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Basics of Industrial IoT: Industrial Internet System

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Introduction

- The digital industrial company, General Electric (GE), coined the term Industrial Internet.
- Industrial Internet is not exactly the same as Industrial Internet of Things (IIoTs), but they are often used interchangeably.
- GE is also a founding member of Industrial Internet Consortium (IIC), which is also a huge contributor in shaping IIoTs

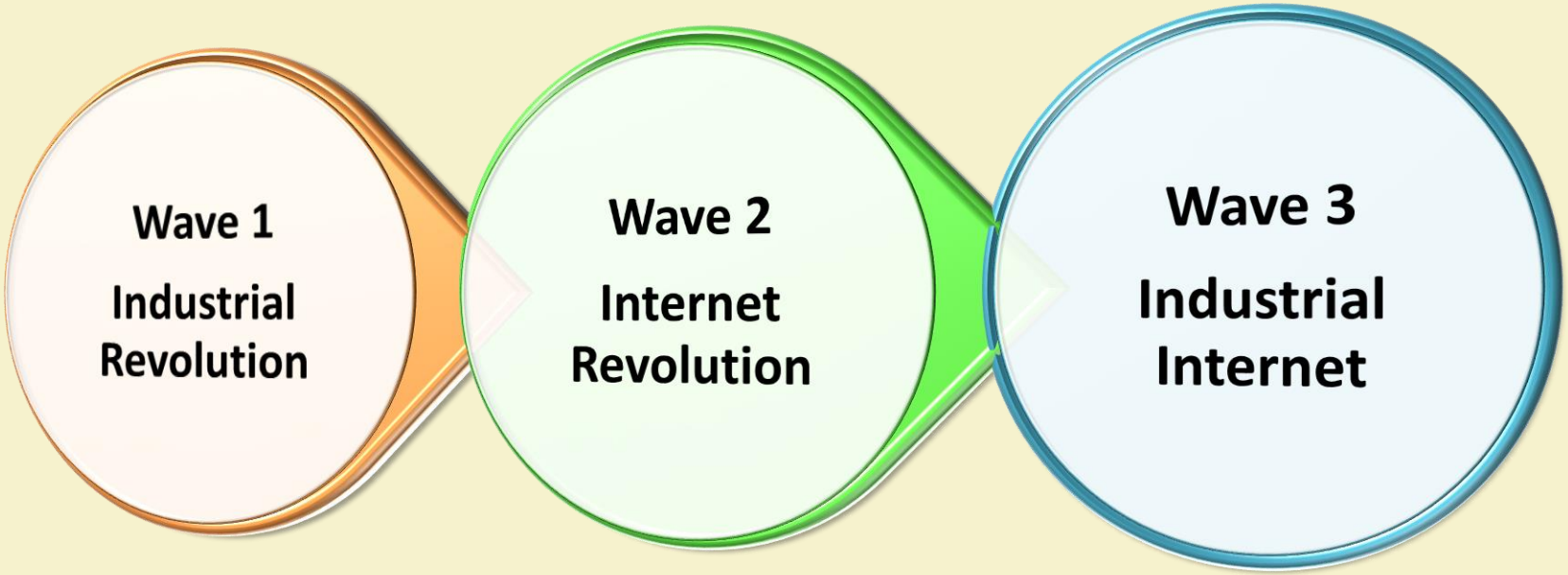
Source: "The Industrial Internet and the Industrial Internet of Things"

Three Waves of Innovation

- According to GE, there are three waves in industrial level
  - The First Wave or The Industrial Revolution
  - The Second Wave or The Internet Revolution
  - The Third Wave or The Industrial Internet

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Three Waves of Innovation



Concept taken from: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

The Industrial Revolution

- The Industrial Revolution lasted for around 150 years which began in 1750 and ended in 1900
- It had two stages.
- Commercialization and the mass production of steam engines marked the beginning of the First Stage. It was started in the middle of eighteenth century.

Source: "Industrial Internet: Pushing the Boundaries of Minds and Machines", GE

The Industrial Revolution (contd.)

