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FUTURE OF COMPUTING USING INTERNET OF THINGS (IoT) METHOD IN OIL AND GAS INDUSTRY FOR SAFETY

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Abstract:

In Oil and Gas Industry for safety. We can use the Internet of Things (IoT) in the oil & gas industry sector of a physical network objects connected with Machine learning.

Oil and Gas Pipeline, vehicles, equipment, buildings, and just about any other thing can be embedded with electronics, sensors, and with network connectivity. As IoT methods servicing for removing the physical barriers in Oil and Gas industry which would help the companies to reach broader target audiences and opening new global business opportunities. Moreover, adopting a certain IoT innovation for oil and gas, increases the value of the company's products for clients, boosts its status, and reduces business maintenance costs in the long term.

In This Paper we are going to propose URLLC (Ultra-Reliable Low Latency Communications and MEC (Mobility Edging Computing) with SCADA (supervisory control and data acquisition).

1. Introduction

Low-cost sensors and computational ability have ensured that components or processes can be monitored in a much cheaper way. For mission-critical operations, only the relevant data can be analyzed to act in real-time. Be it predictive maintenance, automated guided vehicles, augmented reality for workers, or smart grids, there are several use- cases that the industry can benefit from by adopting edge computing. It is also important for oil and gas companies to host these sensors and devices on a private network. This provides numerous benefits such as scalability, performance, cost, and most importantly, security. The recent auction for CBRS spectrum in the United States has led to the democratization of the wireless spectrum. Organizations that own a license can now set up their own private network and can host any number of devices and sensors as per their requirements.

Edge devices and IoT can also address some of the challenges of the midstream sector, related to crude oil storage and transportation. For example, plant machinery connected via sensors streams data to edge devices hosted on a secure private network. This data is analyzed by AI/ML algorithms to predict and identify the deviations in equipment performance. Intelligent AI/ML models hosted on an edge server help extract, classify, analyze, and process data in real- time. A timely alert on an impending equipment failure helps plan the repair process efficiently, thereby avoiding machine downtime. Such predictive maintenance solutions can help organizations save millions of dollars in lost productivity and repairs. Industry leaders like Schlumberger and Shell are already utilizing the power of edge computing for their worker safety

and productivity use cases.

2. Objectives

Oil and Gas Industry Computing a private network for enterprises, telecom companies play a major role in establishing dedicated mobile network infrastructures. With their rich experience in the deployment and operations, telcos can build a robust dedicated on-site mobile network. Spectrum licenses would enable such a network to run under a managed SLA contract. Apart from these, telcos can also offer enterprises with other deployment strategies like network slicing and partner network.

Reports suggest that telcos are experiencing a decline in their core business. With the advent of 5G and its increasing usage across industries, telcos should leverage this to explore new sources of revenue growth. One such area to explore would be 5G private network and edge computing, where B2B offerings can be provided to enterprises with tailored solutions, addressing the industry-specific use cases. It is worth mentioning that the challenges for telcos in setting up a private network infrastructure, aerial deployment to radio backhaul network, and integrating the IT solutions are quite cumbersome. Telcos can collaborate with solution partners to host these software solutions on edge networks in a cost-effective agreement. Such a model would generate monetization opportunities for both the stakeholders..

1. To monitor developments in the domestic market and analyse options for policy changes in pricing, transportation distribution of petroleum products.

2. To collect, compile and disseminate data on the domestic oil and gas sector in a continuous manner and maintain the data bank.

3. To ensure quality of data in terms of prescribed parameters such as accuracy, completeness and timeliness.

4. To prepare periodic reports on various aspects of oil and gas sector.

3. Hazards Related To Oil And Gas Industry

Air is a mixture of gases, but because its composition is reasonably constant it is usually considered as a single gas, which simplifies the measurement of toxic and flammable gases for safety and health applications. Flammable and toxic gas hazards are generally well understood by operators, technicians and safety personnel in the oil, gas and petrochemical industries, continuous training and refreshment of knowledge is essential to avoid potential incidents caused by complacency. New personnel are often assigned work activities in potentially hazardous areas with only very limited training about gas hazards and the use of gas detection equipment. Most organic compounds will burn. Burning is a simple chemical reaction in which oxygen from the atmosphere reacts rapidly with a substance, producing heat. The simplest organic compounds are hydrocarbons, which are the main constituents of crude oil and gas. Hydrocarbons are composed of carbon and hydrogen, the simplest hydrocarbon being methane, each molecule of which consists of one carbon atom and four hydrogen atoms. It is the first compound in the family known as alkanes. The physical properties of alkanes change with increasing numbers of carbon atoms in the molecule: those with one to four being gases, those with five to ten being volatile liquids, those with 11 to 18 being heavier fuel oils and those with 19 to 40 being lubricating oils. Longer carbon chain hydrocarbons are tars and waxes. When hydrocarbons burn they react with oxygen from the atmosphere to produce carbon dioxide and water (although if

