Year after year, Internet traffic grows at exponential rates.

The reasons for growth have changed over the years,

e.g., P2P traffic in the early to mid 2000s,

and before that,

the spread of the world wide web in 1990s.

The current growth is fueled by on-demand video, traffic generated by smartphones and tablets, and ever-expanding range of web services.

Predictions say that exponential growth rate will continue until 2016 at least.

The growth of Internet traffic presents a challenge to Internet service providers (ISPs) carrying the traffic on their core network, content delivery networks (CDNs) delivering content via their server infrastructure and at data centers hosting the web services.

* Network: Increasing the capacity of the network to meet growing demands.
* Delivery infrastructure: cost-effective content delivery with minimal bandwidth costs.
* Website hosting platform:

Internet service providers (ISPs) do long-term capacity planning and invest to increase core network bandwidth to meet the growing traffic on their networks.

Route optimization (also called traffic engineering) also helps to increase effective capacity of network by alleviating congestion hotspots.

More recently, ISPs have started to integrate content delivery functionality such as content caching into their network.

These in-network caches serve to reduce traffic on backbone links. (Additionally, content delivery services generate revenue for ISPs.)

Content delivery networks (CDNs) have depended on hardware technology growth and falling prices of Internet bandwidth to cater to growth in Internet traffic.

Still, CDNs are facing challenges to deliver content in a cost-effective manner.

One reason for this is the commoditization of CDN technology,

which has helped increase the number of CDNs and the competition among them.

A solution to minimize bandwidth costs is to use a hybrid strategy, which opportunistically uses bandwidth from clients to supplement server bandwidth contributed by CDNs. Several CDNs have adopted a hybrid approach.

Towards the goal of providing high-performance content delivery in a cost-effective manner, this thesis studies following resource management strategies:

* Application centric re-evaluation of route optimization techniques
* Content distribution and route optimization in a network CDN
* Server bandwidth management in a hybrid CDN
* Locality and load-aware replication of dynamic content

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* Route optimization is minimally useful
* In-network caching
* Network layer techniques

A second reason is the long tail of content that are rarely reused in caches, and require provisioning larger footprints

as well as dynamic content in web applications that are non-cacheable.