



AGILE IP INDEX



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AGILE IP INDEX - OVERVIEW

For organisations seeking to reap the benefits that VoIP has to offer, it is vital to first be certain that the network has sufficient bandwidth to deliver high-quality voice calls without adversely affecting existing data services. It is also essential to identify in advance how many voice calls the network can safely support.

Further to this, networks are always subject to change, and simply assuring that the network is correctly configured at the outset does not necessarily mean that these conditions will be maintained in the future. It is therefore important to be able to monitor and manage network performance on a regular basis, as part of Business-as-Usual situations.

Agile's IP Index VoIP assessment and monitoring service embraces best-of-breed applications from leading suppliers, and enables these questions to be answered without the cost of pilot deployments or the risk and time demands of a trial-and-error approach.

Agile IP Index therefore forms an important component of Agile's Service Management offer, as part of the Availability Management process.

HOW IS AGILE IP INDEX USED?

Agile IP Index comprises two modes of operation;

- Pre-deployment Mode - Initial network assessment, prior to site deployment
- Management Mode - Ongoing network VoIP performance monitoring.

Each of these modes is described in further detail later in this document.

WHAT DOES AGILE IP INDEX LOOK FOR?

Agile IP Index measures three vital parameters relating to VoIP performance on a network:

- **Delay.** Because voice calls are real-time, full-duplex communications, end-to-end delay of packets can have severe repercussions on usability of the VoIP solution. Delay of less than 50ms is considered acceptable, while delay of more than 400ms is considered to be unusable. Agile IP Index provides accurate assessment of the one-way delay between any two points on the network.
- **Jitter.** In IP networks, not all packets suffer the same amount of delay. Variations in packet delay, also known as jitter, cause VoIP packets to arrive at their destination in uneven patterns. This can result in degraded voice quality. Typically, the solution to jitter problems is to increase the size of the jitter buffer in VoIP components, however this solution increases overall delay. Agile IP Index helps to determine ideal jitter buffer sizes for optimum voice quality.
- **Packet Loss.** Because of the small size of VoIP data packets, an occasional lost voice packet will have negligible impact. However, as packet loss nears or exceeds two percent, voice quality is degraded. Agile IP Index can help determine where there is congestion causing packet loss on the network so that this potential problem can be addressed.

HOW DOES THE PROCESS START?

The first step of the Agile IP Index pre-deployment service is the project initiation meeting between Agile and the customer. From this meeting, Agile develops the Statement-of-Work (in the case of pre-deployment mode), which is the basis of mutual expectation and sign-off.

The Agile IP Index management service is defined within the Service Commitment, agreed to between Agile and the customer as part of the Service Level Agreement.

In each case, information regarding projected call volumes and call quality expectations will be supplied by the customer. These two deliverables may vary between sites or business units. It is relatively common to define better quality calls for customer facing users such as customer service representatives than for operational staff who deal only with internal customers. Other factors such as the cost of bandwidth or switching equipment may also affect these decisions.

WHAT IS THE OUTPUT, AND HOW IS SUCCESS MEASURED?

The output from both the pre-deployment service and the ongoing management service is fully documented in text and graphical-based reports. The key performance criteria are agreed between Agile and the customer prior to project start, and any prerequisites for this performance established. Typically this will include Jitter, Round Trip Delay, and Packet Loss. Responsibility for achieving these parameters will depend on the commercial arrangements agreed to, and Agile has a proven ability to work with customers, network suppliers and service providers to achieve seamless support in this area.

The recognised international standard for measuring voice quality is “mean opinion score” (MOS), a number ranging from 1 (lower quality) to 5 (highest).

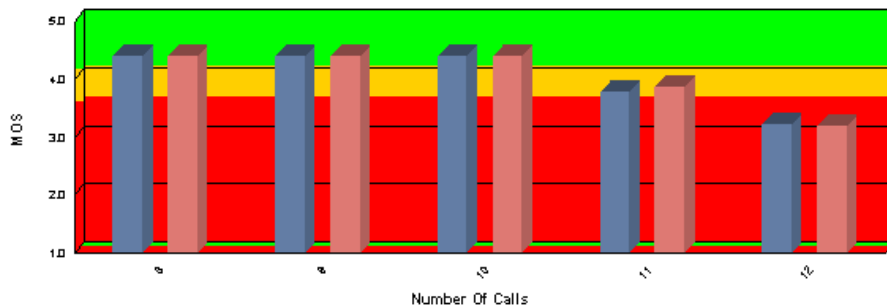
The applications within Agile’s IP Index measure impairments like loss, delay, jitter and other variances in the packet voice call. In the pre-deployment phase, these impairment measurements are applied to an algorithm and the result is the predicted MOS voice quality score.

