



Infoblox Authoritative IPAM for DNS and DHCP

Automated Cloud and On-Premises Network Discovery with 3-Year TCO Evaluation

EXECUTIVE SUMMARY

In recent years, the growth in both cloud and decentralized computing has translated to enormous flexibility for companies large and small. With that flexibility, however, has come a dramatic increase in complexity with respect to IP address management. Not only do traditional IPAM challenges remain but gathering information from disparate locations - and especially cloud services - can involve extensive and ongoing manual labor.

Infoblox IPAM and DHCP solves the traditional challenges of manual Windows-based and other freeware IPAM. Importantly, the solution has been updated and extended to provide IP address discovery for cloud-services and for distributed on-premises (hereafter on-prem) network sites.

Infoblox commissioned Tolly to evaluate the benefits of its cloud-based, automated IP address discovery and its on-prem network discovery. Cloud services included Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). Additionally, Tolly revisited and reconfirmed the TCO benefits of Infoblox IPAM and DHCP automation compared to Microsoft's manual network update processes.

The Infoblox solution demonstrated dramatic time and effort savings with respect to cloud-based IP address management, automated discovery of on-prem network devices and illustrated significant time and cost savings with respect to traditional, manual processes associated with Microsoft Windows Server 2019.

THE BOTTOM LINE

Infoblox Authoritative IPAM provides:

- 1 Automated cloud IP address discovery providing unified visibility and management across Azure, AWS, GCP and other public clouds
- 2 Automatic discovery of local and geographically dispersed on-prem network devices
- 3 Significant total cost of ownership (TCO) benefits vs "free" Microsoft DNS, DHCP & network management tools

Automated Cloud IP Address Discovery Consolidated, Multi-Cloud IP Asset Details

	Actions	Mgmt Platform	VM Name	VM ID	IP Address	VM Avail Z...	Networks
Amazon Web Services		Amazon	GM-01	i-02dfbb4008d...	172.23.2.25	us-west-1c	3
		Amazon	api-proxy	i-0b6e496112e...	172.23.1.177	us-west-1c	1
Microsoft Azure		Azure	ua-az-member	cf36fdba-b9fa-...	192.168.1.132		3
		Azure	ua-az-member	cf36fdba-b9fa-...	20.47.120.76		3
		Azure	ua-az-member	cf36fdba-b9fa-...	192.168.1.4		3
Google Cloud Platform		GCP	ua-gcp-member	238558781920...	192.168.3.2	us-west1-b	3
		GCP	ua-gcp-member	238558781920...	35.212.142.35	us-west1-b	3
		GCP	ua-gcp-member	238558781920...	192.168.3.130	us-west1-b	3

Infoblox uses the native API from each cloud service to gather all asset details into a single control plane.

Labor/Cost Example for Manual Approach

At ~1 min. Per IP address, 1,000 addresses would take 16.5 hours, approx. \$1,300 in labor per refresh.

Note: Cloud environment refresh interval is configurable and can be run automatically.

Source: Tolly, April 2022

Figure 1

Test Results

Multi-cloud Network Discovery

Cloud computing offers manifold benefits to customers large and small. It is here and its growth will likely continue unabated.

Figure 1 illustrates how Infoblox can automatically traverse multiple cloud services and present all IP addresses from all services on a single display.

Without a solution like Infoblox, IP address management across the major cloud services is a completely manual function. While the process varies somewhat across cloud services, invariably the process to document existing IP addresses requires that the network administrator traverse multiple screens to collect relevant address and device information for each cloud instance.

In short, manually gathering and documenting IP address information is a chore. For any but the smallest environments, it is completely impractical.

To illustrate the effort required of the manual approach, Tolly engineers timed the process of gathering data for a single IP address from three services. Results include 30 seconds to take the data and transcribe it into a spreadsheet or database.

Results as follows: AWS - 1 minute and 40 seconds, Azure - 1 minute and 10 seconds, GCP - 1 minute. (The results varied primarily because of differences in the number screens that needed to be displayed in order to get the data required.)

While a minute might not seem like a long time, this effort needs to be expended repeatedly - for every IP address and for every refresh. Figure 2 provides an overview of how onerous the effort is. The manual address discovery needs to be repeated for each device of each virtual

private cloud (VPC) of each data center of each cloud.

