Basics of Industrial IoT: Introduction

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Introduction

➢ Industrial Internet of Things (IIoT) can be considered as a branch of Internet of Things (IoT)

➢ IIoT is the application of IoT in manufacturing and other industrial processes with the aim to <u>enhance the working condition</u>, <u>increase machine life</u> and <u>optimize operational efficiency</u>.
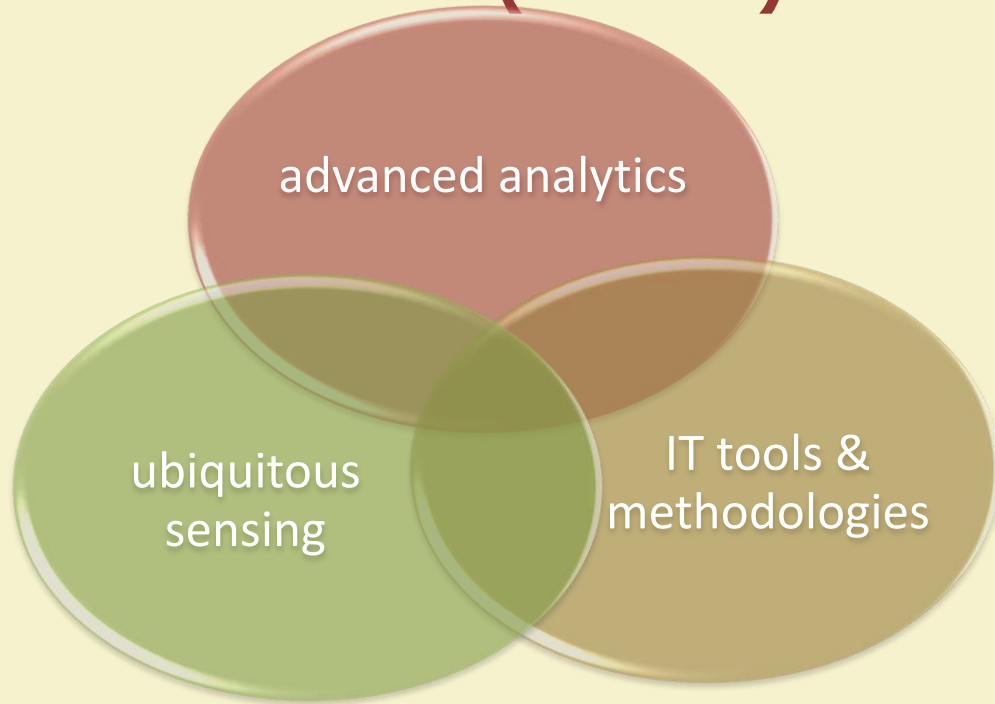
Source: "The Industrial Internet of Things (IIoT)"

IIoT vs Automation

➢ There are three key differences between IIoT and Automation which have been deployed in industries for decades.

➢ They are:

    ➢ ubiquitous sensing

    ➢ advanced analytics, and

    ➢ IT tools and methodologies

Source: "Industrial Internet of Things, A high-level architecture discussion"

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IIoT vs Automation (contd.)

advanced analytics

ubiquitous sensing

IT tools & methodologies

Concept taken from: "Industrial Internet of Things, A high-level architecture discussion"

Ubiquitous Sensing

➢ In traditional automation, sensors and actuators are used to <u>control</u> critical elements (industrial machines, etc).

➢ In IIoT, sensors and actuators are used almost everywhere to <u>control, enhance and optimize</u> various functions.

  ➢ E.g. To monitor machine health, to track various operations, emergency system etc.

➢ Ubiquitous Sensing enables Advanced Analytics

Source: "Industrial Internet of Things, A high-level architecture discussion"

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Advanced Analytics

➢ The various data from array of deployed sensors and actuators can be exploited and extracted to <u>decipher latent meanings</u> using varieties of advanced analytic tools and algorithms.

➢ <u>In IIoT, data much more and varied compared to traditional Automation</u>.

