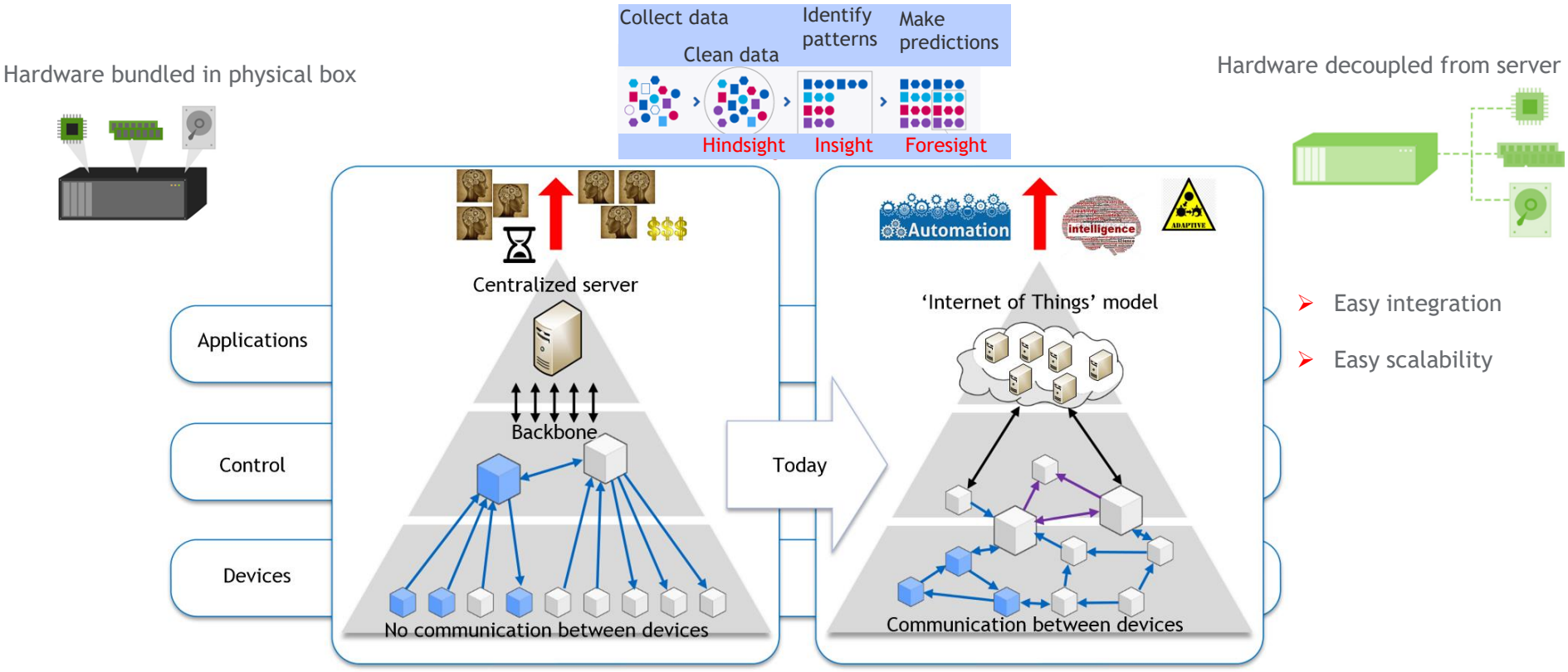
Digitalisation of Process Control

InstMC / SPE 25th and 26th November 2020

IoT and Advanced Data Analytics for Enabling Rig Automation

Michael Affleck – Aramco Overseas

What is ‘Internet of Things (IoT)’?



