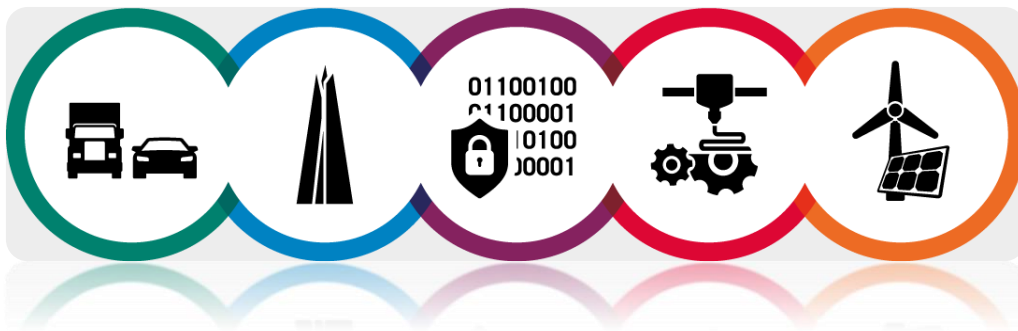# IoT Case Studies from India

Introduction

While India joined the Internet of Things (IoT) bandwagon much later than the other major economies of the world, the growth expectations in the number of installed IoT devices forecast is very high. The current installed base of 0.06 billion units is expected to grow 31 times to 1.9 billion units by 2020 at a market size of $9 billion (as per Deloitte NASSCOM IoT study).

As this rapid growth is set to sweep all sectors of Indian business, it is very exciting indeed to release this document of some IoT case studies deployed in India. You will find in the following pages, there are several IoT use cases across industry verticals, addressing a variety of business needs. These are a select list and showcase a range of situations and benefits achieved. IoT is already impacting a wide range of businesses in India!

These use cases are grouped by the business need being addressed by them. Smart Manufacturing / Industry 4.0 section consists of use cases focused on improving factory operations; the Supply Chain segment has use cases related to improving efficiency of the entire value chain of any business and the Service Operations use cases impact the enterprises that provide customer services of any kind. Transportation & Logistics, Healthcare, Smart Governance & Smart Utilities have use cases that are unique to the industry they are deployed in.

We hope that the stories in this document excites you about the potential impact IoT can have on enterprises in India. However, the fact is that the opportunity of IoT is limitless and open to imagination. As dedicated IoT networks are rolled out and the ecosystem is strengthened, IoT is set to become an integral conversation in any organisation's digital transformation journey.

We sincerely appreciate the time and acknowledge the support of various organisations to this effort. We will keep adding more case studies to this rich repository in the future.

Wish you a wonderful IoT journey!!!

Table of Contents

1. Smart Manufacturing

1.1 Predictive maintenance of machines in food packaging industry - Hitachi

Business Problem

Frequent machine breakdown causing Production loss, impacting Quality, Shelf life and Revenue

Solution Offered

- Retrofitting of non-intrusive sensors to detect and analyse failures
- Predict the machine performance and packaging efficiency
- Correlate and root-cause the failures to find out traceability between –SYMPTOM-CAUSE-IMPACT-REMEDY

Benefits

Effective analysis of manifestation of failures leading to planned shutdown resulted in increase of production by 27%

1.2 Improving efficiency of machine in food package industry – Hitachi

Business Problem

- Around 5% excess material in each packet resulting in to 2 % revenue loss
- Any less quantity than the mentioned weight can lead to dent on the brand and market share

Solution Offered

- No intrusive sensors to detect and analyse phenomenon
- Predict packaging efficiency and when to go for calibration of packaging unit

Benefits

Giveaway has been reduced to 1% and improvement in revenue

1.3 Noise, Vibration and Harshness testing – Bosch

Portable, customisable, quick, connected, easy-to-use App based solution for NVH measurements
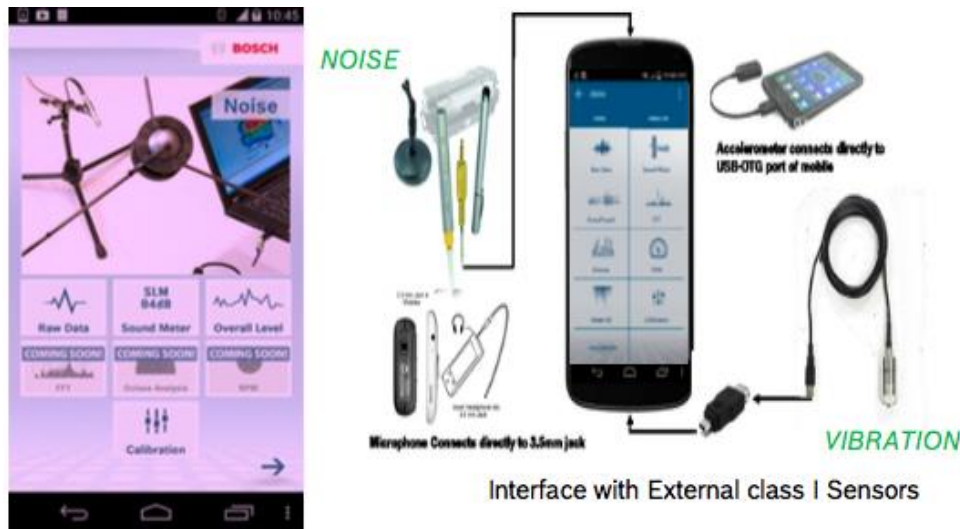
Business Problem

- Higher lead time in instrumentation/DAQ availability
- Higher instrumentation/test set up template creation time
- Higher cost of measurement equipment/analysis tool
- Lack of portability of the existing solution

Solution Offered

- Uses in-built mic and has calibration values for variety of standard mobiles in the market
- Interactive SLM
- Octave band based multi frequency calibration for inbuilt mic ensures improved accuracy (+/- 3 dB)
- Recording and exporting of overall noise data into excel for online sharing
- Disabling of mobile android/iOS filters which enables pure unfiltered data recording

Benefits

- Sensors with class I accuracy and response
- Minimum expertise required to operate the tool
- Product development testing
- End of line or service centre diagnostics

- Fully customisable and interfaceable to a cloud server

1.4   Early Warning System (QA) – Bosch
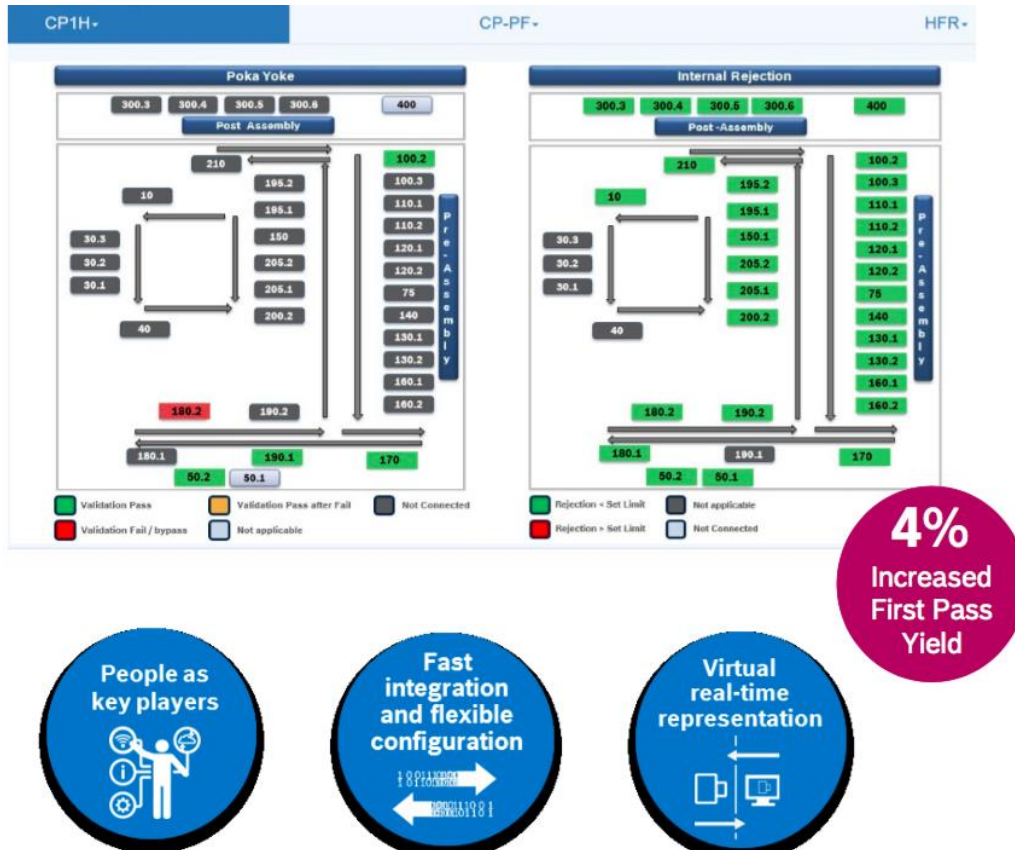
Business Problem

- Complaints due to faulty parts being sent to customers
- Problem of defective parts being mixed with good parts
- Need for shift wise rejection scenario to be transparent

Solution Offered

- Stations are interconnected with server to map the trend of internal rejections and poka-yoke validation
- Validation of OK Master & Not OK Master is done at the beginning of every shift to ensure quality
- SMS and email are triggered to concerned stakeholders when rejections at a particular station go above acceptable limit
- Records a collection of "reaction/correction plan" to be triggered according to the severity of error

Benefits

- Line managers are enabled to intervene at the right time and bring the situation under control
- The system encourages a due date to be set for each of the reaction plans and a reminder is sent to ensure corrective action

- The collection of reaction plans act as database for higher management to identify the most frequently occurring errors and focus on resolving them

1.5 Maintenance Support System - Bosch

Industry 4.0 Solutions @ Bosch

Maintenance Support System (MSS) is an IT system created to support the Operator and the maintenance engineer in order to increase the speed, effectiveness and sustainability in corrective, preventive and autonomous maintenance.

Business Problem

- Resources wasted in coordination & walking distance
- Long reaction time for breakdowns

Solution Offered

- Maintenance Processing: with/without SAP, planned/unplanned
- Maintenance Guidance: situational
- Remote Function: internal/external
- TPM: autonomous maintenance

Benefits

- Reduced Reaction and Walking Time
- Reduced Time to Repair
- Increased OEE
- Paperless Documentation System
- Increased Machine Availability

1.6   Quick Guided maintenance – Bosch

Industry 4.0 Solutions @ Bosch

Operator Assistance System for Real Time Representation of Production Equipment health in assembly layout form

Business Problem

- Need for live representation of machine health in shop floor
- Database of errors for every machine is essential for speedy troubleshooting

Solution Offered

- Machine in the production line are monitored and their health is displayed in real time: heartbeat of all stations are represented in green and red
- Breakdown alert is sent to the line manager or technician through SMS/email
- Station wise error history and corresponding action are recorded for the future reference
- Any parts that are needing replacement are ordered directly through the tool, using SAP integration

- Records valuable information like description of error, its frequency, cause of error, severity of impact, time of breakdown, etc.

