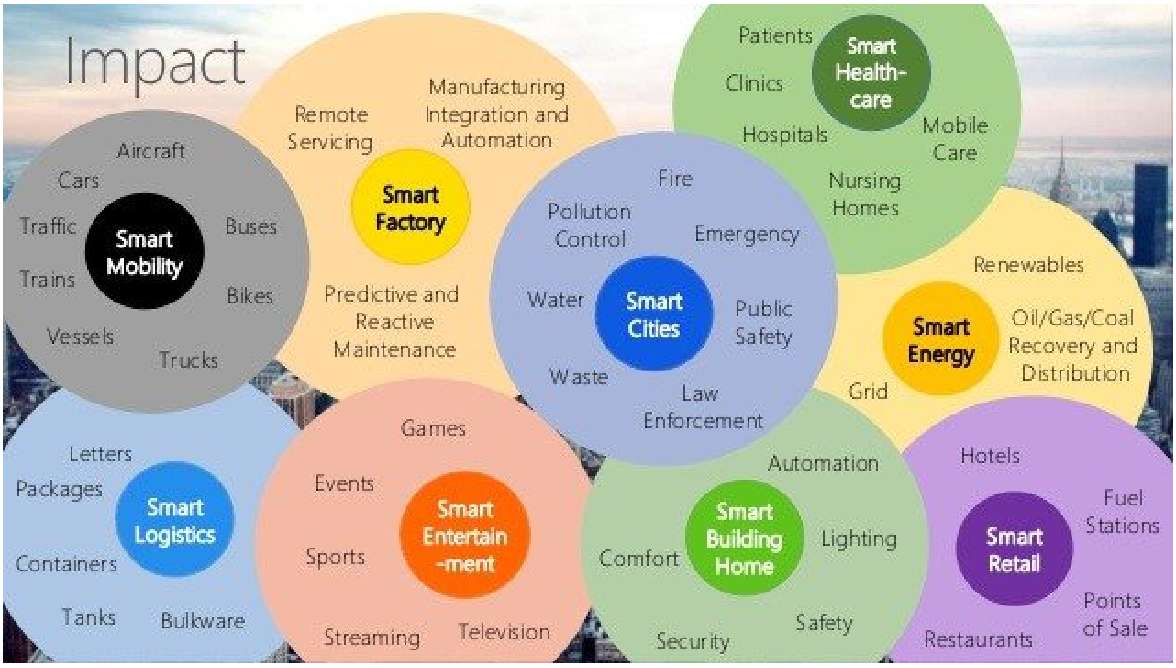

This Is What The Fourth Industrial Revolution Looks Like

TN Note: One key take-a-way from this article is that "the main impetus behind the ramped up industrialization in Germany lies not so much with the consumer, but the potential benefits to multinational industrialists that will be its earliest adopters." Again, consumer demand had nothing to do with it, just like the rollout of Smart Grid in the U.S. when President Obama quietly slipped hundreds of millions in stimulus money to U.S. utilities to roll out the technology. It was all driven by corporate technocrats in collusion with public funds.

It's 7 AM, April 13th, 2025. Your smart clock rouses you from a dreamless sleep and you climb from bed as your house comes to life. The bathroom light turns itself on and the shower begins to heat its water. After washing off, you throw on a T-shirt which has been perfectly fit for your body. You check your phone, only to discover that its battery is about to give out. A push notification informs you that there is no need to worry—a replacement is already on its way. You hear your car start in the garage, ready to take you down to the factory you manage, where, according to your phone, one of the machines has malfunctioned.

Actually traveling to your place of work has become an increasingly rare phenomenon for you—most of the time the factory takes care of itself.

“What a pain in the ass,” you mutter as your car pulls itself out from your garage. “Can’t these things get anything right, anymore?”

Welcome to life after the fourth industrial revolution, where all of the objects you use on a day to day basis are custom-made and constantly talking to one another for your benefit.

The phrase “industrial revolution” probably conjures up foggy memories of sitting in high school history class bored out of your mind. Wasn’t there something about a steam engine? Yes, there was—and in the two centuries since James Watt’s vapor powered technology inaugurated the transition to mass production, there have been two more: in the late 1800s, based around electrification and division of labor, and in the late 1900s, with the rise of information technology.

