



*Advantages and Disadvantages*

## **Caching in a Telecom**

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### **Executive Summary**

The Internet is a big place. Documents, images, and other files, are stored on servers in every corner of the planet. Retrieving those objects can be an expensive endeavour. For the foreseeable future, high-speed Internet access is and will be outpaced by the increasing demands that users place on the network.

As the Internet grows larger and more diverse, network administrators struggle to maintain high quality of service without increasing their bandwidth expenditures. Web caching is often used as a way to solve that problem.

Adding web caching to a network can reduce bandwidth usage by 25% to 35%, depending on the type and number of users on the network. However, due to the large volumes of Internet content requested and the ever-increasing introduction of new types of content, caching can actually expand bandwidth use, especially in telecom networks. Why? Because streaming content is becoming the norm in many regions of the world. Caching requirements are increasing almost on a monthly basis.

### **Technical Challenges with Caching**

From a pure technical perspective, web caches are in-line and do not support asynchronous routing. This means that the return data (which is where the payload exists) has to be seen by the caching server for caching to occur. With ever evolving Internet technologies and the need to deliver more and more services to end users, in-line (synchronous) solutions can cause bottle necks in the service and also make it more difficult to implement.

### ***Ever-Increasing User Appetites***

End users have an appetite for faster and faster Internet download rates, which can cause huge strains on already burdened Internet connections. Many Telecoms already service residential, business, and education customers, each with their own interest groups. The surfing patterns for residential users differ from those of education users, which differ from those of business users.

Larger and faster hard drives must be installed in web caches to service the various users as efficiently as possible. While the price of hard drives has dropped and will continue to drop, larger and more complex RAID systems are required, making drive failures more likely. The more moving parts a system has, the more likely a failure can – and will – occur.

### *Service Requirements*

In some telecoms, teams exist solely to replace bad motherboards, hard drives, RAM, and so on, because the companies have to maintain hundreds of servers. The costs of part replacements alone can range from as little as \$100,000 US to more than \$1,000,000 US per year, depending on the number of servers and moving parts.

Cooling is also a consideration, particularly because moving parts generate more heat and are therefore more likely to break down.

### *Demand for VoIP, VOD*

Another problem with caching is the introduction of VoIP-based services, which cannot be cached, because they are unique and may be encrypted, as may be the case with VOD (Video On Demand) services. There are numerous new and future technologies that will need fast delivery times that can only be delivered if the communication can flow directly into the end users' computers.

### *Caching Adds Latency*

Caching also introduces latency – anywhere from 10 ms to 180 ms, depending on the content cached. This means that if 100,000 users request different content, the cache will try to cache all the objects before delivering the content back to the end users. This can introduce delays of more than 2 seconds.

## Costs

Most basic caching servers range from \$80,000 US to more than \$120,000 US, and additional storage modules may cost \$40,000 and more. So the CAPEX costs are quite high to maximize bandwidth savings. However, our experience has shown that for every one Gbps of Internet traffic, at least one caching server is needed. So with large telecom networks of 50 Gbps or larger, about 50 caching servers may be required – making the total investment needed as high as \$500,000 US.