HP WORLD 2004
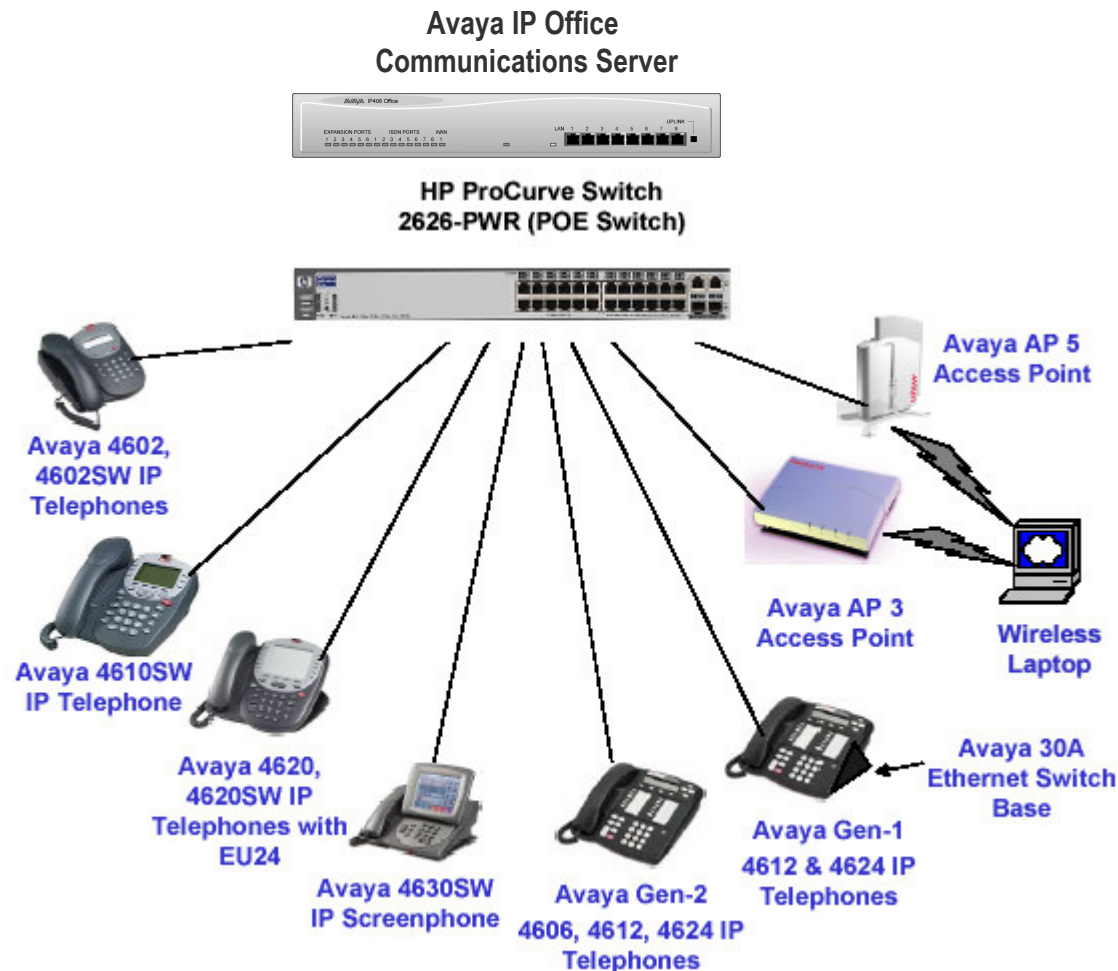## Solutions and Technology Conference & Expo

ProCurve and Wired and Wireless Voice-over-IP Applications

Andy Rawll

Global Product Manager
Avaya

HP ProCurve & Avaya IP Telephony Appliances

Avaya IP Office
Communications Server

HP ProCurve Switch
2626-PWR (POE Switch)

Avaya 4602, 4602SW IP Telephones

Avaya 4610SW IP Telephone

Avaya 4620, 4620SW IP Telephones with EU24

Avaya 4630SW IP Screenphone

Avaya Gen-2 4606, 4612, 4624 IP Telephones

Avaya Gen-1 4612 & 4624 IP Telephones

Avaya 30A Ethernet Switch Base

Avaya AP 5 Access Point

Avaya AP 3 Access Point

Wireless Laptop

Overview – Benefits to Business of ProCurve for VoIP Applications

- Scalability
  - Applicable to any size business
  - Meet today's needs with scope for the future.
  - Uses standards-based Ethernet to deliver telephony services
  - Significantly reduces incremental cost per user

- Mobility
  - Enables new ways of working
  - Supports ubiquitous access to network and voice resources
  - Enables wherever internet access is available, whether wired or wireless,
  - Applicable to home office to the coffee shop to the airport lounge to the head office.

- Agility
  - Easier and quicker for businesses to change the way in which its employee work
  - Improve the underlying processes that allow businesses to serve their customers better
  - Powerful control through user profiling, drag-and-drop configuration, universal extension numbering and real-time update and reporting

Agenda

- IP Telephony Adoption

- Benefits
  - Mobility & flexibility
  - Scale & continuity

- Challenges

- Planning principles
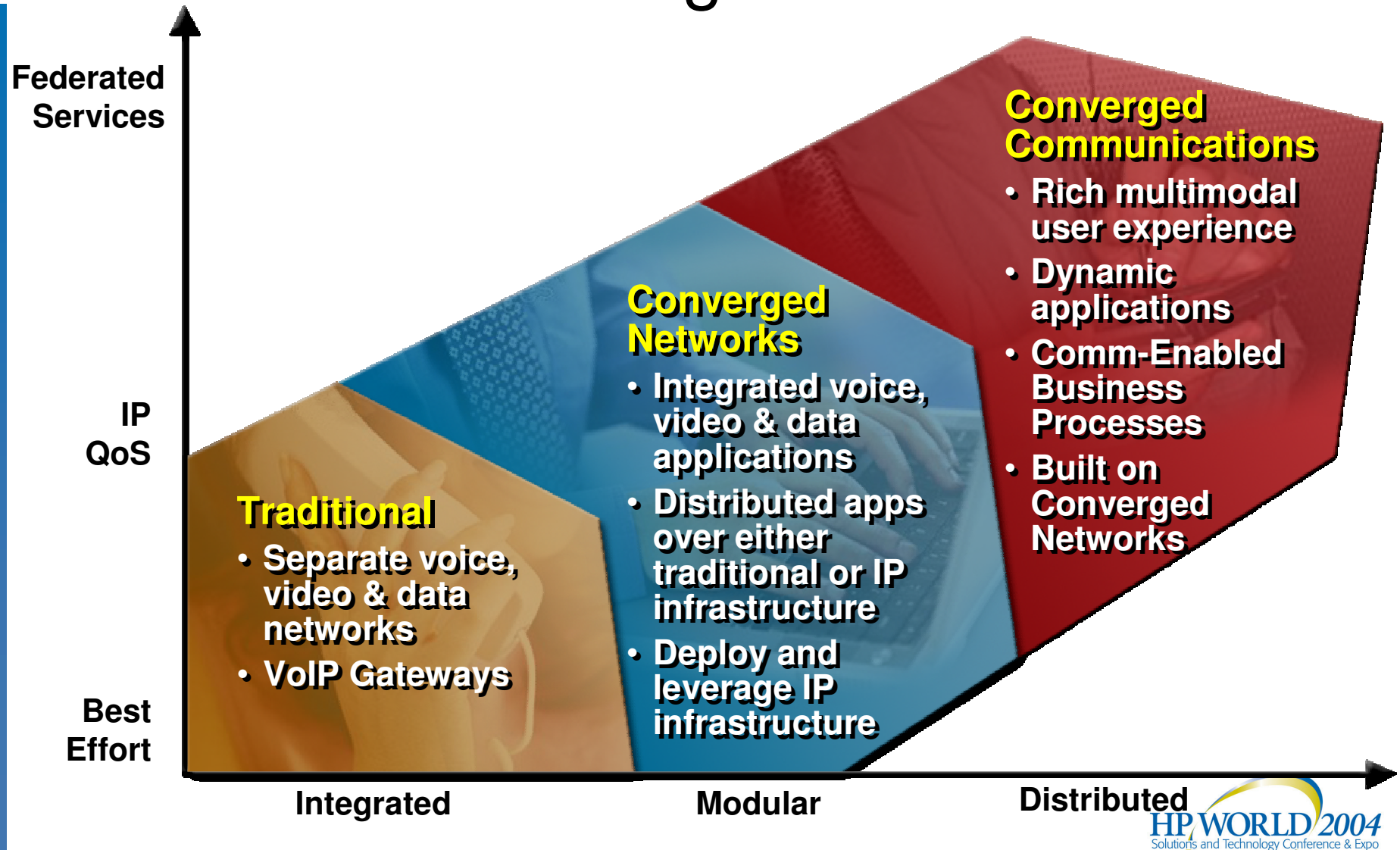
- ProCurve applications
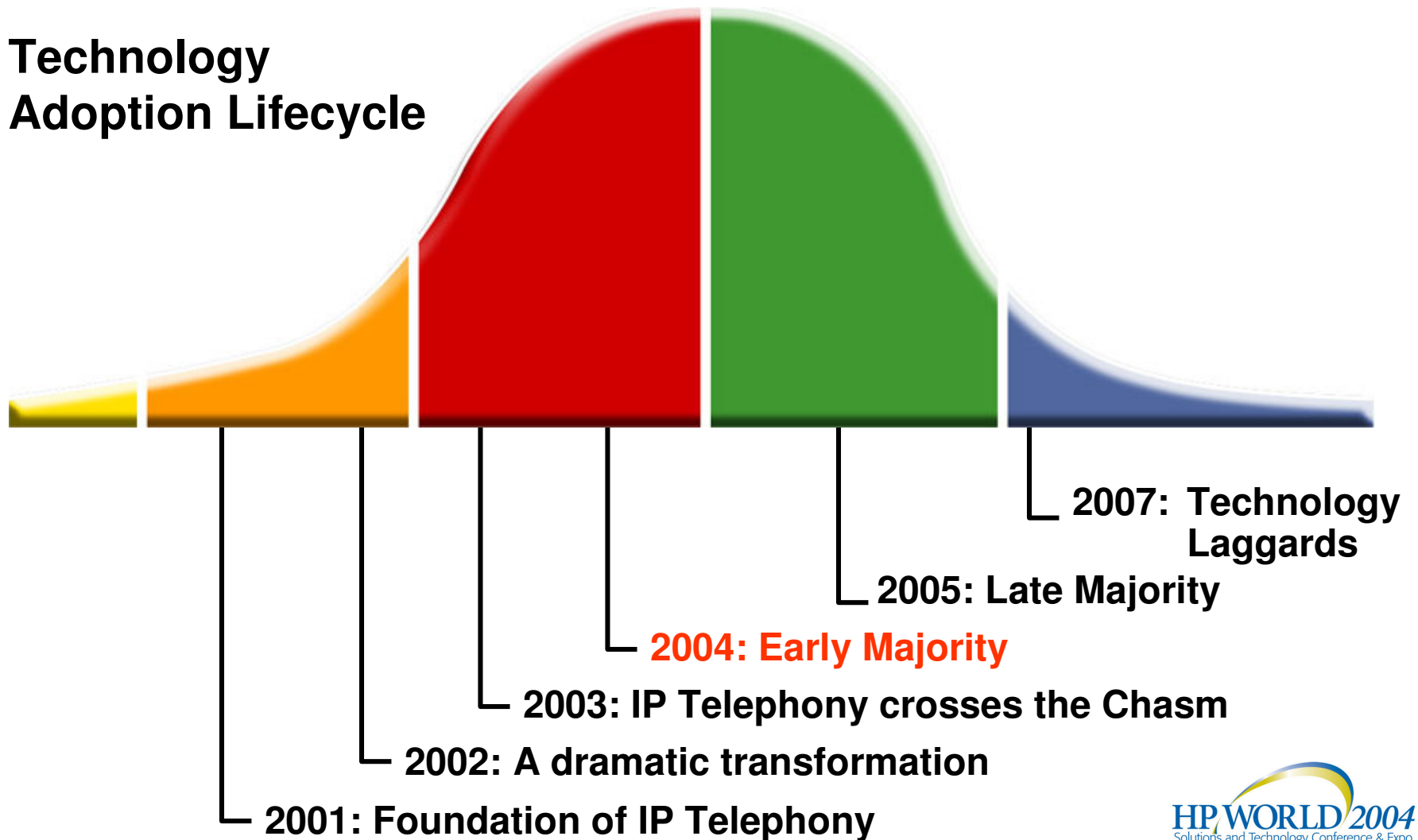
- Summary

