Bandwidth Management

Managing high-latency and limited bandwidth satellite connections

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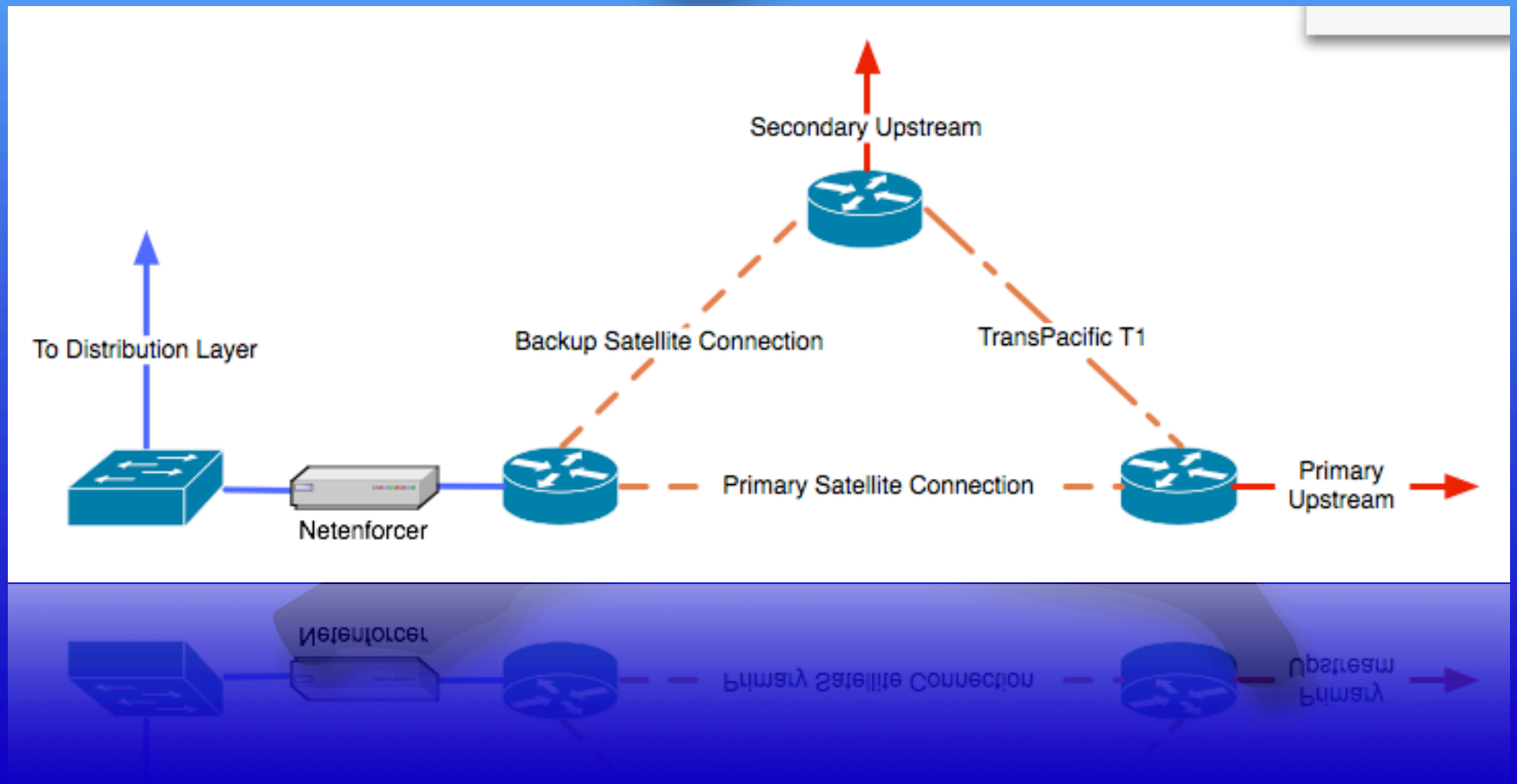
Physical Layout



Latency

- Average of 600ms+ latency to PoP
- Can be up to 1500ms+ depending on path
- Detrimental to VoIP and other real-time services

Latency Mitigation

- There are very few ways to mitigate latency
- Ensure that real-time streaming applications have the highest priority
- For VoIP, we ensure that our providers are no more than 700ms away
- Get the cleanest satellite signal possible

Limited Bandwidth

- Satellite bandwidth is expensive
- Oversubscription is almost a necessity
- Proper management is required for such a finite resource
- Current bandwidth setup is 7.5Mbps inbound and 2.5Mbps outbound
- 300 residential, 100 business, 30 corporate

Management Equipment

- Allot Netenforcer
- Packeteer Packetshaper
- Cacti

Allot Netenforcer

- Bandwidth is categorized as a series of Pipes
- Each pipe can have a number of Virtual Channels (VCs)
- Pipes and VCs operate top-to-bottom (like an ACL)
- Priorities and bandwidth min/max can be set for Pipes and VCs

Pipe and VC Attributes

- Host List
  - IP address ranges, domain names, etc.
- Type of Service
  - TCP/IP ports, All IP
- Quality of Service
  - Bandwidth allocation and priority

Current Configuration

- Top 4 Pipes: Deactivations, Virus, Network-Essential, ICMP
- Corporate customer pipes follow
- General business customer pipes
- Residential customer pipes

