HTNG IoT Working Group:
HOW HOSPITALITY CAN WIN WITH IoT

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What is the Internet of Things (IoT)?

There is no universally agreed definition. Three common definitions of IoT are:

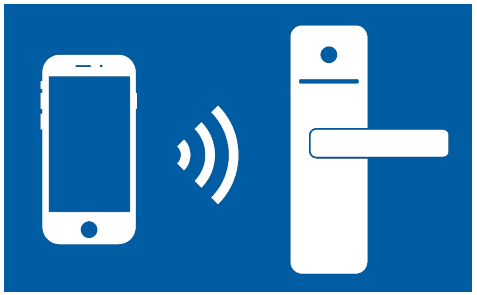
The Internet of Things consists of devices that have been made intelligent through an ability to communicate and interact with the physical world.

IoT is a system consisting of a network of sensors, actuators (machine components) and smart objects which are interconnected in such a way that makes them intelligent, programmable and capable of interacting with humans and each other.

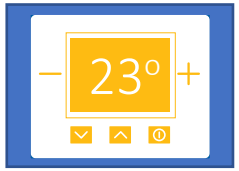
IoT is a system of sensors and actuators which interact with each other and with one or more logical processors; the processors provide analytics and/or control directives, using communications infrastructure which may (in part) belong to entities besides the system owner.

What is the Internet of Things (IoT)?

Hospitality:



Mobile Key



Smart Thermostat

Consumer:

Thermostats

Lights

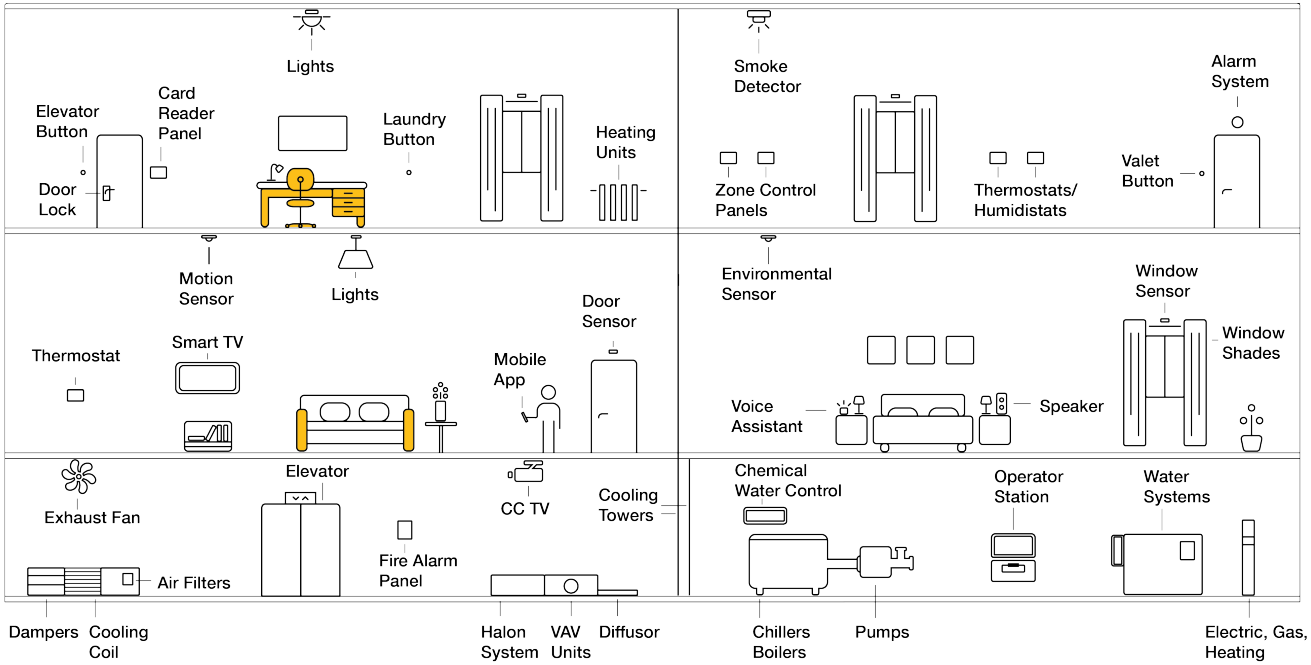
Wearables

Why is this important for me?

