SILICON LABS®

CEILING LIGHTS
25% Brightness

CONTACT SENSOR
Window Closed

❄🌡 **72º F**
COOLING

MOTION DETECTOR
Movement Detected

SPEAKER
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Whitepaper

Z-Wave 700: Unlocking Smart Home Potential

Z-Wave 700:
Unlocking Smart Home Potential

Introducing the Z-Wave 700

As market demand for smart environments continues to grow exponentially, the need for next-generation enabling technologies has become increasingly apparent. The vision of ubiquitous connected intelligence throughout homes, businesses, and buildings presents significant new technical and commercial challenges. For the IoT to achieve its full potential, new solutions are needed that can meet these challenges.

The new generation of connected environments requires sensing and communication technologies that are more powerful, efficient, secure, and accessible. New solutions must be genuinely ambient; small enough to be embedded anywhere, and able to operate for years without attention or maintenance. New products must also be easy to develop, install, and configure with repeatable success. Finally, these new solutions must be economically practical, providing ample returns on investment for manufacturers, resellers and service providers, as well as delivering expected benefits for end users.

The Z-Wave 700 has been designed specifically to meet the demands of these next generation smart applications. Building on the global market leadership of the interoperable Z-Wave protocol, the Z-Wave 700 creates a benchmark platform for connected environments. Pervasive sensing in small and large environments can now move from futuristic vision to accessible reality. The breakthrough advantages of the Z-Wave 700 elevate the state-of-the-art and unlocks the full potential of the smart home.

Smart Environments: Expected from Now On

For more than a decade, smart homes and buildings have been revolutionizing the way we live, work, and play. In doing so, they have transformed traditional industries and created entirely new ones. As just one example, remote monitoring capabilities have permanently altered the home security industry, adding a do-it-yourself component that wasn't possible before the advent of smart home products. On a parallel path, smart technology is now disrupting the insurance industry, moving its central business paradigm from reactive claim services in to proactive loss prevention.

Powerful technologies that are simple to use are fueling demand on the consumer side. Smart speakers and voice controllers have been runaway product hits and are creating demand for more smart home products and services. According to Statista, there are already nearly 35 million smart homes in the US in 2018, with growth expected toward 60 million homes by 2023. Annual revenues in the US alone are nearly $24 billion.

Revenue in Smart Home Market
In Million US$ (United States)
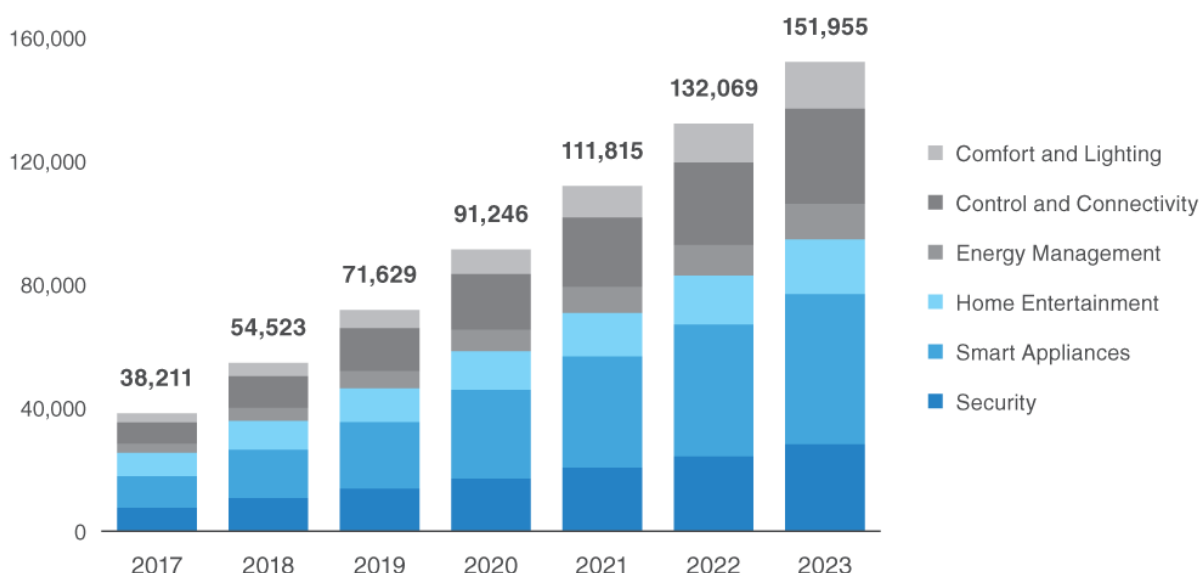
Source: Statista March 2019

