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ABOUT HIOTRON

Building a complete IoT solution can be a challenging task, as it requires technical expertise, a lot of time, resources and capital. On the other side, a ready-made IoT platform simplifies the development and deployment of IoT applications, as it connects devices and sensors easily, delivering more values in terms of cost and time optimization.

We are leading custom IoT solution provider in APAC [Asia-Pacific] region. Our full-fledged hiOTron cloud Platform enables us to provide cost-effective solutions to our customers in shortest period of time with 100 % satisfaction because this is what matter to us.

Our highly passionate in-house development team works in all major vertical of IoT technology. We are expert in such as custom PCB design/hardware development, embedded software development, device-cloud/network integration, communication/web protocols & IT experts, front-end/mobile app or Web-App development & big-data analytics.

With design thinking approach we provide uniquely designed custom solution that improve processes, differentiate products and services. We are global in nature since our inception in 2013, we have served our customers in 8 different IoT business verticals and delivered almost 17800 connected devices and we feel proud in stating that 81% devices are live on our hiOTron IoT™ platform in 26 various cities across 5 countries.
OUR EXPERTIZATION

- **Connectivity**: Wi-Fi, ZigBee (Star/Mesh), LoRa (868 or 915 MHz), Z-wave, Sub-1, Bluetooth, BLE4.0, IR, NFC, RFID etc.

- **Semiconductor**: Freescale, Marvell, Atmel, TI, Microchip & Many more.

- **Communication Channel**: Wi-Fi, Ethernet, GSM/GPRS, GNSS, LTE.

- **Cloud Platforms**: AWS, IBM Blue-mix Watson, Xively, Thing-Worx, hIOTron & Private.

- **Communication & Queuing Protocols**: MQTT, REST, Web-sockets, COAP, XMPP, AMQP.

- **Databases**: Cassandra, MongoDB, Raven DB, MySQL, Oracle, MS-SQL.

- **Mobile**: Android, iOS, Windows.

- **Standards**: OPENIoT, HomeKit, Thread, Nest, Alljoyn, Brillo & Weave.
Selecting a transformer monitoring solution is a critical step in achieving your company’s Smart Grid asset management strategy. Transformer monitoring requires the integration of sensors, data management and analysis to turn sensor data into useful knowledge, and then an overlay of software applications to turn knowledge into actionable information. Appropriate online diagnostic tools can help utilities avoid unplanned failures, lower maintenance costs and extend useful transformer life.

hIOTron® DTMS solution delivers decision support to the right personnel in the context of actionable information.

hIOTron DTMS solution designed to provide transformer monitoring and diagnostics for transformers in a substation or across multiple substations, DTMS turns transformer monitoring data into actionable information by translating oil level, top & bottom temperature, winding temperature other sensor measured data into diagnostic and prognostic messaging.

DTMS provides alarming and trending using models that work with rule-based logic, derived from accepted IEEE/ANSI guidelines, to perform correlations on both measured and calculated data. Alarm messaging includes recommendations on maintenance activity as well as suggested loading should DTMS classify the observed deviation as severe enough that it may result in the damage or potential failure of the transformer.
1. Provides energy parameters and other relevant to the central control station in the form of graph, charts and other user defined widgets with advanced filters.
2. Advanced detection of abnormal conditions and send alerts in the form notifications, mail, message or alarm locally or remotely.
3. UI based advance rules logic to perform correlations on both measured and calculated data
4. Provide maintenance support to address abnormal operation
5. Auto connectivity for remote sites.
6. Fully Flexible, secure and scalable architecture.
7. Easy device configuration, setup, installation on new or legacy transformers from any manufacturer utilizing existing sensors.
1. Parameter: Oil Level | Sensor: Magnetic Float level switch

2. Parameter: Top & Bottom Oil Temperature | Sensor: RTD Sensor

3. Parameter: Load Current | Energy meter over RS232


A: SENSORS & ENERGY METER

B: HI-GATE [AN IOT GATEWAY]

C: HIOTRON IOT® PLATFORM

D: MOBILE APP & DASHBOARD

Wired Distribution Transformer Monitoring System (DTMS)
TECHNICAL DETAILS → SOLUTION ARCHITECTURE → WIRELESS

1. Parameter: Oil Level | Sensor: Magnetic Float switch
2. Parameter: Top & Bottom Oil Temperature | Sensor: RTD Sensor
3. Parameter: Load Current | Energy meter over RS232

8. DISTRIBUTION TRANSFORMER MONITORING SYSTEM (DTMS)

A: HI-NODE

B: HI-GATE [AN IOT GATEWAY]

C: HIOTRON IoT® PLATFORM

D: MOBILE APP & DASHBOARD
TECHNICAL DETAILS ➔ DATA ACQUISITION DETAILS

- **Wired Data Acquisition** – Sensors & Energy meter data can be collected directly through gateway (Hi-Gate) over analog (4/20mA) & RS232 communication using RJ11/45 connector. Gateway can be powered through mains using AC-DC 5-volt or 12-volt power adaptor.