→ **Staff and utilities are the two highest costs in a hotel**

→

IoT will enable use cases that create efficiencies and decrease operational costs

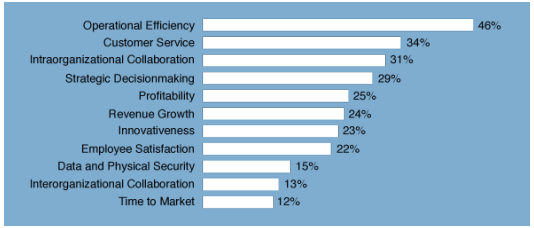


HOTEL

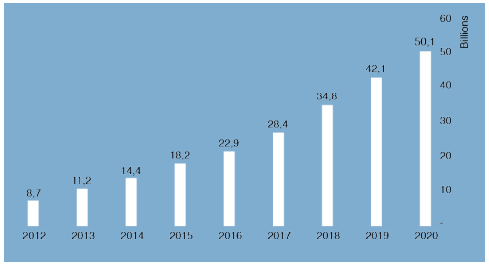
Why is this important for me?

→ IoT is real and here to stay

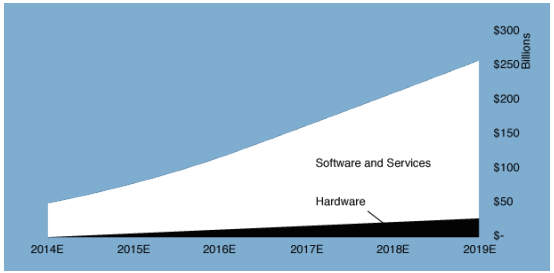
The main business benefits are higher efficiency and customer experience



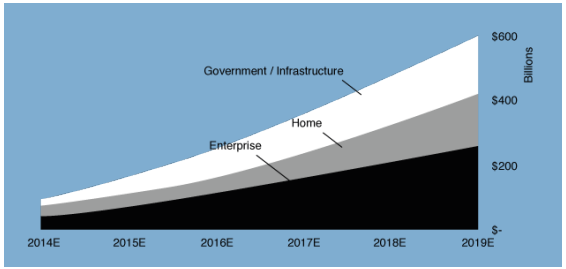
By 2020 50bn connected devices



Businesses will invest $250bn, most of it in software and services



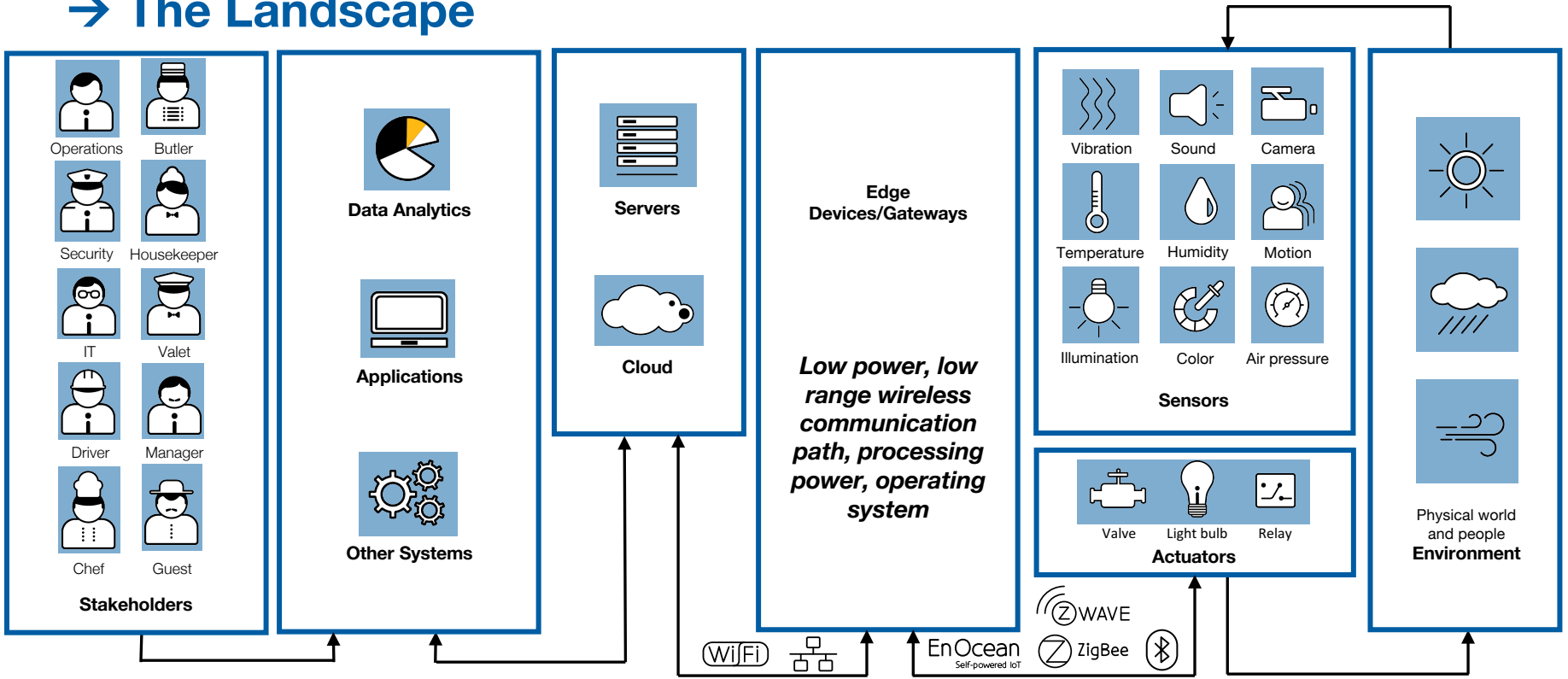
Biggest share of IoT will be in enterprise verticals



