



IPTV Deployment: Trigger for advanced network services!

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Overview

- Introduction
 - advanced access network services
 - IPTV
- Access network architecture
 - network transformation
 - network processing power
- Time-shifted television
 - concept
 - caching algorithms
 - RTSP proxy
- Conclusions



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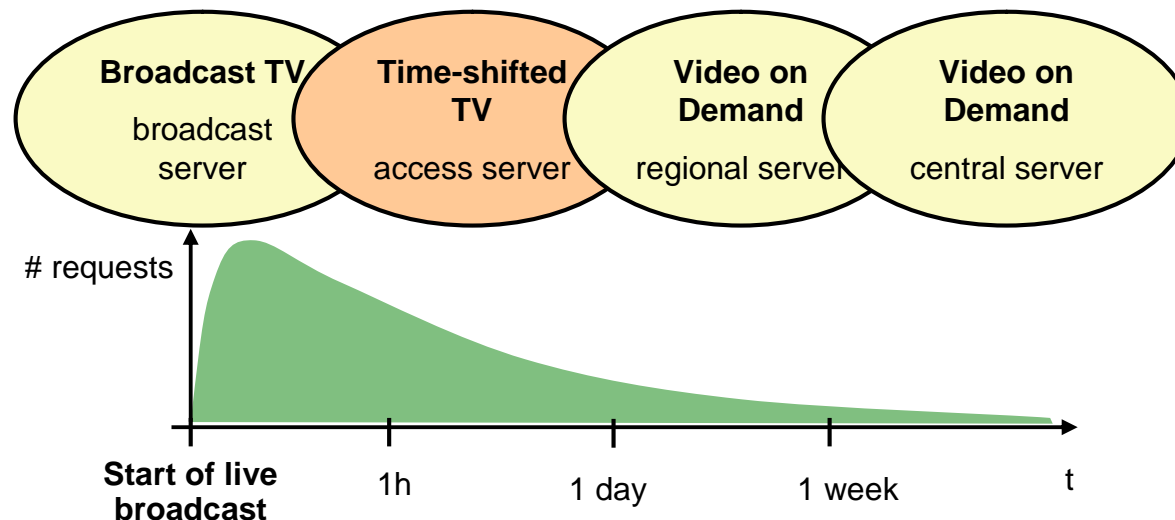
Introduction

- Service network requirements
 - content delivery (IPTV, VoD)
 - high bandwidth, low jitter
 - multiplayer games (server based, P2P)
 - low delay
 - distributed storage
 - low delay, high availability
 - conferencing (IP telephony, video conferencing)
 - low delay and jitter
 - home management (automation, security)
 - high availability



Introduction

- High priority: IPTV services
 - today: broadcast TV (live) or VoD (older content)
 - highly loaded VoD servers at the network edge
 - complete files are stored
 - solution: time-shifted TV for (very) recent content
 - distributed servers in the access network, storing fragments



