Cisco Service Control Engine (SCE)

A way to differentiation in service offering

Aleš Bešter

Cisco Expo 2008

Enable Your Network
Empower Your Business

Agenda

Market Challenges and Opportunities

Service Control Engine Fundamentals

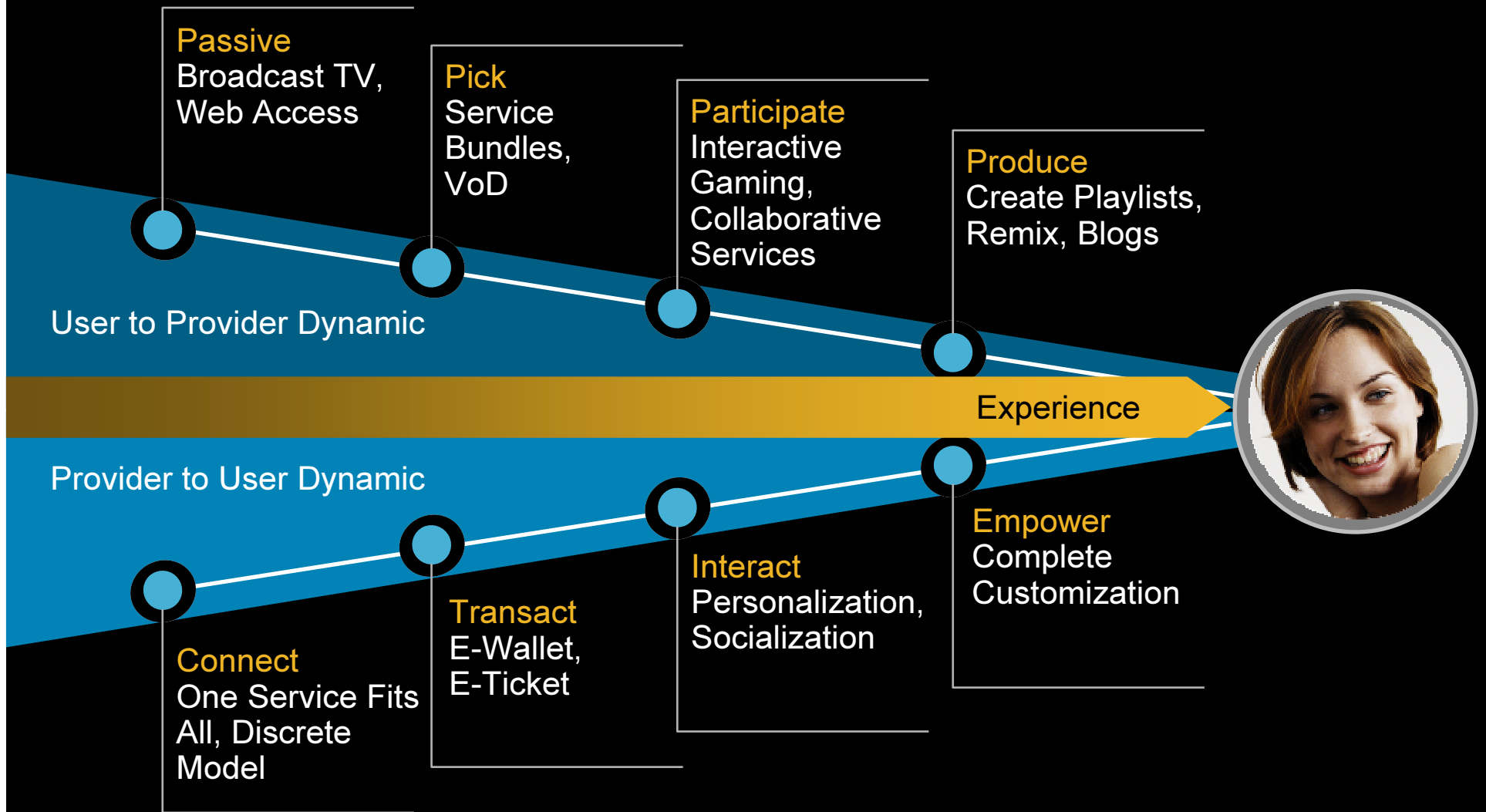**Traffic Analysis and Subscriber Intelligence**

Peer-to-Peer Management and Network Optimization

Tiered Services and Advanced Services

Network Insertion, Management and Integration

The Rise of the Empowered Consumer
Evolutionary Phases of Experience

Passive
Broadcast TV,
Web Access

Pick
Service
Bundles,
VoD

Participate
Interactive
Gaming,
Collaborative
Services

Produce
Create Playlists,
Remix, Blogs

User to Provider Dynamic

Experience

Provider to User Dynamic

Empower
Complete
Customization

Interact
Personalization,
Socialization

Transact
E-Wallet,
E-Ticket

Connect
One Service Fits
All, Discrete
Model

3

New Experience Provider Offer
Enabling the Next Wave of Broadband

Add Services   Add Value   Add Subscribers

Branded VoD ($4.99/movie)

Branded TV ($29.99)

Branded Phone ($15.99 + LD)

Parental-Control ($5.99)	Anti-Spam ($5.99)	Anti-DoS ($5.99)

Broadband Light $19.99	Broadband 4 Kids $24.99	Broadband Basic $29.99	Broadband Advanced $39.99	Broadband Business $49.99

A World of Agile Attackers
and Potential Partners

Value Chain

Content Providers	"Over the Top" Players	Facilities-Based Players	Device Services

Over-the-Top Providers (OTTP)
Value-Add Partners or Disintermediators? Or Both?

Drivers of Collaboration

Access to OTT Services and Applications drives penetration of consumer broadband

Time Sensitive Applications like Video and Voice create opportunities for Guaranteed delivery

The Walt Disney Company

CINEMANOW
WATCH MOVIES AND MORE...

myspace®
a place for friends

skype™

Google™   ESPN.

VONAGE®
THE BROADBAND PHONE COMPANY®

Drivers of Competition

OTT Communications Providers like Vonage, Skype, Google Talk… represent Service Substitution and Pricing threats to Traditional Voice

OTT Content Providers like Disney and CinemaNow are looking for opportunities to use The Internet as a means to disintermediate video distribution businesses

The Experience Provider Transition
Requires New Business Models for Growth and Success

Build…

IP NGNs support more services, provide greater efficiencies, and enable better network, service, and business control

Partner…

With content, OTT, facilities-based, device, and financial partners (et al.) to open new markets and opportunities including expanding advertisement revenue

Innovate…

By blending services, content, and convenience to create unique experiences that build brand recognition and loyalty

Deliver…

Personalized services to any device, to any location, at any time with greater access, content, and billing control
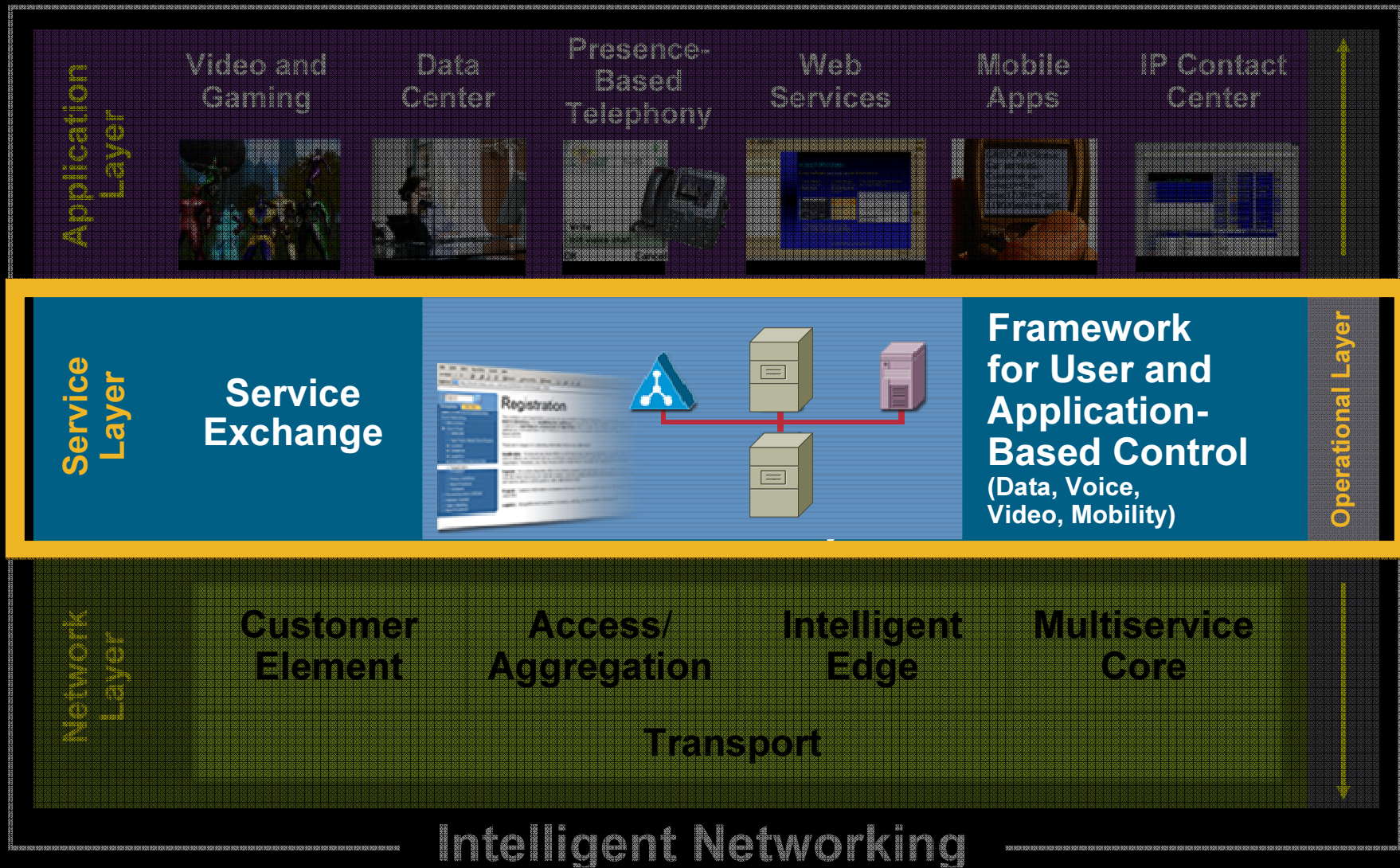
Projected North American Provider Service Diversification:

Provider diversification will drive a huge revenue shift from 90%-95% in telecom today to 70%-80% coming from bundled information and communications solutions by 2016.
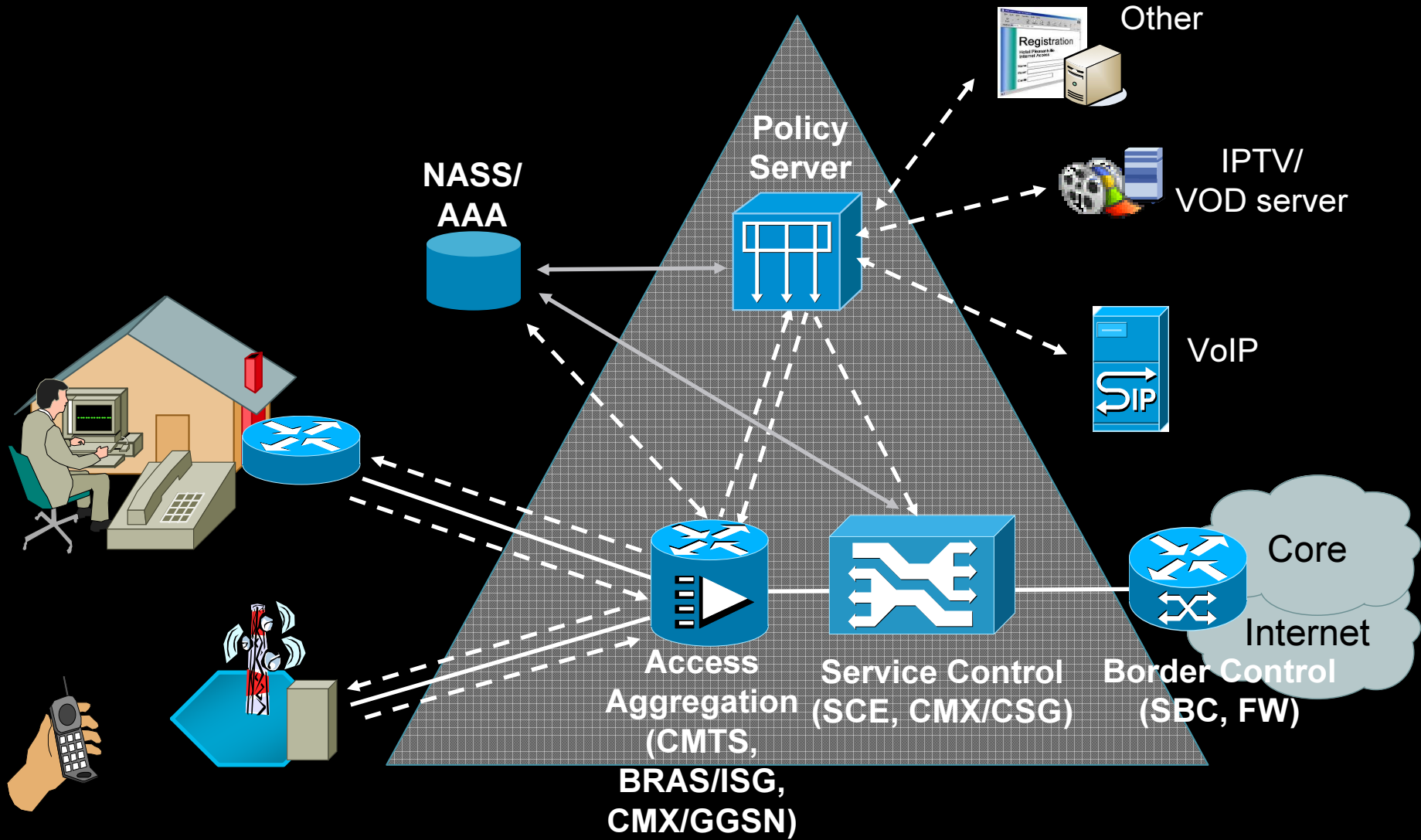
Source: Gartner / 2006

Cisco IP NGN Service Exchange Framework
Enabling Better Service Control and Awareness

Application Layer

| Video and Gaming | Data Center | Presence-Based Telephony | Web Services | Mobile Apps | IP Contact Center |

Service Layer

Service Exchange

Registration

Framework for User and Application-Based Control
(Data, Voice, Video, Mobility)

Operational Layer

Network Layer

Customer Element   Access/ Aggregation   Intelligent Edge   Multiservice Core

Transport

Intelligent Networking

The SEF Building Blocks
Applicable to Wireline and Mobile

Other

Policy Server

IPTV/ VOD server

NASS/ AAA

VoIP

Core

Internet

Access Aggregation (CMTS, BRAS/ISG, CMX/GGSN)

Service Control (SCE, CMX/CSG)

Border Control (SBC, FW)

Today's Broadband Network Environment
Challenges

- New Over-The-Top (OTT) protocols and apps.
  – P2P file sharing, VoIP, HTTP-video,
  online-gaming…

- Protocols and apps. are constantly changing.

- High bandwidth applications can reduce the
  quality of experience (QoE) for all subscribers
  if not managed.

- Services based on latency sensitive
  applications like voice and video require a
  consistent QoE.

- Network traffic is difficult to classify and
  manage due to port hopping(P2P), malicious
  traffic (i.e. worms), etc.

- Price pressures on basic broadband services
  providers want to evolve service away from an
  "All You Can Eat" offering

Deep Packet Inspection (DPI)
Critical To Managing Today's Broadband Networks

- DPI allows service providers to cope with the dynamic nature of the net

  permits SP's to classify all IP applications

  provides subscriber awareness to manage traffic streams based on individual subscriber state and policy

- DPI provides usage analysis and reporting

- DPI enables SP's to implement capacity management and fair-use policies

  to gain visibility into network activities

  to optimize network bandwidth and improve network performance

  to quarantee a consistent QoE for all subscribers.

  Identify and mitigate malicious activities

- DPI enables SP's to create new tiered service offerings, and other differentiated services (such as parental control, turbo buttons, etc.)

- DPI empowers SP's to monetizing OTT/ Non-branded applications by providing blended service offerings
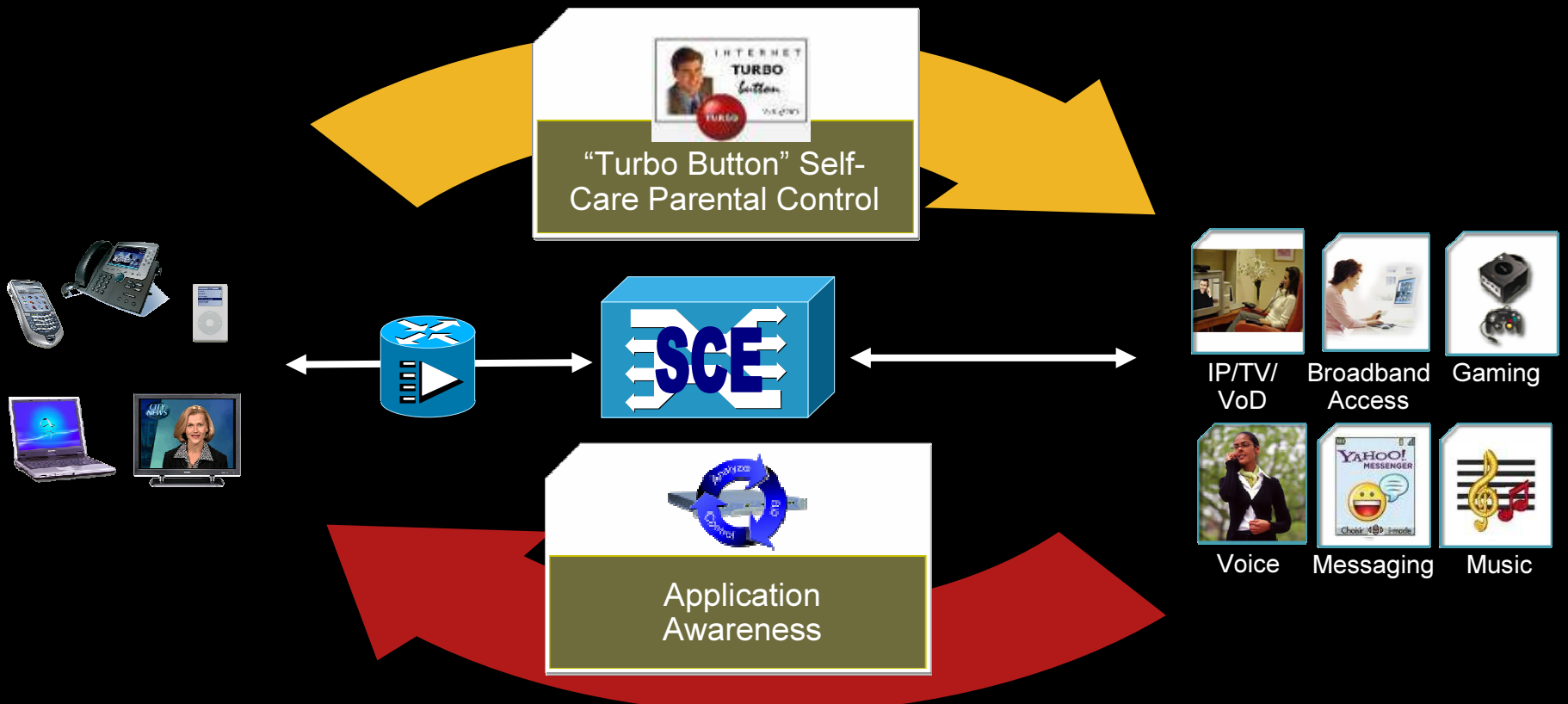
Application Architecture of the Future
SCE enables User Experience

