Faster and simpler with platform independence: TwinCAT HMI
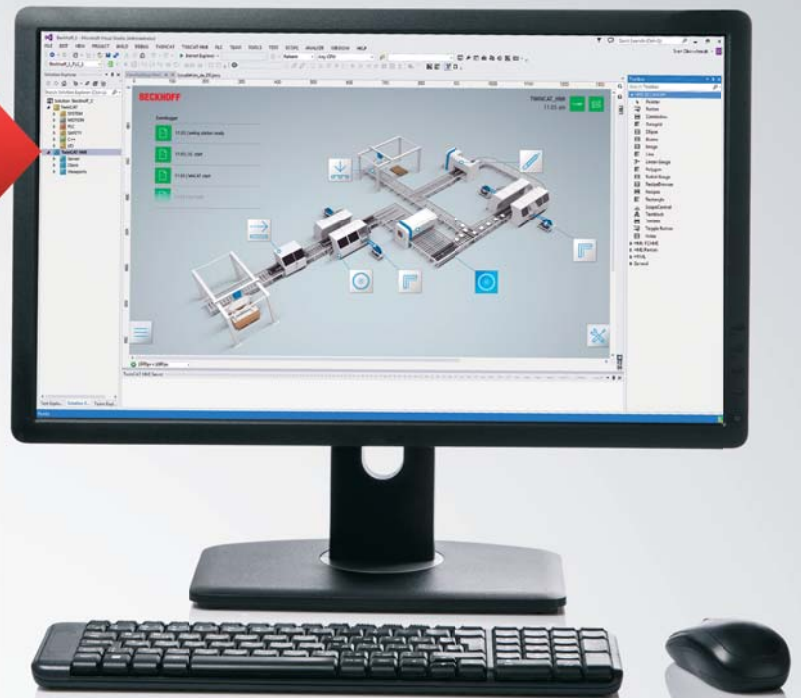
Integrates HMI in Visual
Studio®: TwinCAT HMI

Microsoft Visual Studio

Search

Solution 'Beckhoff_1'
▲ TwinCAT
  ▷ SYSTEM
  ▷ MOTION
  ▷ PLC
  ▷ SAFETY
  ▷ C++
  ▷ I/O
▲ TwinCAT HMI
  ▷ Server
  ▷ Client
  ▷ Viewports

The development environment of the TwinCAT HMI is fully integrated in Visual Studio® and TwinCAT

What will the HMI solution of the future look like? Can the all-important user interface be given industry-spanning design in the future to ensure optimum efficiency with maximum user comfort? Beckhoff has paved the way to the next generation HMI with the new TwinCAT HMI solution which integrates the Human Machine Interface (HMI) directly into the familiar Microsoft Visual Studio® integrated development environment (IDE). Programming is not required, as simple configuration is handled via the user-friendly graphical editor. The simplicity of the configuration is mirrored by the adaptability of the handling: the web-based solution, based on HTML5 and JavaScript, acts "responsively", regardless of the operating system, browser or device. A powerful, standard HMI architecture enables numerous application scenarios: from the local panel display solution to multi-client, multi-server and multi-runtime concepts. Defined interfaces offer simple implementation of individual extensions, plus the mix of standard graphic controls and custom design elements facilitates individualized concepts.

Simplicity

A good HMI must be simple, and achieving this simplicity begins with the engineering process. Through the integration of the TwinCAT HMI in Visual Studio®, the graphical "What-You-See-Is-What-You-Get" (WYSIWYG) editor enables you to use simple controls from a toolbox, arrange them on the interface and link them to real-time variables. In addition, it is possible to assemble and parameterize user controls from the variety of simple controls, making the HMI design kit easy to expand. Ready-made HTML5 templates – like the kind that normally require design specialists – can be integrated with little effort in order to generate complex, yet ergonomic pages.

Depending on experience and the application type, the HMI logic can be implemented either on the client side in JavaScript or as a server extension that offers the option to write extensions in C++ or .NET, achieving maximum intellectual property (IP) protection.

