Technical and Architectural Overview
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Introduction

In today’s constantly changing technology environment, corporations are determined more than ever to implement solutions that are based on standard technologies and platforms. This effort is being driven by both Finance and IT departments in an effort to improve ROI and have a direct impact on the bottom line.

Time America, Inc. has a rich, history of providing solutions that meet and exceed our customers’ expectations. Time America’s XactTime® product is built on a standard, non-proprietary web-based architecture that allows companies to harness their corporate information with the peace of mind that their system will not become tomorrow’s legacy problem.

Recognizing that customers’ configurations come in many different shapes and sizes, XactTime provides a solid foundation to meet the varied needs of enterprises small to large. Offered in a licensed or hosted model, XactTime was designed from the top down to meet both the business requirements and web-based technical demands of today’s enterprises. Its flexible design and use of proven distributed technology is critical to meeting the high volume and availability requirements of these environments. This document provides an in-depth look at the technology and architecture behind Time America’s products. It discusses some of the underlying factors for determining a deployment configuration and provides and in-depth look at some of the driving factors in sizing and configuration of a system. Lastly, it explores four configuration scenarios for companies of varying sizes and environments.
Technology Platform

Time America has adopted Microsoft tools and platforms as a corporate standard for its product suite. Microsoft delivers best-in-class tools and platforms with the reliability, performance, scalability, and manageability required by enterprise solutions.

XactTime utilizes Microsoft Windows 2000 or 2003 Server as a deployment platform because of their proven history. Windows Server is used to provide web and application services with high reliability, efficient management, and support for the latest advances in networking hardware. It provides the best foundation for integrating your business with your Intranet and the Internet.

XactTime utilizes Microsoft SQL Server 2000 or 2005 as the database server. Microsoft SQL Server provides high performance, scalability, and reliability. Beyond these core enterprise qualities, Microsoft SQL Server provides agility to your data management and analysis, allowing your organization to adapt quickly and gracefully to derive a competitive advantage in a fast-changing environment. Microsoft SQL Server provides the lowest cost to performance ratio. In test after test, Microsoft platforms have not only scaled to the highest levels, but have also done so at a lower cost.

Development Tools
Development tools play a fundamental role in the effective use of information technology to build enterprise applications. Development tools enable organizations to create, customize and integrate the corporate applications that can turn information technology into a competitive edge in the marketplace. Time America utilizes Microsoft Visual Studio (including C# and VB.NET) to address all aspects of application development, including user interface, middle-tier component development and assembly, and data access component development.
Application Architecture

Integrated enterprise applications are a primary focus for Time America. Building such applications requires up-front attention to the design process, and requires modular, open application architecture.

To meet these requirements, Time America’s enterprise application architecture includes intelligent application partitioning, the use of modular and reusable components, scalability, distributed services, and open interoperability with third-party applications.

The application architecture is logically divided into the User Interface, Business Object and Data Access layers. This architecture provides a flexible component-based structure that is ideal for web applications.
**User Interface Layer** - Developed as Active Server Pages (ASP), this layer contains the code for all user interface components. ASP runs under Internet Information Server (IIS) and communicates with the COM objects for accessing data and business logic of the application.

**Business Object Layer** - The business object layer contains the code to interact with both the User interface and data access layers. Business objects contain the specific business logic that is performed by the user interface on the data.

**Data Layer** - The data layer accesses the data from the database. COM objects in the business object layer use Microsoft ActiveX Data Objects (ADO) to expose data from the data store into usable row sets.

This architecture provides several fundamental benefits, such as:

**Multi-tier partitioning** - The application can be partitioned into independent layers for user interface, middle-tier business logic and data access. This provides flexibility and modularity so that applications can be easily adapted to changing requirements and varied customer configurations.

**Reusable Components** - All business logic is encapsulated into reusable Component Object Model (COM+) components. COM+ components can be transparently distributed across middle-tier servers on a network.

**Scalability** - Middle-tier business components are run within Microsoft’s COM+ Transaction Server, which provides seamless support for distributed database transactions based on the XA standard, and thread/resource pooling for servicing thousands of concurrent users.

**Support for Standards** - The architecture is based upon the Worldwide Web Consortium (W3C) standards HTTP and HTML. In addition, other standards fully supported include SSL, SQL, ODBC and web services.
Application Components
XactTime can be broken down into its individual application elements or services. These elements consist of different front-end and back-end components performing specific functionality within the application. Understanding application components is important to determine a proper deployment configuration for your enterprise.

The Servers can be broken down into the following two components:

Web Servers
Queue Servers

These servers can be configured to run on one single physical machine or load balanced across several machines for performance and scalability. Load balancing is accomplished using either Microsoft Windows load balancing service or a separate hardware or software load balancer.

