

Fitting Voice Into Your Network

Zeus Kerravala
Vice President, Enterprise Infrastructure
The Yankee Group
zeus@yankeegroup.com

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- Global view, interpreted and applied to local market conditions.
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Defining VoIP

- **Peer-to-peer VoIP**
 - **Internet-based VoIP**
 - **IP-enabled PBX**
 - **IP PBX**
 - **Managed IP PBX**
 - **IP Centrex**
 - **Network-based VoIP**
 - **Hosted VoIP**
- Consumer
- Corporate
- Service Provider Offering

VoIP is Transformational

•Early Adopter Market

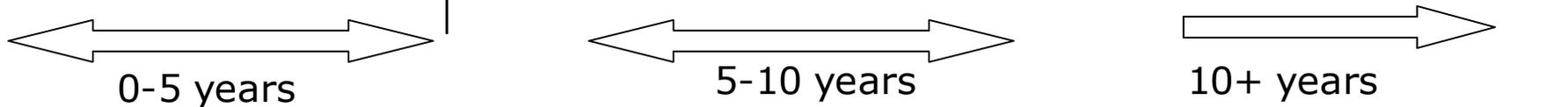
- Making IP look like TDM
- Similar to 3270 emulators
- Focus on the technology
- Concerns:
 - Availability, reliability
 - Security
- TCO more important than ROI

•Mass Market Adoption

- More focus on applications
- Similar to growth of distributed applications
- Value prop delivered by ISVs
- Concerns:
 - Applications integration
 - What's possible?
- ROI is more important than TCO

•Laggers

- Standardization
- Removing cost
- Efficiency



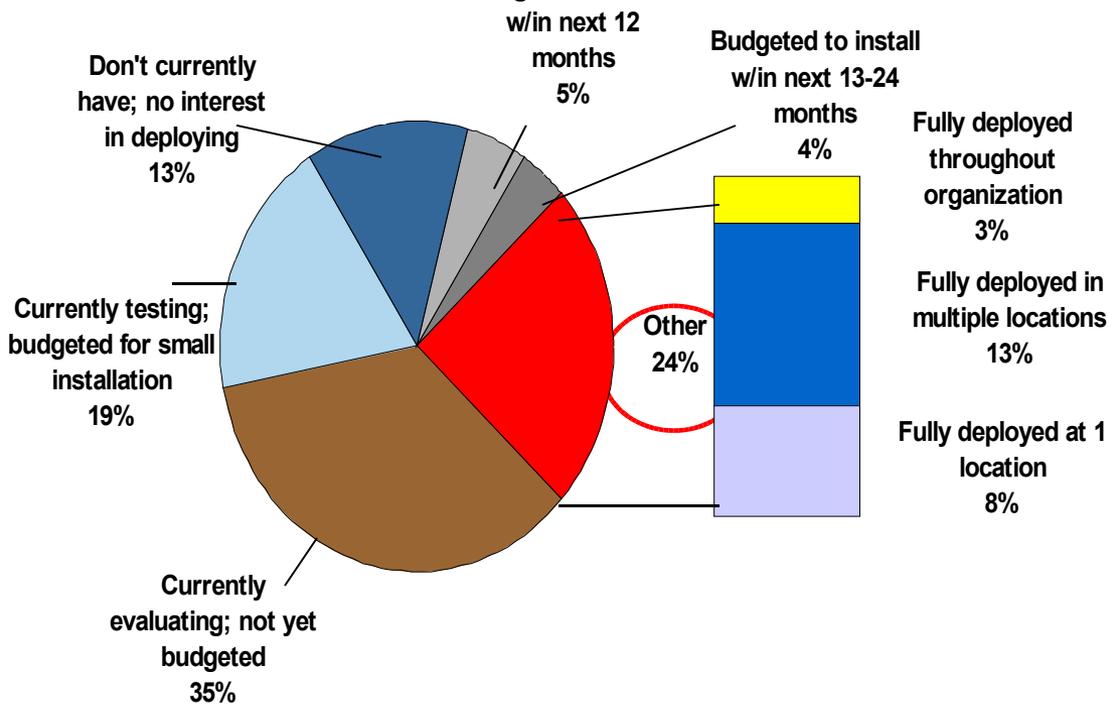
Similar to the migration from mainframes to distributed computing

What is the status of VoIP in your organization?

