3 Screens: Evolution of Devices, Services, Networks

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Outline

- 3 Screens – What and Why
- Implications to Devices, Services, Networks
- Device Evolution
- Service Directions
- Content Processing
- Network Implications

Three Screens

What and Why

3 Screens – Rich Media

3 Screens – Rich Media

"Visual Spectrum"

Seamless

Shared

Interactive

Experience

Anywhere

Anytime

Anyone

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3 Screens
Rich Media – Anytime, Anyplace

Features

Pixels

Power

Screen size: 52”

Full HD 1080 p
(1920 x 1080)

Power: ~ 300W

Mobility

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3 Screens
Rich Media – Anytime, Anyplace

Features

Pixels

Power

Widescreen: 17”
HD 720, WXGA
(1280x800)
Power: ~ 85W

Screen size: 52”
Full HD 1080 p
(1920 x 1080)
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Mobility

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3 Screens
Rich Media – Anytime, Anyplace

Features

Pixels

Power

Screen size: 52”

Full HD 1080 p
(1920 x 1080)
Power: ~ 300W

Widescreen: 17”

HD 720, WXGA
(1280x800)
Power: ~ 85W

Screen size: 3.5-5”
320x480

Power: ~ 2300 mW

Mobility

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Typical Fixed, Portable, Mobile specifications

	Fixed (TV)	Portable (Laptop)	Mobile / PDA	iPhone
Screen size	52” Sharp Aquos LCD	Widescreen 17” (Dell XPS)	5” (iPaq 6500)	3.5” (iPhone)
Processor	-	Dual Core, 2.5 GHz	Intel, 312 MHz	ARM, 620 MHz
Memory	-	4 GB	128 MB	128 MB DRAM
Hard Drive	-	300 GB	2 GB SD card	8 or 16 GB flash
Connectivity	HDMI, S-Video, Ethernet	Ethernet, WiFi, Firewire, USB, IR, HDMI, Bluetooth	GPRS, WiFi, Bluetooth, USB, IR	Quad band GSM GPRS/EDGE, WiFi, Bluetooth
Video output (pixel res.)	Full HD 1080p (1920 x 1080)	HD 720, WXGA (1280x800)	QVGA (320x240)	320x480
Aspect ratio	16:9	5:3	4:3	4.5:3
Audio output	Stereo, 15W + 15W, usually amplified	Stereo, 5 to 10W	Stereo	Stereo
Power consumption	~ 300W	~85W	~2300 mW	N/A

An Explosion of Endpoints

Endpoints **...across Many Types of Premises**

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Video Everywhere

- Mobile Video
- Portable Video
- Desktop Video
- Standard Definition Video
- High Definition Video
- Immersive Video
- Live and On-Demand Enterprise Broadcast Video
- Internet Video Streaming / Publishing
- Thin Client Video Conferencing
- Digital Cinema / Networked Theatre
- Virtual Reality

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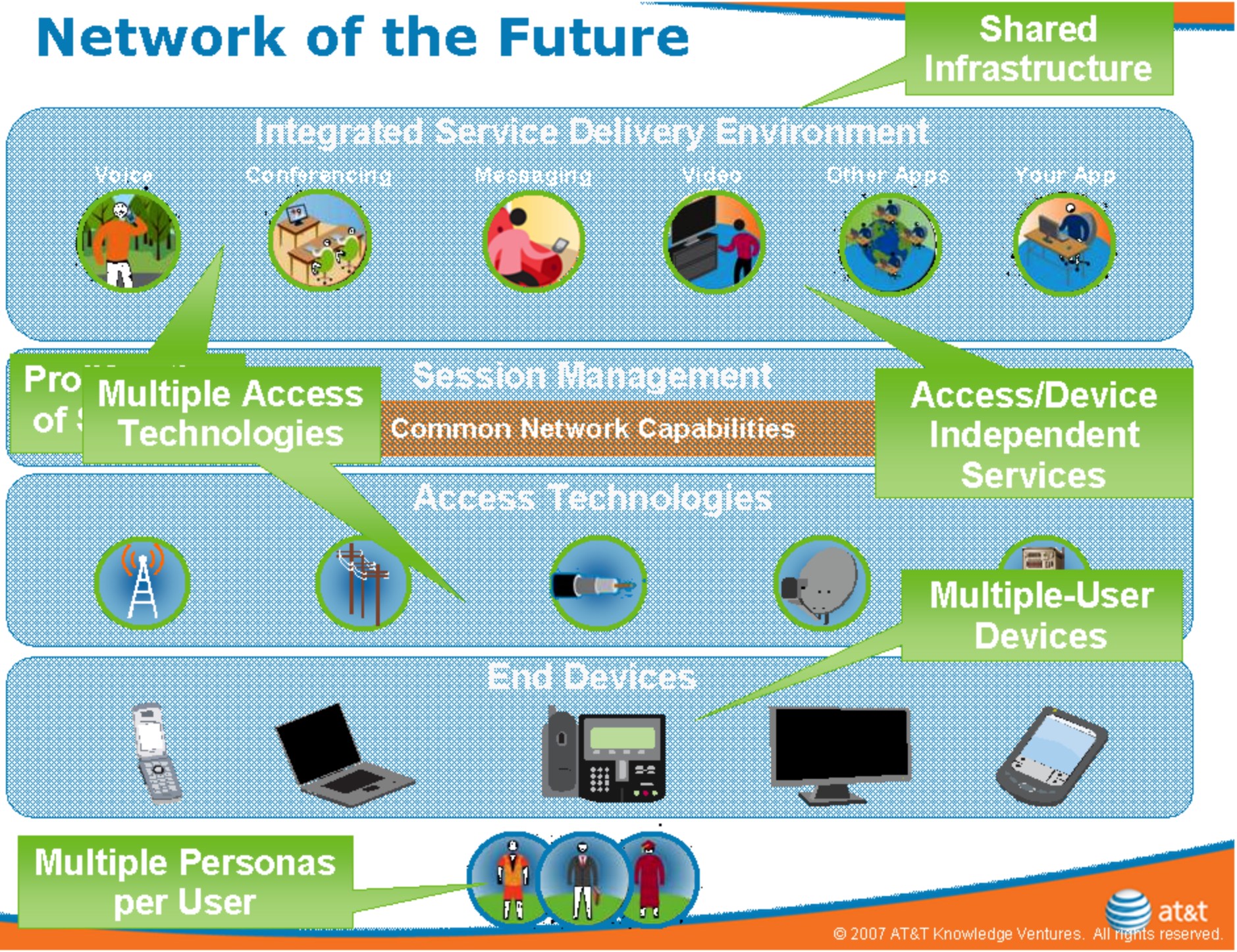
Network of the Future



Three Screens

Implications to:

- Devices
- Services
- Network

Three Screens & Rich Media Content

Exciting Devices

Innovative Services

Powerful Networks

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Three Screens & Rich Media Content

Exciting Devices

- Standards
- Diversity
- Performance
- Multimedia
- Power

Innovative Services

Powerful Networks

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Three Screens & Rich Media Content

Exciting Devices

Innovative Services

- Seamless Mobility
- Content Adaptation & Manipulation
- Convergence

Powerful Networks

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Three Screens & Rich Media Content

