

SmartHome Technical Specifications

System Architecture

The SmartHome system follows a hub-and-spoke architecture with the following components:

SmartHome Hub (Model SH-100)

- Central processing unit: ARM Cortex-A53 quad-core @ 1.4GHz
- Memory: 2GB RAM
- Storage: 16GB eMMC
- Connectivity: Wi-Fi (802.11ac), Bluetooth 5.0, Zigbee 3.0, Z-Wave
- Power: 5V DC, 2A
- Dimensions: 4.5" x 4.5" x 1.2" (114mm x 114mm x 30mm)
- Weight: 8.5 oz (240g)

Communication Protocols

The SmartHome system uses the following protocols for device communication:

- SmartHome Connect (SHC) - proprietary protocol for secure device communication
- MQTT for lightweight messaging
- CoAP for constrained devices
- HTTP/HTTPS for cloud connectivity

Security Features

- End-to-end encryption (AES-256)
- Secure boot
- Automatic security updates
- Certificate-based device authentication
- OAuth 2.0 for API authentication
- Local processing of sensitive commands
- Secure element for cryptographic operations
- Regular security audits and penetration testing

Hardware Components

Main Board

- SoC: Broadcom BCM2711
- GPU: VideoCore VI
- Thermal management: Passive cooling with aluminum heat spreader
- Watchdog timer for automatic recovery

Network Interface

- Wi-Fi: 2.4GHz and 5GHz IEEE 802.11ac wireless
- Ethernet: 10/100/1000 BaseT Gigabit Ethernet port
- Bluetooth: Bluetooth 5.0, BLE
- Zigbee: Built-in Zigbee 3.0 coordinator
- Z-Wave: Z-Wave Plus v2 certified

I/O Interfaces

- USB: 2x USB 3.0 ports
- HDMI: 1x micro HDMI port (for setup and diagnostics)
- Power: USB-C power input
- Buttons: Reset, pairing, and power

Power Management

- Input: 5V DC, 2A minimum (USB-C)
- Power consumption: 2.5W typical, 5W peak
- Backup power: Optional UPS accessory with 4-hour backup
- Power monitoring and management features

Software Architecture

Core Software Stack

- Operating System: Custom Linux distribution (SmartHomeOS)
- Kernel: Linux 5.10 LTS
- Runtime: Node.js 16.x and Python 3.9
- Database: SQLite (local), PostgreSQL (cloud)
- Message broker: Mosquitto MQTT

Software Components

- Device Manager: Manages device discovery, pairing, and lifecycle
- Rule Engine: Processes automations and rules
- Event Bus: Manages event distribution and handling
- State Manager: Maintains current and historical device states
- Security Manager: Handles authentication, authorization, and encryption
- Update Manager: Manages software and firmware updates
- API Gateway: Exposes RESTful and WebSocket APIs

Cloud Services

- Account Management: User accounts and authentication
- Remote Access: Secure remote access to local hub

- Backup & Restore: Configuration and automation backup
- Analytics: Anonymous usage statistics (opt-in)
- Voice Assistant Integration: Cloud-based integration with third-party voice services

Performance Specifications

Device Capacity

- Maximum devices: 200 devices per hub
- Recommended devices: 50-100 for optimal performance
- Event processing: Up to 100 events per second
- Automation limit: 200 automation rules per hub

Networking

- Local network bandwidth: <1 Mbps typical usage
- Internet bandwidth: 50-100 MB per day typical usage
- Local latency: <50ms for device commands
- Remote latency: Dependent on internet connection (typically <500ms)

Reliability

- MTBF (Mean Time Between Failures): >50,000 hours
- Automatic recovery from most error conditions
- Daily automatic diagnostics and health checks
- Optional heartbeat monitoring

Upgrade and Expansion

Software Updates

- Automatic over-the-air (OTA) updates
- Update frequency: Monthly for regular updates, immediate for security patches
- Update window: Configurable by user (default: 2:00 AM - 4:00 AM local time)
- Rollback capability for failed updates

Hardware Expansion

- USB expansion for additional protocols (e.g., Insteon, KNX)
- Support for multiple hubs in mesh configuration
- External antenna options for extended range

Compatibility

Third-Party Integration

- Voice assistants: Amazon Alexa, Google Assistant, Apple HomeKit
- Smart platforms: IFTTT, Samsung SmartThings, Home Assistant
- Custom systems: REST API and WebHooks

Certified Device Partners

- Philips Hue lighting
- Schlage and Yale smart locks
- Ecobee and Nest thermostats
- Ring and Arlo cameras
- GE, Leviton, and Lutron switches and dimmers

Development Tools

SmartHome Developer Kit

- APIs: REST, WebSocket, and local Node.js
- SDKs: JavaScript, Python, Java, Swift
- Development environment: VSCode with SmartHome extension
- Simulator: Virtual device simulator for testing
- Documentation: Comprehensive API reference and tutorials

Certification Program

- Self-certification tools for partners
- Certification requirements and guidelines
- Compatibility testing framework
- Performance and security testing tools

Environmental Specifications

Operating Environment

- Temperature: 32°F to 104°F (0°C to 40°C)
- Humidity: 10% to 90% non-condensing
- Altitude: Up to 10,000 feet (3,000 meters)

Regulatory Compliance

- FCC certified (USA)
- CE marked (Europe)
- UL listed
- RoHS compliant

- WEEE registered
- California Energy Commission (CEC) compliant

Warranty and Support

Warranty

- 2-year limited hardware warranty
- 90-day software support
- Extended warranty options available

Support Options

- Online knowledge base and community forums
- Email support with 24-hour response time
- Phone support (available 7 AM - 9 PM ET, 7 days a week)
- Premium support plans for priority assistance

Future Roadmap (Planned for 2025-2026)

Hardware Enhancements

- Thread protocol support
- Matter protocol certification
- Improved energy monitoring and management
- Enhanced security features

Software Enhancements

- Advanced AI-based automation suggestions
- Improved anomaly detection for security
- Enhanced energy management and optimization
- Advanced scene creation and management
- Expanded developer APIs and tools