Power System & Environment Monitoring (PSEM) Solution

Henry Huang (ENP China)

E-Mail: huangren@emersonnetwork.com.cn

Mobile: 86-13923728821

EMERSON
Network Power

Index

1. Architecture of PSEM
2. Site solution
3. Communication
4. Capacity
5. Management function
6. Application of PSEM
7. Roadmap

EMERSON
Network Power

Practical Problems

- **MSC/BSC**

  2% of sites have a severe disaster each year

  40% of disasters take 12 hours or longer time to be found out from sign to occur.

  60% of them can be identified and recovered within 24 hours.

- **BTS**

  65% of downtime or failures is caused by power facility problem.

  85% of failure take 12hours or longer time to be found out, almost via subscriber complaint, or routine inspection by maintenance team.

  80% of them take more than 24 hours to identify and recover on site.

Source: InformationWeek Research Business Continuity Survey

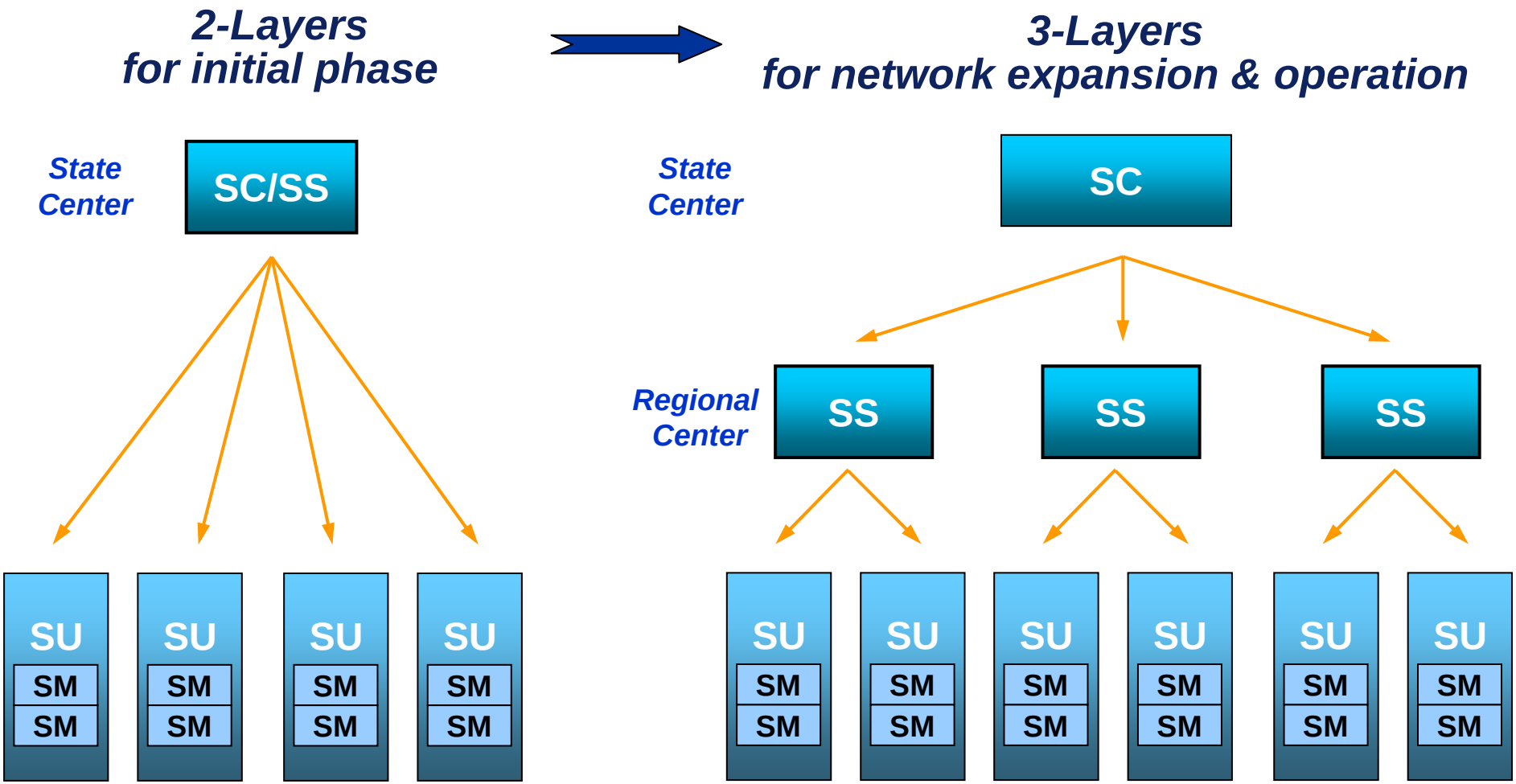
EMERSON Network Power

What We Can Do

- Monitor the operation status in real-time
- Response the emergency quickly
- Prevent disaster proactively
- Manage maintenance work-flow efficiently
- Integrate and unify various alarm systems
- Simplify statistics, plan and report
- Optimized design for telecommunication infrastructure
- Reduce operation cost

EMERSON
Network Power

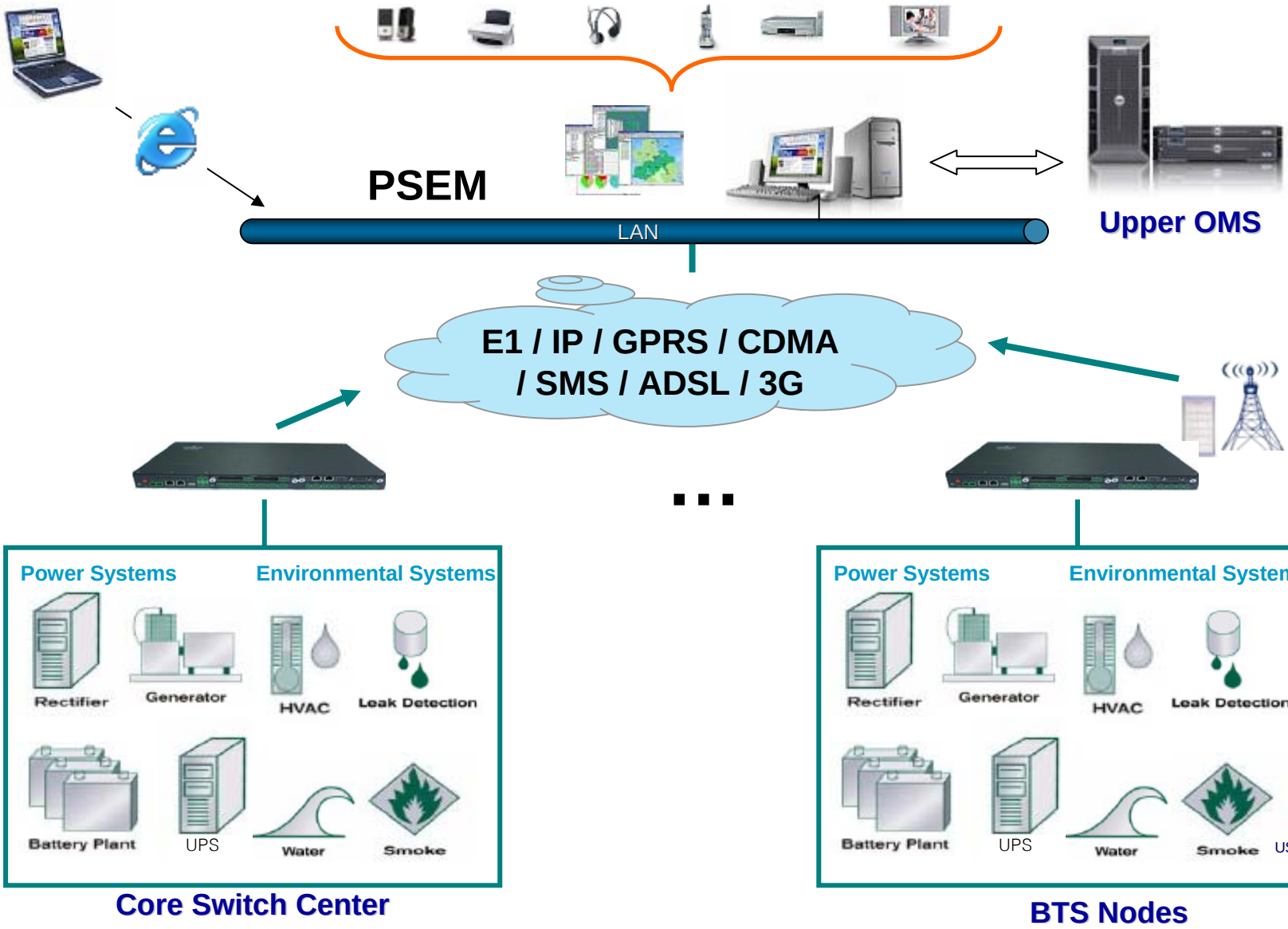
PSEM Architecture



SC: Supervision Center – Network Management and Operation Center
SS: Supervision station – Routine Maintenance Center
SU: Supervision Unit – MSC / Transmission / BTS sites
SM: Supervision Module

EMERSON
Network Power

PSEM Architecture

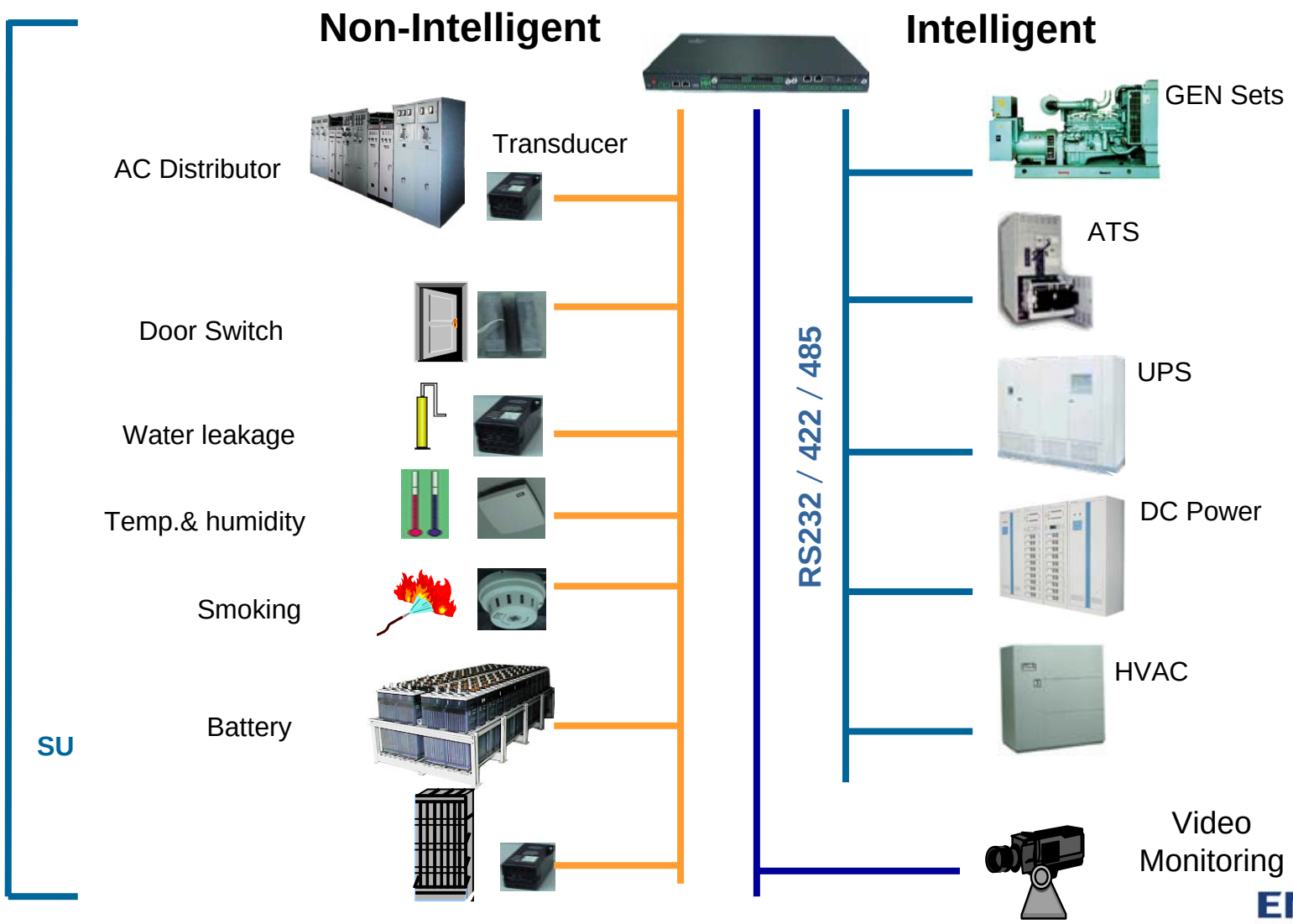


Index

1. Architecture of PSEM
2. Site solution
3. Communication
4. Capacity
5. Management function
6. Application of PSEM
7. Roadmap

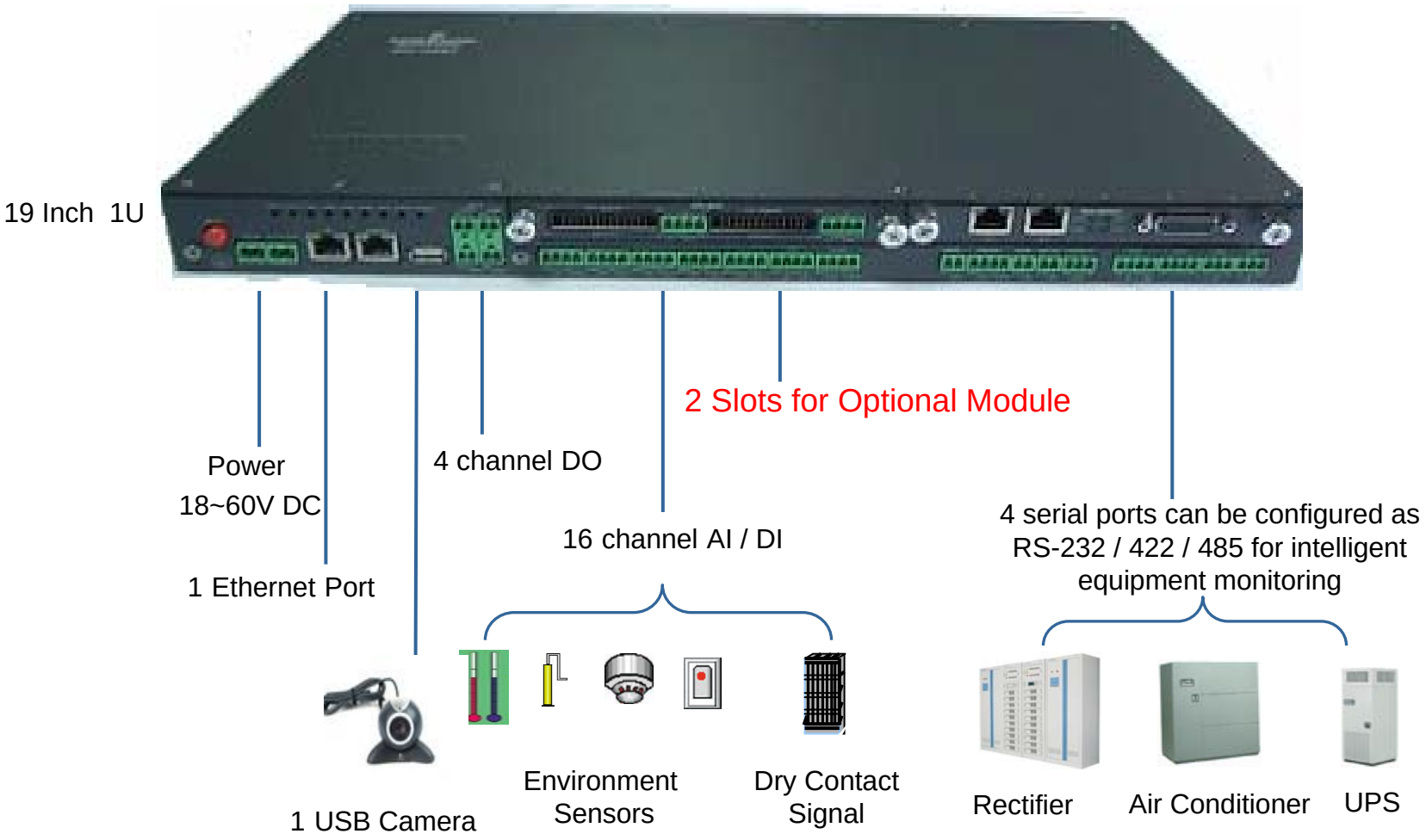
EMERSON
Network Power

Telecom Application



EMERSON
Network Power

Site Controller – IDU



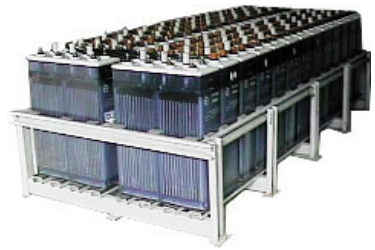
IDU: Integrated Data Unit processes all data from intelligent equipments and sensors.

