Product application guide

Foreseer® Services

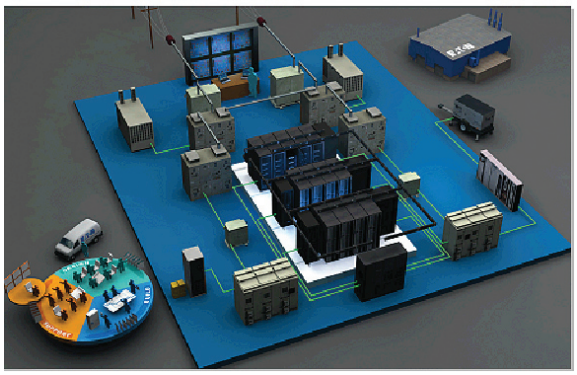


Table of contents

Powering Business Worldwide

1.0 General

Welcome to the Foreseer Services Product Application Guide. This guide provides information on how Foreseer Services are typically implemented and configured in different types of infrastructures and environments.

Each main implementation section of the guide provides information about the key requirements for that specific application in question and includes an implementation example diagram with typical components, as well as example screenshots of what the applications graphical user interface (GUI) may look like.

This guide also details the typical hardware options and accessories used with Foreseer Services along with supported protocols, device categories and vendors. In addition it will point you to additional information available on the topics, e.g. to the Hardware Compatibility List that details specifics of devices supported.

Typical Foreseer Services available, software functionality, and how to get started with a project are described towards the end of the guide along with some typical terminology and acronyms.

1.1 What are Foreseer Software and Engineering Services

Foreseer Software and Engineering Services provide vendor-neutral power and energy infrastructure integration solutions that help companies reduce energy consumption and unplanned downtime due to the failure of critical power, environmental, safety or security systems. For more information including product brochure and marketing collaterals, please visit out web site at **www.eaton.com/foreseer** or **www.eaton.com/4CR**.

1.1.1 Foreseer Service Categories

Foreseer Services have been categorized into three main categories as shown in Figure 1 below.

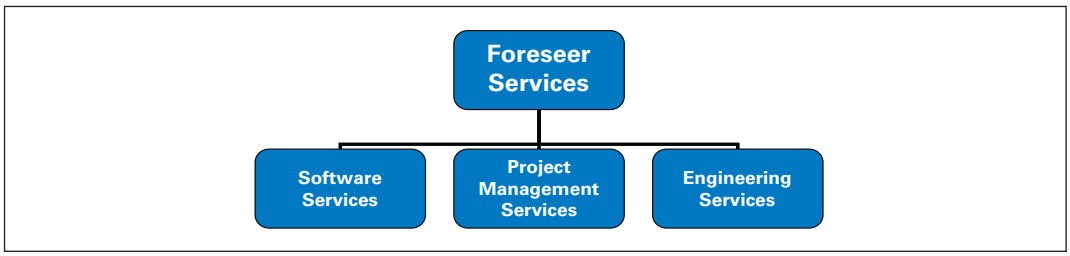


Figure 1: Foreseer Services have been categorized into three main categories.

1. Software Services

Foreseer Software was developed from the ground up to support thousands of devices, connections, device parameters and data logging. It is fully scalable to support a single data center, or multiple facilities no matter where they are in the world. It facilitates monitoring of infrastructure pieces, including HVAC, UPS, power distribution systems (meters, motor control, variable frequency drives, etc.), generators, fire-detection, security systems, and other communicating sub-systems from hundreds of manufacturers—all on one screen.

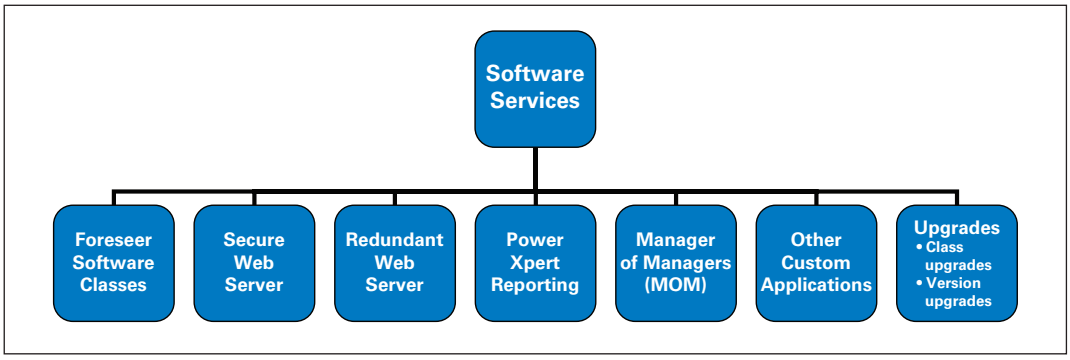
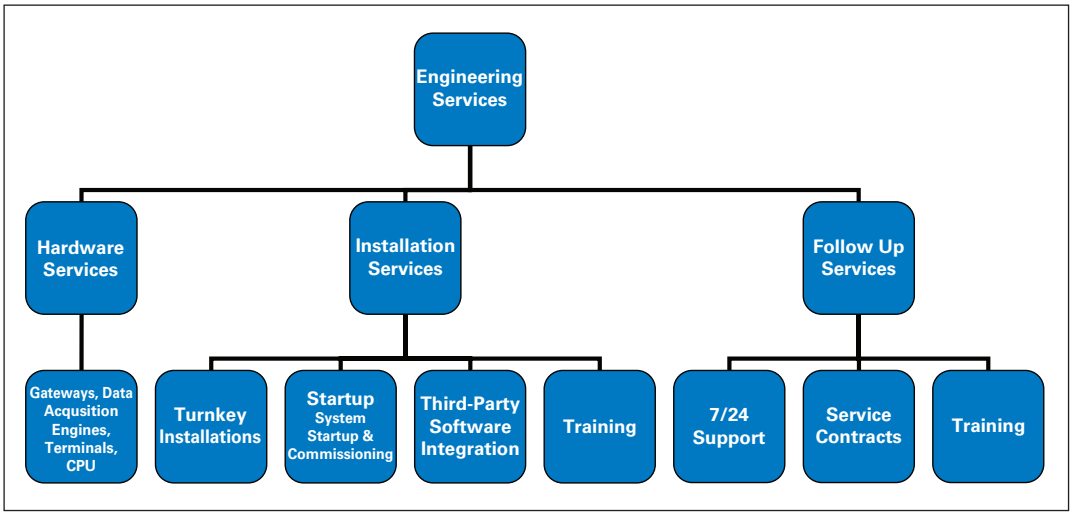


Figure 2: Software Services cover all aspects from choosing the right class of software to custom application development and redundancy requirements.

2. Engineering Services

Foreseer Engineering Services provide you with the full array of services needed to design, install, and commission your monitoring solution.



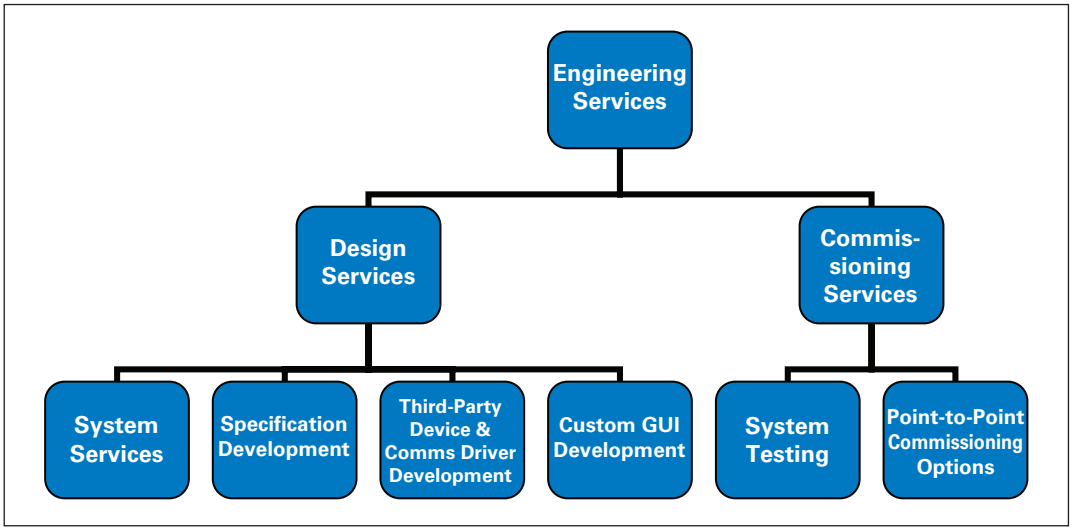


Figure 3: Engineering Services covers all aspects of system design, communications, hardware, installation and follow up services requirements.

3. Project Management Services

Each Foreseer integration project may be customized with a full range of services to fulfill even the most demanding requirements. Services may be selected to fit the immediate and long-term needs of the installation.

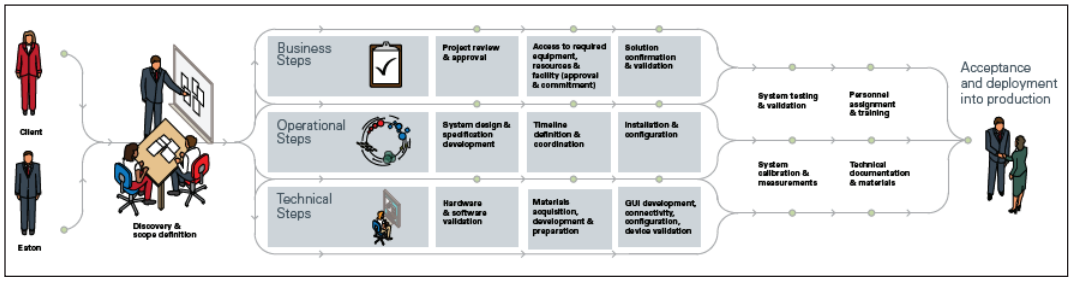


Figure 4: A dedicated Project Manager is assigned to each project along with a project team. The customer is consulted and kept up to speed each step of the way with formal approval requirements.

2.0 How to use the Product Application Guide

2.1 Matching your application

Please use the table of contents to identify which application is the closest match to your environment and general infrastructure. Then review the key requirements for that particular section along with associated implementation and configuration example diagrams. Once you have matched up your application details, please browse to section 11 to review the typical Foreseer Services that you may require, and then go to section 15 to find out how to get started with your project.

2.2 Matching your devices and device manufacturers

Match up the devices that you currently have, and are planning to include in the future, to the device and vendor list in section 12. If necessary review the detailed Hardware Compatibility List available on the Internet to ensure compatibility as described in this section. Once you have matched up your devices, please browse to section 11 to review the typical Foreseer Services that you may require, and then go to section 15 to find out how to get started with your project.

2.3 "I just want to get started with my project, where do I go?"

Please browse to section 11 to review the typical Foreseer Services that you may require and then go to section 15 to find out how to get started with your project.

Foreseer Services is a full scale integration package that can be customized to fit all your needs from simple project management and system design to full turn key, multiple site redundant system delivery around the globe.

3.0 Data center and co-location infrastructure applications

3.1 Application description

Key success requirements for data centers include maximizing system availability and energy efficiency. Other important factors include generating capacity reports and automatically calculating PUE and DCiE metrics, ensuring load balancing and monitoring your environment as well as your greenhouse gas footprint. Benchmark your energy use, record the sequence of events at a 1 millisecond time resolution, and extend your critical infrastructure life with this comprehensive monitoring solution.

