

IoT Patent Pipeline

By: Alec Schibanoff

George Carlin said it best: “A house is just a place to keep your stuff while you go out and get more stuff.” If he were around today, Carlin would say that the Internet is just a way to connect all our stuff while we go out looking for more stuff to connect.



The earliest references to an “Internet of Things” goes back to prehistoric times—1999. And just as technology grows exponentially, applications for the Internet of Things or IoT have grown exponentially as well. Both Lowe’s and The Home Depot have smart home sections—just one outgrowth of IoT—and they are both right up in the front of the store, not in the back with the plumbing and carpeting.

In this edition of Patent Pipeline, we look at four recently granted patents that give us a view into the future direction for IoT technology. We will take a look at improved security for IoT connections and networks, a gigabit optical access network for connecting all those devices, smart home and office management with an emphasis on energy savings, and what comes next after smart homes and smart offices.

Next-Generation Security for IoT Networks

As more and more devices are added to an IoT network—some of which are not directly under control of the network’s owner or operator—the opportunity for fraud increases dramatically. U.S. Patent No. 9,432,378 for “Internet of Things Security” is from independent inventor and IBM alumnus Jerome Svigals, and it addresses this issue head on. This patent has a 2011 Priority Date, and it is the latest in a three-patent portfolio that addresses improved, human-intervention-free, secure communications between and among IoT network devices.

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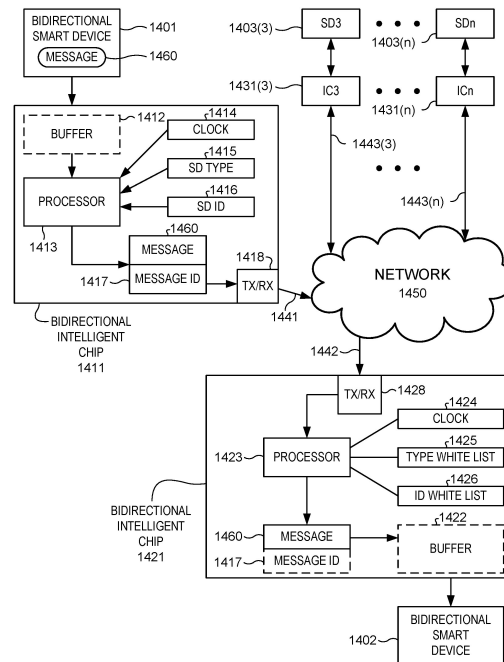
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This patent discloses a security system that enables IoT devices to securely communicate with each other over a network—without human intervention. It creates an interface security device that resides between each IoT device and the network. This interface security device may be implemented as a solid-state mechanism, a logic unit, or an application, and it scans each incoming message to determine its source and time, two unique characteristics that each message has. Each incoming message is only accepted when the source and time of the incoming message is validated by the sender of the message. Additionally, all interface security devices are

synchronized periodically to maintain integrity of time checks so that a hacker cannot fool the system by finagling with the time of the message or the timing of an interface security device.

This technology has applications for IoT device manufacturers, security device developers, and data security software developers, as well as smartphone, PDA, laptop, tablet, PC, server and consumer electronics manufacturers.



This figure from U.S. Patent No. 9,432,378 provides an overview of how an interface security device would be integrated into an IoT network. [\(Click to Enlarge\)](#)

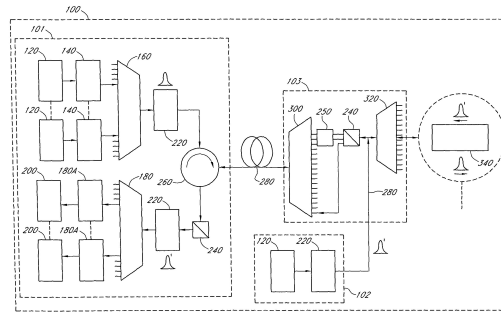
Gigabit Optical Access for Greater Bandwidth

Despite all the telecommuters out there, traffic jams are still common occurrences. In addition to vehicle traffic jams, there are totally different traffic jams that are actually far greater in scope and scale, yet we do not see them. We are referring to all that data trying to get to and from Internet-connected devices and appliances through limited bandwidth smart home and smart office networks. All that data causes enormous bandwidth traffic jams between all those access points. And those bandwidth traffic jams cause not just delays but communications that risk being timed out. U.S. Patent No. 9,723,388 for a "Dynamic Intelligent Bidirectional Optical Access Communication System with Object/Intelligent Appliance-to-Object/Intelligent Appliance Interaction" covers technology that enables critical connectivity by IoT and smart home and smart office installations by creating an intelligent subscriber subsystem that provides greater bandwidth at a very modest cost.

This patent is from independent inventor Mo Mazed and is one property in a four-patent portfolio that also includes an open continuation U.S. Patent Application. All of the patents in the portfolio share a 2006 Priority Date, so there is considerable retroactive patent protection. This portfolio can be used to create technology that can compete favorably against Amazon Alexa or Google Home by simply adding voice command software such as Nuance Dragon®. The portfolio includes not just an intelligent subscriber unit for machine-to-machine (M2M) or IoT connectivity in the home or office, it also provides gigabits or more of bandwidth per second at a significantly lower cost than installing new hardware. It also provides for intelligent, self-learning appliances such as a self-learning telephone.

