



NBTC – ITU Training on Building IoT solutions for e-applications

Session 6b: Developing IOT product - Oil & Gas Case Study

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IoT and the Oil & Gas Industry

The **Industrial Internet of Things** harnesses the power of big data **to improve efficiencies**, particularly in asset-intensive industries such as **oil and gas**. As more and more machinery becomes loaded up with sensors and connected to the internet, there are predictions that the **IoT could slash costs**. Analysts at Nomura, for example, say this could make oil and gas companies **more profitable at \$70pb** than they were previously at **\$100pb...**

Ref: www.eniday.com





IIoT & Oil & Gas Industry

5 WAYS THE INDUSTRIAL INTERNET-OF-THINGS CAN REVOLUTIONIZE THE OIL AND GAS INDUSTRY

- 1 Improved Operational Efficiency
- 2 Revenue
- 3 Real-Time Data
- 4 Less Safety Risk
- 5 Environmental Footprint

Ref: www.eniday.com



Key Drivers of Today's IoT Adoption

Cheaper Technology

- Sensors
- Processors



Better Infrastructure

- Cellular technology
- Mesh networks



Inexpensive Storage

- Cloud data storage
- Hardware costs



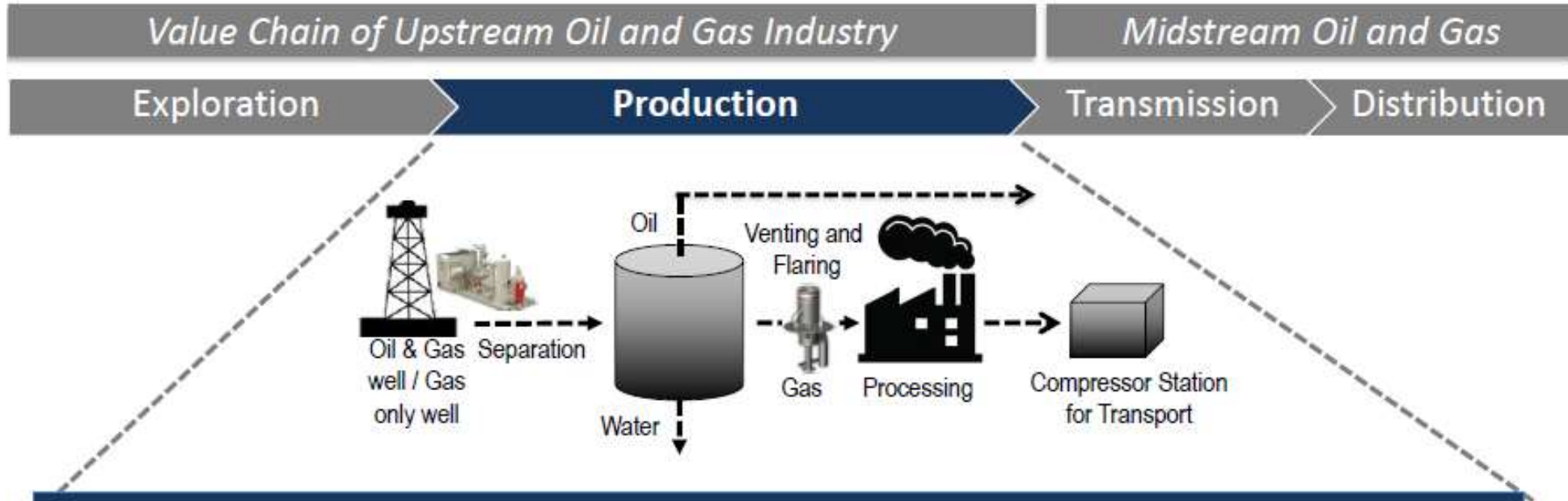
Big Data Analytics

- Hadoop, etc.
- 3rd party analytics





IoT in Oil and Gas Industry

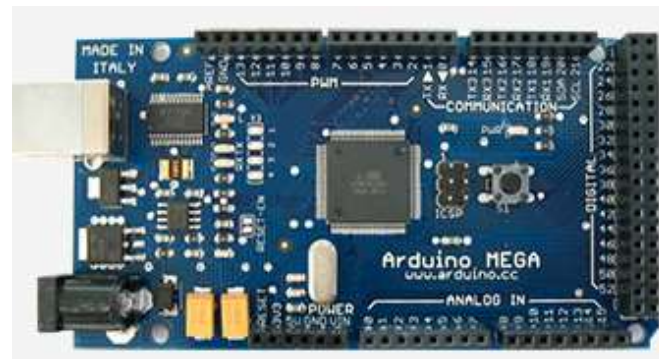
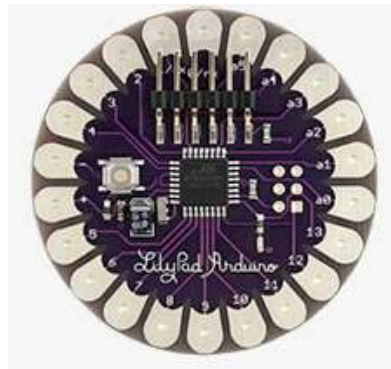


- **IoT offers the ability to help companies compete on cost by improving productivity:**
 - Enable predictive maintenance vs. preventative maintenance
 - Improve process flow achieved by monitoring changes in operating conditions
 - Increase productivity and reduce accident frequency with real time monitoring of assets



The main components of the Internet of Things

1. Embedded Systems (Sensors , Boards, Modules, ...)



The main components of the Internet of Things

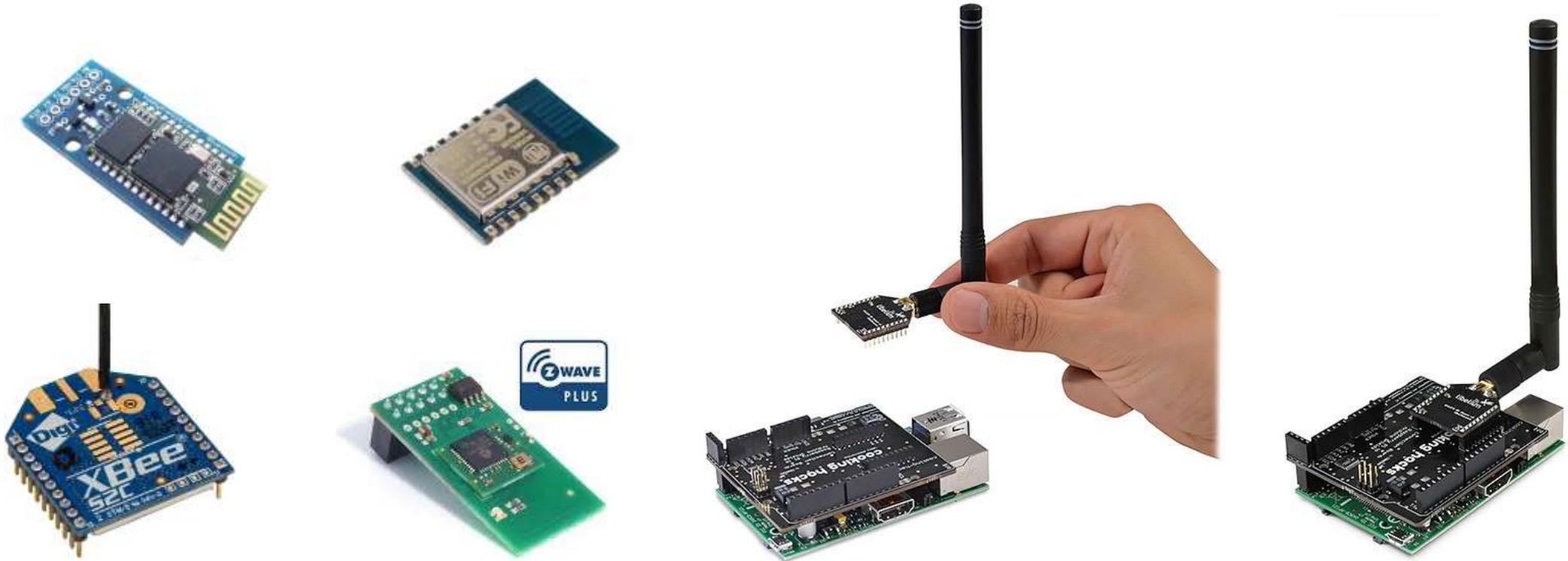
1. Embedded Systems (Sensors , Boards, Modules, ...)





