



# **Cost Savings Analysis of IP Address Management (IPAM) Software for Service Providers**

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**System integrators and analysts have recorded ROIs of 150% to 500% over three years after organizations move from manual to automated handling of IP and DNS.**

## Introduction

Most network downtime, according to Forrester Research<sup>1</sup>, is due to manual errors in IP addresses and DNS records, which are used by every computer, modem, server, printer, VoIP phone, router, and other device to communicate over a network. IP addresses provide network and device identifiers, and DNS records correlate IP addresses to domain names. If these numbers and names aren't accurate, users don't get access to network services.

System integrators and analysts have also recorded ROIs of 150% to 500% over three years after organizations move from manual to automated handling of IP address allocation and DHCP/DNS server configuration. Even so, some organizations are still tracking IP address space manually, often out of a spreadsheet.

The alternative – fully automated IP address management (IPAM) systems – can improve productivity, security, and reliability across an entire enterprise.

That's why many organizations who haven't installed IPAM yet are seriously considering it. Commercial IPAM software packages are available. These are field-tested, engineered to meet reliability standards, and supported by specialists on the vendor side.

What factors may hold up automated IPAM implementations? IT decision-makers may not have access to information about the business impact of manual errors and there are misperceptions that IPAM is hard to deploy.

This paper discusses the critical factors in evaluating potential return on investment for your IPAM solution, including automation-related savings and recovered revenues.

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<sup>1</sup> Forrester Research, Inc. "IP Address Management," by Thomas Mendel, 2004.

**The risks with inefficiently managed IP networks are clear: downtime, lost revenues, dissatisfied customers, and network security and access problems.**

### **The Hidden Costs of Inadequate IP Management**

The risks associated with inefficiently managed IP networks are clear: network downtime, lost revenues, dissatisfied customers, and network security and access problems.

IP is everywhere, and the time required to manage IP address space is growing exponentially. VoIP and IP video services from broadband operators are becoming the norm, and organizations have increasing numbers of mobile workers and remote locations.

As a result, network administrators are now responsible for managing thousands, even millions, of IP addresses. The manual tracking and monitoring of IP networks are no longer viable alternatives for service providers or large organizations. Users won't tolerate access problems and IT administrators are overloaded.

Every network device connected to the Internet or corporate intranet requires at least one, and often multiple, IP addresses. It also needs access to a DNS server to resolve domain names. For example, if there is more than one device with the same IP address, network routers won't know where to pass data packets to, which disrupts operations.

Scenarios resulting from ineffectively managed IP networks include:

- Broadband service cancellations by existing customers (churn) or new customers, or excessive technical support time, caused by the inability to provision the proper IP addresses for Internet access and communications
- Delays in introducing new broadband services after being denied address space by an Regional Internet Registry (RIR) due to inadequate utilization reports and growth plans and lack of cost-effective means to re-allocate existing IP addresses
- Access problems for banking or e-commerce customers because of unavailability or duplication of IP addresses
- Inability to diagnose a network outage or provide access privileges resulting from the lack of IPAM diagnostics tools
- Delays in consolidating business units (in mergers, acquisitions, or re-organizations) due to overlapping IP space
- Disruptions on manufacturing assembly lines caused by misconfigured IP addresses that interrupt material flows

### **IP Address Management Process**

An end-to-end IP address management system keeps up-to-date inventories of IP addresses in use, ensures duplicate addresses are not employed, and supports DHCP and DNS server configuration.

When introducing an IPAM system, an organization may want to provide a "management layer" over top of existing DHCP and DNS servers, or install a complete replacement system that incorporates

the management layer with more efficient DHCP and DNS servers. Either way, there are substantial savings involved.

An IPAM system's management layer is in a supervisory role – responsible for optimized, organization-wide use of IP address space: allocation of IP address pools to various entities, usage analysis, forecasting, verification of address availability, security, and automated reporting.

At the tactical level, a DHCP server answers requests for IP addresses from network devices. The DHCP server assigns each device an IP address, for a “leased” time period, out of an address pool in its database. The address pool is allocated to the DHCP server by the supervising IP address management software.

If the device also needs to contact another network element using a domain name, a DNS server gets involved by associating the domain name with an IP address and then transmitting the address back to the requestor.

