



# Efficiently Enabling Digital Transformation



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# Maintenance

- Predictive Maintenance is the Killer App for IoT
  - Reduces equipment failures and downtime
  - Reduces costs by avoiding unnecessary maintenance
  - Improves safety by avoiding emergency interventions
- A single shutdown can last for days and cost millions of dollars.
  - Recognize early warning signs.
  - The root cause is often different
  - Target Outcome: 40-50% reduction



# IoT + Machine Learning

- Instead of just monitoring for equipment failure, measure and trend monitoring data 24/7
  - Vibration, temperature, flow rate, pressure, tank level, fuel consumption, power consumption, exhaust emissions
- Engine Failure Timeline
  - Vibration signature 2.5 days prior
  - Oil pressure trend 2 weeks prior
  - Cost of early intervention is minor compared to replacement



# How Much Data?

- Syncrude Case Study – \$20M annual savings from reduced outages and lower maintenance costs.
- Example:
  - 1716 data points / sec
  - 50 bytes + 27 byte OH
  - 1.1 Mbps
- The data rate can be higher when running diagnostics

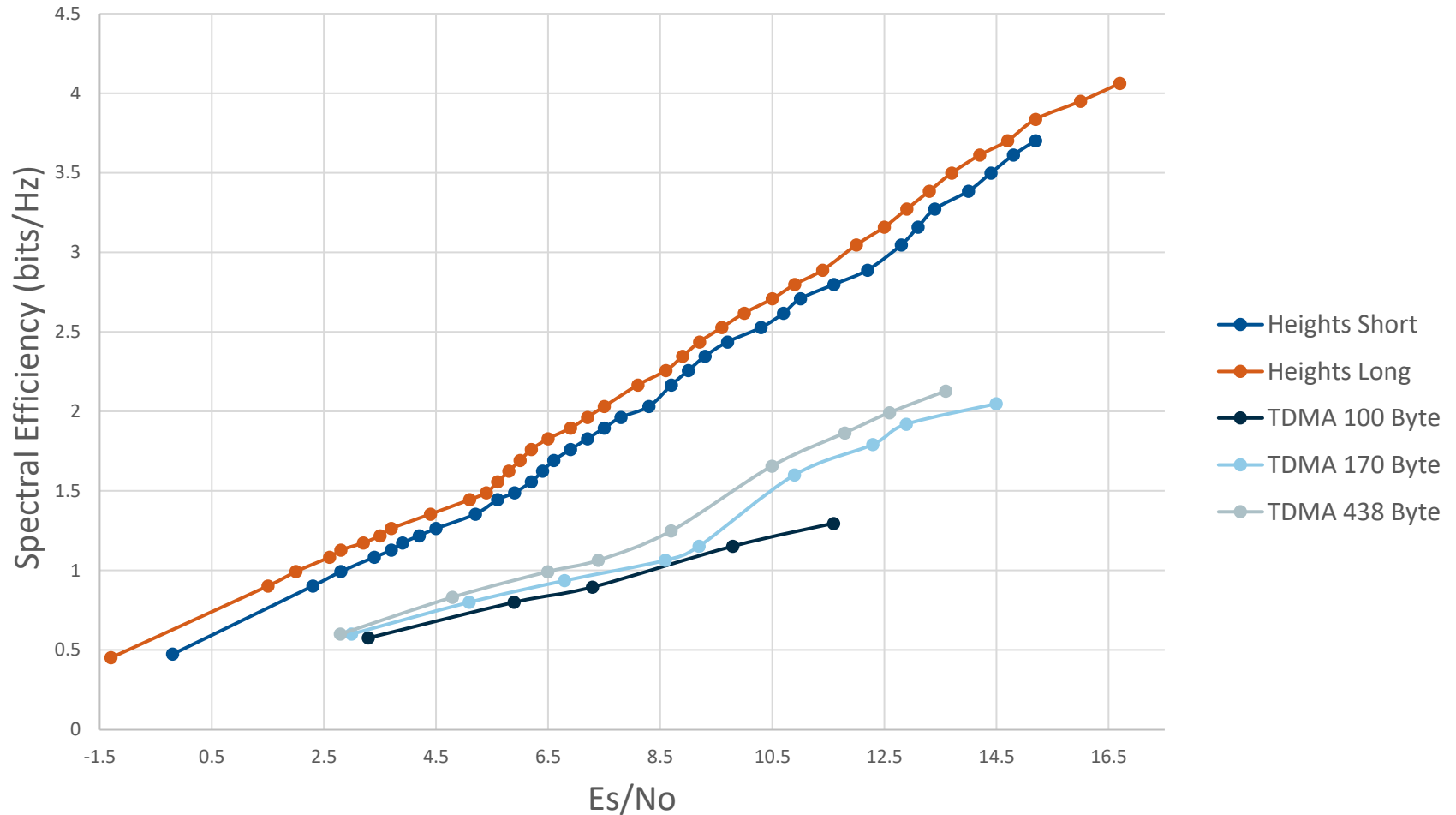
**The business value far exceeds the cost to implement these solutions.**