Brings together state-of-the-art sensors and actuators, smart devices/brilliant machines, people at work and advanced analytics

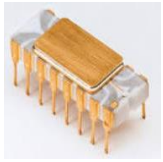
Evolution of IoT

1969

ARPANET

The internet emerges

1970s



Microprocessor (4004)

Mobile phone (DynaTAC)

Internet of content

1980s

PC – IBM 5150

Standard internet protocol

1990s

World Wide Web

Term first coined by Kevin Ashton at MIT

amazon

Alibaba Group 阿里巴巴集团

ebay

E-commerce

First internet connected device

Google

Internet of services

2000s

iPhone

facebook

Social media

YouTube

skype

Internet of people

2010s

Bluetooth LE

Activity trackers

Intelligent personal assistant

Smart clothing

Internet of things

2020s -

Fully Autonomous Platform

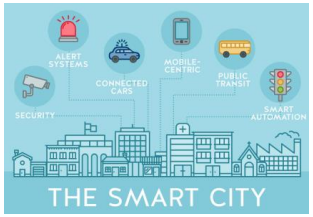
VLC

Self Powered IoT

Internet of application

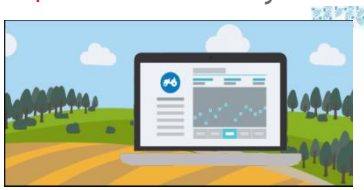
IoT Forecast and Their Role in the Fourth Industrial Revolution

