TotalControl

Internet accessible facilities management

A technology overview

This overview is an outline of the major components and features of TotalControl, deployment possibilities and a list of terms that describe the TotalControl facilities management software.
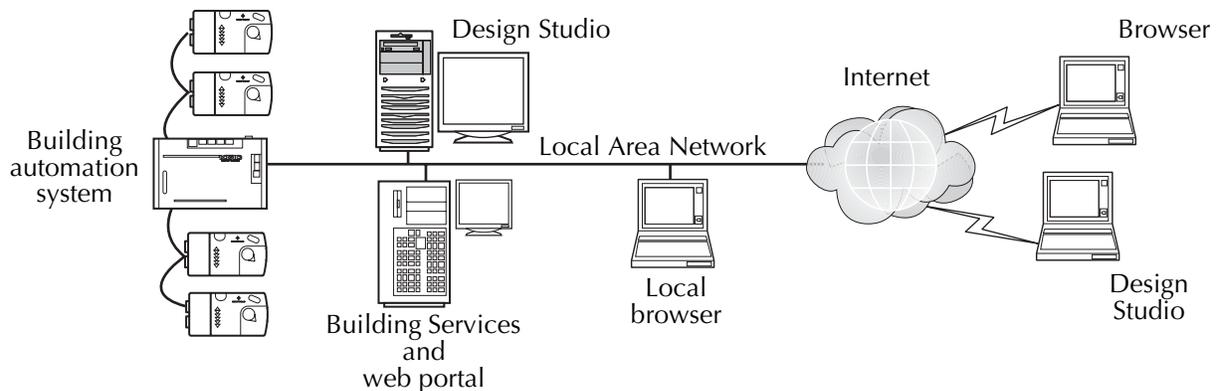
KMC CONTROLS

Web accessible facility management solutions

The complexity of building automation systems, the proliferation of internet access, and increasingly powerful web browsers are driving facility managers to require web accessible solutions. To meet that need, KMC Controls provides two different solutions for web-based facility management.

- Hardware solutions—Products such as the KMD–5270 WebLite and the BAC–A1616BC BACnet Building Controller have internet servers embedded within individual controllers. For systems with only one protocol, a limited number of points or a limited number of controllers connected to the same LAN, the hardware approach works well. However, as a system expands, adding controllers and multiple points of contact becomes cumbersome.
- Software solutions—In a software based approach to internet accessible facility management, one or more computers connected to a building automation system collects data from controllers and then stores it in a central database. As required, other parts of the system retrieve and use the data from the central location. For internet or intranet access, building system data is added to graphic information and then sent to a web browser by a web server.

TotalControl is a software approach to providing internet-based facilities management for a building automation system. Built on XML and the Microsoft .NET framework, TotalControl is a flexible solution that provides multiple deployment possibilities to match the size of the building automation system, the protocols in use and customer requirements for operator access. Regardless of size or complexity, all TotalControl systems are built around the same core components.

- *The TotalControl web portal* and an internet browser provide intranet or internet access to the building automation system.
- *TotalControl Building Services* collects, stores, and moves data between the controllers and the web components.
- *TotalControl Design Studio* is the configuration tool to configure the system and build the operator interface which can then be viewed from an internet browser.

