INDUSTRIAL DATA SPACE ASSOCIATION

Smart Waste Management

Information Technologies Institute

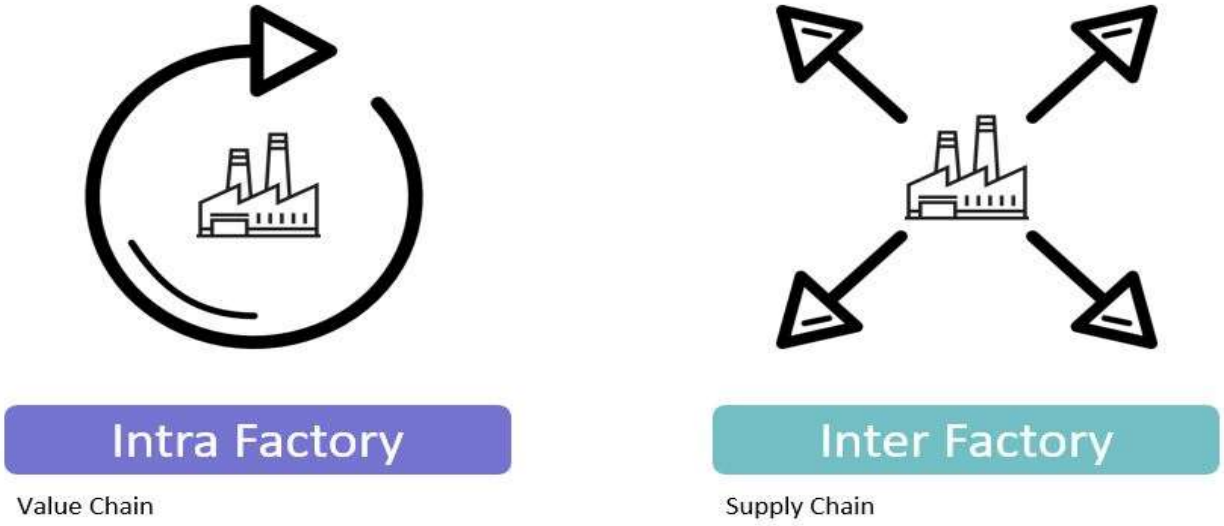
CENTER FOR RESEARCH AND TECHNOLOGY HELLAS - INFORMATION TECHNOLOGIES INSTITUTE (CERTH/ITI)

- CERTH:
  - Leading Research Center in Northern Greece
  - Listed among TOP-25 E.U. institutions with the highest participation in competitive research grants
  - Includes five institutes:
    - Chemical Process & Energy Resources Institute (CPERI)
    - Information Technologies Institute (ITI)
    - Hellenic Institute of Transport (HIT)
    - Institute of Applied Bioscience (INAB)
    - Institute for Research and Technology of Thessaly (IRETETH)
- ITI:
  - One of the leading Institutions of Greece in the fields of Informatics, Telematics and Telecommunications
  - Long experience in numerous European and national R&D projects

COMPOSITION EU PROJECT

ECOSYSTEM FOR COLLABORATIVE MANUFACTURING PROCESSES – INTRA- AND INTERFACTORY INTEGRATION AND AUTOMATION

- Create digital automation framework (IIMS) to integrate and use data across value chain
- Enabling COMPOSITION Ecosystem for interoperable factories



SMART WASTE MANAGEMENT

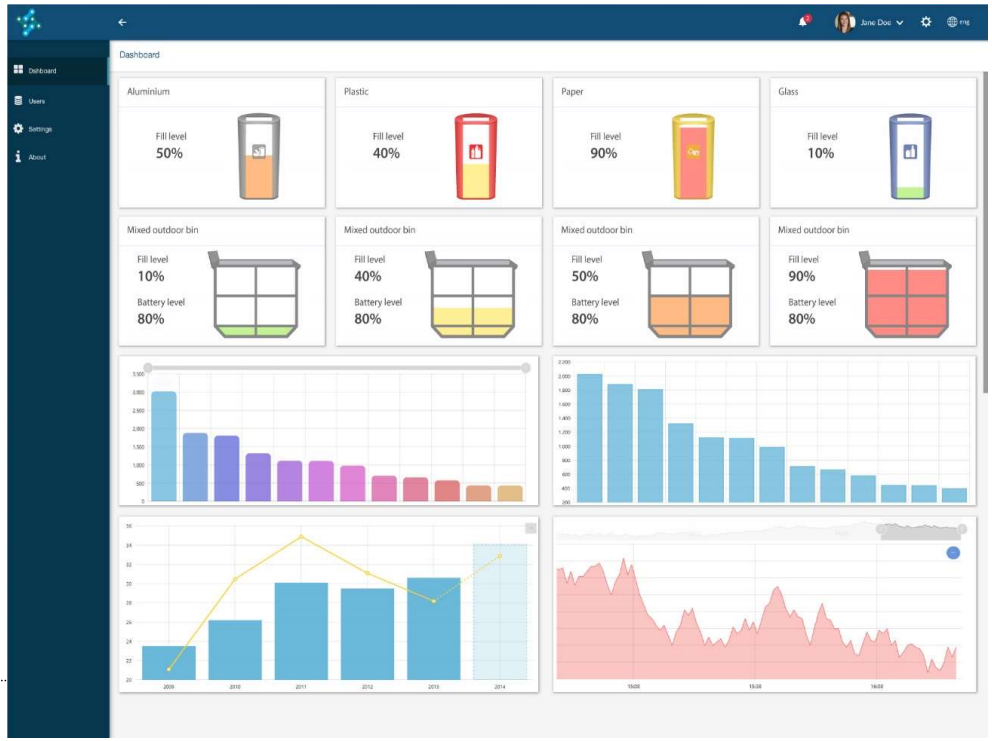
- Total volume of generated wastes is going to get doubled by 2025
- Smart Waste Management Market was estimated over 1 billion USD in 2016 and it is projected to reach 4 billion USD by 2025
- Smart Waste Management reduces the overall transport and collection cost by 50%
- Smart Waste Management is based on sensors and data analytics
  - IoT Sensors cost has been decreased about 50% by 2012
  - Growth of fast M2M connections
  - Continuously increasing of Data analytic tools performance