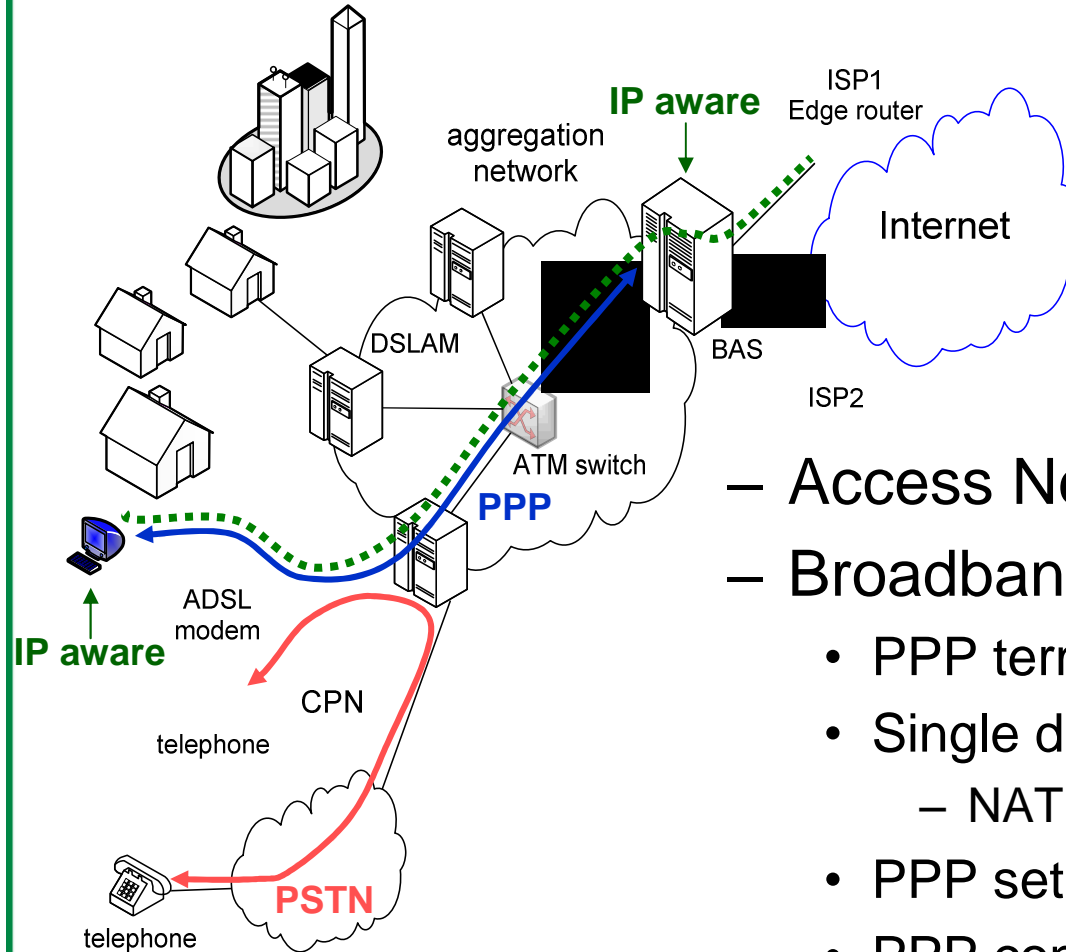


Overview

- Introduction
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- **Access network architecture**
 - network evolution
 - network processing power
- Time-shifted television
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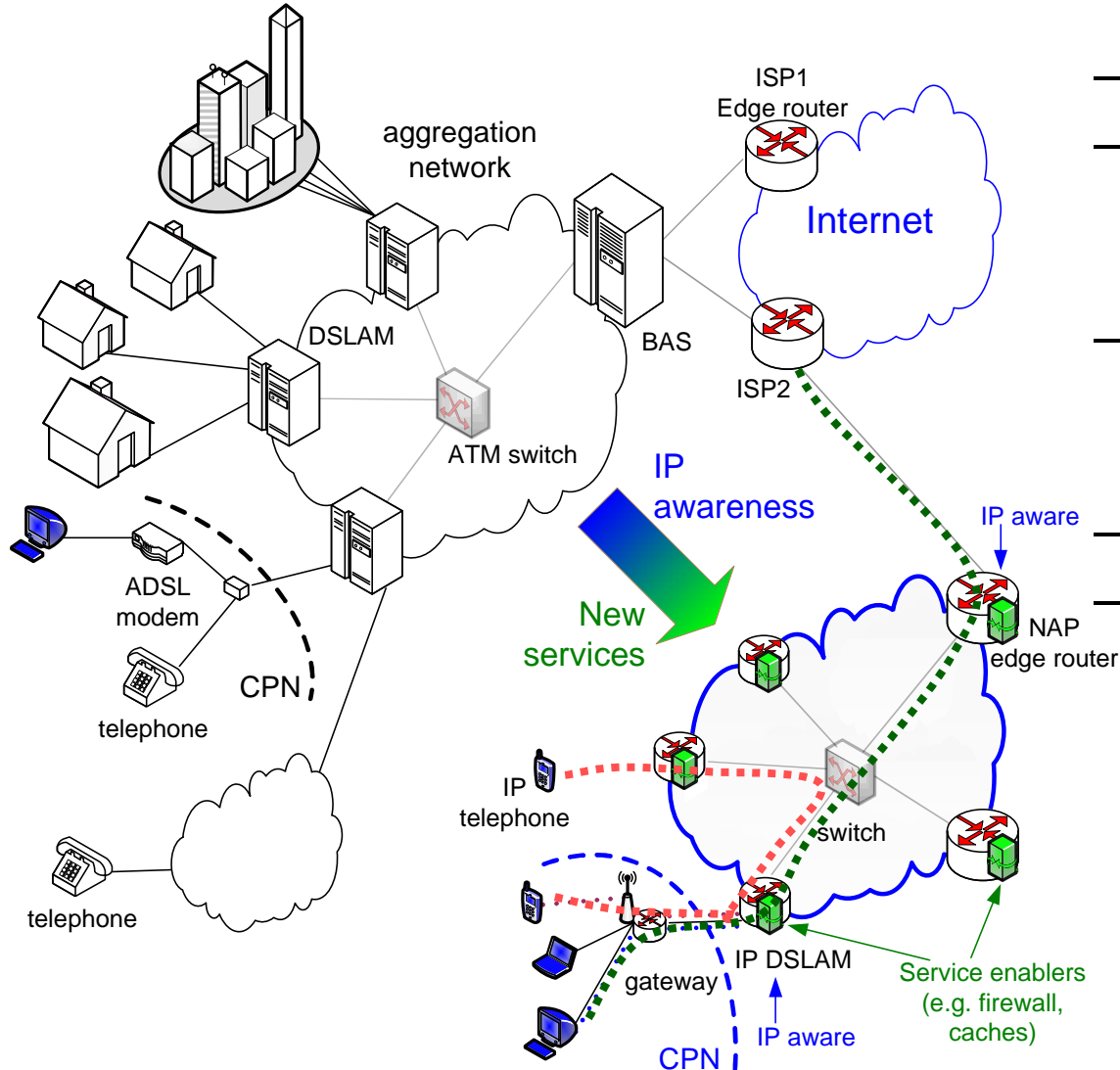
Access network architecture: current