3.2 Key requirements (★★★ = most important, ★ = less important)

Importance	Requirement	Description
	Software & Hardware	
★★★	1 millisecond event timestamp resolution	Millisecond based timestamp support enables understanding the sequence of rapidly occurring events and putting necessary mitigation plans in place
★★★	Alarm Notification	Notify locally and remotely occurring alarm events
★★★	Data Center and Energy Management Solution scalability	Fully scalable from a single data center to multiple facilities around the world
★★	DC Power Plant Monitoring	Monitor battery banks and detect/replace bad strings to avoid costly downtime and maximize equipment service life
★★★	Emergency Power and Fuel Level Monitoring	Monitor generators and emergency power fuel levels
★★★	Event Prediction	Predict upcoming issues utilizing a trend projection graph
★★★	Fire and Safety monitoring	Detect fire and smoke as well as occurring leaks (fuel, water, acid)
★★★	High Availability	Installation of power quality products (UPS, TVSS, PDU, Generators etc.) to minimize unscheduled downtime due to power quality related issues
★★★	High Security	Enable high level of encryption for data access and server-client communications
★★★	Holistic enterprise view of the system	Monitor facilities and Data Center infrastructures around the country, or/and the globe
★★★	Lighting Control	Lighting control high level event integration into Foreseer System
★★★	Load balancing	Balance electrical loads to minimize peak demand and maximize energy cost savings
★★★	PLC Monitoring	Cost effective and simple way to monitor a multitude of PLC linked to critical equipment
★★★	PowerChain® Management	Monitor all the devices in the power distribution system power chain including environmental factors, safety and security systems and connections to other monitoring systems in the facility e.g. Building Management Systems
★★★	Power Measurement	Installation of metering products to understand energy consumption and realize energy savings

★★★	Power Quality Measurement	Installation of metering products to understand sags, swells, transients, harmonics, power factor etc.
★★★	PUE and DCiE	Energy Efficiency reporting, benchmarking and improvement tracking
★★★	Rack level cooling monitoring	Understanding of cooling at the rack level
★★★	Security Monitoring	Utilize IFrames to bring in CCTV, monitor open/closed door to the rack level, integrate high level building security event notification into the software
★★★	Sequence of Events recording	Installation of Sequence of Events recording devices to understand the order of occurring events
★★★	Temperature, humidity and environmental monitoring	Installation of sensors to monitor temperature, humidity and detect leaks (fuel, water, acid) as well as differential pressure
★★★	Third party device integration	Foreseer Software is vendor neutral and supports most third-party devices using their native communication protocol, a standard protocol or a protocol gateway. Programmers develop new drivers as needed during the project
★★★	Weather Monitoring/Lightning detection	Monitoring and alarm notification of upcoming weather conditions and severe weather preparedness
	Reporting	
★★★	Branch Circuit Monitoring Report	Capacity info with understanding of redundant sources. Determine circuit loading levels at-a-glance with color-coded graphics indicating loading against capacity
★★★	Capacity Summary Report	The summary of top and bottom loaded circuits as well as loading details for each circuit according to user defined date/time range and facility hierarchy location
★★★	Data Center Efficiency Report	A summary of data center infrastructure efficiency (DCiE) metrics and power usage effectiveness (PUE) including temperature and humidity. Benchmark, improve and track progress
★	Energy Cost Allocation Report	The total energy bill ($) dollar value or cost per kWh across a facility hierarchy for a user defined date/time range
★★★	Energy Summary Report	The summary of consumption (kWh) and demand (kW) for a user defined date/time range and facility hierarchy location
★★★	Event Summary Report	Provides a Pareto-chart of occurred events according to user defined date/time range and facility hierarchy location
★★★	Greenhouse Gas Report	Captures the six offensive greenhouse gasses: Carbon Dioxide, Sulfur Dioxide, Nitrogen Oxide, Mercury, Methane, and Nitrous Oxide broken down by selected locations within a facility
N/A	Joint Commission Report	Generate a standard JCAHO compliant report to support hospital power test requirements. Check events, key metrics of generators, Automatic Transfer Switches during generator testing at user defined date/time time range and facility hierarchy location
★★★	Power Quality Report	The distribution and trend for amps, volts, THD according to user defined date/time range and facility hierarchy location
★	Utilities Report	Understand and track your utilities (water, air, gas, electricity, steam) consumption, and how effective your improvement efforts have been with day-to-day bar and line charts
★	Other	Other custom reports deemed necessary. **NOTE:** Power Xpert Reporting utilizes standard SQL database storage making it easy to create custom reports with third-party software if necessary.
	Custom Applications	
★★★	A/C Control	The A/C interface offers comprehensive monitoring and optional lead/lag control for Air Flow, Data Aire and Liebert air conditioning units. Lead/lag control and scheduling is viewable via a Web-browser and is controllable with the proper user authority
★★★	Branch Circuit Monitoring	Monitor Branch Circuits from small 42 circuit panels to a fully configured PDU with multiple 84 circuit panels or any configuration of distribution panels. Includes current and watts for each circuit or pole from the panels but can be extended to any data available via an integration protocol with the hardware. Optional advanced features such as totaling breakers for an N+1 application or per customer are supported
★★★	Capacity Planning	Planning electrical usage and demand is a difficult job. As site loads increase and usage patterns change, demand on a device may grow beyond its intended capacity. And, while average demand may not be a concern, peak demand always is. Even a momentary spike has the potential to bring down an entire network. Foreseer Software tracks the kW and kVA over time, immediately informs of peak levels, and projects future demands based on past usage. This knowledge is critical in planning for electrical upgrades and/or changes to the power chain to support changing load patterns
★★★	Dashboard	Various GUI Dashboards are available for specific applications and configurations: • Data Center Risk Analysis • Power Outage • Power Capacity • Executive • Other
★★★	Maintenance Scheduler	The maintenance scheduler offers the ability to preset scheduled (weekly or periodic) maintenance windows within the system to disarm selected devices on which maintenance will be performed. Disarming the devices allows continued monitoring and archiving during the maintenance period while disabling alarms and preventing unnecessary notification of personnel

3.3 Communications diagram

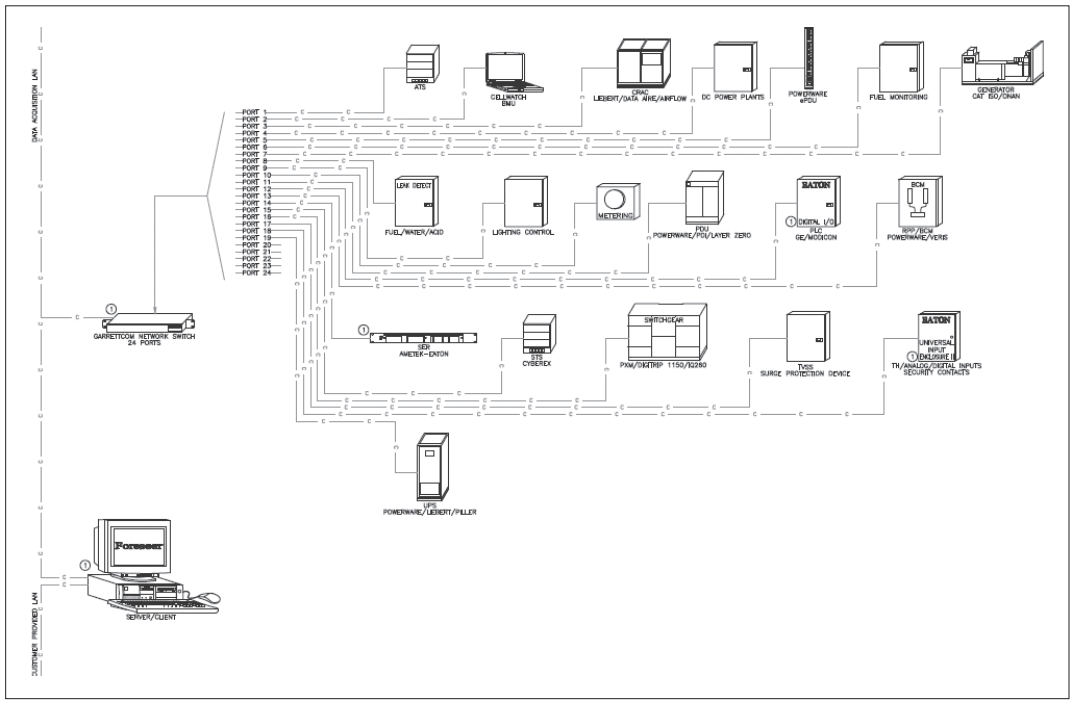


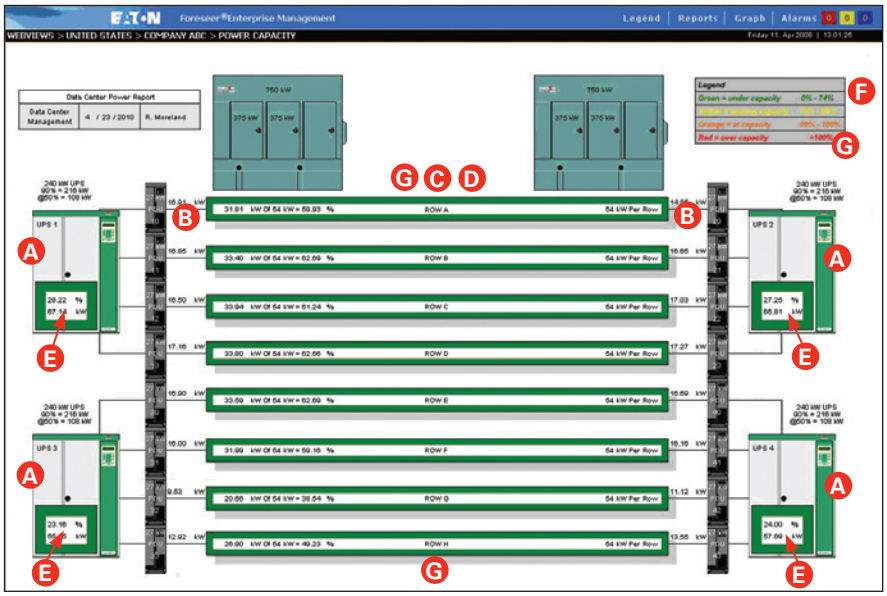
Figure 5: The typical Data Center/Co-Location device mixture includes a large variety of power distribution, cooling, environmental monitoring, lighting, safety and security, backup and emergency power systems that have been purchased over a long period of time. Foreseer Services integrates all of these systems into a simple, single software monitoring package. Support for metering and energy measurement including greenhouse gas monitoring are requirements that need to be taken into consideration as well as e.g. Building Management System integration.

