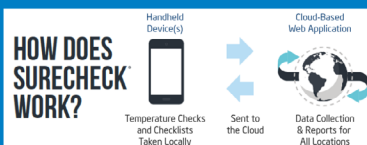


Making Food Safer for Everyone

New laws and new mobile solutions based on Intel® IoT platform technologies are aimed at stopping outbreaks of food-borne illnesses.

Food Safety and IoT

An example of a new IoT-based solution focused on food safety and based on Intel® technology is the SureCheck* Advantage solution from Par* Technology (www.partech.com), a leading provider of technology solutions for the hospitality industry. Par Technology has identified time-saving of as much as 60 percent when using its solution, compared to maintaining paper-based logs. See more details on page 4 of this white paper.



Summary

Food-borne illnesses are notoriously uncomfortable, in many cases deadly and—when proper protocols are followed—very preventable. Prompted by a series of large-scale contamination outbreaks, the U.S. is making a renewed effort to ensure that those protocols are followed. A new federal law—the Food Safety Modernization Act (FSMA)—is bringing about a major shift in safety practices by mandating continuous monitoring of food handling and preparation in compliance with HACCP (Hazard Analysis and Critical Control Points) guidelines. And to simplify and lower the cost of HACCP-compliance, mobile, handheld solutions are being deployed. These solutions, based on Intel® Atom™ processors, can prompt workers to follow proscribed protocols, provide ways for tools to capture data—such as temperature and task completions—and streamline reporting and records storage for HACCP-compliance via the cloud.

With their ability to be directly inserted into complex food preparation processes, these new devices exemplify the new world of the Internet of Things (IoT) and the role it can play in addressing a critical health issue. Read this white paper for an overview of the food safety challenge, the Food Safety Modernization Act, HACCP-compliance, and the role that Intel® IoT Platform solutions play in achieving the goal of a safer food chain.

Food Safety: Always a Risk

Food-borne illnesses (a.k.a. food poisoning) are so common that our ability to avoid them is a big part of our evolutionary success as a species.

Do you prefer sweet-tasting substances to those that are bitter or sour? Most people do and for that you can thank our caveman ancestors. The toxins that cause food-borne illnesses often have a bitter taste. So do the carboxylic acids released when food spoils. Our hunter and gatherer ancestors “learned” to dislike these tastes, enjoyed better survival rates and passed those aversions down to us.

But today, we can’t count on our instincts alone to stay safe. Our food chain has grown immeasurably more complicated

since the caveman era, of course—many of the most dramatic changes occurring within the past few decades:

- Refrigeration, cooking and more sophisticated preparation techniques have improved our lives, but can also have the inadvertent effect of disguising the very tastes and smells that might have been danger signals in earlier times.
- Food imports, once a rarity and often primarily for luxury items, now supply 20 percent and more of our fruits and vegetables;¹ and we often have little information about their origin and handling.
- We eat more fruits and vegetables, which are key to a healthy diet but are more prone to carrying contaminants like *E. coli*.

Table of Contents

Summary	1
Food Safety: Always a Risk	1
A Systemic Issue That Poses a Real Threat	2
The Challenge: Changing Behavior	2
Making HACCP Compliance a Legal Requirement	2
Adapting to HACCP—The Limits of Paper-based Records	3
Food Safety and the Internet of Things (IoT)	3
Par* Technology SureCheck* Advantage	3
Benefits: HACCP-Compliance and More	4
A Safer Future	4

- We also eat far more processed foods than ever before, which increases the opportunities for contamination and—because food processing is often highly centralized—heightens the potential for a single, localized incident to quickly impact a large number of people.

A Systemic Issue That Poses a Real Threat

Given all of these trends, it's no surprise that the risk of contracting a food-borne illness has grown and is now recognized as a systemic issue that poses a significant threat to our health and well-being. The broad scale nature of the problem first came into view over 40 years ago when a deadly incident involving canned vichyssoise soup in suburban New York led to a nationwide panic.

In the years since, there has been one incident after another:

- In 1985, *Listeria* in cheese caused 52 fatalities, the deadliest single outbreak recorded by the Centers for Disease Control since it began keeping records in 1970.
- Also in 1985, *Salmonella* in milk caused as many as 200,000 cases of food poisoning in six Midwestern states.
- 2003 saw the nation's worst *hepatitis A* outbreak when more than 660 people became infected from green onions served in a restaurant chain.
- In 2011, tainted cantaloupes led to 30 deaths and helped make 2011 the country's deadliest single year due to food poisoning.
- 2015 has had several recalls and outbreaks including *Listeria* in ice cream, which has killed four people.