The open continuation U.S. Patent Application that is part of the portfolio will enable the acquirer of these patents to file additional patents fine-tuned to the future technologies of the acquirer while

maintaining the 2006 Priority Date of the other patents in the portfolio.



This figure from U.S. Patent No. 9,723,388 illustrates a block diagram configuration of a bidirectional optical access communication network (101) with a super node (101) as it communicates via a single node optical fiber (280) with a local node (102) and/or a remote node (103).
(Click to Enlarge)

Improved Smart Grid Energy Management and Automation

CEM[®] (Certified Energy Management) systems are emerging key players in the IoT sector. CEM systems integrate the electrical, mechanical, process and building infrastructure in a home or office by determining the optimal solutions to reduce energy consumption in a cost-effective manner. U.S. Patent No. 8,478,450 for a “Power Control System and Method” directly addresses better management of energy consumption by a network of devices and appliances.

This patent is from Advanergy, a smart grid and IoT technology development firm. U.S. Patent No. 8,478,450 is both a robust and foundational patent. It has a 2011 Priority Date, 30 Claims and a whopping 180 Forward Citations. That means that 180 newer patents cite the technology covered in this single patent. It is part of a ten-patent IoT energy management portfolio from Advanergy that also includes smart appliance controls and advanced battery management.

This patent describes an Internet Protocol-based solution that is secure, yet non-intrusive and inexpensive. It uses a global standard, it is plug-and-play installable, and it is compatible with all third-party technology, including the latest electric utility “smart meters” and all ZigBee[®] system components and devices.

With the other patents in the portfolio, it creates an incredibly comprehensive next-generation of energy management—for any IoT network—that includes full monitoring and control of all smart-enabled devices from any location via Internet access; a smart meter control panel that reports smart and non-smart energy usage; detailed consumption reporting by individual device; remote or on-site device control that can also be scheduled; customizable display options that to report data to users in multiple formats; and a smart battery control that ensures that rechargeable devices are not overcharged so they do not overheat, optimizing battery life.

This technology included in this portfolio covers a single, seamless and comprehensive platform for energy monitoring, sensor network security, and device-control battery-charging. It can communicate with the management of an IoT network with any smart device (PC, tablet, desktop, smart phone, etc.) by broadcasting messages, images or video across an internal network or via an encrypted wi-fi intranet.

From Smart Home to Smart Office to Smart Greenhouse

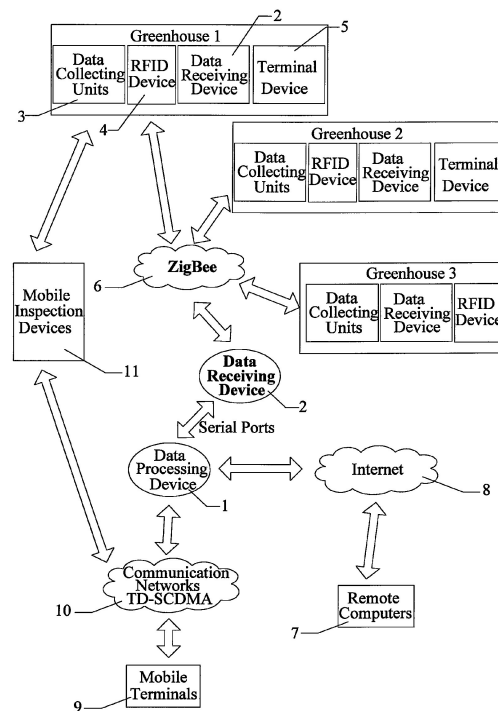
Farming is not usually perceived as especially high-tech, but the farmers of today are just a connected as the rest of us. For example, the combine harvesters of today—those monstrosities that mow down a field a wheat, separate the wheat from the chaff, and shoot a stream of wheat

grain in the back of a truck—are GPS-controlled and do not need a driver! Just as intriguing is U.S. Patent No. 8,643,495 for an “Internet of Things Based Farm Greenhouse Monitor and Alarm Management System” from Chinese inventors Zehua Lan and Lixia Ma. The patent has 67 Forward Citations and a 2011 Priority Date.

More and more produce is being grown in greenhouse for several obvious reasons. Controlled growing conditions, a longer growing season, and a pest-free environment are just three. Even a small farm can have dozens of greenhouses, while a large farm can have hundreds. This patent creates a greenhouse monitoring and alarm-management system that is IoT based, provides real-time monitoring of the environmental parameters that affect the growth of crops in a greenhouse, and will fully integrate with ZigBee systems and components.

This technology covered by this patent is most comprehensive. It includes mobile inspection devices, data acquisition units, data receiving devices, data storage servers, and secure log-in by users. The system can automatically monitor and collect data on greenhouse environmental parameters such as air temperature, humidity, illumination, soil temperature and soil moisture. Using that data, it can also can automatically value and balance the critical value of each parameter for optimal growing performance. It can even determine the priority and validity of any warning or alarms produced by the system.

This patented technology utilizes ZigBee-chip integrated wireless sensors and data collection modules. It integrates remote inspection devices that enable a single person to monitor a hundred or more greenhouses from a central location, dramatically reducing labor costs and travel time between greenhouses by employees.



This figure from U.S. Patent No. 8,643,495 shows the overall architecture of the patent inventions and its integration into a ZigBee network. [\(Click to Enlarge\)](#)

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