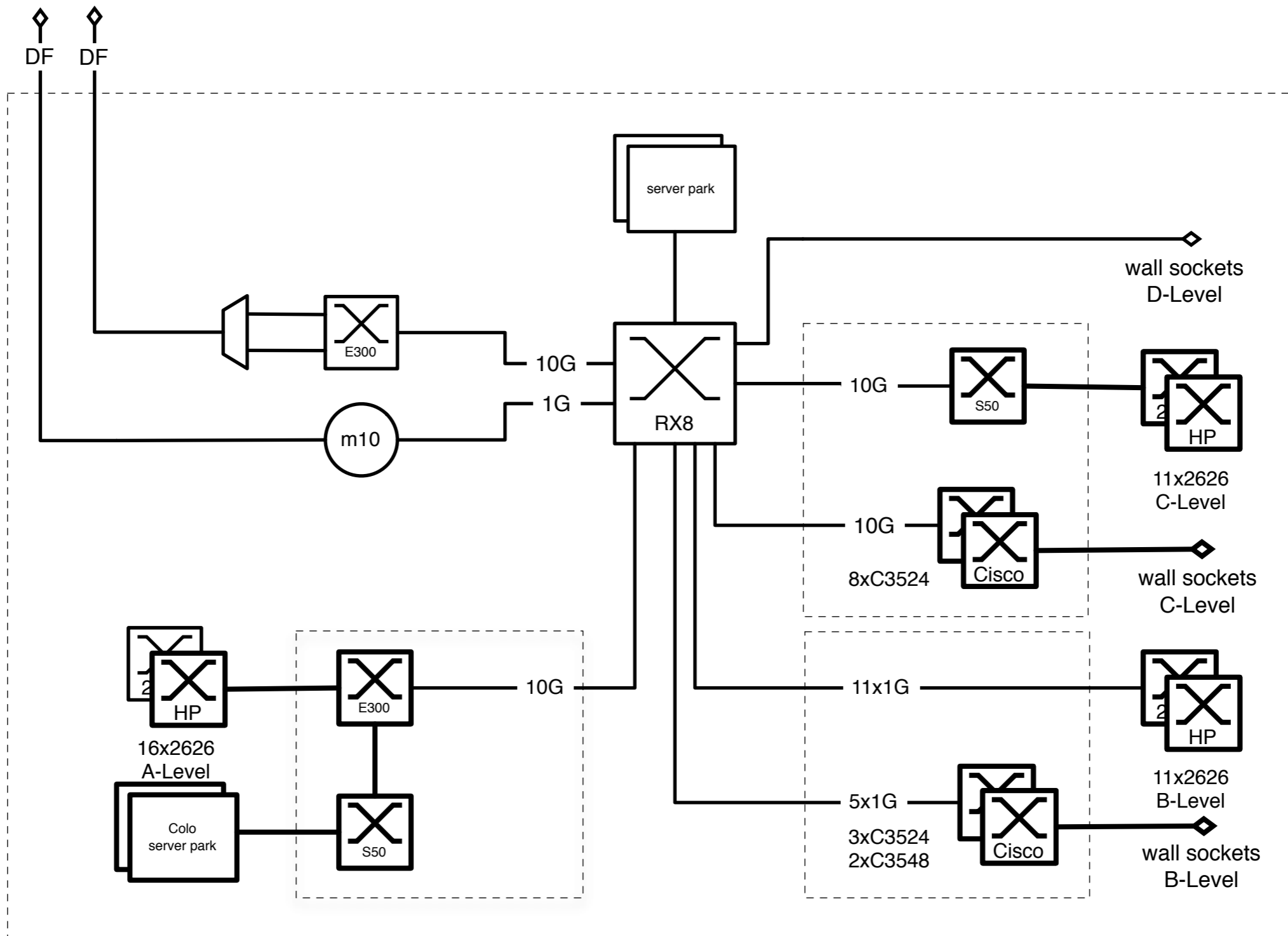


<internet>

Layer 9

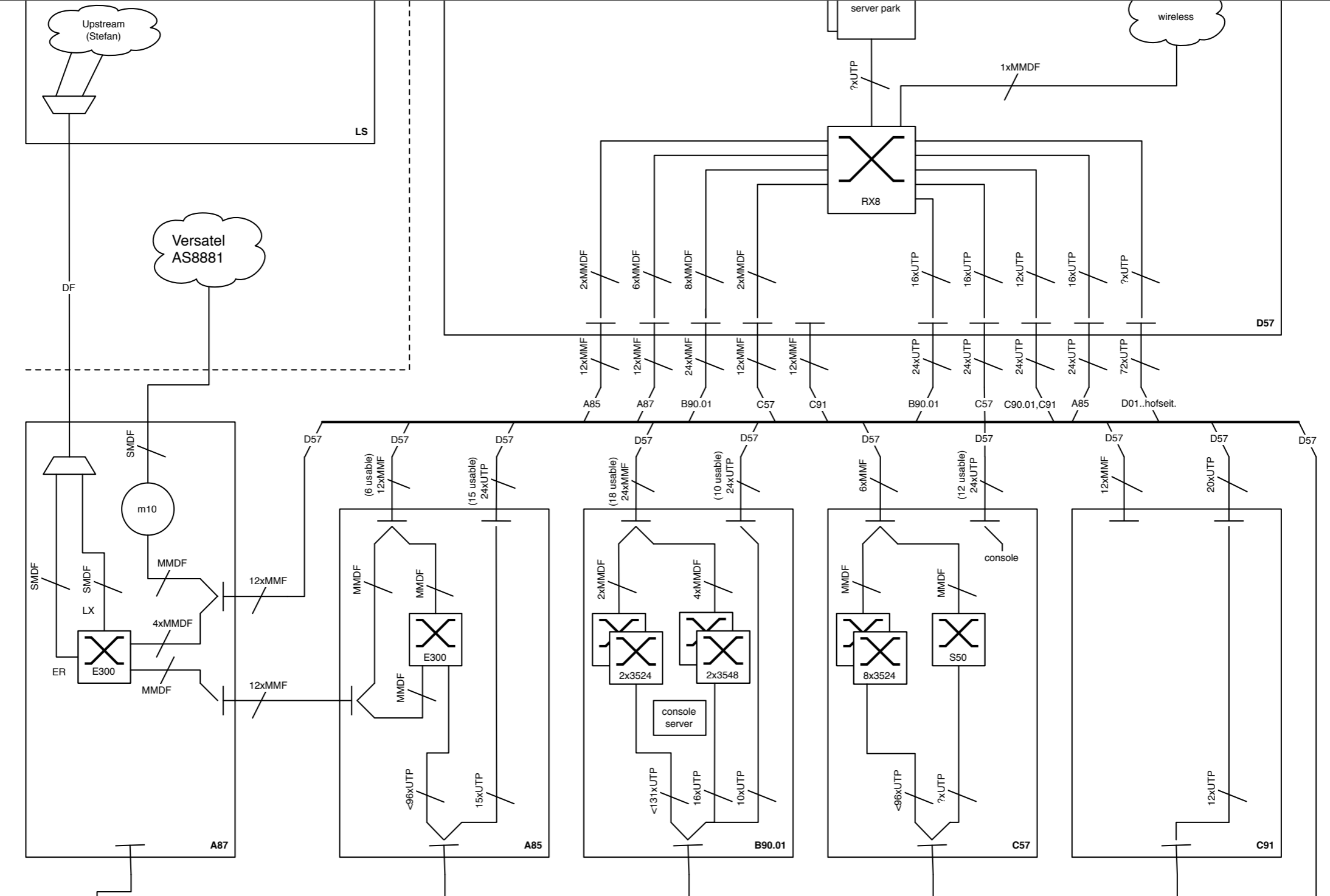


Layer 3



Layer 2

Layer 1



n	room	outl	sw	wl
2	B11			
2	A08			
10	N/C			

n	room	outl	sw	wl
12	A01			
28	A02			
4	A02.01			
6	A03			
6	A04			
6	A05			
6	A06			
4	A07			
6	A08			
2	A10			
4	A33			
6	A44	N/A		
2	A81			
4	B01.01			
8	B0.24			
16	N/C			

n	room	outl	sw	wl
36	B01			
4	B01.01			
6	B01.02			
5	B01.03			
56	B02			
4	B03			
6	B04			
1	B05			
1	B08	N/A		
12	B10			
2	B18	N/A		
2	B19	N/A		
4	B80	N/A		
4	B80.01	N/A		
2	B81	N/A		
8	B82	N/A		
10	B83	N/A		

n	room	outl	sw	wl
17	B05			
2	B05.01			
6	B06			
3	B07			
13	B08			
50	C01			
50	C02			
22	C19			
4	C51			
2	C54			
2	C83			
2	C84			
2	C85			
4	C86			
4	fassad.			
8	access.			

n	room	outl	sw	wl
6	C03			
6	C04			
66	C90	N/A		
52	D90	N/A		
38	N/C			

n	room	outl	sw	wl
4	C90.01			
4	D01			
4	D50			
4	D52			
6	D54			
6	D57			
34	kuppel			
2	dach			
1	alex.st.			
1	hofseit.			
10	N/C			