3.4 Application screenshots

Webviews example data summary:

A. Utility Power – Feed 1 & 2
B. UPS Status
C. Data Center Power
D. PDU Loading
E. Generator Status
F. Battery System Status
G. Data Center Efficiency
H. Cooling System Status
I. Data Center Environment
J. Weather Conditions
K. Foreseer Software Status

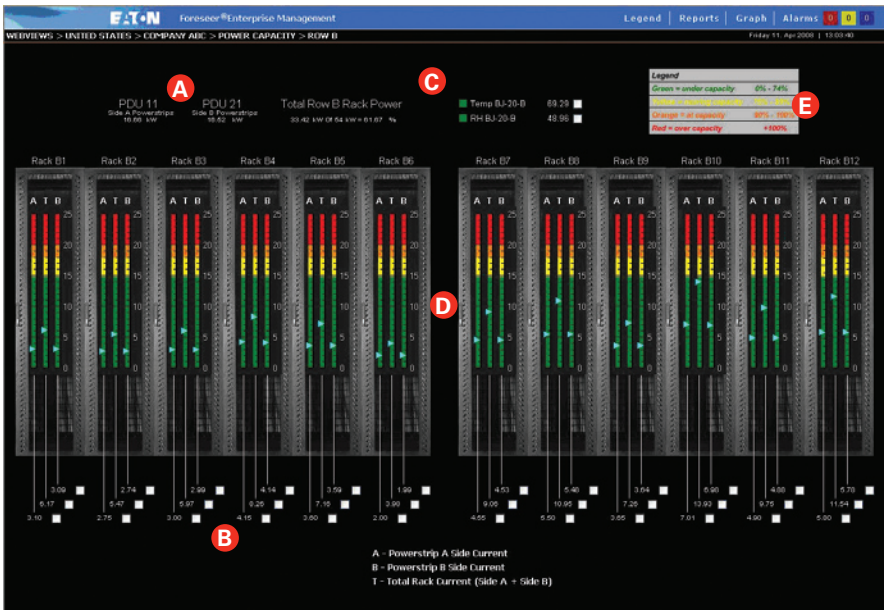
Figure 6: The above example is a single Webview of the most critical elements of Data Center/Co-location infrastructure. Individual data screens display summary information on backup power, cooling, power quality, energy consumption, environment and weather, which are vital to be able to run a mission critical system at maximum efficiency and uptime. Webviews' look and feel can be configured and customized to include mimic screens and any available data including ones derived from complex formulas.



Webview example data summary:

A. Redundant backup power capacity
B. PDU level power capacity
C. Data Center rack-level power capacity
D. Load Balancing overview
E. Backup power distribution analysis
F. Capacity analysis
G. Color coded online and remote event notification

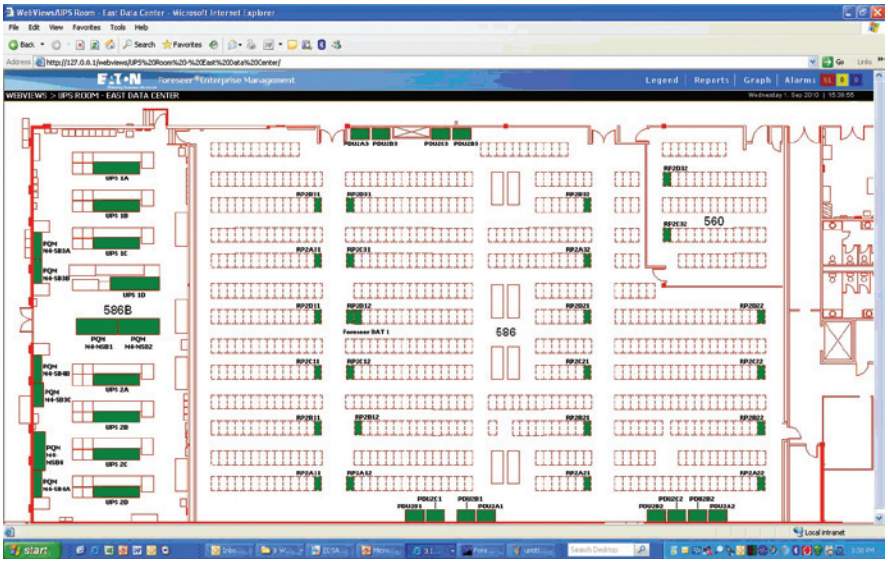
Figure 7: (Optional feature). The Power Capacity View provides an at-a-glance simple analysis of the data centers electrical capacity. Normal, cautionary and alarm events are triggered automatically, both online and remotely once a threshold has been reached. Mapping the data centers capacity is critical for power, cooling and redundancy planning. With Foreseer Software projection graphing capability, data center managers can easily predict when they are going to hit a capacity threshold going into the future and prepare accordingly.



Webview example data summary:

A. PDU level power capacity
B. Data Center rack-level power capacity
C. Load Balancing overview
D. Capacity analysis
E. Color coded online and remote event notification

Figure 8: The Rack Row-level Power Capacity view provides an at-a-glance visual overview of A and B side loading as well as the racks total current utilization. Color coded gauges clearly indicate the alarm notification thresholds and available capacity. With Foreseer Software projection graphing capability, data center managers can easily predict when they are going to hit a capacity threshold going into the future and prepare accordingly.



Webview example data summary:

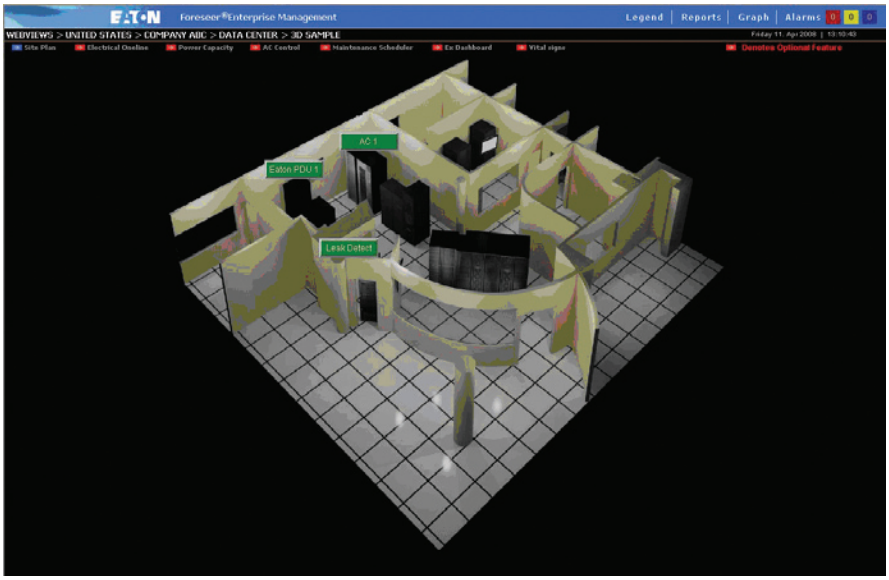
A. Device physical location data
B. Color-coded device status overview
C. Drill down capability

Figure 9: This Floor Plan graphic provides an at-a-glance overview of all the monitored devices on the floor and their corresponding color-coded and animated status indicators. Device objects are clickable and enable the user to drill down into device level details for additional visual and physical information. Floor Plans and blueprints of the facilities can be easily imported into the Foreseer System and modified to fit the user's needs.

Webview example data summary:

A. Color-coded Enterprise wide device status bubble up and overview
B. Drill down capability
C. Alarm Notifications
D. 3D modeling and floor plan
E. Campus layout example
F. Global status tracking and event presentation

Figure 10: This multi-view graphic offers a customized enterprise level overview of the most important sites, systems, locations and campuses running the Foreseer systems along with associated color-coded alarms. The users can immediately take action based on visual, audible alarms and via remote notification through email, SMS, pagers or real-time event printing depending on the best practices in place.



Webview example data summary:

A. Color-coded device status bubble up and overview
B. Drill down capability
C. Alarm Notifications
D. 3D floor plan

Figure 11: (Optional feature). This 3D floor plan modeling example graphic illustrates the capabilities of presenting highly accurate visual positioning of devices along with their associated status' can be displayed within the Foreseer Software framework. Device labels are color-coded displaying the current status. The users can immediately take action based on visual, audible alarms and via remote notification through email, SMS, pagers or real-time event printing depending on the best practices in place.

Webview example data summary:

A. Input voltage, current and frequency
B. Output voltage, current and frequency
C. UPS status indicators
D. Separate alarm category section
E. Battery status indicators and available runtime

Figure 12: This Data Center UPS equipment view example displays at-a-glance the most critical data coming from a UPS system. Input, output, status and alarms along with battery information provide a great inner view into the UPSs overall performance. Note that fields for system location and e.g. battery maintenance schedule can be made available automatically.

4.0 Industrial facility applications

4.1 Application description

Industrial and production facilities, in addition to typical power quality, energy management, efficiency and device maintenance requirements, need all systems to work seamlessly in a rugged shop floor environment.

Utilities consumption (Water, Air, Gas, Electricity, Steam) and metering along with load balancing for peak demand minimizing, energy cost allocation are key requirements that need to go from the bottom floor to the top floor.

