Evolving Nature of Content Delivery

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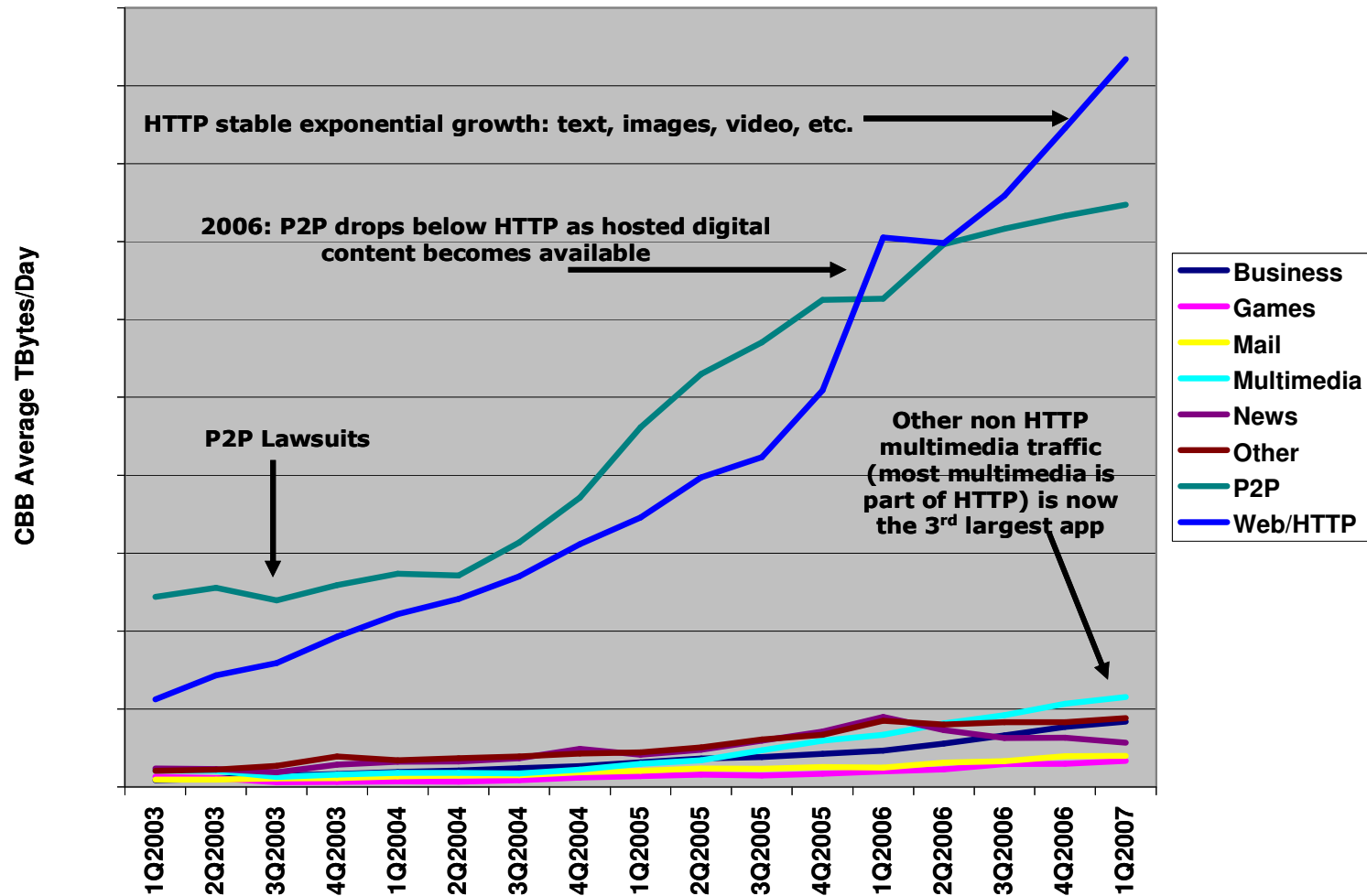AT&T Labs Research

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Content meets network

Network traffic growth is being driven by content

Network-optimized solutions offer the best performance and scale economies

Solutions involving caching, multicast and P2P will be part of the content and network service provider ecosystem

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Backbone Application Growth: 1Q07

HTTP stable exponential growth: text, images, video, etc.

