

# THE EDGE IS WHERE THE BUSINESS IS

A Compendium of Edge Computing Case Studies

May 2021



**NASSCOM<sup>®</sup>**



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Automotive, Branding & Marketing, Consumer Electronics, Energy, Food Processing, Gaming, Healthcare, Infrastructure, Medical Devices, Railways, Technology, Telecom

# Foreword



**Debjani Ghosh**  
President  
NASSCOM

With the proliferation of technologies like IoT/IIoT, AI/ML, big data analytics, AR/VR/MR and others, data generation and consumption is increasing exponentially. What is also expanding in the strides that technology research is taking in analyzing this data at the very source of or very near to its origins. If cloud called for a centralized infrastructure to process data, the emerging area of Edge Computing is changing this model to a more decentralized version.

If the Internet of Things (IoT) re-defined the term hardware to include non-conventional (from a tech angle) devices like cameras, machines and other industrial equipment, edge computing is repositioning infrastructure boundaries to include manufacturing units, telecom towers, warehouses and even homes and public infrastructure. As a result, cloud is now moving to the edge.

With the COVID-19 pandemic as the catalyst and the resultant work-from-anywhere trend, demand for edge solutions has grown and will continue to grow over the next 8-10 years. As companies recognize its importance, we are seeing telecom equipment & service providers, cloud hyperscalers and cloud solution providers progressively shift towards an edge strategy and build solutions and partnerships around edge computing.

At NASSCOM, we view edge computing as an extension of IoT and envisage growing use cases across verticals particularly manufacturing as part of the Ind 4.0 movement. Globally, this segment is growing at over 35% and is estimated to cross \$60 billion by 2028.

We have put together this compendium of edge computing case studies to highlight the role that Indian technology companies – large, medium and small – are playing in enabling edge solutions that impact user experience, improve utilization & effectiveness of equipment, automate processes and help in preventive/predictive maintenance.

I hope you find this report useful. Please do write in with your feedback/comments at: [research@nasscom.in](mailto:research@nasscom.in).



# Objective

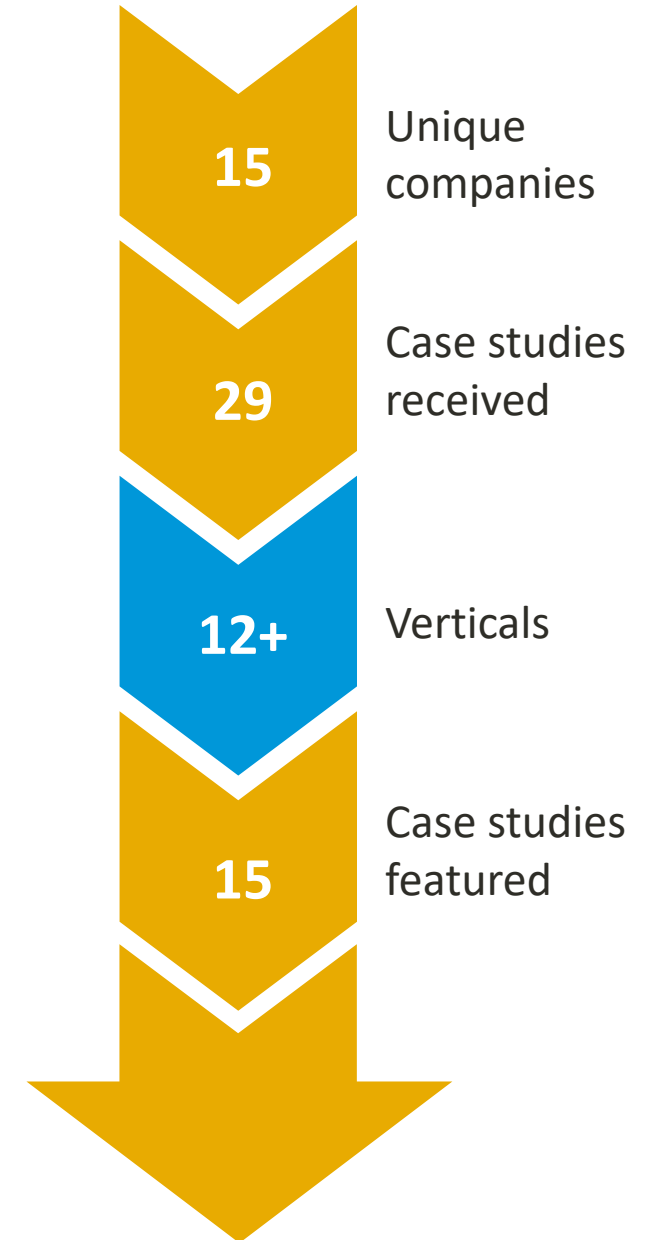
Edge computing is rapidly becoming a mainstream technology, a must-have for enterprises that want to gain a competitive edge over their peers. Today, when the speed of delivery is seeking to match the speed of light itself, staying ever closer to the client is becoming almost mandatory.

The need for and the urgency of maintaining social distancing, demand for contactless solutions and near real-time data analysis driven by the COVID-19 pandemic, is further pushing enterprises of explore the opportunities from edge computing.

NASSCOM began tracking this segment in 2019 and published its first report titled “[Edge Computing-Towards A More Distributed Future](#)” in Dec-2019. It presented the basics of edge computing incl. some myth busting and also highlighted edge solutions & service offerings of companies in India.

One of the best ways to get a wider acceptance of emerging technologies is to evangelise success stories. And this 2021 issue of NASSCOM’s edge computing report does just that:

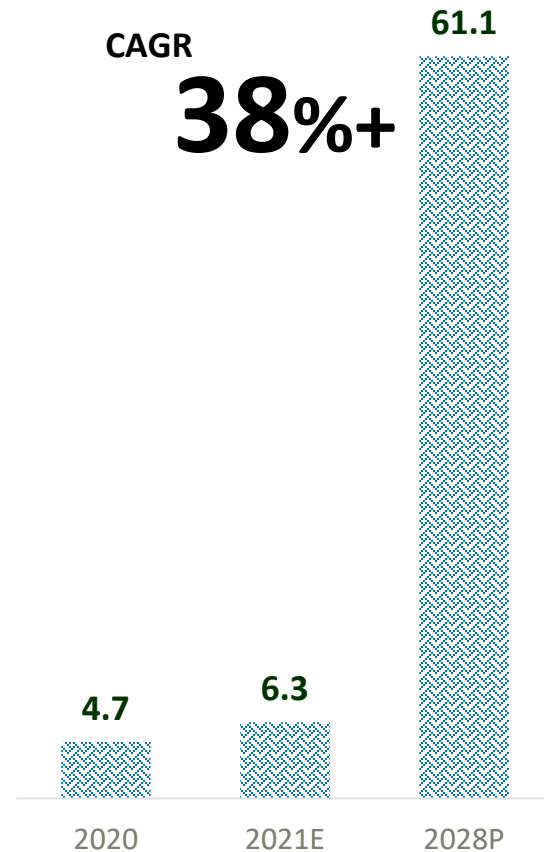
- Showcases 15 case studies of edge deployments across verticals ranging from Branding & Marketing to Telecom to Food Processing, among others
- Highlights the business benefits and RoI from these edge investments
- Explores the ingredients that go into making edge deployments successful



# Edge Computing: Global market to grow ~10X by 2028 driven by IoT, networking, 5G

## Global edge computing market

\$ billion



## Key trends



**PUSH FACTORS:** 5G, network virtualization, online gaming, streaming services, video conferencing driven by work from anywhere (WFA) trend due to COVID-19



**KEY VERTICALS:** Manufacturing (smart factories-IoT/IIoT), Energy (smart grids), Consumers (home automation), healthcare (remote patient care), Education (online learning-AR/VR)



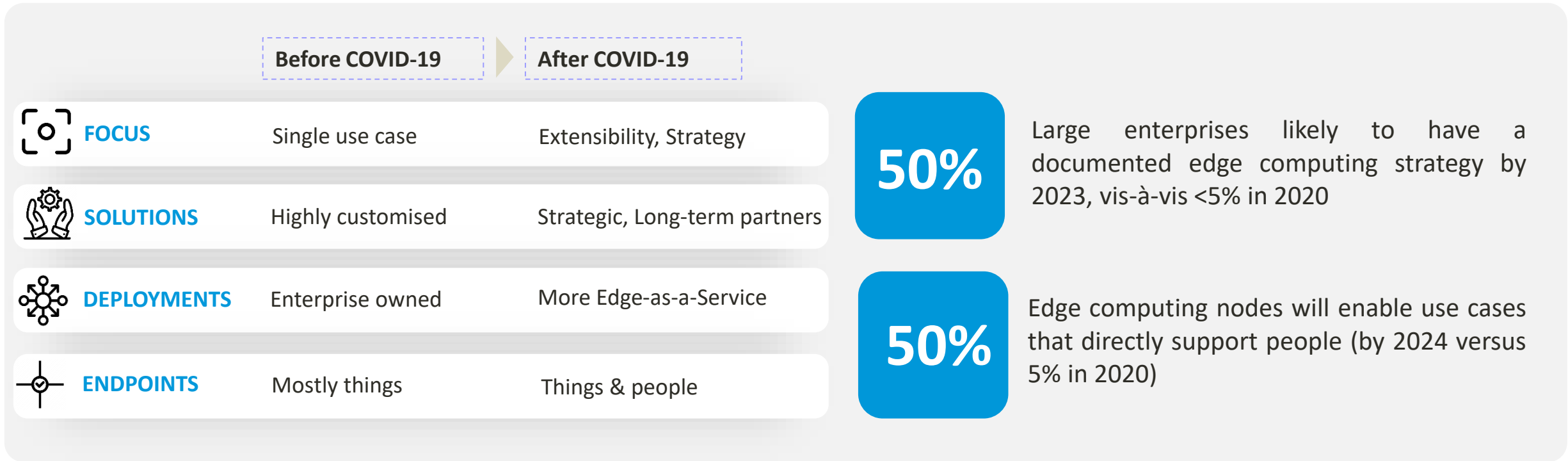
**COVID-19:** Accelerated edge computing deployments to facilitate social distancing, contact tracing & ensuring a safe workplaces

