

CDNetworks Cloud DNS ROI Analysis

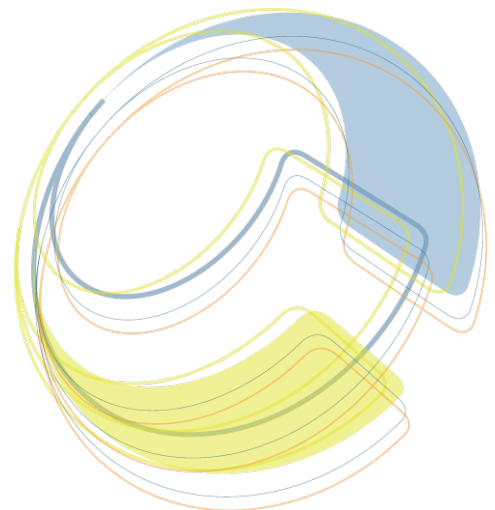


TABLE OF CONTENTS

Executive Summary	1
Cloud DNS Key Benefits	2
DNS Service Requirements	2
Enterprise Costs	3
Local, Continental Network	4
Truly Global Network	7
Outage Costs	10
Conclusion	11

Executive Summary

Cloud DNS is a managed cloud-based authoritative DNS service offered by CDNetworks. It is built on a globally distributed platform across 20+ strategic locations - from the US to Australia. It uses intelligent routing to improve performance. Instead of randomly routing DNS requests to any available location, it uses IP Anycast to route DNS queries to the closest topological location. This ensures consistently high performance for your users every single time, irrespective of their location. The distributed platform provides a layer of security by being resilient to DDoS attacks. CDNetworks Cloud DNS can intelligently distribute traffic across servers, ensuring that it can easily scale to meet your growing traffic demands.



Cloud DNS Key Benefits

- Availability: The DNS system is always on with no outages.
- Performance: Users are directed to closest topological server. DNS changes are instantly propagated across the entire network.
- Scalability: Well-designed network that supports virtually unlimited domains and traffic.
- Security: A widely distributed architecture protects against DDoS attacks.
- Reliability: DNS queries are always correctly resolved, using the latest data.
- Advanced control and reporting: Web based portal for easy DNS administration and detailed near real-time advanced reporting.

This study compares the Total Cost of Ownership (TCO) of an in-house solution to CDNetworks' Cloud DNS solution. Our study compares capital and operational expenses of both a small and a large network. A small network is used by enterprises that cater to a local audience, largely in the same continent. When an enterprise is truly global with millions of users around the world, it needs to maintain a large network that is similar to the one maintained by CDNetworks. The TCO is computed over a period of three years. The study shows that it is significantly more cost-effective to use CDNetworks' Cloud DNS service as opposed to an enterprise-owned in-house solution. In the small network scenario, the cost difference is 170%; in the case of a global network, the cost difference is 636% (Table 1).

Table 1: 3 year cumulative TCO comparison between CDNetworks Cloud DNS Service and an enterprise-owned, in-house system

	Enterprise-owned in-house solution 3-Year Cumulative TCO	CDNetworks Cloud DNS 3-Year Cumulative TCO	Cost Difference
Small, local Network	\$409,400	\$238,140	170%
Global Network	\$1,516,000	\$238,140	636%

DNS Service Requirements

In order to set up a DNS system, an enterprise needs to estimate three items: the expected number of DNS queries from users, the total number of domains served and the number of resource records that need to be maintained. A medium size enterprise typically gets around 5 million queries a month which is based at a rate that is slightly more than a query per second. Similarly, 50 domains and 1000 records are often enough for most organizations. It is assumed that the number in each category increases by 5% from one year to another. Table 2 shows the assumptions made for each of these categories in each of the three years.



Table 2: Expected service requirements of an enterprise

Service Requirements	Year 1	Year 2	Year 3
Queries / Month	5,000,000	5,250,000	5, 512,500
Domains	50	53	55
Resource Records	1000	1050	1102

Enterprise Costs

Running an in-house enterprise authoritative DNS system requires both capital and operational expenditures. Capital expenses include the cost of DNS server appliance. Operational expenses are incurred continually for maintaining and running the system. The DNS appliances need to be hosted in a datacenter which requires paying for rackspace, electricity, power and cooling systems. Many datacenters often charge extra for remote access and administration. In addition, it is necessary to pay for the bandwidth which is incurred from DNS queries. The largest cost is incurred in maintaining the network and the appliances. The network has to be continually monitored for security threats, detecting anomalies and understanding traffic patterns. This in turn is necessary for network provisioning and capacity planning. Further, evolution of the DNS protocol, such as emergence of DNSSEC, requires that software be updated appropriately. Table 3 shows the operational expenses of an in-house DNS system.