- **Wireless Data Acquisition** Sensors & Energy meter data can be collected by Hi-Node (A wireless node) over analog (4/20mA) & RS232 communication using RJ11/45 in case of monitoring multiple transformers at single site which will wirelessly send these data to the Hi-Gate (An Industrial IoT Gateway) over local communication protocol (Zig-Bee IEEE802.15.4 standard) and further push it to cloud (IoT Platform timely or event based. Wireless nodes can be powered directly through mains (5 or 12 volt) initially and further rechargeable (Li-Ion) battery along with solar charging provision can be added (if required).
1. **Oil level** – Oil level is measured using a magnetic float level switch or a float-based sensor. The float moves up & down in the transformer tank with changes in oil. Accordingly, the output analog voltage changes which is measured and interfaced similar to temperature using ADC of the microcontroller. The float handle can be modified according to the tank size of the transformer. Oil level sensor can be fitted in the transformer tank or reservoir.
- **Oil Temperature** – Top & Bottom oil temperature of distribution monitored using Screw-in RTD temperature probes with terminal head form B sensor. Screw-in RTD temperature probes are mainly used for measuring temperatures in fluids and gasses. A decisive selection criterion is the reliable sealing feature of this installation type with vacuum and with overpressure. The analog (4/20Mamp) of sensor fed to ADC of (Analog to Digital convertor) of Arm Cortex M-4 controller. The connection head is suitable for temperatures up to +100 °C.

- **Lug/Winding Temperature** - RTD surface temperature probes are used for measuring temperatures on closed pipework and/or other round or level surfaces. It gives 1 °C accuracy over its operating range of temperature. Type of sensor is NTC thermistor based. The analog (4/20Mamp) of sensor fed to ADC of (Analog to Digital convertor) of Arm Cortex M-4 controller. The connection head is suitable for temperatures up to +120 °C.
• **Transformer loading** - All electrical parameters including loading is monitored using an energy meters with RS232 communication port over RJ45 connection with main unit (Micro-controller). Energy meter memory data can be monitored continuously over this port such as current, voltage & power factors etc which gives a loading profile of transformer.
Main Unit - Hi-Gate (An Enterprise IoT Gateway) is an ARM® Cortex®-M4 Core based an IoT gateway supported with on-board wired (Analog/Digital, RS232/485) & Wireless (BLE4.0, Zig-Bee) Protocols for data collection or inbound communication and Wi-Fi, GSM/GPRS (2G) for cloud or outbound communication.
## Device Specifications

<table>
<thead>
<tr>
<th>Device</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microcontroller</strong></td>
<td>TI-CC3200 ARM® Cortex®-M4 Core at 80 MHz</td>
</tr>
<tr>
<td><strong>Operating voltage</strong></td>
<td>2.3V to 3.6V [<em>Analog Input Maximum 1.5V]</em></td>
</tr>
<tr>
<td><strong>Input voltage</strong></td>
<td>1.5V (USB)</td>
</tr>
<tr>
<td><strong>InBound Connectivity</strong></td>
<td></td>
</tr>
</tbody>
</table>
| | ➢ **Wired**  
| | • 2 Input channels  
| | • 2 Output channels |
| | ➢ **Wireless**  
| | • On-Board: Zig-Bee, BLE4.0.  
| | • **Modular extension (optional)**: Sub-1, LoRa or any other RF communication protocol. |
| **OutBound Connectivity:** |  |
| | ➢ **Wired**  
| | • **Modular Extension (optional)**: Ethernet |
| | ➢ **Wireless**  
| | • On-Board: Wi-Fi(802.11b/g/nRadio), Cellular2G(M66Quectel).  
| | • **Modular Extension (optional)**: Cellular3G(EC20Quectel), 4G(EC25Quectel) |
| **Memory:** | 256KB RAM, 1MB serial flash memory with file system. |
| **Other on-board peripherals** | Buzzer, RTC, Relays, External EEPROM (128KB). |
| **Ambient Temperature Range** | -40°C to 85°C. |
| **Humidity** | 5% to 95% (non-condensing) |
| **Dimensions** | 130x115x36 (mm) |
• **Wireless Node** - Hi-Node is a mains or battery powered wireless node equipped with pluggable Zig-Bee protocol module for wireless inbound connectivity with Hi-Gate having more than 8 on-board GPIO pins for sensors data collection and RJ11 connector for energy meter data collection over rs232 protocol.
<table>
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<th>Device Specifications</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Microcontroller</strong></td>
<td>ATMega644 (8-Bit) microcontroller</td>
</tr>
<tr>
<td><strong>Flash memory</strong></td>
<td>64 KB (ATmega644P) of which 2 KB used by bootloader</td>
</tr>
<tr>
<td><strong>SRAM</strong></td>
<td>2 KB (ATmega644P)</td>
</tr>
<tr>
<td><strong>EEPROM</strong></td>
<td>128 KB (ATmega644P)</td>
</tr>
<tr>
<td><strong>Input Channels</strong></td>
<td>2 Analog, 2 Digital</td>
</tr>
<tr>
<td><strong>Output Channels</strong></td>
<td>L1, L2, L3, L4</td>
</tr>
<tr>
<td><strong>Pluggable module</strong></td>
<td>On-board – RS232 via RJ11 (Wired)</td>
</tr>
<tr>
<td><strong>Input Voltage</strong></td>
<td>5V via USB or 3.7V via Li-on18650 rechargeable battery</td>
</tr>
<tr>
<td><strong>Ambient Temperature Range</strong></td>
<td>-40°C to 85°C.</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>5% to 95% (non-condensing)</td>
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<td><strong>Dimensions</strong></td>
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</table>
**Zig-Bee Introduction**: ZigBee Protocol: Zigbee (IEEE 802.15.4 standard) is low-cost and low-powered mesh network widely deployed for controlling and monitoring IoT applications where it covers 100-500 meters within the range. This communication system is less expensive and simpler than the other proprietary short-range wireless sensor networks as Bluetooth and Wi-Fi. Zigbee’s WPANs operate at 868 MHz, 902-928MHz and 2.4 GHz frequencies. The data rate of 250 kbps is best suited for periodic as well as intermediate two-way transmission of data between node and gateway.

