



PRESENTS

NETWORLD INTEROP

an INTEROP event

Empowering Converged Network Infrastructures

William A. Flanagan
Program Director

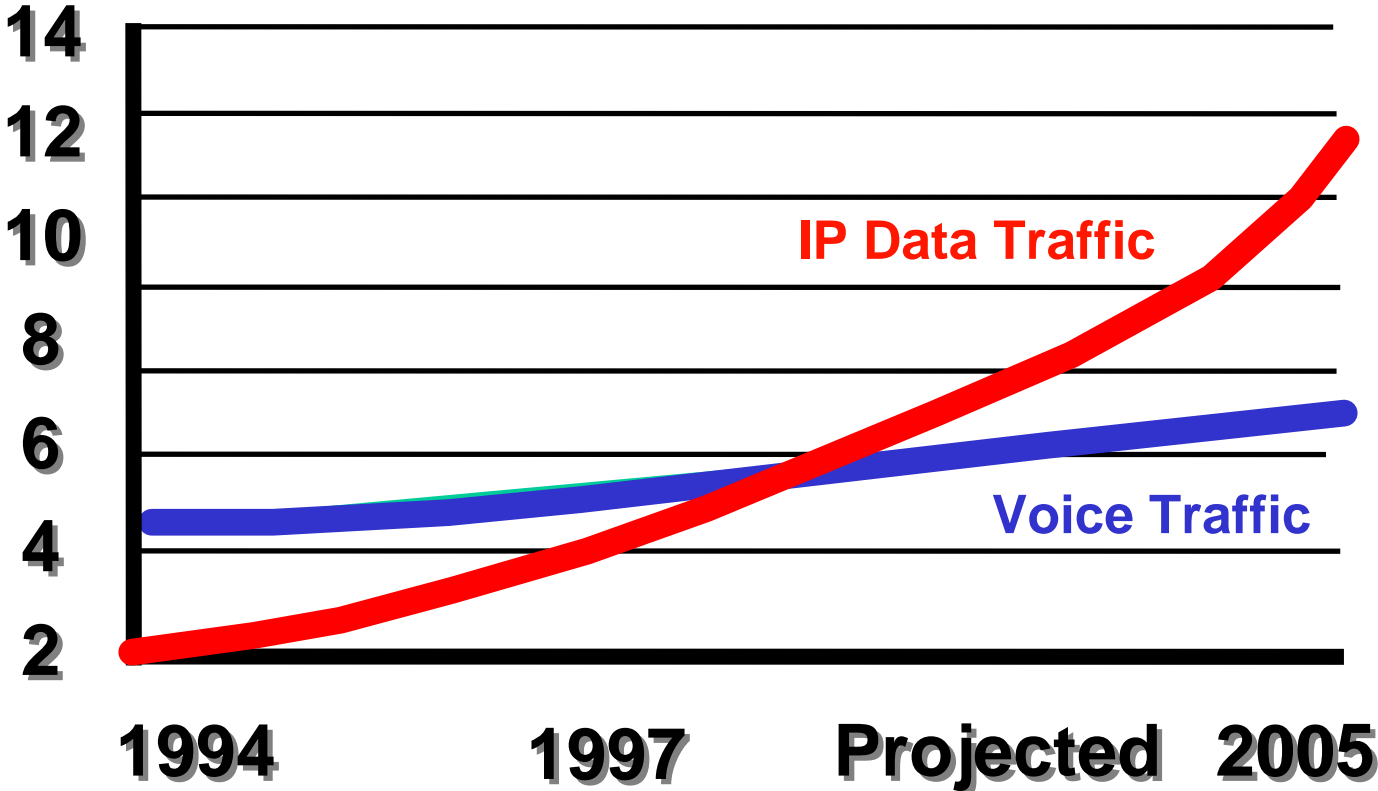
13 September 2001

THE BURTON GROUP

Convergence Thesis

- Huge growth in Internet and WWW traffic leaves voice and all other protocols a small part of the total
- Data networks (packet switched) win the contest over voice networks (circuit switched)--convergence means VoD
- Today's voice networks will persist for quite some time, so migration will be spread over many years
 - As justified by total cost of ownership (TCO)
 - Allowing time to improve data networks for voice service and train staff

Data Wins Running Away



U.S. LONG-DISTANCE TRAFFIC
in billions of gigabits per year

Historical Differences...

