Citrix® EdgeSight™
Performance Management Architecture
Executive Overview

The Citrix® EdgeSight™ Product Line from Citrix is built on the EdgeSight Performance Management Architecture. The architecture provides a flexible and powerful foundation for managing application performance, capacity planning, and software usage across the Citrix Access Platform. The technology enables centralized management of distributed systems, ranging from Citrix Presentation Servers to endpoint desktops, laptops, and point-of-sale devices. Ensuring visibility into the end user’s experience is increasingly challenging due to a complex IT environment consisting of a heterogeneous mix of systems, application delivery methods, home-grown and third party applications and differing modes of connectivity. Compounding these challenges is an increasing reliance on application access and performance as mission-critical to achieving business objectives.

EdgeSight addresses these challenges and provides a uniquely easy-to-use performance management solution enabling companies to have real-time visibility into application and system performance from the end-user perspective. This enables IT organizations to improve service availability and more effectively diagnose and repair problems when they do occur.

The patent-pending distributed processing technology of the EdgeSight Architecture enables enterprise scalability and performance to thousands of endpoints and to Citrix Presentation Server farms supporting tens of thousands of concurrent users. Transparent agents provide local collection and analysis without compromising system performance. Advanced server-side analysis capabilities deliver efficient processing and reporting.

This document discusses the technical aspects of the EdgeSight Performance Management Architecture and how it is designed to address the complexity, scalability, and security issues of managing application performance across the Citrix Access Platform for large scale, diverse, and distributed end-user communities.

System Overview

Citrix EdgeSight components include an agent, server, and administration and reporting console. (See Figure 1 EdgeSight Architecture.)

EdgeSight utilizes an advanced distributed architecture built around powerful, yet transparent agent technology. Each agent employs a highly optimized data collection engine that continuously captures and collates system, application and network statistics for scalable visibility to actual end-user experience and run-time data. Employing a database at each device, EdgeSight continuously captures and correlates crucial information about application performance and the way end-users interact with the Citrix application delivery environment. Agents are specifically designed to be unobtrusive to the environments they monitor and are architected to passively collect and store data without impacting application and system performance. Low, imperceptible overhead is achieved by distributing the data collection equally among processes. The agents communicate with intranet based servers via HTTP or HTTPS and deliver compressed payloads, only sending aggregated data in order to minimize network overhead. Communication and data processing is done at off-hours by default or as scheduled by system administrators.

The EdgeSight Server is built on the latest Microsoft®-based robust technologies including ASP.Net, IIS, COM+ transaction services, Microsoft MSMQ, SQL Server and Reporting Services control.

The EdgeSight Console provides secure access to web-based reporting and administration capabilities from any web-enabled desktop.
EdgeSight System Monitoring Agent
The EdgeSight agent is designed to be a low-impact continuous data collection and inspection engine. By leveraging integration with the endpoint system, the agent postpones correlation and database operations until spare cycles are available or the end-user is away from the device. Presentation Server agents intelligently distribute the correlation and database operations evenly in order to minimize spikes that may impact performance for connected users. In these ways, EdgeSight does not impact end-user performance.

Continuous Collection and Compare
The EdgeSight agent runs 24x7 and collects a comprehensive set of relevant end-user system metrics:

Table 1 EdgeSight System Metrics (partial list)
- System CPU, memory and disk performance
- Application performance and stability
- Application errors and context
- Application crashes and context
- Application usage and task activity
- Hardware and software configurations and changes (per device)
- System reboots
- Network response, delay, and round-trip time
- Web-based network transactions

Notably, metrics such as critical application and service resource statistics are only recorded when the device is actually in use. This improves the accuracy of the recorded metrics and avoids capturing utilization data for non-critical tasks like screen savers. It also ensures an accurate view of performance as experienced by the end user.

The agent also analyzes statistics in real-time and can proactively alert when abnormal conditions and poorly performing applications are detected. If an application crashes, EdgeSight sends an alert along with a complete detailed capture of everything that led to the anomaly.

Hierarchical Granularity
EdgeSight utilizes both the agent and the server components to aggregate and analyze data from across the enterprise. For example, on each client, system and application performance is monitored and captured at 5 second intervals. This fine-grained data is aggregated to 5 minute slices and kept for 7 days. If a mobile device is disconnected from the network the aggregate, consolidated data is maintained for up to 30 days. The EdgeSight server then collects data from each device on 1 hour aggregates.
An advantage of hierarchical granularity is that the existing detailed data remains at each device for diagnosing the problem and determining root cause (See Figure 2 Remote “What Just Happened?”) while endpoint data is continuously summarized at the server.

