

Integrated energy automation

A sophisticated basis for ENEAS
(Efficient Network and Energy Automation Systems)



Answers for energy.

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Making sure that everything runs smoothly

With the emergence of Smart Grids, the highest possible availability and reliably automated operation of power networks is more important than ever. Integrated energy automation system solutions from Siemens point the way.

Demands on the automation, control, monitoring, and optimization of network operation are steadily increasing. Smart Grids and the comprehensive remote monitoring, control, and maintenance of entire power networks make energy automation systems even more complex and lead to an increase in the number of interfaces. In order to ensure the highest possible equipment availability, all components must interact perfectly.

Based on sophisticated products, systems, and solutions that incorporate the steady stream of experience from the world's largest installed base, Siemens offers a holistic approach to energy automation that is unique in the market. The result: ENEAS (Efficient Network and Energy Automation Systems) system solutions with seamlessly integrated components.

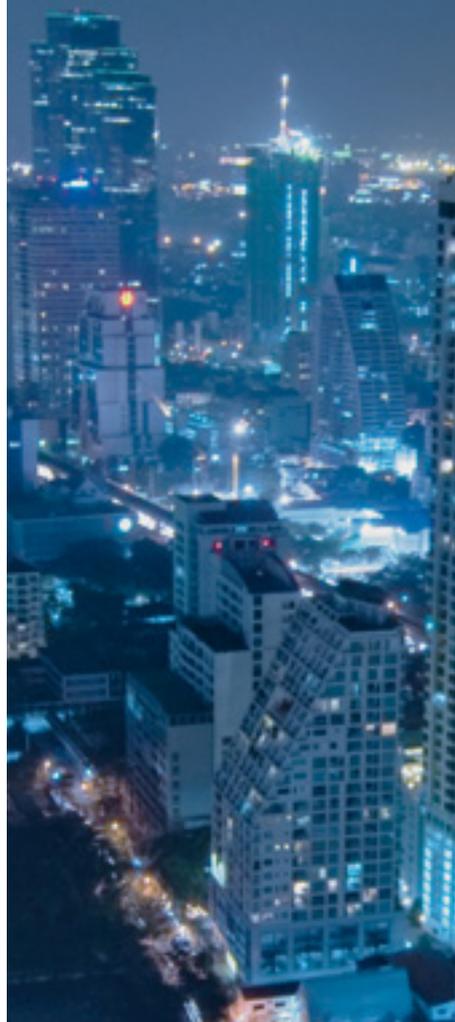
They make possible maximum overview and efficiency – throughout the entire asset, from planning all the way to

commissioning, in day-to-day operation as well as in maintenance.

All integrated energy automation solutions from Siemens are consistently based on:

- seamless communication through the implementation of worldwide standards and flexible expandability
- intelligent cyber-security through secure products, infrastructures, and processes
- efficient engineering throughout the entire automation chain, from the field device all the way to the control center

For you, this philosophy translates into a more streamlined workflow, secure operation, and a considerable optimization of the total cost of ownership. ENEAS from Siemens make integrated energy automation possible.