This remarkable growth has occurred despite the relative limitations of early stage enabling technologies, with capabilities primarily designed for single-family homes and apartments. Today, the business potential for smart environments extend much further into full residential complexes, multi-dwelling structures, commercial spaces, and institutional facilities. These next-gen deployments will require advanced technologies that extend further in range and efficiency, while still remaining secure from intrusion and practical enough to deploy in larger settings.

Moreover, the new generation of smart environments calls for more than simple control and status reporting. Devices and systems will be expected to react intelligently to changing dynamic conditions. The market has already seen the first iterations of context-aware intelligence in consumer products. A popular example is the smart thermostat that learns family preferences. As additional smart devices follow this paradigm, they will be designed to operate with greater intelligence to more contextual variables. The next smart thermostats will sense how many people are in which rooms of the house and adjust accordingly. They will know what time of day energy prices drop and react for optimal economy.

Enabling Smarter Smart Environments

Simple concepts like a learning thermostat point the way to more powerful smart environments, driven by machine learning, artificial intelligence and predictive analytics. The potential settings for these applications extend beyond the standalone residence, and numerous industries have already reacted in kind, with demand for new smart products and services that create value.

As one example, the healthcare industry seeks new ways of monitoring and safeguarding wellness for 70 million US seniors aging at home. Along with them, a population of 43 million family caregivers look after these elderly and seek both peace of mind and helpful insights. Are seniors staying active or becoming sedentary and isolated? Has there been a change in living pattern that might be concerning? Is a visit to the doctor in order? Emerging smart environments for aging in place not only observe, they inform, with actionable data and valuable predictive capabilities.

The insurance industries have become similarly energized by the benefits of context-aware environments. A draft in the home can be traced to a roof in need of costly repair. Moisture in the garage can distinguish between a simple worn valve or an expensive leak in the foundation. Electrical interruptions could point to a faulty breaker box and the possibility of a fire. Contextual data informs risk, which is the currency of the insurance industry. Providers are already using smart devices to offer policies that have been customized to each customer and individual environment.

Contextual intelligence and automation, acquired through machine learning and acted upon by M2M control, is the hallmark of the new smart environment. Until now, limitations in the enabling technologies have kept these advancements from being practical on a broad scale. Transmission range, battery life, computing power and cost of development for compelling products have constricted market growth and business possibilities. The Z-Wave 700 has been designed to overcome these limitations. The 700 provides an ideal platform for streamlined creation of fully intelligent environments, with the technology, economy, flexibility and usability to enable breakthrough opportunities.

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A Decade Of Power On A Coin Cell

A truly smart environment features embedded sensing throughout the entire space; interior and exterior. This naturally includes locations where direct electrical power is either impossible or impractical. Battery operated devices are a necessary mainstay of the smart home landscape. Due to their need for continual battery replacement, service providers and end users often limit the deployment of these devices, thus limiting the effectiveness of the system. The Z-Wave 700 is so efficient that it can allow battery operated sensing devices to provide ten years of service on a single coin cell battery. This advancement revolutionizes key battery powered smart home devices, such as locks, sensors, valve controls and motor driven shades.

The 700's breakthrough energy efficiency has been achieved through a variety of evolutions to the already market-leading energy management of the Z-Wave protocol. As a starting point, the 700 platform has achieved a 3-fold reduction in current draw over the industry-standard Z-Wave 500 Series. A new power management scheme intelligently parses energy so that battery powered devices such as smart locks consume less power for RF transmission, and keep more battery capacity for the heavier lifting of motor operation.