Pipe Layout

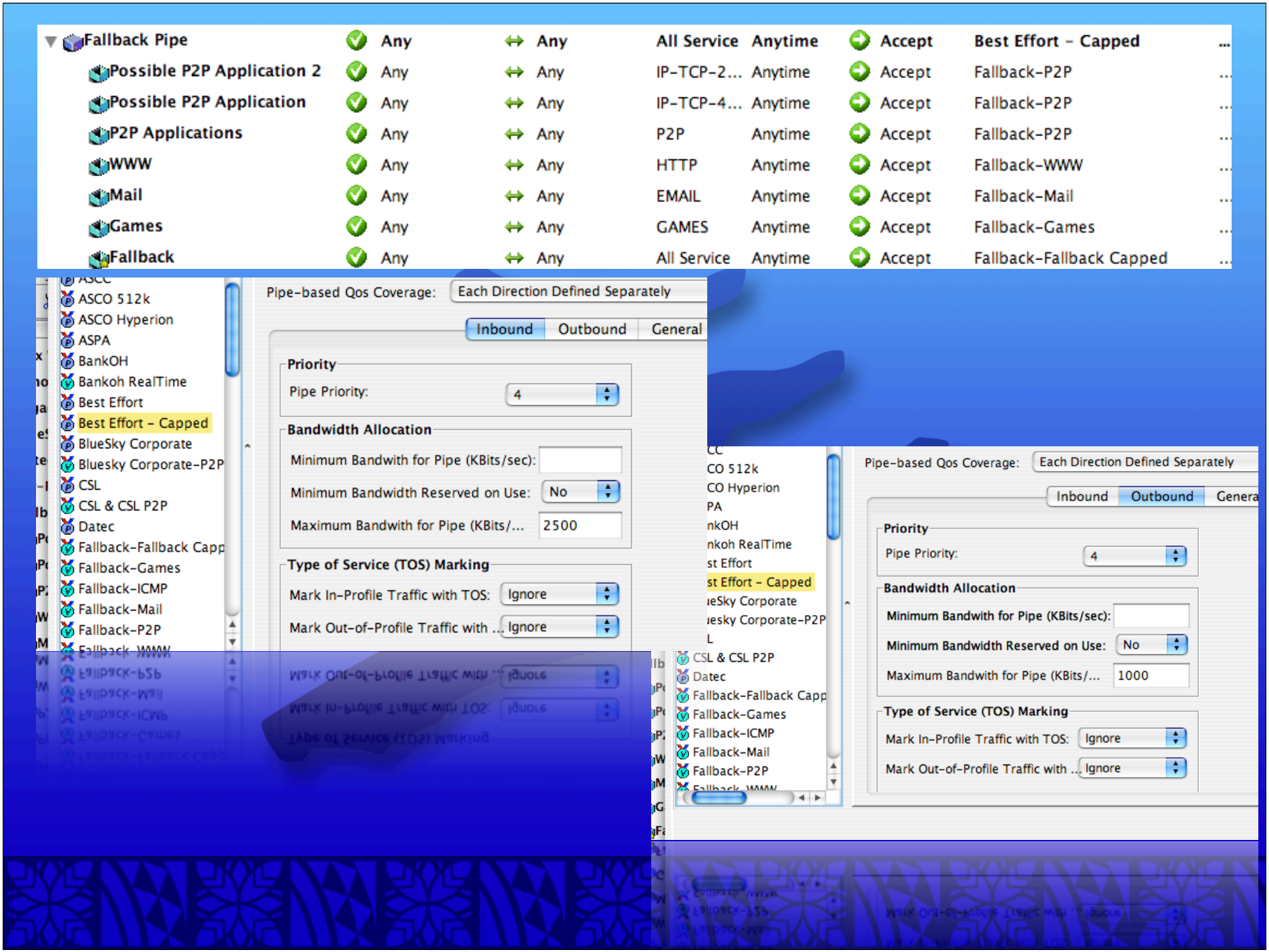
Deactivations, Virus	Match specific TCP Ports and/or IPs	Action: Drop
Network-Essential (BGP, OSPF, ICMP, VoIP)	Match specific packet signatures	Priority: 10 512kbps min and max
Corporate Customers	Match various host lists	Priority: 8 Variable limits
Business Class	Match various host lists	Priority: 7 Plans: 128, 256, 512
Residential	Fallback Pipe Match Any	Priority 5 128 Best Effort

Example Configuration

PIPE	Customer A	512k min/max: Prio8	Hostlist A+B
VC	Location 1	256k min: Prio9	Hostlist A
VC	Location 2	256k min: Prio9	Hostlist B
VC	Fallback	Normal Priority	Any

Example Configuration

PIPE	Customer C	512k up/dn: Prio8	Hostlist C
VC	P2P	64k max: Prio4	Match P2P Packets
VC	WWW	128k min: Prio 8	Match TCP 80, 443
VC	Mail	128k min: Prio 8	Match SMTP, POP3
VC	Fallback	Priority: 7	Match any