In addition to cheese, milk, cantaloupes, onions and ice cream, there have been outbreaks involving ground beef, chicken, turkey, peppers, bean sprouts, salad greens, papaya, apple cider, peanut butter—the list goes on. Those responsible have included mom and pop producers,

brand name processors, supermarkets, small and large restaurant chains and more.

On an annual basis, it's estimated that some 48 million people a year (16.8 percent of the population) become sick from consuming contaminated food. And while most people recover, those who are at risk—an estimated 30 percent of the population, including the young, pregnant women and the unborn they carry, the elderly and people whose health is compromised—can experience long-term consequences including weakened immune systems, arthritis and kidney failure. And the grim reality is that many people die from food poisoning: an average of 3,000 per year.²

The Challenge: Changing Behavior

The causes of food-borne illnesses are well known: *Salmonella*, *E. coli*, *Listeria*, *Campylobacter* and other bacteria are naturally occurring. The steps needed to prevent these illnesses are also well known and essentially come down to preparation and handling: proper cleaning, cooking and storage. A lapse in any one of these activities can lead to problems. In effect, while it's the bacteria that cause the outbreak, it's human behavior that allows it to happen.

That's why, in a major change in the nation's approach to food safety, these behaviors are now the focus of the Food Safety Modernization Act (FSMA), which became U.S. law in 2011 and is now undergoing a phased implementation. The FSMA shifts the focus from responding to contamination incidents after the fact to proactively trying to keep the lapses that cause these incidents from ever happening in the first place.

Making HACCP Compliance a Legal Requirement

The FSMA seeks to achieve its goals by institutionalizing a set of procedures known as HACCP -- Hazard Analysis and Critical Control Points. HACCP procedures are de-

signed to identify potential “hazards” in a production process and the “critical control points” where a lapse or failure could turn the potential hazard into an actual one.

Developed by the military in the World War II era as a way to improve the reliability of artillery shells, HACCP was first applied to food preparation in the 1960s when the National Aeronautics and Space Administration (NASA) worked with the food company Pillsbury on a way to ensure the safety of food brought on space missions. Since then, the applicability of HACCP to food preparation has been a focus of continued interest among safety experts.

The FSMA brings HACCP to new prominence by making it a legal requirement in food preparation. Food facilities—farms, warehouses, food processing plants, grocery stores, restaurants and more—are now required to follow HACCP guidelines to:

1. Evaluate hazards (e.g., the presence of microorganisms that could sicken or kill people)
2. Identify the critical control points where failures could occur (e.g., delivery, sorting, storing, cooking, etc.)
3. Proscribe the preventive steps that will be followed to reduce the hazards (e.g., wash the food, cook to the proscribed temperature, maintain heat at the correct level, check at set intervals, etc.)
4. Follow all of the steps and maintain two years of records verifying that it has done so.

Adapting to HACCP—The Limits of Paper-based Records

The FSMA’s requirement for HACCP compliance represents a sea change in the way that food facilities monitor and track their operations. But following the letter of the law is not without its challenges.

In a busy environment—with numerous food substances, supplied by different sources, being used by different people for different preparations, all simultane-

ously—the process of identifying, scheduling, tracking and reporting on all of the steps needed to reach HACCP compliance can be a major undertaking.

Currently, food facilities typically use traditional, paper-based logs. But the traditional approach is likely to pose a number of operational and scalability issues. While paper-based monitoring will allow some basic tracking of the desired behaviors, it will do little to proactively encourage them. Paper-based processes are notoriously time consuming and prone to inaccuracy. And because the FSMA requires all food facilities with more than \$1M in revenues to keep the records for at least two years, daily paper logs are likely to pose a significant, ongoing storage-management issue.

Food Safety and the Internet of Things (IoT)

As an alternative to paper-based monitoring and reporting, providers of technology solutions are discovering that HACCP-compliance is an application well suited for the emerging world of the Internet of Things (see sidebar on IoT) in the form of mobile devices that can be preloaded with HACCP checklists, prompt workers to perform required inspections, verify that they were completed and then gather and transmit data (e.g., temperature readings) to the cloud where they can be stored, analyzed and reported for compliance purposes.

Par* Technology SureCheck* Advantage

An example of a new Intel®-based IoT solution focused on food safety is the SureCheck* Advantage solution made by Par* Technology (www.partech.com), a leading provider of technology solutions for the hospitality industry.