Exciting Devices

Innovative Services

Powerful Networks

- Diverse Access
- Ubiquity
- Content Distribution
- Performance & Security

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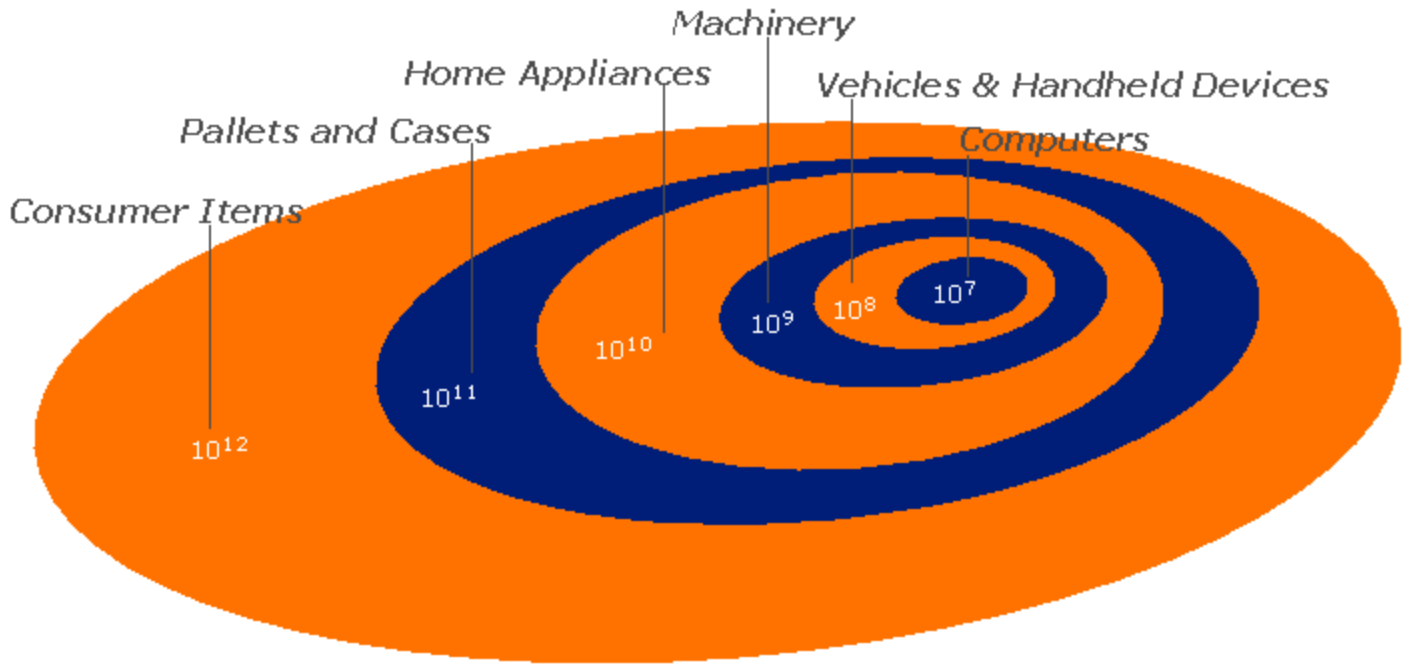
Device Evolution

Devices That Can Be Networked & IP Addressable



Invisible Computing

- *Consumer Items*
- *Pallets and Cases*
- *Home Appliances*
- *Machinery*
- *Vehicles and Handheld Devices*

Will Far outnumber current IT Devices

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Content adaptation has been demonstrated on numerous devices

- **Networks**
- WIFI, EDGE, UMTS, wired IP, PSTN
- **Bandwidth**
- 64 Kbps – 2 Mbps
- **Media**
- Video, audio, still frames, text, metadata filtering
- **Browsers**
- Proprietary, Opera, PIE, NetFront, Safari, RSS feed players