Going forward, enterprises' cloud roadmap will **increasingly integrate** an edge strategy as well

Partnerships with Telecom operators and CDN players would play a prominent role in unlocking **value of edge computing**

**Core skills:** Edge computing architecture, systems design, edge security, edge orchestration

# Use cases continue to expand; pandemic-caused shift from PoCs to large scale deployments

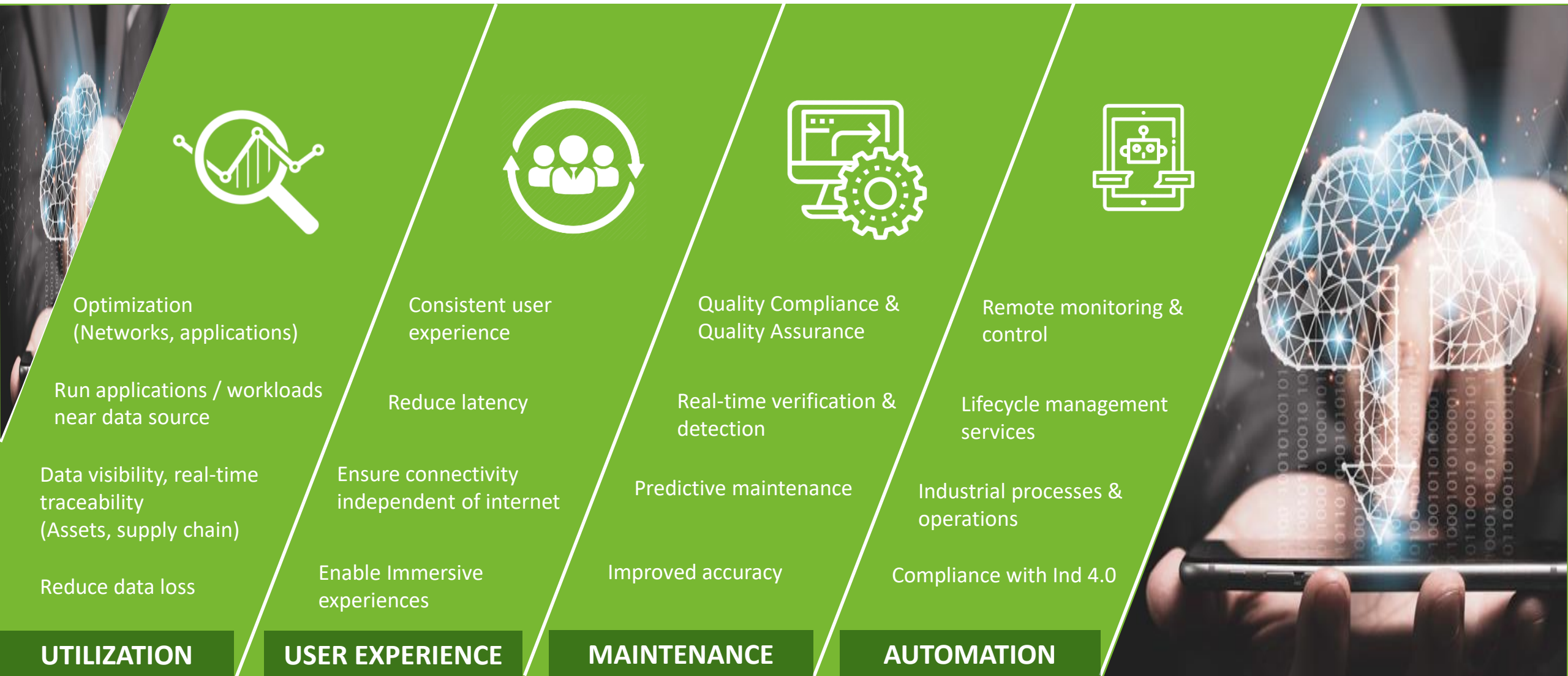


## India: Edge Computing developments

- NTT Ltd. and AlefEdge announced their collaboration in India to deliver the power of 5G based Edge Internet to application developers
- Adani Enterprises and EdgeConneX announced the establishment of a 50:50 joint venture, AdaniConneX. The JV will develop and operate data centers throughout India. In addition to full scale data centers, it will also develop a portfolio of edge data centers strategically located throughout India that will support the need for more proximate capacity
- In Oct 2020, Wipro announced its acquisition of US-based Eximius Design, that provides end-to-end solutions and services for building smarter, smaller and faster connected products for various use cases of Edge Computing, IoT, Ind 4.0, Cloud, 5G and AI

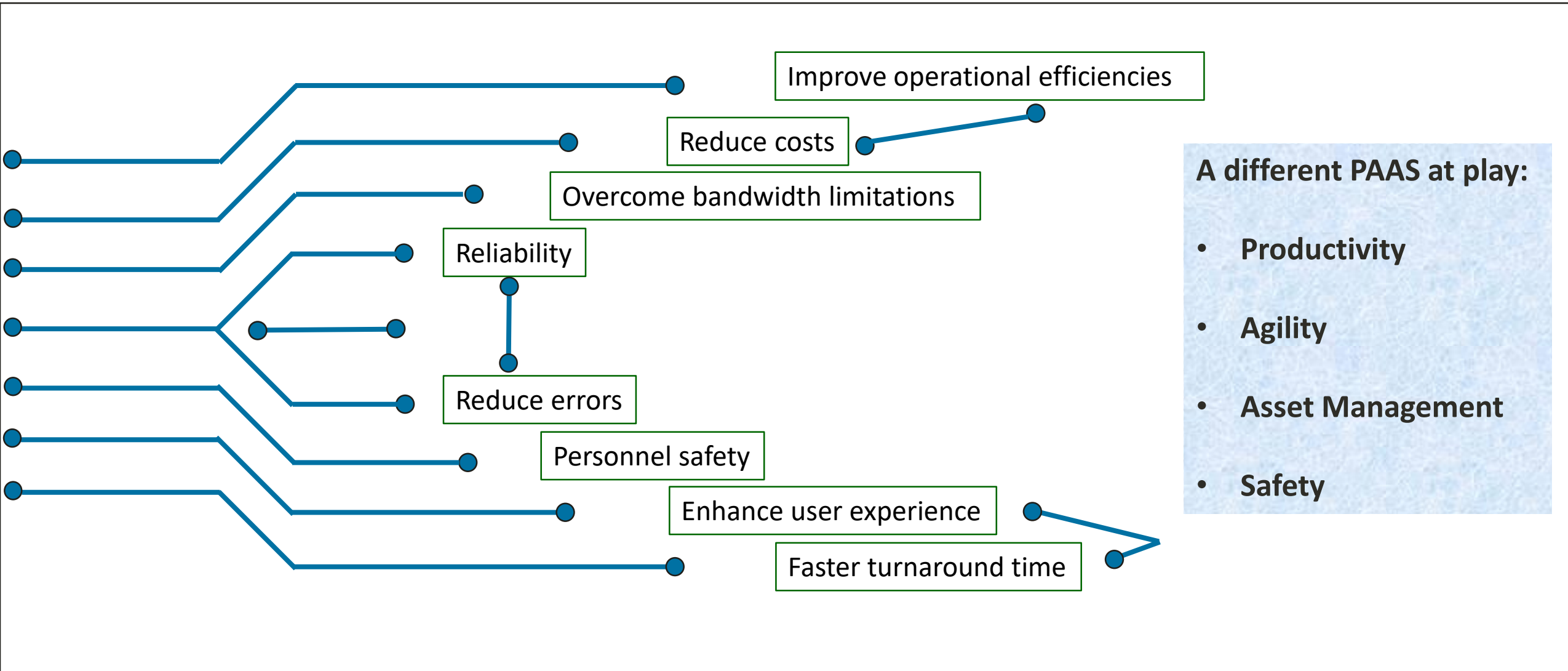
# India's technology industry is enabling deployments across a wide spectrum of use cases

