

Design of an IOT-based Trade Show Management System

*Wang-chan Wong, College of Business and Public Administration, California State University,
Dominguez Hills, Carson, CA 90747, 310-243-1041, wcwong@csudh.edu*

*Charles Mallabarapu, WiSilica, 65 Enterprise, Aliso Viejo, CA 92656, 949-201-3131,
cmallabarapu@wisilica.com*

Dennis Kwan, WiSilica, 65 Enterprise, Aliso Viejo, CA 92656, 619-665-7268, dkwan@wisilica.com

ABSTRACT

In this paper, we propose a design of an IoT platform that provides end to end user experience to support trade shows and expos. The proposed IoT-based trade show management system offers both hardware and software that will provide excellent user experience to the attendees, and flexibility and seamless tracking and monitoring functions to the exhibitors, the event organizers, the venue management, the speakers and sponsors of these trade shows. The platform provides a flexible way to converge infrastructure with devices, sensors, people and context that can understand their environment and use predictive intelligence to improve user experience, reduce cost and improve efficiency.

INTRODUCTION

Internet of Things (IoT) is one of the fast evolving technology eco systems that affect every business. The impact can be seen in day-to-day life experiences, automatic power management and savings, much improved quality of communication between customers and provides huge cost savings for both sellers and buyers, and presence based control among many others. The IoT platform needs can be characterized into three major aspects:

- Smartening the infrastructure by able to securely configure, control and monitor it locally and remotely
- Device and device, device and sensor, and device and cloud communication to things autonomously make rule based decisions with the given data
- Understand the context, environment and apply it to the unique requirements of the used based on machine learning and predictive intelligence techniques

By providing these fundamental functions, an IoT platform with complete security for the devices, its functionality and user's data can be used in any application domain from smart-homes and smart-buildings to industrial automation and complete retail solutions. In this paper, we propose a new IoT application that can be used in trade show and expo management.

TRADE SHOWS AND EXPOS

Prof Gerald Zaltman stated at Procter & Gamble's Future Forces Conference in 1997 that "Consumer preference and motivation are far less influenced by the functional attributes of products and services than the subconscious sensory and emotional elements derived by the total experience" [3]. Companies have adopted marketing practices centered on a holistic view of consumers and their relationships with products based on an emotional rather than a rational approach [10] [12]. Companies are managing customer experience to create a competitive advantage that is difficult to match by competitors. Consider trade shows that aim at consumers such as the Apple User Conference, the CES (Consumer Electronics Show), and the E3 (Electronic Entertainment Expo). Thousands of consumers and potential buyers flock to attend and experience these events. Loyal fans become evangelists and advocates of

these products and services. Potential customers are converted to real customers when they are emotionally charged in the expos. Industrial trade shows are widely used and are viewed as extremely effective for B2B where industrial buyers can find solutions to known problems, to decide on or finalize vendor selection, to identify new methods, to meet with technical experts, and to assess technical directions [7]. Undeniably, attending trade shows is an important and integral part of the total customer experience in this *holistic* view.

IOT AND ITS ARCHITECTURE

Internet of Things (IoT) refers to the networked interconnection of everyday objects through sensors and devices such as actuators and mobile phones. It enhances the ubiquity of the Internet by integrating these sensors and devices via embedded systems. These sensors and devices usually have simple intelligence and business logic built in for their specific application domain. For example, a blood pressure sensor knows the threshold of high or low blood pressure, a LED control device and sensor can sense the ambiance and adjust the lumens, a beacon can detect the presence of a customer and announce it to a salesperson in a retail shop and so on. The interconnection leads to a highly distributed network of devices communicating with human beings as well as other devices. IoT is included by the US National Intelligence Council (NIC) in the list of six “Disruptive Civil Technologies” with potential impacts on US national power. NIC predicts that “by 2025 Internet nodes may reside in everyday things – food packages, furniture, paper documents, and more”. It highlights future opportunities that will arise, starting from the idea that “popular demand combined with technology advances could drive widespread diffusion of an Internet of Things (IoT) that could, like the present Internet, contribute invaluable to economic development” [2]. With the ubiquity of IoT sensors and devices, Google’s Eric Schmidt suggested that the Internet will “disappear” because “there will be so many IP addresses, so many devices, sensors, things that you are wearing, things that you are interacting with that you won't even sense it” [6]. Cloud platform providers such as Amazon’s AWS and Microsoft’s Azure recently started offering IoT software suites to their cloud service subscribers and devices manufacturers [1] [8]. Discussions of the technologies, visions and challenges of IoT can be found in the papers by [2] [9] and [14].