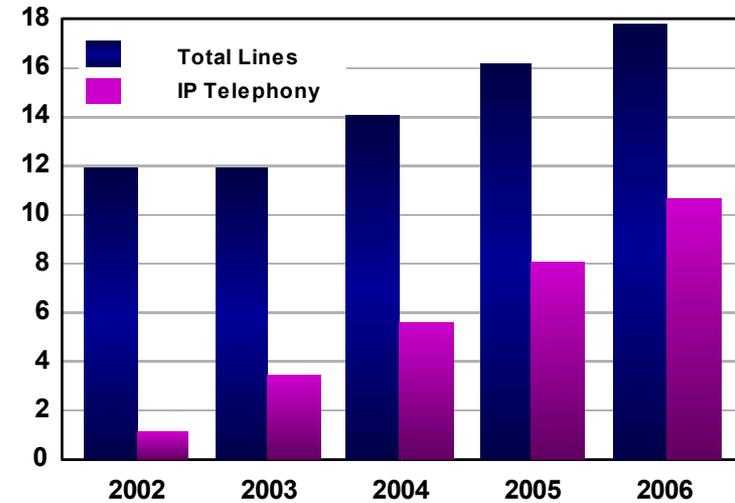
- No interest
- Not deployed, but interest
- Deployed in trials
- Departmentally deployed
- Fully deployed across the company

Adoption Results

Which best describes your deployment of IPT?



(Millions Lines Shipped)

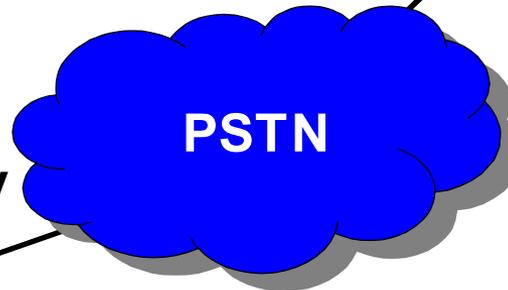


Telephony the Old Way

- Highly reliable
- Closed architectures
- Limited ability to share applications
- Deployed on a per-node basis
- Users are tied to a location
- Complex administration
- Expensive
- Call control located locally



