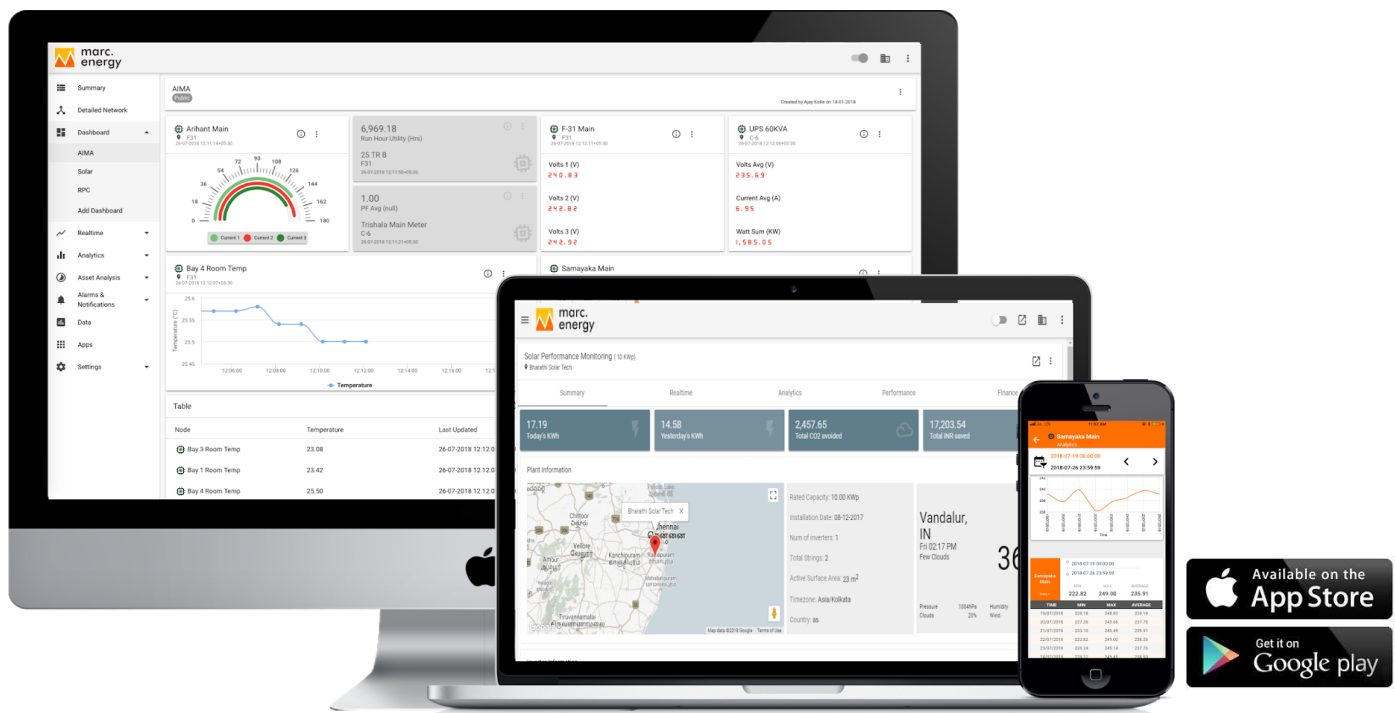




The Next Generation IIoT Platform



INTRODUCTION

Marc is our cloud-based Next Generation IIOT Platform with build-in apps for assets & equipment for managing uptime, efficiency, productivity, condition monitoring, control, preventive & predictive maintenance for demand-side management of system and process parameter monitoring.

It is designed to handle quantitative and qualitative data to provide users with an in-depth analysis and insight into their systems enabling them with possibilities for optimisation, energy OPEX savings, and building efficiency in their networks.

The value addition provided by the system is its problem diagnosis engine based on the trends and data mining of historical data in cloud of an asset preventing expensive downtimes and breakdown of machines, motors, transformers and other loads. The MARC.CLOUD also provides basic remote manual control capability and conditional execution/controlling capability.

