Cloud-Based SCADA Systems: The Benefits & Risks

Is Moving Your SCADA System
to the Cloud Right For Your Company?

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Cloud computing is a hot topic. As people become increasingly reliant on accessing important information through the Internet, the idea of storing or displaying vital real-time data in the cloud has become more commonplace. With tech giants like Apple, Microsoft, and Google pushing forward the cloud computing concept, it seems to be more than just a passing trend.

Recently the focus of cloud computing has started to shift from consumer-based applications to enterprise management systems. With the promise of less overhead, lower prices, quick installation, and easy scalability, cloud computing appears to be a very attractive option for many companies.

Common questions surround this new technology: What is the "cloud"? What kind of information should be stored there? What are the benefits and risks involved? Is is moving toward cloud computing right for your company?

Cloud computing is not a "fix-all" solution. It has strengths and weaknesses, and understanding them is key to making a decision about whether it's right for your company. We'll explore the major benefits and risks involved, and give you a set of factors to consider when choosing what information to put on the cloud.
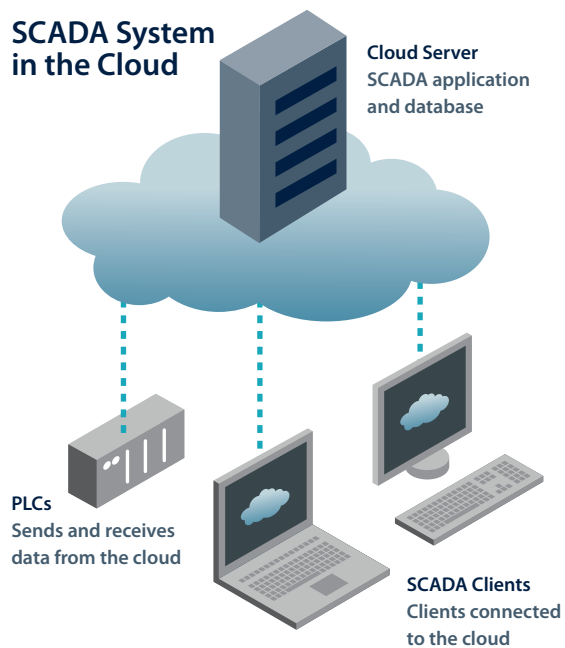
What is the 'Cloud'?

The cloud is the concept of using large arrays of remote Internet-based servers to store and handle your information.

Your company's data is saved off-site, on the servers of a third-party hosted cloud service; this information can be accessed by connecting to the cloud server through your Internet connection. Although the cloud servers don't belong to your company, they are used as if they did.

Think about it like renting a storage unit for items you want to keep around but can't fit in your garage. The space is yours to use as you wish, but you don't own it, and it's not located right next to your house.

Now apply that metaphor to server hardware, IT support, maintenance costs, and software. While many cloud services are specifically meant as storehouses for data, some cloud-based SCADA systems are offered as a "service" – which is referred to as SaaS (Software as a Service). Instead of having the SCADA system software installed on local computers, the entire system and its data is stored and maintained in the cloud. SaaS companies offer their customers the power of software applications, off-site IT support and scalable server space all through the cloud.

SCADA System in the Cloud

Cloud Server
SCADA application and database

PLCs
Sends and receives data from the cloud

SCADA Clients
Clients connected to the cloud

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The Benefits & Risks | **2 of 12**

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To Cloud or Not to Cloud: Choosing Your Data

The manufacturing industry is big, encompassing a wide variety of companies; likewise, the type of information each company tracks can vary greatly. This fact should be taken into account when determining what information, if any, should be stored in the cloud.

Information such as reports, analytics, and configurations are ideal candidates for the cloud. However, information that is vital to safety and control functions – and that which relies on bandwidth availability and reliability – is particularly important to the operation of a manufacturer. It's essential to weigh the risks involved with putting this type of information in the cloud because it can directly affect the functionality and productivity of your company.

The cloud is a relatively new, hot topic, and the buzz about it can make the associated positives and negatives a little unclear.

What follows is a look at the benefits of the cloud along with the three biggest risk factors, so you can decide if moving your SCADA system to the cloud is the right decision for your company.

The Benefits of Moving to the Cloud

While most direct process SCADA system applications are remaining in-house, many sections of manufacturing plants are relocating to the cloud because the benefits outweigh the risks involved. Following are some of the benefits of the cloud that are encouraging companies to move information there.

