



Catalyst for Next Generation Internet & Wireless Technology

## Architecture de Réseaux et Dimensionnement du Trafic

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## Comcast details changes for managing Web traffic



Mon Sep 22, 8:45 AM ET

Comcast Corp (CMCSA.O) has provided U.S. regulators details of how it plans to change the way it manages Web traffic over its high speed Internet network without blocking any applications or content.

The move comes after the Federal Communications Commission voted last month to uphold a complaint that Comcast had violated the regulator's open-Internet principles by hindering peer-to-peer traffic from applications such as BitTorrent.

Comcast said on Friday that under the plan designed to give all users their "fair share" of bandwidth it would focus on managing the traffic of customers who are using most bandwidth when the network is congested.

It said it will use software on its network to determine if particular subscribers have been the source of high volume of traffic and will temporarily give traffic from those subscribers a lower priority status.

It said that when a subscriber's traffic is assigned a lower priority status its traffic could be delayed if the network is congested but would not be delayed if there is no congestion.

Comcast said it expect to have the new traffic management system in place across its network by the end of December.

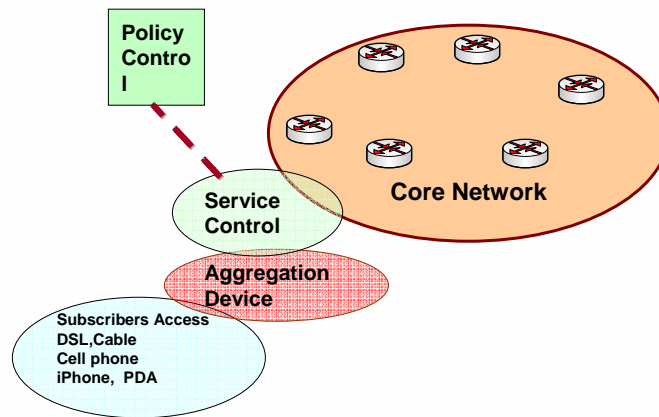
U.S. Internet service providers such as Comcast have been overwhelmed by the rapid growth of online services including peer-to-peer applications as well as online video, music downloading and photo-sharing, and are seeking ways to cost-effectively avoid network congestion.

Comcast, which has more than 14 million high-speed Internet subscribers, had previously said it was changing its network management practices to ensure all Web traffic is treated essentially the same.

## Aspects Architecture de Réseaux

- Network configuration and control
- Protocol and payload analysis
- Layer 4-7 service classification and identification
- QoS, controlling and limiting bandwidth for a particular type of service
- Asymmetrical routing, and non-uniform traffic
- DPI profiling and application classification
- Resiliency, high-availability and recovery

## Network Architecture



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## Dimensionnement de Trafic

- Traffic types and characteristics
- Load verification/ throughput
- Performance Measures
  - No. of flows supported
  - No. of concurrent connections
  - Connection detection rate
  - Drop rate & throughput performance (1G/10G)
  - Latency
  - Detection, restriction and regulation accuracy

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## Isocore P2P Experimentation

- Primary objectives
  - To understand detection and regulation of the Peer to Peer (P2P) traffic and evaluate the adverse impact of using advanced P2P filters on genuine users
  - To understand the pattern of P2P traffic behavior and evaluate prevention of copy right infringement of music and video through controlling the easy flow of copyrighted material across networks
- Considered two leading vendors with major P2P traffic management market
- Isocore based on requirements developed detailed test plans
- Isocore evaluated the performance impact of P2P traffic on Internet

## About Isocore

- Isocore is an independent validation entity serving the Internet and Mobile industry to expedite the adoption of new technologies
- Since Inception Isocore has been instrumental in bringing Service Providers and vendors together to exchange the state and progress of the emerging next-generation Internet technologies
- Isocore has unique state of the art facilities for evaluating and testing innovative solutions offered by vendors in an unbiased environment
- Isocore has several interoperability programs which help industry to resolve implementation issues due to ambiguities in the Standard Development Organizations (SDOs)
- Isocore has unique expertise to benchmark scalability and performance of complex architectures to validate systems under test for scalability and performance for real-world deployments
- Isocore has Major offices in Washington DC (Isocore Americas), Paris (Isocore Europe) and Tokyo (Isocore Asia)

## Isocore Testbed For P2P Verification

- Isocore created testbed very closely mapping to a true carrier network
  - Testbed using routers/switches in the setup, but simplified the setup for basic functionality of the traffic control and monitoring devices
- Created the pattern for the P2P to match the realistic world traffic characteristics
  - P2P emulated/replay/real subscriber traffic
  - HTML traffic
  - SMTP/ POP/ FTP/Voice/ Data Transfer Traffic
  - TCP/UDP Traffic Streams
  - Both individual and multiple P2P protocol streams generated in parallel
- Behavioral P2P detection (frequent disconnects and reconnects, multiple simultaneous connections to single hosts, concurrent connections to multiple hosts)

