IoT Gateway Design Proposal

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# Summary of the Proposal

Prompt: Design a solution for a system to build an IoT gateway which can collect various types of analog and digital sensor data as well as UART based sensor data, IoT gateway should be able to communicate with cloud platform over Ethernet or Wi-Fi interface, IoT gateway should be running Linux distributed system. IoT gateway should support OTA, self-memory management. IoT gateway should send health statistical data to the cloud periodically.

# Block Diagram

The block diagram below explains a high-level system architecture of the IoT gateway aggregating three different sets of sensors and pushing the data to a cloud server for monitoring purposes. At this stage, the control system is not in place.

Diagram

Description automatically generated

# Hardware Requirement

The hardware is specifies based on the industrial standard for ruggedized IIoT gateway. Which runs on Linux distributed system with Zigbee local mesh as the wireless communication protocol.

|  |  |
| --- | --- |
| **Communication** | |
| Wireless Comm. Protocol | Zigbee (Local Mesh) |
| Bands | LTE Cat 4: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B25, B26, B28, B38, B39, B40, B41 3G: B1, B2, B4, B5, B6, B8, B19 2G EDGE / GPRS: 850 / 900 / 1800 / 1900 MHz |
| Connectors | (2) 50 Ω SMA (center pin: female) |
| SIM Slots | (2) Mini-SIM (2FF) |
| SIM Security | Behind SIM cover, secured with screw |
| **Software Management** | |
| Operating System | Linux Distributed System (Debian/Red Hat) |
| Remote Management | SNMP v2/v3, SSH |
| Local management | WebUI (HTTP/HTTPS); CLI (Telnet, SSH) |
| Management / Troubleshooting Tools | FTP client, SCP; protocol analyzer with PCAP for Wireshark; event logging with syslog and SMTP client; NTP/SNTP; Nagios, Intelliflow, iPerf, Dynamic DNS, ping, traceroute |
| **Ethernet** | |
| Port | (1) RJ-45; 10/100 Mbps (auto-sensing) |
| **Serial** | |
| Port | (1) RJ-45 10-pin (10P10C); [RS-232](https://www.digi.com/products/browse/rs-232)/485; software selectable - RS-232 DTE (RXD, TXD, RTS, CTS, DTR, DCD, DSR, RI) - RS-485 (TX/RX+; RX/TX-); half-duplex |
| **Environmental** | |
| Operating Condition | -40° C to 75° C @ 5% to 95% RH |

# Software Support

|  |  |
| --- | --- |
| **ENTERPRISE SOFTWARE** | **Description** |
| Protocol Support | HTTPS, FTP client, SSL, TLS v1.2, SCP (client and server), SFTP, SMTP client for use by scripts and the command line, SNMP (v2/v3), SSH; protocol analyzer, ability to capture PCAP for use with Wireshark; DynDNS; dynamic DNS client compatible with BIND9/No-IP/DynDNS; captive portal, Intelliflow; Nagios, DNS server, NTP server, multicast, mDNS, IPerf |
| Security | IP filtering, stateful firewall, custom firewall rules (iptables), address and port translation; TLS 1.2 and above, OpenVPN client and server; VPN tunnels; authentication: RADIUS, TACACS+; certificates; MAC address filtering; VLAN support |
| VPN | IPSec with IKEv1, IKEv2, NAT Traversal; OpenVPN client and server; GRE PN tunnels; cryptology: SHA-1/256/384/512, MD5, RSA; encryption: 3DES and AES up to 256-bit (CBC mode for IPsec); Diffie Hellman: DH groups 1-32 (CURVE448) |
| Routing/Failover | IP pass-through; NAT, NAPT with IP port forwarding; GRE; multicast routing; routing protocols: RIP (v1, v2) OSPF, BGP; IP failover: VRRP; automatic failover. |
| Other Protocol | DHCP; dynamic DNS client compatible with No-IP/DynDNS |

# Project Timeline

The project timeline below explains the overall timeline from project planning to system testing just before system deployment. The hardware procurement timeline is shortened assuming local suppliers keep the unit in stocks.

Table

Description automatically generated with low confidence

# Component Selection Matrix

The component selection matrix below should guide the selection of goods based on the required specification scored based on the degree of importance (low, medium, high).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of hardware | Weight | Alternative A | Alternative B | Alternative C |
| **General Performance** |  |  |  |  |
| Ease to Implement | 1 |  |  |  |
| Benefit/Cost relationship | 2 |  |  |  |
| Leadtime | 2 |  |  |  |
| Manufacturer Portfolio | 1 |  |  |  |
| **Technical Performance** |  |  |  |  |
| Communication Interface | 3 |  |  |  |
| Software Management | 2 |  |  |  |
| OTA support | 2 |  |  |  |
| Development Environment | 1 |  |  |  |
| **Total Rating** |  |  |  |  |

Scoring:

1. Low
2. Medium
3. High