Benefits

- Line managers are enabled to intervene at the right time and ensure machine is up and running as soon as possible
- The app can also be accessible through tablet, making it more efficient
- The collection of errors and their frequency act as database for higher management to identify the most frequently occurring machine failures and focus on resolving them

1.7   Manufacturing Analytics – Bosch
Industry 4.0 Solutions @ Bosch

Manufacturing Analytics in Bosch is operational innovations by delivering intelligence from industrial equipment such as sensors, MES etc.
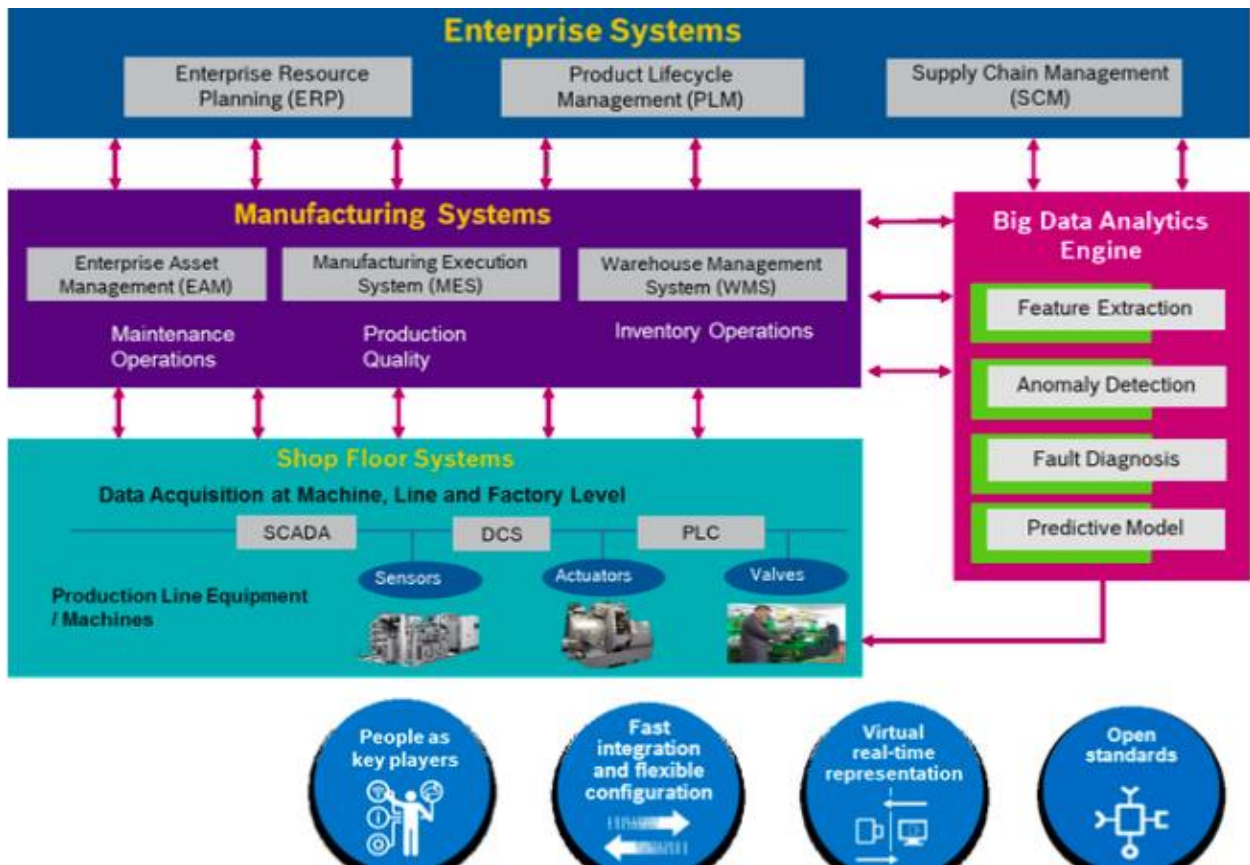
Business Problem

- Lack of comprehensive insights from large arrays of shop-floor data

- Lack of robust analytic algorithm to optimise inventory, test cycle, machine availability and overall productivity

Solution Offered

- Established correlation between process parameters, product characteristics and product performance
- Developed robust analytics algorithms to predict the delivery rate of the product
- User-friendly, browser-based applications for typical problems in production

Benefits

- Reduced End-of-Line (EOL) test cycle time by 35%
- Improved stock optimisation (up to 10%)
- Reduction in product production cost and savings on maintenance costs
- Overall productivity improvement (up to 20%)

1.8   Intelligent Quality improvement - Bosch

Industry 4.0 Solutions @ Bosch

Quality data management solution for visual defects capturing and marking through image driven inspection

Business Problem

- Need for precise capturing of defect data through image processing
- Lack of availability of real-time quality related data throughout the system

Solution Offered

- Visual defects capturing & marking
- Image driven inspection
- Real-time attribute & variable data collection using sensors
- User Configurable stations/Stages. Instant e-mail alert
- Rework time detail/ recurrence issue detail
- Web based Live Reports on Yield /Defects/line efficiency analysis

Benefits

- Eliminate paper based checklists
- Enables quality data flow back to Engineering development improvement
- Real-time production data for the closer monitoring of production defects, downtime, efficiency, production line visibility
- Accuracy in defects identification through image processing

1.9 Smart pairing (assembly) – Bosch

Industry 4.0 Solutions @ Bosch

Real time relational data analysis for sorting sub –assembly parts before assembling different product
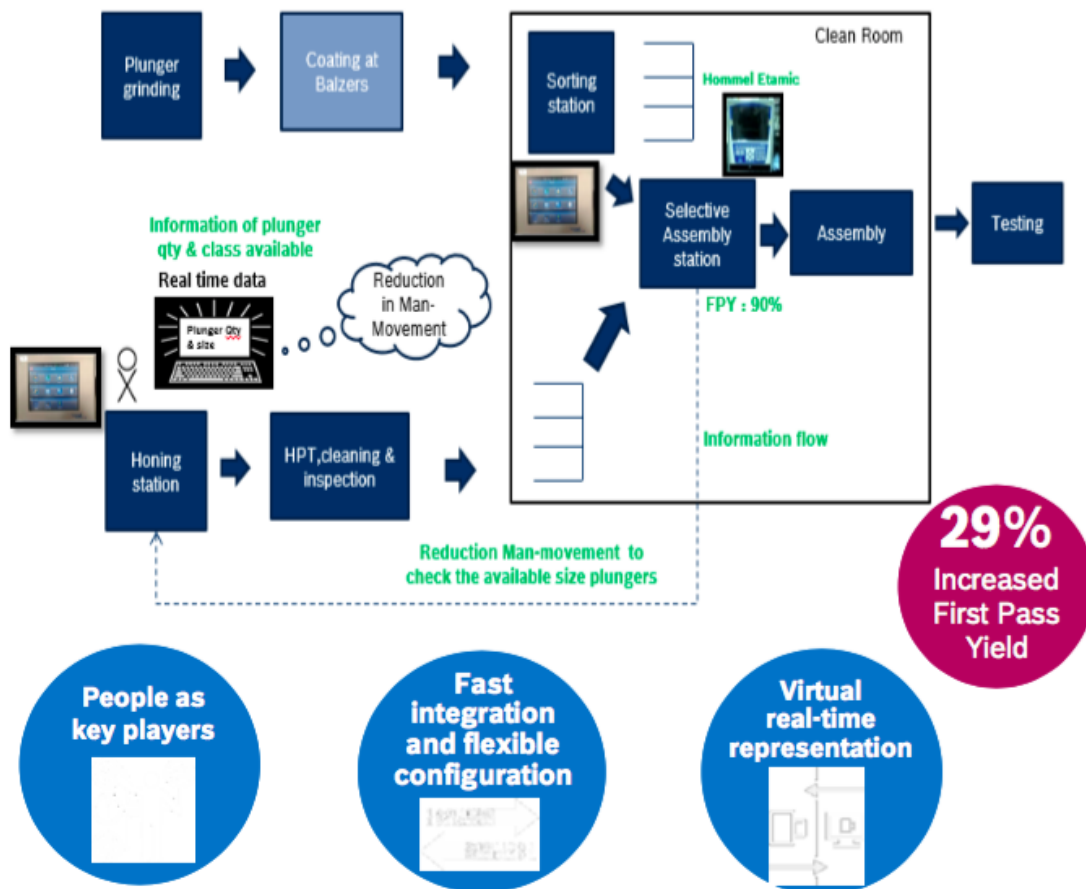
Business Problem

- Increased rejections due to wrong assembly of components
- Man-movement 4 times/shift for checking plunger size and quantity leading to 3.2 % organisation loss

Solution Offered

- Stations are interconnected to show real time data at different stations for part selection
- Reducing the man-movement to improve resource utilisation
- Adding more flexibility to the assembly line to produce 18 classes of products
- Records a collection of reaction "reaction/correction plan" to be triggered according to the severity of error

Benefits

- Reduction in organisational losses from 3.2% to 1.7%.
- 28% reduction in work in progress (WIP) movement.
- Lesser fatigue & Higher employee morale

1.10   Smart testing - Bosch

Industry 4.0 Solutions @ Bosch

Testing with focus on achieving faster test results, productivity through Process Innovation and Data Mining
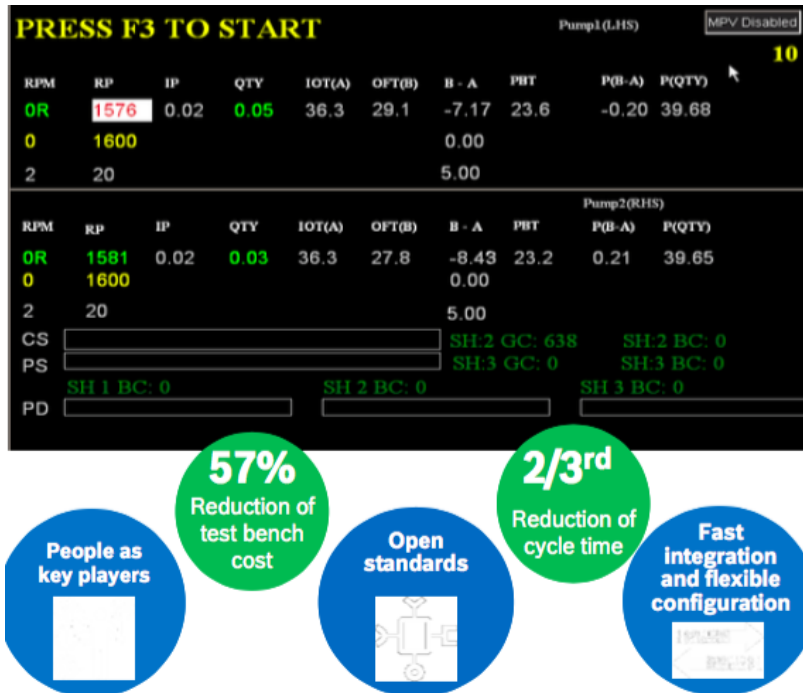
Business Problem

- Reduce time taken for testing of pump temperature according to loading conditions

- To achieve better productivity and improved OEE

- Reduce cost spent on test benches and minimise noise level

 Solution Offered

- Manufacturing analytics performed on production data to predict the temperature in the testing process

- Predicted delivery and actual delivery (with flow meter) follows same pattern

- Simplification of test benches leads to enhanced OEE and improvement through process innovation

- Improved shop floor ambience due to reduced noise level

Benefits

- Cycle time reduced from 180 sec to 60 sec.