**Correlation**

The agent collects a wealth of information about processes running on the machine. The data collected falls into two distinct categories, performance data and event data. Event data is collected as it occurs, and a variety of event based alerts can be configured to flag exceptional conditions administrators might be interested in. Performance data is collected at the data sample period, and performance based alerts can be defined for targeted conditions which are evaluated periodically. The result is a single database source of correlated event log, application activity, and network and system performance information. Completely correlated statistics and end-user activity are available through an OLE-DB/ADO provider or an Excel Spreadsheet.

**Fault Capture**

EdgeSight provides application fault capture and analysis. When an application fault occurs, the complete context for the machine, end-user and application are captured along with a memory dump, stack traces and detailed module list for the failing application. The “core” dump and XML summary are compressed in special payloads and uploaded to the EdgeSight server whenever network bandwidth is available and system resources are free.

**Application Instrumentation**

EdgeSight instruments all applications running on a Windows® device. Through low-level injection techniques, EdgeSight monitors every running application for detailed module usage, version information, activity monitoring, fault detection and error trapping. Each EdgeSight agent employs a sophisticated queuing engine to collect time sensitive data. These application queues enable EdgeSight to record a complete volume of events while remaining unobtrusive on a workstation or Citrix Presentation Server. (See Figure 3, EdgeSight Instrumentation and Queuing.)
Workflow and Scheduling Engine

EdgeSight leverages its embedded database for detailed configuration, alert notification, and an intelligent scheduling engine. Real-time alert notifications can be configured as a group or individually and are tied to the scheduling engine. The alert configurations enable flexible criteria and matching capabilities. Each alert notification can trigger one or more actions such as an email message or SNMP trap.

Figure 3 EdgeSight Instrumentation and Queuing

The configuration information is sent to the desktop agents the next time the device connects to the network or it can be pushed to the agents at the time of the change.

Intelligent Communication

EdgeSight agents communicate with the EdgeSight server via compressed payloads over HTTP or HTTPS. The timing of the communication takes into consideration multiple scheduling, bandwidth, and idleness constraints. When the EdgeSight agent communicates with the server, only the latest changes are queried against the embedded database and the aggregated results are sent back to the EdgeSight Server.

Custom Events

EdgeSight includes a light-weight, simple API that enables events to be written to the EdgeSight embedded database, enabling application developers to see exactly what is happening on the machine at the time the event is written. These events can be used for production performance monitoring inside an in-house developed application or integration component like a Microsoft Office® add-in. Events can be utilized to trigger agent actions such as notification to the server that a critical error has occurred.

Self Updating, Autonomous

EdgeSight agent design ensures error-free operation and transparency in the event of database corruption or low-memory conditions. If a problem does occur, the EdgeSight agent restarts and corrects any database problems that may have occurred. This ensures data integrity and continuation of operations.
Table 3 EdgeSight for Endpoint Agent Platform Requirements

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<tr>
<td><strong>OS</strong></td>
<td>Microsoft Windows XP, Microsoft Windows 2000 Professional or Server SP3 or higher, Microsoft Windows Server 2003</td>
</tr>
<tr>
<td><strong>CPU</strong></td>
<td>500 MHz or higher recommended</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>128 MB of RAM (256 MB recommended)</td>
</tr>
<tr>
<td><strong>Disk</strong></td>
<td>100 MB free space (25 MB of disk space for product installation and 75 MB disk space for the database).</td>
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EdgeSight Server

The EdgeSight server is designed to support scalable data collection and aggregation, real-time alert rules processing and real-time remote queries against the EdgeSight agents.

The EdgeSight server backend is based on relational database technology from Microsoft and utilizes Microsoft SQL Server. The EdgeSight server front end is utilized for reporting, real-time communications, alerting, and agent configuration and leverages Microsoft IIS and Microsoft Reporting Services.