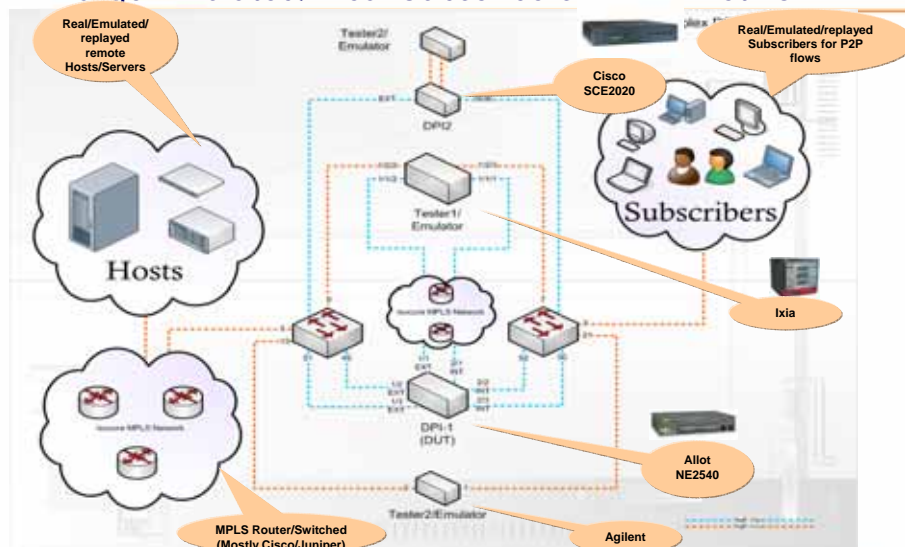
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## Large Network Setup

### Large Emulated/ Real Subscribers Across Network

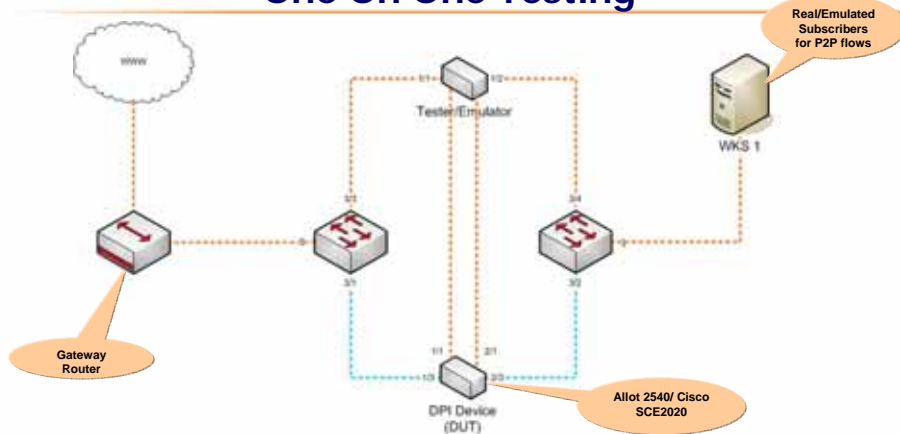


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## Simplified Setup One On One Testing



Tests executed

1. Throughput and Latency
2. Basic verification of P2P recognition behavior

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## Testers used in the Experimentation

- Isocore Test Manager (used for result collection and management)
- Agilent Network Tester
  - Emulation of realistic mix of application P2P traffic
  - Simulation of P2P applications and ability to capture stateful traffic
  - Capture/Replay capability
- Ixia Multiservice Test Solution
  - P2P throughput measurements
  - Real-world application traffic mix
  - Subscriber behavior emulations
  - Ability to capture and replay any P2P stream



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## Sample P2P Client Types Targeted

- P2P Clients and their versions
  - Ares Galaxy – Version 2.0.9.3030
  - Azureus - Version 3.0.4.2
  - uTorrent- Version 1.7.7
  - DirectConnect - Version 1.0
  - eMule - Version 0.48a
  - aMule- Version 2.1.3
  - Kazaa - Version 3.2.7
  - Limewire - Version 4.16.6
  - Shareaza - Version 22.3.1.0
  - Bearshare - Version 6.1.0.42623
  - MANOLITO - Version 1.1.9
  - KCEasy - Version 0.19rc1
  - SoulSeek - Version 156c
  - WinMX - Version 3.53 (patched)
  - Filetopia – Version 3.04



