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University of Petroleum & Energy Studies

College of Management & Economic Studies

Kandoli Campus, Dehradun

END Semester Examination – May, 2017

Program Name: MBA (OG) **Semester: II**
Subject: Advance IT Applications for Oil & Gas Industry **M. Marks: 100**
Subject code: MBOI-903 **(Program Elective)** **Duration: 3 Hrs**

Note: All sections are compulsory. The numbers of pages in the QPaper are 3 (Three).

Section – A (60 Marks)

Q1. Define following: **(2.5 x 4)**
a) Column Data Store
b) NoSQL
c) Cluster Computing
d) In-Memory Computing

Q2. a) What is Master Data Management (MDM)? [5] **(10 x 1)**
b) Discuss the MDM standard used in Petroleum Industry. [5]

Q3. a) Differentiate between IOT, IIOT and M2M. [5] **(10 x 1)**
b) Discuss the role of M2M in Petroleum Industries, - [5]
with the help of examples.

Q4. Explain with the help of examples, how using the Cloud-based Platform, we can reduce the ROI of the solution. **(10 x 1)**

Q5. a) What is Hadoop? [5] **(20 x 1)**
b) Define Big Data and how Hadoop supports Big Data. [2+5]
c) Discuss 2 business scenarios where Hadoop can be used for handing Big Data. [8]

Section – B (40 Marks)

Q4. Answer the questions given at the end of case study – "Case Study: Shell, Rockwell make oil and gas production smart"

Oil and gas producers are doing everything they can to grind through a period of historically low per barrel oil prices. The period has stretched on for more than a year now, with per barrel prices getting as low as $40. With companies struggling to find revenue in this currently high supply low demand market, it has become increasingly important to minimize maintenance and repair costs. A cheap way of monitoring equipment is by installing sensors and sending information to the cloud, an IoT solution to a problem that has existed for generations.

The following are two case studies illustrating the approach of companies that embrace the idea of a connected oil and gas environment, and have seen their efforts rewarded.

Shell goes digital with Smart Field

Shell produces oil and gas from 25,000 wells worldwide, and drills almost a thousand more every year. Many of those wells are located in challenging areas, trapped thousands of meters underground. To help the tricky operations run more efficiently, Shell turned to Smart Field technology. It installed thousands of sensors on its equipment, such as valves and pumps. The sensors capture data on temperature, pressure, and other measurements, and sends it out to control centers back on land. Here, engineers read the measurements and monitor production in real time so they can optimize each individual process.

"Smart Fields is about integrating people, processes and technology," said Joseph Low, a senior engineer based at Shell's Kuala Lumpur center. "You can make decisions or solve problems in a day whereas before they might have taken a week and have slowed production down."

Smart Fields is more than just monitoring and sending information. It's an entire package of integrated solutions that includes high-quality videoconferencing, smart wells, reservoir surveillance, and fiber optics for real-time monitoring. It connects the correct data with the correct person so that problems can be addressed in a timely manner.

The technology has enabled projects to increase production, reduce downtime and improve the overall recovery of oil and gas while reducing costs and minimizing safety risks, according to Shell.

Rockwell turns to Microsoft Azure

The process of turning hydrocarbons trapped deep within the ground into the gas you use to fill up your car is very complex. And every step of that process, from extraction to refining to transporting it to a gas station, requires efficiency and reliability.

Rockwell Automation, with its Connected Enterprise, is tackling those complexities with a solution that helps monitor every step of the petroleum supply chain.

"What we're talking about is delivering a degree of collaboration and visibility unheard of in the oil and gas industry," said Doug Weber, business manager, remote application monitoring for Rockwell Automation. "With sensors, software and the

cloud, these disparate assets can become part of a Connected Enterprise, powered at its core by a rich flow of data."

Rockwell is using Microsoft's IoT services to provide support for its products in the field. The company is using a combination of cloud-based solutions, software, sensors and devices to predict equipment failures, track performance in real time, and help refine designs and processes to prevent future failures. Preventing those failures means savings millions of dollars.

A single pump failing in an offshore rig can halt operations and cost $100,000- to $300,000 a day in lost production, according to Rockwell. To avoid those loses, Rockwell outfitted its pump's electrical variable speed drives to Microsoft's Azure cloud so they could be monitored in real time, providing readings for pressure, temperature, flow rates, and other measurements to engineers.

"The last time we had a well trip offline, within five minutes we had a phone call telling us what broke, what to look at, and how to test it," said Mark McKinley, facilities engineer at Hilcorp. "It saved six hours of troubleshooting or more, and we got right back online. The staff is ecstatic, because they get support before they have to break out manuals and figure it out on their own."

Rockwell Automation and Microsoft also teamed up with Trigg Technologies to connect "skids." Skids are pieces of equipment that measure the amount of product being transferred from one container to the next, and have traditionally relied on paper-based processes. Cloud-enabling this technology makes the required process more accurate and much more efficient.

The company is also working to make gas pumps smart by installing cloud gateway appliances at each station. These pieces of equipment collect data and securely send it to a cloud platform. That information is put in a dashboard that can be easily viewed on a PC, Android, Windows Phones or iPhones.

Questions:

1. Suggest a most suitable Enterprise Architecture for the above cases scenarios. [10]
2. Defend your suggested proposal, mentioned in q1. [10]
3. Suggest a Technology framework/stack as an enabler for the given business solutions, along with its description. [10+10]

Case source: http://www.rcrwireless.com/20160720/internet-of-things/case-study-oil-gas-tag31-tag99