F5 White Paper

Green IT: The Three "R"s

Applying the concepts of environmental-friendly policies to the data center through application delivery to green up your organization.

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Introduction

In general, efforts to "go green" have focused solely on reducing the impact of hardware on the environment through a reduction in power consumption and heat generation. The former consumes less resources and the latter requires less cooling, which decreases the power consumed by those devices. These efforts have dual green benefits. They lessen the impact on the environment (green as in the Earth) and, as luck would have it, improve the corporate bottom line (green as in cash).

But there is another way to "go green" with application delivery; one that doesn't just rely on products being "green" themselves. Application delivery solutions can also improve the overall efficiency of your infrastructure, improving their "green" value to include not only their own reduction in power consumption, but the improvements gained from more efficient servers.

The Three "R"s

A movement to encourage consumers to lessen their impact on the environment began in the late 80s and included a widespread education campaign encompassing what environmentalists called the Three Rs: reduce, reuse, and recycle. Through reducing our waste, reusing some items, and recycling others we were taught that we could improve the environment by decreasing the volume of waste we generated.

Interestingly enough, this concept also applies to efforts to go green in technology and, in particular, to the benefits provided by Application Delivery Controllers.

Reduce

Reducing the number of servers in the data center results in a reduction in power consumption and the cooling required as a result of less heat generation. Consolidation has long been a familiar theme in IT, whether it was sparked by a desire to reduce operating and capital expenditures in a time of tightening IT budgets or a desire to simplify maintenance and management.

The challenge lies in reducing the number of servers without negatively impacting performance and capacity; a challenge that on the surface appears difficult to meet.

An Application Delivery Controller (ADC) addresses this challenge by offloading functionality that consumes excessive resources on servers. As resources on the servers are freed up, they can be redirected toward serving applications, which often results in an increase in overall server capacity.

Experts estimate that offloading SSL functionality to an ADC can reduce the resources required on a web or application server by up to 30 percent. By moving SSL termination and management onto an ADC, the now-available resources—memory and processing power—can be used by the web or application server to serve more users. This increases the capacity of your existing servers, and obviates the need to purchase additional hardware. The increase can also result in the ability to reduce the number of servers needed, as each becomes more efficient when not required to manage SSL.

SSL offloading results in less power required for your applications. On top of this, SSL operations are generally hardware-accelerated in ADCs, meaning not only will you reduce the resources required to serve your applications, you'll improve their performance as well.

Reuse

The second "R" is reuse. In the consumer world this often translates into reusing containers made of materials that are not biodegradable or using alternatives to items that require natural resources to produce, such as choosing to reuse cloth bags instead of using a new paper or plastic bag at the grocery store.

In technological terms, the equivalent would be to reuse existing resources to alleviate the consumption of power required by creating a particular resource. For instance, when delivering web applications you would reuse TCP connections whenever possible to reduce the processing required on the server. Because servers today draw variable power based on load, reusing existing TCP connections means reduced load on the server. This is because the connections do not need to be opened and closed as often, which results in lower power consumption.

ADCs are also capable of providing TCP multiplexing. TCP multiplexing can reduce the burden on web and application servers by reusing existing TCP connections, which translates into fewer resources. TCP multiplexing is possible in ADCs that are full proxies, which means they maintain two separate TCP/IP stacks: one for clients and one for servers. In this way, the ADC can manage the connections separately and the relationship between the browser and server-side connections does not need to be one-to-one. The ADC can mediate between clients and servers and reuse the TCP/IP connections on the server side while maintaining a high number of client-side connections. This increases the efficiency of the servers, and also increases server capacity. In turn, like SSL offload, this can result in a reduction in the number of servers required to serve an application.

# Servers	Watts per server	Total watts	Cost per hour	Cost per year	
10	366	3660	$0.39	$3416.40	Simple load balancing
7	366	2562	$0.27	$2365.20	Application delivery
			Average Savings	**$1051.20**	

Table 1: *Example savings in power and cost throughout a year from TCP multiplexing based on a cost of 1.0656 per kilowatt hour.*

TCP multiplexing and the subsequent reduction in number of necessary servers not only has a positive impact on the environment, but on your IT budget as well.

Recycle

Our third "R," recycle, is not nearly as obvious as the first two when put into technological terms. In the consumer world, recycling is all about the process of taking used items and turning them into other, useful items. In the world of application delivery, recycling takes the form of caching.

By caching static content—and dynamic content that is generated by dynamic mechanisms—an ADC with the appropriate application acceleration technology recycles content. By serving up content from its own cache, the ADC keeps requests from being sent to servers. In doing so, it reduces the resources needed from web and application servers and increases their capacity, again resulting in less power consumed, less heat generated, and a greener (environmental and financial) effect. You might also be able to reduce the number of servers you need or, at a minimum, hold off on purchasing additional servers that would otherwise be needed to increase capacity, but would also increase your power consumption.

If the application acceleration technology has the capability to intelligently make use of the browser's cache, then even more savings can be seen through the reduction in data transferred over the network. Rather than sending an entire object, the ADC can indicate that the request content is already in the cache using a much smaller message. By reducing the amount of data that needs to be transferred to the client, every piece of infrastructure (routers, servers, switches) between the ADC and the client do less work, use fewer resources, and thus consume less power and generate less heat.

Conclusion

If you're truly interested in going green—whether environmentally, financially, or simply because you feel it's the right thing to do—consider the benefits of an Application Delivery Controller. Going green isn't just about devices and their power consumption; it's about how much more efficient and green it can also make the rest of your infrastructure.

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