Source: Business Insider report – "The internet of everything 2015"

Who and What is involved in IoT:

→ The Landscape



What does it all mean:

IoT Technology 1/3

Term	Description	Examples
Sensors	Measures environmental conditions, such as light, movement, proximity, sound, gas, force, position, and more	Motion, Light, Temperature, Humidity, Air Quality, Pressure…
Actuators	Triggers actions on environment, such as switching on power, analog control, digital control.	Relay, Valve
Controller	Device with business logic to make decisions based on sensor input or actuator status.	Thermostat
Embedded Device	Embedded Devices include Sensors, Actuators and Controllers and contain a special-purpose computing system that gives them some intelligence. Many embedded devices may include both sensors and actuators and also incorporate functions from controllers in a single device.	Thermostat, Intelligent door lock
Device Management	Software Platform to manage embedded devices, such as their battery status, firmware version and upgrades, configuration	Proprietary platforms from various vendors
Low Range, Low Power Wireless Protocols	Enable embedded devices to communicate with each other over shorter range and with slower transfer speed than typical WiFi communication, but in a much more power efficient way. This is essential for many IoT devices which are battery powered and cannot connect to WiFi	BLE, ZigBee, Z-Wave, EnOcean

What does it all mean:

IoT Technology 2/3

Term	Description	Examples or Use
Gateway & Edge Computing	Because IoT devices generate a lot of data, it is sometimes unfeasible to send all information over the network, for example to a cloud server. Gateways on the 'edge' of the network, e.g. before reaching the wide area network, can therefore process, filter, consolidate some of the data from devices before it is sent onwards. Sometimes called 'fog' computing, e.g. between on premise and cloud.	There are specific IoT gateways from many providers. In hospitality, thermostats or access points can sometimes play a part of this role.
Cloud	While not directly a part of IoT, the 'cloud' is an important content of many IoT workflows. Essentially, cloud computing refers to utilizing remote (off-site) servers either under control by the end user or by a third party to store data and run applications, instead of running them on premise. This can have benefits in terms of cost, scalability, ease of maintenance and more.	Microsoft Azure, Amazon Web Services, others.
Big Data Analytics	The topic of 'Big Data' is also closely linked to IoT, but not an integral part of it. As IoT devices produce large amounts of data from sensors, it opens new opportunities for analysis of this information to identify patterns and associations which can be utilized for more informed decision making.	Identify how guests are moving and congregating in the hotel to design future hotels more efficiently

What does it all mean:

IoT Technology 3/3

Term	Description	Examples or Use
Machine Learning	Due to the IoT's ability to collect information that can be analysed via Big Data techniques, systems can utilise patterns identified to make more accurate decisions on problems autonomously. This is called Machine Learning and typically classified as a subset of Artificial Intelligence.	Detection of AC usage patterns and optimising performance accordingly without human intervention.

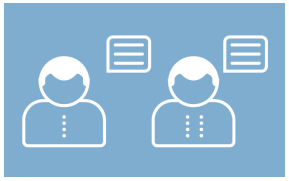
I got it: but how does this benefit hospitality?

