DATA SHEET | TIBIT TECHNOLOGIES

MicroClimate Management System

The Tibit™ MicroClimate Management System® (Tibit MCMS) enables broadband operators to precisely manage and optimize passive optical networks (PONs) through a unified, automation-ready platform. With integrated control, open APIs, real-time telemetry, and scalable analytics, it streamlines operations, reduces costs, and accelerates service delivery—boosting reliability, speeding issue resolution, and enabling profitable, scalable growth with a superior customer experience.

In today's fast-moving broadband market, OEMs and ODMs must deliver PON solutions that meet rising demand while exceeding expectations for automation, scalability, and efficiency. Broadband operators now expect advanced capabilities—management, real-time telemetry, and API-driven integration—to be built in from the start. Meanwhile, intensifying time-to-market pressures drive demand for turnkey solutions ready for immediate deployment, even as customization needs grow.

Operational challenges compound the issue: Network downtime, slow provisioning, and inefficient fault resolution can quickly erode customer satisfaction and competitive standing. Integration hurdles add further complexity, as compatibility with operations support systems (OSS) and business support systems (BSS) and multi-vendor ecosystem adaptability require highly flexible, open systems that can operate across diverse environments.

Ciena's Tibit MCMS addresses these challenges head on. Designed as a unified, automation-ready platform for PON networks, Tibit MCMS delivers centralized or distributed control, open APIs for seamless OSS/BSS integration, real-time telemetry for proactive monitoring, and scalable analytics for data-driven optimization. By embedding or bundling Tibit MCMS

Features and benefits

- Tibit MCMS PON manager with MongoDB delivers centralized, real-time network control with simple and scalable provisioning
- Tibit MCMS REST API enables secure, seamless integration for real-time PON network provisioning and monitoring
- Tibit MCMS NETCONF delivers standardized, model-driven control and monitoring for efficient PON network management
- Tibit MCMS PON controller automates configuration and monitoring, bridging your database with the PON network devices
- Integrated 802.1X authentication, DHCPv4/v6 relay with option 82, and PPPoE
- Secure, standards-based gNMI streaming or real-time configuration, performance, and alarm data
- Unified PON MongoDB single datastore hub for streamlined PON provisioning and real-time monitoring between Tibit MCMS management interfaces and the PON controller