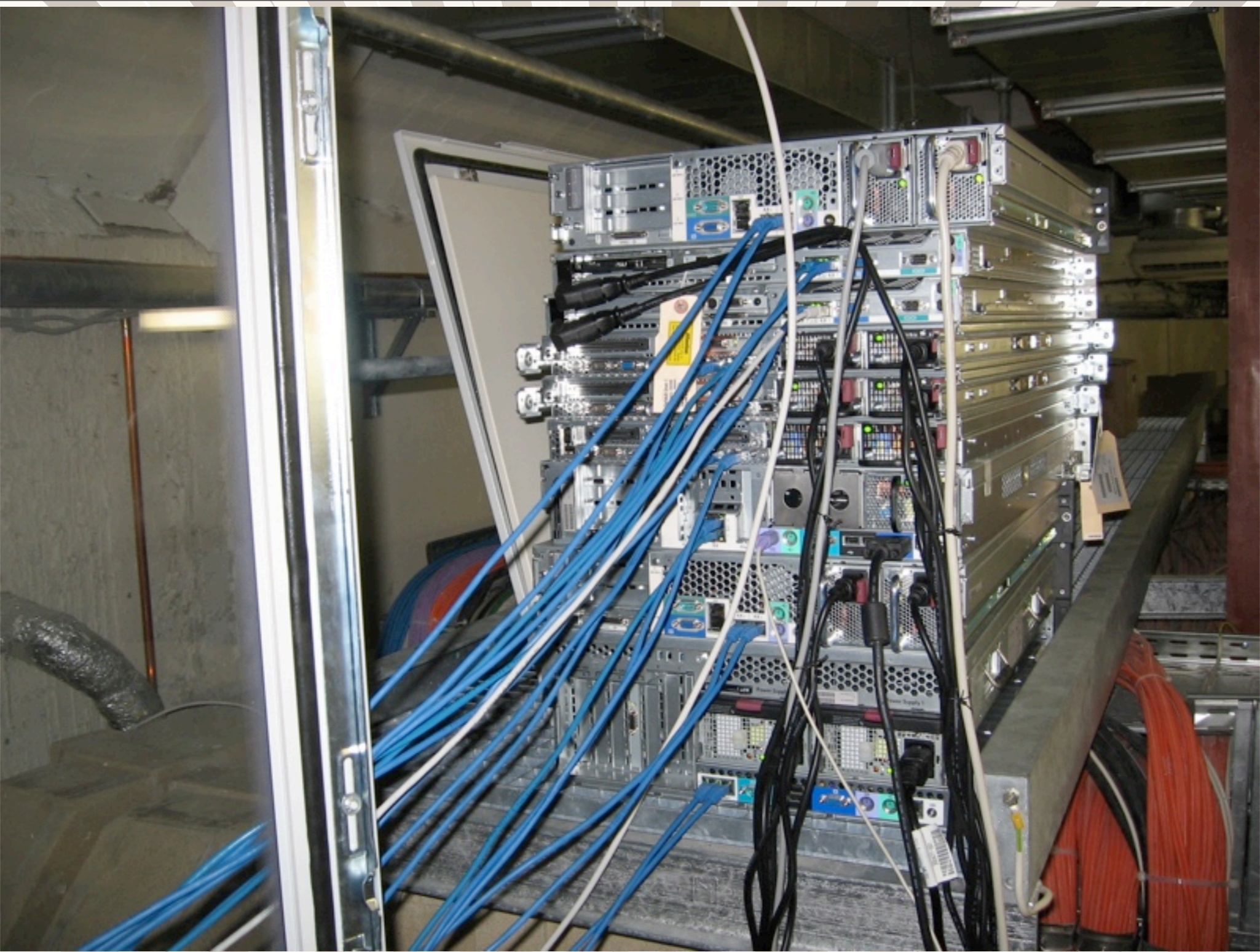
Special Interest Groups



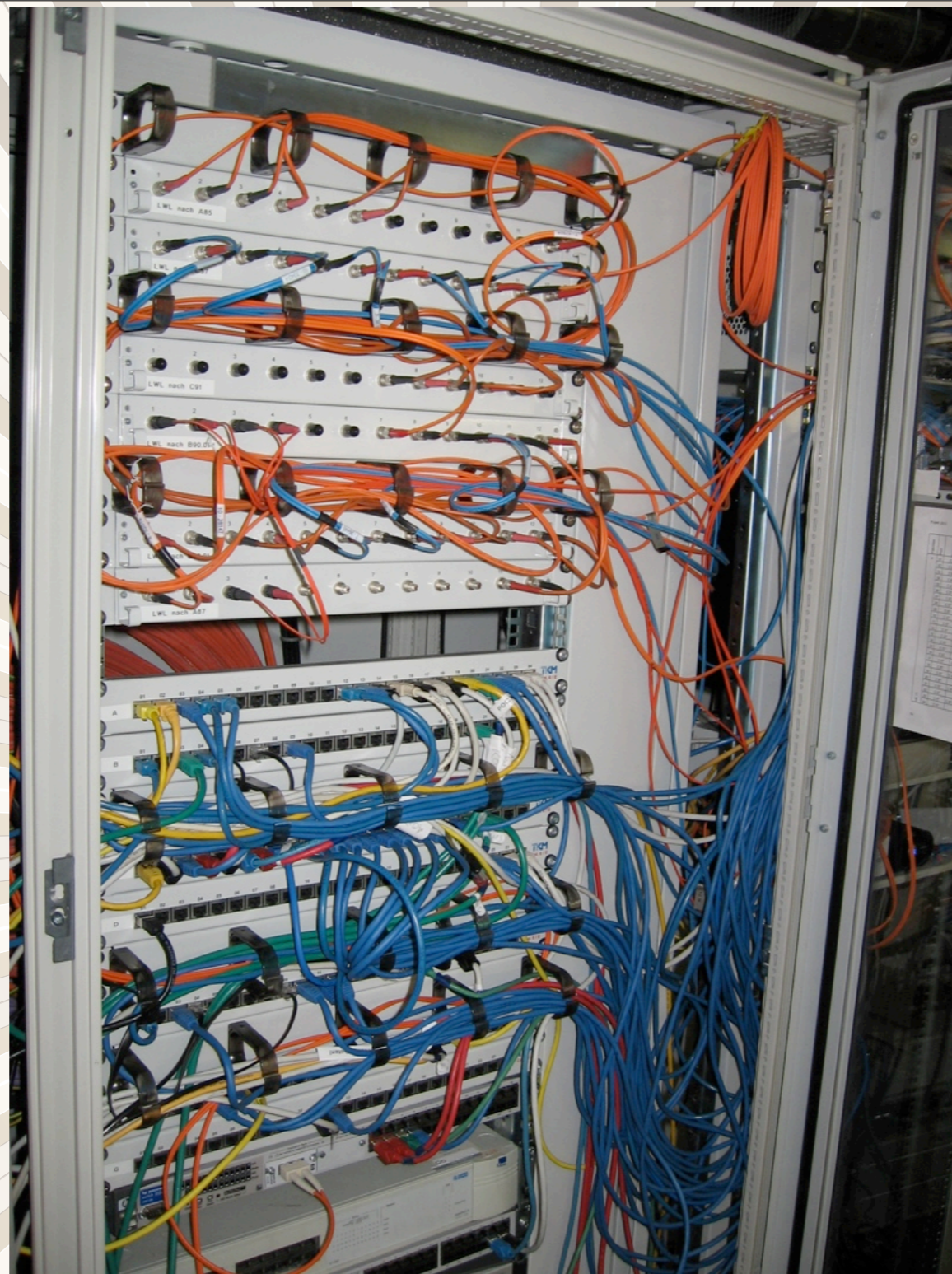
- Colocation
- Freifunk (OLSR)
- Sputnik (RFID)
- cbase fiber & wireless link



