SIEMENS

Network Security

Industrial Security

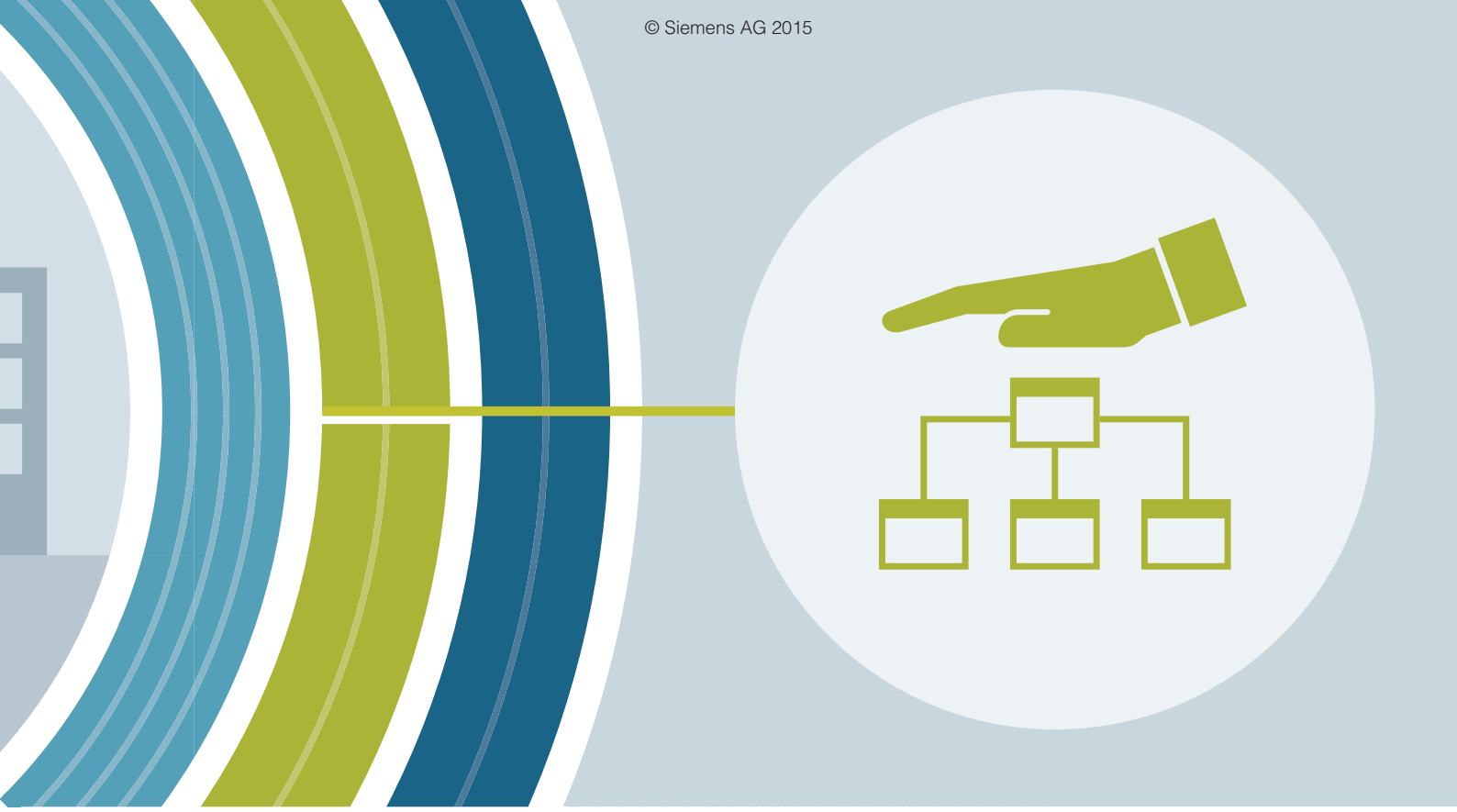
Brochure

Edition 11/2015

siemens.com/industrial-security

The Internet serves as an enormous accelerator of business processes and has revolutionized business operations around the world. The resulting changes in the production industry can also be described as a revolution – the 4th Industrial Revolution. Industry 4.0 affects all aspects of the industrial value chain, including the very important aspects of industrial communication and security.

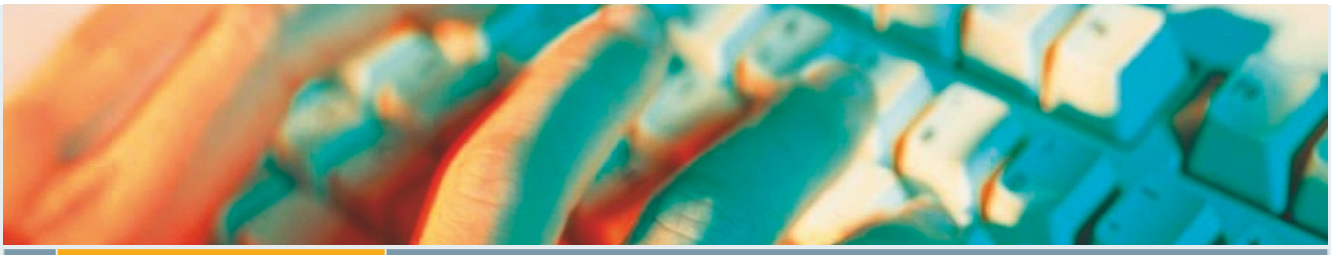
Moreover, security is now also regulated by laws addressing critical infrastructures in particular in order to accommodate increased security requirements. Examples include the IT Security Act in Germany, the ANSSI Certification in France and NERC CIP in USA. After all, open communication and the increased networking of production systems involve not only huge opportunities, but also high risks. To provide an industrial plant with comprehensive security protection against attacks, the appropriate measures must be taken. Siemens can support you here in selectively implementing these measures – within the scope of an integrated range for industrial security.



Content

Industrial Security

Why industrial security is so important



No.	Threat	Explanation
1	Malware infection via Internet or intranet	Standard IT components such as operating systems, application servers and databases generally contain flaws and weak points which can be exploited by attackers.
2	Introduction of malware via removable media and external hardware	Removable media such as USB sticks are subject to unnoticed malware infection. The use of notebooks containing external data and maintenance software that may have been used in other companies poses a comparable danger.
3	Social Engineering	Social Engineering is a method of gaining unauthorized access to information or IT systems through mostly non-technical actions in which human traits such as helpfulness, trust, or fear or respect of authority are exploited. An example of this are deceptive Internet websites that infect the victim's system with malware.
4	Human error and sabotage	Personnel working in an ICS environment occupy a special position when it comes to security. This applies both to a company's own employees as well as all external personnel involved in maintenance or construction work. Security can never be guaranteed by technical measures alone. Organizational regulations are always required too.
5	Intrusion via remote maintenance access	External access to ICS installations for maintenance purposes is a widespread practice. And when one system is accessed for maintenance, other systems can be easily reached. Often the lack of authentication and authorization as well as flat network hierarchies are causes for security incidents.
6	Control components connected to the Internet	Insecure ICS components such as programmable logic controllers are often connected directly to the Internet contrary to manufacturer recommendations without adequate accompanying security measures.
7	Technical malfunctions and force majeure	Failures due to extreme environmental influences or technical defects are always possible – the risk and the potential for damage can only be minimized here.
8	Compromising of smartphones in the production environment	The ability to display and change operating and production parameters on a smartphone or tablet is an additional product feature that is being promoted and used for more and more ICS components. This represents a special remote maintenance access case in which the use of smartphones creates an additional attack target.
9	Compromising of extranet and cloud components	The widespread trend in conventional IT toward outsourcing of IT components is now finding its way into ICS. For example, remote maintenance solution providers are placing client systems for remote access in the cloud, but this leaves system owners with only very limited control over the security of these components.
10	(D)DoS attacks	(Distributed) denial of service attacks can be used to disrupt network connections and required resources and cause systems to crash, e.g. to disrupt the functionality of an ICS.

Threat overview

Source:
Industrial Control System Security: Top 10 Threats and Countermeasures v1.1
Publication date: March 26, 2014

Note:
This list of threats was compiled in close cooperation between BSI (German Federal Office for Information Security) and representatives of industry.
Using BSI analyses, the Federal Office for Information Security (BSI) publishes statistics and reports on current topics dealing with cyber-security. Please direct all comments and notes to:
cs-info@bsi.bund.de

Defense in depth

Network security as a central component of the Siemens Industrial Security concept

With defense in depth, Siemens provides a multi-faceted concept that gives your system both all-round and in-depth protection. The concept is based on plant security, network security and system integrity – according to the recommendations of ISA 99 / IEC 62443, the leading standard for security in industrial automation.

Plant security

Plant security uses a number of different methods to prevent unauthorized persons from gaining physical access to critical components. This starts with conventional building access and extends to securing sensitive areas by means of key cards. The customized Plant Security Services include consulting services, implementation packages and managed security services for comprehensive, long-term plant protection. Production facilities are at the mercy of constant threats. Infected devices, unauthorized personnel, unauthorized access via networks and the Internet call for measures. A security assessment analyzes and assesses the security status of a plant with respect to technology, network architecture, and personnel. Implementation packages range from support for network planning and installation of attack detection systems to integration of system hardening measures. With continuous updates and comprehensive monitoring, managed security services ensure rapid adjustments to changing threats and transparency of a plant's security status thanks to worldwide monitoring and real-time warnings.

Success factor: Network Security

Network security means protecting automation networks from unauthorized access. This includes the monitoring of all interfaces such as the interfaces between office and plant networks or the remote maintenance access to the Internet. It can be accomplished by means of firewalls and, if applicable, by establishing a secure and protected "demilitarized zone" (DMZ). The DMZ is used for making data available to other networks without granting direct access to the automation network itself. The secure segmenting of the plant network into individually protected automation cells minimizes risks and increases security. Cell division and device assignment are based on communication and protection requirements. Data transmission can be encrypted using VPN and is thus protected from data espionage and manipulation. The communication stations are securely authenticated. Automation networks, automation systems and industrial communication can be made secure with "Security Integrated" components such as SCALANCE S security modules, SCALANCE M Internet and mobile wireless routers and Security CPs for SIMATIC.

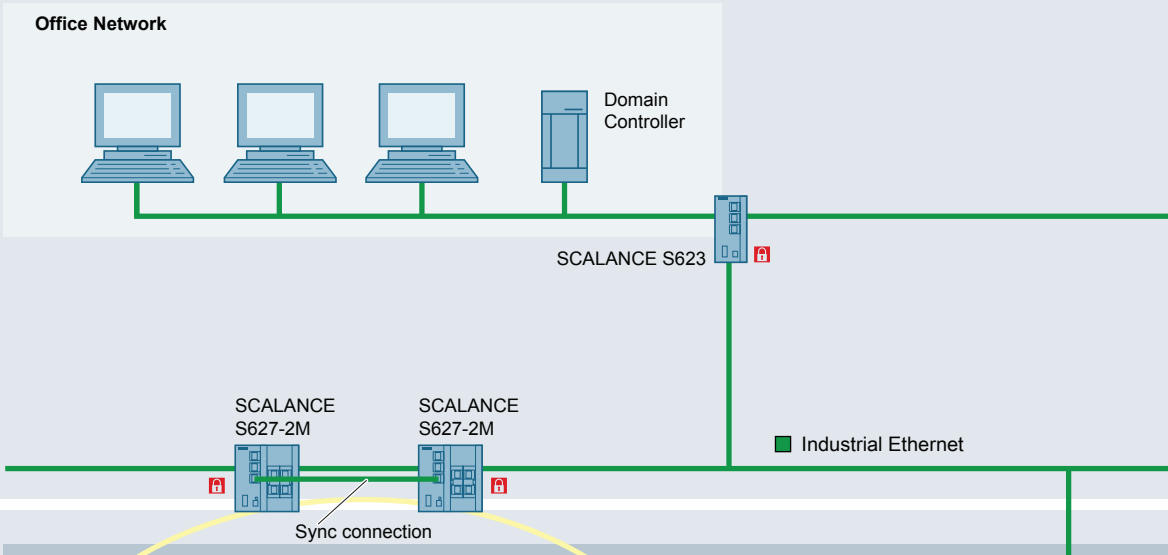
System integrity

The third pillar of defense in depth is the safeguarding of system integrity. The emphasis here is on protecting automation systems and control components such as SIMATIC S7-1200 and S7-1500 as well as SCADA and HMI systems against unauthorized access and on meeting special requirements such as know-how protection. Furthermore, system integrity also involves authentication of users, access and change authorizations, and system hardening – in other words, the robustness of components against attacks.