### **Automation Savings Potential**

An automated IPAM system minimizes the time and errors associated with network planning and expansion, deploying new services, setting up new users, processing service change requests, troubleshooting network access and downtime, forecasting capacity requirements, and RIR reporting.

**An automated IPAM system minimizes the time and errors associated with setting up new users, processing service change requests, troubleshooting downtime, and RIR reporting.**

Manual methods of handling these activities are time consuming. Network administrators must manually edit complex text-based configuration files for servers, check databases to verify permitted IP address pools, and enter IP address assignments into spreadsheets or other files. Before assigning an address, they must assess each device's location, appropriate level of access, suitable IP subnet, and IP address availability; then they must record the IP address in a database and update the DNS server configuration.

Such activities invariably lead to a high error rate, impacting employees and customers, frequently causing service disruptions. Assigning more staff to deal with customer complaints or to oversee a specific region is not scalable in today's cost-conscious, competitive environment. Moreover, multiple spreadsheets that are managed differently across various regions raise significant network security concerns.

In any savings calculations, a service provider needs to consider business customers and residential customers differently. They generate different streams of income and require different types of support. Revenues lost per customer due to service delays or outages add up more quickly on the business side, especially when service level agreements (SLAs) are involved.

***For New Subscribers: IP Address Allocation, Planning, and Optional DHCP/DNS Configuration***

The potential savings of moving from a manual to an automatic system for adding new customers is calculated using the following factors:

- Total number of subnets and/or IP addresses: The total includes the number of business subnets as well as IP addresses or address blocks for residential customers. If you are calculating the savings from a management-layer-only IPAM solution, then you can count IP address blocks for residential customers. If manual DHCP processes are involved, you need to incorporate individual residential IP addresses.
- Number of new customers added to total: This quantity represents the number of new customers added (business subnets and residential subscribers) based on their annual growth rates.
- Average time for an IT department to do one or both of the following:
  - Manually plan, allocate, track, and report on IP address blocks or subnets (IPAM management layer): this often takes at least 30 minutes, especially when the tasks are performed by multiple departments.
  - Manually set up an IP address for each user through DHCP and DNS servers: industry research shows to be 15 minutes<sup>2</sup>.
- Average IT administrator and customer service representative salary including benefits (“loaded labor rate”).

For example, a business with 1,000,000 IPs and over 10,000 business subnets would see more than 500 hours per month spent on IP address allocation and DHCP/DNS server configuration. At an average of \$45 per hour (a conservative estimate based on a range of IT industry salary surveys), that adds up to \$270,000 in the first year.

***IP Address/DNS Re-Configuration for Service Changes***

In the case of service changes, to calculate the possible savings for transitioning away from manual re-configuration, use the average number of business subnets requesting service changes each year, combined with an average time per change and the average IT administrator’s salary. A business-related manual re-configuration typically takes 30 minutes.

For one service provider, the percentage of business subnets requiring service changes each year averaged 5%, at 30 minutes per re-configuration. That represented over 25 hours per month or around \$12,000 per year.

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<sup>2</sup> Gartner Inc. “Pay a Little Now or More Later: Budgeting for TCP/IP,” by J. Pandolfo, 1998.

### ***Reductions in Troubleshooting Access and Downtime Issues***

In a manual IP address system, the percentage of IP addresses or business subnets experiencing troubleshooting issues can easily reach 10%.<sup>3</sup> These issues stem from errors in server configuration files, inconsistent or invalid naming due to decentralized management, and very commonly, data entry errors. These, in turn, lead to problems with security, domain resolution, and invalid IP addresses.

The corresponding network downtime and service outages result in customer service calls and technical support time, with manual troubleshooting averaging 45 minutes per issue.

### ***Time Savings in Analysis and Forecasting of Address Capacity***

Automated IPAM simplifies reporting, data collection, and analysis, and the re-allocation of IP addresses to where they can most effectively meet shifting needs.

Without a robust IPAM system, an organization is dramatically limited in its ability to optimize the use of IP resources. For example, if a service provider is experiencing growth but limited IP space in one region, and has an abundant supply in another region, they face the nearly impossible task of moving IP addresses to where they are needed most.