2006: P2P drops below HTTP as hosted digital content becomes available

P2P Lawsuits

Other non HTTP multimedia traffic (most multimedia is part of HTTP) is now the 3rd largest app

CBB Average TBytes/Day

Legend:
- Business
- Games
- Mail
- Multimedia
- News
- Other
- P2P
- Web/HTTP

X-axis: 1Q2003, 2Q2003, 3Q2003, 4Q2003, 1Q2004, 2Q2004, 3Q2004, 4Q2004, 1Q2005, 2Q2005, 3Q2005, 4Q2005, 1Q2006, 2Q2006, 3Q2006, 4Q2006, 1Q2007

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Content Delivery Dimensions

- User experience

- Security

- Performance

- Revenue Model

- Network Efficiency

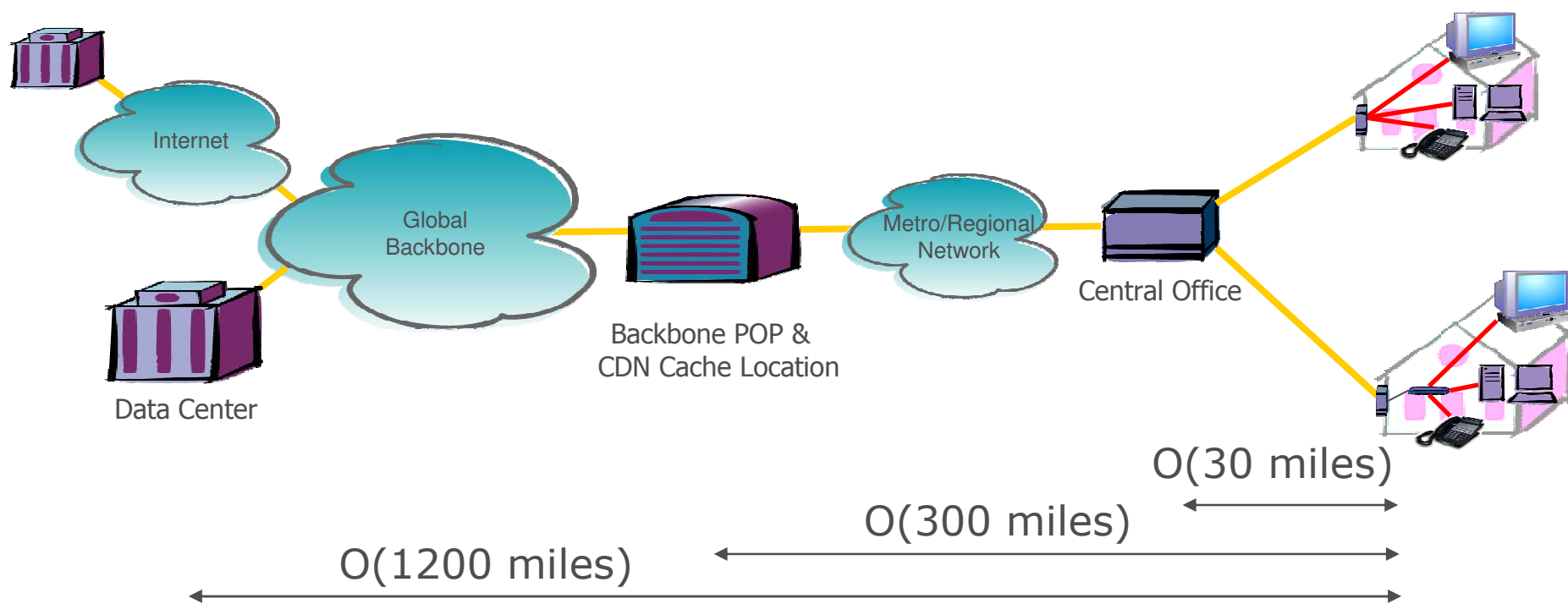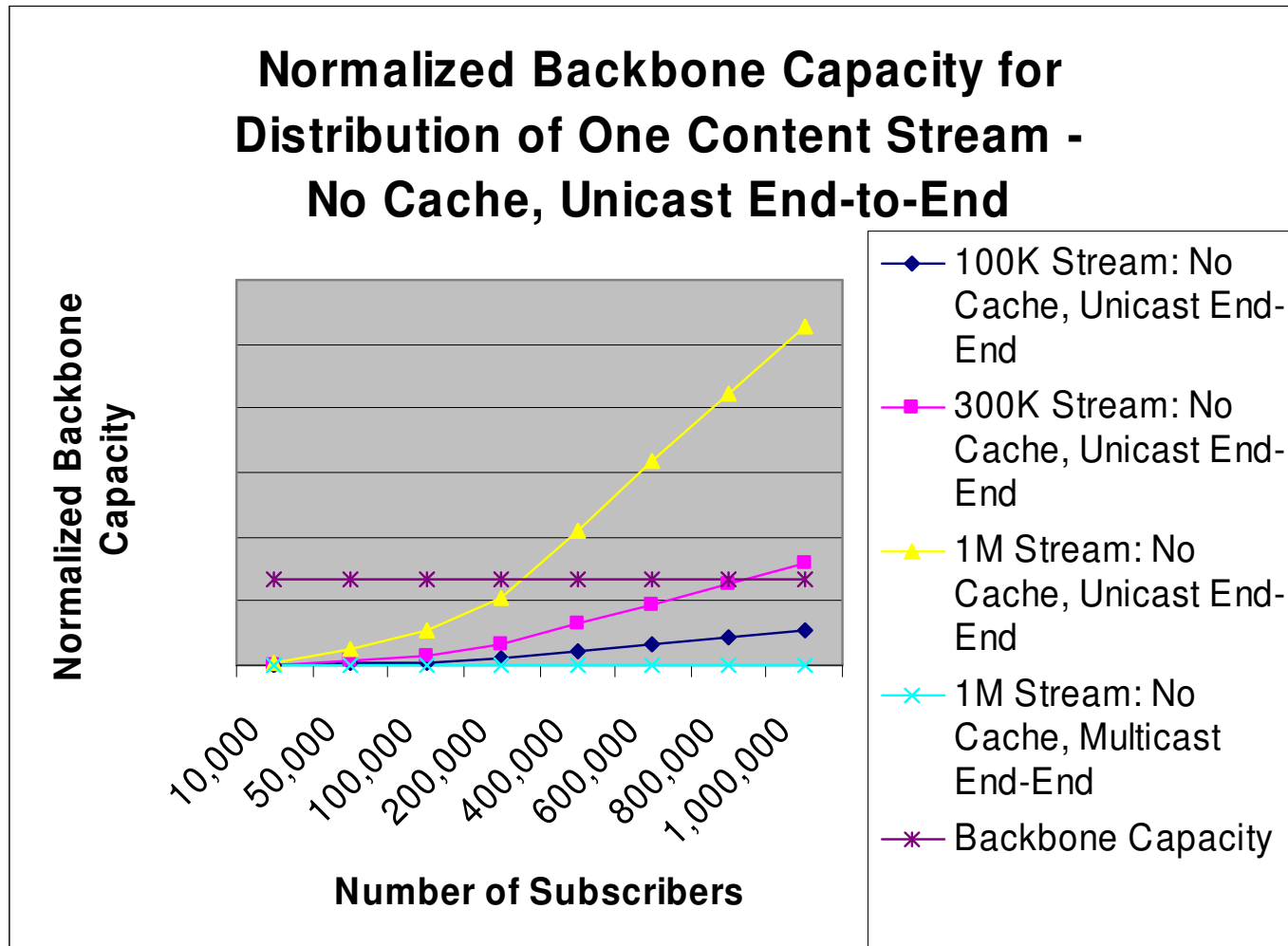- Content Protection