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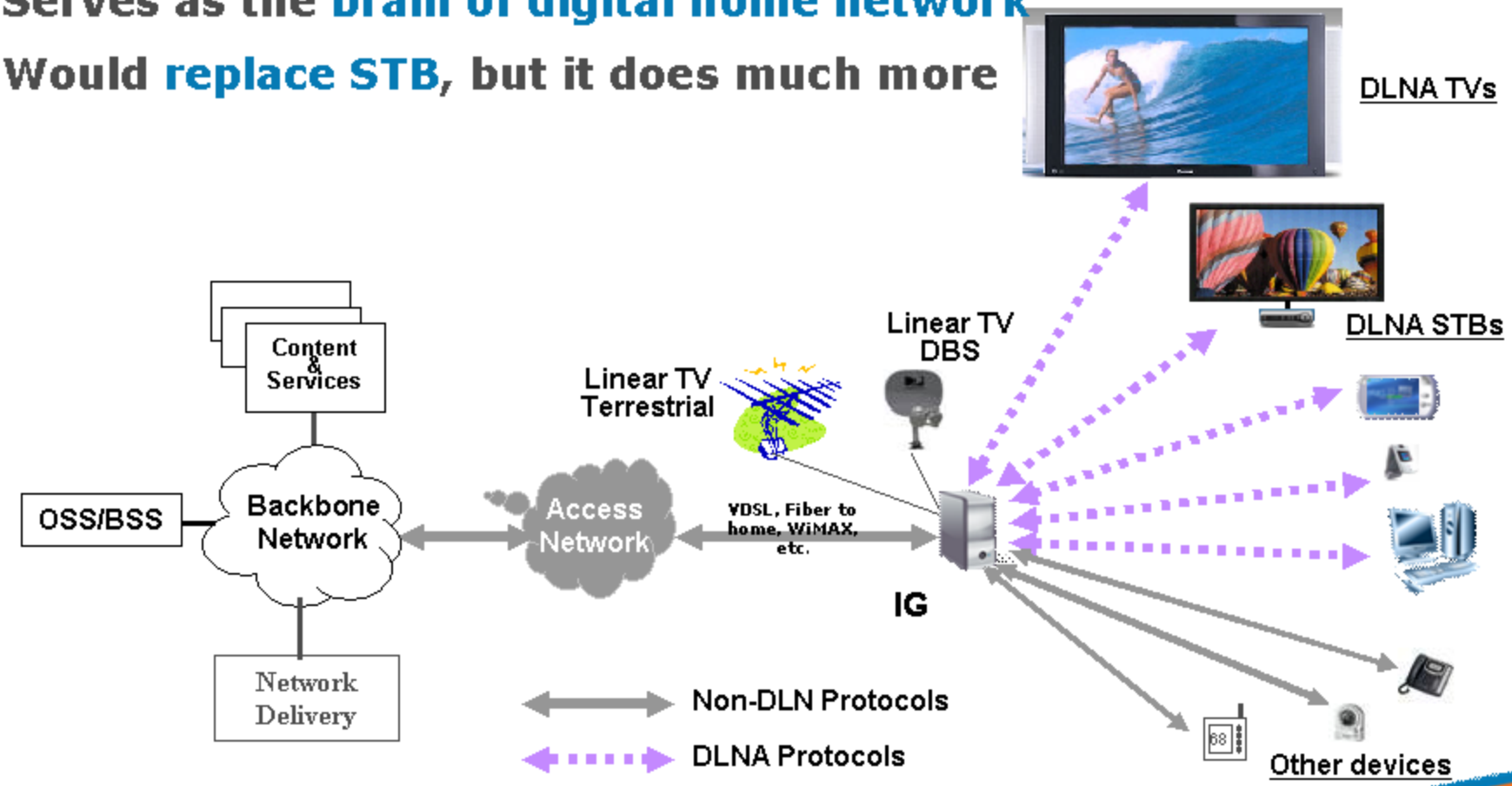
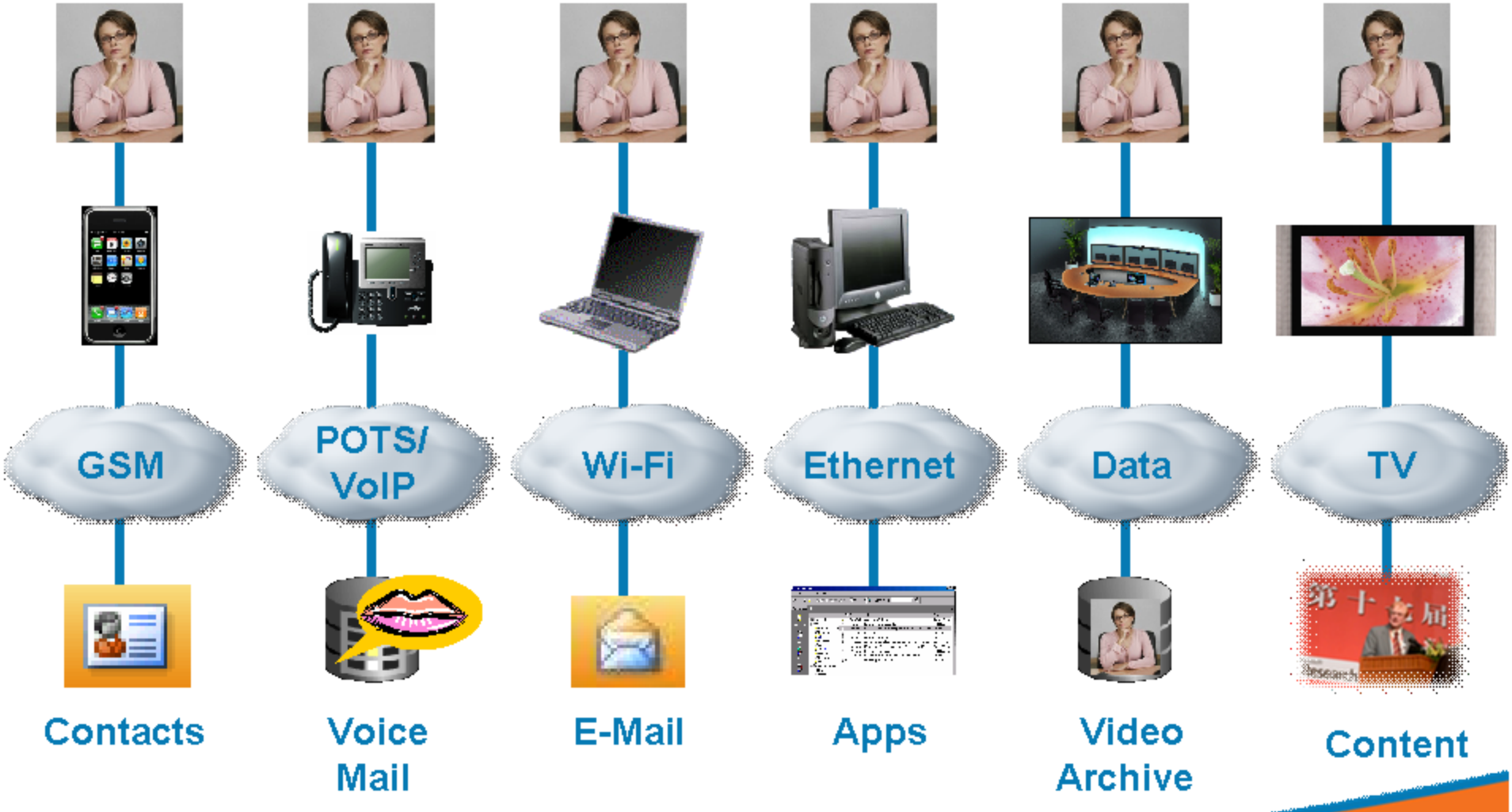
Digital Home Target Architecture

- **Standard based** (DLNA, IMS/SIP)
- Serves as the **brain of digital home network**
- Would **replace STB**, but it does much more



Service Directions

From Multiple Silos…



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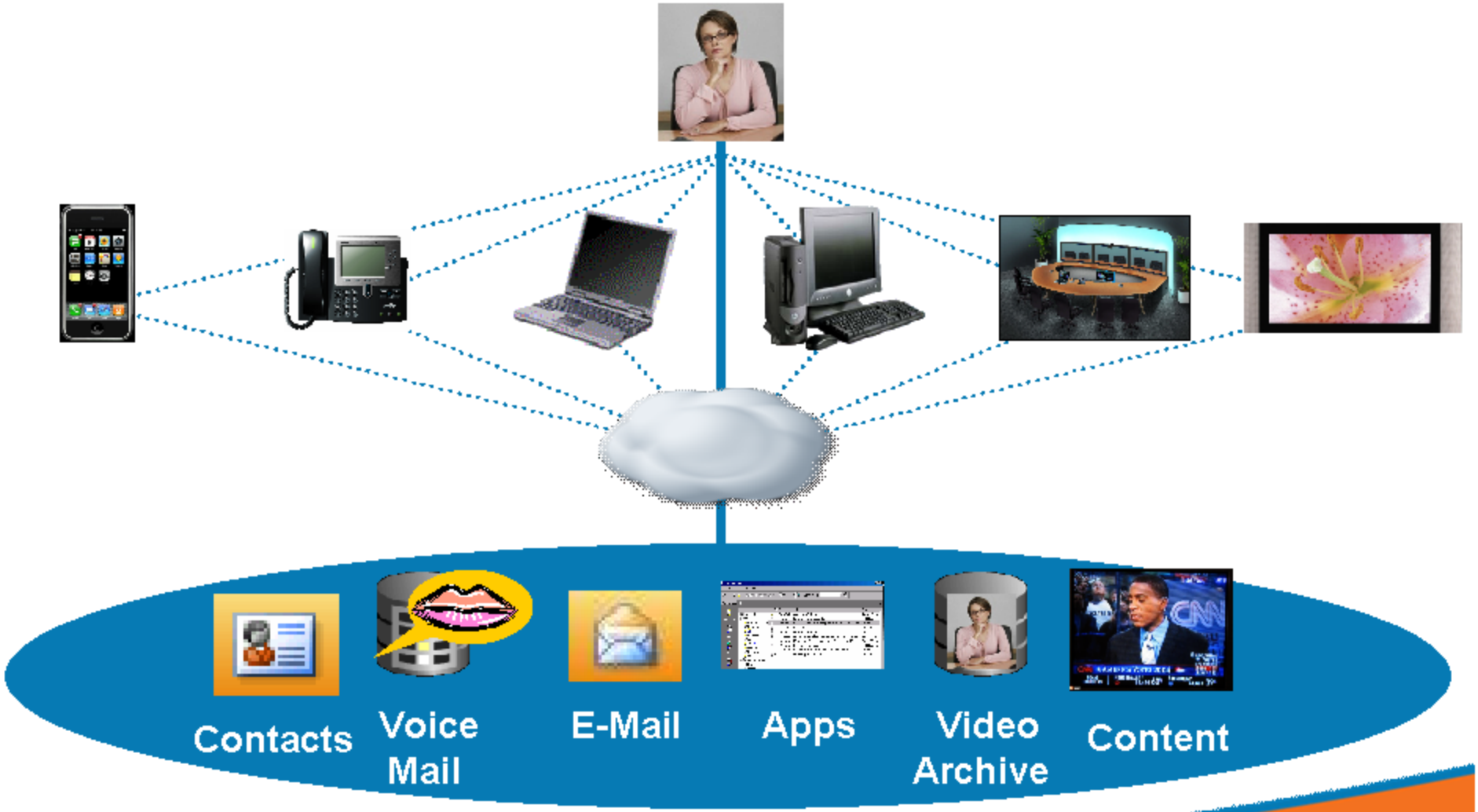
… to a Seamless, Contextualized Experience