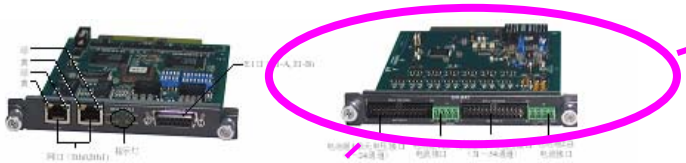
EMERSON Network Power

Optional Module for IDU-HOST

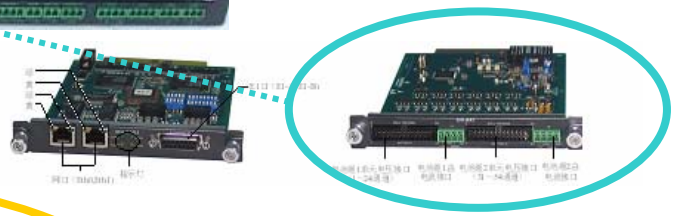
IDU-BAT module: Each battery monitoring module for 24/48 cells of battery. Can support 2V/6V/12V battery voltage signal.

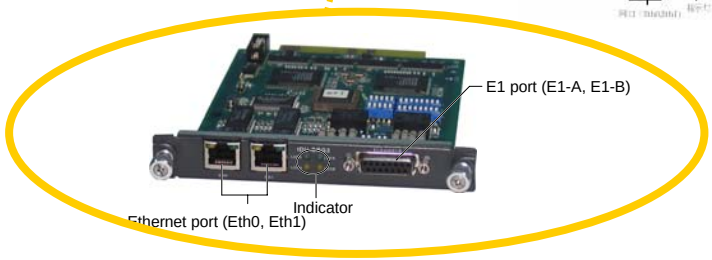
Battery





IDU-COM module: Each com module provides another 4 serial ports for intelligent equipment.





IDU-BRG module: Transmission function module for E1 transmission. Must be configured when using E1.

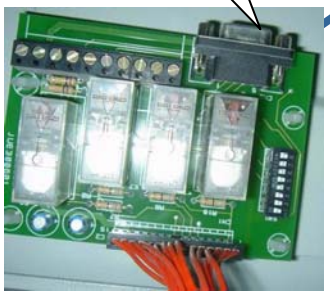
1. Only 2 optional modules can be configured in 1 IDU simultaneously.
2. Only 1 BAT module or COM module can be configured when using E1 for using 1 BRG module.

EMERSON
Network Power

Monitoring of Intelligent Equipment

IDU

RS232



RS422

RS485

UPS

DC Power

AC

IDU-Host has 4 serial ports, which is used to connect intelligent equipment into the system.

EMERSON
Network Power

Intelligent Equipment Supported

- **DC power:**

  Emerson (including legacy products from Ericsson, Huawei, Nortel, Marconi), Eltek, Delta(Ascom), PowerOne, Benning, Switchtec, Saft, Argus…

- **UPS:**

  ABB(APC), Liebert, Delta, Exide , MGE, Chloride…

- **Air conditioner:**

  Liebert (Hiross), RC, Atlas, AirFlow, Isovell, UN, DaiKin, Denco, Stulz, AireDale , Emicon …

- **Generators:**

  Caterpiler, Cummins, Wilson, Simpson, Galaxy, Detroit, Auto …

- **others:**

PSEM is able to monitor over 800 types of intelligent devices in addition to Emerson equipment.

Note: The protocol of 3rd part equipments shall be provided by Operator.

EMERSON Network Power

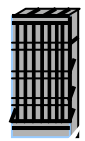
Monitoring of Non-Intelligent Equipment

IDU-BAT module : Battery monitoring module for 2 groups (48- cell volt. 2-current, 2-total volt.). Can be extended to 2 IDU-BAT modules for 4 groups in each IDU.

Battery

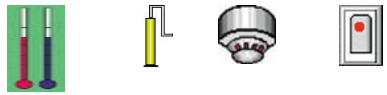
E1 / IP

IDU



Distribution HVAC Others

IDU-IO channel :
16 -channel AI, DI
4 - channel DO



Environment sensors

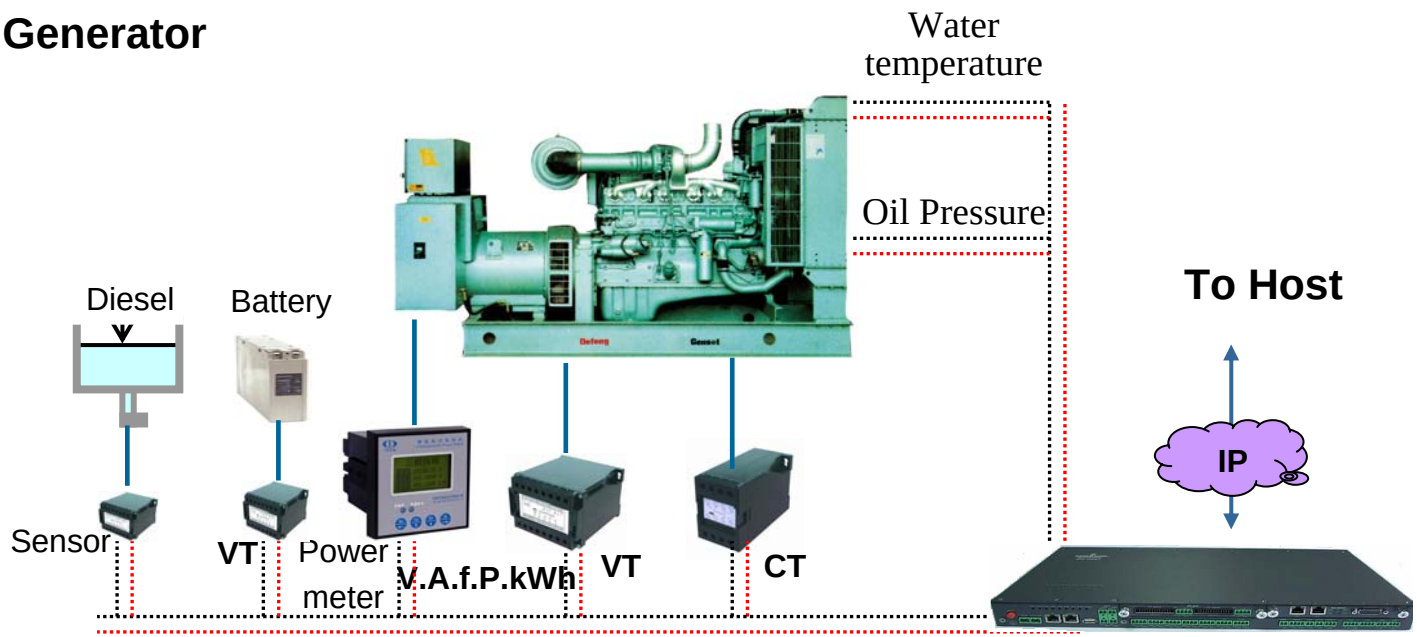
EMERSON
Network Power

Generator set

Intelligent Generator

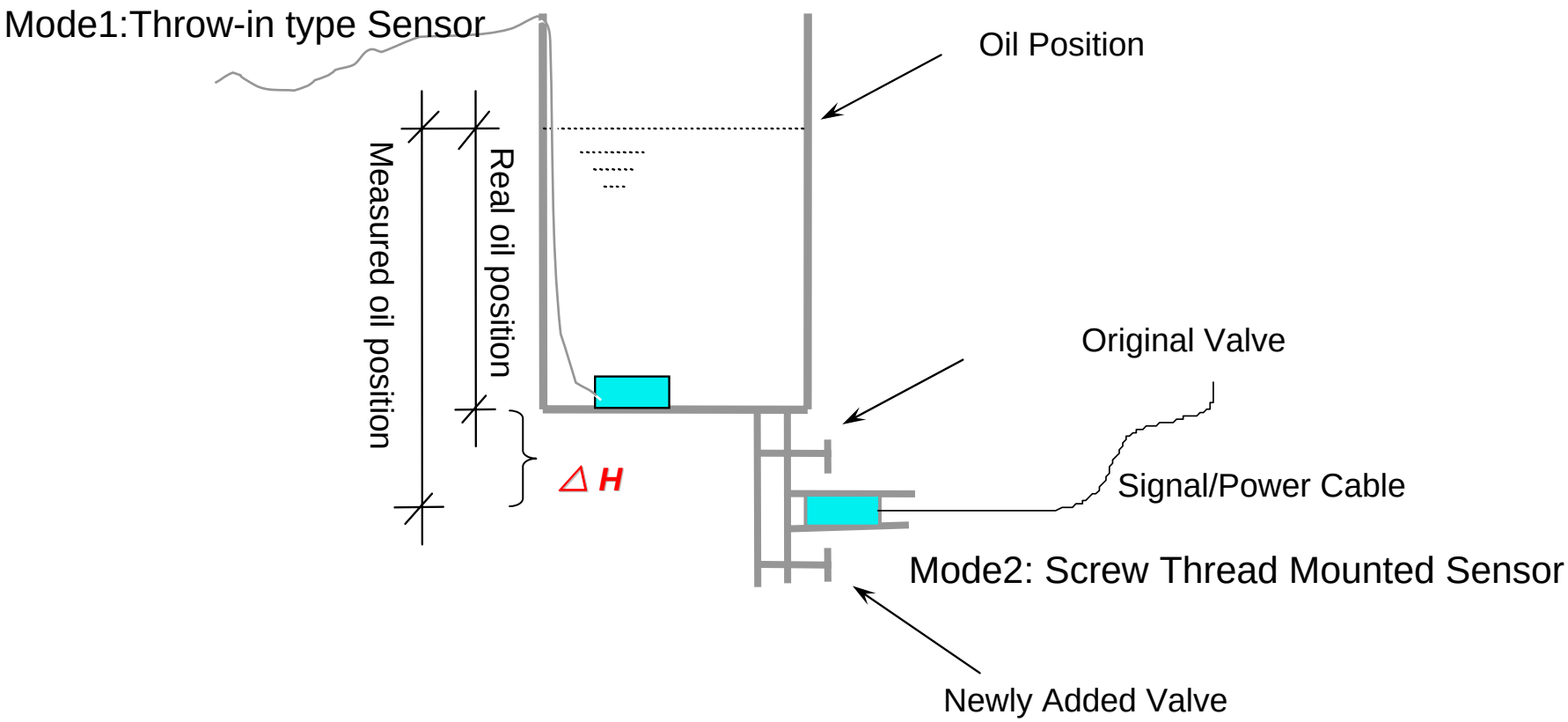
	Vendor
1	Caterpillar
2	Stamp Ford
3	Deutz Genepack

Non-Intelligent Generator



EMERSON Network Power

Diesel Level for Generator



$$H_{\text{Real oil position}} = H_{\text{Measured oil position}} - \Delta H$$

EMERSON
Network Power

Rectifier

Intelligent Rectifier

RS-232/422/485

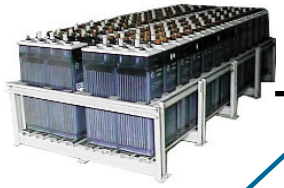
Interface card

IDU

To Host

	Vendor
1	Emerson
2	Ericson
3	Siemens
4	Power One
5	Saft - Nife
6	Benning
7	SPS-2180
8	Alcatel
9	Harrif

