



Happiest Minds* Creates Smart Home Device Management System

Company uses openHAB*-based platform on Intel® processor-powered servers and gateways to allow an IP cable television operator to offer a service that manages and automates disparate smart home systems.



Introduction

Growth in the smart home industry is coming from smart home service providers, which include home automation services companies and communications service providers (CommSPs). To keep a competitive edge, these companies are expanding the number and type of smart home systems in their service portfolios. But managing the connectivity, security, and automation challenges of these services requires a system that can accommodate a very heterogeneous set of devices. One IP cable system operator turned to Happiest Minds,* an Intel® Network Builders ecosystem partner, to develop a common platform interface (CPI) to provide a platform for its smart home service offering.



The Challenge: Managing Growth in Smart Home Systems

A Strategy Analytics* competitive analysis of US providers of fee-based smart home services found that the top 10 service providers have a collective total of 2.4 million subscribers accounting for over 80 percent of all smart home service subscribers.¹ The largest of these smart home service providers specialize in home security and then branch out from there to offer other smart home services.

One challenge for all service providers is connectivity diversity, stemming from a heterogeneous assortment of smart home systems that are manufactured by multiple vendors and operate on different protocols like HTTP, MQTT, CoAp, or XMPP. This diversity makes integration and management quite complex.

This issue was identified as a significant problem in the 2018 Connected Home and Building Technology Trends, a survey conducted by Jabil.* Of those surveyed, 43 percent said that the lack of data communication and application standards was one of their biggest challenges.²

Solving the connectivity and message handling issues of smart homes is just one reason why smart home service providers need a common platform interface (CPI) system. Other challenges include the following:

- **Status Checks:** Smart devices may not be able to send responses when they receive a request; they can only execute the command sent to them. A common example is a TV, which has a one-way data flow from a remote to the TV. There's no way to respond back that the TV is turned on or off or tuned to a particular channel.
- **Security:** Like the rest of the computing world, smart home systems are vulnerable to malware that can send malicious data in place of actual data.

- **Device Onboarding:** Onboarding millions of devices manually onto the platform is a tedious and potentially error-prone job. Additionally, customers want the freedom to extend their service to include the latest self-installed smart home device.
- **Different technology-based devices:** Devices increasingly evolve in their technology and the way they work day by day. There is a need to support these upgraded smart devices.

To help service providers solve these challenges, Happiest Minds Technologies has developed its CPI architecture to provide a single system that can help carriers cost effectively support the protocol diversity and other operational issues that come with a broad-based smart home service offering.

CPI System Utilizes Intel® Processors

Happiest Minds' CPI is a platform that provides connectivity, automation, security services, and onboarding and runs on virtualized or bare metal servers powered by Intel® Xeon® processors that run in a CommSP's network. The server communicates with gateways that are installed on the customer premises and utilize Intel Atom® processors.

Happiest Minds has based its CPI system on openHAB,* an open source home automation platform developed in Java* that connects building automation components from different suppliers into a single platform that is protocol neutral and supports all smart home device manufacturers.

Features within openHAB allow Happiest Minds to build a gateway that can control smart devices, can automate activities based on sensed input (e.g., roll up an awning when it rains) or based on time, and can notify the user if a process is complete (e.g., washer is finished) or when someone is at the door.

A key feature is support for a wide range of software connectors/adapters that the CPI can use for communication with disparate devices. If a particular smart device communicates on HTTP protocol, for example, the CPI can access the HTTP supporting connector/adaptor for communication.

Status checking of devices is another important function of the CPI gateway. The gateway initiates the communication with the smart device and then is able to receive its response in order to send an acknowledgement to the CPI server. The gateway absorbs the challenge of supporting the wide range of status check protocols of the smart home systems.

Smart home devices expand the consumer's attack surface as hackers can break into a sensor or home automation systems to either control it, or to use its internet connectivity and processing power for spam or denial of service attacks. The CPI provides several security features to help combat these attacks.

To help prevent the installation of malware on a smart home device, the Happiest Minds gateway registers the handshake protocol of the software on all of the smart devices in the home and the CPI server matches that to a database of devices. If unregistered software tries to access the gateway, it will deny access and alert the CPI server so that the service provider's customer service staff can call the customer and resolve the issue.

Secure sockets layer (SSL) encryption and API level authentication and authorization provide additional protection to data connections into and out of the CPI gateway.