4.2 Key requirements (★★★ = most important, ★ = less important)

Importance	Requirement	Description
	Software & Hardware	
★	1 millisecond event timestamp resolution	Millisecond based timestamp support enables understanding the sequence of rapidly occurring events and putting necessary mitigation plans in place
★★★	Alarm Notification	Notify locally and remotely occurring alarm events
★★	Data Center and Energy Management Solution scalability	Fully scalable from a single data center to multiple facilities around the world
★	DC Power Plant Monitoring	Monitor battery banks and detect/replace bad strings to avoid costly downtime and maximize equipment service life
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★★★	Event Prediction	Predict upcoming issues utilizing a trend projection graph
★★★	Fire and Safety monitoring	Detect fire and smoke as well as occurring leaks (fuel, water, acid)
★★★	High Availability	Installation of power quality products (UPS, TVSS, PDU, Generators etc.) to minimize unsched-uled downtime due to power quality related issues
★	High Security	Enable high level of encryption for data access and server-client communications
★★★	Holistic enterprise view of the system	Monitor facilities and Data Center infrastructures around the country, or/and the globe
★★★	Lighting Control	Lighting control high level event integration into Foreseer System
★★★	Load balancing	Balance electrical loads to minimize peak demand and maximize energy cost savings
★	PLC Monitoring	Cost effective and simple way to monitor a multitude of PLC linked to critical equipment
★★★	PowerChain Management	Monitor all the devices in the power distribution system power chain including environmental factors, safety and security systems and connections to other monitoring systems in the facility e.g. Building Management Systems
★★★	Power Measurement	Installation of metering products to understand energy consumption and realize energy savings
★★★	Power Quality Measurement	Installation of metering products to understand sags, swells, transients, harmonics, power factor etc.
★	PUE and DCiE	Energy Efficiency reporting, benchmarking and improvement tracking
★	Rack level cooling monitoring	Utilize IFrames to bring in CCTV, monitor open/closed door to the rack level, integrate high level building security event notification into the software
★★★	Understanding of cooling at the rack level	Installation of Sequence of Events recording devices to understand the order of occurring events
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★★★	Third party device integration	Foreseer Software is vendor neutral and supports most third-party devices using their native communication protocol, a standard protocol or a protocol gateway. Programmers develop new drivers as needed during the project
★	Weather Monitoring/Lightning detection	Monitoring and alarm notification of upcoming weather conditions and severe weather preparedness
	Reporting	
★	Branch Circuit Monitoring Report	Capacity info with understanding of redundant sources. Determine circuit loading levels at-a-glance with color-coded graphics indicating loading against capacity
★	Capacity Summary Report	The summary of top and bottom loaded circuits as well as loading details for each circuit according to user defined date/time range and facility hierarchy location
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★★★	Greenhouse Gas Report	Captures the six offensive greenhouse gasses: Carbon Dioxide, Sulfur Dioxide, Nitrogen Oxide, Mercury, Methane, and Nitrous Oxide broken down by selected locations within a facility
★	Joint Commission Report	Generate a standard JCAHO compliant report to support hospital power test requirements. Check events, key metrics of generators, Automatic Transfer Switches during generator testing at user defined date/time time range and facility hierarchy location
★★★	Power Quality Report	The distribution and trend for amps, volts, THD according to user defined date/time range and facility hierarchy location
★	Utilities Report	Understand and track your utilities (water, air, gas, electricity, steam) consumption, and how effective your improvement efforts have been with day-to-day bar and line charts
★	Other	Other custom reports deemed necessary
	Custom Applications	
★★★	A/C Control	The A/C interface offers comprehensive monitoring and optional lead/lag control for Air Flow, Data Aire and Liebert air conditioning units. Lead/lag control and scheduling is viewable via a Web-browser and is controllable with the proper user authority
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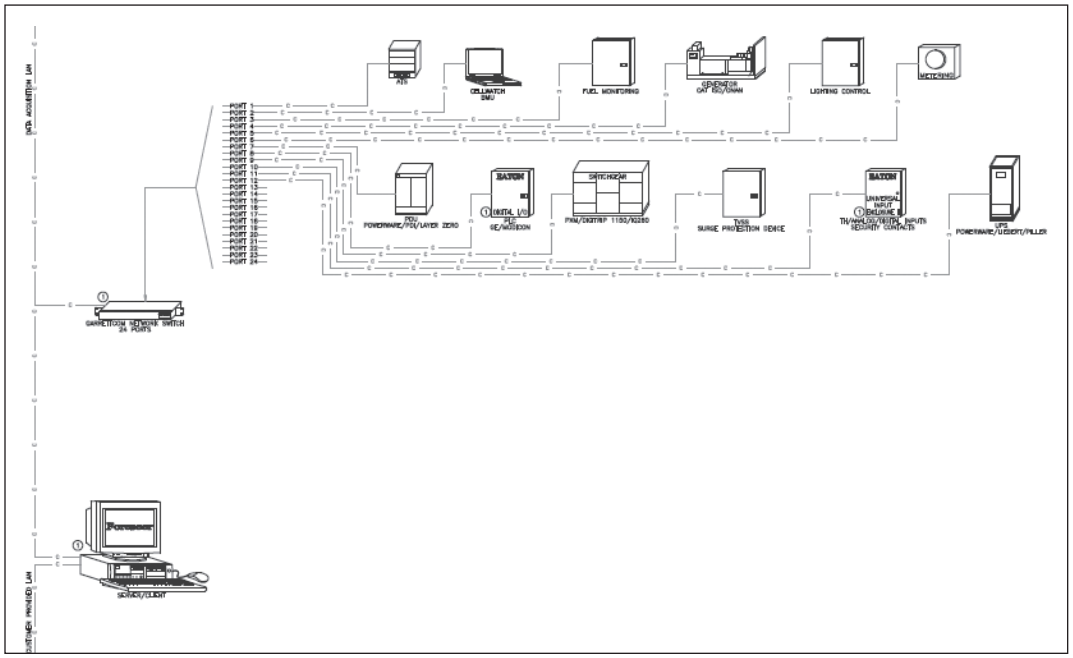

4.4 Application screenshots

5.0 Healthcare sector applications

5.1 Application description

Enhancing patient treatment and safety, along with improving operational efficiencies are requirements that can be achieved at higher levels only with a strong foundation of having security, safety, IT and electrical equipment functioning reliably, efficiently and without interruption, and in accordance to industry rules and regulations including Joint Commission compliancy.

Foreseer Services offer value-add applications for the healthcare sector that empower organizations to maximize system uptime, reliability and provide a wealth of information for future improvements on power quality and energy management as well as device lifetime expectancy. In addition Foreseer software can provide educated predictions with projection graphing to foresee brewing issues before they become real problems.

5.2 Key requirements (★★★ = most important, ★ = less important)

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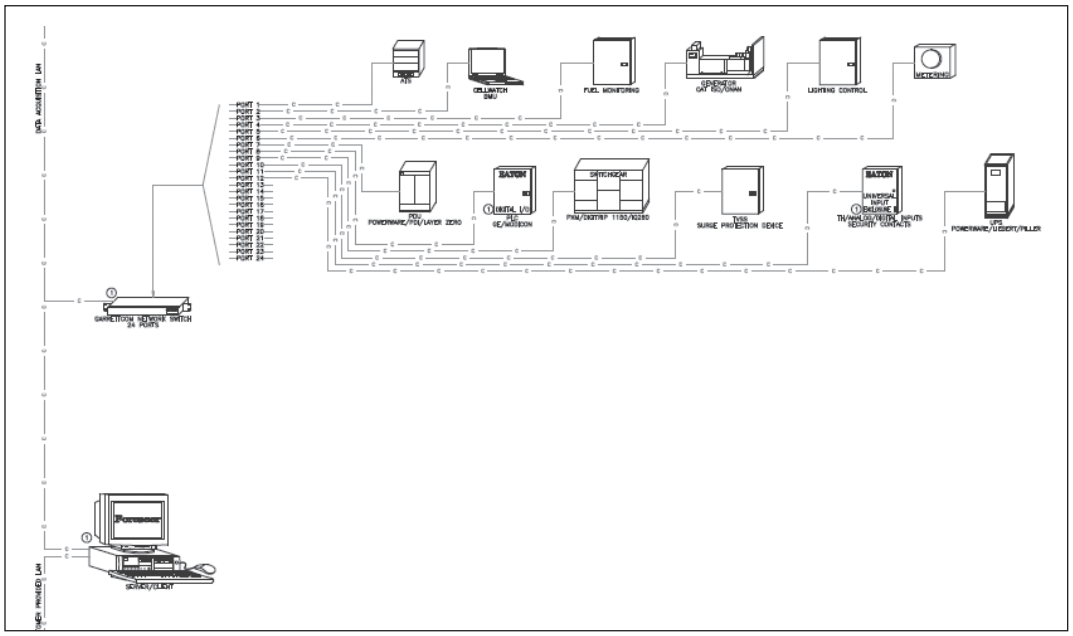
★	Other	Other custom reports deemed necessary
	Custom Applications	
★	A/C Control	The A/C interface offers comprehensive monitoring and optional lead/lag control for Air Flow, Data Aire and Liebert air conditioning units. Lead/lag control and scheduling is viewable via a Web-browser and is controllable with the proper user authority
★	Branch Circuit Monitoring	Monitor Branch Circuits from small 42 circuit panels to a fully configured PDU with multiple 84 circuit panels or any configuration of distribution panels. Includes current and watts for each circuit or pole from the panels but can be extended to any data available via an integration protocol with the hardware. Optional advanced features such as totaling breakers for an N+1 application or per customer are supported
★★★	Capacity Planning	Planning electrical usage and demand is a difficult job. As site loads increase and usage patterns change, demand on a device may grow beyond its intended capacity. And, while average demand may not be a concern, peak demand always is. Even a momentary spike has the potential to bring down an entire network. Foreseer Software tracks the kW and kVA over time, immediately informs of peak levels, and projects future demands based on past usage. This knowledge is critical in planning for electrical upgrades and/or changes to the power chain to support changing load patterns
★★★	Dashboard	Various GUI Dashboards are available for specific applications and configurations: • Data Center Risk Analysis • Power Outage • Power Capacity • Other
★★★	Maintenance Scheduler	The maintenance scheduler offers the ability to preset scheduled (weekly or periodic) maintenance windows within the system to disarm selected devices on which maintenance will be performed. Disarming the devices allows continued monitoring and archiving during the maintenance period while disabling alarms and preventing unnecessary notification of personnel

5.3 Communications diagram



5.4 Application screenshots

6.0 Telecom/CATV applications

6.1 Application description

DC to DC power plants required for telecommunications and CATV applications demand rigorous battery, power transfer, and associated emergency power monitoring capabilities. All battery events are categorized and logged for retrospective analysis. Individual battery cells in the battery strings are continuously checked, and bad cells are identified for replacement. It is also critical to automatically keep track of service intervals and set the monitoring system into maintenance mode to avoid unnecessary alarms as well as alarm escalation to service personnel on duty.

In addition these types of applications require stringent environmental monitoring including temperature, humidity, leak detection (acid, water, fuel) and emergency power fuel level monitoring.

AC to DC converters along with Foreseer Capacity planning application enables the minimization of peak demand fluctuations and maximizes energy cost savings along with energy and event summary reporting associated with installed metering products.

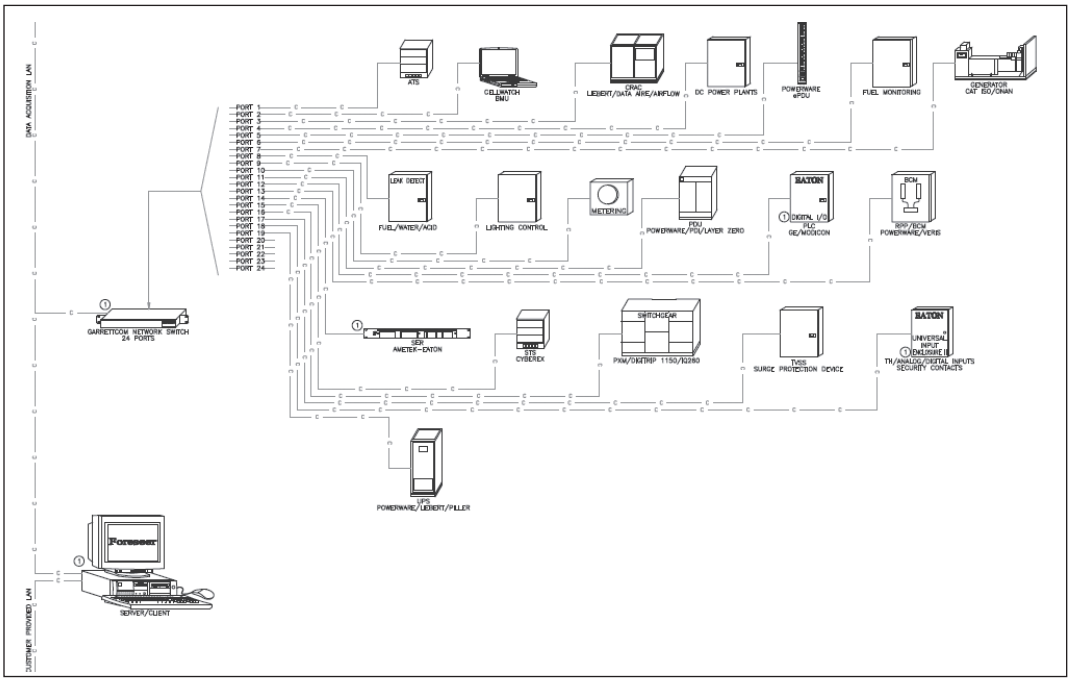
Other typical add on applications include Foreseer Services AC Control, Dashboards and the Maintenance Scheduler.