Web Servers
Web servers provide all user interaction to the application. The web servers consist of Active Server Pages (ASP) and COM components to provide a flexible and high performance web-application
architecture. They perform session authentication, session timeout, redirection, cookie management, COM communications, data access as well as a variety of business logic and HTML generation functions on each user request.

The web server is designed to function in a stateless environment. XactTime’s stateless design allows the web servers to be configured to load balance on a per request basis. This type of configuration affords the highest level of performance and fault tolerance. For example, if the web server’s hardware or software services fail at the time a user clicks on a link to request a new page, the request would automatically be routed to the next available web server and the user would not be impacted. Similarly, in the worse case scenario where the server failed in performing the request, the user would receive a “page cannot be displayed” error and be instructed to refresh the page. Upon hitting refresh, another server automatically processes the request and the user continues to perform the function.

The web servers are installed and configured on servers running Microsoft Windows 2000 or 2003 Server and Internet Information Server (IIS). ASP pages are installed in appropriate web directories and the DLL’s are registered in COM packages.

Queue Servers
The queue servers handle all reporting and employee schedule generation. XactTime comes with standard reporting services that allow users to view and print canned reports online. The queue servers provide the functionality to handle the front-end user interface for users to run, view, and export reports to the back-end functions accessing the data and building the reports. Report data can be downloaded or exported in a number of standard formats (pdf, rtf, xls, tiff) through reporting services to give customers the ability to do ad-hoc reporting. The exported data can be used in Excel or any 3rd party report writer to build ad-hoc views. In addition to reports, standard exports exist for the most popular payroll packages like PrimePay, ADP, and Paychex.

The queue servers run independent of the web servers. If a large number of report requests come in at the same time, the queue servers will intelligently handle each report request, spanning new threads for each report while balancing the number of concurrent reports running at one time. With this methodology no user will experience a slow down of the web site while reports are being generated.

Data Collection
Most enterprise systems will require data collection terminals like bar code/magnetic badge readers or hand recognition terminals. These devices seamlessly incorporate into the XactTime system via a hardware polling utility. This small utility, which is installed on a Windows PC, connects to the XactTime servers and retrieves information about employees and their respective schedules. At a pre-defined time it uploads this data to the terminals using a variety of communication methods including serial (RS232, RS485), modem and Ethernet (TCP/IP). XactTime can be configured to retrieve the information in the terminals as frequently as desired. The punch data is downloaded from the terminals and sent to the XactTime servers where it is processed. The polling utility is run as a Windows service so once it is setup there is no maintenance associated with it.
Offered in a licensed or hosted model, determining the right licensed deployment architecture for a corporation is a tricky task. Many factors must be considered to determine the appropriate hardware and software configuration. Considerations such as peak concurrent usage, fault tolerance, availability, corporate environment, application architecture, performance and platform influence how a system should be implemented in an enterprise. Corporate IT staff will need to consider these and other factors to determine the appropriate configuration for their environment.

**Corporate Environment** – The corporate environment will ultimately determine the type of deployment architecture. Questions such as “Is the solution to be implemented in a single or multi-site scenario?” or “Should you implement a centralized or decentralized solution in a multi-site scenario?” must be considered before all others. Answers to these questions will undoubtedly raise additional questions on LAN/WAN configurations, IT staff availability, costs, etc…

**Usage** – Many corporations size their equipment according to expected peak usage levels. The simple question of how many users you expect to log in and use the application concurrently will determine how many servers will be required. To determine concurrent usage, you will need to calculate the number of different types of users (supervisors, employees reporting time using web services, administrators), by shift, geographic location and time zone. Often, the number of workstations in a corporation with multiple shifts will be a limiting factor for peak concurrent usage. Generally, industry averages for concurrent usage of XactTime systems are five-percent of the total employees being managed. However, this percentage will be higher for enterprises with employees using Employee Self Service to report their time. This factor will also vary depending on industry and the corporate environment.

**Performance** – Many enterprise systems do not have measured performance statistics on a per-user basis to determine server sizing and configuration. Time America products have been load tested at various levels to determine performance capabilities. On average, you can expect to service 250-300 concurrent users per CPU on a dedicated web server. For configurations where multiple services
(database, web, application, reporting, etc.) are installed on the same server, the number of concurrent users per CPU will be decreased.

**Sizing Chart**

The following chart provides a sample employee to server ratio in a licensed software environment. Many factors discussed in this white paper may affect how many servers are required for deployment. This chart does not include machines required for data collection. Typically, these machines are standard PC’s and not high end servers.

