

Solving Streaming Challenges: from Corporate WANs to Million-User Broadband Networks

Internet media streaming is exploding, creating an enormous demand for streaming technologies that enable deployments to be scaled rapidly while maximizing quality of service and minimizing cost. This emerging market challenges vendors and customers alike to architect and deploy the strongest technologies in two key areas: content management/storage and stream serving. Network Appliance meets these challenges with two product lines—NetApp filers and NetCache™ appliances—that leverage its technical lead in content management through high-performance and reliable data movement between disks and networks. **The Network Appliance™ streaming media solution is the only one that delivers high-quality streams to large audiences.**

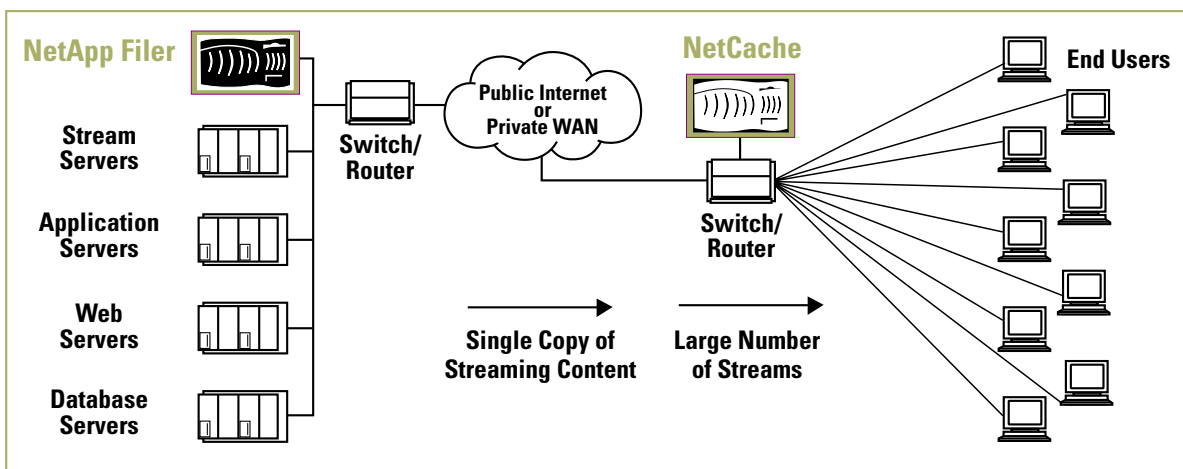
Traditional Streaming Challenges

- ◆ Low-quality media streams
- ◆ High storage costs
- ◆ Servers/storage must be offline to scale
- ◆ Stream servers/networks unable to handle large demand
- ◆ Bandwidth expensive and used inefficiently
- ◆ Multiprotocol means expensive, replicated systems

Network Appliance Solves the Streaming Challenges

- ◆ Improves stream quality
- ◆ Decreased storage costs due to consolidated storage
- ◆ Enables scaling of storage and streaming while online
- ◆ Eliminates bottlenecks, serves large audiences
- ◆ Reduces bandwidth costs and improves bandwidth usage
- ◆ Single storage/single server support multiple protocols

Diagram 1 – Network Appliance Streaming Solution



NetApp filers handle storage and content management, providing industry-leading performance, ease of use, scalability while in service, and uptime—all with a tight cap on total cost of ownership. NetCache appliances handle the toughest stream-serving problems, providing the same advantages as filers while adding the ability to share streaming bandwidth across the major Internet streaming protocols.