6.2 Key requirements (★★★ = most important, ★ = less important)

Importance	Requirement	Description
	Software & Hardware	
★	1 millisecond event timestamp resolution	Millisecond based timestamp support enables understanding the sequence of rapidly occurring events and putting necessary mitigation plans in place
★★★	Alarm Notification	Notify locally and remotely occurring alarm events
★	Data Center and Energy Management Solution scalability	Fully scalable from a single data center to multiple facilities around the world
★★★	DC Power Plant Monitoring	Monitor battery banks and detect/replace bad strings to avoid costly downtime and maximize equipment service life
★★★	Emergency Power and Fuel Level Monitoring	Monitor generators and emergency power fuel levels
★★★	Event Prediction	Predict upcoming issues utilizing a trend projection graph
★★★	Fire and Safety monitoring	Detect fire and smoke as well as occurring leaks (fuel, water, acid)
★★★	High Availability	Installation of power quality products (UPS, TVSS, PDU, Generators etc.) to minimize unscheduled downtime due to power quality related issues
★★★	High Security	Enable high level of encryption for data access and server-client communications
★★★	Holistic enterprise view of the system	Monitor facilities and Data Center infrastructures around the country, or/and the globe
★	Lighting Control	Lighting control high level event integration into Foreseer System
★★★	Load balancing	Balance electrical loads to minimize peak demand and maximize energy cost savings
★	PLC Monitoring	Cost effective and simple way to monitor a multitude of PLC linked to critical equipment
★★★	PowerChain Management	Monitor all the devices in the power distribution system power chain including environmental factors, safety and security systems and connections to other monitoring systems in the facility e.g. Building Management Systems
★★★	Power Measurement	Installation of metering products to understand energy consumption and realize energy savings
★	Power Quality Measurement	Installation of metering products to understand sags, swells, transients, harmonics, power factor etc.
★	PUE and DCiE	Energy Efficiency reporting, benchmarking and improvement tracking
★	Rack level cooling monitoring	Understanding of cooling at the rack level
★★★	Security Monitoring	Utilize IFrames to bring in CCTV, monitor open/closed door to the rack level, integrate high level building security event notification into the software
★	Sequence of Events recording	Installation of Sequence of Events recording devices to understand the order of occurring events
★★★	Temperature, humidity and environmental monitoring	Installation of sensors to monitor temperature, humidity and detect leaks (fuel, water, acid) as well as differential pressure
★★★	Third party device integration	Foreseer Software is vendor neutral and supports most third-party devices using their native communication protocol, a standard protocol or a protocol gateway. Programmers develop new drivers as needed during the project
★	Weather Monitoring/Lightning detection	Monitoring and alarm notification of upcoming weather conditions and severe weather preparedness
	Reporting	
★	Branch Circuit Monitoring Report	Capacity info with understanding of redundant sources. Determine circuit loading levels at-a-glance with color-coded graphics indicating loading against capacity
★★★	Capacity Summary Report	The summary of top and bottom loaded circuits as well as loading details for each circuit according to user defined date/time range and facility hierarchy location
★	Data Center Efficiency Report	A summary of data center infrastructure efficiency (DCiE) metrics and power usage effectiveness (PUE) including temperature and humidity. Benchmark, improve and track progress
★	Energy Cost Allocation Report	The total energy bill ($) dollar value or cost per kWh across a facility hierarchy for a user defined date/time range
★★★	Energy Summary Report	The summary of consumption (kWh) and demand (kW) for a user defined date/time range and facility hierarchy location
★★★	Event Summary Report	Provides a Pareto-chart of occurred events according to user defined date/time range and facility hierarchy location
★	Greenhouse Gas Report	Captures the six offensive greenhouse gasses: Carbon Dioxide, Sulfur Dioxide, Nitrogen Oxide, Mercury, Methane, and Nitrous Oxide broken down by selected locations within a facility
★	Joint Commission Report	Generate a standard JCAHO compliant report to support hospital power test requirements. Check events, key metrics of generators, Automatic Transfer Switches during generator testing at user defined date/time time range and facility hierarchy location
★	Power Quality Report	The distribution and trend for amps, volts, THD according to user defined date/time range and facility hierarchy location
★	Utilities Report	Understand and track your utilities (water, air, gas, electricity, steam) consumption, and how effective your improvement efforts have been with day-to-day bar and line charts
★	Other	Other custom reports deemed necessary

	Custom Applications	
★★★	A/C Control	The A/C interface offers comprehensive monitoring and optional lead/lag control for Air Flow, Data Aire and Liebert air conditioning units. Lead/lag control and scheduling is viewable via a Web-browser and is controllable with the proper user authority
★	Branch Circuit Monitoring	Monitor Branch Circuits from small 42 circuit panels to a fully configured PDU with multiple 84 circuit panels or any configuration of distribution panels. Includes current and watts for each circuit or pole from the panels but can be extended to any data available via an integration protocol with the hardware. Optional advanced features such as totaling breakers for an N+1 application or per customer are supported
★★★	Capacity Planning	Planning electrical usage and demand is a difficult job. As site loads increase and usage patterns change, demand on a device may grow beyond its intended capacity. And, while average demand may not be a concern, peak demand always is. Even a momentary spike has the potential to bring down an entire network. Foreseer Software tracks the kW and kVA over time, immediately informs of peak levels, and projects future demands based on past usage. This knowledge is critical in planning for electrical upgrades and/or changes to the power chain to support changing load patterns
★★★	Dashboard	Various GUI Dashboards are available for specific applications and configurations: • Data Center Risk Analysis • Power Outage • Power Capacity • Other
★★★	Maintenance Scheduler	The maintenance scheduler offers the ability to preset scheduled (weekly or periodic) maintenance windows within the system to disarm selected devices on which maintenance will be performed. Disarming the devices allows continued monitoring and archiving during the maintenance period while disabling alarms and preventing unnecessary notification of personnel

6.3 Communications diagram



6.4 Application screenshots

7.0 Financial institution applications

7.1 Application description

Secure, real-time transactions and mission critical back-office operations along with IT, security, safety, environmental and building management integration for maximum uptime are key considerations for financial institutions.

In addition energy, utilities measurement and management functionality, including benchmarking, progress tracking, coupled with greenhouse gas footprint recognition and full scale third party device integration are key success factors that Foreseer Services can provide to financial institutions.

7.2 Key requirements (★★★ = most important, ★ = less important)

Importance	Requirement	Description
	Software & Hardware	
★★★	1 millisecond event timestamp resolution	Millisecond based timestamp support enables understanding the sequence of rapidly occurring events and putting necessary mitigation plans in place
★★★	Alarm Notification	Notify locally and remotely occurring alarm events
★★★	Data Center and Energy Management Solution scalability	Fully scalable from a single data center to multiple facilities around the world
★★	DC Power Plant Monitoring	Monitor battery banks and detect/replace bad strings to avoid costly downtime and maximize equipment service life
★★★	Emergency Power and Fuel Level Monitoring	Monitor generators and emergency power fuel levels
★★★	Event Prediction	Predict upcoming issues utilizing a trend projection graph
★★★	Fire and Safety monitoring	Detect fire and smoke as well as occurring leaks (fuel, water, acid)
★★★	High Availability	Installation of power quality products (UPS, TVSS, PDU, Generators etc.) to minimize unscheduled downtime due to power quality related issues
★★★	High Security	Enable high level of encryption for data access and server-client communications
★★★	Holistic enterprise view of the system	Monitor facilities and Data Center infrastructures around the country, or/and the globe
★★★	Lighting Control	Lighting control high level event integration into Foreseer System
★★★	Load balancing	Balance electrical loads to minimize peak demand and maximize energy cost savings
★★★	PLC Monitoring	Cost effective and simple way to monitor a multitude of PLC linked to critical equipment
★★★	PowerChain Management	Monitor all the devices in the power distribution system power chain including environmental factors, safety and security systems and connections to other monitoring systems in the facility e.g. Building Management Systems
★★★	Power Measurement	Installation of metering products to understand energy consumption and realize energy savings
★★★	Power Quality Measurement	Installation of metering products to understand sags, swells, transients, harmonics, power factor etc.
★★★	PUE and DCiE	Energy Efficiency reporting, benchmarking and improvement tracking
★★★	Rack level cooling monitoring	Understanding of cooling at the rack level

★★★	Security Monitoring	Utilize IFrames to bring in CCTV, monitor open/closed door to the rack level, integrate high level building security event notification into the software
★★★	Sequence of Events recording	Installation of Sequence of Events recording devices to understand the order of occurring events
★★★	Temperature, humidity and environmental monitoring	Installation of sensors to monitor temperature, humidity and detect leaks (fuel, water, acid) as well as differential pressure
★★★	Third party device integration	Foreseer Software is vendor neutral and supports most third-party devices using their native communication protocol, a standard protocol or a protocol gateway. Programmers develop new drivers as needed during the project
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	Reporting	
★★★	Branch Circuit Monitoring Report	Capacity info with understanding of redundant sources. Determine circuit loading levels at-a-glance with color-coded graphics indicating loading against capacity
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★★★	Utilities Report	Understand and track your utilities (water, air, gas, electricity, steam) consumption, and how effective your improvement efforts have been with day-to-day bar and line charts
★★★	Other	Other custom reports deemed necessary
	Custom Applications	
★★★	A/C Control	The A/C interface offers comprehensive monitoring and optional lead/lag control for Air Flow, Data Aire and Liebert air conditioning units. Lead/lag control and scheduling is viewable via a Web-browser and is controllable with the proper user authority
★★★	Branch Circuit Monitoring	Monitor Branch Circuits from small 42 circuit panels to a fully configured PDU with multiple 84 circuit panels or any configuration of distribution panels. Includes current and watts for each circuit or pole from the panels but can be extended to any data available via an integration protocol with the hardware. Optional advanced features such as totaling breakers for an N+1 application or per customer are supported
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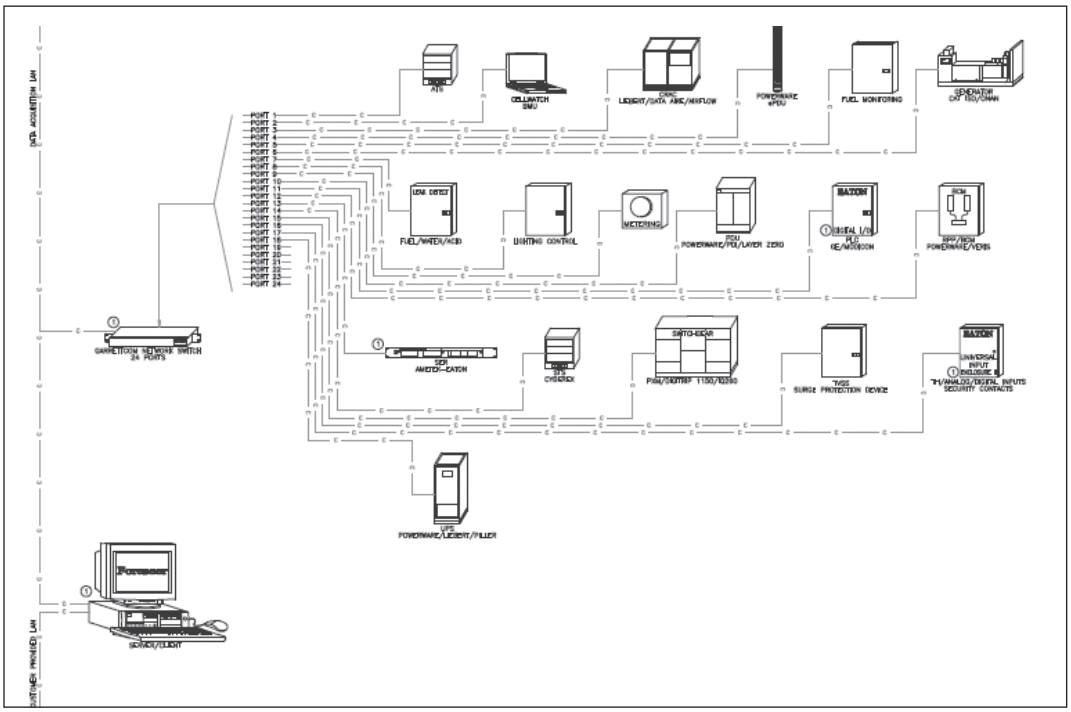
7.3 Communications diagram



7.4 Application screenshots

8.0 Education sector applications

8.1 Application description

From K-12 schools to multiple far-flung University Campuses, they all have rigorous requirements for power quality, energy management, security, safety and environmental monitoring covering the facilities as well as the IT Data Centers. Power Usage Effectiveness, cost allocation, utilities consumption and energy summary along with custom applications are key requirements for the educational sector.

