TSV P2P Efforts – From an ISP's Perspective

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Presentation Overview

- Current application traffic levels
- Unique P2P traffic impacts for ISPs
- TSV WG Efforts for P2P Efficiency
  - ALTO, DECADE, LEDBAT, PPSP
- Benefits of localization and P2P caching

Composition of Network Traffic North America Peak (Sandvine 2010)

Traffic Class	Upstream	Downstream
Real-time Entertainment	16.3%	45.7%
Web Surfing	11.0%	24.3%
P2P File Sharing	53.3%	13.2%
Real-time Communications	5.5%	N/A
Social Networking	N/A	2.4%
Gaming	N/A	2.4%

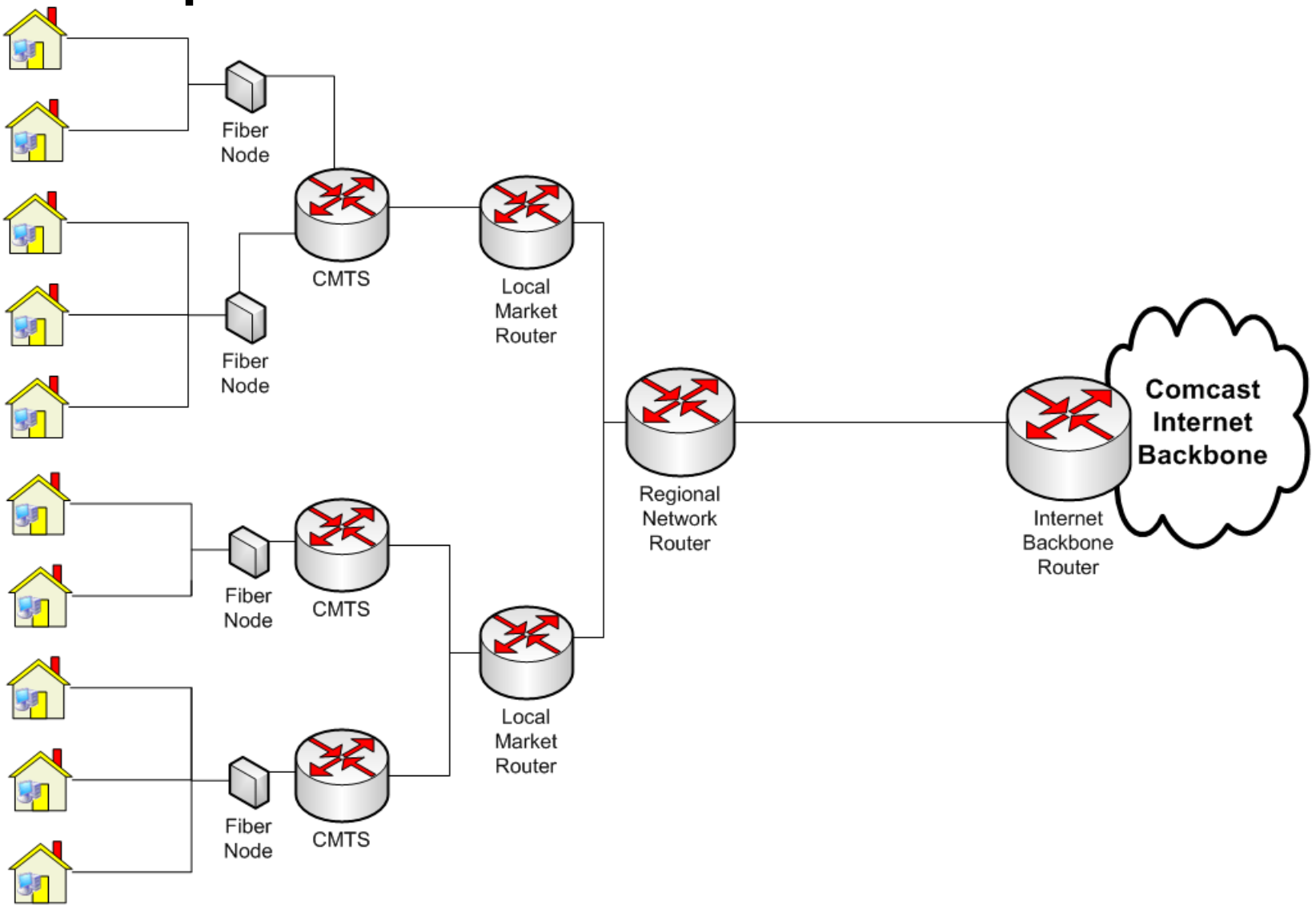
Evolution in Aggregate Traffic North America Peak (Sandvine 2011)