Fallback Pipe Any Any All Service Anytime Accept Best Effort - Capped
Possible P2P Application 2 Any Any IP-TCP-2... Anytime Accept Fallback-P2P
Possible P2P Application Any Any IP-TCP-4... Anytime Accept Fallback-P2P
P2P Applications Any Any P2P Anytime Accept Fallback-P2P
WWW Any Any HTTP Anytime Accept Fallback-WWW
Mail Any Any EMAIL Anytime Accept Fallback-Mail
Games Any Any GAMES Anytime Accept Fallback-Games
Fallback Any Any All Service Anytime Accept Fallback-Fallback Capped
ASCO 512k
ASCO Hyperion
ASPA
BankOH
Bankoh RealTime
Best Effort
Best Effort - Capped
BlueSky Corporate
Bluesky Corporate-P2P
CSL
CSL & CSL P2P
Datec
Fallback-Fallback Capp
Fallback-Games
Fallback-ICMP
Fallback-Mail
Fallback-P2P
Pipe-based Qos Coverage: Each Direction Defined Separately
Inbound Outbound General
Priority
Pipe Priority: 4
Bandwidth Allocation
Minimum Bandwith for Pipe (KBits/sec):
Minimum Bandwidth Reserved on Use: No
Maximum Bandwith for Pipe (KBits/... 2500
Type of Service (TOS) Marking
Mark In-Profile Traffic with TOS: Ignore
Mark Out-of-Profile Traffic with ... Ignore
Pipe-based Qos Coverage: Each Direction Defined Separately
Inbound Outbound Genera
Priority
Pipe Priority: 4
Bandwidth Allocation
Minimum Bandwith for Pipe (KBits/sec):
Minimum Bandwidth Reserved on Use: No
Maximum Bandwith for Pipe (KBits/... 1000
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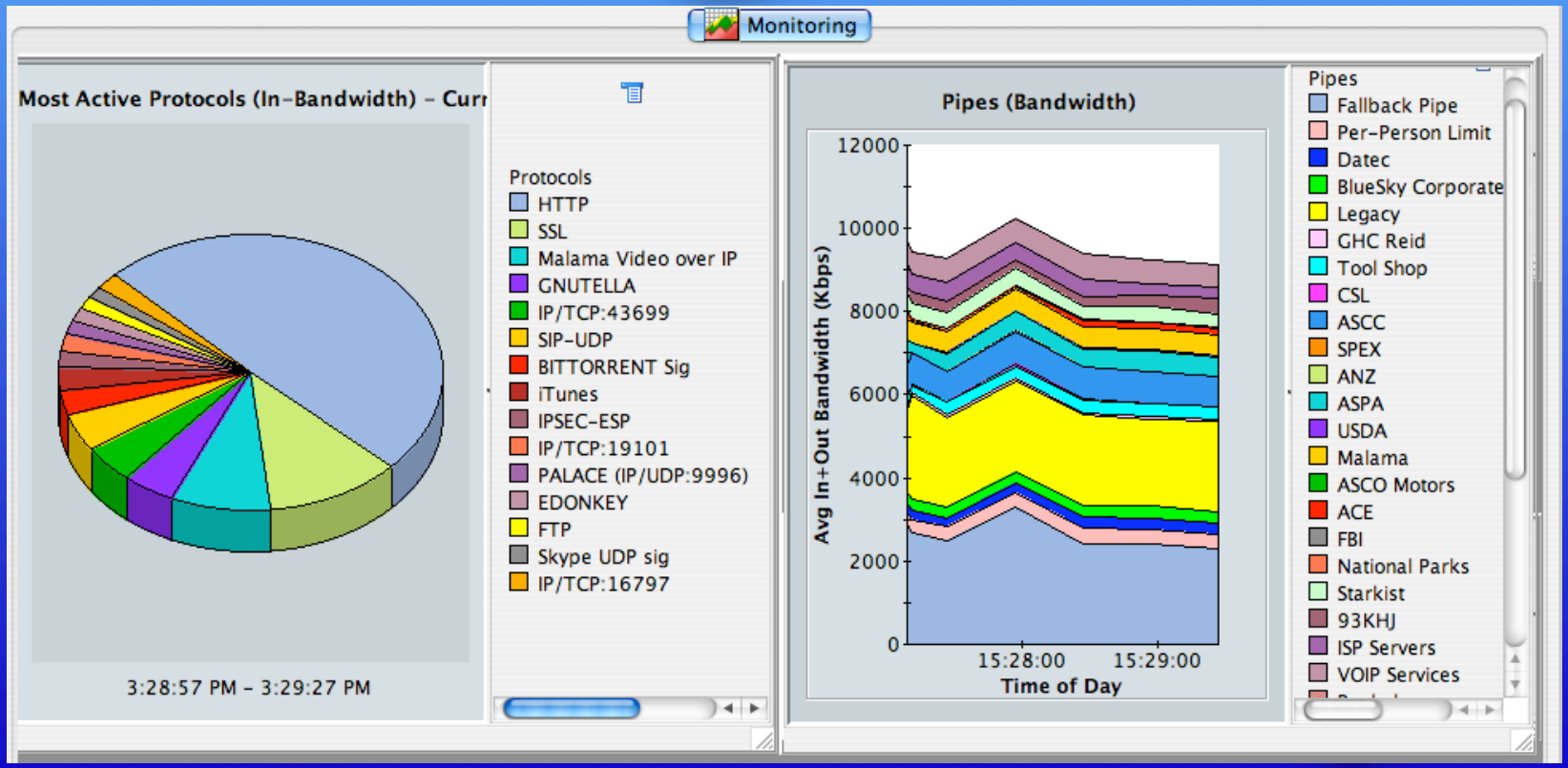
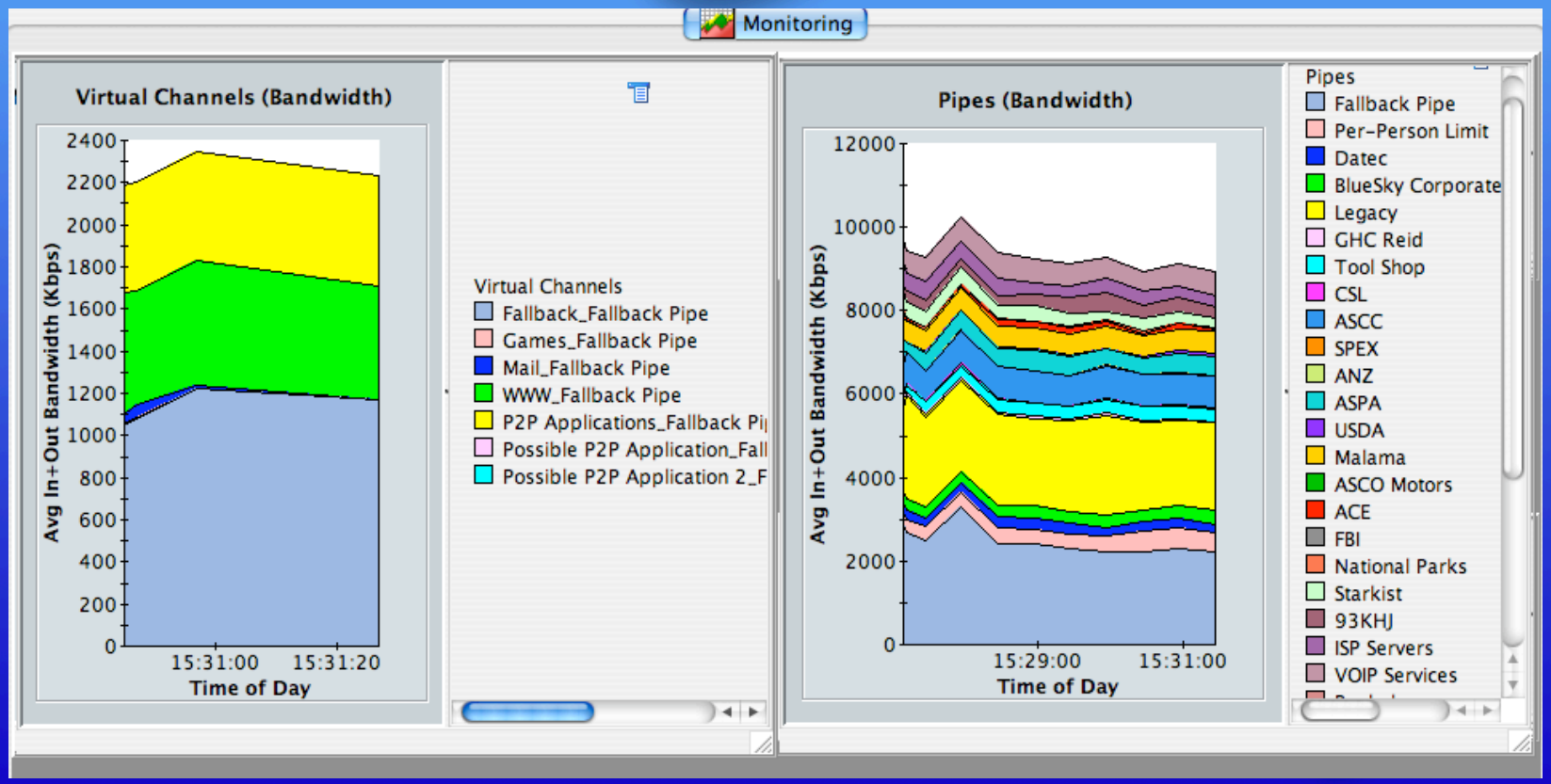
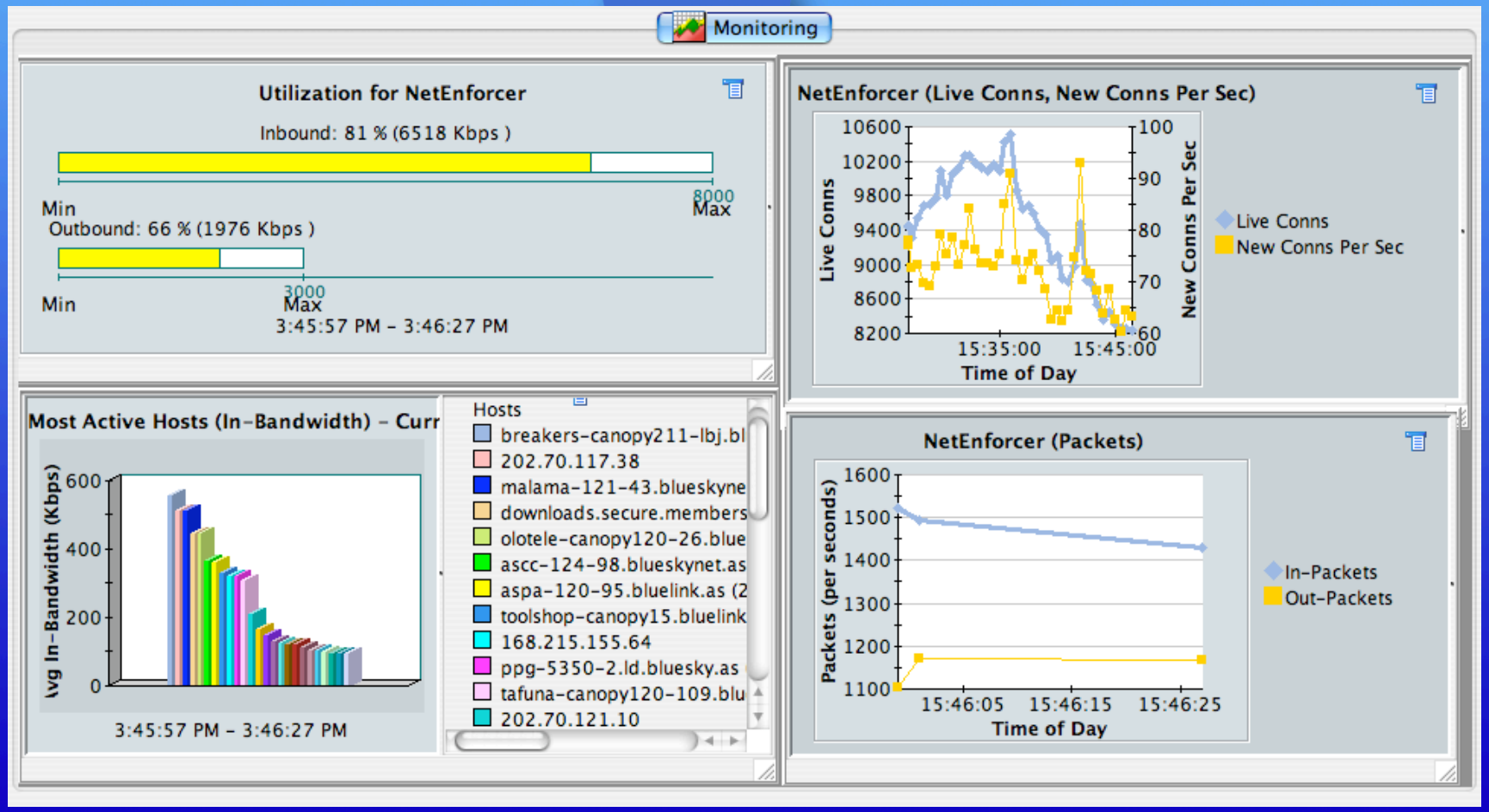
Monitoring