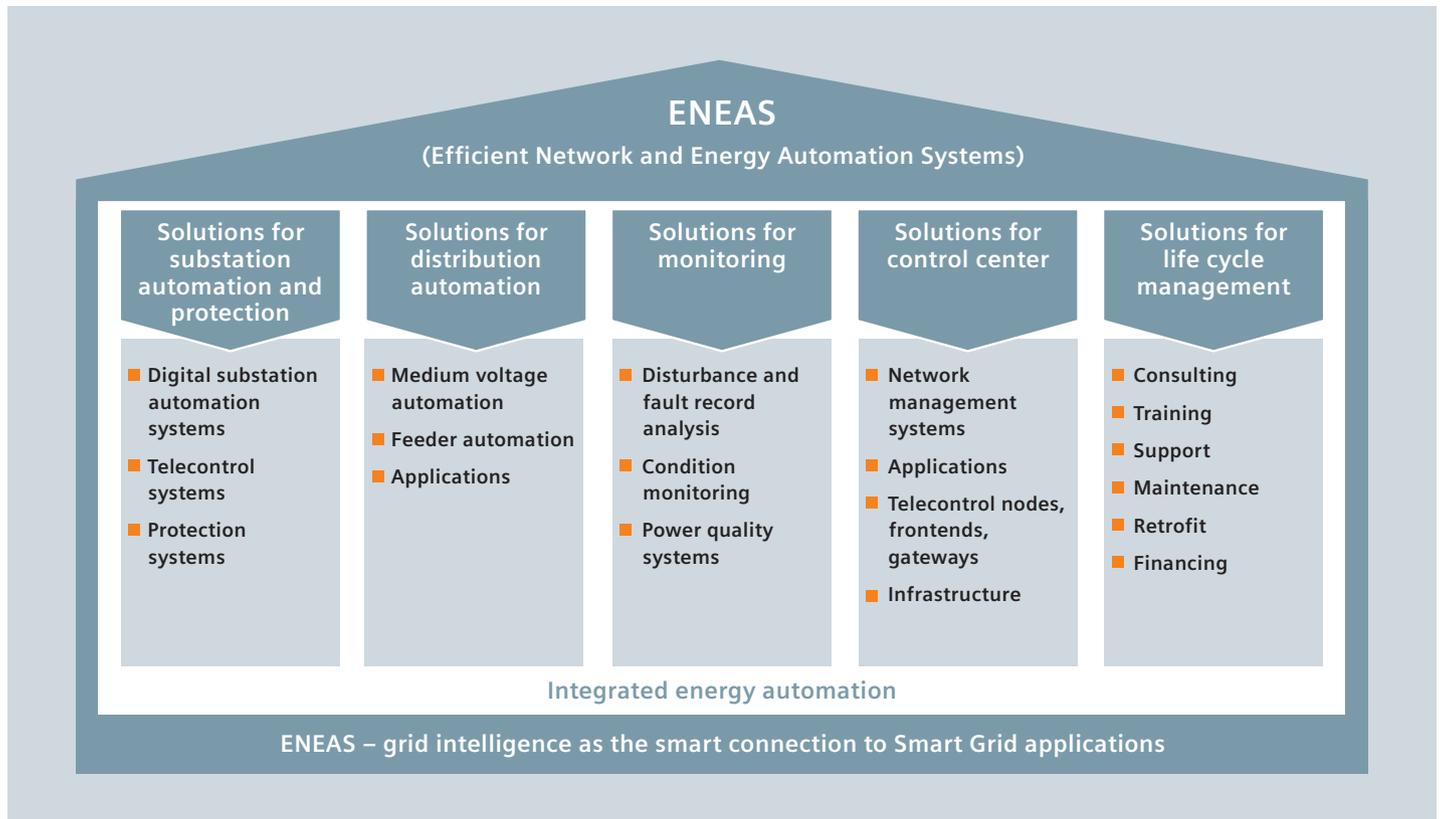
Expertise that pays off

Siemens is synonymous with integrated energy automation system solutions that expand with growing market demands yet still remain straightforward and manageable. Comprehensive communication options, reliable security precautions, and consistent engineering are an integral part of every single product, system, and solution. This integrated approach sets new standards where cyber-security, efficiency, and user-friendliness in energy automation are concerned – from the control center all the way to the field device.

The basis of all integrated energy automation solutions:

Seamless communication

A uniform communication platform forms the backbone of all Smart Grid applications. This makes it possible to access data from everywhere, at any time, and to integrate new applications into an existing architecture in a secure, effortless manner. All system components can be linked throughout the entire automation chain, and new services like online monitoring, remote parameterization, and cyber-security concepts can be implemented according to individual requirements.



Reliable cyber-security

Constant availability of the energy automation solution is made possible with high-end applications and network cyber-security. Integrated cyber-security processes, hardened products, and secure solutions result in integrated cyber-security throughout the entire automation chain.

Efficient engineering

A consistent and clearly structured configuration and operation of energy automation solutions reduces complexity and ensures efficient engineering. Harmonized tools contribute to a simplified and efficient engineering workflow.

Simply seamless communication

Seamless, streamlined communication and the possibility to easily integrate new applications into existing architectures are key to reliable network management and create value added.

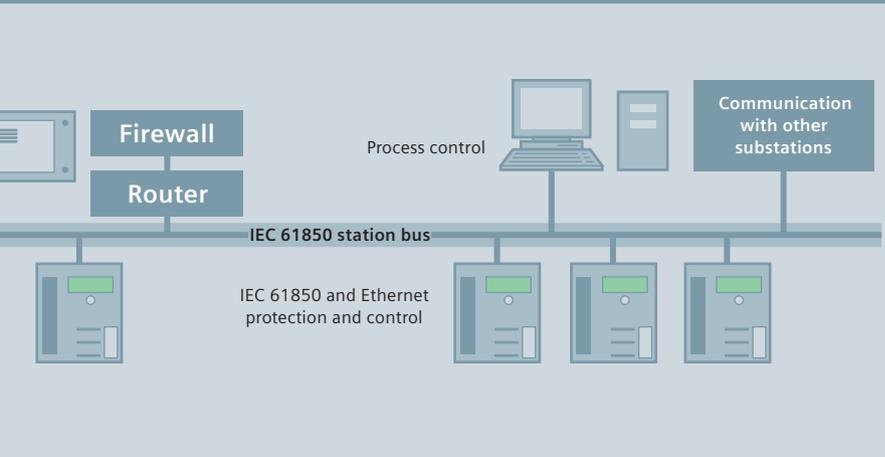
Only a few years ago, on-site operation and maintenance of energy automation equipment like substations required high expenditures of time and personnel. Today, modern communication solutions make possible the effortless remote monitoring, control, and maintenance of all assets.

All this requires a consistent and future-oriented communication platform that enables the seamless integration of all elements from the field level all the way to the control center. This is exactly what Siemens integrated energy automation solutions have to offer, providing maximum asset availability and laying a reliable foundation for the establishment of Smart Grids, the intelligent, highly automated grids of the future.