<table>
<thead>
<tr>
<th>Total Employees</th>
<th>Servers</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 750</td>
<td>1</td>
<td>1 Database/Web/Queue Server</td>
</tr>
<tr>
<td>751 – 2,500</td>
<td>2</td>
<td>1 Database Server 1 Web/Queue Server</td>
</tr>
<tr>
<td>2,501 – 6,000</td>
<td>3</td>
<td>1 Database Server 1 Web Server 1 Queue Server</td>
</tr>
<tr>
<td>6,001 – 12,000</td>
<td>4</td>
<td>1 Database Server 2 Web Server 1 Queue Server</td>
</tr>
<tr>
<td>12,000-18,000</td>
<td>5</td>
<td>1 Database Server 2 Web Servers 2 Queue Servers</td>
</tr>
<tr>
<td>18,001-24,000</td>
<td>6</td>
<td>2 Database Server 2 Web Servers 2 Queue Servers</td>
</tr>
<tr>
<td>24,001 – 30,000</td>
<td>7</td>
<td>2 Database Server 3 Web Servers 2 Queue Servers</td>
</tr>
</tbody>
</table>

**Minimum Implementation Requirements:**

All of the servers must be configured with Microsoft Windows 2000 or 2003 (Standard Edition or Enterprise Edition) with all of the latest service packs installed prior to the implementation date. The servers must be accessible from outside of the local area network via GoToMeeting during the implementation. It is recommended that the client’s system administrator be available for troubleshooting purposes.

Application and Queue Servers

- Microsoft Windows 2000 or 2003 with the latest service packs installed
- Web Servers must have IIS installed and operational

Database Server

- Microsoft Windows 2000 or 2003 with the latest service packs installed
• Microsoft SQL 2000 or 2005 (Standard or Enterprise Edition) with the latest service packs installed

Client Workstation

• Any operating system with a browser that can interpret HTML

• Adobe Acrobat viewer for some PDF formatted report

Prior to the implementation date we will provide them with our implementation guide which includes a list of tasks that should be performed by their system administrator prior to the implementation date.

XactTime Deployment Options

XactTime can only be deployed in one way, a **clean server**. A clean server is a machine that has been reformatted and is being used exclusively for XactTime.

XactTime licensed implementations can be installed in five basic configurations based on the number of users within an organization.
Scenario 1 – 1-750 Employee Company

A company with 750 employees might normally have 25 concurrent users. This minimal configuration could be configured on a single server. The server would be configured with all components including the Database Server, Application (Web) Server and Queue Server.

Single Server Minimum Requirements
- 2x2GHz Xeon CPU
- 2 GB RAM
- 10 GB storage space for data
- RAID 5 Disk Configuration for speed and stability
Scenario 2 – 750-2,500 Employee Company

A company with up to 2,500 employees might normally have 75 concurrent users. This size company would require a Database Server and a Application (Web)/Queue Server for its deployment. This configuration would have plenty of room for growth.

**Web/Queue Server Minimum Requirements**
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

**Database Minimum Requirements**
- 2x2GHz Xeon CPUs
- 4 GB RAM
- 25 GB storage space for data
- RAID 5 Disk Configuration for speed and stability
Scenario 3 – 2,500-6,000 Employee Company

A company with 2,500 employees might normally have 125 concurrent users. This size company would require a Database Server, an Application (Web) Server and a Queue Server for its deployment. This configuration would have plenty of room for growth.

Web Server Requirement
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

Queue Server Requirement
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

Database Requirement
- 2x2GHz Xeon CPUs
- 4 GB RAM
- 25 GB storage space for data
- RAID 5 Disk Configuration for
Scenario 4 – 6,000 - 12,000 Employee Company

A company with 12,000 employees might normally have up to 500 concurrent users. This configuration employs two Application (Web) Servers to be load balanced for improved fault tolerance and extra capacity.

**Web Servers Requirement**
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

**Queue Server Requirement**
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

**Database requirement**
- 2x2GHz Xeon CPUs
- 4 GB RAM
- 25 GB storage space for data
- RAID 5 Disk Configuration for speed and stability
Scenario 5 – 12,000+ Employee Company

A company with 12,000 employees might normally have up to 600 concurrent users. This configuration employs two Application (Web) Servers and two Queue Servers to be load balanced for improved fault tolerance and extra capacity.

**Web Servers Requirement**
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

**Queue Servers Requirement**
- 2x2GHz Xeon CPUs
- 2 GB RAM
- RAID 5 Disk Configuration for speed and stability

**Database requirement**
- 2x2GHz Xeon CPUs
- 4 GB RAM
- 25 GB storage space for data
- RAID 5 Disk Configuration for speed and stability