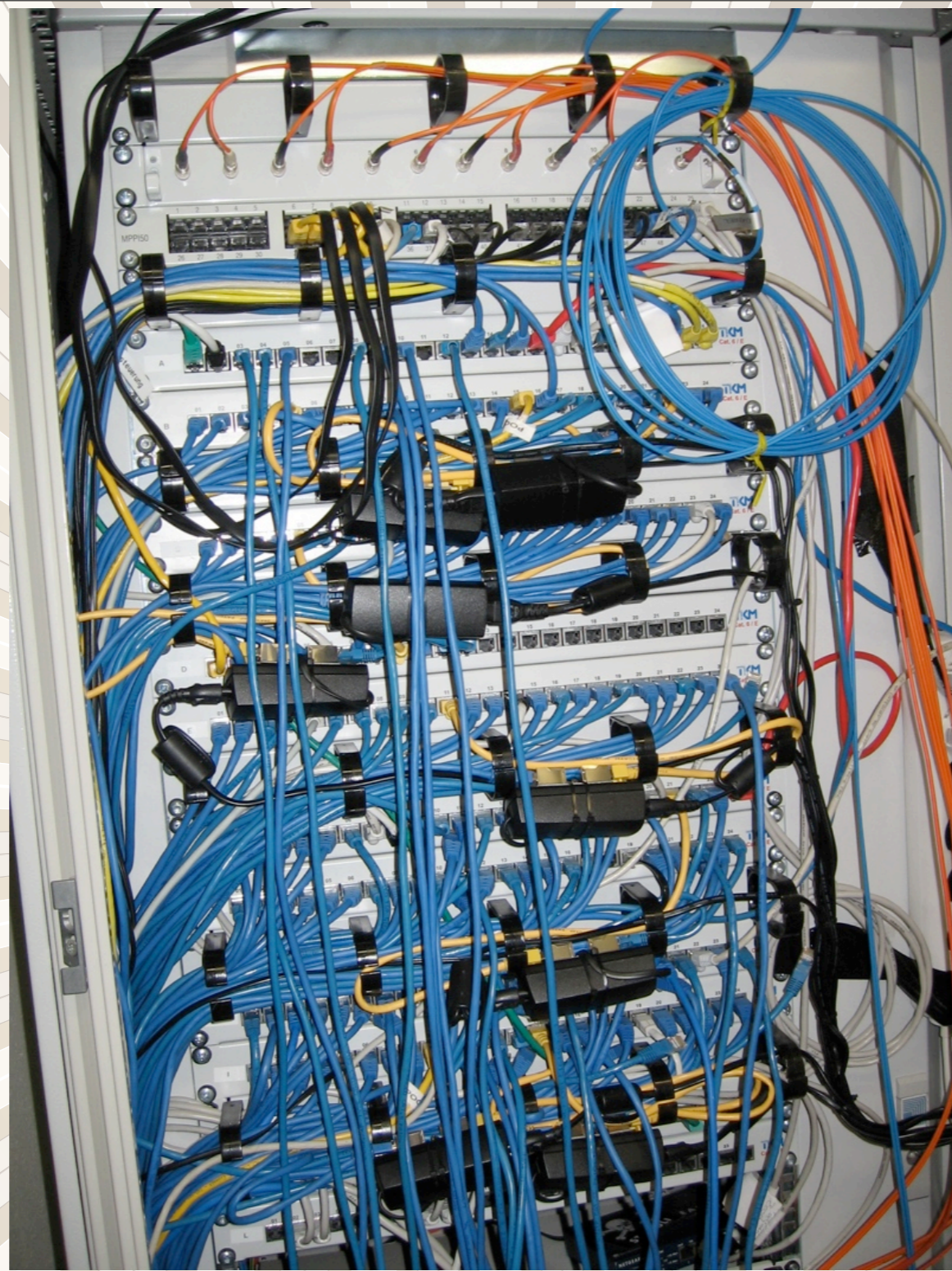
Colocation Area



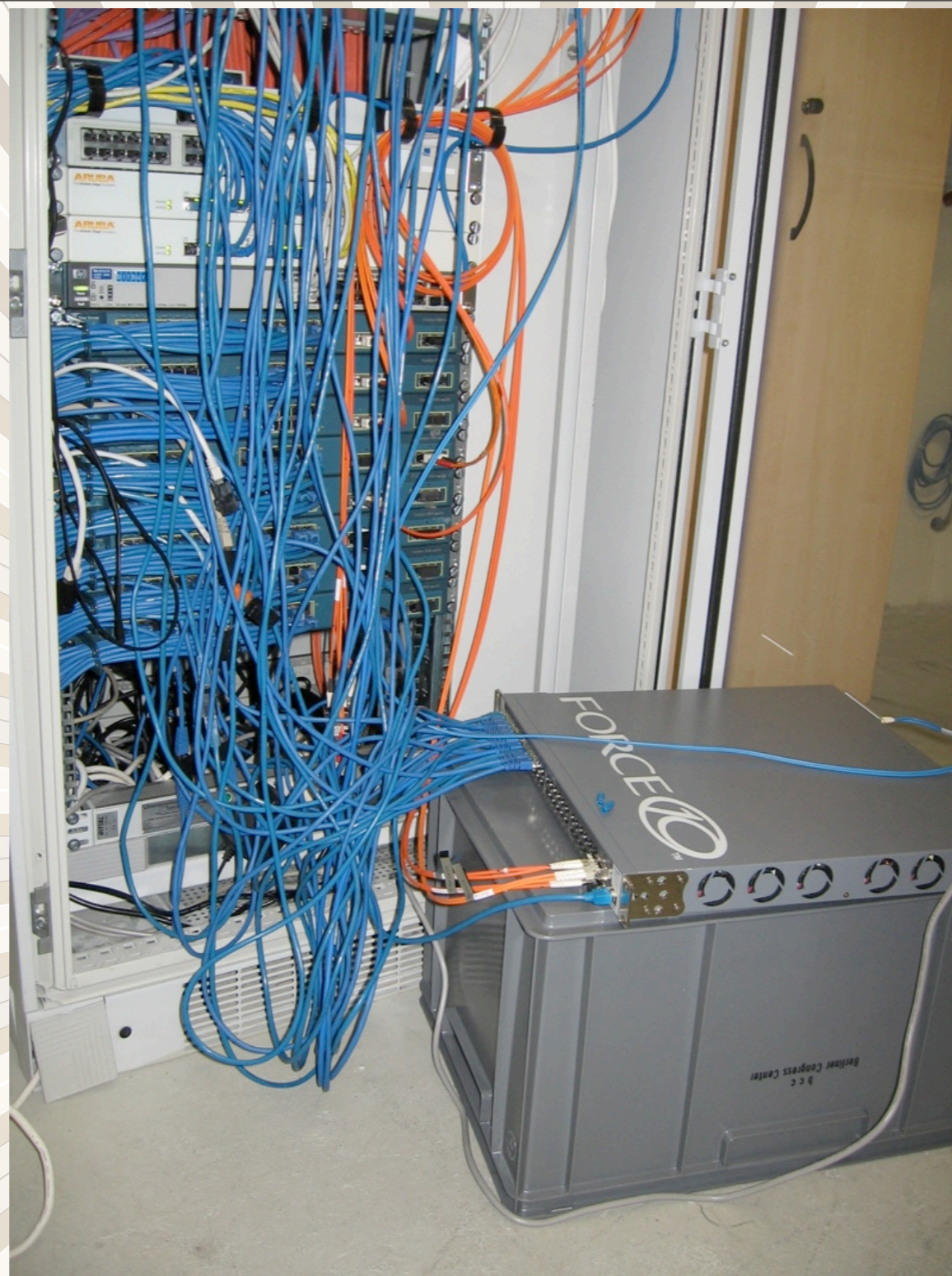
Server Park



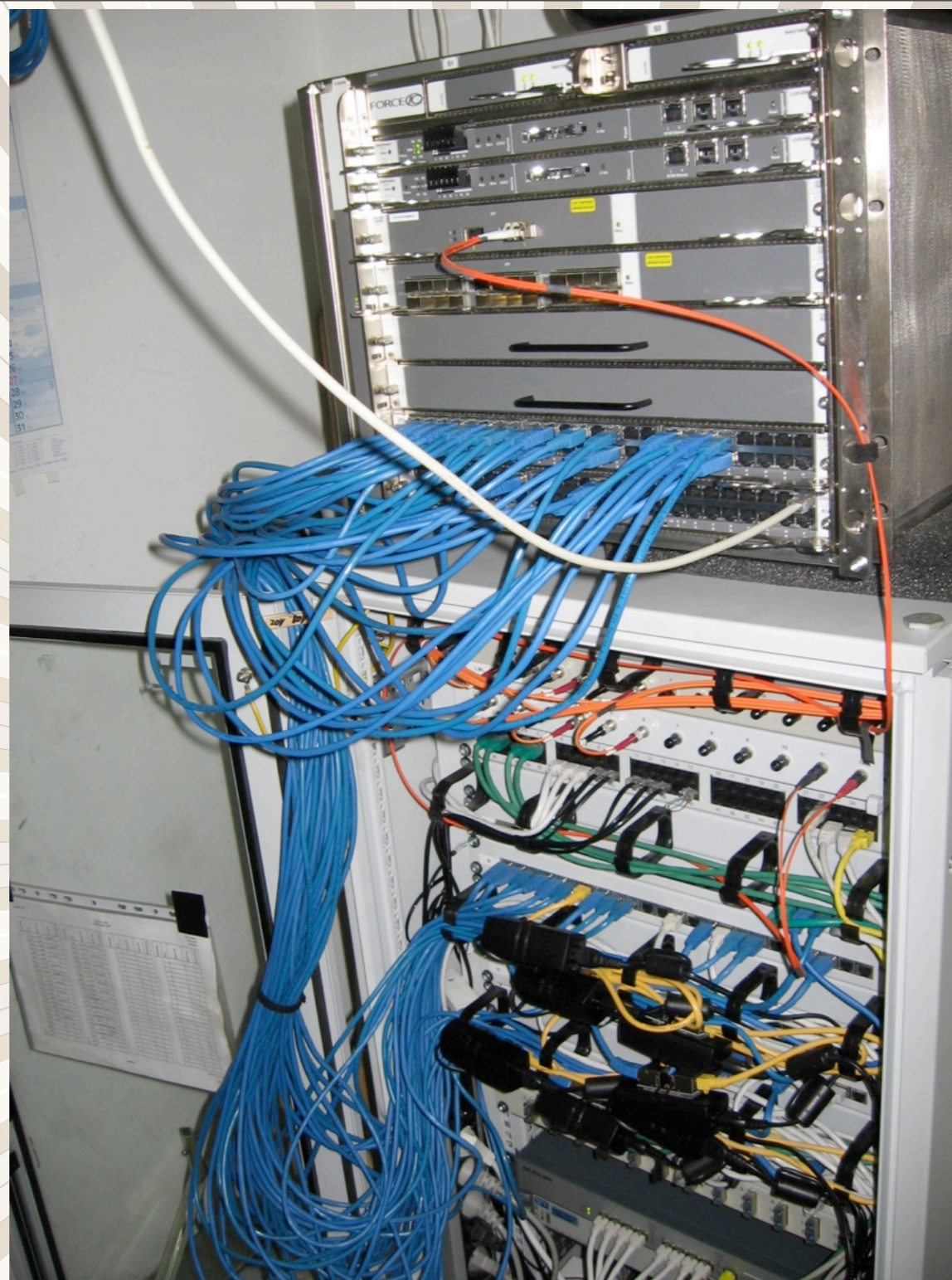
Patches D57



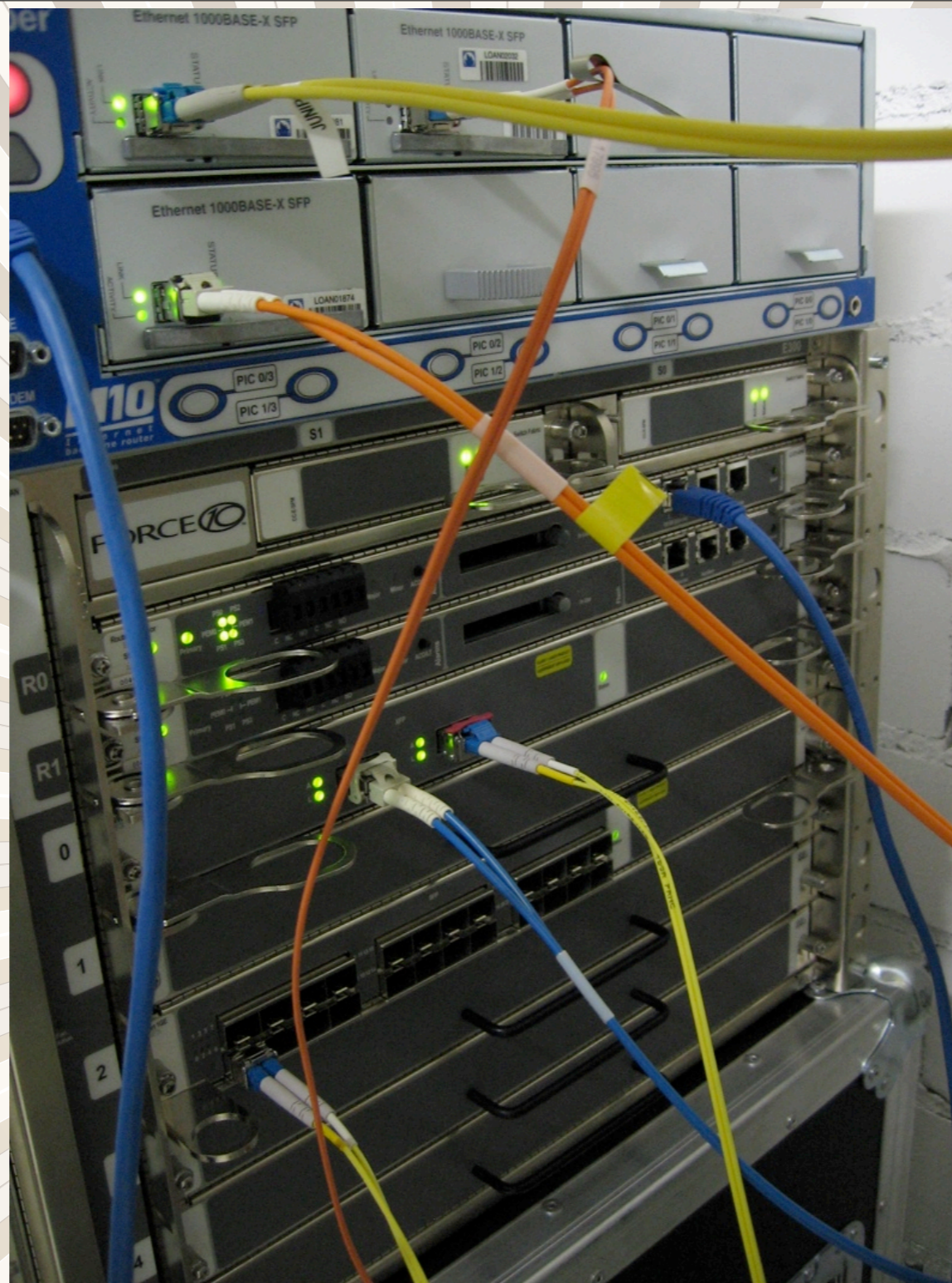
Patches C57



Patches C57



Patches A85



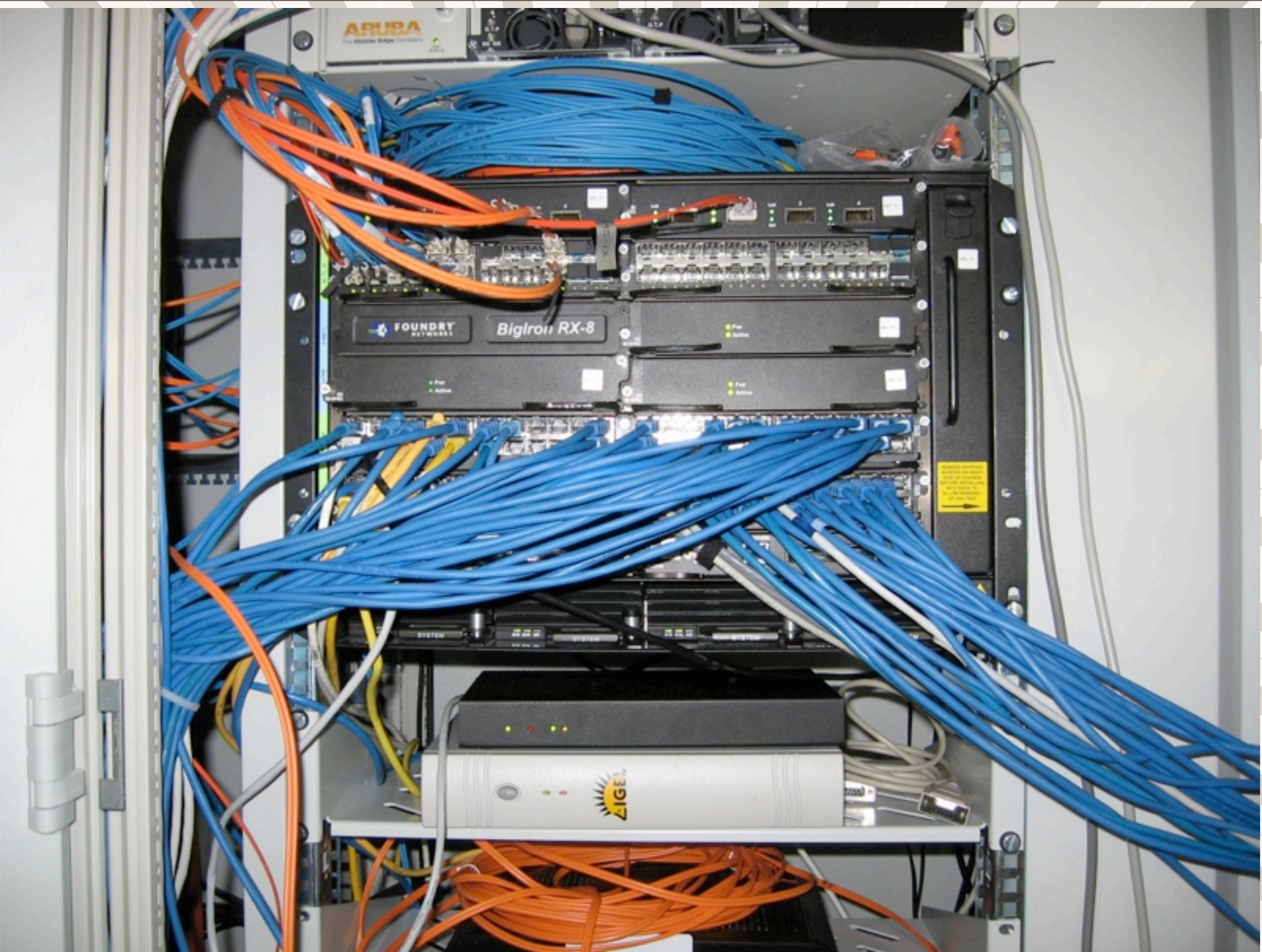
Network A87



Network A87 - CWDM



S50 The Movie



Core Router



Links



- 3 x 10GE-SR
- 1 x 10GE-ER
- 14 x 1000baseSX
- 1 x 1000baseLX
- ± 100 1000baseT
- ± 3,000 10baseT/100baseTX ports
- 1 x 10base2 coax



Issues & Outages



- Late Hardware Deliveries
 - Force I0
 - Servers

Datum/Zelt	Tätigkeit	Standort	Details
Dec 24, 2006	2:20 AM	Zugestellt	BERLIN DE FRANKFURT DE FRANKFURT DE FRANKFURT DE Sendung zur Freigabe bereit
	1:40 AM	In FedEx Station zur Abholung durch Empfänger bereitgehalten	
	12:42 AM	Bei FedEx Station eingetroffen	
	12:42 AM	Im Transit	
Dec 23, 2006	7:59 PM	FedEx Station verlassen	PARIS FR
	6:26 PM	Bei FedEx Station eingetroffen	PARIS FR
Dec 22, 2006	3:19 PM	Ausgangsort verlassen	FELTHAM GB
Dec 21, 2006	5:12 PM	Abgeholt	FELTHAM GB



Outages & Issues



- Core Router
 - Broken Switch Fabric Module
 - High CPU load on linecards
 - Out of IPv4 next-hop memory space



SFM



```
central-services#power-on snm 2
```

```
Power on SNM2.
```

```
rw_power_on_snm: write 000700ff to  
RW_MBRIDGE_CARD_POWER_OFF_REG
```

```
*** SNM 2 POST diags ***
```

```
FE 0 access passed;
```

```
FE 0 Serdes PRBS Loopback passed
```

```
FE 0 multicast distribution table passed
```

```
[...]
```

```
FE200 slot 0 fe 2 Serdes 60 prbs loopback failed
```

```
FE 1 multicast distribution table passed
```

```
FE 2 access passed;
```

```
Error:rw_power_on_snm: SFM POST diags failed for SNM 2
```

```
central-services#
```

```
SYSLLOG: Dec 28 22:28:44:<189>central-services, BGP Peer