INTERNATIONAL DATA SPACES ASSOCIATION

SMART WASTE MANAGEMENT FOR INDUSTRY 4.0 USE CASE

The use case demonstrates how waste management companies can benefit from IDS reference architecture and FIWARE open-source technology by obtaining functionalities for monitoring context data exported from sensors, enabling smarter decision-making

- COMPLETE SOLUTION CONTAINS:
  - Smart IoT fill level sensors for bins real-time monitoring
  - Data analytics tools for decision support and optimization of resources' allocation and management
  - Ecosystem for suppliers/requesters matchmaking, online negotiations and dynamic offers evaluation



IOT PLATFORM SMART WASTE MANAGEMENT

OVERVIEW

- Optimization tool for waste management companies
- State-of-the-art algorithms and methodologies for data analysis
- Advanced data visualization
- IoT devices connectivity and data analysis
- Secure data exchange based on authentication mechanisms

IOT PLATFORM SMART WASTE MANAGEMENT

SOLUTIONS

✓**Monitoring** of bins **fill level** based on **IoT sensors**

✓**Analysis** of the bins **fill level trend**

✓**Forecasting** about **the tonnage of wastes** that is going **to be transported** by a waste management company

✓**Calculator** for **optimal pair** of **routes** and **tonnage** should be transported

✓**Price forecasting** for **various** waste types/materials

✓**Statistical analysis** and **visualization** for better data exploration

IOT PLATFORM SMART WASTE MANAGEMENT

SOLUTIONS – IDS CONNECTORS

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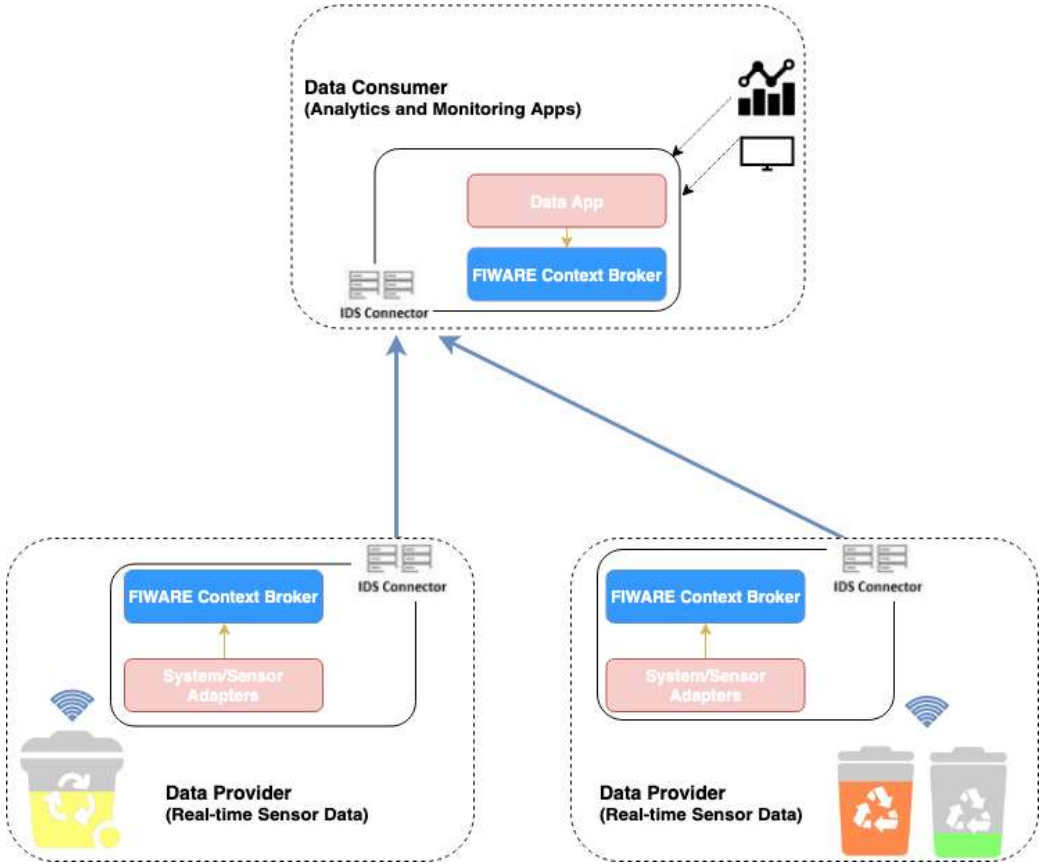
HIGH-LEVEL IDS ARCHITECTURE OF THE USE CASE