Traffic Class	2009	2011
Real-time Entertainment	29.5%	49.2%
Web Surfing	38.7%	16.6%
P2P File Sharing	15.1%	18.8%
All Other	16.7%	15.4%

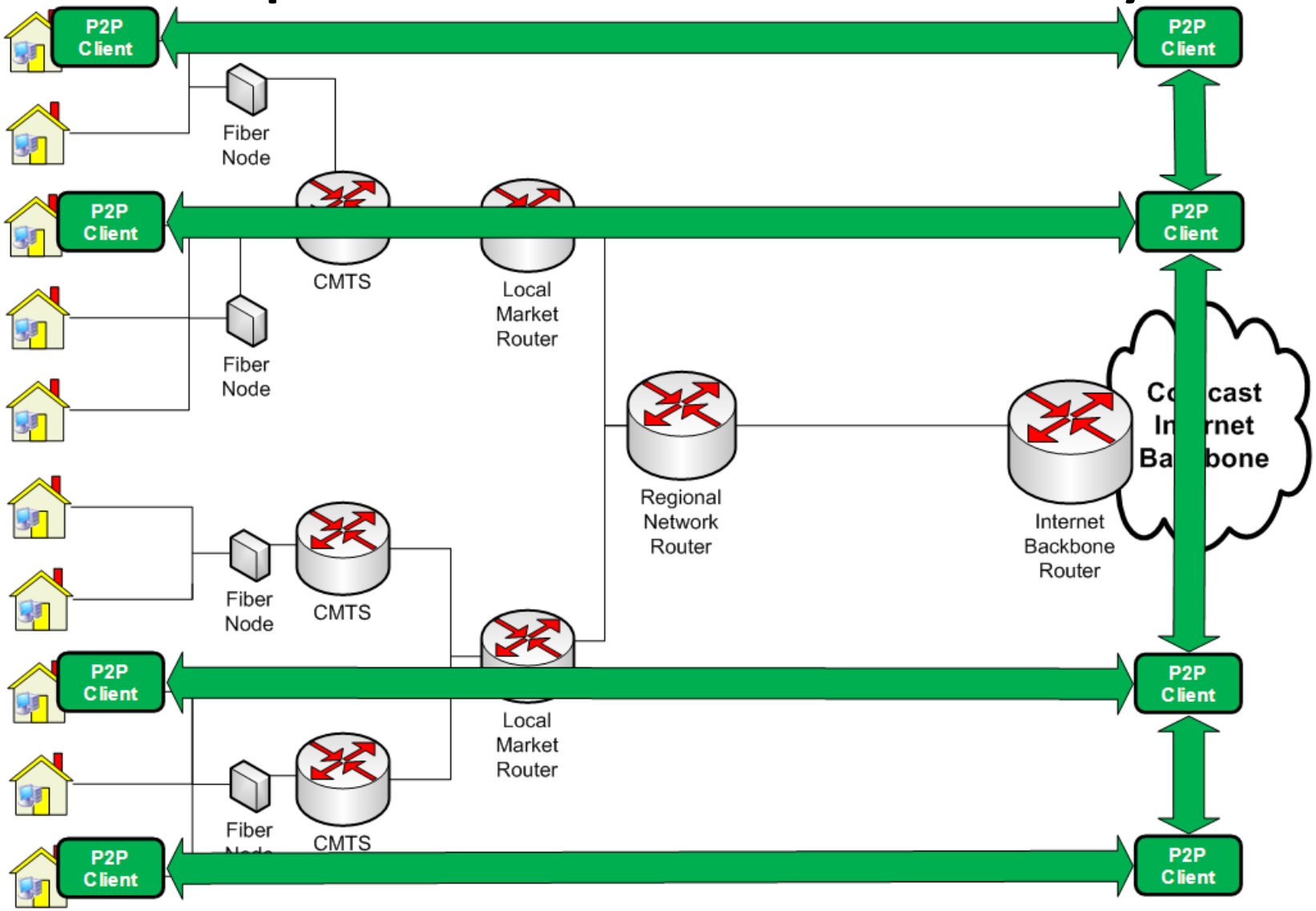
P2P Traffic Impacts on the Network

- Use of overlay network topology
  - Often does not reflect physical net topology
  - Less-than-efficient use of net resources
- Symmetric, high throughput traffic
  - Impacts plans for network capacity augmentation
  - May impact design of network equipment
  - May impact physical allocation of capacity, such as wireless/wireline frequencies