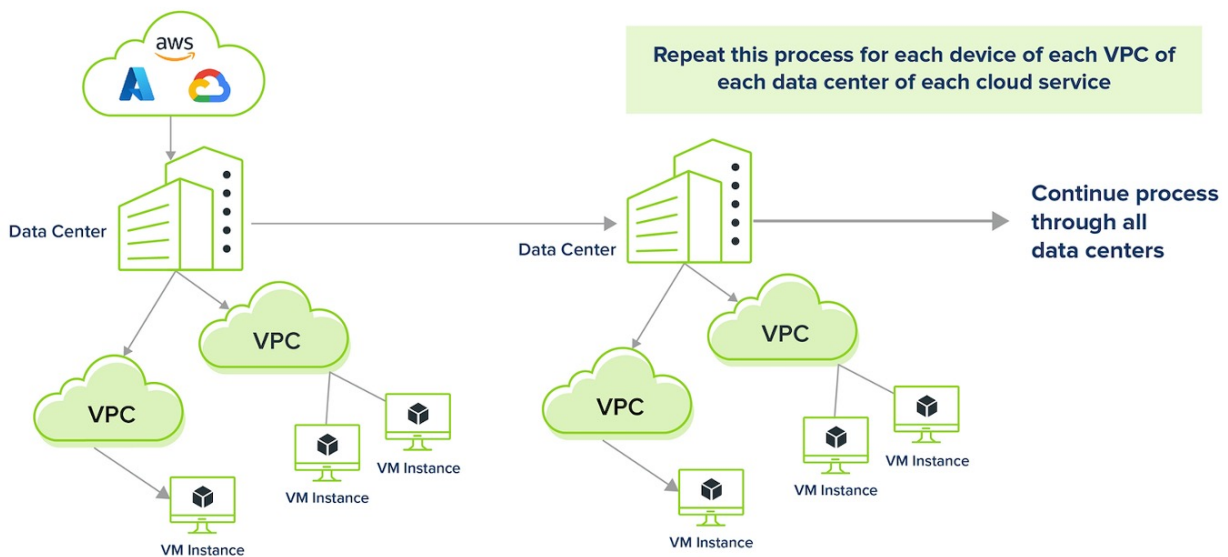
If one's network contains 1,000 addresses, the effort is, at a minimum, 1,000 minutes (or over 16.5 hours) both initially and for every refresh - which could be needed daily. Impractical, if not impossible.

Infoblox uses the native application programming interface (API) of each of the cloud services to locate and store all IP address information shown in Figure 1 (and more).

Initial setup of discovery tasks takes less than one hour for multiple cloud services. During that process, the refresh (re-run) interval is set. After that, the cloud IP address database stays current automatically with no effort required.

The same automated discovery capability exists for private clouds such as Nutanix, OpenStack, VMware, etc. See Figure 3.

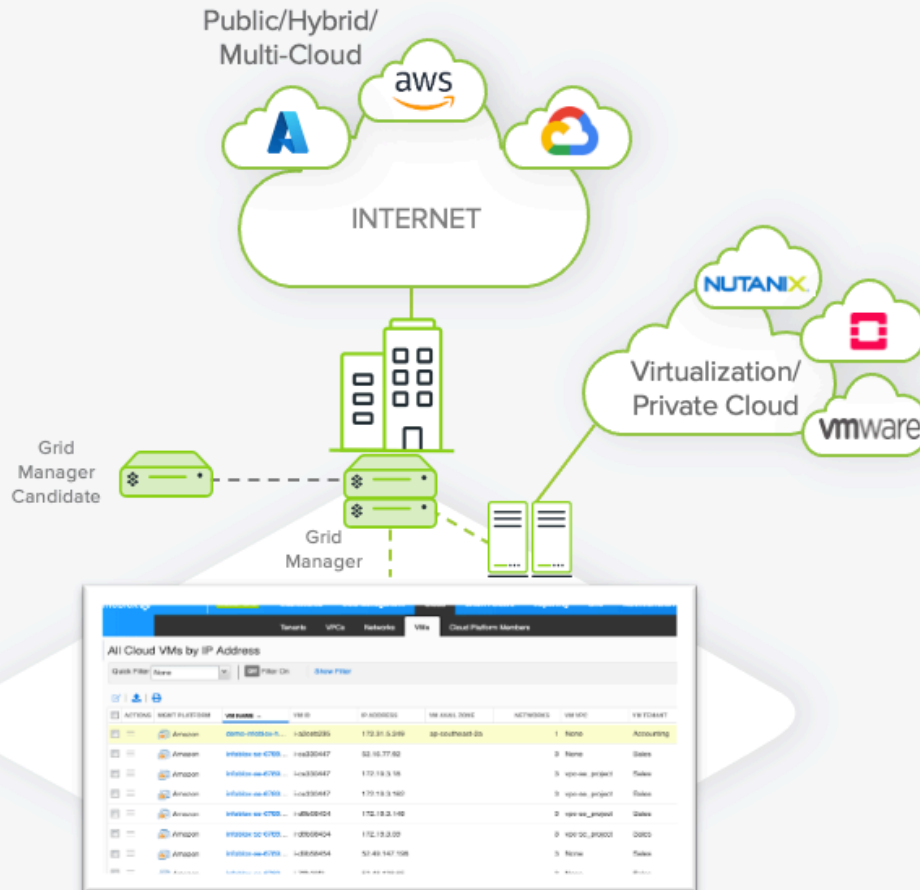
Overview of Manual Process for Identifying Cloud IP Resources