$775 bn market by 2021



Smart Cities

$27 bn market by 2021



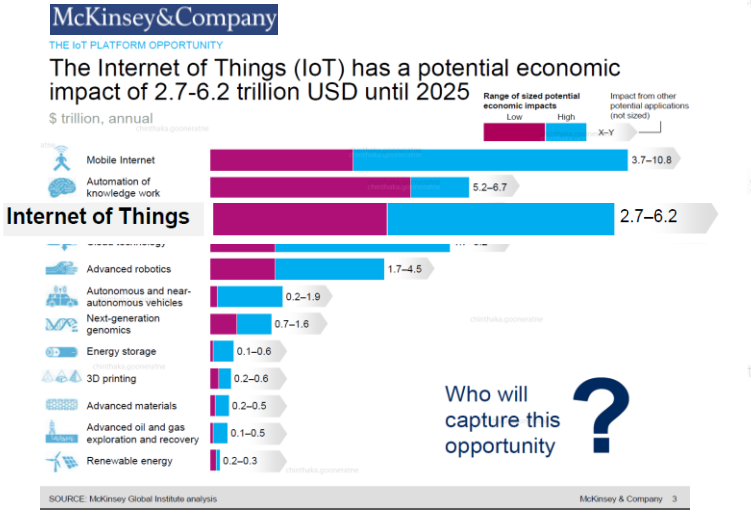
Remote asset management

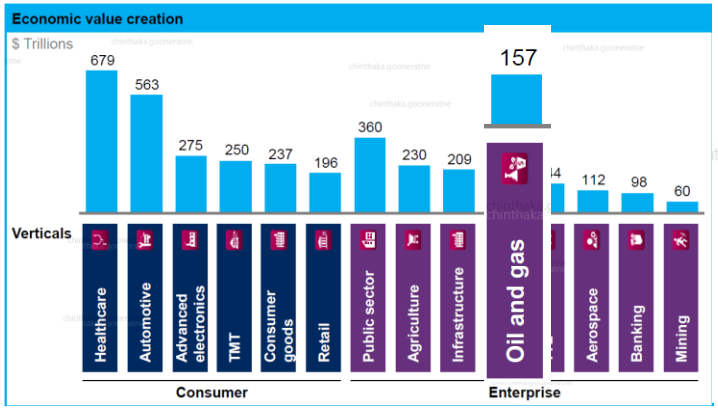
$70 bn market by 2022

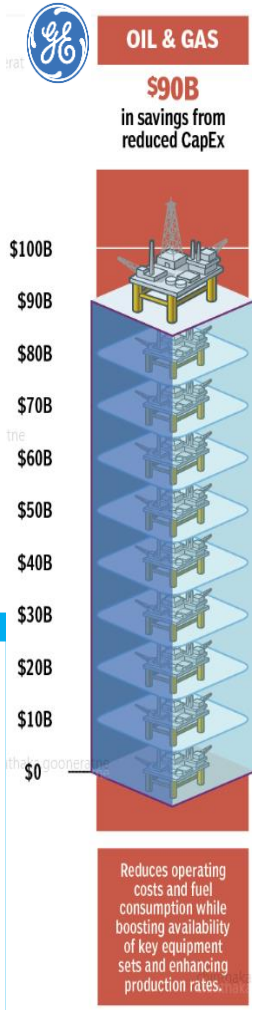
Smart Cars

$158 bn market by 2022

IoT Healthcare

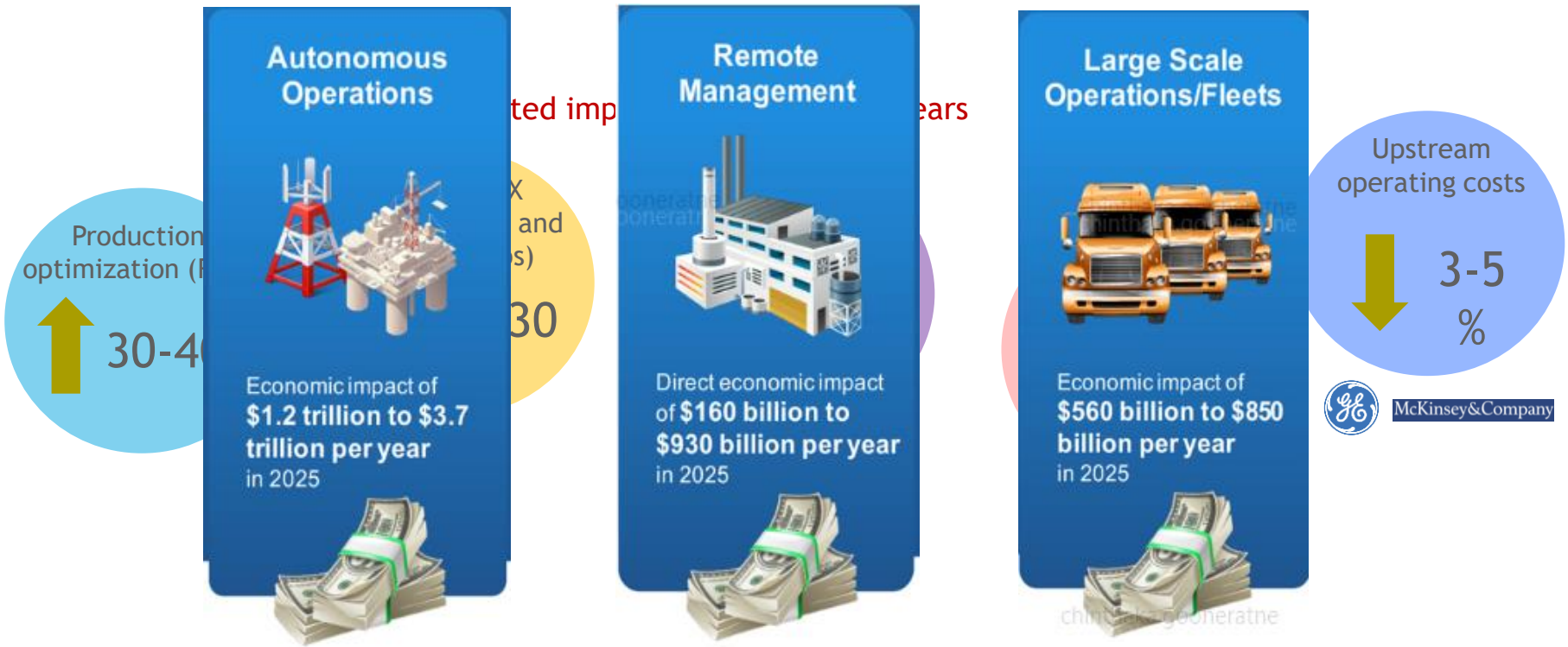






bcg MARKETSANDMARKETS