BINS FILL LEVEL MONITORING

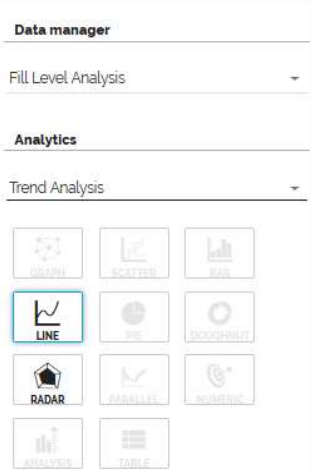
POWERED BY IOT SENSORS AND IDS-FIWARE CONNECTORS

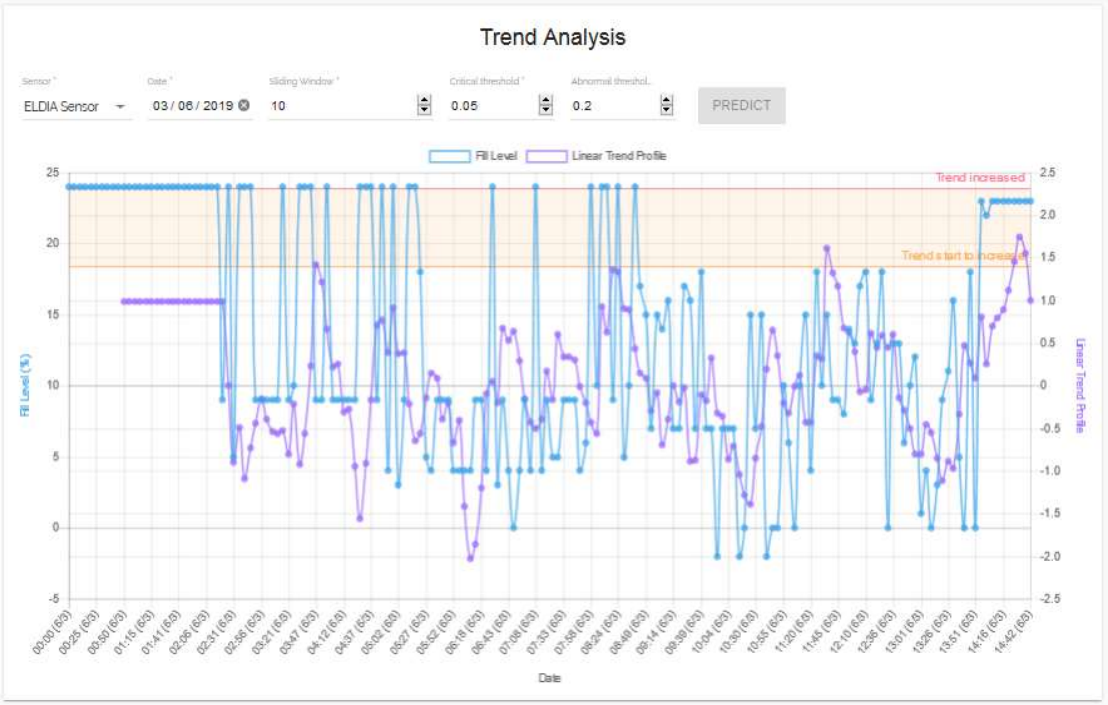
- Use of **Ultrasonic** and **IR** sensors for fill level measurement
- Use of **LoRA** network in order to cover low power needs and get data from sensors
- **Measure** the **fill level** of both **indoor** and **outdoor** industrial bins containing scrap metal and recycling materials
- Provide distant **fill percentage monitoring** for efficient logistics
- **Notification** mechanisms (email) for fill level over 80%

FILL LEVEL TREND ANALYSIS

POWERED BY IOT SENSORS AND IDS-FIWARE CONNECTORS

- **Real-time analysis** of fill level **sensors data**
- **Trend Analysis** applied in order to create a **profile** for fill level trend
- **Slope Statistic Profile** method is applied on the time series of recordings (percentages) of a fill level sensor
- Waste management company is able to define which bin has the **most aggressive trend** in order to arrange a pick-up





WHY IDS?

- IDS infrastructure and architecture enables the creation of a Smart Waste Management ecosystem
- Secure data exchange over IDS
- Reducing effort to connect to IoT devices and analytics tools
- IDS standard interface enables different suppliers and customer to connect in a standard way to COMPOSITION infrastructure and create a real-world ecosystem

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Thank you !!!

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