Illustrative



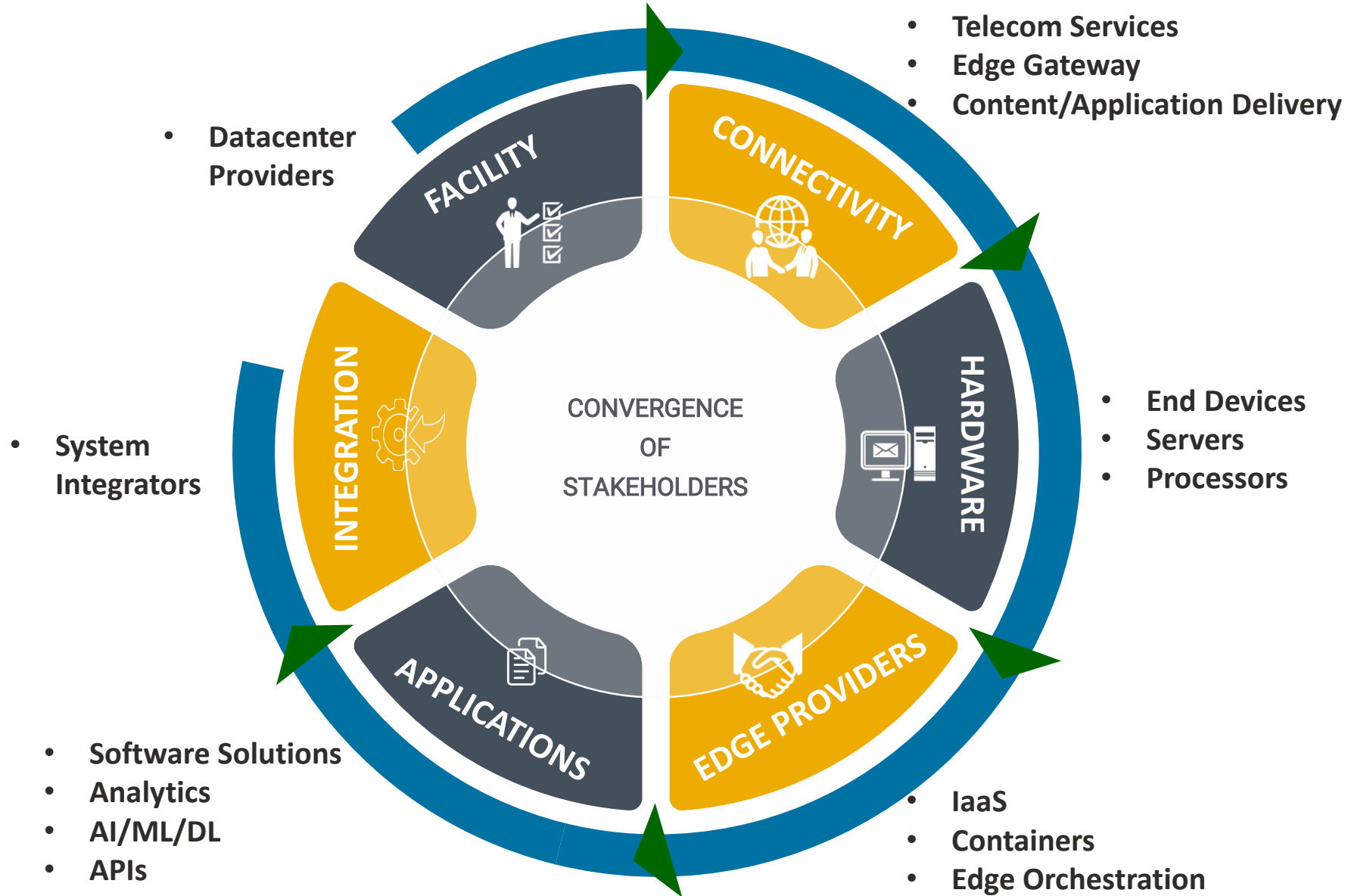
# Setting specific KPIs will be important to mature from pilot stage to production

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# Integrated Ecosystem Partnerships, the key ingredient to successful edge deployment



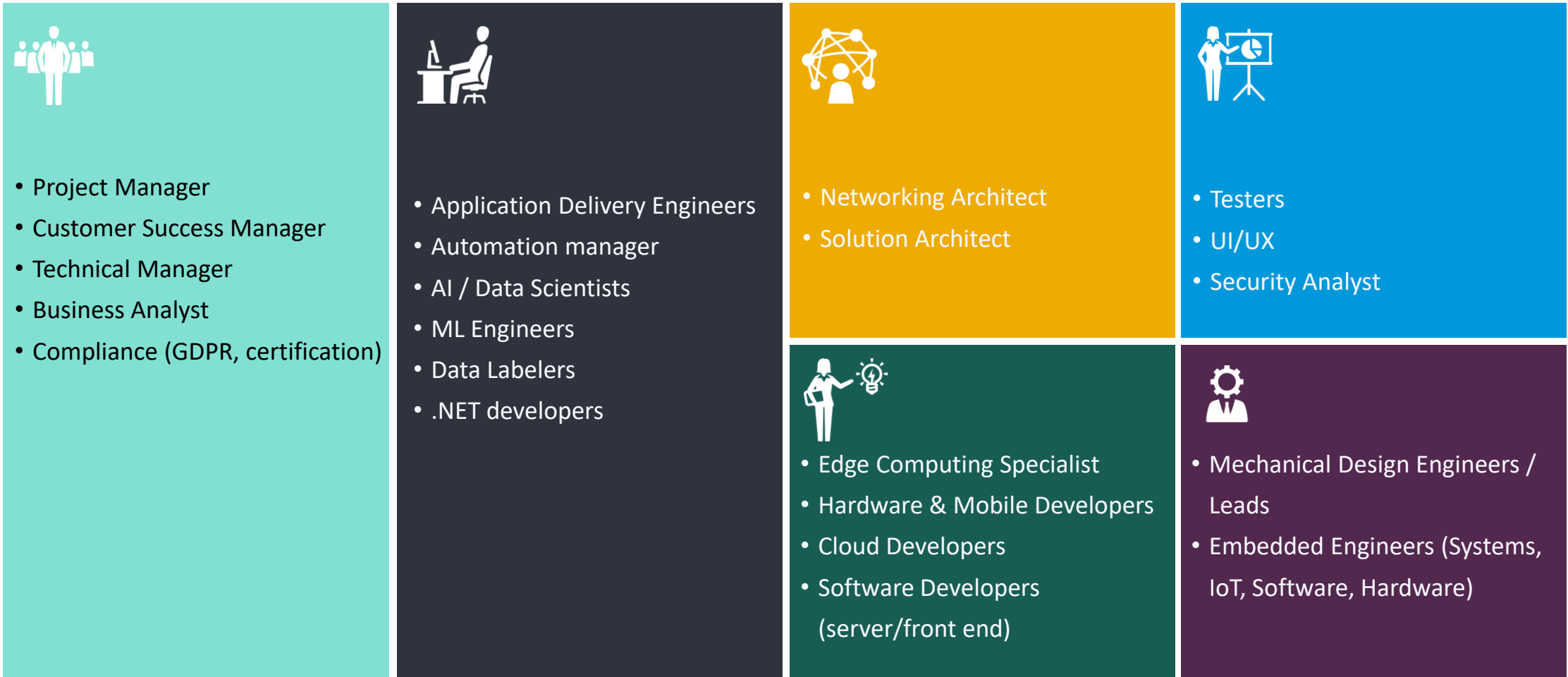
*Illustrative*

## Enabling:

- Faster time to market
- Different use cases
- End-to-end edge stack
- Lower cost of investments

# Team Composition spans managerial, technical and specialists...

*Illustrative*



# ...Seeing an Intersection of skills – software, hardware, middleware, cloud, digital

*Illustrative*

## Internet

- SIP (Session Initiation Protocol) communication

## Hardware

- Sensors
- Wireless Sensor Networks
- Cloud Server

## Cloud

- Cloud Native skills
- Azure IoT Suite, Azure Log Analytics
- Microservices Architecture
- Containerized Applications
- Kubernetes based Container Orchestration

## IoT, Edge

- Edge Computing, Processing, Inference
- Edge AI, AR applications
- Edge PaaS
- Microsoft IoT edge, Azure IoT stack
- GPGPU computing
- RSU Hardware Acceleration using GPU

## AI

- Deep Learning at the Edge
- Computer / Machine vision
- Image Processing
- Model Training, Validation
- AI & ML, Analytics
- Tensorflow framework

## Databases

- Cosmos DB

## Telecom & Networking

- Ethernet
- SD-WAN, LoRaWAN
- BLE/Bluetooth
- MQTT, MQTTS

## Software

- Security
- .NET, Ionic Framework
- Custom Vision API, Power BI Visualization
- C, C++, Shell, Python, Linux
- Device Drivers
- Proto Buffer

# Conclusion: Some key components to get right for your edge strategy



**Partnerships:** Across the ecosystem that can sustain over the long-term, ensure robust supply chain, provide access to customers



Strong **Security & Resiliency** measures: Ensure no compromise of hardware, devices, applications, data and operations – design Governance frameworks for device connectivity, access management, BCP/DR



**Pricing:** As customers shift from PoC to full scale implementations, Edge-as-a-Service / Pay-per-use / Pay-per-transaction provides the flexibility to ram up/down



**Integration & interoperability:** With an ever expanding and complex set of devices, platforms, software, protocols, it is imperative to ensure seamless integration from edge to cloud



**TCO:** Understanding and estimating the **TCO** across the edge stack – infrastructure, hardware, devices, utilities, platforms, software, professional services, change management – Must be clearly defined and then mapped to the expected Rol



**Skills:** A mix of generalists and specialists covering edge applications/workloads, hardware engineers, cloud, IoT, embedded system engineers, cybersecurity specialists, among others



# Success stories: RoI - Productivity gains, cost savings, faster GTM, efficiency improvements



**Customer:**  
Moxie Print, USA

**Implementation year:**  
2020

**Project maturity:** Full scale  
Implementation, Commercial Deployment

**OBJECTIVE:**

Create an enterprise-wide private edge to improve applications experience for employees & optimize networks and applications at the Edge through APIs

**PRIVATE EDGE SOLUTION & APPROACH**

Alef Private Edge (APE) is an easy-to-use Edge as a subscription service for enterprises to accelerate their Digital Transformation with 5G Edge services today.

With APE, Moxie Print connected to the nearest EdgeNet site based in Secaucus, New York & subscribed to Gold Tier offering. Moxie Print was able to upgrade its legacy network with CBRS, program applications with new reusable APIs & connectors through open architecture securing its network and business application.

Moxie Print was able to solve its application performance, security, management and mobility issues for their in-office and remote workers.