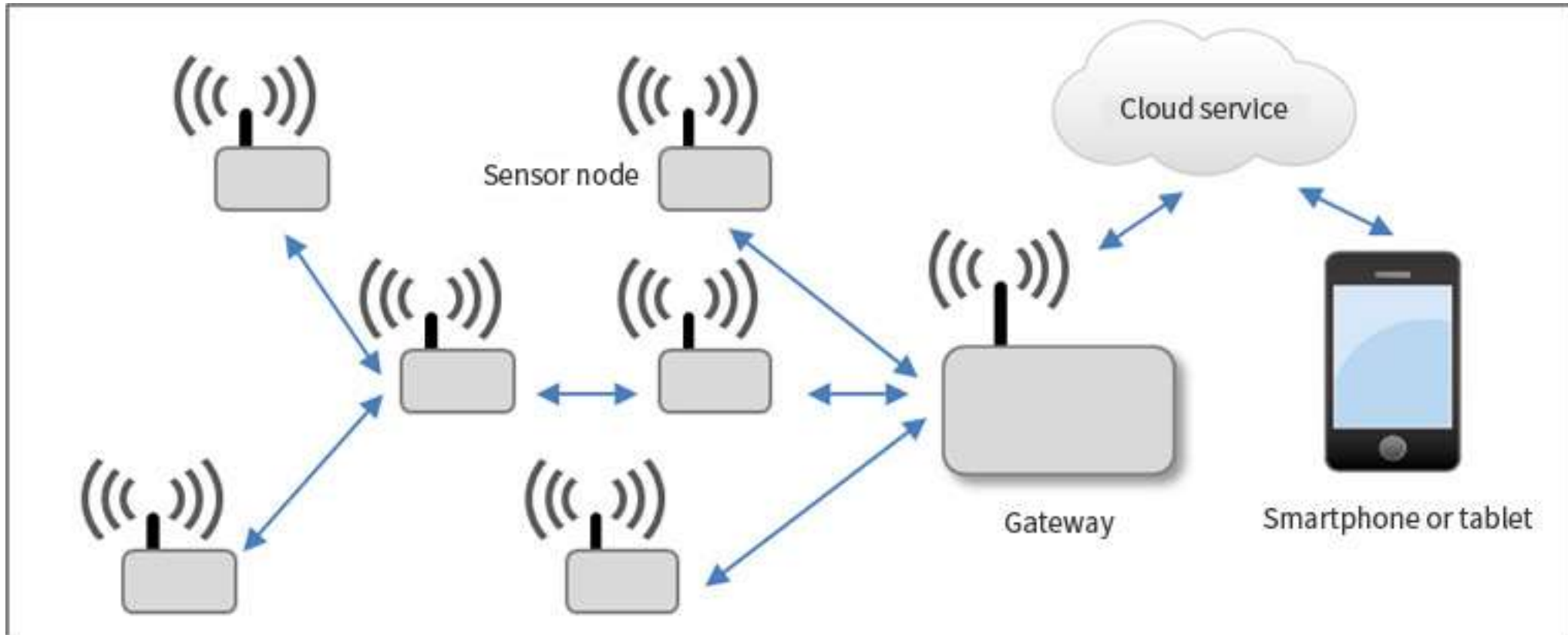
The main components of the Internet of Things

1. Embedded Systems (Sensors , Boards, Modules, ...)



The main components of the Internet of Things

2. Communication Network





The main components of the Internet of Things

2. Communication Network





The main components of the Internet of Things

3. IoT Platform

Smart Product Applications

Software applications running on remote servers that manage the monitoring, control, optimization, and autonomous operation of product functions

Rules/Analytics Engine

The rules, business logic, and big data analytical capabilities that populate the algorithms involved in product operation and reveal new product insights

Application Platform

An application development and execution environment enabling the rapid creation of smart, connected business applications using data access, visualization, and run-time tools

Product Data Database

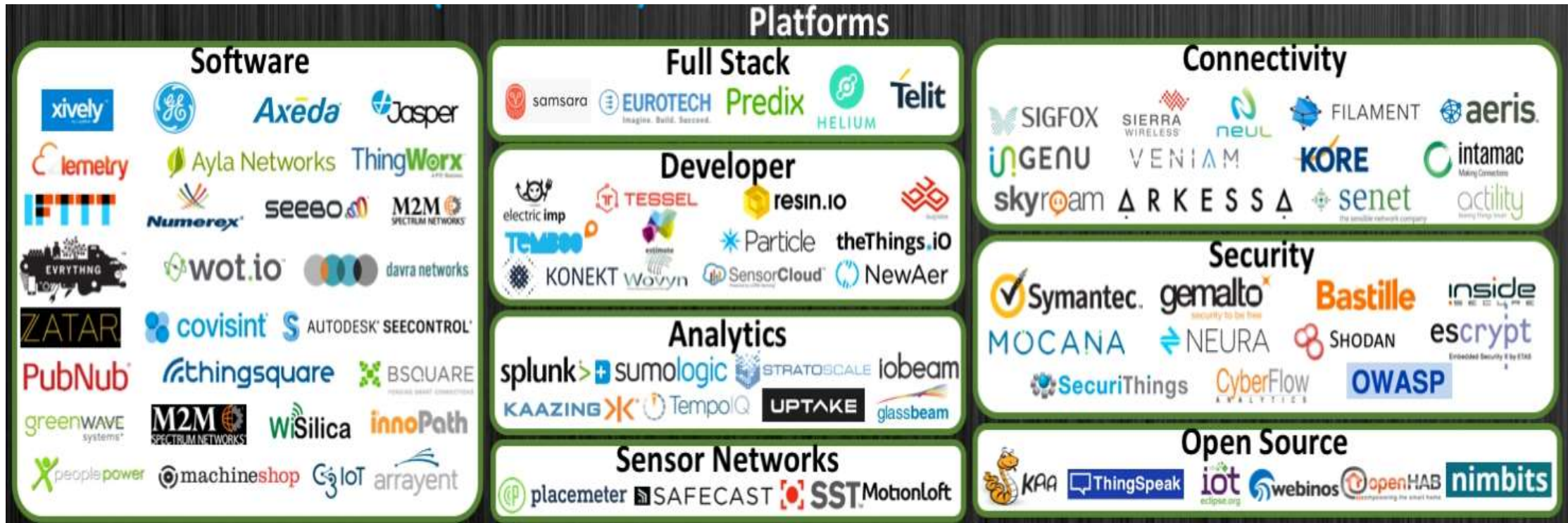
A big-data database system that enables aggregation, normalization, and management of real-time and historical product data