Table 4 EdgeSight Server Requirements

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<thead>
<tr>
<th>Web Server</th>
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<td><strong>OS</strong></td>
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<td><strong>Disk</strong></td>
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### Database Server

<table>
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<th>OS</th>
<th>Windows 2000 Server (SP4 or greater) or Windows Server 2003 recommended.</th>
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| Database | - SQL Server 2000 SP4 Standard Edition (or better), or SQL Server 2005  
|        | Note the following configuration requirements:                          |
|        | - SQL should be configured to use Mixed-Mode Authentication or SQL logins. |
|        | - Network DTC access is required                                       |
|        | - Microsoft SQL Server Reporting Services SP2 (on SQL Server 2000 SP4). Reporting Services is included with SQL Server 2005. Reporting Services can be installed on a separate machine form the data source. |
|        | - SQL Agent Service running and set to start automatically (if Reporting Services is installed on the machine) |
| CPU | 2 GHz or faster CPU |
| Memory | At least 1 GB of RAM, 2GB recommended |
| Disk | Minimum 20 GB free space |

### Notes:

1. The Web Server (IIS), Database Server (SQL Server), and Reporting Services can be installed on the same machine. We recommend having at least 2 CPUs in such a configuration.
2. EdgeSight Server Console users must have Internet Explorer version 5.5 or greater.
3. For testing purposes, the EdgeSight Server can be installed on Microsoft Windows 2000® Professional and Windows XP® Professional. However, Internet Information Services will be limited to 10 concurrent connections and one Web site. More than one Web site can be created, however, a maximum of one can be running at any given time. It is important that all running Web sites are stopped before performing an installation.

### Services

EdgeSight runs its Server Script Host (SSH) as the application service component running in tandem and communicating with the IIS Server(s) utilizing Microsoft Message Queuing (MSMQ). SSH is an administrative and application service that runs a variety of interpreted threads on each EdgeSight server. The SSH threads are responsible for a variety of tasks:

- **Offline payload loading**
  Offline payload loading enables an EdgeSight server to scale and support OLAP and OLTP requirements on a single server. By loading payloads in an offline manner EdgeSight can best control the server load and service real-time alerts and other aggregation requirements.

- **Real-time, scalable alert processing**
  SSH threads wait on MSMQ queues for reading and processing real-time alerts from each EdgeSight agent. Very small and efficient alerts are delivered to the IIS web server. The alerts are then queued to an SSH thread where they are further processed and analyzed before being stored in the database.

- **Scheduling, archive, and job running threads**
  EdgeSight integrates database maintenance tasks with offline loading and other processing to attain high scalability and fine-grained control over the web server and database server load.

- **Systems management integration**
  SSH threads service integrates EdgeSight with systems management solutions by offloading alert processing from other alert receiver threads. EdgeSight asynchronously balances the communication with external applications.

### Real-time Alerting and Historical Metrics

Once you have configured alert rules, EdgeSight always displays the most relevant alerts and critical end-user conditions in real-time. Following agent processing and analysis, an HTTP “bullet” is sent to the EdgeSight server where it is read and queued to an available SSH thread.

Once the queued alerts are received by an available SSH thread, the alert is stored in the database and the set of actions to take on the alert is read and processed. Further queuing and aggregation of alerts takes place in various SSH threads. Additional queues are maintained for each integration toolkit and email processing.
**EdgeSight Reporting**

EdgeSight generates a useful, easy-to-read and actionable set of web-based reports. EdgeSight reports can be viewed with the same hierarchy and configuration shared by an enterprise directory system such as Active Directory. A console administrator can start at the top of the “tree” for a high-level view of the organization units (OUs) and drill down for a narrower view. If an enterprise directory is not used, then a custom hierarchy can be set up and maintained.

Wherever relevant, reports display both recent aggregations and baseline or historical aggregations along with changes between the recent and baseline. Drill-down capability is available for immediate detail at the server or client database.

Custom groups can be defined using any of the metrics collected by EdgeSight. For instance a group can comprise all single processor devices or all systems running Windows XP. Custom reporting is also available via Microsoft Reporting Services and data can be automatically delivered via email or web portal using EdgeSight subscription services.

**Built-in Security and Tolerance**

EdgeSight integrates with Microsoft Active Directory for console operator configuration and security. EdgeSight can be configured to allow report viewers by an AD or NT security group. Further granularity and permissions can be granted by security group. Console administrators can be “rooted” anywhere in the hierarchy so that their permissions are granted only to the OUs below. By default, communications between the EdgeSight agents and the server are encrypted via HTTPS. Since many enterprises are geographically diverse and sometimes require communications via the Internet, information payloads are also signed and verified in order to protect the integrity of the communications.

EdgeSight servers are designed to be fault tolerant. Leveraging distributed embedded databases, EdgeSight servers can be offline for up to 30 days before information is lost. Since the aggregated data is kept on the EdgeSight client databases once an EdgeSight server is back online, all connected EdgeSight agents automatically recover.

**For More Information**

For more information on Citrix EdgeSight products, please go to http://www.citrix.com/edgesight.
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