Predicted Impact on Integrating IoT in Upstream Projects

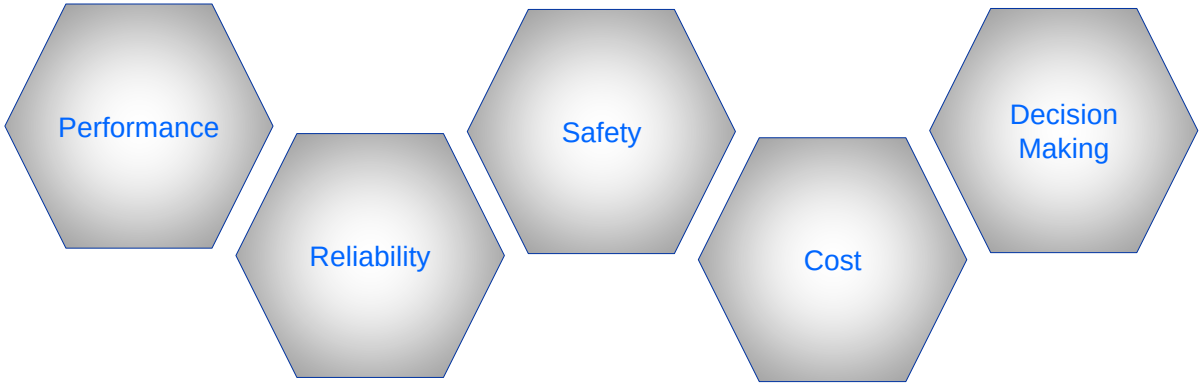


NOMURA 野村證券

The Industrial Internet of Things harnesses the power of big data to improve efficiencies, particularly in asset-intensive industries such as oil and gas.

Analysts at Nomura, for example, say this could make oil and gas companies more profitable at $70pb than they were previously at $100pb...