IP Telephony Adoption

ProCurve and Wired and Wireless Voice-over-IP Applications
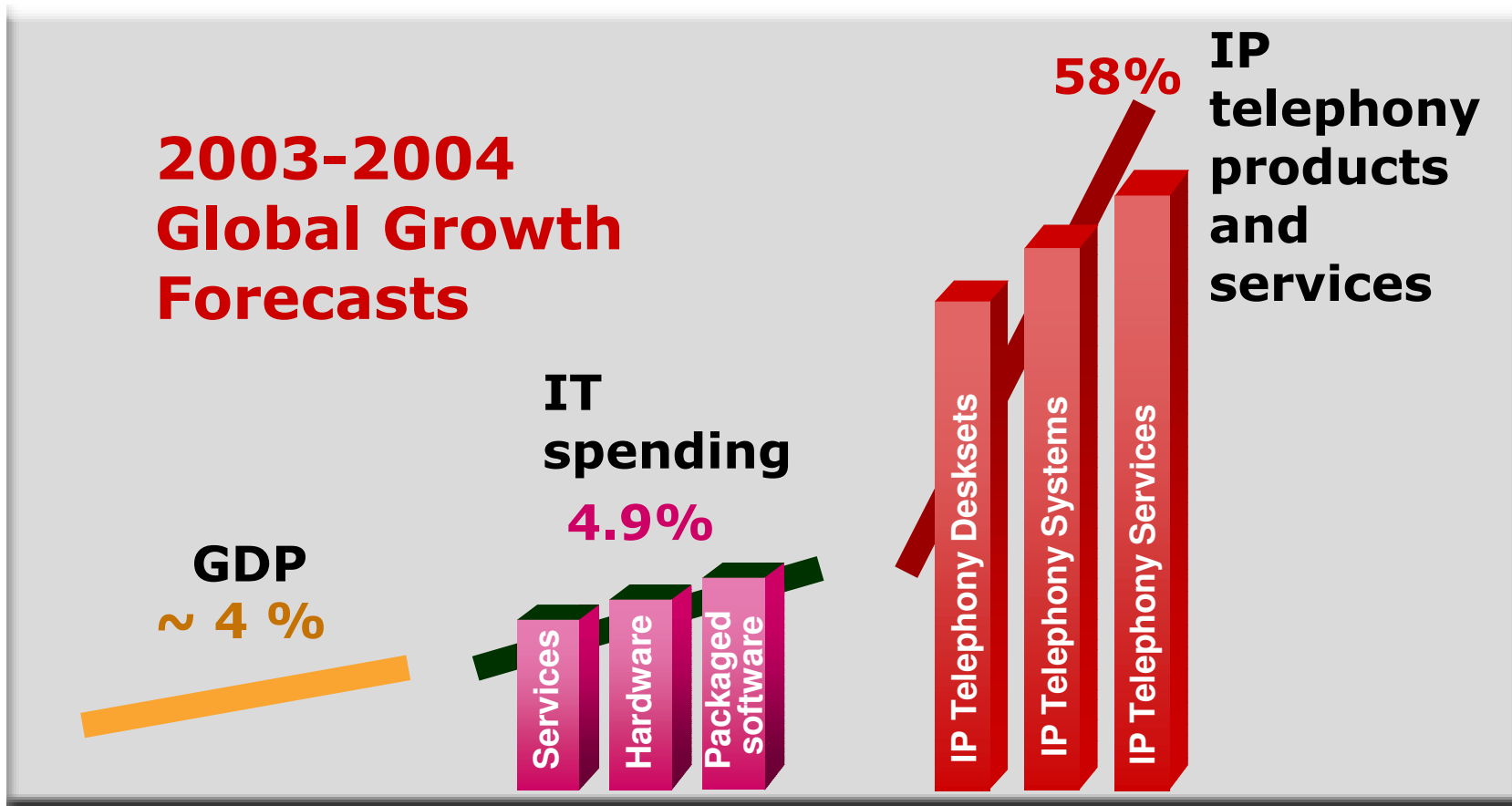
The Next Era –
Evolution to Converged Communications

Federated Services · **IP QoS** · **Best Effort** (vertical axis)

Integrated · **Modular** · **Distributed** (horizontal axis)

Traditional
- Separate voice, video & data networks
- VoIP Gateways

Converged Networks
- Integrated voice, video & data applications
- Distributed apps over either traditional or IP infrastructure
- Deploy and leverage IP infrastructure

Converged Communications
- Rich multimodal user experience
- Dynamic applications
- Comm-Enabled Business Processes
- Built on Converged Networks

IP Telephony Adoption

Technology Adoption Lifecycle

2007: Technology Laggards

2005: Late Majority

2004: Early Majority

2003: IP Telephony crosses the Chasm

2002: A dramatic transformation

2001: Foundation of IP Telephony

IP Telephony is Driving the Growth

2003-2004 Global Growth Forecasts

58%

IP telephony products and services

GDP
~ 4 %

IT spending
4.9%

Services

Hardware

Packaged software

IP Telephony Desksets

IP Telephony Systems

IP Telephony Services

Sources: RDA Global, Gartner, InfoTech, EIU. Avaya analysis.

IP Telephony Benefits

ProCurve and Wired and Wireless
Voice-over-IP Applications

VoIP vs. IP Telephony

- VoIP is just transport.
  - Relatively easy

- IP telephony is applications enablement.
  - Extending traditional business communications features to a converged world

Reasons for Deploying IP Telephony

IP Telephony Deployment Drivers

Driver	%
Cost savings	75%
Need to standardize equipment	66%
Employee productivity gains	65%
Other productivity benefits	64%
Call center volume increases	46%
Other factors	50%

0%   25%   50%   75%   100%

% of responses "somewhat" or "very" important
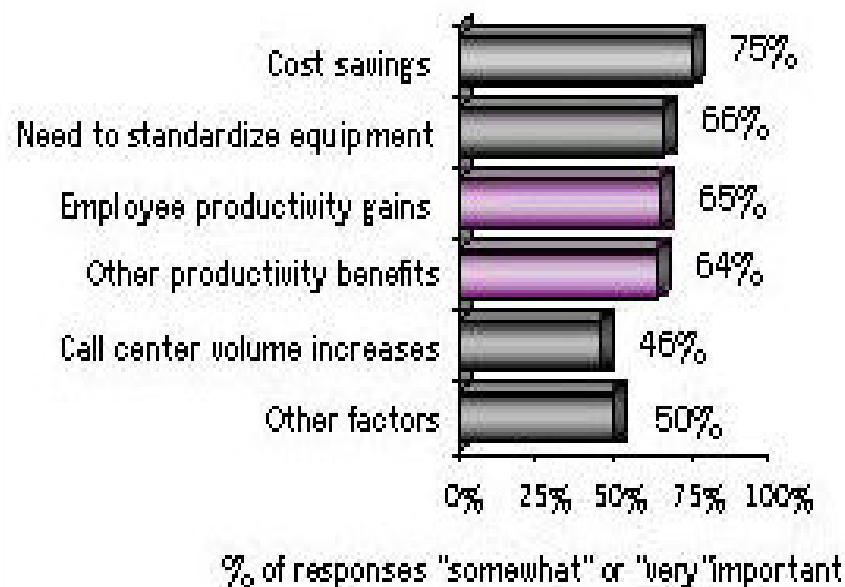
CPE Customer Satisfaction Benchmark Summary Report

