



TimeControl® Technical Architecture

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TimeControl on-premise Architecture

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TimeControl is one of the most flexible and extensible timesheet systems on the market. TimeControl was designed from the beginning to be a system that accommodates the needs of the client rather than a system that requires that clients adjust themselves to the product's features.

TimeControl is used in deployments for as few as 10 users and has been used by as many as 50,000 users in a single implementation. The system has been used on its own or integrated with numerous project, financial, payroll and human resources systems simultaneously. The open architecture of TimeControl provides a tremendous range of architecture options but must also maintain a highly secure environment.

Understanding the various components that are a part of TimeControl and the components which are required to operate TimeControl and those which can optionally extend the functionality of the system is a key element of designing the architecture of your TimeControl environment.

This paper will give an overview of both the required and optional elements of a TimeControl environment and discuss some of the decisions you must make as you create a TimeControl implementation specific to the needs of your organization.

This white paper is a guide to designing your on-premise implementation of TimeControl or TimeControl Industrial not a set of installation instructions. In the IT world, the components referenced here are changing day-by-day. The operating systems themselves, the databases, the web browser on each client station is being updated constantly. To get more specific answers about how TimeControl supports a particular version of a component listed in this white paper, we recommend contacting HMS Software directly:

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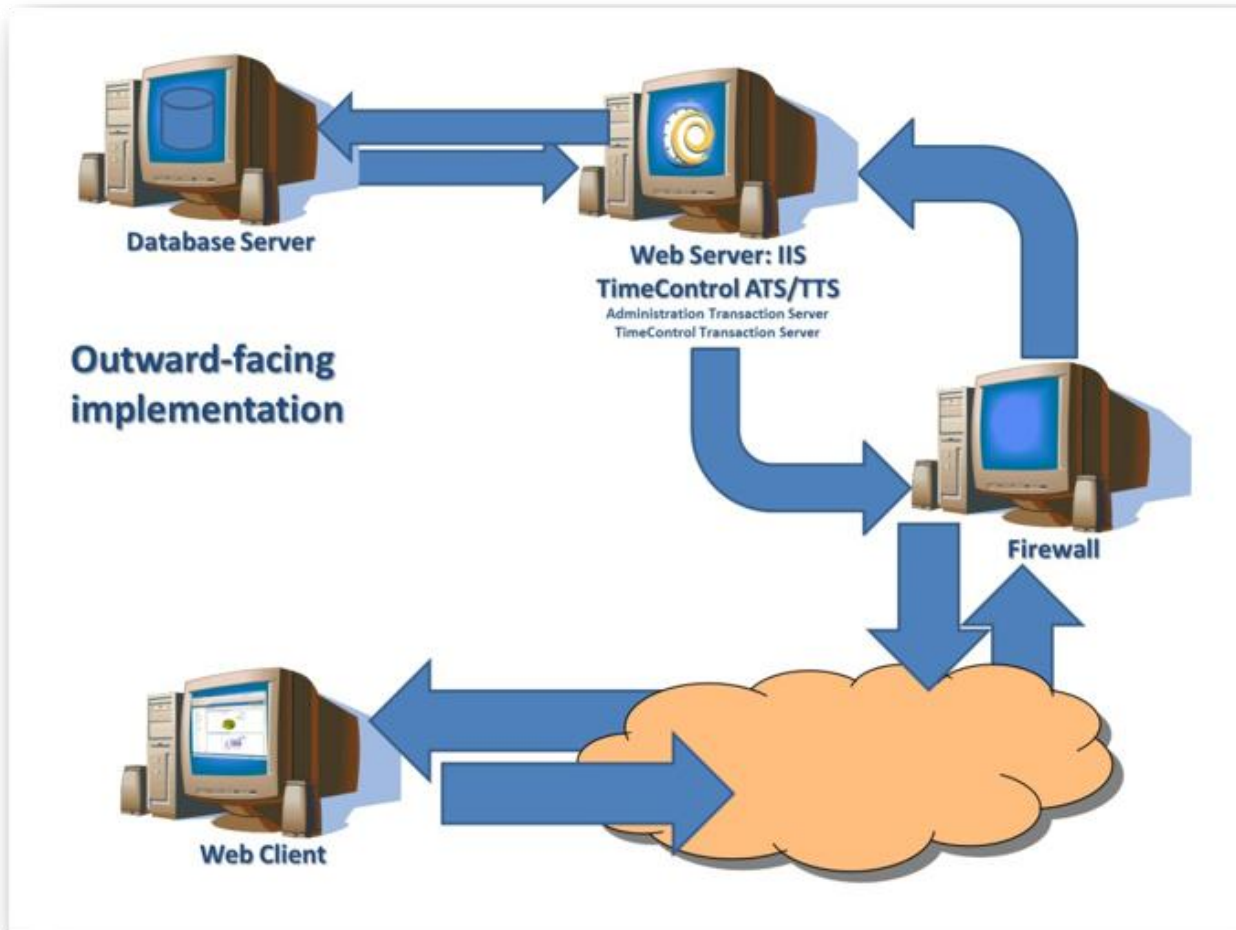
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Required Components

TimeControl has some key components that are critical to system operations. TimeControl is an n-tier application with a design that allows for the system to be infinitely scalable. The key components include a Database Server, the TimeControl Administration Transaction Server middle-ware, the TimeControl Transaction Server Middleware Web Server components and the web-based client. We'll describe these components in more detail here.