Siemens supplies utilities, industry, and large energy consumers with customized and robust integrated communication solutions that respond to such complex demands. Along with fiber optics, powerline, and wireless infrastructures compliant with the relevant standards, Siemens offers a broad spectrum of services, from communication analyses all the way to the operation of the entire system.

Consistent, homogeneous data communication structures and interfaces based on TCP/IP and Ethernet have become a standard in the office world as well as in many industries. The communication networks of power transmission and distribution systems, however, are still quite heterogeneous, which often results in limited capacity, bandwidth, efficiency, and consistency. Making full use of the benefits of an intelligent grid structure calls for successive migration. The final result should be a system that provides IP/Ethernet connectivity to the entire distribution network, including the end customer.





All relevant data at hand – at any time

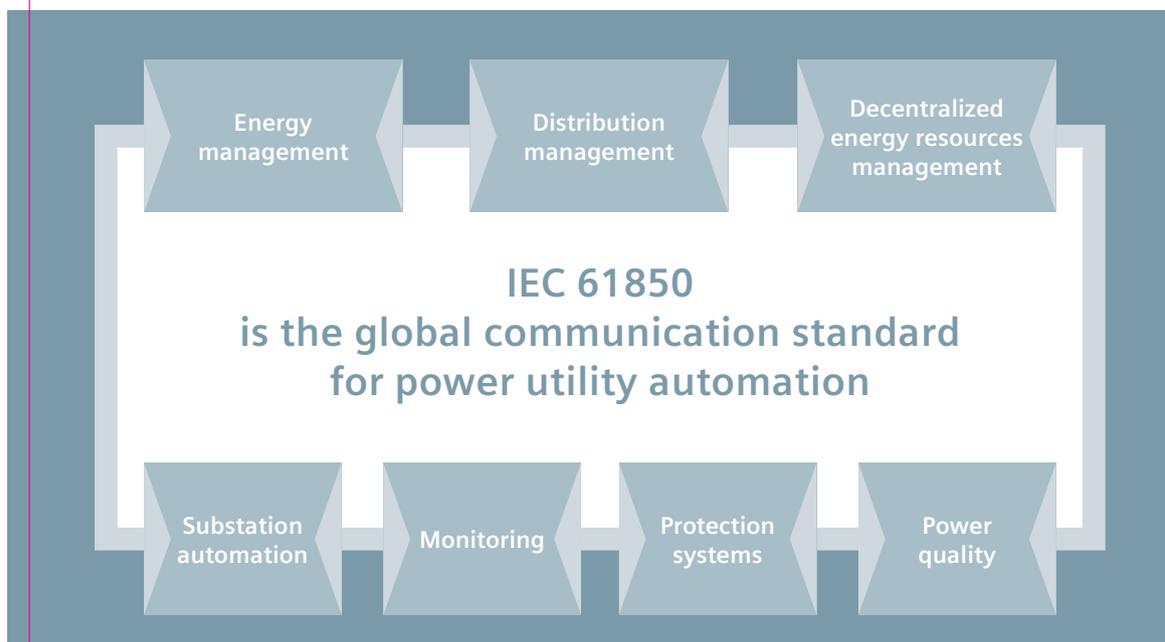
Whether in high-, medium-, or low-voltage grids, integrated energy automation solutions from Siemens provide the basis for network operation and make possible the optimization of availability and supply quality through precise and meaningful data visualized in a readily usable manner. Moreover, the intelligent, automated identification and logical interconnection of the individual data points allows for the retrieval and further processing of data everywhere within the network.

Simply up-to-date

Ready for things to come

Siemens' integrated solutions ensure that the data communication of utilities and network operators can always keep pace with the latest demands and, thus, provide maximum value added. New applications like online monitoring of system components and remote parameterization can safely and easily be integrated into any given architecture.

Communication connects the various levels of energy automation



Integrated energy automation solutions from Siemens provide the high degree of flexibility, adaptability, and intelligence that forms the basis for both highly efficient Smart Grids and the full exploitation of all optimization potentials. Virtual power systems, wide area monitoring, and the smooth integration of distributed generation from renewables become possible – as does remote maintenance for asset components, which can even be automated and performed proactively in the near future: the implementation of bus systems right down to the process level and the implementation of new applications, both based on a consistent communication solution, make all this possible. Consequently, users can react to new preconditions and challenges in the shortest possible time.

Simply comprehensive

Technology that makes the Smart Grid a reality

Due to its immanent intelligence and its high degree of integration, the structure of a Smart Grid is highly complex. Integrated energy automation solutions from Siemens make these structures easily controllable: data communication, as well as all interaction with engineering and cyber-security, is absolutely seamless. Standard protocols and data models like IEC 61850 and IEC 61970, as well as the service-oriented architecture (SOA) of the communication solutions, create maximum possibilities for vertical and horizontal integration.