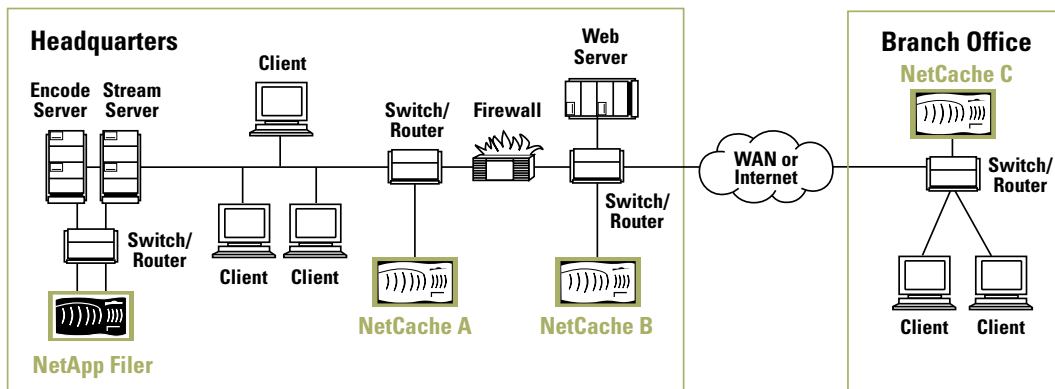
Typically installed at the network center, the NetApp filer uses standards-compliant hardware and patented software that work within existing IT infrastructures—including UNIX®, Windows®, and the Web—to provide centralized

access to data for a range of servers. NetCache appliances can be installed anywhere relative to origin streaming servers—at the streaming network center, at the edge, or both—delivering streams to end users. The NetApp solution will enable you to deploy and scale a streaming media solution quickly and cost effectively.

Corporate Communications

Corporations are recognizing the value of wide-area streaming for many purposes: private distribution of internal presentations/events/information/training, streaming content from the external corporate Web site to the public Internet, public distribution of Web site content, and improving inbound delivery of Internet content to employees. Given the need for deploying secure, cost-efficient, and timely delivery of streaming media by an already over-burdened IT department, streaming solutions that are easy to manage, cost effective, and high performance are critical for success. Possible configurations using Network Appliance filers and NetCache are shown here for various combinations of inbound/outbound and private/public content delivery.

Diagram 2 – Corporate Streaming

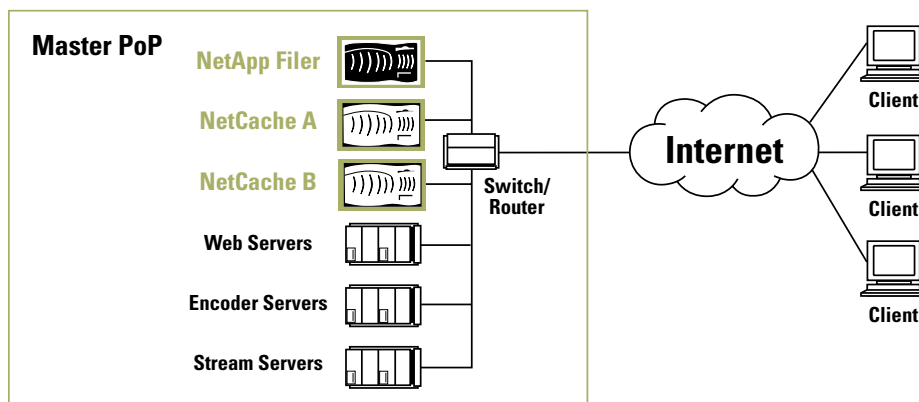


- Filer provides master streaming storage and content management
- NetCache A reduces bandwidth costs and improves response time for receiving streams from the Internet
- NetCache B improves quality of service for serving streams from the corporate Web site
- NetCache C reduces bandwidth costs and improves response time for private, internal communications

Internet Broadcasting/Streaming Web Sites

The Internet enables broadcasters who aggregate and stream content centrally to reach a fast-growing audience located anywhere on the planet. Managing capacity for large and rapidly growing audiences with frequent traffic “storms” creates unique streaming challenges. Following is an example of how NetApp enables high-reliability, cost-efficient streaming that can be scaled rapidly while continuing operation.

