



Technical Overview and Capabilities

Performance,
Scalability,
&
Integration

Valencia Systems Aruba Suite™

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This document details the capabilities of the Aruba Suite™ from Valencia Systems. This document is intended to provide a high-level technical overview and capabilities guideline identifying why Aruba has been touted as a “best-in-class” IT performance management reporting solution for medium to large enterprises and service providers.

Aruba’s scalable architecture, data collection capabilities, ease of use, legacy integration and advanced report analytics are the baseline requirements which Aruba was built. The recent addition of the Aruba NetFlow™ Module to the Aruba Suite now allows Aruba to determine the clear determining factors of application performance problems. With the recent adoption of Business Service Management (BSM), NetFlow has become even more important in providing information on usage, service quality, billing and determining operational cost. The need to analyze, potentially, millions of IP application flows requires a highly scalable, integrated system. Aruba is the only performance management solution that is able to provide ubiquitous performance management for IT infrastructure as well as handle the technical challenges of NetFlow.



The Aruba Suite leverages a Highly Scalable data collection capability and database to provide a "carrier-class" consolidated IT performance management reporting solution. Aruba collects extensive raw SNMP data from hundreds of different networked devices to isolate "hot spots" and report on real-time conditions for troubleshooting, Capacity Planning, Service Level

Management (SLM), Business Service Management (BMS), Quality of Service (QoS), financial-bill back, and operational needs. Raw data is rolled-up into historical reports for current time periods or mutli-year analysis. Aruba is easily configured and installed. Aruba ships with hundreds of preconfigured reports and can be easily customized (using XML) for individual requirements for specific users (IT Managers, Operations, Engineering, etc). Aruba's powerful base lining capability allows enterprises and service providers to determine typical vs. a-typical behavior, trending and predicting behavior and identifying security or policy breakdowns. Aruba is designed to be integrated with existing IT applications to provide a comprehensive, scalable, IT performance management solution.

Aruba Product Features

The Aruba Report/Server

- Carrier-class scalability
- Historical trending & predictive analysis
- Hardware & network capacity planning
- Comprehensive System Management reporting
- Resource utilization & optimization reports
- Efficient provisioning of carrier capacity reports
- Proactive problem area detection
- Verify/Audit QoS goals
- Verify/Audit SLA goals
- Automatic Baseline comparisons
- Threshold based exceptions and alarms
- Secure Access
- ODBC compliant database
- XML- customization

The Aruba Distributed Flow Collector

- Unprecedented scalability, millions of concurrent flows

- Automatic Baseline comparisons
- Service Level (SLA) assurance
- Measure service quality (QoS)
- Utilization
- Congestion
- Errors
- Real-Time Analysis
- Historical trending & predictive analysis
- XML-Web based reporting
- Comprehensive picture of Network Usage, raw & aggregate data
 - o Top N Talkers, Hosts, Listeners
 - o Top N Conversations
 - o Top N Ports
 - o Top N Applications

The Aruba Distributed Poller

- Distributed remotely or centralized
- Add modularly as requirements grow n-tier architecture
- Multithreaded, high speed, polling of SMNP data cache
- Standards-based SNMP polling

The general Aruba Architecture is a scalable architecture which supports the remote/distributed collection of data from routers, hubs, switches, computer systems and other SNMP capable devices (i.e. firewall, or traffic shaping appliances). By distributing the polling function the data may be consolidated from the distributed collectors in a central data warehouse. Data is analyzed against preconfigured or customized report formats to produce actionable, information-based, web reports. Reports are easily categorized and grouped by function, location, priority and detail allowing Network Operations-to-Management utilize performance information for IT troubleshooting or financial and business planning.