Anything that scores at least a 3.6 on the MOS scale is considered general business quality; 4.0 and above is considered toll quality. For example, if 40 concurrent IP telephony calls are required to be able to properly run the business, the Service Level Agreement would reflect this by indicating that the network should be able to sustain 40 concurrent connections at 4.0 MOS voice quality or better.

Example 1:

The following chart illustrates a pre-deployment output, demonstrating the average quality for the number of calls tested along with the low and the high designated MOS thresholds (pre-deployment assessment). Observe that up to and including 11 calls the average MOS value is above 3.6.

The tables below indicate the agreed performance parameters (negotiated within each Scope-of-Work / SLA).



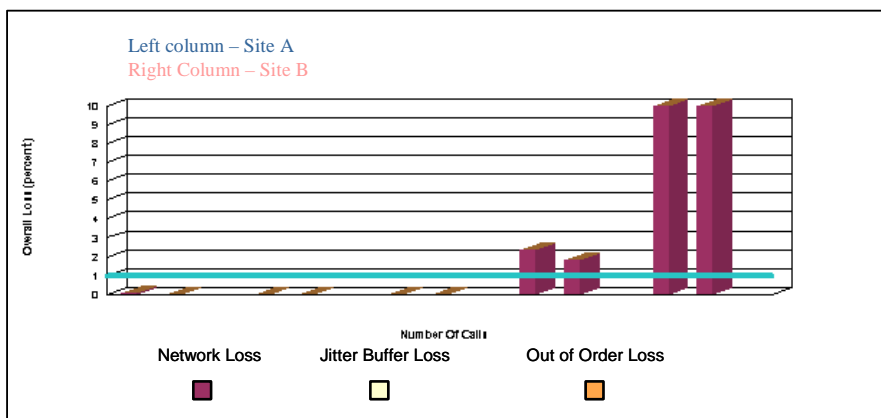
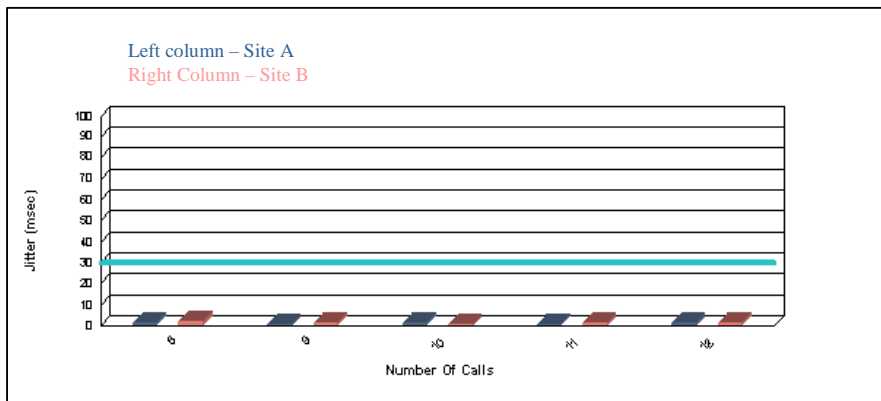
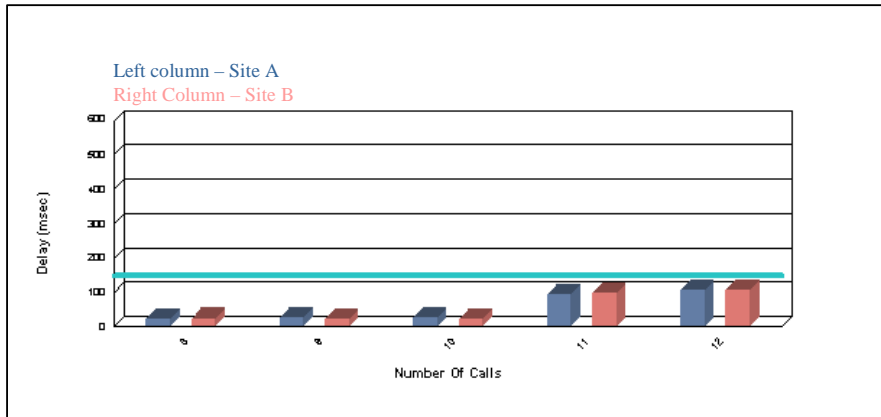
Left column – Site A
Right Column – Site B

Measurement	Good	Acceptable	Poor
MOS	Above 4.0	4.0 to 3.6	Below 3.6

Measurement	Good	Poor
Delay (msec)	Below 150	Above 150
Jitter (msec)	Below 20	Above 20
Loss (%)	Below 2	Above 2

Example 2:

The following three charts illustrate the average delay, the average jitter and the average overall loss values for the number of calls tested, along with the corresponding thresholds. This is also a pre-deployment output.



