# How Sub M Rulemaking Spawned MTS Innovative Technologies

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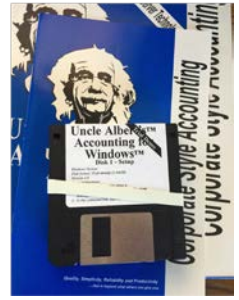
# Introduction

Dean Shoultz

- Started first technology company in 1982, professionally in 1985 (pre-internet, pre-everything, BBS days)
- Authored PC Guitar in late 80's
- Authored popular mid-market accounting systems used by thousands of companies
- One generic accounting customer was a large OSV operator in the Gulf of Mexico
  - Approached us to extend the generic system for specific use in the marine industry
  - What originally started as a back office ERP system became Marine specific
  - Moved to onboard data collection utility
  - Understand their perspective and pain points deeply
- Technology experience
  - Software
  - Cloud
  - Mobility
  - Big Data
  - IoT


My first software




ERP Software

First "PC"

# What is Subchapter “M”?

First proposed in early 2000’s, finally published

Implements new rules on the inspection, standards, and safety policies of towing vessels.

Operators required to have an issued Certificate of Inspection (COI)

- Construction and arrangement
- Operations
- Safety
- Recordkeeping (Towing Vessel Record)
- 2 Years to do so

Affects over 5500 vessels

# What is a TVR?

Towing Vessel Record (TVR)

Defined under section 140.910 of Subchapter M

Big change: E-Format Allowed

- Groundbreaking but modern approach

Record types

- Preventative Maintenance
- Safety/Towing assessments
- E-Logs
- Crew Records
- Fire systems

# My Firms Response to Sub M?

Created “smart client’ onboard data collection system

- To manage the record keeping aspect of Sub M
- Provide a turnkey Subchapter “M” compliance solution; Use it and you’ll be OK.
- IoT platform for vessels, of all types

Required Capabilities

- Smart Client for offline work (poor or no internet connectivity)
- Encryption for cyber-security protection
- Compression to minimize data packet sizes
- Simple to use
- Vessels need to replicate to centralized cloud repository for shore-side analysis

# Where Did That Lead Us?

We now had a reliable, secure footprint on the vessel

Attended industry events, and shocked to learn how empirical data was underutilized

Planned, CBM, and predictive maintenance natural next step

- Capture sensor data
- Leverage replication, compression, encryption
- On-vessel elimination and predictions
- Mobile application attributes

Started to investigate

- Was there marine and transportation industry interest in Predictive Analytics?
- Could it be commercialized?
- Was it economical and value-laden?

# What We Discovered

It had been tried before
- IACS members
- MARAD/DOD funded initiatives (SOCP, UNO ShipNET)
- WAVE
- Public companies, private companies, others

Technically accomplished but with commercial challenges
- Successful algorithms and predictions
- Some fleets still functioning
- Too costly

What's changed?
- Public cloud: Mass storage, compute, ingest
- Reliable, lower cost communications
- Operator acceptance

**Conclusion: Viable**

# Commercial PM and CBM Solution

## Keys to commercial success

- ✓Must have a consistent data model upon which predictions could be based, and algorithms built without needing to be “customized” per vessel/operator
- ✓Shift challenge to a cleanse and transform process,  moving vessel/operator specific data into the standardized model
- ✓SOA cloud architecture, with eventual consistency for performance
- ✓Distributed and edge computing
- ✓Massively scalable data storage (Petabytes and more). Relational, NoSQL, Key/Value pairs, de-normalization, pre-aggregated data sets, etc.
- ✓Massively scalable ingest. API’s preferred, cruder forms accepted (email attachments)
- ✓Highly secure data in motion and data at rest
- ✓Affordable and accurate