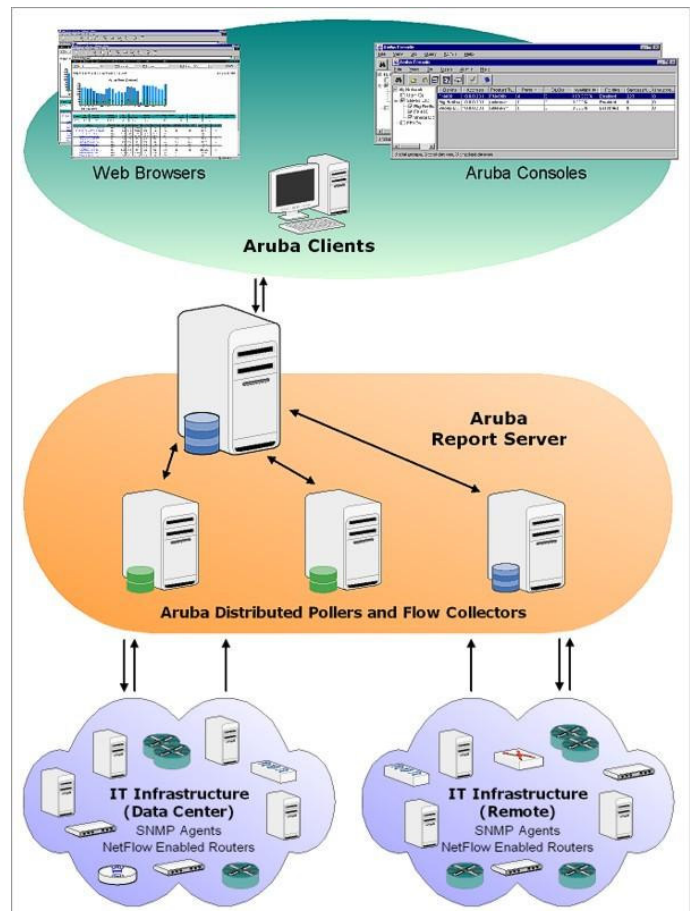
Aruba was specifically architected to support very large-scale SNMP/NetFlow data collection and reporting. The architecture is both multi-tiered and distributed. Aruba can be divided into three logically separate layers: **Client layer**, **Server layer**, and **Collection layer**.

Aruba is a highly scaleable architecture utilizing a client, server, collection layers and an Oracle™ database

The Client layer provides the user interface to the system. The Aruba Console allows the administrator to configure and maintain the system, as well as perform real-time and custom reports.

The Server layer (*Aruba Report Server*) is responsible for generating and publishing reports, storing configuration information, and managing the underlying Pollers and Flow Collectors. There is a single Report Server in an Aruba system.

The Collection layer consists of one or more Pollers and/or Flow Collectors which automatically gather data from the network devices. These clean, normalize and store raw data, as well as aggregating and aging historical data.



The Client, Server and Collection may all be collapsed onto a single machine or they may be distributed on separate computers. For small networks, a single Client,

Report Server, and Poller running on the same machine will be appropriate. Larger networks may require multiple Clients simultaneously connecting to the Report Server, that in turn, managing data from several distributed Pollers and/or Flow Collectors. Aruba's architecture will scale from small to very large distributed installations, without sacrificing simplicity and ease of use.

Why a multi-tiered, distributed architecture?

The optimal solution must minimize data movement by pre-processing the data at the collectors

A monolithic approach, a data collection engine and reporting engine both hosted on a single platform, will eventually be limited by processor performance, available bandwidth, and storage capacity. And long before these thresholds are reached, the user experience is impacted - continuous polling and database processing will consume much of the available machine cycles. Just adding more machines introduces a new problem - each machine now has its own collection and reporting domain. The user must know which machine is responsible for each device, and groups of devices can not span the domains.

An alternative approach is to separate the administrative and reporting functions from the data collection engines. This still gives the user a single machine to access for a holistic view of the entire network, for both reporting and administration. The CPU/bandwidth-intensive collection functionality is distributed across as many machines as needed. An additional benefit is that a collector can now be located close to the data sources, reducing SNMP polling across the WAN.

The downside of this approach, if the collectors rely on the server layer to actually process and store all the data that is collected, is the problem has not been solved. In fact, this only makes it worse, since the data is essentially moved twice. Many solutions which started with a monolithic architecture have been "scalability enhanced" by adding a "server layer" using this approach and must manipulate the data across platforms.

Valencia System feels the optimal solution must minimize data movement by pre-processing the data at the collectors - only summarized data is sent up to the server layer. Granular data (for example, raw polled data) is retained in the collector database, and is only moved to the server if user requested.