AGILE IP INDEX – PRE-DEPLOYMENT MODE

The Agile IP Index Pre-Deployment network assessment provides pre-deployment network evaluation to determine if the network is ready for reliable VoIP, and how many concurrent calls the network will allow.

The core pre-deployment application, NetAlly VoIP, uses software agents that are able to set up simulated voice calls and measure voice quality without the need for dedicated hardware platforms.

NetAlly VoIP can also test a wide range of standard network protocols and traffic. The software agents are managed by the central Test Centre (located at Agile) and are used to actively generate voice traffic between each other using pre-determined test criteria. Each software agent reports back to the Test Centre with the results of each test.

REMOTE EVALUATION

The software-based nature of the Agile IP Index Pre-Deployment service enables Agile to perform evaluations of client networks remotely. Traffic Agents distributed through the customer's network can connect to the Test Centre directly through the public domain or via a NetProxy for greater security (see diagram below).

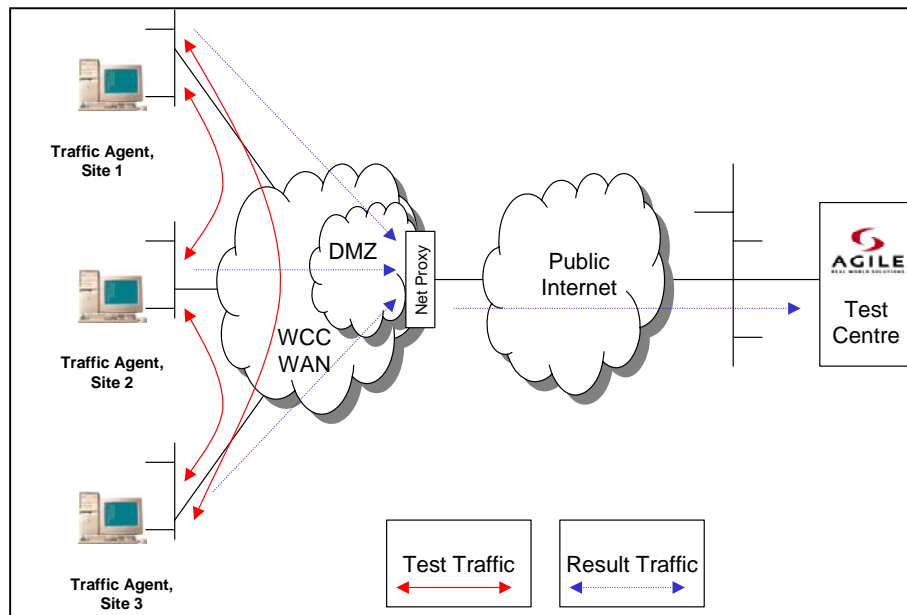


Fig 1 – Agile IP Index Pre-Deployment Mode, Remote Testing

AGILE IP INDEX, PRE-DEPLOYMENT MODE COMPONENTS

Test Centre

The Test Centre provides a full suite of network VoIP deployment tests and provides the Network Analysis troubleshooting tool. This enables the capability to test voice and non-voice applications such as web server, FTP server, DNS, DHCP and lower level TCP and UDP performance.

The Test Centre includes a web server to generate web-based reports, and drives the NetRegard java applet Traffic Agents. The Test Centre has a Sybase database to store test results.

The Test Centre is driven via GUIs that can be located on the same platform as the Test Centre or anywhere with a TCP connection back to the Test Centre (in the event that an instance is required to be installed on the customer site).

Traffic Agents

Traffic Agents are the devices that generate the actual test traffic and report the results back to the central Test Centre.

Traffic Agents are supported on Windows, Linux or Solaris and can be activated via local installation, pre-configured email installation, web download or, alternatively, a NetRegard java applet agent can be brought up on an end-user's machine by simply having the user navigate to a specified web page and enter a single use password. The NetRegard agent is active as long as the web page remains open, and leaves no software residue on the end-user computer.