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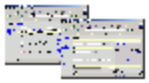
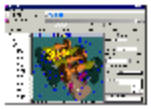
Services over IP Enable Application Convergence

Applications + **Service Enablers** = **New Comm. Solutions**

- VoIP 
- Email, IM, Text Message 
- Audio, Web, Video Conferencing 
- 3rd Party Content 
- CRM, ERP 

- Presence 
- Policy Management 
- Identity Management 
- Location 
- Federation 

- 
  Wireless/Wireline Seamless Mobility
- 
  Enriched media and real-time communication services
- 
  Greater Integration with Third Party Application Developers

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Video-Based Services

Video is enabling better, real-time communication.

Video Exchange and Video Share

Remote Monitoring

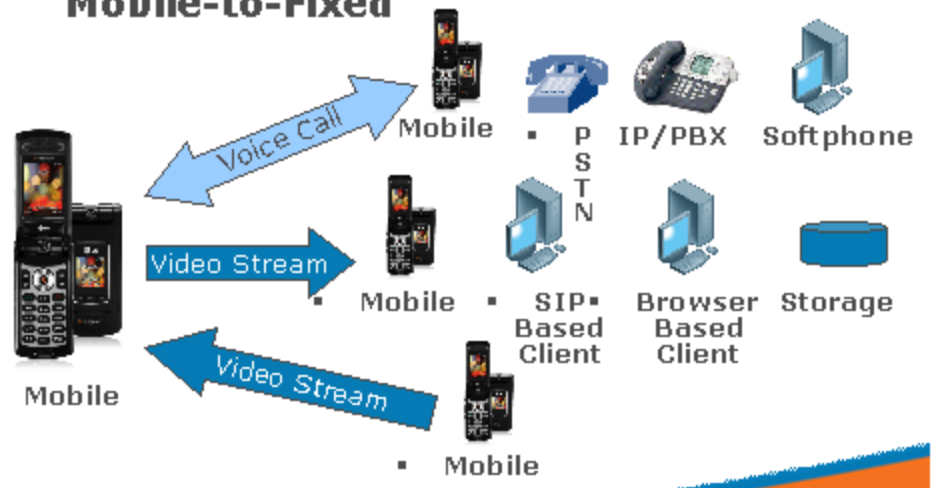
Video Share Calling

Today

- Video Share allows one mobile user to transmit streaming video to another mobile user while on a call
- **Service requirements (both parties)**
  - Video Share capable 3G handsets, provisioned for VSC
  - Within 3G coverage footprint
- **Video Share Devices**
  - Current: LG CU500v, Samsung A707 & A717
  - Future: Add'l consumer + business-centric

Planned 2008/2009

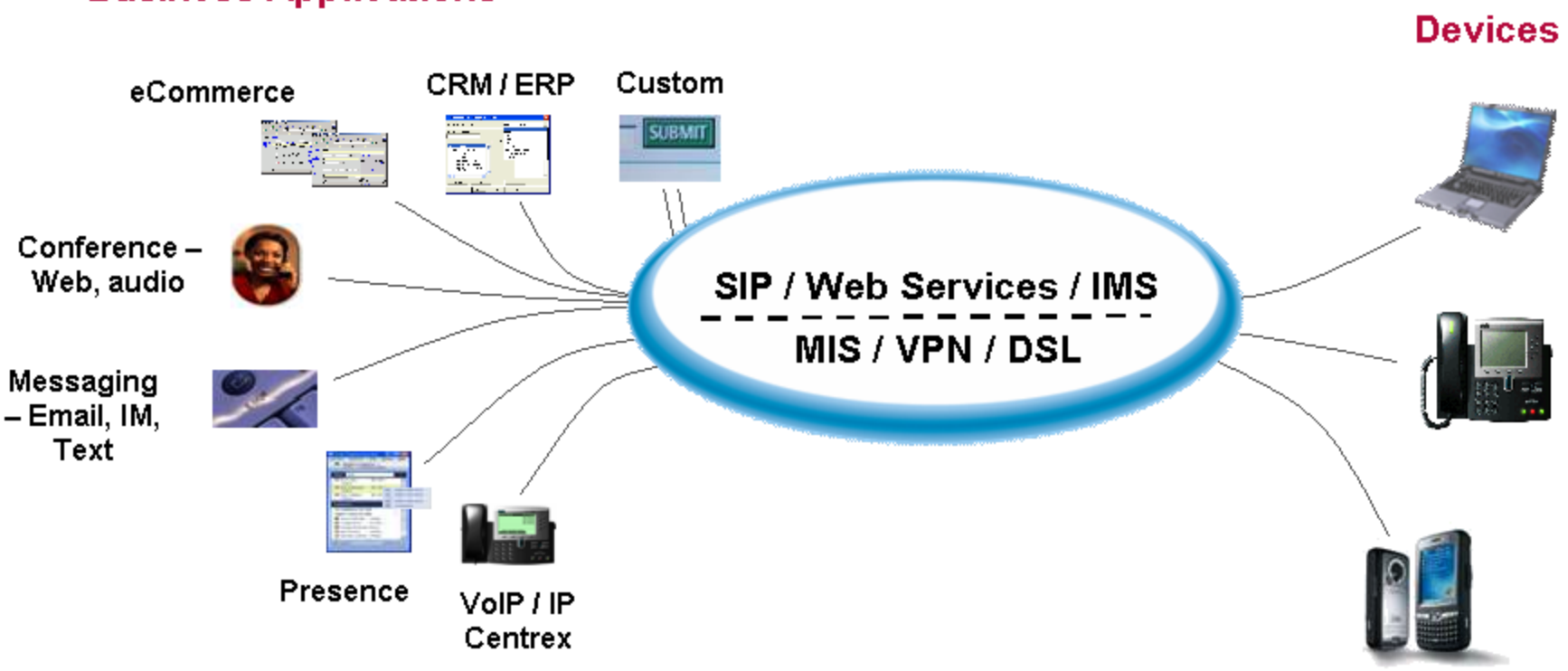
- Extend Video Share capabilities to fixed endpoints
- **Service requirements**
  - Video Share capable 3G handsets (mobile side)
  - SIP or browser based client on fixed side for video
  - Voice call can be terminated to PSTN, IP/PBX or softphone
- **Video Share Devices**
  - Expected on most 3G devices including Business-centric
- **08-09: Incremental End-Points including Mobile-to-Fixed**



