NETWORK VISIBILITY
AND MONITORING

What’s Going on in There, Anyway?

* NVM products are seeing renewed customer interest, leading to an increased level of M&A activity and revenue growth across the segment. Datacenter upgrades, virtualization and service provider rollouts of LTE are driving revenue across the NVM vendor landscape.

KEY FINDINGS

- The network visibility and monitoring (NVM) market has been an active source of M&A activity since 2012. There has been roughly $1.6bn worth of acquisitions of NVM components and companies, as well as two IPOs, since the May 2012 acquisition of Anue Systems by Ixia.

- NVM is both a stand-alone market and an incorporated component of a larger NVM/NPM/APM market. The lines between these traditional silos are quickly blurring.

- Our research indicates that revenue for the NVM space totaled $1.02bn in 2013, and the market for NVM tools and products will reach nearly $3bn by 2018.

- Widespread adoption of virtualization and cloud computing are challenging the capabilities of traditional network monitoring and performance management tools.

- Regulatory and business rules for real-time data recording and retention are driving the installation of parallel monitoring networks alongside production data networks.

- The installed base of network recorders, analyzers and IDS/IPS has, predominantly, 1Gb interfaces, which will drive a large capital expenditure for 10Gb upgrades unless intermediated by (potentially less expensive) matrix switches and aggregators.
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New York
20 West 37th Street, 6th Floor
New York, NY 10018
Phone: 212.505.3030
Fax: 212.505.2630

San Francisco
140 Geary Street, 9th Floor
San Francisco, CA 94108
Phone: 415.989.1555
Fax: 415.989.1558

London
Paxton House (5th floor), 30 Artillery Lane
London, E1 7LS, UK
Phone: +44 (0) 207 426 0219
Fax: +44 (0) 207 426 4698

Boston
125 Broad Street, 4th Floor
Boston, MA 02109
Phone: 617.275.8818
Fax: 617.261.0688
TABLE OF CONTENTS

SECTION 1: EXECUTIVE SUMMARY 1
1.1 INTRODUCTION .................................................. 1
1.2 KEY FINDINGS .................................................. 1

Figure 1: Networking Management Roadmap Technology,
TheInfoPro Networking Wave 10 (2013) ..................... 2
1.3 METHODOLOGY .................................................. 2
1.4 WHO SHOULD READ THIS REPORT ......................... 3

SECTION 2: DEFINITION & SCOPE: WHAT IS NETWORK
VISIBILITY AND MONITORING? 4
2.1 DEFINING NETWORK VISIBILITY AND MONITORING ........ 4

Figure 2: Network Visibility and Monitoring Vendors Discussed
in This Report .................................................. 4
2.2 WHERE WE ARE RIGHT NOW .................................. 4
2.3 HOW DID WE GET HERE? ...................................... 6

SECTION 3: MARKETPLACE: SUMMARY OF MARKET-SIZING DATA 7

Figure 3: Total Market Revenue And Projection To 2018 ........ 7
Figure 4: 2013 Network Visibility And Monitoring Market Statistics .... 8
Figure 5: Network Visibility And Monitoring Vendors By Revenue Tier .. 8

SECTION 4: M&A ACTIVITY AND PUBLIC OFFERINGS 9

Figure 6: Notable NMV Acquisitions ............................. 9
Figure 7: Recent Initial Public Offerings by NVM Vendors ........ 9

SECTION 5: 2014 OUTLOOK: MARKET PREDICTIONS
AND VENDOR PRIORITIES 10

SECTION 6: VENDOR PROFILES 11
6.1 KEY NETWORK VISIBILITY AND MONITORING VENDOR PROFILES 11

INDEX OF COMPANIES 18
Executive Summary

1.1 INTRODUCTION

Network visibility and monitoring (NVM) products are seeing renewed customer interest, leading to an increased level of M&A activity and revenue growth across the segment. Data-center upgrades, virtualization and service provider rollouts of LTE are driving revenue across the NVM vendor landscape. Traditional application performance management (APM) vendors are finding themselves developing, acquiring or partnering for network performance management (NPM)/NVM functionality, while legacy NVM vendors increasingly position themselves as providers of advanced traffic and application analytics. The vendors and overall market struggle with different definitions (and marketing boundaries) of network monitoring switches, recorders, analyzers, NPM and APM, and there are few clear, undisputed lines.