Database Server

TimeControl stores all of its data in a SQL database. The system supports 3 databases including Microsoft's SQL Server, Oracle and, MySQL .

There are numerous database versions supported. To check if a particular version of your database is supported, contact HMS Software's support services at support@hms.ca.

TimeControl Transaction Server (TTS)

TimeControl includes a middleware component called the TimeControl Transaction Server or TTS. The TTS is a .Net web service which interfaces with web-based .Net components and interacts with the database. The Microsoft .Net architecture is highly secure.

The TTS runs as a Windows Service which starts automatically on a Windows Server. Multiple instances of a TTS can be established on the same server.

TimeControl also includes a RESTful API Service which makes many integration scenarios possible as well as acting as a connecting service for our free TimeControl Mobile app.

TimeControl Schedule Service

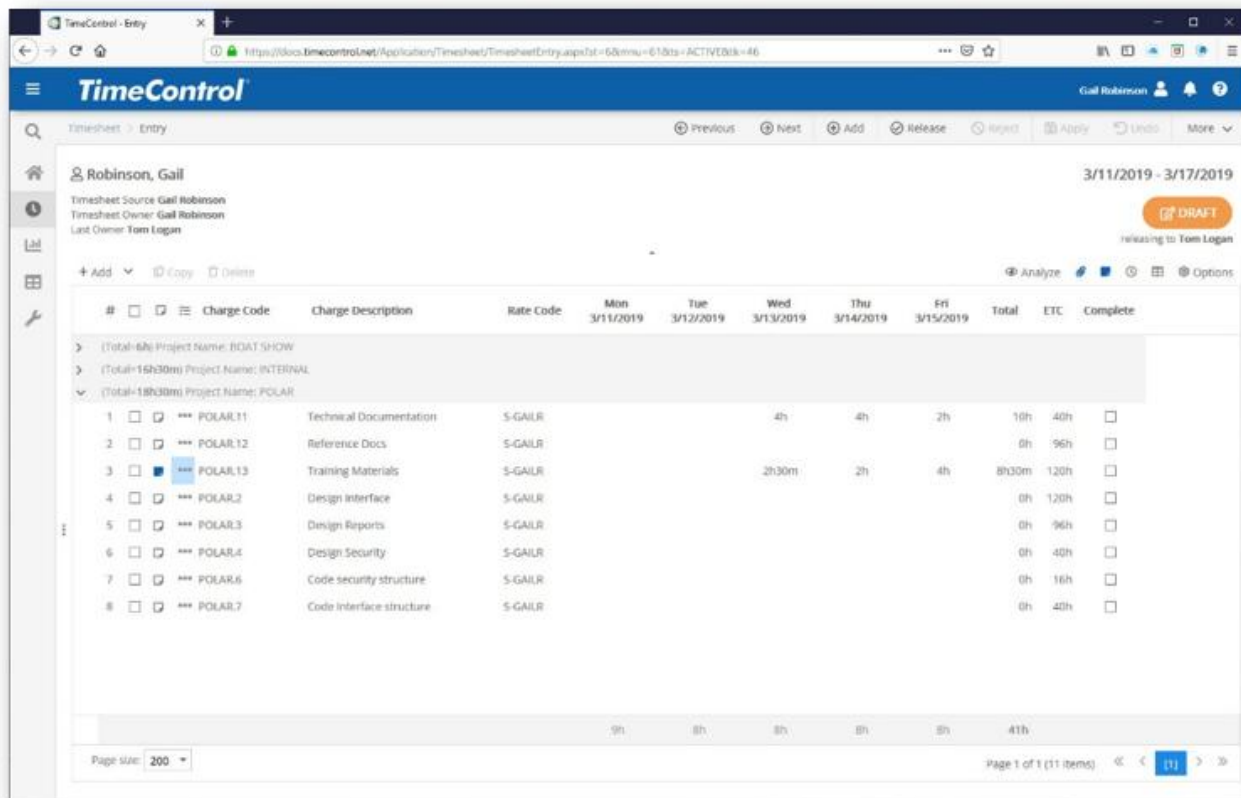
There are several automated functions which can be run as scheduled events within TimeControl. These include unattended emails sent on a schedule, for example, when timesheets are missing and overdue or the posting of timesheets or linking of TimeControl to server-based project management tools. To manage the schedule of these events, the TimeControl Schedule Service is installed on the same Windows Server as the ATS and TTS.

Web Server

TimeControl users are presented with a browser-based web interface written with ASP.net and JavaScript. To deliver this interface to the browser, TimeControl uses Microsoft's Internet Information Services (IIS) which is included with every Windows Server.