The main components of the Internet of Things

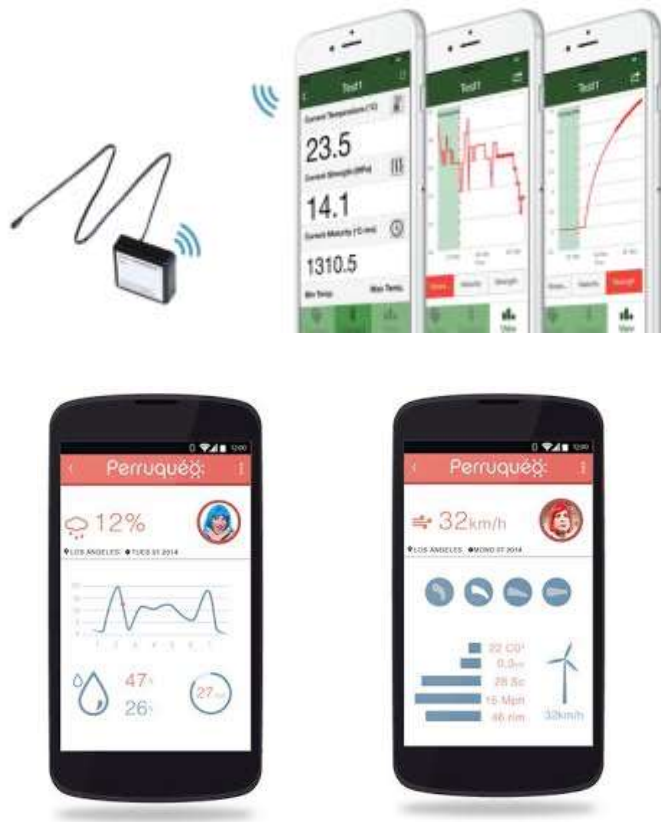
3. IoT Platform





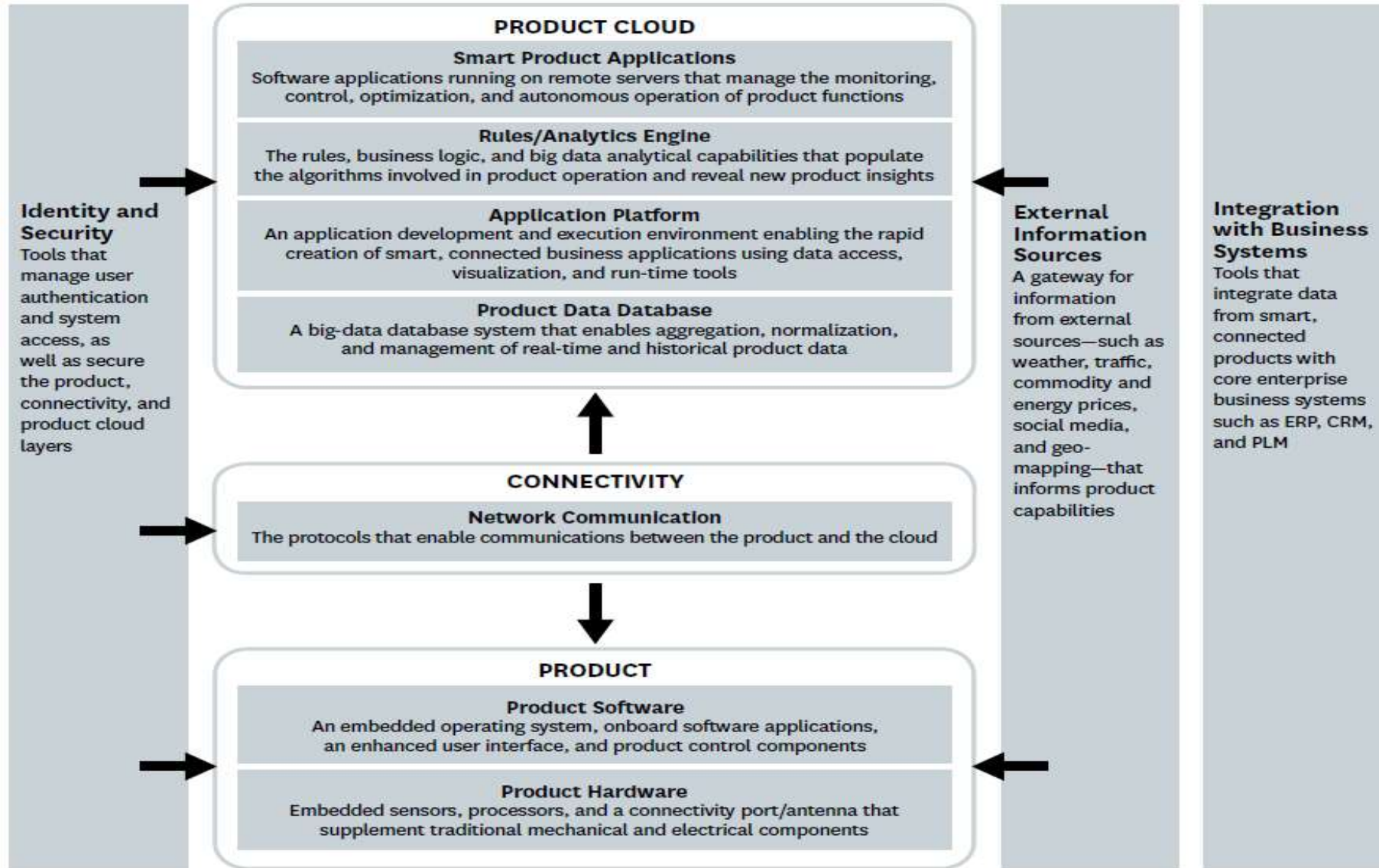
The main components of the Internet of Things

4. Application & Service





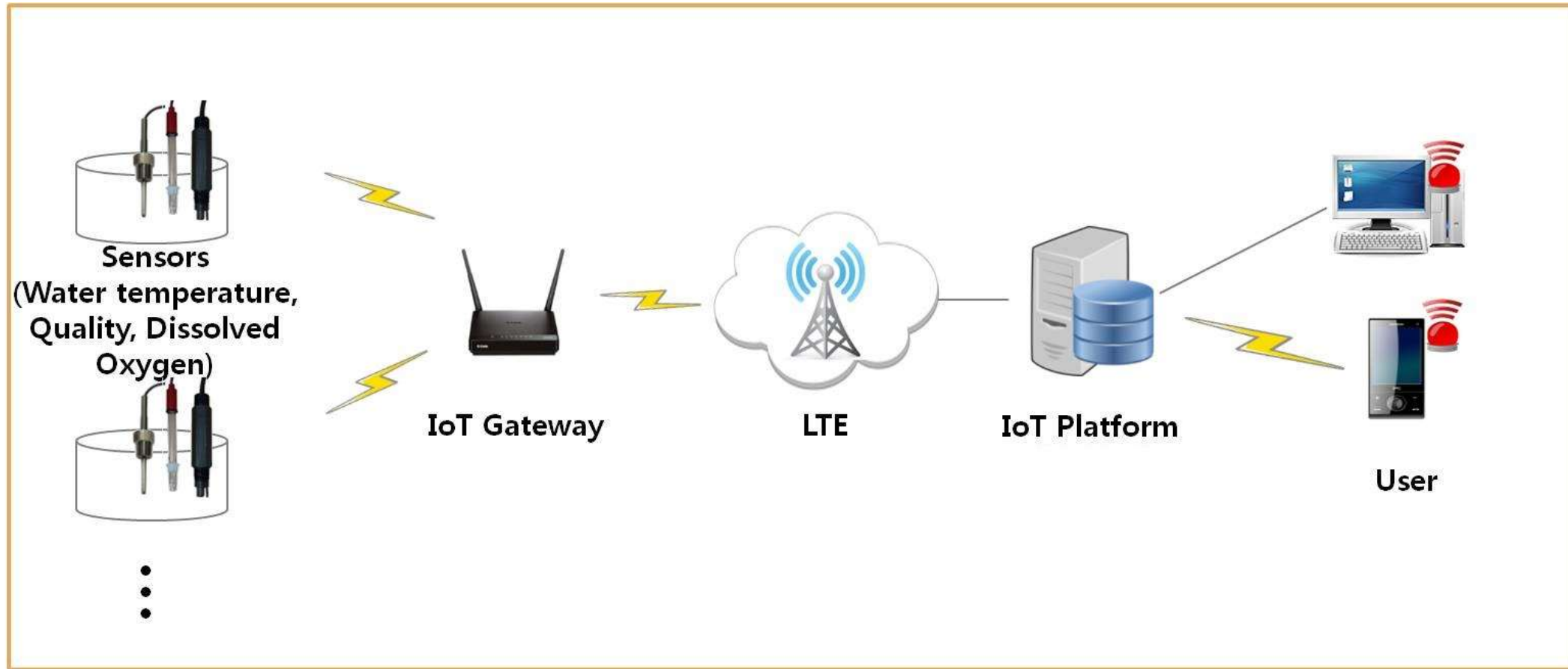
IoT Architecture



Ref: Michael E. Porter & James E. Heppelmann, Nov 2014, Harvard Business Review



IoT Architecture





Developing IOT product

Step 1: Selecting IoT Vertical





Developing IOT product

Step 1: Selecting IoT Vertical

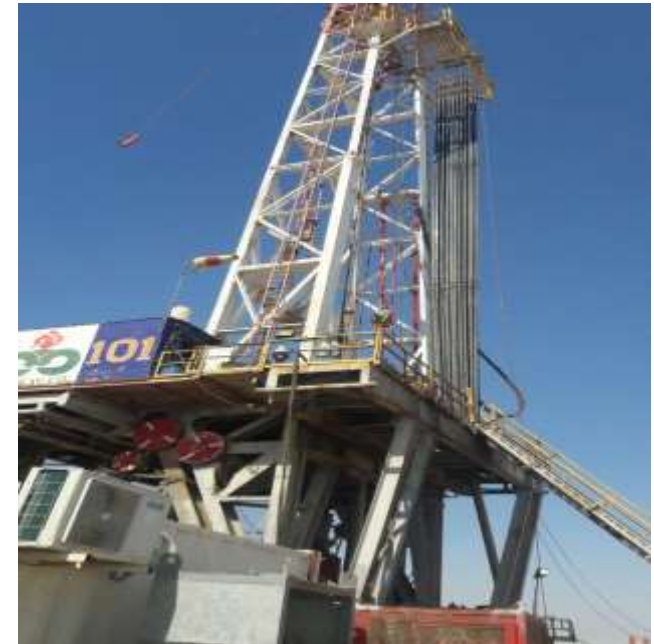
Oil & Gas Industry as a Case Study





Developing IOT product

Step 2: Review the needs and problems of that industry at a meeting with relevant professionals