Simplified Cable Access Network



Impact of the P2P Overlay



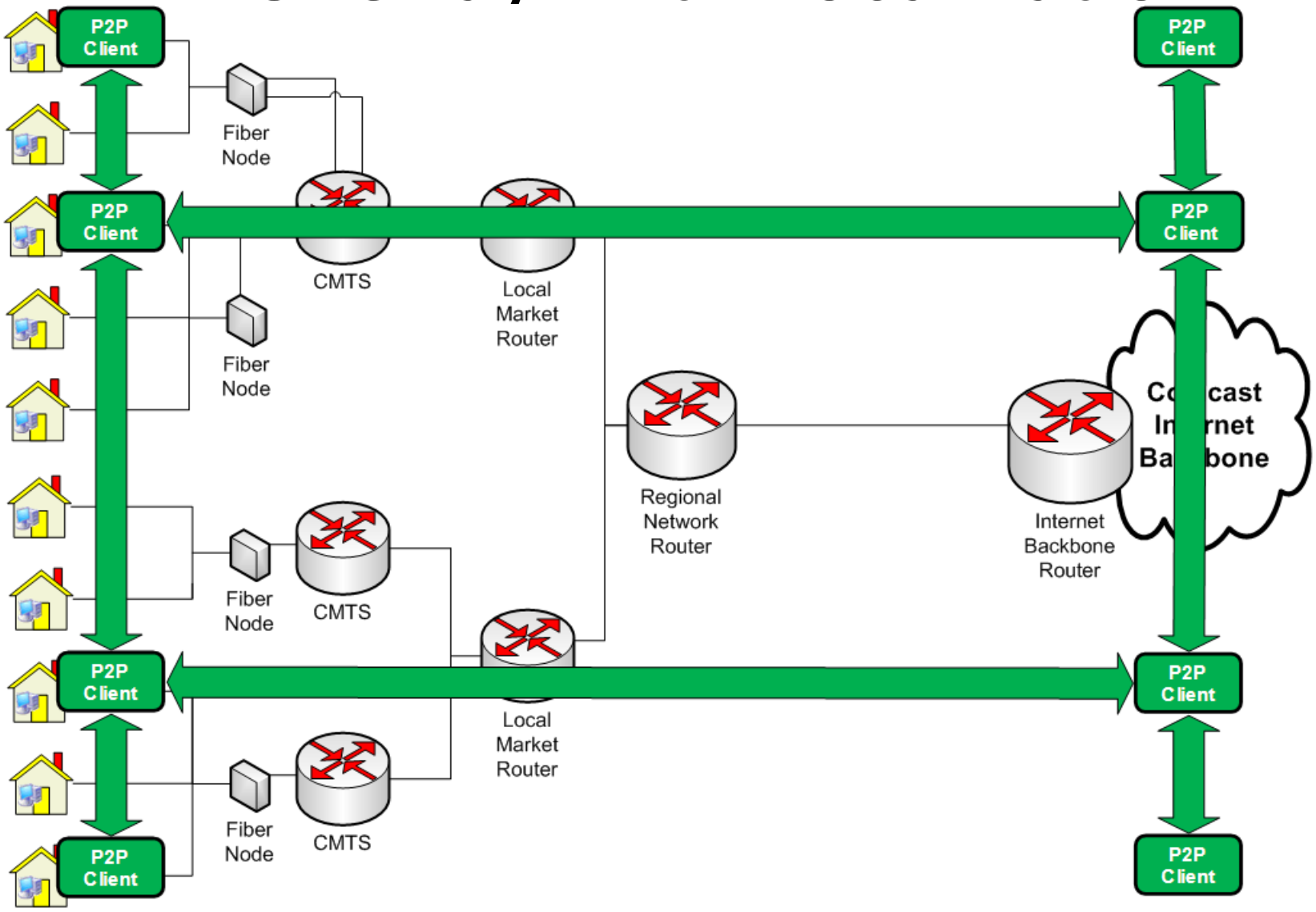
TSV WG Efforts for P2P Efficiency

- ALTO
  - Better initial peer selection for greater swarm localization
- DECADE
  - In-network storage for caching of P2P data
- LEDBAT
  - Congestion control to limit delay impact
- PPSP
  - Enable localization and caching

Benefits of Swarm Localization

- Initial peers are more likely to be located in same ISP network
- Network benefits
  - P2P traffic crosses fewer ISP links
  - ISP may reduce backbone traffic (and backbone interconnect costs)
- Enduser benefits
  - Peers may perceive lower latency, higher network reliability, and higher throughput