Timesheet Web Client

The TimeControl web interface requires a web browser. Numerous browsers and hardware platforms are supported. TimeControl works with Microsoft Edge, Chrome, Firefox, Safari and Mozilla.



Communications: .Net

TimeControl's user web client uses Microsoft's .Net architecture to communicate between the web page and the TimeControl TTS middleware service. This is a highly secure, encrypted environment which uses a streaming object protocol to package data and transmit it quickly from one end to the other.

There are a number of additional elements that might be included in a TimeControl implementation. These components are not required but may be appropriate for particular situations.

Active Directory / LDAP

Some clients will wish to control all application access from Active Directory, LDAP or Windows Authentication. TimeControl supports all of these authentication methods as well as its own security model.

In the TimeControl User Table, select TimeControl Security, Windows Authentication, or Active Directory / LDAP as the authentication type. You may be asked for the location of the LDAP or Active Directory Server. A password needs to be entered into TimeControl only if the TimeControl Security type is selected.

TimeControl will take the User name and Password combination that were used during the login and validate them according to the method selected. If the method was TimeControl Security, TimeControl will search the TimeControl User database for the encrypted password. If the method was Windows or “NT” Authentication, TimeControl will call the Windows Server Authentication module, pass the User Name and Password to it and wait until Windows Server returns a pass or fail reply. If the method was Active Directory or LDAP, TimeControl will send the User name and Password to the AD or LDAP server and wait for a pass or fail.

This is sometimes desirable in very large organizations with the management of new users. Security for various applications and security on servers, is a huge undertaking. TimeControl is an application that is often distributed to every employee and that makes it one more application that requires administrative involvement when the employee is added. When linking to Active Directory or and LDAP server, the management of user passwords in TimeControl need not be done twice.

Access to TimeControl is something that should be rigorously managed. Timesheets, while they take up a minimal part of one’s week, contain data that is considered among the most sensitive to the entire organization. This is not like ensuring that someone can start a word processing package so they can write a memo.

Some organizations ask why there is a requirement for creating a User entry in TimeControl at all. After all, couldn’t Active Directory control this? Entering information for a new employee in TimeControl involves more than just the user name and password. Depending on the configuration of a given implementation, numerous fields and entries might need to be populated to define a wide range of properties for that employee for reporting and analysis purposes with any timesheet data entered. Also, rate information is often entered on an employee-by-employee basis. This type of information is far more extensive than what LDAP servers or Active Directory were designed for.

This is why access for new users is more often keyed off the human resources system. In some TimeControl implementations, direct links have been established to trigger a direct entry

in TimeControl by the database itself. Database triggers can be established to move all the pertinent data from the HR or payroll system to TimeControl in order to properly enter all data required by the system to get the employee started with TimeControl.

HTTPS

Security of TimeControl data is critical and HMS Software's HMI communications layer and the Microsoft .Net communications later protects all transactions between the TimeControl interface and the TimeControl server but what about during the actual login process before the user even gets into TimeControl? For organizations that are implementing TimeControl with an outward facing site that is open to users who will login through the Internet, installing the login page in an HTTPS protocol encrypts even the login process. HTTPS is supported by all major web servers including IIS from within Windows Server.

Firewalls and Proxy Servers

A port on the TimeControl ATS server must be available to any client terminal which needs to access it for TimeControl to work properly. If the TimeControl site is outward facing this means putting the ATS server into what webmasters call the "DMZ" or "Demilitarized Zone". The DMZ is an area of the network which is allowed access to the outside world through the Internet and is allowed access into the network's protected areas. This area is controlled by the organization's firewall. The network firewall must be configured to allow TimeControl traffic.

Many servers and client stations also include individual firewalls which can restrict traffic to and from the network or the Internet. These firewalls must also be configured to allow TimeControl traffic.