Monitoring
Most Active Protocols (In-Bandwidth) - Curr
3:28:57 PM - 3:29:27 PM
Protocols
HTTP
SSL
Malama Video over IP
GNUTELLA
IP/TCP:43699
SIP-UDP
BITTORRENT Sig
iTunes
IPSEC-ESP
IP/TCP:19101
PALACE (IP/UDP:9996)
EDONKEY
FTP
Skype UDP sig
IP/TCP:16797
Pipes (Bandwidth)
Avg In+Out Bandwidth (Kbps)
12000
10000
8000
6000
4000
2000
0
15:28:00
15:29:00
Time of Day
Pipes
Fallback Pipe
Per-Person Limit
Datec
BlueSky Corporate
Legacy
GHC Reid
Tool Shop
CSL
ASCC
SPEX
ANZ
ASPA
USDA
Malama
ASCO Motors
ACE
FBI
National Parks
Starkist
93KHJ
ISP Servers
VOIP Services

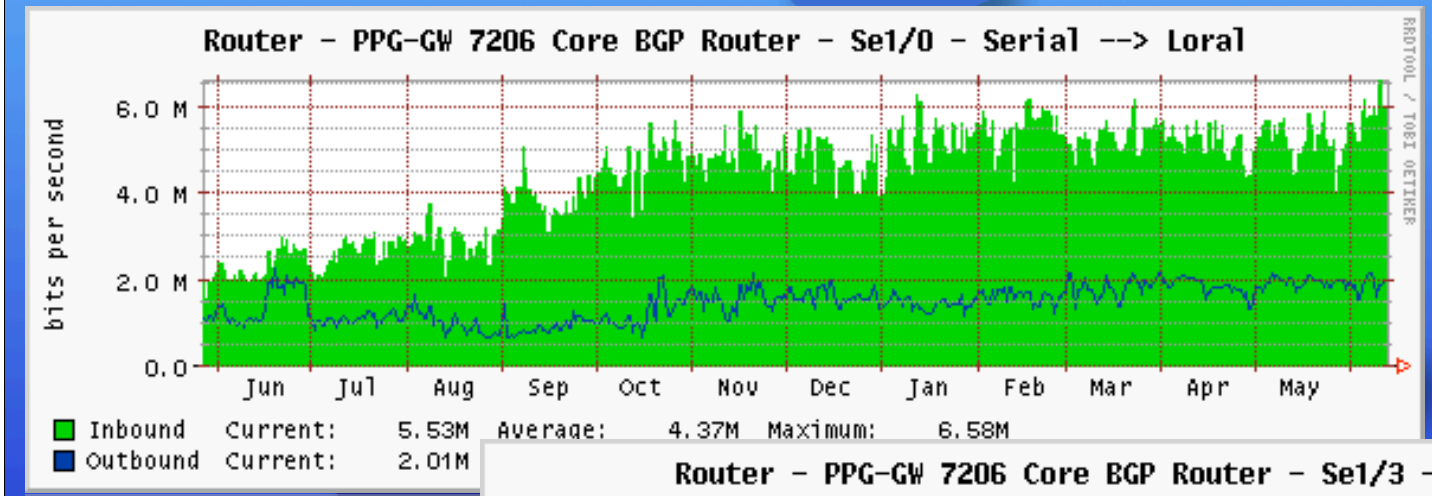
Monitoring Cont.

