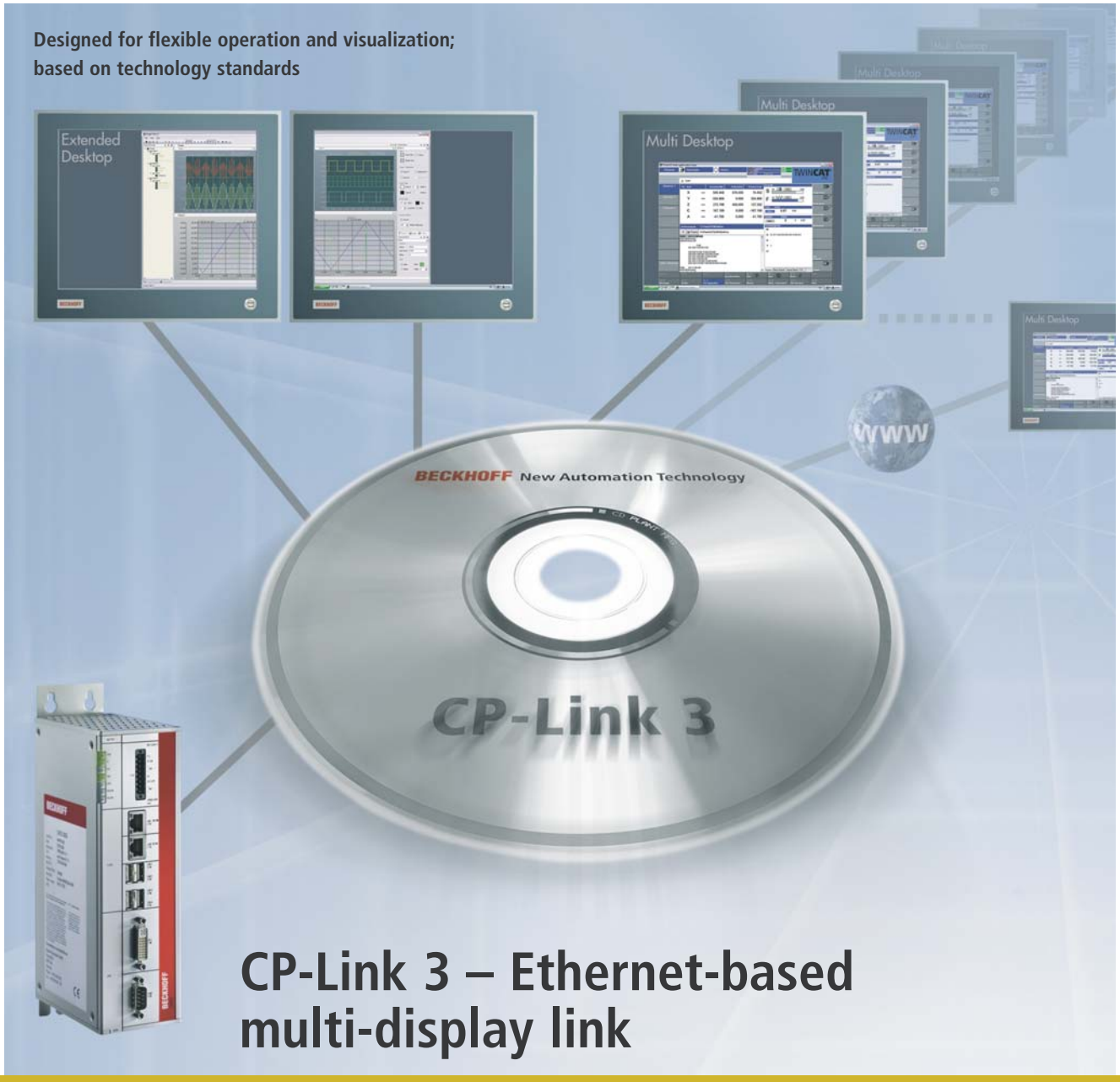


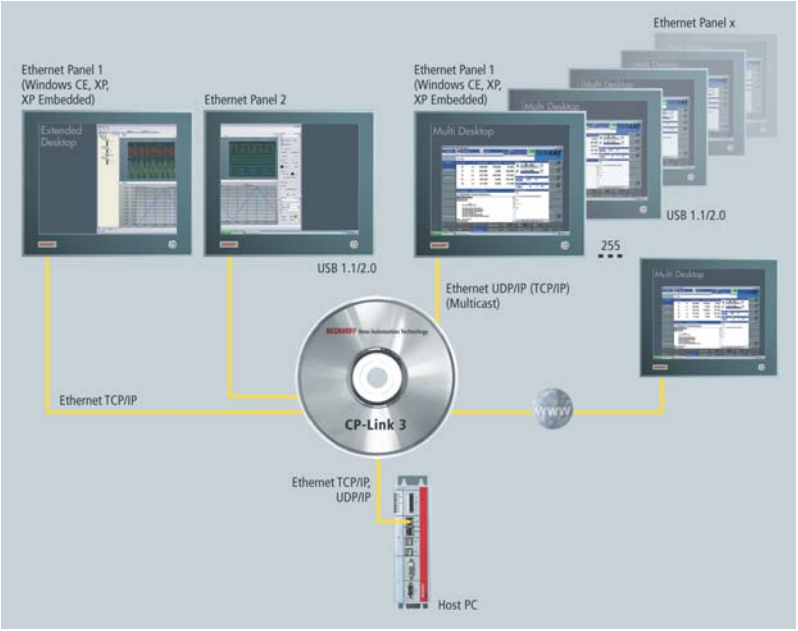
CP-Link 3 – Ethernet-based multi-display link