Diagram 3 – Concentrated Center Streaming



- Filer consolidates storage by supporting large pools of streaming servers
- NetCache enlarges the streaming audience size and ability to maintain quality of service
- Network Appliance enables content storage and streaming capacity to scale during operation

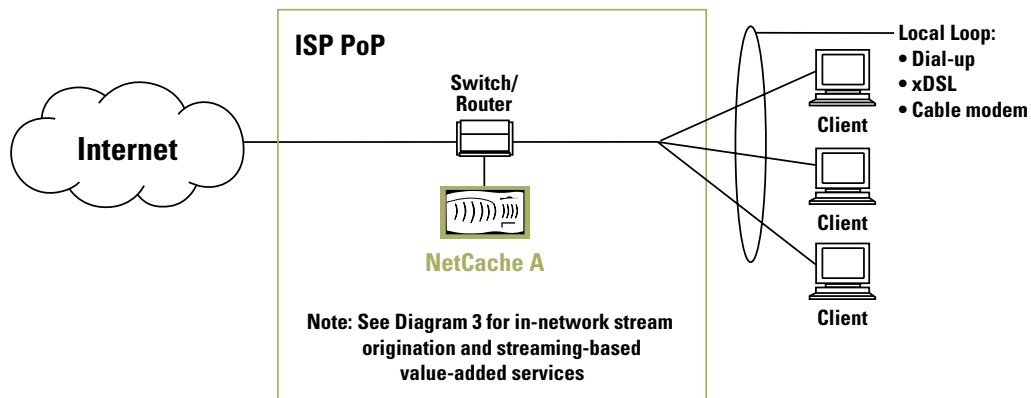
Service Providers: Industrial-Strength Streaming Networks

The Internet brings both opportunity and challenge to large-scale service operations that must deliver bit rates from dial-up to broadband, reaching audiences ranging from the thousands to the millions. These networks demand the most from stream-serving deployment, with storage needs in terabytes and streaming bandwidth needs from tens of gigabits/second to terabits/second. As successful streaming is core to business success, maintaining the highest quality of service and mind-numbing growth rates while compressing infrastructure costs is the paramount challenge. Network Appliance filers and NetCache are built to scale up streaming storage and stream-serving like no other products available in the industry. The diagrams below show how NetApp can enhance streaming in service provider networks.

Edge-Streaming Networks

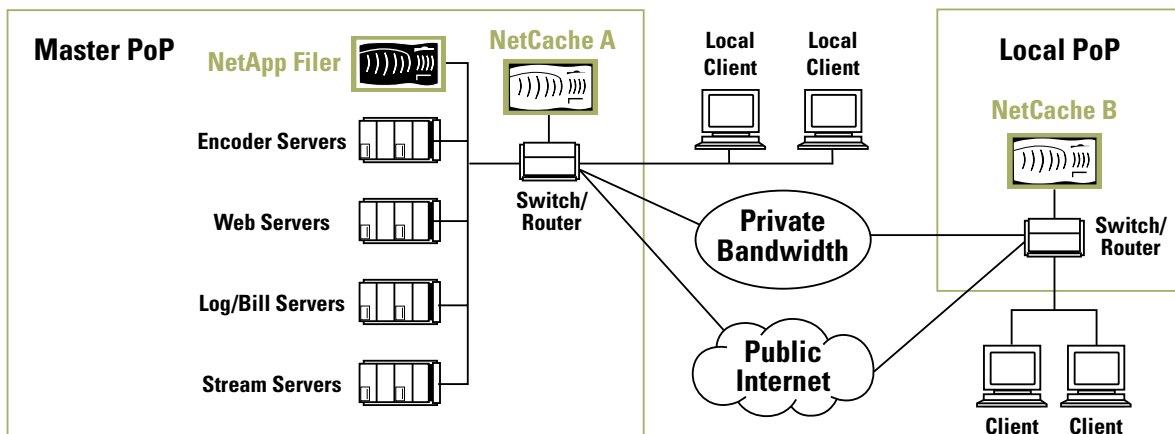
First-generation streaming servers traditionally “stream from the center” of the Internet, but high-quality streaming over broadband connections requires installing streaming servers “at the edge” near viewer populations. The long-haul network is now used to move content from the center to the edge, eliminating long-haul stream quality dependency and reducing usage of long-haul bandwidth. Edge servers can deliver content more reliably and at higher bandwidth than center-streaming systems. A critical additional step in achieving successful and profitable edge-streaming networks is to deploy high-performance and reliable storage and stream-serving appliances such as Network Appliance filers and NetCache.