SureCheck* Advantage is a smartphone-like device with an Intel Atom processor inside and Bluetooth* wireless connectivity. It comes equipped with three temperature-measuring modes: a traditional

The New World of the Internet of Things

The IoT involves equipping devices with microprocessors and connectivity, enabling them to gather and respond to data acquired in real time and communicate over the Internet. Billions of devices are being made intelligent and connected as part of the IoT impacting a wide range of industries. For example, energy providers are distributing smart, connected IoT devices across power grids to manage usage. Manufacturers are doing the same on their production lines. Medical devices are being created to monitor a user’s health and send the information to medical personnel. In retail stores, devices as diverse as checkout systems, digital signs and even mirrors are being made intelligent and networked to streamline the shopping experience. The potential applications of IoT solutions are virtually endless.



Making Food Safer for Everyone

thermometer probe, infrared (for checking the actual temperature of cooking surfaces) and RFID (which can track both temperature and the specific location of the food being checked).

The SureCheck* Advantage provides a convenient display of the HACCP checklist, prompts when a task needs to be completed, keeps track of relevant safety and recall alerts, flags missed steps and violations, issues corrective actions and delivers a complete audit trail broken down by operator name, location verification and timestamp. It's designed to be used across both simple and complex food handling and preparation processes (e.g., heating food, or heating and then cooling within a specified time frame).

In a very active food environment, for example a grocery store that offers a range of fresh, hot and cold dishes, the SureCheck solution might be used this way:

1. Master user (i.e., the primary chef) determines the upcoming menus and enters them on the SureCheck enterprise portal.
2. All of the appropriate SureCheck mobile devices are wirelessly updated daily with new checklists based on the ever-changing menus.
3. As food is prepared and sent out to the floor, the checklist prompts users on each upcoming task (e.g., take temperature). SureCheck uses barcode scans and RFID to identify the exact product and its location.
4. All data is captured and uploaded to the cloud for daily reporting and storage for HACCP-compliance purposes.



Benefits: HACCP-Compliance and More

In the development of the SureCheck* Advantage, Par* Technology has worked closely with one of the world's largest food retailers, which has deployed the SureCheck solution in more than 5,100 locations domestically. Some of the key benefits that have been identified include:

- **Overall Food Safety:** Ensuring critical control points are monitored and proper corrective actions are taken when necessary.
- **Higher Performance:** Because workers are reminded to complete the tasks, more are completed on time and fewer are missed.
- **Audit Trail:** The solution delivers a detailed, automated audit trail of who completed the action and when it was completed.
- **Comprehensive:** The solution establishes a comprehensive source of information including execution timing, missing checklists, non-observed items, top violations, violation details, single checklist detail and a daily summary.
- **Cost-savings:** The solution has demonstrated significant savings in the resources needed to complete food safety inspections. Par Technology has identified timesaving of as much as 60 percent when compared to maintaining paper-based logs.
- **Quality Improvement:** In addition to HACCP-compliance, the information gathered can be used for quality control, such as to identify food preparation where there has been undercooking or overcooking.
- **Simplicity:** The intuitive interface needs little or no training, which is ideal for the high-turnover environment of the food industry. The system is available in multiple languages and dialects.

A Safer Future

The what, why and how of food-borne illnesses and the microorganisms that cause them are well understood. And so is the solution: making sure that the people and companies responsible for growing, processing, delivering and preparing our foods follow the proper steps that are proven to eliminate these contaminants.

With the passage of the historic FSMA, the food industry and the government have agreed that, given the broad scale and systemic nature of the food safety challenge, new strategies are needed. Rigorous implementation of HACCP processes, now a legal requirement, is the chosen path for instilling the behaviors needed to reduce risks across the food chain.

Mobile, handheld solutions that can be deployed anywhere in the food development and preparation process, to prompt the desired behaviors and provide a detailed, accurate audit trail of their completion, represent a major advance over what was previously possible and a powerful example of the role that the IoT can play in this major public health initiative. The advantages over traditional paper-based logs are significant, including a major reduction in the cost of meeting HACCP-compliance requirements.

Like the laws and processes they are supporting, these new IoT solutions offer a way to make the food we consume safer. And that's good for all of us.

Learn More

For more information on Par* Technology SureCheck* Advantage go to www.partech.com.

Go to www.intel.com/loT to get more information on Intel®-based IoT Technology, examples of how businesses are using IoT solutions and how to make them work in your business.

¹ Global Engagement - U.S. Food and Drug Administration, 2012

² <http://www.cdc.gov/foodborneburden/>

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