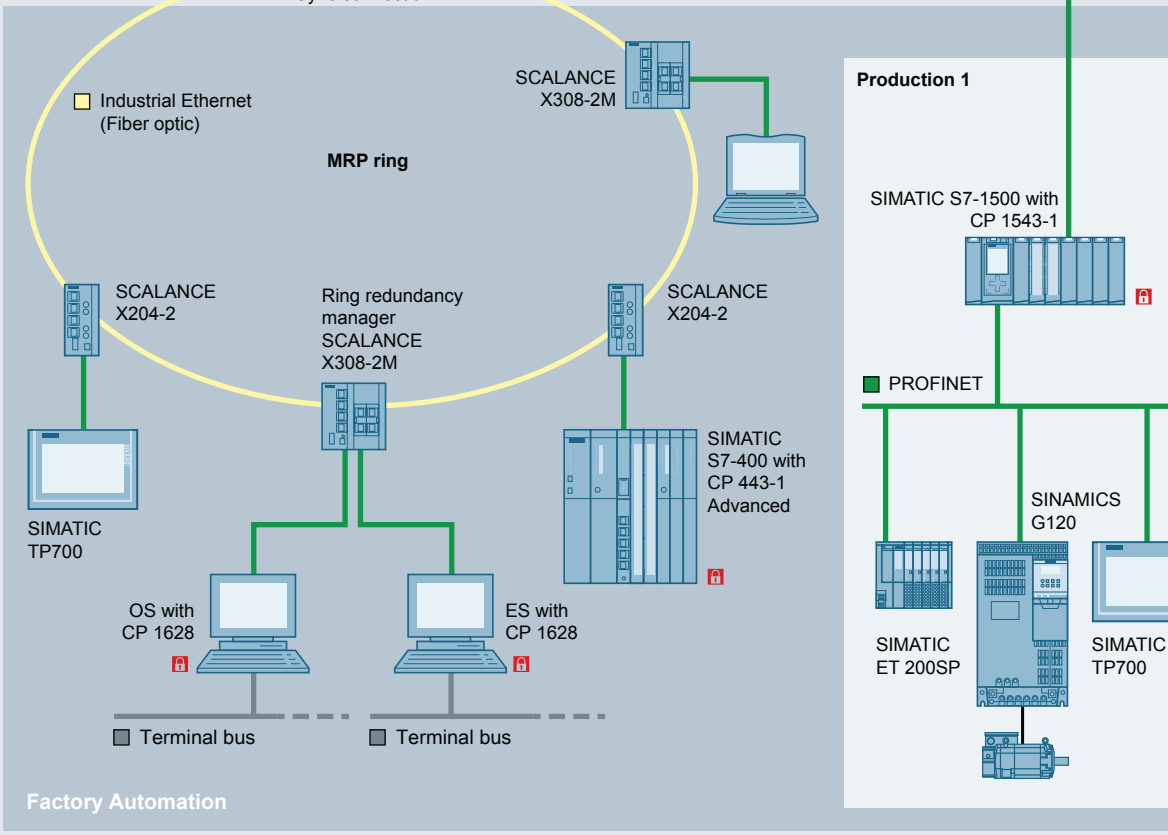
Industrial security at a glance

Plant Security

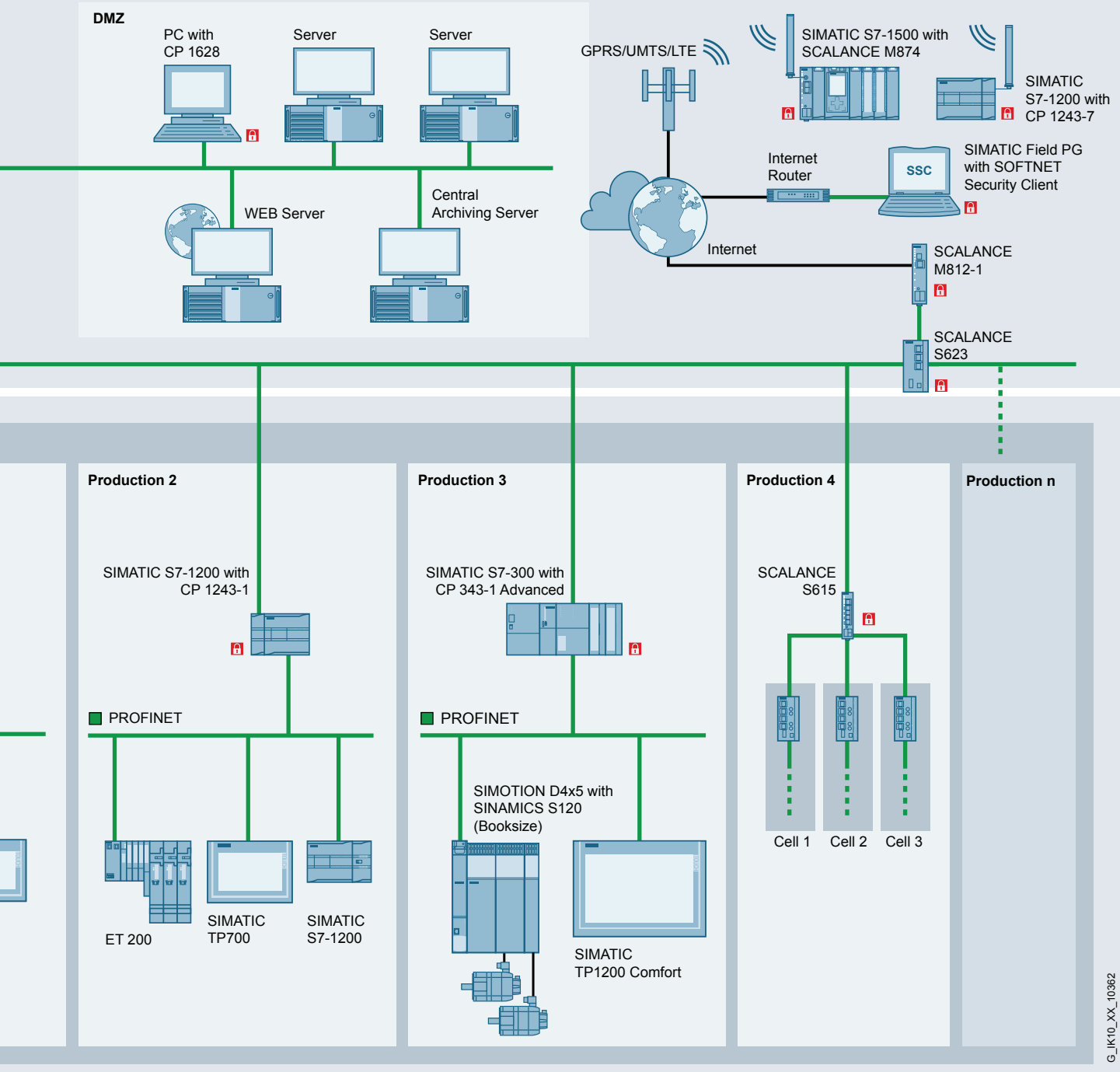
Network Security



System Integrity



- Physical protection
- Security management
- Cyber security operation center



Industrial security products as part of Totally Integrated Automation

	SCALANCE S	SCALANCE M	CP 343-1 Adv CP 443-1 Adv	S7-1200 CPU 1) S7-1500 CPU	CP 1243-1 1) CP 1243-7 LTE CP 1543-1	CP 1628	SOFTNET Security Client
Configurable copy protection				•			
Access protection (authentication)				•			
Enhanced access protection (firewall)	•	•	•		•	•	
Virtual Private Network with IPsec	•	•	•		•	•	•
Manipulation protection (communication, configuration)	•	•	•	•	•	•	•

• Applies

1) as of CPU Firmware V4.0 and STEP 7 Professional V13 (TIA Portal)

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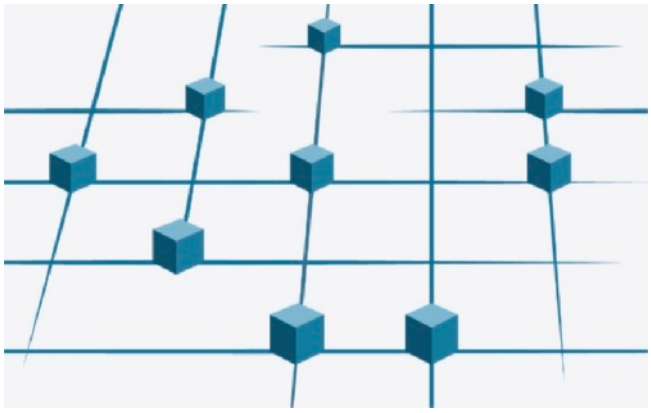
Security Integrated products for industrial use with special security functions to improve the standard of security

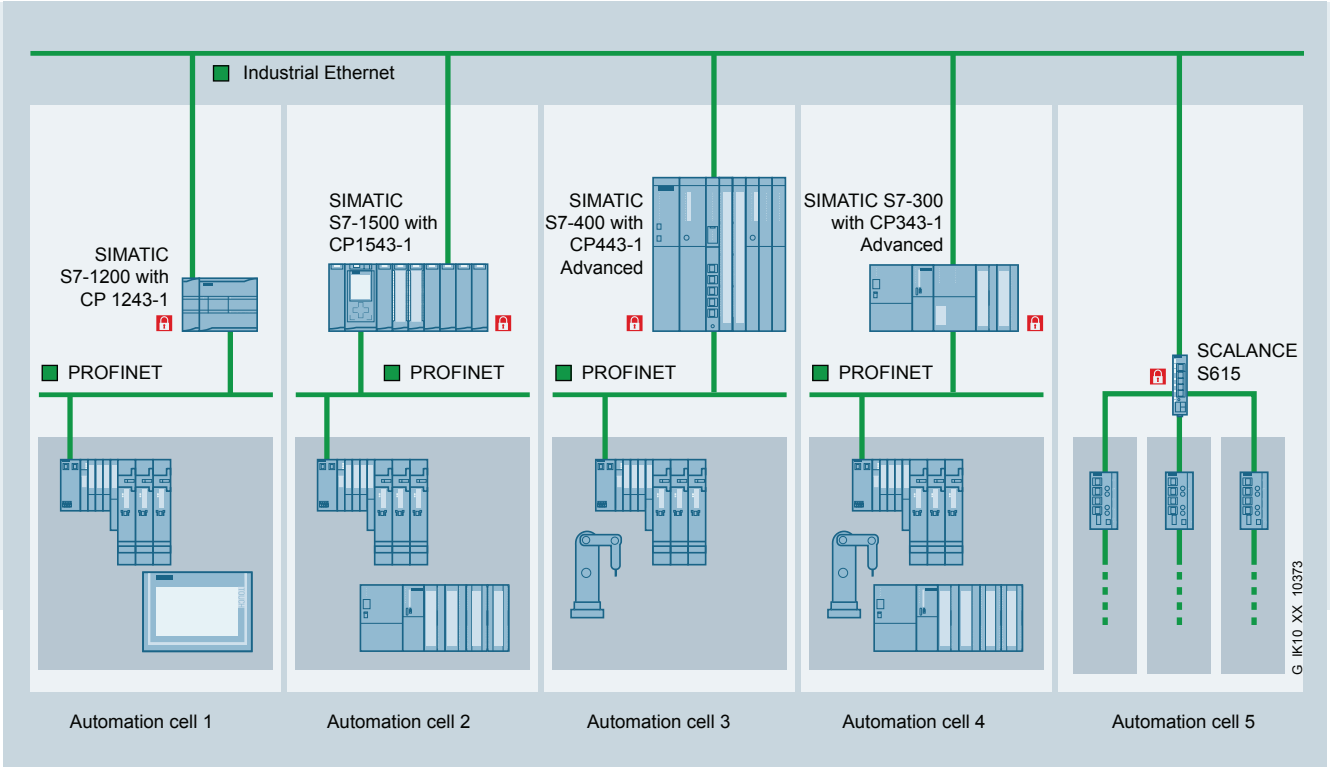


Totally Integrated Automation:
Efficient interaction between all automation components

With industry-compatible security products for network security and system integrity integrated in the TIA Portal, your automation solutions can be efficiently safeguarded and the defense-in-depth concept for the protection of industrial plants and automation systems can be implemented.

Network Security

Cell protection concept



Secure communication between components with Security Integrated in separate automation cells

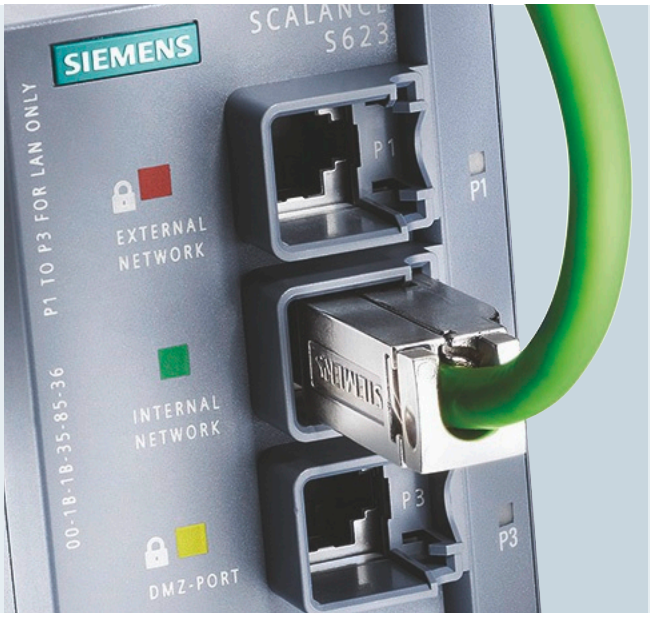
Industrial communication is a key factor for corporate success – as long as the network is protected.

For realization of the cell protection concept, Siemens partners with its customers to provide them Security Integrated components, which not only have integrated communication functions but also special security functions such as firewall and VPN functionality.

Cell protection concept

With the cell protection concept, a plant network is segmented into individual, protected automation cells within which all devices are able to communicate with each other securely. The individual cells are connected to the plant network protected by a VPN and firewall. Cell protection reduces the susceptibility to failure of the entire production plant and thus increases its availability. Security Integrated products such as SCALANCE S, SCALANCE M and SIMATIC S7/PC communications processors can be used for implementation.

SCALANCE S security modules



The security modules of the SCALANCE S range can be used to protect all devices of an Ethernet network against unauthorized access. In addition, SCALANCE S modules protect the data transmission between devices or network segments (such as automation cells) against data manipulation and espionage by setting up VPN tunnels and can also be used for secure remote access over the Internet. The SCALANCE S security modules can be operated in bridge mode, i.e. within an IP subnet, or in router mode, i.e. at the IP subnet boundaries. SCALANCE S is optimized for use in automation and industrial environments and meets the special requirements of automation systems, such as easy upgrades of existing systems, simple installation and minimal downtimes in the event of a fault.

You will find more information on security modules at:
siemens.com/scalance-s

Product variants

SCALANCE S602

- Uses the Stateful Inspection Firewall to protect network segments against unauthorized access
- Connection via 10/100/1000 Mbit/s ports
- "Ghost mode" for protection of individual, including changeable, devices through dynamic adoption of the IP address.

