Building Smart Solutions with the Axeda® SmartLink™ Platform

According to Harbor Research, there are billions of wired and wireless intelligent assets around the globe that can be connected and managed to extract business value. These intelligent assets will create a surge of smart business solutions that will transform the world in which we live and work, as we become smaller, flatter, and more interconnected—in short, a Smart Planet revolution.

There is technology available today to make assets digitally aware and networked. However, these disparate point technologies all come with the same inherent problems: a focus on niche solutions, an inability to scale across the enterprise, and support for a single hardware or communications vendor. As a result, companies cannot harness the full power of their intelligent assets to drive change, improve efficiency, and ultimately achieve new levels of competitive advantage.

To achieve these benefits by connecting to and managing any wired or wireless asset anywhere in the world, companies need a proven, scalable, and secure intelligent asset management platform. The platform must be delivered on-demand with enterprise-class capabilities and integration, out-of-the-box applications, as well as Web Services to accelerate the development of custom applications that manage, service, and track assets for specific requirements. Finally, the platform must be communications and hardware neutral, providing manufacturers, systems integrators, developers, and ISVs with the flexibility to choose the right mix of underlying technologies to build and deploy solutions for Smart Services, Smart Operations, and Smart Products anywhere in the world—regardless of market or industry.

Smart Services enable product manufacturers to increase product uptime, lower cost of service, and improve customer satisfaction. With Smart Products, product manufacturers and ISVs can also deliver value-added content and revenue-generating services to customers. Finally, with Smart Operations, asset owners connect to fixed and mobile assets, tapping into sources of intelligence that improve internal business operations and optimize the supply chain.
Axeda SmartLink Platform
The Engine for the Smart Planet Revolution

Figure 1: The Axeda SmartLink Platform provides the foundation for quickly building and deploying solutions for Smart Services, Smart Operations, and Smart Products.

The Foundation to Build and Deploy Smart Solutions

Unlike a stack of separately designed hardware, software, and custom code, the Axeda® SmartLink™ Platform provides manufacturers, developers, systems integrators, and ISVs with the foundation to quickly build and deploy smart solutions. Built-in Web Services enable custom application development as well as simplify integration with enterprise systems. Axeda® ServiceLink™ on-demand applications enable service and support organizations at more than 100 top product manufacturers to quickly and easily remotely identify, diagnose, and repair issues for maximum asset uptime. Finally, the Axeda SmartLink Platform includes core infrastructure capabilities for enterprise-level scalability and security using wireless communications and edge devices from industry-leading vendors.

As a result, product manufacturers and enterprises can connect, manage, service, and track any wired and wireless intelligent asset anywhere.
Axeda SmartLink Platform
Field Proven at Enterprise Scale

Figure 2: The Axeda SmartLink Platform includes built-in Web Services for application development and enterprise integration, core infrastructure capabilities, and support for leading wireless communications, enterprise applications, and edge devices.

The Axeda SmartLink Platform includes the following out-of-the-box features and easy-to-extend capabilities using a wide array of connectivity options:

Flexible Asset Connection

Connecting to the Axeda SmartLink Platform is easy with a built-in Ethernet connection and support for many different types of wireless edge devices. For wired assets, an Axeda® Agent™ runs on or near assets, providing instant, two-way, patented Firewall-Friendly™ monitoring, communication, and control of asset information and events. For wireless assets, Axeda works with leading edge device partners with a range of capabilities based on your requirements—from basic tracking of location to sophisticated rules with complex data collection.

Wireless Communications and Hardware Neutral

The Axeda SmartLink Platform can communicate using a variety of different methods, including Internet, cellular, and satellite. Customers can choose the communication mode that meets their needs and budget, including lowest cost, optimized communication, high reliability, and maximum flexibility.

The Axeda SmartLink Platform enables you to connect and send rules to both programmable and fixed-functionality devices. For programmable devices, the Axeda Wireless Protocol (AWP) provides a compact method of exchanging information between programmable edge devices and the Axeda SmartLink Platform that is independent of the edge devices’ programming language and operating system. The AWP’s optimized format saves you money on your communications and enables you to connect to a wide range of edge devices. For fixed-functionality devices, the Codec interface supports multiple device types connecting to the Axeda SmartLink Platform without requiring changes to the edge devices.