This report deliberately spans multiple defined boundaries in order to paint a picture of the broad landscape of technologies and offerings brought to market. For the cross section of vendors covered in this report, we anticipate the market segment overall to grow an average of 24% per year over the next four years, and for the small remaining cohort of pure-play NVM vendors to be targets for M&A activity in the next 12-24 months.

1.2 KEY FINDINGS

- The NVM market has been an active source of M&A activity since 2012. There has been roughly $1.6bn worth of acquisitions of NVM components and companies, as well as two IPOs, since the May 2012 acquisition of Anue Systems by Ixia.

- NVM is both a stand-alone market and an incorporated component of a larger NVM/NPM/APM market. The lines between these traditional silos are quickly blurring.

- Our research indicates that revenue for the NVM space totaled $1.02bn in 2013, and the market for NVM tools and products will reach nearly $3bn by 2018.

- Widespread adoption of virtualization and cloud computing are challenging the capabilities of traditional network monitoring and performance management tools.

- Regulatory and business rules for real-time data recording and retention are driving the installation of parallel monitoring networks alongside production data networks.

- The installed base of network recorders, analyzers and IDS/IPS has, predominantly, 1Gb interfaces, which will drive a large capital expenditure for 10Gb upgrades unless intermediated by (potentially less expensive) matrix switches and aggregators.

- Mobile operator rollouts of Long-Term Evolution (LTE) infrastructure have become the primary target market for nearly all network monitoring vendors due to the operators’ need to analyze traffic behavior in order to facilitate the creation of new revenue-generating services.
• Enterprise network teams are increasingly being measured by network availability and performance, in part motivated by internal SLAs between IT and lines of business, which, in turn, is driving broad horizontal adoption of network monitoring tools.

In the recent Networking Wave 10 Study, network managers noted that one of the key measures used to determine the effectiveness of the networking team was network availability. Respondents also noted that they had increased their budgets for data access monitoring (DAM), as well as both network performance management and network-based application performance monitoring and management tools.

**FIGURE 1: NETWORKING MANAGEMENT ROADMAP TECHNOLOGY, THEINFOPRO NETWORKING WAVE 10 (2013)**

<table>
<thead>
<tr>
<th>Technology</th>
<th>IN USE NOW</th>
<th>IN PILOT/EVALUATION (BUDGET HAS ALREADY BEEN ALLOCATED)</th>
<th>NEAR-TERM PLAN (IN NEXT 6 MONTHS)</th>
<th>LONG-TERM PLAN (6-18 MONTHS OUT)</th>
<th>PAST LONG-TERM PLAN (LATER THAN 18 MONTHS OUT)</th>
<th>NOT IN PLAN</th>
<th>DON'T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Fault Monitoring</td>
<td>86%</td>
<td>3%</td>
<td>1%</td>
<td></td>
<td>8%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Network Performance Management</td>
<td>83%</td>
<td>1%</td>
<td>2%</td>
<td>4%</td>
<td>9%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Configuration Management Database (CMDB)</td>
<td>59%</td>
<td>1%</td>
<td>3%</td>
<td>5%</td>
<td>3%</td>
<td>26%</td>
<td>3%</td>
</tr>
<tr>
<td>Network-based Application Performance Monitoring and Management</td>
<td>51%</td>
<td>1%</td>
<td>2%</td>
<td>5%</td>
<td>36%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Data Access Monitoring</td>
<td>29%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>57%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Dynamic Bandwidth Allocation or Provisioning</td>
<td>20%</td>
<td>1%</td>
<td>3%</td>
<td>2%</td>
<td>70%</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