Digital set



Key system



Digital set

IP Telephony Becomes an Application

- **Resides anywhere**

- Hosted vs. premises solutions
- LAN or WAN

- **Accessed from anywhere**

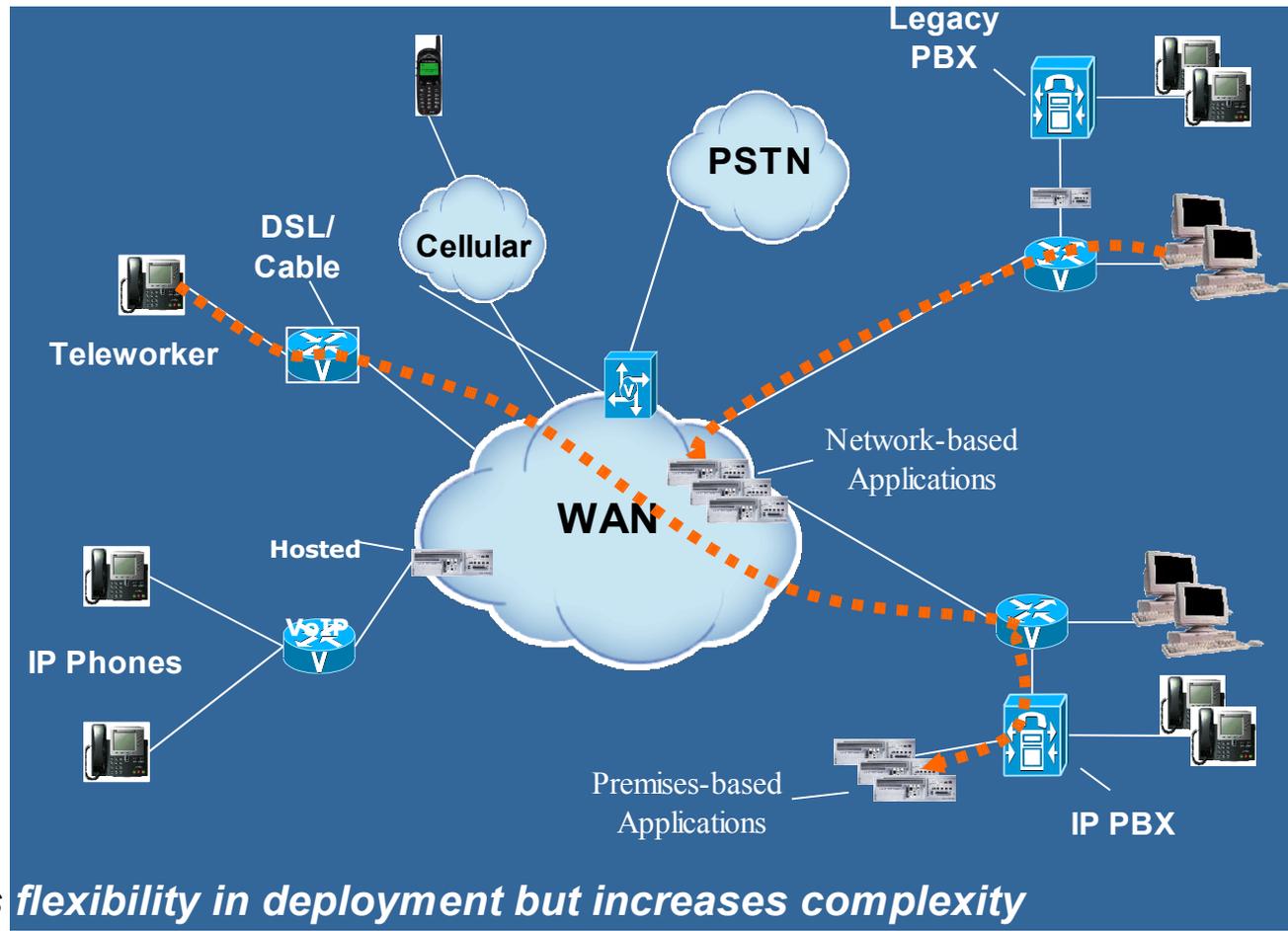
- Uniform access
- Common interface

- **Open architecture**

- Interoperability w/ TDM
- IPT variants

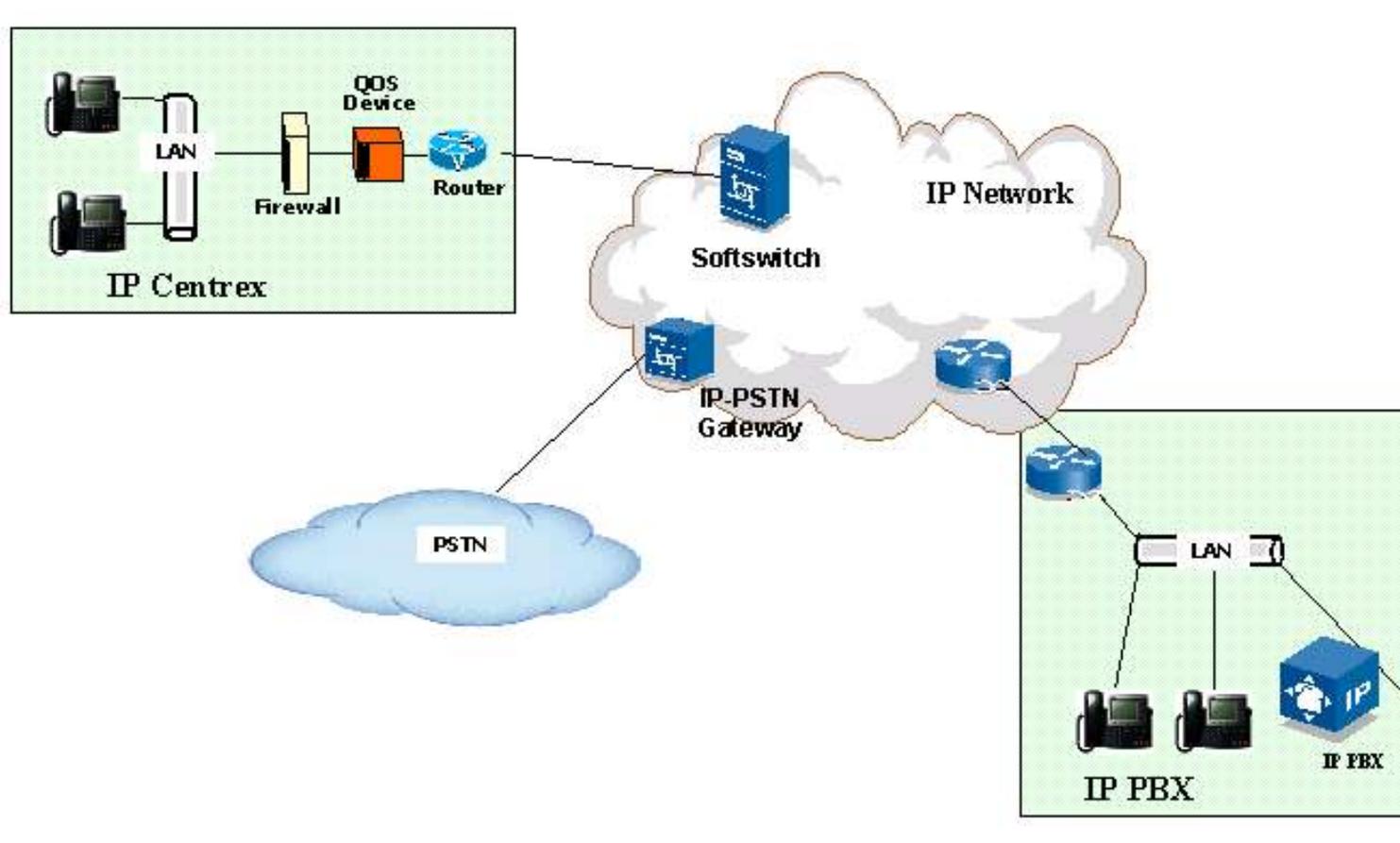


Complexity



IP provides flexibility in deployment but increases complexity

Network-based VoIP



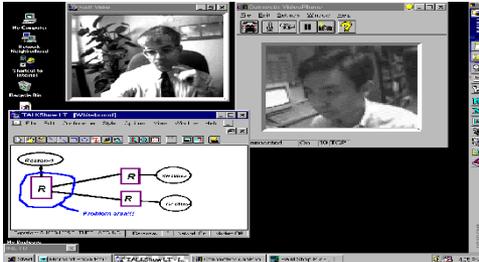
What is/will be your primary deployment strategy?

- Deploy an IP PBX
- Deploy a hybrid IP enabled PBX
- Router based IP PBX
- Use a premise based managed service
- Network-based service (IP Centrex, network-based)

IP Telephony Value Proposition

- **Currently focused on cost savings**
 - **MACD, long distance reduction, administrative savings**
 - **Deployments are “event-based.” Moving location, retiring PBX**
- **Future value will be productivity improvements**
 - **Unified messaging**
 - **Collaboration software**
 - **Call center improvements**
 - **New business process**