**Zig-Bee Topologies**: Zigbee supports several network topologies; however, the most commonly used configurations are star, mesh and cluster tree topologies.

- **Start topology**: the network consists of one coordinator which is responsible for initiating and managing the devices over the network. All other devices are called end devices that directly communicate with coordinator.

- **Mesh topology**: In mesh, the Zigbee network is extended with several routers where coordinator is responsible for staring them. These structures allow any device to communicate with any other adjacent node for providing redundancy to the data. If any node fails, the information is routed automatically to other device by these topologies. As the redundancy is the main factor in industries, hence mesh topology is mostly used.

- **Cluster-tree topology**: In a cluster-tree network, each cluster consists of a coordinator with leaf nodes, and these coordinators are connected to parent coordinator which initiates the entire network.
TECHNICAL DETAILS ➔ PLATFORM DETAILS

- **hIOTron IoT™ Platform (Middleware)** - hIOTron IoT™ Platform delivers a comprehensive platform as a service (PaaS) for rapidly designing, developing, deploying, and operation of enterprise IoT applications to accelerate the IoT innovations right from PoC to Production.
1. Device Connectivity – Web based Platform manages seamless device connectivity & configuration from platform to gateway (OutBound Connectivity Protocols: Wi-Fi, Ethernet & 2G/3G/4G/LTE modem) & gateway to wireless/wired end node [InBound Connectivity Protocols (Wired – Serial, I2C, SPI, RS232/485, Mod-Bus & CAN) & (Wireless – BLE4.0, ZigBee, ZWave, LoRa, Sub-1, RF)] & Vice versa.

2. Device Management – Platform IoT Device Management makes it easy for you to manage your connected devices at any scale with right authentication & authorization process. Organize & Manage your Hub (gateway) & Nodes in hierarchical structure based on its category which help to search/edit/remove devices in bulk.

3. Basic/Advance Edge Analytics Models – Platform supports multiple Anomaly Detection Models to filter data based on event or time & perform some actions (if assigned any) at edge before it reaches to cloud to eliminate the round-trip latency of an actionable insight. In a production environment, same filtered events can be mapped with notifications/switching models to make the process automatic through cloud.

4. Basic/Advance Analytical Models – Platform provides a spectrum of analytics that enable you to start quickly and realize value immediately and visualize your device real time or historical Raw, Formatted & Formulated (Application category based) data in charts/graphs/bars in well-organized way with multiple filters like project/data/ time/threshold/download options

5. Data Storage – Platform stores last 90 days device generated data for any application which is directly in-sync with heart-beat interval (data update period from device to platform) period (default 10 minutes). For example: if Heart-beat interval kept 5 minutes then storage duration will also become half 45 days. For any customization in storage please contact.

6. Reporting Tools – Platform allows user to visualize real time & historical data along with time/event-based mail reporting feature for overall (combined) or each & every pattern of data in PDF format. [xcel format reporting also available with data filtering option]

7. FOTA (Firmware over the air) – Platform maintains the record of every version (Newly or Previous) of firmware of devices associated to it which allows you to update gateways & its associated nodes new firmware one by one or all in one in single click.
Enterprise Features

8. REST APIs Integration – Access of Rest APIs in JSON/string format allows you to embed raw data anywhere in the form custom visualizing model as per business logics or branding requirement.

9. Logo/Theme Branding – Partners can serve hIOTron IoT™ Platform as their platform to their clients with logo & theme branding features.

10. White label branding – Partners can also serve hIOTron IoT™ Platform as their platform with completely white label branding option right from their custom logo to URL.

Get in touch to find out how hIOTron® can help you turn your data into insights.

1. info@hiotron.com for setting up quick demo.
2. partner@hiotron.com to become channel/distributor/OEM (White labelling) partner
3. sales@hiotron.com to buy this solution.
4. Call at +91-9975551455/+91-7028438993.