Convergence of Communications and Applications

IMS / SIP / Web Services Are Enabling Application Convergence

- *Blending services requires integrating functionality and bundling components*



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Scenario– Integrated Service

Find nearby movie theaters
Presence and location

Five simultaneous SIP sessions

Preview movies
Streaming Video

Schedule movies with friends
iCalendar and Instant Messaging

Purchase e-tickets
eCommerce

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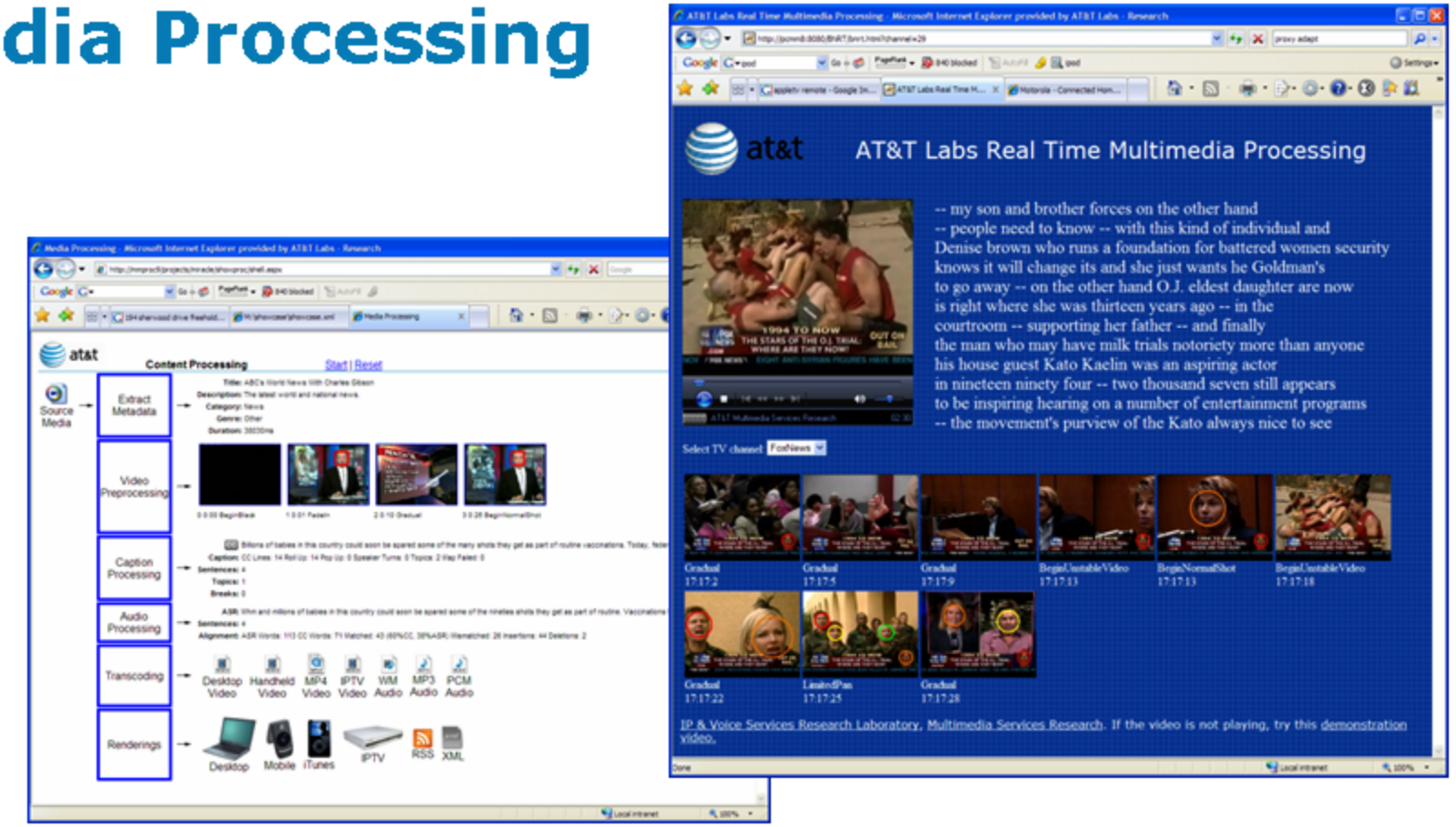
Content Processing

Content Processing Technologies

- Video Processing
  - Content-based sampling
  - Face Detection
  - Concept detection
- Speech Processing
  - Large Vocabulary (200,000+ words) Automatic Speech Recognition
- Audio Processing
  - Speaker segmentation
- Natural Language Processing
  - Entity extraction, topic segmentation
- Machine Learning
- Content based
  - Personalization, Summarization, Association, Adaptation…

Media Processing

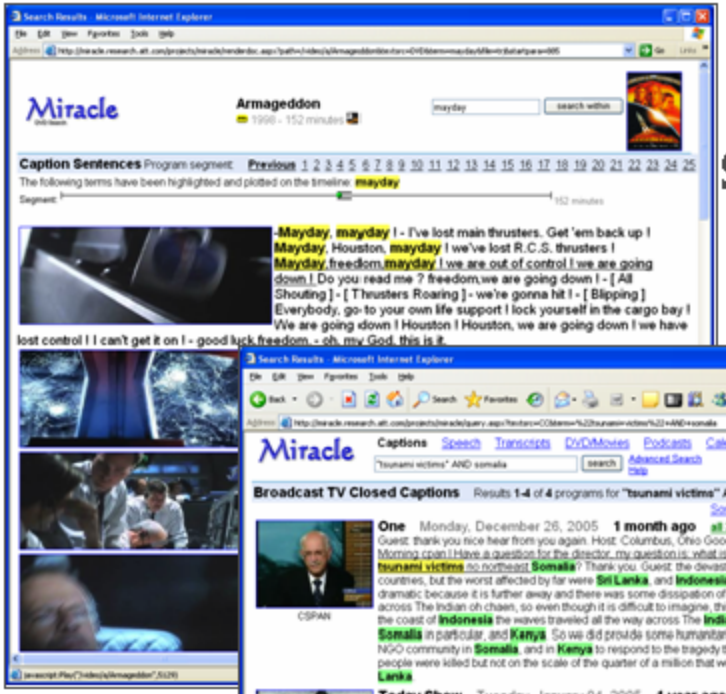


- Video processing #1 at NIST evaluations two years running

Content Personalization Capabilities

- Persistent user preference profiles
- Personalized content creation
  - Identify relevant short-form content
  - Clip long-form content to guide users to relevant content (multimodal topic segmentation)
  - View on any screen
    - HSD (PC), U-Verse (STB), Mobility (Smartphones)
  - "to go" content preparation
    - Self-contained HTML, Images, and media for 'sync' applications
    - Personal RSS generation targets iTunes download manager, Apple devices

