INTEL ROLLS OUT STATE-OF-THE-ART IOT SPORTS SENSORS

Apexon provides real-time data access and user experience

Intel is one of the world's largest semiconductor chip makers, on the leading edge of technological innovation and involved in many aspects of the Internet of Things (IoT) including health, fitness, and sports.

Intel created a new line of sophisticated sensors for sports equipment that can collect and analyze data for various use cases. The coin-sized sensors can be mounted on different types of equipment such as cricket and baseball bats to capture real-time data on a number of different players' bat swings and motions to improve training and skill development.

intel.

🖐 **Founded in 1968**

💲 **+$71B annual revenue**

👥 **+110,000 employees**

🌎 **2030 goal: create technology that enriches the lives of every person on earth**

The potential applications were unlimited, but the sensors also presented some connectivity challenges that Intel had not anticipated.

Apexon began working with Intel in 2014 and was a trusted digital partner. Intel brought Apexon in to assess the technical requirements of the project and propose a solution — one that would enable the exceptional data access and user experience required to deliver on the potential applications for the sports sensors.

THE CUSTOMER JOURNEY

2014	2015	2016	2017	2018	2019

2014
- NDK app scanning
- Android app validation

2015
- Multiple apps validation

2016
- Human subject validation
- Sensor testing
- Cricket - bat and ball validation
- IoT validation - baseball
- Device and apps validation

2017
- Cricket lab extension
- Competitive testing
- App scan renewal

2018
- SMR incremental work

2019
- Windows 10 based app development
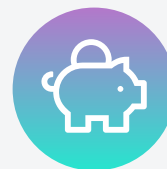
THE RESULTS
KEY OUTCOMES

FASTER TIME-TO-MARKET
Via real-time testing and optimization of sensors

TECHNICAL INNOVATION
With new, market-leading product capabilities

COST SAVINGS
In the set-up of physical infrastructure

THE DIGITAL LIFECYCLE

Apexon works with companies across the digital lifecycle.

GO DIGITAL
LAUNCH & EXPERIMENT

BE DIGITAL
AUTOMATE & ACCELERATE

EVOLVE DIGITAL
BE INTELLIGENT & AUTONOMOUS

Enable digital adoption in a quick, and agile manner

Build digital infrastructure and foundation for enterprises to scale

Leverage data engineering to make strategic decisions and get digital right every time

Understanding the data access and user experience requirements, Apexon kicked off a comprehensive digital engineering initiative from strategy and development through QE.

Working with Intel's team, Apexon conducted field testing at multiple regional levels and championship trophy games to validate sensor data accuracy. The results were displayed during the live telecast.

Apexon installed a cloud application server to store data for future analysis, enable visualization for match or practice sessions, and user registration and mapping.

THE CHALLENGE

TO DELIVER A SEAMLESS USER EXPERIENCE FOR NEXT GENERATION SPORTS SENSORS

Intel is a proven innovator when it comes to creating next-generation technology infrastructure solutions. However, the new sports sensors introduced some challenges even a technology thought leader like Intel had not encountered before.

The company needed to find a way to provide seamless data access and user experience for the sports sensors to deliver on the many potential spots use cases.

Specifically, Intel needed help:

Application development

Conceptualizing and developing an application which would allow coaches and players to analyze and collaborate digitally via smartphones and IoT devices. The solution needed to monitor player performance continuously and provide feedback against predefined goals.

Building infrastructures

Setting up the right physical infrastructure to simulate real-life sporting environments to test the sensors under different conditions.

Accessing resources

Accessing the right resources to execute various sports motions and capture real-time data about them.

Live event solutions

Developing a solution designed to be used during live events and broadcast on air for TV viewers.

Visualizing data

Capturing and visualizing key data elements for intuitive use by players, coaches, and fans.

Improving sensor accuracy

Optimizing algorithms to improve sensor data accuracy.

THE SOLUTION

FORMULATING A DIGITAL ENGINEERING INITIATIVE

Intel engaged Apexon as a digital strategy and execution partner based on its extensive expertise in the product engineering and management of the latest innovations in digital, IoT and wearables.

With a thorough understanding of Intel's needs and expectations, the Apexon team kicked off a comprehensive digital engineering initiative. The engagement was divided into two parts: Development and Quality Engineering.

1. DEVELOPMENT

TThe scope of Apexon's development efforts encompassed all functional flow and requirements, device drivers and algorithms, device interface, mobile application UI and UX, application logic, user dashboard, smart videos, performance analysis, user profiles and management, and reporting. The coin-sized device includes various sensors and a microcontroller with BLE capabilities.

The Apexon team developed drivers for the sensors to receive data and run algorithms on the received data to make a meaningful analysis. The data is wirelessly transmitted to a companion application on a smartphone. It is also stored in the sensor when it is not connected to a smart device.

Key development deliverables included:

Firmware and algorithms for the sport sensor

This enabled the ability to receive data from the device sensors, detect and record key activities such as shots based on a noise threshold, run algorithms to calculate parameters such as shot data, and send that data to the companion application on both Android and iOS.

Android and iOS companion applications

These applications receive, store and display the shot data from the sensor firmware, sync it with the cloud application server, enable visualization with a 3D avatar and control different user modes such as match and practice.

Cloud application server

The application server stores data for future analysis, enables visualization for match or practice sessions, and enables user registration and mapping.

2. QUALITY ENGINEERING

Discovery & Planning

Apexon defined an end-to-end strategy that outlined the most important test scenarios and parameters to be validated.

Ground-Truth Validation Laboratory Setup

Apexon set up a lab and a ground-truth test bench – essentially an indoor cricket pitch. The pitch was surrounded by motion capture and high-speed video cameras to simulate real-time scenarios for developing and validating the sensors.

Field Testing

Working with Intel's team, Apexon conducted field testing at multiple regional levels and championship trophy games to validate sensor data accuracy. The results were displayed during the live telecast.

Coverage, Execution & Reporting

The optical motion capture system was tweaked to capture real-time Cricket bat swing data.

3D Motion Capture

This enabled the capture of movement of the selected object from all angles to get a better idea of the 3D angles.

Data Analysis and Algorithm Optimization

Data was captured for various parameters such as hand speed, hip speed, swing plane, hit angle, etc.

Statistical Models

Created to analyze the data and alter the algorithms to improve the accuracy of the sensors.

![Apexon logo]

Apexon is a pure-play digital engineering services firm focused on helping companies accelerate their digital initiatives from strategy and planning through execution. We leverage deep technical expertise, Agile methodologies and data-driven intelligence to modernize systems of engagement and simplify human/tech interaction.

We deliver custom solutions that meet customers' technology needs wherever they are in their digital lifecycle. Backed by Goldman Sachs and Everstone Capital, Apexon works with both large enterprises and emerging innovators — putting digital to work to enable new products and business models, engage with customers in new ways, and create sustainable competitive differentiation.

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FEELING SOCIAL?