Reducing the ongoing maintenance burden is a major factor in a solution's scalability. To reduce maintenance burden the client layer must be distributed as well. The administrators console should tear away, and multiple administrators must be able to simultaneously make changes. In addition, grouping must be integrated into the administrative functions as well as the reports.

The Database

Aruba is built on an Oracle database. Oracle provides a high performance and scalable foundation for the Aruba Suite. By choosing Oracle, Valencia Systems can insure that our customers will be guaranteed a reliable, resilient, and premier data store for their

reporting solution, capable of reliably processing gigabytes of daily performance data. An additional benefit is integration. Since Aruba does not roll the data up at the poller level but rather the database level, Oracle also allows the migration and 3rd party integration at the raw data or post processing level.

Data Sources

Aruba can collect data from any SNMP data source

The Aruba architecture allows the polling of any SNMP capable device. This includes hubs, switches, routers, servers, etc. The standard device list includes Network equipment, Servers, and specialized software.

In addition, Aruba uses the core distributed architecture to receive application flow data from **Cisco's NetFlow**.

Network Equipment

Aruba is vendor neutral, and is preconfigured to support different network equipment manufactures including Cisco, Nortel, Entarasys, Extreme, Foundry, 3Com, HP, and hundreds of other vendors.

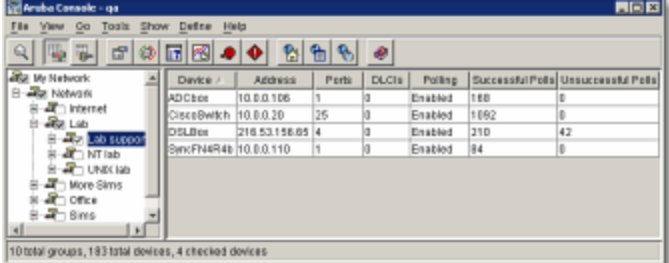
Computer System Monitoring

Aruba is preconfigured to support the polling of standard MIB-2 data as well as specialized Managed Information Bases (MIBs) from a broad range of vendors including IBM, Dell, and HP/Compaq.

The Aruba Console

The Aruba Console is the primary interface into the managed network. This user interface allows the user to monitor current information about network devices and components. It is also used to configure the groups and devices in the network,

define how data about the network is collected and processed, define who has access to the managed network, perform custom queries against the data, and access the Report Server to view the web-based reporting tool. The Console is also used to view real-time information at the component level and to monitor real-time alarm and Aruba alert information.



Device	Address	Ports	DLCIs	Poling	Successful Polls	Unsuccessful Polls
ADCSes	10.0.0.106	1	3	Enabled	188	0
CiscoBwkh	10.0.0.20	25	3	Enabled	1692	0
DSLites	216.53.158.05	4	3	Enabled	210	42
SincFNAR4b	10.0.0.110	1	3	Enabled	84	0

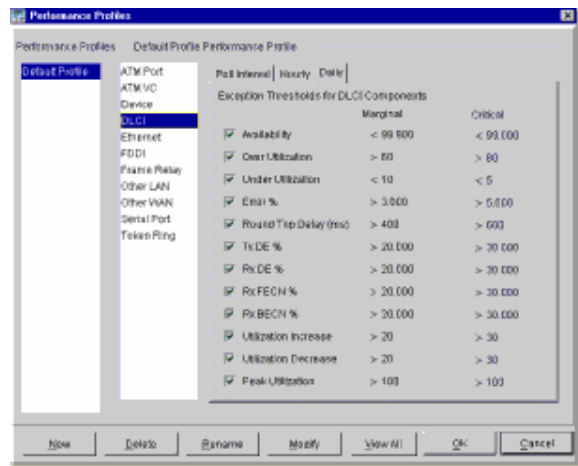
10 total groups, 183 total devices, 4 checked devices

Network Configuration

Web-based configurations provides an easy to use interface, shortening time and training required for implementation

The Aruba Console allows the user to define the managed network. From the Define menu, the user can:

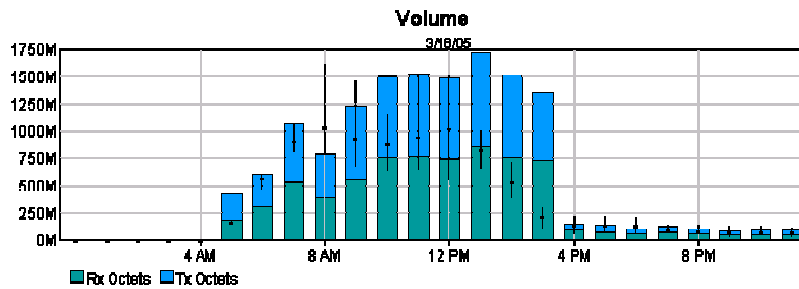
- Define unlimited hierarchical groupings
- Configure devices by group (i.e. change Community strings for all devices in same group in one action)
- View component-level configuration
- Override properties for individual components or groups of components
- Import devices
- Perform auto-discovery of devices
- Configure the alarm monitoring and alert monitoring features
- Define unlimited performance profiles, which allow Marginal and Critical thresholds to be defined for any component, at different poll intervals
- Define up to 1000 user profiles, including password, email address, top-level groups, and privileges
- Configure up to 20 remote Collection Agents
- Configure data collection and reporting hours for Collection Agents
- Configure polling intervals, timeouts and error thresholds
- Configure rollup intervals at every aggregation level
- View operational status and load of all Collection Agents by Managers and Administrators



Analysis

Aruba reporting has a broad base of preconfigured reports and allows the easy customization or creation of specialized reports. The report library shortens the set-up time and professional service cost typically involved in the implementation of performance management software. For higher levels of customization, the report structure is flexible enough to easily make changes and customize fields. Aruba offers real-time reports as well as historical trend analysis by day, week, month, and year. Some example of advanced analytics and preconfigured real-time and historical reports include the following.

Real-Time Reports

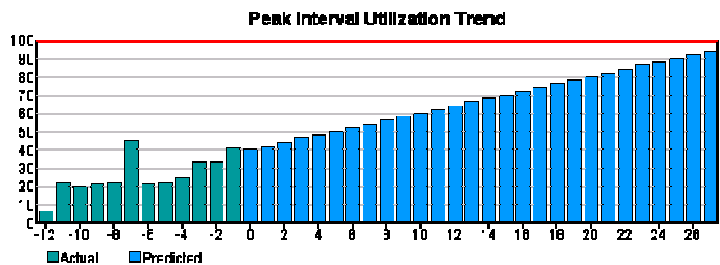


Baseline Comparisons allow the calculation of traffic on all components, showing the peak, minimum, and average traffic volumes experienced during the baseline period.

Utilization allow capacity planning to manage grow

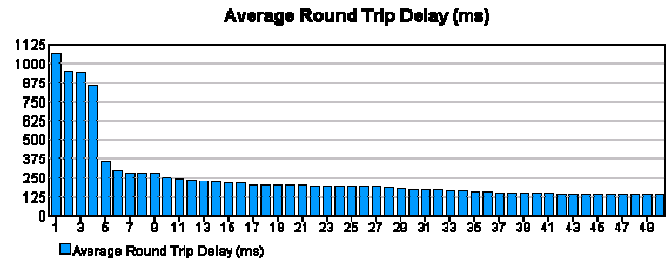
Utilization Trends

Aruba projects past utilization trends into the future and tells the users what future date can be expected to cross configurable utilization thresholds. This provides the ability to prepare for growth before it starts to affect user response times. Aruba's XML report architecture allows the user to customize the time period displayed so the user can adjust the report to fit the department's needs.

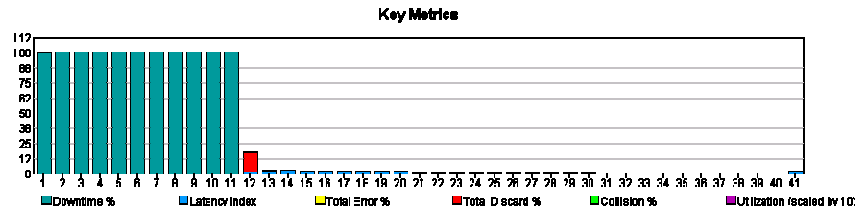


Most Underutilized, Congestion Leaders, Volume Leaders, etc. –

In addition to Exception Reports, Aruba produces a series of "leader" reports that will help to quickly isolate problem areas or opportunities to save money (i.e. reallocating frame relay CIR). In addition, any report can be sorted on demand by nearly any field, allowing you to zero in on peak hours, highest error rates, and other areas of Interest.