**Return on Investments**



- 62% higher data throughput
- 48% increase in network efficiency



- 2.1X better video resolution
- 1.7X faster startup time
- 100% secure zero trust networking



- Better employee experience resulting in improved work engagement



- Pay as you Go - No upfront Capex
- Easy to use Edge-as-a-Service subscription

**PROBLEM STATEMENT**

- Slow applications, limited on the fly upgrade/ update capabilities
- Need for new application (low latency) & improve speed of existing apps
- No mobility & security for applications, so remote working was very difficult
- High network cost

**CHALLENGES**

- No physical visit possible or in person discussion for requirement understanding
- Because of Covid-19, remote deployment was performed with complete automation

Post-Implementation – Remote monitoring and support was handled by managed services team using dashboards and analytics services

**USP**

- With plug & play technology, Moxie Print was able to avail 5G Edge services with no CapEx or dependency on a Telecom Operator for connectivity and edge services
- Allowed access to open, programmable API-based application ecosystem with secure Mobile Breakout enabling new Edge native, Edge enhanced applications with upto 80% savings through optimized least cost routing



**Customer:**  
A Global consortium of CSPs

**Implementation year:**  
Nov-2019 to present

**Project maturity:** Pilots ongoing

**OBJECTIVE:**

- Explore advance Edge Computing topics like Global Edge Computing services via a Federated Interconnect solution, Smart Discovery of Edges and Mobility
- Use these learnings to provide inputs to Specification Design Organizations

**EDGE SOLUTION & APPROACH**

- Definition of the complete architecture of ENSCONCE (EDGE Platform) deployment in multiple CSPs environments and connected via a Federated Interconnect
- Provide controls to each CSP so they can control how much of their resources they want to offer to any of the federated partners
- Global view of deployed Edge Sites for the Operators and the Application Providers
- Multiple policy controls for the operators to influence Edge Allocation for any application while also considering Application requirements
- Flexible deployment model for Operators with each operator choosing whether they want a Bare Metal based deployment or a Virtualized deployment via their NFVI

**USP**

- Solution enables CSPs the capability to offer global deployment capability to their ISVs and Enterprise customers while still owning their resources (as against an aggregation model, where each operator would have to lease out their resources to a 3rd party Edge Aggregator)
- Capability to orchestrate low latency edge applications on geographically distributed edge sites in close vicinity to application clients, and to do this dynamically based on Client interaction via the Client APIs provided by the platform
- Detailed Orchestration controls both to Operators and to Application Providers

**Return on Investments**



- Offer global view of their Edge Computing services via Federated Interconnect partnerships



- Evaluate and devise new business models based on their extended reach via Federation



- Orchestration of low latency edge applications across geographically distributed edge sites



- Enhanced developer experience in using edge computing services from CSPs

**Customer: Leading automotive Fortune 100 MNC, India**

**Implementation year: Dec-2019 - Ongoing**

**Project maturity: Full scale deployment on 1 Nutrunner line with 11 Nutrunners**

**OBJECTIVE:**

- In-Process Quality Compliance Enforcement of Nutrunner operations
- Maintain traceability data for Nutrunner operations

**PROBLEM STATEMENT**

- Eliminate defects and rework due to improperly fastened bolts in Engine Assembly
- Reduce costs

**EDGE SOLUTION & APPROACH**



- PlantConnect SFactory Edge Gateway and a separate on-premises server are deployed
- Edge gateway module reads data from each Nutrunner station directly and in real-time and also from a PLC (Programmable Logic Controller) that controls conveyor for the line. It executes quality checks for torque and angle. If the checks fail, the line is stopped (interlock) and operator is notified
- The solution ensures that the engine assembly is not allowed to move on till required quality is achieved at current station
- In addition to on-line quality enforcement, it provides data historian, traceability, failure alerts, analytics, operator behavior data, reports, etc.
- The solution is working successfully on this line and has improved quality to ~100%. Soon, it will be replicated on 10 more similar lines in the plant

**USP**

- Interlocking with conveyor to ensure ~100% quality adherence

**Return on Investments**



- Improved quality from the previous average of 93-95% to ~100%



- No rejections of delivered engines due to nut tightening issues



- Productivity improved due to elimination of re-work



- Reduction in inspection and re-work costs





**Customer: A leading pharmacy automation company, USA**

**Implementation year: 2019 – 2020**

**Project maturity: Full scale implementation**

## Return on Investments



- 20% improvement in accuracy compared to legacy system



- 30% reduction in inventory stock-out incidences through real-time notifications and proactive replenishment alerts



- High model accuracy of classification and counting of medicine vials and injections - 91% mAP (mean Average Precision)

### OBJECTIVE:

- Build a computer vision-based, automated medical inventory counting solution for hospital operating rooms and pharmacies

### EDGE SOLUTION & APPROACH

- Solution concept blueprinting, patent database research for assessing concept originality and possible infringements on existing patents/applications
- End-to-end solution development and prototype creation:
  - Mechanical fixtures for camera mounting
  - Image input pre-processing in a multi-camera set up – image stitching, tuning
  - Input image annotation for 14K+ full HD images
  - Infrastructure specification and provisioning for algorithm pipeline management (train, validate, infer)
  - Algorithm training with 8 iterations of transfer learning using Tensorflow 1.8.0
  - Validation, edge porting optimization and inferencing

### CHALLENGES

- Evaluating concept originality and ensuring the solution has no patent infringement
- Capturing and tuning image input with low-light and occlusion in field of view
- Accurate and real time detection, identification of multiple medicine types, counts and orientations present in the drawer

### PROBLEM STATEMENT

- RFID based legacy inventory management solution having accuracy related issues
- Need for an alternate solution for automated medicine inventory counting with better accuracy

**Customer:** Leading manufacturer of submersible pumps, India

**Implementation year:**  
-

**Project maturity:**  
-

- OBJECTIVE:**
- Make legacy devices like Pumps and others, compliant with Industry 4.0
  - Enables Edge computing and Remote monitoring & control of Pumps over the cloud

**EDGE SOLUTION & APPROACH**

- Developed “iNetra” which acquire vital parameters from pump
- iNetra collects data like temperature, moisture sensor, energy meter parameters and send this data to cloud. But this same date is used for edge compute for any decisions at the device end
- Current/Voltage/Temperature thresholds are set on device, the device takes runtime decisions based on the threshold values. It can switch on/off the pump on alarm values
- “iThings” an IoT cloud used to store, visualize, and act on data
- The complete pump process can be mapped into the system using decision tree
- Advance analytics give early anomaly, performance KPIs, etc.

**Return on Investments**



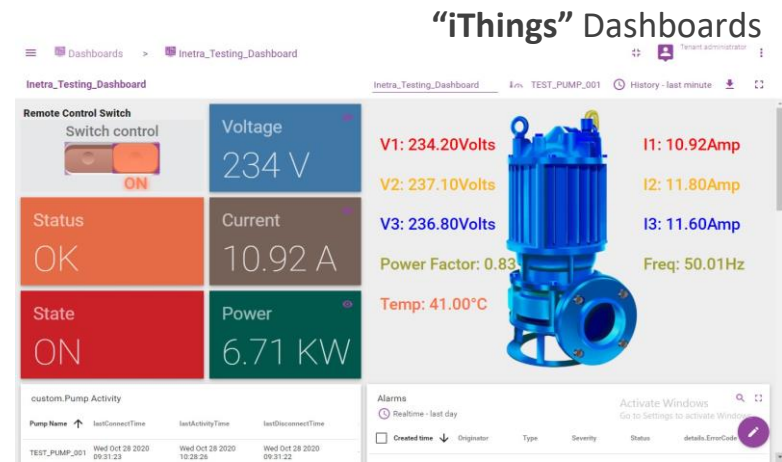
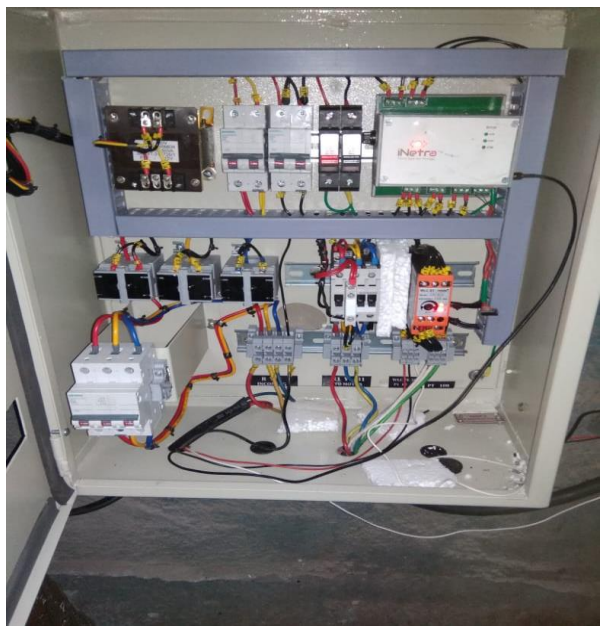
- Advance analytics improve the product quality, reduce cost



- Better visibility of pumps in the operation - improved serviceability & warranty



