IoT Platforms for
Smart Warehousing

As consumer goods organizations digitize the value chains, a key consideration is to improve their business operations and processes leveraging IoT enabled solutions.

One such area is warehouse management, where issues such as delayed deliveries, missing products due to human error, operational inefficiencies due to lack of equipment tracking etc., must be addressed. IoT solutions play an important role in delivering enhanced customer experiences by providing quicker and faster warehouse shipments.

To fulfill these consumer expectations and overcome operational challenges in warehouse management, CPG companies should consider the adoption of platform-based strategies.

At its core, HCL's solution for smart warehouse management offers the following capabilities:

Connectivity Management
To connect various devices, systems, and networks in an IoT ecosystem

Data Aggregation and Storage
To collect data from devices and systems, and store them for further processing

Application Enablement
To build custom IoT solutions for the chosen business use case

The dark assets are energised or 'things' are IOT-zed

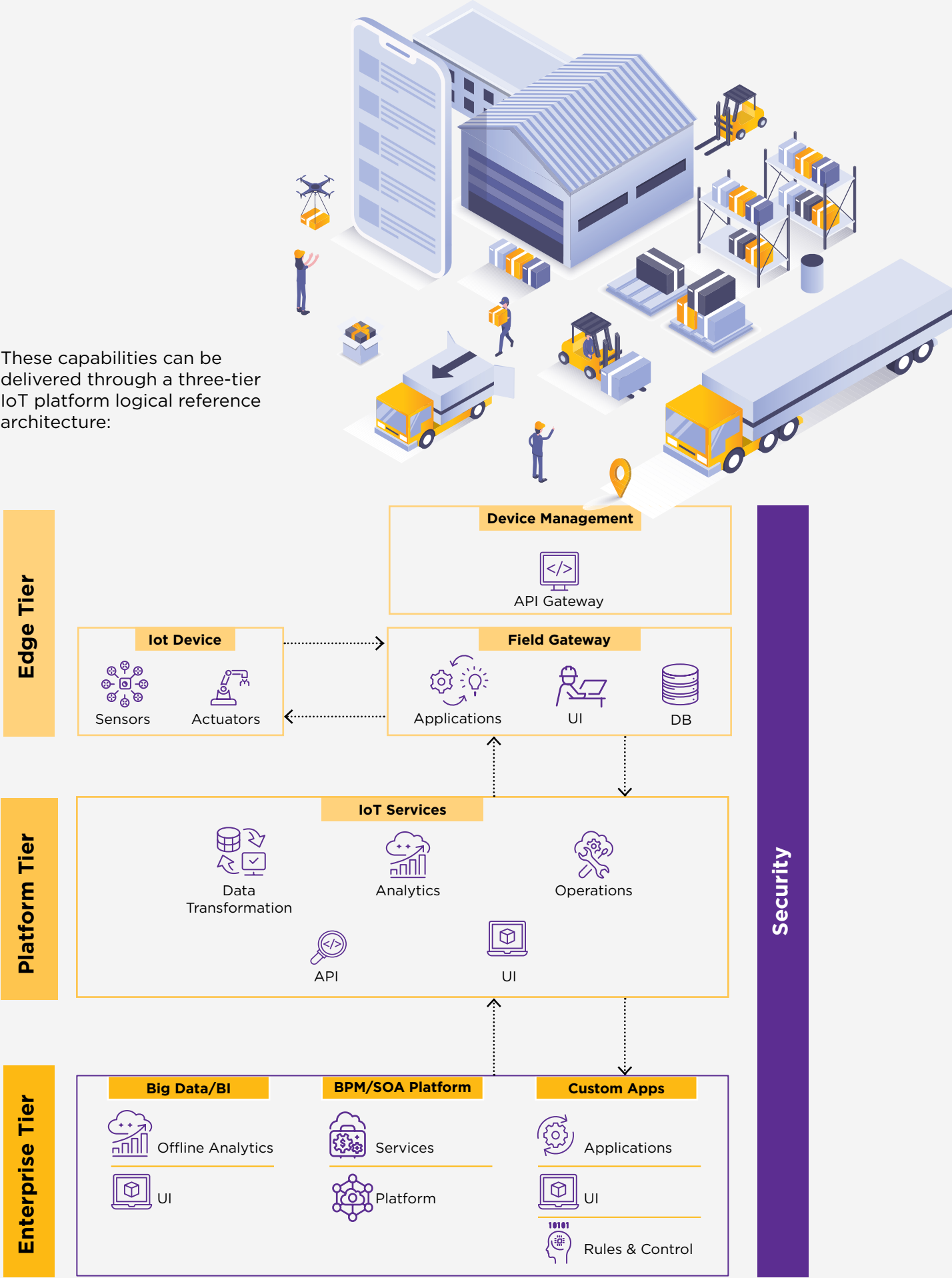Data gets generated and analysed to gather insights

Insights drive fundamental shifts in the processes and the people practices

HCL's approach is structured around the emergence of an IoT ecosystem which has given rise to an asset value chain. This comprise connected ecosystem of data, process and people.