MIRACLE Search & Personalization



Movie Search

PC

TV Search

IPTV

Podcast Search

Mobile

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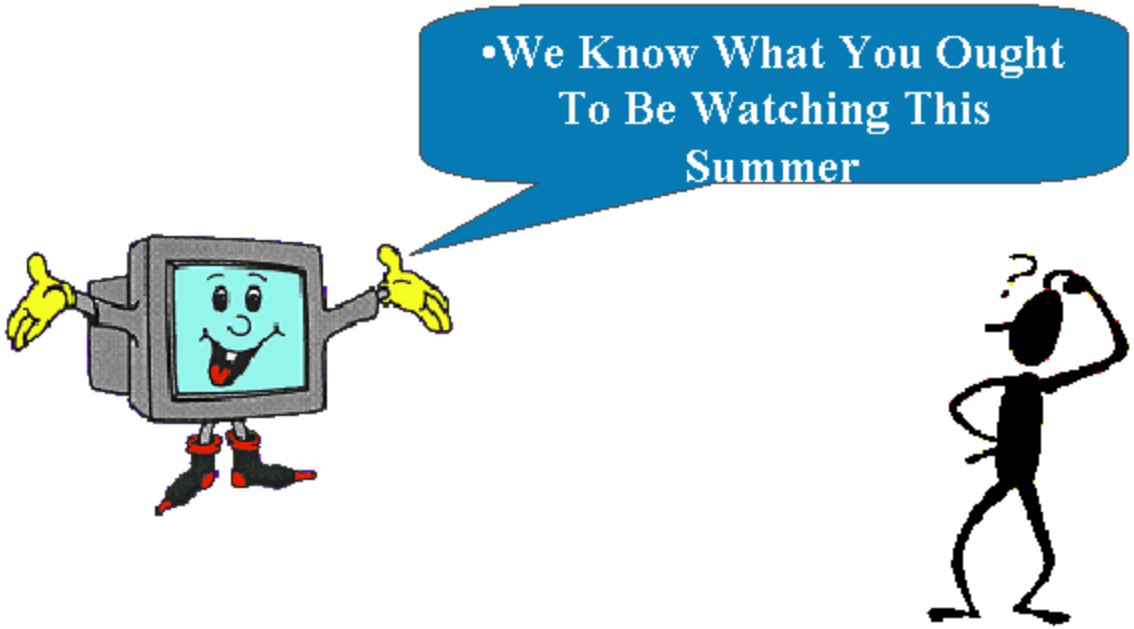
Recommender systems



Media Models: Collaborative filtering

- Recommender systems built on *collaborative filtering* use past transactions of many users to predict what you might want to purchase
    - used by Amazon, TiVo, Netflix, etc.
- Finds other users with similar preference patterns - you have high probability of liking the same items they like.
- Given enough data, specific data characteristics (actors, directors, genre) are irrelevant (!!!)
- Technology can be used to recommend shows, place ads on a page, or customer segmentation.

Netflix Prize

- Training data
  - 100 million ratings
  - 480,000 users
  - 17,770 movies
  - 6 years of data: 2000-2005
- Test data
  - Last few ratings of each user (2.8 million)
  - Evaluation criterion: root mean squared error (RMSE)
  - Netflix Cinematch RMSE: 0.9514
  - results posted on a public leaderboard
- Competition
  - 3000 teams
  - $1 million grand prize for 10% improvement on Cinematch result
  - $50,000 2007 progress prize for best improvement

Network Implications

The Future of Networking

Performance

- End-to-End, Converged Multi-Layer Architecture
- Faster, More Extensive, More Reliable, Photonic Mesh
- Cost Effectiveness

Agility

- Flexible, Continuous, Adaptive
- Multi-Service
- On-Demand, Pay-per-Use / Allocation

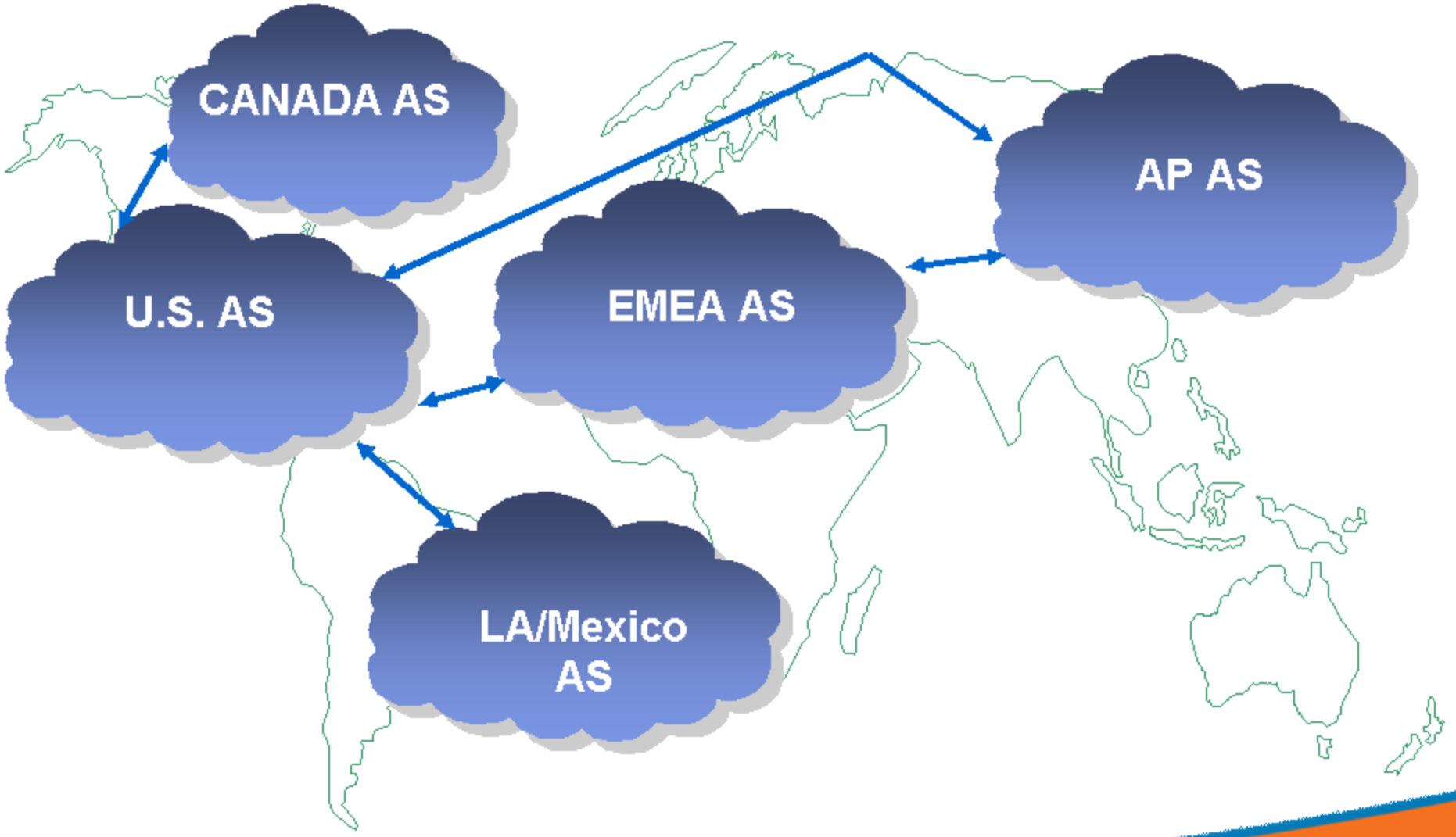
Control

- Integrated Bandwidth, QoS, Route and Packet Control
- Monitored, Managed, Coordinated, Orchestrated, Optimized