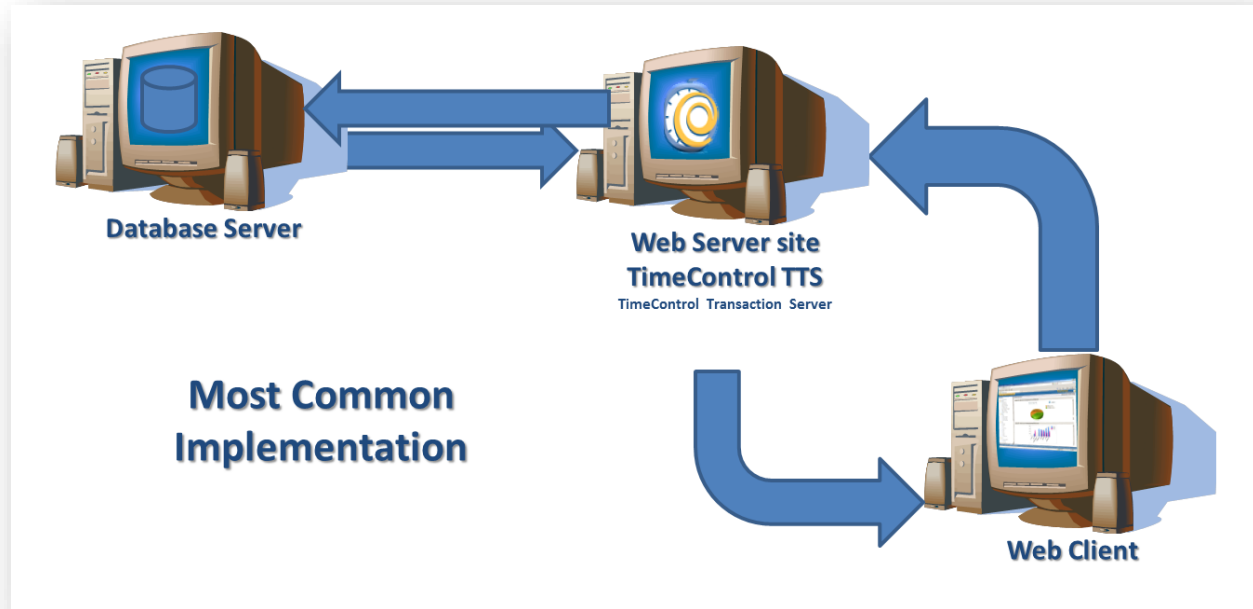
For those implementations which are outward facing, TimeControl also includes the capability of implementing extended security architecture using a proxy server. Using a proxy server redirects traffic from the web server to an internal machine that is not otherwise available outside the network.

This allows the standard web security that is part of every web server to intercept and evaluate traffic. It also allows the internal middleware server to be completely hidden from access from outside the network. A proxy server is accomplished by registering a redirector with the web server that knows how to interpret TimeControl traffic that arrives from the end user browser.

Setting up a proxy server environment can be done at any time either during installation or afterwards.

A simple implementation

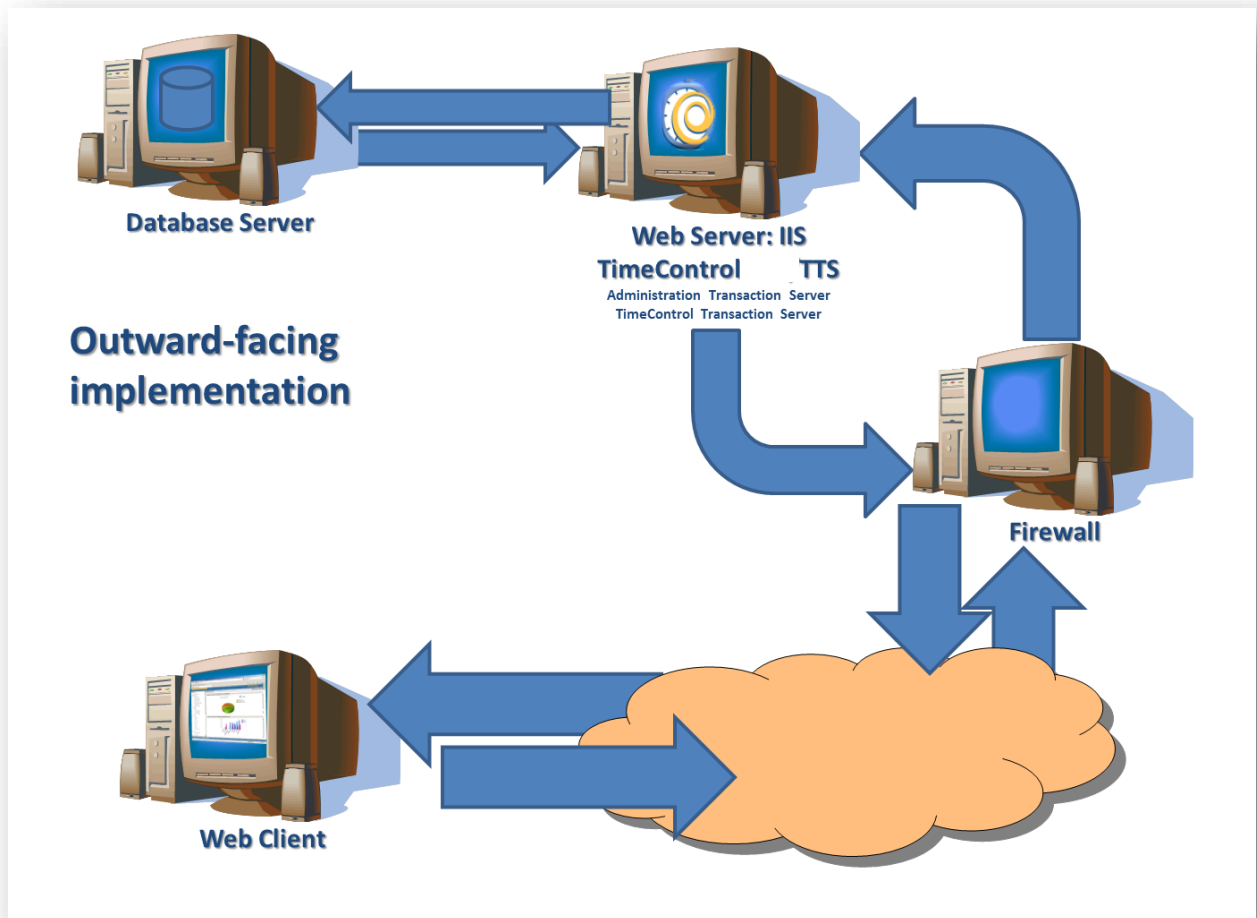
The simplest working implementation of TimeControl is a single-click installation. TimeControl is installed into a Windows Server with the TimeControl ATS, The TimeControl Transaction Server (TTS), the TimeControl Scheduler and Web Components installed at the same time.



