



ZTE iEnergy ElasticNet UME System Product Description

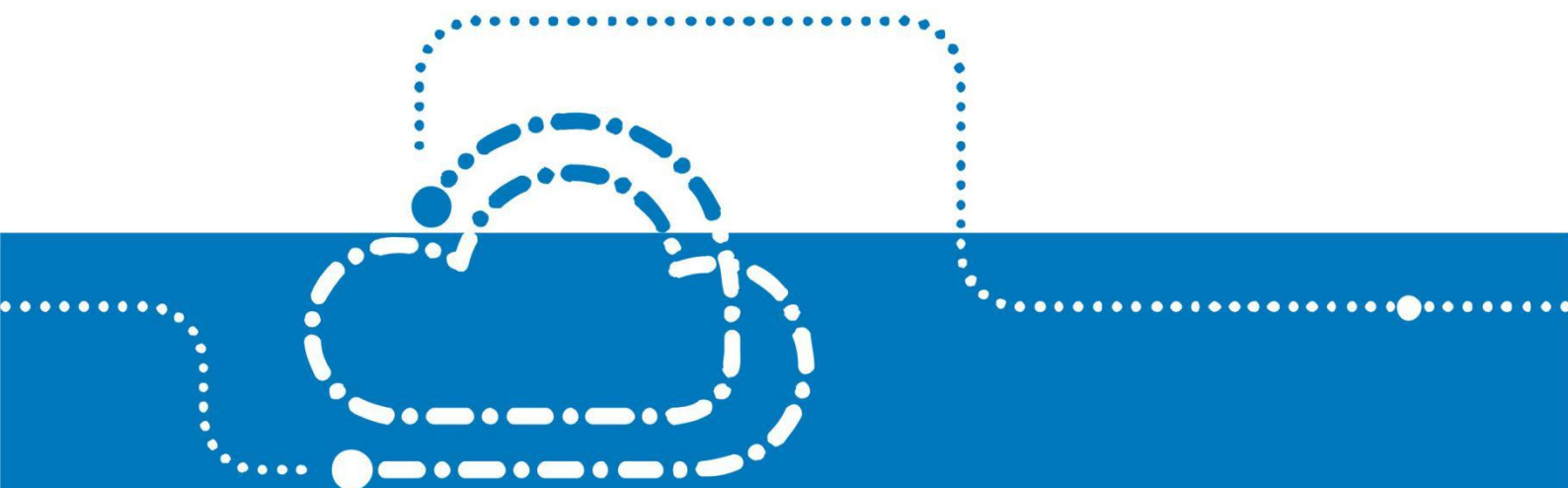


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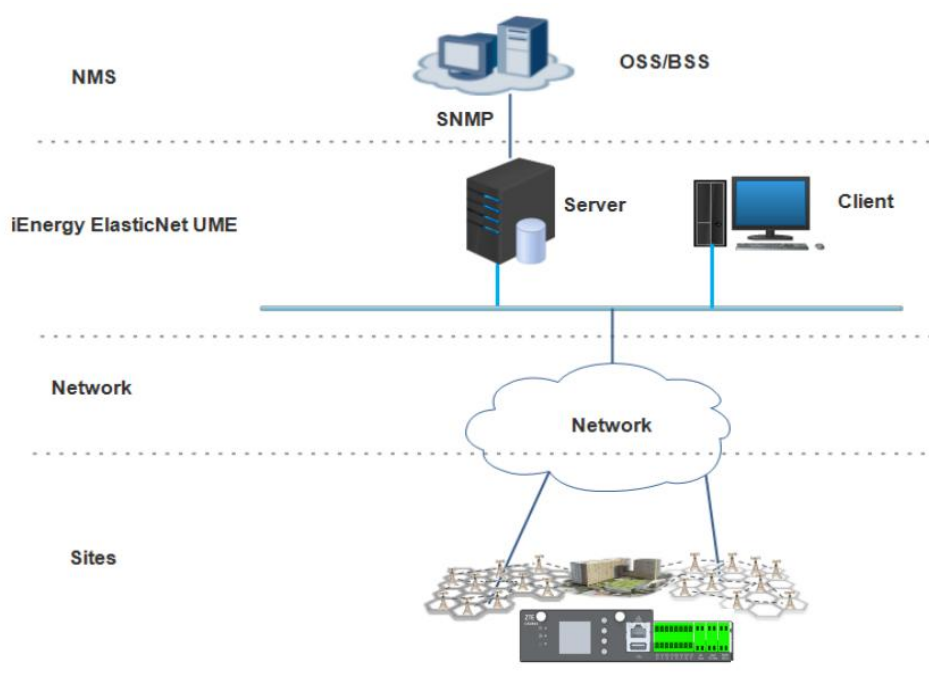
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1 Overview