Edge devices can have multiple communication methods, and the Axeda SmartLink Platform can optimize transmission based on costs. For example, a container on a ship could communicate via satellite when at sea, but only in...
an emergency. Once at port, logged data could be transmitted via WiFi at no cost. When the container is put on a truck, cellular communication is used as necessary to report location and condition.

**Advanced Rules Engine**

The Axeda Rules Engine enables you to create sophisticated rules with thresholds and expressions built using an intuitive UI—with no programming required. You can run expression rules on the Axeda SmartLink Platform or threshold rules on the edge device or Axeda Agent to reduce communication costs. Threshold rules execute actions on the asset, e.g., if the temperature exceeds 80 degrees, then shut off the compressor. Expression rules running on the Axeda SmartLink Platform offer more complexity and nested expressions, e.g., if an alarm has not been acknowledged for the last hour and the time of the day is between 9 a.m. and 5 p.m., then call the shift supervisor or else call the night-time operator.

Rules based on state machines can be created to easily model transitions such as a container on a ship, on a truck, or in a distribution center. This allows handling a condition such as “door open” differently based on the state of the asset, such as a container. If the container is in a distribution center, “door open” is not a problem, but if the container is on the road, an alarm would be generated. Depending on the state, different rules can be initiated to model business processes.

**End-to-End Security**

With certification by VeriSign® and deployments in the world’s most secure environments, Axeda incorporates an end-to-end security strategy covering all levels including network, application, user, and data security.

The Axeda SmartLink Platform is designed to address key information security concerns with features that maintain network security at customer sites and conceal data from unauthorized parties using Secure Socket Layer (SSL) encryption—the same method banks use for secure online transactions.

Security is also ensured with our Tier IV Certification for the TIA-942 data center standard hosting center, which undergoes an annual SAS 70 examination and is built on state-of-the-art equipment, technology investments, and operational expertise. Finally, all access to the system is centrally controlled, users are limited to specific data, views, and actions, and granular policy management capabilities help in meeting auditing and compliance regulations.

**Enterprise-Class Scalability**

The Axeda SmartLink Platform has an enterprise-class architecture that is built to support large-scale deployments with large numbers of assets reporting data from sites around the world. With proven high transaction rates of more than 100 million data readings per day, the Axeda SmartLink Platform provides the performance required to support a large number of concurrent users and reporting assets accessing the on-demand system.

The Axeda SmartLink Platform uses the same architecture as large Web sites with central processing divided across multiple servers and additional capacity available where needed.

High-performance Axeda Agents can be configured to monitor hundreds of wired assets at a customer site, or monitor a single product with negligible resource use. With agents and edge devices around the globe reporting data 24x7, the volume of information can be huge. The Axeda SmartLink Platform is optimized to handle a high volume of transactions while keeping response time fast.

For service organizations with worldwide deployments, the Axeda SmartLink Platform can be configured to handle global deployments with Axeda Global Access Servers located around the world to optimize performance.

For wired assets, communication between Axeda Agents and the Axeda SmartLink Platform is optimized to reduce the amount and frequency of data sent. Wireless assets use the Axeda Wireless Protocol (AWP) to compress data into
Building Smart Solutions with the Axeda® SmartLink™ Platform

a binary format, reducing transmission costs. In addition, edge devices can have multiple communication methods, and the Axeda SmartLink Platform selects the best method based on costs.

On-Demand Delivery

The Axeda SmartLink Platform provides on-demand delivery with minimal administration, enabling you to outsource the IT management responsibilities of your initiatives. As a result, your organization enjoys all the benefits of the solution without the challenges and overhead of administering and implementing the technology and infrastructure. On-demand delivery provides a pay-as-you-go model that minimizes risk, rapid deployment to help you realize fast ROI, and additional benefits, such as:

» **Rapid and easy implementation** - Reduce initial project implementation requirements as well as the struggle in gaining IT approval and ongoing support. Getting started is simplified with GUI-based tools, out-of-the-box drivers, and support for multiple hardware and communications providers.