# PM and CBM Commercialization Model

## Data Sources

Sensor Data from Vessels

Public API'S and Datasets

Commercial Data and ERP

Legal and Insurance Data


Social Media

## Ingest

Windows Azure

Bi-directional API's

Email

FTP, FTPS. SFTP

Regionally consumed and replicated. CDN Networks

- Massively scalable
- Asynchronous
- Elastic
- Secure / Encrypted

## Process

Windows Azure

Cleanse

Transform

Organize

NoSQL/JSON

Relational

Key/Value Pairs

- Massively scalable
- SOA
- Asynchronous
- Elastic
- Queue / Auto-scale

## Predict & Present

Windows Azure

Machine Learning

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Learn

Predict

Present

Consumers

Operators Inspectors

Regulators Surveyors

HSE USCG

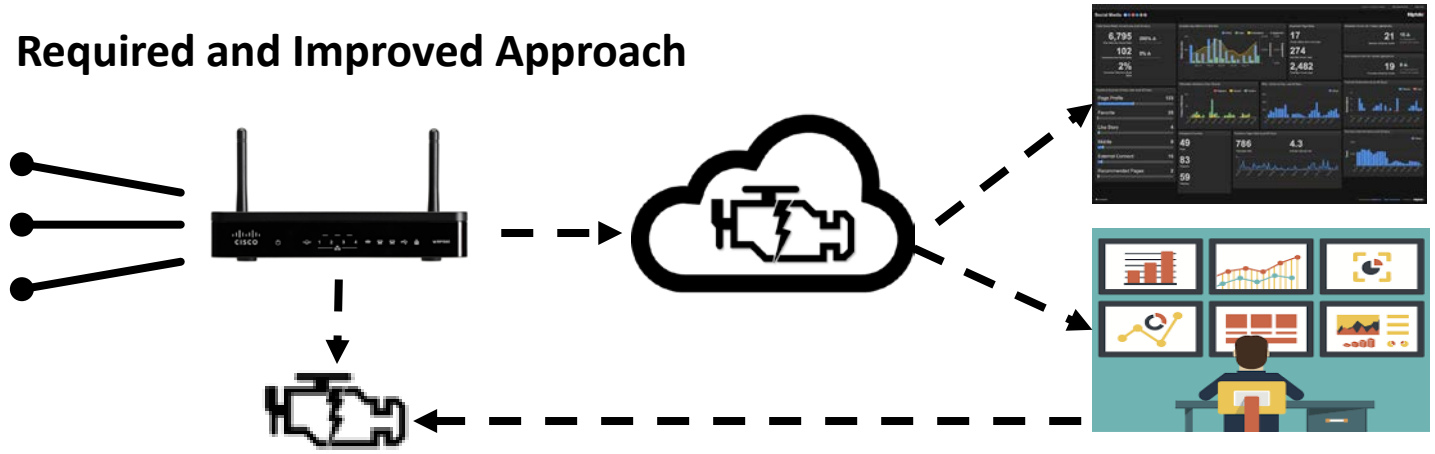
Legal Insurance

- Massively scalable
- 100's or 1000's of Virtual Machines

# Unique IoT Approach, Sub M Motivated

**Common Approach to IoT**

**Required and Improved Approach**



Reasoning:

- Onboard record keeping (TVR) requirements
- Huge volumes of data (petabytes)
- Limited or poor connectivity
- Processing engine on both ends
  - Reduction
  - Predictions
- Change and enhance remotely after installation

Remarkable implications for all of IoT (15 trillion $ industry)

# Why the Microsoft Azure Public Cloud

## Special ‘Thank You’ to Microsoft for helping us build commercial platform

## General characteristics of Azure

- Elastic and self-healing
- SLA
- Eventual consistency, SOA model using messaging

## API’s and Communications

- Scalable, secure ingest over standard protocols
- Geo-load balancing, redundancy

## Big Data

- Massive data at rest and motion capabilities. NoSQL, relational, BLOB, key/value pairs, HD Insight, de-normalization, pre-aggregation
- Organized for prediction optimization.
- Secure
- Backup and redundancy. CDN world-wide staging

## Machine Learning

- Predictions and self-learning
- Built-in and custom algorithms
- R and Python languages

## Affordability

- Consumption based pricing
- Dynamic provisioning and de-provisioning

## Security

- Complies with numerous governmental security standards
- New certifications often
- Data center locations not known

# PM, CBM, and Predictions Capabilities

Alerts
- Configurable text messages and emails
- Set thresholds and severity levels
- Multiple set-points (can be different than what is in pilot house)
- Mobile application and push notifications

Charts, Graphs, and KPI’s
- Historical
- Predictive
- Comparative

Presentations
- Excel Power BI
- Cortana

Accessibility
- API for further innovations
- API for integrations

# Predictive Analytics Partners

| Technology | Data Science | Shipyards | Government | Insurance | Legal | Operators | Class |
|---|---|---|---|---|---|---|---|

Microsoft

Bollinger SHIPYARDS

NOVACES Focus. Accelerate. Achieve.

Marquette Transportation Company

US Army Corps of Engineers

RINA

Jones Walker

Otto Candies, LLC Marine Transportation & Towing

U.S. Customs and Border Protection

NOAA

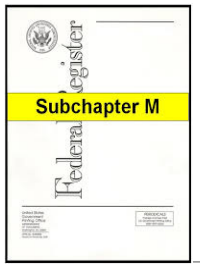
Insurance, Bonds & Benefits

Tidewater Transportation & Terminals

# Seeking Assistance

Please ping me if you're interested in participating in any way

- Higher level of engagement from federal partners
- Good ideas
- BETA testers, vessels and fleets
- Data scientists
- What predictions you need
- Communications and electronics partners
- Sensors or data feeds available




# Conclusion

Hats off to USCG

- Subchapter “M” has had a very positive, perhaps unintended impact
- Technology is being built by several companies in support of Sub M
- It only just beginning

Thank you!

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