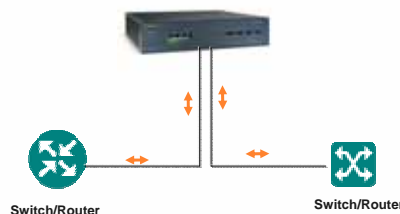
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## Device Under Test Details Cisco Service Control Engine (SCE) 2020

- Cisco Service Control Engine
  - 4 Gbps Fiber Ports
  - Model at Isocore: SCE2020-4XGBE-MM
- Maximum Throughput
  - 4 Gbps
- Number of Concurrent Subscribers
  - Up to 80,000
- Simultaneous Unidirectional Flows
  - Up to 2,000,000
- Tunneling Support and Stateful Layer 7 Deep Packet Inspection
  - Multiprotocol Label Switching traffic engineering (MPLS-TE)
  - MPLS-VPN
  - VLAN
  - Layer 2 Tunneling Protocol (L2TP)
- More than 600 protocols supported
- Extensible to emerging protocols
- Adaptive peer-to-peer (P2P) recognition
- Supports MPLS/VPNS and IP-tunneling environment



Connection Mode of Cisco SCE in the Isocore Testbed

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## Device Under Test Details Cisco Service Control Engine (SCE)

- Cisco Service Control Engine 8000
  - Flagship Product for Cisco DPI portfolio
  - Support 10Gbps speeds
- Stateful DPI Support
- High-Availability Support
- Scalability
  - Manage up to 32 million concurrent unidirectional application sessions over an IP network. Based on Cisco Specs
- Maximum throughput up 30Gbps (unidirectional)
- Concurrent Subscribers – up to 2 million (Cisco Specs)
- Support 2/4 10Gbps interfaces



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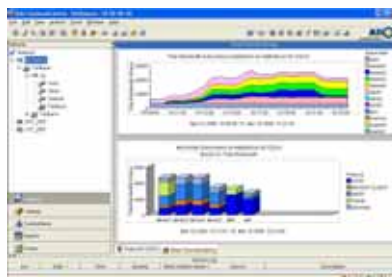
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## Isocore Tested Allot NE AC2540 and SG-Omega

- Allot NetEnforcer AC-2500 Series
  - AC-2540: 8 GE interfaces (4 GE lines)
  - Throughput of 5Gbps
  - 8 total Gige Ports
  - Total Number of Flows supported
    - 4,000,000
- Policies support
  - 80,000 Virtual Circuits
  - 40,000 Pipes
  - Hierarchical QoS support
- More subscribers
  - 160,000 subscribers
- More redundancy schemes
  - Active
  - Serial
  - Parallel
- Supports High-Availability

Allot NetEnforcer 2540



Subscriber Reports

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## Isocore Evaluation of Allot 10 Gig Solution Industry's first 10 Gbps Test Results: SG-Omega

- Focus of Isocore evaluation of Allot SG-Omega
  - Throughput
    - SG-Omega demonstrated over 20 Gbps of throughput in all packet sizes tested (256 and above)
    - Maximum aggregate throughput of 27.8 Gbps with 512 byte frames
  - Scalability
    - SG-Omega successfully supported 10 million concurrent connections
  - High-Availability
    - Recovery from physical disruption was <10ms in all cases.
    - 3 ms recovery time, when SG-Flow processor was removed from the chassis
    - 7 ms recovery time when optical bypass card was pulled from chassis simulating the chassis power failure
  - Application Identification
    - Detection and Differentiation of P2P, HTTP, FTP, SMTP traffic

Allot SG-Omega



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## Highlights of Isocore Evaluation of Allot SG-Omega

Verified Capabilities	Observations/Measured Results
<b>Throughput Measurements</b>	<ul style="list-style-type: none"> <li>• <b>Total Throughput across SG-Omega with No Frame Loss (Chassis and 10-Gigabit Ethernet Ports)<sup>1</sup></b> <ul style="list-style-type: none"> <li>○ Maximum Throughput measured with 1518 byte frames: 26.9 Gbps</li> <li>○ Maximum Throughput measured with 512 byte frames: 27.8 Gbps</li> <li>○ Maximum Throughput measured with 256byte frames: 20.0 Gbps</li> <li>○ Maximum Throughput measured with a single 10-Gigabit Ethernet interface: 19.23 Gbps</li> </ul> </li> </ul>
<b>Connection Scalability</b>	<ul style="list-style-type: none"> <li>• <b>Concurrent Connections – Observed On SG-Omega CLI</b> <ul style="list-style-type: none"> <li>○ Successfully detected 10 Million connections (unique source/destination IP address, and TCP/UDP destination ports)</li> </ul> </li> </ul>
<b>High-Availability And Redundancy Verification (Transition Times)</b>	<ul style="list-style-type: none"> <li>• <b>Recovery Times for chassis recovery – Optical Bypass Mode (For bi-directional traffic)</b> <ul style="list-style-type: none"> <li>○ Service interruption time measured when switching to optical bypass mode: 7 ms</li> <li>○ Service interruption time measured when switching from optical bypass mode: 3 ms</li> </ul> </li> <li>• <b>Recovery Times for SG Flow Processor (SGFP) Failure in N+1 redundancy mode</b> <ul style="list-style-type: none"> <li>○ Service interruption when a SGFP is pulled from chassis: 1 ms</li> <li>○ Service interruption when a SGFP is inserted into the chassis :0 ms</li> </ul> </li> </ul>
<b>Service Application Classification</b>	<ul style="list-style-type: none"> <li>• <b>Differentiating Subscriber Application Aware Traffic</b> <ul style="list-style-type: none"> <li>○ Successfully detected variety of P2P application flows – Edonkey, Gnutella, and BitTorrent</li> <li>○ Successfully classified from a mix of web traffic – HTTP, FTP-Control, FTP-Data, POP3 traffic</li> </ul> </li> </ul>