- 57% reduction in cost of test benches

- 12% in Noise level due to reduction in testing time

- No further add on investments required for upcoming years after implementation

1.11 Asset health & energy monitoring – Bosch

Industry 4.0 Solutions @ Bosch

Advanced analytics solution to monitor, optimise, save and predict energy consumption, asset health and operations
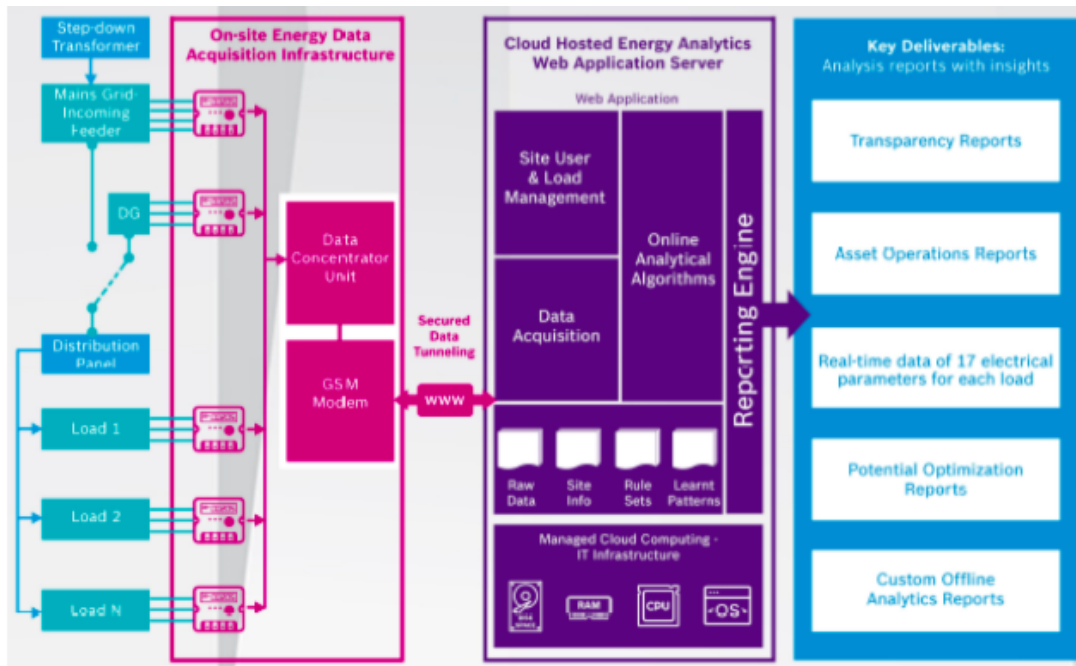
Business Problem

Increasing cost of operation due to inefficient usage and monitoring of energy

Solution Offered

Advanced analytics solution to monitor, optimise, save and predict energy consumption, asset health and operations

Benefits

Energy cost optimisation

- Reduced energy costs based on time of day
- Reduced fixed energy costs

Energy consumption optimisation

- Optimise primary load set-points based on process and production requirements
- Optimise secondary load set points

Asset health and usage optimisation

- Detect breakdown/inefficient assets
- Predictive maintenance
- Detect under and over stressed assets

Operations Optimisation

- Forecast and optimise production
- Optimised maintenance cycles
- Control energy costs

1.12 Connected Industrial Sensors – Bosch (CISS)

Industry 4.0 Solutions @ Bosch

The Connected Industrial Sensor Solution (CISS) is a compact multi-sensor device for harsh environments, to increase your manufacturing efficiency by monitoring your machines, processes and environmental conditions

ONE SOLUTION · INFINITE POSSIBILITIES

Accelero-meter | Digital light sensor | Gyroscope | Humidity sensor | Magneto-meter | Air Pressure sensor | Temperature sensor

People as key players | Fast integration and flexible configuration | Virtual real-time representation | Open standards
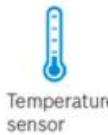
Business Problem

- How to monitor machines in rough environments or locations not easily / safely accessible by people due to harsh conditions

Solution Offered

- Connected Industrial Sensor Solution (CISS) offers compact and robust multi-sensor device in an industrial grade and automotive proof housing capable to be installed in rough environments. Collected data available for visualisation live or historic data over the CISS app or optionally over cloud

Benefits

- Enables IoT applications in rough environments with a compact and robust multi-sensor device. The housing is industrial and automotive proof and already installed a million times worldwide
- Saves money by delivering crucial data for optimisation of maintenance processes
- Allows deployment of a wide range of IoT applications, e.g. condition monitoring and predictive maintenance
- Supplied data-logger/data –streamer which can be configured to project requirements
- Creates a valuable additional multi-sensor context to machine data, enabling productivity enhancement
- Integrates easily to a range of hardware agnostic gateways and clouds
- Connects existing machines without intervening into the machine control
- Visualises live and historic data over the CISS app and optionally over cloud

1.13   Energy Management - Ecolibrium Energy – Vodafone

Ecolibrium Energy is a market leader in Energy Management Solutions in India. Vodafone's IoT currently powers Ecolibrium Energy's SmartSense devices, helping generate accurate data for better energy monitoring and management, and making it a Ready Business.

Business Problem

- Ecolibrium Energy helps customers increase operational efficiency by minimising energy costs and helps improve productivity by optimising asset performance.
- Their SmartSense analytics platform, which promises to cut energy costs by up to 30%, needed robust connectivity for smooth functioning.

Solution Offered

- Vodafone IoT powers the sensors on SmartSense devices, thereby helping transmit valuable energy consumption data to a central platform on a near real-time basis.
- Vodafone's IoT platform helps manage a national network of these SmartSense devices.

Benefits

- Ecolibrium customers can monitor the performance of their energy-consuming assets and move from scheduled maintenance to data-driven maintenance decisions.
- Maintenance is better planned, individual assets can be scrutinised and performance audits can be compiled in real-time.
- Up to 20 sensors per device can be installed in a matter of few minutes.
- Ecolibrium powered by Vodafone IoT envisions playing a significant role in helping manage energy nationally.

2. Supply Chain

2.1 Intelligent supermarket: real time inventory management – Bosch

Industry 4.0 Solutions @ Bosch

Integrated RFID system to visualise Real Time Inventory Data displayed on a Supermarket Andon – a comprehensive RFID enabled eKanban system

Business Problem

- Difficulty in real time tracking of inventory with respect to types
- Need for a dynamic production planning system to show what to be produced in real time

Solution Offered

- Integrated RFID tray system with Super market Andon to display real time availability of critical components
- Andon shows maximum and minimum quantity of parts to be stocked and indicates in red when the stock goes above or below set limits
- Dynamic Production is implemented to give Auto production schedule / Plan for Operator, as per availability in Super Market

Benefits

- Consumption of specific type of parts is updated and displayed to indicate the quantity left in Super Market for that type
- Andon shows different colors for each type depending on the storage level, enabling operator to take precautions at the right time
- Production Planning Dept. gets real time alert if specific type has reached maximum storage limit, in order to stop production of that particular type

2.2 Traceability of manufactured lot – Bosch

Industry 4.0 Solutions @ Bosch

Documenting lineage information of a manufactured lot towards enhanced quality & customer satisfaction
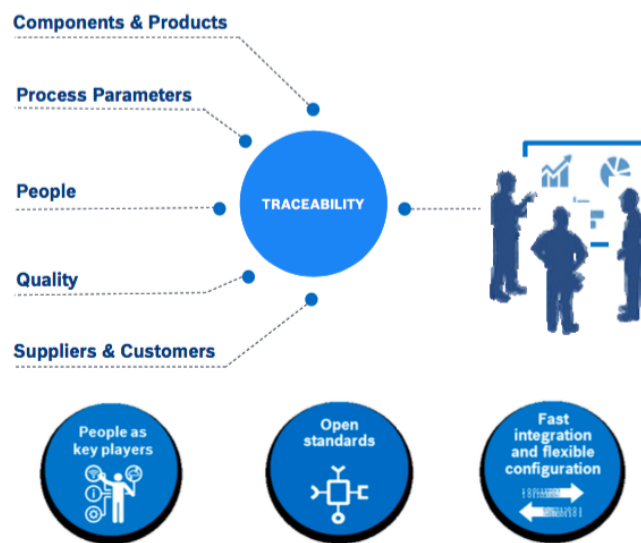
Business Problem

- No reliable method to track products or raw materials in the production line
- In case of a recall, no accountable method to trace root cause of problem
- Inaccurate inventory reporting causes increased stock

Solution Offered

- Traceability provides valuable history of a manufactured lot - steps performed, relevant process variables and quality controls
- Information about each and every component of the product assembly is attached to the final product and job order along with date, time, employee id, supplier details etc.; ERP integration and Data Analytics
- Interlocking feature can be designed to eliminate chances of skips or deviations in standard process sequence that is, no possibility of normal and special variant critical parts being interchanged

Benefits

- Proactively manage production defects with real time corrective action
- Identify root cause of customer complaints and reduce time required to

- address them
- Can be customised to attached detail level info such as material, finish, etc.
- Better inventory visibility and optimised stock

2.3   Automatic Milk Collection – Vodafone

Vodafone's IoT solutions enabled **Prompt Softech,** a dairy solutions provider, to create a novel Automatic Milk Collection System. This let the company extract India's dairy data out of the village and into the cloud. This meant that Prompt Softech could work towards using that data to streamline the collection of milk, making it a Ready Business.

Business Problem

- India is today the world's leading milk producer. However, there are still numerous inefficiencies in the dairy supply chain.
- To tackle this issue, Prompt Softech needed to collect and centralise India's dairy data.

Solution Offered

- Prompt Softech worked with Vodafone's IoT solutions to collect accurate dairy data from numerous villages.
- A single Vodafone IoT platform allows Prompt Softech to manage all their devices.
- Using the Vodafone managed IoT Connectivity Platform, the Automatic Milk Collection System was created. This is used to weigh and analyse local milk production, and then send the data to a centralised record.

Benefits

- A thousand villages have already been connected and Prompt Softech expects to reach 18,000 villages within three years.

- The collected data is used to analyse trends and map production better.
- Farmers also get to know about the quality of their milk, see records of transactions and feel connected to the wider industry.

2.4   Zomato order processing & delivery - Vodafone

Vodafone helped Zomato streamline one of their key processes to make them a Ready Business.

Business Problem

- To launch their unique Online Food Ordering platform, Zomato were looking for the right connectivity partner.
- They needed a stable operator who could provide a pan-India service and deliver a solution tailored to their requirement.