IoT benefits all areas of the Triple Bottom Line:

Economic:

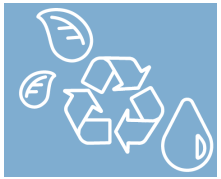
Revenue optimization and cost saving due to:

- Operational efficiency
- Product differentiation
- Energy savings
- Increase revenue



Social:

- Guest experience
- Staff safety & happiness
- More automation



Environmental:

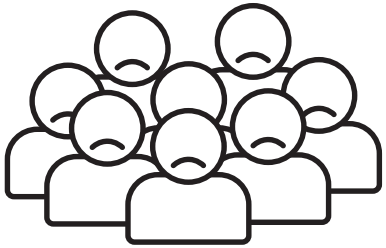
- Energy & water savings
- Less material replacement
- Waste reduction

Who is affected

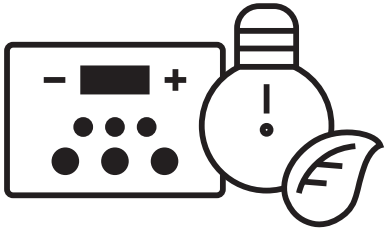
IoT impacts most stakeholders in the property, at corporate level and ownership level

Stakeholder	Included Areas
General Manager	Operational Efficiency, Guest Experience
Engineering	Energy & Water Savings, Equipment Maintenance, Remote Monitoring
IT	New Networks, Devices, Security Aspects, Enable the organization to adopt IoT
Housekeeping	Staff efficiency, Optimize Guest Service
Guest Services	New Guest Interaction
Marketing	Personalization, Advertisement, Analytics
F&B	Inventory, Quality control
Security	People Safety, Access Control, Incident Management
Owner / Franchise	ROI, Privacy
Brand	Loyalty, Central Control, Privacy, ROI
Guest	Personalization, New Experiences

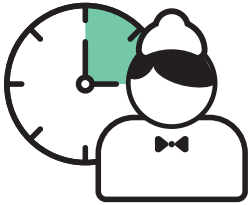
Use Cases: General Manager



Improve guest journey with mobile check-in /-out and mobile key. Decrease peak times at reception.



Decrease consumption of utilities, act sustainable, improve bottom line of hotel



Enable efficiencies in existing tasks and workflows, improve utilization of assets, improve bottom line of hotel

General Manager:

Analytics and Improvements across Operations

Main Challenges	How IoT can help	What is needed?
Optimize overall operation of the hotel	Many opportunities to enhance operations across all departments through automation and smarter decision making	Solution and ROI assessment across use cases and challenges for each department
Provide better and more personalized guest experience	Intelligent devices can react to guest preferences and make the experience more personal	Explore guest facing solutions against current pain points and vision for guest experience
Overall view of hotel and departmental performance in single dashboard	New ways to gather business intelligence data from sensors and physical objects	An overall IoT strategy and the right technical infrastructure to implement it
Optimize bottom line	Optimize energy use and staff time; extended capital equipment lifespan through predictive maintenance	Cost analysis and ROI assessment for available solutions

Key Implications & Actions

- Phase by phase plan for IoT adoption for each department fitting into an overall strategy
- Set a vision and experiment
- Vet and thoroughly assess your suppliers and their qualifications and claims
- Select suitable long term technology and solutions

Case study

Radisson Hotels

Issue faced
The hotel lobby and restaurant area face intense people flow and become waiting areas during check-in of large groups of visitor, who get impatient.

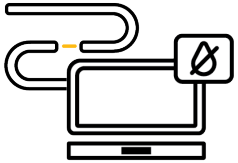
Solution
PressPad Lounge – a digital press corner. People located within the range of Lounge are able to read digital magazines on their mobile devices, for free.

Technology
Utilises iBeacon technology to determine which guests are close to the corner and can therefore read for free.

Impact
Better guest experience during peak time. Beacon data helps understand average wait times for guests. Reduced pressure in Front Desk team

Use Cases: Engineering

If a pipe bursts

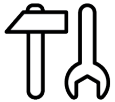


Water supply can be shut off from remote

If guest forgets to switch off water and leaves the room

Water supply is shut off based on presence detection

Temperature sensor

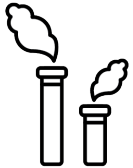


Temperature rise is more than threshold level sensed by temperature sensor

Trigger service request / alert in maintenance system

If room is vacant for more than 3 days

Water in the pipes will be flushed automatically to prevent legionella



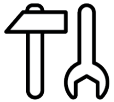
CO2 level measured by air quality sensor is > 1000-2000PPM (Poor Air Quality)

Air Quality sensor

Actuator trigger circulation of fresh air in guest rooms

Equipment working hours measured by run hour sensor reaches threshold

Run hour sensor



Trigger preventive maintenance request in workflow system

Engineering:

Proactive Maintenance and Utility Optimization

Main Challenges	How IoT can help	What is needed?
Identifying energy efficiency and savings on power, gas and water	Many opportunities to save water and energy through intelligent automated decision making based on sensors and data analytics	Solution and ROI assessment across use cases and challenges for each utility
Identifying the status of critical equipment such as Chiller, AHU,FCU, Laundry...	Intelligent devices can monitor status through sensors and other means	Assess existing equipment for capabilities and solutions to impalement monitoring
Keeping track of preventive maintenance for systems	Devices collect data allowing for prediction of possible failure and approaching of maintenance cycles	Installation of sensors and data analytics capability
Fire Safety through prevention, detection and response	Connected sensor and interconnected systems responding to fire	Sensor infrastructure and system interfaces

Key Implications & Actions

- Review of biggest utility consumers and possible wastage
- Solution assessment for ROI
- Monitoring of efficiency and effectiveness
- Sensor and device connectivity infrastruture for data collection and analysis

Case study

ARANDELL
Large chiller installation

Issue faced:
Plant produces significant amount of heating and requires continuous chiller water for operation.

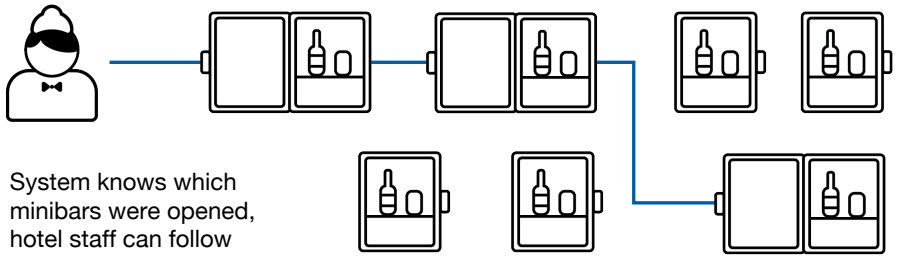
- Requires cooling uninterrupted 24/7/365 days.
- Maintenance without any critical issues
- 9 chillers monitored continuously

Solution:
Easy maintenance tool with planned and predictive maintenance

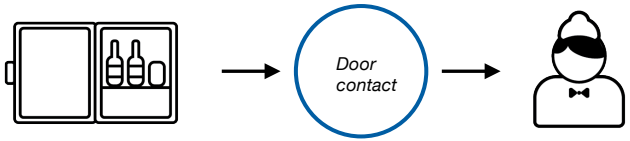
- Proactive maintenance
- Rapid response
- Monitoring 24/7/365

Technology:
IoT based solution from Microsoft cloud service combined with Johnson controls connected chiller products.

Use Cases: Housekeeping



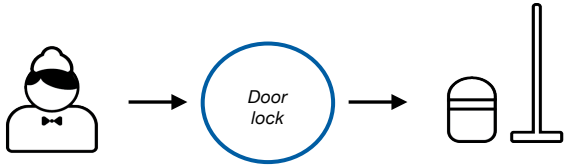
System knows which minibars were opened, hotel staff can follow custom route to save time



The minibar was opened

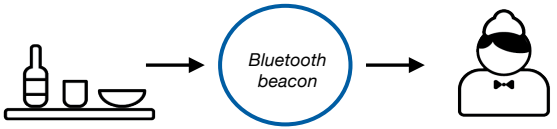
Hotel staff is sent to refill the minibar

According to Carnegie School of Hospitality Management 75-80% of minibars are not used daily.



Housekeeper enters the guest room

Maximum water flow and water temperature settings change



Food tray is left outside the room

Hotel staff is notified to pick up the tray

Housekeeping:

Operational Efficiency and Better Service

Main Challenges	How IoT can help	What is needed?
Efficient allocation of staff with little idle time	Allocation based on proximity through tracking of staff location	Indoor locationing capability for staff devices or through beacons
Effective use of staff time without unnecessary overheads	Environment can adapt to staff needs and record staff activity. Devices can intelligently inform staff if action is required or not	Intelligent devices and context based behavior of room
Fast guest service with minimum disturbance	Reduce unnecessary disturbance by knowing the status of the room through intelligent devices, only act when necessary	Sensors in room devices and equipment

Key Implications & Actions

- Review staff inefficiencies and evaluate solutions that can help solve them
- Ability to collect and monitor data about staff performance and utilisation to measure

Case study

Crowne Plaza Hunter Valley

Issue faced:
Communicating with room attendants and supervisors due to unaware of staff whereabouts.
Difficulties in coordination
Every time to call on phones
Reduced productivity
Cleaning staff travelling between rooms to villas (distance)

Solution:
House keeper solution implemented, which can be integrated with PMS as well.