Pay for Only What You Use
Pay-for-use operating expenses are cheaper than the costs a company incurs when maintaining and keeping their own hardware and software up to date – especially if only a portion of the space being maintained is actually used.

Space that Grows with You
When a company needs more space, it doesn't need to add additional server farms, databases, web servers, etc. You can easily get more space on a virtual cloud-based server without the need to install and maintain additional hardware.

IT Costs are Outsourced
You don't have to pay for as many in-house IT staff to provide support and maintenance for your in-house servers.

Sharing and Accessing Data Anywhere is Easy
Information that is stored on a cloud server is accessible anywhere in the world. This makes the cloud an especially attractive option for managers who constantly need real-time and historical information on the go.

Better Collaboration
Since information in the cloud is easily accessible, multiple individuals at different levels of the company can collaborate on projects more easily. This enables all parties to work together more efficiently, which increases the company's competitiveness.

Ease of Upgrading and Adding Additional Applications
Upgrading and installing new applications are extremely easy in the cloud. Once applications are upgraded or installed, they are instantly available to everyone with access to the network.

Risk Analysis Tips

It's essential to analyze risks when making informed decisions; this is especially true with decisions that directly affect your company's future. The simplest way to analyze risks about any decision is to take the focus off of the benefits, and think about what you *don't* want.

Managers must work through many decisions – and the ones who stop to seriously consider both the upsides and the downsides make better decisions. Jack Krohmer of Process Networks Plus has been running his control system integration business for many years – in that time he's seen the effects of his decisions, both for his business and his customers.

"Risk analysis doesn't have to be complex unless you make it complex," Krohmer explained. "You just need to ask the right questions. The one question you always have to ask yourself is: What are you going to get that you DON'T want? You have to see the bad with the good and then ask yourself: 'Do the upsides exceed the downsides?' Each company has to answer this for itself. You'll get either the productivity gains or losses based on that decision."

The 3 Biggest Risks of Cloud-Based SCADA Systems

The cloud comes with many attractive benefits, but there are still some obstacles that hold companies back from making the jump. This is especially true of companies that deal with a lot of sensitive or critical data on a regular basis. Each company is different and must examine the risks with their own special needs and priorities in mind. The three biggest risk factors to consider for cloud-based SCADA system data are security, performance, and reliability.

Risk #1
Security

Security is a major issue for manufacturing companies. From a risk-analysis perspective, think about the repercussions your company may suffer if any data you've entrusted to the cloud is compromised.

It's Not Public – Or Could It Be?

Large cloud providers such as Microsoft and Amazon spend a good deal of time and money ensuring that information on the cloud is kept secure.

However, just because the cloud security is supervised, information on the cloud is still outside your internal network. Your information can be accidentally leaked, and if it is, anyone can see it.

Krohmer attested that much of the information he works with is critical to his customers' competitive advantage.

"It's fine to put logging or data collection on the cloud; stuff like that is okay as long as security is not an issue, but you don't want to put up control data," Krohmer said. "Anything you put out on a cloud-based solution, you need to ask yourself, 'Is this something I don't care if other people see?' On the cloud, your information is not supposed to be 'public', but it is public in the sense that it always runs the risk of being public should an accidental leak occur."

Manufacturers should think twice about anything that goes up on the cloud – you never know if a security breach will leak valuable information to outsiders, such as your competitors.

Dealing with hackers and spies online is the new reality of security in the Information Age. Every company has to protect itself from cyber-attacks of all types. The more sensitive the information, the more potentially valuable it can be to hackers.

Even the largest and most established companies have had major security leaks because of illegal hacking into the cloud. In 2011, both Citigroup and Sony had major, well-publicized security breaches due to hacking that exposed sensitive data about their customers. In addition to the exposure of sensitive information, the attacks resulted in negative press for both companies.

By choosing to put your information on the cloud you are routing your company's sensitive data through a public network, which leaves your information more exposed to hacker attacks.

In addition, you could unknowingly make yourself a bigger target for hackers. Cloud services are prime targets because of the wealth and variety of information located on them.