Security

- Network-Based Perimeter and Pervasive Security In-Depth

AT&T Global Reach



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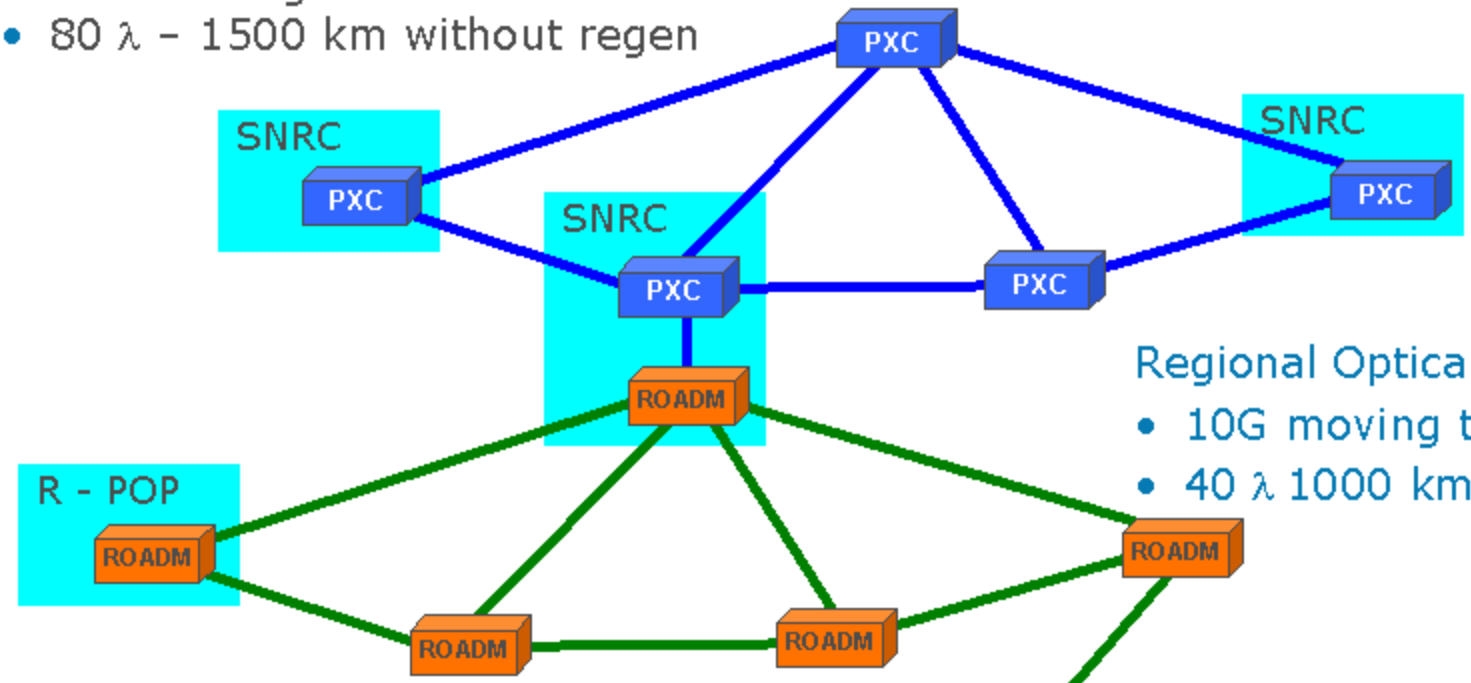
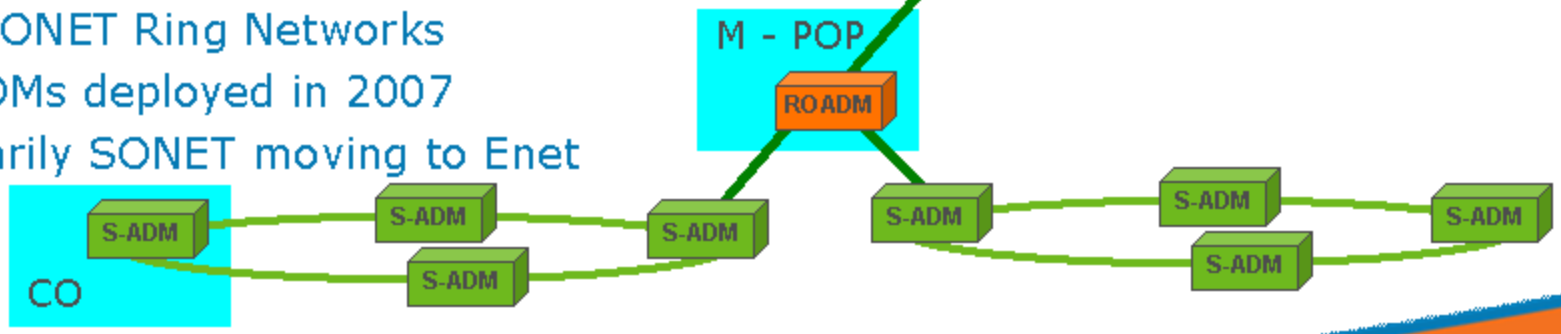
AT&T's Global Photonic Network

Ultra-Long Haul Backbone
- 40G moving to 100G
- 80 λ – 1500 km without regen



Regional Optical Network
- 10G moving to 40G
- 40 λ 1000 km, 8 degrees

Metro SONET Ring Networks
- ROADMs deployed in 2007
- Primarily SONET moving to Enet