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These capabilities can be delivered through a three-tier IoT platform logical reference architecture:

Edge Tier

Device Management
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API Gateway

Iot Device
Sensors
Actuators

Field Gateway
Applications
UI
DB

Platform Tier

IoT Services
Data Transformation
Analytics
Operations
API
UI

Enterprise Tier

Big Data/BI
Offline Analytics
UI

BPM/SOA Platform
Services
Platform

Custom Apps
Applications
UI
Rules & Control

Security

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1 **The Edge Tier**

Edge tier consists of assets/devices such as containers, forklifts, lights, etc., that are IoT-ized with the help of various sensors and actuators. These IoT-ized assets transmit data/messages to a field IoT gateway device, e.g. the current temperature sent from a temperature sensor on a device.

IOT Gateway (Edge Tier)

- Device management
- Bi-directional communication support
- The IoT Gateway supports multiple protocols and data formats
- It also supports secure authorization at the edge

2 **The Platform Tier**

This tier consolidates, processes, and analyzes data flows from the edge tier and provides management functions for devices and field gateways. This tier receives, processes, and forwards control commands from the enterprise tier to the edge tier.

The IoT platform gathers in-transit inventory data from all vehicles and warehouses

Data from field gateways of multiple warehouses is moved to a centralized platform

Data Aggregation and Storage (IoT Platform Tier)
Multi-modal database support such as relational, key value, document, and graph, stream processing, remote data synchronization

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3 The Enterprise Tier (application enablement)

This tier receives data flows from the edge and platform tiers and issues control commands to these tiers. The enterprise tier implements enterprise domain-specific applications, decision support systems, and provides interfaces to end users, including operations.

Below are some of the features that are enabled by HCL's IoT solution for smart warehousing.

Inventory management and tracking
Real-time visibility of stock from the product's arrival to the warehouse to its delivery to a shopper's doorstep

Resource allocation and task automation
Automate repetitive tasks and allocate the workforce more efficiently

Worker safety
Automate workers' safety and action with the help of multi-sensor wearable device and real-time location tracking

Path routing for AGVs, AMRs, and forklifts
Determine how and where goods, equipment, and people should move within the warehouses

Space optimization
Find the best way to pack a space/container using 2D and 3D space layout algorithms

Predictive maintenance
Collect and analyze data from multiple equipment to activate preventive actions

Building Optimizations
Energy optimization and remote monitoring

Product quality tracking
Gather quality information from several steps of product storage and processing to ensure high product quality

Real-time alerts
Timely alerts of respective information to field operators and business level executives

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Benefits of using HCL's IoT solution for your warehouse

Increased operational efficiency through automation, thereby leading to decreased costs, labor, and overhead requirements

Improved supply chain visibility, thus improving visibility of demand, preventing stock-out, and inventory shrinkage

Improved last-mile delivery, enabling delivery trucks to collect orders more efficiently, because of improved space utilization and path routing

Reduced maintenance cost and maintenance downtime through better monitoring

Higher employee productivity

Safer working environment

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Case Study

The Challenge: The organization wanted to build a connected and smart distribution and logistics network to meet the customers' expectation of faster delivery.

Client : The Digital Transformation Journey of Packaged Ice Provider

Our Solution: 3-Tier IoT Platform Ecosystem Solution

Connected Smart Ecosystem	Improved Routing & Fleet Management	Improved Analytics & Reporting	Enhanced Handheld App	Remote Equipment Maintenance

Transformation Benefits

Financial Growth

- Enabled more avenues for sales growth e.g. e-commerce
- Reduced labor cost by bringing in efficiencies

Improved Efficiency

- Automatic order creation and invoice generation using IoT
- Remotely maintain equipment and improve productivity
- Improved routing and fleet management

Customer Satisfaction

- Improved transparency by providing up to date delivery and order fulfilment Information
- Improved issue resolution time
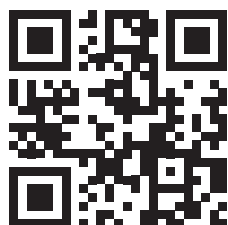- Improved customer service feedback

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For more information
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HCL

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