The best practice would be to not install the database on the same server to protect that server from direct access from the end users although this too could be done in a smaller implementation. This does not require special IP numbers or domain name registration as all users would be within the organization's network.

The most common implementation

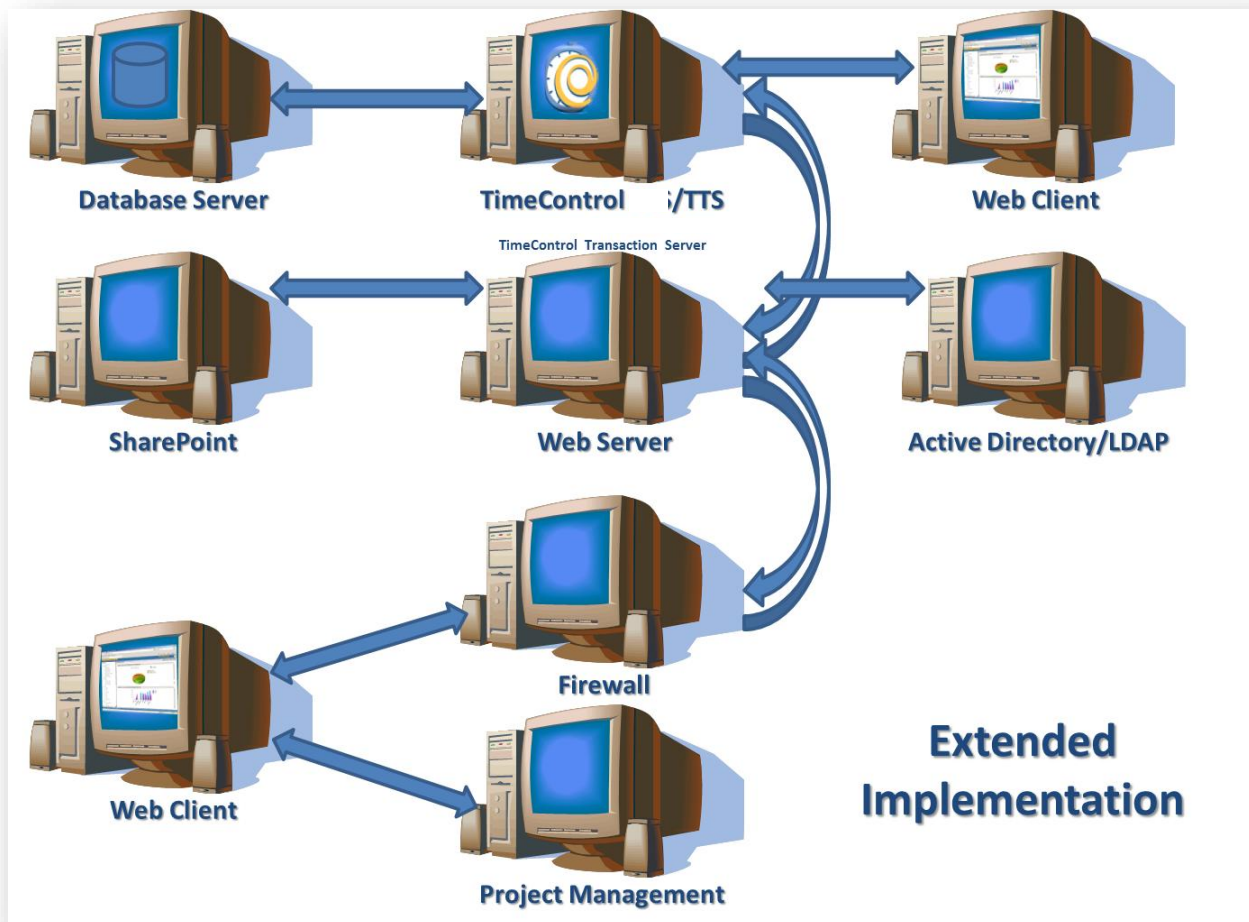
By far the most common TimeControl implementation is one where the end users can access the system from within the organization's walls or remotely via the Internet. This is what is referred to as an "outward facing site". In this case it is quite important for the database server to be kept separate from the TimeControl TTS middleware for the protection of the database server and its data.