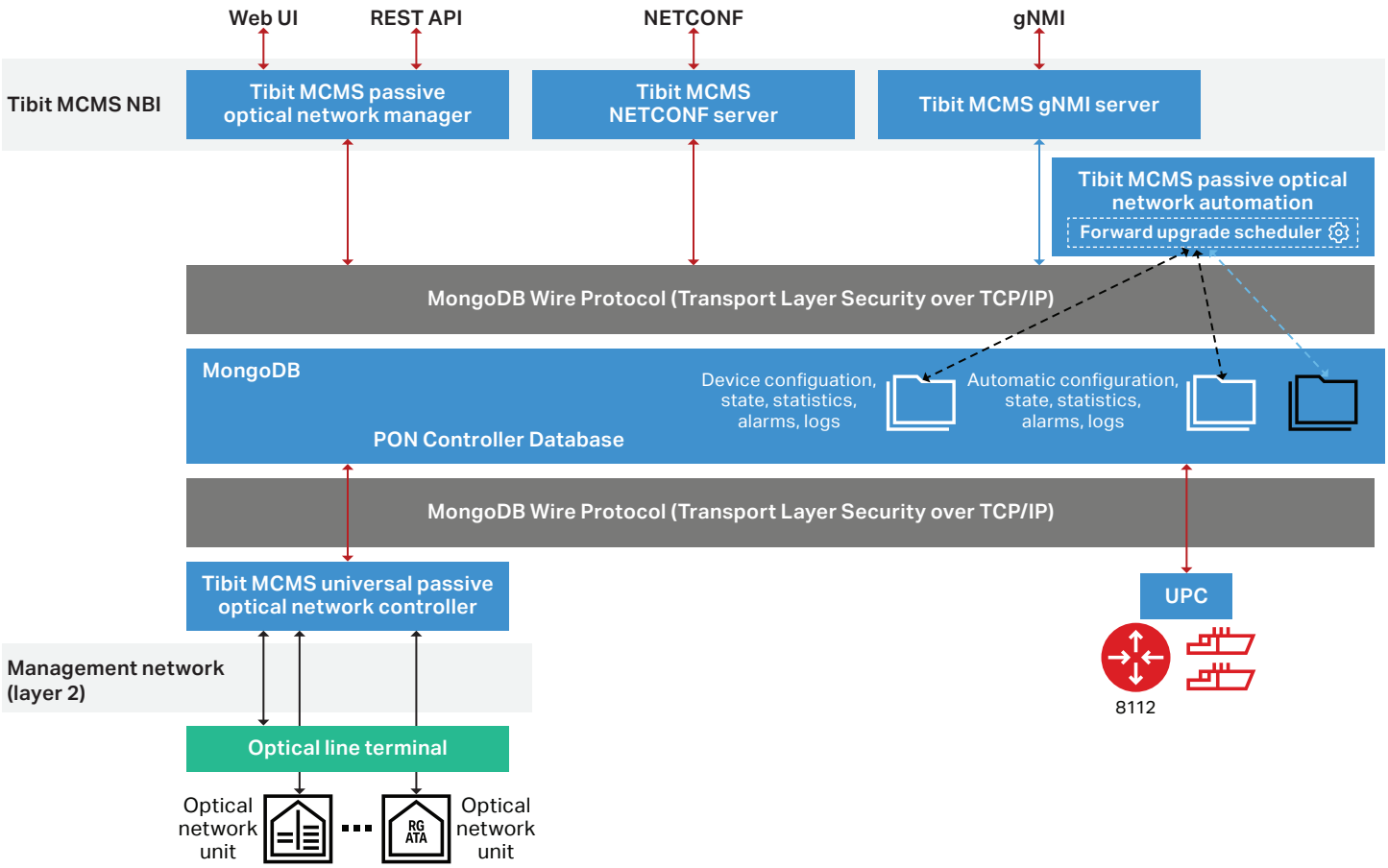


Figure 1. Ciena's Tibit MCMS architecture

into your portfolio, you can shorten development cycles, reduce engineering overhead, and provide operators with a proven, future-ready management framework from day one—empowering you to differentiate your solutions, win more bids, and strengthen long-term customer relationships.

Tibit MCMS is built to meet various use cases for PON networks—from the access to the data center. There are seven components of Ciena's Tibit MCMS: Tibit MCMS PON manager, Tibit MCMS REST API, Tibit MCMS NETCONF server, Tibit MCMS PON controller, Tibit MCMS PON controller host processing software, Tibit MCMS PON gRPC Network Management Interface (gNMI) streaming telemetry server, and Tibit MCMS MongoDB datastore.

Tibit MCMS PON manager

The Tibit MCMS PON manager is a software solution for managing PON networks, combining a single-page web application and a REST API. Built on the Angular v17 framework and integrated with MongoDB, it provides a secure, scalable, and intuitive platform for network management. The web app harnesses libraries like Cytoscape for network visualization, D3 Graphs and ngx-charts for device statistics, and Font Awesome for UI enhancements.

The REST API, hosted on an Apache HTTP server with Django as a Web Server Gateway Interface (WSGI) plugin, facilitates database operations using custom MongoEngine models to support MongoDB. Private API endpoints are reserved for internal use by the web app and are excluded from customer documentation.

Key features

- **Alarm management:** Real-time monitoring and resolution
- **Dashboard view:** Summary of network conditions
- **Device monitoring:** Performance and metrics insights
- **Device provisioning:** Simplified configuration and control
- **Service configuration:** Virtual LANs (VLANs), SLAs, 802.1X, Dynamic Host Configuration Protocol (DHCP) relay, Point-to-Point Protocol over Ethernet (PPPoE)

- **Logging:** Diagnostic tools for troubleshooting
- **Polyglot ONU management and control interface (OMCI) tool:** Service configuration with future 10G Ethernet PON (EPON) operations, administration, and maintenance (OAM) support
- **Database management:** Administration of the PON controller database
- **User management:** Secure user and permissions management

The software supports two primary installation methods with Debian packages or Docker containers, with MongoDB setup required beforehand.