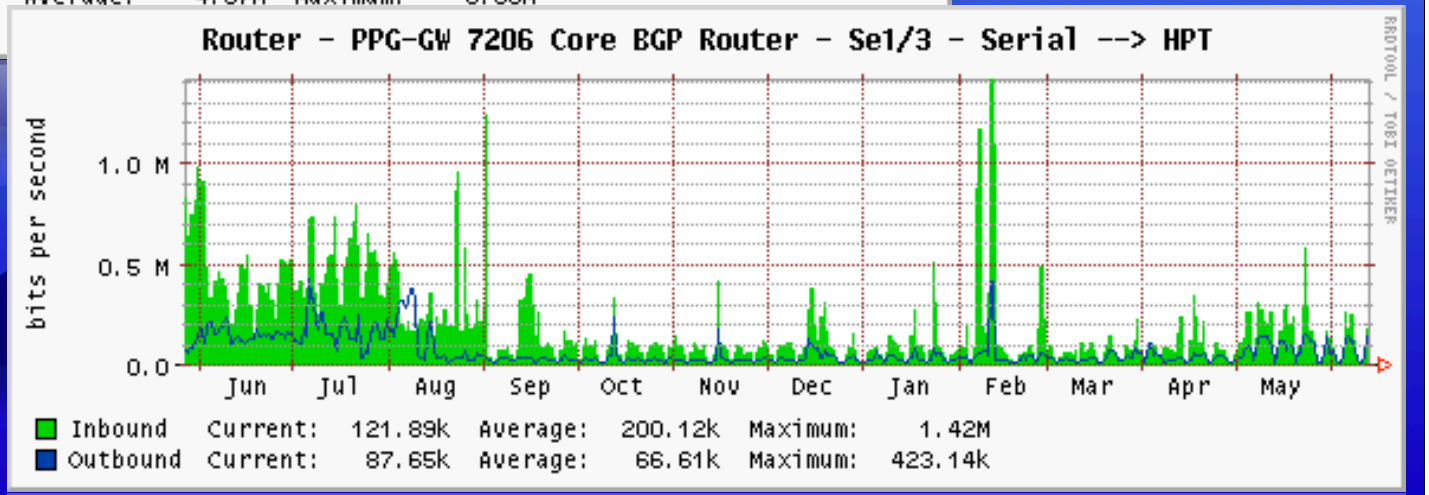


Monitoring Cont.



Trends

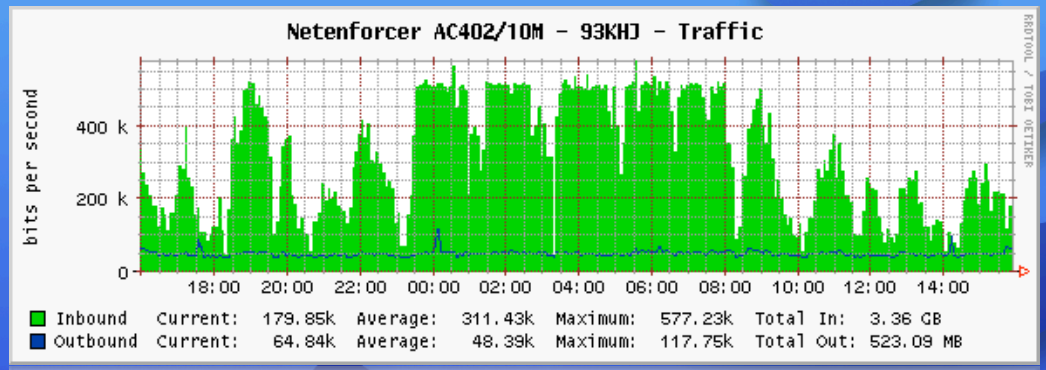

Router - PPG-GW 7206 Core BGP Router - Se1/0 - Serial --> Loral
bits per second
6.0 M
4.0 M
2.0 M
0.0
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Inbound Current: 5.53M Average: 4.37M Maximum: 6.58M
Outbound Current: 2.01M
RRDTOOL / TOBI OETIKER