➢ In IIoT, advanced analytics helps to enhance the working condition, increase machine life and optimize operational efficiency etc.

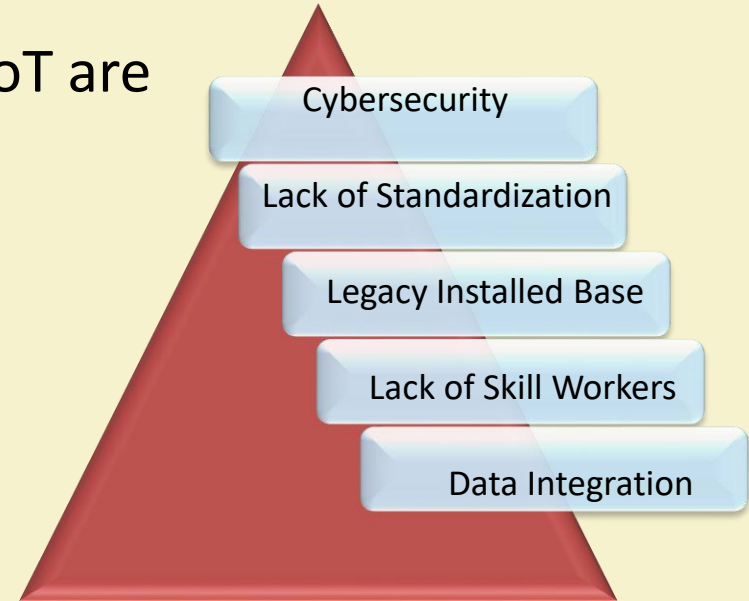Source: "Industrial Internet of Things, A high-level architecture discussion"

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IT methodologies

➢ IIoT modifies the traditional automation techniques by exploiting IT technology.

➢ This modification gives three main benefits:
   ➢ Availability of talent pool
   ➢ Standardization
   ➢ Accessibility of already available IT hardware and software solutions

Source: "Industrial Internet of Things, A high-level architecture discussion"

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Challenges in IIoT

➢ The challenges in deployment of IIoT are
  ➢ Data integration challenges
  ➢ Cybersecurity
  ➢ Lack of standardization
  ➢ Legacy installations
  ➢ Lack of skills

Cybersecurity

Lack of Standardization

Legacy Installed Base

Lack of Skill Workers

Data Integration

Source: "Industrial Internet of Things, A high-level architecture discussion"

Data integration challenges

➢ Big data volume

  ➢ Complex and different varieties of data from different sensors and actuators

  ➢ Frequency of data generated by multiple devices

➢ Data integration is one of the main challenges

➢ Understanding the generated data for analysis and application in business is not an easy task

Source: "Industrial Internet of Things, A high-level architecture discussion"

Cybersecurity

➢ Cybersecurity is one of the most essential elements of IIoT, because in IIoT all the devices are interconnected and these connected devices interact with the real world

➢ The two most important security concerns of IIoT are -

  ➢ information security

  ➢ data privacy protection

Source: "Industrial Internet of Things, A high-level architecture discussion"

Cybersecurity

➢ Examples:

    ➢ Healthcare Industries: Data integrity is highly essential in healthcare industries

    ➢ Food Industries : Information that can harm the reputation of the company should be made confidential

    ➢ Power Grid: Collapse of a power grip can give huge impact

    ➢ National Transportation: National Transportation is like the veins of the nation. Making them secure is very crucial

Source: "Industrial Internet of Things, A high-level architecture discussion"

Lack of Standardization

➢ Large automation supplier firms do not encourage open standardization, as it will reduce the customer's reliance on them

➢ Small automation supplier firms lacks the capability to incentivize this huge step

Source: "Industrial Internet of Things, A high-level architecture discussion"

Lack of Standardization

➢ Lack of standardization leads to different issues related to :

   ➢ Device interoperability

   ➢ Semantic interoperability (data semantics)

   ➢ Security and privacy etc.