the combustion is incomplete because of insufficient oxygen, carbon monoxide will result as well).More complex organic compounds contain elements such as oxygen, nitrogen, sulphur, chlorine, bromine or fluorineand if these burn, the products of combustion will include other compounds as well. For example, substances containing sulphur such as oil or coal will result insulphur dioxide whilst those containing chlorine such as methyl chloride or polyvinyl chloride (PVC) will result in hydrogen chloride.

In most industrial environments where there is the risk of explosion or fire because of the presence of flammable gases or vapors, a mixture of compounds is likely to be encountered. In the oil, gas and petrochemical industries the raw materials are a mixture of hydrocarbons and chemicals, some of which may be being altered by a process. For example crude oil is separated into many materials using processes referred to as fractionation (or fractional distillation), fractions are further converted using processes such as ‘cracking’ or ‘catalytic reforming’. Flammable hazards are therefore likely to be represented by many substances on a typical petrochemical refining plant.

4. Existing System and Proposed System

Existing System

1. No easy way to identifying the risks

2. Low level Evaluating and prioritizing the risks

3. Implementing preventive/low protective measures to control the risk on Pipe Line.

4. High cost and takes long days for repair.

Proposed System

URLL in Industrial Oil and gas pipelines are known as the backbone of global energy, and securing their safety is crucial for energy supply. In this study, we utilized a novel machine learning method based on the spatiotemporal features of distributed optical fiber sensor signals to monitor the safety of oil and gas pipelines in real time. **MEC** and **URLL** Encouraging empirical results on a large amount of data collected from real sites confirmed that our model could accurately locate and identify the damage events of a pipeline in real time under strongnoise and various hardware conditions, and could effectively handle the signal drift problem.

5. Methodology

Fix the spatial domain, and slide a window in the time domain to generate samples.

Ultra-Reliable Low Latency Communications (URLLC), a subset of the 5G network architecture, ensures more efficient scheduling of data transfers, achieving shorter transmissions through a larger subcarrier, and even scheduling overlapping transmissions. It supports highly important data transfer that requires low latency, such as self- driving cars and remote surgery.

6. Mobile Edge Computing (MEC)

Multi-Access Edge Computing (MEC) moves the computing of traffic and services from a centralized cloud to the edge of the network and closer to the customer. Instead of sending all data to a cloud for processing, the network edge analyzes, processes, and stores the data.

The 5G network architecture has been designed with three key service areas in mind:

Massive Machine-Type Communications (mMTC). This will be used to connect large numbers of devices and is expected to transform the IoT industry.

Enhanced Mobile Broadband (eMBB). This supports high bandwidth applications such as augmented/virtual reality (AR and VR) and streaming, providing faster download speeds and improved user experiences.

7. IoT of Oil and Gas Pipeline Phases.

1. Pipelines monitoring
2. Asset maintenance program
3. Drilling and extraction operations

CONCLUSION

Finally, In This Project Oil and Gas Industry Deployment of IoT-based smart energy solutions results in better field communication, reduced costs of maintenance, real-time monitoring, digital oil field infrastructure, reduced power consumption, mine automation, greater safety and security of assets, and thus higher productivity.

In addition, Operational of Excellence Predictive maintenance Pipeline and equipment monitoring Location Intelligence Emissions monitoring and control and the release of management.

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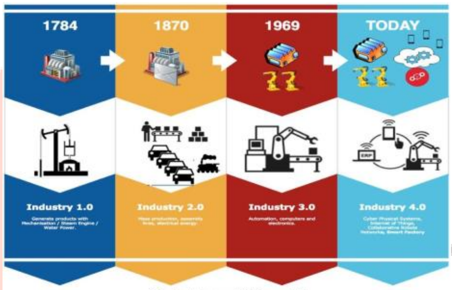

Fig. 1. Industry 4.0 Phases [9]

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