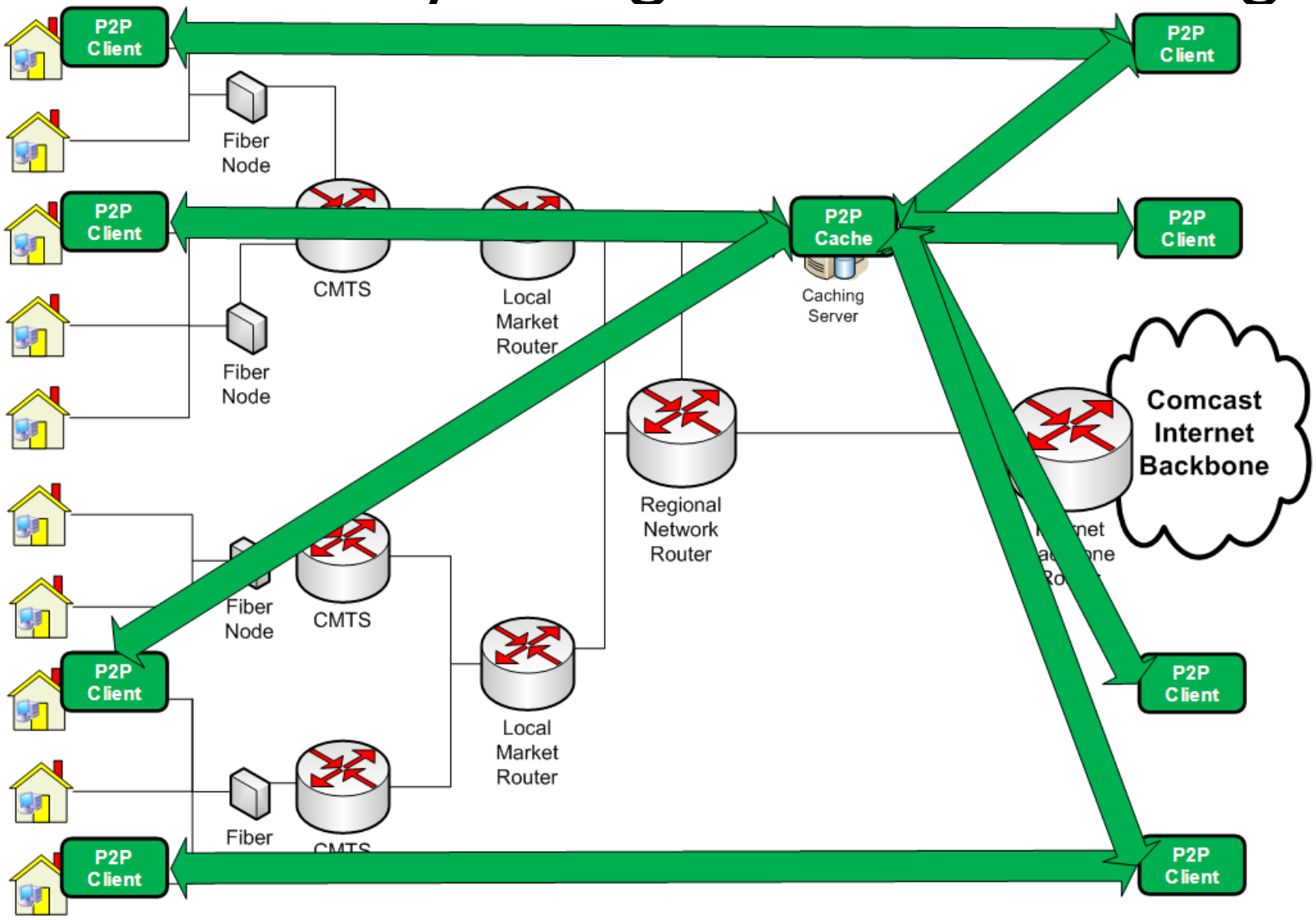
P2P Overlay With Localization



Benefits of P2P Caching

- Traffic exchange among peers is directed through network caching server
- Network benefits
  - Peers avoid both duplicate uploads and downloads of data
  - ISP may reduce access & backbone traffic
- Enduser benefits
  - Peers may perceive lower latency, higher swarm reliability, and higher throughput

P2P Overlay Using Network Caching



Economics Behind Network Caching

- Continued growth in overall Internet traffic
  - 45-60% y-o-y growth (Arbor/Cisco/MINTS)
  - Need 33% y-o-y cost reductions to keep up
- Divergence in infrastructure cost reductions
  - 15% y-o-y cost reduction in routing and transport costs
  - 38% y-o-y improvement in price / performance for commodity servers
  - 30% y-o-y improvement in storage density
- This is still a work in progress!

TSV P2P WG Efforts Represent a Promising Industry Direction

- Pro-active traffic management
  - Versus reactive traffic management
- Applications leverage network information and resources
  - Versus unilateral actions by either the network or enduser applications
- Win-win traffic optimizations
  - Versus zero-sum tradeoffs among stakeholders