Table 3: The different expenses incurred in maintaining an in-house system

Operational Expense	Description
Colocation	Housing servers in datacenters require renting of space, paying for electricity and HVAC to power and cool the servers respectively. Some datacenters even charge for remote access.
Bandwidth	Network bandwidth must be bought to accept DNS queries.
Network & Server Maintenance	Network provisioning and monitoring. Network surveillance and security is required to react to DDoS attacks. Understanding the existing infrastructure as well as evaluating current traffic conditions for capacity planning, provisioning and maintenance requires specialized skills. Hardware and software upgrades to all systems. Software upgrades include not only patches but also incorporating newer features and support newer protocols. In case of a failure, fault isolation and recovery mechanisms have to be put in place.

When an enterprise uses Cloud DNS service, it will still need to incur an internal IT cost of administering the service. We refer to it as the DNS Administration cost. However, the cost is only about changing DNS data if necessary and does not involve any kind of active monitoring and maintenance.



For each of the categories above, we make the following assumptions on unit costs (Table 3). We assume that collocation costs include power, cooling and network access costs. We assume a fixed cost for bandwidth. It is important to remember that most datacenters charge a high overage fee which can be easily incurred when there is an unexpected surge of traffic. During a DDoS attack, this could incur a significantly more expense than our assumptions in this paper.

Table 4: The unit cost for each of the cost categories under operational expense

Cost category	Unit cost
DSN Server Appliance	\$15,000 ¹
Colocation	\$150 / server / month
Bandwidth	\$50 / Mbps / month
Network & Server Maintenance	Annual salary: \$130,000 ²
DNS Administration	\$115 / hour ³

¹ Infoblox 1550 Series

² The rate between Booz Allen Hamilton and U.S. General Services Administration for Systems Engineer is \$180/hr.

³ The rate between Booz Allen Hamilton and U.S. General Services Administration for Senior Network Engineer is \$115/hr.

Local, Continental Network

We first consider the case of a small network. We assume that this is used mostly to serve users from a single large country (such as the United States) or a small continent (such as Europe). As such, we also refer to it as a local, continental network. To serve users adequately from a continental geographic span requires at least three datacenters. Each location must have at least two redundant servers for failover. We assume that each server appliance requires 1U of rackspace. When computing bandwidth requirements, we assume that the traffic will be roughly equally distributed across all the datacenters. We also make allowance for a marginal spike in traffic. We do not account for additional traffic in case of massive DDoS attack which could generate traffic in excess of 1 Gbps. We assume that we require a dedicated staff in the first year to setup the entire network and the servers. The following years require just 50% of the time. Table 5 shows the number of units in each cost category and the assumptions behind them.



Table 5: Infrastructure requirement for a local network

Cost category	Number	Assumptions
DNS Server Appliance	6	3 datacenters; 2 at each location for redundancy.
Colocation	6	1U rackspace for each appliance.
Bandwidth	3 datacenters *5 Mbps = 15 Mbps	Based on number of queries, the traffic is approximately 8 Mbps.
Network & Server Maintenance	1 full time employee	100% time in 1 st year. 50% of time in next 2 years.
DNS Administration	1 hour / month	Depends on DNS data, and not the size of the network. Changes fairly infrequently.

Table 6 below shows the Total Cost for both an enterprise-operated in-house DNS system and a Cloud DNS service. The expenses have been separated into capital, operational and service expenditures. We make a simplifying assumption that collocation and bandwidth costs remain constant during the three year period. Network and server maintenance cost decreases as the system becomes more stable. The description of each expense category, the unit cost and the total number of units required have already been described before.