SCALANCE S612

- Uses the Stateful Inspection Firewall to protect network segments against unauthorized access
- Up to 128 VPN tunnels can be operated simultaneously
- Connection via 10/100/1000 Mbit/s ports

SCALANCE S615

- Uses a firewall and Virtual Private Network VPN to protect data traffic against unauthorized access (IPsec and OpenVPN for connection to SINEMA Remote Connect)
- Up to five variable security zones per port-based VLAN (Virtual Local Area Network) allow configuration of security zones and any firewall rules between security zones
- A variety of configuration, management and diagnostic capabilities with WBM (Web-based Management), CLI (Command Line Interface) and SNMP (Simple Network Management Protocol)
- Digital input (DI) for connection of a key-operated switch for controlled setup of a tunnel connection
- Autoconfiguration interface for easy configuration of a connection to SINEMA Remote Connect
- Connection via 10/100 Mbit/s ports

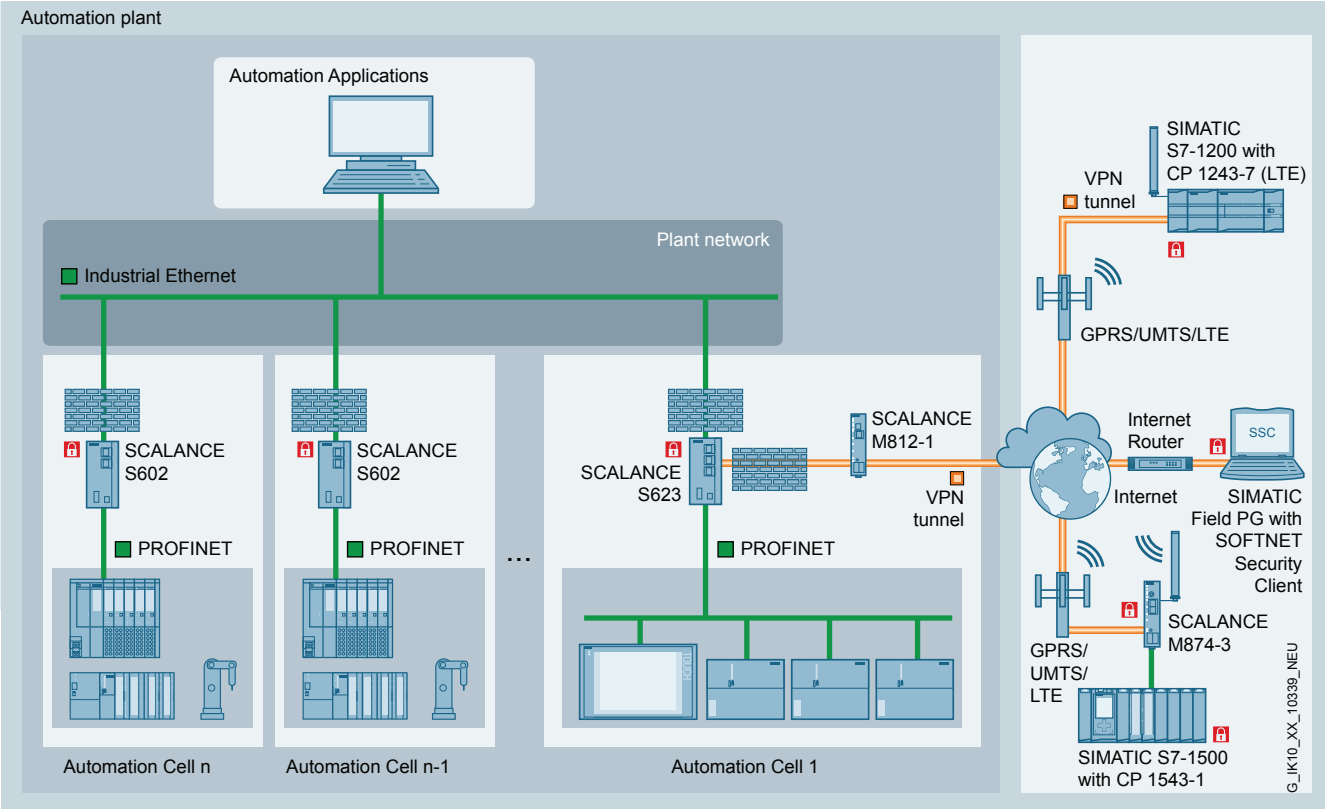
SCALANCE S623

- Uses the Stateful Inspection Firewall to protect network segments against unauthorized access
- Up to 128 VPN tunnels can be operated simultaneously
- Connection via 10/100/1000 Mbit/s ports
- Additional RJ45 DMZ (demilitarized zone) port for secure connection, for example, of remote maintenance modems, laptops or an additional network. This yellow port is protected by firewalls from the red and green ports and can also terminate VPNs
- Redundant protection of automation cells by means of router and firewall redundancy, stand-by mode of the redundant device and status matching via the yellow ports

SCALANCE S627-2M

- Uses the Stateful Inspection Firewall to protect network segments against unauthorized access
- Up to 128 VPN tunnels can be operated simultaneously
- Connection via 10/100/1000 Mbit/s ports
- Additional RJ45 DMZ (demilitarized zone) port for secure connection, for example, of remote maintenance modems, laptops or an additional network. This yellow port is protected by firewalls from the red and green ports and can also terminate VPNs
- Redundant protection of automation cells by means of router and firewall redundancy, stand-by mode of the redundant device and status synchronization via the yellow ports
- Two additional slots for 2-port media modules (same as for SCALANCE X-300) for direct integration in ring structures and FO networks with two additional switched red or green ports per module
- Bridging of longer cable lengths or use of existing 2-wire cables (e.g. PROFIBUS) through the use of MM992-2VD media modules (variable distance)

Application examples
Secure remote maintenance with SCALANCE S



Secure remote access without direct connection to the automation network with SCALANCE S623

Task
A system integrator requires secure Internet access to their machine, or part of an end user's plant, for servicing purposes. But the integrator is to be given access only to specific devices and not the plant network. In addition, a secured connection is to be set up from the system to a remote station using mobile networks (e.g. UMTS or LTE).

Solution
Starting points are, for example, system integrator with VPN client (SOFTNET Security Client, CP 1628, SCALANCE M874-3)

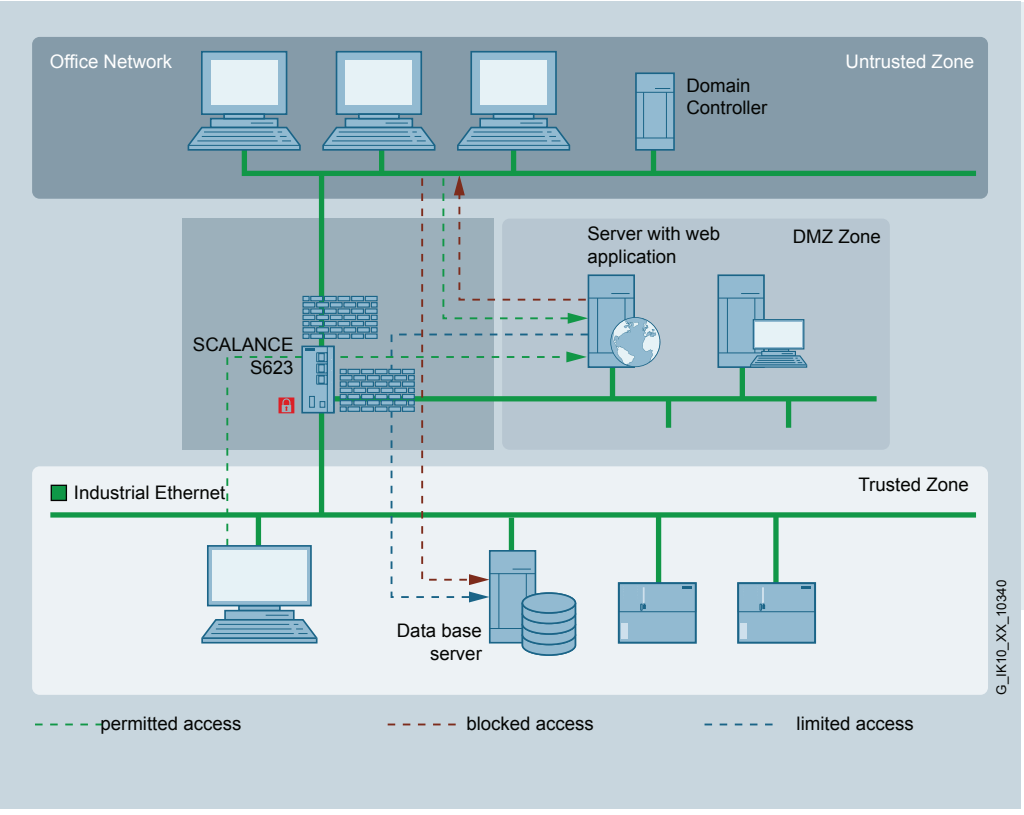
End point (automation system):
SCALANCE S623 as VPN server

- Red port: connection to plant network
- Yellow port: connection of Internet modem/router
- Green port: connection to protected cell

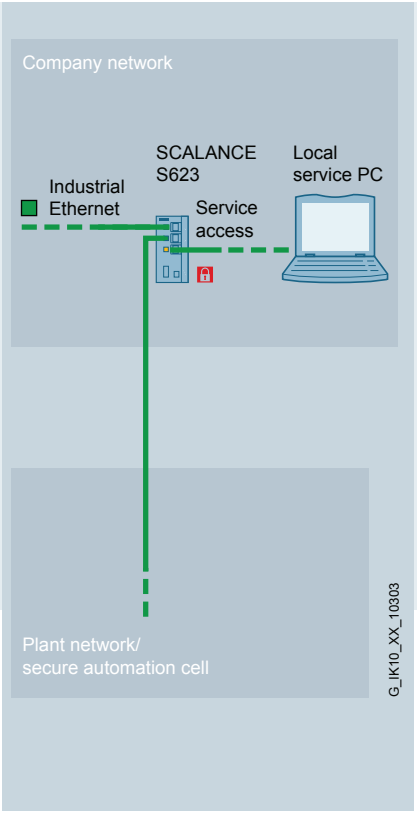
Advantages at a glance

- Secure remote access via the Internet or mobile networks such as UMTS or LTE by safeguarding the data transmission with VPN (IPsec)
- Restriction of access possibilities with integrated firewall function
- Secure remote access to plant units without direct access to the plant network with SCALANCE S623 3-port firewall

Network access protection with DMZ



Network security as a central component of the Siemens Industrial Security concept



Connection of a local service PC via the DMZ port of the SCALANCE S623

Task
Network participants or servers (e.g. MES servers) should be accessible both from the secure and non-secure network without a direct connection between the networks.

Solution
A DMZ can be set up at the yellow port by means of a SCALANCE S623. The servers can be positioned in this DMZ.

Advantages at a glance

- Increased security through data exchange via DMZ and prevention of direct access to the automation network
- Protection of automation networks against unauthorized access at the network boundaries

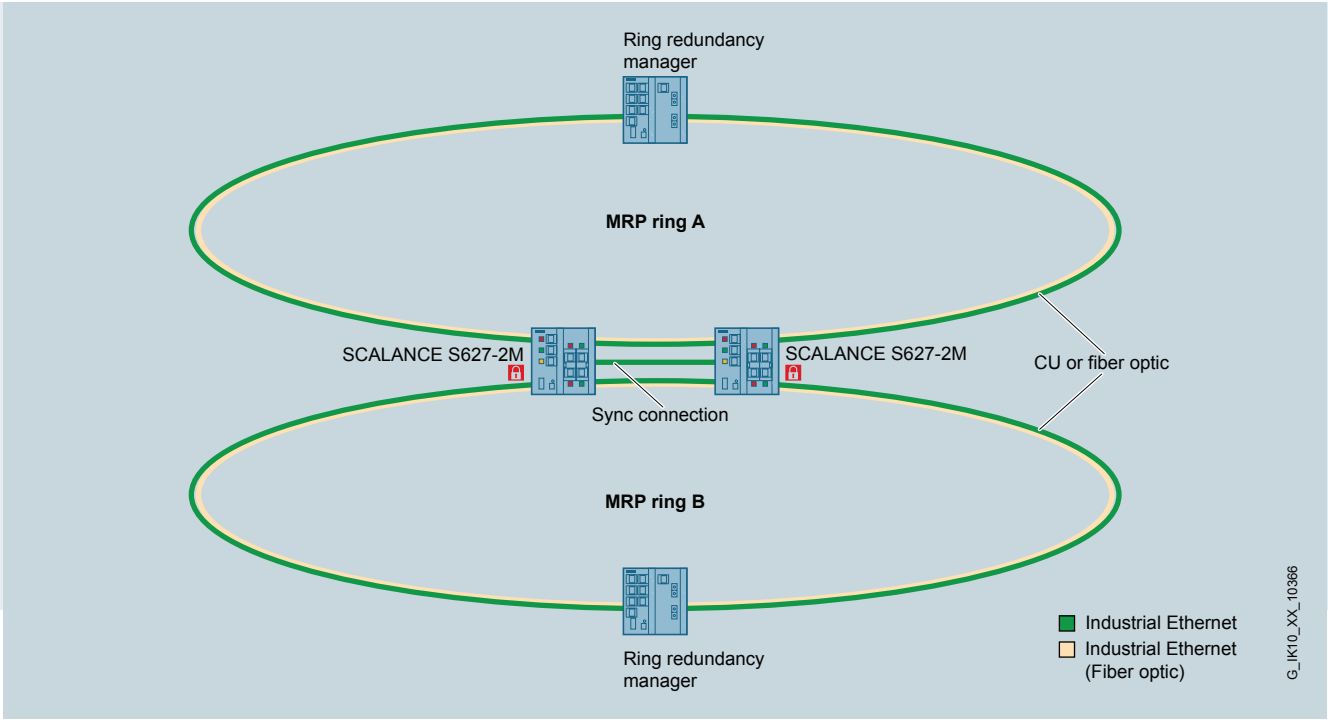
Task
The local network is to be protected against unauthorized access and authorized individuals are to receive only the access rights for their role.

Solution
The DMZ port of a SCALANCE S623 is the single locally accessible port.
The security module is connected to the plant network (red port) and a lower-level automation cell (green port). User-specific firewalls are created for each user. To receive access to the network, the user must be logged in to the SCALANCE S with user name and password.

Advantages at a glance

- Securing of local network access
- Flexible and user-specific access rights
- Central authentication possible with RADIUS

Application examples
Secure redundant ring coupling



Secure, redundant connection between two MRP rings with SCALANCE S627-2M

Task
Two rings should be securely and redundantly connected to one another.

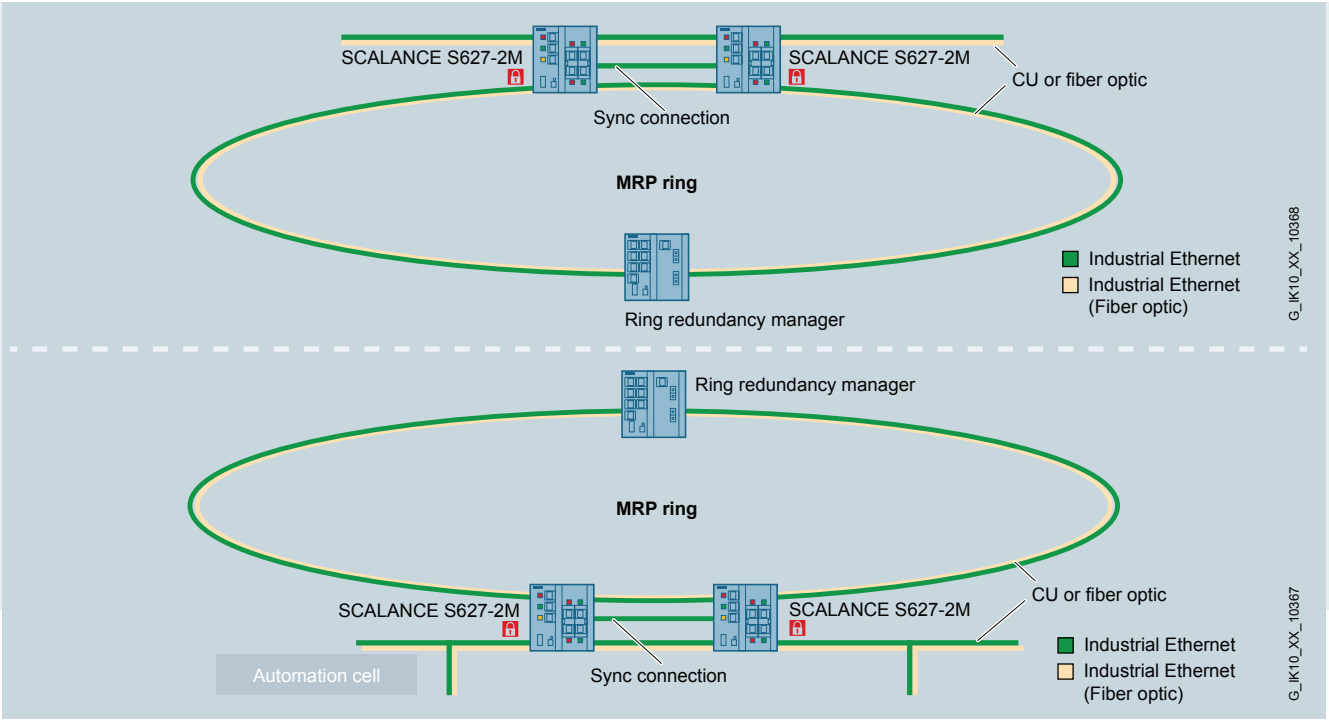
Solution
Ring A is connected to the ports of the first media module (red ports) and Ring B to the ports of the second media module (green ports) using SCALANCE S627-2M.
SCALANCE S627-2M functions as a router and firewall.
A second SCALANCE S627-2M is similarly connected and operates in stand-by mode. The coupling for synchronization of the firewall status between the two SCALANCE S modules is by means of the yellow ports, which are connected with a synchronization cable.