Three years ago the Germans predicted a fourth, one which promises to dramatically transform the workplace and finally make the entire world of objects revolve around you.

Changing everything, again

The fourth industrial revolution, more commonly known as “Industry 4.0,” derives its name from a 2011 initiative spearheaded by businessmen, politicians, and academics, who defined it as a means of increasing the competitiveness of Germany’s manufacturing industries through the increasing integration of “cyber-physical systems,” or CPS, into factory processes.

CPS is basically a catch-all term for talking about the integration of smart, internet-connected machines and human labor. Factory managers are not simply reimagining the assembly line, but actively creating a network of machines that not only can produce more with fewer errors, but can autonomously alter their production patterns in accordance with external inputs while still retaining a high degree of efficiency.

In other words, Industry 4.0 is the production-side equivalent of the consumer-oriented Internet of Things, in which everyday objects from cars to thermostats to toasters will be connected to the internet.

This would be a "completely new approach to production," according to a report released in 2013 by the Industrie 4.0 Working Group, a conglomerate of major industrialists, artificial intelligence experts, economists and academics.

The German government readily endorsed the idea, announcing that it would be adopting a "High Tech Strategy" to prepare the nation.

The approach has not only found massive support in Germany, but is increasingly demanding attention elsewhere in the world as well. The United States, for instance, was quick to follow Germany's lead and established a non-profit Industrial Internet consortium in 2014 which was led by industry giants such as General Electric, AT&T, IBM, and Intel.

What does Industry 4.0 look like?

One of the more tangible aspects of the fourth industrial revolution is the idea of "service oriented design." This can range from customers using factory settings to produce their own products, to companies tailoring individual products for individual consumers.

The potentials enabled by this mode of production are enormous. For example, the communication between smart products on the Internet of Things and the smart machines manufacturing them on what GE calls the "Industrial Internet" means that objects will be able to monitor their own use and determine when they are going to give out.

If your phone knows that it is going to "die" in the near future, it can notify the factory, which can alter its production levels to reflect the data coming in from the smart objects produced there. When your phone kicks the bucket, there will already be another one waiting for you, meaning the days of back-ordering are numbered.

What's more, as this process becomes more sophisticated and integrated, your phone will arrive already programmed with your custom settings, just like how you had it when it gave out on you a few hours ago.

This process is not just limited to phones and other sophisticated electronics, however. Everything from custom-fit clothing to custom shampoos and soaps will be at the consumer’s disposal, without the added cost that has typically accompanied individually tailored designs in the past. Objects will increasingly be made just for you and in a very real way—it will no longer be about selecting one out of a handful of predetermined colors for your phone and calling it personalized.

Furthermore, the increasing integration of smart factories into industrial infrastructures could mean large reductions in energy waste. As the Industrie 4.0 working group noted in its report, many factories squander large amounts of energy during breaks in production, such as weekends or holidays, something which could be avoided in the smart factory.

According to proponents of this framework for totally integrated production, Industry 4.0 also has the potential to change the definition of human labor. Since machines are able to perform repetitive, routine tasks in manufacturing with much more efficiency than their human counterparts, these tasks will increasingly be automated. Yet rather than putting people out of work, this will supposedly free them up for more creative, skilled tasks, rather than subjecting them to menial, low-skilled work. Moreover, as physical systems become digitized, workers will have to spend less time in a designated physical work environment—rather, managing a factory can be done remotely over the internet.

The new industrial giants? Same as the old industrial giants

Those that stand to benefit most from the advent of the fourth industrial revolution, such as Cisco, Siemens, or ThyssenKrupp, claim that the implementation of CPS is due to popular demand rather than any corporate agenda.

Yet despite the rhetoric, further investigation shows that the main impetus behind the ramped up industrialization in Germany lies not so much with the consumer, but the potential benefits to multinational industrialists that will be its earliest adopters.