Illustration 1 Typical TotalControl system

TotalControl Building Services

TotalControl Building Services collect and manage information from the controllers in a building automation system. They run in the background of one or more computers connected to the building automation system network. Once configured with Design Studio, the bundle of programs in Building Services provides the data to route alarms, manage schedules and display historical trend data for either Design Studio or the TotalControl web portal. The major components of the building services are the Protocol Driver service (PDS), the Control Application Services (CAS) and the web and server components.
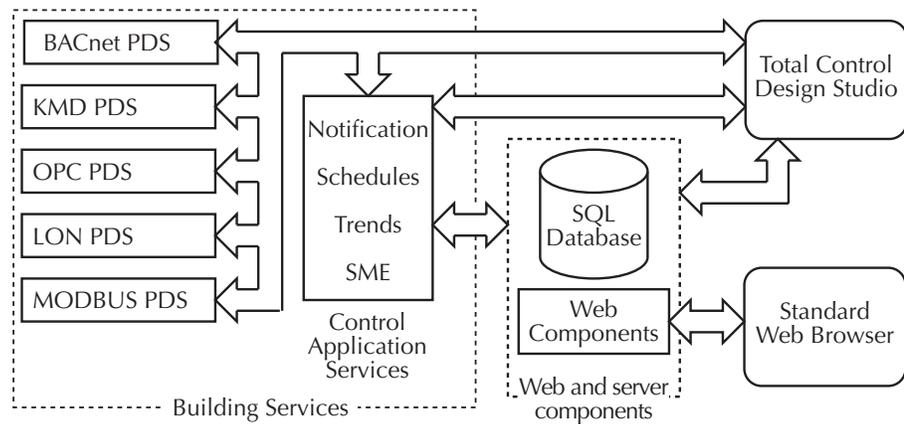
Illustration 2 TotalControl core components

Protocol Driver Service
A Protocol Driver Service (PDS) is the link between a building automation system and other TotalControl services. When data is required from a controller, the PDS retrieves the data, forwards it to the requesting service and, depending upon the type of data, caches it for future use. Each supported protocol requires a corresponding PDS and network connection. The PDS is one of the licensed components of TotalControl Building Services.

Control Application Services
The control application services perform key functions to monitor, display and manipulate data from the building automation services. These services include:

- Notification of alarms and events
- Schedule management
- Trend data collection
- Data management among the components of TotalControl by the Service Monitor Engine (SME).

Web and server components

The web and server components are distributed with TotalControl Building Services but may be installed on a computer separate from the computer running the Control Application Services. Regardless of where the web and server components are running, they provide two functions:

◆ Store data, graphic pages and web pages in an SQL database.
◆ Serve web pages and building automation system data to the TotalControl web portal.

Web components The web components are a combination of a web server and the TotalControl web portal components.

◆ Internet Information Services (IIS) distributed with the Windows operating system fills the web server function for a TotalControl managed site.
◆ The TotalControl web portal components —through a combination of custom graphic pages stored in the database and trend, schedule, alarm and administration modules—provide complete access to a site. Once configured with Design Studio, authorized operators need only an internet browser for site management.

SQL server components TotalControl is a database managed system and requires a Structured Query Language (SQL) database server to store both system data and graphic pages. The size and type of database server depends upon the complexity of the building automation system.

◆ Systems with 300 controllers or less can operate with Microsoft SQL Server Express which is distributed with Building Services.
◆ For systems with more than 300 controllers, use Microsoft SQL Server 2005 Workgroups, Standard or Enterprise.
◆ Other factors, such as a collection over 1000 trend logs, may also require using Microsoft SQL Server 2005 as the site database.

When a service retrieves data from a controller through the appropriate PDS, the data may also be stored in the database. Each of the services can then query the database for information.

The TotalControl web portal

Operators view and manage the key functions of a building automation system by viewing web pages with a standard internet browser. The pages are constructed in Design Studio with the *Graphics Designer*. Once constructed, the pages are stored and served to web browsers from the computer or computers hosting the SQL database and Microsoft web components.
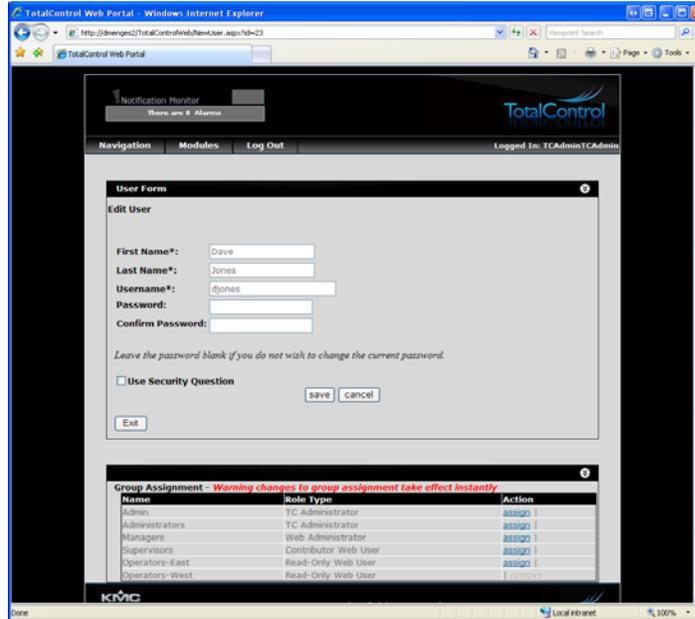
Illustration 3 TotalControl web portal