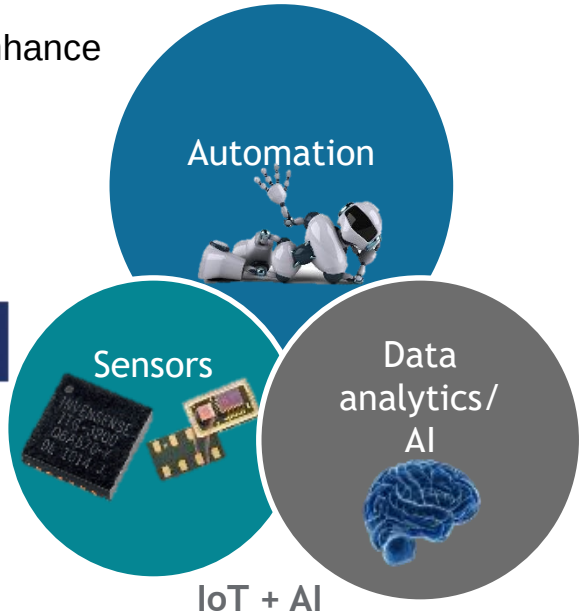
Oil and Gas Industry – Current Approach



Standard approach

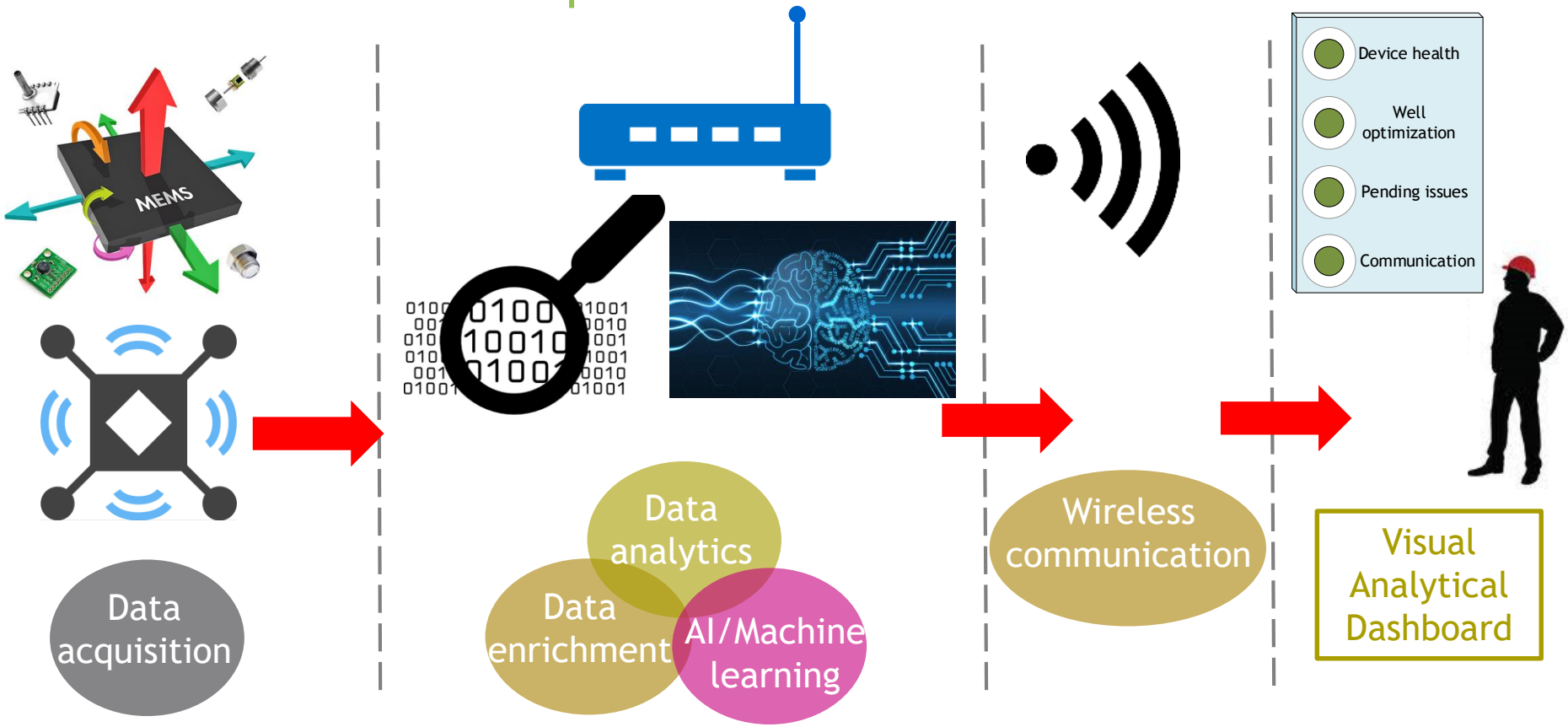
What can we do to enhance this framework…

Optimal performance



IoT + AI Technologies

Framework for IoT Implementation



Automated Flare Stack Monitoring

OIL & GAS

REAL TIME VIDEO ANALYTICS AND ROOT CAUSE CORRELATION ANALYSIS

CHALLENGE

- Monitor large number of flare stacks
- Limited communications / compute resources
- Ensure compliance with environmental/regulatory requirements
- Reduce large spend on maintenance and compliance