- The Second Stage started in 1870 with the invention of internal combustion engines and electricity
- The Second Stage is more powerful
  - Electricity brings new types of communications
  - Combustion Engines brings new forms of transportation systems

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Drawbacks of Industrial Revolution

- Even though Industrial Revolution brought significant leap in the economy and society, it had some negative effects
  - The waste products harmed the environment
  - Bad working environment
  - Inefficient

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

The Internet Revolution

- The Internet Revolution started around 1950 and lasted for around 50 years
- It was started with a government sponsored experimentation on computer networks
- It became more eminent with the emergence World Wide Web
- Computing capacity had also increased
- Rapid information exchange over large geographical distance was made possible

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

The Industrial Internet

- Integration of Internet-based technologies to industries
- Currently we are under Third Wave or The Industrial Internet
- Third Wave has not reached its peak
- According to GE, Industrial Internet can be defined as “the association of the global industrial system with low-cost sensing, interconnectivity through internet, high-level computing and analytics”

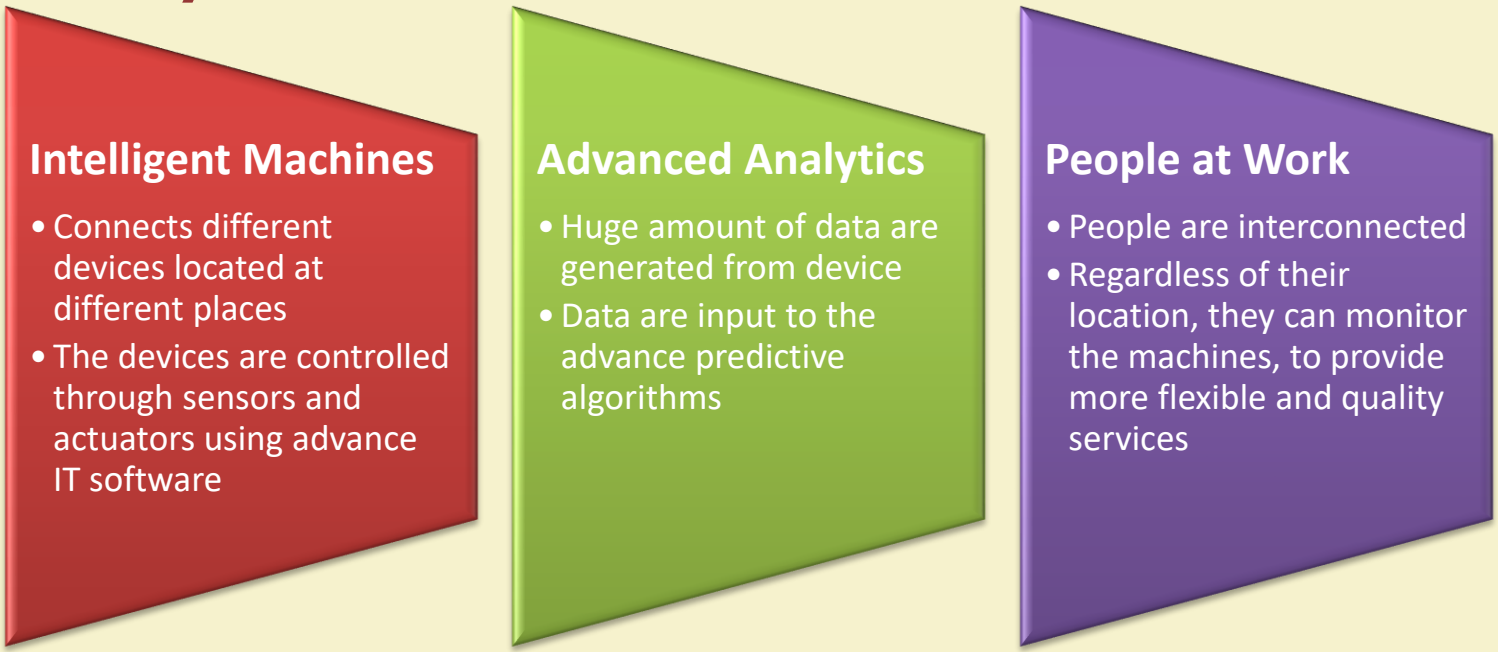
Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

The Industrial Internet (contd.)