- Improved downtime by predicting anomalies, better inventory management



**Customer:**  
Railway Coach Factory, India

**Implementation year:**  
Mar-Aug 2020

**Project maturity:** Full scale implementation – Production from Aug'20

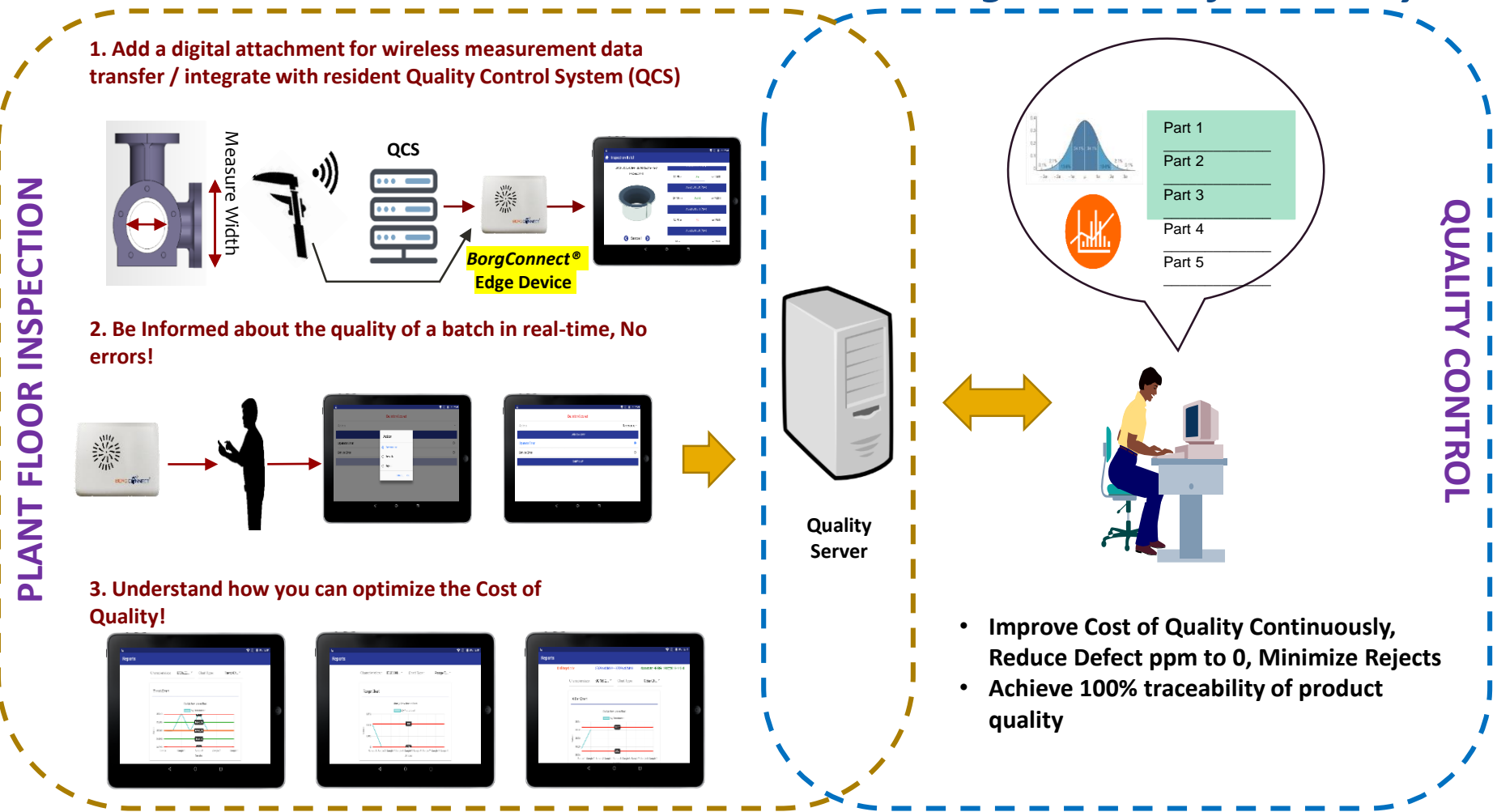
**OBJECTIVE:**

- Elimination of human errors & omissions during quality inspection
- Replace paper records with digital records
- 100% traceability of inspection & quality

**PROBLEM STATEMENT**

- Manual inspection & measurements of quality parameters during production of rail bogies and/or passenger rail vehicles are prone to errors and omissions by quality inspectors
- This leads to external & internal quality failures and increases cost of quality

**EDGE SOLUTION & APPROACH**



# Fifth Generation Technologies: Smart Solution for Railway Coach Manufacturing Quality Control (2/2)

## The Solution

- A tablet-based user interface connected to the Edge Device directly reads dimensional measurements from different gauges and gadgets
- The Edge Device performs computations wherever necessary and flags measurements that are out of tolerance. This self diagnostic error proofing capability greatly contributed to the removal of erroneous inspections

## Challenges

- Complex Measurement Parameters because of large size of Coaches – Made suitable fixturization for all digital measurements
- Multiple types of Measurement devices with varied outputs – Made the system configurable so as to eliminate the need for changes based on the type of devices
- Change Management in using Tablet for inspection. It was felt it is additional work – Overcame by proper education and training on the tool and proving that manual work as well as errors can be considerably reduced



Picture showing multiple quality inspectors at the Railway Coach Factory concurrently using BorgConnect® for Quality solution

## Return on Investments



- 100% traceability of quality at granularity of each batch of production



- 0% errors in Quality Inspection Process from earlier 8%
- 100% compliance of Quality Plan validated in real-time as against ~60%



- 15 % Improvement in number of Inspections per day



- Reduction of Cost of Quality
- Automatic digital recordings of dimensional measurements without user inputs



**Customer:** Leading consumer electronics company with smart home solution, India

**Implementation year:**  
Oct 2016 & April 2018

**Project maturity:** Full scale implementation-full integration with server

**OBJECTIVE:**

- Connect to the Smart Hub from outside the home network
- Connect to third party devices placed inside the home

**EDGE SOLUTION & APPROACH**

- Built a framework on Gateway Device which is portable across any hardware platform. The Gateway framework accelerates support for new sensor, which may operate with different protocols
- Designed the framework such that any new device can be onboarded with very little effort thus giving the ODM the flexibility to allow connecting/supporting variety of devices of different manufacturer within little or no time
- Built an innovative device modeling and a proprietary protocol for Cloud controller to manage the Smart Hub
- Also developed a simple protocol and abstraction layer to securely communicate with sensors across various communication channels
- Intuitive and interactive Mobile App interface with ease of configuration for a home user as DIY

**Return on Investments**



- Within one week, ported Gateway from one hardware platform to another. Earlier it would take 2-3 months



- Quick support of new Gateway Hardware with the built Gateway Framework
- Reduction in 30% of time taken earlier



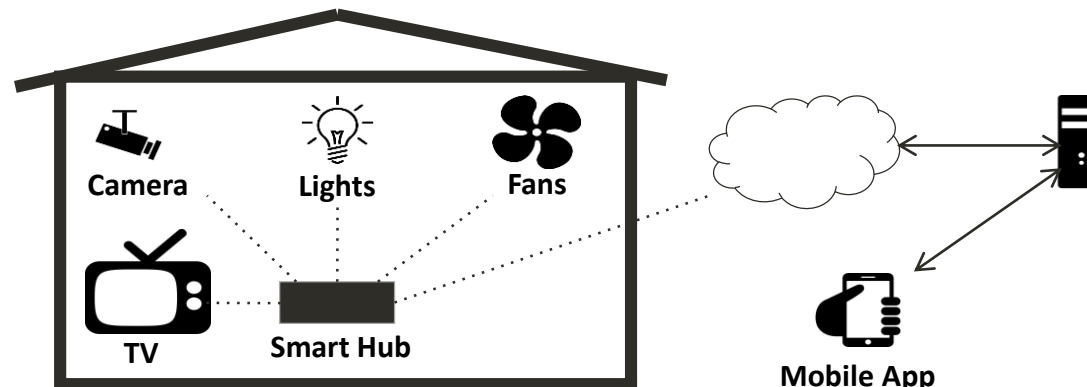
- Flexibility to add and manage new sensors within a week
- Easy to deploy, manage and provision with a Cloud based controller



- 70% reduction in engineering efforts and faster time to market due to innovative device modeling & management frameworks

**PROBLEM STATEMENT**

- Every time they moved to different Gateway hardware platform, it used to take 2-3 months of porting time and additional time to port individual devices



**Customer: Aerial Imaging & Remote Sensing Solution Provider, USA**

**Implementation year: 2018 – PoC  
2019 – Field Deployed for Railway Infra  
2020 – Extension to other Infrastructure**

**Project maturity: Field proven, Re-usable, scalable to other civil Infrastructure**

**OBJECTIVE:**

- Improving quality of video data acquisition
- Anomaly detection using video analysis

**INDUSTRY**

Infrastructure Maintenance (Railways, Roads, Wind Turbines, Pipelines, etc.)

**PROBLEM STATEMENT**

- Increasing operational efficiency and lower operational costs in civil infrastructure maintenance
- Pain points: Labour intensive and requires specialized knowledge

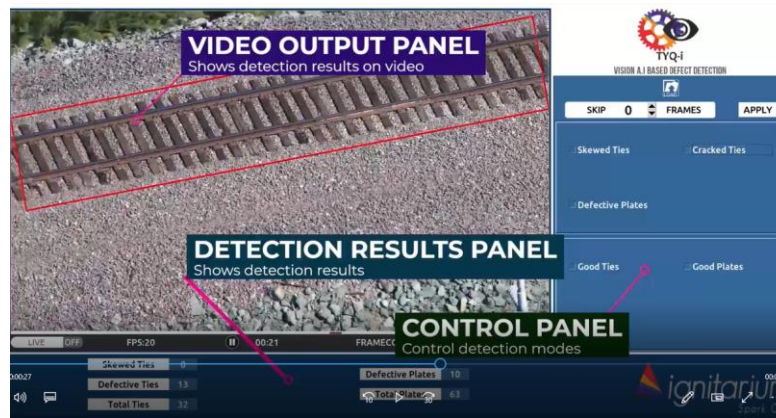
**EDGE SOLUTION & APPROACH**

Efficient data acquisition and automation of data analysis

- Jointly identified specific anomalies of interest (cracked ties, skewed ties, missing bolts on plates)
- Agreed upon flight parameters, camera type, etc.
- Ignitarium developed dynamic camera alignment algorithm targeted to an edge device (NVIDIA Jetson TX2) and deployed it on a hardware platform
- Customer deployed this device and Ignitarium's TYQ-i AI Platform (software) on board the aircraft and acquired video footage of tracks of interest
- From the captured footage, the TYQ-i software automatically detected rail track defects and generated annotated images and reports

**Challenges during implementation**

- Detections of small size anomalies: To be able to detect smaller defects with consistency by implementing custom image pre-processing and neural networks
- Quality of training datasets: To achieve higher accuracy in supervised learning systems, quantity and quality of input data is very critical: Overcome by AI based control of camera view during data acquisition and using a hybrid of manual and automated labeling and pre-processing tools



**Nvidia GPU  
(Anomaly Detection)**



**Nvidia Jetson TX2  
(Gimbal Control)**

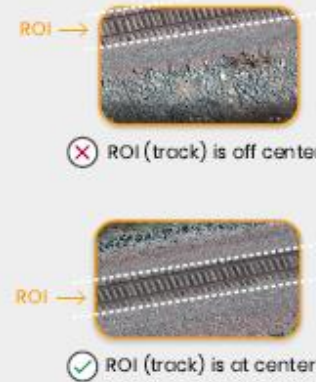
**USP**

- Computer controlled camera gimbal system – Using AI
- Use of custom image pre-processing and neural networks to detect finer anomalies from video footages