Non-Intelligent Rectifier



Shunt

Power meter

VT

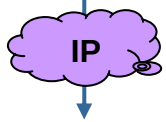
CT

V.A.f.P.kWh

VT

CT

To Host



EMERSON
Network Power

PAC

Intelligent PAC

RS-232/422/485

IDU

To Host

Interface card

	Vendor
1	Liebert
2	RC
3	Hirros

Non-Intelligent PAC

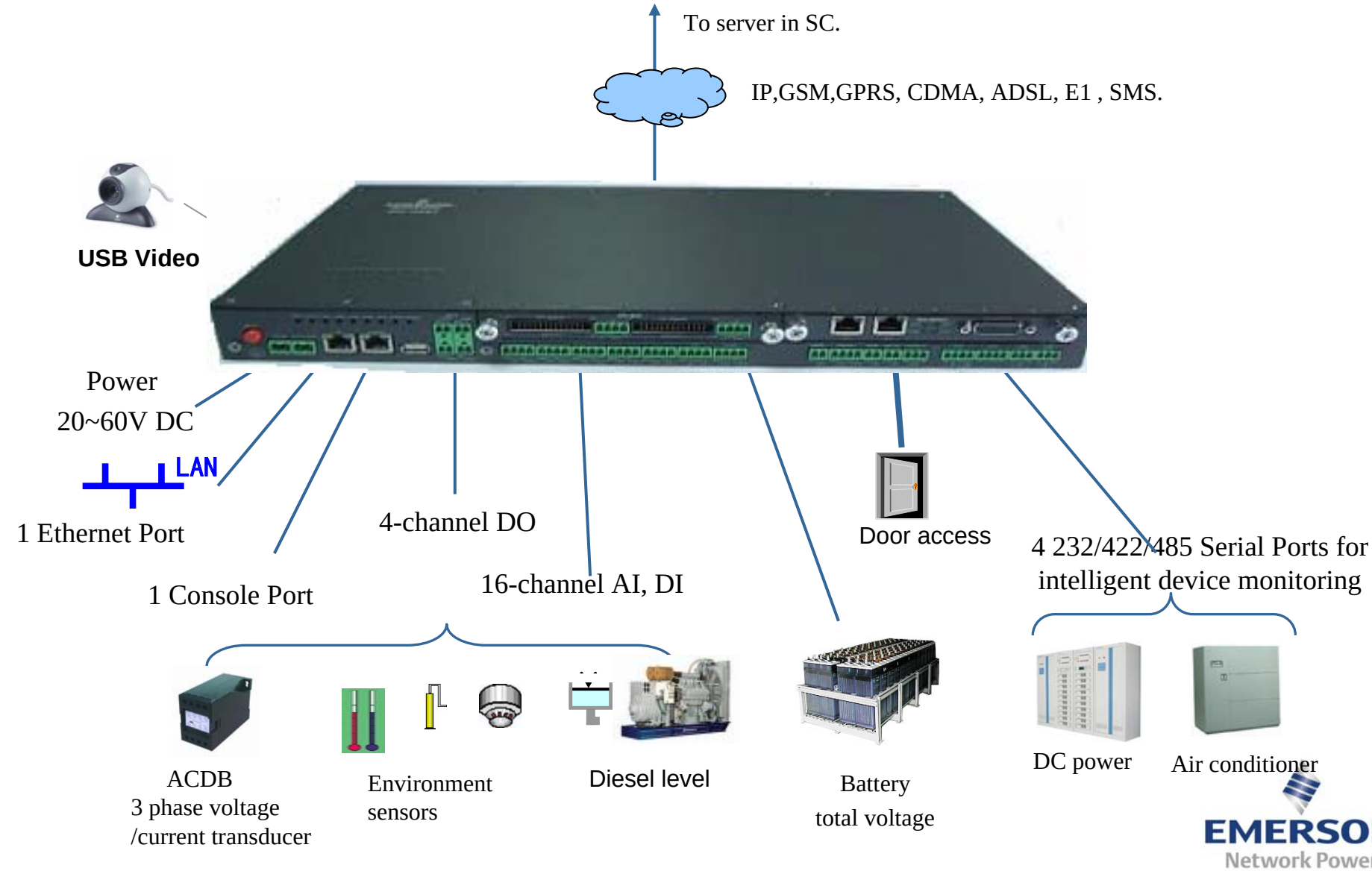
Temperature
Humidity sensor

To Host

IP

EMERSON
Network Power

BTS solution



EMERSON
Network Power

IDU Family

✓**IDU-Host**

- 16-channel DI/AI inputs
- 4 relay outputs
- 4 serial ports, maximum 8 with an IDU-COM
- Monitoring 1 or 2 battery strings with a IDU-BAT
- Ethernet communication
- 2 extended slots all kinds of functional card
- 1 USB port
- I2C interface for low cost temperature & humidity sensor connecting

✓**IPLU1202**

- 6 General IO
- 1 Battery String Total Voltage
- 1 DO
- 1 I2C Temperature and Humidity Sensor Interface
- 2 Intelligent Serial Ports
- Ethernet Communication
- E1 Communication
- 1 USB Video

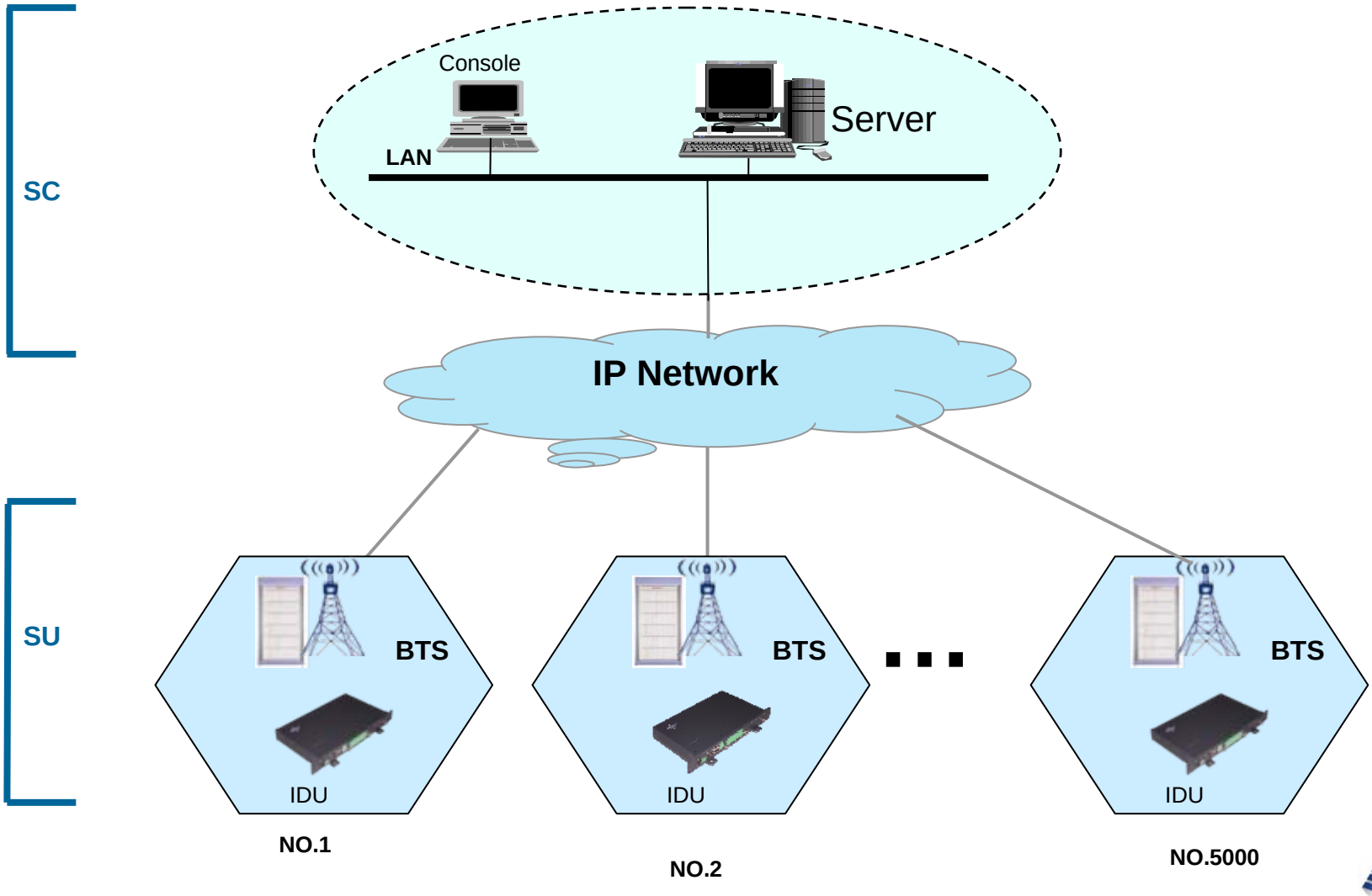
EMERSON
Network Power

Index

1. Architecture of PSEM
2. Site solution
3. Communication
4. Capacity
5. Management function
6. Application of PSEM
7. Roadmap