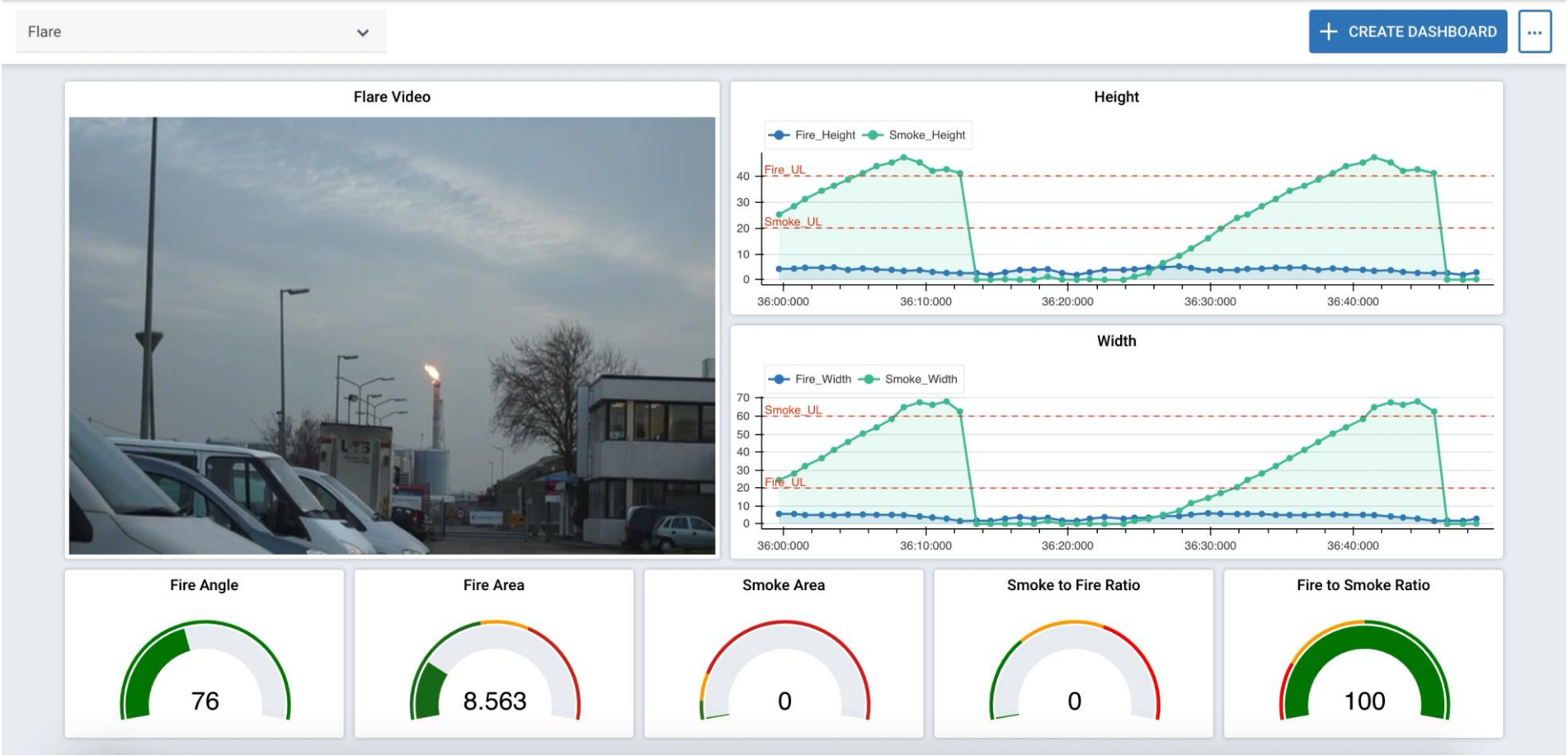
FOGHORN SOLUTION

- Lightning™ Edge installed into existing gateways (<1Gb)
- Real time audio / video analysis of flare feeds
- Convolutional neural networks (CNN) for deep learning
- Sensor fusion correlate flare state with compressor audio