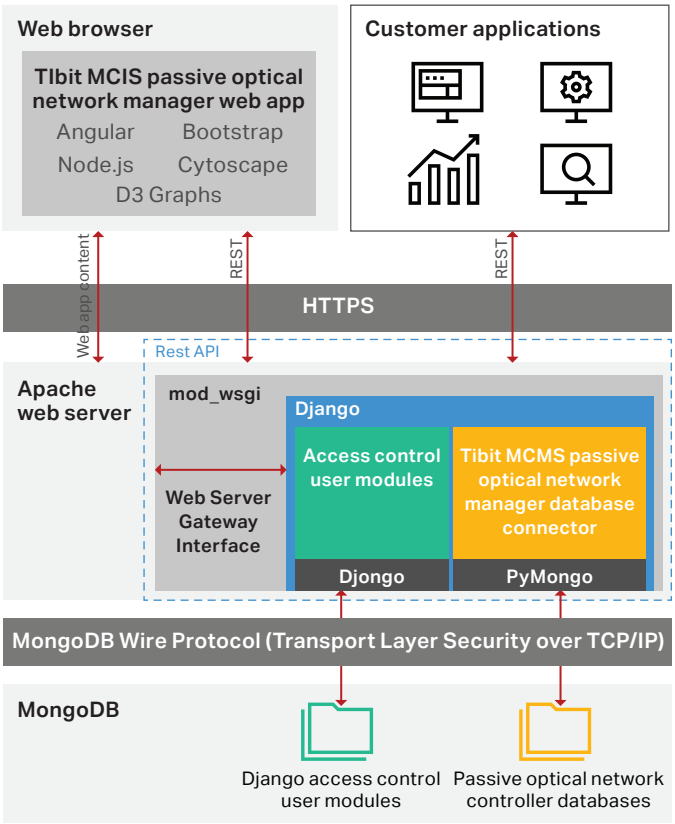


Figure 2. Tibit MCMS PON manager architecture

Tibit MCMS REST API

The Tibit MCMS REST API is a secure HTTPS-based interface that enables efficient management of PON devices for Tibit solutions. It supports device provisioning, service configuration, performance monitoring, log collection, and file management. The API is also used by the PON manager web app for PON and user management.

The API provides endpoints for:

- **Device management:** Configuration and status for PON controllers, optical line terminals (OLTs), optical network units (ONUs), switches, and routers
- **Service configuration:** SRV-CFG, VLANs, SLAs, 802.1X authentication, DHCP relay, and PPPoE
- **Performance monitoring:** Access to device statistics
- **Logging and alarms:** Device logs and alarms for diagnostics
- **File management:** OLT/ONU firmware and device pictures

Built on RESTful principles over HTTPS, the API supports provisioning and monitoring of OLTs, ONUs, and third-party ONUs compliant with XGS-PON and 10G-EPON standards. It aligns directly with the Tibit MCMS PON controller data model in MongoDB, ensuring seamless mapping of endpoints to database collections.

The Tibit MCMS REST API is a scalable and versatile solution for managing PON networks.

Tibit MCMS NETCONF

The Tibit MCMS NETCONF server provides a standard NETCONF interface and customer-facing API for managing PON networks. Built on the ConfD framework, it integrates with MongoDB to facilitate provisioning, configuration, and monitoring of PON network elements.

Tibit uses YANG data models to define and manage key components of the PON network, including:

- PON controllers
- OLTs
- ONUs
- SLAs
- Service configuration

The NETCONF server acts as an agent to execute requests from NETCONF clients. It enables programmatic installation, modification, and deletion of device configurations, as well as retrieval of operational data. Communication between the NETCONF client and server is based on remote procedure calls (RPCs), with messages and data encoded in XML.

The Tibit MCMS NETCONF server provides a robust and standardized solution for managing PON networks, using YANG data models and NETCONF protocols to ensure efficient and scalable network operations.

Tibit MCMS PON controller

The Tibit MCMS PON controller is a stateless management application designed to configure and monitor Tibit MicroPlug OLTs and their PON endpoints. Operating at customer-defined intervals, it applies configurations and retrieves state, statistics, alarms, and logs from devices, using MongoDB as its northbound interface. The PON manager and NETCONF interfaces manage the PON controller through MongoDB.

The PON controller's southbound interface uses the API, a Python-based implementation of the Tibit OLT Management Interface (TOMI) protocol, enabling communication with OLTs and ONUs (through OMCI/DPoE). It supports both ITU-T XGS-PON (10G symmetric GPON) and IEEE 10G-EPON standards, with device communication occurring over IEEE 1904.2 OAM packets.

The PON controller operates without direct external interfaces, relying on MongoDB for all instructions and results. Multiple PON controllers can share a single database, which stores configuration data, current system state, and monitoring history. Its primary role is to transfer configurations from the database to the PON system and status updates back to the database.

