

# 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