Service Providers: OSS Needs Assessment--A Sage Technology Roundtable

IP Telephony Productivity Benefits

Service Provider Confidence Index

IP Telephony Business Benefits

1. **Location Transparency**
   - IP Telephony provides "infinitely long wires"
   - Enabling new business models and topologies
   - Increasing the speed of business change

2. **Single Network**
   - Provides a range of significant cost reductions
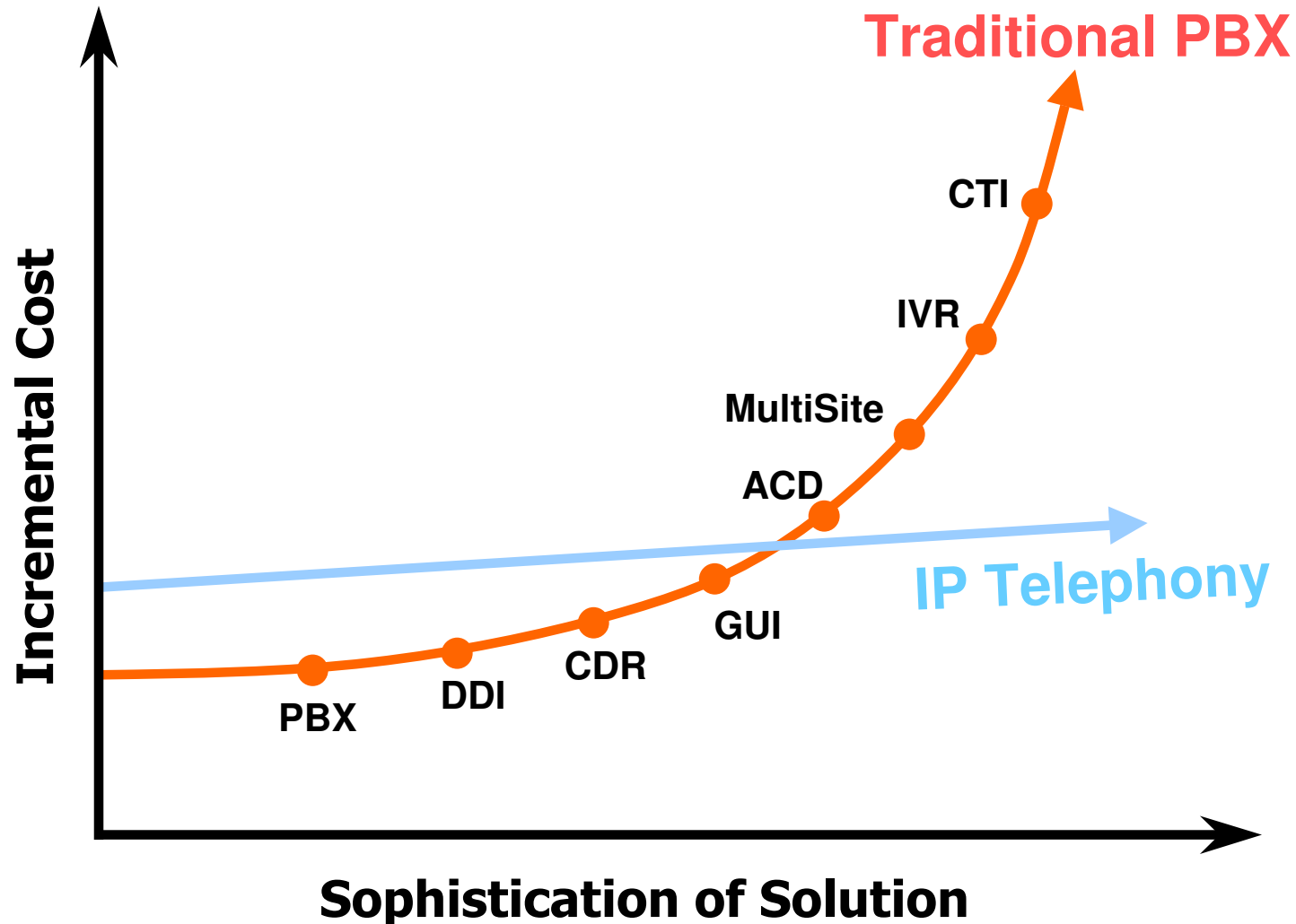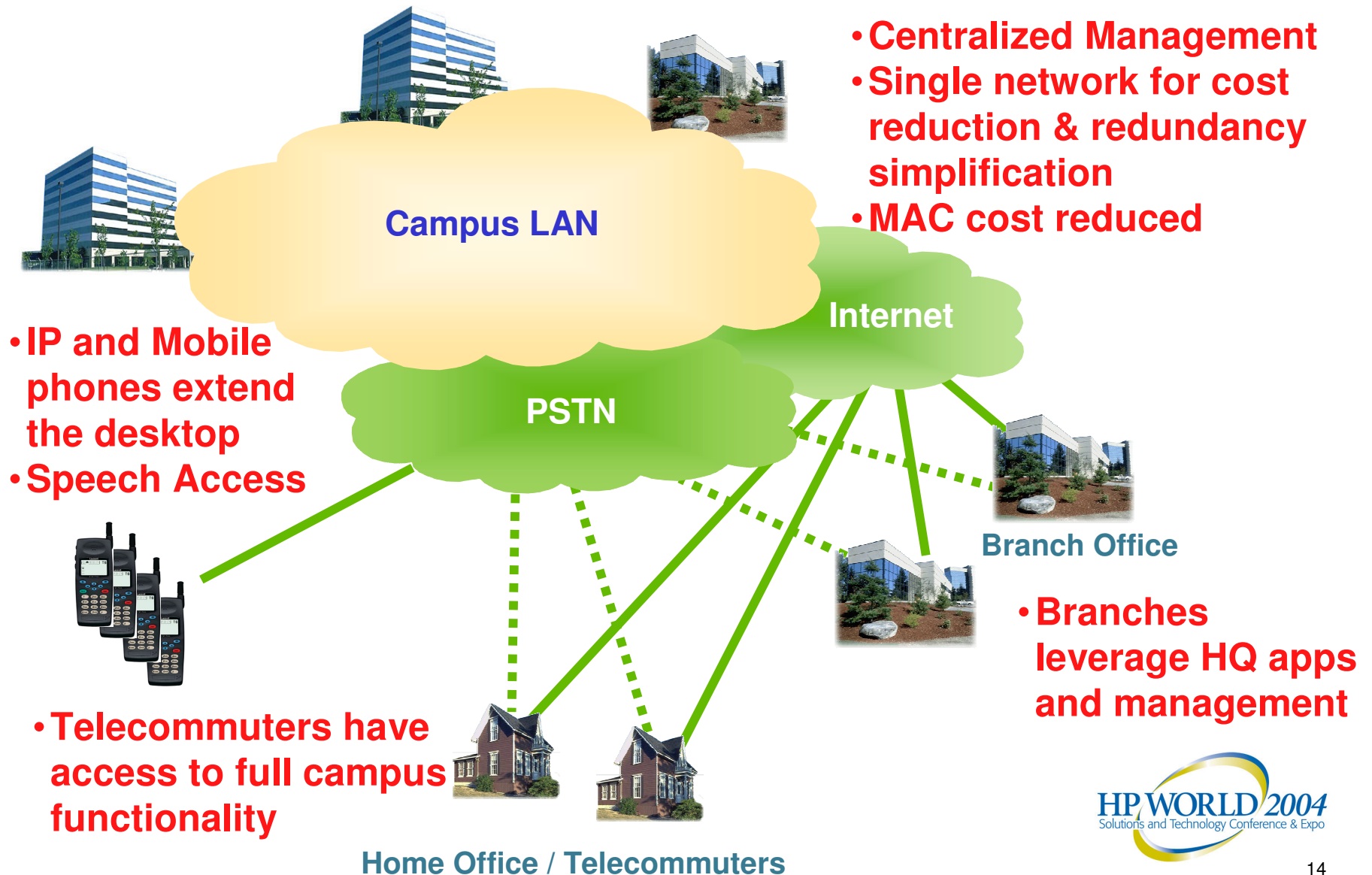   - … management time, skills, MACs, circuits, LD costs