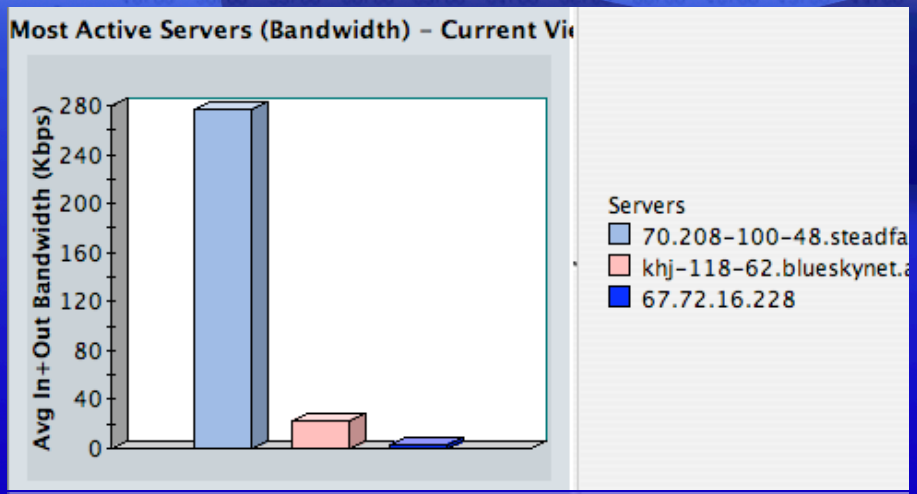

Router - PPG-GW 7206 Core BGP Router - Se1/3 - Serial --> HPT
bits per second
1.0 M
0.5 M
0.0
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Inbound Current: 121.89k Average: 200.12k Maximum: 1.42M
Outbound Current: 87.65k Average: 66.61k Maximum: 423.14k
RRDTOOL / TOBI OETIKER

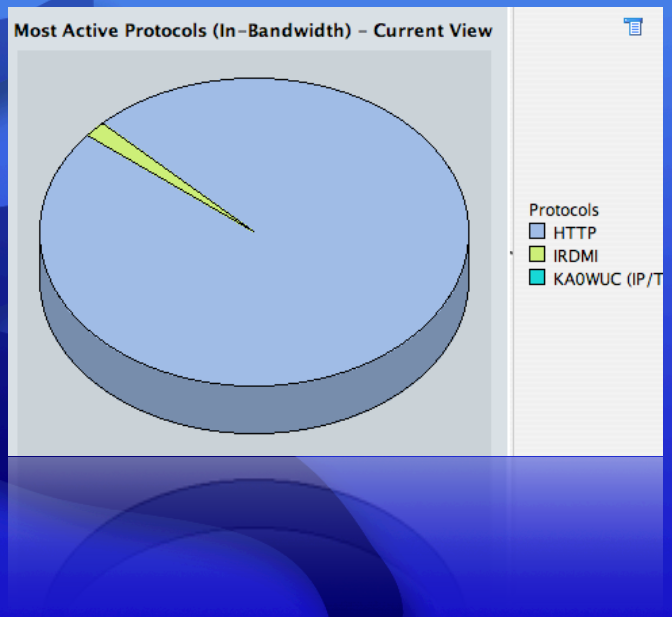
Testing

- Testing from customer premises is done with Speakeasy and Internetfrog
  - http://www.speakeasy.net/speedtest/
  - http://www.internetfrog.com/mypc/speedtest/
- Business and Corporate customers are given a Cacti login