Cellular/WiFi Mesh/WiMAX

DSL

Fixed Wireless

Cable

Enterprise

Service Control Point

Service Exchange Framework

Service Provider Network

IP/TV/ VoD

Broadband Access

Gaming

Voice

Music

Messaging
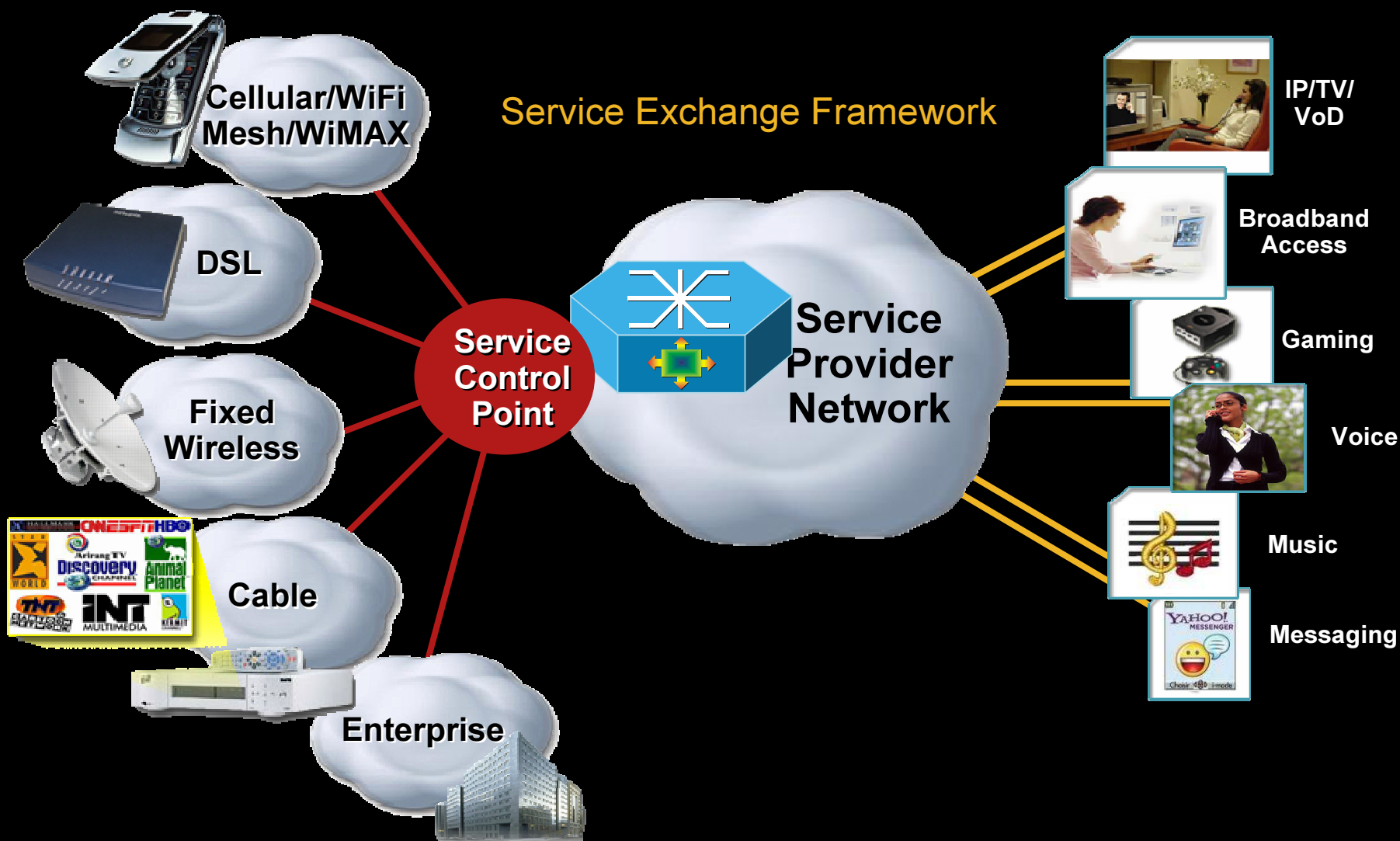
Dynamic Personalized Services
Enhanced Quality of Experience

Industry's First Subscriber and/or Application-Driven Solution

"Pull": Enhanced Experience Is
Subscriber-Driven

"Turbo Button" Self-Care Parental Control

SCE

IP/TV/VoD   Broadband Access   Gaming

Voice   Messaging   Music

Application Awareness

"Push": Enhanced Experience Is
Application-Driven

What Is the Service Control Engine

Application Awareness

Service Velocity

Technology

Subscriber Intelligence

Real-Time Control

Stateful Deep Packet Inspection: Instead of processing packets as individual events, the SCE fully reconstructs flows up through Layer 7.

Rapidly Programmable: Rapidly re-tasked to support new protocols or applications.

Application Session-Level Bandwidth Shaping, Blocking, Redirecting (HTTP, RSTP, SIP)

Carrier Class: Designed for carrier-grade deployments requiring:
High Performance for Multi-Gigabit and 10 Gigabit Speeds.
High Availability & Reliability with stateful failover.

Subscriber State Management with Per-Subscriber BW Management, and Quotas

Extensible Platform & Open Architecture: Based upon a flexible purpose-built platform:
Modular and scalable
HW acceleration
Easy-to-use, with open APIs for seamless OSS Integration

Process of Service Control

Intelligent Inspection and Control of IP Packets

- Classify to end-user application; determine application semantics
- Map to subscriber identity, policy and state
- Select action based on conditions - time of day, congestion, usage, other concurrent activities
- Take action and report

Application

Subscriber

Network Condition

Mark

Block

Redirect

Set QoS

Report

Service Control Engine
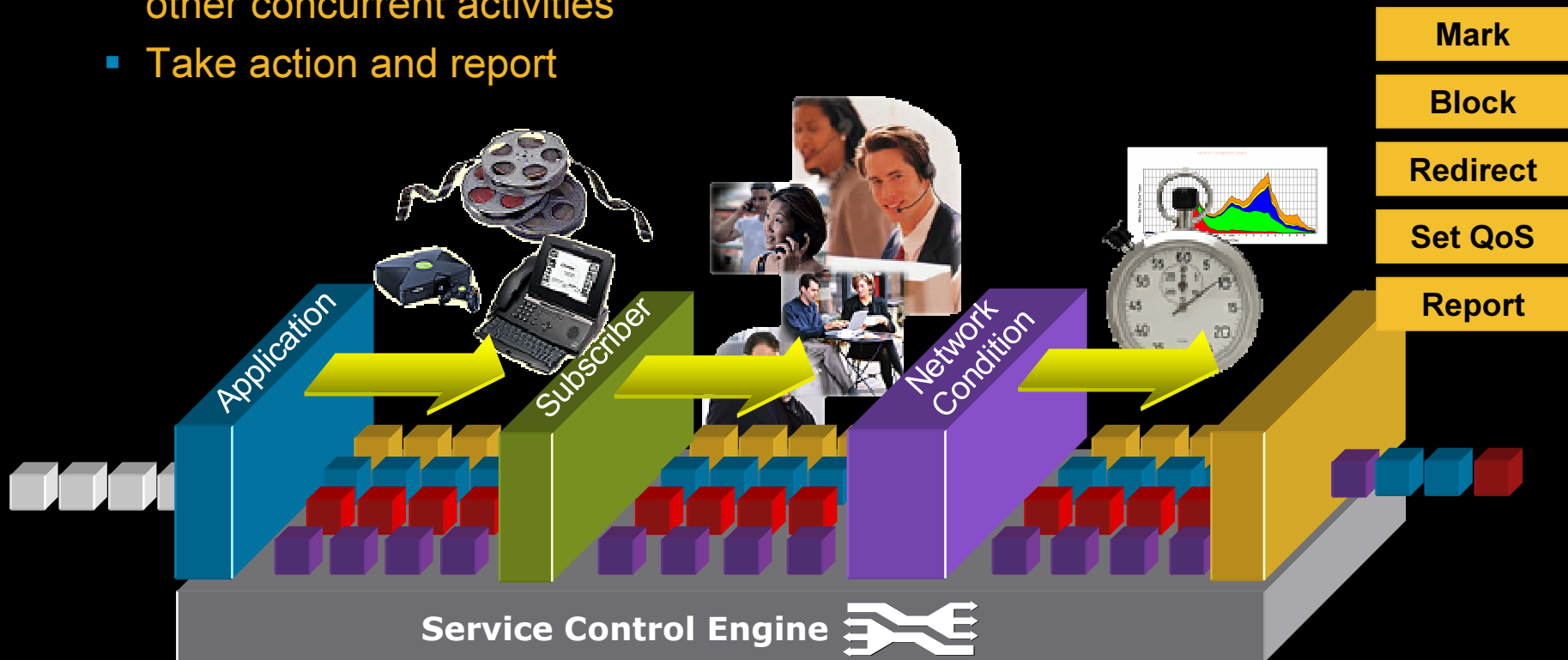
Service Control Engine
Functional Examples