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The Benefits & Risks | **5 of 12**

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Risk #1
Security

When a cloud service is hacked, the attack could potentially affect any of the companies hosting information there. In June 2011, *Automation World* published an article on cloud computing that illustrated this point:

> "Amazon, one of the largest suppliers, recently had a widespread outage that temporarily crippled some of the highly trafficked websites, computing resources and data centers it hosts. By comparison, had this computing infrastructure been at just one business, the problems would have been related only to that business; when Amazon's cloud failed, it affected many, vastly different businesses."

When your information is located in the cloud, it is more difficult to trace the hackers than it would be if the hackers broke into your own internal system. With cloud services you lose control on how your security is set up, which leaves resolution of security problems entirely in the hands of your cloud service.

Big Brother is Watching

One final note on security for companies in the United States: The U.S. government has legal authority to get copies of anything you place on the cloud, without notifying you. This law came into effect through the Department of Homeland Security after the Sept. 11, 2001 terrorist attacks.

The exact letter of the law is a little ambiguous, but the essence of it means that if the government wants to gain access to data that is stored in a cloud server located in the U.S., it can pretty much get it without a search warrant and without notifying you. If the data is located on your premises, such as your local *intra*net, the government is required to notify you of their interest in accessing it and can only force the matter by legally obtaining a search warrant.

If your information is stored on the cloud, the government can access it through your cloud service provider, or your ISP (Internet service provider). This means that your information could be exposed at any time and you might never even know it, unless your cloud service notified you. In fact, because of Homeland Security, the government may even force your service provider not to tell you. The only way to ensure that no one sees your sensitive information is to keep it off of the cloud.
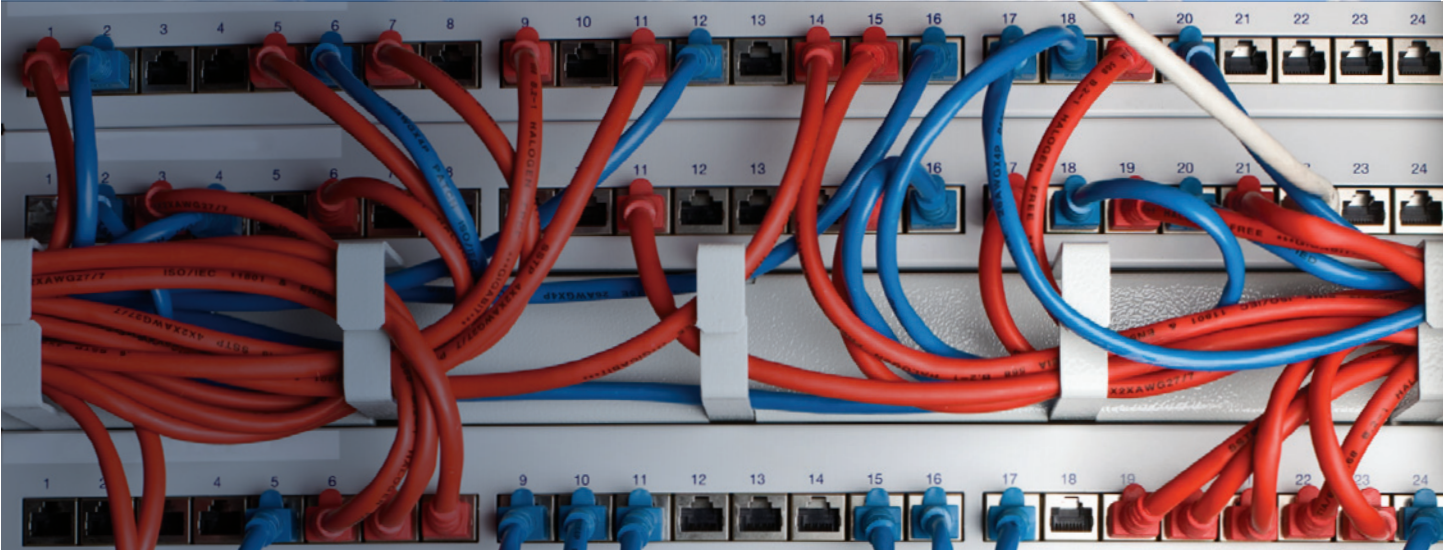

Is It Worth the Risk?

If your information is on the cloud, it can be accessed by people outside of your company. Whether the information is exposed due to the illegal activity of hackers – or through legal channels – once it's out, it's out, and it could have a drastic negative impact on your company.

Your job is to decide if it's worth that risk. If nothing too dreadful would happen if your information got out, then you should be safe in your decision to place it on the cloud.