We have designed and developed a platform with a robust, scalable, distributed architecture that supports high volume of devices and users seamlessly interacting with each other and generating lot of useful data. It consists of three main components *device*, *app* and *cloud*. Each component is further organized into a smaller component that narrows the functionality to a specific domain. Each component exposes the necessary functionality through APIs to interact with other components of the platform providing the capability to easily add, update, and remove solutions as needed without affecting the rest of the module.

BLE Devices: An array of Bluetooth Low Energy (BLE) based smart devices starts coming out to the market [1] [8]. These BLE modules implement device connectivity and security and can be directly controlled using smart phones or tablets without a need for a bridge. Our BLE modules can be integrated as hardware and/or software modules.

BLE Mesh: BLE Mesh technology securely interconnects BLE devices and smart phone Apps, and eliminates BLE range issues. This non-flooding mesh architecture makes it possible to operate BLE devices without requiring a bridge/gateway or a connection to the cloud server.

WiFi-Bridge: A bridge is used to provide connectivity between BLE and WiFi to enable connectivity between BLE devices to our cloud. We provide our bridge device as well as the Connect App that can be installed on an Android or a Linux device that supports both BLE 4.1+ and WiFi.

Cloud: Our cloud enables application development, deployment and integration by providing powerful services such as multi-level authentication and access control, remote management and operations of devices, and sharing devices with friends. Scalability and performance are ensured without compromising the security. Our cloud supports multi-tenancy for cost effective scaling.

IOT-BASED TRADESHOW AND EXPO MANAGEMENT SYSTEM



Our platform architecture provides best user experience in all types of venues including trade shows, conferences, entertainment venues, sports arena, hotels, exhibitions and such. Our platform developers can also highly benefit from the Expo app and the readily integrated BI solutions.

The Expo App as shown in Figure 1 can also effectively engage users to organize their time and optimize their experience providing event schedule, directions, venue information, register for their space in line and such. It will also help the user to share their experience easily with pictures and videos through their favorite social network. Locations, events, user groups and all frequently used links can be bookmarked within the app for easy access to these feature.

Our platform is built with scalable, distributed architecture that supports high volume

of devices and seamlessly interacting with each other and generating useful data. In this expo management system, all modules of the system play a vital role. Figure 2 is a conceptual diagram illustrating how the IoT devices work together with beacons and the network. Beacons advertise their presence and any app that listens for these advertisements can process that information. The Expo App provides a personalized user experience by listening for beacons. When one or more beacons are detected this information is processed at the cloud to provide the following:

- Personalized greetings, venue information, booth/presentation information and such.
- Easy access to event calendar and optimized experience depending on the user availability, venue conditions and event timings.
- Provides indoor and outdoor directions to venue locations
- Provides information from sponsors based on user preferences
- Can be connected to third party cloud services to provide additional information.

Use Cases of the Trade Show Management System

The Expo app is designed to offer solutions of the following use cases.

Figure 1. Expo App users

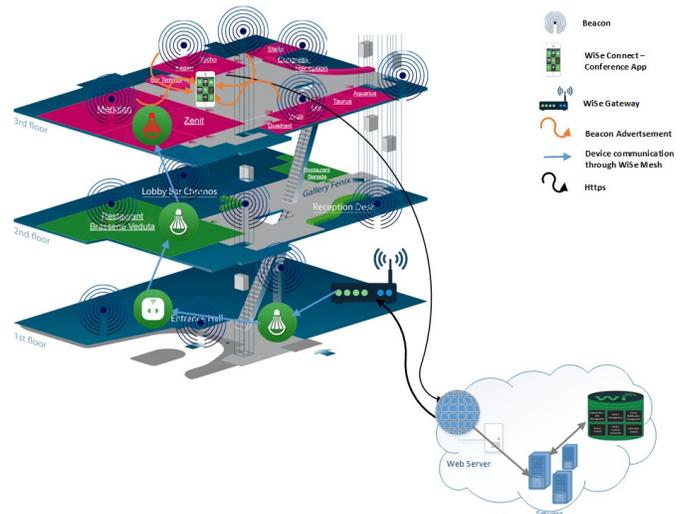


Figure 2. The IoT-based Trade Show Management System

Attendee

1. Register for Trade Show.
2. Attendee uses the Expo App to search, select and register an event.
3. Check-in at Trade Show. When an attendee enters the exhibition hall he gets automatically checked through the Expo App that is running on his phone.
4. Plan the visit. The Expo App will let the attendee explore the conference hall using areas of interest, speakers, booth map and schedules. When attendee picks the desired booths and event, the Expo App will automatically suggest the best way to cover all the selected items.
5. Register for sessions. Sessions that attendee is interested in requires pre-registration the Expo App will guide the attendee through the registration process.
6. Track events. Track scheduled or ad-hoc sessions, demos based on location, interests, and category.
7. Identify and participate in user-groups. Based on attendees interest suggests user-groups. Provides facility to join, comment on a thread, start a new thread, post photos, videos, links and articles, and schedule/notify meetings.
8. Navigate. Based on the selected event/location provides directions by shortest part, by shuttle, or most optimal coverage.
9. Rendezvous friends. Plan and meet friends, ad-hoc or scheduled ahead of time. Share your location and see the location of friends who are shared their location with you.
10. Effective communication. Easily ask questions, send feedback, and share contact info with exhibitors, speakers, event organizers and sponsors.