ZTE developed an integrated energy management system of energy devices and infrastructure, which called iEnergy ElasticNet UME system (hereinafter referred to as iEnergy). Based on the digitization of energy equipment, iEnergy system can make whole network site visible, manageable and controllable. It focuses on the unified management of energy, environment and security of different scenarios (center office /sites), and can help customers reduce O&M costs and improve energy efficiency.

iEnergy system complies with TMN model and is located in EML (Element Management Layer), as shown in the following figure. The site controller sends the site energy equipment and environment information to the iEnergy server. After the server obtains the data, it processes, stores and displays it to realize the multiple functions. Besides, the iEnergy system supports sending alarms and performance data to the NMS system through northbound interface.

Figure 1-1 iEnergy ElasticNet UME System in TMN Model



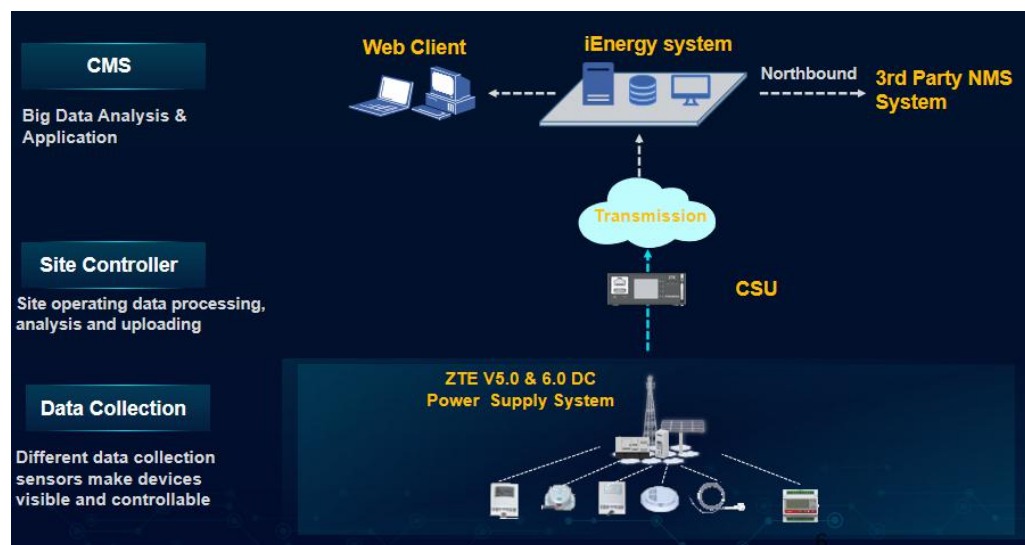
2 Solution Architecture

The iEnergy solution adopts a three-part architecture, including the communication site, networking, and iEnergy system, to provide integrated management of multiple site energy devices.

For telecom site layer, the site controller collects and processes site energy equipment operation information, and transmitted to iEnergy system. It is proposed appropriate site controllers for different scenarios. Various networking modes are available, including in-band, out-band and hybrid networking ways. (Note: Networking resources are provided by customers.)