Note: Keystrokes and screen flows will vary by cloud service but will follow this basic workflow. Source: Tolly, April 2022

Figure 2

Multi-Cloud Architecture on a Single Control Plane



Source: Tolly, April 2022

Figure 3

Understanding Infoblox Authoritative IPAM

Infoblox on-prem and cloud network discovery tools automatically capture device and user metadata connected to the network and sync, remediate and report that data into an accurate, centralized authoritative IPAM database that delivers a single source-of-truth for everything on the network. Authoritative IPAM metadata can then be trusted and used for network security, automation, orchestration, operations and workflow management.

For more information, go to:

DNS, DHCP and IPAM (DDI): <https://www.infoblox.com/products/ddi/>

IPAM for Microsoft: <https://www.infoblox.com/products/ipam-for-microsoft/>

Network Insight: <https://www.infoblox.com/products/network-insight/>

Cloud Network Automation: <https://www.infoblox.com/products/cloud-network-automation/>



On-Prem Network Discovery

is likely to exceed even the estimated "1 minute per station" shown above.

effort is required on the part of the network admin.

Discovering device information is equally important for on-prem network locations comprised, typically, of headquarters, regional and various remote/branch offices.

For Infoblox users, that process is as simple as connecting the Infoblox solution to the network and directing it to discover devices.

The power of Network Insight is best shown visually. Figures 4 and 5 (below) show two of the information tabs available. Figure 4 (upper left) shows basic information including IPAM utilization, first and last discovered dates, if the IP is managed, and other data presented in the "IPAM" tab.

Companies with 1,000 or more IP addresses likely already employ some manual method of tracking IP addresses. That may involve using a freeware or commercial network scanning tool and then transferring that information to a spreadsheet or database for storage. Such scanners likely provide only basic information about each station. As with cloud environments, data must be refreshed manually, and the time required

Infoblox uses routing tables to traverse the connected networks and provide not only IP addresses but also important details such as device type, vendor, model and version for network infrastructure devices. The time required for the initial discovery will depend upon how many networks and devices exist to be discovered. According to Infoblox, 24-hours is typically sufficient time for the initial scan. Once the automated process is initiated no further

Figure 5 (partial, bottom right) shows detailed metadata about network infrastructure revealed in the "Devices" tab including device name, type, model, vendor, device version and other important attributes.

Network Insight - Auto Discovery Example GUI Screens

The screenshot displays the Infoblox Network Insight interface. The top navigation bar includes 'Dashboards', 'Data Management', 'Cloud', 'Smart Folders', 'Reporting', 'Grid', and 'Administration'. The 'Data Management' section is active, with sub-tabs for 'IPAM', 'VLANs', 'Super Host', 'Devices', 'Network Users', 'DHCP', 'DNS', and 'File Distribution'. The 'IPAM' tab is selected, showing a list of networks. A callout box labeled 'IP Information' points to the first network entry: 10.1.0.0/16, which has 1.0% utilization and is managed by 'None'. Below this, the 'Devices' tab is shown, displaying a table of discovered devices. A callout box labeled 'Device Information' points to the first device entry: IP Address 198.18.200.1, Name 'c05-n3k-discov...', Device Type 'Switch-Router', Model 'N3kC3048TP1GE', Vendor 'Cisco', Device Version '7.0(3)I7(1)', and Chassis S/N 'FOC1837R0T7'.