Cost Management

- Over-The-Top Application Partnership Services
- Multimedia (Voice/Video) Traffic Prioritization

- Traffic Analysis and Reporting
- Quality of Experience Monitoring
- Usage Demographics

Premium Service Enablement

Usage Analysis

Content Charging

CISCO Service Control Technology

Traffic Optimization

- Volume and Time Based Billing Services
- Parental Control & Content Filtering

- Traffic Mix Optimization
- Fair Use Policy Enforcement
- QoS assurance

Tiering & Access Control

Service Security

- Service Self Selection
- Volume and Time Based Tiering of Services
- Bandwidth on Demand (Turbo Button)

- Traffic Anomaly Detection and DDOS Protection
- Anti-X (SPAM/Worms)
- Safe Harbor and Quarantine Services

Revenue Generation

Service Control Platform Strategy

SCE Building Blocks

Multi-Gigabit Service Control Platform: Load-balancing between a cluster of SCEs for scaling to tens and hundreds of Gbps

SCE1000 & SCE2000 State-of-the-Art Service Control Appliances

Service Control For 10Gig And Beyond

MGSCP, 10G-MGSCP

Router Integration

Integrating DPI into Cisco Routers (i.e. ISR Adapter)

Service Control Platforms

	SCE1000	SCE2000*
Interfaces	2-GBE (Fiber SX/LX)	4-GBE (Fiber SX/LX)
Mgmt. Interface	10/100 FE	2 x 10/100 FE
Processor Memory	768MB	1.5GB
Max. Flows	2M Concurrent Unidirectional Application Flows	2M Concurrent Unidirectional Application Flows
Max Subscriber-Contexts	40,000	80,000
Network Configuration	Out of Line Inline	Out of Line Inline Clustering

What does an SCE solution look like?
SCE sits at the access or aggregation layer

Billing

Policy Server/Portal

Service Portal

AAA DHCP Radius

Collection Manager

Reporting Tool **Engage Console**

Subscriber Manager

Subscribers

Service Control Engine

Network
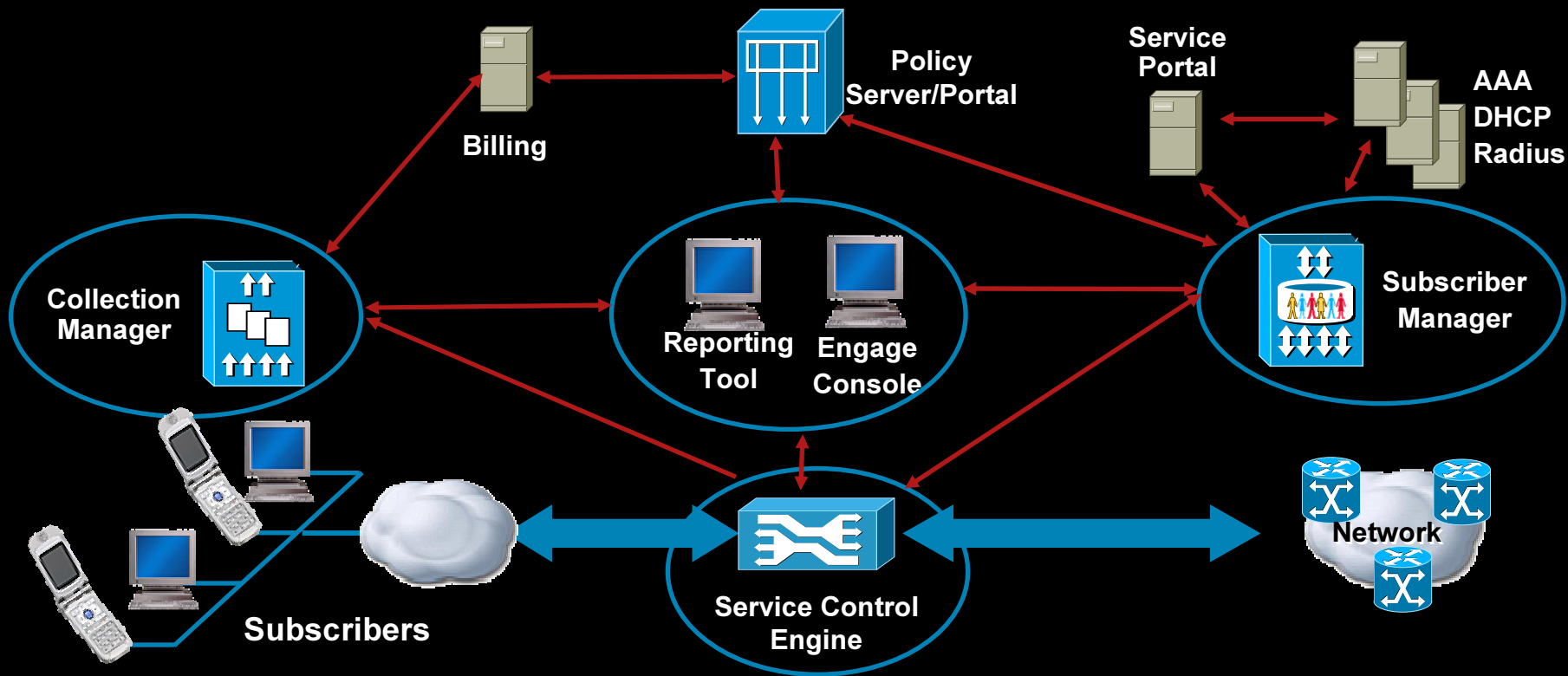
1. SCE Appliance to view and act on the packets

2. Collection Manager to collect data records for Reporting & external DB's

3. Subscriber Manager to coordinate sub info w/ AAA and control sub-level policies

4. Policy Manager to control multiple devices and sophisticated policies

Service Control Engine Deployment
Approaches

1

Implement Traffic Analysis:
- Implement traffic monitoring, analysis, and reporting,
- Determine subscriber and application usage patterns,
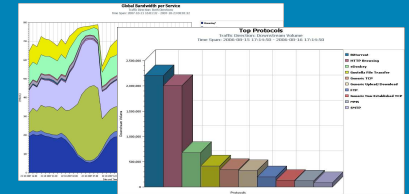
2

Implement Fair-Use Policies (FUPs):
- Manage bandwidth-intensive applications through packet flow optimization techniques,
- Multimedia (Voice/Video) Traffic Prioritization

3

Implement Revenue Generating Services:
- Implement tiered services using volume and time-base quotas
- Implement Service Self Selection
- Implement Over-The-Top (OTT) Application Strategy and Blended Services
- Implement Security Services (Anti-X, Quarantine, etc.)
- Innovate other Differentiated Services such as Parental Controls, Content Filtering, Turbo Buttons, Allowance Based Services, Prioritized App. Services, Pay-as-you-go Services

Subs Profile

DHCP

Policy

AAA

Portal
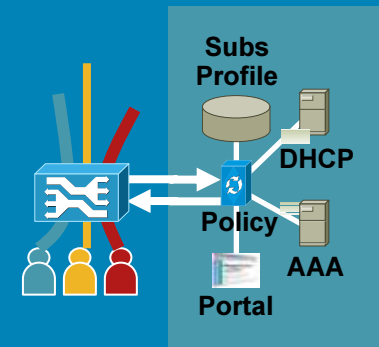
Traffic Analysis and Subscriber Intelligence
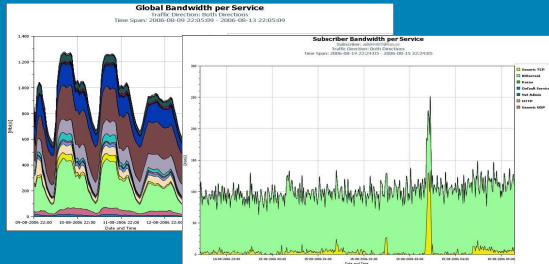
Bandwidth/Capacity Reports

- What is eating up my network resources?

- When do I need a capacity upgrade?