The system is flexible, allowing the database to be accessed through NETCONF interfaces (with YANG data models), human interfaces like command line interface (CLI) or GUI tools, or custom operator-generated solutions. The PON controller focuses solely on facilitating communication between the database and PON endpoints, ensuring efficient and scalable network management.

Tibit MCMS PON controller hosting software

The Tibit MCMS PON controller software incorporates host-processing components to deliver key control protocol functions essential for deploying PON access networks. These include:

- **802.1X authenticator** with RADIUS support
- **DHCPv4 and DHCPv6 relay agents**
- **PPPoE intermediate agent** with Broadband Forum circuit ID and remote ID vendor tag insertion

Additional capabilities include DHCPv4 relay agent option 82 insertion. The host-processing software is bundled with and deployed alongside the PON controller, providing integrated support for secure authentication, service provisioning, and access management.

Tibit MCMS PON gNMI

The Tibit MCMS PON gNMI streaming telemetry server provides a standards-based, asynchronous subscription interface for accessing Tibit MCMS data stored in MongoDB. External gNMI clients—including third-party IT systems—can subscribe to configuration monitors, statistics, and alarms, all sourced from the Tibit MCMS datastore. Data is delivered over a secure Transport Layer Security (TLS) transport with JSON-encoded output, supporting both sample and on-change subscription types.

Built on the gNMI protocol as defined by OpenConfig, the server enables clients to retrieve, stream, and modify network device configurations using YANG-based data models. gNMI unifies configuration management and real-time telemetry in a single interface, making it a powerful tool for monitoring and controlling PON networks. It supports three core RPC operations: "Get" to retrieve configuration or state data, "Set" to modify device configurations, and "Subscribe" to receive real-time telemetry streams.

Tibit MCMS MongoDB datastore

The Tibit MCMS MongoDB datastore serves as the central datastore for Tibit MCMS, holding all device configuration, state, statistics, alarms, and logs for the PON. Northbound interfaces—such as the Tibit MCMS PON manager, Tibit MCMS NETCONF server, and customer applications—connect to MongoDB to provision devices and retrieve monitoring data. It acts as the bridge between the PON manager/NETCONF interfaces and the PON controller.

The PON controller defines the document formats and schema within MongoDB. Provisioning data flows downstream: the PON manager and NETCONF interfaces write configurations to MongoDB, which the PON controller reads to program OLT and ONU devices. Monitoring data flows upstream: The PON controller periodically collects device state, statistics, alarms, and logs, then writes them to MongoDB. The PON manager reads this data from MongoDB to present real-time status in its web interface.

Technical specifications

Application	Hardware guidelines	Description
Application subscriber size	3072 subscribers	100K subscribers
PON controller	1 instance: • 1 vCPU • 1 GB RAM • 1 GB disk space	32 instances: • 32 vCPUs • 32 GB RAM • 32 GB disk space
PON manager	• 2 vCPUs • 8 GB RAM • 1 GB disk space	• 16 vCPUs • 32 GB RAM • 100 GB Disk Space
NETCONF server	• 2 vCPUs • 1 GB RAM • 50 GB disk space	• 8 vCPUs • 32 GB RAM • 100 GB Disk Space
gNMI server	• 16 vCPUs (Intel Core i7 Raptor Lake or better) • 8 GB RAM • 50 GB disk space	
PON Auto	• 16 vCPUs (Intel Core i7 Raptor Lake or better) • 18 GB RAM • 50 GB disk space	
MongoDB	• 2 vCPUs • 8 GB RAM • 10 GB disk space	• 16 vCPUs • 64 GB RAM • 100 GB disk space
Operating temperature	ANSI SCTE 158, Class 1, Condition A, operating temperature -40°C to +60°C	
Storage temperature	-40°C to +70°C (-40°F to +158°F)	
Humidity	5% to 95%, non-condensing	

Software features

Software guidelines	Description
Ubuntu Linux version	MongoDB version
22.04	6.0
24.04	8.0

Ordering information

Part number	Description
S10-LIC-MCMS-OEM	MCMS SW ANNUAL UPGR/UPDT PER OLT INCL. PERPETUAL RTU LIC (OEM)
S10-LIC-OLTFW-OEM	OLT FW ANNUAL UPGR/UPDT PER OLT INCL. PERPETUAL RTU (OEM)
S10-LIC-ONUFW-OEM	ONUFW PER ONU INCL. PERPETUAL RTU LIC ON

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