```

```
2001:4ce8::3 DOWN (Hold Timer Expired)
```




LP CPU



```
SSH@central-services#show cpu lp
```

```
SLOT #:          LP CPU UTILIZATION in %:  
          in 1 second:   in 5 seconds:   in 60 seconds:   in 300 seconds:  
1:         25           25           23           24  
2:         19           22           22           19  
3:          7           9            9           11  
4:          1           1            1            1  
5:          3           4            3            2  
6:          3           3            3            4  
7:          1           1            1            1  
8:          4           3            3            3
```

```
SSH@central-services#
```



Nexthop



SAN		Company	AMSIX	Region	Benelux	
Contact	Niels Bakker	End User Company	AMSIX	End User Company SAN		End User Ticket #
Case Status	Closed	Priority	3			
Date Opened	28-Dec-2006	Last Update	28-Dec-2006	TAC Engineer		
Product	BI-RX-8	Code Version	2.3.01a			
Problem Description	I'm getting the below syslog message on an RX-8 that is running BGP and OSPFv2, and is forwarding IPv4 and IPv6 traffic out of numerous ports					
Problem Status	12/28 : System limitation supporting only 4K next hops. Customer will find a workaround with respect to this. Ok to close per customer.					
Close Description	12/28 : System limitation supporting only 4K next hops. Customer will find a workaround with respect to this. Ok to close per customer.					
Bug ID						

INFO: Out of nexthop entries for path count 1 on slot 2.



Nexthop



```
SSH@central-services#rconsole 1
```

```
Connecting to slave CPU 1/1... (Press Ctrl-Shift-6 X to exit)
```

```
rconsole-1/1@LP>ena
```

```
No password has been assigned yet...
```

```
rconsole-1/1@LP#sh ip nexthop
```