TimeControl in this case will likely work through a firewall to ensure that only traffic which should reach the TimeControl TTS arrives there and the Web Server will need to be configured to have an externally reachable IP address. This too is managed from within the firewall along with the network's webmaster and Internet Provider. A domain name is often registered by companies for their TimeControl implementation such as timecontrol.companyname.com.

Extended Implementation

TimeControl is an infinitely extensible system. There are numerous components that can be installed or integrated or referenced by the implementation. Not every component we've listed here is required but it is important that an organization which needs to be able to integrate these elements are able to do so in a system that often becomes mission critical.



TimeControl is designed as a solution but at HMS, we know the problems to which that solution will be applied are as diverse as there are organizations which need a timesheet. That's why TimeControl was created as an open-architecture system.

Whether it's for linking to a commercial ERP or an in-house project management tool or to Active Directory for password authentication, TimeControl is able to do so.

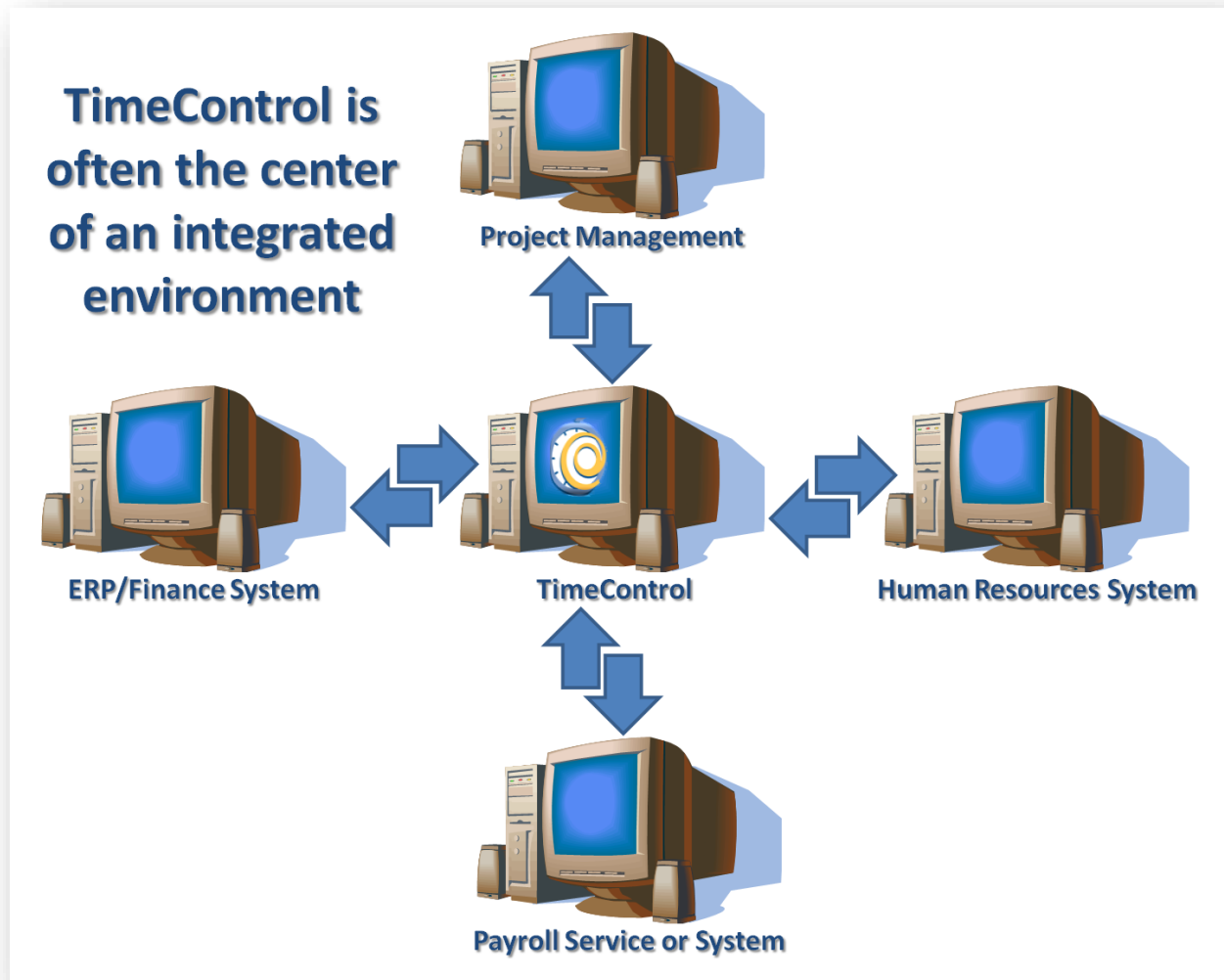
There are additional ways that TimeControl can be extended because the database schema or design is also published. Many organizations link TimeControl to systems which the TimeControl developers never even hear about because the creation of those links are managed by the clients themselves.