Alarm viewer and manager

Notification of alarms and events are managed, viewed and acknowledged with the alarm tools module. Programs within each device monitors a condition and then—when a value moves outside of normal parameters—a notification event is created that the TotalControl notification service processes as an alarm.
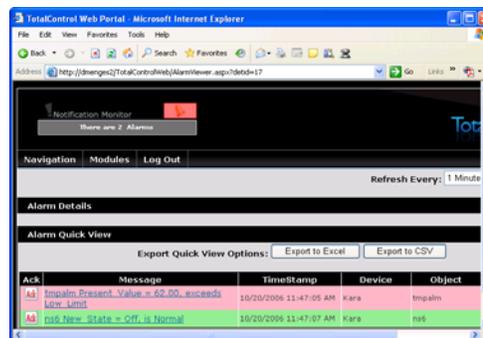
Illustration 4 Alarm management

Trend management

The trend viewer and configuration modules retrieve historical data for viewing trend logs, managing trend log configuration and exporting trend log data.


Illustration 5 Historical data displayed in a trend log

TotalControl manages three types of trend logs:

◆ Controller trend logs are sets of historical data collected and stored only within the memory of an individual controller.

◆ Database trend logs are controller trend logs that TotalControl has retrieved from a controller and then stored in the site database.

◆ A PC trend log is a polling process performed by the TotalControl trend service.

Web administration

Authorized operators use the web administration module to add or remove operators and assign operator permissions to various parts of the site.
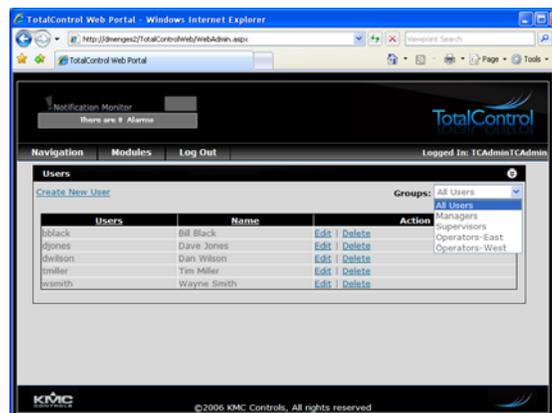
Illustration 6 Operators are granted access through web administration

Schedule management

The schedule management module configures weekly and annual schedules to control recurring events.

Illustration 7 Schedule module

TotalControl Design Studio

Design Studio is the master operator software with which you can build browser based operator pages, configure controllers, manage the database, and set up security, trends, schedules and alarms. Once the graphic pages are constructed and the site is configured, Design Studio is not required for daily operation.
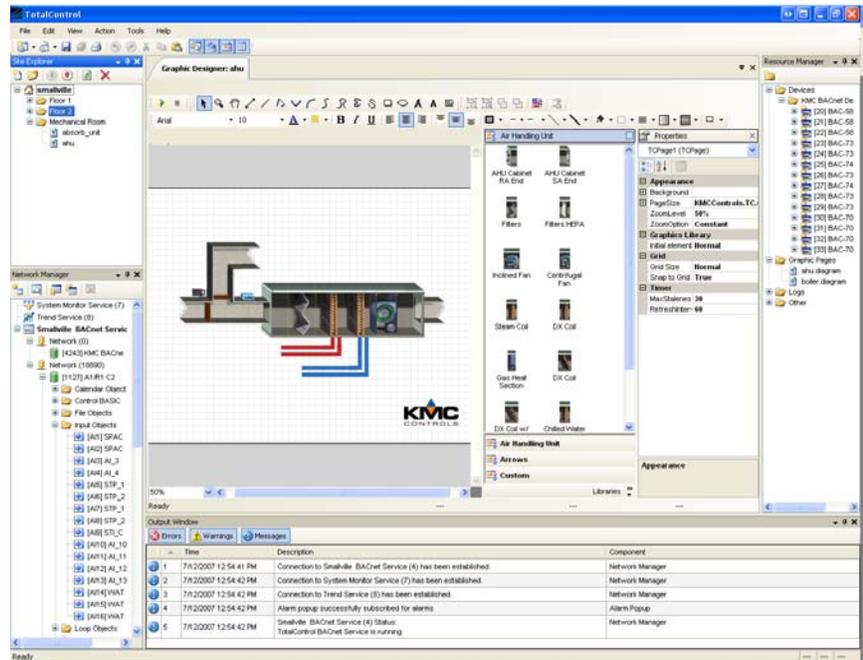
Illustration 8 TotalControl Design Studio