# Network Bottleneck

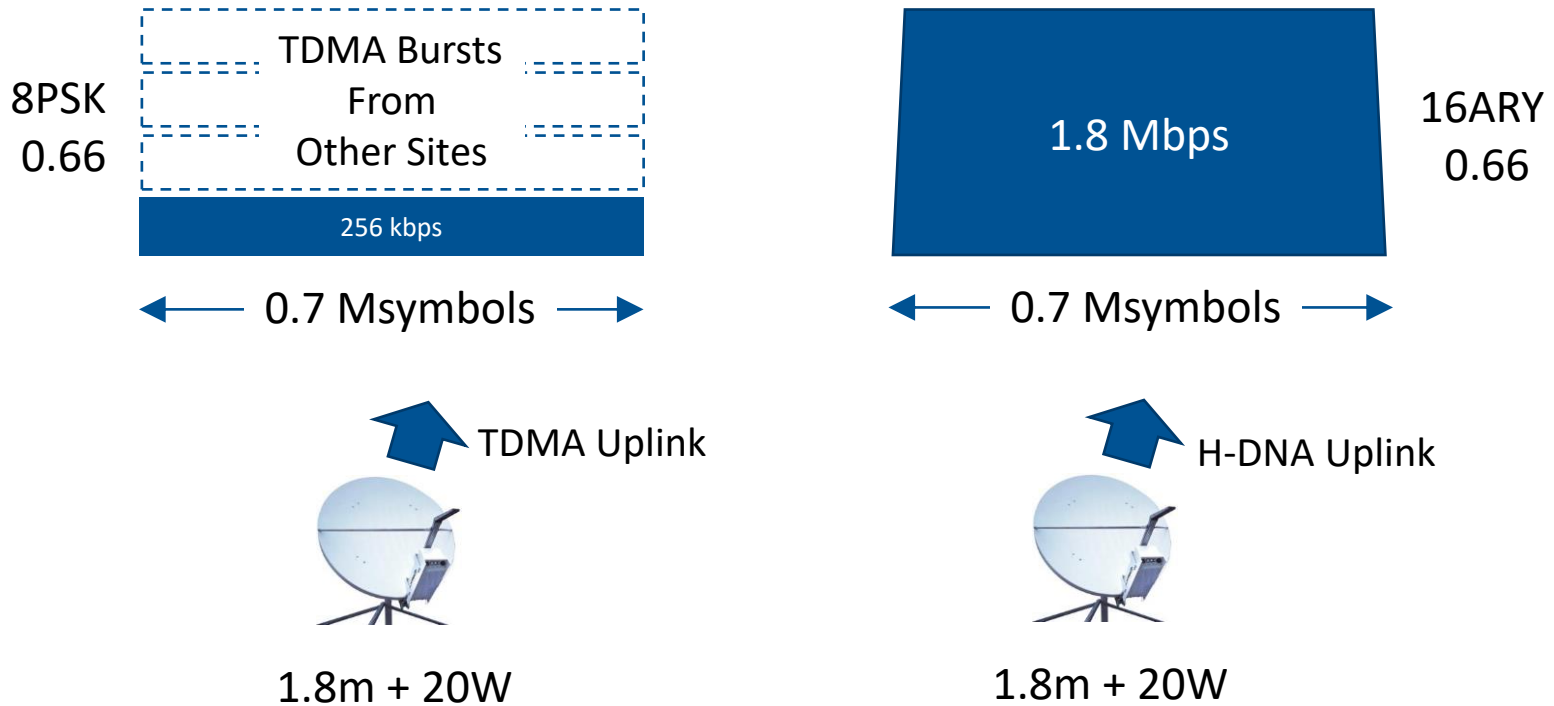
- Higher uplink rates often outpace legacy TDMA VSATs
- Upgrading the uplink often requires a bigger BUC
  - Open the radome.
  - Risk of damage? Corroded components? Rebalance?
  - Worker certification + health & safety requirements.
  - Is the Modem Packets per second up to the task?
- A better solution would be to do more with the current terminal by upgrading to a more efficient solution such as Comtech's Heights platform.

# Heights vs TDMA Spectral Efficiency

Including Overhead



# Heights vs TDMA Terminal Efficiency



TDMA supports 256 kbps vs H-DNA 1.8 Mbps = 7x higher return link  
Compared with TDMA using the same Antenna and BUC

# Efficiently Enabling Digital Transformation

- Business benefits of Predictive Maintenance are very compelling:
  - Reduced downtime
  - Lower maintenance costs
  - But implementation projects still have to be cost conscious
- Upgrading legacy TDMA systems to Heights
  - Reduces CapEx and complexity of implementation
  - Bandwidth efficiency reduces OpEx





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# Eelume – Underwater Robotics