Customer Connections







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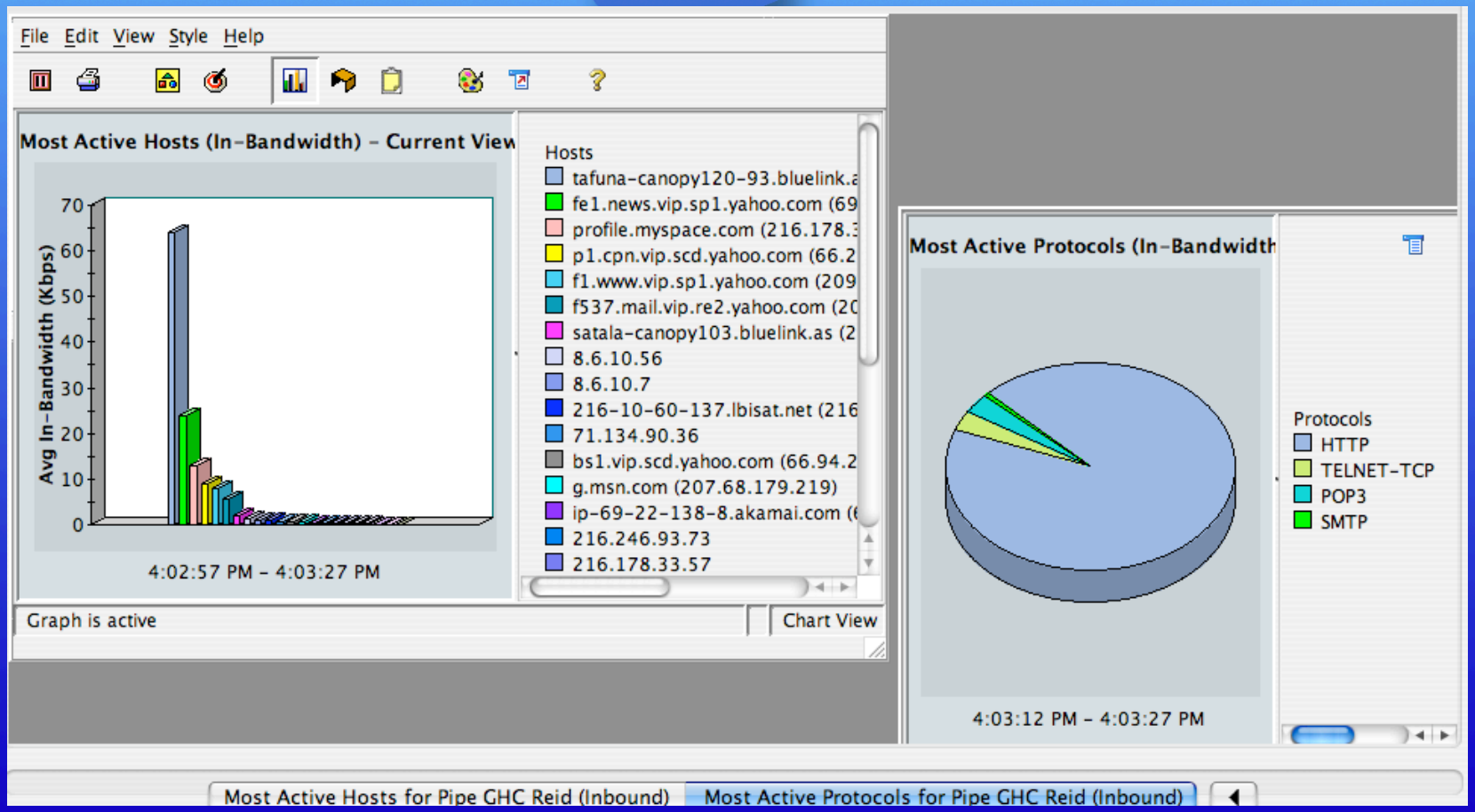
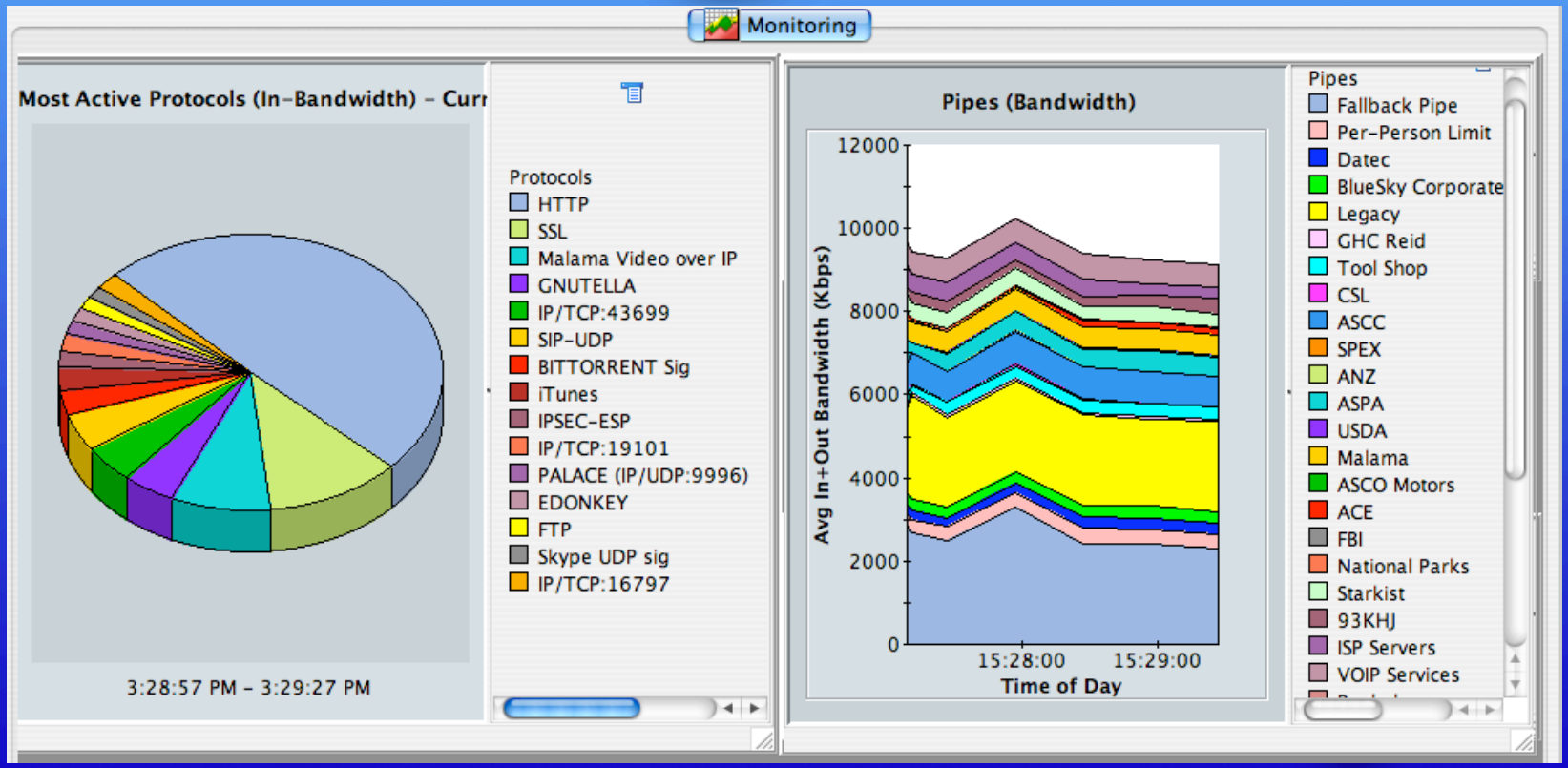


General Usage



Overall Guidelines

- Always limit Peer-to-peer/filesharing
- Managing traffic is always ongoing
- Adjust to the customer's needs
- For most customers, perception is a key factor