According to a November 1, 2017, announcement regarding research of the edge computing market across hardware, platforms, solutions and applications (*smart city, augmented reality, analytics etc.*) the global edge computing market is expected to reach USD 6.72 billion by 2022 at a compound annual growth rate of a whopping 35.4 percent.

Edge Intelligence

Overview

The concept of edge intelligence (EI) introduces a paradigm shift with regard to acquiring, storing, and processing data: the data processing is placed at the edge between the data source (e.g. a sensor) and the IoT core and storage services located in the cloud. As such, the literal definition of edge and intelligence is: the ability to acquire and apply knowledge and skills is shifted towards the outside of an area, here the core communication network or the cloud.

Applicable Industries

- Electronics & Embedded Devices
- Equipment & Machinery
- Telecommunications

Applicable Functions

- Facility Maintenance
- Logistics
- Maintenance
- Procurement & Sourcing

Production - Manufacturing

Quality Assurance

Case Studies

Engaging Fans at one of the largest Stadiums in the USA

Engaging and delighting fans has become the number one priority. This large stadium was looking for a set of recommendations to improve the experience in venue for all fans and recommendations to impr ...

Koito - Reality AI: Next-generation Adaptive Driving Beam (ADB) smart headlight

The current versions of Adaptive Driving Beams available in Japan and Europe are using traditional machine vision techniques like template matching. Those machine learning techniques perform very well ...

Market Size

Estimate A

According to a November 1, 2017, announcement regarding research of the edge computing market across hardware, platforms, solutions and applications (smart city, augmented reality, analytics etc.) the global edge computing market is expected to reach USD 6.72 billion by 2022 at a compound annual growth rate of a whopping 35.4 percent.

Source: iscoop.eu

User Viewpoint

Business Value

How does this use case impact an organization’s performance?

EI allows bringing data (pre-) processing and decision-making closer to the data source, which reduces delays in communication. In addition, such (pre-) processing

makes it possible to accumulate and condense data before forwarding it to IoT core services in the cloud or storing it, which perfectly matches the capacities offered by the upcoming fifth generation wireless technology (5G) networks providing localized throughput and delay enhancements. Edge computing makes computing and storage resources available in close proximity to mobile devices or sensors, complementing centralized cloud nodes and thus allowing for analytics and information generation close to the origin and consumption of data. Supplementary resources may even reside on end devices that might not be continuously connected to the backbone network. Additionally, EI allows future applications to depend on context awareness capabilities for mutual detection and proximity services, (near) real-time responsiveness for a tactile internet, data analytics at the edge and/or end device and device-to-device communication capabilities.

By introducing intelligence at the edge computing nodes (ECNs), systems can:

- Take decisions more quickly and efficiently by placing machine learning (ML) algorithms on the edge devices and reducing the frequency of contact with cloud servers, thus steadily reducing the effect of the roundtrip delay on decision-making;

- Reach decisions according to local identity management and access control policies specific to the running applications, securing the data close to its source and following local regulations;

- Lower communication costs by reducing communication over public wide area networks, using caching or local algorithms to pre-process the data so that only decisions or alarms can be forwarded to the cloud servers, rather than raw data;

- Load-balance the user, application or network requests based on changes in the edge or core infrastructure, adapting to temporary failures or maintenance procedures;

- Take decisions based on the alarms or pre- processed information exchange between the edge devices, i.e. east/west (E/W) communication between two peers on the edge.?

Key Performance Indicators

How is the success of the system measured for users and for the business?

Time and therefore costs saved by the edge intelligence structure would be a key performance indicator of the system.

System Capabilities & Requirements

What are the typical capabilities in this use case?

Edge intelligence (EI) is edge computing with machine learning (ML) and advanced

networking capabilities. This means that several information technology (IT) and operational technology (OT) industries are moving closer towards the edge of the network so that aspects such as real- time networks, security capabilities to ensure cybersecurity, self-learning solutions and personalized/customized connectivity can be addressed.

Performance Requirements: Differs by each use case but in most of the cases, sensors and communication devices might be required.

Deployment Environment

Where is the 'edge' of the solution deployed?

Potentially any device which has the ability to connect to the internet.

Technology Viewpoint

Sensors

What sensors are typically used to provide data into the IoT system, and which factors define their deployment?

Edge Intelligence can be integrated and the data can be received by installing sensors on the device. For example:?An edge computer in a semiconductor factory processes sensor data collected from the shop oor and converts it to data which can be analyzed by a server in a cloud. With the help of the analysis result, factory operators can minimize the number of products determined to be defective by mistake and improve the productivity. The analysis result also enables predictive maintenance.?

Analytics

What types of analysis are typically used to transform data into actionable information?

?

Cybersecurity

What factors define the trustworthiness of the solution?

Edge intelligence's machine learning capabilities can improve cybersecurity functions used on other devices.

Data Viewpoint

Data Sources

How is data obtained by the system?

EL is placed directly at the edge between the data source and the IOT core and storage services located in the cloud. It's source is directly taken from the data source situated in the system.

Implementation Viewpoint

Business & Organizational Challenges

What business challenges could impact deployment?

There are various technical challenges and requirements that need to be considered when adapting EI:

- Credibility and (decentralized) trust

- Self-organization, self-configuration, and self-discovery

- E/W communication between multiple ECNs

- Implementation of algorithms for ML

- Definition of basic functionality of ECNs

- Semantic interoperability

- Fault detection Standards

- Embedded system containerization for application programming interface (API), and execution level capability and tenancy

- Carrier mode selection for avoiding connectivity loss?

Integration Challenges

What integration challenges could impact deployment?

Edge devices are creating quite a challenge for systems integrators since most are generally building cloud-based applications which rely on receiving information from IoT devices to accomplish the business goal. There are many challenges that exist in developing a path for this information flow, including: message/network protocols, bandwidth requirements, redundant data reporting and data routing/orchestration.

Installation Challenges

What installation challenges could impact deployment?

There will be a disruption of business and commercial models when switching to an edge intelligence system. During the last decade, the industry experienced a change from the traditional software license model to the services model: software as a service, platform as a service, infrastructure as a service. These services are typically located in the cloud, i.e. in centralized data centres. With the advent of edge computing, there will be an extension of these service models to the edge and combinations of traditional license and service models.?

Regulatory Challenges

What regulatory challenges could impact deployment?

There are some regulatory challenges regarding Edge intelligence, especially because it does not have a certain set of "standards" yet. No specific standards yet exist in this area.

IoT ONE Use Case

Accelerating the Industrial Internet of Things

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