

# NETWORK OPTIMIZATION WITH MEDIA FLOW CONTROLLER

Deploying Media Flow Controller as a  
Transparent Cache to Improve Network  
Efficiency and Reduce Costs

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## Introduction

As the demand for rich media content such as Internet videos and the like continues to grow, the resulting traffic growth is straining service provider networks. Not only does this content consume an incredible amount of pure capacity, but the way it is delivered today is very inefficient. Most content is served from off-net data centers, and individual requests for the same content have to traverse the network singularly. For popular content, the same video clip may be transported over the network thousands of times.

When deployed as a transparent cache, Media Flow Controller addresses this challenge by caching and delivering popular content from a cache device within a service provider's network, thereby reducing off-net the bandwidth and subsequently driving down costs.

Media Flow Controller can function in transparent mode, so that for neither the origin server or the end-user need be aware of the presence of the cache. This enables a network operator to optimize the network for rich media delivery without any changes to the Domain Name System (DNS) infrastructure.

## Scope

This document describes how Media Flow Controller can be deployed as a transparent cache and the benefits that will result from such a scenario. We introduce the design considerations and factors that affect performance when Media Flow Controller is used to optimize the network through transparent caching.

## Design Considerations

The transparent proxy application described herein requires Media Flow Controller version 2.0.2 or later. Media Flow Controller can be running on any VXA Series Media Flow Engine or a suitable x86 server.

## Description and Deployment Scenario

A transparent proxy is defined as a cache/proxy that intercepts requests from users transparently, and serves content from origin/cache without modifying the requests/responses. This is in contrast to a reverse proxy that receives requests destined to certain origin servers and serves content from origin/cache with or without modifying the requests/responses. With a reverse proxy, both the origin and user can be aware of the presence of an in-between cache/proxy; in transparent proxy, the origin/user is not aware of the presence of a cache/proxy. The table below summarizes the differences between reverse and transparent proxy.

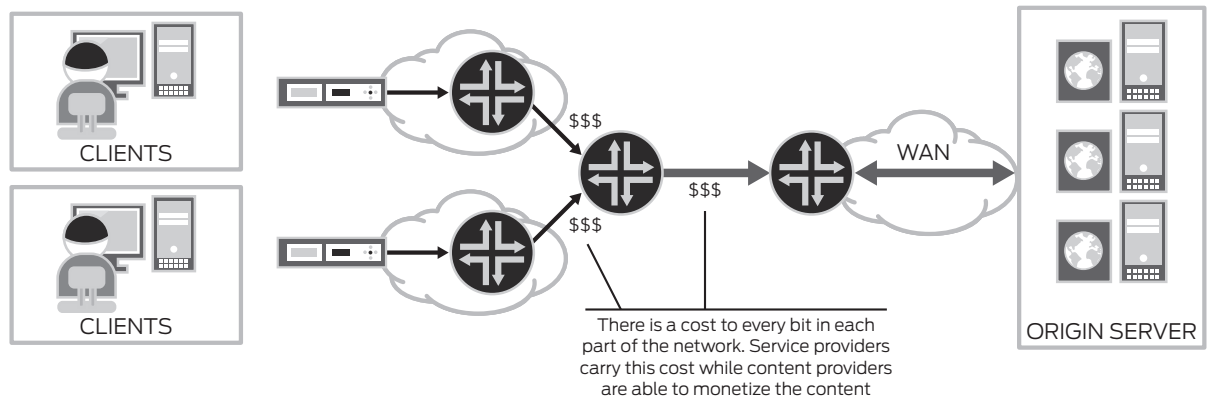
	TRANSPARENT	REVERSE
Client sees	Origin's IP Address	Media Flow's IP address
Server sees	Client's IP Address	Media Flow's IP address
Requires contract with content owner	No	Usually
Typical use case	ISP network optimization; traffic reduction	CDN; origin cache; campus edge
Modification to DNS	No	Yes

In general, Media Flow Controller would be deployed as a transparent cache when you have one or more of the following requirements:

- Do not want the users or origin servers to know about the presence of a proxy/cache
- Interested in caching at the edge as a means of reducing transit traffic costs
- Would like to avoid having clients configure browsers to point to a proxy
- Are not able or do not want to change the DNS configuration
- Able to implement policy-based routing at the edge
- Do not own the content being cached
- Want the cache to be deployed transparently
- Would like control over the caching infrastructure to potentially enable new services in the future

## Who Can Benefit from Transparent Caching

Service providers looking for ways to reduce transit costs for over-the-top traffic are among those who can benefit most from Media Flow Controller's transparent proxy functionality. For service providers—especially those who pay high peering costs—the cost of transporting traffic from off net sources can be significant. By caching and delivering content closer to the edge, service providers can reduce these costs, or possibly extend the lifetime of a saturated network link. The diagram below illustrates service provider pain points.



**Figure 1: Network operators are looking to reduce the costs associated with transporting content across their networks.**

All types of service providers can potentially benefit from transparent caching, but it can be particularly compelling for those who pay significant fees for bandwidth or peering costs. Also, network operators who see a lot of popular content originating off net—operators in developing countries or rural service providers, for example—can see benefits from caching popular content within their network. Deploying Media Flow Controller as a transparent proxy can also be valuable for network operators who are facing a costly upgrade to a particular link (e.g., a transoceanic submarine cable or microwave link to a remote area). Caching popular content at the near end can improve the efficiency of the saturated link, enabling an extended lifetime. Transparent caching also improves the end users' Internet experience, as the downloads will be faster.