Leveraging other systems

There is no limit to the number or type of systems that can be integrated to TimeControl. We've identified a couple of the most commonly requested systems below.

Integrating with ERP, Payroll, Human Resources and Project Management Tools

TimeControl is often the most flexible and maneuverable enterprise tool in the organization and, as such, often becomes a central pivot in creating an effective enterprise environment for tracking work. TimeControl already includes links to project management tools and a General Link module for creating links to and from other enterprise systems such as Finance/ERP tools, Human Resources, Payroll software or a Payroll service.



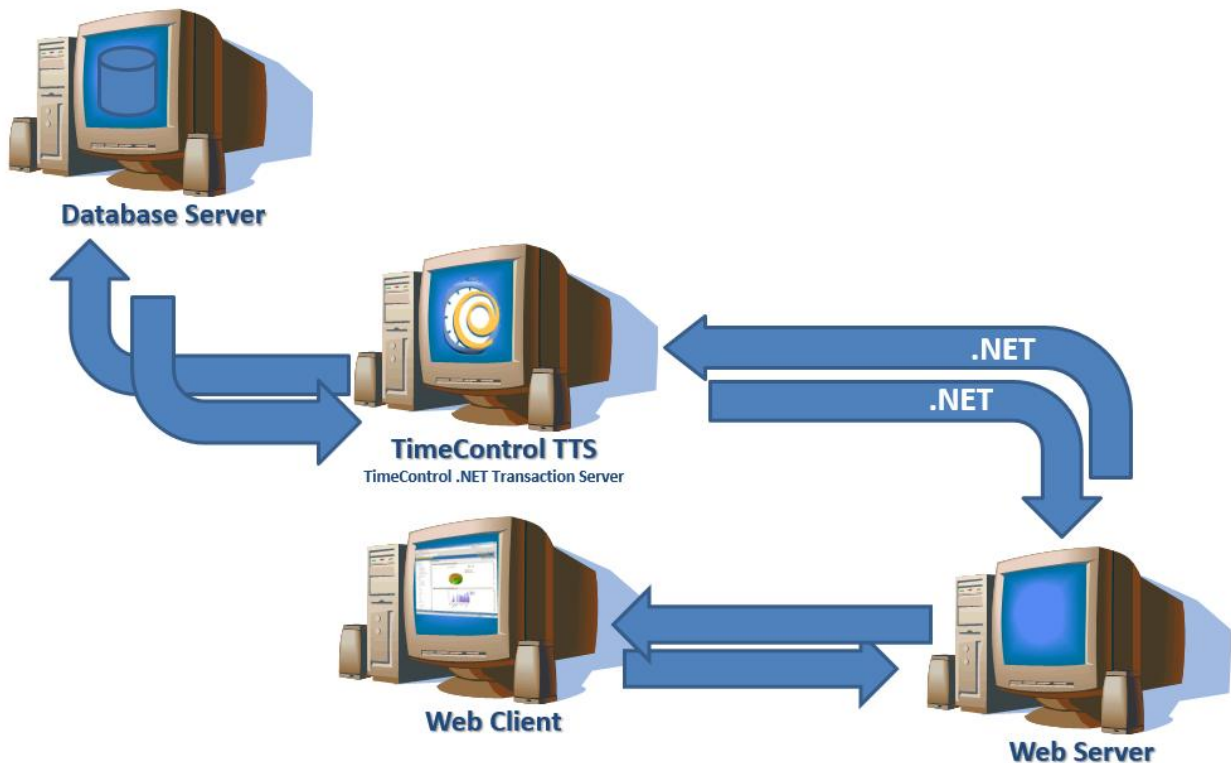
TimeControl has internal controls to link to project management tools including Microsoft Project and Project Server, Primavera, Brightwork Birdview, and many others. It uses transaction files in either CSV or XML format to move data to ERP tools such as SAP, Oracle or Microsoft Dynamics as well as HR tools like PeopleSoft or Payroll services like ADP.

TimeControl Hardware Requirements

Required Components

TimeControl is an “n-tier” application with a design that allows for the system to be infinitely scalable. TimeControl has key components that are critical to system operations. The key components include a Database Server, the TimeControl Transaction Server middleware, Web Server components and the web-based client. Each component has its own minimal requirements. *

In the most common installation, TimeControl’s TimeControl Transaction Server (TTS), the TimeControl Scheduler Service and the Web Server are installed on the same server, and the database is installed on a pre-existing data server.



TimeControl components

For more information on a wide variety of installation configurations, we recommend consulting the TimeControl Architecture white paper available at www.timecontrol.com/resources/whitepapers.

TimeControl Hardware Requirements

The hardware, operating system and version requirements for each component of TimeControl are described below:

TimeControl (TTS) Middleware Server

The TimeControl Transaction Server (TTS) is the TimeControl middleware that communicates between the end-user's station and the database. The middleware, TimeControl Transaction Server (TTS) is installed as Service on the target machine along with the TimeControl Scheduler Service. The TimeControl Transaction Server (TTS) is used for the bulk of TimeControl functions.