Solution Offered

- Vodafone provided a customised mobility solution to Zomato for order processing, leveraging strong network and superior service delivery.
- Our solution is now deployed in devices that Zomato supplies to restaurants and establishments for their online order fulfillment.
- Service support is also provided for the customised solution.

Benefits

- Processing online orders is now smooth on Zomato with our bespoke solution which has also helped them optimise their costs.
- Zomato were satisfied with the solution which delivered an experience consistent with their brand.
- Vodafone is now Zomato's preferred connectivity partner for online order processing across India.

2.5 Printing process automation from publication to roll-out - Vodafone

Vodafone helped a **leading daily** with a readership base of 15 million, operating 26 printing facilities across India, capture circulation data over its wide distribution network. This let the company recognise and improve its key areas which needed attention, making the company a Ready Business.

Business Problem

A leading daily needed to monitor the entire printing process from publication to rollout, thus improving efficiency and minimising operational hurdles and difficulties.

Solution Offered

- Vodafone provided the company with a BlackBerry® Enterprise Solution (BES) that connected them to their clients.
- The application worked on a BlackBerry® handset and was hosted on the client's side in the MDS component of the BES.
- The client's BlackBerry® handset was connected to the company's servers and used the BES service to communicate.
- The server side of the application resided at the company's Data Centre, which integrated with the company's current system.

Benefit

- All circulation data was captured live – from start of publishing till the distribution to the vendor.
- Business Managers used dashboards that allowed them to see live figures.
- Reports for unsold, off-take and outstanding stocks were generated at the click of a button.
- Employee performance and customer satisfaction were enhanced.

3. Service Operations

3.1   Automated data centre environment monitoring - Tata Communications

Business Problem

- Little visibility to the environmental threats such as heat, humidity, smoke etc. in the data centre
- These factors were recorded manually, no alert mechanism existed for anomalies which made maintaining precision air-conditioning of data centre rooms difficult
- There was no way to represent environmental trends in the absence of an automated process and consequently physical maintenance was a reactive process

Solution Offered

Tata Communications offered an IoT solution based on a low power wide area network (LPWAN). The solution comprised of 3 main elements:

- Hardware Devices – Battery operated end devices which were fixed in data centres, in customer's premises, to monitor temperature and humidity based on a defined period.
- Network – A dedicated IoT public network powered by LoRa technology deployed by Tata Communications.
- Application– Application design to meet the business requirement of provisioning, maintaining and providing individual device data to improve business visibility into environmental factors & performance of the data centres. The application also includes data visualisation and reports

Benefits

- Customer has a real time single dashboard view of data centre temperature and its trends across the main cities in India. Customer may also assure its own customers that the environmental parameters of servers are within accepted values.
- Improved monitoring as dependency on manual checks and reporting is eliminated.
- With event based alerts, corrective actions are taken immediately instead of waiting for manual reports.
- Resource Optimisation, I.e., diminished need of people to records temperature inside data centres.
- Efficient energy management. Energy savings facilitated by monitoring temperature within narrowed tunnel.

3.2   Remote machine fleet monitoring (JCB) - Vodafone

Vodafone's IoT solutions helped construction equipment manufacturer JCB automate the monitoring of its machinery. This helped it maintain the health of the machinery and reduce down-time, making it a Ready Business

Business Problem

- Since construction equipment is very expensive to monitor and maintain, JCB felt the need for quick, reliable information for better upgrades and upkeep.
- They devised the Livelink telematics system to help stay connected to their machine fleets.
- JCB needed a strong partner to power Livelink for remote monitoring and management.

Solution Offered

- Vodafone developed & deployed a robust IoT solution to power Livelink. This helped monitor and provide information on service, operation and security of the JCB equipment.
- Automotive-grade SIM cards for improved efficacy and longevity were provided.
- The Vodafone IoT Managed Connectivity Platform makes it easy for JCB to make large scale IoT deployments.
- Secure connectivity was ensured to prevent any misuse.

Benefits

- JCB users receive real-time data and alerts to remotely manage the efficiency, maintenance and health of their equipment.

- It is easier to manage working-versus-idle time, fuel usage, and identify small problems before they cause unscheduled downtime.
- The solution helps ensure that issues are quickly sorted out, and machines are fully operational and back on-site

3.3   Project Surya stove monitoring - Vodafone

Vodafone's connectivity helped **Project Surya** equip rural households with clean cooking technologies, replacing biomass and other harmful cooking methods. This helped rural households breathe better, making the nation ready for a cleaner future.

Business Problem

- Household air pollution resulting from cooking with biomass kills three times as many people around the world as malaria, HIV/AIDS and TB combined.
- In India alone 875,000 deaths occur every year due to Indoor Air Pollution.
- Project Surya is working with local energy entrepreneurs to distribute clean cook stoves, at a subsidised cost. In addition, it pays the users based on usage and the resulting savings in carbon emissions.
- To enable paying the users of clean cook stoves for their usage, Project Surya needed to gather regular and accurate usage data from each stove

Solution Offered

- Working together with TERI and Nexleaf Analytics, the solution developed by Vodafone allows Project Surya to remotely collect data from Nexleaf's smartphone based StoveTrace sensor through the data network, including 3G, with the SIMs managed centrally

Benefits

- Vodafone's Remote Connect Solution offered reliable coverage across locations, especially in Uttar Pradesh, which was a key area of focus for the project.
- If coverage to an individual SIM dropped out, the SIMs automatically connected to another network.
- Vodafone's global M2M reach ensured that the project could be replicated across the world.

3.4   Card payments for small retailers (Mswipe) - Vodafone

Vodafone used its IoT SIMs to help the newly established **Mswipe,** a card payment processor, accept payments at customer's premises. This let the company take its services nationwide, making it a Ready Business.

Business Problem

- Manish Patel, CEO of Mswipe, ran into a common problem faced by merchants: he was unable to take card payments at customers' premises.
- His response was to devise a solution capable of taking card payments via a smartphone.
- Patel created a company called Mswipe to develop the hardware and software and to market the solution.
- To work effectively it needed a network partner delivering connectivity nationwide

Solution Offered

- The Mswipe solution centres on a piece of hardware called the Wisepad, linked to a smartphone via Bluetooth.
- Users download the Mswipe application on their smartphones and then cards are swiped at the point of purchase and payment details sent via a Vodafone IoT SIM

Benefits

- Mswipe's solution for the first time enables smaller retailers to accept card payments, reducing the cost of doing business.
- Solution rolled out to 7,000 merchants in first year.
- Vodafone IoT SIMs ensure the most robust, reliable connectivity, nationwide with the scope to expand internationally.
- Paves the way for Mswipe to develop payment and customer loyalty applications for specific market sectors.

- Solution meets government and card industry regulations, with no customer data stored on local devices.

4.   Transportation / Logistics

4.1 Fleet tracking (Tata Fleetman) – Vodafone

Vodafone's IoT solution helped **Tata Motors** track its trucks and improve their efficiency. This helped the auto giant differentiate themselves in the market, making them a Ready Business.

Business Problem

- Tata Motors were looking to offer more value to their customers
- They wanted to help fleet owners improve operational efficiency
- Tata Motors also wanted to differentiate themselves in the market
- Their truck telematics service, Tata FleetMan, was being offered to their customers and they were looking for a strong solution to support it.

Solution Offered

Vodafone deployed the following to power the Tata FleetMan:

- Vodafone IoT SIMs for point-to-point data communication with incoming SMS to remotely manage the truck telematics unit
- Vodafone IoT Managed Connectivity Platform to manage SIM cards and help prevent misuse
- Bar-coded SIMs for managing SIM inventory at the warehouse
- Dedicated service and support for the solution

Benefits

The solution helped deliver the following:

- Real-time vehicle tracking
- Geo-Fencing for setting specific vehicle travel zones
- Email/SMS alerts for over-speeding, stoppage, main supply removal, entering/exiting a geo-fence, harsh braking and harsh acceleration etc.
- Trip Management and Reports
- SMS-based solution for a truck's current location and remote telematics management
- Monitoring engine idle time for all trucks

4.2   Connected car for Mahindra Reva - Vodafone

Mahindra REVA, a pioneer of electric vehicle technologies, was able to bring the connected car to life through Vodafone's solutions. This helped build a customer experience that could not easily be matched by rival auto manufacturers, making it a Ready Business.

Business Problem

- Bangalore-based Mahindra REVA is one of the most experienced electric vehicle manufacturers in the world.
- It came up with the concept for a new breed of 'connected' cars which enables owners and service teams to remotely access various features and functions of their vehicle.
- Now, it needed to find a reliable way to deliver data connectivity to vehicles across India and around the world

Solution Offered

Vodafone provided secure managed connectivity between the cars via its IoT network.

Benefits

- Reliable IoT connectivity enables drivers to access various features of their vehicle remotely using a smartphone app or a dedicated webpage.
- Owners can check the status of the car battery, control its air-conditioning, lock or unlock doors, find the nearest charging station and use many other innovative features.
- Mahindra REVA's connected car – the e2o - also automatically provides SMS alerts when a door is left unlocked, a parking brake is not applied or a charging point fault.
- In addition, Mahindra REVA service teams use the IoT platform to monitor a vehicle's condition and proactively warn drivers when issues are likely to arise.
- Overall, the partnership has helped Mahindra REVA to move one step ahead of its competition, while Vodafone's global footprint will provide support for international expansion plans.

4.3   Geofencing for Bhagirathi Travels - Vodafone

Vodafone's geo-fencing enabled connections helped **Baghirathi Travels,** a company that was managing fleets of various types and was growing rapidly, keep a track of its fleets. This let the company know exactly when and where their resources were allocated, making it a Ready Business.

Business Challenge

- Formed in 2003, Baghirathi Travels has grown in their standards of efficiency and organisation.
- With expertise in managing fleets of different types, they wanted a way to track their vehicles across locations which would help monitor fleet maintenance with added efficiency

Vodafone Solution

- Vodafone empowered Baghirathi with 200 IoT connections, all of which were geo-fencing enabled.
- This gave them full control over the monitoring of their vehicles' status and current locations.

Business Benefit

- Baghirathi was able to monitor all the routes used by their fleets.
- With the geo-fencing feature, they could channel their vehicles through safe and approved routes.
- Better fleet management saved valuable travel time, resulting in increased frequency.
- Optimising travel enabled fuel optimisation, while also reducing vehicle maintenance cost

4.4 Riddhi Infosystems fleet management - Vodafone

Vodafone equipped **Riddhi Infosystems,** a company that provides vehicle tracking and fleet management along with other integrated business solutions to companies of all sizes, with its tracking solutions. This helped the company expand its services without holding back, making it a Ready Business.