Diagram 4 – Regional Acceleration and/or Edge-Streaming Networks



- NetCache A conserves bandwidth from upstream Internet while improving downstream quality of service

Diagram 5 – Stream Service Providers: Geographically Distributed Edge-Streaming Networks



- NetCache A streams to master PoP clients
- NetCache B streams to local PoP clients
- Manage content at center and edge locations reliably and cost effectively
- Scale rapidly and efficiently for profitable streaming service
- Minimize downtime headaches/maximize quality of service
- Stream direct to end users or into access service providers' regional networks

Network Appliance Streaming Advantages Summary

	NetApp Filer	NetCache
High Performance	<ul style="list-style-type: none"> • Single filer supports large number of streaming servers 	<ul style="list-style-type: none"> • Single NetCache serves streaming bandwidth over 300+ Mb/s*
High Reliability	<ul style="list-style-type: none"> • Downtime less than 15 minutes per year** • RAID4 data protection • Hot-pluggable disks/hot spare • Dual power supplies • Appliance OS and file system • Cluster support • Data recovery in seconds to minutes 	<ul style="list-style-type: none"> • Downtime less than 1 hour per year** • RAID4 data protection*** • Hot-pluggable disks/hot spare*** • Dual power supplies*** • Appliance OS and file system • Cluster support/load balancing • Lights-out/remote management
High Density	<ul style="list-style-type: none"> • High disk I/O performance per rack unit • Disk consolidation reduces space needed 	<ul style="list-style-type: none"> • Streaming density over 150Mb/s per rack unit**** • Runs cool enough to pack the rack
Multiprotocol	<ul style="list-style-type: none"> • Each filer concurrently supports servers running: <ul style="list-style-type: none"> ▶ Windows NT® ▶ UNIX ▶ HTTP 	<ul style="list-style-type: none"> • Supports major Internet streaming formats
Low Cost	<ul style="list-style-type: none"> Enables major cost reduction through: <ul style="list-style-type: none"> • Storage consolidation (one filer supports multiple servers) • High data availability without need for mirroring/doubling disks 	<ul style="list-style-type: none"> • Compact OS means compact and less expensive hardware • High performance means disk consolidation and lower overall disk costs • High reliability = low support costs
Scale While Streaming	<ul style="list-style-type: none"> • Add streaming servers/Web servers • Publish new content • Add filers by plugging into network—no downtime • 15 minute install 	<ul style="list-style-type: none"> • Add disk storage/expand file system per NetCache • Add more NetCache appliances to the network • Enables content push and pull models while streaming • 15 minute install
Security	<ul style="list-style-type: none"> • Appliance OS and file system limit hacker knowledge • SnapRestore™ allows quick isolation of corrupt data and rapid return to known good state of data 	<ul style="list-style-type: none"> • Appliance OS and file system limit hacker knowledge • Compact appliance OS reduces intruder entry points • Hardened TCP stack adds security

* Broadcast mode (e.g, WM stream-splitting), 100Kb/s streams. Performance varies per NetCache model and configuration parameters

** Includes both scheduled downtime and unscheduled downtime

*** Model C1100 does not include this feature

**** Stream-splitting density on C1100, varies per NetCache model and storage requirements

Network Appliance streaming solutions offer valuable flexibility, profitability, and manageability to anyone requiring streaming deployment: enterprises, ISPs, stream service providers, Internet broadcasters, and streaming Web site operators. With a NetApp solution, you can keep your data and service intact while adding storage and servers. You can share data among heterogeneous servers, and even change from NT to UNIX—all with a minimum disruption of service. By optimizing the ability of your network to deliver high-quality streaming media, ensuring high availability and unlimited scalability, and lowering total cost of ownership, a NetApp solution can play a major role in the success of your streaming media business. For more information on Network Appliance, visit www.netapp.com.