Our future depends on intelligent infrastructures

siemens.com/intelligent-infrastructure
By combining engineering and data expertise, we enable our customers to make informed decisions when answering the challenges that urban and industrial infrastructures face today.
Intelligent infrastructure: key for our future

Infrastructure is the backbone of the world’s economies. It moves people and goods, it powers our lives, it fuels growth. Whether it’s a reliable transport system, electrical grids that provide a dependable energy supply, or buildings that offer space for housing or commerce: Safe and efficient infrastructure is the foundation on which an economy is built. Yet around the world infrastructure systems are coming under increasing strain due to unprecedented urbanization, continued globalization, and the effects of climate change. In addition, developing countries are struggling to build new infrastructure while developed countries must replace aging infrastructure. Between now and 2030, an estimated minimum of $50 trillion in infrastructure investment will be required to fuel global development.

The scale of the challenge calls for a more intelligent approach to infrastructure – one that involves getting more out of what we have and making the most out of what we build. What we need is intelligent infrastructure that optimizes energy generation and distribution, makes buildings smarter, and keeps traffic flowing. Siemens is uniquely positioned to help our customers reap the full potential of their infrastructure systems: By combining engineering and data expertise, we can provide answers to the core challenges confronting urban and industrial infrastructures today:

- Increased intelligence and transparency – providing the right information at the right time in order to make informed decisions
- Integration – so that information can be shared across systems and organizations to eliminate silos and optimize performance
- Automated processes – to boost efficiency and reduce costs

Siemens offers the perfect combination of domain expertise and experience as an innovation leader to provide intelligent solutions for both today and tomorrow.

? How can infrastructure projects become more financially viable

? How can we expand the capacity of existing infrastructure, such as increasing transportation on existing lines

? How can we ensure a sufficient and safe power supply wherever people need electricity

? How can our buildings contribute to solving our climate protection issues
Bringing the pieces of the puzzle together
Infrastructure 3.0 brings all parts of the infrastructure puzzle together and incorporates them into a single interdependent and reliable whole. Infrastructure 3.0 provides real-time optimization and incident handling across all domains. It allows us to adapt to the pressures of rapid urbanization, climate change, and other trends by utilizing advances in sensors, controls, and software to predict outcomes, take actions, and manage systems more effectively.

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<th>Impact of intelligence</th>
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<td><strong>Rolling stock</strong></td>
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<td>Save up to 30 percent in lifecycle costs</td>
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<td>20 to 30 percent capacity increase with driverless trains</td>
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<td><strong>Road and rail</strong></td>
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<td>Approx. 20 percent increase in city traffic speed</td>
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<td><strong>Power and utility grids</strong></td>
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<td>Integration of renewables: 25 to 40 percent lower investment (compared with traditional grid expansion)</td>
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<td><strong>Buildings</strong></td>
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<td>20 to 30 percent less energy consumption</td>
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Stages of infrastructure development

1.0

"Brick and steel" infrastructure
- Road and rail tracks
- Commercial buildings
- Electrification islands

2.0

(Semi-) automated infrastructure
- Electric railways and basic rail automation
- Modern standard buildings
- Mono-directional power grids

3.0

Intelligent infrastructure
- Driverless trains
- Fully automated buildings
- Smart grids managing loads, storage, and generation

Fully integrated intelligent infrastructure
- Integrated real-time optimization and incident management across all infrastructure domains

Efficiency, reliability/capacity, flexibility/resilience, and adjustability

For example, in an Infrastructure 3.0 world, smart buildings and the Smart grid cooperate seamlessly to optimize energy consumption. Smart buildings take on surplus energy when it is cheap and plentiful, storing it for later and feeding it back to the grid when demand is high. Traffic systems become more user-friendly, integrating all transport modes and operators so that travelers can optimally plan their journeys using real-time information – which reduces both congestion and emissions. And command and control centers are capable of integrating transport, water, gas, and electricity networks to exercise pre-emptive actions or respond swiftly in a crisis.

Siemens recognizes the challenges in upgrading infrastructure systems to achieve this level of integration. We have consistently provided our customers with advanced technological progress in automation, with products ranging from building automation systems to trains and power distribution systems, all equipped with the intelligence required to automate processes and improve efficiency. Thanks to our solution portfolio and our consulting and domain expertise, we can offer the technology, experience, and expertise needed to ensure that infrastructure development continues to reach new heights.
Siemens offers innovative solutions to ensure that people and goods reach their destinations quickly and safely. Our expertise includes comprehensive domain and turnkey expertise that enables us to service the entire mobility spectrum – from operation controls for rail and road traffic, rail electrification systems, rolling stock, and electric buses to parking management and tolling solutions. Our intelligent solutions optimize the overall performance of transportation networks to better manage load and volume, while our integrated mobility platforms combine diverse transport providers to offer an end-to-end travel experience across metro, bus, car, bike-sharing, parking, and taxi services in real time. And as a single-source provider and system integrator, we provide high-quality rail products and solutions for urban and interurban transportation and logistics. The result is greater control throughout the entire transportation network, increased business potential, lower greenhouse gas emissions, and better service for citizens.

Smart mobility – rethinking efficient transportation

Transportation of people and goods is a top priority for metropolitan areas. Population growth, congestion and the growing demand for mobility all place increasing burdens on transport systems with negative impacts for businesses, residents and overall quality of life.
Dynamic tolling system, Tel Aviv
In Tel Aviv, the Siemens dynamic tolling system keeps traffic moving by automatically increasing tolls when the traffic volume is high. The system has increased the use of public transportation and reduced congestion as well as exhaust emissions.