**The manual “grooming” of blocks of IP address space to meet varied levels of demand is a time-consuming process.**

The manual “grooming” of blocks of IP address space to meet varied levels of demand (by customer type, region, or service) is a time-consuming process. It involves manual reviews of server logs for changes in utilization and capacity. As well, IT administrators in one region won't know when previously allocated addresses are going unused in another region until they go looking for them. Those unused addresses are valuable, as the service provider doesn't have to purchase more from an RIR.

Industry case studies have shown an average of four hours per month for every 10,000 business subnets or every 10,000 residential IP addresses. The specific time required depends on the characteristics of each service provider's operation.

Another consideration in moving to automated IPAM is the avoided cost of not adding unnecessary IP address space due to improved viewing, monitoring, and reporting capabilities.

### ***Savings in RIR Reporting***

Finally, there is the cost of administrators to compile and analyze multiple reports to satisfy the requirements of RIRs such as ARIN and RIPE reports as well as SWIP updates for the WHOIS database. ARIN and RIPE reports are needed periodically and also whenever the service provider wants to request more address space.

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<sup>3</sup> Giga Information Group “The Savings from Automated IPAM Software,” by Stan Schatt, 1999.

**It is not uncommon for RIR reporting to consume the equivalent of at least one month of each network administrator's time.**

It is not uncommon for RIR reporting to consume the equivalent of at least one month of each network administrator's time. This time includes both validating current use and requesting additional IP addresses as the customer base grows and new services are introduced. More often than not, new services will require more than just a single IP address per customer.

A service provider can estimate the cost of manual RIR and SWIP reporting by considering the number of times per year they need to expand IP address space – this depends on the growth rate. For example, at a 20% growth rate, assuming that the service provider is already using over 80% of address space, RIR reports (at 8 hours per 1000 subnets or residential addresses) and requests could happen twice per year.

RIRs also require a SWIP update for every subnet that is assigned. The time for manual SWIP reporting depends on the customer growth rate, at approximately 10 minutes per SWIP email.

### **Annual Recovered Revenues Potential**

**More costly than staff labor may be lost revenue opportunities.**

More costly than staff labor may be lost revenue opportunities. Limited IP management functionality causes a significant impact to the bottom line.

If customers demand service and cannot get it with a high level of reliability, they will find a competitor that satisfies their needs. Some service outages are caused by IP address-related problems.

Another threat to the bottom line is the loss of new subscribers who cannot be accommodated because of the lack of address space. Nearly all broadband providers have been negatively impacted by being unable to serve new customers. These users turn to another solution from another provider when they cannot get access immediately.

According to industry research on churn<sup>4</sup> and customer satisfaction, a churn rate of less than 4% is acceptable. One service provider managing one million IP addresses lost 150 existing customers each year due to IP-related problems.

### ***Recovered Customer Revenues***

IP-related service outages may cause service providers to lose 1% of the 5% of customers affected, and in a highly competitive environment, this figure can be much higher. The recovered revenue calculation is based on the revenues a service provider would have made if those customers hadn't left.

### ***Reduced Service Delays or Interruptions***

Delays in subscriber activations mean that service fees cannot be collected immediately. An automated IPAM system can reduce activation time by a minimum of one day, and that is a conservative estimate. This translates into at least one extra day's worth of revenue per subscriber.

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<sup>4</sup> ISP-Planet, "Market Research: Notes to Top ISPs by Subscriber, Q4 2002," by Alex Goldman, 2003

***Maintenance of Service Level Agreements***

SLAs provide guarantees to business customers for service reliability. If service disruptions go beyond the thresholds stipulated in an SLA, the service provider must pay the customer a penalty. Even if only 10% of disruptions affect SLAs, the penalty fees can quickly add up.

**Summary**

As IP-based networks grow in size and complexity, the need for effective management of IP address space has become critical to an organization's profitability. There are also tighter restrictions on new allocations of IP address space from RIRs.

Inadequate IP management has a direct impact on the bottom line. It leads to lost revenues, increased costs, inefficient deployment of network staff, and less time on business-critical activities.

Automated IPAM provides excellent opportunities to recover revenues, reduce costs, re-position staff onto other priorities, and maintain uptime.

**IP address space has become critical to an organization's profitability.**

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