## Deployment Considerations

The real benefit of transparent proxy caching is seen when service providers cache the popular content. Thus, transparent cache deployments require a means by which to selectively forward media traffic to the Media Flow Controller. This is commonly achieved by leveraging a router configured with filter-based forwarding (FBF) or policy-based routing (PBR). An example would be to route port 80 (HTTP) traffic to the Media Flow Controller (or to a server load balancer front-ending multiple Media Flow Controllers). Another approach would be to use deep inspection or dynamic application awareness capabilities to more selectively forward requests for specific websites. The figure below illustrates a high-level call flow.

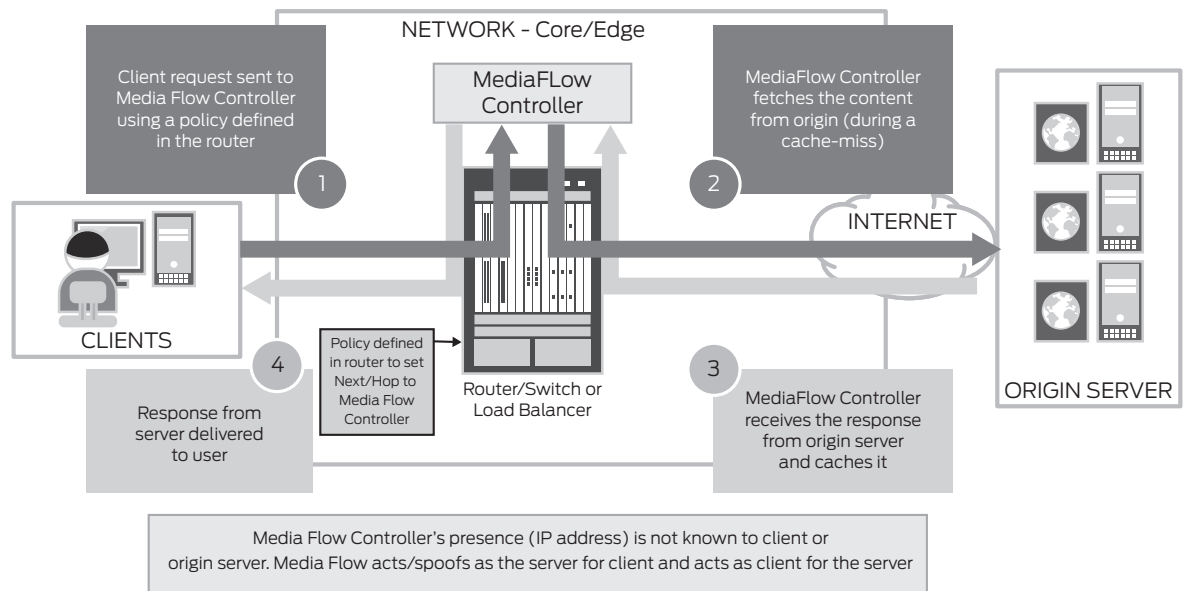


Figure 2: Call flow for a transparent proxy deployment.

## Performance

Deployment in a service provider network serving hundreds or thousands of subscribers can mean that external factors such as traffic patterns can be unpredictable. Content access patterns are more random, tending to cause the cache hit ratios to be lower than in reverse proxy configurations. All of these factors have an impact on performance, and as such, the actual performance that would be seen in a given customer network is calculated by profiling customer data. Performance can also be optimized by ensuring caching policies and traffic steering is implemented in a way best-suited to each particular network's requirements.

Regardless of the deployment scenario, Juniper Networks Media Flow Solution delivers significantly higher throughput than other solutions—typically by a factor of at least three to six times.

## The Benefits and ROI of Transparent Caching

The fundamental benefit of using Media Flow Controller as a transparent proxy is the efficiency gains and associated cost reductions that come with reducing the number of times content must be delivered from off-net sources.

Calculating the benefits of such a deployment in terms of bandwidth saved is a function of cache hit ratio, which is itself a function of the content access pattern of users. In networks where a small percentage of "hot content" accounts for a disproportionate amount of bandwidth, the benefits of caching are more substantial than in networks with an unclear hierarchy between hot and cold content.

A cache hit ratio of 20%, for example, would reduce the traffic behind the Media Flow Controller by 20%, which is a powerful reduction that can extend the life of existing links. (Based on experience, 20% is a conservative and very achievable ratio.) As traffic grows, if the proportion of cacheable traffic remains the same or also grows, the value only increases over time as the total amount of bandwidth saved increases. In the scenarios modeled for customers, Juniper has estimated immediate and significant cost savings in the first year of deployment, and positive ROI by year two, with significant increases by year three and beyond.

Juniper Networks has performed extensive ROI analysis that can quantify the actual costs and benefits of Media Flow Controller. Costs can vary based on many factors, including whether the operator owns or leases capacity, the cost of bandwidth, the type of network equipment, and a number of other considerations. For this reason, Juniper has developed an ROI tool that can be customized to align with specific network characteristics. If you are interested in calculating the ROI for your specific deployment, please contact your Juniper account representative.

In addition to the immediate cost reduction benefits, a solution based on Juniper Media Flow provides another significant advantage: the same platform can be used as the foundation for new services in the future. Service providers interested in offering CDN services, for example, could use Media Flow as the caching component within those offerings as well. It is this flexibility and future-proofing—in addition to the scale and performance advantages discussed above—that sets Media Flow apart.

## Summary

Transparent caching is an important capability that can enable network service providers seeking to reduce the costs of transporting the growing amount of over-the-top traffic. When configured to operate as a transparent proxy, Media Flow Controller can intelligently cache and deliver popular content, reducing traffic on the network. This significantly improves the performance and efficiency of the network, reducing costs and enabling more profitable operation.

## About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at [www.juniper.net](http://www.juniper.net).

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