WHAT PROCESSES ARE INVOLVED IN PRE-DEPLOYMENT MODE?

Roles and responsibilities

The starting point for the undertaking an Agile IP Index Pre-Deployment assessment is the establishment of roles and responsibilities relating to the test team. Agile can provide experienced engineering resource to work within a wider team, or can equally offer a turnkey analysis of network performance. Results are published in a high-level format that can be interpreted by business managers for further decision-making. Once roles and responsibilities are decided, Agile will prepare a Statement of Work (SoW) and commercial negotiations are then finalised.

Network Topology Definition

The network topology needs to be investigated with all components mapped out onto a network schematic diagram. The following additional supporting documentation is also required:

Ethernet switching and routing components; manufacturer, model and software versions

- IP Addresses
- QoS model
- IEEE 802.1p/Q capability
- VLAN design details
- Bandwidth
- Proposed VoIP solution connectivity
- Proposed Codec selection for LAN and WAN

Traffic Agent Deployment

The method of Traffic Agent deployment will have been determined during commercial discussions. Traffic Agents may need to be tested and approved by the customer prior to being deployed in the production environment.

Once this approval has been granted, the Traffic Agents are deployed in production and connectivity to the Test centre is established.

Change control procedures are used to lock down the network configuration.

Agile IP Index Evaluation Reporting

Over the following seven days network performance is measured and the results passed to the Agile Test Centre. Agile engineers ensure that the test platform components remain operational so that test data is not lost or compromised.

At the completion of testing, Agile engineers produce the Evaluation Report, which is then distributed to all involved parties. A follow up meeting is arranged (if required) to address any questions in regard to the report.

One of the key outputs is a graphical display of the Mean Opinion Score (MOS) rating of the IP network. Business owners can then quickly establish through Agile IP Index whether or not their IP network is voice-ready. This also forms an important part of the sign-off and acceptance process.

The value of NetAlly VoIP network assessment can be easily seen in the reports automatically generated by the system. Reports are generated in Microsoft Word format for easy customisation.

Please Note: If the Agile IP Index shows the IP network is not meeting VoIP expectations, Agile will conduct or assist with troubleshooting as required. However it should be noted that this activity is normally outside the scope of the Agile IP Index, and is subject to separate commercial negotiation.

AGILE IP INDEX – MANAGEMENT MODE

This service provides a crucial role after the initial deployment, continuing to verify voice and data performance on an ongoing basis and diagnose network performance problems in real time.

Again Agile has selected best-in-class applications for this purpose – Avaya Integrated Management.

Avaya Integrated Management provides a comprehensive set of tools that make it simpler to manage converged network infrastructures. The applications in this set of tools manage both voice and data communications through common web-based user interfaces designed for System Management, Network Management and Application Integration platforms.

With this comprehensive set of tools, Agile is able to gain an end-to-end view of the VoIP system. Engineers can configure, monitor, and optimise the performance of Avaya Media Servers, Gateways and endpoints, monitor VoIP traffic, manage QoS policies and control IP voice network quality.

Avaya Integrated Management complies with widely accepted standards, such as Simple Network Management Protocol (SNMP) and Lightweight Directory Access Protocol (LDAP), and runs on standard operating systems such as Red Hat Linux, Microsoft Windows 2000, and Sun Solaris.

Avaya VoIP Monitoring Manager (VMON Manager)

Avaya VMON Manager is a QoS monitoring and feedback software tool that allows the visualization of real-time operation of VoIP systems. The tool provides information on QoS parameters related to VoIP quality, and the ability to view QoS related information through a web-based client GUI application that can be accessed from the customer's LAN or via Agile's Network Operations Centre.

Avaya VMON Manager enables monitoring and review of the quality of any call on an Avaya VoIP Network. Using the Avaya VMON Manager enables viewing of the QoS data (i.e. the Jitter, Round Trip Time (RTT) and Packet Loss) experienced at the endpoints and during a session. This data displays in real-time or for previously active endpoints. With this highly detailed information, engineers can begin to troubleshoot and isolate problems.

Search Endpoints

Using the SQL Database within VMON, engineers (and users) can search endpoints active from a specified time in the past or between a date range, in order to determine performance parameters associated with specific calls or users. Advanced search options enable narrowing of the search to match phone numbers, network addresses, or QoS levels.