Business Problem

- The scale of operations of the company meant difficulties in monitoring the functioning and punctuality of large fleets.
- They needed a solution that helped them manage their fleets more efficiently

Solution Offered

- Vodafone offered Riddhi Infosystems a GSM-based Vehicle Location Tracker (VLT) solution and also created a SIM management (GSDP) portal for them
- This solution allowed Riddhi Infosystems to monitor their fleets' locations, map their routes and observe the time consumed

Benefits

- Riddhi Infosystems now had full control over their fleets with the ability to check various aspects they previously couldn't.
- Usage of the GSDP portal helped them increase productivity with better on-time deliveries.
- The geo-fencing feature also sent alerts whenever fleets travelled on unapproved or unsafe routes.
- Maintenance costs were reduced while fuel efficiency increased.
- With better fleet management, Riddhi Infosystems' business efficiency increased, allowing them to handle more requests than before.

4.5   Logistics company - global shipment tracking – Vodafone

Vodafone helped a logistics company with a network spanning 120,000 global destinations keep a real-time track on its shipments. This helped the company streamline its resources, making it a Ready Business.

Business Problem

- The business needed to keep a real-time track of shipments. However, with a network spanning 120,000 global destinations, it was proving to be quite a challenge.
- The company needed an effective solution to provide quick, accurate and real-time information of shipments to its customers globally

Solution Offered

- Vodafone engineered a state-of-the-art, robust and secure wireless solution over a GPRS connection, for the client. This was integrated with Fujitsu scanners, powered by a Vodafone SIM, to capture data and deliver it back to the company servers in real-time.

- This enabled the company to provide proactive delivery notifications to customers via various channels like e-mail, SMS, fax and phone

Benefits

- The company initiated plans to streamline and further enhance operational efficiency by increasing the number of devices deployed on the Vodafone network across the nation.
- An exclusive APN meant the enterprise scanners were able to transmit the data at lightning speed back to the central servers.
- In-built security standards complying with international GSM security norms gave uncompromising security.

5. Healthcare

5.1   Diabetacare - Diabetic patient monitoring - Vodafone

Business Problem

- Traditional diabetes treatments require patients to stick to a rolling regime of medication and monitoring
- This demands strict discipline from patients as well as regular doctor visits that cost time and money
- Diabetacare was testing a new glucometer device which required real-time data connectivity

Solution Offered

- With Vodafone's special IoT SIM, the device was able to monitor patients' glucose & blood pressure levels and send this data to doctors & experts
- This enabled personalised treatment, supported by periodic face-to-face visits at the nearest clinic

Benefits

- Diabetacare could launch the world's first remote diabetes treatment and prevention solution, creating first-mover advantage.
- It provided a real-time view of customer data usage, billing and SIM control from a single global platform.
- The Single Global SIM allowed the business to plan for an international expansion supported by findings from the local pilot

5.2 Maternal antenatal monitoring - Mobile Obstetrics Monitoring (MOM) - Philips

Connecting home to health center

Caregiver app
Register patient and record pregnancy data and vital measurements on a mobile device.
- Register patient from her home
- Record more detailed entries (midwives) or basic entries (community health workers)
- Collect data offline
- Update patient records
- Available in English and Bahasa

Doctor app
Doctor reviews patient information — anytime, anywhere
- Remotely view reports
- Remotely view patient information

MOM web portal
Allows midwife or clinician to register patient and record pregnancy data and vital measurements. Resident doctor reviews data and ultrasound reports.
- Automatically calculate clinical decision support pregnancy risk level
- Access expanded or simplified view of data
- Record examinations, investigations, management, and delivery details
- Send SMS reminders to patients, midwives, and community health workers
- Generate reports
- Available in English and Bahasa

MOM software solution includes
- MOM web app
- MOM caregiver app
- MOM doctor app

The power of timely information

Business Problem

Challenges in antenatal care delivery in India:

- Poor access to care in remote locations
- Shortage of doctors and minimally equipped midwives
- Need for early identification of high-risk pregnancies
- Difficult to share non-electronic patient data

Solution Offered

Philips Mobile Obstetrics Monitoring (MOM) solution connects home to health centre via several components:

- MOM software - this consists of MOM web app, MOM caregiver app and MOM doctor app which help maintain comprehensive digital patient records that allow calculation of a clinical decision support pregnancy risk level, helping standardise pregnancy risk stratification so that high-risk cases are not missed
- Community worker backpack - Allows data collection at patient's home using weighing scale, foetal Doppler, blood pressure apparatus, thermometer, tests for urine protein, haemoglobin level, blood glucose
- Philips ultrasound - Simple and mobile, quick to learn and use, with easy integration of images with MOM
- Clinical partner - Facilitates effective adoption of MOM and provides clinical training to the users

Benefits

- Pilot underway in Karnataka since December 2016 with entries of antenatal data in MOMs being done at Primary Health Centres. Stratifying pregnancy risk remotely through MOM and Ultrasound being utilised extensively to detect pregnancy related complications.

MOM key results measured in Indonesia in 2014:

- Zero maternal deaths during the 2014 pilot
- 99% reduction in anaemia from the first to third trimester
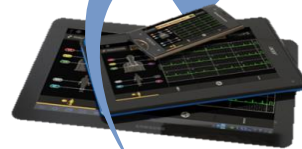- 3X increase in detection of very high-risk pregnancies during the pilot

Efficia ECG100

Processing requirements greatly reduced!

Small and portable form factor!

No dependence on Infrastructure WiFi

Display and keyboard moved to Android based mobile device

Affordable WiFi printers

started penetrating the market by end 2013

Printing on standard A4 paper instead of thermal and also cloud printing

Business Problem

- Death / disability due to heart attacks a big health issue in India - nearly 2 million heart attacks a year in India and majority of the victims are youngsters. One person dies every 33 seconds in India owing to a heart attack
- Early diagnosis and treatment is critical in heart attack - Heart attack care is a "Race against Time".

Solution Offered

- Philips Efficia ECG100 solution offers a small and portable ECG machine with the display and keyboard moved to an android based mobile device, with no dependence on infrastructure WiFi.
- The printing of the ECG is also supported on A4 paper instead of thermal printing and the same can be accessed and printed remotely over the cloud. With increased availability of affordable WiFi printers this makes the ECG printing task much easier.

Benefits

- It saves hearts and lives of heart attack patients by providing early diagnosis and treatment.
- This solution empowers General Practitioners (GPs) at remote clinics, paramedics in the ambulances or non-cardiologists to make care decisions at first medical contact with guidance from cardiologists at PCI (Percutaneous coronary intervention) hospitals. This helps improve care and outcomes for acute chest pain patients throughout the region around a PCI hospital.
- It helps reduce costs, stress and unnecessary admissions for low risk patients with chest pain symptoms
- It helps raise general level of cardiac care throughout the region being served

Manipal CPC Pilot Results

Spoke 1 – Hebri — community health centers

Hub – KMC Manipal

Spoke 2 – Malpe — community health centers

Spoke 3 – Hirebettu — community health centers

Spoke 4 - Kukkikatte — community health centers

Spoke 5 - Karkala — community health centers

Manipal Pilot - Abnormal Cases

- Needs echo 69%
- Needs evaluation 15%
- No recommendation 13%
- Needs emergency intervention 3%

380 ECGs
Acquired & transmitted by Spokes
Ages: 14-80 years, 97% 31 years or older
Males: 189 (49.7%); Females: 191 (50.3%)

376 ECGs
Noise- and artifact-free

4 ECGs
with noise or artifact

379 ECGs
Successful on 1st transmission

1 ECG
Successful on 2nd transmission

380 ECGs
Received at Hub, read/interpreted by ECG Reader and Cardiologist

362 ECGs
Same day email to PCP

10 ECGs
Next day email to PCP

8 ECGs
2 days after email to PCP

3 STEMI patients were treated with primary

5.4   Fitness Wearables - Envisioning a new fitness future - GOQii
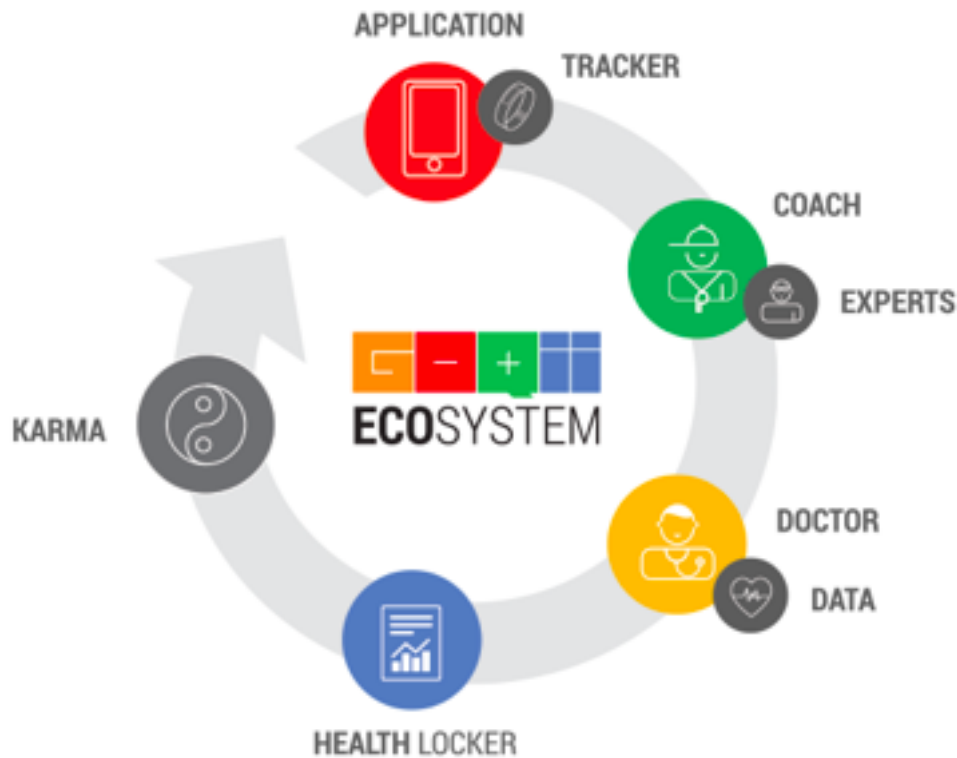
Business Problem

- One-third of Indians aged above 30 are victims of lifestyle diseases (high cholesterol, diabetes, thyroid, blood pressure) as per GOQii India Fit 2017 report. It is found that disruptive lifestyles changes over the years in India have resulted in lack of exercise, erratic eating habits, unbalanced diet (lacking in fibre/protein), increase in stress levels and poor sleep patterns leading to these lifestyle diseases.
- Traditional fitness bands only measure the user's physical activity data but do not have a qualified personal coach analysing the data and recommending a suitable exercise and diet regime
- Users struggle to find/engage with health coaches. Self-interpretation and management of health data can prove harmful and sometimes fatal.
- Users need motivation, regular monitoring and a regular interaction with their health coach

Solution Offered

- The GOQii solution consists of fitness activity tracker band (to measure user's steps, distance travelled, heart rate etc.) and a remote personalised coaching service through the GOQii app. The band is Bluetooth paired with the user's smart phone and the data is transmitted from the band to the user and to their personal coach.