Ten years after the introduction of the CP-Link technology, Beckhoff now presents CP-Link 3, the next generation of this operating and visualization concept. CP-Link 3 is a pure software solution based entirely on standard hardware (Ethernet) and IP-based protocol for real-time transfer of images. Networking can be done using cost-effective, standard Ethernet cables (CAT 5) which are suitable for drag chains.

Using the CP-Link concept, Beckhoff has relied on remote operating elements since as far back as 1998; i.e. the control and display elements make up an independent unit, separate from the control level. The computer is housed in a control cabinet. The flexible positioning of the Control Panels gives the user a great deal of scope. While the existing CP-Link 1 and CP-Link 2 solutions are based on special hardware components, CP-Link 3 is a pure software solution.

| **CP-Link 1** transfers the data using a proprietary, high-speed serial bus. The IPC must have a special interface card for each display so the number of displays that can be connected is limited by the number of available slots in the PC. Data transfer to the panel takes place by means of two coaxial cables. For longer distances – over 70 m – complex, expensive coaxial cable must be used in order to guarantee fault-free data transfer.

| **CP-Link 2** is a combination of DVI and USB, known as "DVI/USB Extended" at Beckhoff. Both are standardized transfer techniques, however they have limitations with regards to the range and the number of displays that can be operated simultaneously. With the help of additional hardware solutions (DVI splitters, DVI extenders, USB extenders) distances of up to 50 m can be covered.



CP-Link 3 mode of operation

In contrast to previous solutions, the CP-Link 3 concept is based entirely on standard technologies: 100 Mbit/s Ethernet and IP protocol. The screen contents are captured by a virtual graphic adapter in the host PC and sent using Ethernet to one or more Beckhoff Ethernet Panels with Windows operating systems (CE and XP Embedded, XP). For display communication, TCP/IP or UDP/IP (Multicast) can be configured, depending on the operating mode. Four panels can be connected in the TCP/IP mode and up to 255 in the UDP mode.

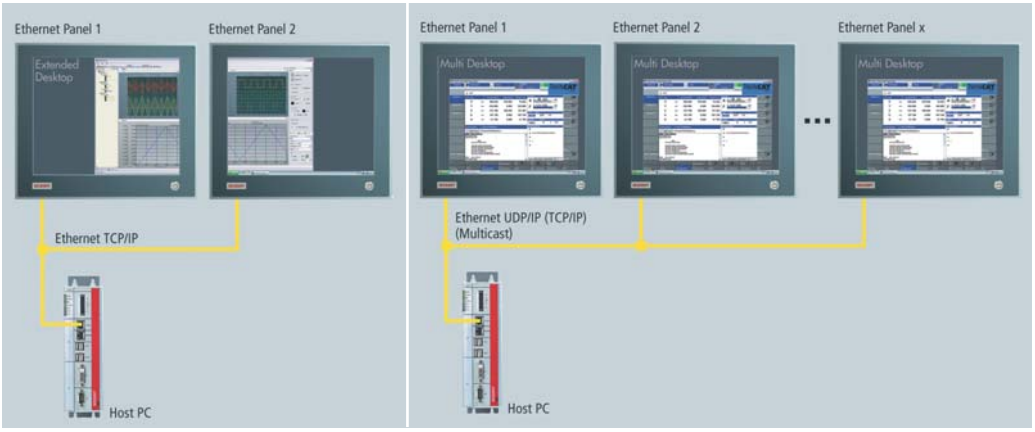
There are three different operating modes for the screen display which are parameterized using the configuration menu in the CP-Link 3 software.

- **Single Desktop:** A virtual graphic adapter shows the image of the host PC on a display connected via Ethernet.
- **Extended Desktop:** One or several virtual graphic adapters are used as extensions to the host PC desktop. In this way, windows can be shown on addressed displays, i.e. program windows can be moved to any additional screen, for example. Communication takes place using TCP/IP.
- **Multi Desktop:** All connected displays show the same image. Communication takes place using TCP/IP (up to four panels) or via UDP Multicast (up to 255 panels). The benefit of Multicast lies in the fact that messages can be transferred to several Ethernet Panels simultaneously without the transmitter bandwidth multiplying by the number of receivers.