Developing IOT product (Step2)



Oil & Gas Industry Accidents: Explosion of Abadan Refinery (4 Jul 2017, 11 people were killed and wounded)





Developing IOT product (Step2)



Oil & Gas Industry Accidents: Explosion and fire in Tehran's oil refinery (27 Oct 2017, 10 people were killed and wounded)





Developing IOT product (Step2)



Oil & Gas Industry Accidents: Explosion of another oil platform in the Gulf of Mexico (Sep 2010)





Developing IOT product (Step2)



Oil & Gas Industry Accidents: Explosion at the largest Venezuelan oil refinery (Sep 2012, 25 people were killed and wounded)





Developing IOT product (Step2)



Oil & Gas Industry Accidents: Taiwan Gas Pipeline Explosion (3 Aug 2014, 26 were killed and 267 wounded)





Developing IOT product (Step2)



Oil & Gas Industry Accidents: Oil platform blast in Louisiana, USA (Oct 2017, Six injured, one missing)



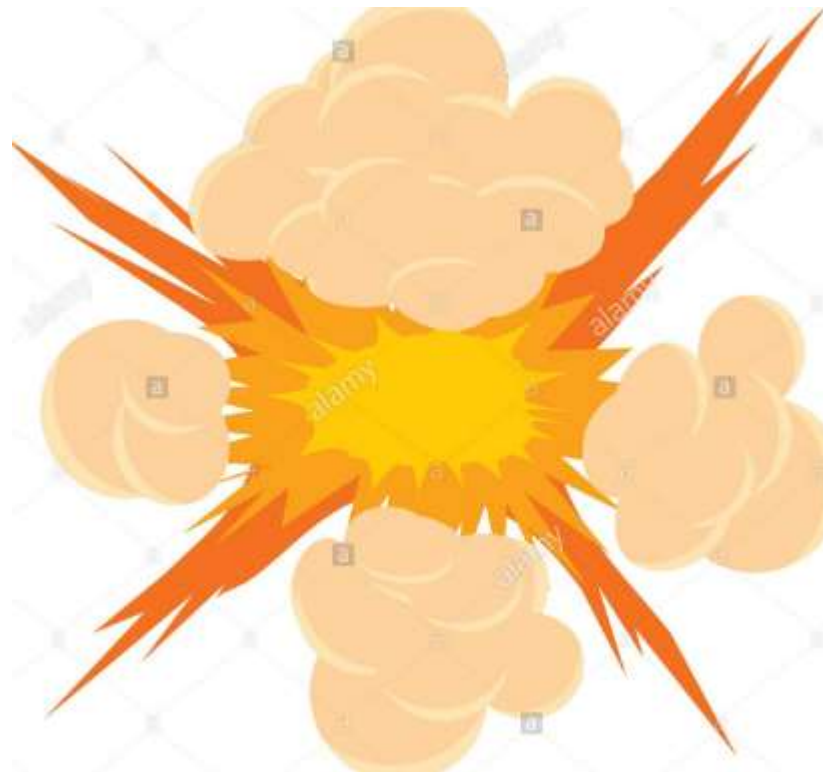


Developing IOT product (Step2)



What was the cause of the incident?

Gas leak and explosion!



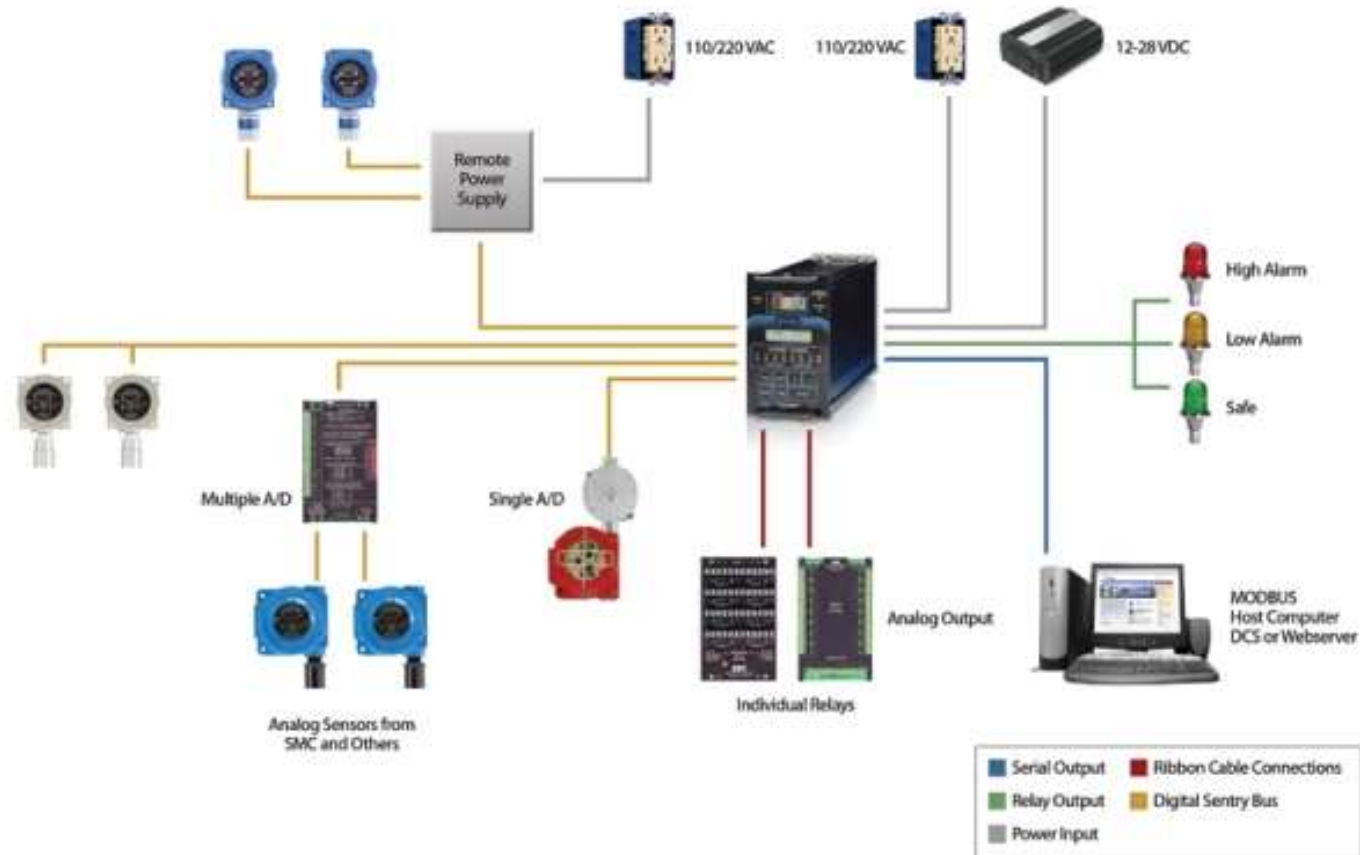


Developing IOT product (Step2)



What is the solution?