Note
As an alternative to MRP, Ring A or Ring B can be an HRP ring.

Advantages at a glance

- Secure redundant coupling of the MRP rings
- Control of data communication between MRP rings
- High availability due to redundant design of the SCALANCE S627-2M

Secure redundant coupling with rings



Secure, redundant connection of an automation cell to an MRP ring with SCALANCE S627-2M

Task

1. A ring is to be securely and redundantly connected to the plant network or
2. Lower-level cell is to be similarly connected to the ring.

Solution

1. The ring is connected to the ports of the second media module (green ports) and the production network to the ports of the first media module (red ports) using SCALANCE S627-2M.
2. For the connection of lower-level cells to the ring, the ring is connected to the ports of the first media module (red ports) and the lower-level cell to the ports of the second media module (green ports).

A second SCALANCE S627-2M is similarly connected in each case and operates in stand-by mode. In order to match the firewall status between the two SCALANCE S modules, the yellow ports are coupled by means of a synchronization cable.

Note
As an alternative to MRP, Ring A or Ring B can be an HRP ring.

Advantages at a glance

- Secure redundant connection of an MRP ring to the plant network or secure redundant connection of an automation cell to a higher-level ring
- Control of the data communication between an MRP ring and a lower-level automation cell
- High availability due to redundant design of the SCALANCE S627-2M

SCALANCE M Internet and mobile wireless routers

SCALANCE M874-2, M874-3, M876-3 und M876-4

SCALANCE M874-3 and **SCALANCE M874-2** are mobile wireless routers for cost-effective and secure connection of Ethernet-based subnets and automation devices via mobile networks of the 3rd generation (UMTS) or 2nd generation (GSM).

The integrated firewall and VPN (OpenVPN and IPsec) security functions protect against unauthorized access and secure the data transmission.

SCALANCE M874-2

The SCALANCE M874-2 supports GPRS (General Packet Radio Service) and EDGE (Enhanced Data Rates for GSM Evolution).

SCALANCE M874-3

The SCALANCE M874-3 supports HSPA+ (High Speed Packet Access) and therefore enables high transmission rates of up to 14.4 Mbit/s in the downlink and up to 5.76 Mbit/s in the uplink (depending on the infrastructure of the mobile wireless provider).

SCALANCE M876-3 and SCALANCE M876-4 are mobile wireless routers for cost-effective and secure connection of Ethernet-based subnets and automation devices via mobile networks of the 4th generation (LTE), 3rd generation (UMTS) or 2nd generation (GSM).

The integrated firewall and VPN (IPsec) security functions protect against unauthorized access and secure the data transmission.

SCALANCE M876-3

The SCALANCE M876-3 supports dual-band CDMA2000 and HSPA+ (High Speed Packet Access). Thus, it enables high transmission rates of up to 14.4 Mbit/s in the downlink and up to 5.76 Mbit/s in the uplink (depending on the infrastructure of the mobile wireless provider).

SCALANCE M876-4

The SCALANCE M876-4 supports EDGE (Enhanced Data Rates for GSM Evolution) and LTE (Long Term Evolution). Thus, the device enables allows high transmission rates of up to 100 Mbit/s in the downlink and up to 50 Mbit/s in the uplink (depending on the infrastructure of the mobile wireless provider).

SCALANCE M812-1, M816-1 and M826-2

SCALANCE M812-1 and SCALANCE M816-1

SCALANCE M812-1 and SCALANCE M816-1 are DSL routers for cost-effective and secure connection of Ethernet-based subnets and automation devices to wired telephone or DSL networks that support ASDL2+ (Asynchronous Digital Subscriber Line). Thus, the devices enable high transmission rates of up to 25 Mbit/s in the downlink and up to 3.5 Mbit/s in the uplink.

Secure access and communication is achieved through the security functions of the integrated firewall and through VPN tunnels.

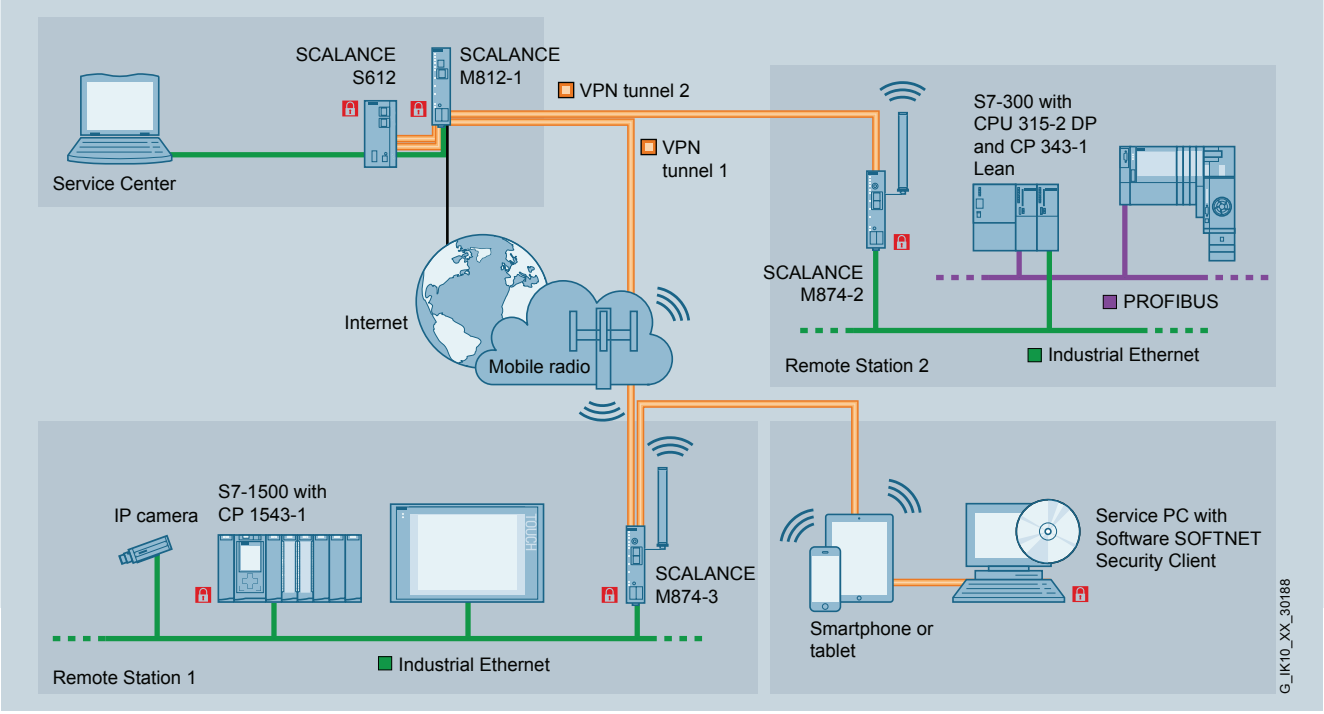
SCALANCE M826-2

The SCALANCE M826-2 is an SHDSL modem for cost-effective and secure connection of Ethernet-based subnets and automation devices via existing two-wire or stranded cables and supports the ITU-T standard G.991.2 and SHDSL.biz (single-pair high-speed digital subscriber line). Thus, the device enables high symmetrical transmission rates of up to 15.3 Mbit/s per wire pair.

Secure access and communication is achieved through the security functions of the integrated firewall and through VPN tunnels.

Application examples

Secure access to plant sections via mobile wireless networks



VPN for secure remote maintenance with SCALANCE M874

Task

Typical applications such as remote programming, parameterization and diagnostics, but also monitoring of machines and plants installed worldwide, should be performed by a service center that is connected over the Internet.

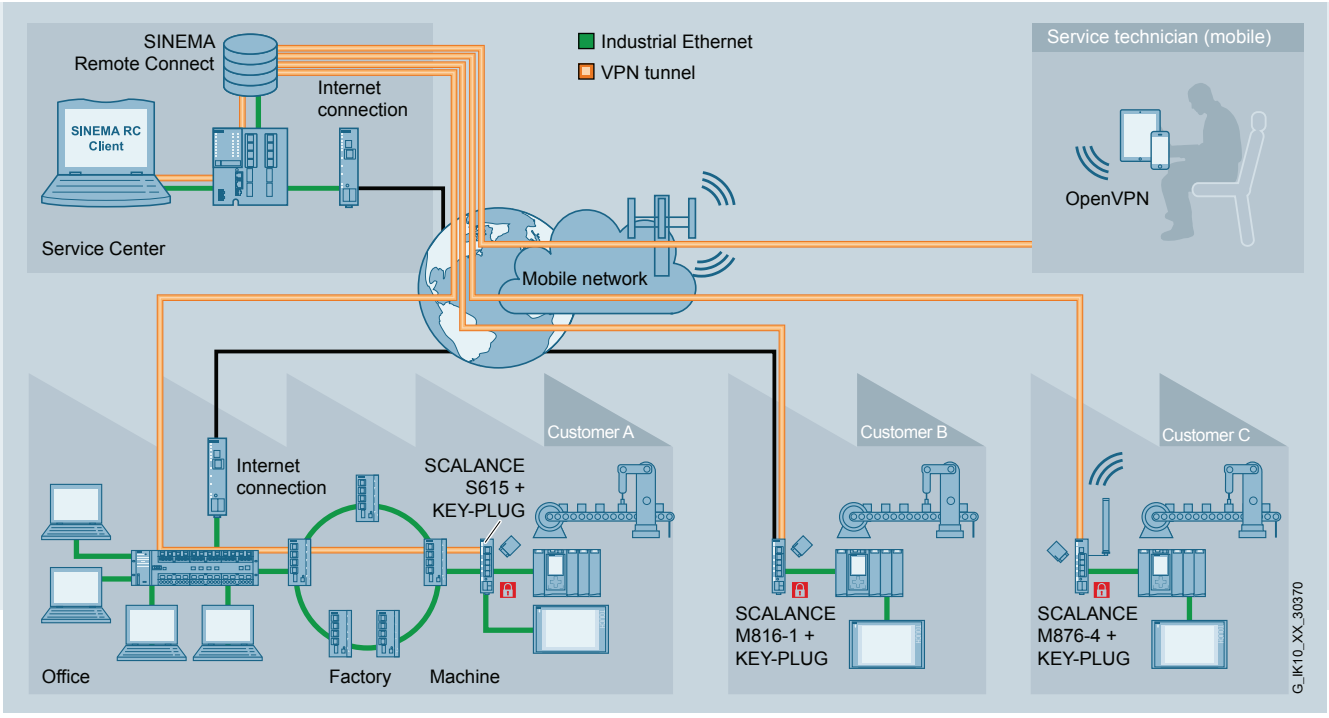
Solution

Any IP-based devices and particularly automation devices that are downstream of the SCALANCE M874 in the local network can be accessed. Multimedia applications such as video streaming can also be implemented due to the increased bandwidth in the uplink. The VPN functionality allows the secure transfer of data around the world.

Advantages at a glance

- Low investment and operating costs for secure remote access to machines and plants
- Reduced travel costs and telephone charges thanks to remote programming and remote diagnostics via 3G/UMTS
- User-friendly diagnostics via Web interface
- Short transmission times thanks to high transmission rates with HSDPA and HSUPA
- Protection by integrated firewall and VPN
- Utilization of the existing UMTS and LTE infrastructure of the mobile wireless provider
- Simple planning and commissioning of telecontrol substations without the need for special radio expertise
- Worldwide availability thanks to UMTS/GSM (quad band) technology; note country-specific approvals

Secure access to plant sections with SINEMA Remote Connect



SINEMA RC configuration example – General overview

Task

- Remote maintenance for series machines and larger plants with identical subnets
- Remote access to special-purpose machines and sensitive areas. Central management of the connections needed to acquire status/maintenance data
- Easy creation of devices with routing/NAT information in SINEMA Remote Connect

Solution

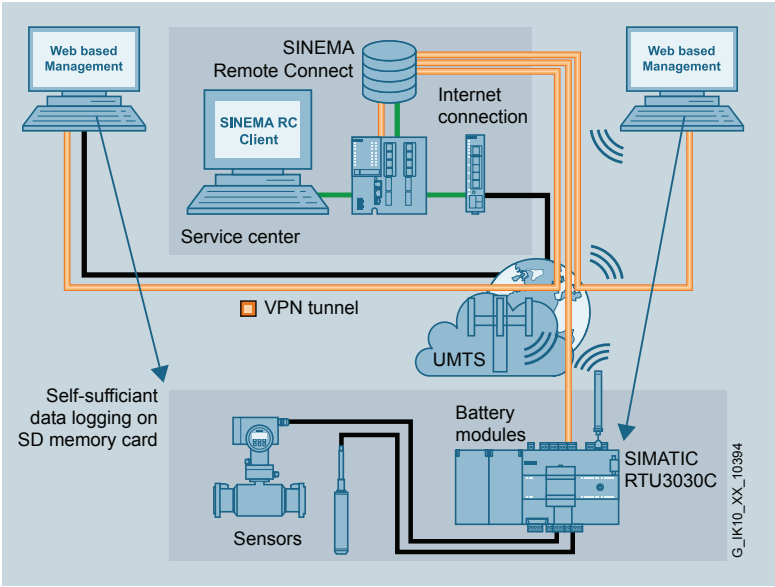
- Central management of machines and service technicians in SINEMA Remote Connect
- Assignment and management of user rights and access authorizations

Typical areas of application

- Plant and machine builders
- Energy distribution / substations (municipal authorities)
- Logistics / port logistics
- Intelligent Traffic Systems (ITS) / transportation companies
- Water & wastewater (municipal authorities, etc.)