The energy conservation of the Z-Wave 700 also ensures that devices always operate at the lowest possible power mode. Power consumption is driven by events determined by the application, rather than devices having to draw power continuously while waiting for commands.
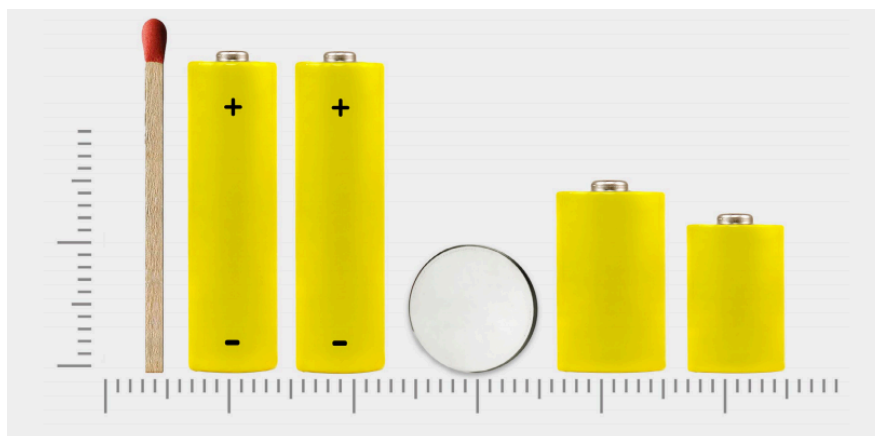
The extraordinary energy management capabilities of the Z-Wave 700 features super-fast sleep time with near-instantaneous wake up. This performance is achieved through the use of FLiRS (frequently listening receiving slave) technology. In this scheme, devices live in an extended sleep mode, expending only minute bursts of energy at pre-determined times to "listen" for incoming commands. When an event command is received from the application, the device wakes up, performs its function, and then immediately returns to sleep, where it then continues to listen for further commands. In this method, battery powered sensors consume only the absolute minimum energy necessary with reliable, low latency operation.

When a sensor can perform for up to ten years without maintenance, and operate within a minute form factor, as the small-footprint 700 allows, intriguing new products become feasible. Environmental and activity sensors can be embedded virtually anywhere; inside drywall, inside furniture such as beds and floor mats; inside appliances of every size. Smart valves can be added to plumbing systems deep within building infrastructure. Buildings with dozens or hundreds of sensors become practical to deploy and maintain. The energy efficiency of the Z-Wave 700 overcomes one of the key challenges for next-generation smart environments.

The Power and Range for Local Intelligence

One of the key edge challenges for new smart environments is sufficient processing power within every type of individual device. Contemporary enabling technologies were designed for modest TX-RX range inside a home, extended by the topology of a mesh network. Intelligence and insights regarding system operation resides solely on the cloud, with local devices acting as mere functionaries, as opposed to managers. In many smart deployments, all device commands are received from the cloud, which substantially slows performance time.

The Z-Wave 700 provides enough on-board power so that intelligence can stay local, within the smart environment. This power encompasses both transmission range and computational abilities, resulting in longer direct TX-RX reach and the ability to provide edge computing functions, including local data processing. These capabilities can now be performed locally, with no latency from cloud communications.
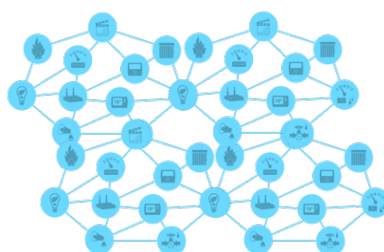
In terms of transmission power, the 700 provides increased radio sensitivity of -97 dBm, which yields a 150% increase in direct device-to-device range for Z-Wave objects in the US region. Devices can now communicate for 100 meters directly, and full Z-Wave mesh networks can extend for 400 meters. Outside the US region, up to +14dBm output radio power can be utilized increasing the range even further enabling Z-Wave deployments in the EU and Asia, direct transmission range between nodes to be increased by 250%.

This extended range yields significant benefits to entire smart deployment. Because devices can transmit further, larger areas can be covered with connected intelligence. Entire multi-dwelling structures, such as condominium complexes, dormitories, nursing homes and hotels can be run efficiently by a single network. Outdoor areas such as yards, gardens and parking lots can be monitored and controlled as easily as interior spaces.

Because the increased range of the 700 allows more direct contact between devices, the entire Z-Wave mesh network benefits from improved efficiency and performance. Fewer hops between devices are required. There is less need for repeater devices. Because fewer actions and less activity is required, overall energy efficiency is improved. The Z-Wave 700 not only creates more powerful networks, it makes networks more robust.