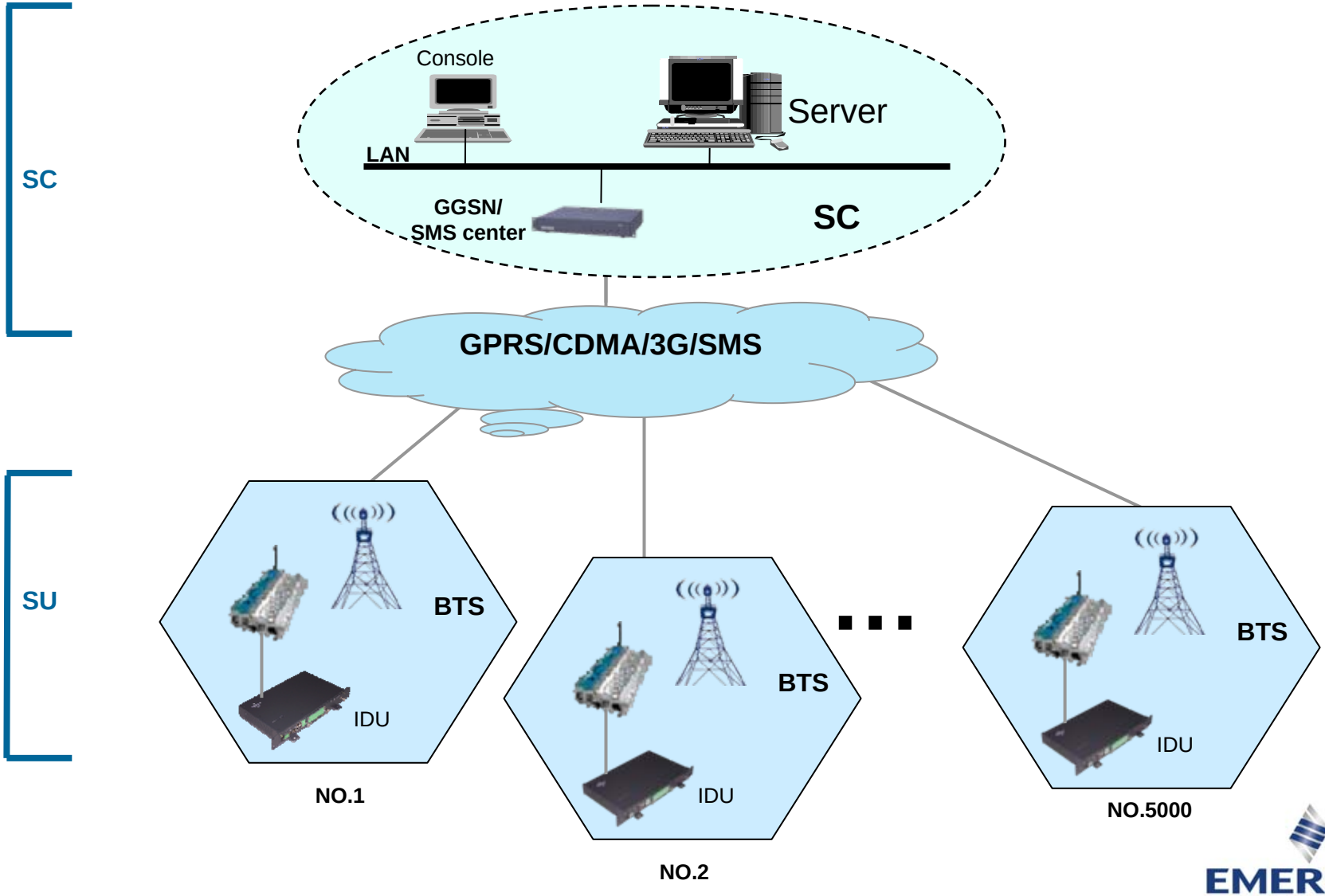
EMERSON
Network Power

Communication ---from BTS to SC via IP Network



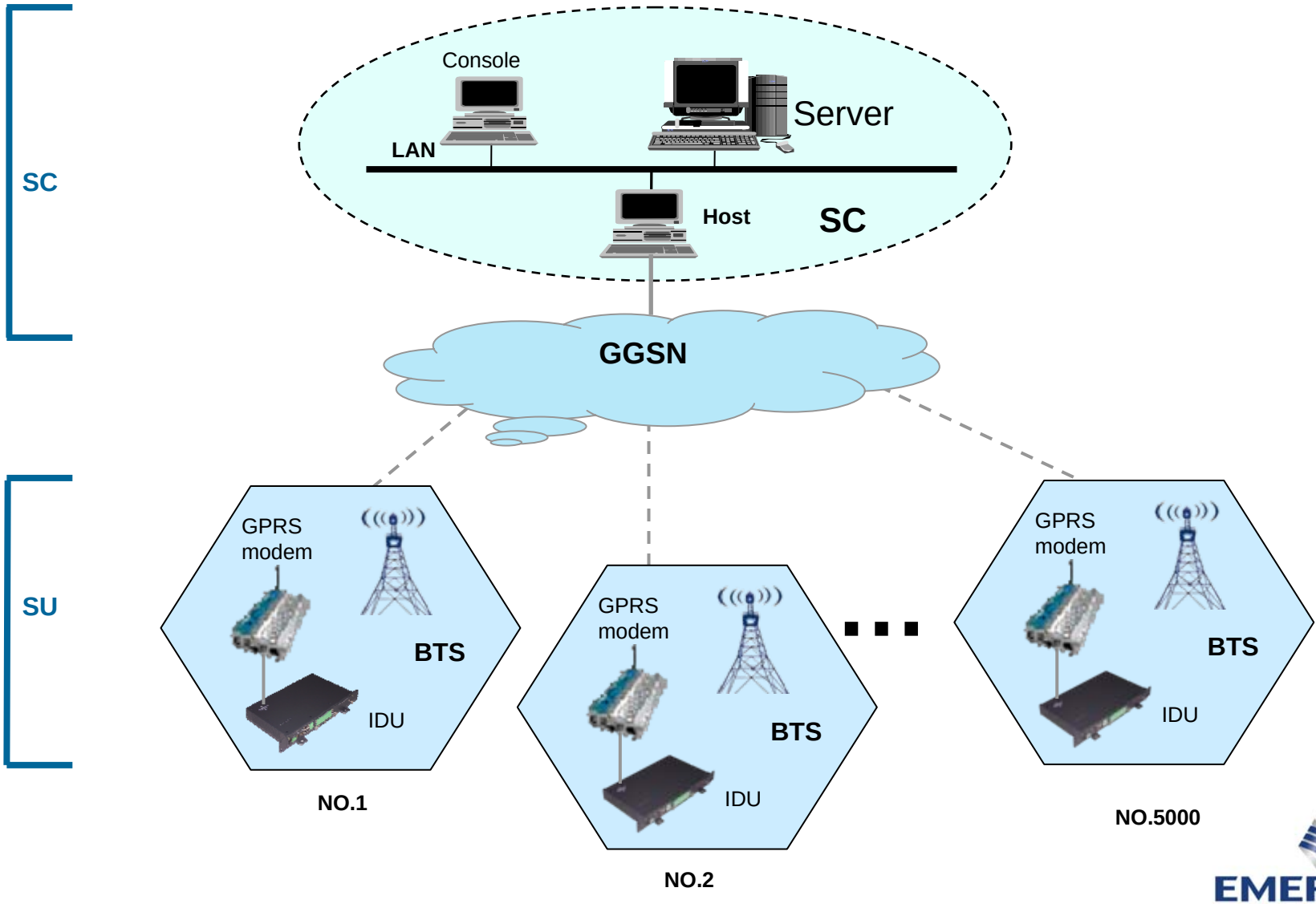
EMERSON
Network Power

Communication --- via Wireless



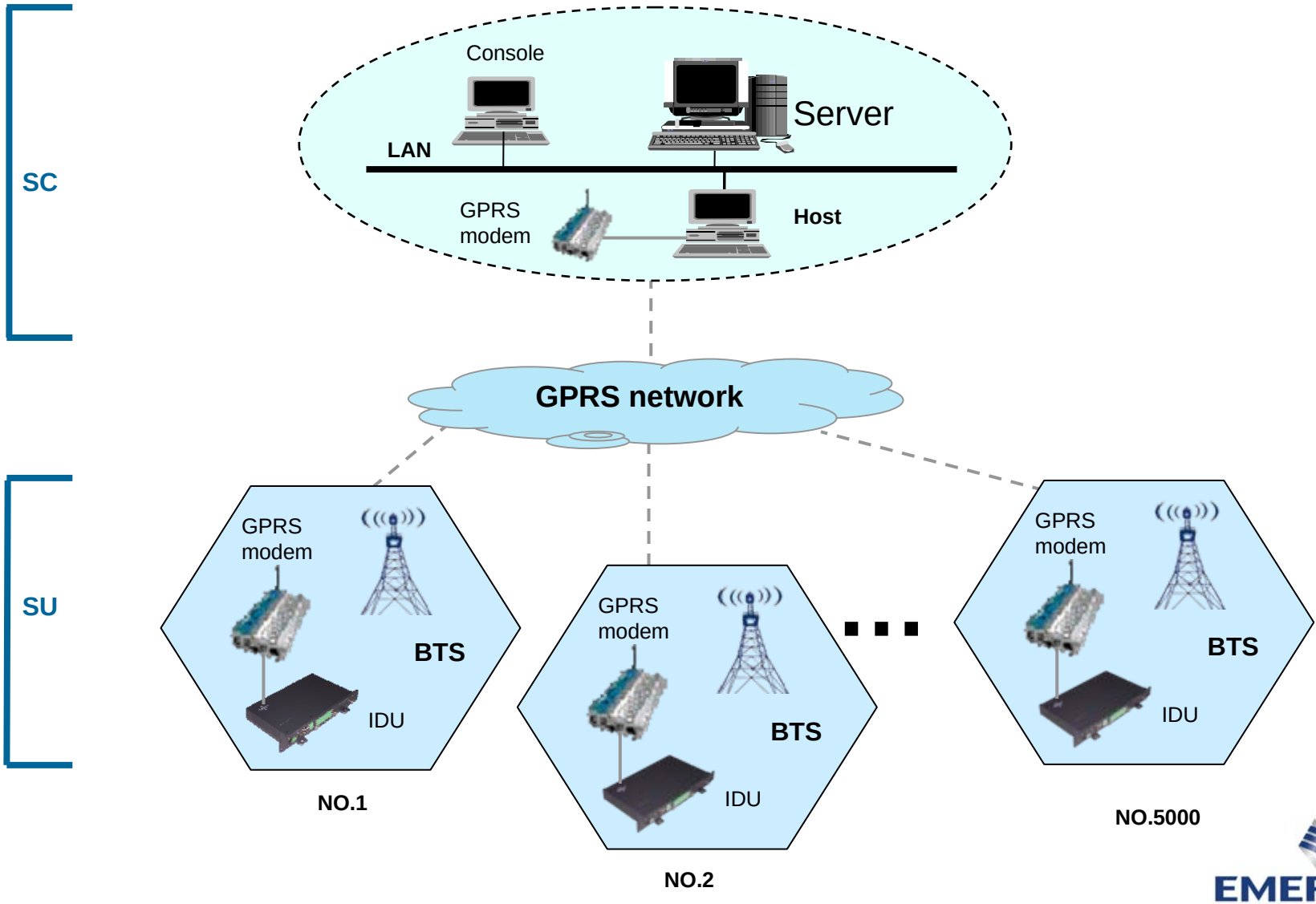
EMERSON
Network Power

Communication 1 --- via GPRS



EMERSON
Network Power

Communication 2 --- via GPRS



EMERSON
Network Power

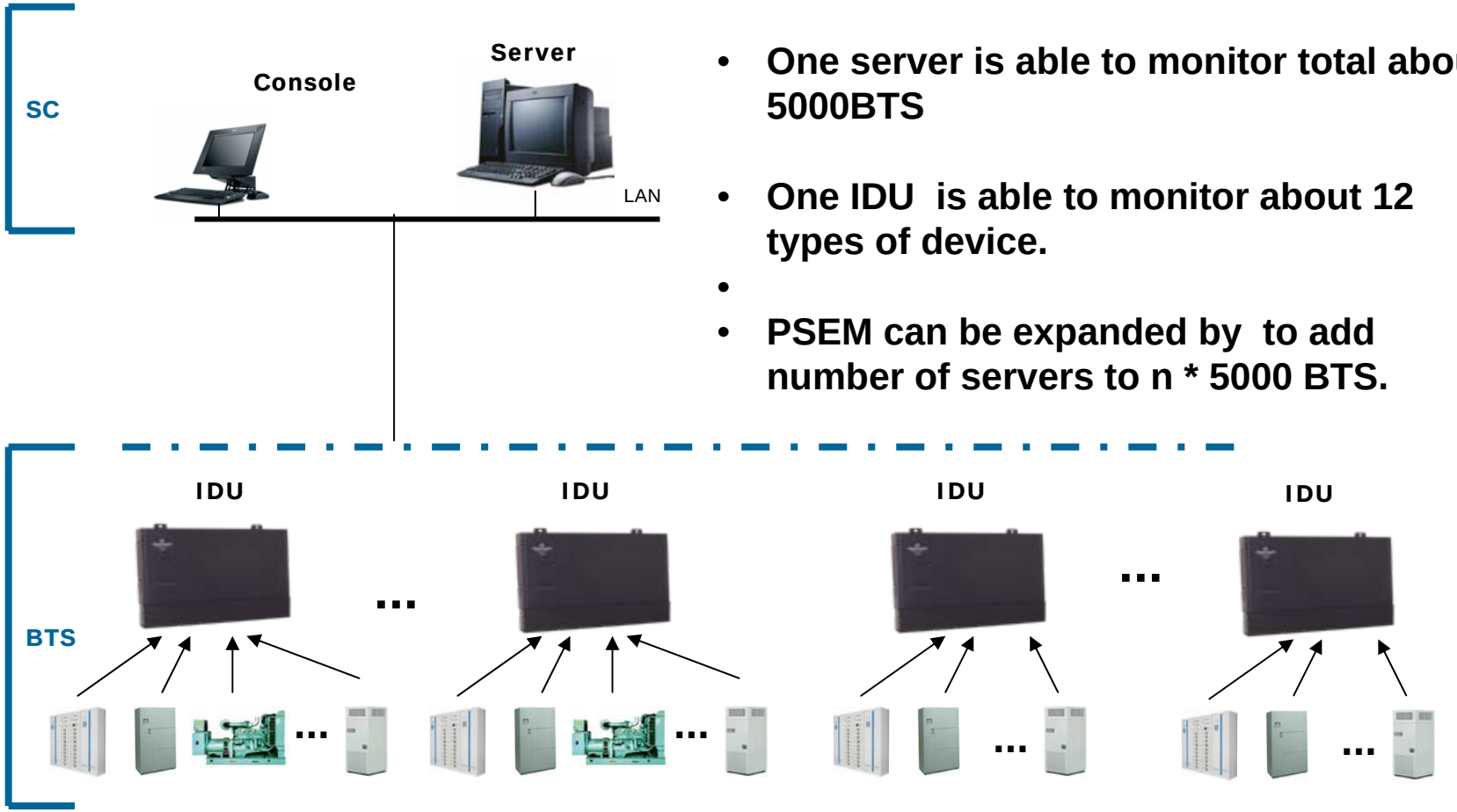
Index

1. Architecture of PSEM
2. Site solution
3. Communication

4. Management function
5. Application of PSEM
6. Roadmap

EMERSON
Network Power

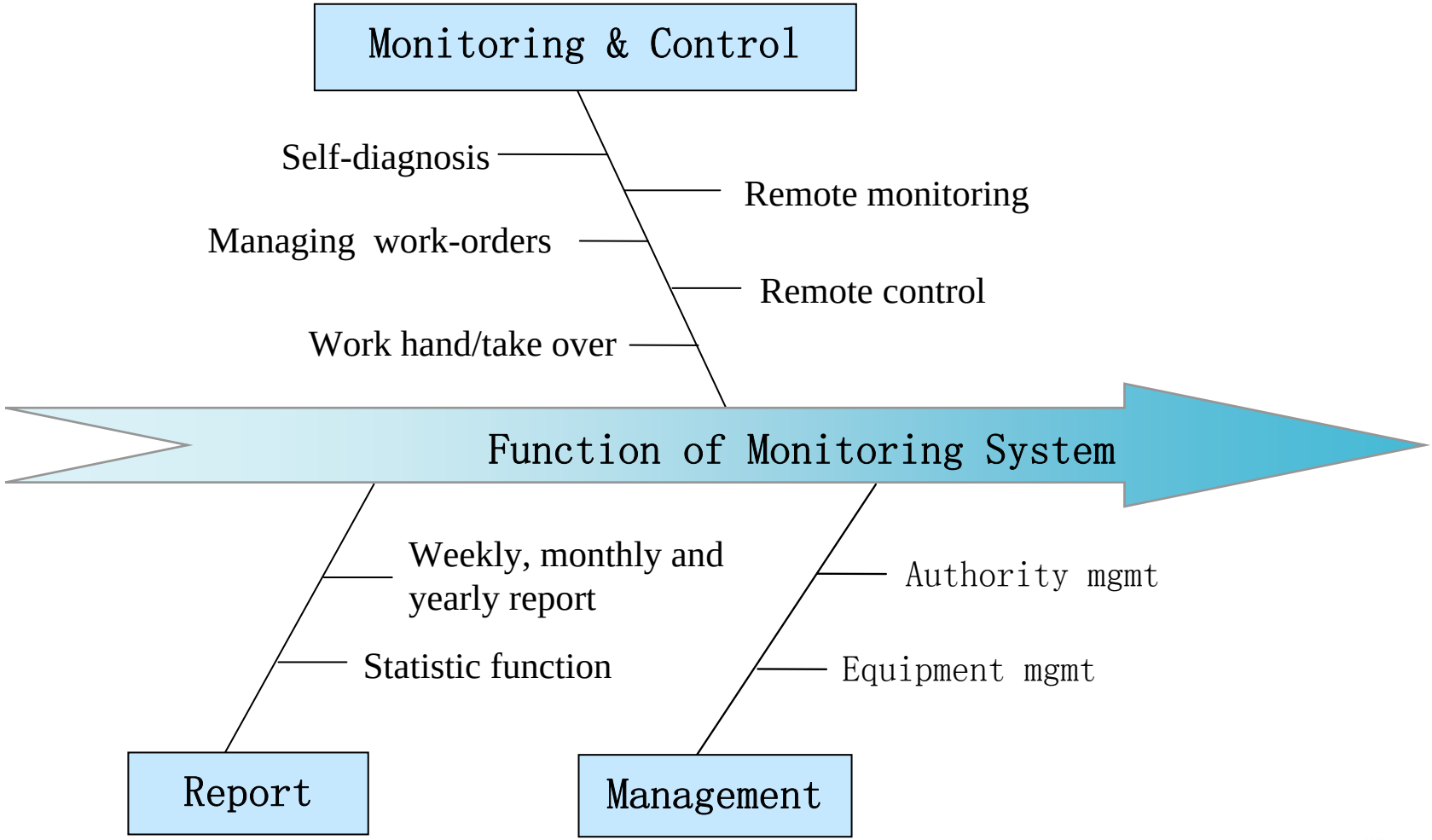
Capacity of PSEM Using IDU



- One server is able to monitor total about 5000BTS
- One IDU is able to monitor about 12 types of device.
-
- PSEM can be expanded by to add number of servers to n * 5000 BTS.

EMERSON
Network Power

Functions of Software

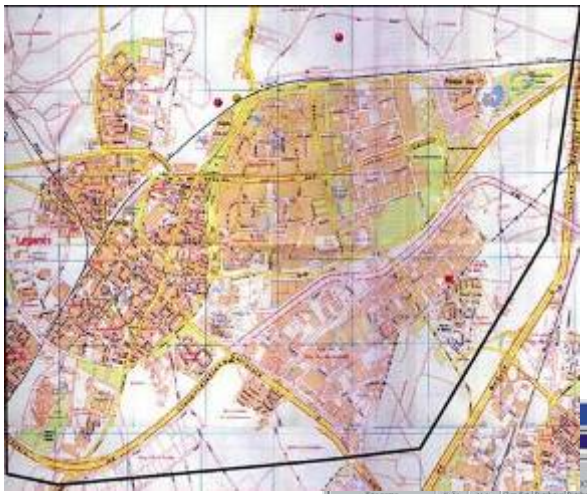


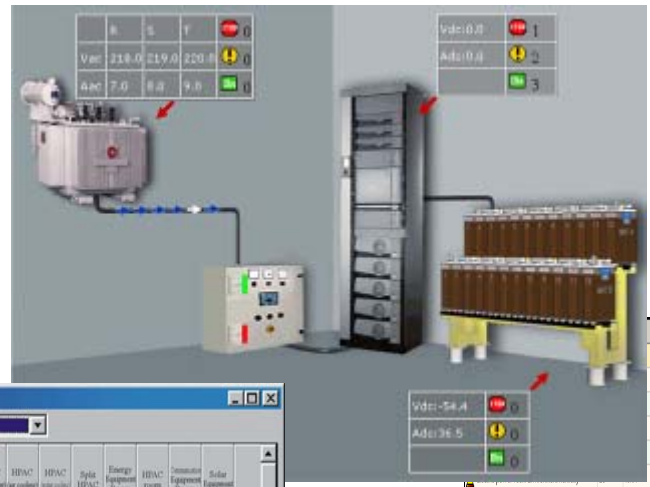
EMERSON
Network Power

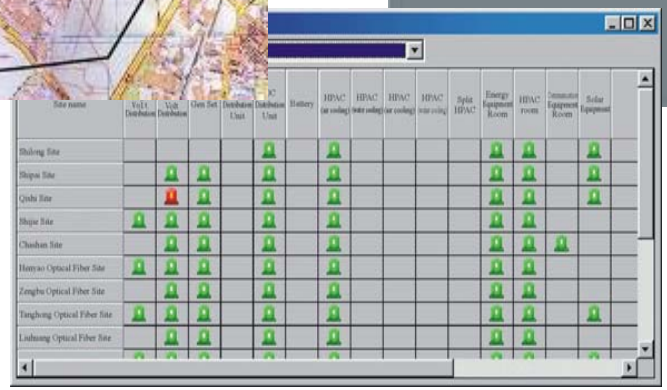
Functions of PSEM software

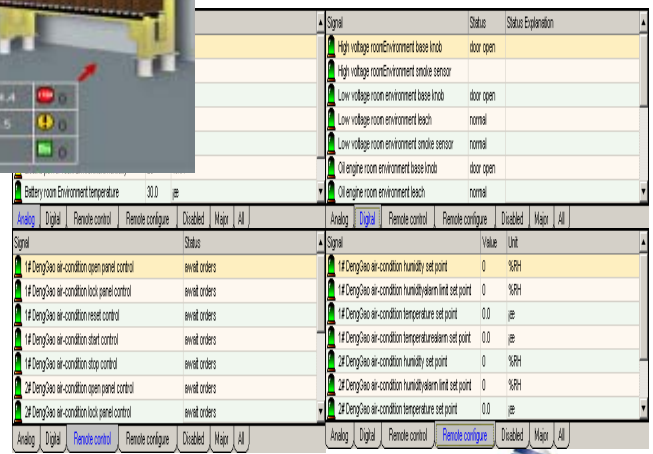
Electronic site map and free navigation

Simply and exactly remote on- line configuration, monitoring and trouble ticketing









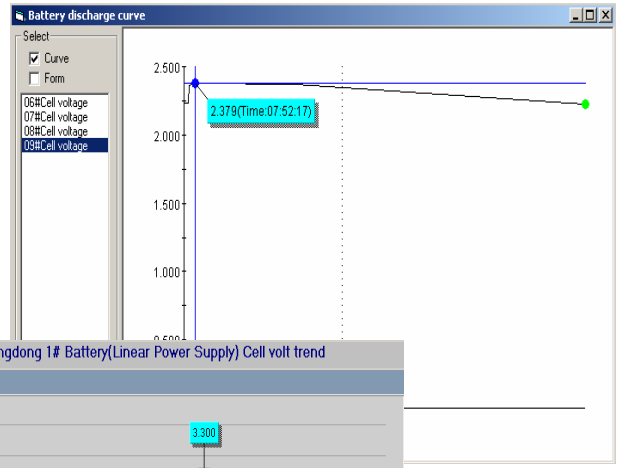
Real time monitor all sites and equipments simultaneously