Risks to Consider:

• If there is an accidental information leak, what type of repercussions will your company suffer?

• How much of your information would be suitable to put on the cloud?

• If someone did gain access to your sensitive information, would you even know?

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The Benefits & Risks | **6 of 12**
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Risk #2
Performance

In order to obtain acceptable performance for certain manufacturing applications, high bandwidth networks with low latency may be required. Exterior networks such as those provided by ISPs may not be able to fulfill these requirements.

Bandwidth Overload

Your SCADA system will be dependent upon the bandwidth and latency of your cloud service's Internet service provider, as well as your own.

By using the cloud, you put your company at the mercy of your ISP or your cloud service's ISP to fix downtime, bandwidth or latency problems.

If the system gets overloaded, the solution is most likely out of your control. You can't access the cloud to see why the overload is occurring, nor can you diagnose how to resolve the issue.

When systems are hosted on your local network, these factors are most likely under your control.

Furthermore, long-range network architecture planning and execution would likely be handled better in-house under your company's control, which is not likely to occur with outsourced cloud IT administrators or ISPs.

Latency Issues

In a network, the term latency refers to any delay or waiting a person experiences that increases real or perceived response time.

Latency occurs when data is actively moving through a network, but to the operator there appears to be no activity. The data is traveling through the system, but that fact is not apparent because it takes quite a few seconds for the system to respond to the operator's command.

In a network, data is constantly flowing back and forth through servers, routers, switches and other hardware. Even a single command can make multiple round-trips along a network in order to complete a data transfer. This can cause the effects of latency to multiply, often to unacceptable levels.

The variance of latency is also magnified within cloud-based systems because of the unpredictable nature of data moving through the Internet. The increased and unpredictable latency associated with using the cloud can lead to a very unsatisfactory real-time experience.

Internet traffic can be heavy, lines can be down, connections can fail and any number of other

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The Benefits & Risks | **7 of 12**
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mishaps can occur to slow data movement and cause latency. Latency can vary from a few milliseconds to hundreds of milliseconds or more, and that can be for just one leg of a round-trip that the data is making.

The further data has to travel, the more problems can occur to slow its progress.

Inconsistent Performance

If your performance is inconsistent, it can cause problems on your production lines. For example, pushing a button on an HMI (human machine interface) screen will have a delay, whether it is a second or even two or more seconds. In this case the variability of delay is the problem, since it gives operators a feeling something is wrong.

Krohmer explained why inconsistent response times are a problem on the plant floor: "When panels were hard wired, you pushed a button and the light came on instantly. On modern HMIs, if it takes a second or two for the light to come on once the button is pushed, that is acceptable. If it goes more than a couple of seconds, the operators think the button isn't working and may press it numerous times."

If the delay is consistent, operators learn to account for the delay. Inconsistency, on the other hand, can cause errors or slow down the productivity of your production team.

Is It Worth the Risk?

Before you switch to a cloud-based system, consider the upsides of performance using an internal network that you can control yourself. It may cost more to maintain, but having control over your own network gives you the power to address any performance issues that arise.

Risks to Consider:

- If performance fluctuates, how will that affect your company?

- How will latency and latency variability affect your customer's experience?

- How much latency is acceptable? Latency might not matter much in some systems, such as those for monitoring and reporting.

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The Benefits & Risks | **8 of 12**
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Risk #3
Reliability

Questionable availability accompanies every system placed on the cloud. The servers are in an unknown location that your people cannot access. SCADA system data is usually dependent on real-time monitoring and control, so losing this functionality for even a few seconds or minutes can wreak havoc on production departments.

More Possibility for Connection Failures

Servers can crash, connections can go down, and the more connections you have the more locations for disconnections. Every connection line is a risk. Adding the cloud to your SCADA system adds one more source for an unreliable connection.

It really becomes an issue of trust: Do you trust the cloud service with the welfare of your company? If they go down, potentially so does your profit. In addition to placing trust in your cloud service, you must place trust in your ISP and the ISP of your cloud service. If either of them go down, you are cut off from your data.

Consider just some of the many occurrences that can cause this to happen – power outages, storms, hacker attacks – any one of these can result in connection failure. Even a redundant Internet connection can be affected if your ISP goes down.

The bottom line is this: The more hands your information passes through, the more likely it is to be dropped.

