HARMAN

WHITE PAPER
Internet of Things

SMART DELTA: SECURE OVER-THE-AIR (OTA) TECHNOLOGY FOR REMOTE MANAGEMENT OF IOT SOLUTIONS

The rapidly multiplying embedded devices in the Internet of Things (IoT) require remote management capabilities for constant updates of the embedded software. With a multitude of assets dispersed across geography, terrain, industrial environments, office spaces or customer locations in an IoT deployment, the task of managing remote software updates is critical to effective operations of an IoT cloud. Industry verticals such as automotive, manufacturing, mining, agriculture, e-health and connected spaces rely ever more on a high performing IoT cloud for desired outcomes.

IoT delivers the potential for a strong ROI for organizations looking to adopt a solution for cost reduction, productivity advantages, or business transformation. However, like all IT deployments, ROI can only be realized through streamlined execution. Remote Management of IoT Solutions involves firmware upgrades, diagnostics, basic troubleshooting, security patches, and configuration changes, all of which could be delivered remotely and securely to the IoT devices - wherever those may be - from a central location. For a technician to service each device for an update would be cost prohibitive. As a result, over-the-air (OTA) updates remain the only viable option.

Potential Complexity with Remote Management

The software updates in certain key IoT segment verticals are delivered over limited bandwidth networks, which causes long wait times and increases failure rates. With connectivity and data consumption often at a premium, the delivery of over-the-air (OTA) updates to embedded devices on a cellular or other wireless network can quickly become a major financial burden.

With IoT, as the number of devices grows and the frequency of software updates increases, the upsurge in network cost and idle time for upgrades gets in the way of user satisfaction, experience, and productivity. In addition, software updates are often delivered to memory constrained devices, which means the device agent that executes these updates must be lean enough to fit and operate within the constraints of the device.

A Faster and Leaner Alternative

An OTA update system with Smart Delta technology offers a solution that provides organizations with the ability to implement secure, standards-compliant management of their IoT embedded devices. The Smart Delta technology produces a 10-fold reduction in update software payload sizes, resulting in greatly decreased network data consumption, and 80% faster update delivery.

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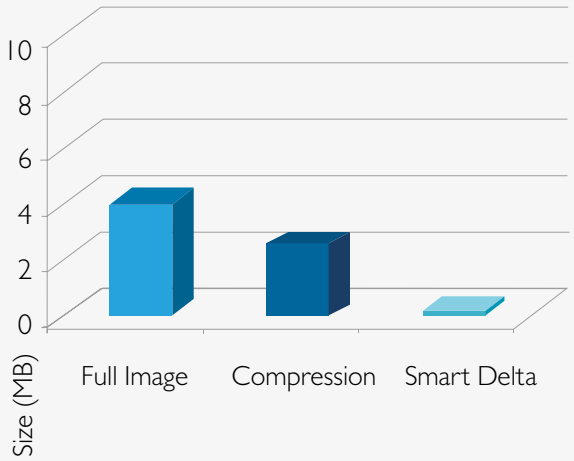
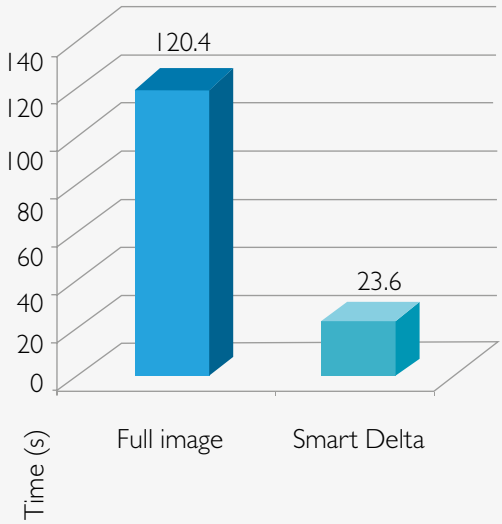
The technology effectively allows any software enabled device – regardless of OS, chipset and device resource constraints – to be updated over the air, via the smallest possible, connectivity, storage- and cost-efficient payloads. Smart Delta refers to the reduced size of the payload compared to the full image of a firmware upgrade (see figure below).