As a full-range supplier, Siemens can offer consistent communication solutions that integrate all process levels and all entities within the energy conversion chain, from power generation to the end customer. Siemens provides the required high-performance data communication infrastructures, and supplies "plug and

play” interfaces that enable the seamless integration of trendsetting new applications and services. In a nutshell: seamless communication for energy networks, which is the backbone of a Smart Grid, is now available as a solution from a single source.

Simply promising

Impressive prospects for years to come

The fast-paced development of communication solutions and standards puts features within reach that seemed like distant dreams only a few years ago, and Siemens is a long-standing driver of these developments. Siemens leads the field in the development of the IEC 61850 standard, which describes the self-descriptive protocol for substation automation purposes, and still drives innovation in this field. The new second edition of the IEC 61850 standard will for the first time ever enable standardized communication among substations themselves, thus opening entirely new perspectives in the field of grid automation, and at the same time substantially reducing engineering costs. The aim is clear: durable and ongoing simplification of grid operation and the highest possible flexibility and availability of the entire infrastructure.



Simplify your cyber-security Think reliably

Reliable cyber-security for energy automation that simply works

Imagine your critical infrastructure availability as an equation with many variables. One important variable is reliable cyber-security in the form of protection against unauthorized access, "hackers," operator errors, and other internal and external threats.

But what ultimately counts for you is the outcome – in the form of energy automation that simply works. And this is precisely the philosophy behind integrated energy automation. Our vision is of end-to-end solutions that combine all the variables for you into a single transparent equation that ensures maximum availability.

With integrated energy automation, we deliver a cyber-security concept that not only ensures the confidentiality and integrity of your data, but especially its availability.

Integrated energy automation relies on a consistent foundation to ensure simplified operation – so you can focus on your core areas of expertise. This foundation comprises reliable cyber-security, seamless communication, and efficient engineering for the entire automation chain, from the control center to the field device.

Integrated energy automation solutions from Siemens allow you to benefit from a simplified workflow, reliable operations, and significantly lower total cost of ownership.

Simply complete

A view of your entire critical infrastructure at all times

If you consider your critical infrastructure as a whole, the individual parts resemble a chain. And when it comes to cyber-security, it is clear that your automation chain is only as strong as its weakest link. Integrated energy automation delivers seamless cyber-security to ensure the

continuous availability of your critical infrastructure. Our holistic approach guarantees a universally high standard of cyber-security throughout the entire automation chain.

Zone-by-zone protection

The graphic representation of the cyber-security network, the so-called system blueprint, depicts the infrastructure and architecture of your system. This provides a clear segmentation that we use to precisely analyze the risk of every link in your automation chain, without losing sight of the effects on the system as a whole.

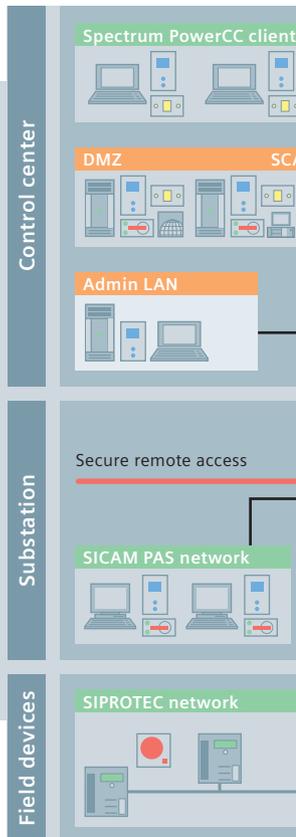
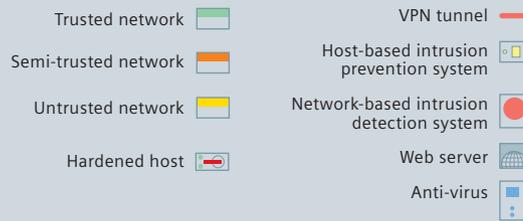
We divide your network into manageable zones so we can equip them with precisely the right level of cyber-security – the level necessary and practical both for protecting the data in these zones and ensuring problem-free operation of the system.

End-to-end cyber-security among all interfaces

With the expansion of the Internet and increased networking, today every interface poses a potential cyber-security risk.

You need a simplified way to assess these risks. So with integrated energy automation, Siemens pursues a cyber-security philosophy that simply offers you protection.

To achieve this, we rely on standard, transparent processes for authentication, authorization, intrusion detection and prevention, malware protection, effective patch management for third-party components, standardized logging, and continuous cyber-security tests.



Simply high quality

Continuous hardening of applications

Secure products are the essential foundation for a secure system. That is why we continually harden our applications against attacks and weak points. We do this through individualized risk analyses and regular tests, including specific tests for third-party components, with a defined package of cyber-security test programs designed to identify weak points (test suite).