**1.3 METHODOLOGY**

This report focuses on network monitoring and visibility and is the result of interviews with end-user customers and briefings with vendors directly and indirectly involved in network monitoring technology. More insight into the growing trends in data access monitoring and application and network performance management can be found in the Networking Wave interviews and research conducted by TheInfoPro division of The 451 Group, as well as carrier-specific monitoring research conducted by The Yankee Group division of The 451 Group.
Reports such as this one represent a holistic perspective on key emerging markets in the enterprise IT space. These markets evolve quickly, though, so 451 Research offers additional services that provide critical marketplace updates. These updated reports and perspectives are presented on a daily basis via the company’s core intelligence service – 451 Market Insight. Forward-looking M&A analysis and perspectives on strategic acquisitions and the liquidity environment for technology companies are also updated regularly via 451 Market Insight, which is backed by the industry-leading 451 M&A KnowledgeBase.

Emerging technologies and markets are also covered in additional 451 practices, including our CloudScape, Datacenter Technologies (DCT), Enterprise Security, Information Management, Infrastructure Computing for the Enterprise (ICE) and 451 Market Monitor services. All of these 451 services, which are accessible via the Web, provide critical and timely analysis specifically focused on the business of enterprise IT innovation.

This report was written by Christian Renaud, Senior Analyst, Networking, with substantial assistance from Greg Zwakman, Research Director, Quantitative Services, and Victoria Simons, Research Associate, Quantitative Services. Any questions about the methodology should be addressed to Christian Renaud at: christian.renaud@451research.com.

Christian Renaud – Senior Analyst, Networking

As a Senior Analyst within 451 Research’s Enterprise Networking Practice, Christian covers the evolution of converged networks in this increasingly cloud-driven, mobile and software-defined industry. For 25 years prior to joining 451 Research, Christian built nationwide networks at large and small enterprises, worked with Fortune 50 companies in the systems integrator channel, built products at Cisco Systems and ran the company’s New Markets and Technologies team. He has also been the CEO of multiple technology startups. Christian is a frequent keynote speaker on entrepreneurship, technology and future trends.

For more information about 451 Research, please go to the company’s website: www.451research.com.

1.4 WHO SHOULD READ THIS REPORT

This report is targeted at two groups of readers: first, those network managers or architects who are considering the deployment of new infrastructure and are developing a proactive monitoring process to ensure reliability and performance, and second, those inside or outside the industry who have been watching the rapid growth of the network visibility vendors and wish to understand the impetus for the increase in activity.
Definition & Scope: What is Network Visibility and Monitoring?

2.1 DEFINING NETWORK VISIBILITY AND MONITORING

The boundaries of the NVM space are not well defined and could potentially include APM/NPM vendors, tool vendors of intrusion detection and prevention systems (IPS/IDS), network recorders, VoIP analysis and many other functions. For the purposes of this report, we have chosen to focus on companies that exclusively sell technology for network monitoring fabrics (matrix switches), or do so as a critical component of a broader offering (e.g., Riverbed), and have not included specific tool vendors other than where NVM vendors have incorporated functions typically instantiated in tools into their own offerings. The rationale behind this selection is to draw attention to this growing market segment, which has also experienced a high level of M&A and investment activity. Where possible, we have also attempted to include those vendors that have NVM as a feature (Arista) or topological benefit (OpenFlow/Big Switch); however, the list is by no means exhaustive.

FIGURE 2: NETWORK VISIBILITY AND MONITORING VENDORS DISCUSSED IN THIS REPORT

<table>
<thead>
<tr>
<th>Apcon</th>
<th>Arista Networks</th>
<th>Big Switch Networks</th>
<th>cPacket Networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datacom Systems</td>
<td>Emulex</td>
<td>Gigamon</td>
<td>Interface Masters</td>
</tr>
<tr>
<td>Ixia</td>
<td>Napatech</td>
<td>NetScout</td>
<td>Riverbed</td>
</tr>
<tr>
<td>VSS Monitoring</td>
<td>WildPackets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.2 WHERE WE ARE RIGHT NOW

The NVM vendor landscape consists of an elaborate amalgam of passive and active (and now virtual) taps, probes, high-speed matrix switches, centralized and distributed analysis appliances, load balancers, generators of NetFlow and sFlow traffic, and a number of other advanced functions. The network monitoring industry is in the process of growing from simply being plumbing for tool pools to providing actionable analytics to mobile providers for service creation, as well as merging application and network performance monitoring with real-time traffic behavior.