- Access Network per Service
- Broadband Internet (DSL / ATM based)
 - PPP terminated in single device (BAS)
 - Single device per subscriber
 - NAT → breaks E2E connectivity
 - PPP setup hampers autoconfiguration
 - PPP conflicts with application-based QoS and multicast support



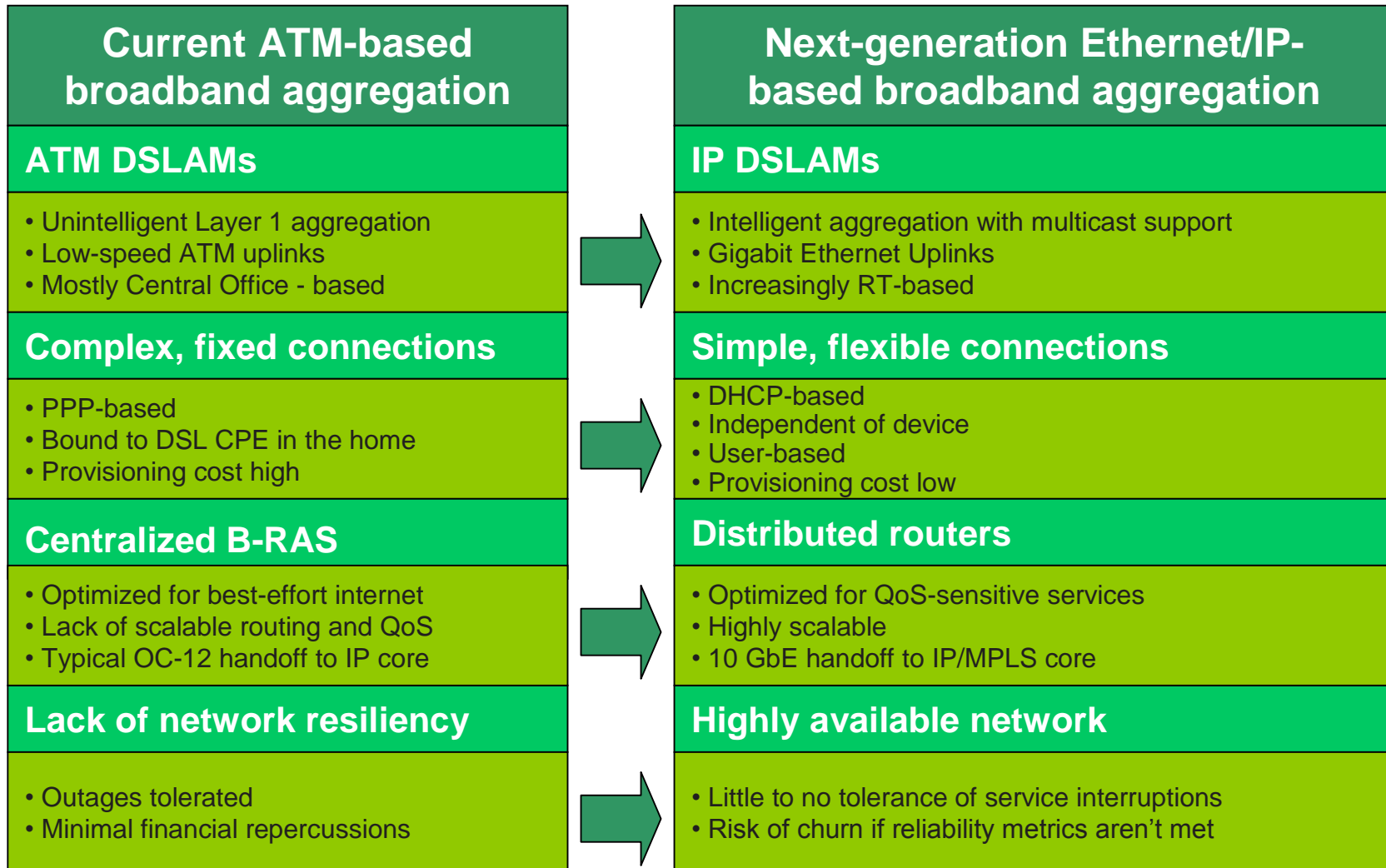
Access network architecture: evolution



- Converged access network
- IP awareness
 - Multicast support
 - Local P2P traffic
- Multi edge
 - Scalability
 - High availability
- New services (triple play)
- Application based QoS