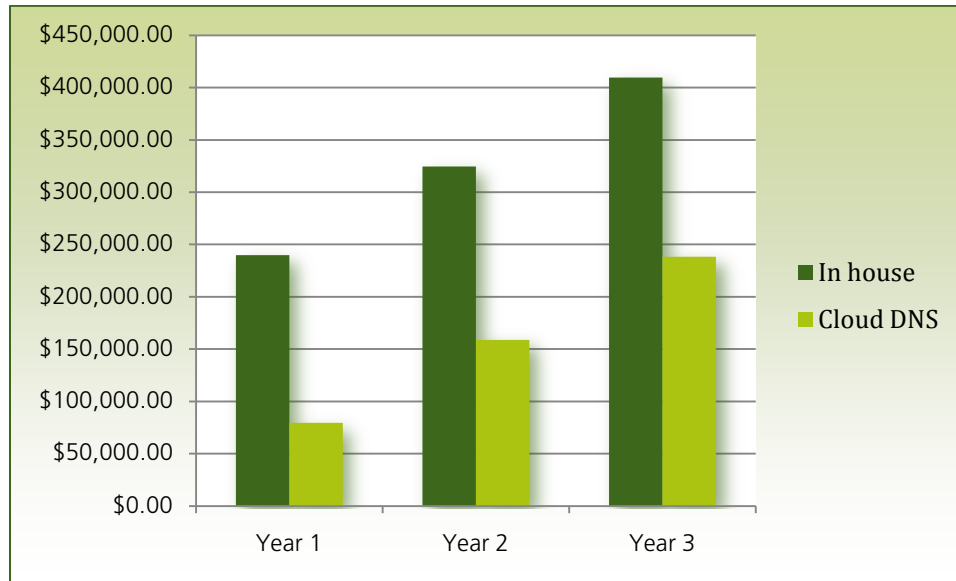
Table 6: Cost comparison between in-house system and Cloud DNS over a 3 year period

Total Expenditures	Year 1		Year 2		Year 3	
	In House	Cloud DNS	In House	Cloud DNS	In House	Cloud DNS
Capital Expenses						
DNS Server Appliances	\$90,000	-	-	-	-	-
Operational Expenses						
Colocation	\$10,800	-	\$10,800	-	\$10,800	-
Bandwidth	\$9,000	-	\$9,000	-	\$9,000	-
Network & Server Maintenance	\$130,000	-	\$65,000	-	\$65,000	-
Outsourcing Expenses						
Service Expenses	-	\$78,000	-	\$78,000	-	\$78,000
DNS Administration	-	\$1,380	-	\$1,380	-	\$1,380
Annual Total Cost	\$239,800	\$79,380	\$84,800	\$79,380	\$84,800	\$79,380
Cumulative Total Cost	\$239,800	\$79,380	\$324,600	\$158,760	\$409,400	\$238,140

As can be seen from the above, using CDNetworks Cloud DNS is significantly more cost-effective than an enterprise owned and operated system. The cumulative expense of Cloud DNS over a three-year period is cheaper than the expense incurred by an in-house system in one year. The following chart (Figure 1) compares the cumulative TCO between the two options over the three-year period. The cumulative TCO for an in-house system is almost 170% more than that of Cloud DNS over this period.



Figure 1: TCO comparison of a local network between in-house system and Cloud DNS over a 3 year period



Truly Global Network

We next consider the case of a truly global network, at the scale of CDNetworks. The typical enterprise is one with a user base that is geographically distributed across the world – from Sydney to Sao Paulo. Such a global network requires twenty datacenters with two redundant servers in each location. We make the same assumptions on rackspace, network and traffic. It is important to note that datacenter and network costs for some places like South America and Africa is significantly higher than that in the United States and Europe. However, for simplification, we use the same low rates for all datacenters. Owing to the larger size of the infrastructure, we assume the need to have two dedicated staff in the first year. We make the same assumption, as above, that it requires 50% of their time in subsequent years. Table 7 provides all the details.



Table 7: Infrastructure requirement for a large network

Cost category	Number	Assumptions
DNS Server Appliance	40	20 datacenters; 2 at each location for redundancy.
Colocation	40	1U rackspace for each appliance.
Bandwidth	20 datacenters *5 Mbps = 100 Mbps	Based on number of queries, the traffic is approximately 8 Mbps.
Network & Server Maintenance	2 full time employees	100% time in 1 st year. Subsequently requires 75% of time.
DNS Administration	1 hour / month	Depends on DNS data, and not the size of the network. Changes fairly infrequently.