Network	Comment	IPAM Utilization	First Discovered	Last Discovered	Discovery Engine	Managed
10.1.0.0/16		1.0%			None	Yes
10.60.16.0/24		1.1%	2020-11-13 16:...	2022-04-14 09:...	Network Insight	No

IP Address	Name	Device Type	Model	Vendor	Device Version	Chassis S/N
198.18.200.1	c05-n3k-discov...	Switch-Router	N3kC3048TP1GE	Cisco	7.0(3)I7(1)	FOC1837R0T7
198.18.200.22	c3750x	Switch	catalyst37xxStack	Cisco	12.2(55)SE3	FDO1415POUU
198.18.200.101	cologrid	vNIOS	IB-V1415	Infoblox	8.5.4	4207F9D91706E3D04
198.18.200.102	cologrid	vNIOS	IB-V1415	Infoblox	8.5.2	420774E51B7895B42
198.18.200.100	cologrid	vNIOS	ND-V805	Infoblox	8.5.4	4207E7F3573E29F1D
198.18.200.21	cisco-p4r3-34	Switch-Router	catalyst3560v248ps	Cisco	12.2(55)SE12	FDO1534X2ZB
198.18.200.15	dell_switch	Switch	PowerConnect 6248	Dell	3.3.3.3	CN0GP9312829818V
198.18.200.16	Extreme	Switch-Router	summitX460-24t	Extreme	12.5.4.5	1347N-41186

Source: Tolly, April 2022

Figures 4 & 5



Reporting

Infoblox dashboards and reports provide summary, forensic, historical, current, predictive analytics, visualization and visibility into device, IP, attached host and subnet inventories. Visibility and access to rich network metadata not only keeps network administrators current about the network and devices but is also useful in troubleshooting and security investigation.

Microsoft Discovery

Infoblox will automatically discover your Microsoft DNS records, physical devices and virtual machines. The GUI displays rich contextual IP attributes, data and mapping to enhance visibility and simplify administration. Infoblox tools empower a system administrator to easily find, see and manage Microsoft AD DNS records and devices.

TCO vs. Manual Revisited

Tolly previously issued a report (Tolly report #218113) that calculated TCO labor savings

when using Infoblox vs. Windows Server 2012 R2. In 2022, this work was checked against Windows Server 2019 and Tolly determined that the manual methods had not changed substantively. Thus, relevant TCO information from that prior report is included herein.


Background

For organizations using Microsoft DNS and DHCP, the Infoblox automated platform provides an easy-to-deploy IPAM solution that does not require modification of the Microsoft infrastructure. The value of implementing the Infoblox solution is tied to the enhanced visibility, manageability and task automation for dealing with IP addresses and making common changes such as assigning VLANs or activating/deactivating a switch port.

Tolly engineers tested and validated Infoblox's support for enterprise-grade platform for business-critical DDI solutions. To attempt to compare Microsoft capabilities with Infoblox, IT teams would need significantly more investment to

Infoblox, Inc.

Infoblox Authoritative IPAM for DNS and DHCP



Automated IPAM, Cloud Automation and Network Discovery & TCO

Tested April 2022

cluster servers and maintain an automated patch management system – and yet still would not achieve the visibility and availability metrics. In addition, Microsoft deployments would need additional management tools and/or extensive manual processes to achieve the enhanced network discovery and automated network change capabilities built into Infoblox.