In-house CERT as an expert partner

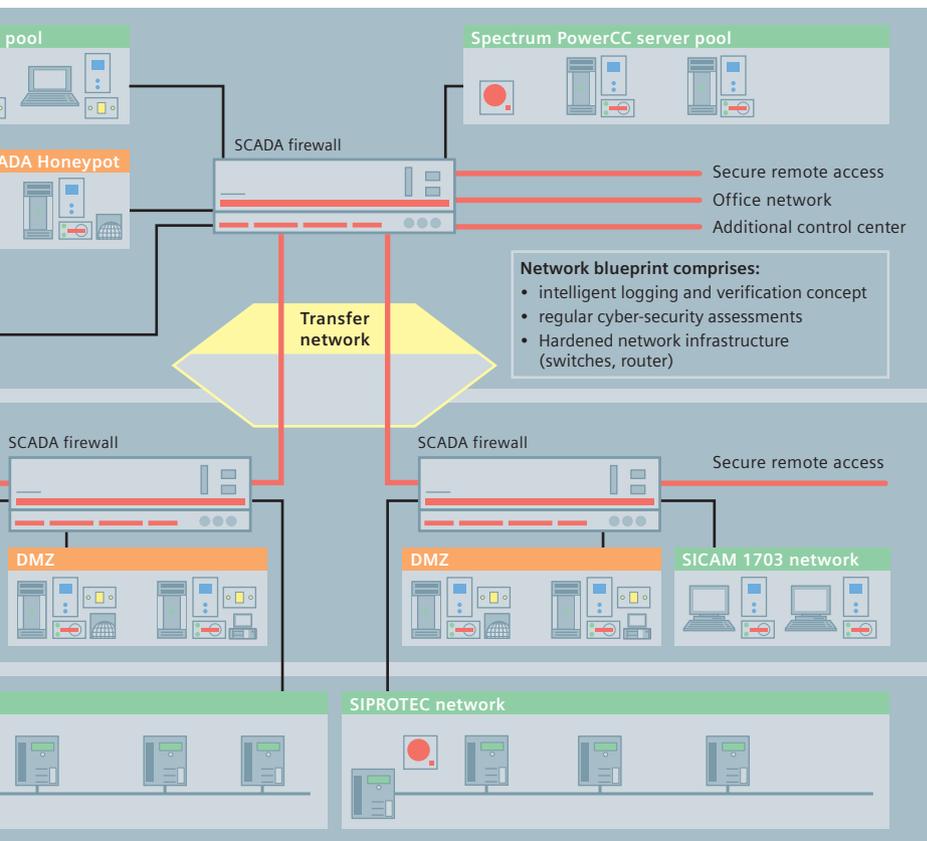
Siemens has its own in-house Computer Emergency Response Team (CERT). Organizations that research cyber-security-critical topics and issue up-to-date warnings are normally only operated by universities and governments to keep industry users informed. Our in-house CERT has been in existence for ten years, during which time it has issued warnings about cyber-security risks and offered approaches to solutions that are specifically derived from the company's areas of expertise.

In its capacity as an expert partner, the Siemens CERT creates rules for secure coding and programming of our products and trains our programmers. CERT carries out deliberate hacker attacks to assess the products for weak points. And the team also collects and distributes reports on weak points and upgrade notifications for third-party components and links them to recommendations, concrete proposals, and requirements.

This institution gives us an important advantage in terms of expertise – from which our customers can also benefit. And the best testimonial for our CERT is the solid cyber-security of the Siemens global corporate network.

Applying standards effectively

Standards are designed to offer you quality, increased long-term cyber-security, and investment protection. There are hundreds of cyber-security standards now in existence, but only some of them are really necessary and useful for your system.



Drawing on our many years of experience in the marketplace, we can select from the many different cyber-security standards and guidelines available those that will protect your network most reliably and effectively.

That includes advising you on which cyber-security standards you need to comply with, both internationally and locally.

As a global company represented in approximately 190 countries, we have extensive expertise and experience, accumulated over many years, with different cyber-security regulations and standardization measures at the international level.