Advantages at a glance

- High transparency and security
- Error prevention through explicit assignment of know-how owners to the respective plant sections
- Transparent IP communication
- Logging of accesses



Secure connection of SIMATIC RTU3030C via OpenVPN with SINEMA RC

Security communications processors for SIMATIC S7-1200

CP 1243-1
The CP 1243-1 communications processor securely connects the SIMATIC S7-1200 controller to Ethernet networks. With its integrated firewall (Stateful Inspection) and VPN protocol (IPsec) security functions, the communications processor protects S7-1200 stations and lower-level networks against unauthorized access and protects data transmission against manipulation and espionage by encrypting it. Furthermore, the CP can also be used for integrating the S7-1200 station into the TeleControl Server Basic control center software via IP-based remote networks.

CP 1243-1

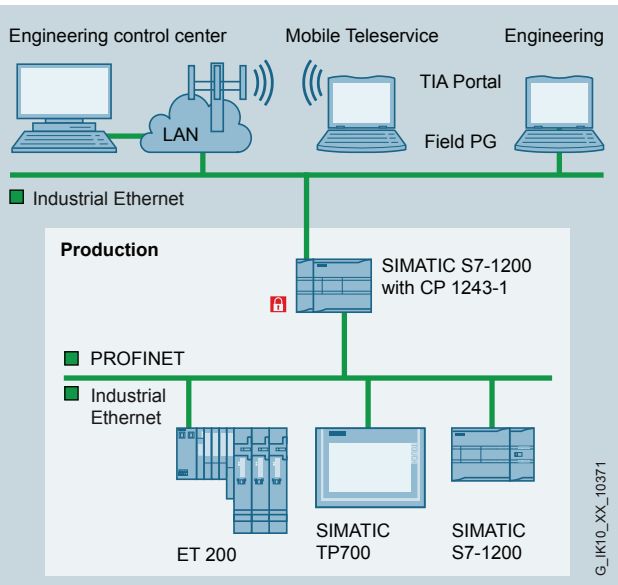
Task
Communication between the automation network and lower-level networks with S7-1200 is to be secured by means of access control.

Solution
The CP 1243-1 is placed upstream of the automation cells to be protected in the rack of the S7-1200. In this way, the communication to and from the S7-1200 and the lower-level automation cell is restricted to the permitted connections with the aid of firewall rules and, if necessary, protected against manipulation or espionage by setting up VPN tunnels.

Advantages at a glance

- Secure connection of the SIMATIC S7-1200 to Industrial Ethernet by means of integrated Stateful Inspection Firewall and VPN
- Can be used in an IPv6-based infrastructure
- Connection to control centers with TeleControl Server Basic

Protection of an S7-1200 and lower-level automation cell with CP 1243-1



SIMATIC S7-1500

CP 1543-1

CP 1543-1
The CP 1543-1 communications processor securely connects the SIMATIC S7-1500 controller to Ethernet networks. With its integrated firewall (Stateful Inspection), VPN (IPsec) and protocols for data encryption such as FTPS and SNMPv3, the communications processor protects S7-1500 stations and lower-level networks against unauthorized access and protects data transmission against manipulation and espionage by encrypting it.

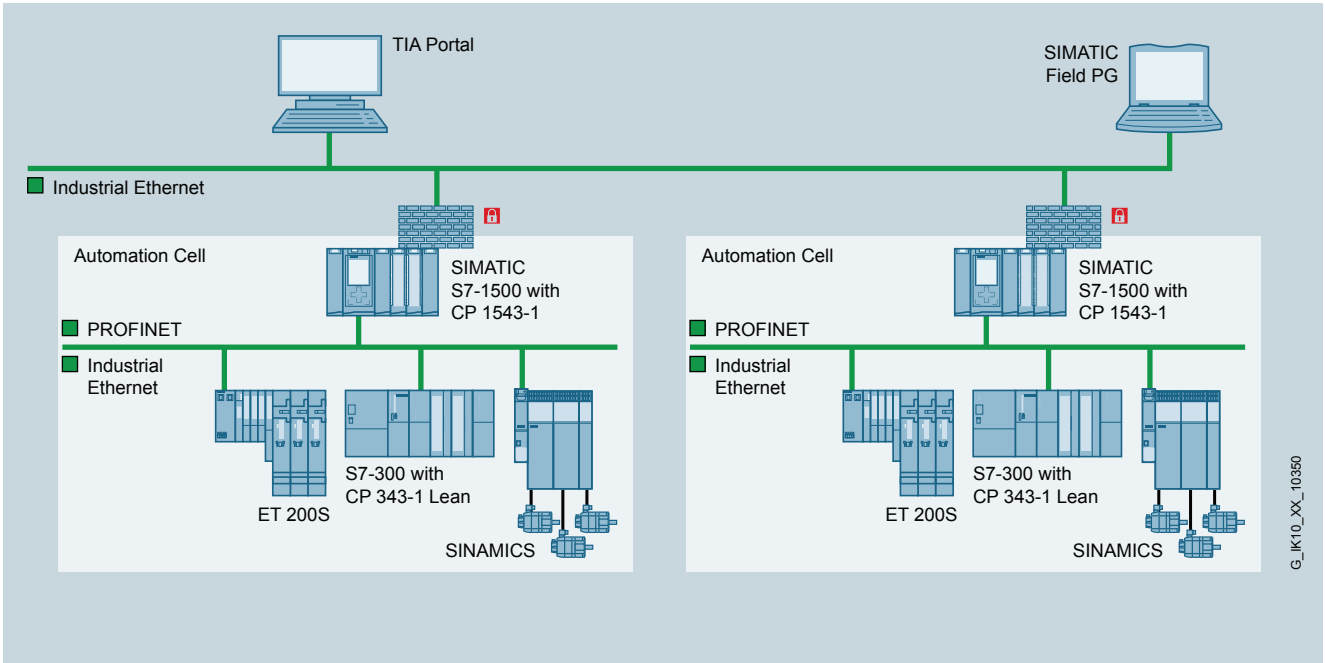
Task
Communication between the automation network and lower-level networks with S7-1500 is to be secured by means of access control.

Solution
The CP 1543-1 is placed in the rack of the S7-1500, upstream of the automation cells to be protected. In this way, the communication to and from the S7-1500 and the lower-level automation cell is restricted to the permitted connections with the aid of firewall rules and, if necessary, protected against manipulation or espionage by setting up VPN tunnels.

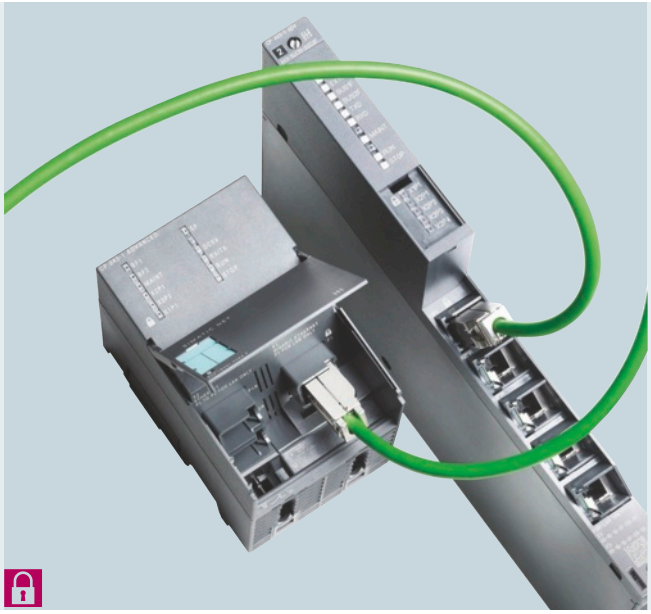
Advantages at a glance

- Secure connection of the SIMATIC S7-1500 to Industrial Ethernet by means of integrated Stateful Inspection Firewall and VPN
- Additional secure communication possibilities: File transfer and e-mail
- Can be used in an IPv6-based infrastructure

Segmentation of networks and protection of the S7-1500 with CP 1543-1

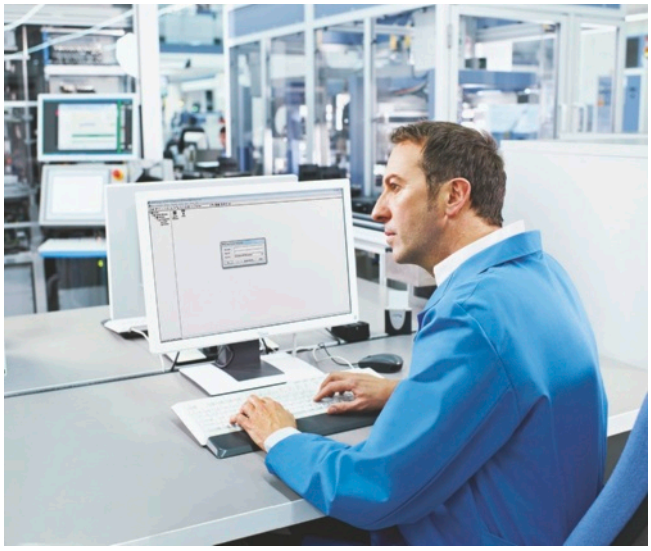


Security communications processors for SIMATIC S7-300 and S7-400

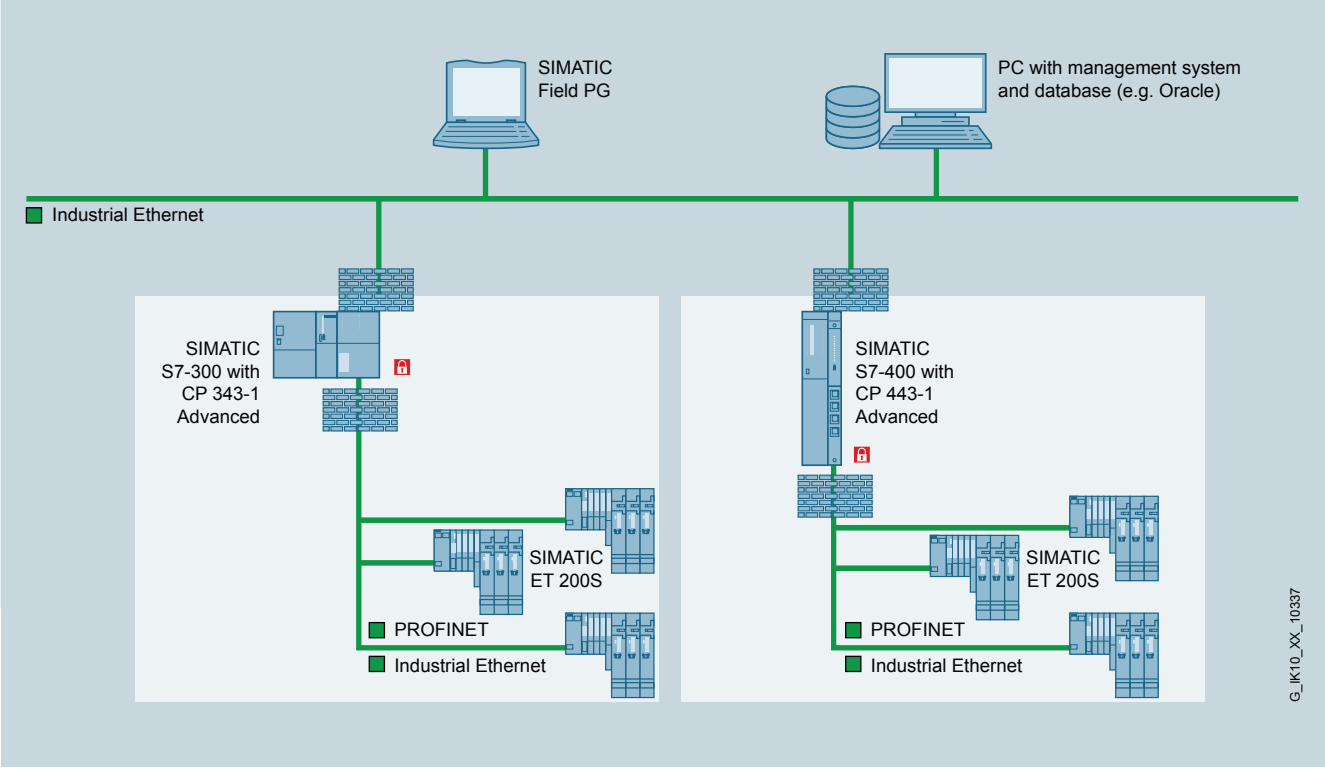


CP 343-1 Advanced and CP 443-1 Advanced

CP 343-1 Advanced and CP 443-1 Advanced
Alongside the familiar communication functions, an integrated switch, and Layer 3 routing functionality, the Industrial Ethernet communications processors CP 343-1 Advanced and CP 443-1 Advanced for SIMATIC S7-300 and S7-400 contain Security Integrated, i.e. a Stateful Inspection Firewall and a VPN gateway for protection of the controller and lower-level devices against security risks.



Application example



Segmentation of networks and protection of the S7-300 and S7-400 controllers with CP 343-1 Advanced or CP 443-1 Advanced

Task

Communication between the office level administration system and lower-level networks of the automation level is to be secured by means of access control.

Solution

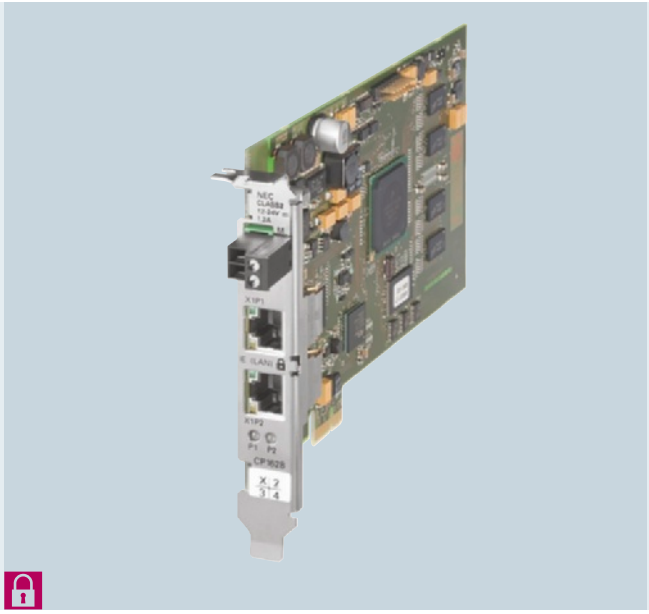
CP 343-1 Advanced and
CP 443-1 Advanced are placed upstream of the automation cells to be protected. This limits communication to the permitted connections with the aid of firewall rules.