- Upon registration and activation of GOQii account, the user fills information about his physical activity and lifestyle/habits and is presented with 3-5 coaches and the user is allowed to choose one. This is followed with a call between the user and coach and they mutually agree on initial set of goals. The GOQii app then transmits user's data to the coach who then monitors and guides the user for adopting a healthy lifestyle. The user can chat, message or email the coach from the app.
- The service additionally has a social service component, where the user can earn "karma points" which can be donated for social causes.
- The GOQii band comes free of cost along with a coaching subscription of 3, 6 or 12 months with the flexibility for the user to either renew the subscription or continue using the band and app for free without the coach.

Benefits

- Using fitness bands does not make a person fit. It is the data from the band which when analysed by an expert/coach can lead to advice on suitable exercise regime, lifestyle modification along with constant motivation and monitoring from the human coach. The GOQii solution is based on successful inter-working of technology and human connect to bring beneficial results. As reported by IDC in June 2017, GOQii is the market leader in fitness wearables in India with a 20.8% market share.
- The user is monitored and guided by a trained/certified coach rather than the user monitoring himself which can prove harmful and fatal.
- The social service component motivates the user to earn "karma points" and use them for donating for social causes. In May 2017, GOQii reported that it raised INR 4.7 crores through its Karma program which was used for social causes.
- No forceful bundling of coaching service and mandating the service for the user - after the initial subscription, the user has the flexibility to renew or else use the band & app for free without the coach.
- GOQii has created a "coach marketplace" and a user can be connected to the world's best coaches from any location and based on the type of goals set. This has also enabled qualified coaches to work remotely and earn a decent monthly income.

5.5 Max Bupa alliance with GOQii and Swiss Re - Integrated Wellness ecosystem -GOQii

Business Problem

- Healthcare is a very essential need for humans and healthcare costs are on the rise due to rise in chronic diseases (primarily driven by lifestyle changes).
- Preventive healthcare is emerging as a key approach rather than sick care.
- Preventive healthcare focuses on adopting healthy habits, disease prevention and regular wellness monitoring.
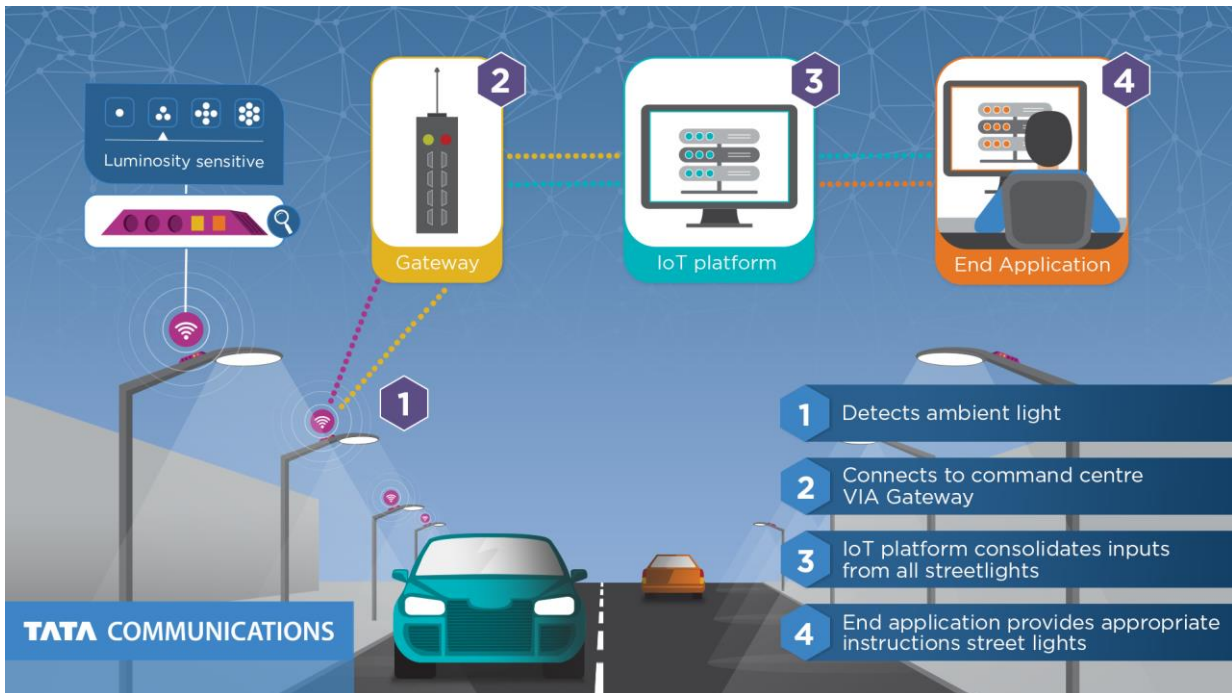
Solution Offered

- Max Bupa Health Insurance has announced a three-way tie-up with GOQii, a leading fitness technology player and Swiss Re, a leading global reinsurer to provide holistic wellness offerings.
- As part of the offering, Max Bupa customers will get ready access to GOQii's solutions and Swiss Re will assist Max Bupa in creating relevant products and building expertise to create risk assessment models for future.

Benefits

- Healthcare is seeing a fundamental shift from "illness to wellness" and focus is shifting on disease prevention and well-being
- This is immensely beneficial for customers also as they now have integrated wellness offerings to choose which shall not only take care of their healthcare expenses but focus more on their adopting healthy habits, disease prevention and regular wellness monitoring.
- With this Max Bupa is the first health insurer in India to create holistic wellness solutions and introducing a new approach to healthcare in India.

6. Smart Governance

6.1   Smart street lighting - Tata Communications

Business Problem

- Managing scale
- Data concentrators use single point of failure
- High cost due to use of GSM for Remote management
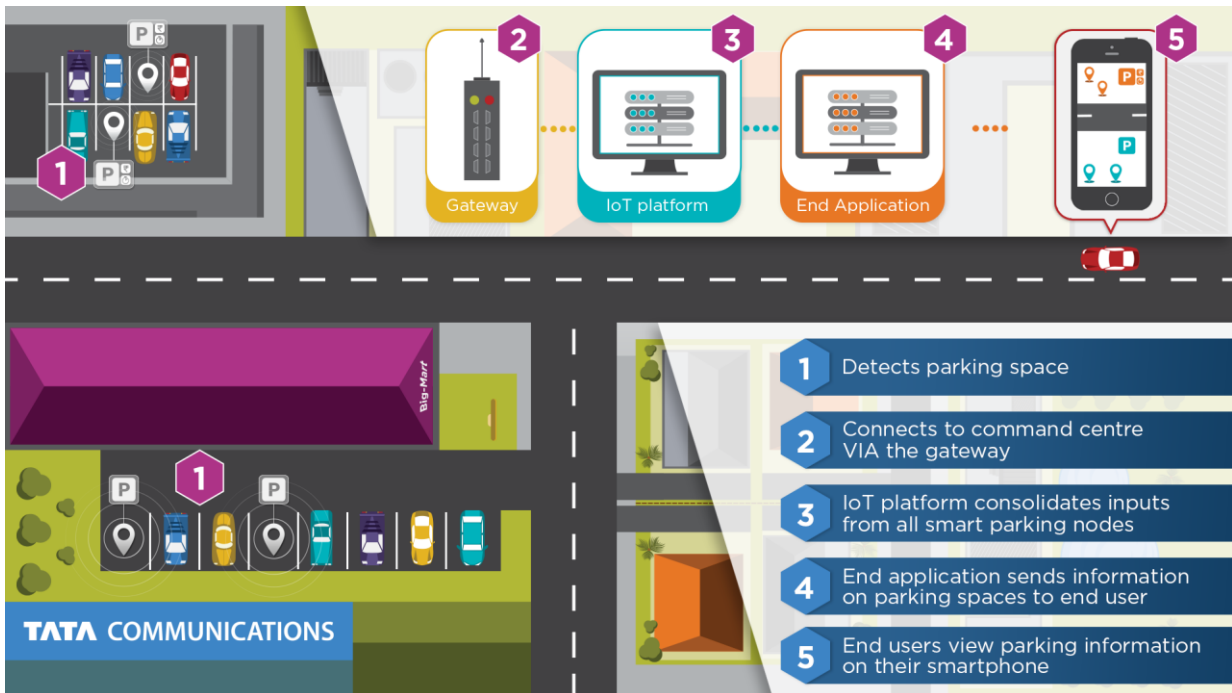
Solution Offered

- LoRaWAN based IoT Solution to ensure reliability
- A viable centralised remote management solution in the form of an Integrated Command & Control Centre
- Enable automated monitoring and management through astronomical calendar settings

Benefits

- Delivering well-lit and safe public areas
- Saving tax payers' money
- Easy to maintain centralised operations

6.2   Smart parking - Tata Communications

1. Detects parking space
2. Connects to command centre VIA the gateway
3. IoT platform consolidates inputs from all smart parking nodes
4. End application sends information on parking spaces to end user
5. End users view parking information on their smartphone

Business Problem

- Underground parking leads to network reliability issues
- High cost of scale deployments
- Unauthorised parking & inefficiency

Solution Offered

- Deep indoor coverage provided by LoRaWAN technology
- Route mapping, real time view of parking spaces on application
- Integration with mobile applications

Benefits

- Remote management & user application focused to improve revenue generation for customer
- Increased utilisation
- Provide better service to customer's customer

6.3   Water distribution management - Tata Communications

Business Problem

- Large & intricate water distribution network difficult to maintain manually
- Actual losses due to overflows not identified
- Precious water loss due to delay in fault detection

Solution Offered

- LoRaWAN IoT Solution ensures reliable coverage of distribution system
- Remote management of all sensors placed throughout the system
- Remote operation of distribution valves

Benefits

- Water savings by 30%
- Analytics lead to improved planning
- Reduced manual intervention