Paths	Total	Free	In-use
1	2816	0	2816
2	512	0	512
4	512	0	512
8	256	0	256



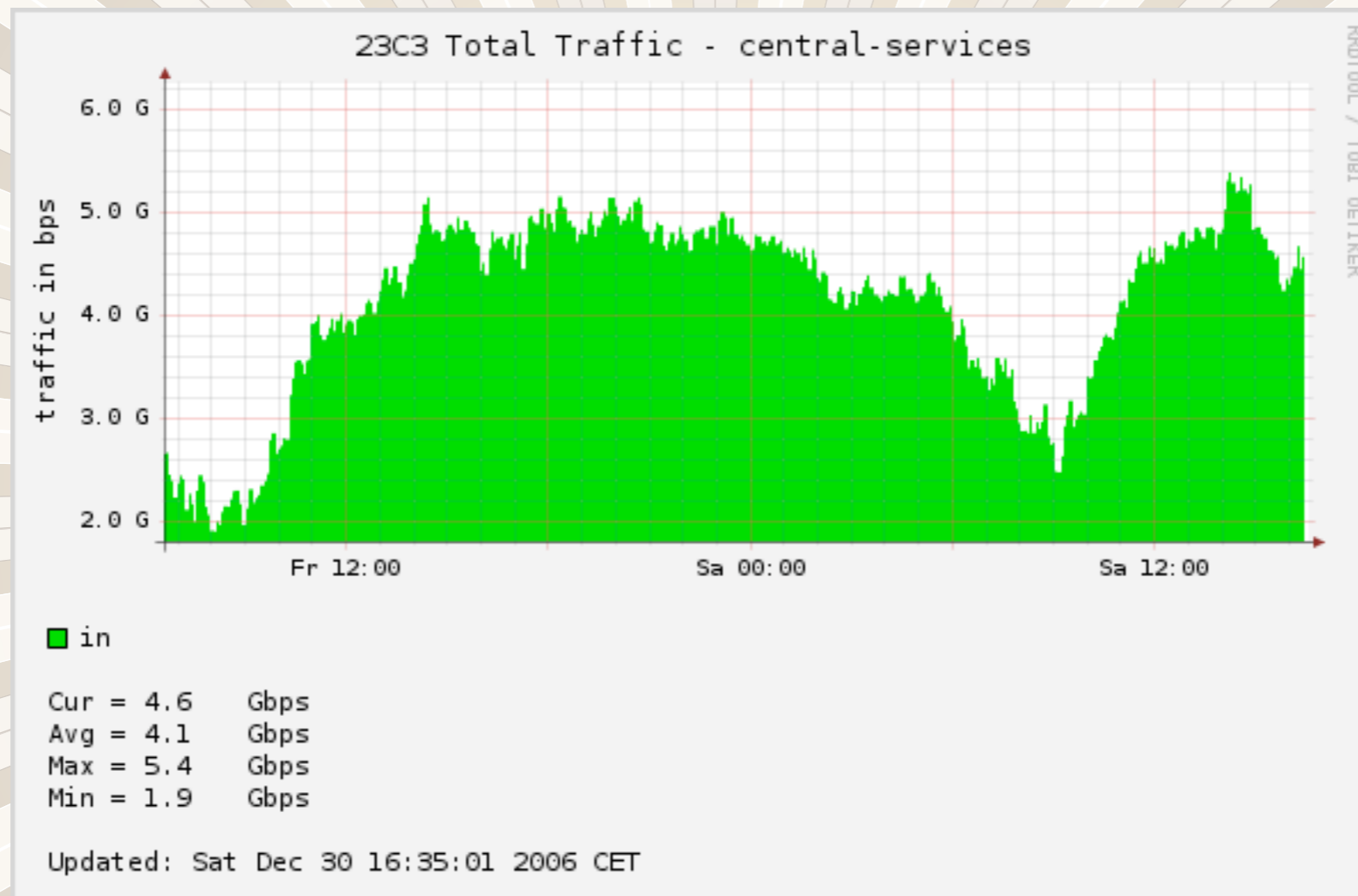
Nexthop



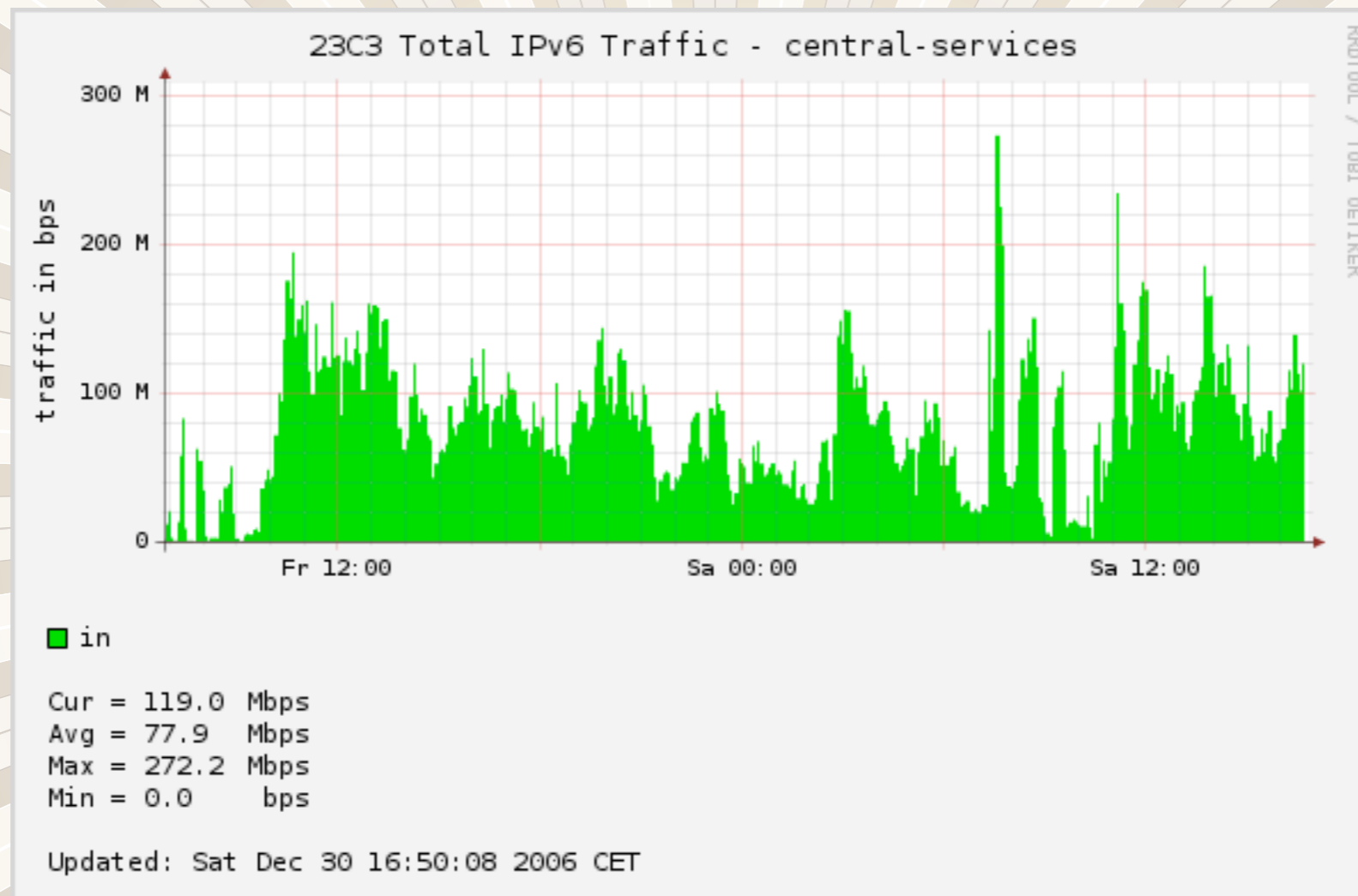
- Workaround: Kill ARP sponge to free up resources on all linecards
- Conversation with supplier is ongoing

```
rconsole-1/1@LP#sh ip next
```

Paths	Total	Free	In-use
1	2816	894	1922
2	512	510	2
4	512	508	4
8	256	240	16



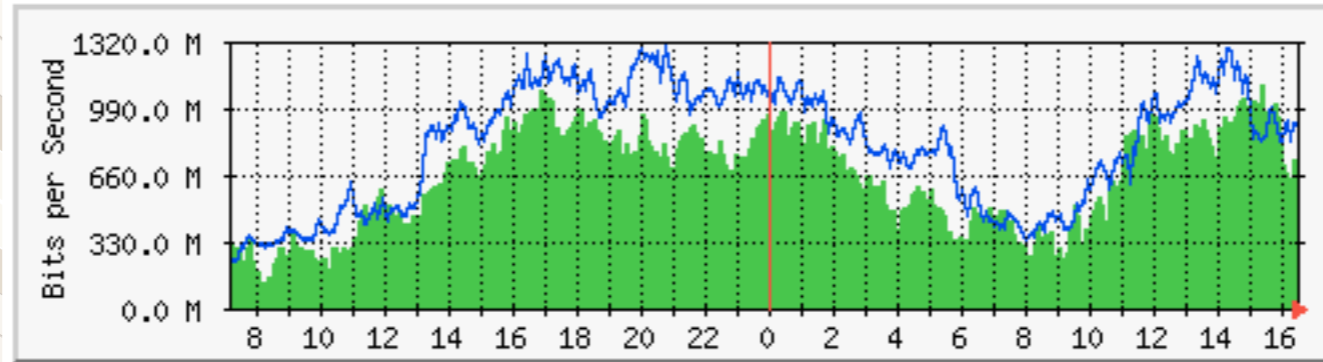
Graphs! - Core Traffic



Graphs! - IPv6

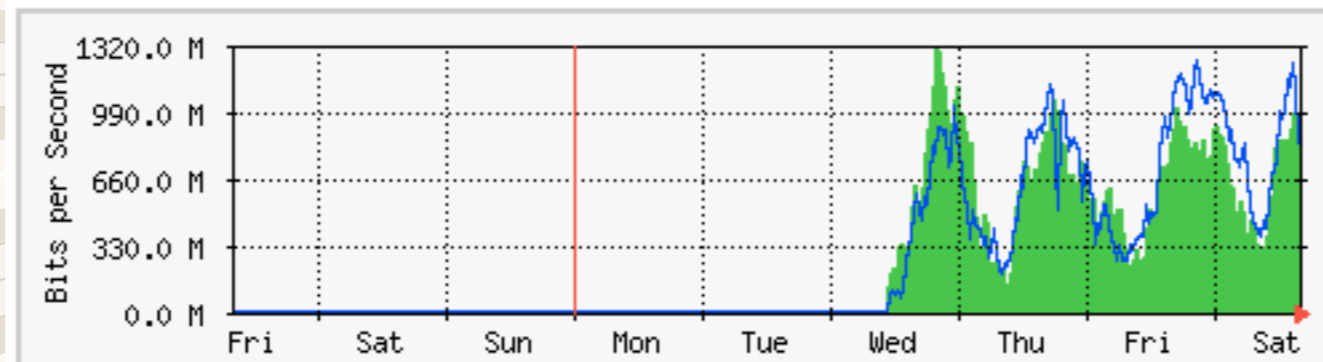
The statistics were last updated **Saturday, 30 December 2006 at 16:30**,
at which time 'jamesbrown' had been up for **5 days, 2:23:20**.

'Daily' Graph (5 Minute Average)



	Max	Average	Current
In	1102.8 Mb/s (11.0%)	639.3 Mb/s (6.4%)	731.9 Mb/s (7.3%)
Out	1282.1 Mb/s (12.8%)	808.1 Mb/s (8.1%)	919.3 Mb/s (9.2%)

'Weekly' Graph (30 Minute Average)



	Max	Average	Current
In	1319.7 Mb/s (13.2%)	622.5 Mb/s (6.2%)	946.0 Mb/s (9.5%)
Out	1238.4 Mb/s (12.4%)	664.8 Mb/s (6.6%)	900.2 Mb/s (9.0%)

Graphs! - A Level

Total Upstream BW

System: A bunch of really fast routers

Maintainer: The Amazing NOC

Description: Total Upstream BW

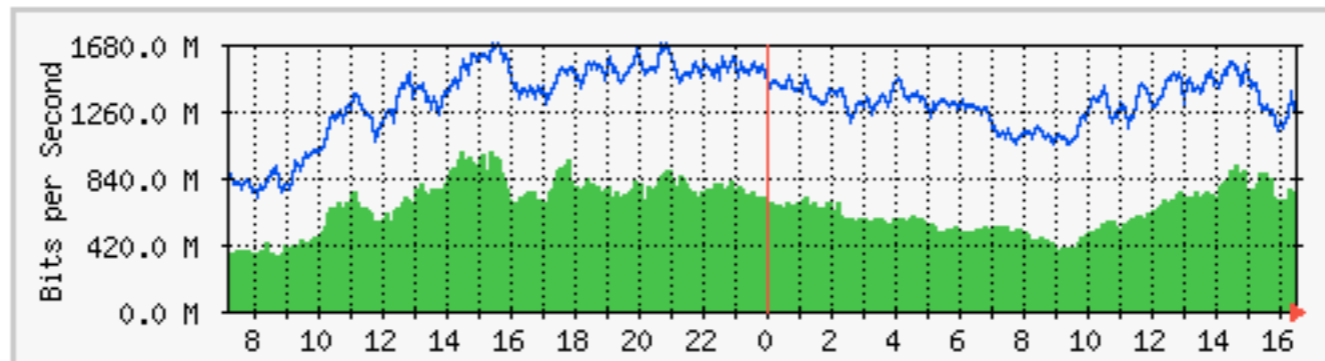
ifType:

ifName:

Max Speed: 5.0 Gbits/s

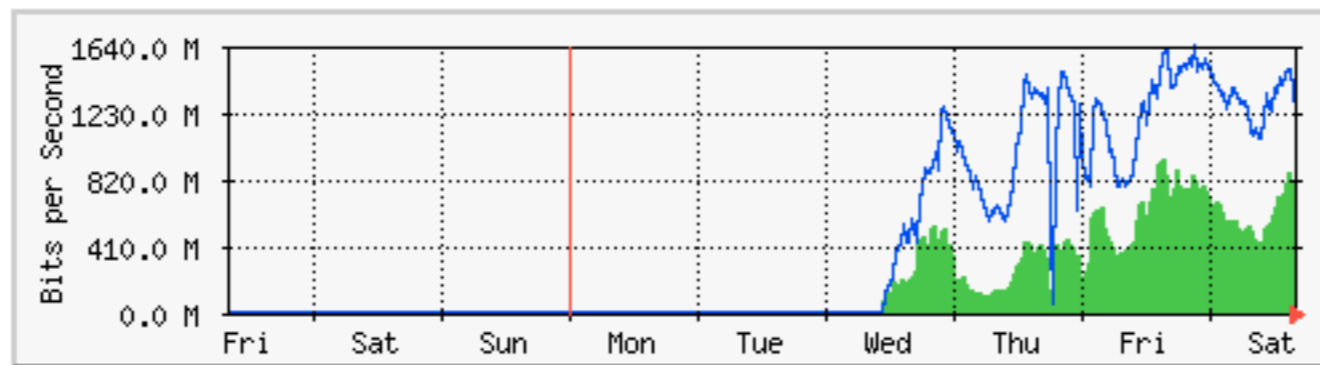
The statistics were last updated **Saturday, 30 December 2006 at 16:30**

'Daily' Graph (5 Minute Average)



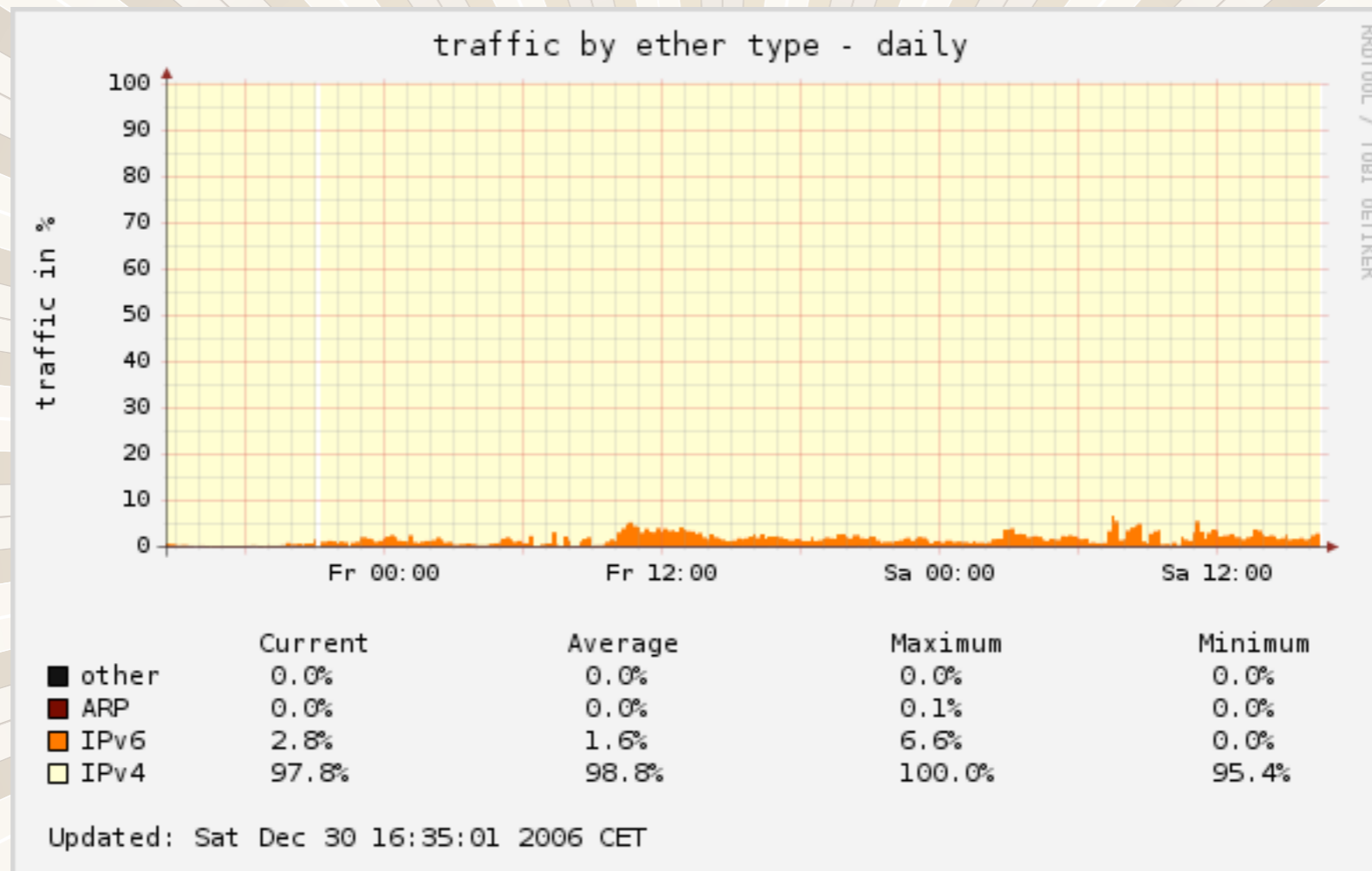
	Max	Average	Current
In	1003.4 Mb/s (2.0%)	646.5 Mb/s (1.3%)	741.1 Mb/s (1.5%)
Out	1675.1 Mb/s (3.4%)	1318.3 Mb/s (2.6%)	1230.2 Mb/s (2.5%)

'Weekly' Graph (30 Minute Average)



	Max	Average	Current
In	945.2 Mb/s (1.9%)	446.9 Mb/s (0.9%)	764.7 Mb/s (1.5%)
Out	1624.6 Mb/s (3.2%)	1075.4 Mb/s (2.2%)	1214.8 Mb/s (2.4%)

1003 Mbps incoming
1675 Mbps outgoing



Peak Traffic IPv6: 6.6%





Wireless LAN 23C3

Agenda



- 22C3 Recall
- Preparation & Design
- Topology
- Performance & Security
- Monitoring for Station Troubleshooting
- Statistics
- Outlook 2007 & Thanks...



Wireless LAN 22C3 Recall



- 36 Single Mode Access Points
- Low density 802.11a
- 2400 Aruba Switch = 512 Max Users
- User peak 509 != Average 350
- Performance Issues (QoS)
- Rogue Access Points



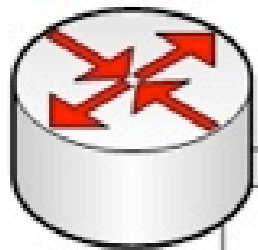
Wireless LAN 23C3

Preparation & Design



- Location Planning
 - Autocad
- Backbone Design
 - Separation
- QoS
 - Snort, Shaping
- Security
 - ACL, Fuzzying, Load tests

D57



Uplink Router D57

Gigabit Ethernet NOC Server VLAN

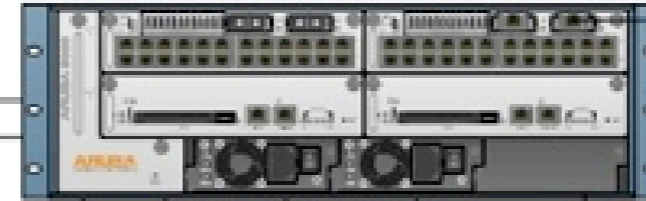


Snort.congress.ccc.de

Wireless LAN Uplink VLAN (Trunk) Table		
VLAN-ID	SSID	Link Type
1096	23C3_DHCP	802.11b/g
1104	23C3_DHCPa	802.11a
1108	23C3_FIXIP/FIXIPa	802.11a/b/g