Test Results

Tolly engineers benchmarked seven varied tasks to illustrate the differences between manual change management and Infoblox

Total Cost of Ownership (TCO) Analysis: Select DNS, DHCP and Networking Tasks Infoblox IPAM vs. Manual Configuration

Number of IP Addresses	10,000	25,000	50,000	100,000
Estimated Staff Hours/Year (without Infoblox IPAM)	730.00	1,825.00	3,650.00	7,300.00
Estimated Staff Hours/Year (with Infoblox IPAM)	225.00	562.50	1,125.00	2,250.00
3-Year TCO Savings from Labor	\$119,685	\$299,213	\$598,425	\$1,196,850
Percentage of Savings From Labor with Infoblox IPAM	69%			

Note: 1. Labor cost is \$79/hour.
2. Calculation is based on evaluation and assumptions to execute specific network support tasks with certain frequencies for certain percentage of the number of IP addresses in the network. See the Test Methodology section for details.

Source: Tolly, April 2022

Table 1



Common IPAM, Discovery and Configuration Tasks Infoblox IPAM vs. Manual Configuration

		Time to Finish a Task (Seconds)		Percentage of Savings for Each Task
		Manual	Automated with Infoblox	
Add a New Host	Add a Static IP Host	190	75	61%
	Add a DHCP Reservation	135	85	37%
	Install a Group of Printers	240	35	85%
Add a New Subnet		240	80	67%
Switch Port Configuration		75	55	27%
Troubleshooting (Resolve Conflicts)		110	20	82%
Network Resource Management		60 seconds for each switch	15 seconds for all switches	>75%

Note: In a real world environment, the manual method of may require collaboration in several departments. For the "best case," the wait time and collaboration process time was not included here for the manual method.

Source: Tolly, April 2022

Table 2

DDI. Table 1 summarizes the results when extrapolated to environments of up to 100,000 IP addresses. Significant labor savings are identified at every level of organization. TCO does not include any licensing costs for Infoblox.

Add A New Host

Tolly engineers documented the addition of hosts both via static IP and dynamic IP addresses and verified the process for adding a group of seven printers. Where these tasks ranged from 35 seconds to a maximum of 85 seconds using Infoblox IPAM, the task times for the manual process ranged from 135 to 240 seconds. When installing the group of printers, the manual process required almost 6x the amount of

time needed for Infoblox IPAM. For all results, see Figure 1 for the increased time required and Table 2 for the time required for each task and the percentage of time reduction using Infoblox IPAM.

Add A New Subnet

This task required both adding a new subnet to the network as well as reserving certain addresses that would not be used by the DHCP service. Using the manual process, that required 240 seconds to complete. With Infoblox IPAM, the task was finished in 80 seconds including assisting with interfacing to the upstream switch/router to reserve addresses.

Switch Port Configuration

This test involved accessing a LAN switch and modifying certain port parameters. Again, this was accomplished more rapidly with the Infoblox solution. Perhaps more importantly, Infoblox provides a GUI-based workflow to lead the user through the task. Anyone using the native switch command line interface (CLI) would likely require training before even attempting this task manually.

Troubleshooting (Resolve Address Conflict)

It is not uncommon for a single IP address to come into use by a second network device. Infoblox IPAM offers a variety of automatic and on-demand methods to query relevant parts of the environment to determine such usage. In the current test, the second address was discovered in 20 seconds.

In a manual approach, the user must scan network resources to attempt to find the faulty address. In the current test, that required 110 seconds but might be even longer in a complex network environment.

Network Resource Management (Switch Port Availability)

It is important for network managers to understand which ports on their switches are available for new users. As Infoblox IPAM monitors and records the ports where it sees a particular address, this information is always available and always up to date in the Infoblox solution. In the current test, it required less than 15 seconds to call up this information for all the switches in the network.

With the manual approach, an administrator would need to log in to each switch and see which ports were currently



active. In a “best case” scenario this would require about 60 seconds to view. This does not include the time required to record this information. Furthermore, the information might be inaccurate as a port that shows as “free” may simply be connected to a user device that is currently powered down.

TCO Test Methodology & Detailed Results

In the test scenarios, Tolly engineers calculated the time it takes to perform the common maintenance and administration tasks involved with IP address management as well as the manual CLI steps needed for enhanced discovery and control for the free DNS and DHCP management tools bundled with Microsoft Server 2019. Then the same test was completed using the Infoblox platform.

Finally, the time measurements obtained comparing the tests were used to calculate the time and cost savings for each task. Then assumptions were made to determine the estimated total cost of ownership over a 3-year period.