Graphics Designer Use Graphic Designer to assemble graphic pages from either the included graphics library or imported graphic files. Once a page is constructed, it is stored in the database and then published for viewing with a standard web browser.

Network Manager All networks, devices, objects, points and properties are managed through the Network Manager. The complete job site is displayed in a list that can be expanded to manipulate a specific point or property or collapsed to view only networks, devices or controllers.

Site Explorer Site Explorer manages the graphics pages in the TotalControl database. Versions of the graphics pages are controlled by checking the pages out of the database for editing. While a page is checked out, it cannot be edited by other operators.

Resource Manager Resource Manager displays and manages a list of local files. Through the Resource Manager, these local files can be edited without connecting to a site. Files in Resource Manager can also be used to restore a backup configuration to networks, controllers or points and objects.

Security Manager A TotalControl administrator assigns permissions and passwords to authorized operators with the Security Manager.

Code Editor Control Basic programs in KMC controllers are edited, compiled and sent to controllers with the Code Editor.
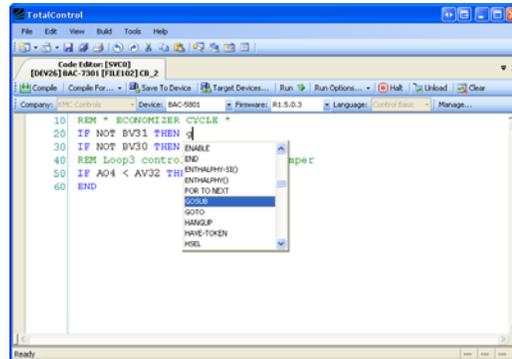
Illustration 9

Trends   With Design Studio, you can set up controller, database and PC trends. Controller trends can be viewed with Design Studio.
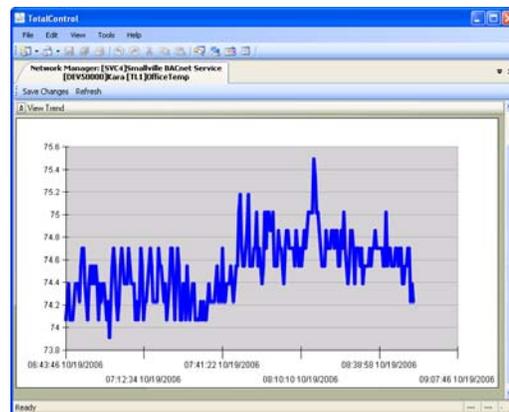
Illustration 10 BACnet controller trend in Design Studio

Alarm management With Design Studio you can set up alarms to notify key operators of critical events. Notification includes custom messages in e-mail text.

Deployment options

While all TotalControl core components are required for a complete system, they may be located on separate computers. This provides a path for both upgrade and expansion of a building automation system. Three typical computer systems are discussed on following pages.