We also offer Android & iOS apps for any Android & iOS device, which can be downloaded from Google Play Store & Apple App Store.

Mobile App: [marc.energy](#) & [marc.solar](#)

A PC /Laptop /Server/gateway functions as the server or base station to continuously execute all actions and functions described above. The configuration of the PC /Laptop /Server/gateway and the associated network connectivity will depend on the amount of data being collected, analyzed, reported and executed

WORKING PRINCIPLE

The MARC CLOUD System executes the following functions continuously:

Polling energy meters for specific data. Collection of data from various devices and storage in raw format in a database in a marc cloud.

Evaluation of raw data to

- extract meaningful information and present the information in specific reports.
- Generate alarms based on user-defined limits.
- Generate Notification based on user-defined limits.
- Generate a live dashboard for online monitoring.

The device which will be configured to [marc.energy](#) is:

- Energy meter
- VFD
- PLC
- Solar Inverters
- Water Meter
- Weather Station
- Relays
- Counters
- Weather Station & many more...

APPLICATION OF MARC

- ❖ Planning and Scheduling of Resources.
- ❖ Audit Applications and to create a Management Information Report.
- ❖ Root Cause Analysis of Breakdown.
- ❖ Predictive Maintenance.
- ❖ Helps in Achieving Efficiency.
- ❖ Optimization of Running Hours.
- ❖ Water, Energy Management.
- ❖ Transformer Monitoring, HVAC Monitoring.
- ❖ Live Weather Monitoring.
- ❖ Plant Monitoring.
- ❖ Asset Monitoring.
- ❖ Solar Remote Monitoring.

BENEFITS OF MARC

- ❖ Do a SWOT analysis of your energy with our MARC Platform to have awareness about the consumption pattern of different production equipment, true energy cost for your different product. Energy cost allocation is made possible for various products and fixes Energy-saving formula. Evolve a typical Energy Cost Centre pattern.
- ❖ Know your Plant Energy Efficiency, predict the Maximum Demand with your varying load profile and even out the varying demands to save Maximum Demand charges.
- ❖ Improve your Plant Energy Efficiency by identifying the areas of wastage. Monitoring the trend of power factor, suitable power factor control scheme is made possible which not only avoids the penalty for poor factor but also results in maximizing the incentive from EB.
- ❖ Reduce Specific Energy Consumption for your Product by monitoring it on a real-time basis identifying the low productivity and wrong scheduling.
- ❖ Even out the Demand and Energy will help you to achieve Optimum Utilization of your Assets like Transformers, Motors, AC etc.
- ❖ Know your potential for expansion or up-gradation, thereby avoid unnecessary capital investment by analyzing the trend of all power parameters such as kW, kVA, kVAR, PF etc and knowing how close the operation is to the maximum ratings of the equipment.
- ❖ Know the quality of your power using special meters (Power Quality Analyser / Power Quality Monitor) at critical locations.
- ❖ Assess your distribution losses accurately as a percentage of power transmitted and compare with the standards and benchmarks to enable you to improve by suitable design / operational changes.
- ❖ Since all the measuring devices are plus-minus 0.5% accuracy and data acquisition is on a real-time basis, all the information are highly reliable. Hence right action can be taken without hesitation to achieve the desired results.