Read the Fine Print

While cloud service providers can promise anything in terms of uptime, the practical day-to-day reliability of the service may be different.

Promises made in a service-level agreement are based of averages across a large and complex network. This means that your actual experience using the cloud may differ greatly from what is promised in the contract.

If your service does go down and you lose profits as a result, what recourse do you have to recoup

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The Benefits & Risks | **9 of 12**
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your losses? If the cloud service is responsible you can take it up with them, but the cause of a down-time event can be hard to pinpoint in the cloud. It could be a problem with an ISP, an error in the cloud service network, or a local connection issue.

The question is how much time can you afford to spend determining the source of the problem, and if you do find the root cause, can you undo the damage that's been done?

No Direct Access to Fix Problems

If the cloud system goes down, you are at the mercy of the cloud system administrators. You must wait for them to get it fixed, and meanwhile your plant can be left at a standstill. You won't have any idea about what the problem is and who is in charge of fixing it.

Many manufacturers lose thousands of dollars every minute their production is down – an hour quickly adds up in lost revenues.

Waiting around for an outsourced IT department to solve the problem might be a risk you can't afford to take, not to mention the potential finger-pointing between the various entities involved.

Risks to Consider:

- If the system goes down for a few minutes, how would that affect the company?
- What if your system goes down for a few hours?
- If your system goes down will you lose important data?

Is Your Data Backed Up?

It's a fact of computing that hardware will sometimes fail. When it does, information can be lost and that can mean a loss of profits.

Maintaining your backups locally gives you the control by having a staff member responsible for its maintenance. If your information is in the cloud, you have no control on how the data is backed up and who is responsible for its maintenance.

You can hold the cloud service accountable for backed up data, but it is one more item you entrust to them.

Is It Worth the Risk?

Placing data such as reporting and analytical data on the cloud is usually a safe bet, but placing SCADA system information is a more difficult decision for managers to make. If you're looking at moving some of your SCADA system to the cloud, ask yourself how you will be affected if the cloud goes down during a production run.

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The Benefits & Risks | **10 of 12**
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Alternatives to the Cloud: In-House, Web-Based Software

The only way to decide if moving to the cloud is right for your company is to evaluate risks involved for your own SCADA system. There's no single right answer; each situation has to be evaluated on its own terms. When evaluating this decision you also need to consider the alternatives to cloud-based SCADA systems.

While the cloud flexes with the amount of space you need, provides you instant scalability, and gets you away from maintaining big IT departments, there are some major drawbacks.

If you decide to keep your SCADA system information off of the cloud, you can consider the alternative: Build an in-house cloud-like system.

These type of systems are usually referred to as "web-based." Web-based means using HTTP or HTTPS protocol to launch clients anywhere on a network (given adequate permissions) using a zero-install deployment model.

The web-based system is located on an in-house server, and is usually accessed through a web browser. Since the server sits on the company's local intranet, the web-based SCADA system can be securely protected with IT protocols like firewalls, SSL, and other common IT security measures.

Web-Based Benefits

Web-based SCADA systems are a good solution for achieving cloud-based benefits, without the security, performance and reliability drawbacks that can be associated with the cloud.

Performance
A web-based SCADA system will not be affected by latency issues as much as cloud-based systems. And since locally hosted web-based systems only need to travel through a company's local *intra*net there is much less chance that it can be slowed down. The result is fewer latency issues and better predictability, which increases the overall performance.

Reliability
Locally hosted web-based systems can be more reliable because there are potentially less points of failure. Redundant servers can also be used to increase the reliability of your main server, so if it your main server goes down you will still be up and running.

Secure
Web-based systems offer better network security than a cloud-based service. By having the central server on site, it's easy to know who is responsible for maintenance and security.