- Manageability

Content delivery solutions such as P2P
are evolving to meet these needs

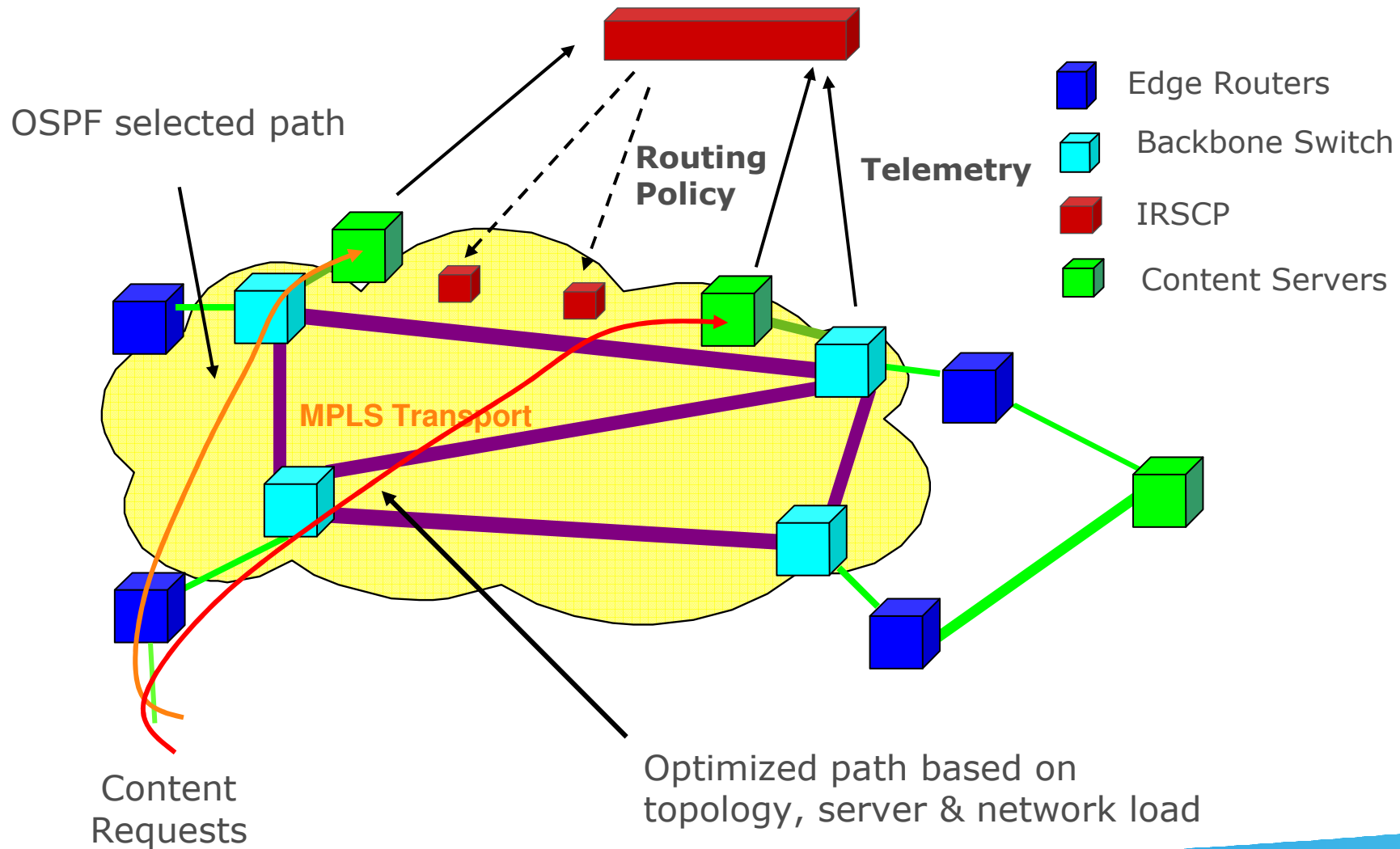June 11, 2007

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Network Costs of Content Delivery

- Traditional P2P and unicast are inefficient in use of network resources
  - => $$$
- Network optimized solutions
  - Multicast for live content
  - CDN caches for popular non-live content
  - Peer-assisted near VoD that cooperates with infrastructure (future?)

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Capacity Tradeoffs – One Content Stream

Normalized Backbone Capacity for Distribution of One Content Stream - No Cache, Unicast End-to-End

Legend:
- 100K Stream: No Cache, Unicast End-End
- 300K Stream: No Cache, Unicast End-End
- 1M Stream: No Cache, Unicast End-End
- 1M Stream: No Cache, Multicast End-End
- Backbone Capacity

Y-axis: Normalized Backbone Capacity

X-axis: Number of Subscribers (10,000; 50,000; 100,000; 200,000; 400,000; 600,000; 800,000; 1,000,000)

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Intelligent Routing Service Control Point (IRSCP)
Network & Application Aware Load Balancing

OSPF selected path

Routing Policy

Telemetry

Edge Routers

Backbone Switch

IRSCP

Content Servers

MPLS Transport

Optimized path based on topology, server & network load

Content Requests

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Our Approach

Unified approach to efficient support for content delivery using

– Caching with intelligent redirection

– Multicast

Research underway: topology-aware P2P

– Leverage client storage for high-quality near VoD

– Integrated with network-based cache and multicast

– Maintain quality – minimum (i.e., zero) user perceived interruptions while watching arbitrary length content

Service provider solution

– Scalable, high performance, network optimized solution

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