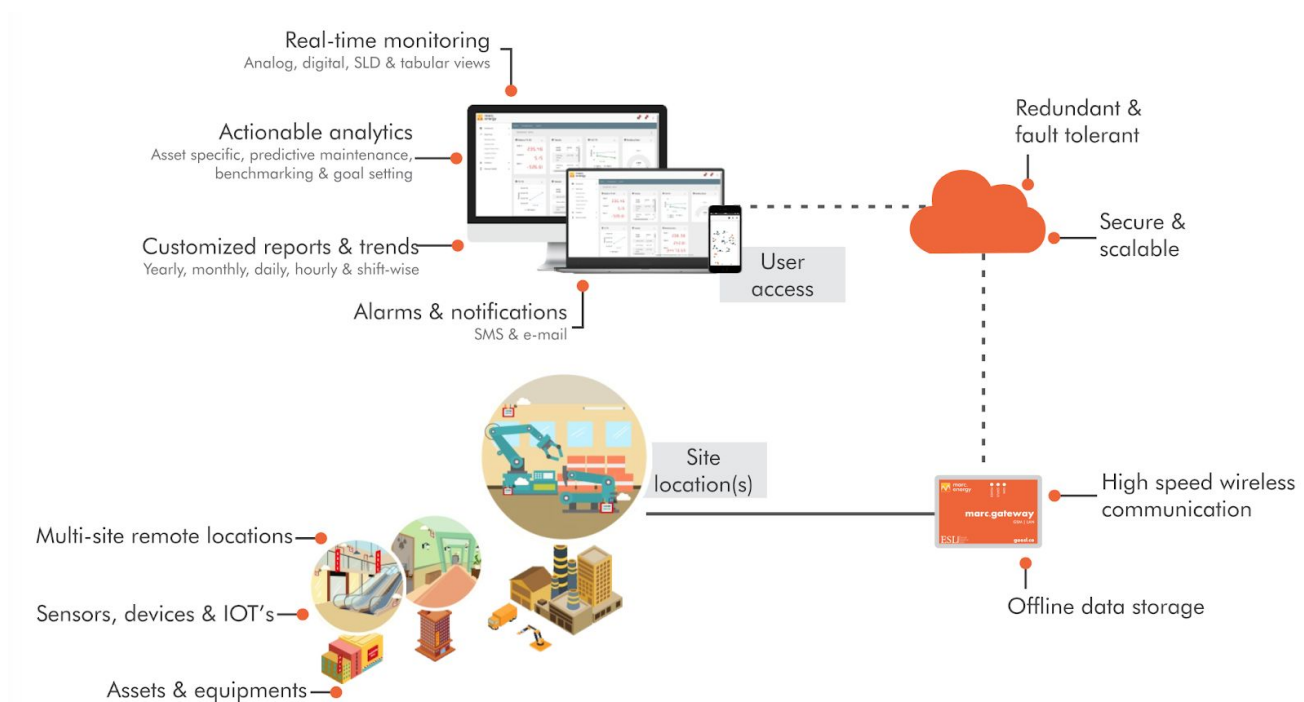
- ❖ Compute energy bills yourselves, compare with that from Utility and check your Utility bills
- ❖ Assured return on investment with low payback period and it is an investment and not an expense.
- ❖ Identify and explain the increase or decrease in Energy Use. e Save Maximum demand Charges.
- ❖ Draw Energy Consumption trends (Hourly, Daily, Weekly, Monthly) e Determine Future Energy use when production planning changed. i.e Diagnose specific areas of wasted energy.
- ❖ Develops performance targets for energy management programs.
- ❖ Manage energy consumption as a variable cost rather assuming as a fixed cost.
- ❖ Reduce energy cost through improved energy efficiency and energy management control - Waste Avoidance, Product and Service Cost, Budget Allocation & Load Management.
- ❖ Calculation of transmission and distribution losses within the plant. Location wise energy consumption difference.
- ❖ Production Vs Energy Consumption Reports. Reduce Specific Energy Consumption.
- ❖ Easy Feeder Information Management.
- ❖ Easy User Management, Task Scheduler, Plant load Factor Indication
- ❖ Maximum Demand identification
- ❖ Power Factor Correction and Improvements