Advantages at a glance

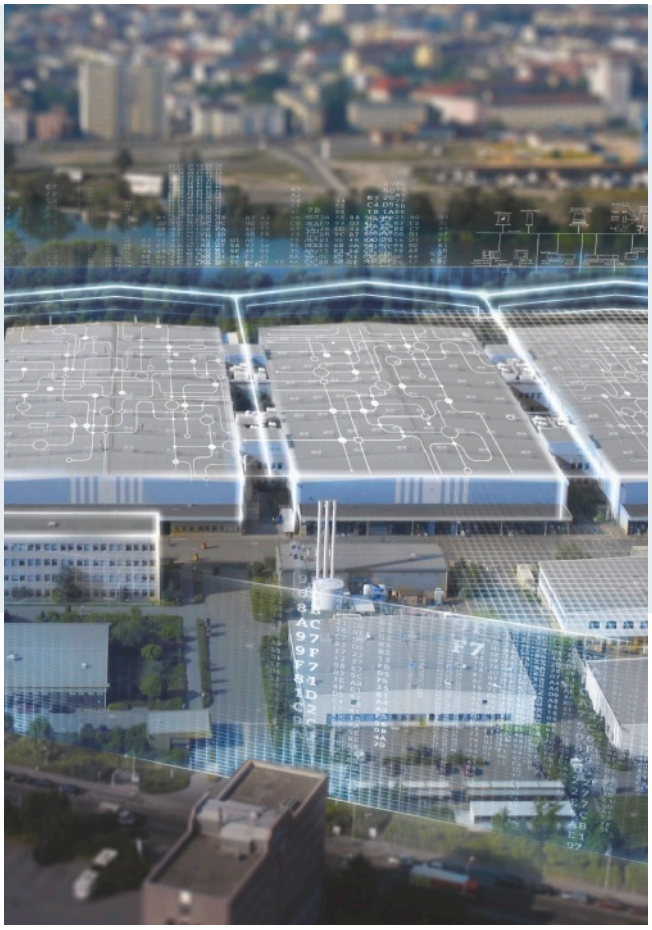
- Firewall, VPN gateway, and CP in one device: The latest generation of Advanced CPs comes with integrated firewall and VPN security functions for implementing a protected automation cell and for protecting data transmission – and for the same price as the predecessor version.
- Secure communication integration: The CPs are easily configured with STEP 7; VPN tunnels can be set up among the CPs or to the SCALANCE S security appliance, the SOFTNET Security Client VPN software, the secure CP 1628 PC module and the SCALANCE M Internet and mobile wireless routers.

Particularly users already employing Advanced CPs will find it simple to set up secure networks. All CP 343-1 Advanced and CP 443-1 Advanced users get Security Integrated and do not need any separate hardware or special tools besides SIMATIC S7 to configure the security of industrial plants.

Security communications processor CP 1628 for PCs



CP 1628



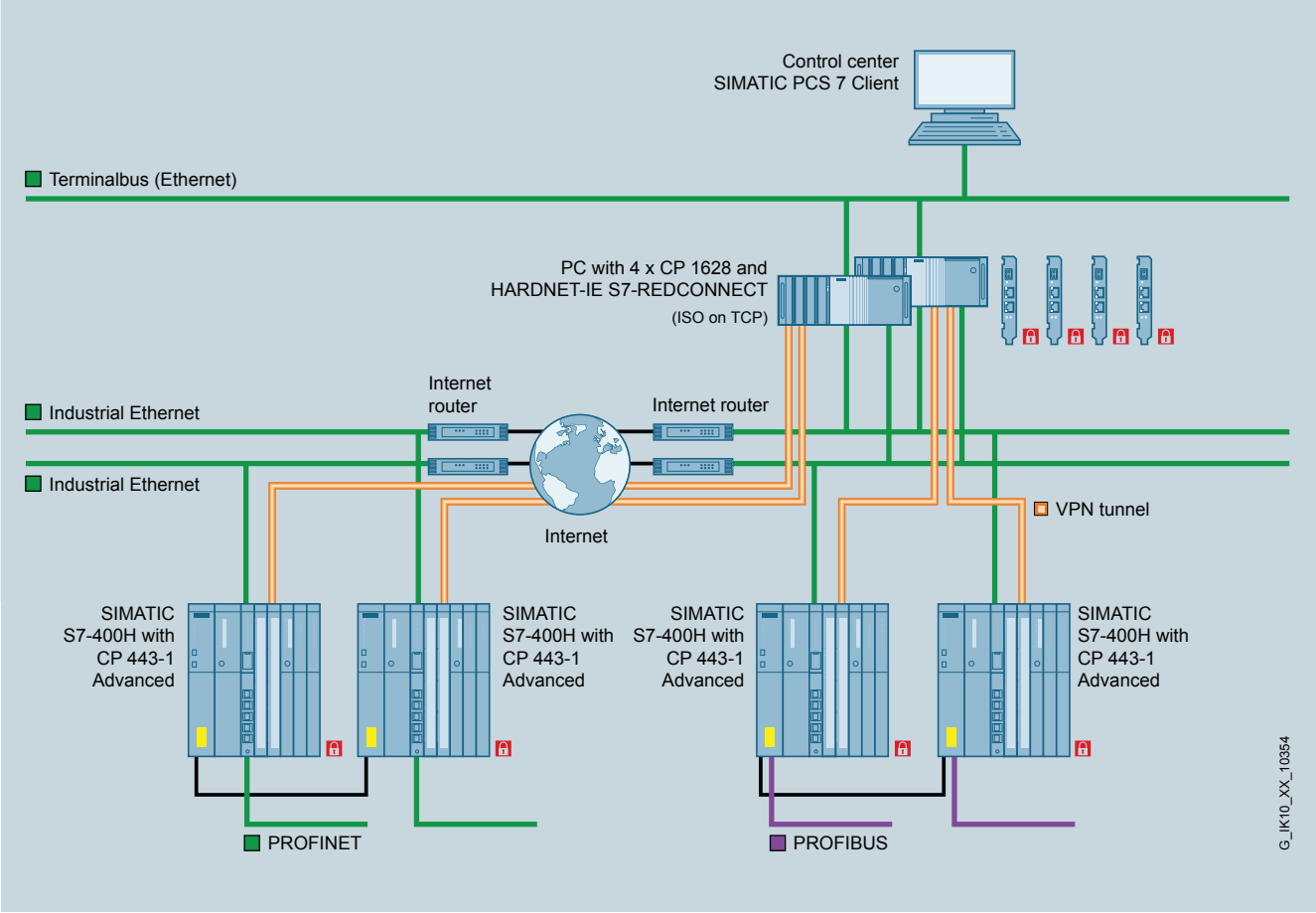
CP 1628

The CP 1628 Industrial Ethernet communications processor protects Industrial PCs through a firewall and VPN – for secure communication without special operating system settings. In this manner, computers equipped with the module can be connected to protected cells.

The CP 1628 makes it possible to connect a SIMATIC PG/PC and PCs with PCI Express slots to Industrial Ethernet (10/100/1000 Mbit/s). Additional field devices can be flexibly connected to Industrial Ethernet via the integrated switch.

Along with the automation functions familiar from CP 1623, the communications processor also has Security Integrated, i.e. a Stateful Inspection Firewall and a VPN gateway for protection of the PG/PC system against security risks.

Application example



Secure redundant connection to CP 1628 and CP 443-1 Advanced

Task

Protection for the redundant connections between a PC system and the S7-400H controllers in a high-availability plant.

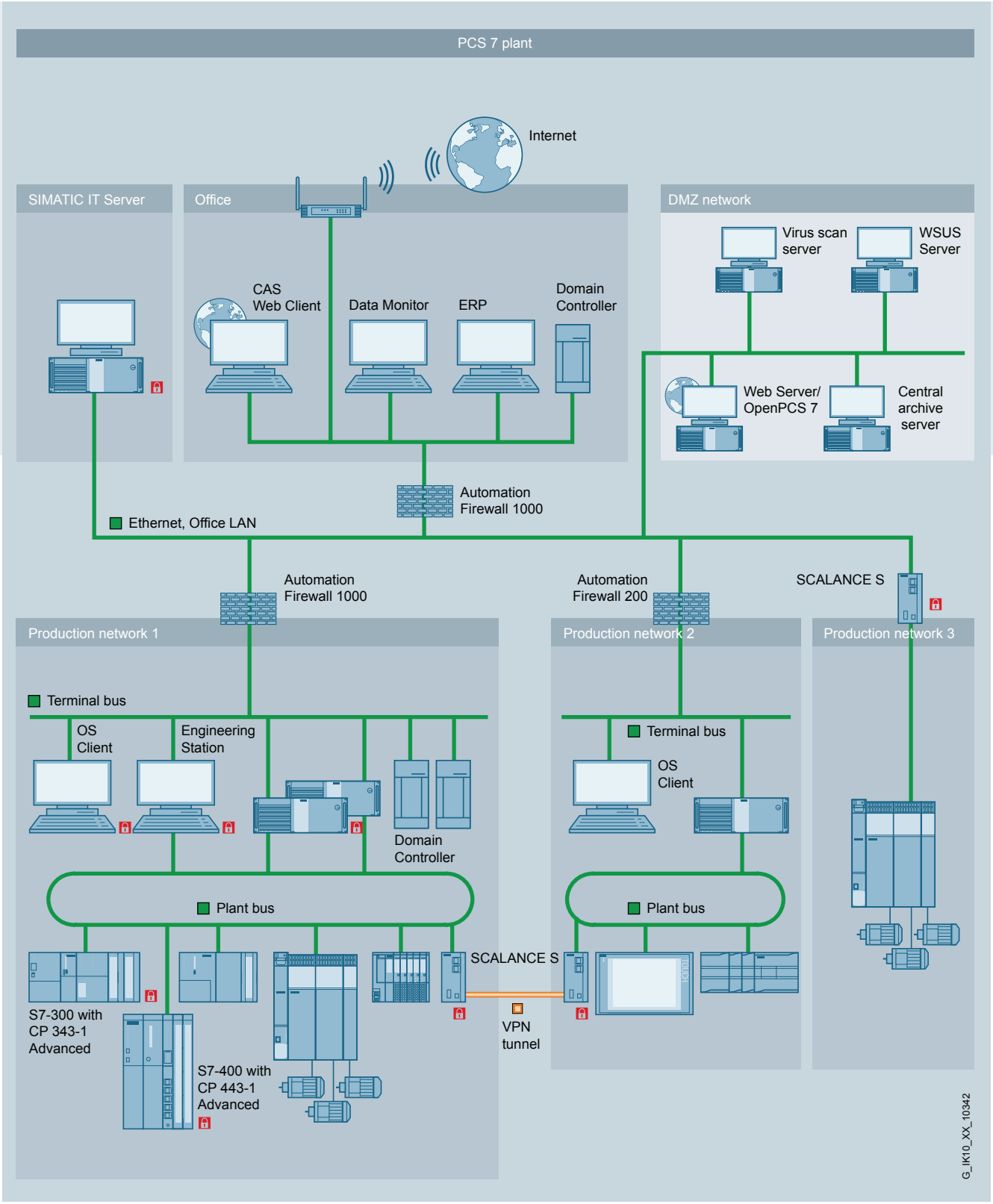
Solution

VPN tunnels are set up between the security communications processors CP 1628 and CP 443-1 Advanced, which allow the secure transmission of the H communication. In addition, the CP 1628 protects the PC system from unauthorized access by means of its integrated firewall.

Advantages at a glance

- Firewall, VPN gateway, and CP in one device: This new product version offers users an integrated, fully-fledged security module that protects the PC from manipulation and unauthorized access.
- Secure communication integration: The CP is easily configured with STEP 7/NCM PC (V5.5 SP3 or higher) or with STEP 7 (TIA Portal) V12 SP1 or higher.

SIMATIC PCS 7 Security



SIMATIC PCS 7 Security – Example system

Elements of the PCS 7 Security concept

- System hardening
- User administration (SIMATIC Logon)
- Patch management
- Malware detection and prevention
- Firewalls and cell protection
- Training and processes

The PCS 7 Security concept follows the defense-in-depth strategy. That is, multiple protection levels are created in order to minimize risks and to increase the security of plants with the following functions:

- Assignment of access rights only to certain users, with SIMATIC LOGON
- Firewalls: Segmentation of your networks, use of security cells, firewalls and so-called demilitarized zones (DMZ) which allow certain network areas to be segmented for security purposes
- VPN: Secure communication over non-secure networks
- Use of up-to-date virus scanners and compliance with a patch management strategy in order to reduce the risk of damage to your system
- Specification of programs approved to run on your system – through the use of so-called whitelisting

Technical specifications

SCALANCE S security modules

Product type designation	SCALANCE S602	SCALANCE S612	SCALANCE S615	SCALANCE S623	SCALANCE S627-2M
Article No.	6GK5602-0BA10-2AA3	6GK5612-0BA10-2AA3	6GK5615-0AA00-2AA2	6GK5623-0BA10-2AA3	6GK5627-2BA10-2AA3
Transmission rate					
Transmission rate	10 / 100 / 1000 Mbit/s	10 / 100 / 1000 Mbit/s	10 / 100 Mbit/s	10 / 100 / 1000 Mbit/s	10 / 100 / 1000 Mbit/s
Interfaces					
Electrical connection					
for internal network	1x RJ45 port	1x RJ45 port	1 ... 4 x RJ45 port	1x RJ45 port	3x RJ45 port+media module
for external network	1x RJ45 port	1x RJ45 port	1 ... 4 x RJ45 port	1x RJ45 port	3 x RJ45 port+media module
for DMZ	–	–	1 ... 4 x RJ45 port	1x RJ45 port	1x RJ45 port
for signaling contact	1x 2-pin terminal block	1x 2-pin terminal block	–	1x 2-pin terminal block	1x 2-pin terminal block
for power supply	1x 4-pin terminal block	1x 4-pin terminal block	1x 5-pin terminal block	1x 4-pin terminal block	1x 4-pin terminal block
C-PLUG swap media	Yes	Yes	Yes	Yes	Yes
Supply voltage, current consumption, power loss					
Supply voltage, external	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Range	19.2 V ... 28.8 V DC	19.2 V ... 28.8 V DC	10.8 V ... 28.2 V DC	19.2 V ... 28.8 V DC	19.2 V ... 28.8 V DC
Permissible ambient conditions					
Ambient temperature					
during operation	-40 °C ... +60 °C	-40 °C ... +60 °C	-40 °C ... +70 °C	-40 °C ... +60 °C	-40 °C ... +60 °C
during storage	-40 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +70 °C
during transportation	-40 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +80 °C	-40 °C ... +70 °C
Degree of protection	IP20	IP20	IP20	IP20	IP20
Design, dimensions and weight					
Design	Compact	Compact	Compact	Compact	Compact
Width / height / depth	60 mm / 125 mm / 124 mm	60 mm / 125 mm / 124 mm	35 mm / 147 mm / 127 mm	60 mm / 125 mm / 124 mm	120 mm / 125 mm / 124 mm
Net weight	0.8 kg	0.8 kg	0.4 kg	0.81 kg	1.3 kg
Product function: Security					
Firewall configuration	Stateful Inspection	Stateful Inspection	Stateful Inspection	Stateful Inspection	Stateful Inspection
Password protection	Yes	Yes	Yes	Yes	Yes
Product function with VPN connection	–	IPsec	IPsec, OpenVPN (as Client for SINEMA RC)	IPsec	IPsec
Number of possible connections with VPN connection	128	128	20	128	128
Restricted bandwidth	Yes	Yes	No	Yes	Yes
NAT/NAPT	Yes	Yes	–	Yes	Yes
Encryption algorithms	–	AES-256, AES-192, AES-128, 3DES-168, DES-56	AES-256, AES-192, AES-128, 3DES-168, DES-56	AES-256, AES-192, AES-128, 3DES-168, DES-56	AES-256, AES-192, AES-128, 3DES-168, DES-56
Authentication procedure	–	Preshared Key, X.509v3 certificates	Preshared Key, X.509v3 certificates	Preshared Key, X.509v3 certificates	Preshared Key, X.509v3 certificates
Hashing algorithms	–	MD5, SHA-1	MD5, SHA-1	MD5, SHA-1	MD5, SHA-1