The core layer is the iEnergy system (also called CMS, Central Management System), which can display site information, control site equipment, and provide multiple high-value functions. Users can access and view the iEnergy system through web client which is authorized. In addition, it can upload key information (alarms and performance) to the third-party upper NOC system.

Figure 2-1 System Architecture of iEnergy Solution



2.1 CMS architecture

2.1.1 Hardware architecture

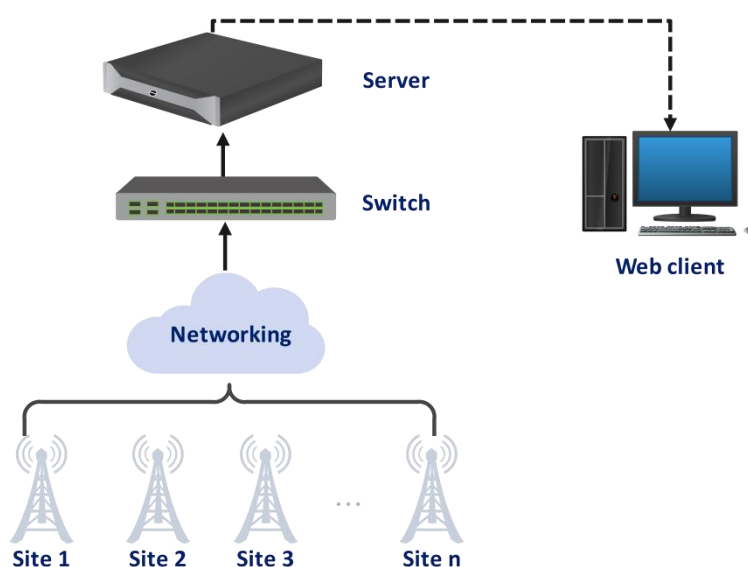
The iEnergy system uses the B/S system architecture, including server, database,

client software, KVM if necessary, etc. The software and operating system is installed on a server that can host all processes, with access to the system through a client software browser. The iEnergy system supports checking the operation status of the power supply equipment of the site (hereinafter referred to as the Site), such as the power system and ZTE intelligent lithium-ion batteries, using a web client or application at anytime and anywhere, in order to easily realize remote monitoring and control of the entire energy infrastructure of the network.

➤ Static container deployment

Static container deployment adopts single server deployment, supports physical server/ cloud server/ virtual server. And it is recommended that there should be no more than 5,000 access sites. To access more sites, customer can expand the server directly, and the iEnergy system can support 50,000 site access at most.

Figure 2-2 iEnergy System Static Container Deployment Architecture

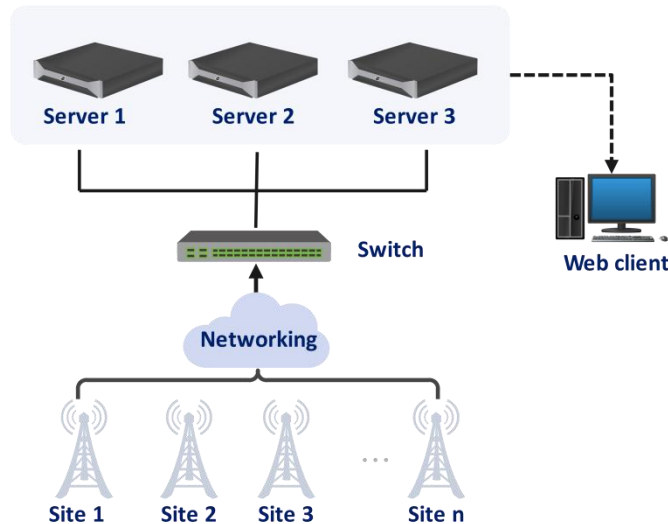


➤ High availability deployment

High availability deployment adopts 3 server deployment at least, supports physical server/ cloud server/ virtual server. And it is recommended that there should be no more than 10,000 access sites. To access more sites, customer also can expand the server directly, and the iEnergy system can support 50,000 site access at most. Each server adopts completed public components & support mirror image function, guarantee high reliability of data and service. And it has automatically SLB (Server

Load Balancing) ability, can ensure high data availability.