- Identifies staff location
- Measures Net cleaning time
- Time spent outside rooms
- Turnaround times of rooms
- Identifies bottle neck

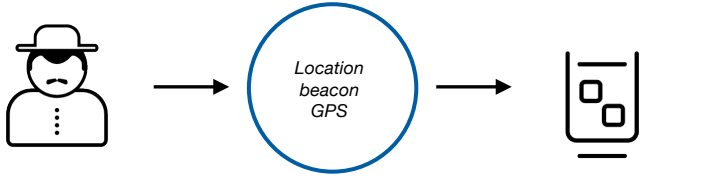
21% productivity improvement
95% reduction in communication

Technology:
Smartphone location tracking combined with cloud based solution

Use Cases: Marketing

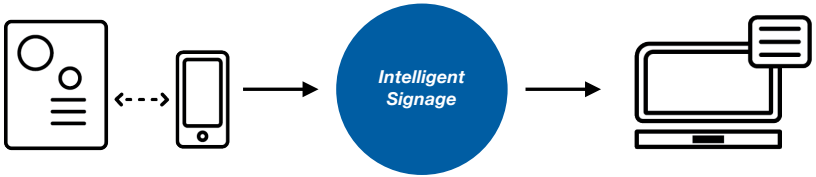
Guest is in F&B outlet, and identified by location service

Application sends location based offers as message (example: 20% discount on happy hours)



Guest arrives at hotel lobby

Reception desk alerted to greet the guest individualized check in process



Customer reads or interacts with digital signage advertisements

Application sends interest of customer, Marketing manager can profile customer interest. (customer can get offers as push notification on interest subject)

Marketing:

Personalization & Location based services

→ A location aware hotel has effects on guests, staff and assets

Main Challenges	How IoT can help	What is needed?
Targeted promotions and offers that are relevant to guest context	Location and context sensitive promotions and information provision through detection of guest	Indoor location infrastructure, Beacon enabled application
Personalized guest experience and driving engagement	Allows to serve correct content and the correct place	Indoor location framework, Beacon enabled application
Effectiveness measurement of campaigns	Additional data points to understand guest engagement and ROI	Infrastructure for data collection and analysis

Key Implications & Actions

Rethink localized marketing approach and identify use cases

Case study

Marriott International:

Marriott international adapting to Local perks Push notification program using geo-location technology

Issued Faced:
A more personalized and engaging guest experience

Solution:
For guests with guest services app running on their phone can receive a welcome push message upon entering the lobby along with basic information about
- Hotel amenities
- Special exclusive offers
- Bar information
- Kids club information
- Event information, etc.

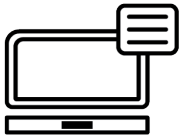
Technology:
Beacon infrastructure program combined with mobile application.

Use Cases: F&B

Tray tracking

If food tray is kept outside the guest room

→ Bluetooth sensor →

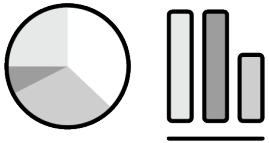


Pickup service is notified to restaurant

Inventory control

If food and beverage items delivered to stores

→ RFID TAG →



Automated system will update the inventory status and send report to F&B manager

Cold room

If the cold room or freezer unit temperature fluctuate more than specified band

→ Temperature sensor →

Dashboard provides Temperature failure status to F&B manger's freezer dashboard.
(Food ingredients quality maintenance)

F&B:

Automation and Waste Reduction

Main Challenges	How IoT can help	What is needed?
Waste reduction during food production and storage	Monitoring of equipment and wastage levels	Intelligent sensors and dashboards
Inventory Management in kitchens	Automated inventory control and order processing through sensors	Sensors and inventory management system
Quality Control of experience delivery	Ability to monitor timings and quality such as temperature through sensors	Sensor network and alert system

Key Implications & Actions

- Adaption of process and staff training
- Implementation of business processes to automate

Case study

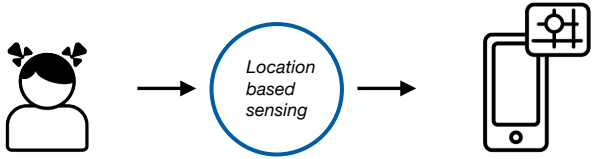
Decathlon

Issue faced:
The key challenge for Decathlon was to improve its inventory visibility while enhancing its in-store loss prevention capabilities.