Access network architecture: evolution





Access network: processing power

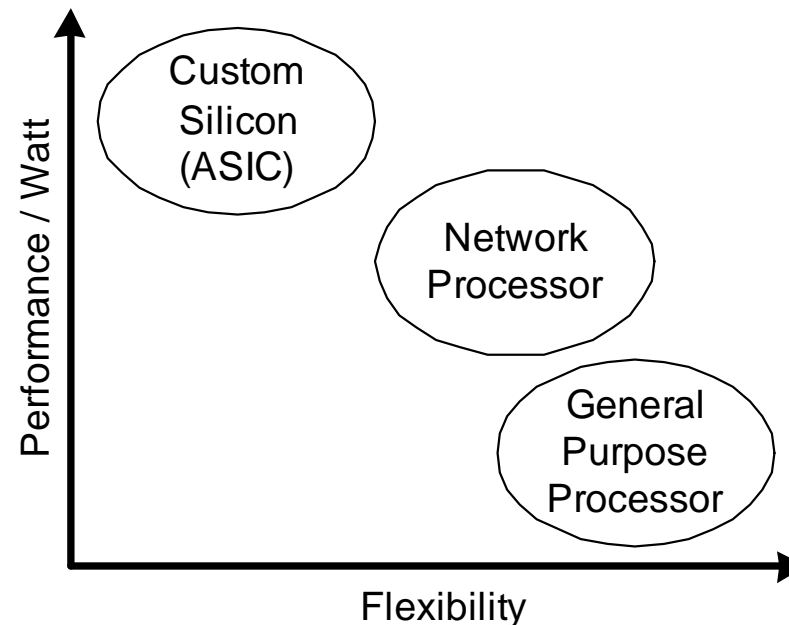
- Increasing need for powerful and flexible network systems
 - today: fixed-function ASICs or low-performance general purpose processors

	GPP – based solutions (General Purpose Processor)	ASIC – based solutions (Custom silicon)
Pro	<ul style="list-style-type: none"> • <i>Programmability: flexible</i> • <i>Component reuse</i> • <i>Relatively low cost (RISC)</i> 	<ul style="list-style-type: none"> • <i>Very fast</i> • <i>Highly scalable</i>
Con	<ul style="list-style-type: none"> • <i>Low performance</i> • <i>Power requirements</i> 	<ul style="list-style-type: none"> • <i>Long time to market</i> • <i>High cost</i> • <i>Inflexible: little reuse</i>



Access network: processing power

- next generation: network processors (NPU)
 - *A special-purpose, programmable hardware device that combines the low cost and flexibility of a RISC processor with the speed and scalability of custom silicon*





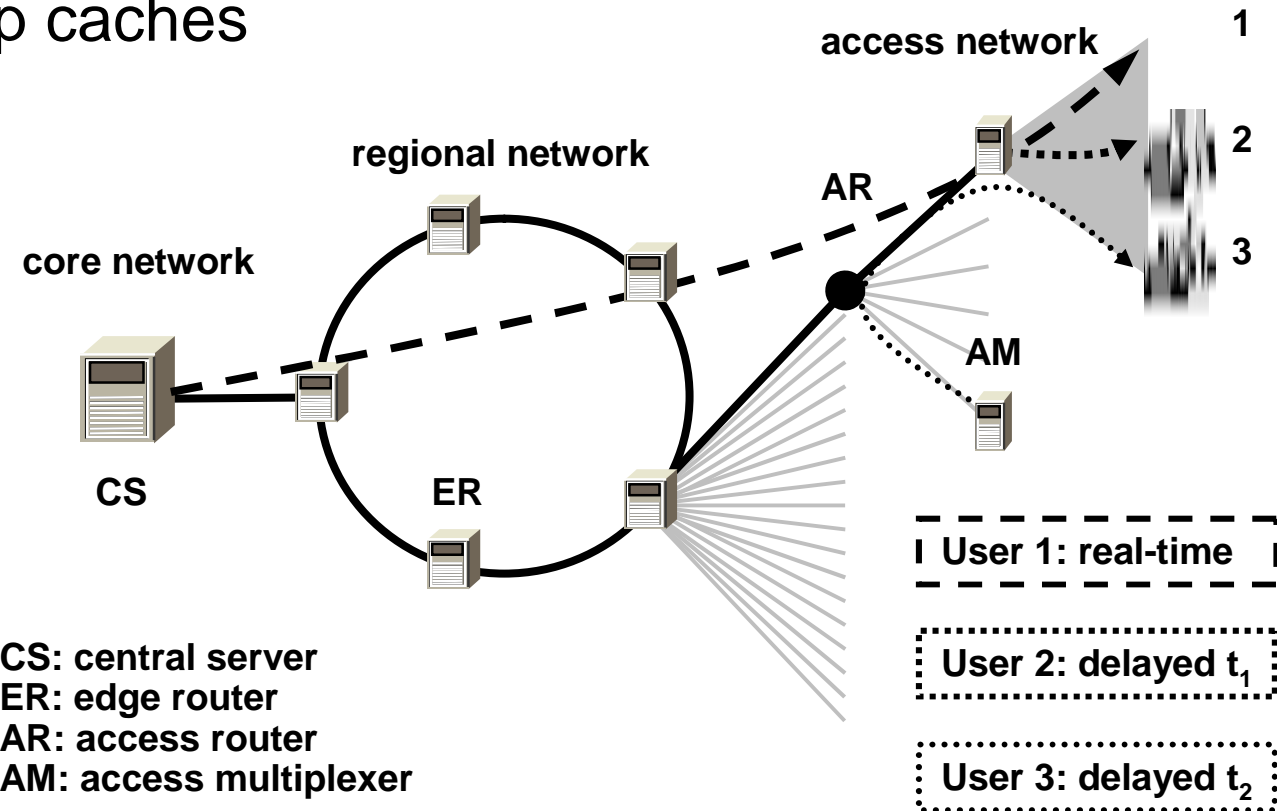
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Time-shifted TV