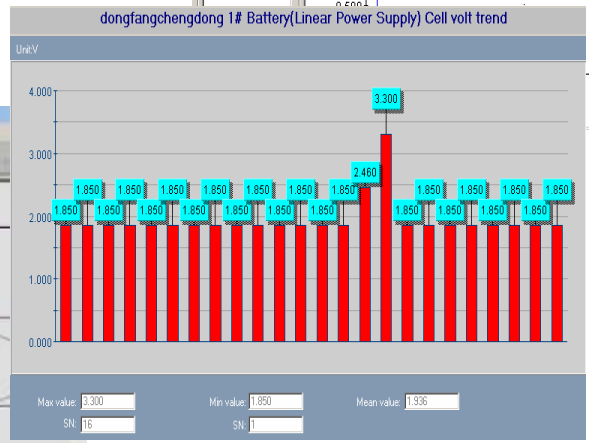
EMERSON
Network Power

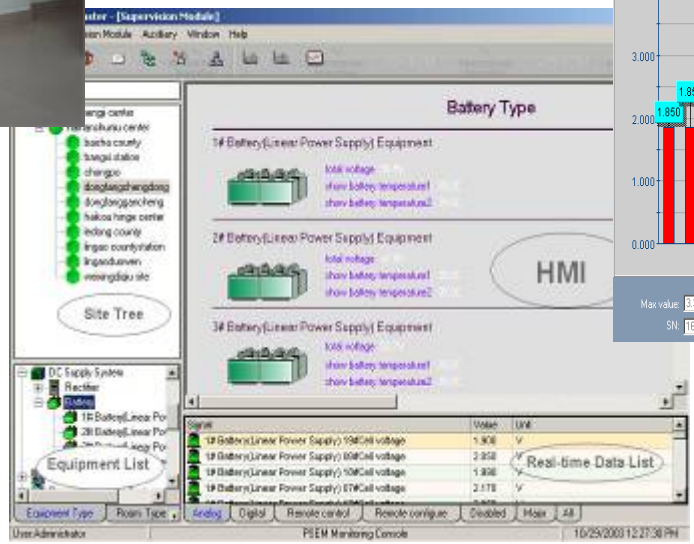
Functions of PSEM software

Advanced battery management

Battery capacity
Battery backup time calculation
Battery charge / discharge test
Lag-behind battery checking
Battery cable anti-theft







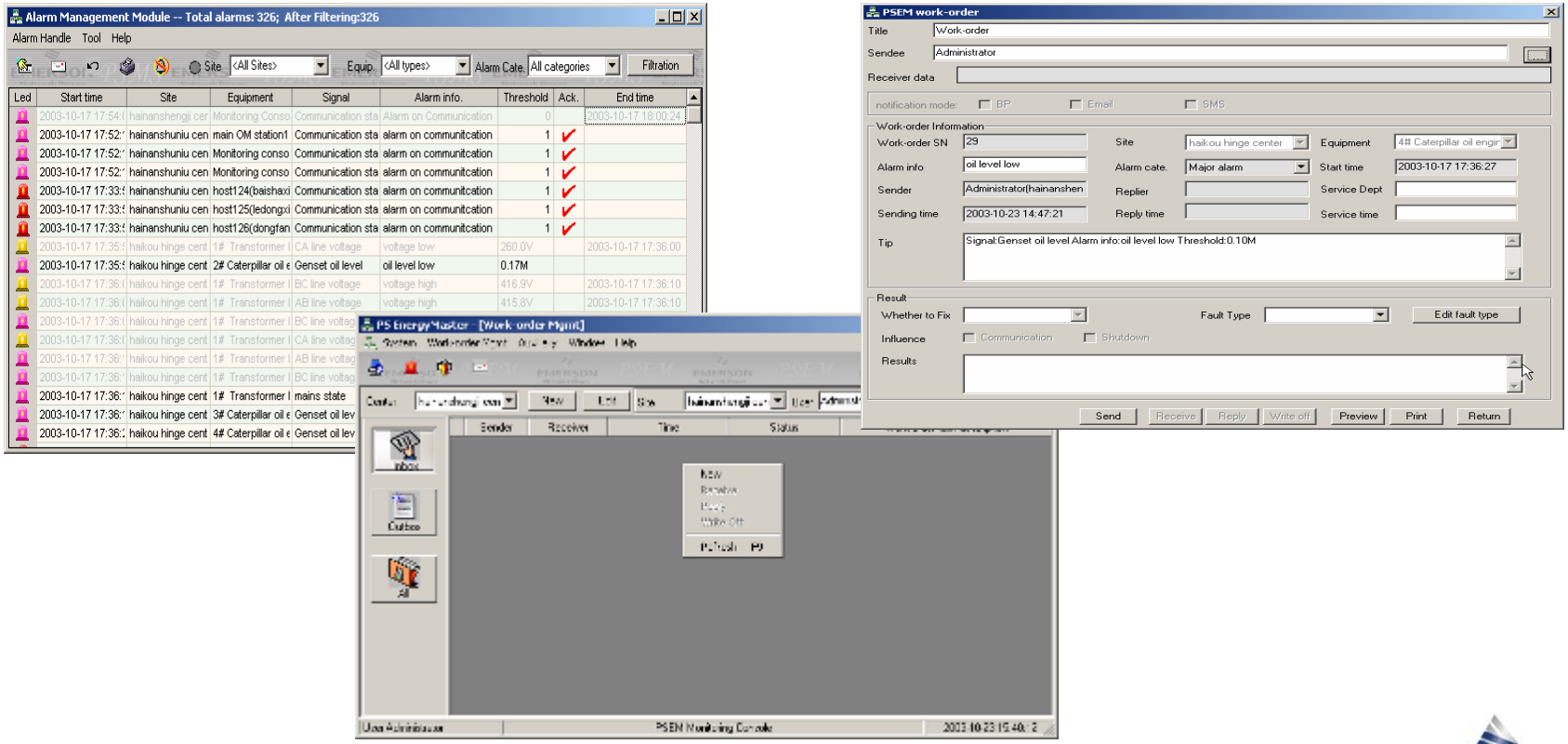
Outage power allocation such as intelligent distribution of Gen-sets when input power outage happens

EMERSON
Network Power

Functions of PSEM software

Facility trouble shooting expert system

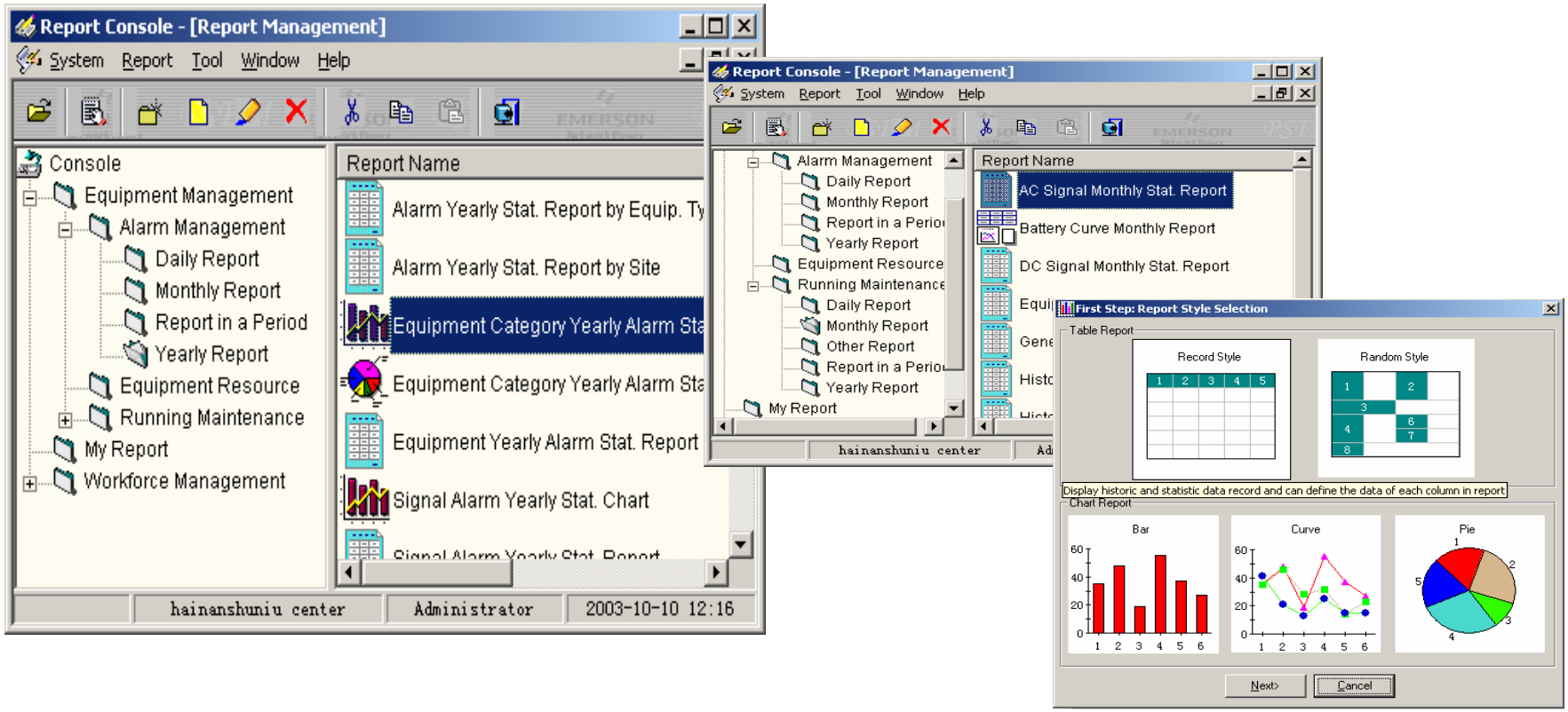
3rd party maintenance compliance management



PSEM can smoothly connect to 3rd party work flow trouble ticketing system

EMERSON Network Power

Functions of PSEM



Preventive/predictive maintenance by data statistics and analysis

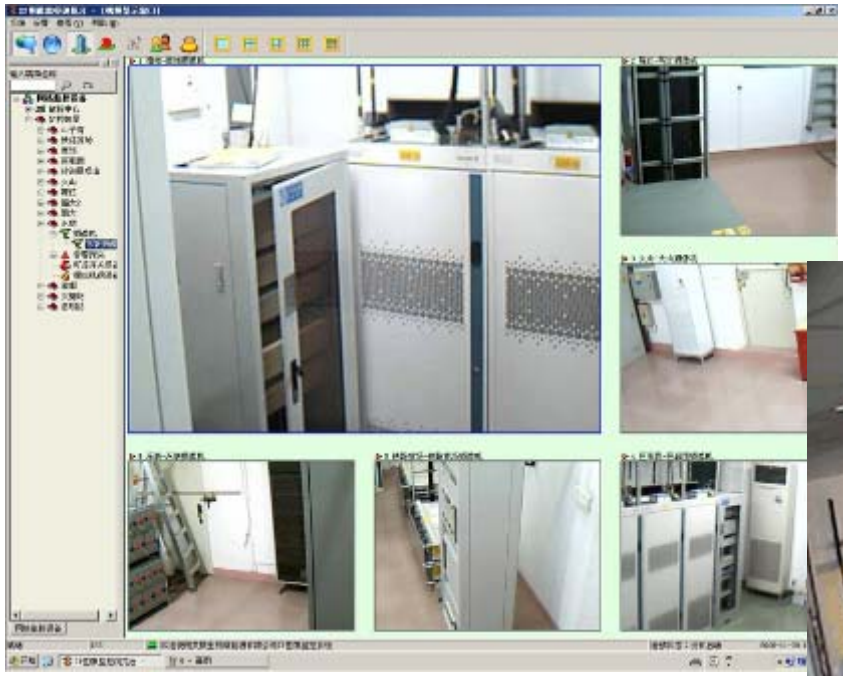
Equipment life cycle and asset management

Efficient tools for backup power system / network optimization

EMERSON
Network Power

Functions of PSEM

Economic video system for theft control and personnel compliance management

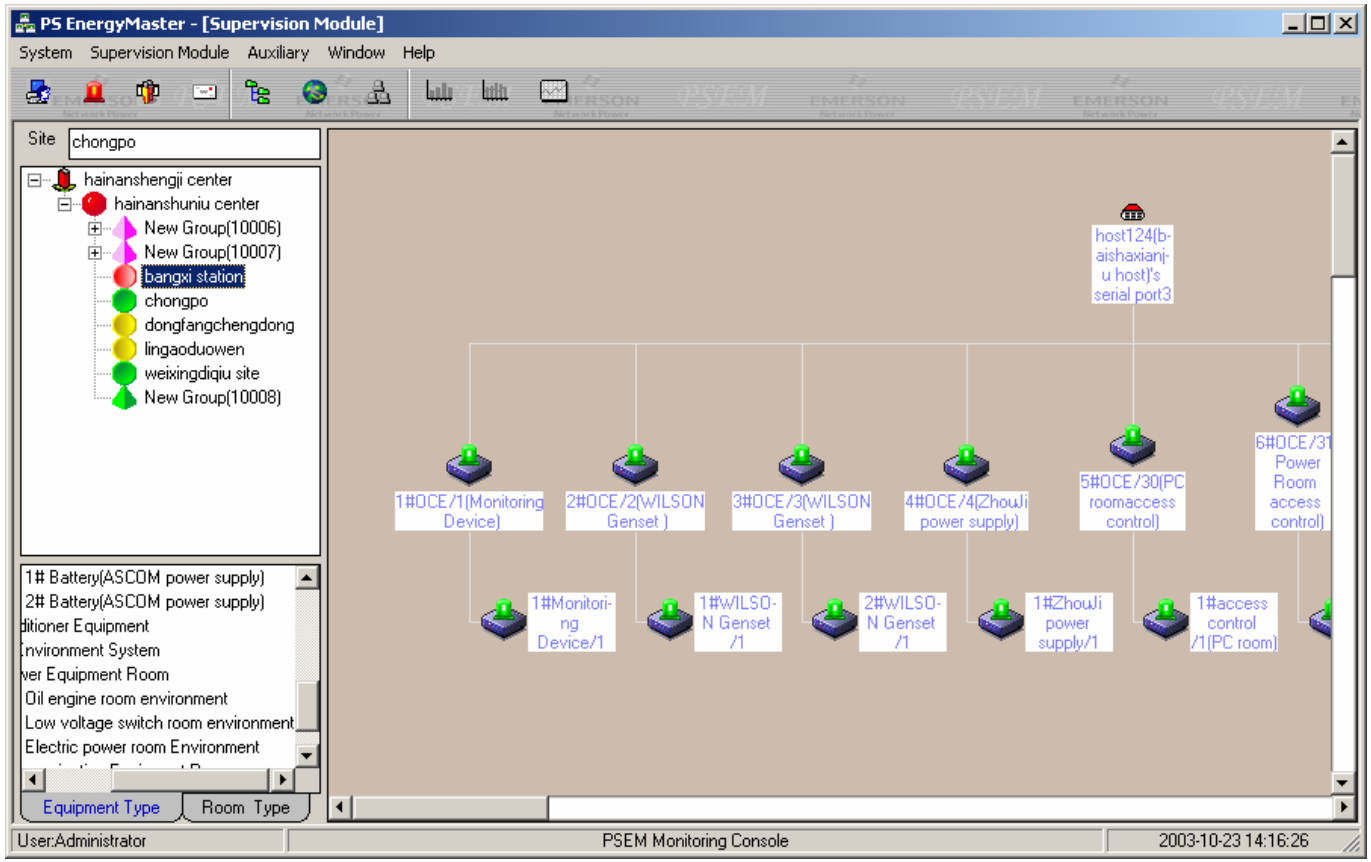


Both USB camera and IP camera are available

Current CCTV integration by using original camera

EMERSON
Network Power

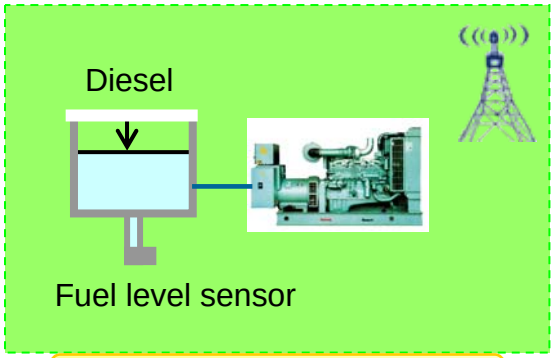
Functions of PSEM



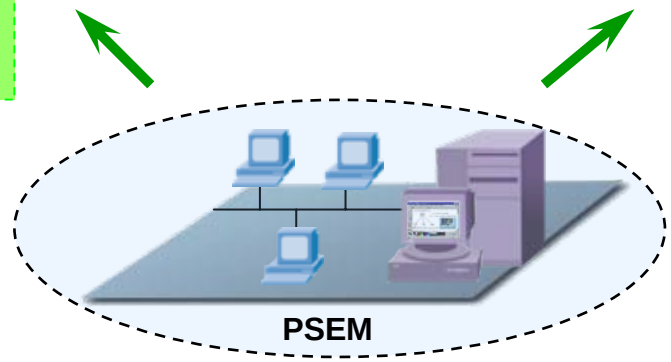
Self-diagnosis help to ensure the stability of system