VoIP Enables Integrated Communications

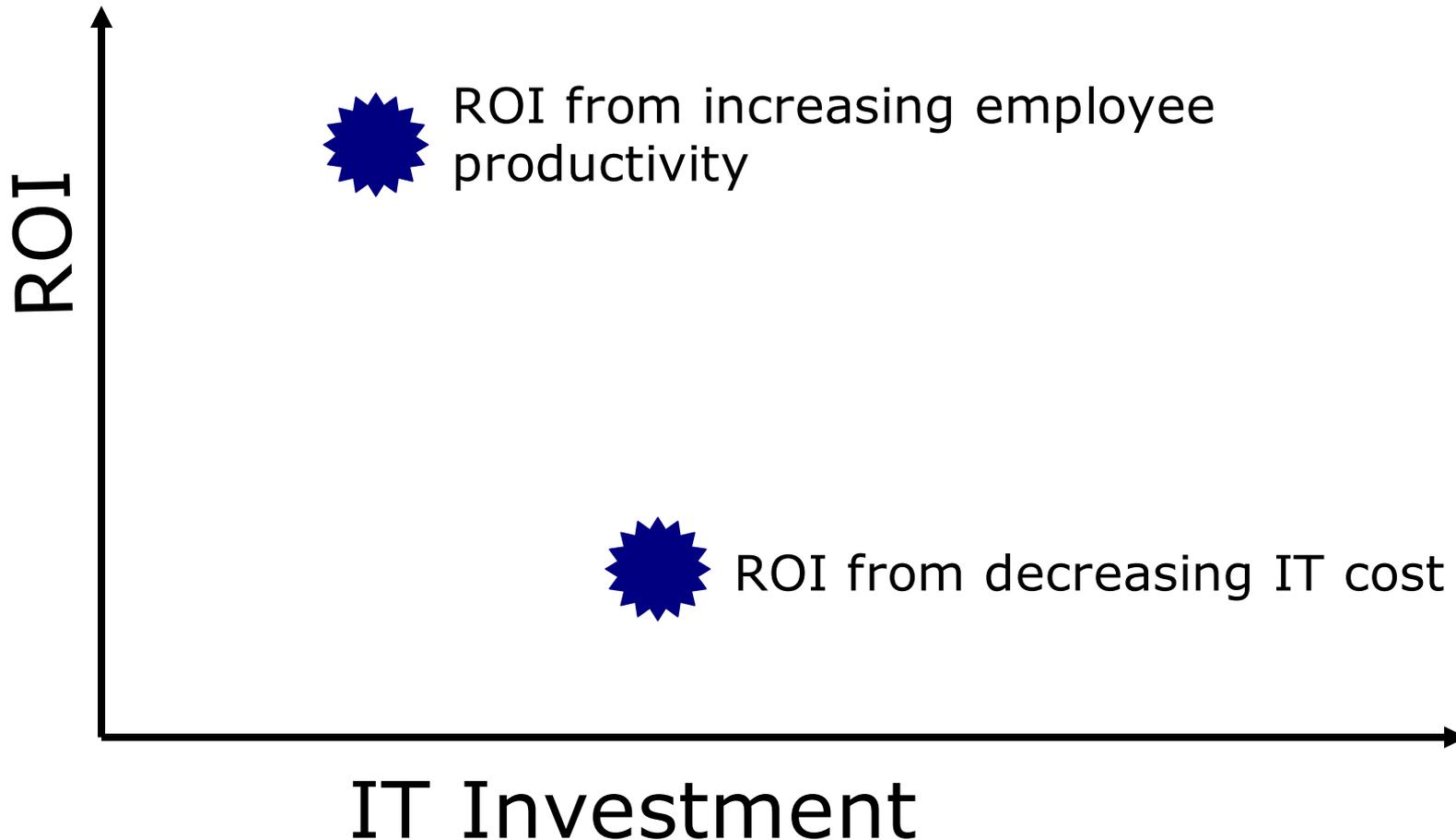


Picture yourself in a hotel room accessing your office and mobile voice mail and e-mail from your laptop with the same interface and procedures you use in your office.

Now imagine every employee in your company with the same capability.

- **Integrated interface**
- **Uniform experience**
- **Services at every network edge**
- **Voice *and* data**
 - **Telephones and computers**
 - **Telecom and IT**
- **Anywhere. Anytime**

Productivity Impact of IP Telephony



IP Telephony Value and Risk

Value

- **Gain a competitive advantage**
- **Lower TCO than running separate systems**
- **Improve efficiency of end users**
- **Will increase user productivity by unifying collaborative apps**
- **It's about voice OR data**

Risk

- **Competitive disadvantage if performance is erratic**
- **Increased TCO if pre-work and analysis is not done**
- **Will lead to inefficiency if not deployed correctly**
- **End users will not use new applications if the experience is not consistent**
- **Its about voice AND data**

What savings/premium do you expect a converged network to yield?

- Greater than 125% the cost of running two separate networks
- 101% to 125%
- The same
- 75% to 99%
- Less than 75%