Fast Ethernet - NOC Mgmt VLAN
Gigabit Ethernet - Uplink VLAN Trunk

GigE - Snort VLAN



PoE - AP VLAN



C 57

PoE - AP VLAN



15x AP abg

Gigabit Ethernet - AP & MGMT VLAN Trunk



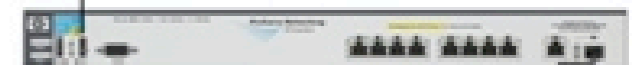
Gigabit Ethernet - AP & MGMT VLAN Trunk

Gigabit Ethernet - AP & MGMT VLAN Trunk



8x AP abg

B 90.01



Gigabit Ethernet - AP & MGMT VLAN Trunk

A 85

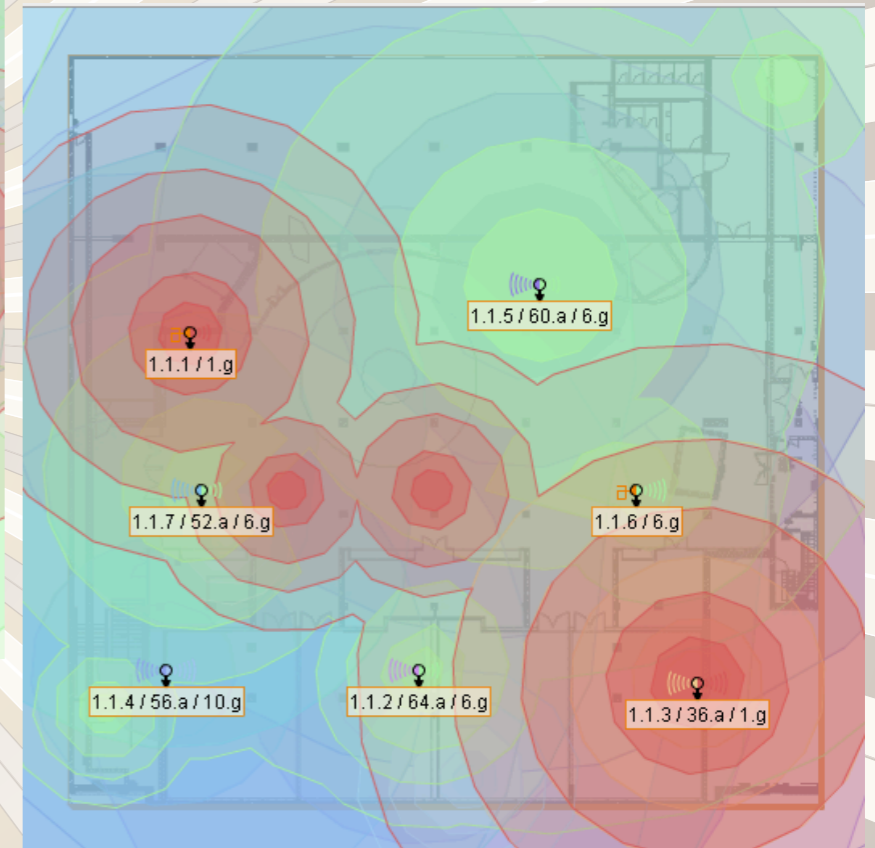
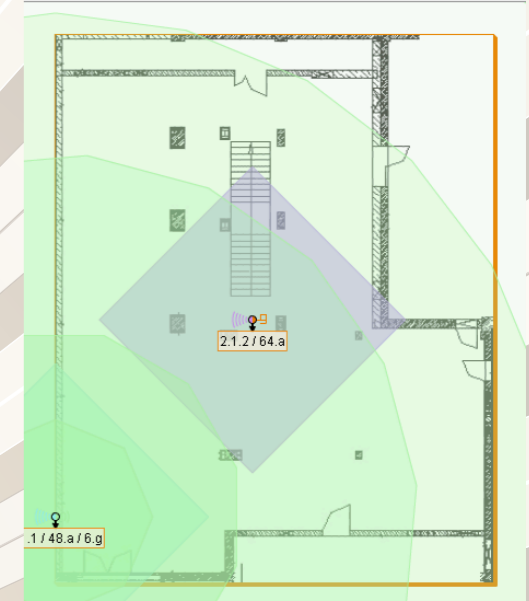
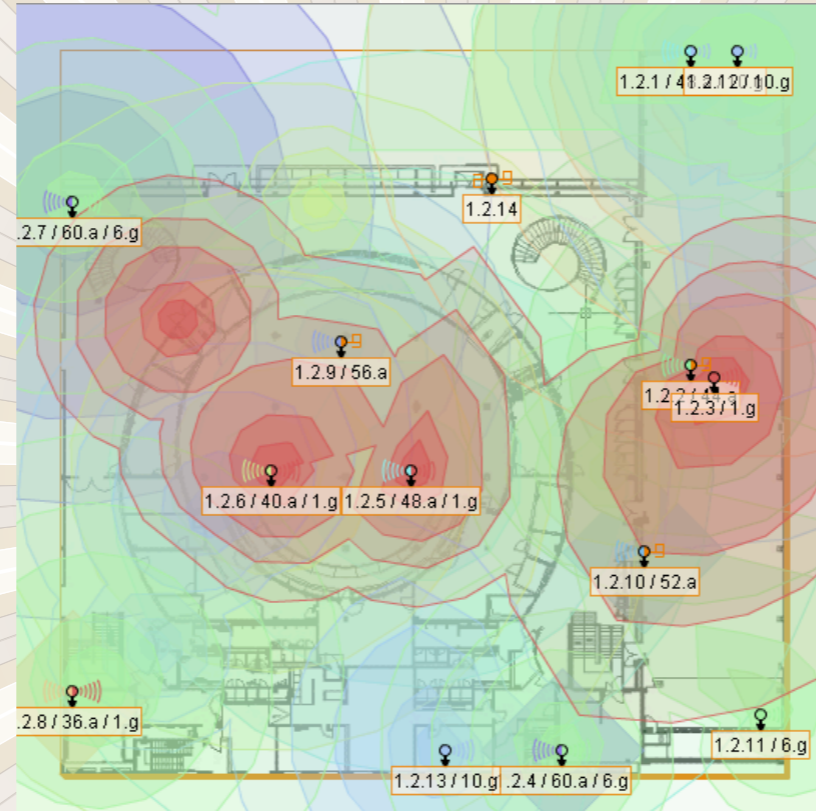
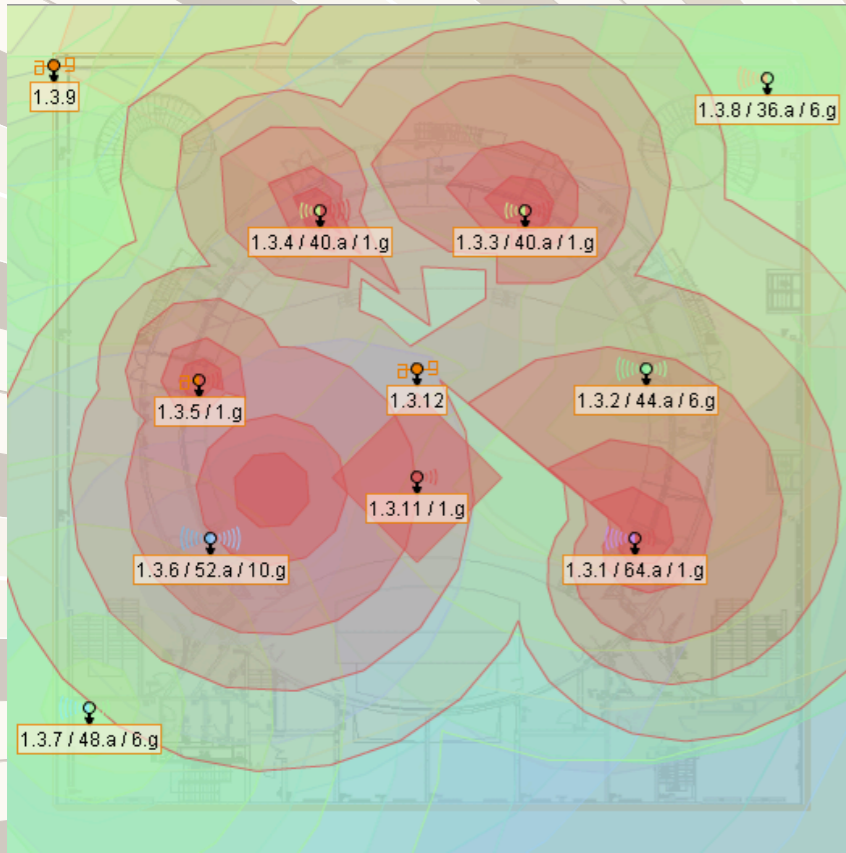
PoE - AP VLAN



8x AP abg



Layer 2 Backbone
23C3 Wireless LAN



Wireless LAN 23C3 Topology



Wireless LAN 23C3 Setup

802.11 Performance



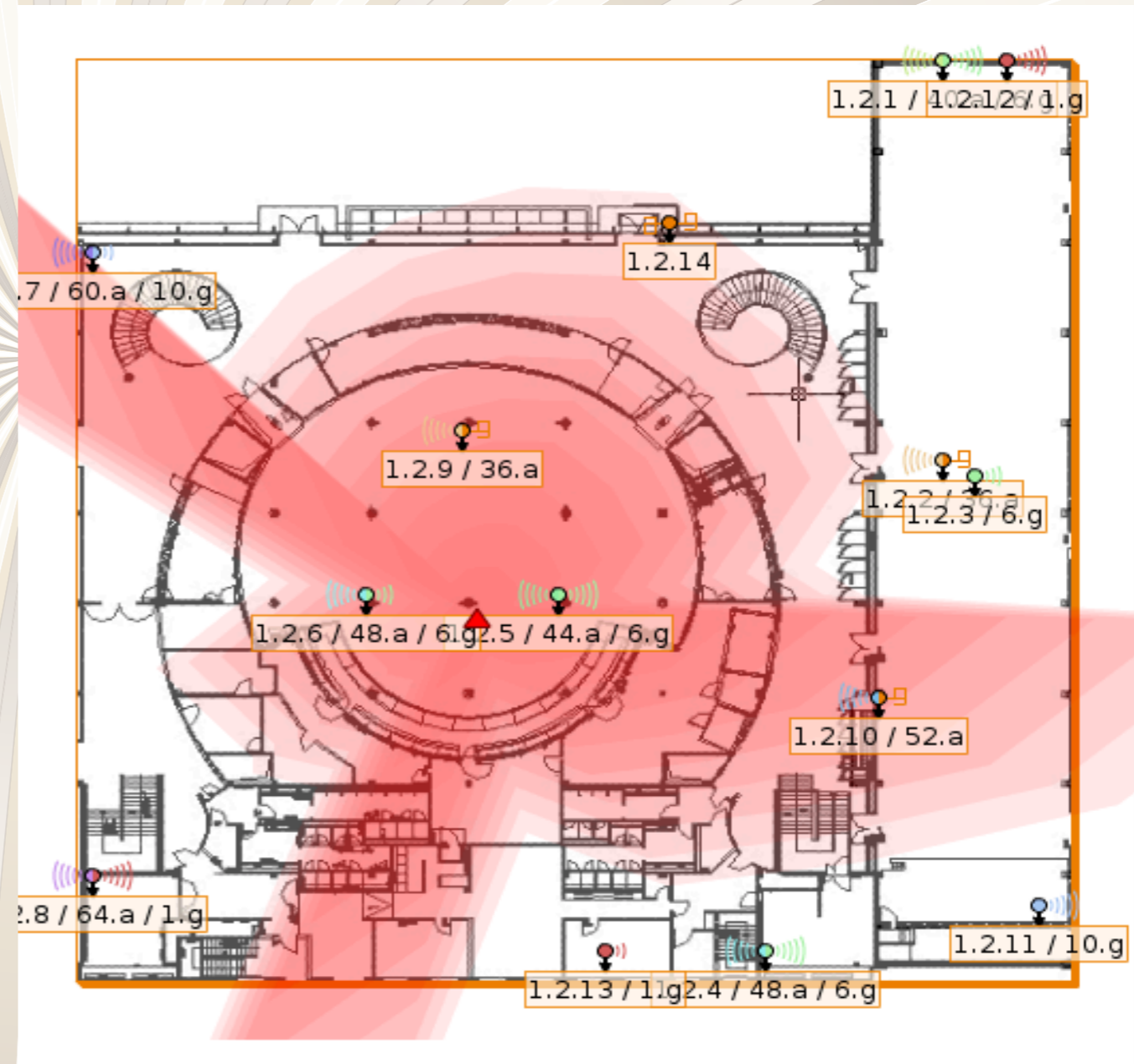
- Calibration
- Channel Setup
- Load Balancing
- Traffic Shaping