Using Gas Detection Systems

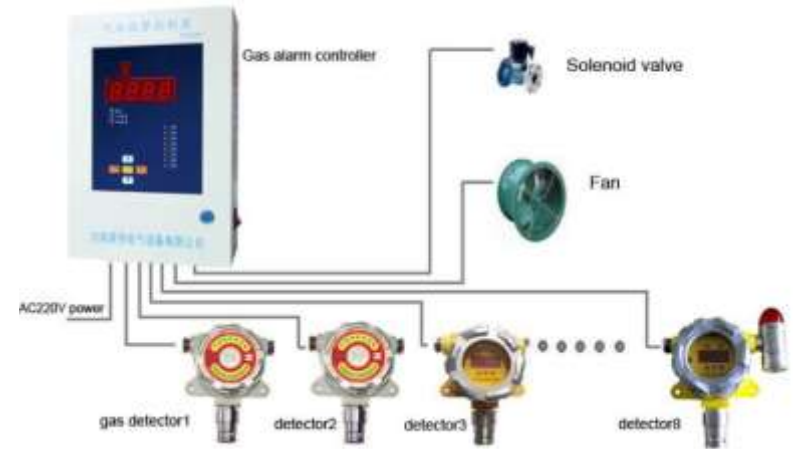




Developing IOT product (Step2)



Common Oil & Gas Detection Systems



NO LONGER AVAILABLE

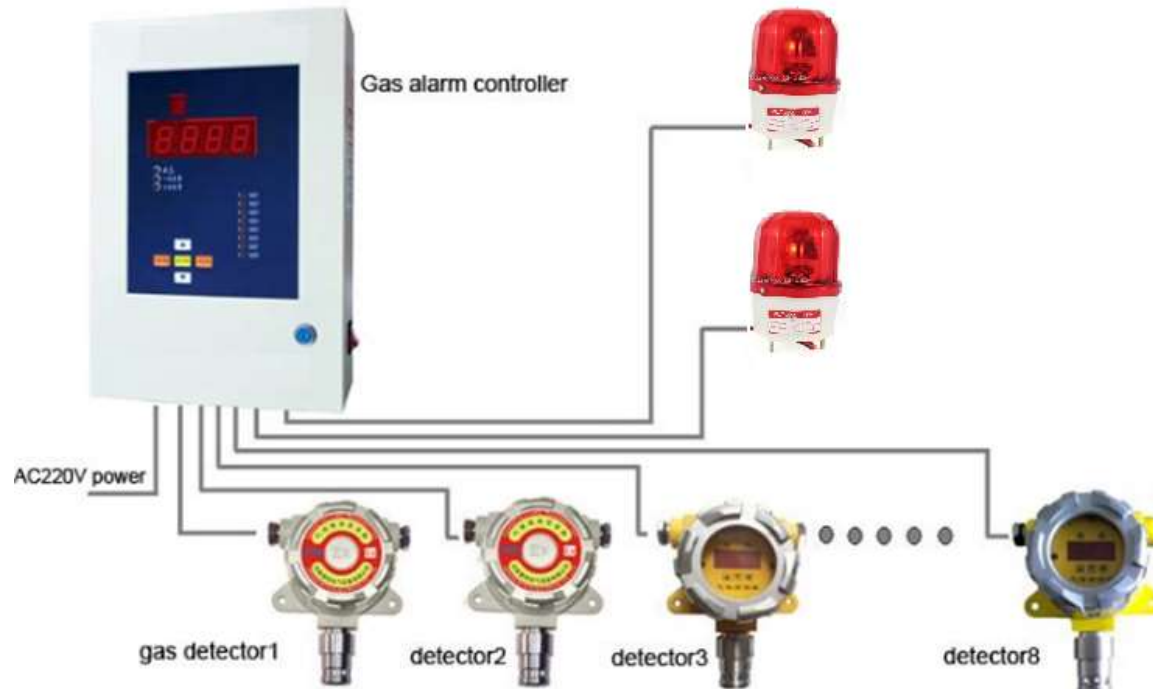




Gas Detection Systems – Current Situation (Step2)



- Number of Channels (1, 2, 4 and 8 Channels are Common)
- Limitation in Number of Sensors and Alarms
- Repeater Limitations (1 extra system, short distance)
- Commercial Limitation for higher number of channels (for example 16, 32 and 64 channels)
- Most of them did not have remote accessibility
- Unable to display multi-system information simultaneously
- Additional features like Low/High Pressure Oxygen Bank Monitoring





Internet of Things Features (Step2)



- ❖ Sensors are connected to each other and the Internet
- ❖ Sensors send their data (API based) through Gateway to an IoT Platform (Cloud)
- ❖ There is no limit to the number of sensors and alarms
- ❖ Any Time/ Any Place/ Any Things Connection
- ❖ There is no limit to the distance and Repeater
- ❖ There is no Limitation for higher number of channels (for example 16, 32 and 64 channels)
- ❖ Access to the Detection system and Sensors data through Mobile phone, Desktop and Web Application
- ❖ Able to display multi-system information simultaneously
- ❖ There is no limitation for additional features like Low/High Pressure Oxygen Bank Monitoring





Developing IOT product



Step 3: Define the required priority Proposal

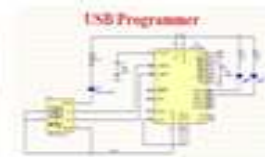
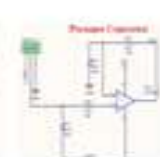
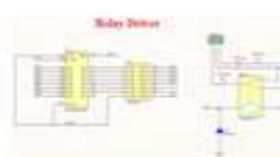
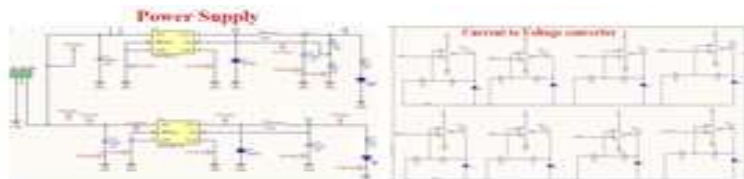
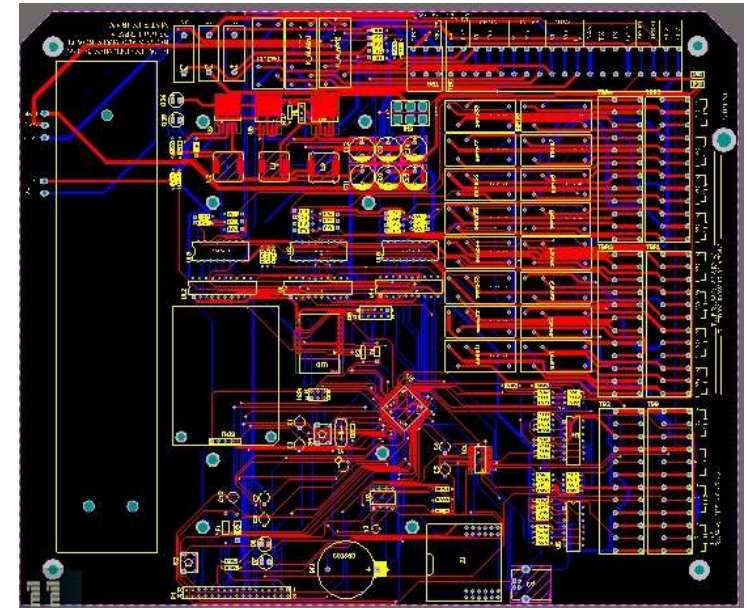
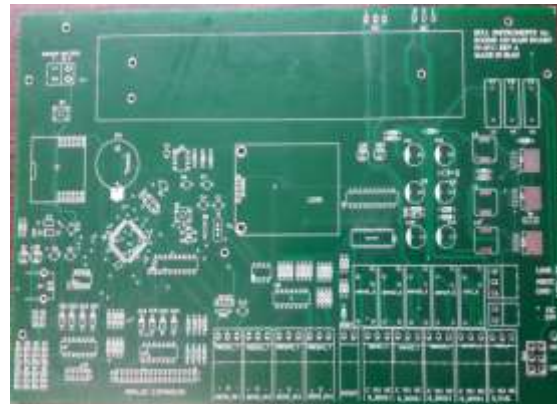
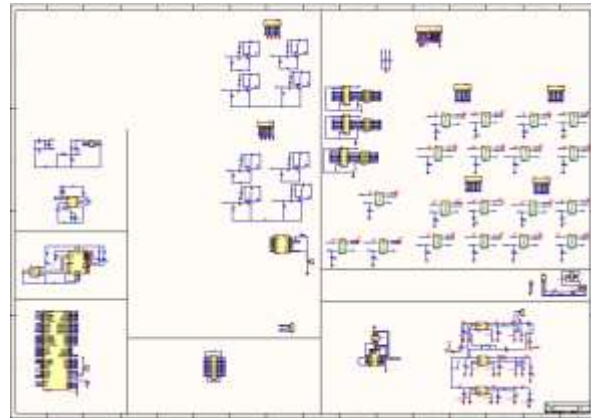
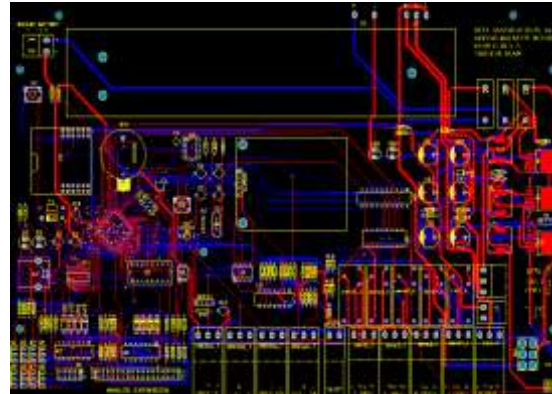
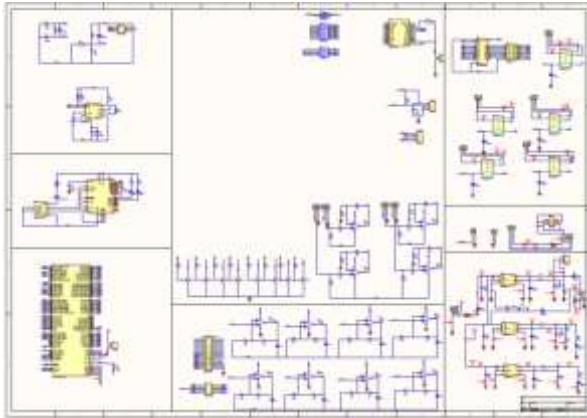
**We need IoT based
Gas Detection System
(H₂S & LEL)**