TwinCAT HMI automatically adjusts according to the respective resolution and orientation of the display hardware. This permits use with various display sizes, aspect ratios and screen orientations. Since the browsers are available on different hardware platforms and operating systems, TwinCAT HMI can be executed on all processor platforms – from the ARM and Core™-i series to many-core computers – without recompiling or adaptation.

Integration

Visual Studio® facilitates efficient design of the HMI and its various pages and a graphical editor offers the possibility to place controls on the interface, as well as to parameterize them. In addition to the visual parameters such as size and color, it is also necessary to create the link to the variables, e. g. from the PLC or from a C++ module. Various software wizards provide assistance to handle this with ease.
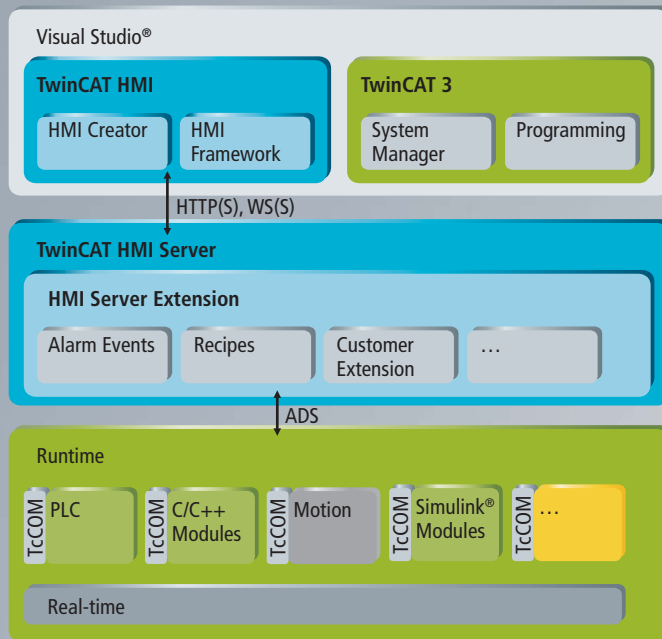
Engineering architecture of
the TwinCAT HMI
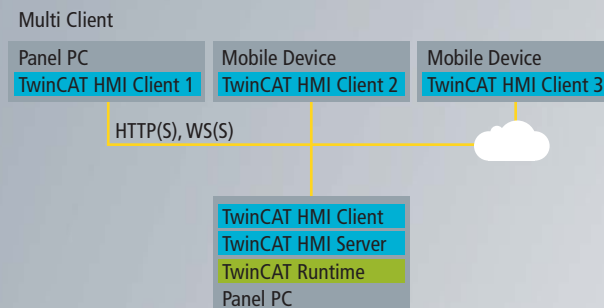
The TwinCAT HMI can be observed and operated from
several clients in parallel.
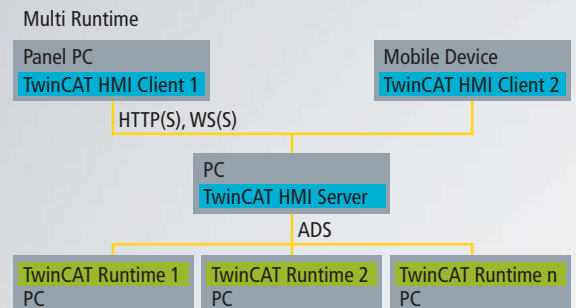
The TwinCAT HMI server supports access
to several runtime systems.

To allow the display of online values so that they can be seen even during the development of an HMI, the designed HMI page can be directly animated with the variables. Of course, modifications are also possible in live mode. The use of a source code database, such as Team Foundation Server or Subversion, enables the connection of all data, making team-based software development work simpler and easier to manage.