Table 8 below shows the Total Cost for both an enterprise-operated in-house DNS system and a Cloud DNS service for a large global network. As in the case of a small network, the expenses have been separated into capital, operational and service expenditures. We make the same simplifying assumption that collocation and bandwidth costs remain constant during the three year period.



Table 8: Cost comparison between in-house system and Cloud DNS over a 3 year period for a global network

Total Expenditures	Year 1		Year 2		Year 3	
	In House	Cloud DNS	In House	Cloud DNS	In House	Cloud DNS
Capital Expenses						
DNS Server Appliances	\$90,000	-	-	-	-	-
Operational Expenses						
Colocation	\$10,800	-	\$10,800	-	\$10,800	-
Bandwidth	\$9,000	-	\$9,000	-	\$9,000	-
Network & Server Maintenance	\$130,000	-	\$65,000	-	\$65,000	-
Outsourcing Expenses						
Service Expenses	-	\$78,000	-	\$78,000	-	\$78,000
DNS Administration	-	\$1,380	-	\$1,380	-	\$1,380
Annual Total Cost	\$239,800	\$79,380	\$84,800	\$79,380	\$84,800	\$79,380
Cumulative Total Cost	\$239,800	\$79,380	\$324,600	\$158,760	\$409,400	\$238,140

Just as in the case for a local network, it can be seen that CDNetworks Cloud DNS is a significantly more cost-effective alternative to an enterprise owned and operated system for a global network. The cumulative TCO of an in-house system is almost 636% more than that of Cloud DNS. The following chart (Figure 2) compares the cumulative TCO between the two options over the three-year period.

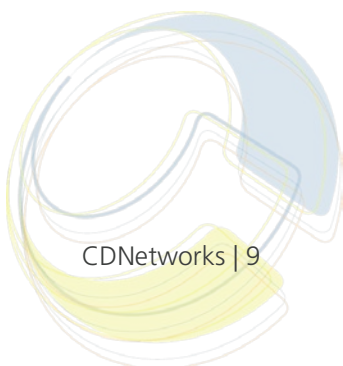
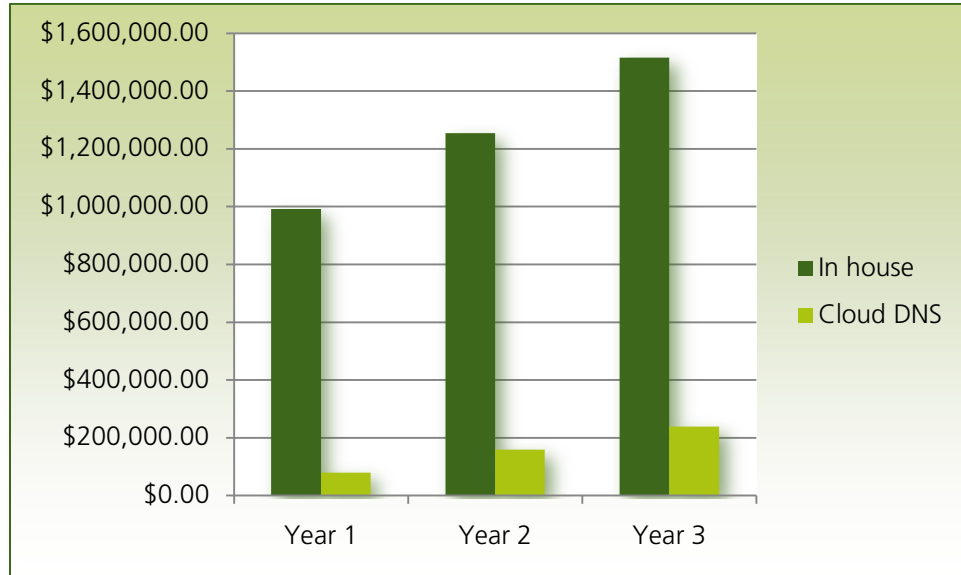


Figure 2: TCO comparison of a global network between an in-house system and Cloud DNS over a 3 year period



Outage Costs

The most significant expense to an enterprise is the cost of an outage. This could be due to two reasons.