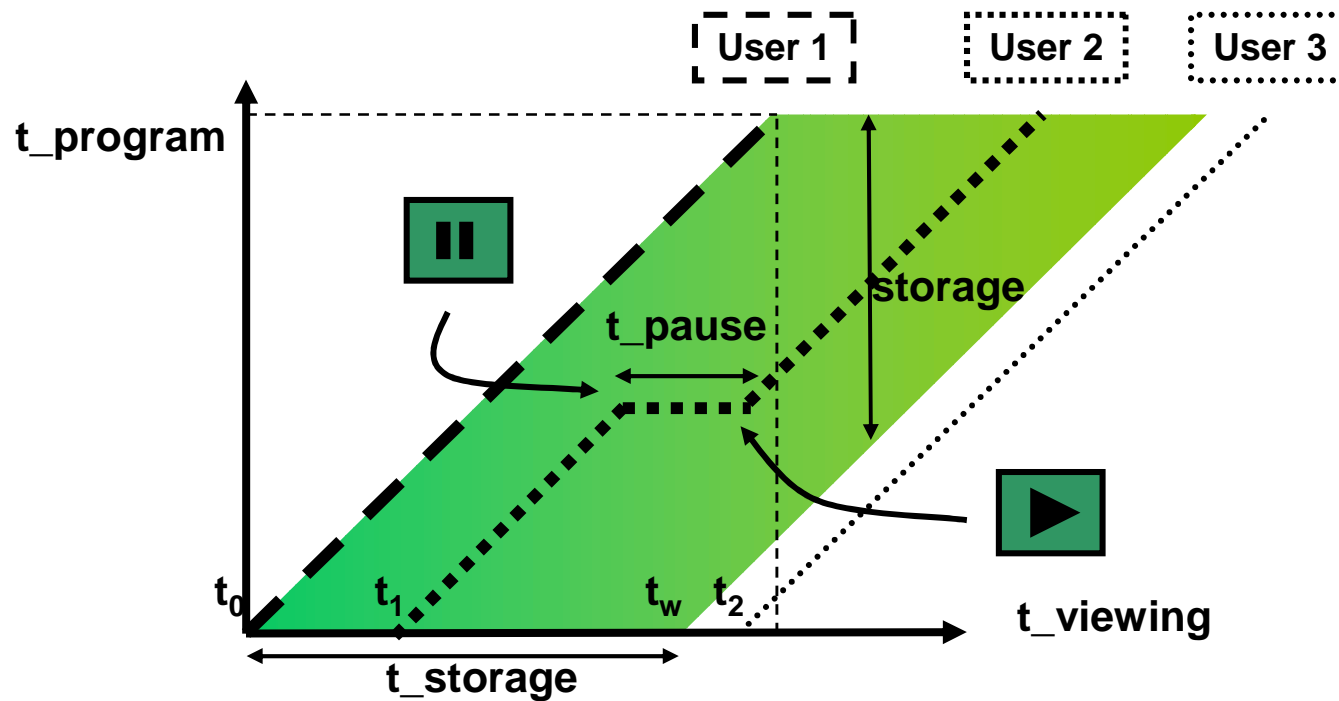
- Network view
 - caching of fragments
 - p2p caches