Designs for data nets have been loose compared to voice

- Data
 - Frequent outages were accepted
 - Reboot crashed servers
 - Replace network hardware, Install new software
 - Packet loss designed into TCP/IP
 - Congestion notification for TCP
 - The way routers deal with temporary overloads
- Voice
 - Always available (99.999+% uptime)
 - Every bit is precious – no data discarded

Mission-critical data applications require high availability data net, which is also better for voice

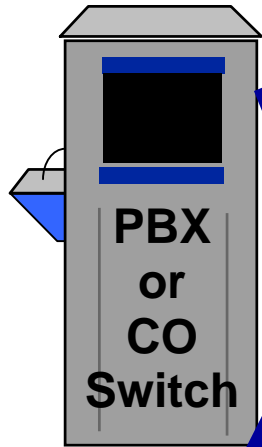
...Lead To Historic Changes

- Monolithic PBX devolves into separate components
 - **Application servers** for specific features
 - Conferencing
 - ACD
 - Unified messaging
 - **Call processor** (signaling)
 - Soft switch
 - Call agent
 - Call manager
 - **IP infrastructure** provides switching fabric

Splitting the PBX Atom

Circuit-Switched Before Convergence

- Embedded Applications
- Embedded Call Control
- Embedded Circuit Switching
- Closed
- Proprietary
- Inflexible
- Centralized



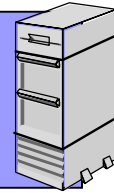
Proprietary Signaling
Direct Connections

Proprietary
Telephones



Packet-Switched After Convergence

Open Service
Application Layer



Application
Server

Open/Standard Protocols

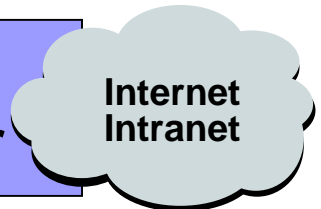
Open Call
Processing Layer



Call
Server

Open/Standard Protocols

Standards-Based
IP Transport Layer



Internet
Intranet

Open/Standard Protocols



Open-Standard
Telephones

Features

Signaling

Fabric

It's the Applications That Will Justify VoIP

- Not the initial savings in cost
 - Far from certain today that VoIP costs less than a PBX/Key System
 - VoIP can cost many times the price of a PBX in certain locations
- New VoIP features on separate servers:
 - In a short time frame
 - At low cost
 - Tailored to specific enterprise
- Call Control on dedicated soft switches
 - Buy or rent
 - Standards-based

The IP Network Will 'Switch' Voice

- To the desktop
 - Where IP is universal
 - Beats out Frame Relay and ATM which do only trunking
- Over the WAN
 - IP dominates mix of many forms of data
 - On public Internet VPN or intranet to ensure performance
- Issues for management
 - Staff capabilities and responsibilities
 - Fault isolation procedures for voice on a data network
 - Combined network management
 - Availability of voice services

Availability Not a Simple Issue

- Historically, expectations were very different for Voice and Data
- Improving VoIP availability necessarily involves all parts of a data network
 - Backbone
 - Access
 - Transmission
 - Power to IP phones
- Major expense to boost availability for voice; critical data (transaction processing) may justify too
- NTSS Technical Position on Availability and Resiliency shows how to keep balance