Most Users Expect to Pay More

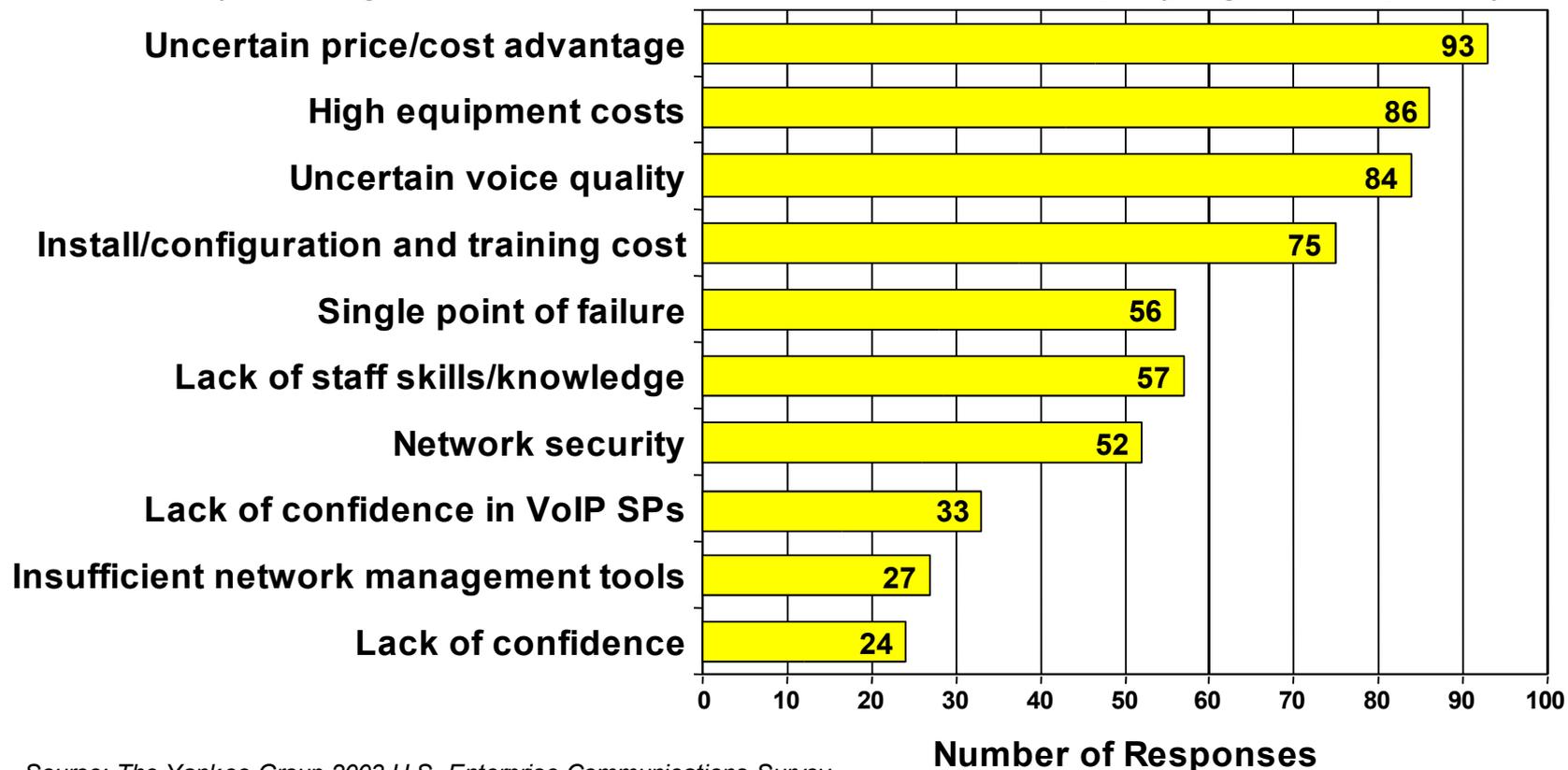
	IT Execs	Telecom Execs	Net. Managers
Savings you expect from adopting a converged telephone and data network?			
26% or more than running a separate network	2.26%	14.71%	10.00%
16% - 25% more than running a separate network	18.64%	11.76%	15.00%
6% - 15% more than running a separate network	24.29%	11.76%	5.00%
0% - 5% more than running a separate network	12.43%	14.71%	0.00%
The costs will be about the same as they are today	7.91%	17.65%	20.00%
0% - 5% cheaper than running a separate network	7.34%	8.82%	10.00%
6%-15% cheaper than running a separate network	16.38%	11.76%	25.00%
16-25% cheaper than running a separate network	9.60%	8.82%	15.00%
26% or cheaper than running a separate network	1.13%	0.00%	0.00%

- On average, 55% of users expect to pay more
- Network managers more likely to expect saving
- IT execs least likely to expect savings

*-Upgrades ~\$600-\$800/user

Perceptions/inhibitors to IPT

What are your organization's main concerns about deploying IP telephony?



Source: The Yankee Group 2003 U.S. Enterprise Communications Survey

Pitfalls of IP Telephony

- Voice and video applications are extremely sensitive to delay, jitter, and packet loss
- Need PSTN-like call quality
 - New features and functions do not compensate for poor quality
- Large networks require network audits and upgrades
- QoS must be implemented
- Call quality difficult to measure and manage