# Ignitarium: Smart Infrastructure: AI Enabled Maintenance (2/2)

## Rail track defect detection



## Tower defect detection

- Missing bolts
- Loose bolts
- Warped girders
- Broken girders
- Rust



## Deployment models



## Return on Investments



- Higher analytics throughput – 10X increase in inspection throughput



- 50% reduction in flight crew - Automatic rail tracking and gimbal control software removed the need for manual camera control



- 30% increase in practically usable video footage - Automatic rail tracking ensured frames with “clipped” rail tracks were reduced



- Fatigue-less automatic inspection
- Repeatable insight generation immune to human subjectivity



**Customer:**  
Helios IoT Systems Pvt. Ltd, India

**Implementation year:**  
Aug 2017 - Ongoing

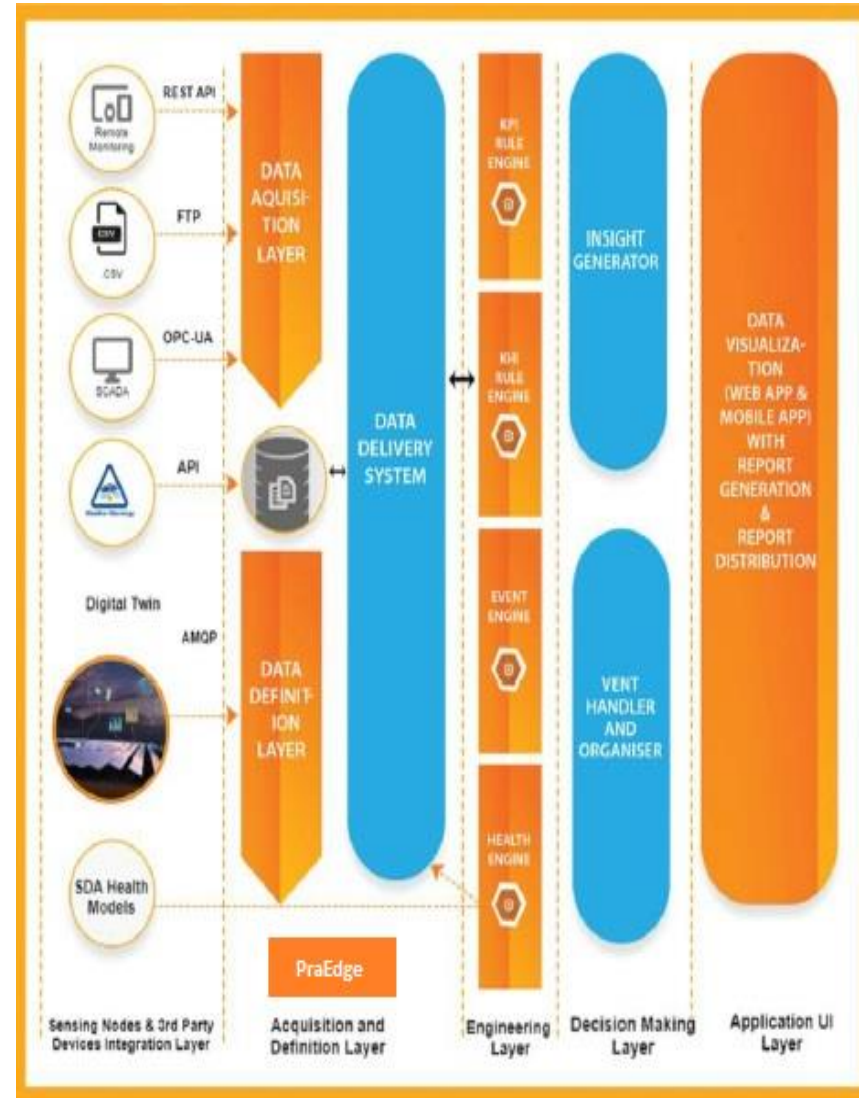
**Project maturity:** Full scale implementation completed. Successfully on-boarded 7 Indian IPPs and EPCs & 1 UK IPPs

**OBJECTIVE:**

Devise an energy analytics solution focused on performance & health related insights for renewable energy assets / plants

**PROBLEM STATEMENT**

- The O&M and Asset Management space in the renewable solar energy market is in dire need of optimization, predictive maintenance, performance intelligence & health analytics solution



**EDGE SOLUTION & APPROACH**



Apollo analytics computation needed data captured from solar plant with accuracy and quality. Pratiti's PraEdge system enabled edge solution to capture this data from field devices. It was used as it is easy & quickly configurable-reduces customer on-boarding time:

- Lite weight and easy to install edge system on-premises/cloud
- Ability to communicate with field devices and RMS/SCADA systems using industry standard protocols such as Modbus TCP and OPC UA, among others
- This integration helped to further manage devices and deliver 150+ KPIs, 50+ Performance insights, 300+ KHIs and 90+ Health insights
- Helios team integrated advanced analytics in the solution to offer Apollo as an energy analytics solution. Helios is now offering the solution to its solar IPPs, EPCs and O&M customers

**USP**

- PraEdge has defined mechanism to interface with variety of sensors, IoT specifications/protocols. It can be leveraged as a Software Edge Gateway with better edge compute capability



# Pratiti Tech: Enable better performance of equipment, reducing generation loss (1/2)

Operations & Maintenance

Asset Management

## Pain points

1. Lack of predictive analytics for critical assets like Inverters, Transformers, Solar PV panels
2. Large incoherent data to analyse & generate meaningful actionable insights
3. Poor asset performance benchmarking
4. Data quality issues
5. Inaccurate decision making regarding health of components
6. Unexpected shutdowns due to orientation of PV panel

## Case Scenarios

1. Transformer Failure - Oil leakage problem: Leads to 6-24 hours of downtime
2. Inverter Failure - IGBT Heat sink problem: Minimum 12-48 hours of downtime
3. Inverter Performance - Early shutdown
4. CB/String Performance - Fuse failure
5. PV Module - Soiling loss optimisation
6. On-Site Issue Log for O&M engineers

## Return on Investments (Various customers)



- Prevented transformer failure - saving generation loss of ~9,500 kWh for a 2.2 MVA IDT
- Prevented inverter failure - saving generation loss of ~750 kWh



- Inverter availability increased to 99% - led to 0.6% higher generation on monthly basis



- Generation loss of ~50 kWh saved per day
- Generation increase of 1.8% and 8% lower cleaning water consumption in 3 months of cleaning optimisation of PV modules



- Manpower time effectiveness up 12%
- 3% lower time to close an issue



**Customer:**  
Various

**Implementation year:**  
April 2020 to till date

**Project maturity:** Implemented pilots and rollout for customers in USA and APAC

**OBJECTIVE:**

Contact Tracing and Social Distancing monitoring for COVID-19 prevention at workspace

**EDGE SOLUTION & APPROACH**

- Proximity Tags on BLE/ UWB and LORWAN for proximity alerts
- Edge processing computes cumulated exposure for each contact based on time and distance and warnings and alerts are generated as per the EDGE computation
- LORAWAN for wide coverage and ease of deployment
- Requires very minimal infrastructure to be deployed in the plant – Bluetooth Beacons and LoRaWAN™ Gateway / BLE Gateway
- Easy to install and maintain
- Low OPEX cost

**Features**

- Local Proximity alerts with Snooze (2-3 m) on the Tags
- Provides good range and battery life
- Proximity History / Contact Tracing using BLE / UWB
- Communication to cloud using LORAWAN Gateways / Bluetooth Gateways
- Analytics and Reports
- Clustering of vulnerable zones

**CHALLENGES**

Remote Installations	Overcome by Pre-configured tags and Gateways, plug n play approach, remote support
Tag Orientations	Overcome by having UWB low cost tags, which provided 360 degree orientation and monitoring
Privacy Concerns	No GPS, no personal data monitored, pseudo IDs based on tag

**Return on Investments**



- Creating sense of safety amongst workers against COVID-19
- Contact tracing incase of infected employee



- Solution as per GDPR compliance
- Cost effective solution for customers



- Extended use cases post COVID-19



- Zone monitoring for cluttering



**Customer:**  
Larsen & Toubro Infotech, India

**Implementation year:**  
Jan-2018 to Aug-2020

**Project maturity:** Full scale implementation

**OBJECTIVE:**

Support monitoring critical health parameters of machines in an industrial environment and raising alerts to maintenance personnel when any of the parameters breach configured threshold values

**PROBLEM STATEMENT**

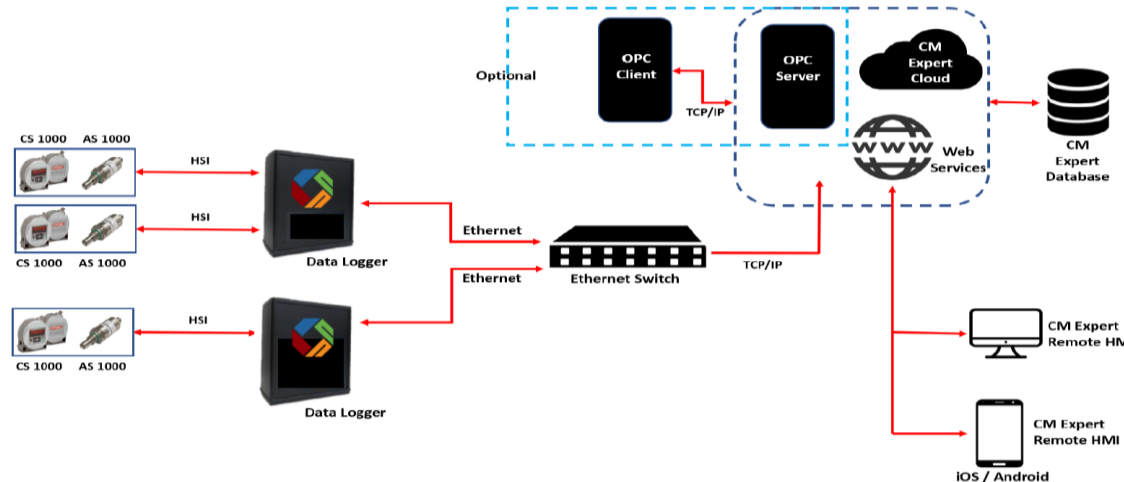
- LTI needed an industrial gateway which can log their industrial sensor data and send data to cloud server periodically

**CHALLENGES**

- Interfacing various industrial sensors for accurate data
- Space constraint in fitting the HMI Electronics – Capacitive Touch, Battery within the available IP66 Enclosure along with the sensors
- Optimized power management for longer battery Life;
- Boot-up time optimization
- Porting Android application from Kitkat to Marshmallow

**EDGE SOLUTION & APPROACH**

- Unizen proposed Industrial Edge Gateway that is logging industrial sensor data over ModBus protocol and sending the raw sensor data to the configured cloud server
- The Gateway supports acquiring data from multiple industrial sensors and sending the data to the Unizen Server. Server Application will be hosted on a server machine on the customer network. Alternatively, Unizen can maintain a private cloud to manage the data from multiple customers with secured access to each customer
- Unizen specified the benefits on cloud server where LTI is free to select on which cloud platform they want to host their cloud server and web application
- Alternatively, if LTI do not wish to host cloud server and web application on their platform, then Unizen can provide a platform to host cloud server and web application to maintain log and database



**Return on Investments**



- 20% cost saving
- 20% lower inventory / inventory costs, etc.