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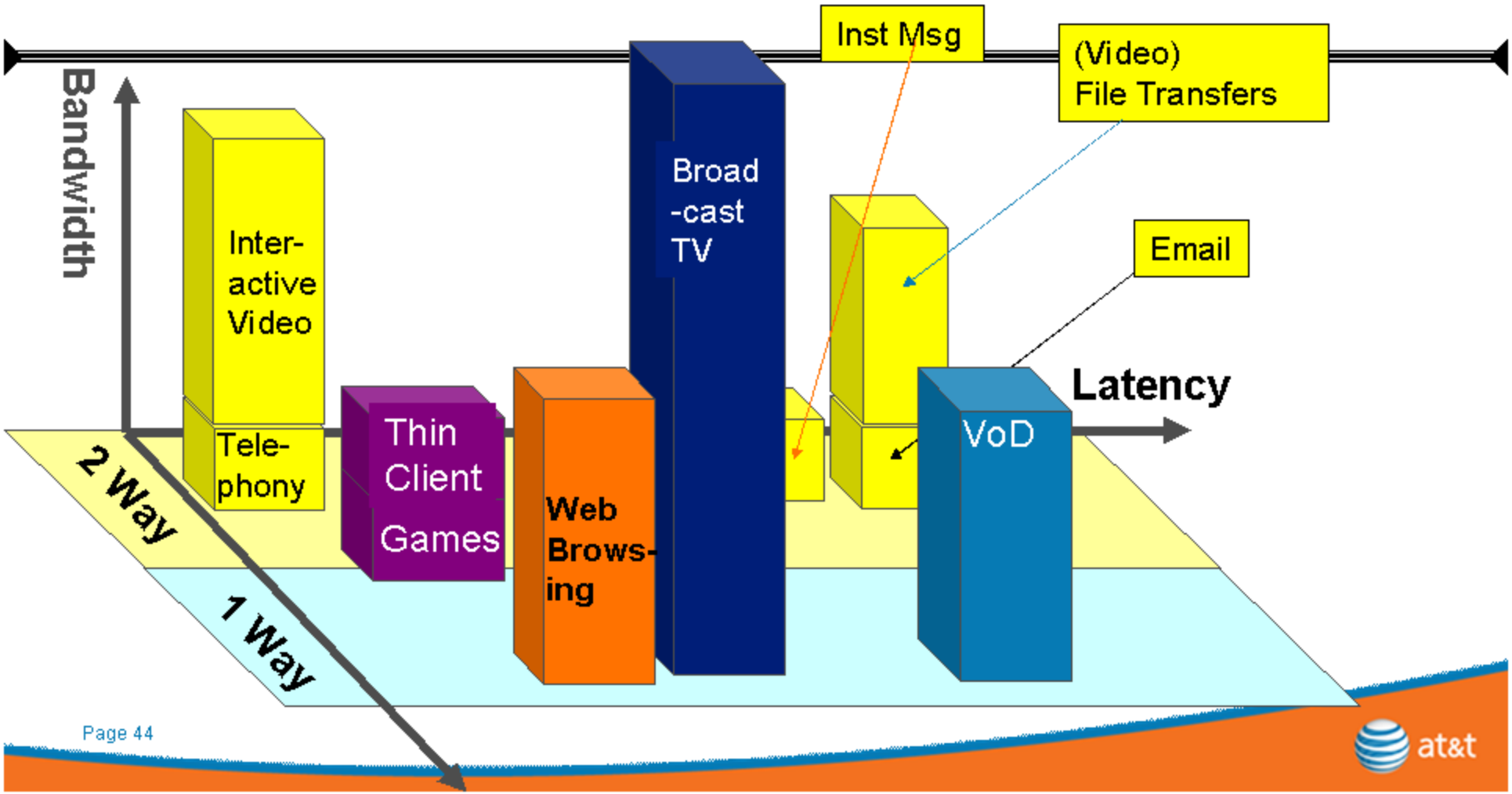
Bandwidth Demands Will Keep Growing…

- Triple Play … Video Conferencing
- IPTV
- Gaming
- RFID / Sensor Networks
- Digital Video Surveillance
- Thin Client Computing
- File Sharing and Movie Downloads
- Synchronous Mirroring / Continuous Data Protection
- Stretch Clusters
- Cloud Computing and Storage Utility Grids
- …

Bandwidth Isn't Everything



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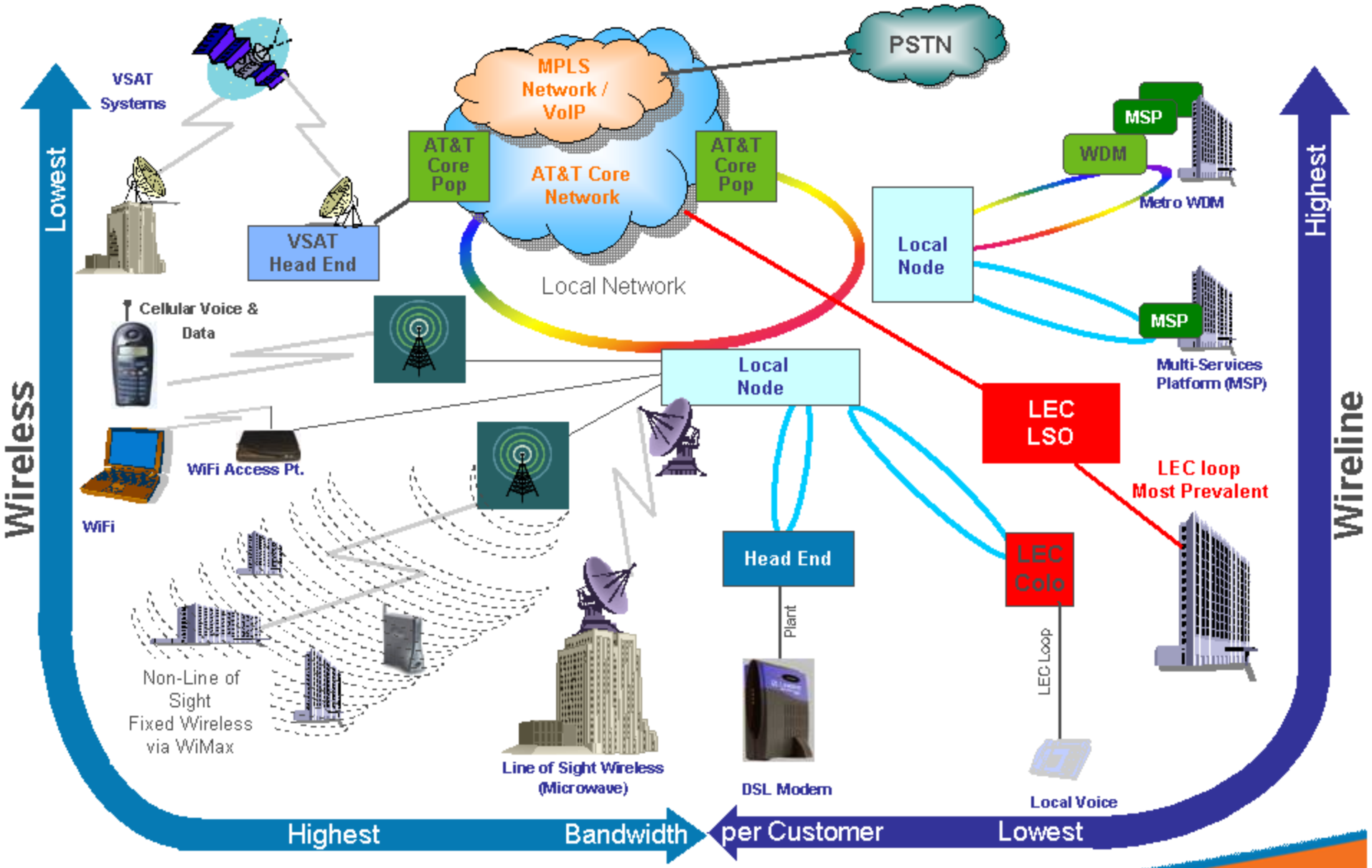
Access Technologies



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Conclusion

"Three" Screen Technology

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Video Services Evolution

- Point-to-Point ➔ Multi-point
- Intranet ➔ Extranet ➔ Internet
- 3 Screen ➔ *n* Screen
- Static Connection ➔ Dynamic Connection
- Homogeneous Vendor ➔ Vendor Interoperability
- Homogeneous Endpoint ➔ Endpoint Interoperability
- Intra-Provider ➔ Inter-Provider
- Transient ➔ Archived ➔ Searchable
- Fixed ➔ Mobile
- Private ➔ Utility
- Native ➔ Composited ➔ Augmented Reality
- Connection ➔ Collaboration ➔ Community