



IoT Capabilities





The Internet of Things (IoT) refers to a network of physical devices connected to the internet, collecting and exchanging data without human intervention. These devices include **smart home gadgets, industrial sensors, healthcare wearables, connected cars, and more.**

Healthcare

- Remote Patient Monitoring
- Smart Medical Devices
- Electronic Health Records (EHRs)
- Smart hospitals
- Asset tracking

Finance

- Smart ATMs
- Fraud Prevention
- Personalized Banking
- Connected Insurance using Telematics
- Asset Tracking
- Automated Payments
- Inventory Management
- Credit Scoring
- Smart Wallets
- Market Monitoring

Manufacturing

- Predictive Maintenance
- Smart Factories
- Supply Chain Management
- Waste and Emissions Reduction
- Energy Management
- Safety and Security

Retail

- Smart Shopping Carts
- Inventory Management
- Store Management

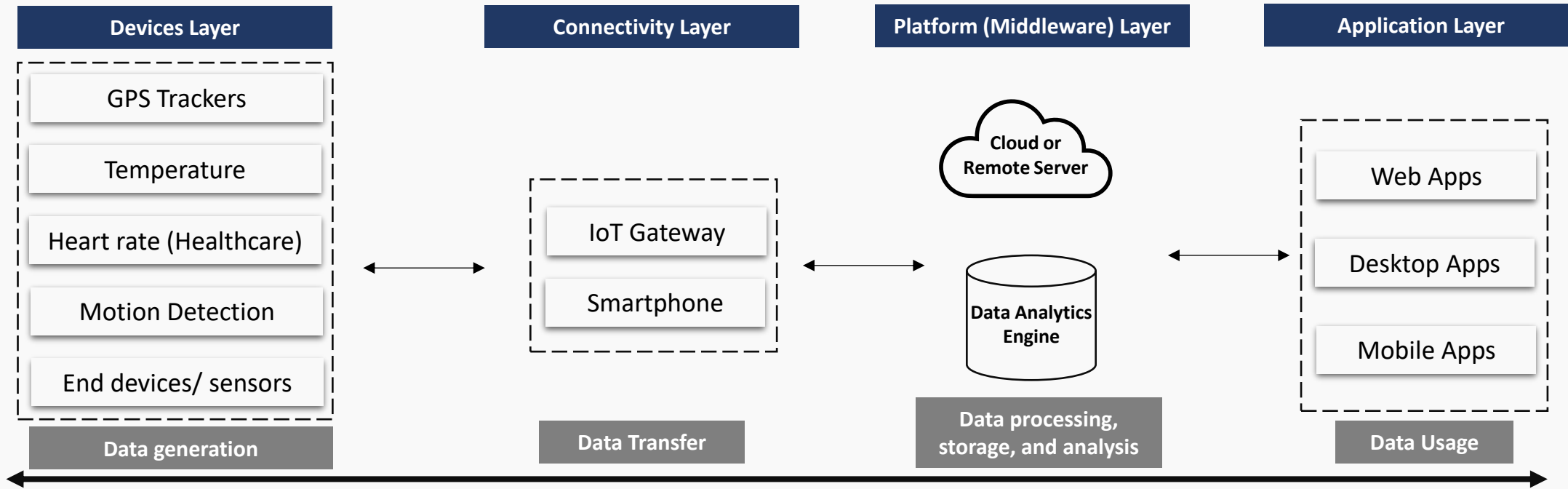
Energy

- Smart grid management
- Energy-efficient buildings
- Renewable energy
- Water Management
- Carbon Emissions Reduction

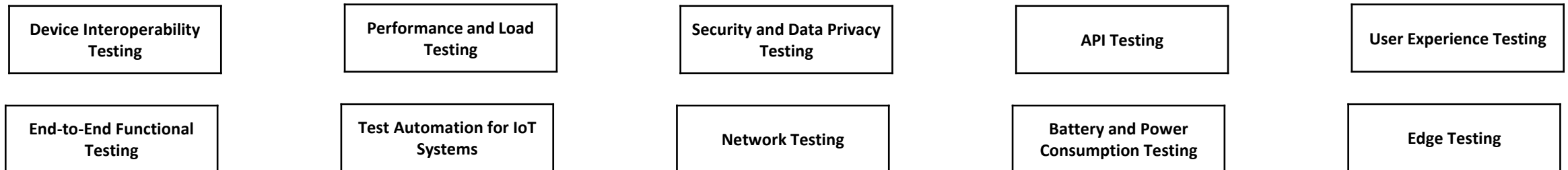
Transportation and Logistics

- Smarter Logistics and Management
- Connected Vehicles
- Improved Public Transportation
- Fleet Management
- Autonomous Vehicles
- Route Optimization