Infoblox IPAM integrates the DHCP server, DNS server, IP address management functions into one solution. It also provides functions such as discovering devices on the network, executing commands to over 55 different vendors’ switches/routers remotely, etc. This test used Cisco switches/routers but other vendor equipment should deliver comparable time savings.

Without the Infoblox IPAM solution, administrators may need to use multiple vendor-specific solutions such as the Microsoft DHCP server, Microsoft DNS server, Cisco command lines to finish one task.

In a real-world environment, the manual method may require collaboration in several departments. For the “best case,” the wait time and collaboration process time was not included here for the manual method.

Add a New Host

Add a Static Address Host

When new devices (e.g. servers) are needed, the network team need to determine the available static IP addresses, add the DNS records, reserve the switch ports by bringing the ports down and change the port description.

Automated: Add a host record in Infoblox IPAM, use the workflow to bring down a switch port and change the description of the port.

Manual: Add a host record using the Microsoft DNS Manager tool in the Microsoft Management Console (MMC). Then use the command line (CLI) to bring down a switch port and change the port description.

Add a DHCP Reservation

When the new devices (e.g. printers, VoIP phones, etc.) prefer using DHCP to get the IP addresses and the network team decide to give them specific ones, the network team need to reserve the IP addresses in the DHCP server with the new devices’ MAC addresses, bring down the switch ports and change the description of the ports.

Automated: Add a fixed address in Infoblox IPAM, use the workflow to bring down a switch port and change the description of the port.

Manual: Add one reservation in the

Microsoft DHCP server. Then use the CLI to bring down a switch port and change the description of the port.

Install a Group of Printers

The network team may decide to give the new devices (e.g. printers) a specific DHCP range which exclude any other devices to use the range. Engineers used a group of seven printers as an example for this test.

Automated: Use the DHCP template with fingerprints in Infoblox IPAM to create the DHCP range. Infoblox has built-in fingerprints for different vendors’ devices (e.g. HP printers). It not only blocks other devices from joining the range, but also push the HP printers to the range instead of letting them join other available DHCP ranges.

Manual: Create 7 DHCP reservations with the printers’ MAC addresses in the Microsoft DHCP server.

Add a New Subnet

When the current subnets do not provide enough IP addresses, administrators need to add a new subnet to the network and enable the DHCP service for that subnet. Administrators may have a certain pattern to add a new subnet. For example, they may want the first certain number of addresses to be reserved or excluded for certain usage.

Automated: Infoblox supports Network Template which can add the DHCP scope, make a certain number of IP addresses as Fixed Addresses (reserve the IP addresses),

Test Bed Information

Component	Version
Infoblox virtual appliances TE-1415 and ND-1405	NIOS 8.5.4
Microsoft Windows Server 2019	

Source: Tolly, April 2022

Table 3



and add an Exclusion Range in the DHCP scope. The GUI-based workflow also enables the IP helper addresses on the specified upstream router.

Manual: Add a DHCP scope, with reservations and exclusions in the Microsoft DHCP server. Enable IP helper using CLI of the switch.

Switch Port Configuration

In this scenario, administrators need to change a single or group of ports admin status, VLAN assignment and port description.

Automated: With the CLI credentials configured, Infoblox can manage the switches on the network and provide a GUI-based workflow for switch port management.

Manual: Use the CLI to do the task on a switch.

Troubleshooting (Resolve Conflicts)

Conflicts on the network are unavoidable for a multitude of reasons. Infoblox Authoritative IPAM can eliminate the administrators ability to cause a conflict by using the "Next Available IP Address" functionality. However, when a user creates a conflict on the network, Infoblox can detect the conflict and give options for remediation thru the GUI. These remediation options are constructed by utilizing DHCP lease, DNS records and ARP table collection from each Cisco or other L2/L3 device on the network.

Automated: Infoblox can find all hosts on the network regardless of DHCP lease and DNS information by using 8 different

configurable discovery parameters. With graceful periodic pulling and triggered immediate pulling, Infoblox can discover MAC addresses which do not match the configured IPAM record. Administrators can then use the GUI-based dialog box to choose keeping the existing record and clearing the discovered data or updating the record with the discovered data and removing the pre-existing record.

Manual: Discover the conflict. Update the IPAM database or the Microsoft DHCP reservation to resolve the conflict.

Network Resource Management

Administrators need to manage the current percentage of ports that are available or used by devices.