Since locally hosted web-based systems are only on the *intra*net, there are fewer ways for a hacker to gain access to system data.
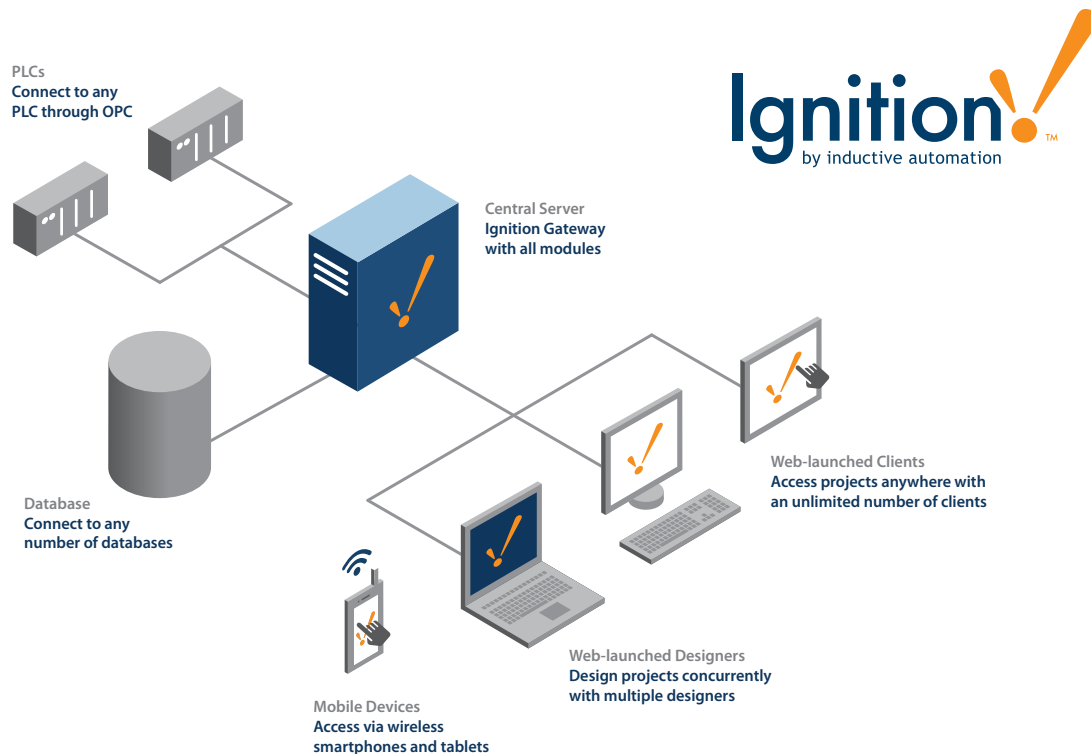
Is It Right for Your Company?

A locally hosted web-based system may be a better choice for your company than a cloud-based solution.

The only way to know is to understand what kind of system you need and to explore the available options. Are you going to use the system for simply recording and reporting? Is it a real-time control system? How easily accessible do you need your data to be?

These are some of the questions you need to ask in order to determine whether to host locally or outsource to the cloud. While evaluating your options, one web-based SCADA system solution you should consider is Ignition by Inductive Automation™.

Easily Build a Web-Based SCADA System

PLCs
Connect to any PLC through OPC

Central Server
Ignition Gateway with all modules

Database
Connect to any number of databases

Web-launched Clients
Access projects anywhere with an unlimited number of clients

Web-launched Designers
Design projects concurrently with multiple designers

Mobile Devices
Access via wireless smartphones and tablets

Ignition by Inductive Automation™ is an industrial application server, used to create systems that cover the full spectrum between HMI, SCADA and MES. Its unique architecture enables accessibility from any computer no matter the operating system, rapid project development and deployment, and massive scalability without complexity.

Web-Based Access Anywhere

Ignition is web-based; it's server software that is configured via any web browser. The drag-and-drop Ignition Designer and clients are launched from web browsers using innovative web-launched technology. With Ignition, tedious client installations of software are a thing of the past.

Get the Power of SQL Databases

With Ignition, your data is always stored in an open, accessible format. The SQL Historian feature is compatible with any modern SQL database. Ignition has native support out of the box for nearly any SQL database including Microsoft SQL Server, MySQL, Oracle, IBM DB2 and PostgreSQL. The SCADA and reporting features can pull data in from multiple databases simultaneously.

Cross-Platform: Use Any OS

Ignition is written in 100% Java, making it the first mature cross-platform HMI, SCADA, MES package available on the market. Top-to-bottom support for all major operating systems opens new dimensions of architecture flexibility. With Ignition, companies are now free to use the system they want – not the system they're constrained to by outdated technology.

Unlimited Licensing Makes It Affordable

Access is important for efficiency, that's why it shouldn't be limited by software licensing costs. With Ignition, buying client licenses or tags will no longer hold up your project. This allows you to put your effort toward adding more functionality into your system, while providing access to everyone who needs it.