» **Lower up-front costs and minimized risks** - Take advantage of much lower upfront capital investment. An annual subscription fee enables your organization to easily incorporate the on-going annual expense into your budget.

» **Focused on the business, not IT infrastructure** - Free your organization from supporting high-cost, time-consuming IT functions. These include purchasing, supporting, and maintaining the server infrastructure, equipment redundancy and housing, and the labor-intensive patch and upgrade process.

» **Faster time-to-value** - Reduce the time required to install licensed software and instead use our data center from SAVVIS that undergoes an annual SAS 70 examination to accelerate the deployment time of your solution.

» **Greater end-customer acceptance** - Enable end customers to preserve their own security policies and network protection. Axeda’s VeriSign certified security gives the assurance needed to ease adoption of the solution by even the most security-focused customers.

» **Fast deployment success** - The Axeda On-Demand Deployment Success Program includes a series of reviews and a dashboard report to assist you in driving the success of your Smart Services initiative. Axeda’s Vice President of Customer Success will work closely with your executive sponsors to assess your company’s progression to deployment goals and objectives, identify and execute on course-correction actions, field concerns/questions and align Axeda subject matter experts, and act as the main deployment feedback and issue escalation point.

Fast Application Development

Building on its connectivity and rule processing capabilities, the Axeda SmartLink Platform provides developers with the Web Services required to build applications quickly. Using the Axeda SDK, developers can write applications in popular languages, such as Java and .NET, enabling them to:

» Display information within the Axeda SmartLink Platform, such as readings, locations, alarms, and package deployments

» Efficiently find all assets near a location, or assets with an alarm, or assets that satisfy some condition, such as toner <25%

» Subscribe to events and receive notifications as alarms, registrations, and data conditions change with no need to poll

» Send commands to assets (to affect I/O, operator display, product configuration, etc.) or deploy packages

» Configure the Axeda SmartLink Platform to manage rules, groups, associations, and more
All calls to the Axeda SDK use permissions and security configurations in the Axeda SmartLink platform, ensuring that any actions taken comply with security policies.

**Enterprise Integration**

The Axeda SmartLink Platform has an open architecture built on standards-based technology and includes built-in Web Services for two-way communications with other enterprise systems.

The Axeda SmartLink Platform captures live, up-to-date information about all your fixed and mobile assets, giving your CRM, ERP, and other enterprise systems real-time data to speed operations. For example, detected product faults can trigger automatic generation of a trouble ticket in a CRM system, dispatching field technicians with detailed information on required repairs. Usage data can be sent to billing and supply chain management systems, eliminating error-prone manual steps and eliminating process time delays.

With these capabilities, product manufacturers and asset owners can perform seamless, sophisticated business process innovation and integration, combining product performance data with other business application data for increased productivity and revenue.

**Axeda ServiceLink Applications**

Running on top of the Axeda SmartLink Platform, Axeda ServiceLink applications provide information access from Web-based user interfaces to monitor, manage, and repair wired and wireless intelligent assets.

Manufacturers use a full portfolio of applications to address all service and support tasks, including remotely accessing assets, collaborating with partners and service providers, scheduling and performing preventive maintenance, automating the distribution of software patches and updates, and building and deliver professional reports and dashboards that measure the value of your initiatives.

**Wireless Partner Ecosystem**

To deliver applications that require wireless connectivity, Axeda has teamed with an ecosystem of partners to deliver a complete solution. Types of partners that make up the ecosystem include:

**Edge Devices**

Wireless connectivity requires radio technology, either cellular or satellite, to send and receive data from assets. Edge device partners provide a wide range of hardware from simply reporting location when an asset moves to more sophisticated solutions that can collect data from multiple I/O sources, execute threshold rules, and communicate through multiple networks.

**Wireless Communication**

For cellular and satellite communication, networks are required to securely transport the data from edge devices to the Axeda SmartLink Platform. Since the Axeda SmartLink Platform is communications neutral, multiple wireless communication partners are available to provide this transport mechanism.

**Systems Integration**

The complete solution requires a holistic view of your business including integration into business systems, optimization of business processes, and custom applications as required. Axeda partners with global system integrators to ensure your success.
Deployment and Operation Logistics

Deploying the solution into the field may require resources to connect existing assets, manage the roll out of new assets, and run ongoing operations. Axeda has partners with the manpower and business process expertise to keep your operation running smoothly.