6.4   Smart waste management - Tata Communications
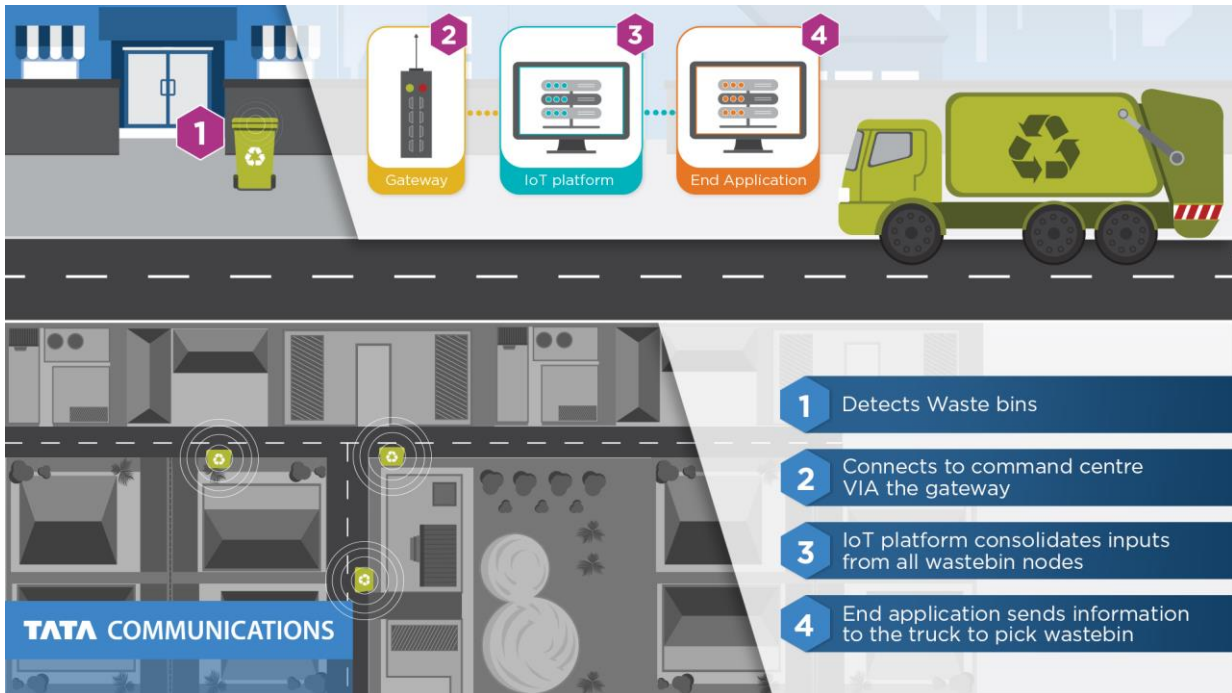
Business Problem

- Manual Intervention to identify overloaded bins
- No differentiation between underload & overload situation for routing
- Overloaded storage of waste in the same volume of bin will lead to unhygienic environment
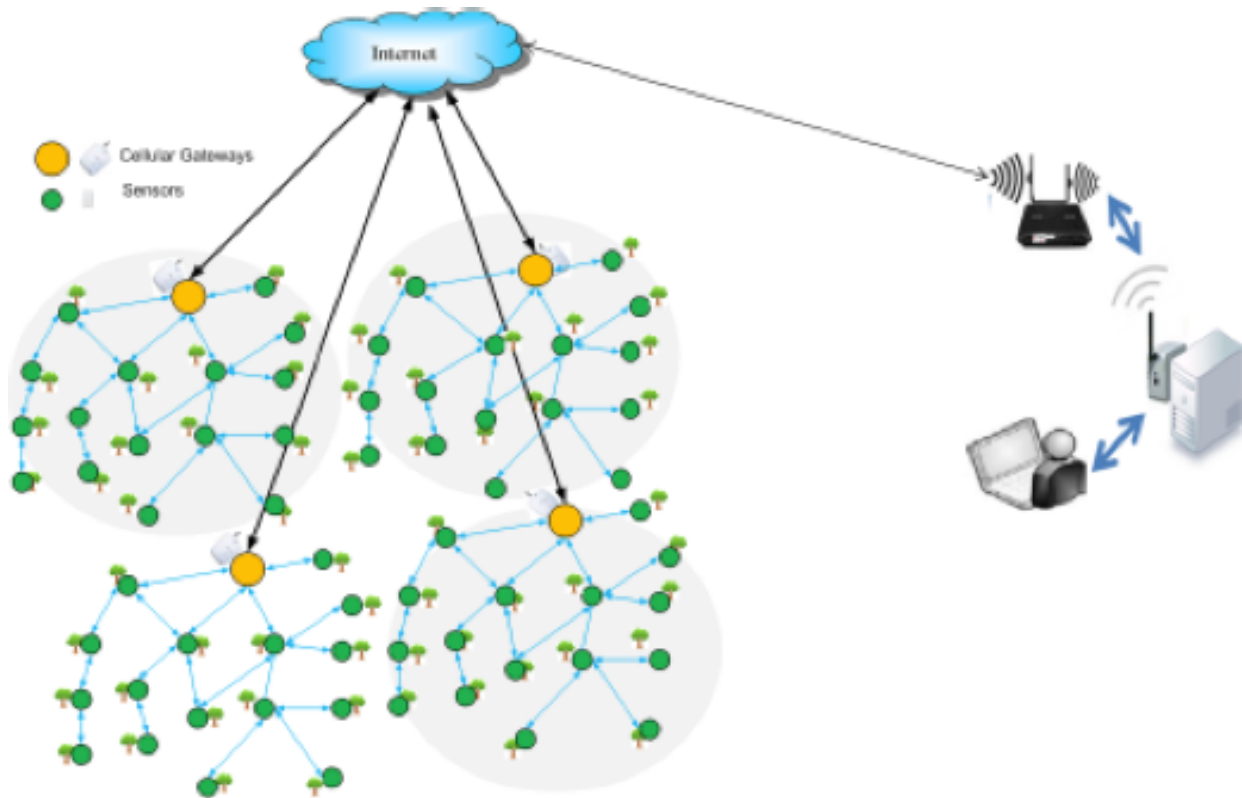
Solution Offered

- JIT monitoring through alert generation of LoRaWAN sensors
- Smart route planning
- Analytics feature leading to locational intelligence

Benefits

- Transportation frequency is optimised leading to reduction of OpEx
- Easy to maintain clean environment
- Automated control

6.5 Smart Forest - Hitachi

Business Problem

- Uprooting / chopping / theft of valuable trees in forest (within designated areas / boundary)
- Track shifting of chopped tree stem and locate from which exit gate / area those are getting transported out of forest / designated area

Solution Offered

- Smart sensor to detect the chopping and transportation of trees
- Alert nearby guard with the coordinates of tree under attention and the nearest route to get to the location
- Centralised monitoring station to track each tree

Benefits

Protection of rare species trees and promotion of IoT technology for Smart Foresting

7.   Smart Utilities

7.1 Distribution transformer monitoring - Tata Communications

Business Problem

- Manual maintenance team overburdened by large number of old transformers
- Fault detection in reactive mode, i.e. in the case of an outage
- No real-time information available

Solution Offered

- Coverage of entire network through city-wide LoRaWAN deployment
- Retrofitted old transformers making them smart
- Remote monitoring at the Integrated Command & Control Centre

Benefits

- Reduction in operation costs
- Better control & monitoring over entire distribution network
- Enhanced transformer health & operation

7.2   Demand forecasting & Asset monitoring - L&T
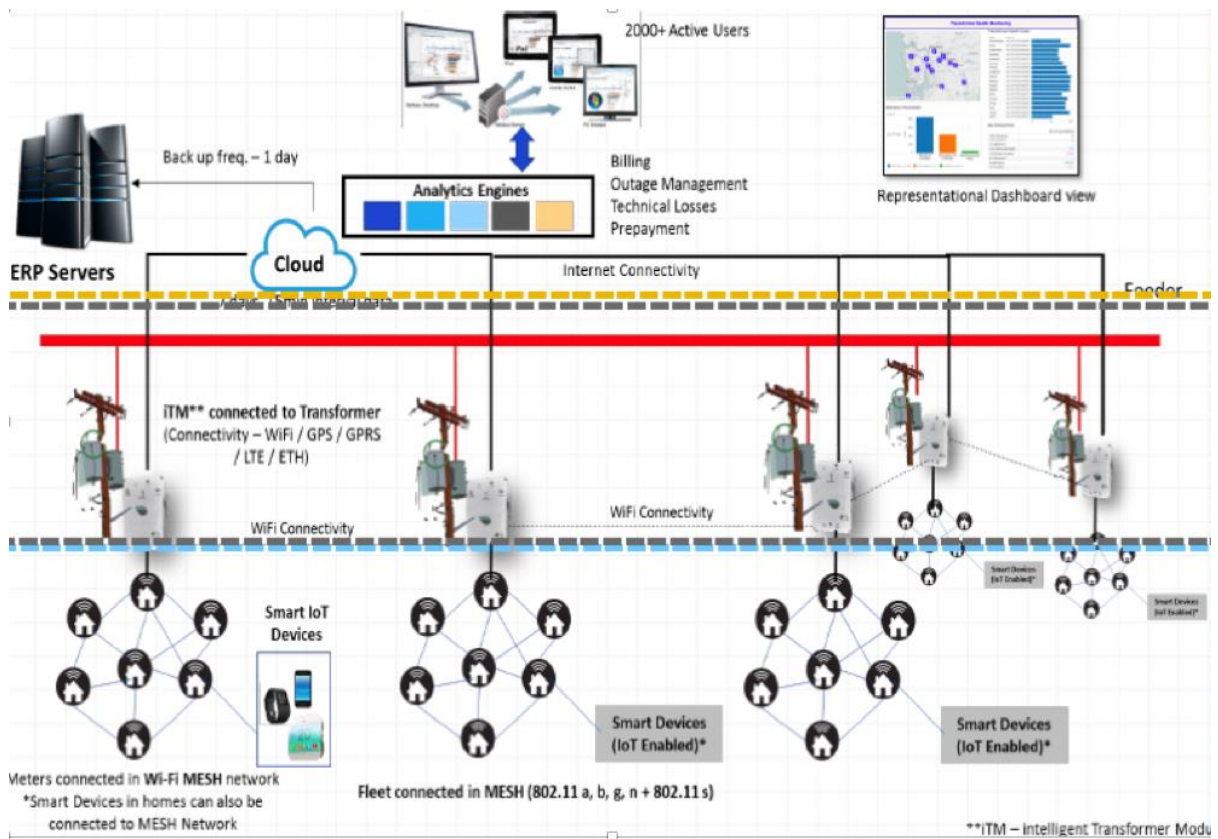
Business Problem

Huge gaps in Load requirement Vs Power generation

The customer needed

- Highly accurate Demand forecasting model which can forecast the load requirement based on customised set of inputs
- Evaluate influences of various parameters / events using rich visualisation

- Dashboards to enable planning of strategies for power purchase, expansion, policy making, outage management etc.