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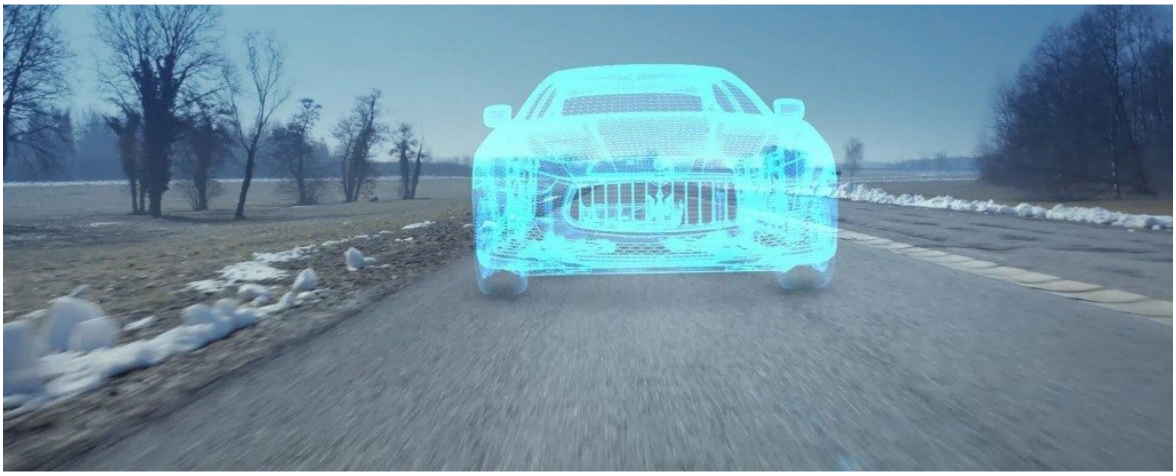

Siemens and IoT: The Seamless Integration Of The Physical And Virtual Worlds

TN Note: This article is from the official Siemens website page titled "Pictures of the Future". Siemens is a German-based conglomerate and one of the biggest players in the technology of Technocracy. It leads in Smart Grid, wind turbines, factory automation and especially, in the creation of the Internet of Things (IoT), where devices talk to and interact with each other autonomously.

Whether in factories, rail and traffic management systems, or decentralized power distribution systems, the trend is toward networking individual devices with entire systems – a process that is based on the integration of the physical world with the virtual world of data. The result is what Siemens calls the Web of Systems. As this process evolves, it will allow Siemens to help its customers to enrich their existing equipment through the advantages of the digital universe without endangering or sacrificing either data protection or intellectual property.

Our day-to-day lives are being filled with more and more devices that let users find out the status of an object via the Internet or the Cloud. Examples of this trend include fitness-tracker armbands, sensors that monitor plants' moisture levels, and houses that learn to set their heat and lighting to fit their residents' living patterns. As this process evolves, it is realistic to expect that eventually every "thing" will be equipped with an Internet address, thus opening up whole new ways to interact with those "things."

This paradigm of the Internet of Things (IoT) opens up immense opportunities for Siemens. After all, Siemens is a major player in combining hardware and software – for example, in automation solutions for production, in rail and traffic management systems, and in the decentralized delivery of electric power.

All the same, factories, traffic networks and utility grids are a good deal more complex than smartphones and tracker armbands. All are examples of real and virtual systems that have been intermeshed and that often even involve critical infrastructures. Customers in such critical areas have entirely different expectations about safety, reliability and durability than those purchasing a smart thermostat or plant moisture tracking system. What's more, such customers want to enrich their existing equipment through the advantages of the evolving digital universe without endangering or sacrificing either data protection or intellectual property. That's why Siemens has expanded the concept of the Internet of Things for industrial applications to create the Web of Systems, meaning systems that are digital, communicate with each other, and can act autonomously. Siemens' vision is that as this ecosystem takes shape its elements will be managed via future Web technologies that use standardized protocols and languages of the kind that are used for the Internet today.

This linking up of the real world and the virtual world of data offers multiple advantages for Siemens customers. It enables them to capture and analyze the current status of a system and its parts anytime, in detail. This in turn yields immense opportunities for savings through predictive maintenance, as well as major potential for optimizing systems. Using today's technologies from the World Wide Web environment, systems can often be implemented and commissioned faster and more economically. A system’s intelligence can be distributed as needed between real components and virtual systems in the Cloud, resulting in enhanced robustness and customer data protection. Finally, as the digital landscape is transformed along these lines, it will become easier to update systems with new functions, or to update system software on the fly, in much the same way as smartphones and other devices are updated through apps.