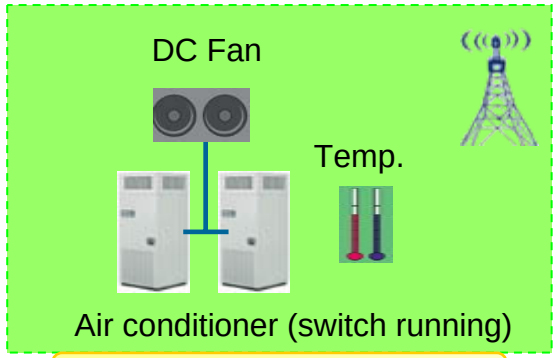
EMERSON
Network Power

Functions of PSEM----Energy management

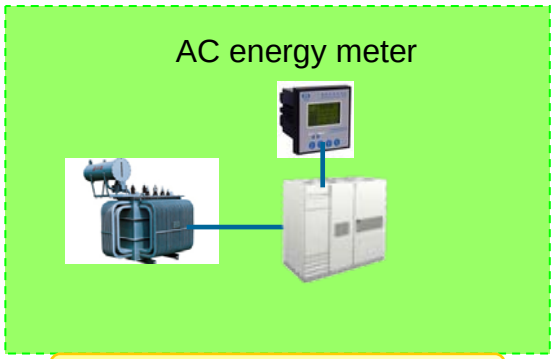


- Fuel mgmt.

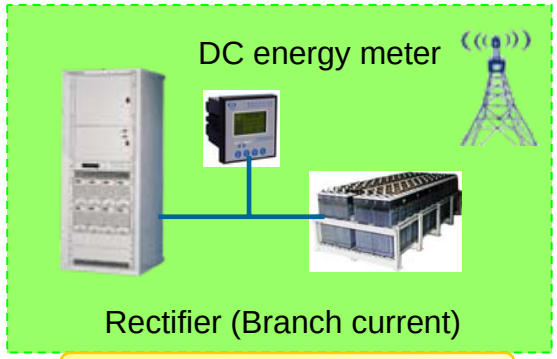




- Air Con. KW mgmt.



- Mains KW mgmt.



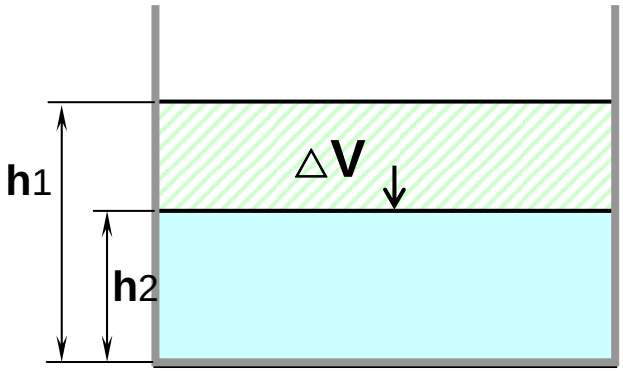
- DC KW mgmt.

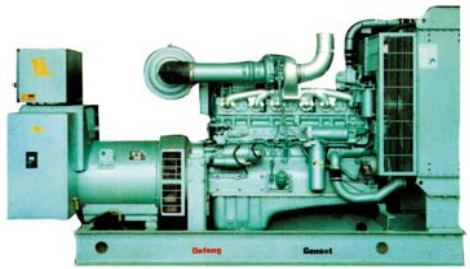
EMERSON
Network Power

Diesel consumption management

Diesel Consumption:

$$\triangle V = (h1-h2) * S$$





	month				
running times	1	2	3	.....	n
Diesel (liter)	L1	L2	L3	.....	Ln

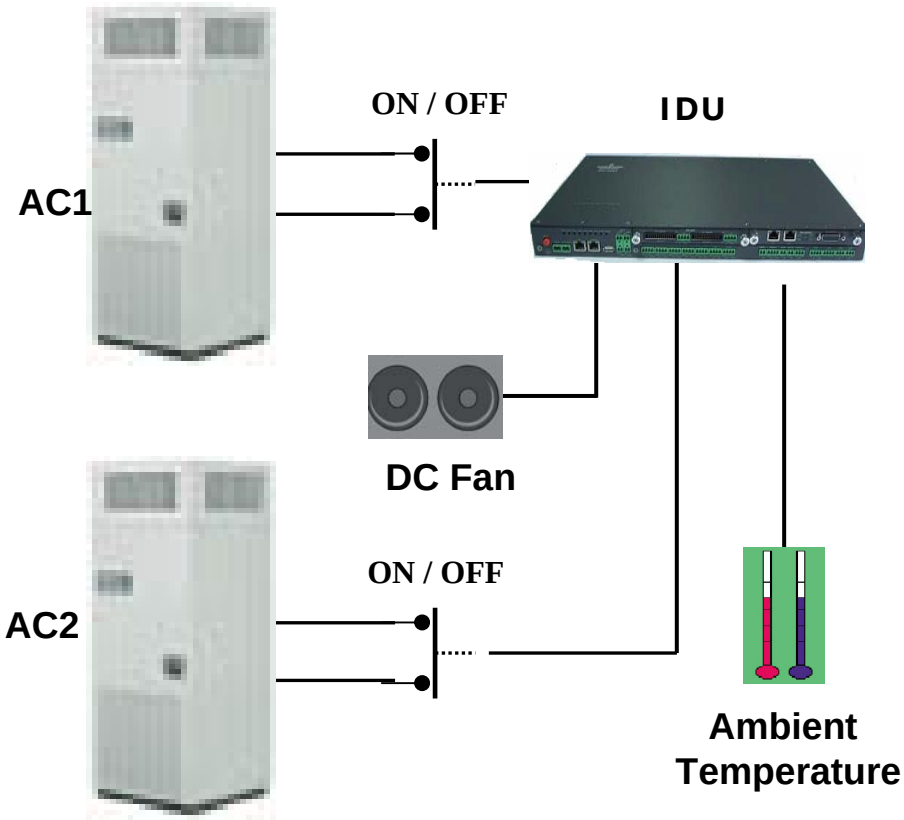
site \ month	1	2	3	.....	12
BTS1	L1	L2	L3	.....	Ln
BTS2	L1	L2	L3	.....	Ln
BTS3					
⋮					

EMERSON
Network Power

Air conditioner management

Flexible field logic control strategies

Efficient energy cost cut-off solutions



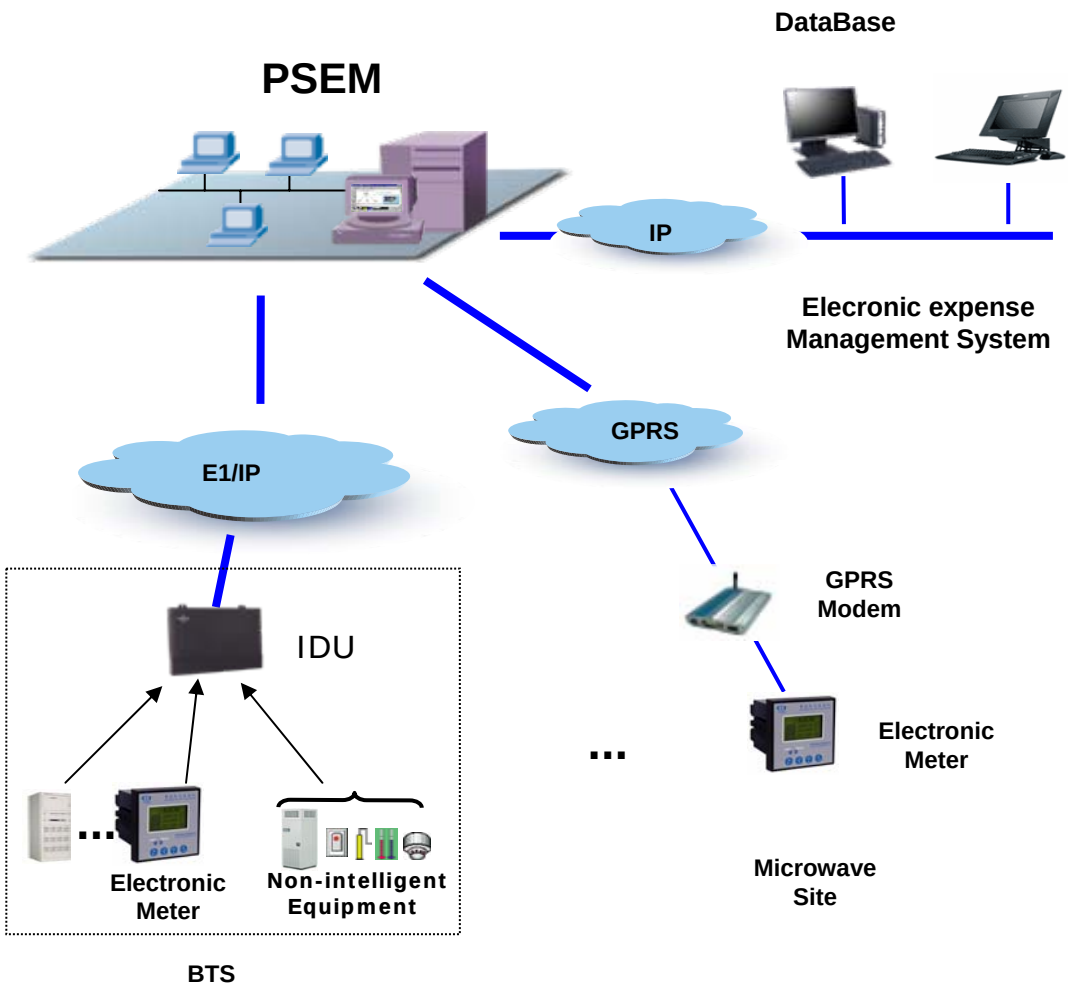
Energy Saving Mode

Temp	AC 1	AC 2	DC Fan
Mains failure	0	0	1
Over 35℃	0	0	1
28℃- 35℃	1	1	0
23- 28℃ Switch running	0	1	0
	1	0	
running Based on ℃	28 ℃ on	23 ℃ off	0
Below 23 ℃	0	0	0

Optimize set-point to control air conditioners to reduces energy cost for AC by 15% per site per year

EMERSON Network Power

Mains/DC bill management



- BTS site management
- Payment management
- Statistics
- Pre-alarm (arrear, rent at term, abnormal electricity expense)
- System management
- User management

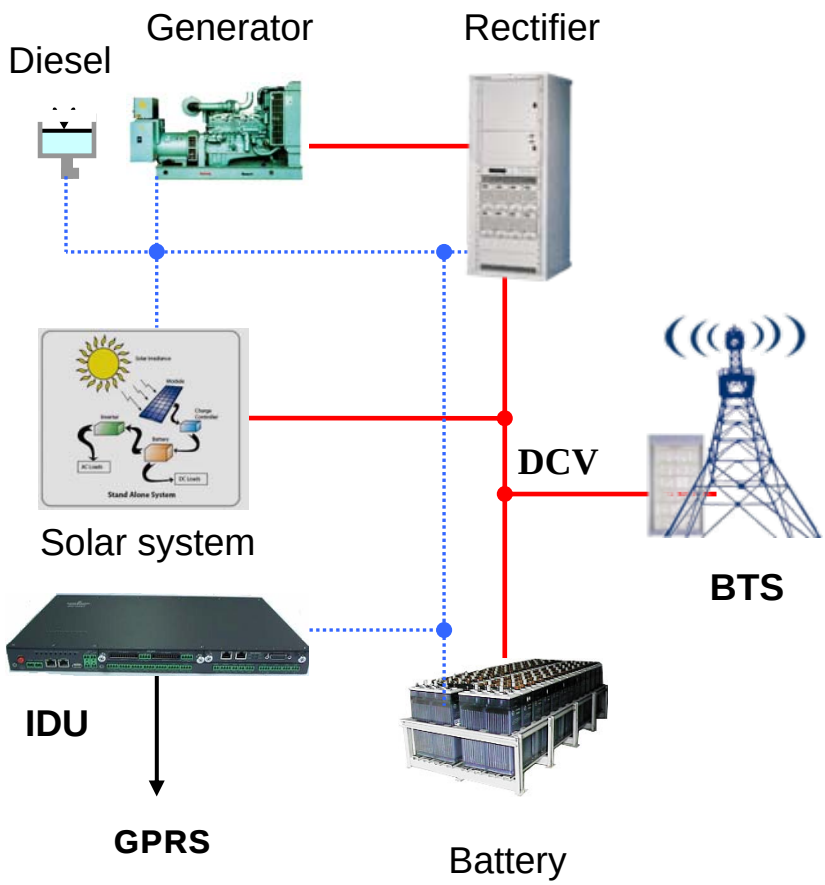
EMERSON
Network Power

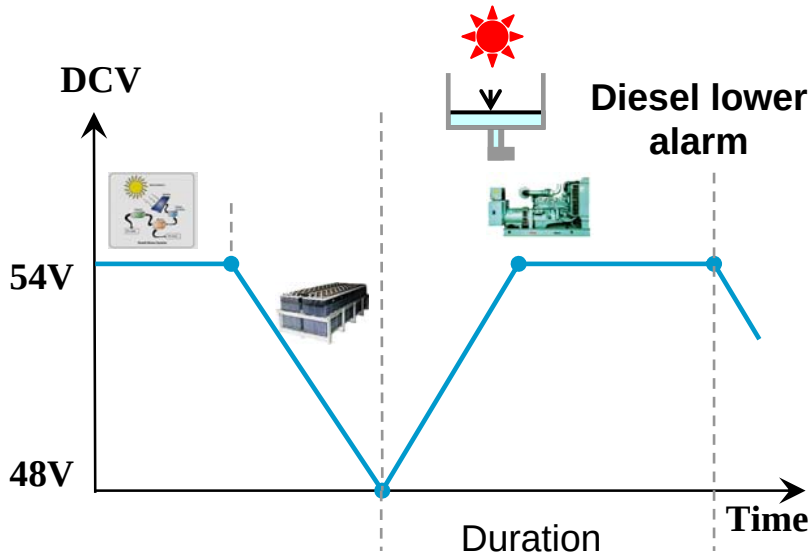
Index

1. Architecture of PSEM
2. Site solution
3. Communication
4. Management function
5. Application of PSEM
6. Roadmap

EMERSON
Network Power

Power management (Telstra in Australia)