- It has three key elements
  - Intelligent machines
  - Advanced analytics
  - People at work

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Three Key Elements



Concept taken from: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Intelligent machines

- Different kinds of machines located at different locations can be interconnected
- These machines can be monitored using advanced sensors and actuators using related software

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Advanced analytics

- The huge data generated from different kinds of machines and sensors, advance analytic and prediction techniques make possible in shaping a whole new era of automation and intelligent machines.

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

People at work

- Through web and mobile interfaces, everybody can connect with one another regardless of their location.
- A doctor can interact with his patient virtually, a worker can control a machine from anywhere etc.
- This makes the system more intelligent, maintenance and operations become easier, safety and the quality of services also enhances at the same time.

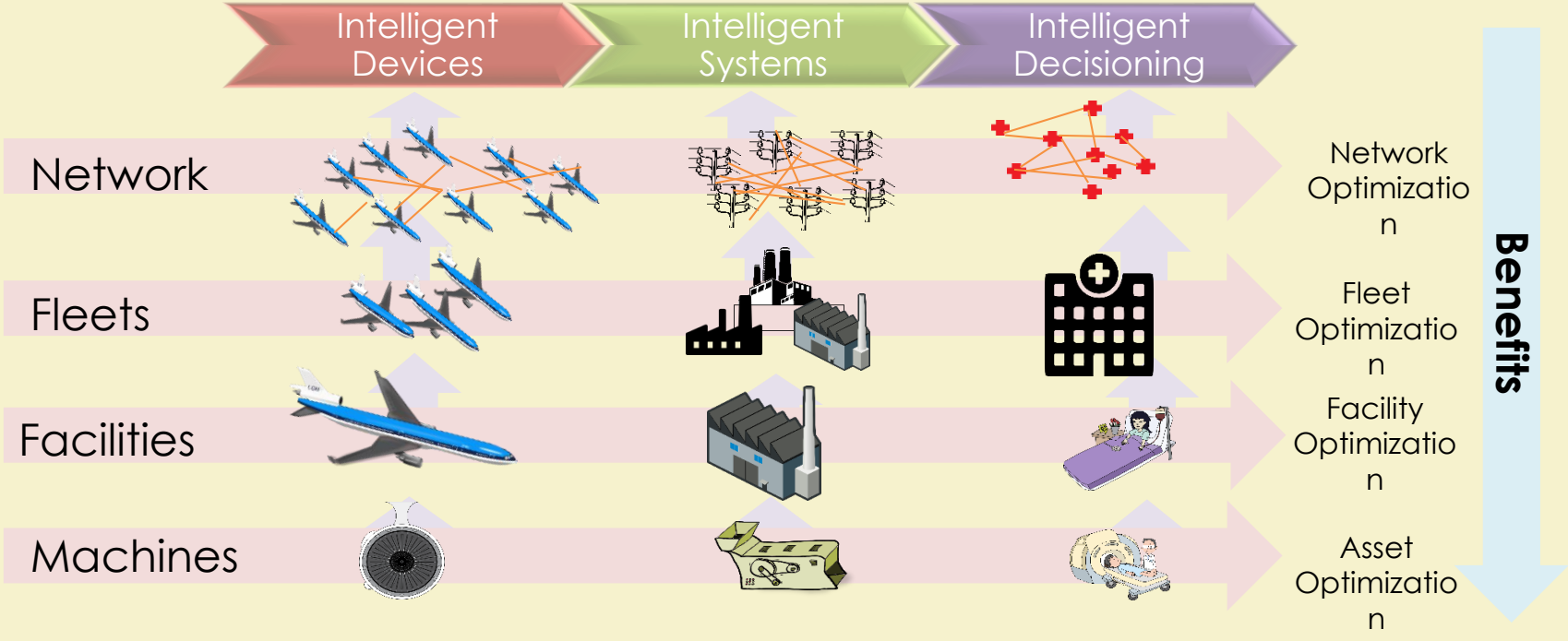
Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Applications