- **Branch offices, distributed small locations**
- **Speed of establishing new offices**
- **Business Continuity**
- **Telecommuters, off-hour working**
- **Mobile workers, access to communications**
- **Virtual contact centers, at-home agents**
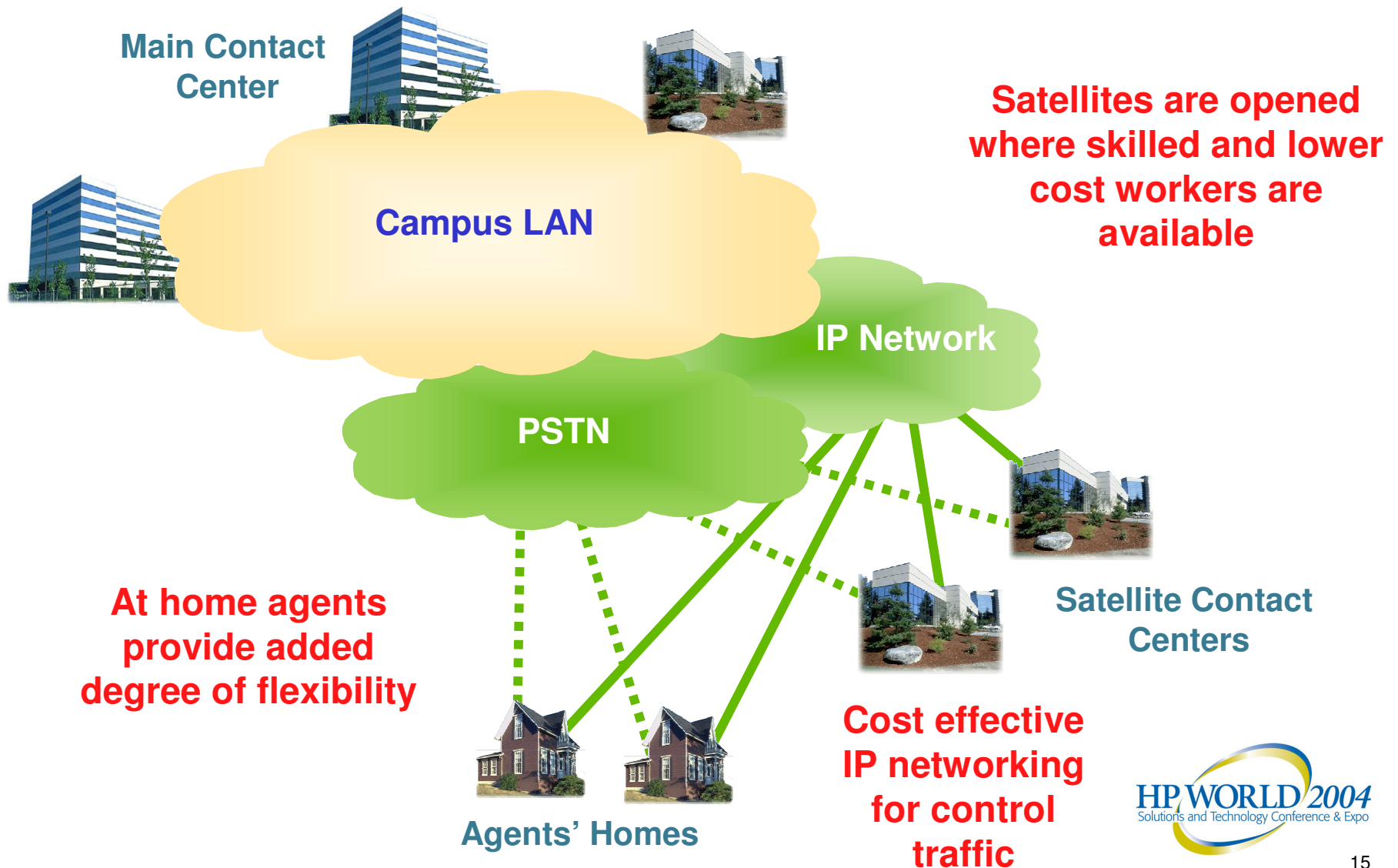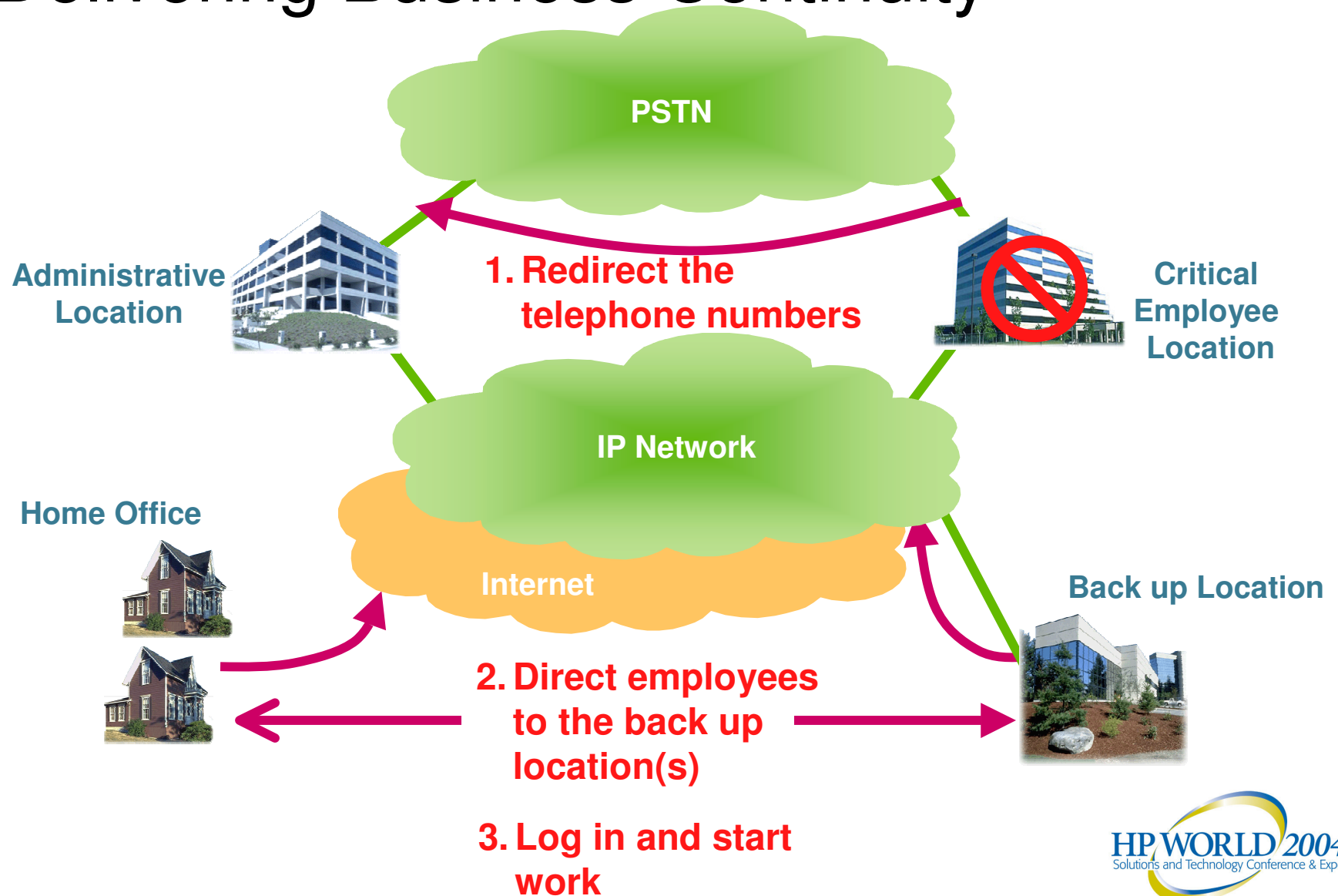- **Globally distributed contact centers**

The Distributed Enterprise

IP Telephony – Lo TCO: Hi ROI

Source: BT

13

Mobility and Scale

Campus LAN

Internet

PSTN

- **Centralized Management**
- **Single network for cost reduction & redundancy simplification**
- **MAC cost reduced**

- **IP and Mobile phones extend the desktop**
- **Speech Access**

- **Telecommuters have access to full campus functionality**

Branch Office

- **Branches leverage HQ apps and management**

Home Office / Telecommuters

Flexibility & Ubiquity

Main Contact Center

Campus LAN

Satellites are opened where skilled and lower cost workers are available

IP Network

PSTN

At home agents provide added degree of flexibility

Satellite Contact Centers

Cost effective IP networking for control traffic

Agents' Homes

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Delivering Business Continuity