Enterprise Applications

The information collected by the Axeda SmartLink Platform is valuable to many business systems in the enterprise including ERP, CRM, EAM, and others. Our enterprise applications partners supply the software, and together we ensure seamless integration to the Axeda SmartLink Platform.

For an updated list of Axeda partners as well as to become an Axeda partner, please visit www.axeda.com/partners_overview.htm.

Smart Planet Revolution
Disruptive Innovation Enabled by “The Internet of Things”

Remote services that increase product uptime, lower costs of service, and improve customer satisfaction

Connected assets provide intelligence that improves internal business operation and optimizes the supply chain

A platform to deliver content and services directly to customers

Figure 3: The Axeda SmartLink Platform enables manufacturers and enterprises to connect, manage, service, and track intelligent assets with solutions for Smart Services, Smart Operations, and Smart Products.

Smart Services Solutions for Product Manufacturers and Systems Integrators

Axeda and leading systems integrators deliver on-demand Smart Services solutions to more than 100 of the world’s leading manufacturers. With these solutions, manufacturers can proactively service and support products, driving optimal uptime at the lowest possible cost. Whether they use the Axeda SmartLink Platform or work with systems integrators to build and deploy custom applications, leverage partner applications, or use out-of-the-box Axeda ServiceLink applications, manufacturers can connect, manage, service, and track both wired and wireless intelligent assets anywhere.

As a result, product manufacturers can:

» **Reduce Cost** - Increase margins without sacrificing customer satisfaction. Meet the needs of a growing customer base without adding headcount. Support increasingly complicated products with less expensive and less skilled resources.

» **Increase Revenue** - Revenue and margins from product sales are increasingly under pressure from global competition. Product manufacturers can no longer rely solely on product innovation to increase market share,
improve gross margins, and grow revenue. Smart Services increase service contract renewal rates and provide premium services that increase service revenue. Improvements in the service supply chain can provide a disproportionately high contribution to profit as margins from product sales shrink.

» Manage Risk & Compliance - Regulations, such as HIPAA in healthcare and Sarbanes-Oxley (SOX) in finance, require special attention, and the introduction of Smart Services themselves can create new security challenges if not handled properly. Axeda solutions are built with security in mind, and have been successfully deployed in thousands of customer locations.

Business Processes Affected – Smart Services

Smart Service Delivery – Varian Medical Systems is the world’s leading manufacturer of integrated cancer therapy systems. Traditionally, system and product problems have required one or more service technicians to diagnose and resolve issues at the hospital site, resulting in higher costs and lost patient time. The loss of one day’s treatment time for a typical treatment device can result in 35 patients missing their treatments.

To manage these issues, Varian has deployed Axeda—marketed as SmartConnect™—to 10,000 devices at more than 3,000 treatment centers, where they are used an average of 17,000 hours per month. Today, Varian resolves 700 calls in the United States per month remotely by their help desk, resulting in four hours of travel time saved per call. Since an average customer service call is approximately two hours, the company is realizing a 50% reduction in mean time to repair.

Moreover, an average response time of four hours can also be reduced to two hours on SmartConnect-enabled systems, with an estimated savings to a hospital of more than $2,000 per event. Finally, the company reports that the product’s Smart Services capabilities have helped grow software service contracts, which are currently captured at a rate of 17% higher than hardware service contracts.

Optimized Software Management and Distribution – Philips Healthcare is a leading developer, manufacturer, and distributor of innovative products and programs that serve the global sleep and respiratory markets. Like so many other manufacturers under pressure to differentiate their products, Philips Healthcare sought new ways to deliver new value-added services, lower their customers’ total cost of ownership, and deliver superior service at lower costs.

Philips uses Axeda—marketed as Respi-Link™—to deliver software updates, feature options, and offer proactive maintenance and service support of its Esprit® Critical Care ventilators. Six months into the rollout of this program, with now more than 6,500 deployed devices, the company has earned overwhelming customer acceptance, largely due to the ability to install software updates at the customer’s convenience—without interrupting patient care.