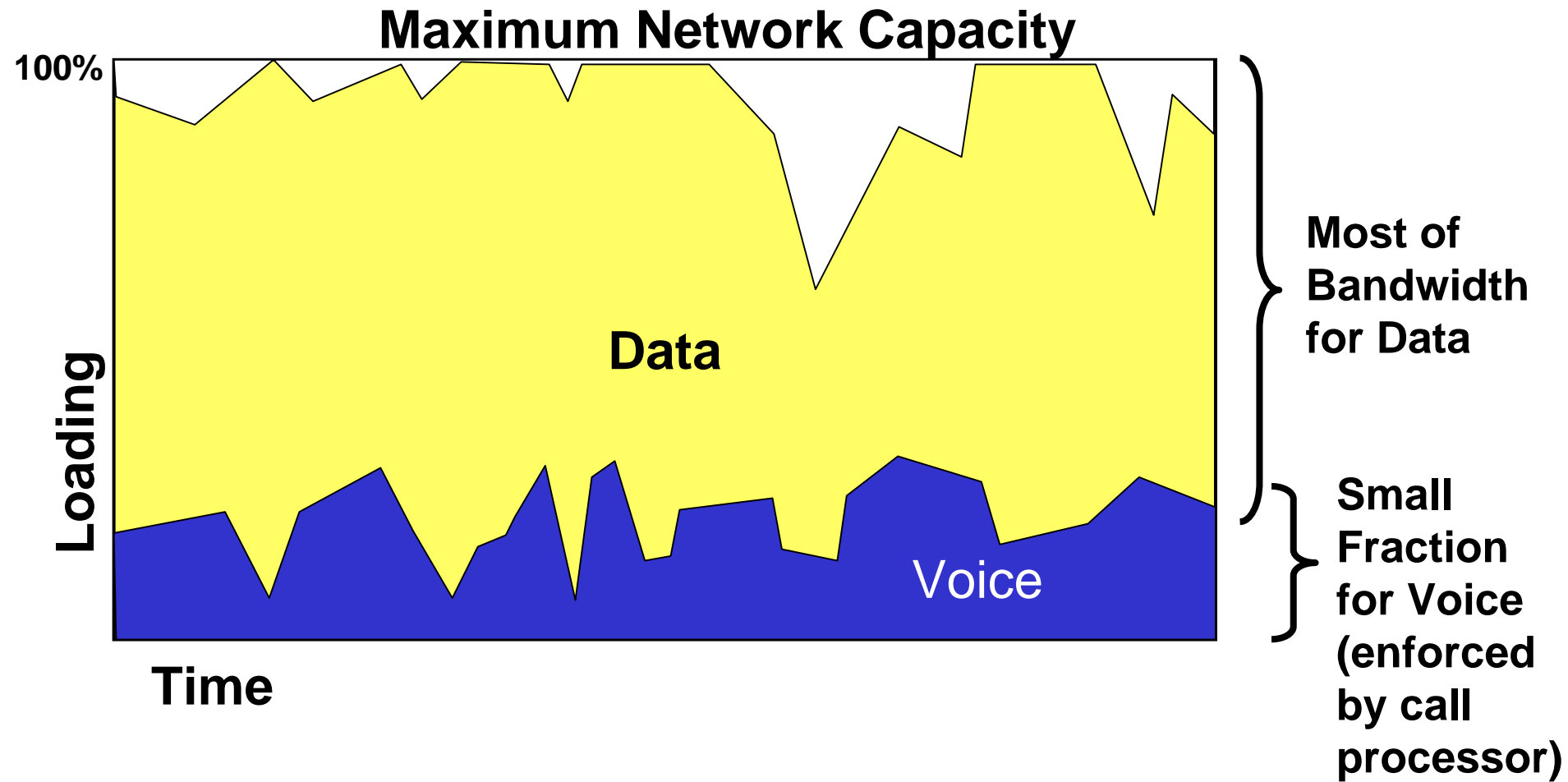
Voice and Data Have Different Needs

- Voice applications require:
 - Lightly loaded packet network to approach circuit performance
 - Low latency and jitter
 - Low packet loss
 - High availability
- Data users want:
 - Heavily loaded network for:
 - Large throughput
 - Low cost (per bit, compared to voice)
 - Which produces large latency, jitter, and packet loss
 - Some downtime usually acceptable, though tolerance is decreasing and is quite low for many applications

One Example for Mixing Voice and Data

- Apply Traffic Engineering
 - Ensure voice is only a fraction ($<1/4$) of total on any link
 - Install sufficient bandwidth (redundant for availability)
 - Apply controls to limit new calls (SoftSwitch function)
- Give voice absolute priority in all nodes
 - Class-based queuing
 - Other QoS mechanisms
- Each service gets what it wants
 - Voice sees lightly loaded network
 - Data can use all remaining bandwidth

Voice Prioritized, But Limited



Assume Big Concerns Can Be Satisfied

- Sufficiently high availability for all users
 - Redundant routers and switches
 - Redundant links
 - Back-up power for all devices and phones
- Acceptable voice quality
 - Latency below 100 ms end-to-end
 - Packet losses no more than a few percent
 - Adequate phones or gateways

Examine the Whole Business Case

- Do product offerings match the enterprise's needs?
 - Are all PBX features necessary? Which do *you* need?
 - Does the solution scale up sufficiently?
- Factor in new applications
 - Development/purchase
 - Installation
- Build business case on TCO – and beyond
 - Not just VoIP costs
 - Recognize cost of data network upgrades, staff and user training