Along with increased transmission power, the 700 adds the computational power necessary for powerful edge computing, including artificial intelligence. An ARM® Cortex®-M4 engine with 32-bit processing provides capabilities that allow developers to create new products and applications that were previously heavily limited by the 8-bit processor.

Keeping computational capabilities local provides two important benefits. First, the speed and responsiveness of the network is improved; there is less need for communications with the cloud and therefore less latency. More importantly, the devices themselves now have the power to provide contextual intelligent control. Developers can embed custom applications within the devices themselves. The 700 platform provides generous flash memory, which has been doubled from 32kB to 64kB over legacy Z-Wave. Application SRAM has also been increased by 400%. Entire smart networks can now learn, operate and report with virtual independence at the local level.

The Next Generation Becomes Easy and Cost Effective

Superior technology alone does not ensure successful products and services. To prevail in the coming smart home markets and provide attractive value to manufacturer, provider and end users, products must be practical and cost effective for all these stakeholders. The Z-Wave 700 offers developers radical new benefits in the ease, speed and cost of product development. New products can be brought to market quickly, and all products are able to accept firmware upgrades once they're deployed in the field.

The power behind this economy begins with the Simplicity Studio tool set. Simplicity Studio is an integrated development environment that among other benefits includes a real-time debugging system. The labor of the debugging process involved in conventional IoT product development is greatly reduced.
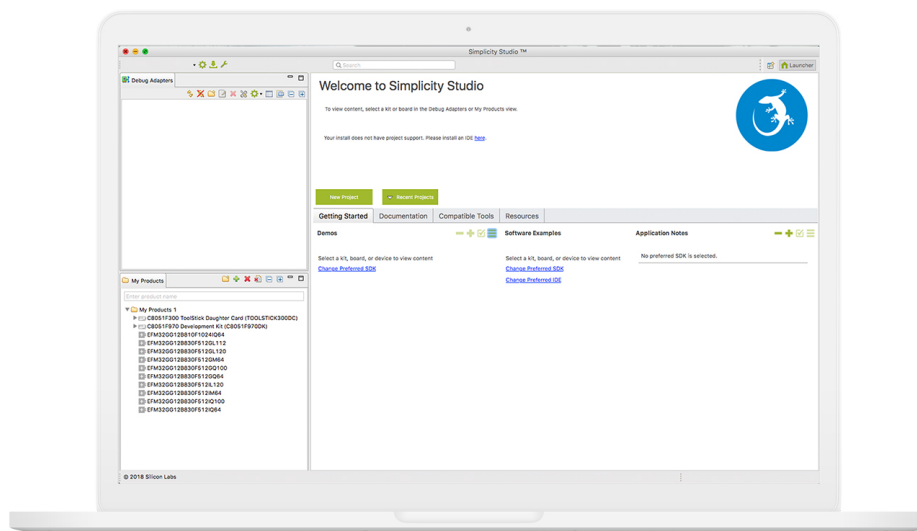
The Simplicity Studio Development Environment

In addition to real-time debugging, Simplicity Studio includes a real-time energy profiler. Developers can now know a device's energy needs and characteristics while the product is being created. The profiler displays power consumption and draw consequences for application events in real time during the product's development phase. Developers can examine the application's energy usage line by line within the application code, allowing them to optimize as they work. Energy efficiency and in-field performance are known in advance.

The Z-Wave 700 also speeds development and time to market with ready-made certified reference code that ensures the minimum time from prototype to certified product. These pre-certified building blocks address 90% of development needs, allowing developers to concentrate on desired product features and differentiation, rather than coding core functionalities from the ground up. In addition to ready-to-use software, Z-Wave provides hardware reference designs for both gateways and end devices. Applications can be completed in a matter of days, and new products can be brought to market in a few months.

Economy of development is one of the foundations of the Z-Wave 700 platform. With 700 development, there is no need for a SAW filter to apply regional compatibility. The elimination of this extra step and cost allows a single product SKU to serve multiple geographical regions. In addition, the 700 platform eliminates the need for external memory, EEPROMs or extra MCUs. These advancements result in lower bills of materials and faster, better ROI.