Developing IOT product

Step 4: Design of Required Hardware





Developing IOT product

Step 4: Design of Required Hardware





Developing IOT product

Step 4: Design of Required Hardware





Developing IOT product

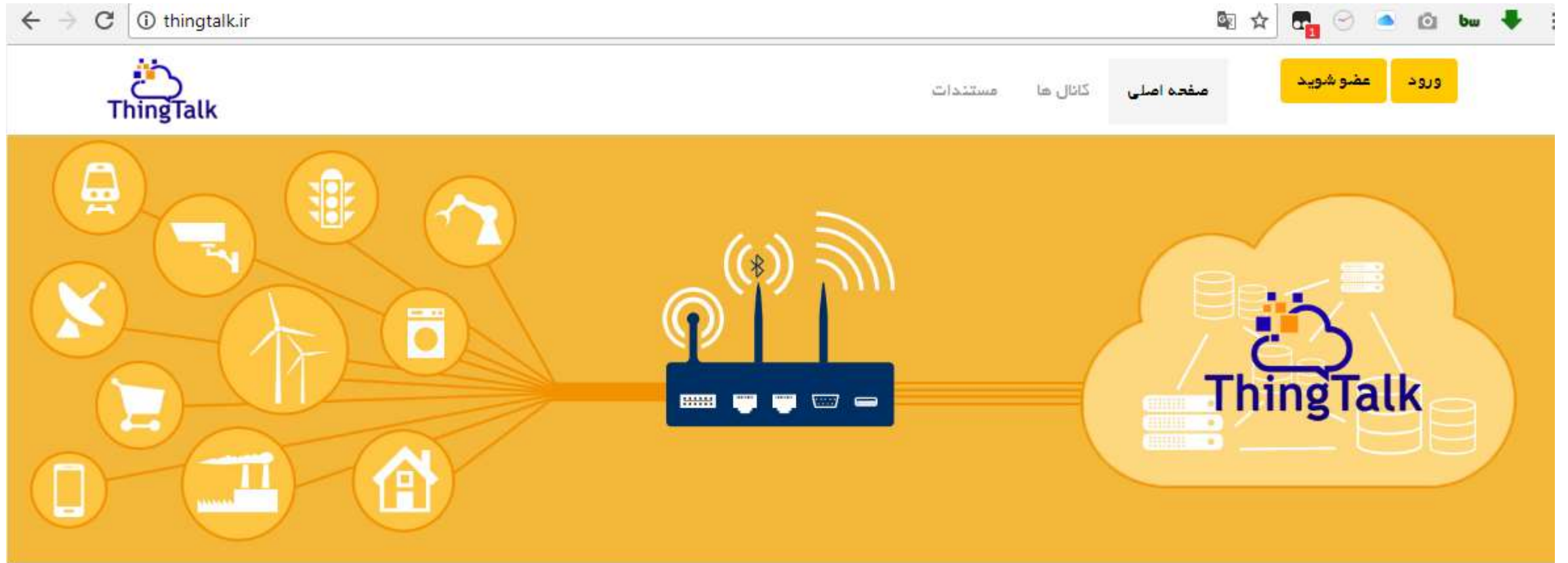
Step 4: Design of Required Hardware





Developing IOT product

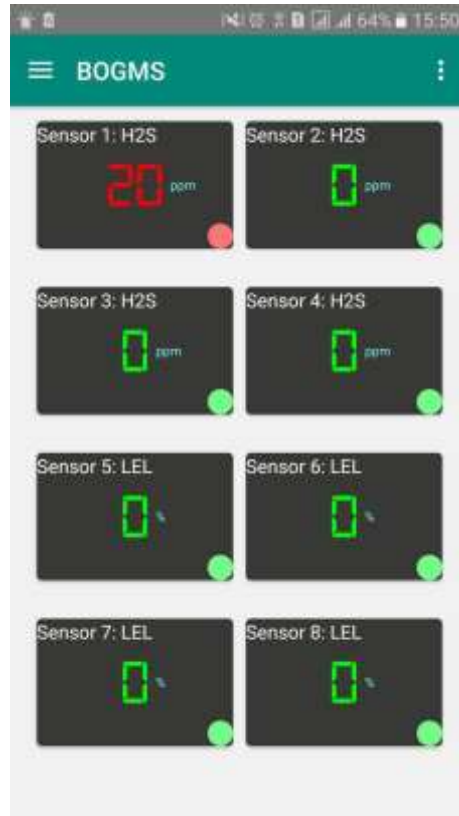
Step 5: Selecting IoT Platform





Developing IOT product

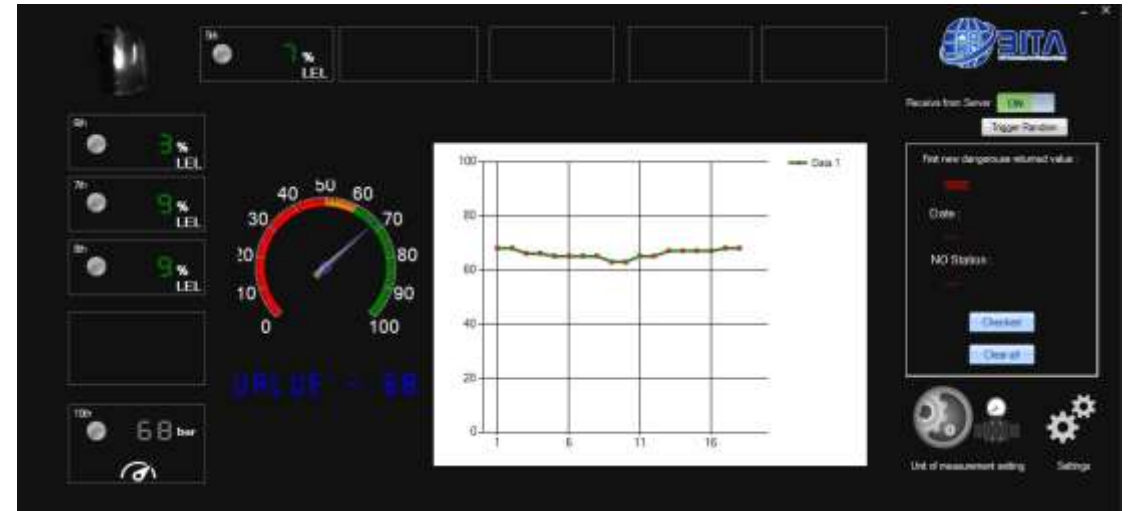
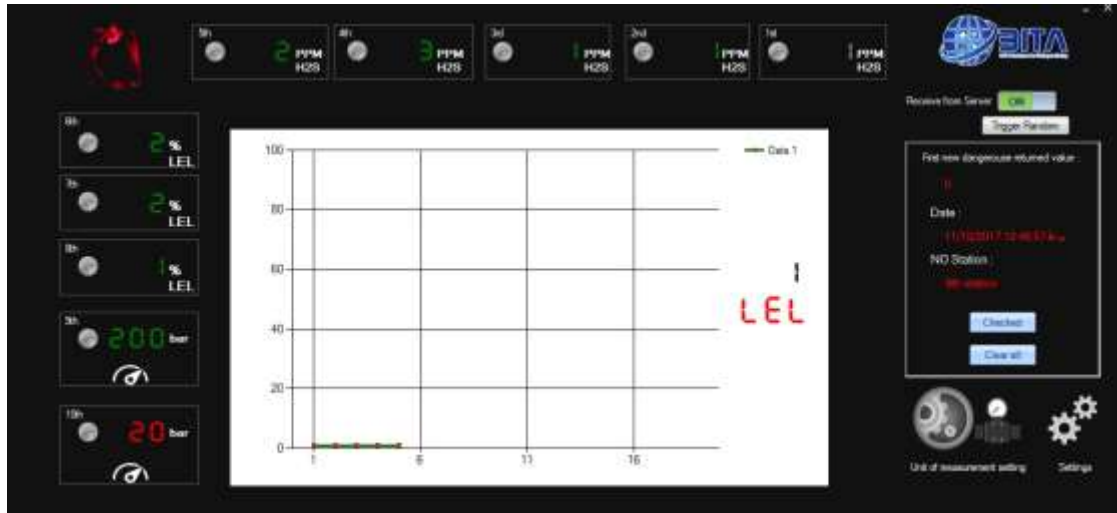
Step 6: Design and Implementation of Mobile & Desktop Application