Solution:
RFID source tagging program enables items to arrive in store shelf-ready, freeing employees from manually checking deliveries or applying labels to merchandise before they reach the shop floor. IoT to improve end-to-end visibility in supply chain.

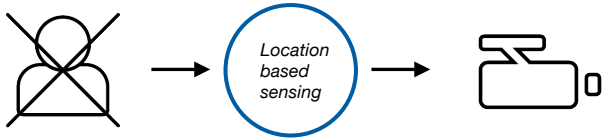
Technology:
This uses IoT technology, such as radio frequency identification (RFID) from Checkpoint Systems

Use Cases: Physical Security and Safety



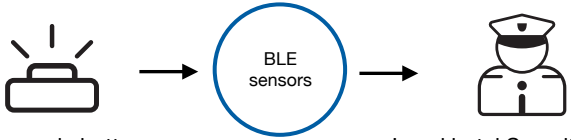
Children move away from the threshold area

Alarm and location can be monitored from mobile



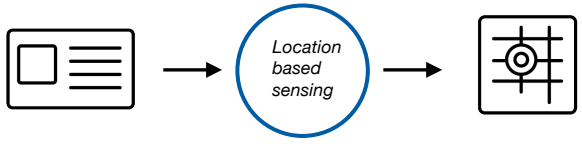
Movement happens at unauthorized area

Camera will start recording and alarm given to security office, same time push notification to nearest security



If the panic button is pressed by staff

Local hotel Security will be notified immediately based on the nearest location

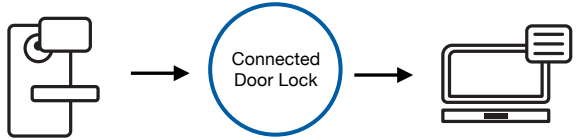


Controlled movement for visitors with BLE chip visitor card

Visitor location can be monitored for safety and security

Hotel asset locations are beyond the specified location

Security system will alert the Security office



If door locks are accessed with wrong cards more than specified time

Alert Information will reach to security

Physical Security and Safety:

→ For Guests and Staff

Main Challenges	How IoT can help	What is needed?
Physical staff and guest safety	Smarter staff tracking and incident reporting capability for staff	Location infrastructure and trigger buttons
Incident Response capability and investigation	Additional data collection through sensors and online devices	Intelligent devices and communication infrastructure
Equipment / Material protection	Sensors and access management	Location infrastructure and intelligent access control
Trespassing	Real time detection and alerts of trespassing and wandering intruder	Sensors and intelligent devices with data analysis

Key Implications & Actions

Review security system risks and gaps

Case study

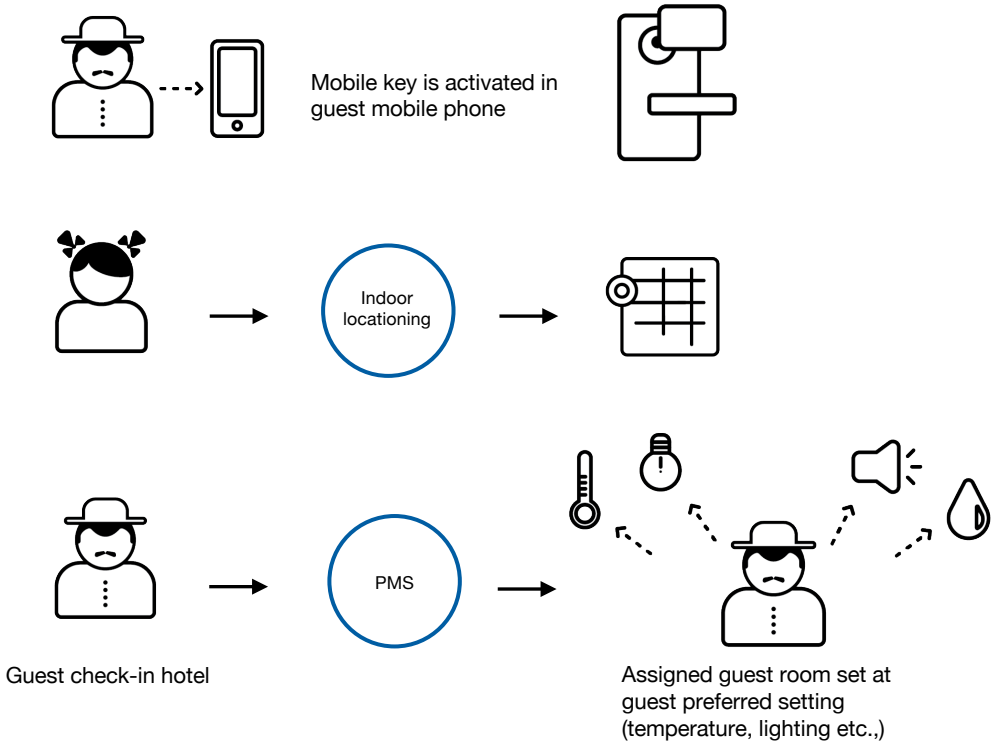
AIG

Issue faced
According to the Occupational Health and Safety Administration (OSHA), more than 20 percent of worker fatalities in 2014 occurred in the construction industry.