- Commercial Aviation
- Rail Transportation
- Power Production
- Oil and Gas Sectors
- Healthcare

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Applications of Industrial internet



Concept taken from: "Industrial Internet: Pushing the Boundaries of Minds and Machines", GE

Commercial Aviation

- The Industrial Internet can benefit commercial aviation industries by improving both airline operations and asset management
- Airline operation
  - Reducing fuel consumption
  - Effective management of crews, flight scheduling, minimizing delays and cancellations of flight

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Commercial Aviation (contd.)

- Asset Management
  - Proper maintenance of engines and other parts
  - Timely repairing

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Rail Transportation

- Real-time analysis and application of predictive algorithms will help
  - in reducing the maintenance cost
  - in preventing engine breakdown
- Availability of software will help in providing a real-time overview of the entire system to operators. Therefore,
  - the rail operator can monitor the trains and make optimal decisions
  - optimal train scheduling

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Power Production

- In power industries, outage is a huge problem because locating a broken power line or equipment is not an easy task
- With the help of industrial internet, everything will be connected to internet. Therefore
  - status updates and performance related data will be easily available
  - analysis of the incoming data will provide new insights relating to potential problems which may occur in future
  - cost of field inspection before repairing will be reduced

Source: "Industrial Internet: Pushing the Boundaries of Minds and Machines", GE

Oil and Gas Sectors

- Industrial Internet
  - reduces fuel consumption
  - enhances production
    - tracking events inside well, simulation of inside well, improve production flow
  - reduces costs
    - real-time monitoring and alert system for safety and optimization
- Predictive analysis of the incoming data from different devices helps in understanding the behavior of the underground reservoir

Source: "Industrial Internet: Pushing the Boundaries of Minds and Machines", GE

Healthcare

- Industrial Internet enables safe and efficient operations.
  - availability of the information and reputations of doctors helps the patients to choose the right doctor
  - connectivity of healthcare devices to the internet helps in location each devices and also know the status of the connected devices and the patients monitor by them
  - availability of healthcare data helps in advance healthcare researches

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Advantages of Industrial Internet

- One percent fuel savings (in 15 years)
  - Commercial Aviation Industries will save $30 billion
  - Gas and Power segment of Power plants will save $66 billion
- One percent reduction in system inefficiency in
  - Healthcare sector will save $63 billion
  - Freight transportation through world rail network will save $27 billion
- One percent reduction in capital expenditure during exploration and development in Oil and Gas industries will save $90 billion
- The emergence of cloud-based system will replace the isolated systems

Source: "Industrial Internet: Pushing the Boundaries of Minds and Machines", GE

Advantages of Industrial Internet

Industry	Segment	Type of Savings	Estimated Value (Over 15 Years)
Aviation	Commercial	One percent in fuel Saving	$30 Billion
Power	Gas-Fire Generation	One percent in fuel Saving	$66 Billion
Health	System Wide	One percent reduction in system inefficiency	$63 Billion
Oil	Freight	One percent reduction in system inefficiency	$27 Billion
Rail & Gas	Development and Exploration	One percent reduction in capital expenditure	$90 Billion

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Catalysts

- Innovations in terms of
  - Equipment
  - Advance analytics
  - System platform
  - Business processes
- Infrastructure
- Cybersecurity management

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Catalysts (contd.)

- Talent Development
  - Next Generation Engineering
  - Data Scientists
  - User Interface Experts

Source: “Industrial Internet: Pushing the Boundaries of Minds and Machines”, GE

Conclusion

- Industrial Internet has many benefits and promises across the globe
- But it needs a little innovation, capital, and platform

References

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Thank You!!