Exhibitor

1. Know the attendants. Know who is close to your booth. Obtain their contact info and details on their interests in your technology just by their presence. Process information live and identify the right resource to interact with the attendee.
2. Tailor experience. Use the data on the attendee(s) and provide personalized demo and cover their area of interests.
3. Make it interactive. Enable user to participate in the demo directly from the Expo App by providing an easy interface from the app. Ask questions specific to the user interests to enable user respond and participate. Provide them links and other information for attendees to learn more.
4. Schedule events dynamically. Based on the number of attendees around and their interest create ad-hoc events such as quick hands-on session, presentation on top of the regular demo, or a suitable game.
5. Enable feedback and follow up. Enable user to provide immediate feedback, share contacts and ask questions.
6. Organize user groups. Create user groups based on the data collected from attendees to keep them involved even after they leave the booth.

Event Organizer

1. Know the exhibitors. Know the schedule of your exhibitors to help them at their success.
2. Know the attendees. Know the attendees and provide them with better experience such as providing event schedule, meeting places, shortest path and optimal route.
3. Improve location. Organize booths and events in appropriate locations based on the attendees interest to reduce congestion.
4. Communicate effectively. Provide real time information such as change of events, new additions, lines, shuttles, and concessions.

5. Enable feedback and follow up. Enable user to provide immediate feedback, share contacts and ask questions.

Venue Management

1. Know the numbers. Understand the number of people attending the events, number of active booths, area most used, resources such as power, gas, and water consumption per booth, floor and building.
2. Enable excellent experience. Provide adequate resources, paths, equipment to provide excellent experience based on the audience interest. Provide notifications to the users about the available resources.
3. Optimize energy consumption. Control energy usage based on factors such as occupancy, and event schedules.
4. Enable feedback and follow up. Enable user to provide immediate feedback, share contacts and ask questions.
5. Promote events. Promote events based on the interest of attendees, exhibitors and/or speakers relevant to the building management.

Speaker

1. Know who the attendees are.
2. Enable feedback and follow up.
3. Organize user groups.

Sponsor

1. Know all the logistic numbers, attendant records, etc.
2. Know the interests of the participants.
3. Promote interests to the attendees.

CONCLUDING REMARKS

Trade show is a crucial part of a holistic approach in managing total customer experience. In [13], there are some compelling statistics supporting and explaining why:

1. B2B exhibitions were 39.2% of B2B marketing budgets in 2011, the largest amount of any other marketing channel.
2. 81% of trade show attendees have buying authority. 46% of trade show attendees are executives or upper management.
3. 99% of marketers said they found unique value from trade shows they do not get from other marketing media.
4. The top 3 goals for exhibitors at trade shows are brand awareness, lead generation, and relationship building. 83% of exhibitors agreed that “building, expanding brand awareness” is a high-priority marketing-related objective for trade shows.
5. 84% of exhibitors say “high quality of attendees” is the most important factor when deciding whether to exhibit or expand booth size.

However, as reported in [11], the overall trade show attendee experience can be summarized as: *sensorial overwhelming, information over-load* and *physical fatigue*. In this paper, we proposed an IoT-based trade show management system. We described the overall system architecture of the system along with specific use cases that offer services to all the constituents of a trade show. We believe the IoT technology can improve and better manage customer’s experience by empowering them to plan, navigate and connect to exhibitors, event speakers, friends and colleagues with a much better experience. The technology also empowers the exhibitors, the event organizers and the venue owners by providing

them instant business intelligence and potential new revenue streams from the events. There are several major managerial implications:

1. Our system offers an overall win-win situation for all constituents of a trade show such as attendees, exhibitors, event organizers, venue management, speakers, and sponsors.
2. The system can offer Zara-like [4] real time interaction with customers. Ad hoc promotional campaigns can be implemented with web application through the cloud to the Expo App.
3. Data collections are done fully automatically. They can be analyzed real time during the trade show and afterward.
4. The system is disruptive to the conventional trade show management system.

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