SCALANCE M Internet and mobile wireless routers

Product type designation	SCALANCE M wireless M874-2, M874-3 / M876-3, M876-4		SCALANCE M wired M812 / 816 / 826		
Article No.	6GK5874-2AA00-2AA2 6GK5874-3AA00-2AA2 6GK5876-3AA02-2BA2 6GK5876-4AA00-2BA2		6GK5812-1BA00-2AA2 6GK5816-1BA00-2AA2 6GK5826-2AB00-2AB2		
Transmission rate					
1 with Industrial Ethernet / 2 with Industrial Ethernet	10 Mbit/s / 100 Mbit/s		10 Mbit/s / 100 Mbit/s		
GPRS transmission uplink / downlink, max. eGPRS transmission uplink / downlink, max. UMTS transmission uplink / downlink, max. EV-DO transmission forward link / reverse link LTE transmission uplink / downlink, max. ADSL2+ transmission uplink / downlink, max. SHDSL transmission, max	85.6 kbit/s / 85.6 kbit/s 236.8 kbit/s / 236.8 kbit/s 5.76 Mbit/s / 14.4 Mbit/s 3.1 Mbit/s / 1.8 Mbit/s (M874-3 and M876-3 only) 50 Mbit/s / 100 Mbit/s (M876-4 only) – –		– – – – – 1.4 Mbit/s / 25 Mbit/s –		– – – – – – 5.3 Mbit/s
Interfaces					
Electrical connection					
for internal network	RJ45 port (10/100 Mbit/s, TP, autocrossover)		RJ45 port (10/100 Mbit/s, TP, autocrossover)		
for external network	SMA antenna sockets (50 ohms)		DSL interface		
for power supply	Terminal strip		Terminal strip		
Supply voltage, current consumption, power loss					
Supply voltage / range	10.8 V ... 28.8 V		10.8 V ... 28.8 V		
Permissible ambient conditions					
Ambient temperature					
during operation	-20 °C ... +60 °C		-0 °C ... +60 °C	0 °C ... +60 °C	-40 ... +70 °C
during storage	-40 °C ... +85 °C		-40 °C ... +70 °C	-40 °C ... +70 °C	-40 ... +80 °C
Degree of protection	IP20		IP20		
Design, dimensions and weight					
Module format	Compact		Compact		
Width / height / depth	35 mm / 147 mm / 127 mm		35 mm / 147 mm / 127 mm		
Net weight	0.4 kg	1.0 kg	0.4 kg		
Product function: Security					
Firewall configuration	Stateful Inspection		Stateful Inspection		
Password protection	Yes		Yes		
Packet filter	Yes		Yes		
Product function with VPN connection	IPsec		IPsec		
Number of possible connections with VPN connection	20		20		
Type of authentication with VPN PSK	Yes		Yes		
Key length					
with IPsec DES for VPN 1 with IPsec AES for VPN 2 with IPsec AES for VPN 3 with IPsec AES with VPN with IPsec 3DES / with Virtual Private Network	56 bit 128 bit 192 bit 256 bit 168 bit		56 bit 128 bit 192 bit 256 bit 168 bit		
Type of Internet key exchange with VPN main mode	Yes		Yes		
Type of Internet key exchange with VPN quick mode	Yes		Yes		
Type of packet authentication with VPN	MD5, SHA-1		MD5, SHA-1		

CP 1243-1 and CP 1543-1 communications processors

Product type designation	CP 1243-1	CP 1543-1
Article No.	**6GK7243-1BX30-0XE0**	**6GK7543-1AX00-0XE0**
Transmission rate		
at interface 1 / 2	10/100 Mbit/s / –	10/100/1 000 Mbit/s / –
Interfaces		
Electrical connection		
to interface 1 according to IE	1x RJ45 port	1x RJ45 port
to interface 2 according to IE	–	–
for power supply	–	–
C-PLUG swap media	–	–
Supply voltage, current consumption, power loss		
Supply voltage		
1 from backplane bus	5 V DC	15 V DC
External	–	–
Permissible ambient conditions		
Ambient temperature		
during operation		
- when installed vertically	-20 °C ... +60 °C	0 °C ... +40 °C
- when installed horizontally	-20 °C ... +70 °C	0 °C ... +60 °C
during storage	-40 °C ... +70 °C	-40 °C ... +70 °C
during transportation	-40 °C ... +70 °C	-40 °C ... +70 °C
Degree of protection	IP20	IP20
Design, dimensions and weight		
Module format	Compact S7-1200, single width	Compact S7-1500, single width
Width / height / depth	30 mm / 110 mm / 75 mm	35 mm / 142 mm / 129 mm
Net weight	0.122 kg	0.35 kg
Product function: Security		
Firewall configuration	Stateful Inspection	Stateful Inspection
Product function with VPN connection	IPsec	IPsec
Type of encryption algorithms with VPN connection	AES-256, AES-192, AES-128, 3DES-168	AES-256, AES-192, AES-128, 3DES-168, DES-56
Type of authentication procedure with VPN connection	Preshared key (PSK), X.509v3 certificates	Preshared key (PSK), X.509v3 certificates
Type of hashing algorithms with VPN connection	MD5, SHA-1	MD5, SHA-1
Number of possible connections with VPN connection	8	16
Product function		
Password protection for Web applications	No	No
ACL – IP-based	No	No
ACL – IP-based for PLC/routing	No	No
Deactivation of services that are not needed	Yes	Yes
Blocking of communication via physical ports	No	No
Log file for unauthorized access	No	Yes

CP 343-1 Advanced and CP 443-1 Advanced communications processors

Product type designation	CP 343-1 Advanced	CP 443-1 Advanced
Article No.	**6GK7343-1GX31-0XE0**	**6GK7443-1GX30-0XE0**
Transmission rate		
at interface 1 / 2	10 /1000 Mbit/s / 10/100 Mbit/s	10/1000 Mbit/s / 10/100 Mbit/s
Interfaces		
Electrical connection		
to interface 1 according to IE	1x RJ45 port	1x RJ45 port
to interface 2 according to IE	2x RJ45 ports	4x RJ45 ports
for power supply	2-pin plug-in terminal strip	–
C-PLUG swap media	Yes	Yes
Supply voltage, current consumption, power loss		
Supply voltage		
1 from backplane bus	5 V DC	5 V DC
External	24 V DC	–
Permissible ambient conditions		
Ambient temperature		
during operation		0 °C ... +60 °C
- when installed vertically	0 °C ... +40 °C	–
- when installed horizontally	0 °C ... +60 °C	–
during storage	-40 °C ... +70 °C	-40 °C ... +70 °C
during transportation	-40 °C ... +70 °C	-40 °C ... +70 °C
Degree of protection	IP20	IP20
Design, dimensions and weight		
Module format	Compact	Compact S7-400, single width
Width / height / depth	80 mm / 125 mm / 120 mm	25 mm / 290 mm / 210 mm
Net weight	0.8 kg	0.7 kg
Product function: Security		
Firewall configuration	Stateful Inspection	Stateful Inspection
Product function with VPN connection	IPsec	IPsec
Type of encryption algorithms with VPN connection	AES-256, AES-192, AES-128, 3DES-168 DES-56	AES-256, AES-192, AES-128, 3DES-168 DES-56
Type of authentication procedure with VPN connection	Preshared key (PSK), X.509v3 certificates	Preshared key (PSK), X.509v3 certificates
Type of hashing algorithms with VPN connection	MD5, SHA-1	MD5, SHA-1
Number of possible connections with VPN connection	32	32
Product function		
Password protection for Web applications	Yes	Yes
ACL – IP-based	Yes	Yes
ACL – IP-based for PLC/routing	Yes	Yes
Deactivation of services that are not needed	Yes	Yes
Blocking of communication via physical ports	Yes	Yes
Log file for unauthorized access	No	No

CP 1628 communications processor and SOFTNET Security Client

Product type designation	CP 1628	SOFTNET Security Client
Article No.	**6GK1162-8AA00**	**6GK1704-1VW04-0AA0**
Transmission rate		
at interface 1 / 2	10/1 000 Mbit/s / –	dependent on the PC system
Interfaces		
Electrical connection		
to interface 1 according to IE	2x RJ45 port	
of the backplane bus	PCI Express x1	
for power supply	1x 2-pin terminal block	
Supply voltage, current consumption, power loss		
Type of power supply voltage	DC	
Optional external supply		
Supply voltage	Yes	
1 from backplane bus		
2 from backplane bus	3.3 V	
External	12 V	
Range	24 V 10.5 V ... 32 V	
Permissible ambient conditions		
Ambient temperature		
during operation	+5 °C ... +55 °C	
during storage	-20 °C ... +60 °C	
during transportation	-20 °C ... +60 °C	
Design, dimensions and weight		
Module format	PCI Express x1 (half length)	
Width / height / depth	18 mm / 111 mm / 167 mm	
Net weight	0.124 kg	
Product function: Security		
Firewall configuration	Stateful Inspection	–
Product function with VPN connection	IPsec	IPsec
Type of encryption algorithms with VPN connection	AES-256, AES-192, AES-128, 3DES-168 DES-56	AES-256, AES-192, AES-128, 3DES-168 DES-56
Type of authentication procedure with VPN connection	Preshared key (PSK), X.509v3 certificates	Preshared key (PSK), X.509v3 certificates
Type of hashing algorithms with VPN connection	MD5, SHA-1	MD5, SHA-1
Number of possible connections with VPN connection	64	Unlimited or dependent on the computer configuration

Industrial Security

Security with SCALANCE X and SCALANCE W

SCALANCE XB-200, XM-400, XR-500

SCALANCE W product family

SCALANCE X

The managed switches of the SCALANCE X product range are very well suited for the setup of line, star, and ring topologies. They offer high-speed redundancy in the ring for electrical or optical lines.

SCALANCE X-200, X-300, X-400 and X-500 can control network access and have the following security functions:

- ACL port/MAC and IP-based
- IEEE 802.1X (RADIUS)
- 802.1Q-VLAN – enables logical separation of the data traffic between pre-defined ports on the switches
- Broadcast/Multicast/Unicast Limiter
- Broadcast blocking

In addition, the following secure protocols are supported, each of which replaces the weak predecessor protocol:

- SSH (instead of Telnet)
- HTTPS (instead of HTTP)
- SNMP v3 (instead of SNMP v1/v2)

SCALANCE W

Reliable wireless communication solution on different automation levels according to IEEE 802.11 – the SCALANCE W IWLAN products enable scalable applications.

SCALANCE W access points and client modules have the following security functions:

- Management security with IP based ACL
- IEEE 802.1X (RADIUS)
- Access protection according to IEEE 802.11i
- WPA2(RADIUS)/ WPA2-PSK with AES

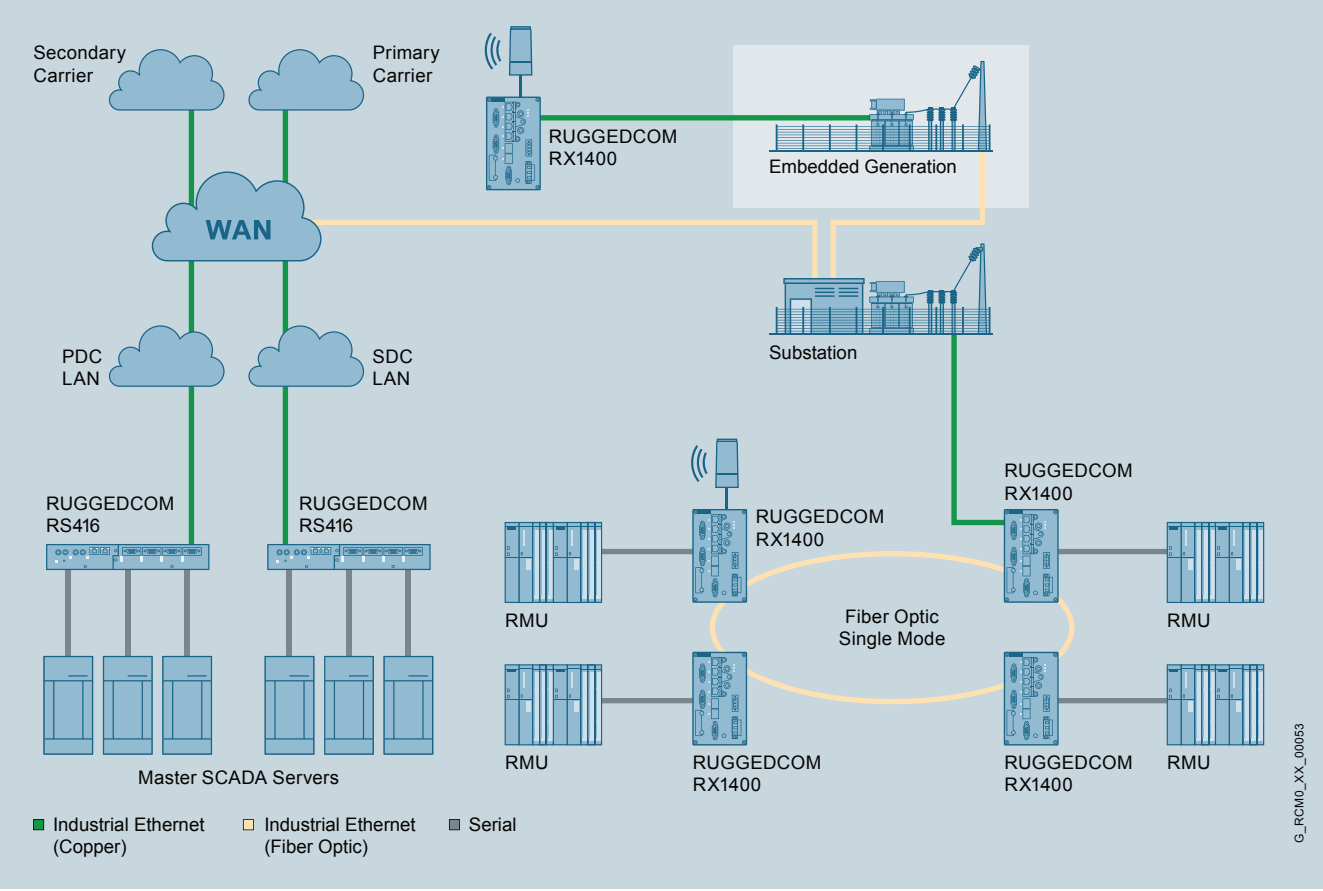
In addition, the following secure protocols are supported:

- SSH
- HTTPS
- SNMP v3

Inter AP Blocking

Available in firmware version 4.x and higher. This increases the security in a network environment with multiple SCALANCE W access points.
WLAN clients that are connected via a layer 2 network (switches) using different access points can communicate directly with one other. This could pose a security risk depending on the application. "Inter AP Blocking" is used to specify those communication partners or gateways that WLAN clients are permitted to communicate with, thereby minimizing the security risk. Communication with other devices in the network is prevented using KEY-PLUG W700 Security (6GK5907-0PA00). It can be used with all SCALANCE W access points with a KEY-PLUG slot

Security with RUGGEDCOM

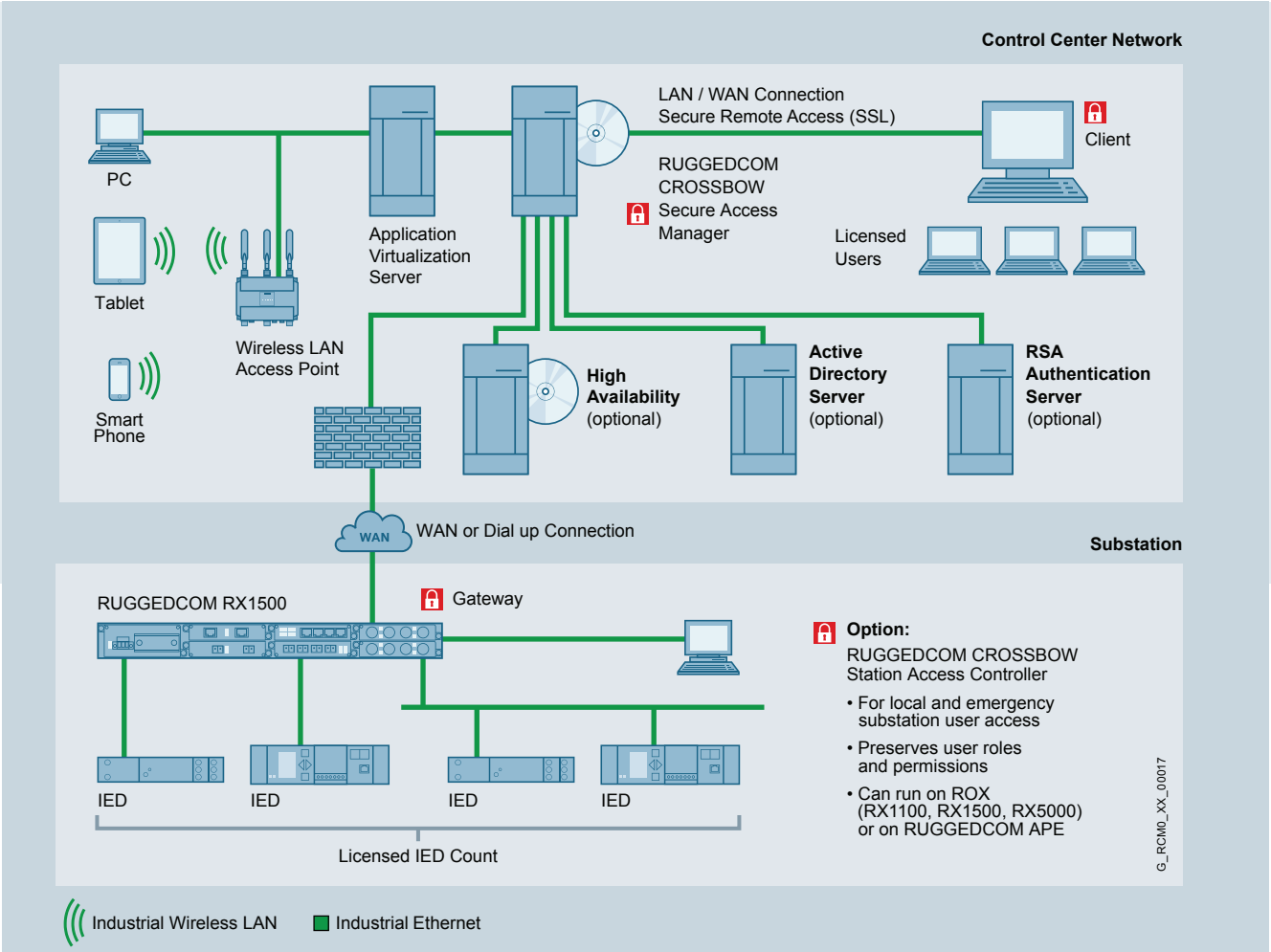


The RUGGEDCOM RX1400 is suitable for reliable connection of low-voltage transformer substations and distributed power generation plants over public mobile wireless networks.

Security

Security is specially important in the energy sector. Automation and communication networks also play a key role here for task-critical applications. High reliability is of utmost importance. The following features of the RUGGEDCOM RX1400 address security threats at the network level:

- VPN (IPsec) – the integrated hardware encryption engine enables powerful IPsec data communication without use of the main processor
- Passwords – satisfy the NERC guidelines including the option for RADIUS-based authentication
- SSH / SSL – enhanced password protection with the option of encrypting passwords and data for transmission within the network
- Unblocking/blocking of ports – Ability to block ports so that unauthorized devices cannot establish a connection to unused ports
- 802.1Q-VLAN – enables logical separation of the data traffic between pre-defined ports on the switches
- SNMPv3 – encrypted authentication and access protection
- HTTPS – for secure access to the web interface
- 802.1X – ensures that only permissible field devices can be connected to the device
- MAC address list – access control for devices that do not support RADIUS



RUGGEDCOM CROSSBOW: Application overview

System architecture

The figure on the top illustrates the typical system architecture of a utility using RUGGEDCOM CROSSBOW. The CROSSBOW Secure Access Manager (SAM) is the central enterprise server via which all remote access connections are established. It represents the sole trustworthy data source for clients from the perspective of intelligent electronic devices (IED). It forms the heart of the system and provides role-based access control and management of website and IED access.

For user access to remote IEDs, the CROSSBOW clients establish secure SSL connections to the SAM. The SAM is connected via a secure WAN to gateway devices on the transformer substation, such as RUGGEDCOM RX1500 or another supported device. The gateway establishes the connection to IEDs either directly or through lower-level RTUs.

CROSSBOW SAM also enables feedthrough to IEDs via their own direct modem access, e.g. for applications on the top hamper, counter or process control, IEDs for status monitoring or other host computers/servers. Based on its ability to provide secure RBAC remote access to any IED, CROSSBOW is an indispensable tool for any application with IEDs in the following sectors:

- Utilities (power, gas, water)
- Transport control systems
- Industry and mining applications
- Building management systems

Plant Security Services

The increasing internetworking of production and office has made many processes faster and easier, while uniform use of the same data and information creates synergies. This trend, however, is also causing increased risks.

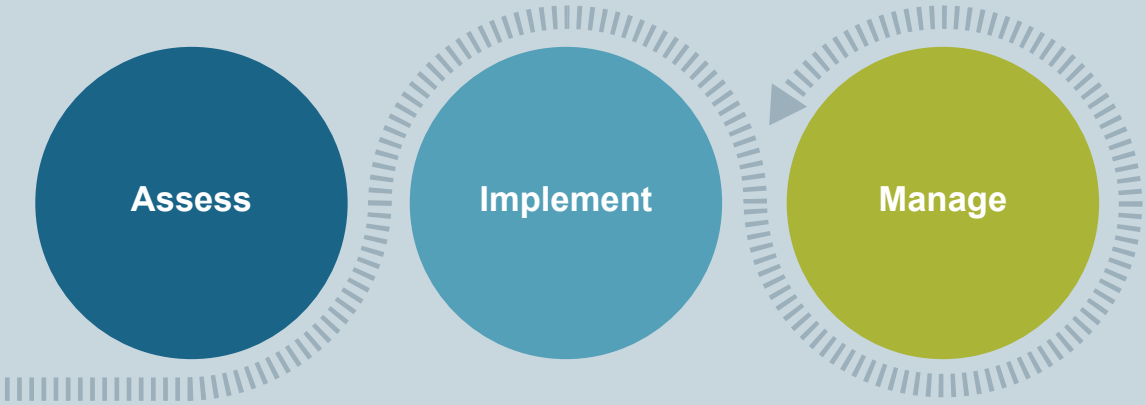
Today it is no longer just the office environment that is under threat from viruses, hacker attacks, etc. - production plants are also at risk of malfunctions, manipulation of data integrity and loss of know-how. Many weak spots in security are not obvious at first glance. For this reason, it is advisable to check existing plants in regard to security and to optimize them in order to maintain a higher level of plant availability.
To enhance the safeguarding of a plant against failure in the event of attacks, a multi-level service concept for industrial security (Assess, Implement and Manage) is available from Siemens.

In the first step "Assess", the existing plant is analyzed to start. This identifies weak spots or deviations from standards. The result of this examination is a detailed report about the actual status of the plant with a description of the weak points and an assessment of the risks. The report also contains actions based on the results for improving the level of security.

In the second step "Implement", the measures defined in the assessment are implemented. These can be divided into three blocks:

- **Training**
  Personnel are given specific training so that they understand what IT and infrastructure security means in the industrial environment and know how they can contributed to a higher level of security.
- **Process improvement**
  Security-relevant regulations and guidelines relating to the existing plant requirements are drawn up and implemented, and compliance with them is monitored.
- **Security technologies**
  Protective measures are implemented for hardware and software, as well as in the plant network. Also included here is long-term protection through monitoring with the help of a Cyber Security Operation Center (CSOC).

The measures defined and implemented in the first two steps are continuously managed in the third step "Manage". Additional measures are added based on monitoring of the security status. This is carried out with the support of a Cyber Security Operation Center (CSOC), which analyzes the security-relevant data of a plant 24/7 and is activated under alarm conditions. This activity also includes periodic review of the level of security including optimized measures for the changing threat landscape. When changes are made to the plant network, software landscape, or management of access rights for users and administrators, it is also ensured that the relevant data remains inside the system, thereby reducing possible attack points. The "Implement" and "Manage" steps are customized to the specific requirements in each case.



Competency

- Access to leading experts in automation engineering and IT security
- Global Cyber Security Operation Center (CSOC)
- Proven holistic approach with state-of-the-art technologies

Engineering

- Simple modular portfolio including consultation, implementation and managed services
- Fast implementation
- Plant-specific custom-fit engineering
- Optimized for your requirements and your budget

Service

- Plant Security Services is a managed service
- Determination of the security level and, based on this, drawing up a plan of action for reducing the risks
- Concentration on your core business

Operation & Management

- Continuous monitoring of the security status of the plant
- Continuous protection of your investments
- Continuous adjustment to the threat situation
- Early detection and advice on eliminating security risks

Terms, definitions

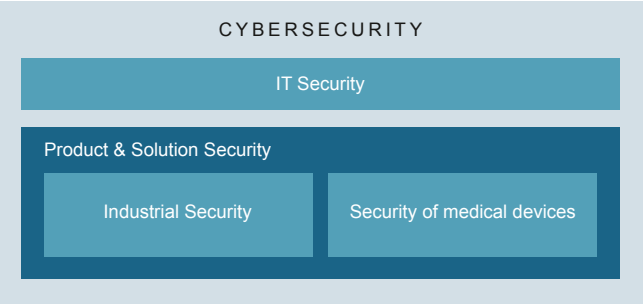
Global Cyber Security Operation Center (CSOC)
Plant Security Services obviously face special requirements in the sensitive field of cyber security. The CSOCs specifically responsible for industrial security bundle the competencies and expertise of international threat intelligence and make this available to customers. As the first point of contact for customers, CSOCs provide support on all security-relevant matters.

Demilitarized zone (DMZ)
A demilitarized zone or DMZ denotes a computer network with security monitoring of the ability to access the connected servers. The systems in the DMZ are shielded by one or more firewalls against other networks (such as Internet, LAN). This separation can allow access to publicly available services (e.g. email) while allowing the internal network (LAN) to be protected against unauthorized access. The point is to make computer network services available to both the WAN (Internet) and the LAN (intranet) on the most secure basis possible. A DMZ's protective action works by isolating a system from two or more networks.

Firewall
Security modules that allow or block data communication between interconnected networks according to specified security restrictions. Firewall rules can be configured for this. It is thus possible to specify that only a particular PC may access a given controller, for example.

Industrial Security
Industrial Security comprises the protection of information, data and intellectual property during processing, transmission and storage in the industrial environment. Availability, integrity and confidentiality are to be safeguarded. The purpose is to defend against attacks, threats, dangers and economic losses and to minimize risks. Guidance is provided by various national and international standards such as IEC 62443, ISO/IEC 27000, ISO/IEC 15408 and the national laws in effect, e.g. Federal Data Protection Act in Germany.

Port security
The access control function allows individual ports to be blocked for unknown nodes. If the access control function is enabled on a port, packets arriving from unknown MAC addresses are discarded immediately. Only packets arriving from known nodes are accepted.



RADIUS (IEEE 802.1X):
Authentication via an external server
The concept of RADIUS is based on a central authentication server. An end device can only access the network or network resource after the logon data of the device has been verified by the authentication server. Both the end device and the authentication server must support the Extensive Authentication Protocol (EAP).

System hardening
System hardening deactivates unneeded interfaces and ports, thereby reducing the vulnerability of the network to external and internal attacks. Every level of an automation system is considered: the control system, network components, PC-based systems, and programmable logic controllers.

Virtual Private Network (VPN)
A "VPN tunnel" connects two or more network stations (e.g. security modules) and the network segments behind them. Encrypting the data within this tunnel makes it impossible for third parties to listen in on or falsify the data when it is transmitted over an insecure network (e.g. the Internet).

Virtual LAN (VLAN)
VLANs (IEEE 802.1Q) enable logical separation of the data traffic between pre-defined ports on the switches. The result is several "virtual networks" on the same physical network. Data communication takes place only within a VLAN.

Whitelisting
Whether it's for individuals, companies, or programs: A whitelist – or positive list – refers to a collection of like elements that are classified as trustworthy. Whitelisting for PCs ensures that only those programs that are actually required can be executed.

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Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit **http://www.siemens.com/industrialsecurity.**

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit **http://support.automation.siemens.com.**

Siemens AG
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Process Automation
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GERMANY

Subject to change without prior notice
Article No. 6ZB5530-1AP02-0BA4
W-FPN16-PD-PA207 / Dispo 26000
BR 1115 2. WÜ 40 En
Printed in Germany

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