Marc (Cloud) specifications

- Next Generation IIoT data analytics platform for configuration of all parameters of WAGES (Water, Air, Gas, Electric & Steam) over RS485 Modbus.
- Node Base Licence with easy to add-on.
- Included Mobile App for Android & iOS Devices on Google Play Store & Apple App Store.
- Parameter & Device agnostics platform.
- Multi-Language - User Settable.
- Alarms & Notification - User settable SMS & email notification & alarms.
- Reports in Excel & pdf format, along with user-configurable excel report.
- Real-time data visualization - Analog, Digital, Graphical, Network & Tabular view.
- Multiple User-specific user-configurable dashboards with public and private view lock
- Multi Licence with different authorization (User & Admin)
- Unrestricted parameter logging of energy meter.
- Network visualization & Analysis - Graphical & SCADA view visualization & network health visualization.
- Next Generation data analytics engine :
 - A. Trend report at the interval: Raw data, 15 min, Hourly & Daily with user-selectable Duration: Day, Week, Month, Year & Custom.
 - B. Consumption report for Single Node multi-parameter & Multi-Node Single Parameter at the interval: Raw data, 15 min, Hourly & Daily with user-selectable Duration: Day, Week, Month, Year & Custom.
 - C. Compare reports on one click for selected configuration of trend report & Consumption report.
 - D. Time slice report of the nodes as per the shift setting for section level / Plant level. (Location / Sub-location)
 - E. Customized excel report format for ready MIS reporting with auto mailing facility to multiple users.

- Add-on assets monitoring applications like Transformer monitoring, Solar Power Generation monitoring, OEE, SCADA, weather, Power Factor & many more.
- Finance dashboard to monitor the performance of the individual asset.
- Users can build custom code on top of the platform by the use and access of API.
- RS485 Gateway with in-build LAN & GSM based communication channel to Cloud Server to connect 30 devices.
- Grouping feature for visualization of nodes
- Customization arithmetic equation
- Display unit management feature to correct multiplication factor
- Module to view data volume and sampling
- Full User admin
- Email if users log on from different PC
- OPT SMS for mobile application registration for security
- Over the air configuration of the gateway
- Auto mail & SMS to the user to inform off status of Node.
- Summary view of the plant -- Total configured Nodes, Total Connected Nodes, Total connected Gateways,
- Total User, Total Locations.
- Encrypted data transfer

Network Architecture



marc (Desktop) specifications

- Next Generation data analytics platform for configuration of all parameters of WAGES (Water, Air, Gas, Electric & Steam) over RS485 / Ethernet.
- Node Base Licence with easy to add-on.
- Open source Cassandra database.
- Parameter & Device agnostics platform.
- Multi-Language - User Settable.
- Alarms & Notification - User settable SMS & email notification & alarms.
- Reports in Excel & pdf format, along with user-configurable excel report.
- Real-time data visualization - Analog, Digital, Graphical, Network & Tabular view.
- Multi Licence with different authorization (User & Admin)
- Unrestricted parameter logging of energy meter.
- Network visualization & Analysis - Graphical & SCADA view visualization & network health visualization.
- Next Generation data analytics engine :
 - A. Trend report at interval : Raw data ,15 min,Hourly & Daily with user selectable Duration : Day , Week , Month, Year & Custom.
 - B. Consumption report for Single Node multi parameter & Multi Node Single Parameter at interval : Raw data,15 min, Hourly & Daily with user-selectable Duration: Day, Week, Month, Year & Custom.
 - C. Compare reports on one click for a selected report for the cumulative parameter.
 - D. Shift Consumption report of the nodes as per the shift setting for section level / Plant level. (Location / Sub-location). Same report used to get consumption as per the TOD.
 - E. Customized excel report format for ready MIS reporting with auto mailing facility to multiple users.
 - F. All Node Consumption report to get the report of the cumulative parameters of all nodes.
 - G. One Day reading report to get the report of the cumulative parameters of grouped nodes.
 - H. Pie chart report to get the distribution pattern of consumption of cumulative parameter.
- RS485 Gateway/ Converter with in-build LAN & GSM based communication channel to Cloud Server to connect 30 devices.
- Grouping feature for visualization of nodes
- Customization arithmetic equation
- Display unit management feature to correct multiplication factor
- Full User admin
- Over the air configuration of gateway/Converter
- On-line auto up-gradation of Software (marc logger & viewer).
- Authenticated login & Logout of marc.energy.
- Encrypted data transmission.
- Role-based user based Authenticated login & Log-off of marc.energy.
- Role-Based Access Control (RBAC).