In multi desktop mode, an input can be made to each panel at the same time. The displays can be interlocked (mouse and keyboard) to coordinate the inputs. The locking functions are controlled by means of TwinCAT PLC or using an application program. The signals necessary for this are transferred by means of the CP-Link 3 protocol. Appropriate software interfaces (APIs) and PLC blocks are available for this.

The host PC transfers image signals, "virtual USB," as well as touch screen and special key functions to the Ethernet Panel. The USB devices that are connected

	CP-Link 1	CP-Link 2	CP-Link 3
Data transfer	serial high-speed bus CP-Link	DVI/USB Extended	Ethernet TCP/IP (UDP)
Max. distance from PC	100 m	50 m	100 m
Data transfer medium	2 x coaxial cables	1 x DVI cable, 1 x Ethernet cable (CAT 5),1 x power supply	1 x Ethernet cable (CAT 5), 1 x power supply
What is transferred?	image, touch RS232 (keyboard, special keys), PS/2 mouse), special keys with LEDs, K-bus, voltage	image (DVI), USB 1.1, touch, special keys with LEDs	image, USB 1.1(2.0) touch, special keys with LEDs
Required hardware	CP-Link PCI card per display	DVI-E/USB-E cable set including USB Extender CU8800 or DVI/USB splitter CU8810 for up to four displays	–
Control Panel	CP60xx, CP70xx	CP69xx, CP79xx	Panel/Panel PC e.g. CP66xx, CP67xx, CP77xx (Windows CE) or CP62xx, CP72xx (CE, XP)
Software	Beckhoff TwinCAT or TwinCAT CP	Beckhoff TwinCAT or TwinCAT CP	Beckhoff CP-Link 3
Operating system	Microsoft Windows XP, XP Embedded	Beckhoff TwinCAT or TwinCAT CP	Panel/Host PC: Windows CE, Windows XP, XP Embedded
Max. number of panels which can be connected	3	1 (4)	4 (TCP/IP), 255 (UDP/IP)



Extended Desktop **Multi Desktop**

to the Ethernet displays appear in the host PC like locally plugged-in devices and can be used in the normal way. Additional input/output devices on the displays, such as rotary switches, buttons, etc. are read by the host PC using an additional communication channel. Printers and webcams, which are connected to an Ethernet Panel by means of USB, can be used from the host PC.

An additional functionality is that any chosen image details from the host screen can be transferred to the Ethernet displays. The relevant details are defined in the CP-Link 3 software and assigned an IP address.

Because the data and image transfer are based on TCP/IP, the operating and display functions can be optionally extended using the Internet. Ethernet Panels can be integrated using the Internet via VPN (Virtual Private Network). The VPN then takes over the security functions.

"Virtual USB"

In addition to image data, CP-Link 3 also transfers USB. "Virtual USB" emulates a USB root hub in the host PC. If a USB device is plugged into an Ethernet Panel, the virtual hub logs the device onto the operating system of the host PC and transparently transmits the ensuing communication. For the operating system, the USB device behaves as though it was directly connected to the PC. Virtual USB transfers the standards USB 1.1 and USB 2.0. As communication takes place using 100 Mbit/s Ethernet, the USB 2.0 transmission performance (400 Mbit/s) is restricted.

The CP-Link 3 software needs to be installed on both the server and client sides. All functions, such as control locking using PLC, can also be accessed in the TwinCAT automation software suite. Ethernet Panels (Windows CE) or Panel PCs (Windows XP, XP Embedded) can be used as clients. Once started, the application software (PLC/NC, HMI, etc.) runs on the host PC; any necessary software license fees are charged only once for the host PC. The Control Panels only contain image data. If there is more than one graphics card in the PC, then only one license per application is required.

Product announcement Beta version for SPS/IPC/DRIVES 2008, estimated market release 2nd quarter 2009.

Beckhoff Ethernet Panel/Panel PC

The CP-Link 3 concept is supported by all Beckhoff Ethernet Panels and Panel PCs. The requirement for this is the CP-Link 3 client software and Windows CE or XP Embedded as an operating system. The aluminum Control Panels have high-quality TFT displays in a variety of sizes and resolutions. A touch pad or touch screen can be integrated as an option. The following Panel/Panel PCs are some of the options for use with the CP-Link 3 concept:

- **Built-in Control Panel CP66xx:** Intel® IXP420 with XScale® technology, 533 MHz, Windows CE
- **Built-in Panel PC CP67xx:** 500 MHz processor for Windows CE or XP Embedded
- **Built-in Panel PC CP62xx:** incl. Intel® Core™2 Duo processors, Windows XP or XP Embedded
- **Panel PC CP77xx:** 500 MHz processor for Windows CE or XP Embedded
- **Panel PC CP72xx:** incl. Intel® Core™2 Duo processors, Windows XP or XP Embedded