Figure 2-3 iEnergy System High Availability Deployment Architecture



2.1.2 Software architecture

With a micro service architecture, the iEnergy system software provides micro services based on the PaaS platform, and provides support for monitoring, management, and intelligent operation.

➤ Access layer

This layer provides access and adaptation for southern devices, including environmental control devices (temperature/humidity/water/smoke sensors), HVAC equipment/air conditioners/humidifiers (optional), power devices (UPS/smart voltage meters), security devices such as door access control and video surveillance (optional), and ZTE power devices: power system/batteries and other diesel generators (optional).

➤ Data layer

This layer processes and converts original data into standard data. It also stores and manages standard data, and transmits data to the upper-layer NMS through the northbound interface.

➤ Northbound service

The northbound interface uploads data to the upper-layer NMS through SFTP or

SNMP.

➤ Application layer

This layer provides the following micro service modules: monitoring management, alarm management, energy efficiency management, network operation, service operation, security management, interconnection, system management, and configuration management.

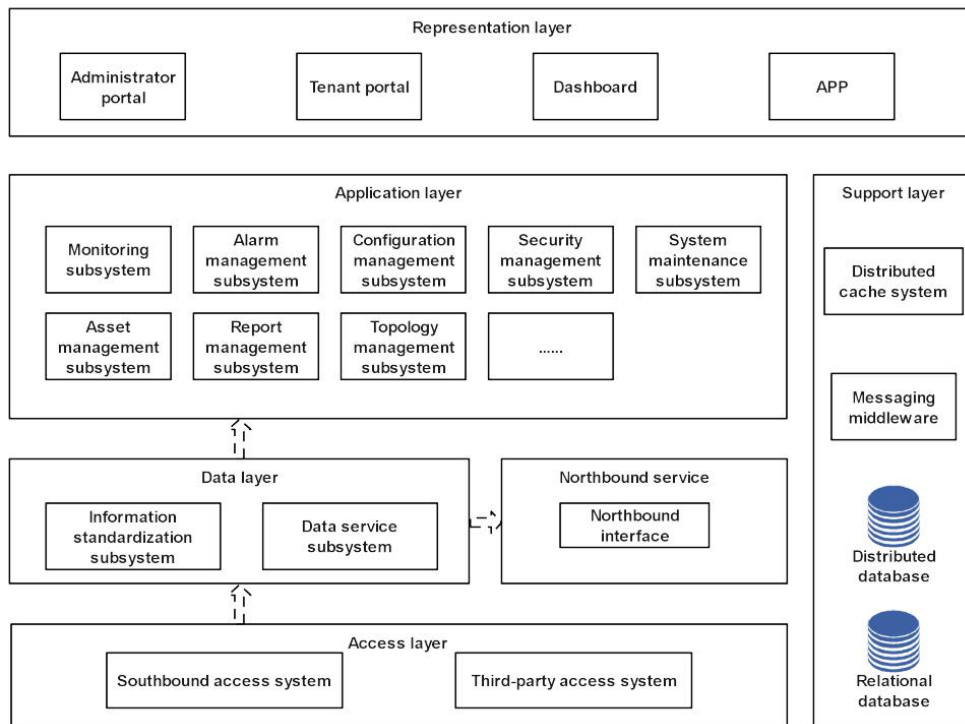
➤ Representation layer

This layer supports different types of terminals, provides user-friendly GUIs, and visualizes monitoring, management, and other services.

➤ Support layer

This layer provides basic IT services, including database and messaging middleware, to implement persistent data storage.