Total Cost of Ownership for VoIP

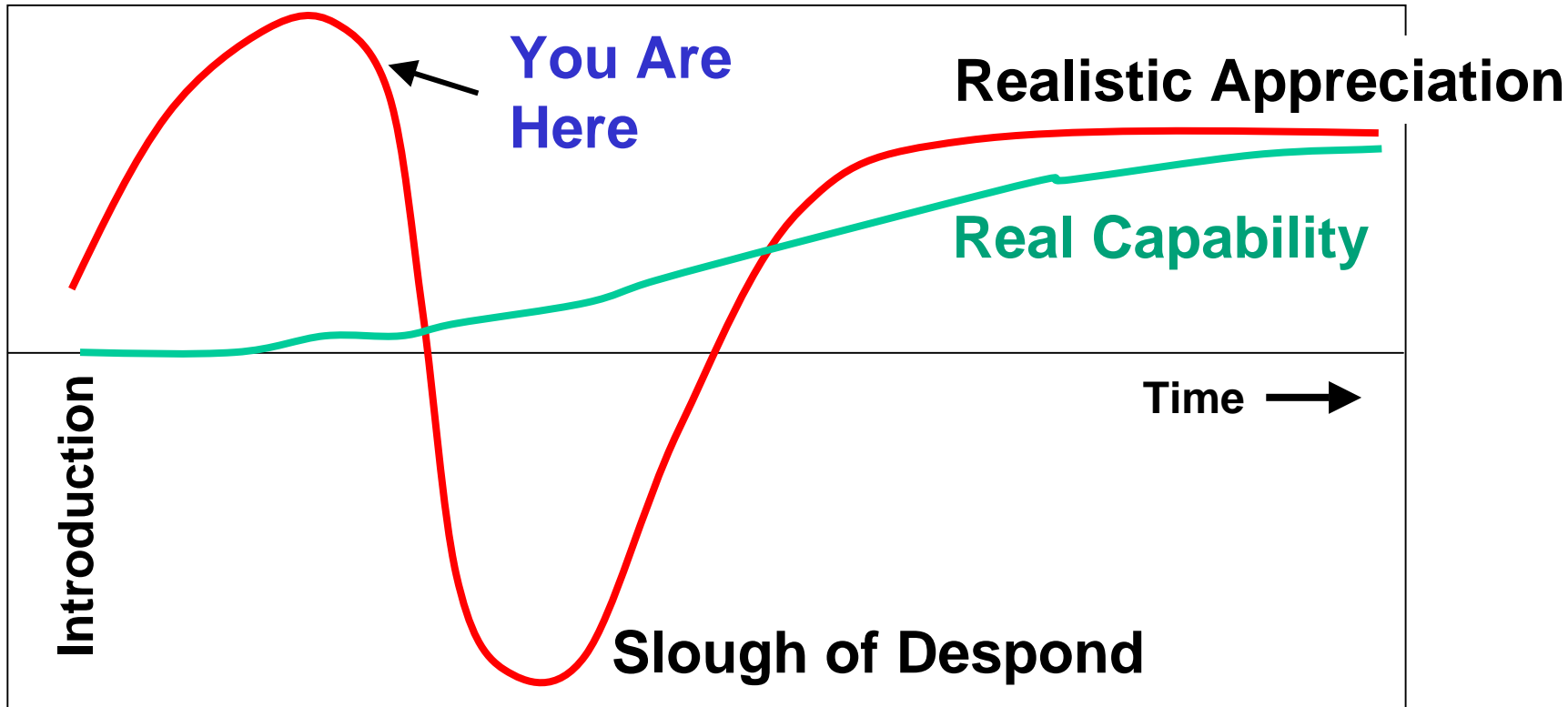
- Cost reducers:
 - One network rather than two or more
 - Simpler management, especially moves and changes
 - Less expensive support for teleworkers
 - Potentially less expensive equipment
 - Sale of legacy equipment
- Additional expenses:
 - Upgrades to data network
 - Administration for voice prioritization
 - Faster response to outages in data net
 - Staff reorganization and retraining
 - Increased bandwidth in some places

Beyond TCO in Dollars

- Is the feature set adequate immediately?
 - What applications are available?
 - Do they work as you want them to?
- Who will add features? How? And when?
 - Vendor
 - Third party/application service provider
 - The enterprise itself

Watch the 'Hype Curve'

Unrealistic Expectations



Disgust and Aversion

What Can Push VoIP into the Slough?

- High costs
- Shortage of features
- Imposition of Taxes
 - ILECs collect huge amounts for local, state, and federal governments
 - VoIP not taxed; ISPs don't pay into Universal Service Fund; no access charges
 - Can system tolerate serious revenue loss?
- ILEC choking off access for voice ISPs
 - Could HR 1542, which prohibits ILECs from offering VoIP, create grounds for ILECs to refuse to carry traffic from ISP that offers VoIP?
 - Refer to the condition of DSL-based CLECs

Private Networks May Be Immune

- Leased lines have always been transparent
 - Carrier doesn't monitor or charge for content
 - No taxes on internal voice traffic
- Enterprise can control its own network
 - Engineer traffic loading and utilization
 - Set priorities
- Telephony over WAN practical
 - True private network
 - Virtual Private Network on single ISP infrastructure
 - Guaranteed availability, latency, and packet loss on IP service network separate from open Internet

Deploy Carefully

- Test the features and functions you need
 - Some documented features don't exist
 - Some features aren't documented yet
- Install at small site
 - Validate design
 - Train staff; gain experience and confidence
- Roll out to enterprise *as appropriate*

Conclusions

- Data networks often need expensive improvements to deliver voice quality and availability of circuit switching
- New applications will justify convergence, not reduced costs
- Openness of VoIP holds promise of many new applications from many sources