- ◆ *Single computer deployment*
- ◆ *Distributed systems*
- ◆ *Enterprise system*

Single computer deployment

The single computer system is the simplest deployment of the TotalControl system. This system is suitable for small systems with minimum resources.
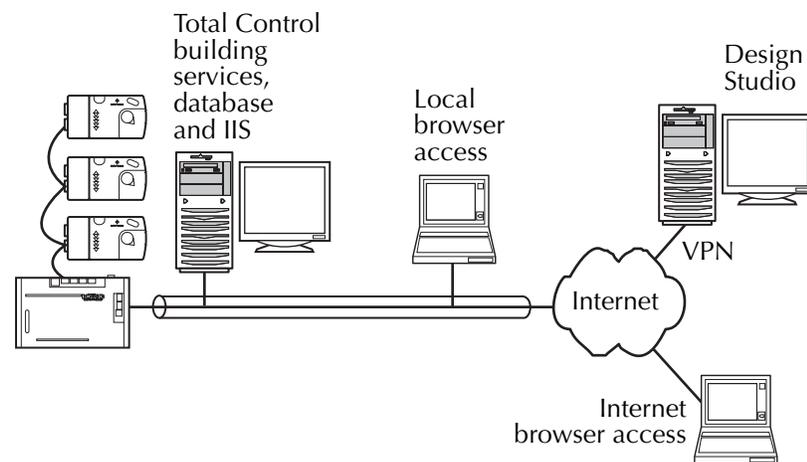

Illustration 11 TotalControl single computer system

- ◆ All licensed components for TotalControl Building Services are installed and operate on a single computer.
- ◆ The computer serves the web pages created by TotalControl Design Studio in addition to managing the interface to the schedule, alarm, trend and administration web modules.
- ◆ The system uses Microsoft SQL Server Express distributed with TotalControl Building Services.
- ◆ Graphic pages were created with Design Studio by the system installers. It was used also to configure controllers. It is not a required to be a permanent part of the finished site. If needed, a master operator can connect Design Studio to the TotalControl managed site over a virtual private network (VPN).

Distributed systems

Medium size building automation systems may require spreading TotalControl components across two or more computers. The distributed system shown in Illustration 12 is similar to the single-computer system except that a separate computer hosts the SQL database. In addition Design Studio is included as a master operator workstation.
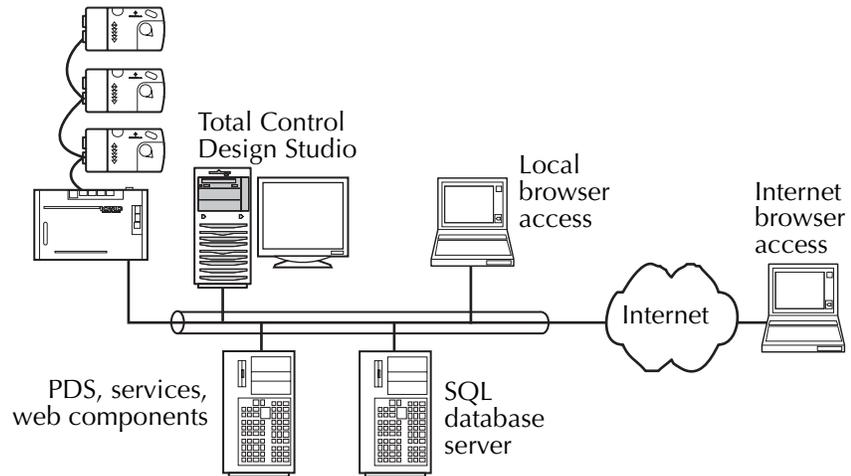

Illustration 12 Distributed system

- ◆ The TotalControl Design Studio is an on-site part of the system. The system engineer uses this workstation for administrative functions and to build graphic pages.
- ◆ All TotalControl services are running on one computer and a second computer hosts the SQL database. The building services computer also operates IIS and serves the web pages created with TotalControl Design Studio.
- ◆ Depending upon the size of the system, the distributed system could use Microsoft SQL Server Express distributed with TotalControl or a dedicated SQL server running on the Windows Server 2003 operating system.

Enterprise system

Use enterprise deployment for large installations that include multiple buildings, protocols and locations.

◆ TotalControl Design Studio is part of the system. The system engineer uses Design Studio for administrative functions and to build graphic pages.

◆ Each building automation system connects to its own computer running the PDS appropriate for the protocol and the TotalControl services for that building's automation system.