Figure 2-4 Software architecture of iEnergy system



2.1.3 Standard Configuration list

The iEnergy system can provide optimal configurations depending on the project

requirements, main accessories including: server, KVM (if needed), database, operating system, application software, network cables and others (at the request of the customer, it is supplied complete with power systems and / or ZTE batteries). Typical server and client configurations are as follows.

Table 2-1 Standard configuration requirement of server

Component		Requirement
Server	CPU	4 x Intel 5218-16core@2.3GHz
	RAM	8 x 16GB
	DISK	2 x 600GB + 4 x 600GB
	Network card	4 x GE
Data base		PostgreSQL V3.0
Operating system		CGSL (Carrier Grade Server Linux) V5.04
Software		ElasticNet UME R32 V16

General PC can be the client of iEnergy system, which are provided by customers, the client configuration recommended by ZTE as follows.

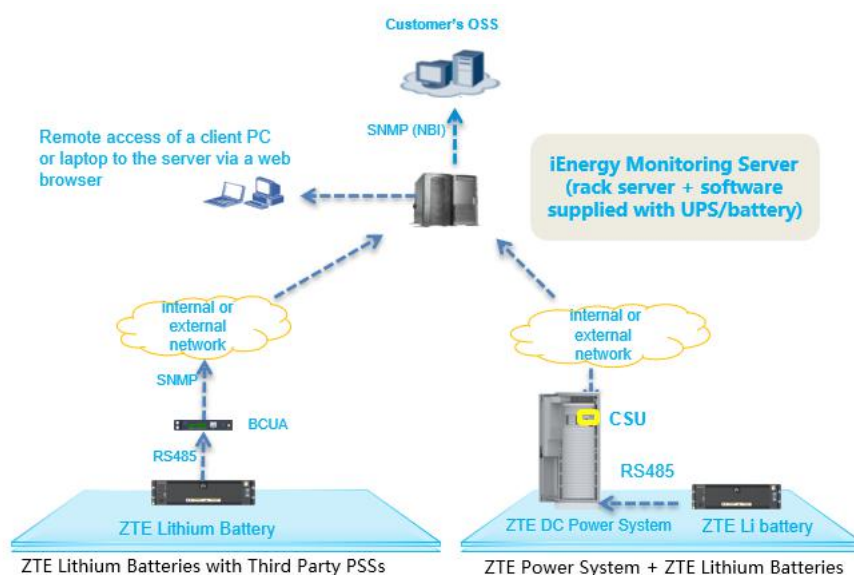
Table 2-2 Recommended configuration requirement of clients.

Component	Requirement
CPU	not less than CORE i5
RAM	not less than 2G
DISK	not less than 10G
Network card	support Ethernet, 10/100M self-adaption
Video card	support graphics hardware acceleration
Operating system	Windows 7 and above, Linux, mac OS
Browser	Google Chrome 49.00 Version and above, Firefox

2.2 Flexible Networking

iEnergy Solution supports in-band, out-band and hybrid networking mode. Customers can choose optimal networking mode according to the situation of the site, to realize the flexible access of the site to the network management. All networking resource is provided by customers.

Figure 2-5 iEnergy system networking mode



2.2.1 In-band networking mode

iEnergy system supports RS232/IP in-band networking. The data is transmitted to the iEnergy ElasticNet UME system through SDR/ IT RAN platform.

2.2.2 Out-band networking mode

iEnergy system supports wired and wireless out-band networking, depending on transmission resource provided by operators.

2.2.3 Hybrid networking mode

Hybrid networking is a combination of in-band networking and out-band networking. The iEnergy can supports multiple networking modes at the same time.

2.2.4 Networking resource requirement

Notes: Different network elements support different network technology.