View and Export Reports

Once a list of endpoints has been collated, further selection can be made of an endpoint or endpoints in a session, and the relevant report viewed. The reports display the full QoS data (i.e. Jitter, Round Trip Time (RTT) and Packet Loss). This is particularly useful for monitoring gateways or locating problems at a particular endpoint. The ability to view reports for endpoints involved in a session greatly assists with determining problems that occur between two endpoints or in an isolated area of the network.

Report data can be exported to the customer in a comma separated value (csv) file. This file can be opened in most database and spreadsheet programs such as Microsoft Excel. Exporting the data to a spreadsheet enables manipulation of the data so that users may create their own reports.

Generate Automatic Alarms

Alarm monitoring, via SNMP Traps, allow the Monitoring Manager to alert when the Jitter, RTT or Packet Loss reaches certain pre-determined threshold levels. This service is used to routinely monitor the network, and troubleshoot problems.

AGILE IP INDEX, MANAGEMENT MODE COMPONENTS

The VoIP Monitoring Manager incorporates the Avaya VoIP Monitoring Manager RTCP Monitor and the Avaya VoIP Monitoring Manager Server, which accepts connections from the Avaya VoIP Monitoring Manager Client. The components and their relationship are described in more detail as follows:

Avaya VMON Manager Server

The Avaya VoIP Monitoring Manager Server acts as a proxy between the Client and the RTCP Monitor, which may be located at Agile (in the case of Agile's managed service). The main purpose of the Server is to reduce the amount of traffic to the Client by performing large data downloads and extensive processing of the MIB data stored on the RTCP Monitor. The Server can reside on the same PC as the RTCP Monitor.

Avaya VMON Manager RTCP Monitor

The RTCP Monitor collects the RTCP packets sent from the Avaya endpoints and stores the information in a database. The RTCP Monitor also runs as a sub-agent of the Windows SNMP agent. All the information contained in the database can be queried through SNMP.

Avaya VMON Manager Client

The Avaya VoIP Monitoring Manager Client provides the graphical user interface (GUI). The Client does not communicate with the RTCP Monitor and does not use the Windows SNMP service. The data that is displayed is gathered from the Server. The Client may be installed on the same machine as the Server, or it may be installed on another machine on the network. It is possible for the Server and the Client to communicate over a dial-up connection.

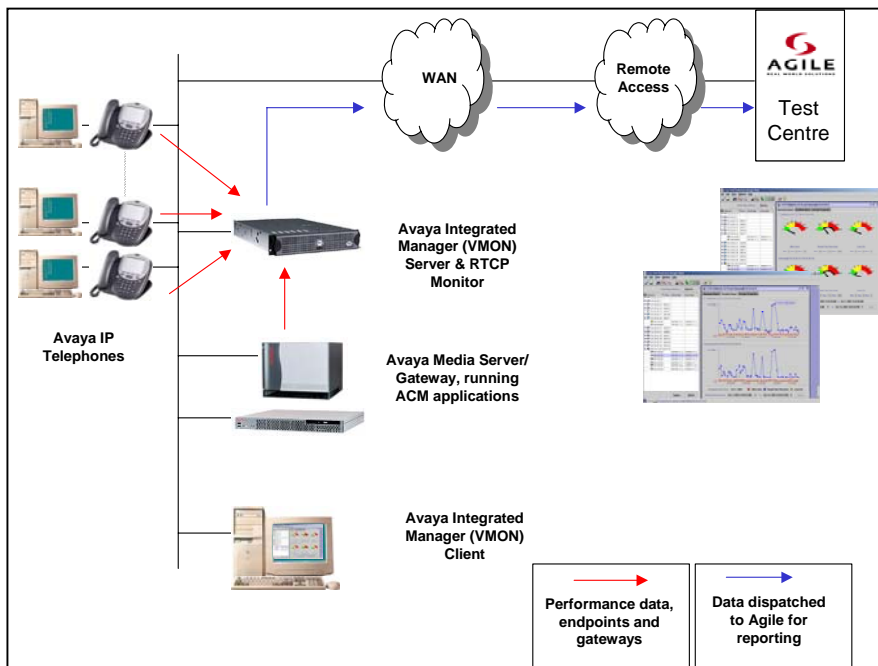


Fig 2 – Agile IP Index Management Mode, Remote Access

WHAT PROCESSES ARE INVOLVED IN MANAGEMENT MODE?

Initial setup

The Avaya VMON Manager application leverages the inbuilt capabilities of the Avaya Media Gateways and Endpoints (typically IP telephones and IP softphones).