Another source of customer support issues is onboarding a new smart home device that a customer has purchased and installed themselves, only to find that they can't connect it to the network. This onboarding process has been automated by integrating the CPI server with the CommSP's order management and inventory management systems. Whenever a new smart home device is registered, the order management and inventory management databases are checked to ensure that the device is authentic and part of the provider's offering. This allows the consumer to get immediate network access. The CPI also includes a software defined networking (SDN) controller for managing the data flows into and out of each of the gateways.

Optimized for Intel® Xeon® and Intel Atom® Processor-based Systems

Happiest Minds' CPI servers are based on Intel Xeon processors, which provide significant performance and power efficiency benefits for scaled-out data center and network virtualization applications. With built-in virtualization support, the Intel Xeon processors are well suited for SDN and NFV applications. These include Intel Xeon Scalable processors, which offer the scalability to deliver workload-optimized performance in NFV applications.

CPI gateways make use of the Intel Atom® SoCs (systems on chips), which are ultra-low-voltage and designed for a variety of light scaled-out workloads that require very low power, high density, and high I/O integration. These applications include network routers, switches, storage, security appliances, dynamic web serving, and more. With integrated Intel® QuickAssist Technology (Intel® QAT), Intel Atom SoCs can accelerate encryption of customer data, freeing up valuable processor cycles. Built-in Intel® Virtualization Technology (Intel® VT) hardware virtualization enables dynamic provisioning of NFV services located at the network edge.

Intel Atom SoCs are available in a range of configurations from 2 cores to 16 cores, supporting up to 256 GB of addressable memory. The SoCs feature an integrated platform controller hub (PCH), integrated I/O, up to four integrated 10 Gigabit Intel® Ethernet adapters, and a thermal design point (TDP) of between 8.5 watts and 32 watts. The SoCs can run the same software and instruction sets as Intel Xeon processors to provide software consistency and deployability from the data center to the network edge.

The CPI uses several messaging protocols that require low latency and high message throughput. Happiest Minds has developed the system utilizing the open source Data Plane Development Kit (DPDK), a set of software libraries and drivers for high-performance data plane functionality in an Intel® architecture-based server to achieve this performance. DPDK processes data packets in user space, avoiding the OS kernel that can cause latency. The performance of these DPDK-enabled servers helped Happiest Minds to achieve a packet throughput of 12.5 million packets per second,³ significantly higher than their design goal of 6.25 million packets per second. The CPI infrastructure is also configured with SR-IOV network interface, enabling it to exchange north-south traffic efficiently.

Conclusion

Smart home device connectivity, security, and automation are key value propositions for smart home service providers. With the development of the robust CPI platform for its cable customer, Happiest Minds has a feature-rich and customizable solution for other service providers. Leveraging openHAB features and powered by Intel® processors and technology, the Happiest Minds CPI can support the fast-evolving nature of smart home services.

About Happiest Minds

Happiest Minds enables digital transformation for enterprises and technology providers by delivering seamless customer experience, business efficiency, and actionable insights through an integrated set of disruptive technologies: big data analytics, internet of things, mobility, cloud, security, and unified communications. Happiest Minds services have applicability across industry sectors such as retail, CPG, e-commerce, banking, insurance, hi-tech, engineering R&D, manufacturing, automotive and travel/transportation/hospitality. As a Mindful IT Company, the focus is on "Being Mindful" and "Doing Mindful," which involves perceiving immersively, processing non-judgmentally, and performing empathetically. Headquartered in Bangalore, India, Happiest Minds has operations in the US, UK, The Netherlands, Australia, Middle East, and Turkey.

About Intel® Network Builders

Intel Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at <http://networkbuilders.intel.com>.



¹ Strategy Analytics Announces the Top 10 Smart Home Service Providers in the US <https://www.prnewswire.com/news-releases/strategy-analytics-announces-the-top-10-smart-home-service-providers-in-the-us-300395620.html>

² Link to article in IoT for All: <https://www.iotforall.com/smart-home-data-communication-standards/>. Link to survey (log in required): <https://www.jabil.com/forms/connected-home-building-tech-trends>

³ Testing conducted by Happiest Minds. Configurations: Intel® Xeon® CPU E5-2643 v4 @ 3.40GHz with 6 cores, 64 GB of DDR4 RAM; Intel Corporation 82599ES 10-Gigabit SFI/SFP+ Ethernet controller supporting 10 Gbps and two 10 Gbps interfaces. Performance results are based on testing as of September 27, 2018, and may not reflect all publicly available security updates. See configuration disclosure for details. No product or component can be absolutely secure.

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