Size: File size reduced

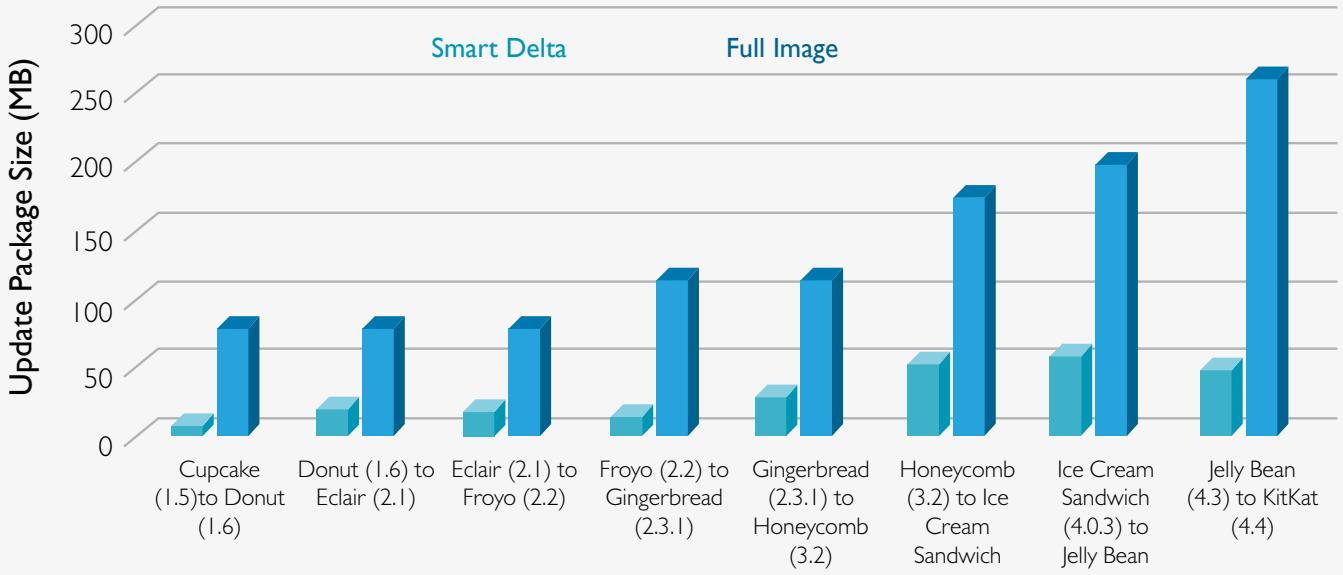


Speed: Downtime reduced



Smart Delta OTA technology is more cost effective on devices relying on an operating system other than Android or IOS. Having said that, a comparison of the Smart Delta payload with the full image of Android showed a progressive performance differential for Smart Delta for each subsequent release of Android (see figure below).

Major Android Update examples (based on emulator images)



Limitations of a Home-grown OTA Solution

Many organizations attempt to develop and use an in-house solution for OTA updates. In IoT deployments, once faced with scalability, the limitations in efficiency and effectiveness of such home-grown solutions are exposed by the impact to overall cost of the project. For instance, a manufacturer initially developed relying on an open source utility - BSDIFF – their own firmware update solution. However, as the base of IoT deployment continued to grow, the frequency of software updates skyrocketed. Aside from high (and pricey) cellular data consumption, updates were lengthy – leaving the eventual users of their products having to wait up to 45 minutes for updates to download, and 20 minutes or more for those to install. Some instances even ended up being bricked in the process - needing a costly technician visit for manual USB updating.

Updates with Security

Ensuring security not just in the update process but also creating a management environment for a safer IoT deployment remains a key consideration for the industry. The Smart Delta technology utilizes the tried and tested Open Mobile Alliance (OMA) device management specifications to ensure secure delivery and installations of software. Moreover, the speed and ease of updates ensures that security patches, software fixes and remedial files for any component can be deployed rapidly with an IoT solution. Through frequent and nimble delivery of OTA updates, an IoT solution can be robust and prepared for rapid response to any potential security breach.

Performance in Varied Environments

The remote management solution using Smart Delta was originally launched for the mobile market and in the last three years has been very successful in the automotive market where it has successfully been deployed in more than 17 million cars, trucks and heavy machines around the world to date. Leading automotive brands, including twelve OEM's, have adopted the Smart Delta solution including the most innovative. One of which adopted the solution after observing a 10X improvement over a non-optimized update.