- Incorrect configuration and setup: DNS is a highly complex system which requires hard-to-find skilled personnel. Setting up the infrastructure requires careful planning and execution and a single oversight could bring down the entire infrastructure. Further, it's easy to misconfigure a DNS zone file which could also lead to costly outages.
- DDoS attacks: DNS is one of the most vulnerable Internet infrastructure software. It has a long history of being attacked. If the system is not capable of handling a DDoS attack, it will cause a DNS outage.

The impact of an outage depends upon the duration of the outage as well as the amount of business conducted through the Website. If we assume a single outage of 4 hours, then a business that generates annual revenue of \$25 million will lose approximately \$12,000. That is almost twice as much as the average monthly cost of CDNetworks Cloud DNS service which is \$6615. Figure 3 makes similar comparisons for businesses that generate annual revenues of \$100 million and \$500 million.



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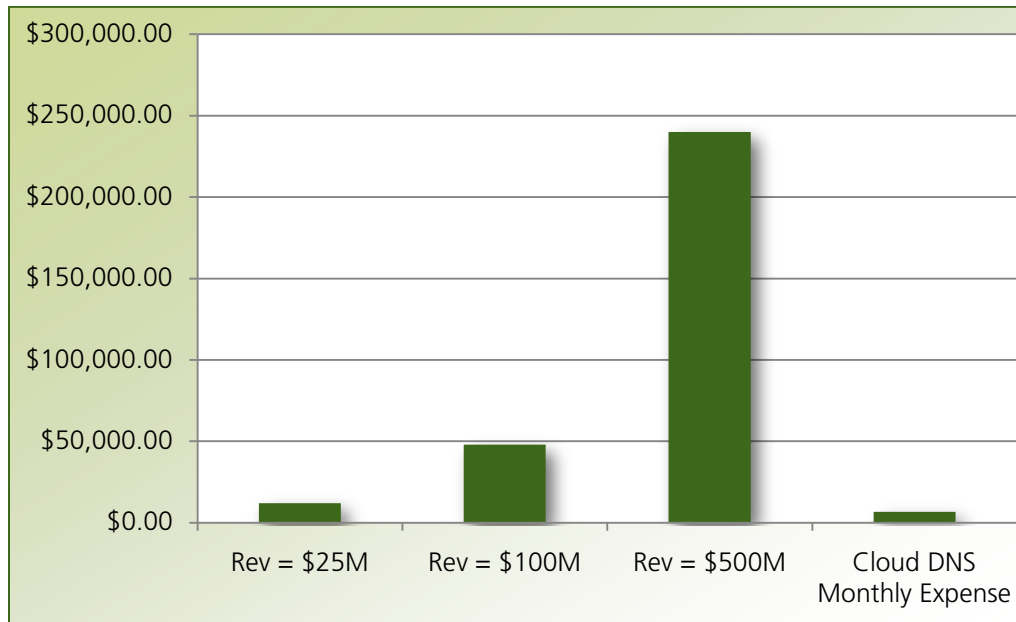
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Figure 3: Cost of outage as compared to monthly cost for Cloud DNS



Conclusion

DNS is a critical piece of Web infrastructure. An enterprise has two choices of implementing its DNS infrastructure:

- Build and maintain an in-house system.
- Use CDNetworks Cloud DNS service.

If an enterprise chooses to build and maintain its own infrastructure, it faces significant upfront capital investments as well as continuous, on-going operational expenses. The enterprise must identify datacenter locations that best suit their needs and buy expensive, redundant DNS appliances. These servers must be setup and configured perfectly to ensure that users can reach the Website. The enterprise also incurs ongoing costs of maintaining these appliances, renting datacenter space, paying for network bandwidth, maintaining the network itself and doing difficult fault and performance management.

Alternatively, an enterprise could use CDNetworks Cloud DNS service. This allows the enterprise to take advantage of a global secure and reliable network that offers superior performance and can scale on-demand. The service is always available, ensuring that there is no downtime experienced by the Website.

As we have shown in this paper, using the Cloud DNS service is significantly more cost-effective. Cloud DNS allows an enterprise to offload the complex task of DNS infrastructure to CDNetworks, while it can concentrate on its core business, and get massively scalable, high performing and secure DNS system without large upfront capital costs or technological investment.