◆ A central computer operates the SQL database; a second computer operates IIS. The web pages created with TotalControl Design Studio are hosted and served by IIS from this computer.
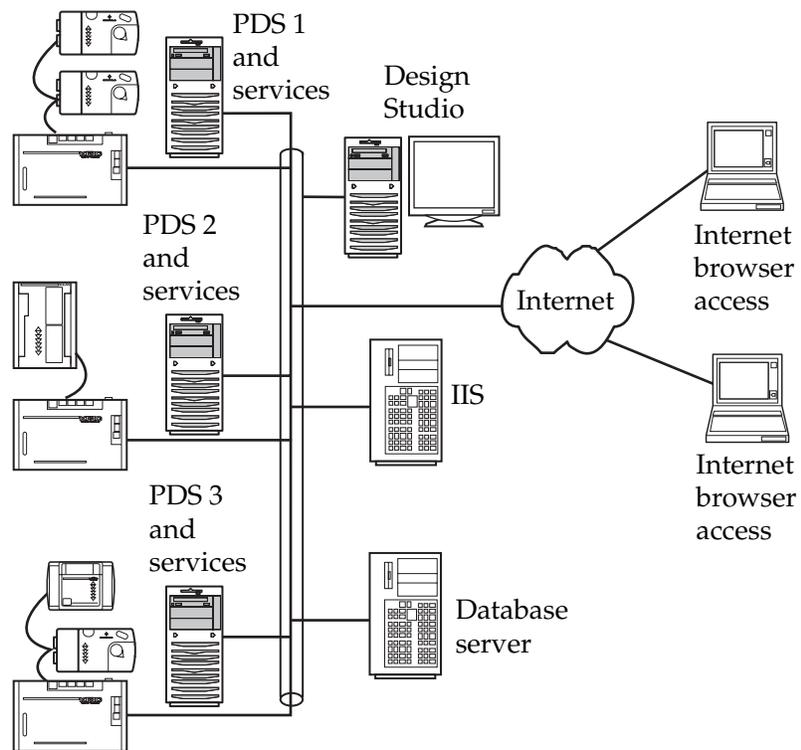
Illustration 13 Enterprise system

TotalControl terms

Building Services
The package of programs that collects and stores data and routes data between a building automation network and an operator interface or workstation. The set of services include the following:

- Alarm management is handled by the notification service
- The trend service creates historical trend logs
- The system monitor engine coordinates movement of data among the other services and an operator interface
- Schedules are managed by the schedule service
- Protocol driver service (PDS) provides the network connection to a building automation protocol such as a BACnet or KMDigital network.

Design Studio
Design Studio is the master operator software for the TotalControl software package. System engineers and master operators use Design Studio to create custom web pages, configure controllers, set up security, manage alarm routing and other configuration tasks for TotalControl.

Internet Information Services (IIS)
Microsoft Internet Information Services (IIS) are a set of Internet-based services for servers using Microsoft Windows. It is an integrated set of services that enable the deployment of high-performance web sites, web applications, and web services. IIS was initially released as an additional set of Internet based services for Windows NT 3.51. Today, it is shipped with both Windows Server 2003 and Windows XP Professional.

NET Framework
The Microsoft .NET Framework is a component of the Microsoft Windows operating system. It provides a large body of pre-coded solutions to common program requirements, and manages the execution of programs written specifically for the framework. The framework is intended to make it easier to develop computer applications and to reduce the vulnerability of applications and computers to security threats.

Protocol driver service (PDS)
A component of the TotalControl Building Services. Each type of building automation protocol requires a compatible PDS to communicate between the network of controllers and the other services in TotalControl. For the early release of TotalControl, BACnet and the KMDigital protocol will be supported. MODBUS and OPC Server protocols are planned for later releases. Each computer running a PDS requires a license for the PDS.

SQL
Abbreviation of Structured Query Language, and pronounced either see-kwell or as separate letters. SQL is an industry standard query language for requesting and manipulating information from a database.

XML
The Extensible Markup Language (XML) is a standard for marking up documents and data. An XML document structures and labels the information it contains so that diverse computer systems and programs can extract, sort, filter, and arrange the information in highly flexible ways.