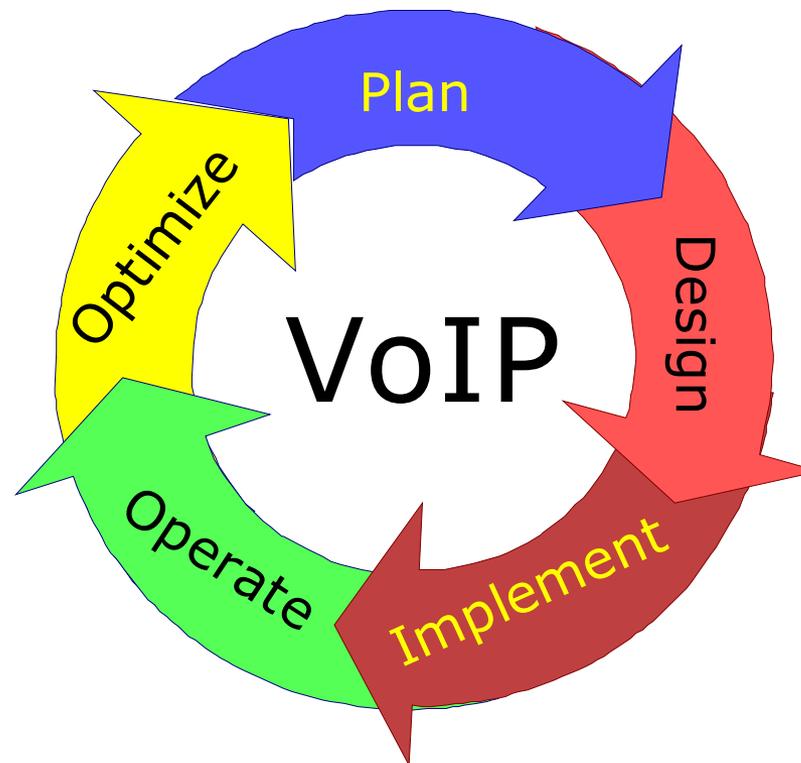
The Network Challenge

- VoIP is **not** just another application on the network
 - Voice is sensitive to the inherent characteristics of IP networks
 - Latency, jitter and packet loss
 - Most companies have never managed an application with such high availability and performance requirements
- How do I guarantee the quality and availability of voice traffic without degrading data packet transmission?

What is your biggest concern regarding VoIP?

- Quality of VoIP compared to TDM
- Uncertainty regarding costs
- Uncertainty regarding productivity benefits
- Security
- I do not see the benefits to VoIP

VoIP Requires a Lifecycle



The VoIP Lifecycle

Deployment			Maintenance	Operational Support
Plan	Design	Implement	Operate	Optimize
Site Surveys WAN Analysis Project Requirements Workshop Hardware Readiness Assessment Bandwidth Modeling/Voice Capacity Requirements Security Policy Development Change Management Process Development Fault Management Process Development Availability Benchmarking	Low-Level Network Design Proof of Concept Testing Network Modeling Solution Review and Acceptance Floor Plans and Cutover Sheets	Network Staging Customer Acceptance Criteria Installation Integration and Configuration Acceptance Testing Create Documentation Cutover Support Operational Handoff Training Customer Admin. and End-User Training	Technical Support Online Account Hardware Replacement Configuration Backups Moves, Adds, Changes Network Monitoring Problem Determination Resolution Configuration Management Availability and Service-Level Reporting LAN and PSTN Management	Ongoing Software Release Assessment Ongoing Design Support Knowledge Transfer Performance Analysis and Recommendation Network Tuning Network Reliability Improvement Analysis Security Audits and Assessments

Measuring Call Quality

- Has traditionally been subjective – picking up a handset and listening to the quality
- Leading scoring mechanism is MOS (mean opinion score)
 - Comes from the traditional telephony world
 - Widely accepted
- Subjective measurements do not scale
 - Expensive, time-consuming and inconvenient