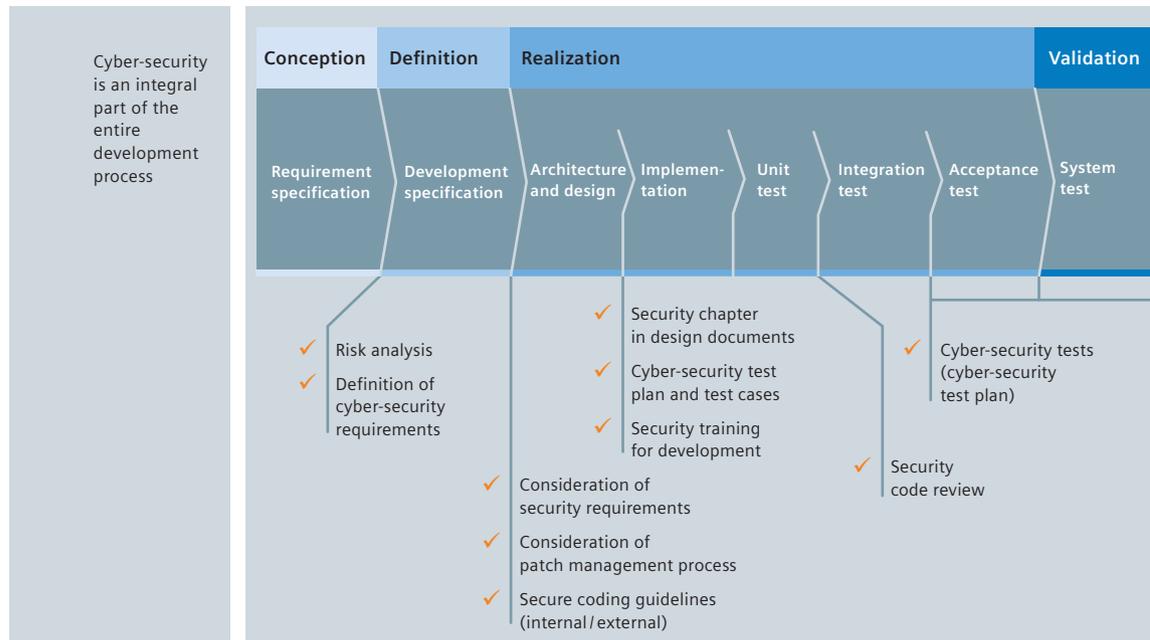
Risk analyses: facing the challenges

An important first step for successful cyber-security management is the assessment of existing cyber-security risks.

We identify and evaluate these risks with customized risk analyses. Using these analyses, we classify the risk potential and develop corresponding

recommended actions for you. In the recommendations, the mitigations must be matched to the value of the data to be protected. The mitigations must be defined appropriately in order to balance cost, flexibility, and vulnerabilities: if they are defined too broadly, the result is high costs and lack of flexibility, while too few measures leave open major cyber-security gaps.

Our risk analyses offer you a transparent, informative, and complete comparison of risk and costs, giving you the best possible input for deciding on further measures.



Simply integrated

Implementing a “cyber-security gene”

Our goal is permanent, long-term cyber-security for your system – so secure products and infrastructures alone are not enough. With integrated energy automation, Siemens implements all required security procedures to ensure that cyber-security is fully established end to end, and guaranteed throughout the system’s entire life cycle.

Cyber-security starts in the development process

The life cycle approach of integrated energy automation means more than just keeping an eye on your entire system. For us, complete cyber-security also means that the security of our products is integrated throughout the complete development process – and not just later in the test phase.

Cyber-security guidelines for development, handling of processes, service, and other functions ensure that cyber-security is an integral part of all processes. Examples of this include security briefings for product management before a product is developed or programmed in the first

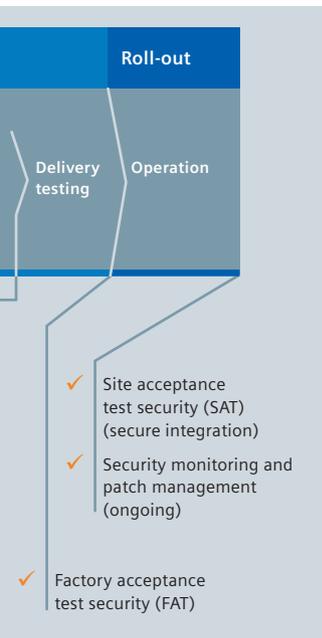
place. Programmers work according to defined guidelines for secure coding, as stipulated by the Siemens CERT. For effective patch management, updates of third-party security products like firewalls are tested during the development phase of our products. Penetration tests of all relevant products are specified in a test plan. And these steps also include defining and creating a security test environment and suitable test cases.

With these measures, we subject our products to an objective and critical certification process that allows us to ensure and control cyber-security on the basis of suitably selected standards. As a result, the cyber-security of our products is always reproducible and transparent, and naturally is continuously being improved.

Integrating cyber-security into your daily operations

The security of a system is directly dependent on how the operator handles it. And a high level of security can only be achieved through close cooperation between the manufacturer and operator.

We have observed great potential for optimization in systems when security concepts are implemented continuously



throughout the daily operations. For this, too, we support you with our extensive experience, advising you, for example, on the selection and evaluation of third-party components.

We offer a wide range of tools that allow users to benefit from cyber-security as a standard part of the daily operations of their system. We implement standardized security processes for updates and system backups. At the same time, we provide you with efficient tools for administering access in the system. This includes effective management of rights as well as secure logging tools. Automatic compiling of logs or creation of log files is not only legally mandated – they can help determine retrospectively how system damage occurred.