Testing of IoT systems



Testing of Above IoT Components



Major IoT Testing Tools Expertise



End to End Testing of IoT



Testing Service	Intelligent Devices	IoT Protocols	IoT Platforms	Enterprise Systems	Applications
Device Interoperability Testing	✓	X	X	✗	X
Performance and Load Testing	X	✓	✓	✓	✓
Security and Data Privacy Testing	X	X	✓	✓	✓
API Testing	X	X	✓	✓	X
End-to-End Functional Testing	✓	✓	✓	✓	✓
Test Automation for IoT Systems	✓	✓	✓	✓	✓
Network Testing	X	✓	X	X	X
Battery and Power Consumption Testing	✓	X	X	X	X

Areas/ Devices/ Protocols/
Systems/ Applications

Sensors, actuators, and
smart appliances, etc.

MQTT, CoAP, ZigBee,
BLE, etc.

AWS IoT, Azure IoT, etc.

CRM, ERP, and business
intelligence systems

Web, Mobile and
Desktop

Synopsis	Business Need and Application Details	Solution/Approach	Challenges Faced & Tools Used
 End to end functional testing for a renowned company dealing in wearable technology and smart health and fitness & empowering people to improve their health , fitness and lifestyle using Artificial intelligence.	▪ Client was looking for Functional Testing for iOS Native application developed using iOS system Frame work. ▪ Client wanted to implement testing Processes to build a quality product. ▪ The application consisted of various modules, one of them was called “Challenge” wherein users had to select any challenge and perform actions accordingly. Users were to pick up their favourite challenges and they could also pass it on to their peers. ▪ Application measured each and every activity of the users and the data was being fetched from M7 processor. ▪ The application had training modules & also the app controlled the diet activities of users.	▪ Tx performed the pre launch testing of the application by setting up a team of experts in a hybrid model. ▪ Based on the application flow, Tx team prepared test strategies and created 730+ high level test cases. ▪ The team was involved in end to end pre launch testing lifecycle including test case design, test execution, defect reporting, re-testing and regression testing. ▪ Tx leveraged its in-house mobile test lab to arrange the required devices for testing and executed test cases on 15+ devices. ▪ On completion, observations and recommendations were documented with all the appropriate statistics and published as a test report on daily and weekly basis.	CHALLENGES ▪ Major challenge that Team faced was multiple Crashes in the application. ▪ App designs were changing rapidly, so it was getting difficult for QA team to test the application. ▪ Client didn’t had any pre-defined document, so team created all necessary documents from scratch TOOLS USED ▪ Testlink for test case creation ▪ Bugzilla for Bugs reporting.



BI coach

- The unique feature of the Bolt Life app is BI Coach, which is an artificial intelligence based chat bot.
- BI Coach is a chat bot for building better habits, interacting with user and guiding for building lifestyle and listing the where the body is lacking in the day to day.
- Get personalised suggestions at the click of a button with unlimited check-ins.



Training

- Live Instructions for workout
- Smart In the moment guidance to check if the training is done properly
- Different types of personalized training programs for different things like losing or gaining weight etc.
- Training programs are recommended based on the user's weight, height, BMI etc.



Bolt Connect

- Users can easily connect Bolt gears to get data from their devices
- 3 type of devices including 2 type of Wrist bands and Stride sensor or Footpad can be connected for tracking activities.
- Bolt gear impacts activity and sleep data.
- Users can gather data in the Offline mode
- Can fetch data from other brands devices (Fit bit, Adidas, Nike) also using their third party services.



Workouts

- Specially designed workouts videos for weight gain, weight loss, improving endurance with 3 intensity levels. (High, Medium and Low.)



Challenges

- Challenges with other users of specific kind of workout to stay motivated.
- Leader board for publishing results of the participants.



Sleep

Track of sleep with its Bifurcation as:

- Bed time, wake up time
- Toss and turns, light sleep
- Bed in time, disturbed sleep



Health Vault

- Tracking BP, Glucose & cholesterol
- Helps in tracking lab tests & other diagnosed condition



Partner Apps

- Extracts data input from other fitness applications installed in the Users phone



