1. Introduction

Base stations are key elements in any mobile network. Their monitoring and upgrade functions are essential for operators to compete with other multiservice providers. Statistics from within the industry indicate that 65 percent of communications interruptions are caused by power supply failures, with 85 percent of them discovered after more than 12 hours, and only due to customer complaints. Other challenges to base station operation include heat, fire, flood, and theft. All of these issues make onsite power and environmental monitoring essential for smooth base station operations.

Ascent's comprehensive BTS monitoring solution manages site power and environmental impact using latest IOT technology. It combines power and environmental monitoring, ensures power supply/security, reduces site visits, and reduces OPEX. With efficient monitoring and optimization, operators can enhance their power consumption efficiency, avoid expensive system shutdowns, and reduces theft for remote sites.

Features:

- RS-485 MODBUS RTU interface for generator and ATS monitoring and control.
- Monitors all generator controller parameters (oil pressure, temperature, battery voltage etc.)
- Measures AC voltage, current, frequency, and status for generator and grid.
- Configurable alarm generation for all measured parameters and monitored states.
- Automatic and manual control for external ATS switch.
- Monitors HVAC, UPS, Site Security.
- Remote management via SNMP.

2. System Architecture

The whole comprehensive BTS monitoring system consists of the following four components: The field sensor, the field data acquisition layer, the Monitoring Center server, and the remote Browsing monitor terminal.
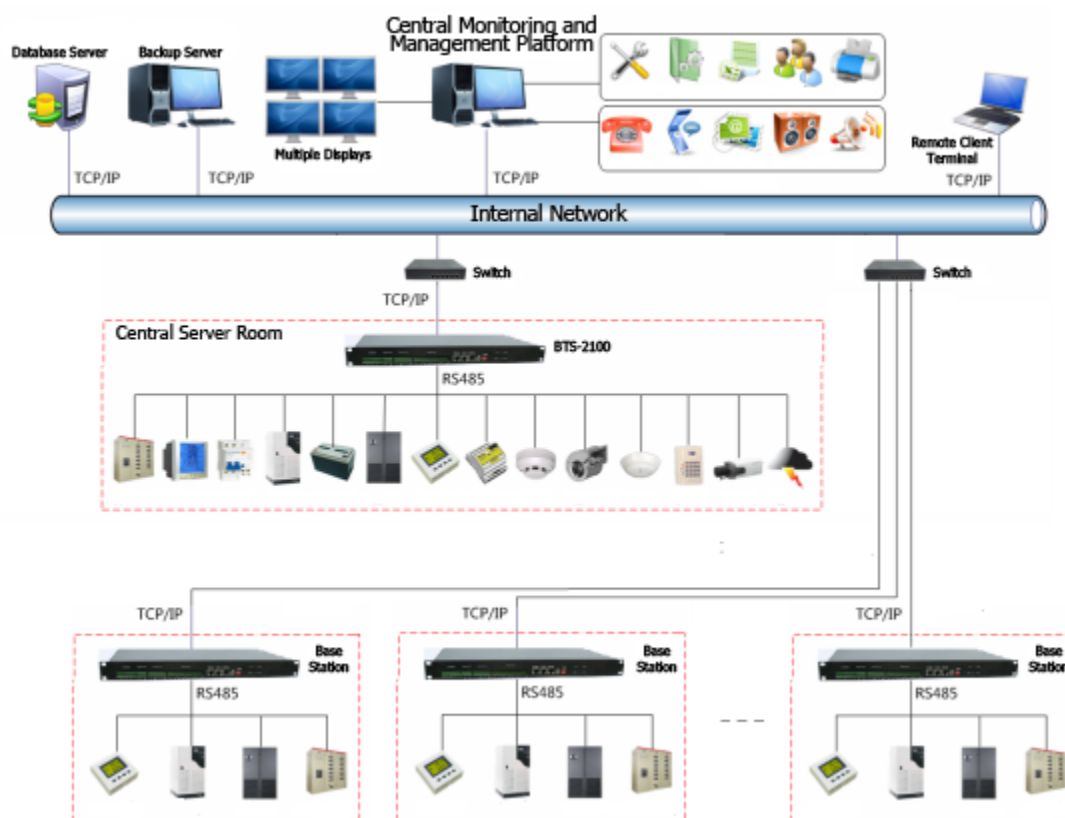
The main roles of the four components are as follows:

Live IOT Sensors: there are various monitoring sensors: temperature and humidity sensor, leak detection sensor, smoke detector group, power failure detection sensor, a variety of sensors installed in the base station and the computer room of the collection points, through the signal cable connected to the data acquisition equipment, the sensor power supply is centralized power supply mode.