Solution
In 2016, AIG made a strategic investment in Human Condition Safety (HCS), a start-up company that uses the IoT to help create a safer environment for workers by identifying and reducing job-site risks.

Technology:
HCS has adapted wearable technology, On a construction site, if a worker wearing HCS sensors enters a “danger zone” — such as the blind spot around a piece of heavy machinery — the system can warn the worker to move to a safer location or automatically shut down the machine.

Use Cases: Guest



Guest:

New Experiences and Personalization

Main Challenges	How IoT can help	What is needed?
Efficient Room Access	Automation of check in and room access process through connected devices	Intelligent devices with connectivity supporting infrastructure
Locationing	Enable mapping capability to identify location of devices and items	Indoor locationing infrastructure
Context sensitive information	Interact with hotel depending on status of guest journey, receive relevant information based on location and context	Indoor locationing infrastructure and interactive actors in relevant locations

Key Implications & Actions

Individual services within brand mobile apps will deliver tangible value to guests and will help brands to drive adoption of the brand app, leading to increased loyalty and direct bookings

Case study

Disney
Magic Band

Issue faced:
No central way to personalise guest experience across the entire resort and park.

Solution:
RFID-enabled MagicBand and MyMagic Web portal enables guests to pre-book, pre-order food and pre-pay for their visit, so at park entry, ride entry and restaurants, they can show up, instantly be greeted by name and be served. The MagicBand can be used to pay for goods, open hotel room doors and as a real-time locator to find family members, via thousands of sensors embedded discretely around the park and triangulation technology that also helps servers locate guests at their tables

Technology:
Wearable RFID band which uniquely identifies guests across all touchpoints in the resort and parks.

What are the privacy hurdles?

Hotel Guest

Collected information
Access privileges

Hotel Staff

Activity tracking

Owner / Brand

Data confidentiality
(guest, corporate)

How can we overcome privacy hurdles?

Hotel Guest

Collected information
Access privileges

Offer “opt out”
Ensure devices fail secure & backup

Hotel Staff

Activity tracking

Ensure staff is aware of tracking

Owner / Brand

Data confidentiality (guest, corporate)

Policies, Procedures & Technical Safeguards

What are the security hurdles?

Hotel Guest

Authentication,
Authorization, &
Access controls

Hotel Staff

Authentication,
Authorization, &
Access controls

Owner / Brand

Authentication,
Authorization, &
Access controls

How can we overcome security hurdles?

Hotel Guest

Authentication,
Authorization, &
Access controls

Threat Model,
Trust Model,
& Trust but Verify

Hotel Staff

Authentication,
Authorization, &
Access controls

Threat Model,
Trust Model,
& Trust but Verify

Owner / Brand

Authentication,
Authorization, &
Access controls

Threat Model,
Trust Model,
& Trust but Verify

What are the cost & ROI hurdles?

Hotel Guest

Only valuable if influences booking/loyalty decisions

Hotel Staff

Only valuable if staff efficiencies increase

Owner / Brand

Only valuable if costs are reduced or revenue increases

How can we overcome cost & ROI hurdles?

Hotel Guest

Only valuable if influences booking/loyalty decisions

Vendors: must demonstrate to brand that there is value to Guest

Hotel Staff

Only valuable if staff efficiencies increase

Vendors: must demonstrate efficiency gains

Owner / Brand

Only valuable if costs are reduced or revenue increases

Vendors: prove the business case

Reference sites:

http://www.businessinsider.com/internet-of-everything-2015-bi-2014-12?op=1/#/#0

https://www.presspadapp.com/

http://www.pplounge.com/manifesto

http://www.chainstoreage.com/article/decathlon-gets-source-supply-chain-efficiency

http://optiisolutions.com/uploads/docs/hunterValley.pdf

http://optiisolutions.com/case-studies

http://www.johnsoncontrols.com/-/media/jci/insights/2016/be/files/be_cs_arandell.pdf?la=en