8.2 Key requirements (★★★ = most important, ★ = less important)

Importance	Requirement	Description
	Software & Hardware	
★★★	1 millisecond event timestamp resolution	Millisecond based timestamp support enables understanding the sequence of rapidly occurring events and putting necessary mitigation plans in place
★★★	Alarm Notification	Notify locally and remotely occurring alarm events
★★★	Data Center and Energy Management Solution scalability	Fully scalable from a single data center to multiple facilities around the world
★	DC Power Plant Monitoring	Monitor battery banks and detect/replace bad strings to avoid costly downtime and maximize equipment service life
★★★	Emergency Power and Fuel Level Monitoring	Monitor generators and emergency power fuel levels
★★★	Event Prediction	Predict upcoming issues utilizing a trend projection graph
★★★	Fire and Safety monitoring	Detect fire and smoke as well as occurring leaks (fuel, water, acid)
★★★	High Availability	Installation of power quality products (UPS, TVSS, PDU, Generators etc.) to minimize unscheduled downtime due to power quality related issues

★★★	High Security	Enable high level of encryption for data access and server-client communications
★★★	Holistic enterprise view of the system	Monitor facilities and Data Center infrastructures around the country, or/and the globe
★★★	Lighting Control	Lighting control high level event integration into Foreseer System
★★★	Load balancing	Balance electrical loads to minimize peak demand and maximize energy cost savings
★★★	PLC Monitoring	Cost effective and simple way to monitor a multitude of PLC linked to critical equipment
★★★	PowerChain Management	Monitor all the devices in the power distribution system power chain including environmental factors, safety and security systems and connections to other monitoring systems in the facility e.g. Building Management Systems
★★★	Power Measurement	Installation of metering products to understand energy consumption and realize energy savings
★★★	Power Quality Measurement	Installation of metering products to understand sags, swells, transients, harmonics, power factor etc.
★★★	PUE and DCiE	Energy Efficiency reporting, benchmarking and improvement tracking
★★★	Rack level cooling monitoring	Understanding of cooling at the rack level
★★★	Security Monitoring	Utilize IFrames to bring in CCTV, monitor open/closed door to the rack level, integrate high level building security event notification into the software
★★★	Sequence of Events recording	Installation of Sequence of Events recording devices to understand the order of occurring events
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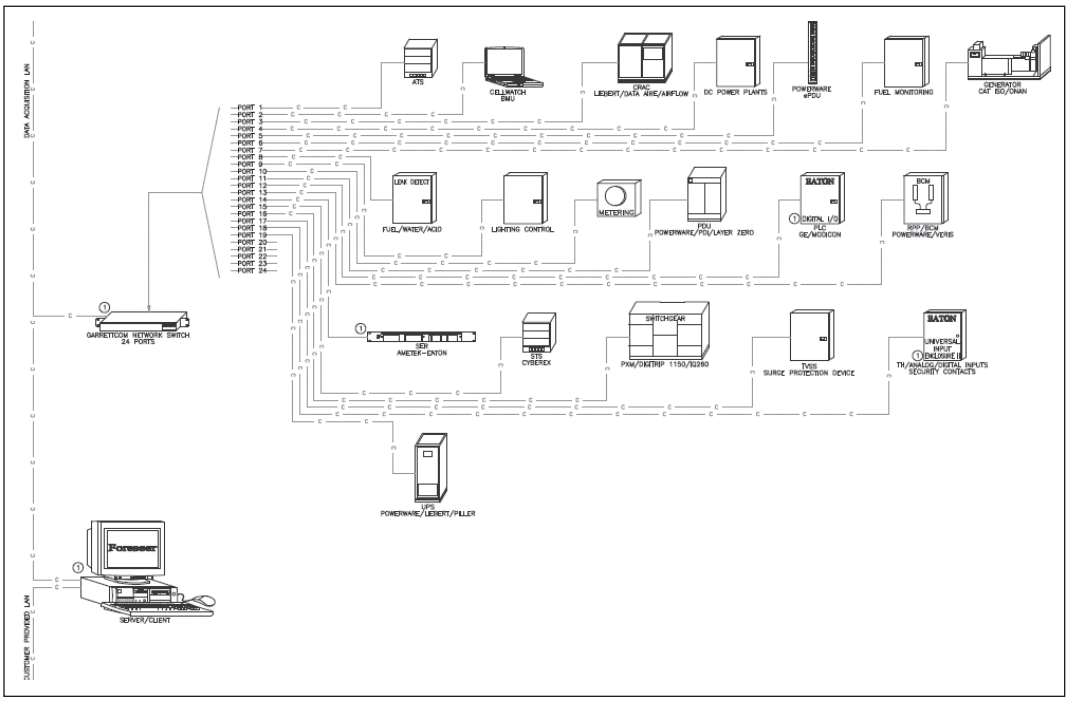
8.3 Communications diagram



8.4 Application screenshots

9.0 Government sector applications

9.1 Application description

Government agencies, aviation and military applications all require rigorous security and safety specifications fulfillment according to existing best practices as well as laws and regulations. Power quality and systems reliability need to be at the highest possible levels. In addition what-if scenarios modeling, projection graphing along with statistical analysis are key requirements.

For government operated facilities and departments, energy measurement and power usage effectiveness along with cost allocation are also major contributors and in many cases mandatory requirements abiding to the Energy Policy Act of 2005.

Also adherence to the Energy Independence and Security Act of 2007, as well as many executive orders, are critical success factors.

9.2 Key requirements (★★★ = most important, ★ = less important)

Importance	Requirement	Description
	Software & Hardware	
★	1 millisecond event timestamp resolution	Millisecond based timestamp support enables understanding the sequence of rapidly occurring events and putting necessary mitigation plans in place
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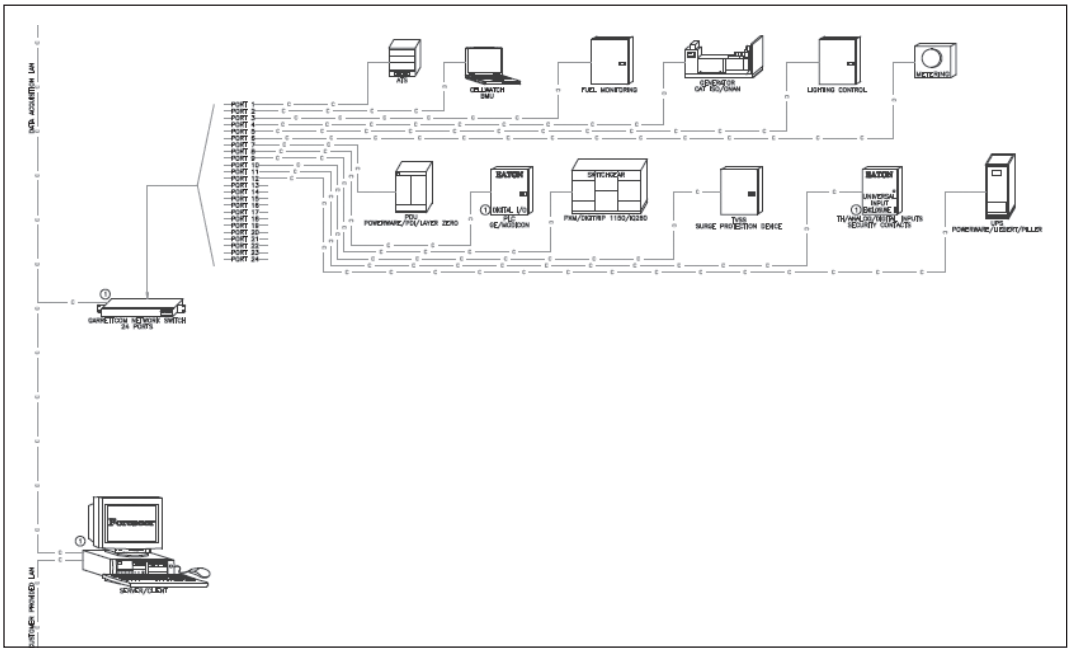
9.3 Communications diagram



9.4 Application screenshots

10.0 Custom applications

10.1 Air conditioner monitoring and control

10.1.1 Introduction

The Foreseer Software AC interface offers comprehensive monitoring and optional lead/lag control for Data Aire and Liebert air conditioning units. Lead/lag control and scheduling is viewable from any Foreseer client and is controllable with the proper user authority.

10.1.2 Features

- Zone assignment/support for all AC units based on N+1 or N+2 standby scheme.
- Primary and secondary schedules allow easy changeover for weekends/holidays.
- AC auto changeover on a unit basis by selectable standby schedule or user selected critical alarms.
- Lead/Lag standby rotation with 8 hour to 30 day schedule.
- Standby unit activation by temperature threshold from embedded or externally monitored temperature sensors.
- Manual control of any unit in an On/Off/Standby mode.
- Zone inhibit function to block different AC's within a zone from humidifying/dehumidifying or heating/cooling at the same time.
- All scheduling or manual control password protected

10.1.3 Tools

- **Alarm Actions view:**
  - Off Alarm settings – Used to indicate which alarms will cause a unit to be controlled off and cause the current standby unit to be controlled on.
  - Standby Alarm settings – For selection of alarms that will cause a 'Standby' unit to supplement the zone until the alarm is cleared from the 'On' unit.
- **Zone Assignment view:**
  - Allows grouping of AC's into geographically controlled zones
  - Primary/secondary schedule initial status, set's the initial startup for each AC.
  - Allows ON/OFF/AUTO manual control for each AC.
- **Schedule Setup view:**
  - Rotation Day/Time, used to enable and select rotation frequency of standby unit(s)
  - Secondary schedule, used to enable and control the secondary menu start date/time and stop date/time

- **Control Logic view:**
  - Temperature zone override, used to start the standby unit within a zone if the units in the zone are unable to keep cooling within a specified deadband from the average setpoint.
  - Zone inhibit control, used to enable the zone inhibit functionality and set the temperature and humidity tolerance which activate the inhibit.