BENEFITS

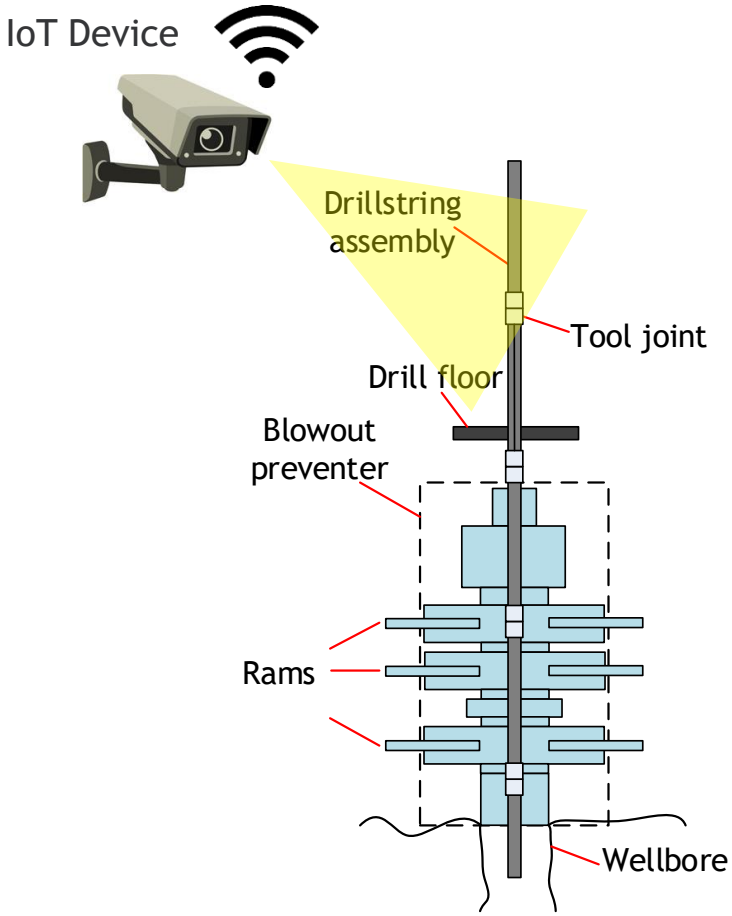
- Lower Opex and maintenance costs
- Broad compliance monitoring
- Improved safety