- What is causing congestion?
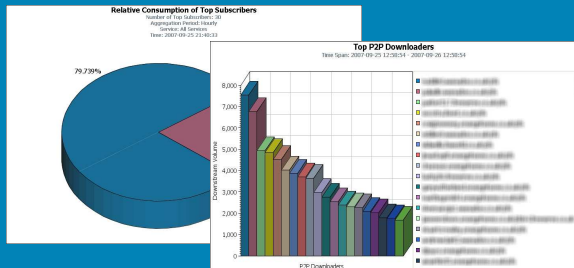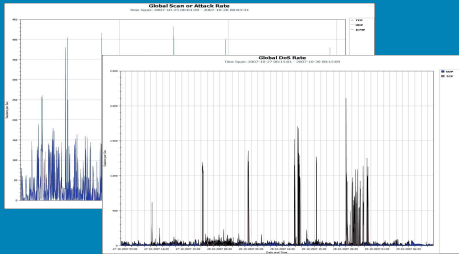

Subscriber Demographic Reports

- What percentage is using P2P/gaming/flash application?

- What are the usage patterns of different subscriber groups?

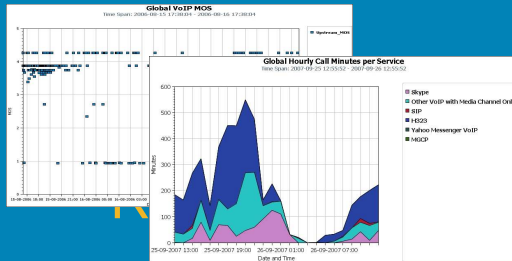- What is the cost-impact of my top subscribers?
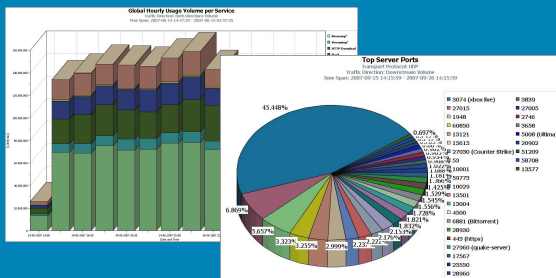
Server Activity

- What are the popular web-hosts used?

- What are the popular streaming sites?

Traffic Analysis and Subscriber Intelligence

Security Reports

- Which subscribers are infected and attacking others?
- Which subscribers are spamming?
- Which subscriber is attacking network resources?

Voice Reports

- Quality of experience of VoIP calls
- Minutes spent on VoIP services
- Total and concurrent calls per VoIP service
- Compare managed vs. non-facility service

- Efficient and reliable usage export protocol
- Stand alone of integrated into upstream management or billing systems
- Scaleable collection software
- Powerful and easy to use, template-driven reporting tool

Fair Use Policies
Addressing Heavy Users
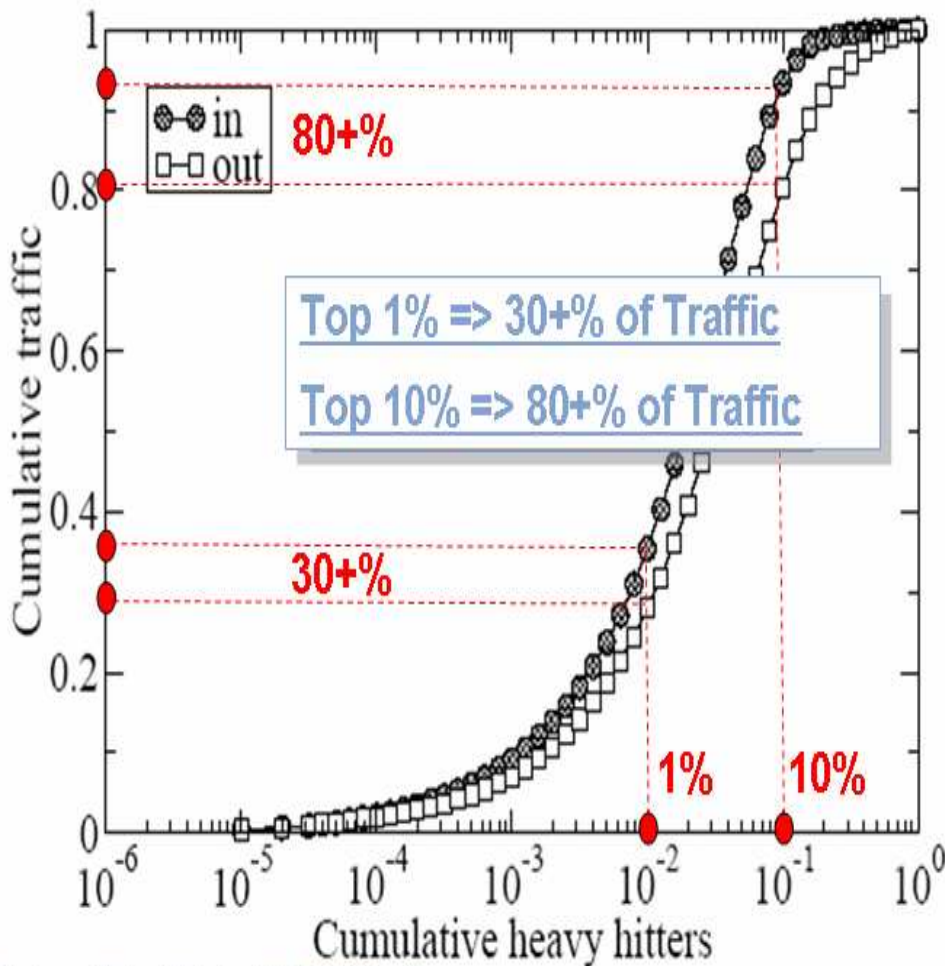
By Managing Congestion, Fair Use Policies (FUP) Can Significantly Increase the Performance of Interactive Applications (VoIP, Gaming, etc.), Thereby Benefitting the Majority of Users, While Keeping Network Upgrades in Sync with Revenue Growth

OTT Impact
Three Main Areas of Concern

- Out-of-control Traffic Growth

  Average User's Traffic is increasing more than 100% per Year

- Usage Substitution

  Time people spend on the Internet (e.g., User Generated Video) reduces time spent watching TV

  Advertising spend shifts with usage

- Service Substitution

  Time shifting is one of the most important consumer behavioral trends related to entertainment and is "OTT-friendly"

  Explosion of Online content sources (iTunes, Xbox, Amazon, CinemaNow, MovieLink, Vongo…)

Source: Cisco IBSG, December 2006

Over-The-Top Application Strategies
SPs Four Possible Actions towards OTT Players

Ignore/Monitor

- Ignore the thousands of irrelevant OTT services.
- Deploy Traffic Analysis and Monitoring capabilities.

Defend

- Intermix OTT applications
- Quota, Traffic Management, Fair Use Policies…
- Re-Assess Free Peering.
- Reserve some network capacity for own use. (Private-IP)
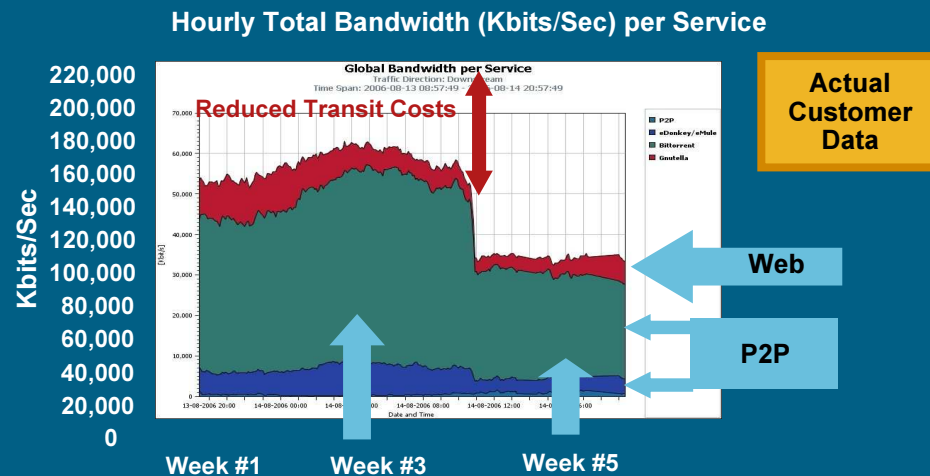- Triple Play = Default Service.

Collaborate

- From Co-marketing to Integration of Services.
- Optimized Delivery, QoS, CDN, Multicast, Quota exemption…
- Improved Access to TV and Mobile.
- Websvcs Interface to IP-NGN
- Targeted Advertising.

Become/Imitate

- Deploy Services beyond your own footprint, ex. VoIP over any broadband.
- Develop an attractive Online Portal suitable for Fixed and Mobile access.
- Develop an On-line video strategy.