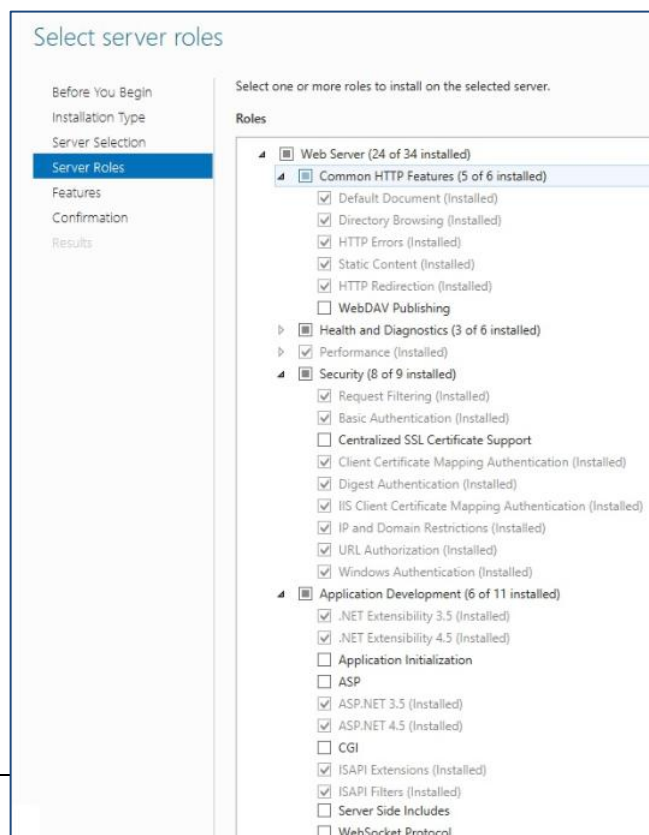
Requirements

- Windows Server operating system capable of supporting .NET framework, version 4.8+ as well as the .NET 8 runtime
- Minimum RAM should be 16 GB.
- For implementations with over 1,000 users, 32GB of RAM is recommended as a minimum
- Dual core is the minimum recommended
- Quad core is minimally recommended for implementations of more than 1,000 users.
- Windows .NET 4.8 framework or higher
- TimeControl can be installed in a virtual environment such as VMWare or Hyper-V.

The typical load for the TTS is 2% - 20% of CPU cycles.

Web Server

A standard installation of TimeControl installs both the Middleware and Web components on the same server. In this situation, TimeControl requires the Web Server role (IIS) as well as the TCP Port Sharing Role. Additional information on roles is displayed in the image on the right. Additionally, the web server requires the .net 4.8 framework, and the windows ASP.NET Core Hosting Bundle version 8.0.11+.



About HMS Software

HMS Software, a division of Montreal, Canada-based Heuristic Management Systems Inc., is a leading provider of enterprise timesheet and project management systems. HMS is an Oracle Gold partner.



Founded in 1984, HMS Software's expertise in implementing enterprise project-management and enterprise timesheet systems is recognized worldwide by some of the world's best known organizations. HMS's signature product, TimeControl, an enterprise timekeeping system designed to serve the needs of both Finance and



Project Management, is distributed worldwide through an extensive list of distributors and dealers located on every continent with representatives in the US, the UK, Australia, Mexico, Europe, Asia, South Africa and the Middle East.

HMS Software's client list includes some of the world's leading corporations in the telecommunications, IT, finance, engineering, defense/aerospace and government sectors including such organizations as Acergy, Aecon Construction, Alcan, the Atlanta Airport, Akzo Nobel, The Canadian Business Development Bank, The City of Montreal, EDS, Ericsson, General Motors, the Government of Saskatchewan, John Deere, Kelly Services, The UK's National Health Service, Standard Life, UPS, Volvo Novabus and hundreds of others. HMS maintains offices in Montreal, Quebec and Toronto, Ontario.

For more information about HMS, please: visit www.hms.ca, email info@hms.ca or phone +1 514-695-8122

TimeControl

First published by HMS in 1994, TimeControl has been adopted hundreds of clients and over hundreds of thousands of users around the world. TimeControl is designed to serve the needs of both project and finance simultaneously. It allows an organization to use a single timesheet for project tracking, time and attendance, time and billing, HR tracking, R&D Tax Credits, DCAA and project costing instead of having to deploy many timesheets to serve these needs. TimeControl is available for purchase for an on-premises implementation or as a subscription as service. TimeControl's architecture is flexible and extensive supporting numerous databases such as Oracle, Microsoft SQL Server and MySQL. It supports multiple browsers including Microsoft Edge, Firefox, Safari, Mozilla, Internet Explorer and Chrome and includes the free TimeControl Mobile App for both iOS and Android devices.

For more information about TimeControl, please visit: TimeControl.com.

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To try TimeControl for free, visit our free hosted trial at: freetrial.timecontrol.com.