Vendors reported the following key drivers behind this growth:

- The current purchasing cycle to upgrade enterprise datacenter networks from 1/10Gb to 10/40/100Gb and the considerable potential cost of network analysis tool upgrades.
- Increasing demand for surveillance (lawful intercept) being imposed on service providers worldwide
- The opacity of highly virtualized networks, as well as public and private cloud networks, which is handicapping traditional network monitoring and visibility techniques
The rapid rollout of LTE networks by mobile operators, and the concurrent interest in building capabilities into these new networks for subscriber experience management

General enterprise interest in network instrumentation, and the ability to proactively monitor traffic types, patterns and APM/NPM for internal clients

At the same time, the majority of infrastructure within enterprise networks is aging, and a refresh cycle for both the datacenter and wiring closet is under way. Driven by an increasing percentage of VM-to-VM (also known as ‘East-West’) traffic, datacenters are being upgraded from 1Gb server connections to 10Gb server connections, with 40Gb or 100Gb uplinks replacing legacy 10Gb uplinks to spine switches. Wiring closets are being impacted by faster Wi-Fi (802.11n/802.11ac Wave-1) speed demands, which, in turn, are being driven by an increasing number of user-provided mobile devices.

The often-costly purchase of these monitoring tools can be rationalized as network instrumentation: the ability to see network performance and trends proactively, prior to performance issues or network failure. By monitoring link utilization, traffic patterns and user/application behavior, organizations can identify potential ‘choke points’ and critical points of failure in network designs and (hopefully) re-architect and add capacity prior to network performance issues or outages.

As the market has matured, the NVM vendor community has begun dividing into specific camps, each with its own target customers and representative platforms. There are vendors such as Big Switch that are leveraging aspects of OpenFlow to copy and redirect network traffic to tool pools, and outliers such as Arista, which, leveraging software, repurposes its high-performance Ethernet switches as network visibility switches. Then there are vendors of ‘pizza box’ switches such as Interface Masters and Datacom Systems that have carved out profitable niche markets by OEMing to larger technology firms for inclusion into broader offerings. The high end of the market is divided between companies approaching from an ‘application down’ perspective, such as NetScout and Riverbed, and those that are approaching the market from a ‘network up’ angle, such as Ixia and Gigamon. It will be at the intersection of these two approaches between large (publicly traded) companies that the majority of market activity will occur.

NVM vendors have been increasingly growing the feature lists of their products to include application-analysis functions. This points to an important broader transition under way, which is the holistic approach to application, subscriber or customer-experience monitoring. This holistic approach merges the traditionally separate fields of APM, NPM and NVM. The goal is to provide a management and monitoring infrastructure that can alert when applications drift out of acceptable performance guidelines, and rapidly pinpoint the likely culprit for the deviance (e.g., server load, network congestion, etc.). The APM/NPM tools have included trending and ‘heat map’ functions for many years, and the addition of NVM to the equation rounds out the reactive troubleshooting toolkit required to achieve fast time to resolution. The NVM tools also address critical regulatory monitoring and traffic analysis aspects that are not traditionally addressed by APM and NPM vendors.
2.3 HOW DID WE GET HERE?

Network analysis tools have existed as a subdomain of network management nearly as long as networks themselves. When network traffic existed within a single collision domain, such as within an Ethernet hub or Token Ring network, it was relatively simple to set a network adapter to ‘promiscuous mode’ and monitor network traffic to determine the source of network congestion or misconfiguration. Specialized packet-analyzer PCs (later laptops, then single-purpose appliances) were eventually created for this function, the best known of which was Sniffer, a specific product developed by Network General. As hubs evolved into switched networks, the addition of remote monitoring functionality was added to switches, as well as the ability to replicate (mirror) traffic from one port to another port, known as a switched port analyzer (SPAN) function, which was later expanded to include backhaul to remote sites with remote switched port analyzers (RSPAN).