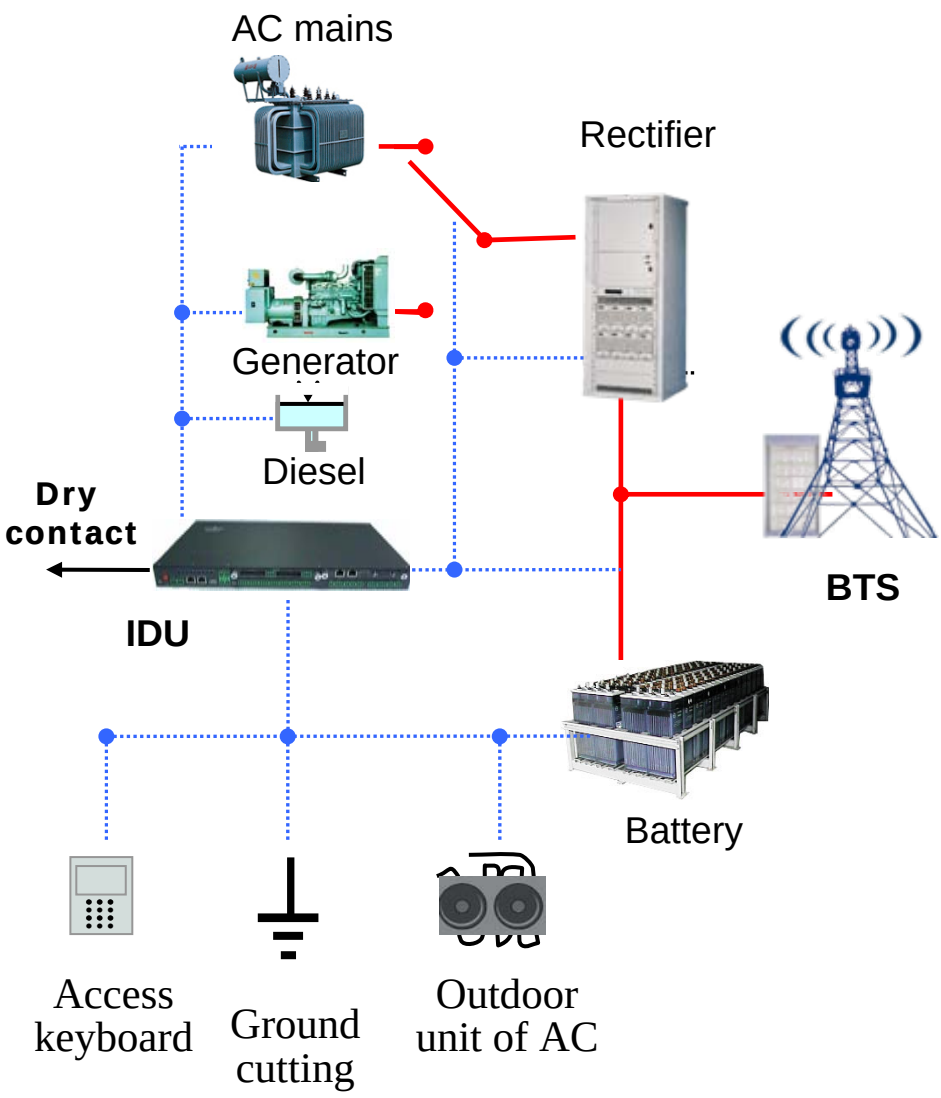


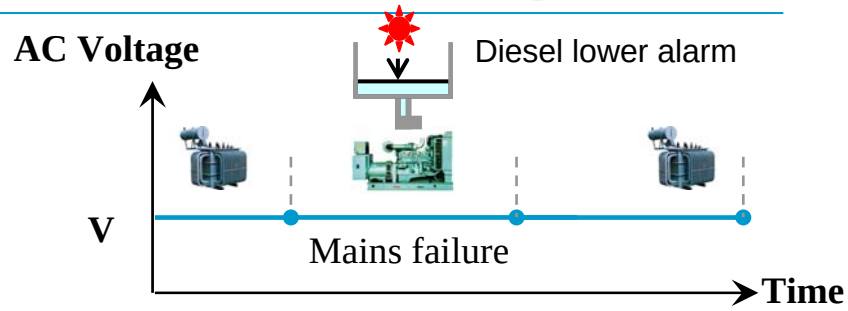


DCV	Day		Night	
	54->48V	<48V	54->48V	<48V
Generator	0	1	0	1
Solar	1	1	0	0
Battery	0	0	1	0

EMERSON
Network Power

Power management (PT Win in Indonesia)

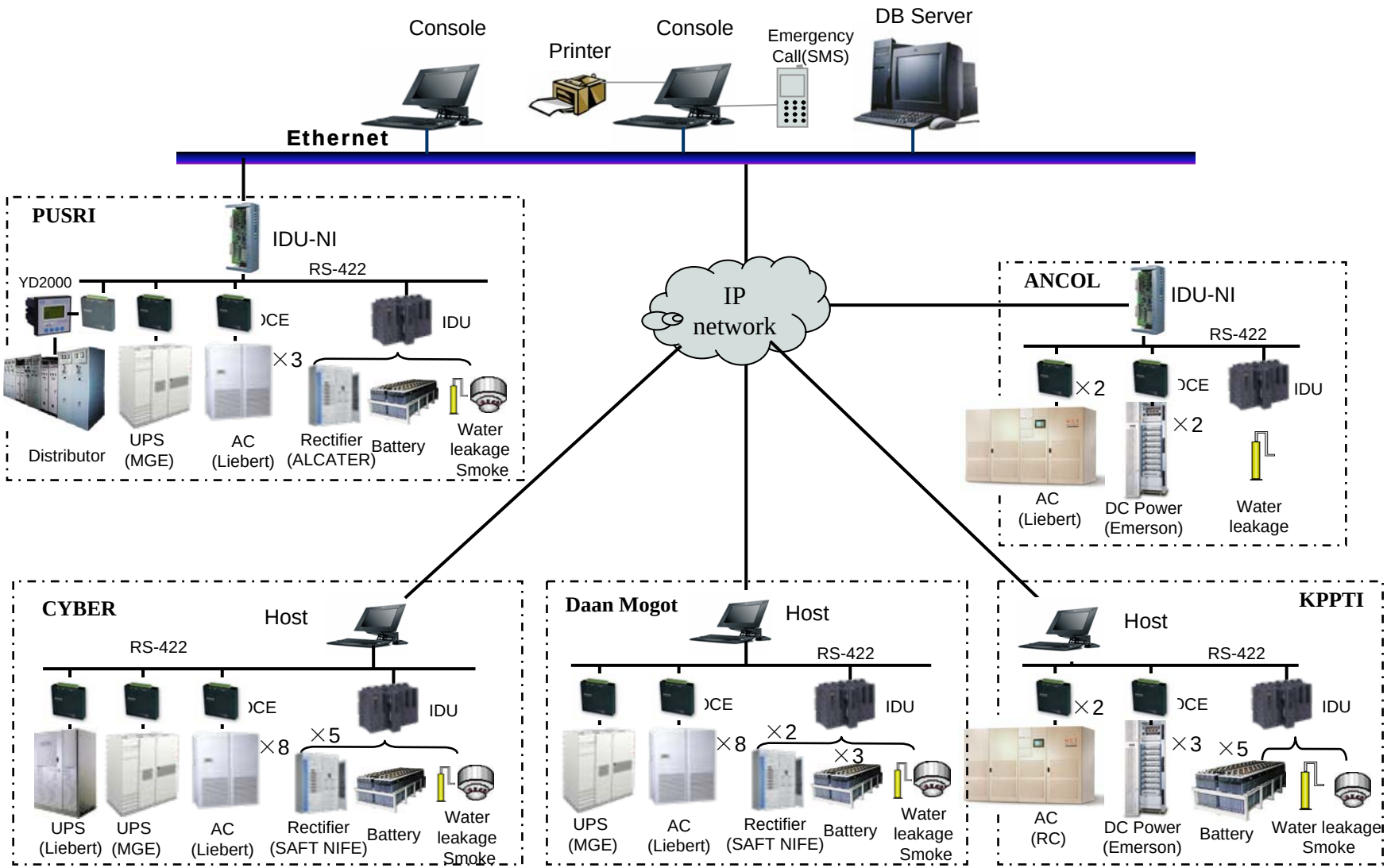




	Normal	Mains failure/ Phase trip	Trigger Alarm
Mains	1	0	0
Generator	0	1	1
Door open expired			1
Temperature over 35 ℃			1
Fuel tank empty			1
Arrester failure			1
AC outdoor unit removed			1

EMERSON
Network Power

Example---Indosat (Indonesia)



Case Study – CMCC (Jiangsu)

Location: East of China

Area: 102,600 km²

Population: 75,495,000

GDP(2006): USD 282 billion (3rd)

Per capita: USD 3,775 (5th)

Growth rate of GDP: 15.4%

Capital: Nanjing

Prefecture-level: 13 divisions

Mobile penetration: 51%

EMERSON
Network Power

Case Study – CMCC (Jiangsu)

Company Overview:

1. BTS number: Over 14,712.
2. Subscriber: Over 30 million.
3. Revenue(2006): USD 2.5 billion
4. Market share: 80%

Monitoring Overview:

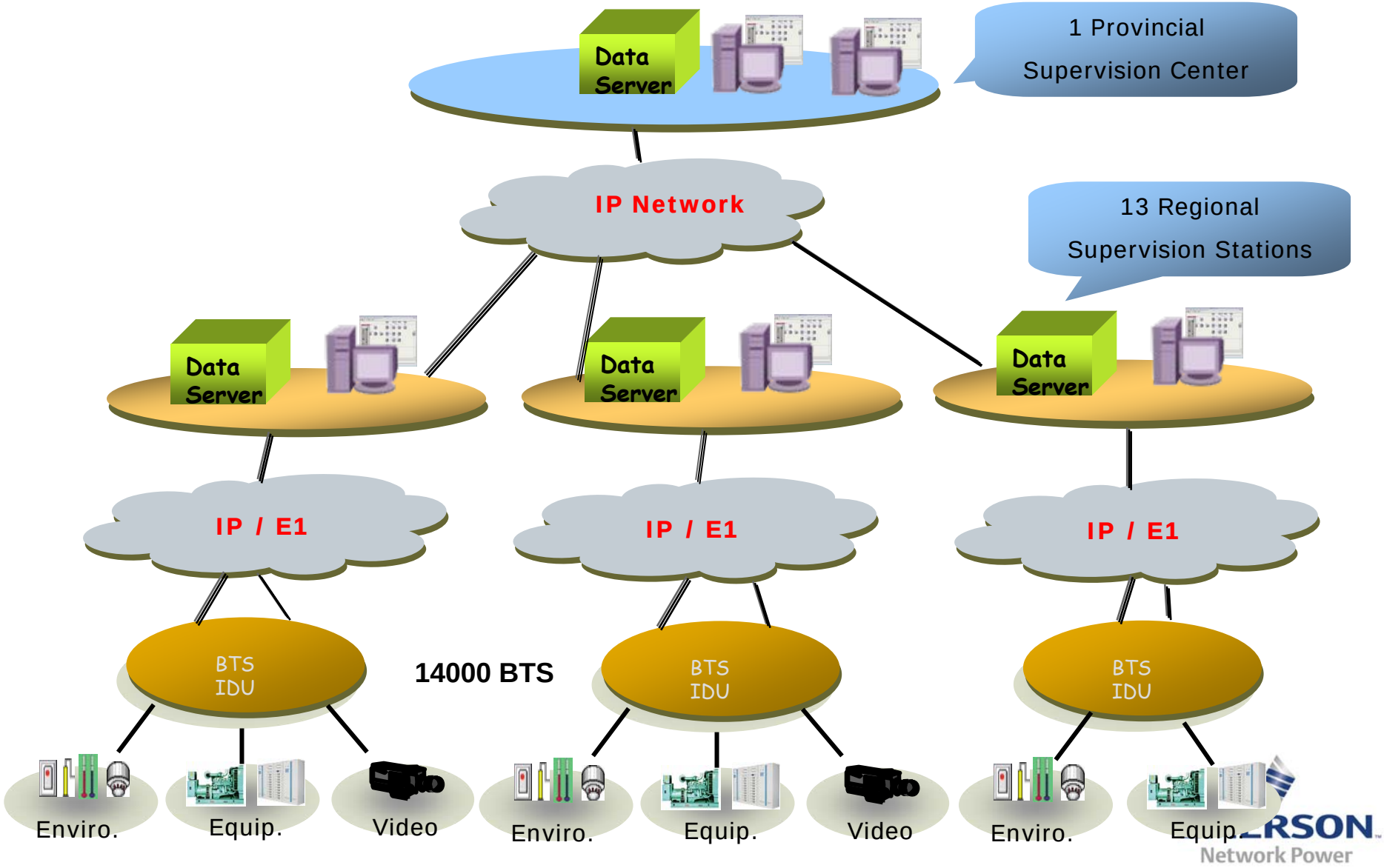
1. One Supervision Center
2. 13 regional Supervision Station
3. BTS sites monitored: 14,000+.
4. Monitoring penetration: 98%

City / Region	BTS No.
Suzhou	**2352**
Nanjing	**2023**
Nantong	**1122**
Yancheng	**1128**
Xuzhou	**1135**
Yanzhou	**752**
Taizhou	**719**
Huai'an	**683**
Zhengjiang	**674**
Changzhou	**1023**
Lianyungang	**803**
Suqian	**796**
Wuxi	**1502**
Total	14712

Over 11,000 sites built by Emerson.