Figure 13: AC Control Alarm Actions View

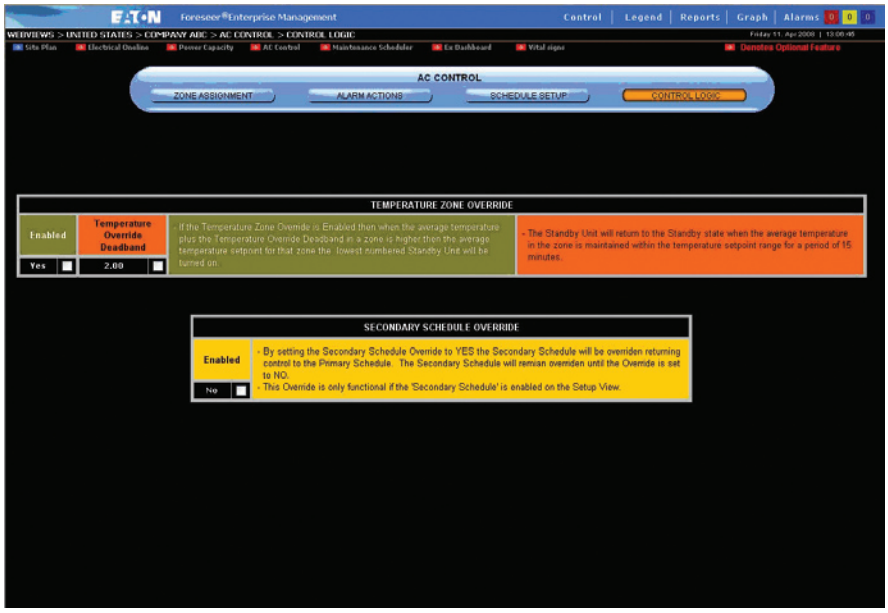


Figure 14: AC Control Logic View

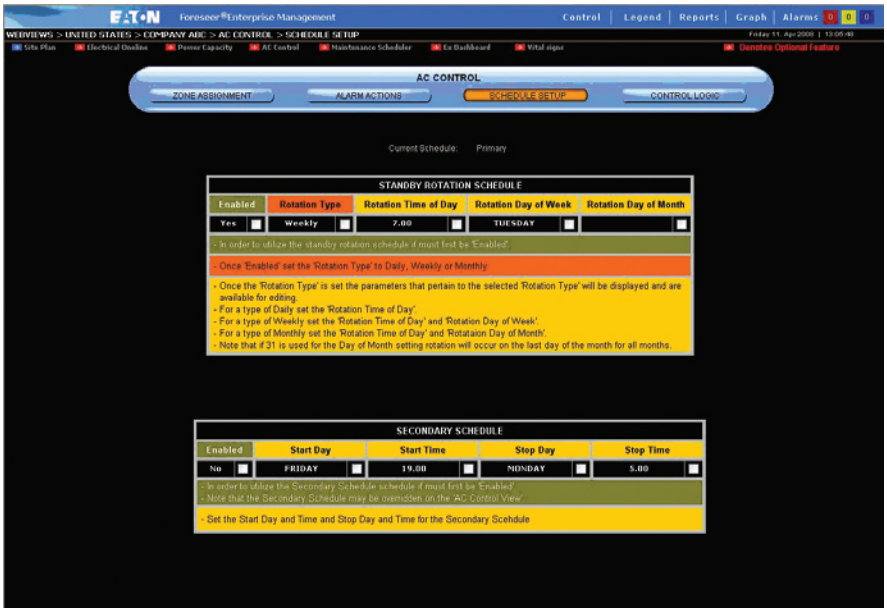


Figure 15: AC Control Schedule Setup View

Figure 16: AC Control Zone Assignment View

10.2 Scheduled maintenance and alarm management application

10.2.1 Introduction

The Eaton Foreseer Software maintenance scheduler offers the ability to preset scheduled (weekly or periodic) maintenance windows within the Foreseer Software System to disarm selected devices maintenance will be performed on.

Disarming the devices will allow all continued monitoring and archiving during the maintenance period while disabling alarms from occurring and Message Management from unnecessarily notifying personnel.

10.2.2 Features

- Single button for Enable/Disable of entire schedule
- Schedule by the day of week or monthly date
- Easily select/review devices that will be disarmed
- Single view allows control/review of all settings
- All scheduling and control password protected

10.2.3 Tools

- **Maintenance Schedule Control View**
  - Allows complete control for up to 30 devices.
  - Multiple views may be installed grouping like equipment per view or splitting electrical/mechanical equipment.
  - Includes the ability to manually disarm any of the listed equipment with a simple right click control menu, password protected.
  - Automatically indicates when the schedule setup is invalid, only allows for a maximum 48 hour window.

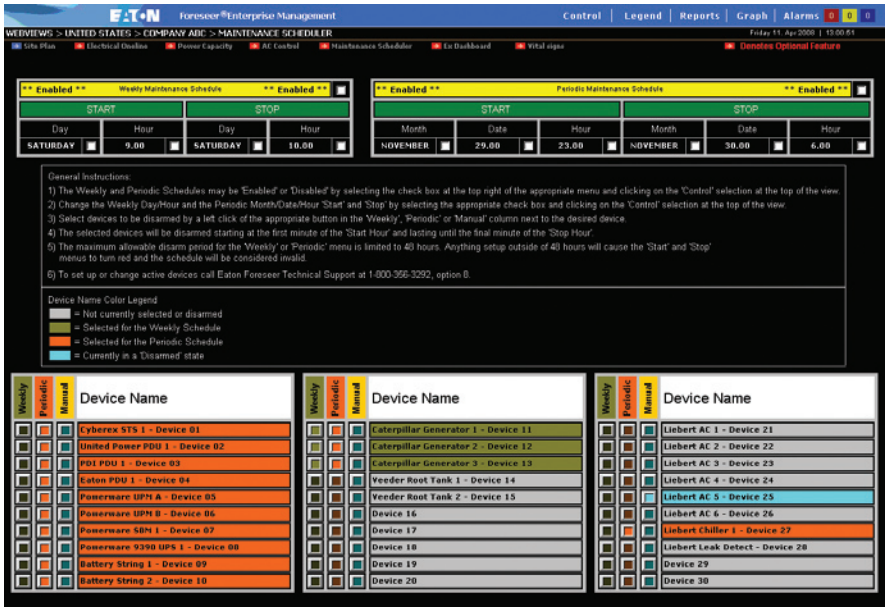


Figure 17: Maintenance Schedule Control View

10.3 Branch circuit monitoring

10.3.1 Description

Foreseer Software fully supports all aspects of Branch Circuit Monitoring from a small 42 circuit panel to a fully configured PDU with multiple 84 circuit panels or any configuration of distribution panels. Support for Branch Circuit Monitoring typically includes current and watts for each circuit or pole from the panels but can be extended to any data available via an integration protocol with the hardware. Included are default alarm settings for 70% cautionary and 80% critical of the rated breaker size. The user interface with this driver is a graphical representation depicting the panel itself and including breaker sizes, number of poles per breaker and breaker load assignments. The end user is also supplied tools and a user's guide for keeping the panel graphics and schedules up to date as dynamic changes are implemented within the application. Optional advanced features such as totaling breakers for an N+1 application or per customer are easily implemented.

10.3.2 Application requirements

- Current panel schedules for 'as delivered' implementation will provide the customer with most complete and accurate system from the start.
- Any changes to the default alarm settings are easiest implemented prior to configuration.

10.3.3 Application screenshot

10.4 Power flow monitoring

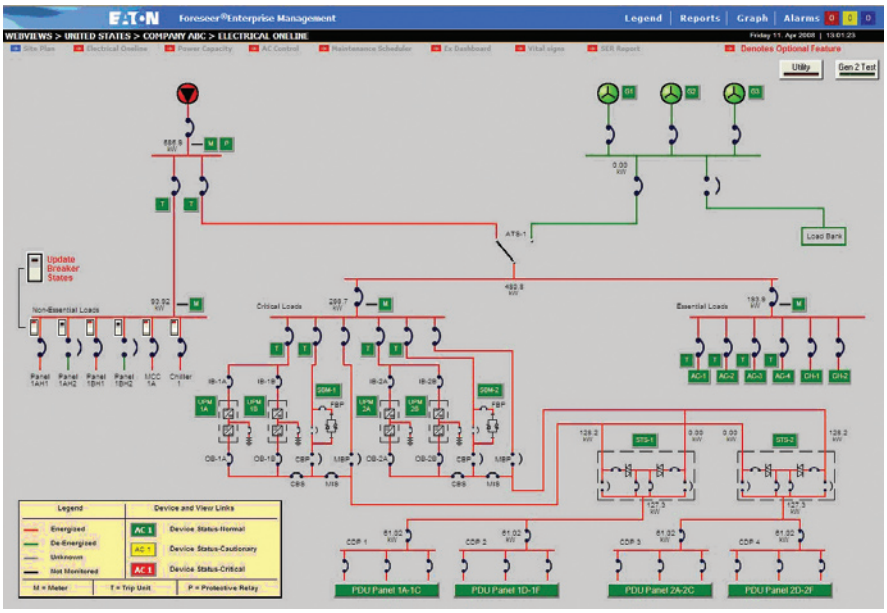
10.4.1 Description

Foreseer has the ability to bring your electrical oneline to life. Actual energized/de-energized conditions can be presented on any area of the electrical oneline where equipment is being monitored. ATS, STS, Breakers and disconnect switches all dynamically show current position as reported to Foreseer.

10.4.2 Application requirements

- Accurate AutoCAD drawing of the Electrical Oneline.

10.4.3 Application screenshot



11.0 Services

Typical design services

- System Design and bill of material development and recommendations
- Specification development, drawings and documentation
- Third Party device, communication interface and driver design and development
- Interactive software user interface design
- Other, please contact us

Typical installation services

- Complete project management services
- Complete Turn-key installation options
- System installation and startup services
- System testing and customization
- 50% - 95% - 100% custom installation drawing package
- Customized graphic layouts and backgrounds
- Facility and equipment mimic graphics
- One-line layouts development
- Customized device gauges and status indicators
- Custom software installation and configuration
- Device configuration, setup and testing
- Custom software and application development
- Third Party Software integration
- Reporting setup and configuration
- Basic Foreseer System training
- Other, please contact us

Typical commissioning services

- Overall system testing
- Tiered systems testing
- Full point-point system commissioning options
- Other, please contact us

Typical follow-up services

- Connectivity devices installation, configuration, testing and customization
- Eaton Hardware integration
- Third Party Hardware integration
- Other device configuration, setup and testing activities
- Advanced Foreseer System customer training
- 7 x 24 technical support
- Customized service contract w/scheduled site visits
- Other, please contact us

12.0 Hardware compatibility list

Please refer to the Foreseer Services Hardware Compatibility List. Latest version is posted on **www.eaton.com/4cr**

12.1 Supported protocol list

- Modbus RTU
- Modbus TCP
- SNMP
- BACnet IP
- OPC
- LONworks
- Multiple proprietary protocols
- Other

12.2 Supported device categories and vendors

12.2.1 UPS's

- APC
- Best Power
- Borri
- Caterpillar
- Chloride
- Eaton
- Exide
- GE
- IPM
- Liebert
- MGE
- Mitsubishi
- Piller
- Power Tecnique
- Powerware
- Thycon
- Toshiba
- UPS Ltd
- Other

12.2.2 Power distribution equipment

- APC
- Aphel
- BayTech
- Danaher
- Eaton
- IBM
- Layer
- Layer
- Liebert
- MGE
- PDI
- Powersmiths
- Powerware
- United Power
- Other

12.2.3 Meters

- Autometers
- BMI
- Circutor
- Crompton
- DataTrax
- Dent
- Dranetz
- Eaton
- Electro Industries
- EMON
- Entes
- GE
- IME
- Kele
- NK
- Onicon
- PML
- Satec
- Schneider
- Siemens
- SquareD
- Universal
- Veris
- Westinghouse
- Other