Managing P2P Traffic:
Packet Flow Optimization Example

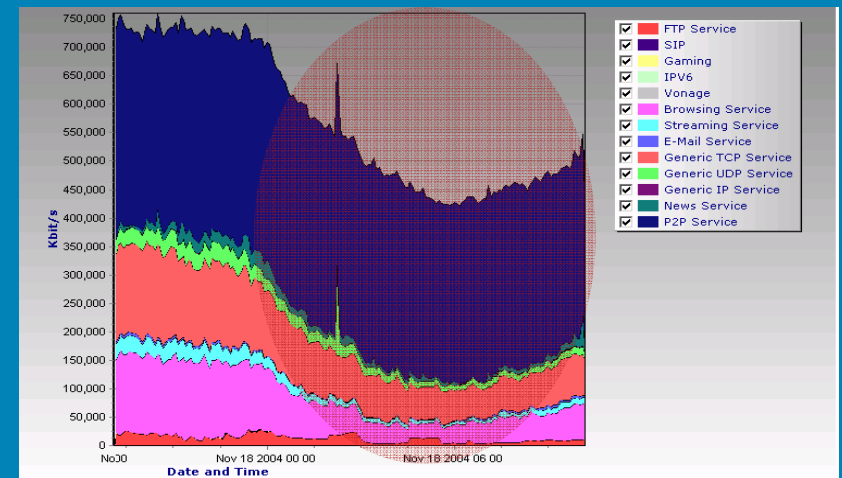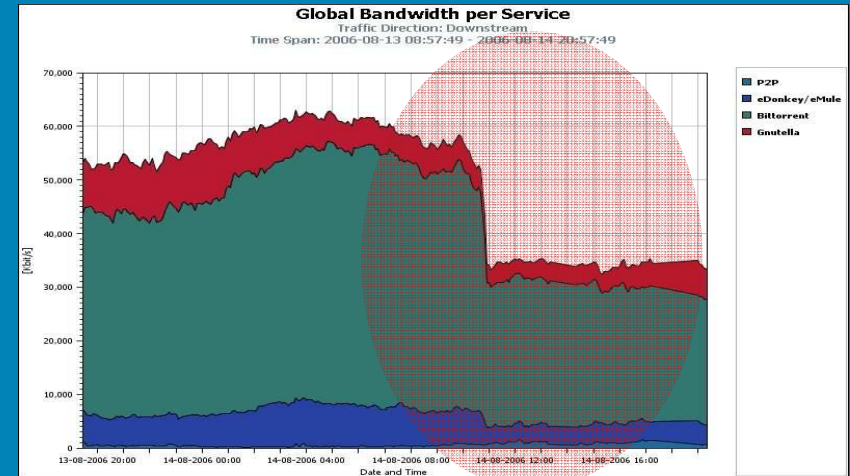## Service Prioritization via Packet Flow Optimization

Hourly Total Bandwidth (Kbits/Sec) per Service

220,000	
200,000	
180,000	
160,000	
140,000	
120,000	
100,000	
80,000	
60,000	
40,000	
20,000	
0	

Kbits/Sec

Reduced Transit Costs

Actual Customer Data

Global Bandwidth per Service
Traffic Direction: Downstream
Time Span: 2006-08-13 08:57:49 – 2006-08-14 20:57:49

P2P
eDonkey/eMule
Bittorrent
Gnutella

Web

P2P

Week #1   Week #3   Week #5

Managing P2P Applications

- **Enable new business models between content and service providers**

- **Detect and manage affiliated applications and align QoS**

- **Co-branding and fee sharing**

P2P Management and Network Optimization
Fair-Use Policy Enablement

- Upload P2P Control

  Sessions or bandwidth

- Time-based control

  Peak/off-peak hour policies

- Congestion-based control

  Prioritize sensitive applications during congestion

- Subscriber fairness

  Per subscriber quotas and limits

- Destination-based control

  Different policies for on-net/peering/transit traffic

Global Bandwidth per Service
Traffic Direction: Downstream
Time Span: 2006-08-13 08:57:49 - 2006-08-14 20:57:49

Volume and Time-Based Quota Services
Tiered Services Example

Implement Fair Use Policy

- Eliminates bandwidth bottlenecks
- Enhanced user experience

Usage	Less Than 2.8GB	Less Than 4.2GB	Less Than 5.6GB	Over 5.6GB
E-mail + WWW	No Limit	No Limit	256 kbps	256 kbps
Audio/Video Streaming	No Limit	128 kbps	65 kbps	48 kbps
P2P	48kbps	28 kbps	28 kbps	16 kbps
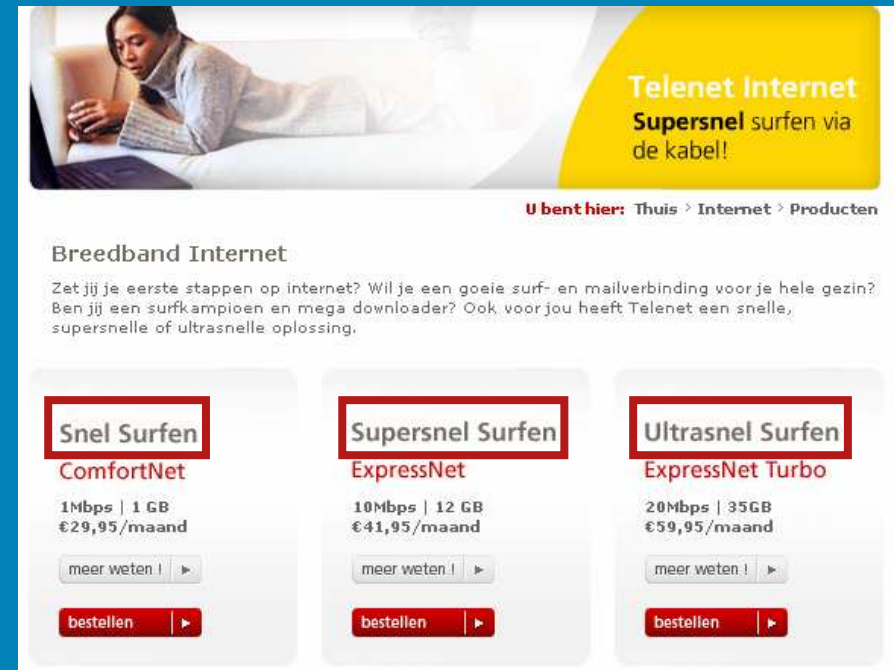
User Quota Based on 7-Day Timeframe

Quota Based Tiering
Telenet: Cable Company in Belgium

- Quota compliments Speed as a Tiering parameter

- When a User reaches Quota, his Internet service is reduced to dial-up speed or default speed

- The User then has the option to upgrade his Quota Level or continue at reduced speed till the end of the month

- 15% of the Customers upgrade their Quota every month*

- Belgacom, the Belgian Incumbent deployed similar Quota system on xDSL

*http://www.billingworld.com/rev2/main/featureArticle.cfm?featureID=7799

Telenet Internet
Supersnel surfen via de kabel!

U bent hier: Thuis › Internet › Producten

Breedband Internet

Zet jij je eerste stappen op internet? Wil je een goeie surf- en mailverbinding voor je hele gezin? Ben jij een surfkampioen en mega downloader? Ook voor jou heeft Telenet een snelle, supersnelle of ultrasnelle oplossing.

Snel Surfen
ComfortNet
1Mbps | 1 GB
€29,95/maand
meer weten ! ►
bestellen ►

Supersnel Surfen
ExpressNet
10Mbps | 12 GB
€41,95/maand
meer weten ! ►
bestellen ►

Ultrasnel Surfen
ExpressNet Turbo
20Mbps | 35GB
€59,95/maand
meer weten ! ►
bestellen ►

Service Creation
SCE's Rich Service Creation Environment

Rich Service-Creation Environment

- Application-based control on a per-subscriber basis

- Integrates with AAA, policy-server to deliver personalized broadband experience
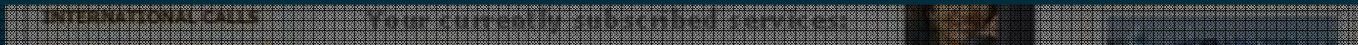
Personalized Subscription Service Examples

- Parental Controls and Content Filtering: Set Internet controls for children, including blocking access and imposing time limits on online use

- Bandwidth-On-Demand (Turbo Button): A turbo button to boost bandwidth for a set or undetermined period of time, or for the life of a specific application

- Allowance-Based Subscription Services: Choose volume or time-based quotas for a set period of time as referred to as prepaid service

- Copyright Infringement: Validate that content distributed does not infringe copyrights.

- Advertisement Insertion: Perform local advertisement insertions.

- Security Services: Network-based security services to protect subscribers from attacks or mitigate risks associated with attacks emanating from the subscriber.
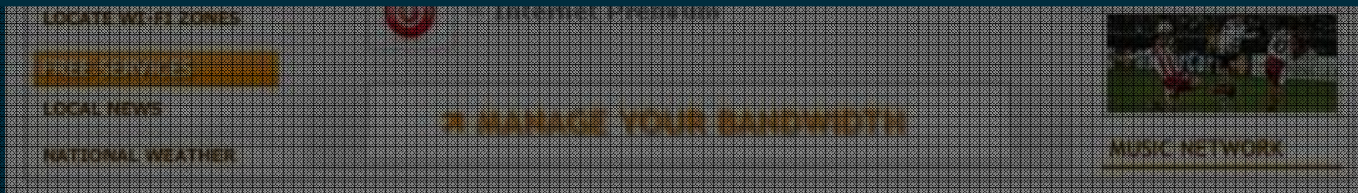
Self-Subscription Service
Via Personalized Web Portal
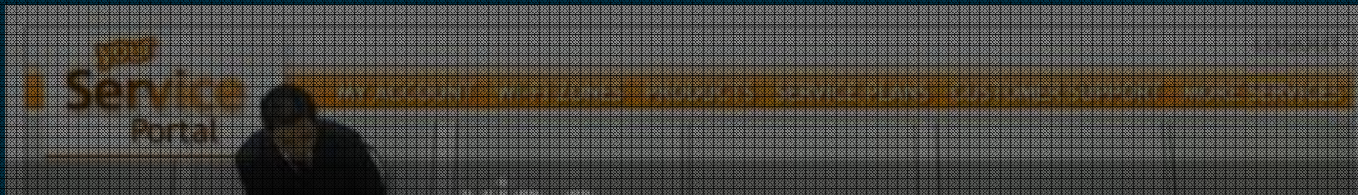
Enable Zero-Touch Provisioning,
for Full Self-Service Account Setup