The ROI of the Smart Services initiative has been impressive with $1.2 million in annual savings from the optimized software upgrade process and 12% increase in service contract renewals. On the cost reduction side, Philips is reducing field service visits by 20% and overall service costs by 15%.

Smart Product Solutions for Manufacturers, ISVs, and Systems Integrators

Manufacturers, ISVs, and systems integrators can deliver value-added content and services on products by building and deploying custom applications for customers through the Axeda SmartLink Platform.

As a result, manufacturers and ISVs can:

» Create New Sources of Revenue - With a connection built into your smart products, you can provide mobile e-commerce applications, value-added services, and targeted content delivery. Through superior customer experience, customer loyalty is improved, increasing retention.
Connect with Your Customers - Use the smart connection to your products to learn more about customer behavior, so that you can deliver content and services that suits their needs.

Reduce Engineering Costs - Buy and build on proven, scalable technology rather than develop smart product capabilities from scratch, reducing engineering cost and effort.

Business Processes Affected – Smart Products

Thief Detection - OmniCell, a leading provider of patient safety solutions in more than 1,600 healthcare facilities, developed and sells a medical surveillance application to pharmacists to detect drug theft from their cabinets. Upon log-in, the Medical Surveillance Service application lists suspicious transactions, including drugs issued to discharged or “dummy” patients as well as in large quantity, medication overrides, discrepancy patterns, and more. Nurses and doctors also receive emails with a listing of suspicious findings as well as an action button to drill-down reports covering inventory levels, inactive inventory, lost charges, and more. By exposing the information gathered from their intelligent asset management solution, OmniCell has created this new value-added service for which pharmacists will pay.

Regulatory Services - Siemens Medical Solutions Diagnostics manufactures in-vitro diagnostic (IVD) test instruments and assays (chemicals). Their customers are medical labs, required by the FDA to run a quality control (QC) cycle per instrument, per shift, and per type of test performed. All QC results go to a lab supervisor who looks for trends indicating a bad assay lot or an instrument operating off spec. Tests performed on off-spec instruments must be re-run, which is costly, time-consuming, and embarrassing to the lab. In high-volume labs, effective QC analysis is a matter of data management; problems can take weeks to spot.

Siemens leveraged its network by building Online Reports, a Web-based QC application. Now Siemens’ system collects QC results from each instrument in real time and submits them electronically to the lab supervisor and to Siemens, who consolidates the data. Lab supervisors log into Online Reports and compare test results for their lab(s), other labs, or batches of assays. The result has been increased customer satisfaction and retention. Online Reports has elevated Siemens to being a partner in quality results, not just a product vendor.

Intelligence and Reporting – Xeronics is a leading provider of solutions for operational data collection, performance, reliability monitoring, and related business intelligence solutions for the life science lab automation industry. By working with the world’s largest medical and life science manufacturers, Xeronics identified a market need for more diversified data collection and more intelligent data analysis in increasing system performance and subsequently helping manufacturers to engineer more sophisticated products.

By adopting Axeda, Xeronics created a product suite called ODIS.IBM that securely connects manufacturers’ instruments to the Internet and automates the previous manual data collection tasks. With ODIS.IBM and Axeda, Xeronics goes beyond monitoring instruments and capturing data values and creating charts. Their approach involves a more complex form of data collection and storing the data with all key process parameters in creating business intelligence reports through statistical analysis.

Other industry examples demonstrate the growing prevalence of Smart Products solutions:

Location Services – OnStar® is the in-vehicle safety and security system to help protect drivers and passengers on the road. With its three-button system, OnStar offers 24-hour access to expertly trained advisors, a connection to emergency assistance, and access to hands-free calling. OnStar makes GM cars Smart Products, enabling them to charge for a variety of services, such as automatic crash response, emergency services, roadside assistance, vehicle diagnostics, and more.
Mobile E-Commerce - Apple®, iPod™ is a portable digital audio player device that stores and indexes thousands of songs. iPod enables music fans to store and access an entire collection of songs within a few clicks. iTunes, the digital media player application, enables users to play and organize digital music and video files as well as connect to the iTunes Store to download music, music videos, games, television shows, and more. With this connection, Apple has turned this portable digital audio player into a commerce engine as the most popular content delivery method in portable electronics.