Table 2-3 Networking resource requirement

Network technology		Scenario
In-band	ZTE transparent RS232	SDR/IT RAN equipment

Network technology		Scenario
	ZTE transparent TCP/IP	
Out-band	Wireline IP	Network bandwidth of wired IP resource: more than 256Kbps
	3G/4G	Network bandwidth of signal resource: more than 64Kbps

3 Feature Description

iEnergy system can help remotely monitor and manage the whole network customers the whole network control and management, maintenance support. The system can help customers to improve energy efficiency, site security level, and highly reduce the maintenance cost, etc. Please refer *the feature list as table 3-1*. This feature list is only for standard product description.

Table 3- 1 iEnergy Standard Feature List

No.	Feature	Sub-feature	Introduction
1	Homepage	Alarm	Displays the number of alarms at each grade in the whole network or each area in real time, and the number of alarms of different types in each area.
		Communication status	Displays the number of sites with communication lost in the whole network or each area in real time, displays the proportion of sites with communication lost and sites with normal communication, and displays the change trend of communication lost sites.communication, and displays the change trend of disconnected sites.
		Power supply	Displays the number of sites with power supply interruption in the whole network or each area, power supply interruption ratio, and total number of sites in real time.
2	Control and Management	Real-time info view	Displays site and equipment key information in real time
			View the details of the power supply, battery, and environment.
		Power system Monitoring	View the AC input voltage, current, DC output voltage, current and rectifier module working status.
			Remotely turns on/off the rectifier module, controls battery discharge, and sets some key parameters of CSU, if the CSU supports
		Battery	View the working status, voltage, current and temperature of

No.	Feature	Sub-feature	Introduction
		info view	the battery bank. View the cell voltage and temperature of for lithium-ion batteries only, if the battery's BMS can provide and send them to RMS.
		Env & Security Monitoring	Displays the ambient temperature, door status, water logging, and smoke
		History Data	User can query the history data of some measurement point in specified time period.
3	Alarms Management	Alarm Query	On the Real-time Alarm page, User can view real-time alarms and detailed alarm information, and acknowledge, unacknowledged, and clear alarms in single or batches.
			On the Historical Alarm page, user can view the detailed information of historical alarms. Query historical alarms by alarm Severity, alarm type.
		Alarm statistics	The system can collect statistics of alarm information (for example, Location, Time, Severity, and Type) from multiple dimensions, and display the statistics results in tables, histograms, and circular graphs.
			The system can periodically export alarm reports or manually export the exported files in accordance with the created task, and upload the exported files to the specified location for storage and analysis through the configured FTP address.
		Alarm Settings	Provides different types of alarm and notification rule settings. Users can set and adjust the corresponding rules in accordance with their own service requirements. Alarm masking, filtering, reminding, forwarding, and association rules can be set.
4	Reporting Management	Basic Report	The system provides a report query Wizard, which supports the search method to query reports, and supports report export (Excel)
			The system provide some basic&general reports based on monitoring and alarm functions, such as DC power, Battery, environmental, DG, Site report, Alert report.
5	System Management	User Management	User can query, create, modify, delete, and copy users, and set role permissions, account rules, and user groups for users.
		Role Management	User can query, create, modify, delete, and copy roles, and set operation sets for roles.

No.	Feature	Sub-feature	Introduction
		Account Security	User can set different policies for different users, including the password policy, account locking rule, account policy (validity period, login mode, and login time), and login IP range control.
		System check	Check the services, servers, databases, service performance, node servers, and alarms of the system in real time.
6	Log Management	System logs	Three types of logs (operation logs, security logs, and system logs) are queried by condition, and are counted by time, grade, and log name in different dimensions and displayed in form of a diagram.
7	Configuration Management	Quickly Create Site	Batch create Site by using the template
		Parameter Management	Communication link parameter configuration
8	Software Management	System Software Management	License management

4 Abbreviation

Table 4- 1 Abbreviation

Abbreviations	Full Characteristics
EML	Element Management Layer
NMS	Network Management System
TMN	Telecom Management Network
CMS	Central Management System
SNMP	Simple Network Management Protocol