PSTN

Administrative Location

1. Redirect the telephone numbers

Critical Employee Location

IP Network

Home Office

Internet

Back up Location

2. Direct employees to the back up location(s)

3. Log in and start work

IP Telephony Challenges

ProCurve and Wired and Wireless
Voice-over-IP Applications

IP Telephony Adoption – Vertical Markets

Teledensity Factor by Industry

The teledensity factor measures the number of phones per employee for a given industry. Note that the industry that a firm competes in greatly impacts their needs for enterprise communications.
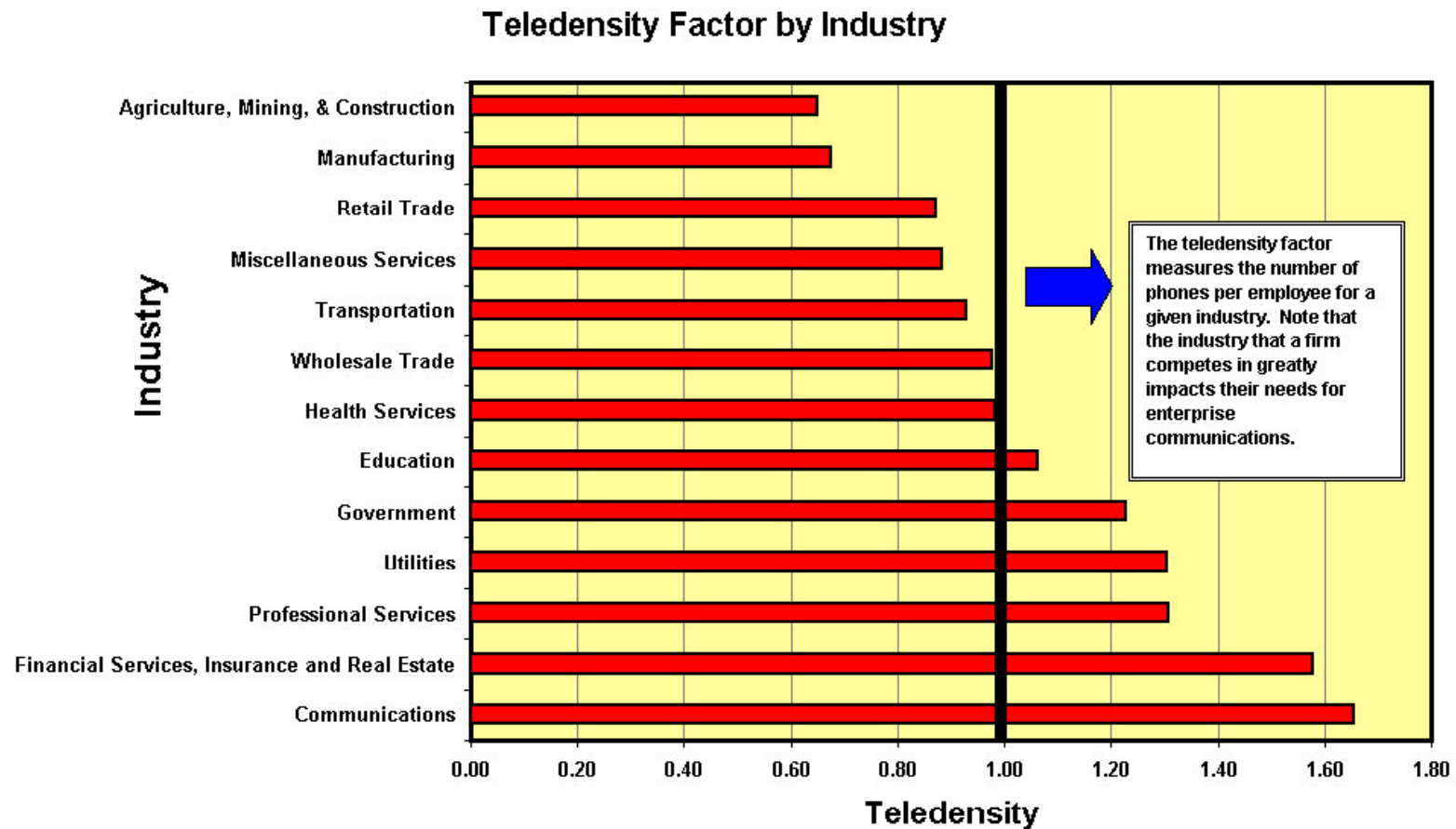
IP Telephony Adoption – Vertical Markets
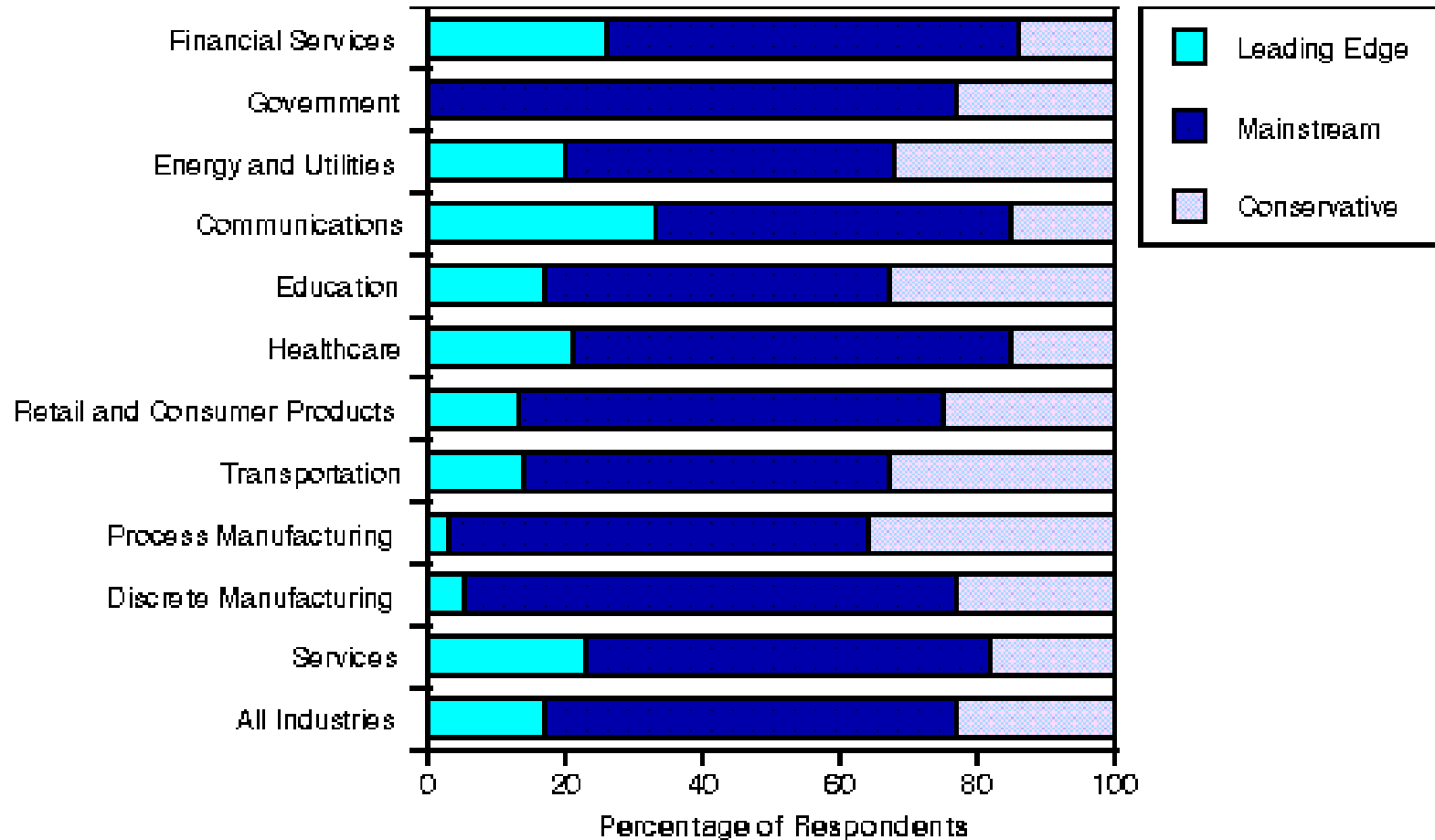
Source:

Gartner Dataquest
(2003)

Convergence - Potential Obstacles

Potential Obstacles — **Rating of Potential Obstacles**

Potential Obstacles	Rating
Reliability	8.4
Voice quality	7.5
Price	6.8
Scalability	6.0
No compelling reason to replace PBXs	6.0
No compelling applications	6.0
PBX investment not fully depreciated	5.9
IP Telephony is unproven technology	5.8
Incompatible with current systems	5.6
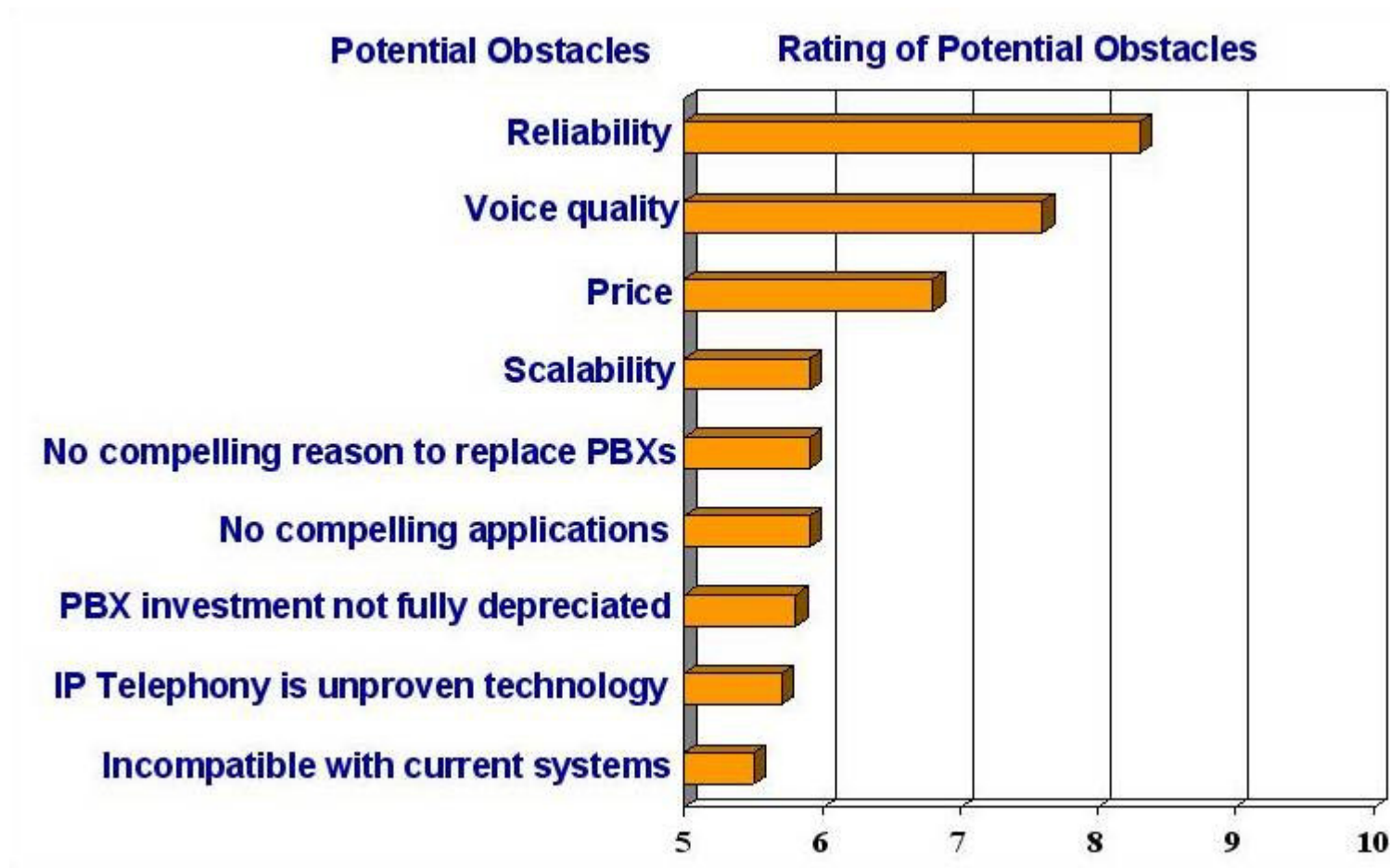
Voice vs. Data:
Fundamentally Different Networks

Voice	Data
Connection-based	Connectionless
Guaranteed	Best-effort
Black phones, intelligent networks	Smart hosts, dumb networks
Stable and predictable	Dynamic and exponential growth

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Market Confusion
Invalid technology-level assertions confuse customers.

Unless customers move to a "pure" IP solution, they will not get the full benefits of IP telephony.

Adding more choices within the distributed client/server IP architecture provides full IP benefits and is not less "pure."

"Hybrid" solutions are an alternative architecture to the "pure" IP approach.

There is no distributed client/server <u>architecture</u> difference.

Customers must replace their existing phones with IP phones to get the real benefits of IP.

Why? IP phones are useful, but IP benefits do not depend on phones.