Solution Offered

Analytics at the Utility Level

Analyse data from meters and utility assets to provide insights into the following

- Demand Forecasting & Outage Management
- Energy Consumption Trends
- Asset Health assessment and status
- Auto connect disconnect service based on billing status

Analytics at the substation Level

- Capturing transformer parameters like Oil Temp, Ambient Temp, Oil Level, Moisture Level, Acoustics, Power flow etc.
- Performa data mining and analysis (Transformer health status, oil condition, fault detection, etc.) and send processes data over cloud

Analytics at the meter level

- Capturing data points like **Meter ID, daily energy consumption data**
- **On chip analytics solution** that performs data mining activities, user profiling, consumption patterns etc.
- Send processed meter data over available networks to substation

Benefits

- Continuous monitoring of key parameters facilitated in optimising the generation and power purchase plans
- Accelerate prediction has reduced the load shedding instances
- Increase in revenue owing to reduced cost towards power purchase
- A balance between investment and revenue is achieved

Solution Dashboards

Effect of consumer type on Demand

- Equation to predict/forecast load with respect to number of consumers is achieved
- Consumer type analysis helps in planning for expansions, infrastructure development and policy making localized to each consumer type

- Alarming events analysis helps in evaluating the power requirements for particular events and facilitates effective planning in future for similar events

7.3   Transformer Health Monitoring – L&T

Remote Transformer Monitoring using Mesh Network Architecture
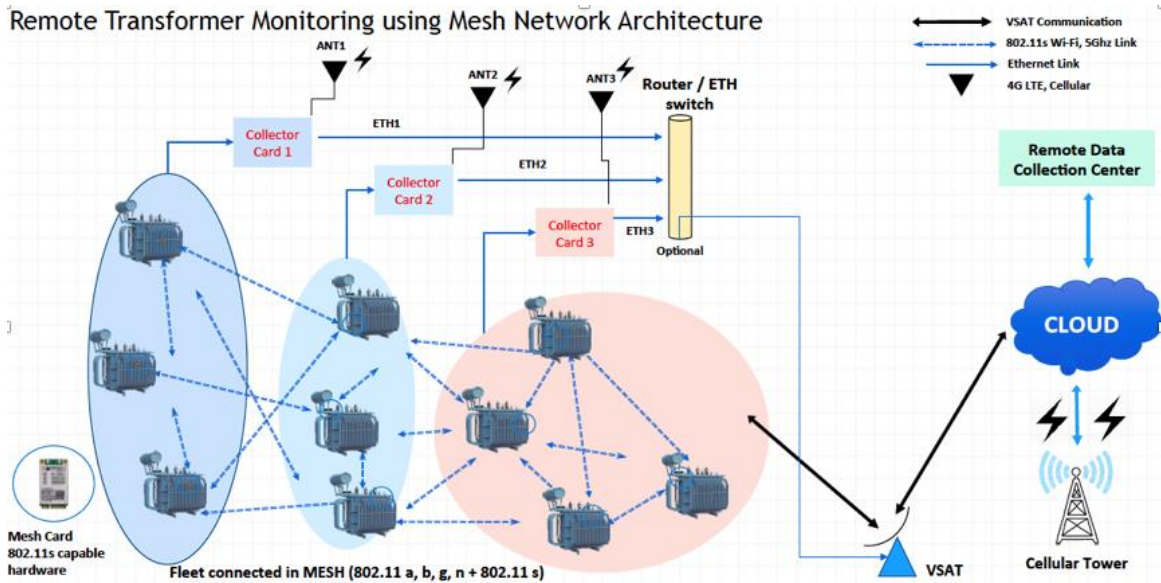
Business Problem

Absence of smart devices and lack of integrated database has led to high maintenance cost and frequent failure of power transformers having significant impact on the company's revenue as well as customer satisfaction.

The customer needed

- Continuous monitoring of power transformers' key parameters
- Predicting internal faults and Health Index of power transformers
- Optimise cost towards maintenance and facilitate efficient planning for power distribution and replacement of the transformer based on remaining life prediction
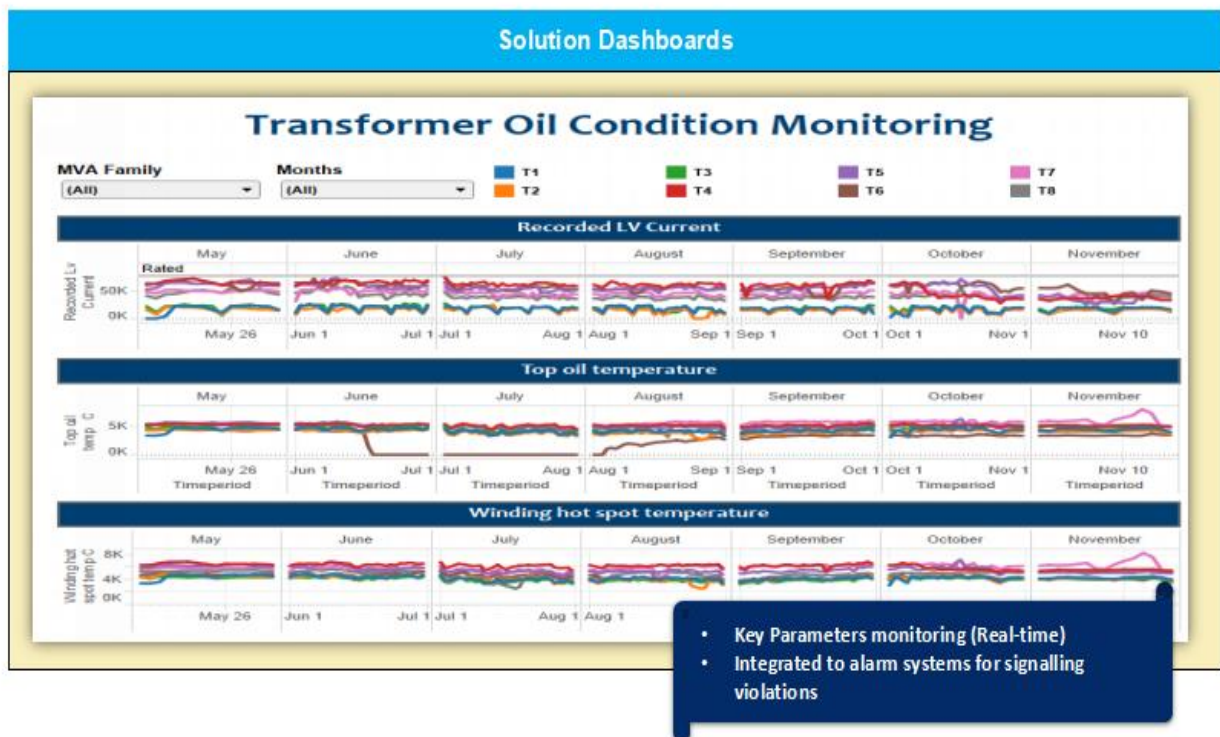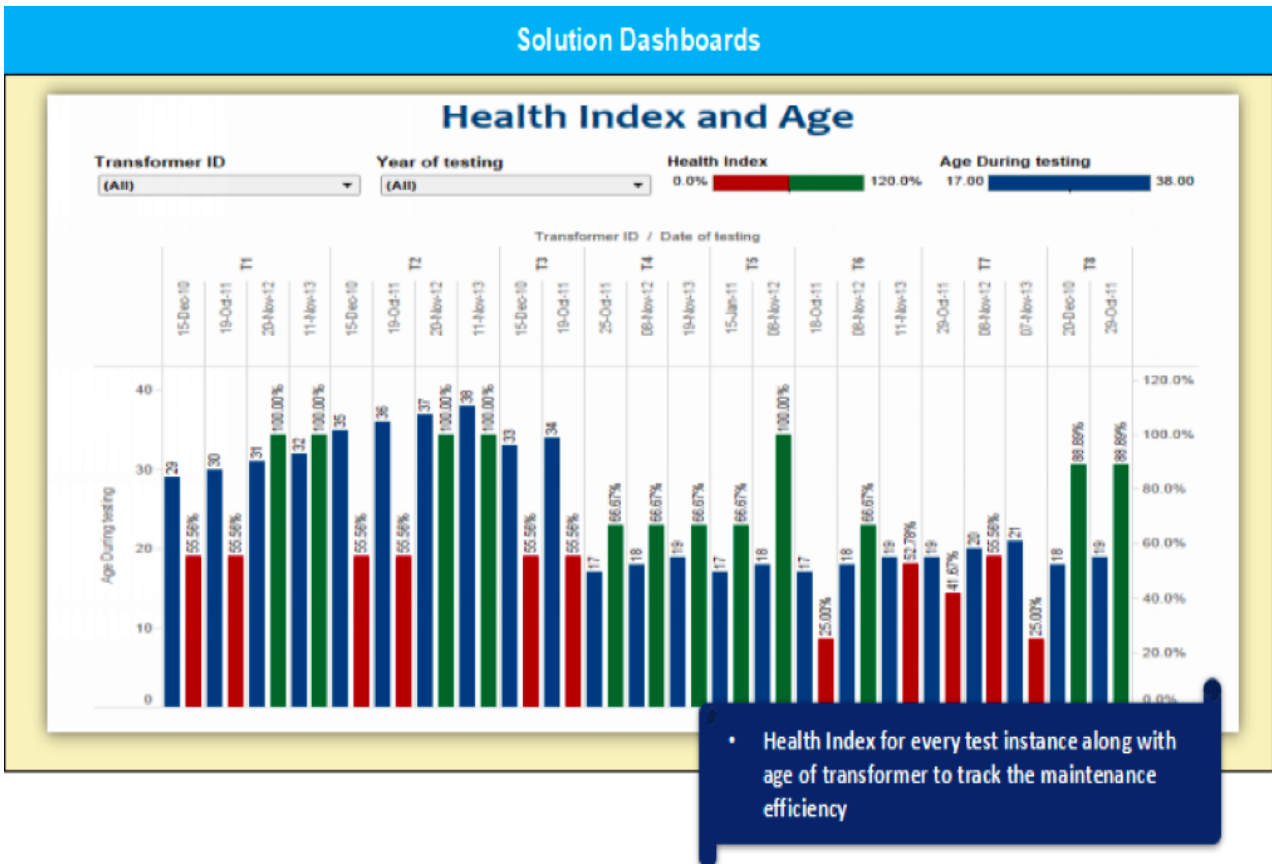
Solution Offered

Cost effective solution for maximum utilisation of available data to have accurate prediction by:

- Integration of all the test reports (DGA, OST etc.), and parameters monitored using SCADA, sensors, physical inspection along with history of maintenance activities for hundreds of distribution transformers
- Dashboards for real time monitoring of key parameters and its integration with alarms
- Prediction of faults using IEC ratio/Duval's triangle/Roger's ratio methods
- Evaluation of DGA & OST results and prediction of Health Index of transformer
- Prediction of remaining life of transformer using Health Index of transformer

Benefits

- Continuous monitoring of key parameters with customised alarm levels have reduced unexpected failures thereby improving customer satisfaction rating
- Optimising testing and maintenance plan has reduced the cost and increased uptime has improved the revenue for the company
- Hazardous faults are predicted in advance during initial stages of development to prevent accidents at site
- A balance between investment, revenue and maintenance cost is achieved

Solution Dashboards

Health Index for every test instance along with age of transformer to track the maintenance efficiency

7.4 Smart metering for Electricity board - Vodafone

Vodafone's IoT SIMs helped a state electricity board with an installed base of over 30,000 users conduct remote electricity meter readings. This data was used to build a more efficient system, making the board ready for a greener future.

Business Problem

- The board wanted to produce, transmit and distribute electricity as efficiently as possible, with the least amount of pilferage.
- They needed someone to capture and transfer energy consumption data.
- Electricity meters operated on Circuit Switched Data (CSD). We needed to fetch data from remote locations across the state and load it on to the main server; and do this securely to poll the data for automated bill generation

Solution Offered

- Vodafone engineered a novel system integrating the use of SIM cards with secure meters to capture energy consumption data.
- Data was pulled automatically and the same was charged to the end customer.
- We placed (CSD) operated meters all over the state and placed Vodafone SIM cards in them.
- These SIM cards helped pull data from distant division offices.
- The data was then captured from the server for billing purposes.

Benefits

- Innovative, secure and tamper-proof method of capturing the data.
- No physical visits were required to check for charging at remote locations.
- Vodafone helped build efficiency into the electricity board's operations.

8. Acknowledgments

8.1   Contributors

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