Source: "Industrial Internet of Things, A high-level architecture discussion"

Legacy Installations

➢ Technology evolves fast

➢ <u>Coexistence</u> of the fast evolving technology with legacy equipment is a huge complication

Source: "Industrial Internet of Things, A high-level architecture discussion"

Lack of skills

➢ Limitation of workers with IIoT related skills, like data integration etc. because

  ➢ The technologies associated with IIoT are new
  ➢ Workers should have vast and diverse knowledge

Source: "Industrial Internet of Things, A high-level architecture discussion"

Applications of IIoT

➢ The key application areas of IIoT are -
- ➢ Healthcare industry
- ➢ Mining industry
- ➢ Manufacturing industry
- ➢ Transportation & logistics
- ➢ Firefighting

Source: "Industry 4.0: the industrial internet of things"

Healthcare industry

➢ <u>Availability of the information and reputations of doctors</u> helps the patients to choose the right doctor

➢ <u>Connectivity of healthcare devices</u> to the internet helps in location each devices and also knows the status of the connected devices and the patients monitor by them

➢ Availability of healthcare data helps in advance healthcare researches

Source: "Industry 4.0: the industrial internet of things"

Mining industry

➢ Sensor networks comprise of

　➢ different <u>gas sensors</u> for detecting oxygen, combustible gas like methane, poisonous gases etc.

　➢ <u>strata monitoring device</u>, rock mass deformation device to detect the internal structural condition of the mine

　➢ RFID tags for <u>tracking miners</u>

　➢ Wi-Fi and other wireless networking module

Source: "The Industrial Internet of Things (IIoT): the business guide to Industrial IoT"

Mining industry (contd.)

➢ These will benefit in

  ➢ early disaster warning

  ➢ working condition of the miners

  ➢ locating and monitoring miners

  ➢ Safety and increasing efficiency

Source: "The Industrial Internet of Things (IIoT): the business guide to Industrial IoT"

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Manufacturing industry

➢ The <u>interconnection and integration of devices, equipment, workforce, supply chain, work platform</u> comprises smart manufacturing

➢ This provides
  ➢ reduction in operational costs
  ➢ efficiency of the worker
  ➢ Improved safety at the workplace
  ➢ resource optimization and waste reduction
  ➢ end-to-end automation.

Source: "Industry 4.0: the industrial internet of things"

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Transportation & logistics

➤ Easy monitoring of equipment, engines, tracks using the connected devices, deployed sensors, GPS etc.

➤ Analysis of data from devices will provide the information related to

  ➤ maintenance

  ➤ status and performance

  ➤ optimum scheduling

Source: "Industry 4.0: the industrial internet of things"

Transportation & logistics (contd.)

➢ Optimum scheduling will

    ➢ provide good customer services by reducing cancellation and delays

    ➢ reduce fuel consumption

➢ Proper maintenance of the equipment will

    ➢ provide better safety to both the on boarded passengers and machines

    ➢ reduce maintenance expenses

Source: "Industry 4.0: the industrial internet of things"

Firefighting

➢ Sensor networks with RFID tags are deployed, which helps in

  ➢ real-time monitoring

  ➢ early warning of disaster

  ➢ fast and automatic diagnosis

  ➢ This makes the emergency rescue more effective.

Source: "Industry 4.0: the industrial internet of things"

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Benefits of IIoT

➢ Improves connectivity among devices

➢ Improves operational efficiency

➢ Improves productivity

➢ Optimizes asset utilization

➢ Creates new jobs and business opportunities

➢ Reduces operation time

Source: "The Industrial Internet of Things (IIoT): the business guide to Industrial IoT"

Benefits (contd.)

➢ Remote diagnosis

➢ Cost effective

➢ Boost worker safety

➢ In depth knowledge of customer demand

Source: "The Industrial Internet of Things (IIoT): the business guide to Industrial IoT"

Conclusion

➢ IIoT has many promising features, but at the same time it has many barriers.

➢ It does not mean its future is bleak, but it is better to deploy it in the areas, where the hindrances are less

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Thank You!!

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