TDM bus technology should not be used within IP solutions.

All vendors use TDM in some way, and TDM has a valid a role in IP telephony.

Customers do not really need all the traditional telephony features, applications, and support services they have today.

Why? Customers expect <u>more</u> from IP telephony.

IP Telephony Planning Principles

ProCurve and Wired and Wireless

Voice-over-IP Applications

"Before you replace anything audit the network."

Forrester Group

IP Telephony
Ongoing Implementation Model

Planning

Audit

Optimization
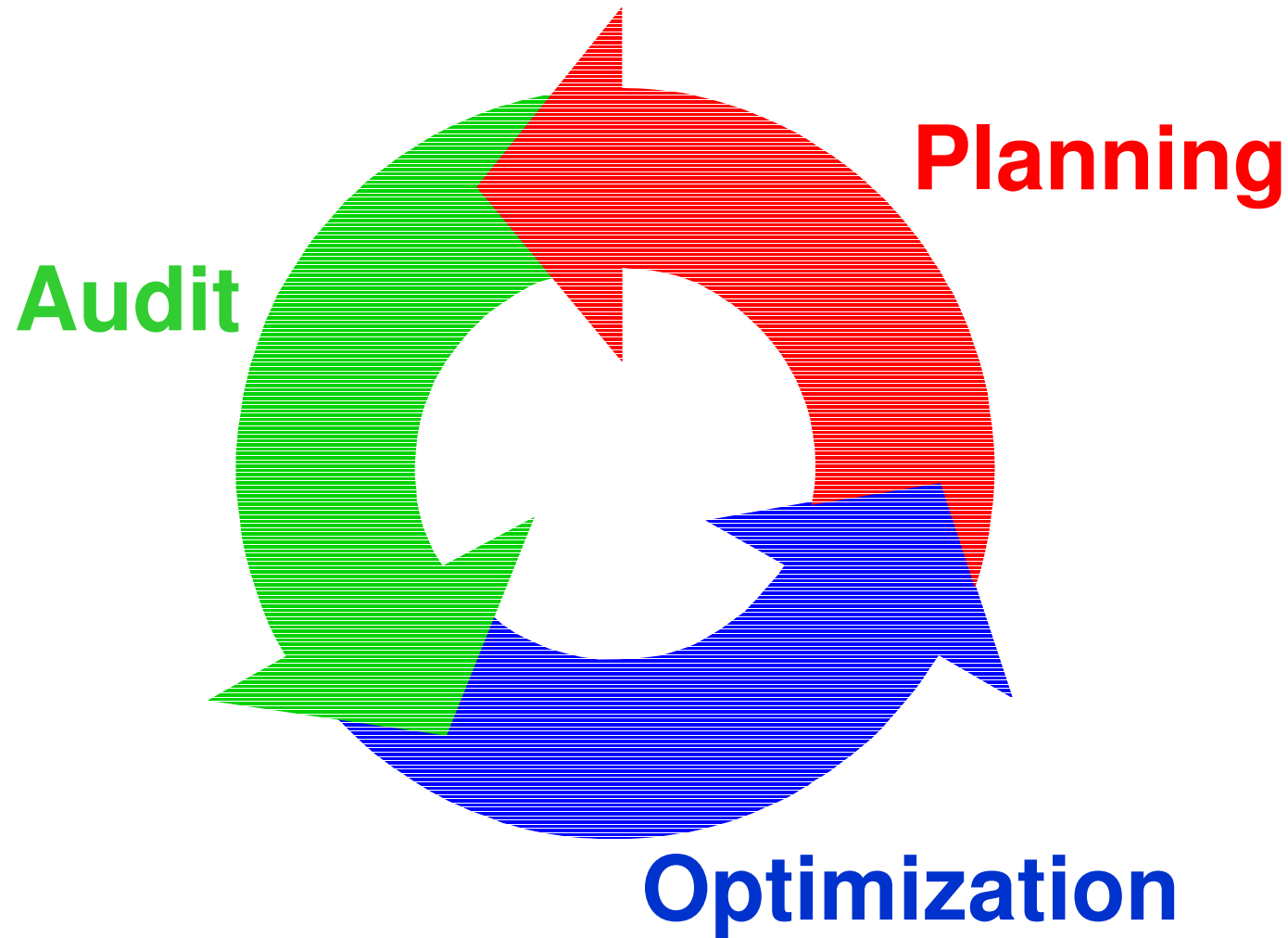
Design Guidelines for Toll Quality Voice

- **Network Delay: One-way between endpoints**
    - 80ms (milliseconds) delay or less can, but may not, yield toll quality.
    - 80ms to 180ms delay can give business communication quality. This is better than cell-phone quality and in fact is very well suited for most businesses
    - Delays exceeding 180ms may still be quite acceptable depending on customer expectations, analog trunks used, codec type, etc.

- **Network Jitter: Delay variation**
    - Toll quality suggests average jitter be less than 20ms or less than the packet payload.

- **Network Packet Loss: The maximum loss of packets (or frames)**
    - 1% or less can yield toll quality depending on many factors.
    - 3% or less should give Business communications quality. Again, this quality is better than cell-phone quality.
    - More than 3% may be acceptable for voice but may interfere with signaling
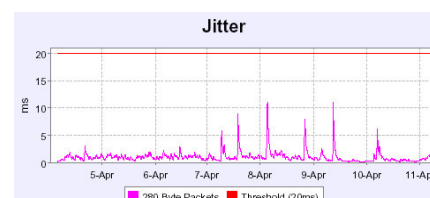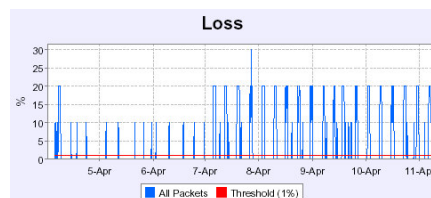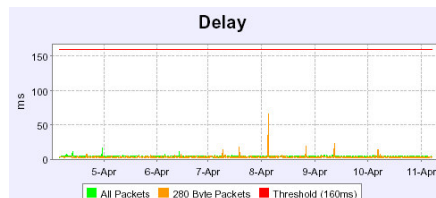
Bandwidth Usage

- Without enough bandwidth customers will not be able to make calls
  - It is common to misquote bandwidth requirements
  - In optimum conditions as little as 13kbps may be required per call
  - G.729 8k Compression actually uses ~27-30kbps per call
  - G.711 64k Compression uses more than 80kbps per call
  - Without ample bandwidth calls may be cut/clipped or unable to initiate
  - For integrity of quality all devices should have QoS
  - The choice of WAN technology may impact QoS

Return on Bandwidth Investment
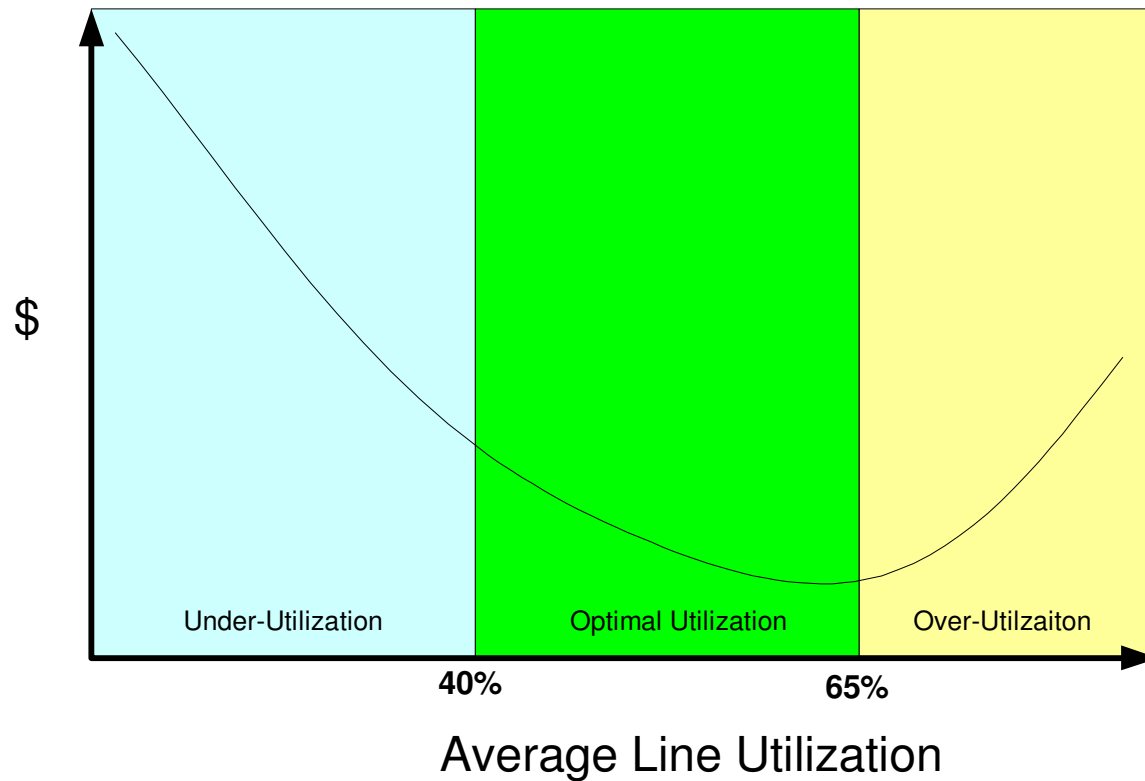
When links are 65% utilized, they lose efficiency.