Time-shifted TV

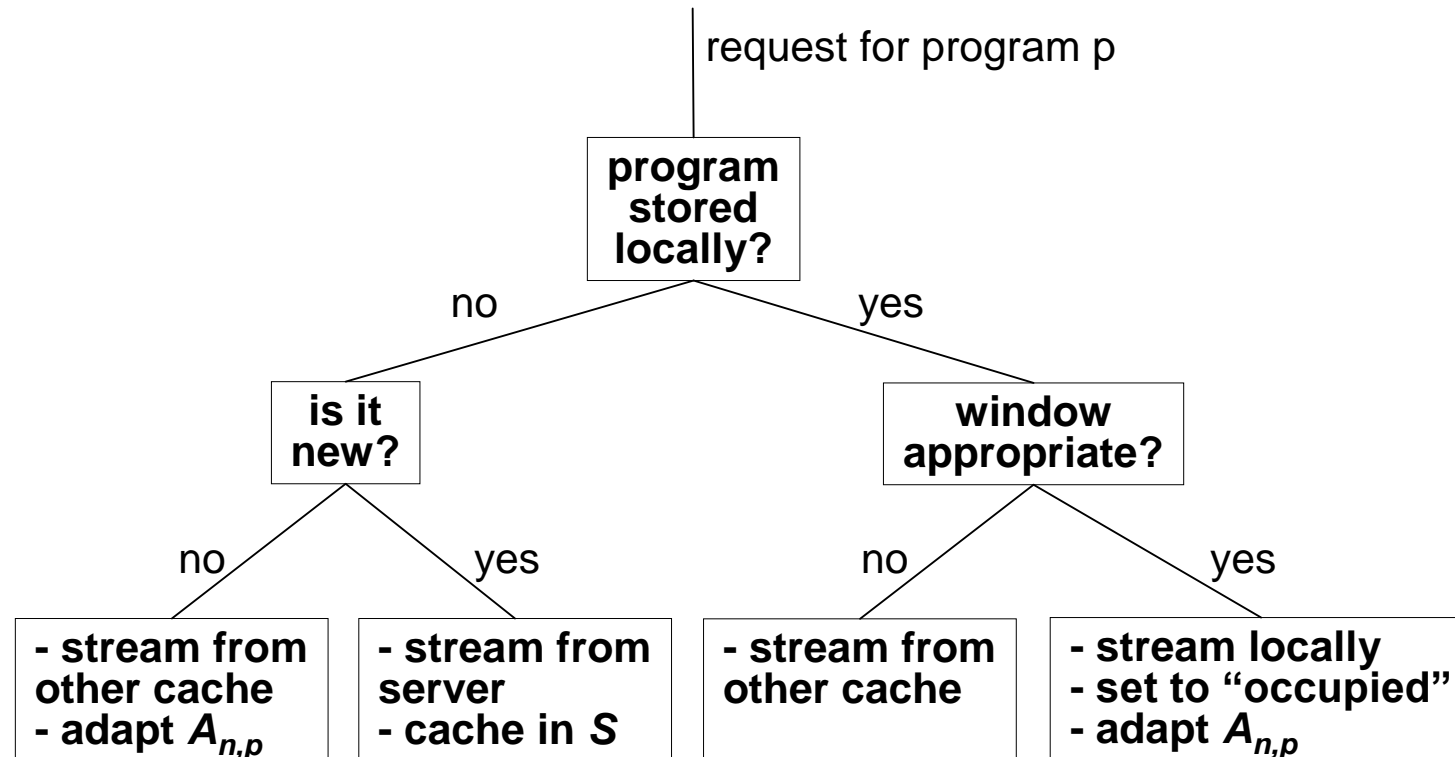
- Streaming diagram





Time-shifted TV

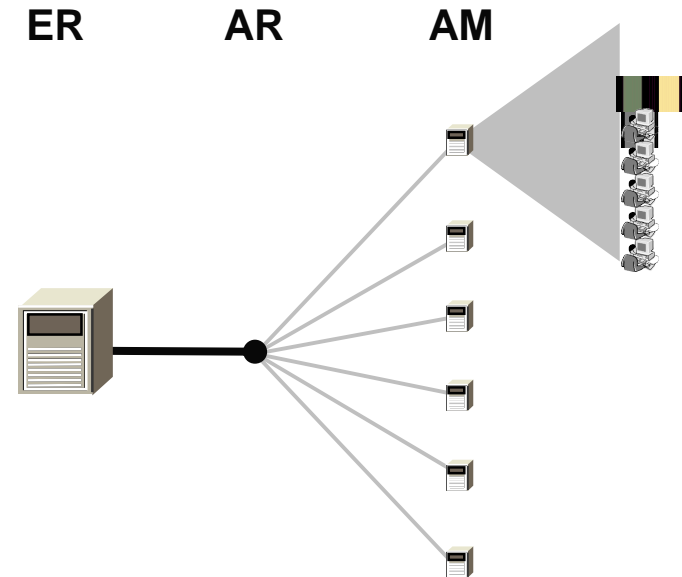
- Caching algorithm
 - small part S for learning (< 1 GB)
 - large part L for storage of popular/distant fragments





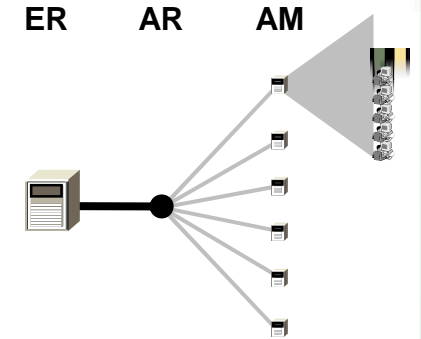
Time-shifted TV

- Input parameters
 - 5 tsTV channels
 - 6 programs per channel
 - 45 minutes per program
- Deployment options
 - hierarchical caching
 - caches at AR and AM level
 - co-operative caching
 - co-operating caches at AM level