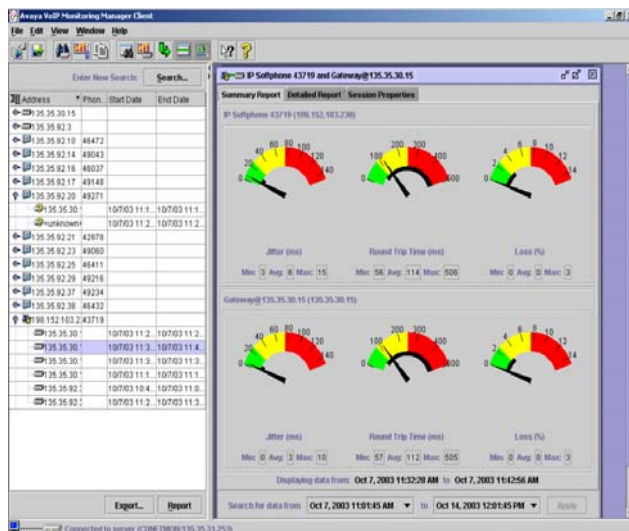
It is a requirement to have a VMON Manager Server installed on-site, for local collection of statistical data. Further to this it is also recommended that a client machine be allocated for installation of VMON Manager Client, so that the customer has access to the VMON Manager capability on a local basis.

In the event that Agile is providing regular IP Index Management Assessment as part of the Service Level Agreement, Agile will also require access to the VMON Manager Server, typically via RAS (Remote Access Server) or via dialup.

Managed Service

Under the Managed Service scenario, the Service Level Agreement will stipulate the parameters to be measured, the performance levels to be monitored, and the reports that are to be supplied (according to the agreed reporting frequency).

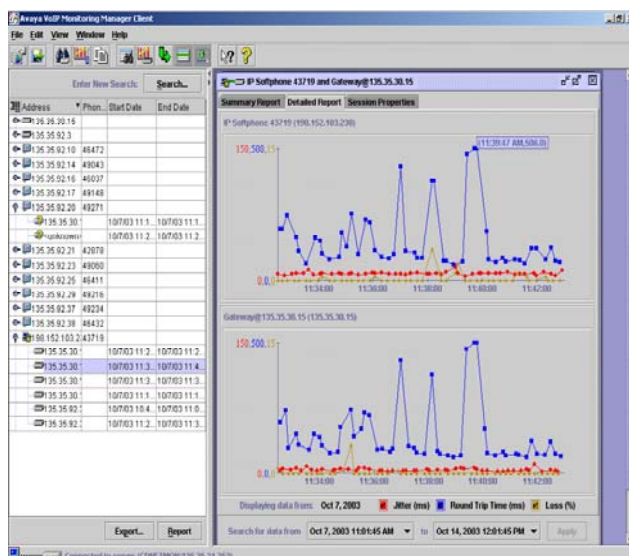
Responsibility for achieving VoIP performance parameters will depend on the commercial arrangements agreed to, and Agile has a proven ability to work with customers, network suppliers and service providers to achieve seamless support in this area.



Example 1

Displays a summary report showing the minimum, maximum and average delay (latency), jitter and percentage packet loss for session data

Uses SQL storage setting & increased capacity for history reports on service levels



Example 2

Avaya IP end-points calculate network quality statistics based on the timing and sequence numbering of the VoIP packets received.

The monitor gathers the statistics for all the end-points at a central location.

Allows users to view graphs and summary reports of this data.

Send alarms when QoS drops under given thresholds.

AGILE IP INDEX PRICE MODEL

The Agile IP Index service is billed in either of two ways;

- Project-based fee for initial VoIP Network Pre-deployment Assessment
- Monthly fee per monitored site under the Management processs. A monitored site can be either a single office or a particular subnet of a larger LAN.

Full details of the Agile IP Index pricing are determined on a case-by-case basis, depending on customer requirement, site size, and complexity.

ABOUT AGILE

Agile, a subsidiary of the Comworth Group, has had a long-standing association with two of the leading suppliers of voice processing and contact centre technologies in the world - Avaya and NICE.

With Agile's depth of experience across a wide variety of industry verticals and the committed support of these world-leading organisations, Agile has the expertise, the know-how and the tools to help organisations get a superior return on the investments they make in communications technologies.

More than 60 highly skilled people, a large group of dedicated business partners, hundreds of installations, thousands of applications and a host of satisfied customers speaks volumes for Agile's commitment to delivering the best solutions, training, service and support.

Nothing matters more than our customers. Nothing.