- 30% lower defects or faster detection



- 30% increase in productivity / operational efficiencies



- 50% faster time to market
- 60% improvement in utilization

**Customer:** A leading global solution provider in medical device manufacturing

**Implementation year:**

-

**Project maturity:**

-

## OBJECTIVE:

Automate factory operations and reduce human dependencies to comply with executive mandate for automation with lights out in 3 years

## EDGE SOLUTION & APPROACH



The PLCs (Programmable Logical Control Unit) were connected to IoT Sense using built-in communication protocols like Modbus and Canbus. Various sensors like beam photoelectric sensors for counting output and vibration sensors to monitor machine health were integrated.

A set of pre-defined workflows were set using IoT Sense smart triggers to automate workflows based on data processed through edge computing. Custom real-time analytics dashboards were set up across the shop floor for real-time visibility.

IoT Sense provided AI-based detailed analytical reports and predictions on machine breakdowns and maintenance activities computed at the edge. IoT Sense integrated with external systems like ERP and WMS with its open API architecture to get the relevant business information.

Real-time records were created in these systems by IoT Sense and analytics provided real-time analytics and AI powered reports on predictive maintenance, inventory management and production insights.

The edge computing helped company leverage the existing infrastructure and create a secure data management and processing environment.

They already had set of cameras and other hardware's; we ensured our software is compatible with whatever they already have. So, they don't have to reinvest. IoT Sense is hardware agnostic.

## Return on Investments



- Real-time monitoring with KPIs like OEE, quality and cycle time at plant, line and machine level



- Predictive maintenance
- Alerts and machine breakdown forecasts
- Increased availability



- 15% increase in productivity due to improved WIP visibility
- 20% lower machine downtimes



- 15% scrap reductions
- 500 man-hours saved with process automation & triggers
- Financial benefits: ~\$60,000 per year

**Customer: One of the largest Railways in APAC**

**Implementation year: 2019-2020**

**Project maturity: Proof of Concept**

**OBJECTIVE:**

Design an advanced communication system for emergency response that is easy to use by first responders

**EDGE SOLUTION & APPROACH**

Wistron AiEdge provides robust, boosted and reliable connectivity for live video streaming, voice and data applications. It works on patented Universal Bonding (UBonding) technology which is based on Edge Computing and leverages AI & ML.

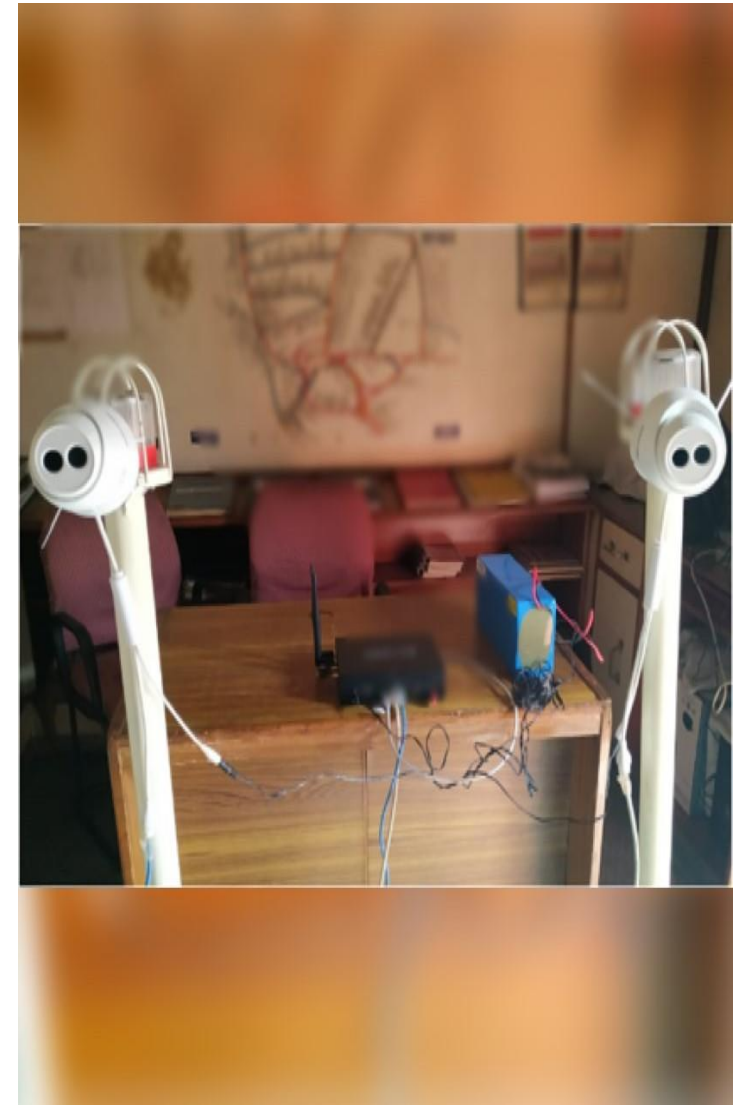
**PROBLEM STATEMENT**

Existing solutions are based on VSAT technology:

- They are bulky weighing ~600kg and difficult to transport. It requires 5 people to setup and operate
- It takes about an hour to setup and needs AC power to operate
- VSAT systems are unreliable during heavy rains
- Hardware and spectrum used is expensive
- Have lower bandwidth capacity and constraints in supporting video streaming

The Edge Gateway is a light piece of hardware (<2 kgs) that has 4 SIM slots and can aggregate bandwidth from any Telcos. It uses a portable battery pack that powers the equipment for up to 15 hours continuously.

UBonding Software provides flexibility to route traffic based on applications and their priority. The solution could be unpacked and setup within 10 mins. This is possible because the time taken for cellular connections to latch on and connect to servers is miniscule. The equipment including the gateway, 2 cameras, battery pack and accessories comfortably fit into an easy to carry back pack.



## USP

### Multi-WAN Bonding- Faster Speeds & Higher Availability

- Multi-WAN packet-level bonding – aggregates any connection or network (cellular, WIFI, broadband) or traffic type enabling Bi-directional data transfer - uplink and downlink

### SD-WAN Support- Intelligent Routing Policies & Rules

- Data traffic can be intelligently routed over available connections by session, priority and QoS

### Application Specific Algorithms- Flexible to manage traffic based on Apps

- Simultaneous working of different routing policies based on applications or data type

## Return on Investments



- Easy transportation to the accident site
- 85% decrease in set-up time



- 90% reduction in equipment size



- 4X Increase in connectivity options
- Manpower needed down from 6 persons to 1 person



- Can run up to 15 hours on 12V Lithium battery with 40 AH capacity compared to AC power



**Customer: A Meat Manufacturing Company, USA**

**Implementation year: 2018-19**

**Project maturity: Full scale implementation**

**OBJECTIVE:**

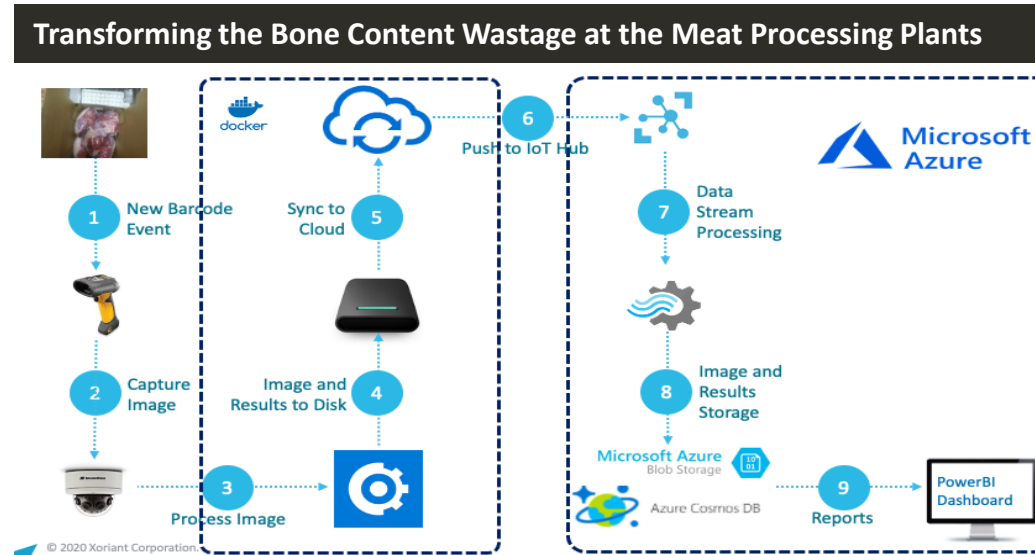
- A real-time verification of right meat type & correct number of pieces in labeled packaging box for delivery.
- Generate a signal for each box on right/wrong meat types it contains.