At Rishabh / ESL we use new-generation NoSQL databases over legacy old SQL(Relational) databases.

Question: **Why No SQL is BETTER than SQL Databases for Time Series Data?**

Answer : <https://www.datastax.com/nosql-databases>

Relational Database means SQL, MySQL, MS SQL & other

<https://db-engines.com/en/ranking/relational+dbms>

No SQL database means Cassandra, HBase, Microsoft Azure Cosmos DB & other.

<https://db-engines.com/en/ranking/wide+column+store>

Rishabh highly recommends using a NoSQL database for the energy management application.

Question: Why Rishabh / ESL are using Cassandra Database?

Answer: **Cassandra is the top-rated no SQL database for times series (time stamped) data and is used by more than 40 fortune 100 companies data analytics**

<https://db-engines.com/en/ranking/wide+column+store>

Cassandra is Top database in wide column store (No SQL)

Name	Cassandra		
Description	Wide-column store based on ideas of BigTable and DynamoDB		
Primary database model	Wide column store		
DB-Engines Ranking	Score	119.58	
Trend Chart	Rank	#1	Wide column stores
Website	cassandra.apache.org		
Technical documentation	cassandra.apache.org/doc/latest		
Developer	Apache Software Foundation		
Initial release	2008		
Current release	3.11.2, February 2018		
License	Open Source		
Implementation of language	Java		
Server operating systems	BSD , Linux , OS X & Windows		
Data scheme	schema-free		
APIs and other access methods	Proprietary protocol		

	Thrift
Supported programming languages	C#, C++, Java, JavaScript, Clojure, Haskell, Erlang
	Go, Perl, PHP, Python, Ruby & Scala
User concepts	Access rights for users can be defined per object

Cassandra	
Specific characteristics	Apache Cassandra is the leading NoSQL, distributed database management system, well suited for hybrid and multi-cloud environments. It drives many of today's modern business applications by offering continuous availability, high scalability and performance, strong security, and operational simplicity while lowering the overall cost of ownership.
Competitive advantages	No single point of failure ensures 100% availability. Operational simplicity for the lowest total cost of ownership. Best-in-class scalability and performance of NoSQL platforms.
Typical application scenarios	Internet of Things (IoT), fraud detection applications, recommendation engines, product catalogues and playlists and messaging applications.
Key customers	Apple, Netflix, Uber, ING, Intuit, Fidelity, NY Times, Outbrain, BazaarVoice, Best Buy, Comcast, eBay, Hulu, Sky, Pearson Education, Walmart, Microsoft, Macy's, McDonald's, Macquarie Bank.
Market metrics	Cassandra is used by 40% of the Fortune 100.

Advantage & Benefit of OPC-UA

- OPC-UA is the successor to OPC-DA. It has many benefits, one of the most prominent being that it is platform agnostic. There are SDKs available in a multitude of languages and OPC-UA can be implemented on anything from a tiny embedded to a device running Linux, to a desktop running Windows, or a server running the OS of your choice.
- OPC UA is not only for OPC-DA but for all OPC Classic (DA, AE, HDA, etc). OPC Classic uses DCOM communication for Client-Server connection. DCOM is for Windows OS. So, OPC UA is a new technology which does not rely on DCOM communication and is a platform (OS), independent. OPC UA supports Linux as well. OPC DA communication medium is COM/DCOM. Where is OPC UA about TCP/IP and/or HTTPS?