QoS

- QoS (Quality of Service) is used to prioritize Voice traffic above data traffic on a customers network
  - Data traffic is very resilient and is generally unaffected by pauses or retransmits
  - Voice traffic under those circumstances produces a myriad of problems
  - QoS can help to alleviate some of this stress

- Limitations of QoS
  - QoS is not perfect and we should understand that it is only significant where it is implemented

Optimizing IP Telephony Performance

Jitter

↓

Jitter Buffer

↓

Delay

Delay

↓

Prioritization

↓

Delay

Bandwidth Conservation

↓

CODEC Selection

↓

Delay

Security

↓

NAT

↓
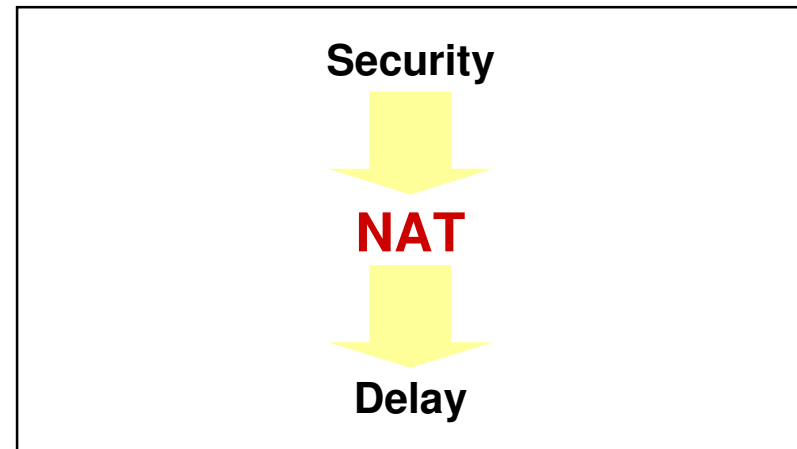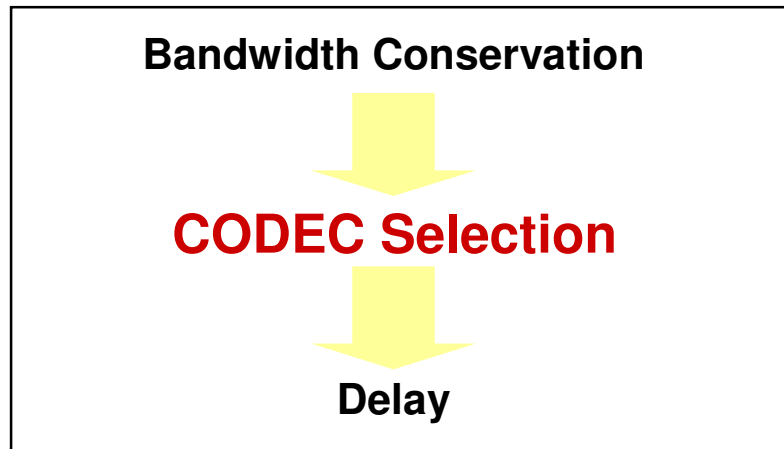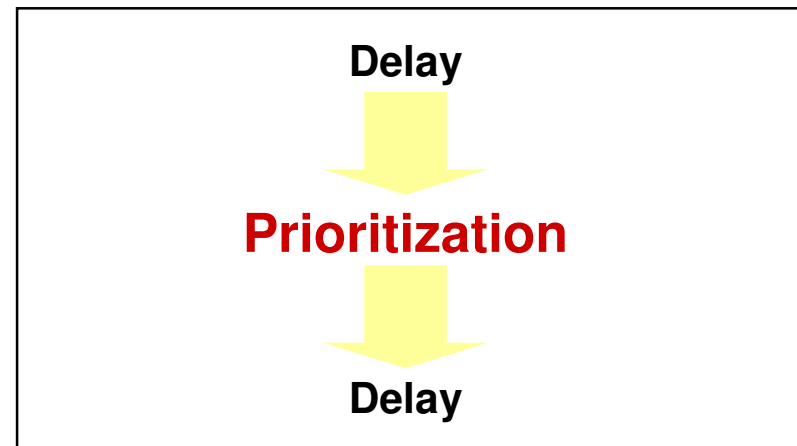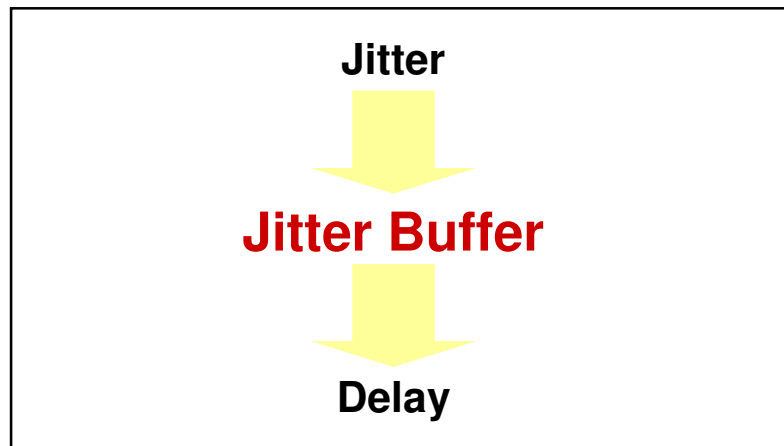
Delay

Recommendation
Network Inventory & Assessment

- Considerations
  - Bandwidth: average & peak utilization; packet loss
  - Infrastructure: quality & vintage; cabling; power
  - Delay: jitter and round-trip transit time

- Methodology
  - Document network topology
  - Measure network performance
  - Benchmark results against standard metrics

Recommendation
Network Quality Assurance (Data)

- Layer 2 QoS
  - 802.1p/Q: tagging of voice packets with priority bit

- Layer 3 QoS
  - DIffServ/ToS marking of IP packet as priority

- Network segmentation
  - VLANs: software defined broadcast domains

- Performance monitoring
  - Jitter – most significant metric
  - Bandwidth – capacity for growth & peak loads

Recommendation
Network Quality Assurance (Voice)