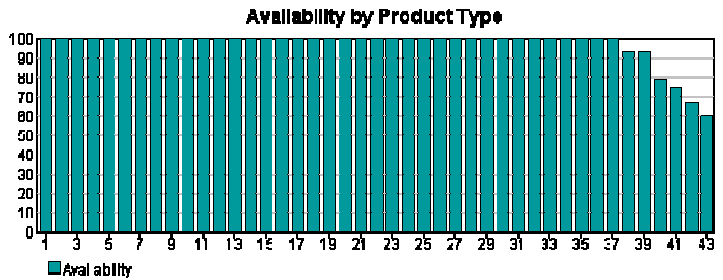
Exception Reports – Statistics are automatically compared against configurable sets of daily performance metrics. Aruba watches areas such as availability rates, current status, utilization, latency, congestion, error rates, and sustained, rapid growth. It then alerts you through the Aruba Alarm Monitor, which can be configured to send e-mails or traps to other Network Management Systems. Daily exception reports can highlight problem areas. If Aruba doesn't flag any



exceptions to profile, assuring that the network is operating according to your specifications.

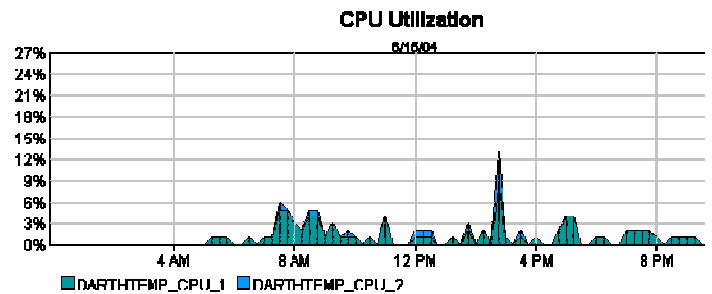
Chronic Exceptions – Aruba tracks components that appear consistently on daily exception reports and brings these chronic problems to your attention.

Service Quality – In service and out of service hours, availability, MTBF/MTTR and delays, and outage information are all in one place for convenient service quality review with your service provider. Because Aruba can provide this information as group-to-group comparisons, IT managers gain immediate insight into their network’s performance.

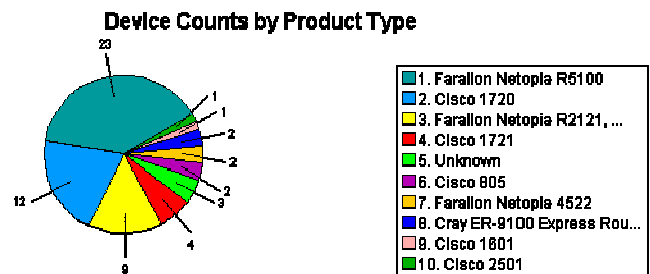


Aruba monitors critical servers for performance and troubleshooting

Server Monitoring -- CPU Utilization, Memory utilization, and LAN utilization are all monitored by Aruba allowing the user to detect memory leaks, CPU-intensive applications, and network usage. Aruba can generate alarms as disk drives near capacity, and Valencia’s proprietary CPU-balance algorithm will show how well your multi-CPU systems are functioning.



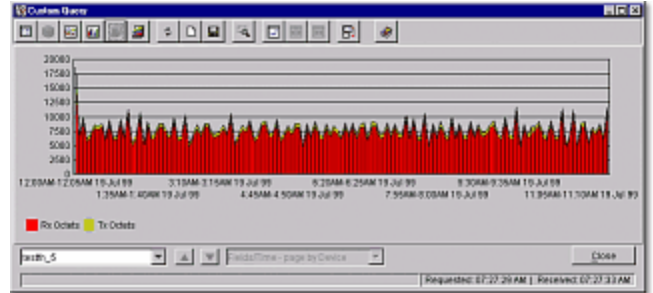
Asset Reports – Aruba automatically tracks the routers, switches, and servers in the network, easily visualizing assets in any group. Operators can quickly see what ports are configured, current software versions, and other useful configuration information.