Why Smart Grids Need Distribution Transformers

One of many examples where our Web of Systems offers advantages is smart grids. Until just a few years ago, electric power grids were organized in a strict hierarchy. But today they’ve become decentralized systems. Photovoltaic installations and other renewable energy sources feed electricity into the grid on an unregulated, fluctuating basis, at voltage levels that used to apply only to consumers, not generators. In a worst-case scenario, that can make a grid unstable.

So grids have to be given the ability to counteract that shifting environment. One component here is distribution transformers that can adjust independently and cooperatively to smooth out voltage fluctuations within their local areas. But for that they need their own intelligence and communication capability – in other words, they need to be “smart” and networked. And this is where one important difference from the typical Internet of Things scenario comes in. The Internet of Things is connected to the Cloud, and the Cloud is where the data – for example from the equipment’s sensors – is primarily processed. Response times and reliability are often a secondary priority. But in a Web of Systems, things themselves have intelligence. They can respond locally, fast, and reliably, while at the same time drawing on the power of the Cloud for optimization.

How to Keep a Secret

In order to realize the vision of a Web of Systems, associated software has to be able to understand the data, so it can derive intelligent conclusions from it. And that’s possible only if information that describes the data’s meaning is either already present or supplied alongside it. Human experts can respond to this kind of challenge because they understand the context in which data is embedded. But software has to be told the context explicitly. Yet that context includes important information about the system in question and its associated processes, which in many cases are valuable business secrets that an operator would be very unwilling to deliver unfiltered into the Cloud. In view of this, it is better if machines can draw conclusions themselves, locally, so that the context remains protected. With regard to distribution transformers, for instance, they can assess independently whether to smooth out a critical grid state or whether they will need help from a higher level, thus ensuring a high level of data protection by restricting secrets to local systems.

Although localized, this information can nevertheless be used to generate value – for example by using predictive maintenance or developing new services. To make use of this and other data from industrial systems, trains or gas turbines, Siemens relies on Sinalytics. This is a new platform for industrial data analysis that makes it possible to offer new digital services to every customer. Sinalytics processes data from many different distributed systems and their sensors in real time and also supports local data processing directly in devices.

The Road to Self-Stabilizing Grids

Another advantage of the Web of Systems approach is that it opens the door to a platform approach in which functions can be distributed and installed like apps, and run in much the same way. For example, services can easily be distributed that make the systems environment more attractive not just for Siemens, but for its customers and even their own customers. In such an environment, a distribution transformer could, for instance, run applications for energy-efficient management of neighborhood street lighting. When an update is due or a new function is needed, the software can be uploaded remotely.

The smart distribution transformer – a new Siemens development – is already being used in practice for voltage regulation in the low-voltage grid, and is thus a key part of a future system known as an intelligent secondary substation node (ISSN). With its computing power and optional communication connection, the iSSN will provide the possibility for far more than supplying households with the right voltage. It will enable the power grid to cope with additional feed-ins or loads with no need for massive infrastructure expansions.

This iSSN is currently being developed further in the context of the Web of Systems project. Its Web connection, for example, will make it significantly easier to commission, maintain, and update it. And each such substation will supply a wealth of data that will make it possible to identify potentially destabilizing grid conditions, thus providing an important additional tool for predictive power grid planning.

But a distribution transformer doesn't add up to a Web of Systems all by itself. The other components in the electric network – meters, building distribution systems, photovoltaic systems, electric cars – must also be equipped with sensors, local intelligence, and the ability to communicate. That is already becoming the case. For Siemens, that means new opportunities in virtually every one of the sectors in which it does business.

Webs of Systems that are already Operational

Siemens is already using Webs of Systems to implement solutions that used to involve a great deal of engineering or installation work. One example is the electric bus charging system that Siemens has installed in a number of European cities. Here, everything from bus electronics and fast charging stations to the management backend systems communicate over the Web in order to coordinate and optimize the charging process. Another example is the optimization of water distribution networks with a sensor network that detects leaks and minimizes pumps' energy consumption. An important point here is that data integration is taking place in the context of existing control systems. Siemens is looking at similar situations in many other existing installations. The reason for this is clear: customers want the reliability and flexibility that are the hallmarks of advanced digital systems. The Web of Systems can be the essential key to opening up these benefits.

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