Automated: Infoblox monitors ports and notes when a MAC address was last seen on a given switch port and updates the IPAM database. So it keeps tracking the status of all switch ports and shows the percentage of available ports and used ports.

Manual: Login to each switch and use CLI to check the port status. Then, document the free ports by typing the information into a spreadsheet.

The results shown in the report only counted one switch. When one considers all the switches on a typical network, the difference will be greater (Infoblox has an even greater advantage).

Cost Model

The hourly labor cost was determined by referencing the U.S. Bureau of Labor Statistics (BLS) entry for network

administrator¹. Tolly used the 75th percentile hourly rate of \$51.74. Overhead costs will vary but are always significant. For this study Tolly used the rate of 53.7% based on a calculation provided by ExakTime². Thus, the labor cost was calculated as \$79.00.

For the 10,000 IP address results, it assumes an organization needs to add 300 hosts with static IP addresses, 100 hosts with DHCP reservations, and 200 groups of DHCP devices every month.

The following percentage represents the frequency Tolly assumed for each task to occur. For example, "Add a host with static IP: 3%" means: in the 10,000 IP address scenario, administrators need to modify 10,000 * 3% = 300 hosts with static IP addresses every month.

- Add a host with static IP: 3%
- Add a host with DHCP reservation: 1%
- Add a group of devices: 2%
- Add a New Subnet: 1.5%
- Switch Port Configuration: 1%
- Troubleshooting (Resolve Conflicts): 3%
- Network Resource Monitoring: 4%

The actual occurrence rate of a given task is, naturally, dependent upon the environment. This model assumes a relatively low percentage of change per month. Prospective customers should map these results to their environments to provide more relevant time and cost savings calculations.

¹ <https://www.bls.gov/oes/current/oes151244.htm>

² <https://www.exaktime.com/calculate-labor-costs/>



About Tolly...

The Tolly Group companies have been delivering world-class IT services for nearly 30 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services. You can reach the company by email at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at:
<http://www.tolly.com>

Tolly on Infoblox...

Search other Tolly reports on the Infoblox resource portal at:

<https://www.infoblox.com/resources/>

Terms of Usage

This document is provided, free-of-charge, to help you understand whether a given product, technology or service merits additional investigation for your particular needs. Any decision to purchase a product must be based on your own assessment of suitability based on your needs. The document should never be used as a substitute for advice from a qualified IT or business professional. This evaluation was focused on illustrating specific features and/or performance of the product(s) and was conducted under controlled, laboratory conditions. Certain tests may have been tailored to reflect performance under ideal conditions; performance may vary under real-world conditions. Users should run tests based on their own real-world scenarios to validate performance for their own networks.

Reasonable efforts were made to ensure the accuracy of the data contained herein but errors and/or oversights can occur. The test/audit documented herein may also rely on various test tools the accuracy of which is beyond our control. Furthermore, the document relies on certain representations by the sponsor that are beyond our control to verify. Among these is that the software/hardware tested is production or production track and is, or will be, available in equivalent or better form to commercial customers. Accordingly, this document is provided "as is", and Tolly Enterprises, LLC (Tolly) gives no warranty, representation or undertaking, whether express or implied, and accepts no legal responsibility, whether direct or indirect, for the accuracy, completeness, usefulness or suitability of any information contained herein. By reviewing this document, you agree that your use of any information contained herein is at your own risk, and you accept all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from any information or material available on it. Tolly is not responsible for, and you agree to hold Tolly and its related affiliates harmless from any loss, harm, injury or damage resulting from or arising out of your use of or reliance on any of the information provided herein.

Tolly makes no claim as to whether any product or company described herein is suitable for investment. You should obtain your own independent professional advice, whether legal, accounting or otherwise, before proceeding with any investment or project related to any information, products or companies described herein. When foreign translations exist, the English document is considered authoritative. To assure accuracy, only use documents downloaded directly from Tolly.com.

No part of any document may be reproduced, in whole or in part, without the specific written permission of Tolly. All trademarks used in the document are owned by their respective owners. You agree not to use any trademark in or as the whole or part of your own trademarks in connection with any activities, products or services which are not ours, or in a manner which may be confusing, misleading or deceptive or in a manner that disparages us or our information, projects or developments.