Ad Hoc Queries

The Aruba Query performance data-mining tool, which is part of the Aruba Console, is powerful and flexible, yet easy to use. The Query tool supports:

- Flexible selection of components to view, by group or device
- Raw, hourly, daily and weekly aggregation levels
- The ability to choose which days (and optionally which hours across those days), weeks, months, quarters, or years to view
- The ability to select which component data fields to display
- The ability to filter queries (for example, only display ports with availability less than 98%)
- Converted or actual times for devices in multiple time zones
- Storage of selection definition templates, which can be made available to all Engineering users
- The ability to refresh a query, which is useful when viewing data for the current day and want to see data collected after the query was performed.
- Easy manipulation (sorting, pivoting, resizing, etc.) of query results
- Multiple graphical and chart formats of query results
- The ability to graph a selection of the query results data export to HTML or comma-delimited ASCII format file.



In addition to providing critical management information, Aruba provides features that increase utility, improve usability, and ease system administration:

Flexible grouping allows reports to be tailored to the individual user by line of business or functional area

Flexible Grouping – Aruba provides a flexible hierarchical grouping facility, allowing any device or component to be a part of any group or any number of groups. This facilitates such operations as branch-to-branch and Line-of-business reporting comparisons and easy maintenance of performance profiles. Grouping is also used in conjunction with secure access to determine what subset of the network each user is authorized to view. This can be used to offer a local network view to regional administrators or for network service providers to offer information to customers on only their portion of the network without revealing that data to other customers.

Secure, Partitioned Access – User access, whether for administration or reporting purposes, is secured by user ID and password. Users can be restricted to a subset of groups of devices they can see, whether they can perform custom queries on the database, and which reports they receive automatically via e-mail. Aruba Administrators can set temporary passwords and configure user passwords to expire.

XML-based Report Architecture -- Aruba's XML report architecture lets the customer build and edit Aruba's reports to fit the needs of their enterprise. Users can select and place a number of different types of charts that show historical data, calculate trends, and compare fields--including "Top N" charts for any statistic. Furthermore, it's possible to mix and match component types in a single report, providing an opportunity to create your own "Executive View" report displaying all of the important areas of your network--WAN interfaces, Server utilization leaders, LAN leaders, etc.

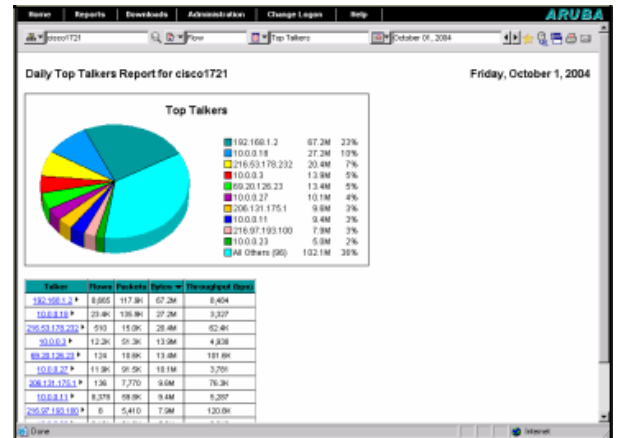
NetFlow

NetFlow technology provides the metering base for a key set of applications including network traffic accounting, usage-based network billing, network planning, as well as Denial Services monitoring capabilities, network monitoring, outbound marketing, and data mining capabilities.

Aruba Flow is a comprehensive solution for NetFlow-based billing, planning and monitoring

Aruba collects and reports on flow records from routers and switches that support Cisco's NetFlow, enabling extensive IP traffic analysis without the use of probes.

Cisco NetFlow IOS® tracks unicast IP Packets as they enter the router through a specific interface and tracks IP packets on a "per flow" basis. NetFlow answers questions regarding IP traffic: who, what, where, when and how. NetFlow provides information for troubleshooting, capacity planning, policy management, security, and cost and quality used to evaluate financial decisions. This information can be collected to produce a baseline and audit information to support the foundation of Business Service Management (BSM).