Onsite Device Capture Layer: Installed in each base station monitor specialized BTS-2100 Embedded Data Acquisition host (integrated various I/O Mining control module functions, can collect analog and switch volume), embedded data acquisition host directly connected to a variety of sensors and monitored equipment,BTS-2100 Embedded acquisition host using multi-channel channel I/O modular design, input and output points through the combination of mining control module to monitor the monitoring system needs to be monitored equipment and control points matching, and collect UPS, air-conditioning, temperature and humidity, Leakage and other field signals. the BTS-21000 embedded

collection host uploads data to the Monitoring Center server via the SNMP network protocol.

Adopting embedded acquisition mainframe greatly improves the reliability, maintainability and expansibility of the system.

Monitoring Center server: used to store, real-time processing, analysis and output of all kinds of information in the field Equipment collection layer, and responsible for sending control commands to front-end data acquisition equipment at any time, server can integrate all kinds of monitoring equipment data information, can be integrated on-site for distribution, fire, leakage, UPS, precision air-conditioning systems, with powerful integration capabilities.

Remote Browsing monitor terminal: The primary function of remote browsing is through the network on the remote host with IE to Browse, easy to manage the staff anytime and anywhere to understand the equipment and the actual situation of the environment, to achieve control integration, and remote access to monitor the screen, on-duty staff can easily in the Network Unicom Intranet remote view of the monitoring of the host's screen and real-time data.

3. **Main Controller**

Ascent Comprehensive BTS monitoring solution provides continuous monitoring of HVAC systems, energy usage, backup power and site security, all critical to the reliable operation of a BTS installation. An SNMP Interface enables the transmission of monitored data and real-time alerts to a remote software management platform, BOSSc Element Management System, or a third-party SNMP management tool. The Model 2100 features an external interface for a standalone Automatic Transfer Switch.

SNMP Management Interface
- Connection by socket TCP/IP management protocol.
- Remote configuration update by TCP/IP or local via USB, IP.
- Configuration reset function (Reset to default configuration and/or firmware).
- Nonvolatile parameter configuration.
- Password protection for parameter settings.
- NOC notification of configuration changes.
- Stores up to 1000 events with automatic deletion of oldest events when full.
- Measurement updates < 10 seconds (configurable for maximum performance).
- Notification updates < 1 second.

AC Power Main and Generator Monitoring and Control

- Monitors all generator controller parameters (oil pressure, temperature, battery voltage etc.).
- Measures AC voltage, current, frequency and status for generator and grid.
- Calculate and log power consumption from grid and generator.
- Support for single and 3 phase sources 0-260 VAC rms.
- Automatic and manual control for external ATS switch, monitoring of ATS status.
- Generator accumulated operational time with configurable maintenance notifications.

Uninterruptable Power Supply Monitoring and Control

- Monitoring and control of UPS through MODBUS RTU or TCP.
- Monitor battery voltages and battery bank charge and discharge current.

HVAC Monitoring and Control

- Monitor and control of 2 HVAC units, 1 ventilation (free cooling) unit.
- Monitoring and control of HVAC units through MODBUS RTU or TCP/IP.
- HVAC enable/disable contactor control.
- Monitors shelter temperature, outside temperature, HVAC output temperature.
- Monitors HVAC power consumption.

Site Security and Miscellaneous Monitoring and Control

- 12 digital GPIO ports can be configured for monitoring door closures, motion detectors, smoke detectors etc. Control of door locks, alarms etc. can also be configured.
- 12 analog GPIO ports can be configured for analog monitoring.

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