Objective Call Measurement

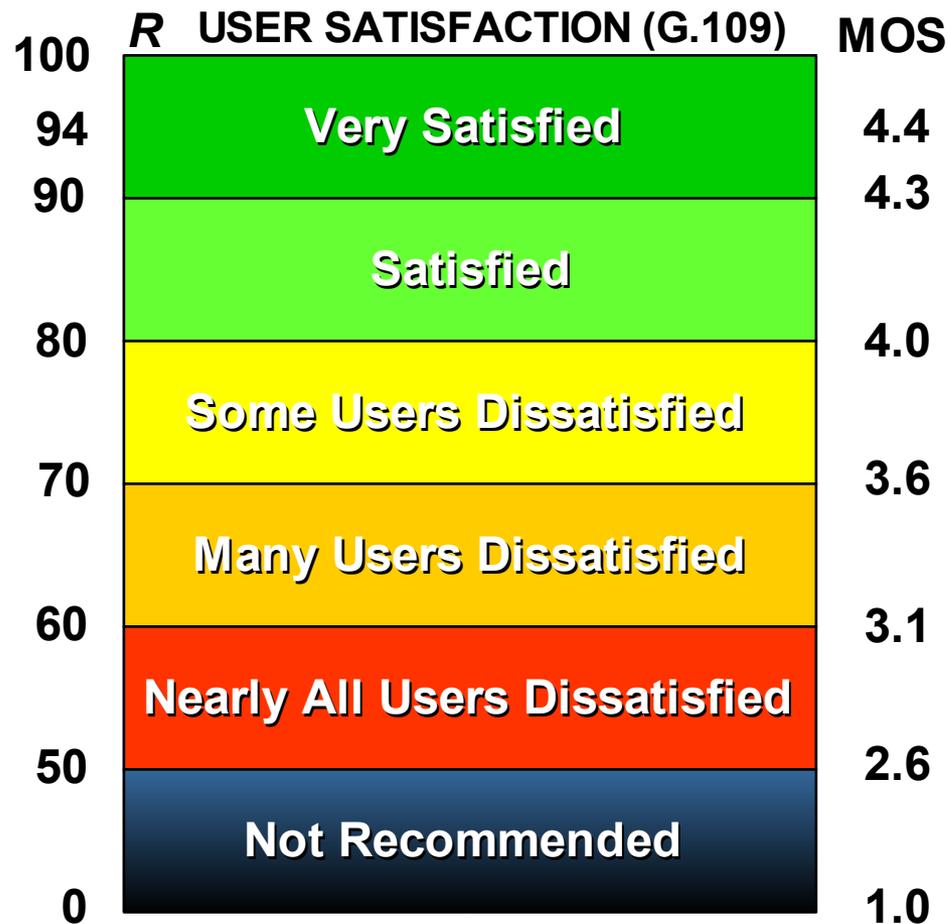
- **Objective testing *estimates* subject quality**
- **Two objective measurement techniques**
 - PESQ, PSQM, PAMS – uses MOS as scoring technique
 - All use active testing to compare a reference signal at the destination to assess call quality
 - Best suited for assessments and service assurance
 - PESQ does not indicate the nature of the problem (only that there is a problem), does not help tune or troubleshoot
 - PESQ needs exact input signal to work so it can't be used to monitor speech quality
 - Great lab tool

Objective Call Measurement

● Objective Model 2: E-model

- ITU recommendation calculates an R-value from network delays and equipment impairments. R-value converted to MOS
- Benefit: Uses network statistics; voice quality score can be correlated to actual network performance
- Used for both service assurance and network management, not as well-suited for service assurance
- Primarily a transmission-planning tool for estimating user satisfaction
- Intent is to model the performance of an unknown connection relative to a known connection
- Good to pinpoint problems due to metric combinations
- Output is the R-factor, R-value or R-rating

R-model/MOS Scoring



Voice Quality Summary

- **PESQ developed to overcome limitations of older techniques**
 - Invasive technique that requires comparing input/output signals
 - Useful for analysis of end-point impairment
 - Use for voice equipment testing
- **E-model developed for transmission planning**
 - Uses end-to-end measurement to provide quality score
 - Useful for monitoring, network planning and ongoing monitoring

Other Multimedia Applications

Application	Bandwidth	Degradation due to		
		Delay	Jitter	Packet Loss
VoIP	Low	High	High	Med
Stream video	High	Med	Med	Med
Video conf	High	High	High	Med
Web	Med	Med	Low	High
Stream audio	Low	Med	Med	Med

Successful Deployment Checklist



Consultation, engineering and management services

~~from in house~~ **can only be done with a services partner**



Understand your calling patterns

Percent off-net/on-net calls, international/domestic calling, average calls per employee hr, MOU, call duration are biggest factors



Roadmap current and future communications and choose correct *platform*

-Video, unified messaging, audio/web conferencing, presence



Understand which sites are better suited for hosted voice

-Ideal implementation will be a hybrid of in house/hosted

Who is your preferred partner for deployment support

- I will do it all in house
- Telco (AT&T, Verizon, etc.)
- Systems integrator (IBM GS, Accenture, etc.)
- My local reseller
- Hardware vendor (Cisco, Avaya, Nortel, etc.)

Recommendations

- VoIP will happen. Be ready.
- Perform a network assessment to evaluate all current networks and elements.
- Choose a test bed for deployment.
- Review sample business cases, reference accounts.
- Investigate VoIP management vendors.
- “Measure twice and cut once.”

Thank You

Zeus Kerravala

Vice President

Enterprise Infrastructure

The Yankee Group

617-956-5000 phone

zkerravala@yankeegroup.com

<http://www.yankeegroup.com>