System scalability is a critical requirement

Traditional performance management solutions are not designed to handle the demanding, real-time raw data, requirements of NetFlow management. The historical IT environment, "pre-NetFlow", for gathering data was not constrained to managing large amounts of real-time data but utilized off-hour polling techniques to collect the raw metrics into a datastore for analysis. With NetFlow, the paradigm has changed. When NetFlow is enabled on a Cisco router, a NetFlow cache is built by the router to track flows as they enter the router in a 64-byte record (one per flow) that details each respective flow. The size of the NetFlow cache (NetFlow data storage) is dependent on the router platform and/or the amount of memory in the router. Most routers are optimized to dump cache before the router performance will be impacted. This requires a NetFlow management solution to support a, scalable, multi-tiered architecture for real-time collection and processing. Further, most performance management vendors will tout their ability to monitor a large number of interfaces but the reality is that this number is misleading. With NetFlow the number of interfaces is irrelevant as *NetFlow needs to scale to support the number of concurrent Flows*. This analysis of flow traffic could easily reach into the MILLIONS of flows.

Deployment

Because almost all routers support NetFlow (even non-Cisco devices), the capital investment required to use Aruba's NetFlow feature is very low. It is straightforward to configure, requiring only a few configuration commands to have the router automatically forward application traffic flow statistics.

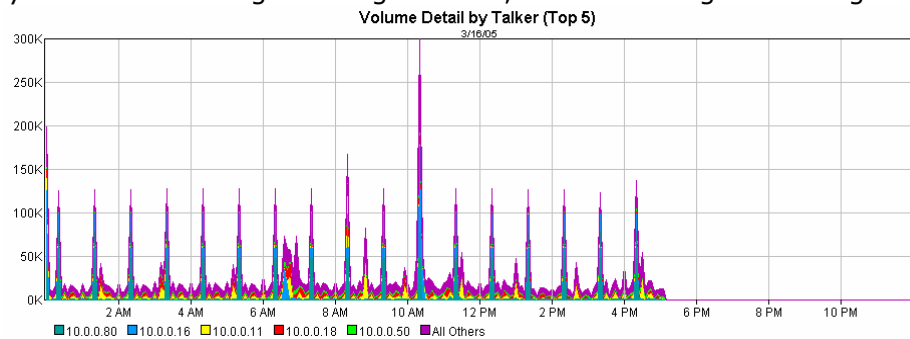
Aruba's NetFlow reporting overlays the infrastructure already monitored by Aruba; it takes advantage of Aruba's flexible grouping capability, secure portioned access, and XML-based reporting architecture.

Aruba's NetFlow feature adds the next level of detail to Aruba's extensive SNMP reporting.

Aruba's NetFlow feature adds the next level of detail to Aruba's extensive SNMP reporting, leveraging Aruba's multi-tiered architecture to *support the collection of MILLIONS of application flows* and the analysis to support operational decisions. At the report level, a user may literally "drill down" from the SNMP based report and quickly troubleshoot the specific application traffic that has caused the link utilization to spike. At the highest level, Aruba shows the following information for any interface or device:

- Top N Talkers
- Top N Hosts and Listeners
- Top N Conversations (Host Pairs)
- Top N Network Protocols
- Top N Traffic Types
- Top N Applications

Aruba can automatically detect that a WAN link has suddenly exceeded its baseline, and will notify a network manager. Using NetFlow, a network engineer can group of interfaces for the selected time period.



Network Protocols are based on server ports.

Aruba comes with a standard list of Network Protocols that map IP ports to Network Protocol names. Users can also define IP ports (and layer 4 protocols) as Traffic Types, and multiple port numbers can be mapped to the same Traffic Type.

Business Application definitions are based on IP Address/Port pairs. Users can define an Application as one or more pairs. An application can be running on multiple machines and/or multiple ports. Specific hosts, pairs, ports, etc. are also searchable which allows the detection of specific traffic (i.e. virus on port X). Aruba also supports full customized reports, queries against flow data and integration with 3rd party systems.

For more information regarding Aruba please see our website at <http://www.valenciasystems.com> or contact sales@valenciasystems.com

Aruba collects NetFlow to support the measurement of cost and quality for Business Service Management