Developing IOT product

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Developing IOT product

Step 7: Testing the System





Developing IOT product

Step 7: Testing the System





Developing IOT product

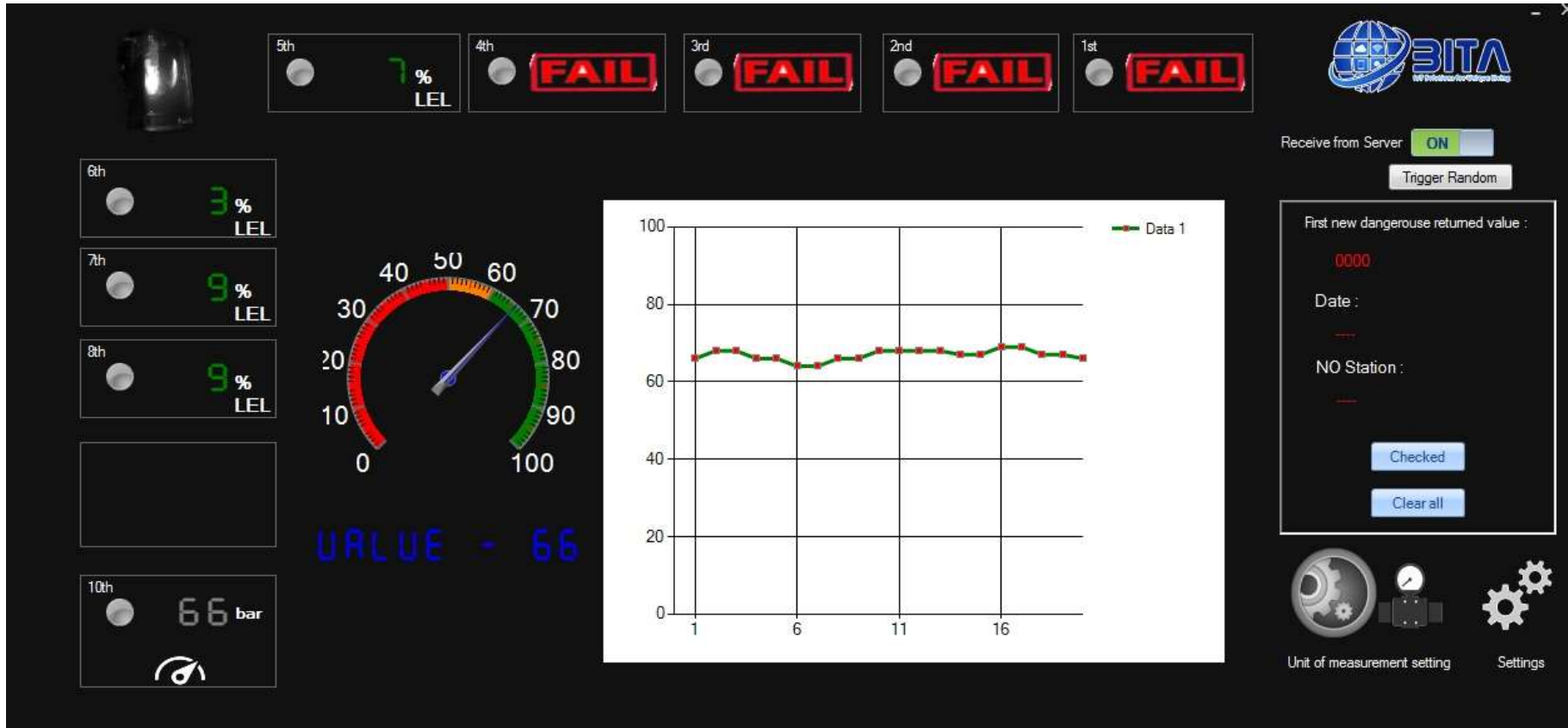
Step 7: Testing the System





Developing IOT product

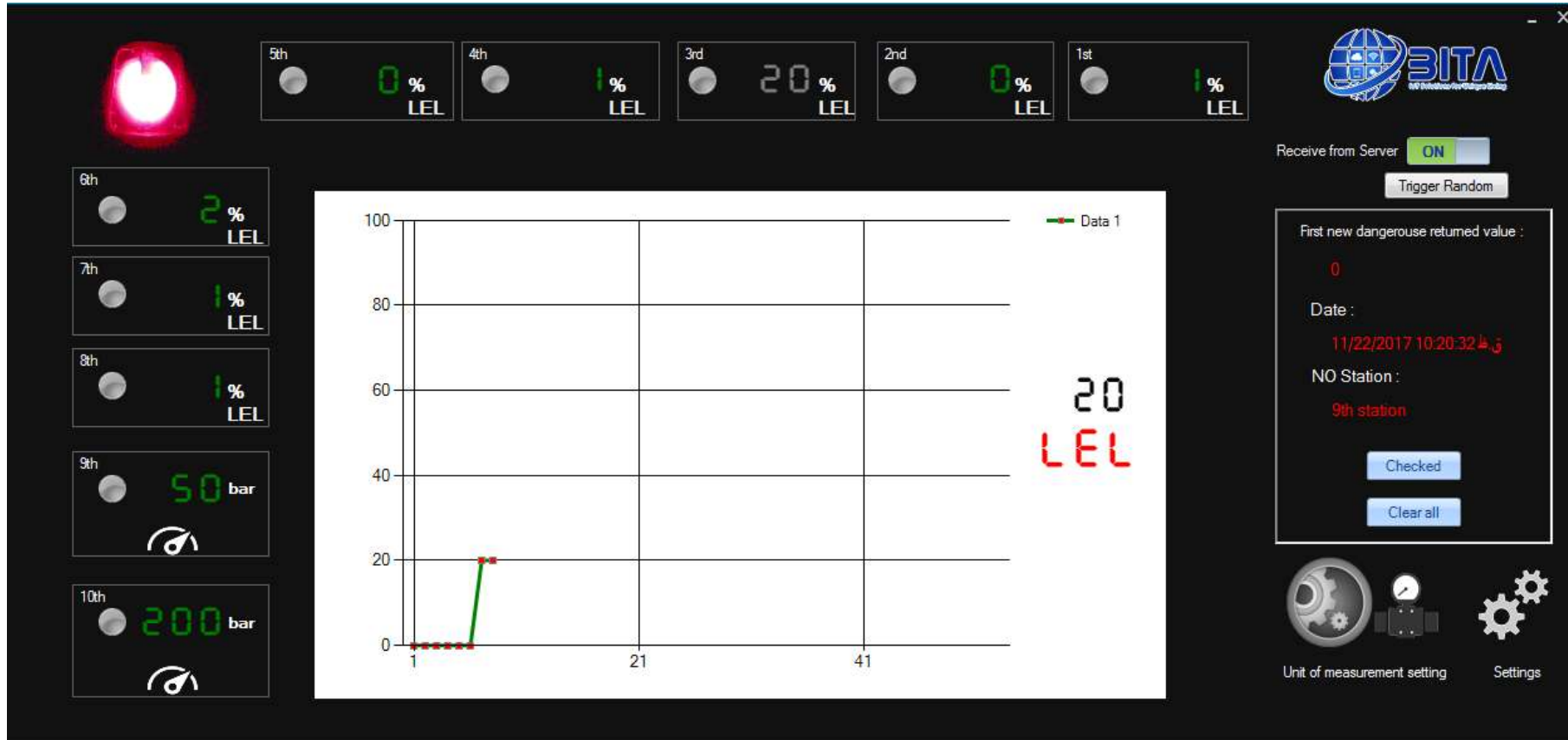
Step 7: Testing the System