3 Call Limit

Data has all the Bandwidth

Voice priority pushes back the Data

Up to the Max' Voice bandwidth Set

Silence suppression lends voice bandwidth
back to Data when it's not being used

Time
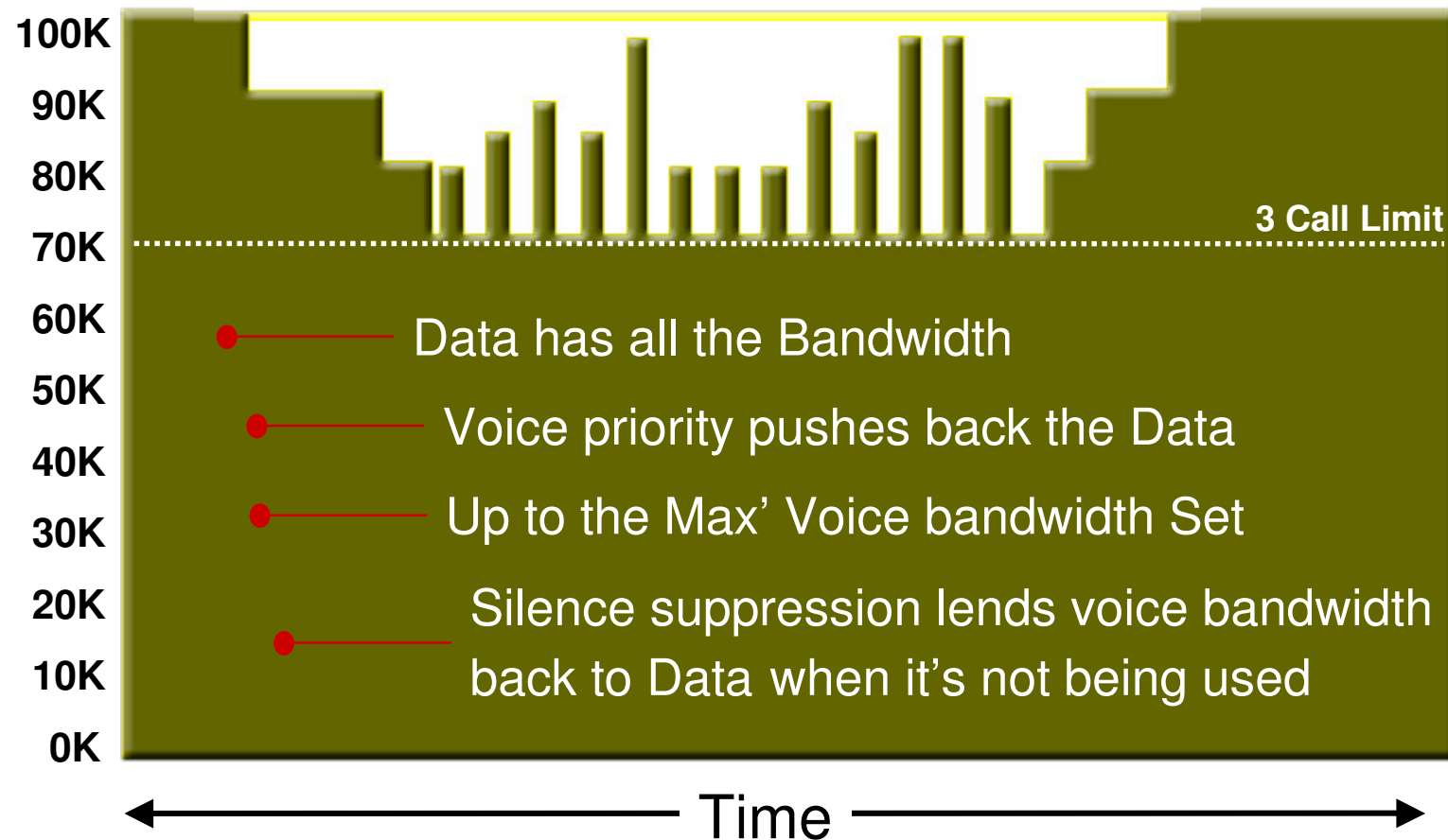
ProCurve Applications

ProCurve and Wired and Wireless

Voice-over-IP Applications

HP ProCurve & Avaya
IP Telephony Integration
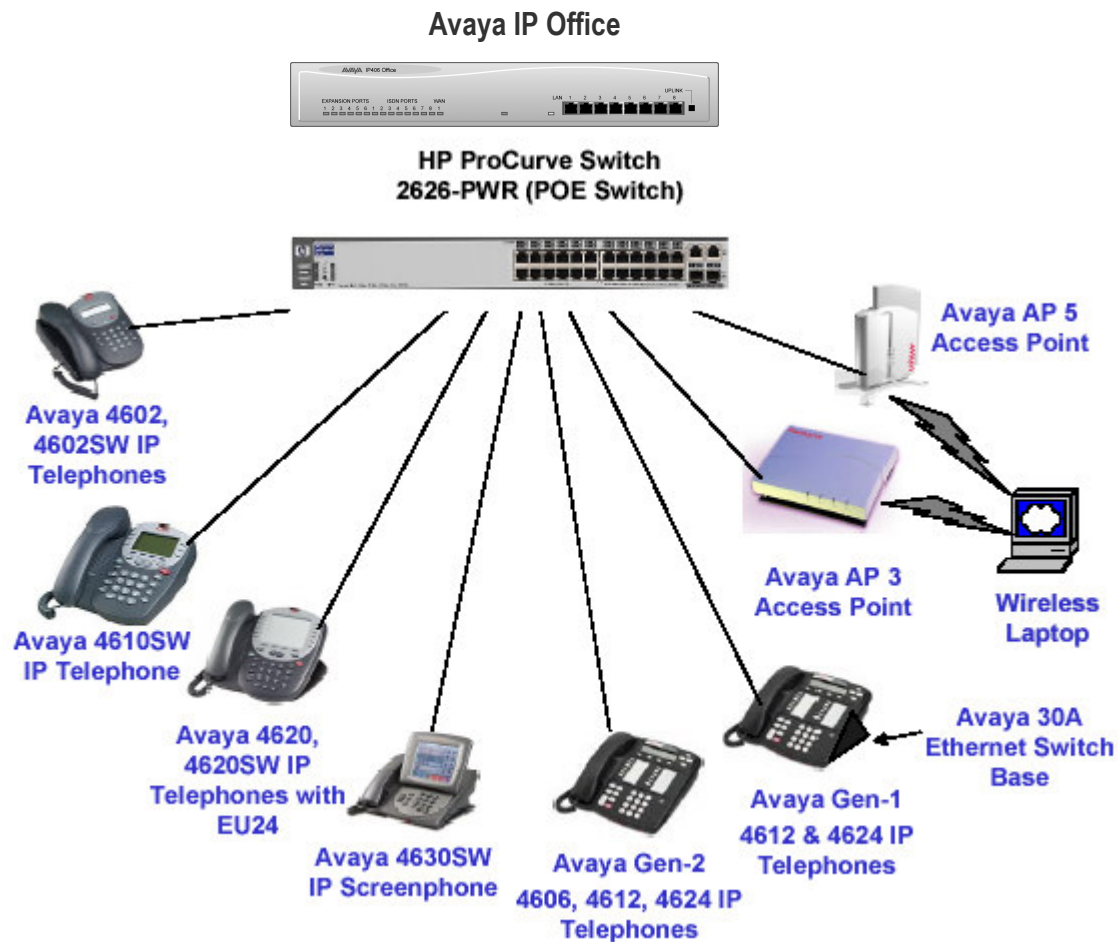
ProCurve In-line Switch Commands

- Monitor & control in-line power status

- Interface <port-list> power |critical|high|low

- Power threshold <1-99>

- Show power management

Class	Usage	Power (Watts)
0	Default	15.4
1	optional	4
2	optional	7
3	optional	15.4

802.3af Power Classes

ProCurve Value-add for IP Telephony Applications

- 802.1q VLAN support

- 802.3af power over Ethernet

- Recognizes 802.1p priority

- Recognizes IP ToS (Diffserv)

- Inserts 802.1p/Q tag

- Translates IP ToS to 802.1p

- Up to 4 hardware queues per port

ProCurve In-line Power Settings

ProCurve In-line Power Status Summary


```
HP ProCurve 2626-PWR#show power-management brief

Status and Counters - Port Power Status
         | Power             Configured        Detection    Power
   Port  | Enable  Priority Type               Status       Class
   ----- + ------- -------- ------------------ ------------ ------

   1     | Yes     Critical                    Delivering   3
   2     | Yes     Critical                    Delivering   2
   3     | Yes     Critical                    Delivering   1
   4     | Yes     Low                         Searching    0
   ----- + ------- -------- ------------------ ------------ ------

HP ProCurve 2626-PWR#show power-management 1-3

Status and Counters - Port Power Status for port 1

   Power Enable      : Yes
   Priority          : Critical       Configured Type  :
   Detection  Status : Delivering     Power Class      : 3
   Over Current Cnt  : 0              MPS Absent Cnt   : 1
   Power Denied Cnt  : 0              Short Cnt        : 0
   Voltage           : 500 dV         Current          : 140 mA
   Power             : 7000 mW

Status and Counters - Port Power Status for port 2
   Power Enable      : Yes
   Priority          : Critical       Configured Type  :
   Detection  Status : Delivering     Power Class      : 2
   Over Current Cnt  : 0              MPS Absent Cnt   : 1
   Power Denied Cnt  : 0              Short Cnt        : 0
   Voltage           : 500 dV         Current          : 67 mA
   Power             : 3350 mW

Status and Counters - Port Power Status for port 3

   Power Enable      : Yes
   Priority          : Critical       Configured Type  :
   Detection  Status : Delivering     Power Class      : 1
   Over Current Cnt  : 0              MPS Absent Cnt   : 0
   Power Denied Cnt  : 0              Short Cnt        : 0
   Voltage           : 500 dV         Current          : 64 mA
   Power             : 3200 mW
```
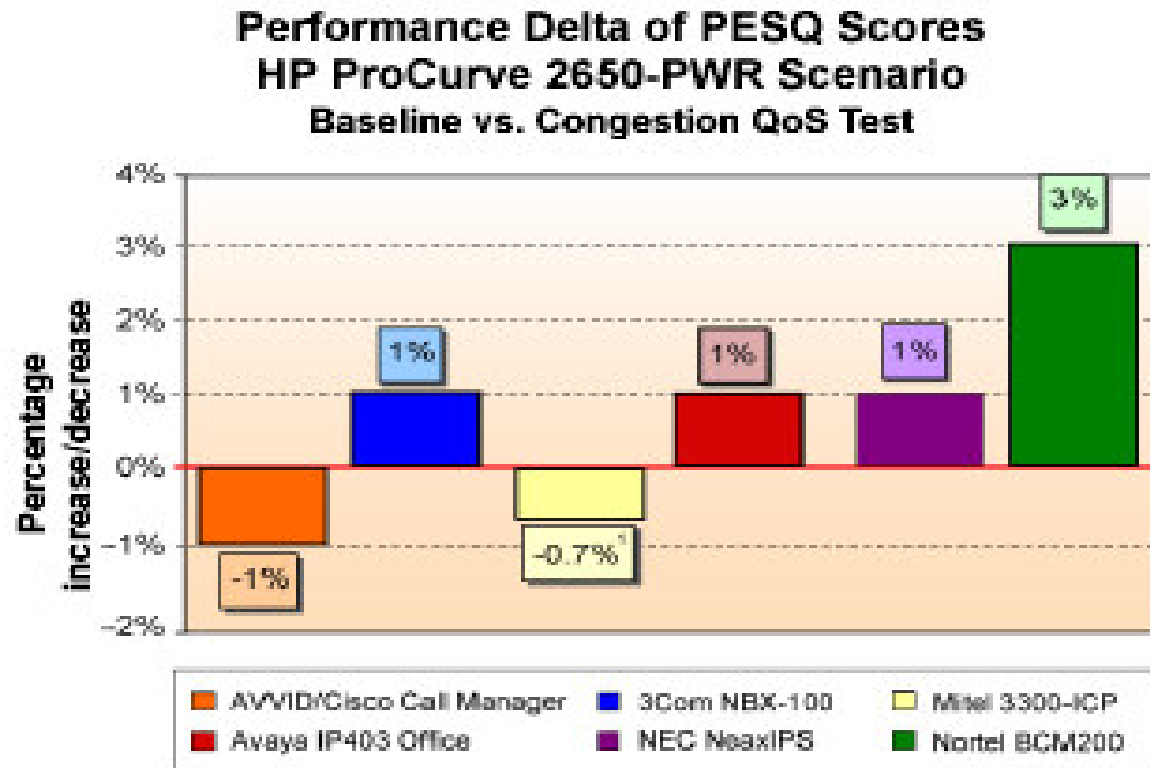
ProCurve Performance for IP Telephony Applications

Performance Delta of PESQ Scores
HP ProCurve 2650-PWR Scenario
Baseline vs. Congestion QoS Test

- Compatible with popular VoIP solutions
- Introduces minimal latency with VoIP calls
- Tolerant to network congestion
- 100ms average delay for VoIP
- Supports high quality VoIP

SOURCE: Tolly Group - Oct 2003

IP Telephony Value-add for ProCurve Applications

- Telephony and call routing become LAN applications
- LAN switch ports provide power to IP phones
- QoS on LAN switch ensures optimum IP telephony quality
- Users handle calls & control preferences from their PC
- Click-to-dial from any location, wired or wireless
- Flexible message notification
- UM synchronisation with MS-Exchange/Outlook
- Optional integration with 3rd party CRM/back office systems
- Listen/reply to your emails in / out of the office
- Standardize systems management through HP OpenView

Summary

ProCurve and Wired and Wireless
Voice-over-IP Applications

IP Telephony—Lessons Learned

Lesson 1   **Don't shortcut the planning process.**

Lesson 2   **Target collaborative and productive business benefits.**

Lesson 3   **Use cost savings to fund business transformation.**

Lesson 4   **Look at teamwork and organizational structure.**

Lesson 5   **Pilot and see for yourself what IP telephony can do.**

Lesson 6   **Evolve gradually; reuse existing investments.**

Lesson 7   **Choose a strong convergence partner.**

Lesson 8   **Evaluate network readiness.**

Lesson 9   **Make appropriate network improvements.**

Lesson 10   **Your IP network is now mission critical—manage it!**

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Avaya Communications Solutions Providing a Flexible Path to IP

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