**EDGE SOLUTION & APPROACH**

- Real-time stream of image processing captured by IP cameras, IoT Edge Azure & cloud-based solution was built to capture images of the beef and detect the type of meat being packed into the package
- Built an analytical platform enabled to study process efficiency, margins, errors, etc.
- Built deep learning computer vision neural network to recognize the type of beef cut
- Stored the image in Azure Blob, Invoked the Azure Machine Learning service for constant training and tuning of the algorithm
- Deployed the trained neural network on the edge to run inference at the edge

**PROBLEM STATEMENT**

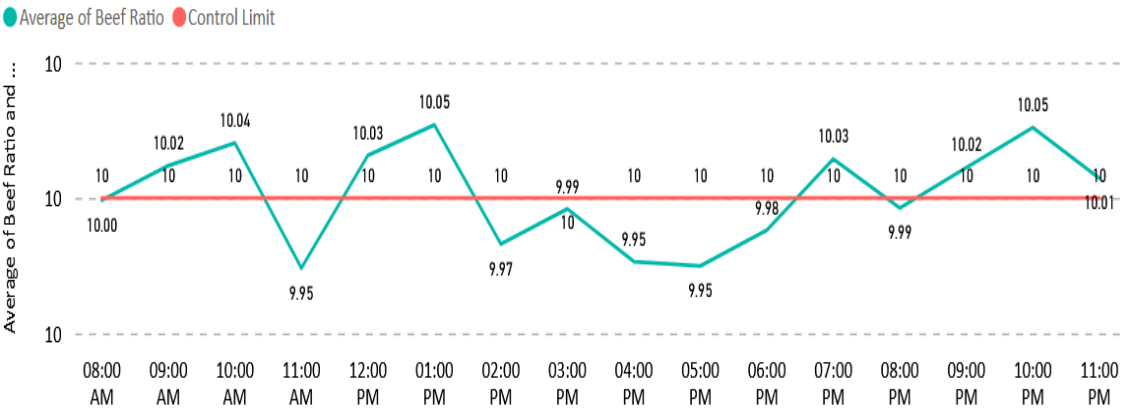
- Existing is manual process causes human error and involved cost
- No historical data to capture anomalies and analytics for improvement
- Processing of continuous image streams to trigger required QA action



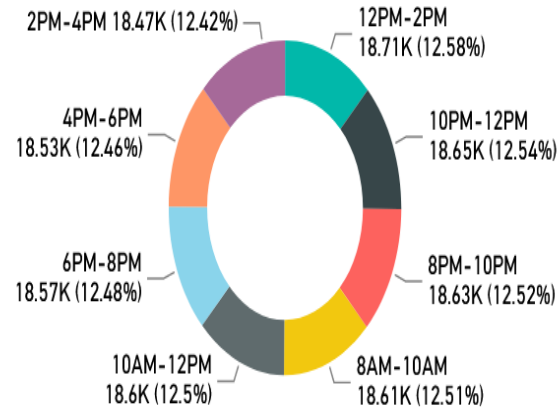
# Xoriant Corporation: Food Quality Compliance using IoT (2/2)

Total Frames	Threshold	Above Threshold	Equals Threshold	Below Threshold	Dates	Shift	Hour Range
297.60K	10 %	148.78K	142	149K	All	All	All

Average Beef Ratio By Hour



Count of Beef Ratio Above Control Limit by Hour Range



Dates	Shifts	Hour Range	Time	Beef Bone Ratio%	Count of Beef Ratio Above Control Limit	First Image URL
05/04/2021	1st Shift (8AM-4PM)	10AM-12PM	10:00:00 AM	12.63 %	1	<a href="#">🔗</a>
			10:00:06 AM	5.36 %	0	<a href="#">🔗</a>
			10:00:12 AM	1.51 %	0	<a href="#">🔗</a>
			10:00:18 AM	10.47 %	1	<a href="#">🔗</a>
			10:00:24 AM	2.26 %	0	<a href="#">🔗</a>
			10:00:30 AM	19.78 %	1	<a href="#">🔗</a>
			10:00:36 AM	18.46 %	1	<a href="#">🔗</a>
			10:00:42 AM	15.40 %	1	<a href="#">🔗</a>
			10:00:48 AM	3.11 %	0	<a href="#">🔗</a>

## Return on Investments



- Streamline operations
  - Helped client with plant connectivity, Custom vision API and Visualization accelerators along with proven ML model to identify meat types in QA process



- Reduced manual efforts
  - Enabled faster automated QA process reducing manual errors and lowering the costs



- Bone processing
  - Apply coloration techniques and fairly estimate wastage



- Packaging QC
  - Able to identify with 90%+ accuracy for 3 beef cut types required by the customer
- Customer was wasting 0.1% of food processed. This project helped reduce waste equivalent to 100K meals in 1st year
- Meat packaging defects reduced by 17%

# Zenlayer: Online gaming: Lower latency, better user experience (1/2)

**Customer:**  
Leading mobile game publisher

**Implementation year:**  
2018-Ongoing

**Project maturity:** Full-scale implementation with continued growth

**OBJECTIVE:**

Truly immersive gameplay for millions of competitive gamers playing simultaneously all over the world

**EDGE SOLUTION & APPROACH**

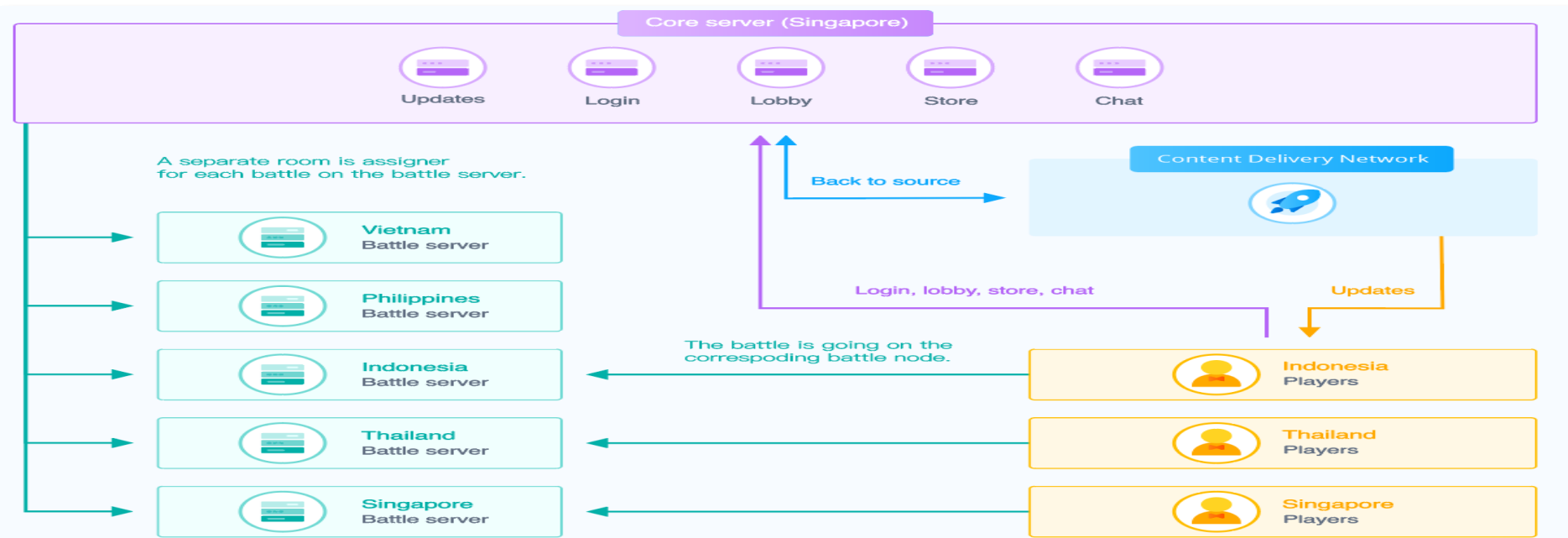
Zenlayer enabled Client to quickly deploy applications in edge locations through utilizing a combination of Bare Metal Cloud and Edge Data Center Services. Each edge deployment was connected to each other and where necessary, to regional public clouds the Client already was using via Zenlayer’s private, global network.

The Client had studied regional markets and initially, wanted to focus heavily on Southeast Asia. The first deployments were made in Hong Kong, Indonesia, Malaysia, and Singapore. Since then, the Client has experienced exponential growth and expanded their servers to 15 countries spanning Asia (with major deployments in India), North America, South America and Europe.

**PROBLEM STATEMENT**

- Reduce latency and packet loss to deliver a good user experience
- Easily scalable solution to meet sudden increases in player demand
- Interconnected across regions to offer same low latency experience everywhere

**Basic architecture structure for regional core server and edge servers**



# Zenlayer: Online gaming: Lower latency, better user experience (2/2)

## MAJOR SOLUTION ASPECTS

- **Content Delivery Network (CDN)** – CDN is used to cache installation and update packages in edge locations near users, relieving pressure on the regional core servers, reducing bandwidth costs, and increasing core server security
- **Bare Metal Cloud (BMC)** – BMC allows the Client to take advantage of already deployed servers available on demand for quick scaling. Each server is dedicated to the client and is configured for high performance
- **IP Transit** – Zenlayer's abundant global resources, including more than 70 edge locations in India and Southeast Asia, use a blend of the best local providers to minimize latency
- **Cloud Networking** – Instant connections to public clouds and other data centers are available on demand for quick scaling and creating regional hybrid clouds

## Return on Investments



- Average latency: <20 ms
- Average packet loss: <0.01%



- Application delivered to 90+ million players worldwide



- Fast expansion: Grew quickly from serving 4 countries in 2018 to 15 countries in 2020



- Ease of deployment: Only one vendor (Zenlayer) needed to expand into any new region

# Zenlayer: Online gaming: Lower latency, better user experience (2/2)

## MAJOR SOLUTION ASPECTS

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[Edge Computing-Towards A More Distributed Future](#)



[IoT Adoption in Indian Agriculture: A 2020 Landscape](#)

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