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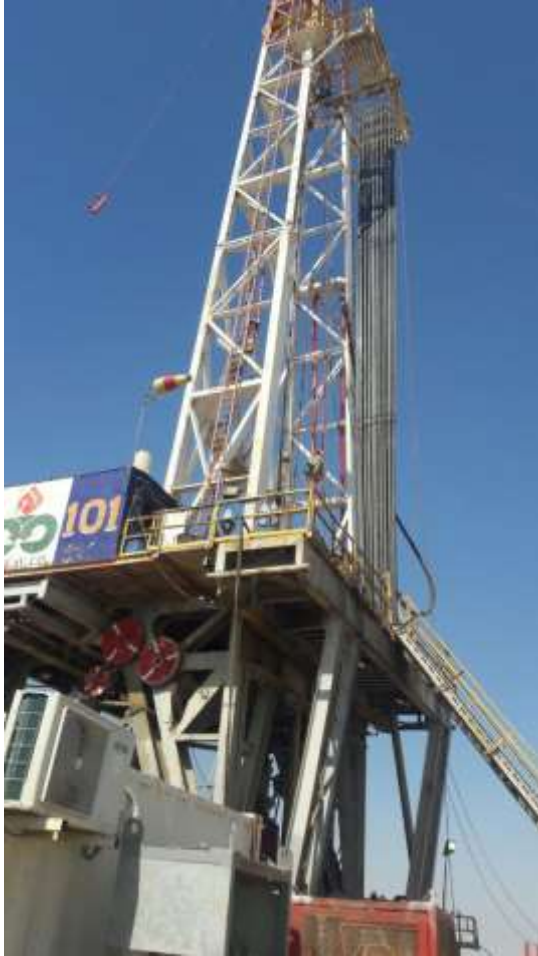
Step 7: Testing the System





Developing IOT product

Step 7: Testing the System





Developing IOT product

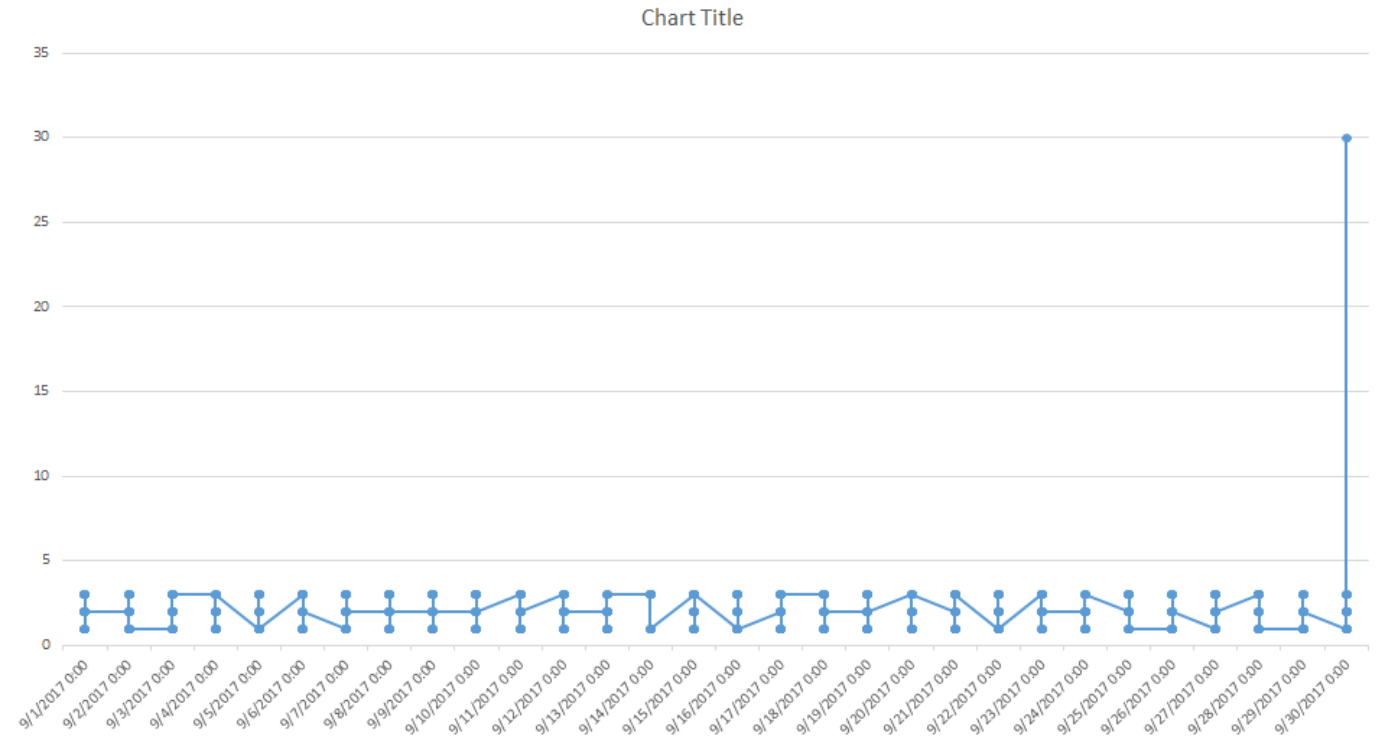
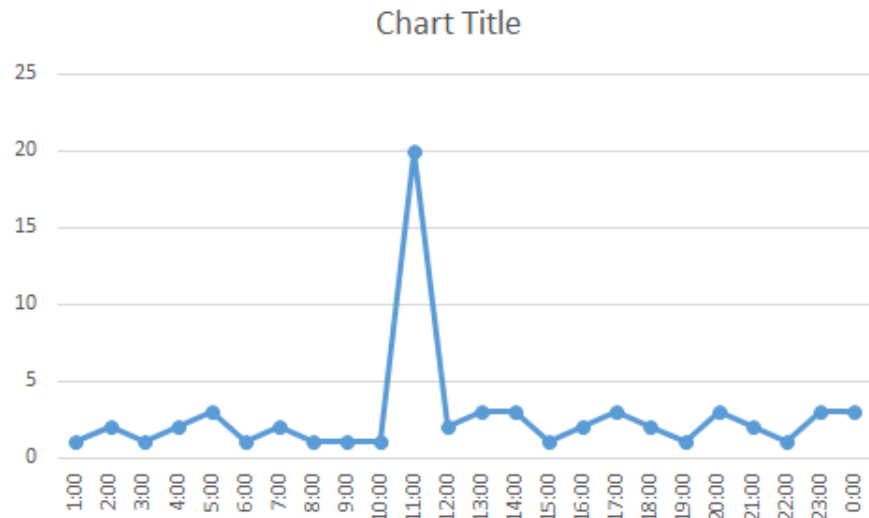
Step 7: Testing the System





Developing IOT product

Step 7: Testing the System





Thank You

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