Content Delivery - Amazon®, Kindle™ is a portable device for reading electronic books. The Amazon Kindle enables readers to store and read all their favorite books from one single display. With its wireless connection, the Amazon Kindle enables customers to purchase and download all their favorite books and subscriptions. As a result, Amazon has extended its e-commerce business to these portable devices and opens up a world of opportunities for additional value-added services, such as subscriptions, advertising, online teaching, and more.

Smart Operations Solutions for Asset Owners and Systems Integrators

Applications built and deployed on the Axeda SmartLink Platform provide systems integrators and asset owners with an end-to-end solution for connecting wired and wireless assets anywhere into the enterprise.

As a result, enterprises can:

- **Optimize Asset and Business Process Performance** - Provide personnel with real-time performance and condition of intelligent assets to optimize operations. Feed asset information into all areas of the organization by integrating with CRM/ERP systems.

- **Create Intelligent Supply Chains** - Track containers during transport and monitor the contents throughout the shipping process. Reduce theft or loss by knowing the location of containers at every point in the supply chain.

- **Improve Efficiency** - Maximize the efficiency of your assets by remotely monitoring power consumption and production output. Provide operations and logistics with valuable data to accurately track and monitor assets during daily operations.

Business Processes Affected – Smart Operations

**Intelligent Supply Chain** – Applications built with and deployed on the Axeda SmartLink Platform can enable perishable producers/distributors to track the location of their equipment during transport (trucks and ships carrying fruit to various parts of the world), understand what is happening inside the equipment (temperature of the fruit inside the boxes as well as their movement during transportation), and, finally, control what is happening inside the equipment/containers (increasing or decreasing the temperature). As a result, perishable producers/distributors can save millions of dollars in reducing transport costs, cutting cycle time of containers, and detecting transport deviations. These companies can also increase revenue by increasing the pricing potential of liners and other accessories used in the safe transportation of the perishables. Finally, with an optimized supply chain, perishable producers/distributors can increase operating margins by reducing quality-related rejected loads and labor costs, while increasing customer satisfaction.

**Mission-Critical Asset Monitoring** – Petroleum companies with drilling equipment, well heads, and platforms in the most remote areas of the world can use applications built with and deployed on the Axeda SmartLink Platform to remotely collect information on flow rates, pressures, temperatures, tank levels, and equipment status. As a result, these companies can ensure the proper operation of their assets, continue the uninterrupted drilling and processing of petroleum, while reducing the cost of dispatching personnel to the far reaches of the world to collect information manually.

**Smart Retail Vending** – Producers of consumer goods, such as soda, can use applications built with and deployed on the Axeda SmartLink Platform to track the soda shipments to distribution centers as well as to vending machines.
For soda offered in vending machines, vendors can remotely track the usage levels by product line and even increase the prices of those product lines that are in higher demand. The solution also enables machines to report back to their operations center with their current stock and any malfunctions. As a result, vendors can track sales from each machine in real time for improved forecasting and reporting and suppliers can ensure maximum uptime of the machines.

Summary
The world will continue to become smaller, flatter… and smarter. We are moving into the age of the globally integrated and intelligent assets. The question is, how will you leverage this new smarter network to improve your business? The opportunities are unlimited and companies that build smart solutions will emerge as tomorrow’s market leaders by changing the game.

The Axeda SmartLink Platform extends the value and benefits of intelligent asset management from product manufacturers of wired and wireless assets to asset owners at large enterprises. Manufacturers, developers, systems integrators, and ISVs can avoid the inefficiency of piecemeal point solutions and use the Axeda SmartLink Platform to build and deploy smart solutions that reduce costs, increase revenue, improve operations, and deliver new revenue-generating services.

About Axeda
Axeda Corporation is the leading on-demand intelligent asset management company delivering M2M solutions for Smart Services, Smart Operations, and Smart Products. The company’s VeriSign® Security certified platform and applications allow companies to connect, manage, service, and track wired and wireless assets anywhere—it serves over 100 of the world’s leading enterprises including Diebold, EMC, and Philips. Axeda Corporation is a privately held company headquartered in Foxboro, Mass. and can be reached at www.axeda.com.