FOURTH INDUSTRIAL REVOLUTION - IMPLEMENTING FOURTH GENERATION SCADA WITH THE REVOLUTIONIZING TECHNOLOGY OF INTERNET OF THINGS

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Abstract— **Digitization is a major driving force of our time, turning our world inside out. Smart and connected systems are increasingly pervading all types of applications. The internet of things (IoT) is already starting to affect environments of all kinds – homes, cities, travel, logistics, retail and medicine, to name just a few – and it will not stop at our factory gates, either. According to a recent estimation by McKinsey, the potential economic impact of IoT applications in 2025 is between US$ 3.9 and $11.1 trillion, of which $1.2 to $3.7 trillion is allotted to IoT applications within the factory environment. Also known as smart manufacturing, or Industrie 4.0 in Germany, these are fully networked manufacturing ecosystems driven by the IoT . In a future where all "factory objects" will be integrated into networks, traditional control hierarchy will be replaced by a decentralized self-organization of products, field devices and machines. Production processes have to become so flexible that even the smallest lot size can be produced cost-effectively and just in time to the customer's individual demands. Customers are driving this development too, as they can design and order products at the click of a mouse. They can also expect their products to be delivered within a few days – or even hours – and don't want to wait weeks for goods to travel from far regions of the world where labour costs are lower.**

Keywords—IOT, Industrie 4.0 and smart manufacturing

I. INTRODUCTION

The Internet of Things is a culmination of advances in connectivity hardware, data networks, cloud computing and big-data processing. IoT begins where SCADA, DCS, and Historians end. Manufacturing is a mature industry with machines and assembly lines that run with a high degree of automation. Supervisory Control & Data Acquisition Systems (SCADA) and Distributed Control Systems (DCS) are prevalent industry standards. IoT relevant to manufacturing and it is a critical part of Industry 4.0 initiative.

IoT is complementary to SCADA and DCS. Information generated from SCADA systems acts as one of the data sources for IoT. SCADA's focus is on monitoring and control. IoT's focus is firmly on analyzing machine data to improve productivity and impact top line. Essentially, IoT should be viewed as a technology that is implemented on top of SCADA. It makes things like scalability, data analytics, standardisation and interoperability realities.

Co-founder and CEO of IoT ., Nico Steyn, noted that "in fact, IoT is what's going to bring SCADA systems to the next level. Instead of fighting against each other, the two technologies can instead integrate to push industry even closer to the edge."

II. THE INTERNET OF THINGS

The Internet of Things is a network of physical objects – vehicles, machines, home appliances, and more – that use sensors and APIs to connect and exchange data over the Internet.

What makes the IoT possible?

The IoT depends on a whole host of technologies – such as application programming interfaces (APIs) that connect devices to the Internet. Other key IoT technologies are Big Data management tools, predictive analytics, AI and machine learning, the cloud and radio-frequency identification (RFID).

IoT platforms and architecture

Cloud-based IoT platforms and architecture connect the real and virtual worlds. They help companies manage IoT device connectivity and security – as well as collect device data, link devices to backend systems, ensure IoT interoperability, and build and run IoT applications.

Harnessing the IoT data explosion

Smart devices generate a massive amount of IoT data that needs to be analysed and leveraged in real time. This is where predictive and Big Data analytics come into play. Machine learning is also used to add context to data – and trigger actions without human intervention.

The Industrial Internet of Things (IIoT) & M2M

In manufacturing, the IoT becomes the Industrial Internet of Things (IIoT) – also known as the Industrial Internet or Industry 4.0. The IIoT uses machine to machine (M2M) technology to support everything from remote monitoring and telemetry to predictive maintenance.

III. BENEFITS OF THE INTERNET OF THINGS

New business models and revenue

Automatic product replenishment? Subscription services? Apps? The IoT is disrupting traditional business models and creating massive opportunities for companies to create new services based on real-time sensor data and information.

Operational efficiency

One of the biggest benefits of the IoT is the efficiency it can offer. Many companies are using it to automate business and manufacturing processes, remotely monitor and control operations, optimise supply chains and conserve resources.

Workforce productivity

Wearables and other IoT-enabled devices are boosting workforce productivity and job satisfaction in many verticals. The technology is helping employees improve decision making, automate routine tasks, fast-track communication and more.

Enhanced customer experiences

From integrating customer care with actual product performance and usage, to delivering highly personalised products and services, the IoT offers many ways to create more compelling customer experiences across digital and physical worlds.

IV. IoT USES

The Internet of Things is having a profound impact on many different industries and lines of business. Here are three sectors leading the way:

Manufacturing

The Industrial Internet of Things (IIoT) is completely transforming the way products are made. Manufacturers are using the IIoT and M2M communication to drive industrial automation, predict and prevent equipment failures, improve worker safety and much more.

Transportation

Intelligent transportation systems are moving people and cargo from A to Z all over the world. Thousands of IoT sensors are used on planes, trains, ships and vehicles to optimise everything from engine performance and safety to logistics and supply chain management.

Automotive

Car manufacturers and tech companies are using the IoT to help drivers in connected cars (or smart cars) avoid accidents, predict maintenance issues, find parking spots and more. The IoT and machine learning are also bringing self-driving cars to the market.

V. THE COMPARATIVE ANALYSIS

In the end, both SCADA and IoT involve sensors and data acquisition. Although they do differ in many aspects, they both share the one common goal. The optimization of use and eventually, better control over some devices or a process. The whole idea of a smart grid leads to SCADA and IoT integration. As SCADA is not a full control system, rather a computer system that gathers and analyses real-time data, it is useful in monitoring and controlling a plant or industrial equipment. It will gather information about a mishap, transfer it back to a central site and alert the home station. It will then carry out any necessary analysis and control and display the information in a logical and organized fashion for humans to then interpret and use accordingly.

The Internet of Things is made up of a network of physical devices connected via electronic embedding, software setups, sensor-actuators and network connectivity which all act together for the objects to connect and exchange data. IoT allows objects to be sensed or controlled remotely across different networking infrastructures. Therefore, it creates opportunities for more direct integration of the physical world into computer-based systems. This results in improved efficiency, accuracy and economic benefit and also cuts down on human intervention.

Both platforms offer an abundance of advantages, as well as some vulnerabilities. It is predicted that by 2020, 50 billion devices or things will be connected to the internet. Therefore, the dynamics of an Internet-based control system are becoming a living reality. Industry 4.0 is an era in which emerging trend automation and data exchange in manufacturing technologies are allowing for a shift from traditionally implemented SCADA to an IoT implemented one. With SCADA, cyber-physical systems, the Internet of Things, cloud computing and cognitive computing, Industry 4.0 is an era that will change the dynamics of the entire automation industry.

VI. CONCLUSION

Industry 4.0 is a term the German government coined to describe the new Smart Factory: Computerization of manufacturing. It suggests that four design principles, which leverage nine pillars of Industry 4.0, are catalyzing the 4th Industrial Revolution. Industry 4.0 is often used synonymously with Manufacturing 4.0.According to BCG (Boston Consulting Group), the nine pillars of Industry 4.0 are:

Autonomous Robots; Big Data; Cloud Computing; Internet of Things (IoT & IIoT); Cybersecurity; System Integration; Simulation; Augmented Reality (and Virtual Reality); Additive Manufacturing (e.g., 3D printing)

A key benefit of this 4th Industrial Revolution is mass-customization: The ability to deliver customized products with standard lead-times and in low volume, high-mix production environment.

VII. REFERENCE

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