Wireless LAN 23C3 Security



- Access Lists
- L2 Frame Monitoring
- Rogue AP prevention
- Gateway protection





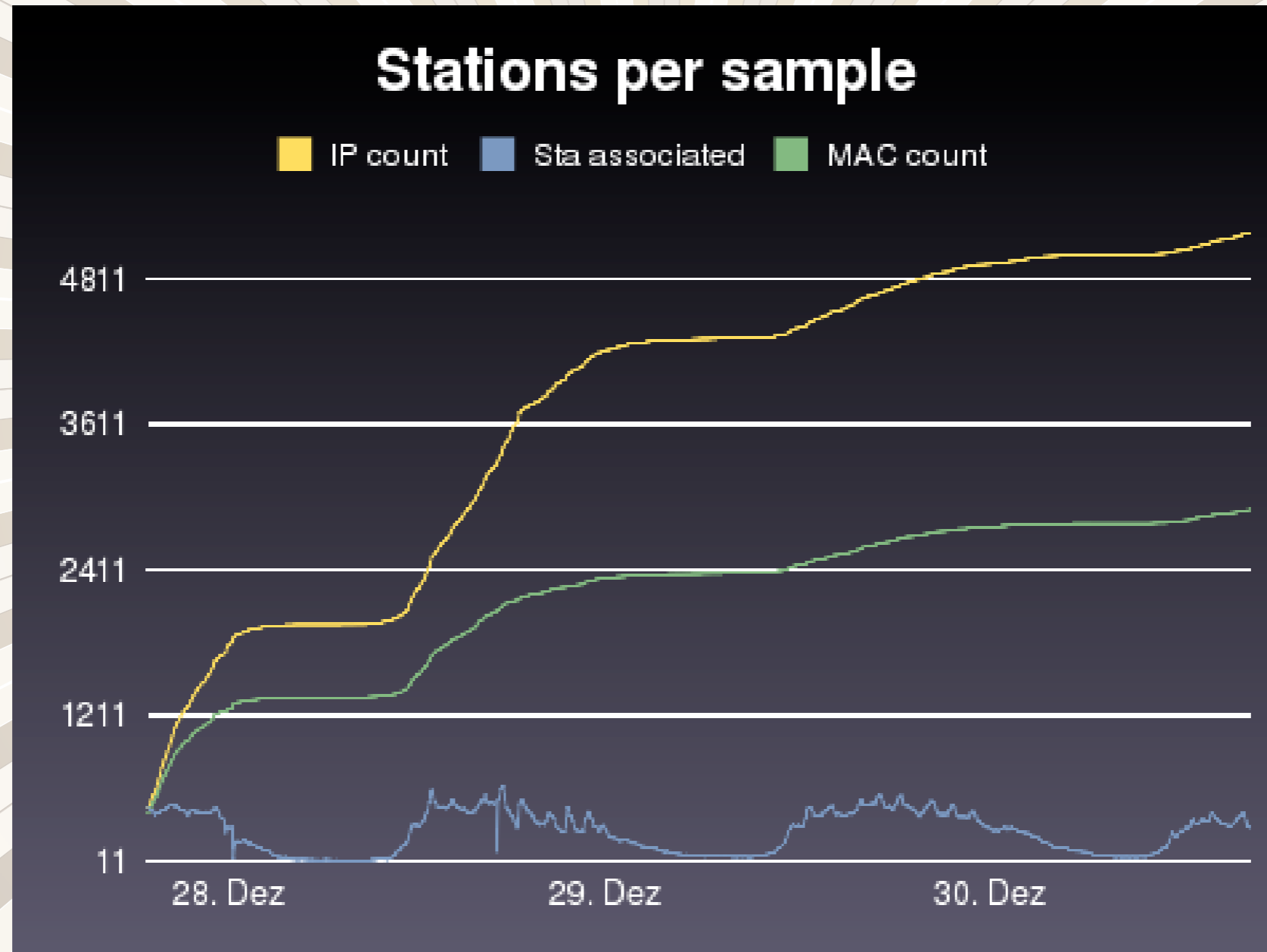
Monitoring for Troubleshooting





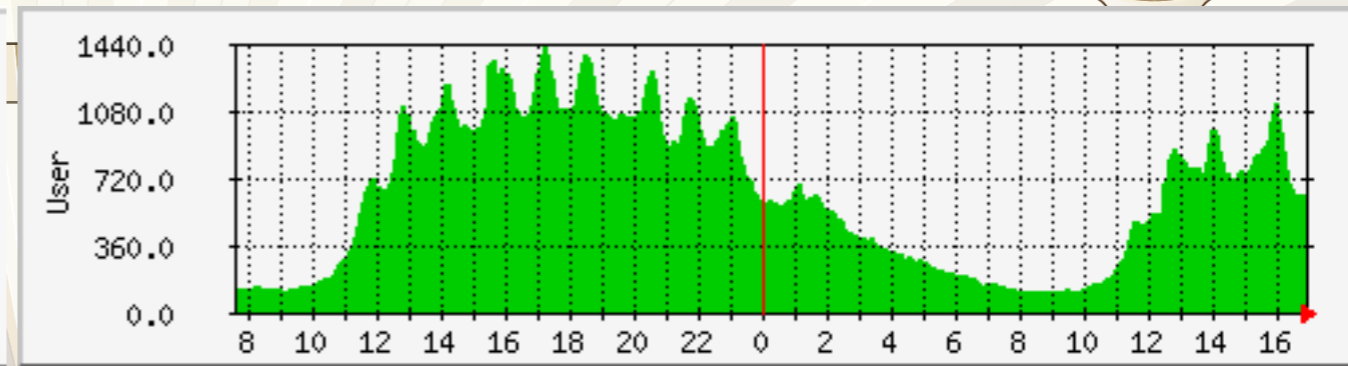
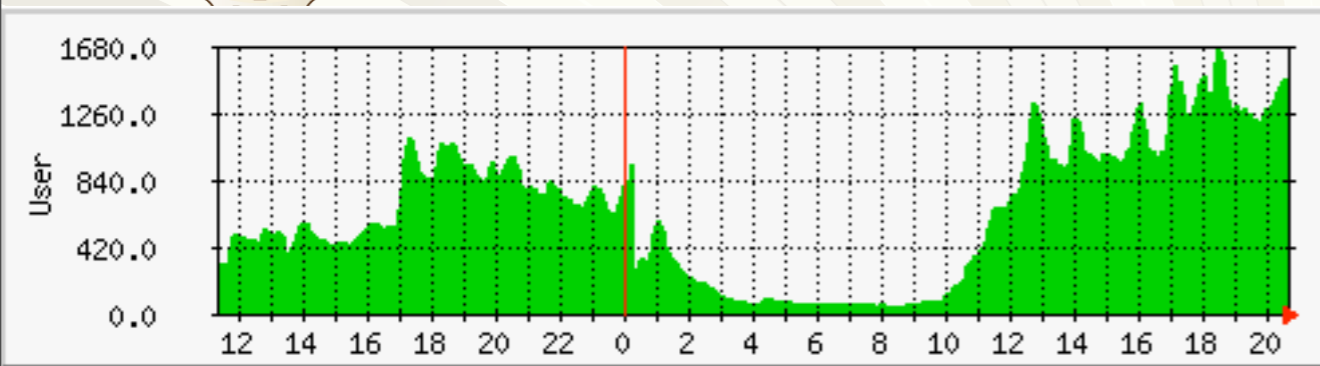
Wireless LAN 23C3

Statistics

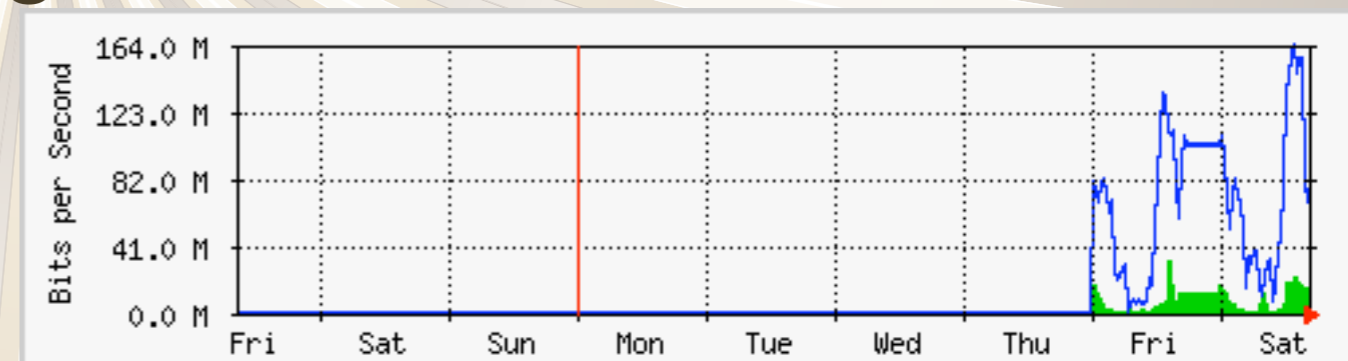
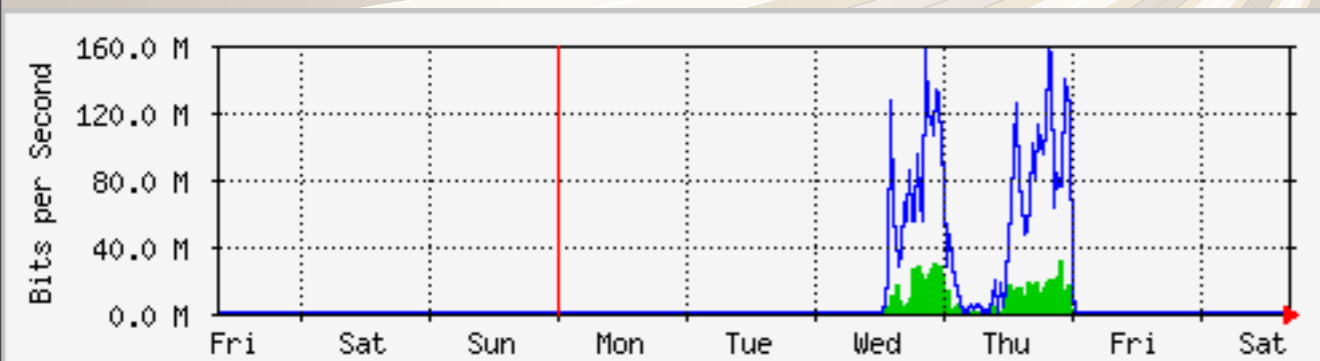




Wireless LAN 23C3 Statistics



- 1-2d Max Assocs 1678, Average 631, Current was 1399
- 3-4d Max Assocs 1423, Average 633, Current was 633



- 1-2d Max in 156.5 Mb/s, Max out 30.9 Mb/s
- 3-4d Max in 163.1 Mb/s, Max out 32.1 Mb/s



Wireless LAN 23C3 Outlook



- Protect users with a bridge filter?
- Provide 5 GHz Cards?

USE 802.11a 5 GHz!!!

Thanks to Aruba Networks, Luiz





Thank You!