Design in HTML5

As the rising global standard in modern web programming, HTML5 provides simple, high-performance and globally-available technology for webpage design. Successfully used and driven forward by all major webpage developers and more influential tech companies every day, HTML5 has been integral in mitigating many of the previous issues with "living" webpages. TwinCAT HMI utilizes HTML5, helping many thousands of designers create modern and ergonomic HMI pages, and enabling numerous browser types to quickly and easily display these webpages.

Connectivity and security

One might ask, "How can TwinCAT HMI exchange data with a PLC?" Simply put, the client, i. e. the browser, communicates directly with the HMI server.

Long-familiar, tried-and-tested standards, such as HTTPS and Websocket Secure, guarantee security from the client to the server. The HMI server, on the other hand, connects to the respective controller(s) via the appropriate protocols. OPC UA, for example, provides this type of functionality, along with the Automation Device Specification (ADS) within TwinCAT software. Further protocols, such as industry-specific protocols, including BACnet and IEC 61850, are simple to implement using the server extensions.

Various controllers can exchange their data with one or more clients in a local network. These clients can run on local PCs or Panel PCs, or on mobile devices such as tablets and smartphones. A secure connection to cloud-based services is also integrated, allowing the display of HMI pages on smartphones connected to the machine via internet, for example.

Flexibility and openness

The use of HTML5 can serve as the simple extension of the TwinCAT HMI via individual HTML pages. For example, complex user controls can be assembled from the individual controls. In this way, a thoroughly modular and simply extendable system exists on the viewer side. JavaScript can be used for the client logic, but this is not the only option. Those who are unfamiliar with JavaScript
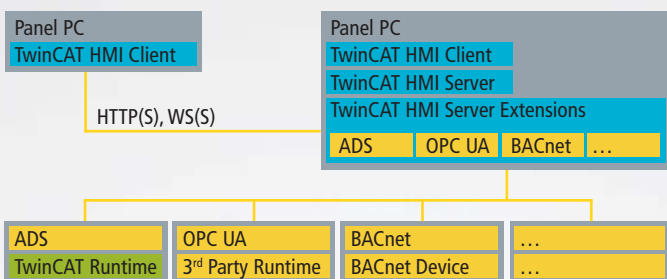
Dr. Josef Papenfort,
TwinCAT Product Manager, Beckhoff

Sven Oberschmidt,
TwinCAT Product Manager, Beckhoff

Multi Protocol

Panel PC		Panel PC			
TwinCAT HMI Client		TwinCAT HMI Client			
		TwinCAT HMI Server			
HTTP(S), WS(S)		TwinCAT HMI Server Extensions			
		ADS	OPC UA	BACnet	…

ADS	OPC UA	BACnet	…
TwinCAT Runtime	3rd Party Runtime	BACnet Device	…

The TwinCAT HMI server can be modularly expanded for further protocols.

can simply configure certain conditions using a graphical editor instead of programming them.

On the server side, extensions can be programmed very simply, with functionalities modularly extended or retrofitted using the previously mentioned extensions. These could be logic functions programmed in C++ or .NET, or even an extension for a certain protocol. TwinCAT HMI offers the ideal solution for industry-specific controls; however, controls of a completely different design can be integrated just as easily.

Paradigm shift for modern HMI solutions
The new TwinCAT HMI ushers in a significant paradigm shift in the field of HMI software: Instead of proprietary systems for engineering and communication and their use only on certain operating systems, TwinCAT HMI makes use of standard development technologies for design, especially Visual Studio® and HTML5, as well as standards for the communication, namely Websockets and HTTPS. There is also no dependence on the operating system – TwinCAT HMI runs on any browser compliant with HTML5 and with any operating system. In this way, Beckhoff has created a future-proof, open and high-performance solution for a highly-connected world moving toward Industry 4.0 concepts.

i The highlights at a glance:

– Efficient engineering, integration into Visual Studio®
– Platform-independence
– Web-based (HTML5, JavaScript)
– Powerful architecture
– Modular expandability
– High-level language integration
– Standard graphic tool chains

Product announcement
estimated market release: 3rd quarter 2016

Further information:
www.beckhoff.com/TwinCAT-HMI