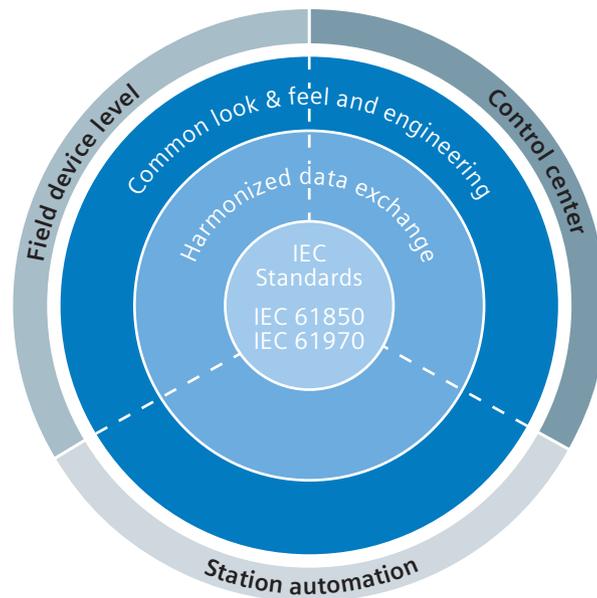
The principle of simplicity and transparency

Naturally, these are only a few of the services we provide. With integrated energy automation, Siemens offers holistic solutions – intelligently coordinated and harmonized – for energy automation. Only a company like Siemens has a complete portfolio of perfectly matched solutions as well as the expertise to see the bigger picture while highlighting just those parts that are important for you.

With integrated energy automation, we always follow the principle of simplicity and transparency, because guidelines and standard processes are the best basis for cyber-security. This reduces operator errors and safeguards the availability of your system in the long term.

For you, energy automation with Siemens means ...

- you benefit from the experience of the largest installed base in the world
- you are able to contact us quickly – we have representatives in approximately 190 countries
- we keep you at the cutting edge of technology with our innovations in research and development
- you can select from a comprehensive range, from single product to turnkey solution
- you can simply focus on your core areas of expertise



Engineering that is simply seamless to handle

Bottlenecks in the engineering workflow need to become a thing of the past in order to ultimately achieve streamlined processes that allow for fast and precise adaptations to new conditions and demands.

Integrated energy automation makes engineering simple. We provide efficient engineering where the individual components work perfectly together – from the control center through substation automation all the way to the field devices, TOOLBOX II serves as an integrated and efficient engineering tool for an entire system based on SICAM 1703.

Intelligent combination of engineering tools

Our engineering environment is based on the toolkit principle. It consists of a comprehensive portfolio of homogeneous and integrated modules, so you can assemble your solution depending on your individual needs: as a stand-alone solution, as a flexible combination of modules, or as a complete engineering environment.

Support an optimized workflow

We deliver solutions tailored to your needs that constantly grow with your

requirements – but which, nevertheless, remain optimally functional. For you, engineering with integrated energy automation most notably means a faster workflow as well as simple and reliable configuration and operation.

Simplify your workflow

International standards such as IEC 61850 and IEC 61970 (CIM) ensure the harmonized and consistent administration of your engineering data. For example, engineering data only need to be entered once – but will be used throughout the entire automation chain. Consistent user interfaces make orientation seamless. And avoiding errors will considerably help to reduce your costs.

Integrate the future today

All engineering tools use harmonized data formats and open interfaces. This makes extending your system seamless – at any time. And it allows for the effortless integration of existing data that may have been created using previous versions or other tools. In this way, efficient engineering with integrated energy automation also protects your investments by utilizing migration-capable data models.

Simply future-oriented

A new way of looking at tomorrow's engineering

Tomorrow's engineering environment will help to simplify your processes. To attain this goal, we focus our efforts on seamless data exchange and harmonized user interfaces. And with our modular design principle of homogeneous and integrated modules, we meet all requirements on the control center, substation automation, and field device levels as well as for the entire automation chain.

Seamless data handling and exchange

For efficient engineering, a common "language" is the foundation. All engineering tools will use this language in order to perfectly communicate with each other. Consistent data models allow seamless data handling and level-spanning workflows, and make data migration a snap.

Seamless orientation and navigation

Efficient engineering forms a "seamless" engineering landscape where all components work perfectly together. By utilizing flexible yet comprehensive

and homogeneous views from the control center to the field devices, you may attain a new level of transparency when configuring your system.

Save time through reuse

Configuration prototypes and patterns can easily and flexibly be created and copied. Using these templates and adapting them for project-specific purposes will save you time and effort when creating your engineering data.