Enable Customers to Self-Select
and Modify Services and Features

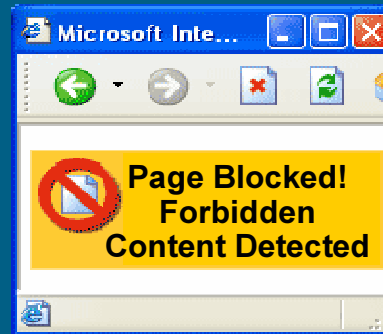# Parental Controls
Getting Involved in Your Child's Experience

Parental Controls and Content Filtering

Adults Can Access a Web Portal and Set Internet Controls for Children, Including Blocking Access to Certain Types of Websites, and Imposing Time Limits on Online Access

Parental Control and Content Filtering
Example

Content Filtering

**Page Blocked!
Forbidden
Content Detected**

- Subscriber-managed parental control

- Basic website blacklisting provided free of charge

- Comprehensive filtering and security for a small monthly subscription

Bandwidth-On-Demand
Meeting Subscriber Needs on Demand

Turbo Button

Subscribers Who May Have a Standard Lower-Speed Internet Service May Visit a Web Page on the Provider's Site and Click on a Turbo Button to Boost Their Bandwidth for a Set Period of Time or to Leave the Button Engaged Until They Return and Deselect It

Allowance or Quota Based Services
Buy Time or Bandwidth as Needed

Allowance Based Subscription

This Feature Allows Subscribers to Choose Volume Quota-Based or Time-Based Bandwidth for a Set Period of Time, for Example on a Monthly Basis

Pay-as-You-Go Subscription Service

This Option Is Ideal for Subscribers Who Use the Internet Intermittently and Only Want to Buy Time or Bandwidth as Needed; When Users Launch Their Browsers, They Are Redirected to a Web Portal Where They Select the Two-hour "Pay As You Go" Option; After Two Hours, the Session Could Either Be Terminated or the User Could Purchase More Usage
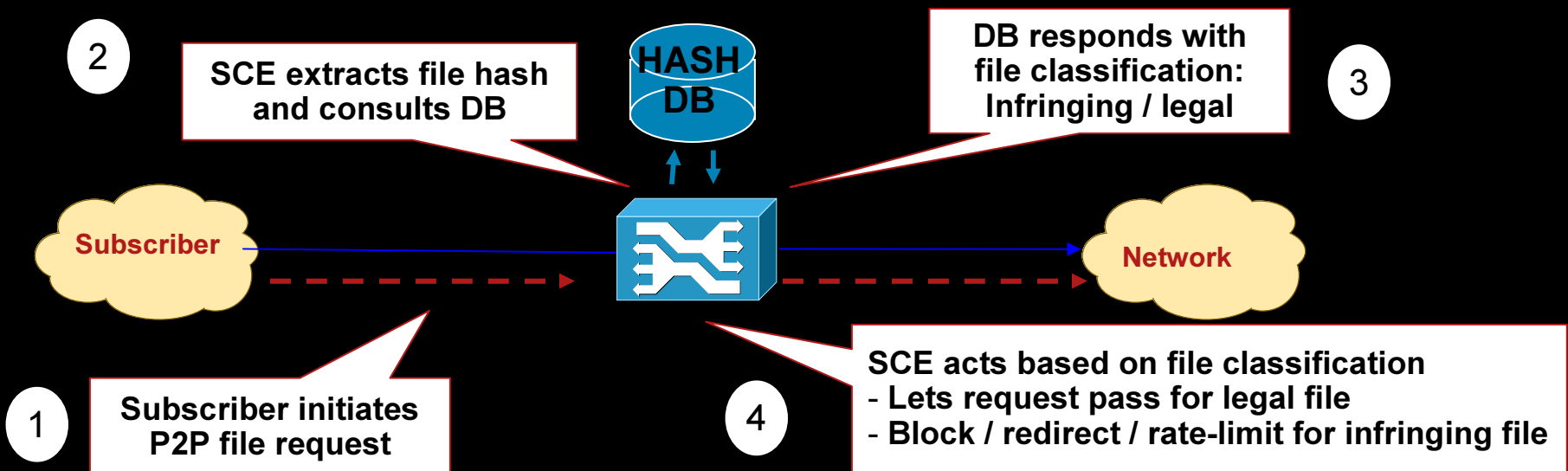
Infringing / Non-Infringing
P2P Identification

Proof OF Concept !

Classifying P2P content into infringing / non-infringing

- Identifying and reporting infringing material per the SP's policy
- Using the detection and blocking to up-sell a legal copy of the original request or a subscription to the SP's Content store
- Using the information to de-prioritize or control infringing material

2 SCE extracts file hash and consults DB

HASH DB

DB responds with file classification: Infringing / legal **3**

Subscriber

Network

1 Subscriber initiates P2P file request

4 SCE acts based on file classification
- Lets request pass for legal file
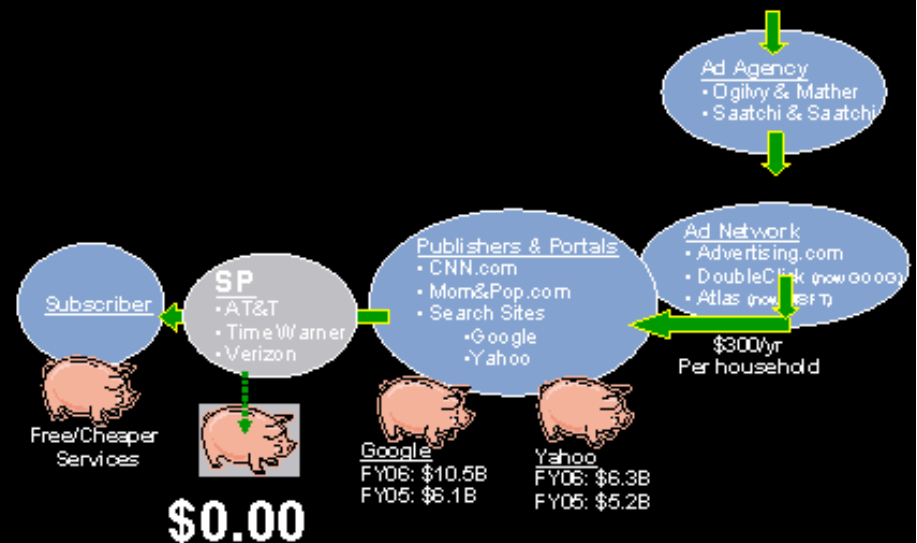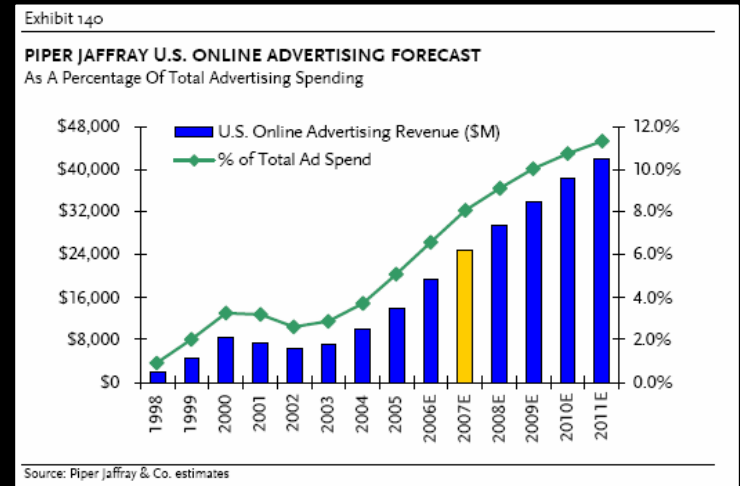- Block / redirect / rate-limit for infringing file

SCE in Online Advertising

- Online advertising is the fastest growing segment within the huge advertising market

  Expected to exceed $25B in

  2007, with ~30% year-over-
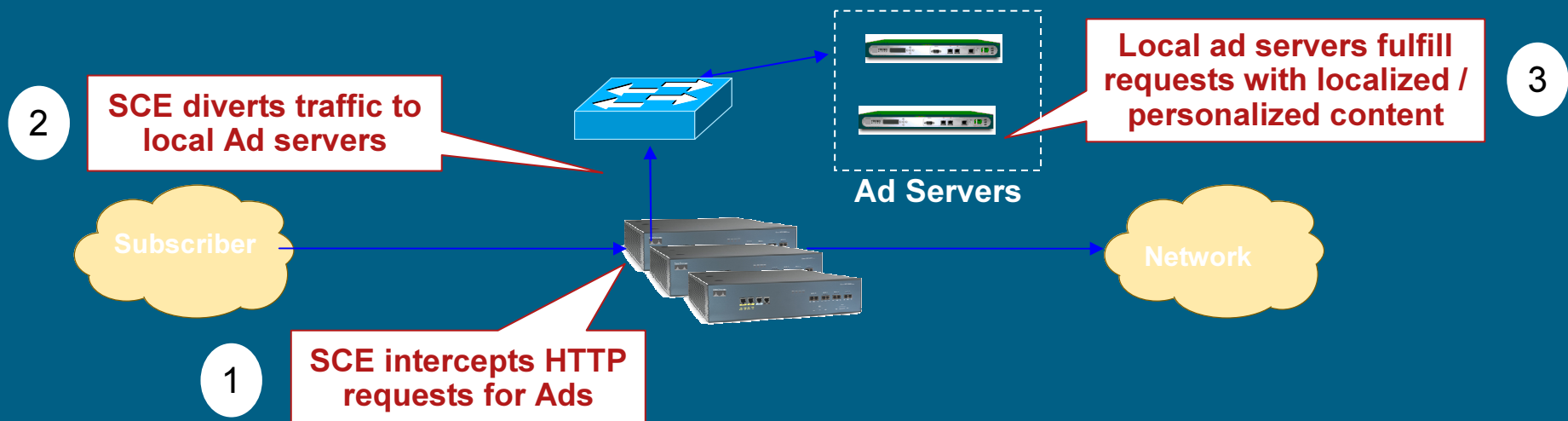
  year growth (US only)