Nutrition

- Track and suggest day to day nutrition as per user's need



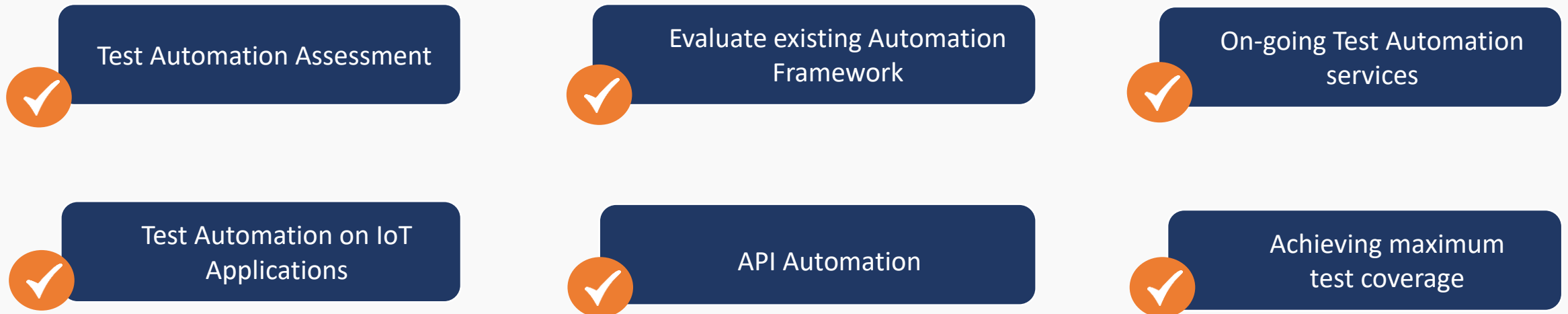
Activity

- Track of day to day activity like steps, distance, power walk, running, stair count, sleep, active time, resting time, leisure time etc.

About Client:

- Client is a Belgium based company which specialises in offering a full range of application interfaces and web services to facilitate the integration with the customers' platforms, enriching smart homes and buildings.
- Client provides a modular approach to integrate old and new technologies, such as smart meters, optical meters, sockets, switches & the online services are used via modern user interfaces like smartphones, pc's and digital TV.
- Client has a gateway for which smart plugs are paired, Smart plug is controlled with the API which is being developed by the CLIENT.
- Client also has Data Intelligence solutions to detect Water leaks, PV Assistants (Solar Panels), Fridge freezer alerting's, TV alerting's, Oven Alerting's and automatic appliance detection.
- Client was looking for a consultant cum Partner to carry out test assessment, evaluate their existing testing and automation framework and provide ongoing testing services for their **IOT** systems.

Key Business Needs:



Project
initiation

Initial Test
Assessment at
Onsite

Recommendation
on Test Automation
Framework

Setup the test
environment

Testing applications & API's

Overall enhancement
of IoT systems

- TestingXperts (Tx) started the engagement with a team of Test Consultants across Onsite and Offshore to perform initial test assessment
- Tx built a comprehensive testing and automation approach for the client, including recommendations on test automation framework. Tx further built a testing team for the client to work on ongoing testing and test automation activities on their **IoT** systems.
- Components of client's IOT application includes HAM: (Home Area Manager), Smart Plug, Smart DIN Rail Module, Smart Thermostats, Web Application, Smartphone Application, Automatic Appliance Detection, Automatic Intelligent Alerting, Smart Switches, Central Metering and Fifthplay Induction Clamp Solution.
- Tx team suggested to set up an ideal environment that covered most part of the technology and Tx used same APIs to test the system. This way the APIs that client produces were tested.
- Tx proposed Service Virtualization which in turn helped to remove the dependency of physical devices
- Tx Team also added extra validation steps for the gateway which takes SSH commands. This way all the requests/instructions that were being sent to gateway were noted and nothing was missed. The response was also validated at the different levels (API response, SSH response and the DB status, wherever necessary).
- Tx arranged meetings with different stakeholders & identified, reviewed and enhanced the test cases for automation. Tx did the ROI analysis, suggested ways & helped in improving the Return on Investment.
- A BDD automation framework was developed for client. In order to implement Specflow and BDD process, Specflow and Specflow. MSTest was added to the framework
- Tx automation solution was catering to all the Client's services which included: Device services, Energy Services, Alerting Services, Gateway Services, Becker Services and Thermostat Services

Business Benefits

Testing IoT Applications and API's increased profitability in terms of speed usage and eventually intensified user experience

Overall IoT system quality was enhanced along with acceleration in release timelines

Testing of applications done via IoT specific tools which resulted in achievement of required business objectives

Established and standardized testing processes leading to efficient testing

ROI from testing was significantly improved

Tools Used



Visual Studio 2017
(Community Edition)



Spec Flow



Selenium

A background image showing a close-up of two hands shaking in a firm grip, symbolizing a business deal or agreement. The image is dark and moody, with a large, solid red diagonal shape overlaying the right side. The text 'Thank you' is centered in a white box on the left side.

Thank you