## Isocore Testbed For the Evaluation

- Testing Performed at Isocore Internetworking Lab, Washington, DC
- Setup included
  - 1 SG-Omega with 4 10G ports
  - Ixia Test Solution with 10G ports
  - Emulation for P2P traffic generation
- Test Focus
  - Verify the throughput capacity of Allot SG-Omega across the chassis and a pair of 10-Gigabit Ethernet ports
  - Verify the scalability of SG-Omega in terms of maximum number of concurrent connections it can detect and hold
  - Benchmark the failure recovery times for both SGFP and chassis failures, confirming the high-availability capabilities of the platform
  - Verify the ability of SG-Omega to classify application-based subscriber traffic



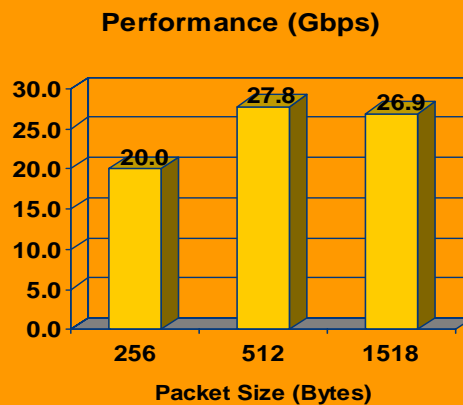
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## Detailed Test Results: Throughput Tests

### Forwarding performance of SG-Omega during Application Identification

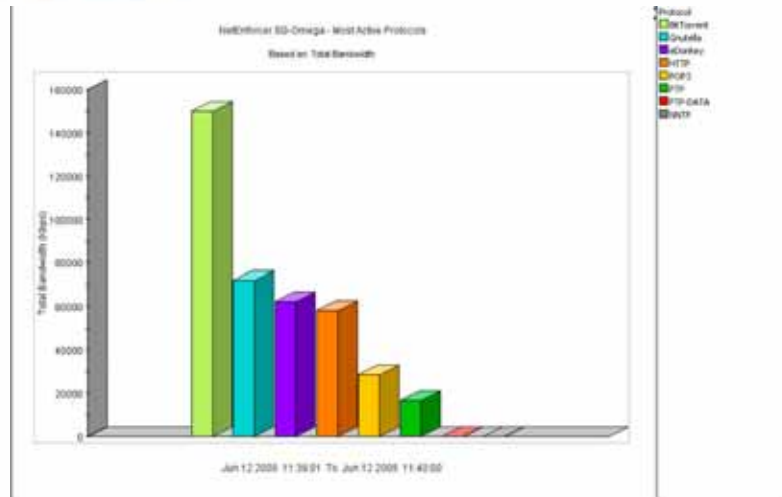


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## Application and Packet Classification



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## Summary Results

- Graphs and Tables illustrating observed results of experimentation
- Load verification/ throughput
  - Combined throughput of SMTP, FTP, Web Traffic and P2P flows
  - Latency measurement characteristics at different traffic rates
  - Detection with co-existence of these applications with varying traffic loads
- Performance measurements and accuracy
  - P2P flow observation/ detection and accuracy
  - P2P flow detection and restriction
  - P2P flow Regulation
  - Asymmetric traffic recognition

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## Conclusions

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- Isocore extensively tested the products from Cisco and Allot, and these two vendors have major market share
- The testing was conducted to assess functionality and performance of P2P traffic management devices
- During the testing it was observed that only the P2P traffic was filtered and regulated while Layer 3 and application traffic (such as HTTP, SMTP, FTP, POP3) was not impacted by the regulation policies
- The observed regulation and restriction performance for all tested P2P protocols were good
- Regulation and restriction were performed both with encrypted and unencrypted protocols