12.2.4 Circuit protection

- Basler
- Eaton
- GE
- SEL
- Siemens
- SquareD
- Utility Relay Co.
- Other

12.2.5 Transfer switches

- APC
- ASCO
- BayTech
- Chloride
- Cyberex
- Danaher
- Eaton

- GE
- Kohler
- L3 STS
- Layer
- Liebert
- MGE
- Onan
- PDI
- Russelectric
- Spectrum
- TwinSource
- United Power
- Other

12.2.6 Drives

- ABB
- Danfoss
- Eaton
- Eurotherm
- Saftronics
- Telemecanique
- Yaskawa
- Other

12.2.7 HVAC

- Airflow
- APC
- Compu-Aire
- Data Aire
- Dectron
- Hiross
- Liebert
- Nortec
- Opengate
- Stulz
- Other

12.2.8 Environmental monitoring

- Eaton
- Powerware
- APC
- Caron
- Chromalox
- IT Watchdogs
- Lighthouse
- Nalco
- PointSix
- Sensa
- SquareD
- Boltek
- Davis
- Global Atmos
- Rugid Computer Weather
- Other

12.2.9 Protocols

- APC ASCII
- BACnet
- BACnet WS+
- BCM
- CMI ASCII
- INCOM
- Liebert Info
- Modbus RTU
- Modbus TCP
- Modbus3
- OPC Server
- QCPort
- Shut
- SNMP
- UPSCode II
- XCP
- Other

12.2.10 BMS

- Alber
- BTech
- CellWatch
- JCI
- Phoenix
- Powershield
- Other

12.2.11 Generators

- Basler
- Caterpillar
- FW Murphy
- Generac
- Katolight
- Kohler
- Onan
- Synergy
- Other

12.2.12 Chillers

- APC
- Carrier
- Liebert
- McQuay
- Multistack
- Rittal
- York
- Other

12.2.13 Security and safety

- Cerberus
- Fike Fire
- Generic Fire
- Kidde-Fenwal
- Other

12.2.14 Fuel monitoring

- EarthSafe
- EBW
- JCH
- Omntec
- Phoenix
- Pneumercator
- Preferred Inst
- Veeder-Root
- Other

12.2.15 PLC's

- Allen-Bradley
- GE
- JCI
- Modicon
- TWIDO
- Other

12.2.16 Leak detection

- AquaLeak
- Liebert
- PermAlert
- RLE
- Tracetek
- Other

12.2.17 Lighting control

12.2.18 Other

13.0 Typical options & accessories list

Power Xpert Reporting
Offers the big picture every time. Power Xpert offers a convenient report boils down the numbers and events to intuitive graphs and charts. The report allocates energy costs, compares consumption, monitors branch circuits, keeps capacity in check and summarizes your power quality. And you get it automatically delivered via e-mail at intervals that you define.

Manager of Managers (MOM) Provides a powerful means to integrate data from multiple locations where each location is running its own Foreseer Class server. This unique feature provides a scalable system where the total number of integrated points on the centralized MOM server can be as large as 256,000 points.

Secure Web Server (https) Provides an encrypted means to protect all data that is viewed via a standard Web browser on the Internet or intranet. Utilizing the OpenSSL package from the Internet, Foreseer Class software is able to provide 128 bit encryption between the Foreseer Class Web server and the Web browser client. Both registered certificates from a 3rd party provider or self-signed certificates are allowed to be used with this option.

Software Classes
There are four Software Classes:

- Foreseer C-Class Server Software (up to 15,000 channels)
- Foreseer M-Class Server Software (up to 25,000 channels)
- Foreseer R-Class Server Software (up to 100,000 channels)
- Foreseer S-Class Server Software (up to 256,000 channels)

Redundancy
Safeguards valuable information. The inclusion of one or more extra Foreseer Class servers provides the highest levels of system reliability. In the event that one Foreseer Class server fails, the remaining servers carry the load of the power monitoring system.

Data Acquisition Engine (DAE)
Designed specifically for geographically or physically removed sites where local IT expertise may not exist. The Data Acquisition Engine automatically collects and sends data from critical infrastructure devices, and communicates that data back to the Foreseer Class server. Using local processing and the shared bandwidth of an IP network, the DAE reduces the cost required to transmit data to the central server. The DAE also continues to operate independently and generate alarms even if the connection to the central server is unavailable, increasing the overall availability of the management system.

Data Acquisition Terminal (DAT)
Easily integrates monitored equipment and sensors located in small, networked remote sites. The DAT employs standard Modbus communications to relay information to either a Foreseer Class server or a Data Acquisition Engine over a TCP/ IP network. Data is packaged in sequential Modbus registers to enable optimum scan times without impacting network bandwidth.

Services

Hardware:

- Data Acquisition Engine (DAE)
- Data Acquisition Terminal (DAT)
- Server CPU
- Other

Software:

- Foreseer Software Classes
- Foreseer C-Class Server Software (up to 15,000 channels)
- Foreseer M-Class Server Software (up to 25,000 channels)
- Foreseer R-Class Server Software (up to 100,000 channels)
- Foreseer S-Class Server Software (up to 256,000 channels)
- Manager of Managers (MOM)
- Secure Web Server
- Redundant Server
- Power Xpert Reporting
- Branch Circuit Monitoring Report
- Capacity Report
- Data Center Efficiency Report
- Energy Cost Allocation Report
- Energy Summary Report
- Event Summary Report
- Greenhouse Gas Report
- Joint Commission Report
- Power Quality Report
- Utilities Report
- Upgrades
- Foreseer Class-C Software Upgrade to Class-M
- Foreseer Class-C Software Upgrade to Class-R
- Foreseer Class-C Software Upgrade to Class-S
- Foreseer Class-M Redundant SQL Support Upgrade
- Foreseer Class-M Software Upgrade to Class-R
- Foreseer Class-M Software Upgrade to Class-S
- Foreseer Class-R Software Upgrade to Class-S
- Foreseer System Upgrade v. 4 x to v. 5.x - wo/ Contract
- Foreseer System Upgrade v. 4.x to v. 5.x - w/ Contract
- Foreseer System Upgrade v. 2.x to v. 5.x - wo/ Contract
- Foreseer System Upgrade v. 2.x to v. 5.x - w/ Contract

14.0 Software functionality list

14.1 Foreseer Server functions

- Data acquisition and storage
  - An extensive vendor independent device driver library of over 800 devices.
  - Historical data to support proactive equipment management. All analog readings are stored in the database every minute and digital points are stored on a change of state.
- User defined channels
  - Powerful, real time, feature that enables the end user to apply any mathematical or logical equation to a combination of channels or data to represent virtual information about their facility or environment.
- Message management channel configuration
  - Used to assign channels to Alarm Notification call lists.
- Device and channel properties
  - Allows customization of alarm thresholds, alarm messages, data scaling etc.

14.2 Foreseer Webviews functions

- Facility/enterprise overview and management
  - A Virtual site or enterprise is created that represents the actual site location and floor plan, navigation is through a simple point and click drill down paradigm. Equipment views show the specific device, current status and data readings. Color utilization makes it easy to determine current state of each site, device or data point.
- Channel properties
  - With the proper authorization allows customization of alarm thresholds, alarm messages, data scaling etc.
- Standard Webviews
  - Semi-custom dashboard displays an overview of the facility equipment based on customer selection of Power, Environmental, Life-Safety and Conservation objects. Includes items and calculations for DcIE/PUE, Quality of Power based NERC standards and aggregation of quantities of like equipment.
- Alarm management
  - The user-interface uses a stop light color scheme (green, yellow, and red) for easy identification of alarm conditions. Each analog channel is measured against four configurable alarm limits (hi-hi, hi, lo and lo-lo). Green indicates normal state, yellow indicates cautionary level alarm, and red indicates a critical level alarm.
  - Operator alarm response instructions are configurable for each alarm limit of every data point.
  - An alarm summary screen can be accessible with a mouse click from any level of the system software. These alarms can be listed by priority, time of occurrence, and type.
  - Each Client has the capability to filter data point alarms, so that individual users can view specific alarms.
- Data analysis
  - High performance trend analysis and forecasting tools to assess equipment performance through cause analysis, impact analysis, capacity planning, preventative maintenance assessments and trending.
  - Automatic statistical analysis – Min, Max, Mean, Range, Standard Deviation and Trend.
  - Projection graph doubles the x-axis of the graph to project the trend into the future.
- Reports
  - Diagnostic System Reports
  - System Configuration Reports
  - Notes Reports.
  - All alarms are automatically logged to an alarm history report. This report is formatted in 1, 7 and 30 day time periods and display data point in alarm, level, time of occurrence, acknowledgement and rearm.
- Advanced reports with PXR

14.3 Message management functions

- E-Mail, SNMP traps or paging of alarm events
- Automatic notification escalation

14.4 Advanced applications functions

14.4.1 Custom dashboards

- Risk Analysis Dashboard – Based on current conditions what is the risk your Data Center is experiencing?
- Power Outage Dashboard – A single overview to monitor/manage through a power outage.
- Power Capacity Dashboard - Track power capacity in real time in an electrical block diagram of your electrical system. Can include items such as carbon footprint and monthly energy usage.

14.4.2 Maintenance manager

- The Maintenance Scheduler (MS) is an option within the Foreseer system that allows devices to be disarmed based upon weekly or periodic maintenance schedules. This prevents the alarms that would accompany a device p.m. but at the same time allows for monitoring of the channel. The device is placed upon a predetermined schedule that will disarm that device and the rearm it again at a later predetermined time.

14.4.3 AC control

- The Foreseer CRAC interface offers comprehensive monitoring and optional lead/lag control for Data Aire, Liebert, and Airflow air conditioning units. Lead/lag control and scheduling is viewable from Webviews and is controllable with the proper user authority

14.4.4 Energy cost allocation

- Electrical cost has always been a significant part of the operating expense for any business. With the electricity costs increasing every year, tracking usage by individual circuit has become part of the energy management strategy of many companies. Foreseer offers design methods for monitoring and allocating electrical cost to the individual users of a department, device, branch circuit, or even an individual, below is an example.
  - The application totalizes kilowatts per department based on a fixed voltage parameter, total current from a series of breakers assigned to each department and power factor from an upstream device. Each department's kilowatt usage is integrated into kilowatt hours which are saved on a monthly basis. Total kilowatts are also calculated for air conditioning the environment which is then integrated into kilowatt hours and saved on a monthly basis. Each department's percentage of the total kilowatt usage is then calculated. This percentage is then used to assess a portion of the energy used for air conditioning. This results in a department's total allocation for energy on a monthly basis.

14.4.5 Capacity assessment

- Foreseer supports informative information on power capacity and power density. Making cogent understanding of power issues, an easy process. This information can show individual capacity of equipment, or a system. With higher density of communications and IT equipment being placed into smaller areas, power density has become a critical measurement. Foreseer can display power density by device or power density for an entire area.

15.0 How to get started with your project

15.1 Foreseer Services hotline

To learn how Foreseer Services can enhance the reliability and value of your power distribution, environmental, safety and security systems, or to see a live, online demo, visit our Web site at **http://www.eaton.com/foreseer**, call your local Eaton representative or our Foreseer Services hotline at +1.800.356.3292, option 3.

Eaton Corporation
Electrical Sector
1111 Superior Ave.
Cleveland, OH 44114
United States
877-ETN-CARE (877-386-2273)
www.eaton.com/foreseer

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