- OPC DA is an older version of OPC specification. Where there was data modelling (not to a greater extent like OPC UA has). The only information which was transferred between server and client is VQT (Value Quality and Time). Whereas OPC UA has data and information Modelling, Along with VQT, there are many attributes/Properties which can be shared between the server and client about a variable (in simple example, Say describing what this variable doing. Which is the conversion formula used, whether the variable is accessible by user or not! to name a few).
- One of the limitations of OPC DA is its inadequate security, as in today's world security is the major issue because systems are more frequently attacked by some sophisticated viruses and malware and this security issue is solved in a higher version that is OPC UA.
- The only reason to use OPC-DA at this point in time is if you're connecting to a legacy product that only supports OPC-DA and cannot be replaced or upgraded.

SIX key features that OPC UA delivers to the end-users:

- Ease-of-use
- Plug-and-play
- High reliability and redundancy
- Enhanced performance
- Multiplatform support
- Easy migration plan for existing OPC products to the OPC UA technology.

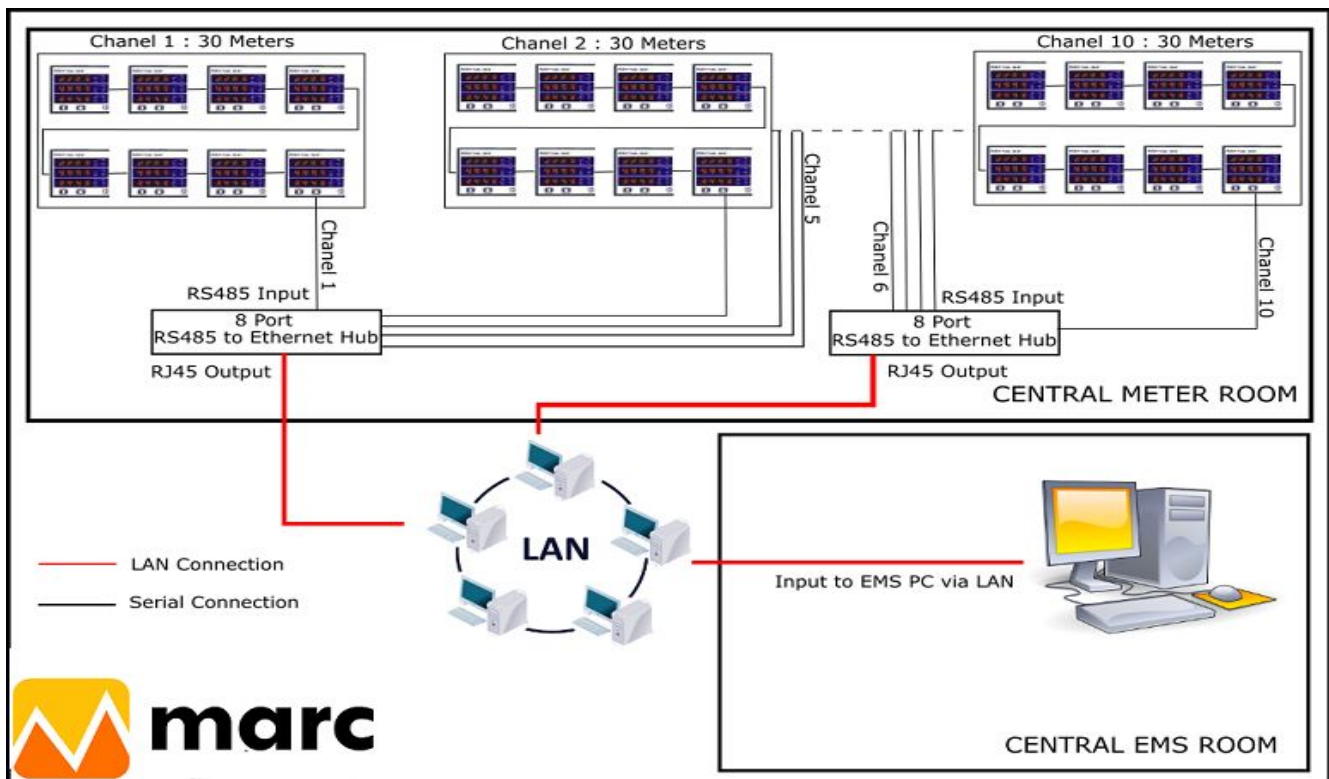
OPC-UA IN INDUSTRY 4.0

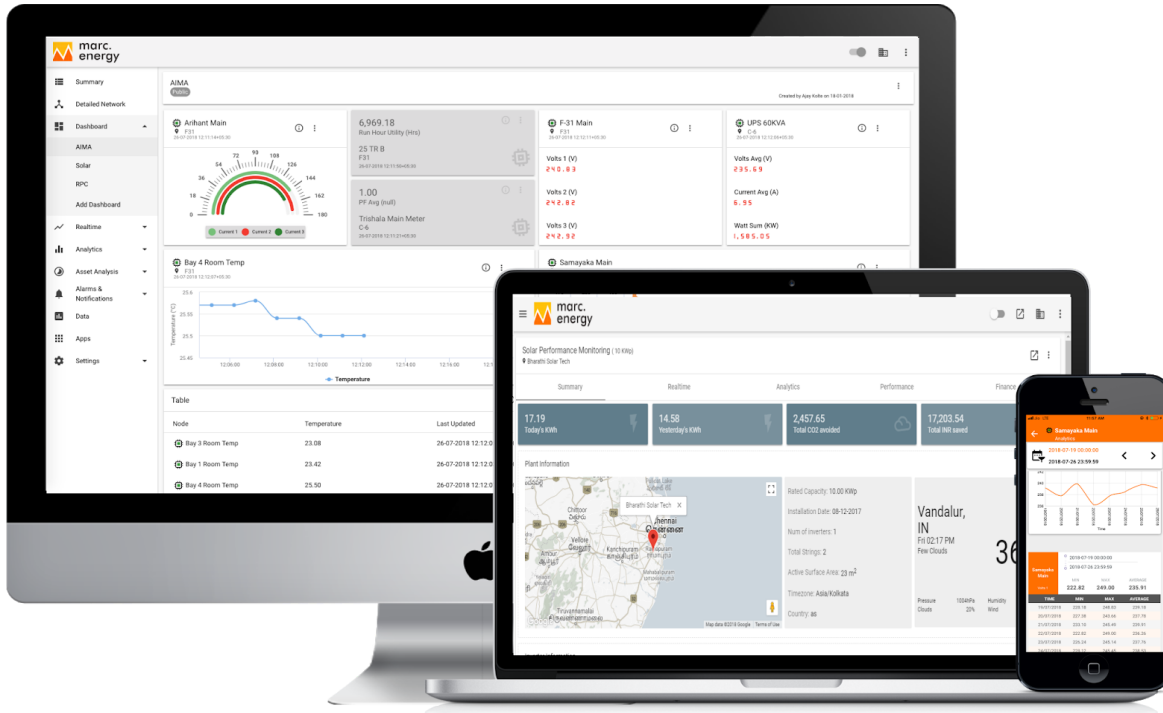
- As per revolution, Industrial 4.0 is the current trend for automation and manufacturing industries. It is nothing but a one step up, focusing on the field of cybersecurity, cloud computing and the industrial internet of things.
- This revolution brings a great challenge for the manufacturers which were using OPC DA or older versions in terms of security and slow communication speed with less innovation in their process.
- So it has been stated that there is no Industry 4.0 without OPC UA. The main challenge as per Industrial 4.0 and IIOT (Industrial Internet Of Things) is the secure, exchange of data its information between different devices, machines etc. across different industries which may or may not be located at the same place.
- As it is recommended by IEC standard, OPC UA is best-suited standard for communication in this revolution. It has also been said that OPC UA is not just a protocol, it is a whole IoT into one.

OPC UA: Platform Independence & Scalability



Network Architecture





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