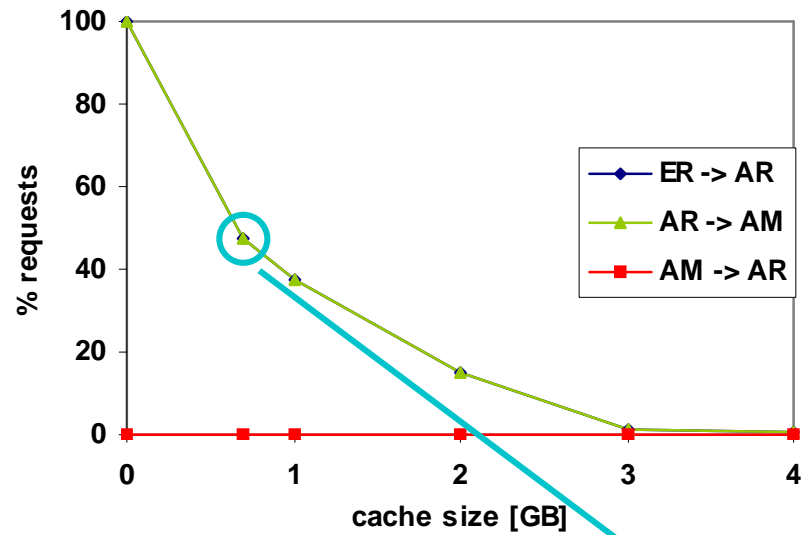


Time-shifted TV

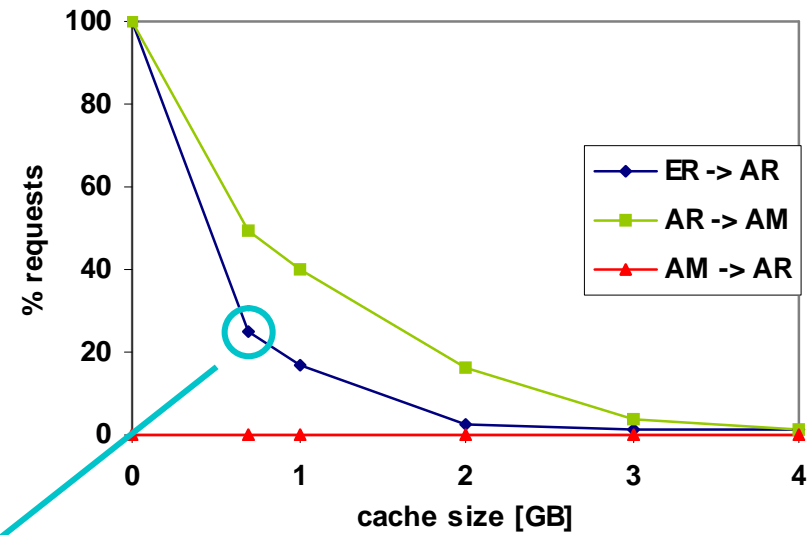


- Hierarchical caching

AM caches only



AR and AM caches

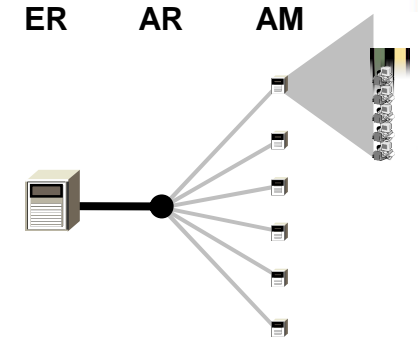


Server load reduced by 50% to 70% with 0.5GB caches

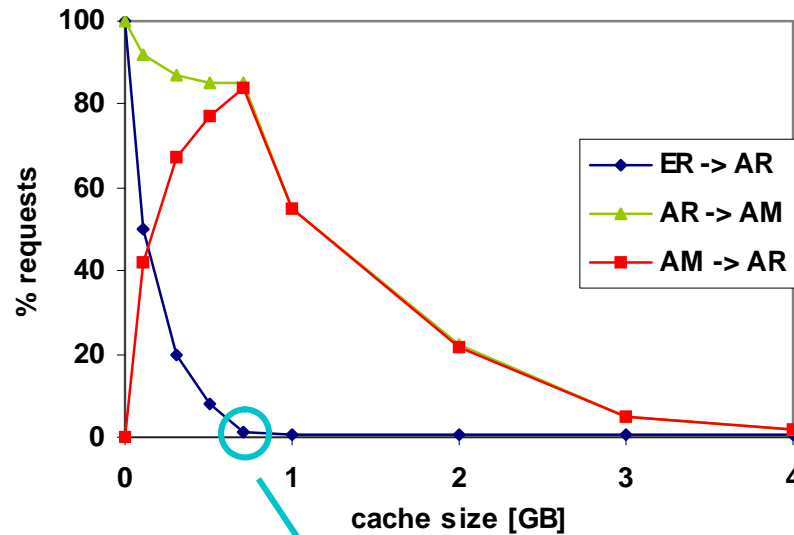


Time-shifted TV

- Co-operative caching



AM caches only

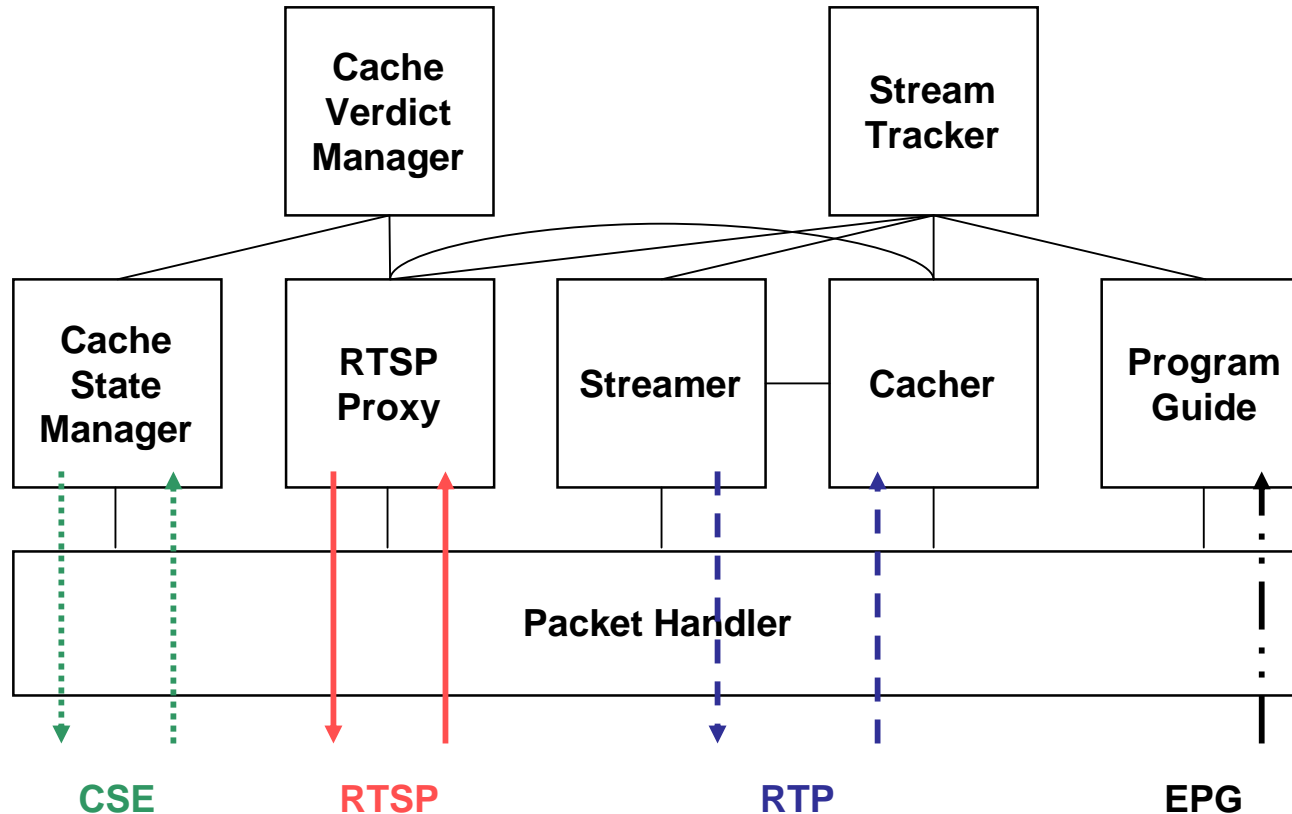


Server load reduced by 95% with 6 co-operating 0.5GB caches



Time-shifted TV

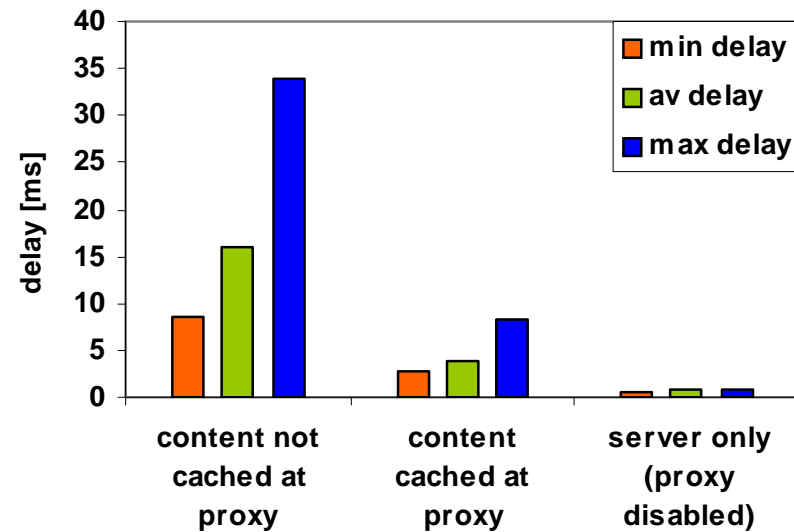
- RTSP proxy
 - implementation using RTP / RTCP / RTSP





Time-shifted TV

- RTSP proxy
 - measurements
 - AMD Athlon™ 64 (512MB RAM)
 - delay between PLAY request and first RTP packet in a server - proxy - client configuration





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Conclusions

- Access network transformation
 - from ATM based broadband aggregation to multi-service IP-aware access networks
- IPTV
 - identified as highest-priority, bandwidth intensive residential telecom service
 - server load and access network load reduced effectively through time-shifted TV using distributed proxy streamers