While traffic analyzers are still widely used to pinpoint specific issues, the ability to sample or replicate traffic broadly across a network shifted the emphasis from troubleshooting and tactical problem resolution to a systemic, proactive posture. This required the development of special-purpose network tap devices that sit on each network segment and function similarly to a SPAN port, redirecting network traffic to a central location for analysis or archiving.

Custom appliances and tools were developed for traffic recording, driven by lawful intercept (originated by the 1994 US wiretapping law, the Communications Assistance for Law Enforcement Act (CALEA)) or the capture and retention of financial trading traffic. Additional tools to monitor application performance, tying in IDS/IPS systems and VoIP analysis, were developed as special-purpose appliances. This resulted in a proliferation of ‘tool pools’ of multiple single-function devices, many of which often required access to the same traffic flow.

It was this many-to-many traffic problem that drove the development of network visibility switches to multiplex traffic to the downstream tools. Using a matrix switch, multiple tap and span ports can be fed to one or more switches, which then distribute the traffic to the tool pools as needed. In this way, traffic from a single source can be multiplexed to traffic recorders, APM tools and IDS/IPS simultaneously. Adding further value, some vendors’ implementations can correlate sessions that traverse the infrastructure (such as 802.11 wireless sessions that move from access point to access point, or LTE sessions that move horizontally peer-to-peer between 3GPP X2 interfaces), strip encapsulating protocols or headers, de-duplicate traffic, and filter traffic to offload the computational load on the tool appliances.

Increasing complexity and speed in enterprise and service provider networking has shifted traditionally overlooked NVM tools to a new relevance, as the revenue growth demonstrated by the publicly traded vendors such as NetScout and Gigamon shows.
Marketplace:
Summary of Market-Sizing Data

By our measurement, the aggregate network visibility and monitoring revenue generated by the 14 companies we have included in this analysis totaled $1.03bn in 2013, and we expect that number to grow at a CAGR of 24% to exceed $2.99bn in 2018. This forecast is the result of a bottom-up analysis that incorporates the current revenue and growth potential of each vendor included.

FIGURE 3: TOTAL MARKET REVENUE AND PROJECTION TO 2018 (SM)*

*For the purposes of market sizing, we have chosen to include the services revenue of the companies profiled because the sales models of each of the companies differ, with some companies charging a larger up-front hardware fee with smaller annual maintenance fees, while other firms charge a smaller hardware fee and larger annual maintenance (often software) fees. In addition, a number of these vendors do not focus exclusively on the NVM market; therefore, the 451 Quantitative Services group developed an ‘attach rate’ estimate – based on both interviews with vendors and publicly available data – to exclude non-NVM products (such as the majority of Arista’s Ethernet switches, Riverbed’s WAN Op and ADC products, and Ixia and NetScout’s test products) from the market size estimates below.

FIGURE 7: RECENT INITIAL PUBLIC OFFERINGS BY NVM VENDORS

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>IPO DATE</th>
<th>MARKET/SYMBOL</th>
<th>FISCAL REVENUE (M)</th>
<th>MARKET CAPITALIZATION (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigamon</td>
<td>June 2013</td>
<td>NYSE: GIMO</td>
<td>$140</td>
<td>$503</td>
</tr>
<tr>
<td>Napatech</td>
<td>December 2013</td>
<td>OLSO: NAPA</td>
<td>$32.6</td>
<td>$43.84</td>
</tr>
<tr>
<td><strong>GIGAMON (NYSE: GIMO)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headquarters: Santa Clara, CA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEO: Paul Hooper</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**PRIMARY FOCUS AREA**

**FUNCTIONALITY SUPPORTED**
Matrix switches, taps

**COMMENTARY**

Gigamon is one of the most visible pure-play NVM vendors. The company primarily sells a full array of matrix switches, with analysis and tap products rounding out the product portfolio. The 2013 IPO of Gigamon was well received, and the stock price grew until the most recent quarter, when the company adjusted guidance down based on a large transaction that did not materialize, resulting in a sharp drop in price to below-IPO levels. Gigamon continues to push the envelope of the NVM market, making it a company to beat from a feature/functionality perspective.