- Money flows from the advertisers

- to ad-agencies, ad-networks and publishers

  SPs do not participate in the business (similarly to other OTT services)

Exhibit 140

PIPER JAFFRAY U.S. ONLINE ADVERTISING FORECAST
As A Percentage Of Total Advertising Spending

U.S. Online Advertising Revenue ($M)
% of Total Ad Spend

Source: Piper Jaffray & Co. estimates

SCE in Online Advertising

- SCE allows the Service Provider to become part of the value chain

  Leveraging his familiarity with subscribers to facilitate highly targeted advertising

- SCE allows replacement of Ads embedded in web pages

  Identifying the HTTP requests for ads submitted by subscribers…

  Diverting them to an alternate local server, which fulfills them using localized / personalized content

2 — SCE diverts traffic to local Ad servers

3 — Local ad servers fulfill requests with localized / personalized content

Ad Servers

Subscriber

Network

1 — SCE intercepts HTTP requests for Ads

Service Security Protection

- Mitigates security threats in the open broadband network

  DoS: DoS attacks from subscribers

  Spam: Spam activity from botnets or malicious users

  Worms: Worm infections and propagation attempts

- Three-tier solution; uses a combination of anomaly detection and signature matching to:

  Identify: Threat using stateful traffic processing and alert SP operations

  Protect: Block/mitigate threat based on configured policy

  Notify: Quarantine subscriber and notify of security risk
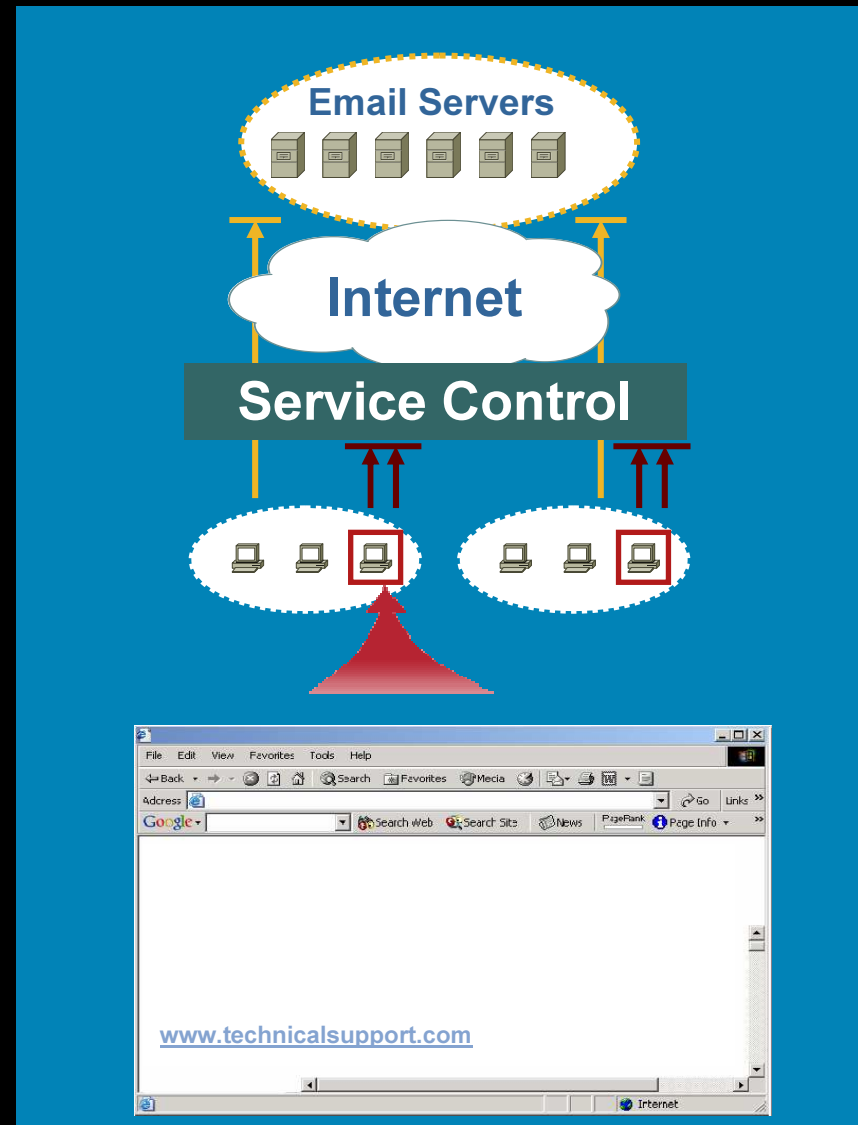
Service Security Protection
Value to the Service Provider

✔	Reduce Administrative Costs During Outbreaks
✔	Limit Subscriber Infection to Reduce Call Center Load
✔	Increase Customer Loyalty and Reduce Churn
✔	Upsell Opportunity of Security Add-on Services
✔	Saving on Network Bandwidth

The Service Control Implementation Cycle

• Solutions initially deployed for profiling and traffic mgmt are now being used for creation of individualized services, including:

• enhanced gaming services
• parental controls
• telecommuter services
• application-restricted services
• quota-based services
• bundled services

(6-18 months after installation)

Expanded Individualized Services

Initial Sale (Cost Control)

Cisco Service Control

Initial Individualized Services

Incremental Solution Rollout

Expanded OpEx Control (Service Security)

• Solutions initially used for profiling / traffic mgmt / cost control
 • Initial deployments are typically followed with expanded network coverage / expanded application control

• Customers expand use by using the solution for control of worm/spam propagation, and preventing DoS / DDoS attacks

(3-12 months after initial installation)

Activities Timeline - Stage 1

Identify Traffic Patterns
    0-3 Months

Evaluate traffic patterns, with baseline evaluation
to include at a minimum:

- Subscriber usage patterns by application type

- Subscriber usage patterns by time

- Demographic "clustering" (SCE reports and surveys)

- Presence of "over the top" services

- Application type trends over time

- Relative use of latency-sensitive applications

- Top users

- Top servers

Detailed view of subscribers for business modeling

Activities Timeline - Stage 2
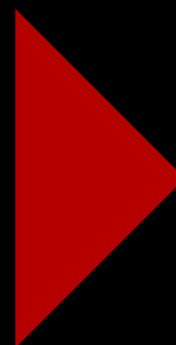
Identify Traffic Patterns
0-3 Months

Condition Network
3-12 Months

Implementation of control policies considering...

- Control policies vs. corporate branding

- Implementation timeline (phased approach)

- Manner in which the control policies will "feed" into service development

- Level of proactive marketing activities required

- Other ...

Example ...

- P2P control - time of day, domestic vs. international, per subscriber allocation

- Each has associated merits / issues that can only be evaluated in the context of the business model

"Conditioned" Network for Services Rollout -

Business Modeling Based on Controlled Bandwidth

Activities Timeline - Stage 3

Identify Traffic Patterns	Condition Network	New Services
0-3 Months	3-12 Months	6-18 Months

Implementation of application- / content-based services in context of business model considering ...

- Potential cannibalization of existing high-margin services
- Timeframe of service implementation
- Construction of sell-up opportunities
- Any relevant quotas and policies upon expiration
- Specific corporate assets that can't be easily replicated by competitors - eg. Transport / Wireless bundling
- Marketing / PR support and service positioning
- Required development activities by technical teams

Services Rollout, Network Optimization, Ongoing Evaluation

Service Control –
Advancing Broadband Services

- **Over 400** Service Providers Deployed

  ANY broadband Network: xDSL, FTTx, Cable, Mobile 3G, Fixed-Wireless

  Significant rollouts in live networks

- **Largest Service Control deployments in the world** – over 20 million subscribers served

Cisco IP NGN Vision and Architecture
Enabling Unique Connected Life Experiences

Resources

Comprehensive IP NGN Portfolio

Build

CRS-1, ISG, 7600, 7200/7300

IP DNA

Unmatched IP Expertise and Experience

Partner

Content Providers, Middleware, System Integrators

Commitment

Over $2B R&D FY'07 for SPs

Aquire

Scientific Atlanta, Linksys, Arroyo

Cisco Service Provider Vision

Connecting Customers with Services, Services with Networks, and Networks with Each Other

Consumer — Small/Medium Business — Enterprise — SP Wholesale

IP Next-Generation Network

VPNs — Internet — Content — Voice and Video — Mobility — Transport