Uniformity and Expected Results in the Field, Every Time

When considering ROI for new smart products and services, development is only one component of overall cost. Subsequent market factors comprise the true cost, and they apply from the distribution phase through installation and end user satisfaction. Can the product deliver value that is acceptable and salable to all these stakeholders? Is installation and configuration simple and cost-effective for the service provider? Will the DIY customer experience frustration and contemplate a return or discontinuance of service? Are concerns about device and network security adequately answered? Finally, will the product work as expected and deliver expected benefits with other smart products in the network?

The 700 platform builds on Z-Wave technology's foundational commitments to brand-agnostic interoperability, best-in-class security, backward compatibility and ease and consistency of experience, both for installer and end user. These benefits are the underlying DNA of Z-Wave.

Device interoperability is more than a technical capability. It represents the difference between a network that can be expanded and one that's essentially closed. No one manufacturer of any kind is able to deliver all the different device types that make up a modern smart environment. Yet is essential that these disparate devices, including a multiplicity of sensors, locks, switches and controls, be able to work together. Different brands from different manufacturing verticals supply these devices, and deployments must be able to use them all, indiscriminately. The Z-Wave ecosystem of interoperable products is the world's largest, comprising over 2400 products from 700 companies worldwide. Thanks to this interoperability and backward compatibility, every Z-Wave product works with every other product, regardless of type, brand, manufacturer or version. No other smart home/IoT protocol can make this claim.

In terms of security, Z-Wave also leads the market, where its Security 2 (S2) Framework provides the most hack-proof solution for IoT smart devices. S2 Security, which is resident in every Z-Wave 700 product, features end-to-end encryption for smart home devices and controllers. Data in motion and data at rest are protected both in the local environment and through connection to the cloud. The speedy inclusion process for new devices into a Z-Wave network minimizes vulnerabilities through the fast scan of a QR code. The time needed for secure inclusion of 700 devices has been minimized by 90% over previous Z-Wave.

The fast inclusion process is a component of Z-Wave's SmartStart technology, which allows devices and systems to be pre-configured at the manufacturer or distribution point. With SmartStart, setup complexities are eliminated for the installer, whether they are professionals or do-it-yourself consumers. Devices need only be powered on once they arrive at the home or building. This minimizes costly installation time for the provider and eliminates frustrations for the end user.

Difficulties with installation and setup are the #1 reason for product returns, according to a survey by PlumChoice, a leading independent provider of white-label technical services for cloud and IoT companies. The costs of labor, product returns or exchanges, and potential customer churn figure heavily in any calculation of ROI. Products built with the Z-Wave 700 greatly alleviate these challenges and provide consistent, profitable pathways for smart IoT environments.

Create the Future Now With Z-Wave 700 developer kit

The Z-Wave 700 has arrived to meet the technical and business challenges for the new smart environments and deliver on their limitless opportunities. The 700's combination of power, efficiency, economy and small form factor makes it easy to develop powerful new products and services that were not possible before. What could your company do with these new possibilities?

For companies already developing products with Z-Wave, a 700 development kit is the next step toward profitable answers. Reference designs are available for both end devices and gateways. Z-Wave's Application Framework simplifies the development of firmware for new Z-Wave end devices. The Application Framework provides building blocks for many common devices and a library of robust, field-tested code that can be readily re-used for new products. Simplicity Studio development tools help eliminate coding errors and let developers pre-visualize energy consumption.

Z-Wave's Z/IP technology for gateways provides connectivity between Z-Wave devices and IP applications in an IP environment. Connectivity is achieved via a Z/IP Gateway. Thanks to the Z-Wave Application Framework and Z/IP, the development of new smart products is exceptionally fast. Z-Wave 700 can literally enable a one-day end device and a one-day gateway.

For companies that are already providing smart services with a product partner, the 700 marks the perfect time to try out new smart projects. The small energy footprint of the 700 hardware makes new form factors and applications possible. At the same time, the speed and ease of the Z-Wave 700 makes experimentation less costly, and the anticipated business intelligence more immediate.

Smart environments and the IoT are shaping every business vertical. How will they change your business? Get a development kit for the 700 and find out. If your company wants to be in the IoT, you'll want to know Z-Wave 700.