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More recently, IoT devices such as smart locks, patient care tools, industrial automation components, and irrigation systems represent potential segments for adoption. Here are some of the use cases where Smart Delta technology offers a viable option.

EHealth

Let's take the example of a healthcare company that sells a clinical device for families to perform baseline evaluation on a patient at home before sending the data back to a physician for diagnosis. The Linux based, wifi enabled device, barely the size of a large smart phone, can be used to check temperature, take pictures of ear, nose and throat, listen to a patient's lungs, count their heart rate, and capture other clinical symptoms to send in real time to a clinician. The device needs periodic firmware upgrades. Smart delta technology for OTA updates in such situations would reduce not only the time it takes for upgrades, but also reduce the risk of adverse impact on the electronics within the device.

Smart Infrastructure

Smart street lighting units dispersed over large geographical distances – connected via a low-powered WAN mesh network – tend to have high failure rates on full size image OTA updates due to low bandwidth. A smaller image makes it far easier to improve the success rate of upgrades for such installations.

Smart Agriculture

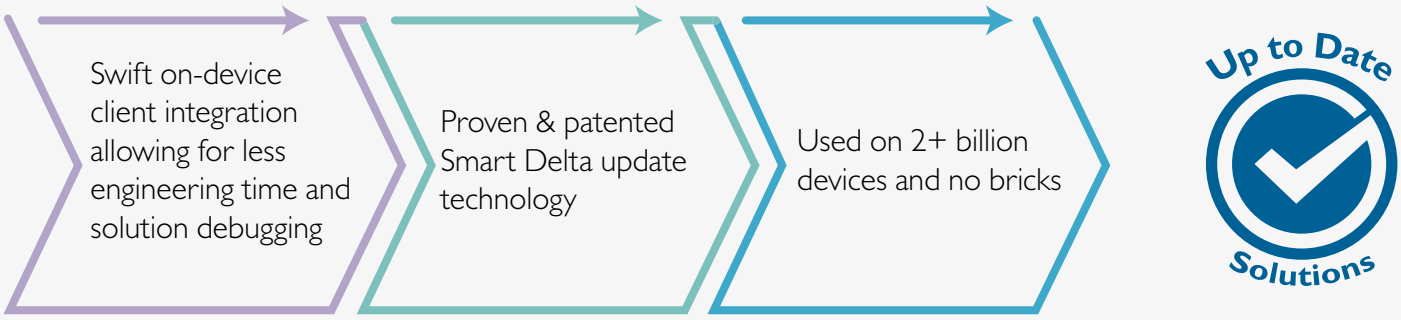
Smart agriculture, with its networked irrigation systems, represents another IoT application where connectivity and distances make Smart Delta technology a prime candidate for OTA updates. Smart irrigation systems can regulate water supply to various parts of an agricultural land based on moisture data generated from sensors in the soil. OTA updates in such environments, where a host of gateways are connected over narrowband IoT, could help decrease maintenance cost by ensuring increased predictability, reduced network cost, and reduced failure rate.

Commercial

Preponderance of cameras for monitoring and automation are prime candidates for Smart Delta technology for OTA updates within Industrial IoT. Cranes operating in remote low-bandwidth terrains, or in areas with patchy cellular coverage, could benefit from Smart Delta as well. Similarly, smart locks for building management, which operate using low energy blue-tooth technology, present significant challenges in firmware upgrades. Such solutions benefit from Smart Delta by allowing faster upgrades and reduced customer wait times.

Demonstrating Smart Delta OTA Technology

With all deployments across connected spaces, industrial automation, automotive, smart cities, and ehealth, the Smart Delta technology has been adopted on more than 2 billion devices over the last decade. The adoption and success of Smart Delta technology demonstrates that the solution is able to support the most critical of IoT applications under the demanding of environments.



With speed and efficiency being the cornerstones of any effective IoT solution, if your organization is evaluating an OTA solution for a smart city, smart building, infrastructure, industrial IoT, wearable, or other IoT related project, evaluating the advantages of Smart Delta image technology could offer a viable alternative to the current solution.

As you consider your remote management options, feel free to contact HARMAN to schedule a demonstration in person or over the web. As part of the demonstration, you also have the option to send us a sample of your firmware version for us to generate the Smart Delta to assess your potential network cost and time savings.

For questions or comments about the document, please write to **nader.nanjiani@harman.com**

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