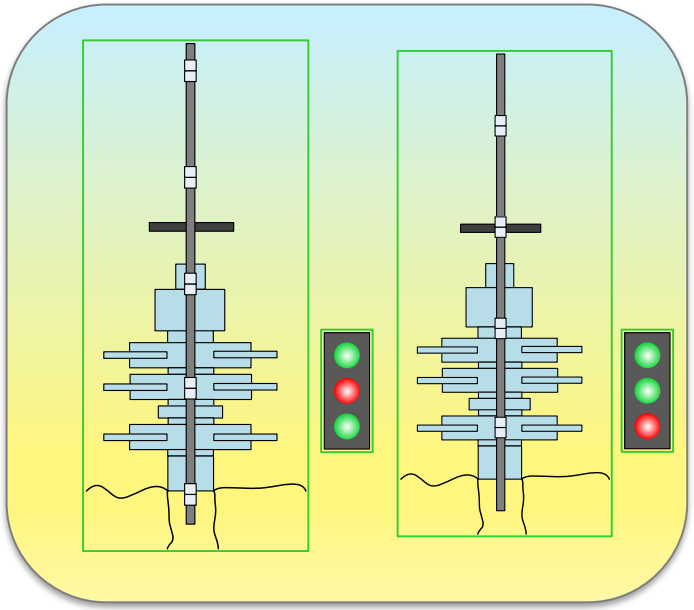
Demo Video

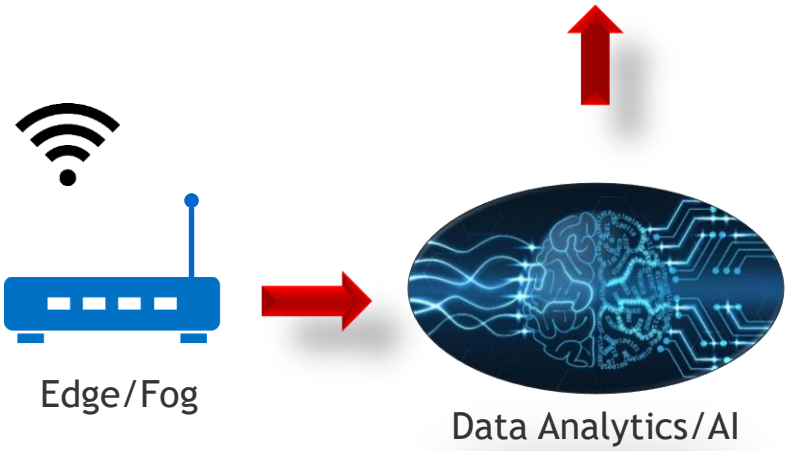


Material courtesy of Foghorn

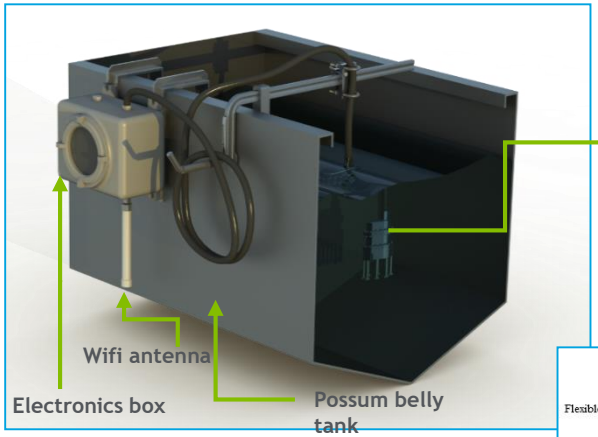
Auto Well Space Out



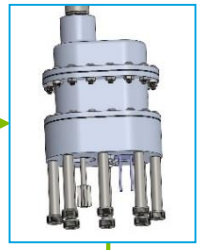




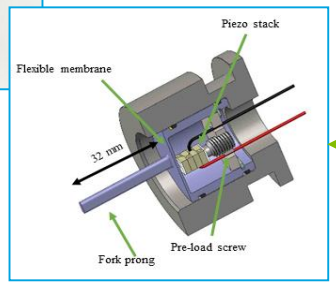
Tuning Fork Viscometer

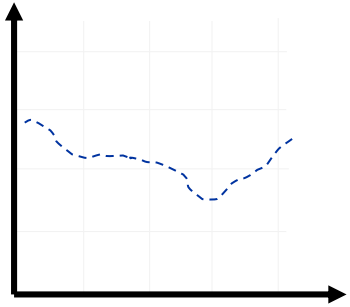


Submergible housing



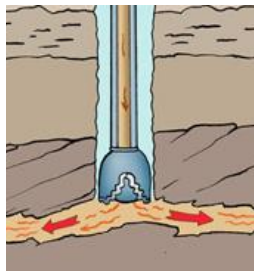
Mud Fork Resonator





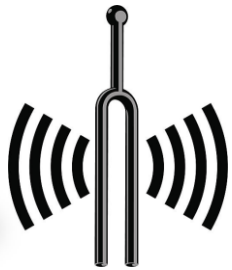
Real-Time Rheology of Drilling Fluids

Stuck pipe



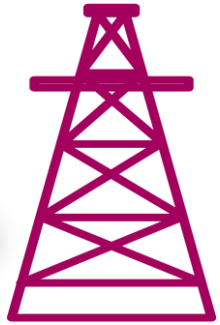
Lost Circulation

Algorithms



Tuning Fork

Data Analytics/AI



Increase Drilling Performance

Conclusion

- People, process, and technology as an integrated solution will help in achieving top performance while increasing reliability, safety, decision making, and sustainability.
- Digital transformation in Oil & Gas industry requires marrying of physical and digital technologies.
- Currently most of the projects are either related to cost reduction or addressing safety.
- Organizational push is required to enable digital transformation of drilling and production, requires change in infrastructure, behavior and skills.
- Cybersecurity is one of the major challenges along with scalability of models.
- IoT have entered the Oil & Gas industry and several case studies are published. This will continue to grow as more Oil & Gas companies are now seeing the benefit of utilizing **automation** for optimizing drilling and production.

Thank you