



Apple's ADK and Software Authentication

The much awaited catalysts for
HomeKit development



Apple is world-renowned for their devices. They have set the benchmarks in design, security and user experience. And yet, the home accessory ecosystem has been slow to adopt Apple's HomeKit. There are roughly 250 core smart home accessories—alarms, sensors, thermostats—that are compatible with an Apple device. In comparison, there are 5,000 home automation accessories using Google Home and 12,000 home automation accessories on the Alexa ecosystem within a wider range of accessory categories¹; however, Apple is pushing to close the gap.

With the launch of Apple's HomeKit ADK (Accessory Development Kit) and Software Authentication Specification, it is now possible for a wide variety of smart home accessory brands to bring their accessories into the Apple ecosystem with relative ease—at a lower cost, and a significantly faster time-to-market. These two catalysts solve the two most critical challenges that smart home accessory developers have faced to date, to meet Apple's robust and strict HomeKit requirements.

Challenge 1: Use of Apple's authentication co-processor chip

At Apple, security and quality are of the utmost importance. Consumers trust that Apple certified accessories are tested and audited by Apple. To ensure accessories are trusted, Apple has required accessory developers to buy Apple's proprietary co-processor chip for accessory authentication.

This must-have requirement makes it economically challenging for accessory developers. In addition to the increased BOM cost, the implementation of the authentication chip into the accessory design also incurs development, operation and procurement challenges that ultimately drive up bottom line cost. The authentication chip and supporting circuit components take up circuit board real estate and add complexity and time for engineering development. In addition, the authentication chip is not upgradeable. This

means authentication chip revisions may require circuit board re-designs, and the inability to upgrade the accessories that are already out in the field could require a product exchange program for critical security updates. Another common challenge some accessory developers face is production delays due to the delivery lead time for this authentication chip. All these complications can add up to \$10 to the accessory retail cost, making the price prohibitive when compared to a Google Home or Alexa accessory.

So, how do Google and Alexa sidestep the cost of an authentication chip? By simply not using hardware for authentication; instead, they use software. This has had the added advantage of allowing them to upgrade device authentication remotely—rather than battling problems with replacing a physical chip.

Fixing the authentication challenge

In late 2017, Apple announced the Software Authentication Specification for HomeKit, addressing the challenge of the authentication chip requirement. Software Authentication requires the accessory developer to implement a token provisioning scheme. The accessory developer needs to set up a licensee server to request tokens for provisioning. If the tokens are provisioned to the accessory during manufacturing, the accessory is ready for activation; if the accessory is out in the field already, then the tokens can be provisioned to the accessory via a firmware update. Finally, the provisioned tokens get validated during activation by an Apple server. This is a significant shift for Apple as they look to disrupt the accessories market landscape.

Challenge 2: HomeKit Accessory Protocol implementation

The challenge on the HomeKit Accessory Protocol (HAP) software implementation side remained. Developing a HomeKit accessory takes, on an average, about a year. This is an unacceptable time frame for most consumer electronics manufacturers who have to deal with

¹<https://www.techhive.com/article/3269825/home-tech/google-assistant-5000-smart-devices.html>



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new competitive developments every day. A major part of the challenge was associated with learning and implementing Apple's HAP, wireless discovery, setup protocols (Bonjour and WAC) and strict cryptographic point-to-point security methods used for accessory pairing and authentication. Translated into business, this meant that only the bigger manufacturers could afford the engineering resources required to overcome the challenge posed by the protocol implementation. Small outfits, startups and inexperienced OEMs were still finding it difficult to develop devices compatible with the Apple ecosystem in an acceptable timeframe.

Simplification for faster prototyping and production

The release of Apple's HomeKit ADK has addressed the issue by introducing a major simplification. Apple eliminates the burden of writing large sets of code by providing a HAP API (i.e., a framework implementation for managing and communicating with authorized accessories). Now, a fully functional prototype can take as little as one week and a complete product development cycle could be as short as three months, using fewer development resources.

The ADK provides chip manufacturers the ability to develop a SDK (Software Development Kit) for

their platforms. This means accessory developers can focus on the accessory programming, which in many cases is their main or only area of expertise.

One of the nice features of the ADK is that it uses the Raspberry Pi 3 as an early reference platform. Developers can easily procure the Pi for \$35-\$40. Developers will find this attractive for a number of reasons other than the fact that the Raspberry Pi is affordable:

- The developers do not have to choose a target platform and/or chip vendor during research, evaluation or proof of concept—which means the developer does not need to lose time meeting platform vendors, getting NDAs out of the way until the developer can get their hands on an SDK, on development boards and tools.
- Some of the chip vendors' SDKs and development boards are pricey or have limited availability. On occasion the chip or board are at the engineering sample stage, which means you may get boards only as loaners, for a limited time, and you are not allowed to make any permanent and irreversible physical modifications to the boards.

- The Raspberry Pi is an open platform and there are numerous forums, tutorials and project examples to learn from.
- Developers can expand the R&D beyond the ADK on the accessory side by adding sensors, I/O interfaces, system controls, etc., in which some hardware functionality can be easily implemented.

While the release of Apple's HomeKit ADK and Software Authentication did not garner much attention at Apple's Worldwide Developer

Conference (WWDC), the combination of the two has the potential to be as meaningful to the accessory developer community as the release of xCode did to the app developer community in 2003. Apple's focus on new HomeKit developer tools is poised to incentivize a host of smart home accessory developers to build HomeKit certified products—paving the wave for the next generation of home automation.



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Mario has 14+ years of experience in consumer electronics full cycle development. As a senior product development engineer, he has achieved broad experience with embedded systems design, firmware programming, consumer electronics industry standards, specializing in design for Apple MFi, product compulsory compliance, quality assurance and reliability testing requirements.

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