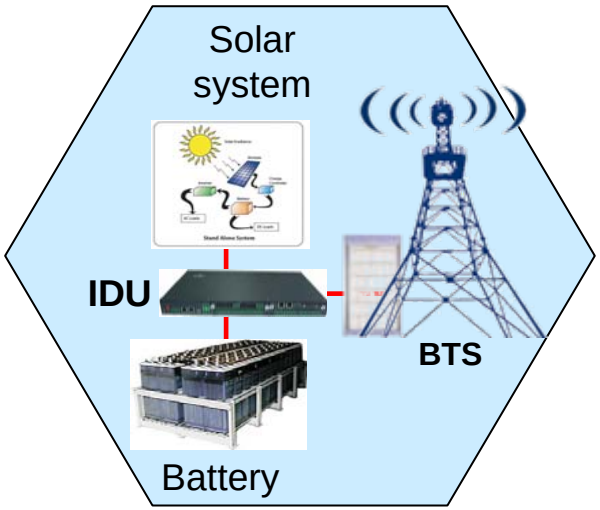
EMERSON
Network Power

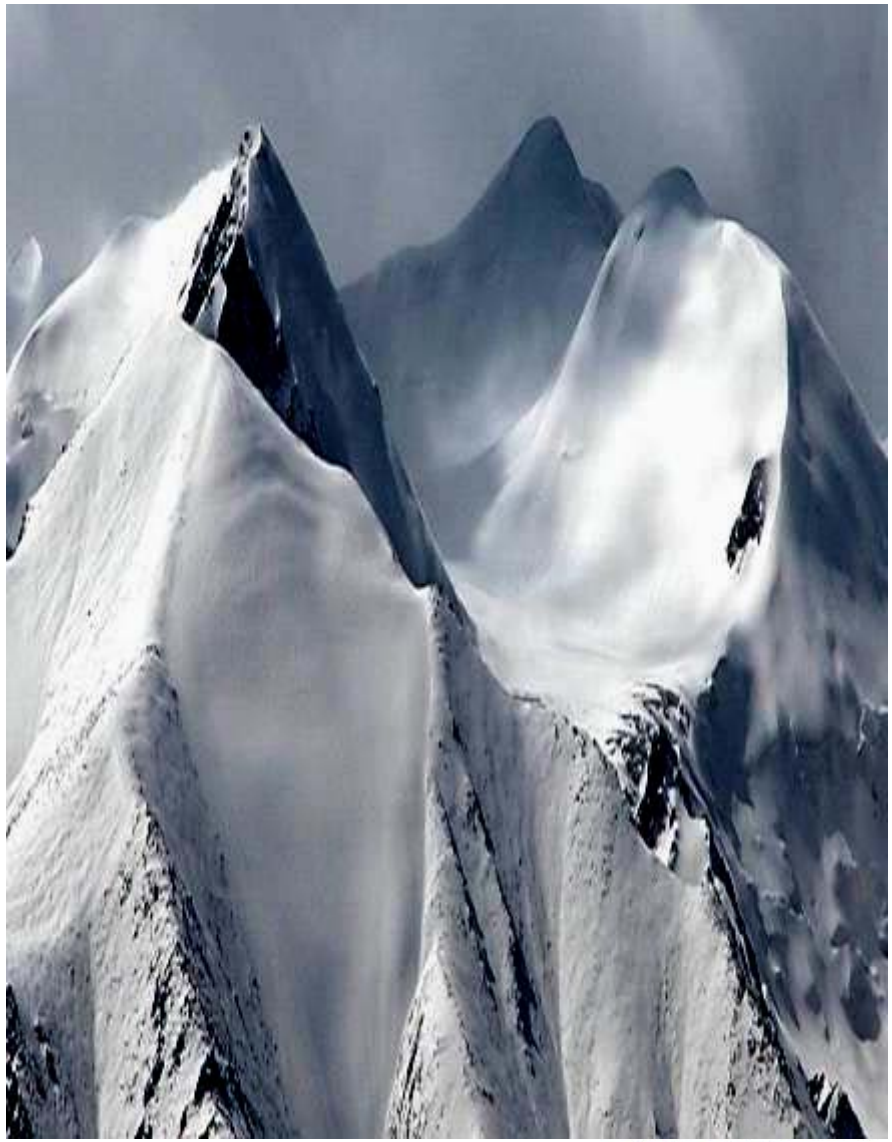
Monitoring Network Topology



Monitoring for Base Station (BTS)

- The highest position of BTS monitored is on Everest . (Altitude 6500 meter)

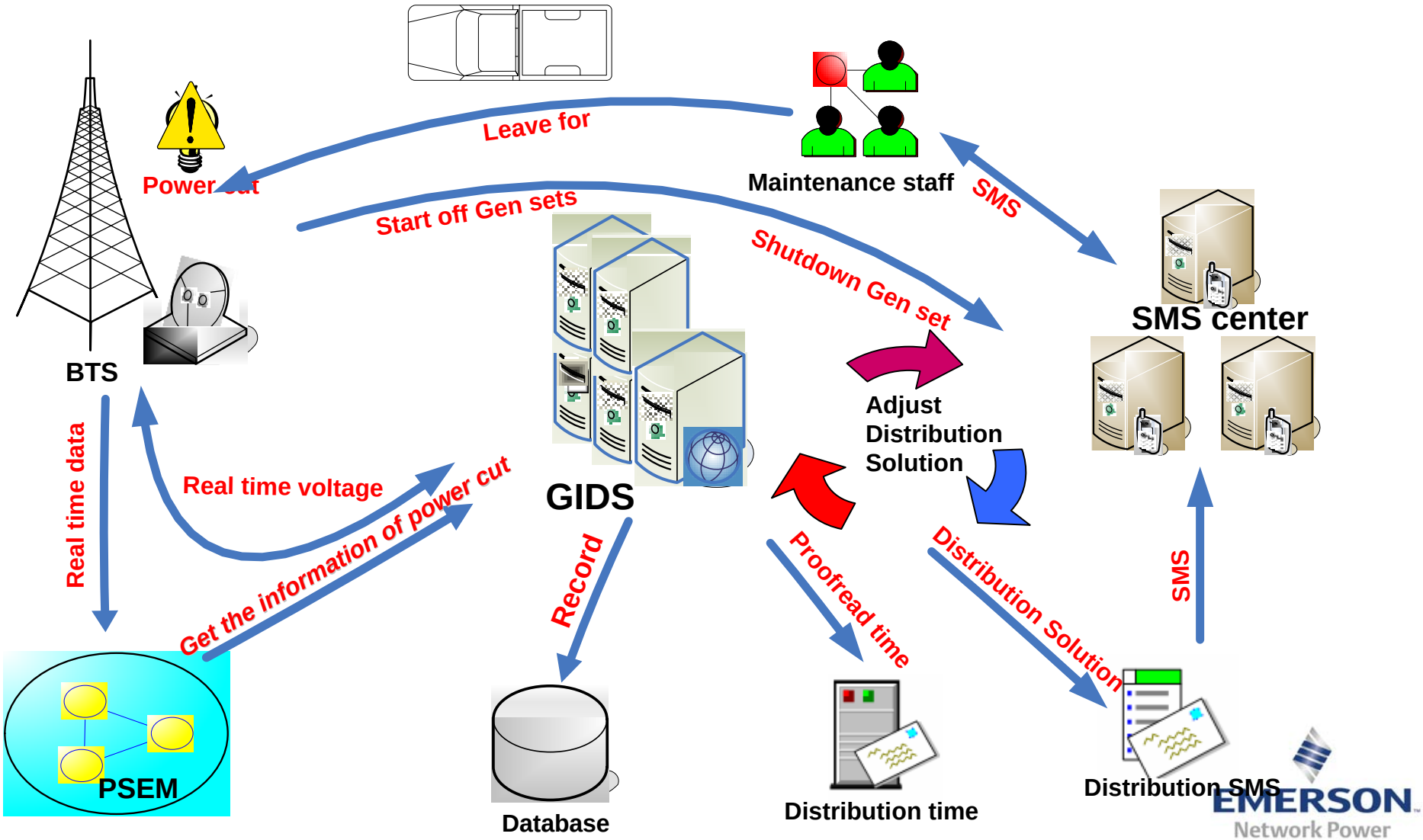




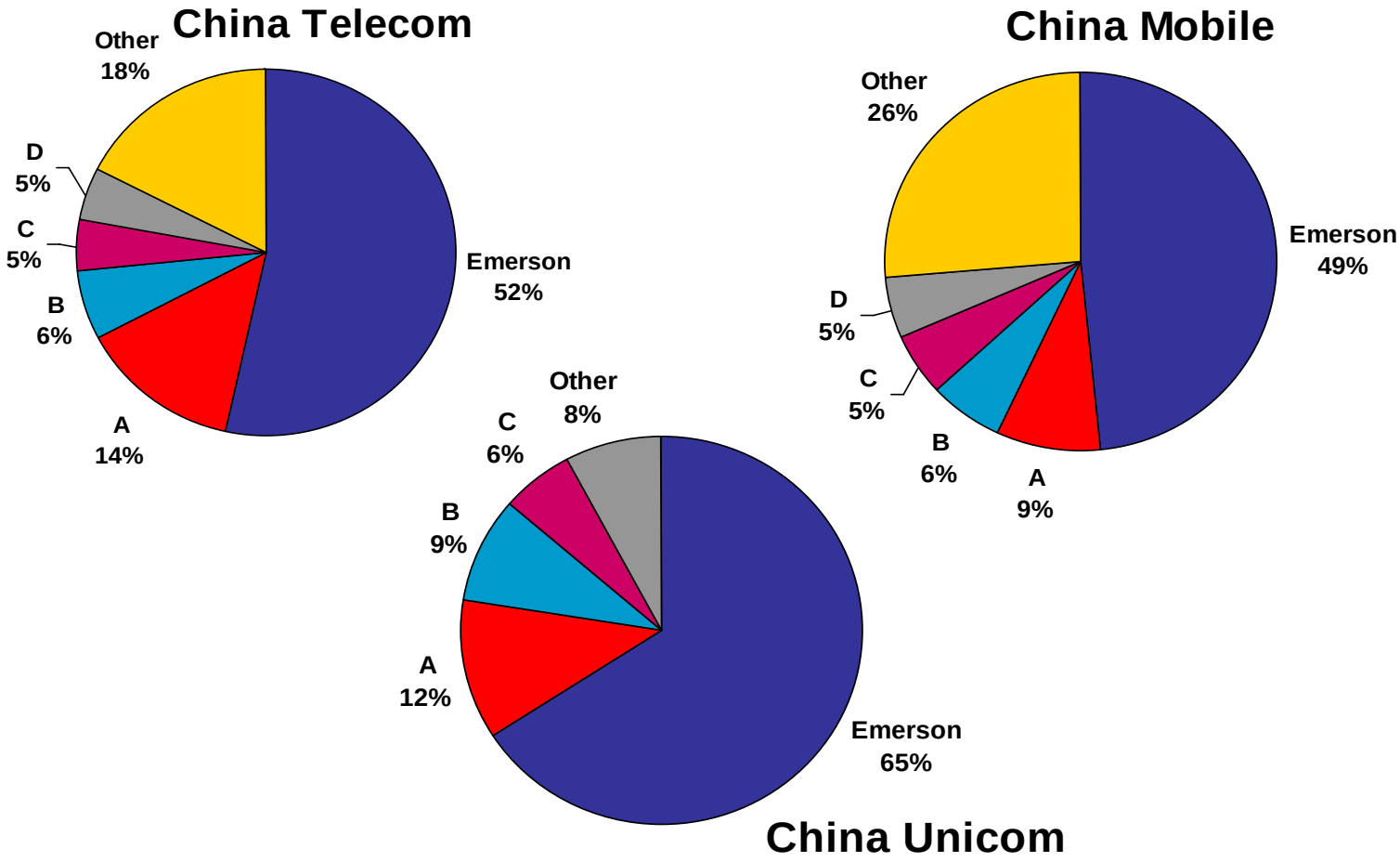
Network Power

Business application

Gen-sets Intelligent Distribution System (GIDS)



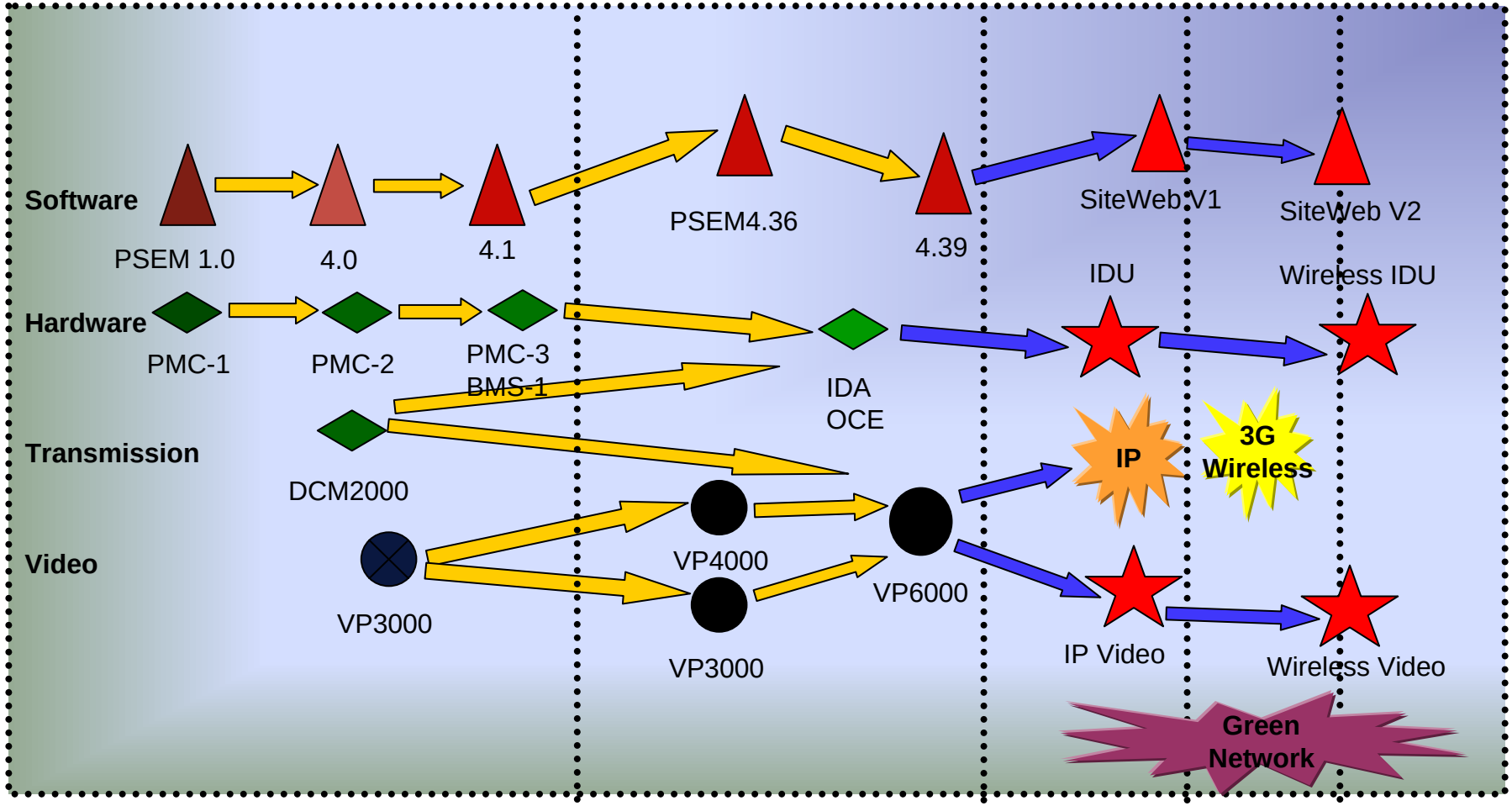
Shares in China Telecom marketing



- **Total 872 suits of monitoring system of PSEM be used for 109572 sites monitored until May,2007.**

EMERSON
Network Power

PSEM System Development Roadmap



EMERSON
Network Power

Thank you

EMERSON
Network Power