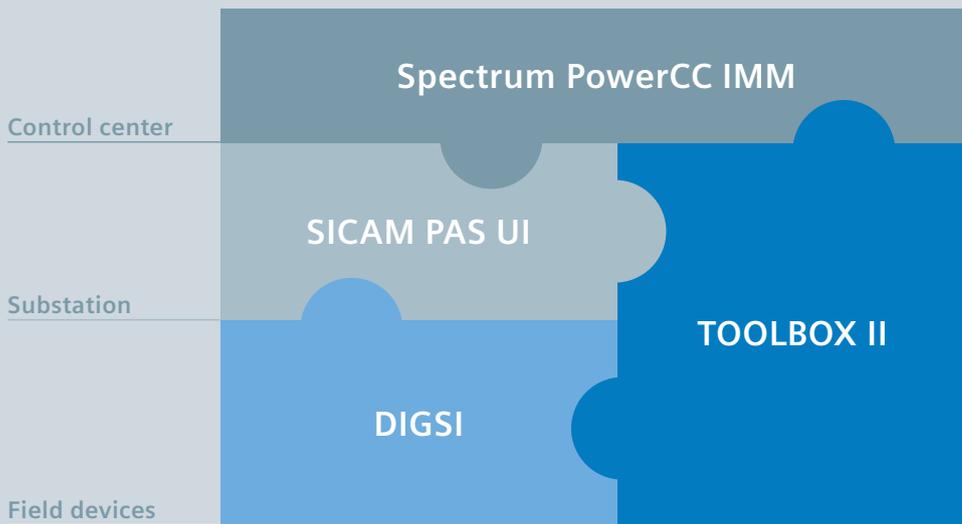
Efficient handling of mass data

Intelligent functions allow consistent changes of mass data in one single step instead of having to edit each object separately. Open interfaces, for example, to MS Excel make import and export of mass data seamless.

Clearly arranged documentation

Standard formats and adaptable layouts support transparency and harmonization when preparing the technical engineering documentation. All engineering data that accumulates during a project's execution can be accessed easily, as is the generation of well-organized and straightforward reports.

Seamlessly harmonized engineering tools



Simply consistent and efficient



Overcome regional distances

Our tools support multiple languages for the user interface as well as for the engineering data. In addition, you may access the same engineering data from different locations.

Consistent configuration

The tools support you in creating and maintaining consistent configurations throughout the system's entire life cycle, so even during complex and long-term projects you will easily retain the overview of your engineering data. Intelligent tools reduce complex configuration tasks and individually support your workflows. That way, you directly benefit from Siemens' expertise with context-specific support and comprehensive consistency checks.

One environment – many possibilities

We provide you with four engineering tools, perfectly harmonized and tailored for the specific tasks of the field devices, substation automation, and the control center.

Combined, our engineering tools form an integrated solution. Thanks to this optimal integration, information can be transmitted from one system to another quickly and without any loss of quality. This helps to avoid errors and to save time.

Seamlessly integrated

Spectrum PowerCC IMM – fast, seamless, and secure data management in the control center

Spectrum PowerCC IMM allows you to create a hierarchical data structure according to your needs and to make changes to the data without a service interruption. Data may be imported from external sources like other databases or ASCII files, and may be edited using an object-oriented editor. Intelligent wizards provide optimal support for maintaining your data.

TOOLBOX II – integrated and harmonized engineering

TOOLBOX II supports the entire engineering process for all automation devices of the SICAM 1703 product family: from gathering and modeling the data or loading parameters to test and fault diagnosis. Parts of a system may be modeled as objects which then can be easily copied, and the changes can be passed on to the next generation of the system.

SICAM PAS UI – time-saving substation automation operation

SICAM PAS UI, the development tool for SICAM PAS, has been optimized for all substation automation applications.

Efficient engineering

Efficient engineering through standardized data models

Data exchange based on standards

“Single source”

Data model

Automated data exchange

Consistent data management

Usability consistent user interfaces and tools

The UI supports you by providing hints and online help. Consistency checks point you toward potential input errors.

DIGSI – consistent engineering at the field-device level

DIGSI allows for well-structured and simple parameterization, commissioning, and operation of all SIPROTEC protection and field-control devices. Due to its modularity, DIGSI may be tailored to your needs and can be extended with optional components whenever the need arises.

Simply consistent

Efficient engineering with high consistency

Based on the IEC 61850 and the IEC 61970 (CIM) standards, we have created a consistent data model that spans all engineering tools and levels. And since you only have to enter your data once, you will see a reduction in your engineering effort, while at the same time you will benefit from a consistent data quality.

Seamless data exchange with XML

Today, all engineering tools communicate using XML (Extensible Markup Language) as their common language. The XML format serves as the foundation for all import and export scenarios, and ensures

efficient and universal communication within the entire Siemens engineering environment.

Less effort for future data management

Data exchange via XML format encourages the creation of new, level-spanning workflows in the future. Exchanged data will automatically and comprehensively be checked for consistency, and so you will benefit from higher data quality across the entire automation chain.

High usability for efficient engineering

Efficient engineering means that it is not the people who adapt themselves to the tools, but rather the tools that meet the demands of the users. In order to improve our understanding, we analyze the ways our users work on-site at their desks, and conduct usability workshops with them. These findings will directly influence further development of the tools. The result is an engineering toolbox that allows for a steeper learning curve and higher productivity.

Homogeneous applications and intuitive operation

Our development follows internal policies and style guides. This will ensure that, in the future, applications will become as homogeneous as possible. And you will benefit from these advances, for example, from easier navigation or from functions like “Search” or “Filter” that behave the same way throughout the system. Diagrams, icons, and error messages, too, will follow the same, consistent requirements.

To provide optimal support of your engineering activities, the user interface concept is aligned to your workflows. In this way, step by step, intuitive operation becomes a reality. And since the engineering tools are constructed in the same way for the entire automation chain, you will be rewarded with easier orientation and less time required to get up to speed.

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