Driverless trains, Paris
Driverless trains from Siemens can increase capacity by about 20 percent by safely reducing the intervals between trains by 20 seconds. Since converting to a driverless system, Paris’ Metro Line 1 can carry an additional 70,000 passengers during peak travel times, while reducing energy consumption by 15 percent.

eTicketing, Lisbon
Thanks to the new Siemens eTicketing system in Lisbon, commuters can use a single card to access a large group of public transport options. The system provides updated information panels, help points, video surveillance, data networks, and uninterruptable power supply systems, which means that each user can enjoy a safe, quick, and comfortable trip.

Public transportation, London
Public transportation in London is becoming more efficient, less congested, and more comfortable thanks to Siemens technologies. For example, Siemens detection and enforcement infrastructure is being used to enforce the city congestion charge in central London, resulting in a 20 percent traffic decrease. And hybrid drive technology has been installed in a growing number of double-decker buses to decrease the amount of emissions emitted by 40 percent and save up to 30 percent on fuel.
Buildings not only offer space for working and living, they are also capital investments. Their value can be maintained only if they are operated cost-effectively.

Today buildings account for some 40 percent of the energy consumed worldwide. In Europe alone, 95 percent of the energy used to provide heat, hot water, air conditioning, lighting, and ventilation for buildings is consumed by structures that were built before 1980. Modernizing existing buildings – making them more efficient, more integrated, and more “smart” – therefore offers enormous savings potential. But so does constructing buildings with intelligent technology right from the start, too.

Solutions like Siemens’ Desigo CC offer savings potentials for both new and existing structures. Desigo CC integrates a number of building functions in a management station platform that provides centralized monitoring and control. Fire protection, safety and security, and building automation systems can all be integrated into a single system, increasing efficiency and ease of operation for building managers and improving safety conditions and comfort for users.

Siemens’ solutions for data centers also offer fully integrated security solutions to ensure the security of buildings and assets, with fire detection and protection systems tailored to suit the data center environment.

Intelligent buildings: setting a new standard of “smart” for the future
Tornado Tower, Doha
In Doha, the iconic 200-meter-high office building Tornado Tower is a prime example of a fully integrated system. Here power distribution, building automation, fire safety, and security systems are unified in a single management station, Siemens’ Desigo Insight. Through continuous monitoring and reporting, energy consumption has been decreased by at least 20 percent, reducing operating costs and achieving new levels of both efficiency and safety. The integration of video surveillance, access control, and intelligent alarm systems makes it possible to detect dangerous situations quickly and initiate an immediate response.

Taipei 101, Taiwan
In Taiwan, Siemens automation and control technology ensures that the world’s tallest certified LEED (Leadership in Energy and Environmental Design) building, Taipei 101, has a 30 percent lower energy consumption than comparable buildings, resulting in annual savings of $700,000 in energy costs.

Swiss National Supercomputing Center, Lugano
In Lugano, Siemens equipped the new Swiss National Supercomputing Center’s new data center with the Siemens Desigo Insight management system. The entire complex can be easily monitored and controlled from a single source. As a result, a wide range of security and fire safety systems ensure the highest standards of security. At the same time, energy-efficiency goals can be monitored and even more potential savings identified.

O’Hare Airport, Chicago
In Chicago’s O’Hare Airport, one of the world’s busiest airports, the Siemens Desigo CC system integrates 40,000 data points to achieve seamless operations – from fire protection and extinguishing to video surveillance. Desigo CC keeps the airport running smoothly and safely while also providing the utmost in comfort to passengers.
A constant reliable energy supply is crucial for economic growth and stability, as well as social well-being. However, today’s grids were not designed to handle the growing power requirements or the increasing proportion of fluctuating power generated from renewable sources. These trends – in addition to power outages caused by storms, excessive demand, and aging infrastructure – have a significant impact on businesses and households alike. If the power supply fails, there are repercussions across all infrastructure domains.

Smart grid technologies make it possible to modernize and adapt existing power grids to future demands. They can enable power operators to manage energy more efficiently, react more flexibly to changing demands, and boost efficiency in the network as well as incorporate electricity from distributed and renewable sources.

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Smart grids – rethinking power for the better

For example, Siemens’ Smart grid Suite offers solutions for generation grids, micro grids, demand response, and smart metering systems. It lies at the heart of the Smart grid, providing operators with increased situational awareness through sensors, communications, and intelligent controls. Industrial power supplies can also benefit from integrated automation solutions – which we call Totally Integrated Power. Our power distribution products and systems can be interfaced to building or industrial automation systems via communication-capable circuit breakers and components. In addition, the Siestorage energy storage unit helps stabilize distribution grids that need to handle a large number of decentralized renewable power generation plants.
In the United States, reliability is being taken to a whole new level in North America’s largest transmission grid. Siemens Spectrum Power energy management system (EMS) is playing a key role in helping the U.S. grid operator PJM to ensure a reliable and virtually uninterrupted power supply and grid control in the event of a control center malfunction.

Working with the Dutch grid operator Stedin, Siemens developed a self-healing network solution to solve network system failures in the region’s underground cable grid. Primary substations automatically manage fault location, isolation, and restoration. The regional control unit communicates via a GPRS network with local control units that execute switching operations. The results are a significantly reduced number of power outages and customer power re-supply in less than one minute in the event of an outage.

In India, where energy demand is soaring and the infrastructure is vulnerable, Siemens is helping the State of Maharashtra to deploy innovative Smart grid technologies to upgrade its infrastructure and ensure a reliable power supply for 20 million people – while avoiding a costly power grid expansion.

In Munich a virtual power plant (VPP) from Siemens enables Germany’s largest utility company, SWM, to create and monitor a dispatch plan based on weather forecasts, current electricity prices, and energy demand. The VPP ensures reliable and cost-effective operation as well as the integration of renewable energy sources. Decentralized power integration solutions like this are helping cities transition to a sustainable energy future.