

PROACTIVE RT SOLUTIONS



RTAS - Real Time Advisory System

***Supplier Neutral Real Time Data (RTD) System
Enabling***

Safe, efficient, reliable Drilling Operations for every well.

Kevin Lacy – CEO Proactive RT Solutions
IADC Spark Tank - April 4, 2018

Introductions, Context, RTD/RTC Brief History

PRTS perspective and purpose in developing RTAS for the Oil and Gas Industry

- **The industry has a complex, growing problem that requires an effective solution.**
 - Experience levels at the rig site and in the operator’s office have decreased significantly.
 - The pace of drilling and complexity of wells is increasing while experience is decreasing.
 - Cost pressures and metrics drive aggressive well plans and faster well drilling rates.
 - Major incident rates are not decreasing, especially in the US.
- **We cannot change the key dynamics of the industry but we can find ways to offset the negative impacts on cost performance and safety.**
 - In this environment there is tremendous pressure on the well site crews to achieve targets.
 - Mistakes are made due to pace, distractions, lack of experience, miscommunications.
 - Well site crews are still the best “first responders” if they have timely, quality information.

A new RTD system must offer new, significant capabilities at a cost-effective price.

OUR GOALS in creating RTAS

Our primary goal is to provide management, asset teams, drilling crews, , drilling supervisors, and drilling engineers with a system that lowers risk, improves performance, and improves the quality of well planning in a very cost-effective manner.

Our secondary goal is to provide a better system to facilitate cross discipline collaboration, improve communication between the field operations and the office, and streamline the process for managing and reporting information to fulfill regulatory requirements.

“The concept of industrializing the process really leads you towards standardized drilling, equipment and software. It definitely increases the skills need of the driller not decrease it. “
Kevin Neveu – President - CEO Precision Drilling

“Historically, this industry has relied on lots of rules of thumb, but those rules came about because we lacked data about what was really happening downhole. We are realizing that the inherent inconsistency of humans is worse than we ever thought.”
David Reid – CMO National Oilwell Varco

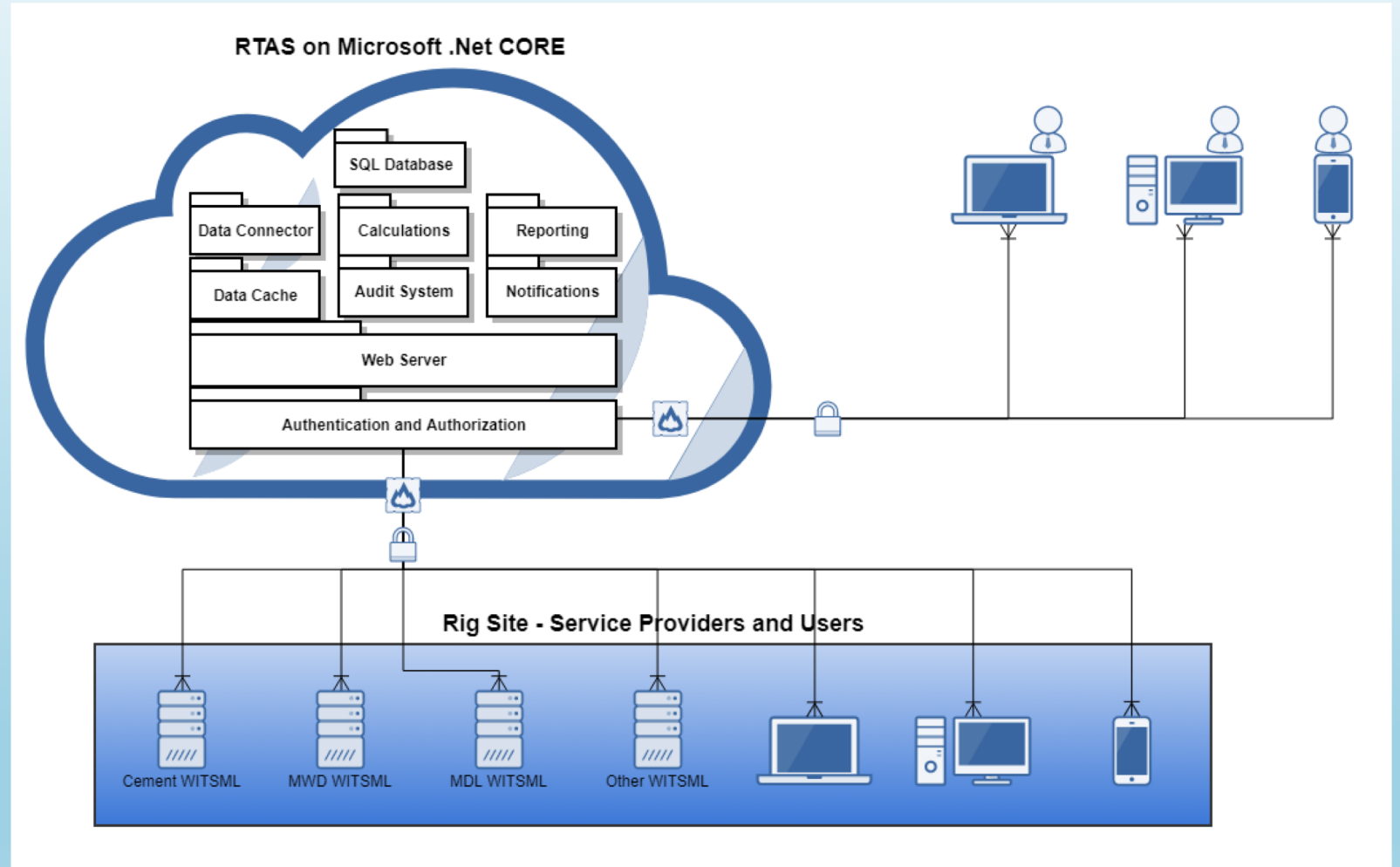
“In the coming years, I really think we’ll have to utilize data more aggressively and effectively, in conjunction with advanced rig automation.”
Garret Jackson – VP Drilling Devon

What Is RTAS?

- A PROACTIVE, unique real-time monitoring system:
 - State of the art IT design – secure, powerful, flexible, highly customizable
 - Proactively identify drilling hazards as they evolve
 - Provide “watch” alerts to user determined individuals or teams – can send to any monitoring console or web enabled device
 - Supports regulatory compliance and enables full data and action audit trail (customizable for any drilling or regulatory environment)
 - Sync and customize any WITSML, digital, or analogue data track into real time
 - Unique capability for historical analysis: root cause, simulation, and training

RTAS: The Architecture

- Utilizes industry-leading IT technologies.
- Modular, Scalable, and Dynamic Framework
 - Built to add new data input types, features, product lines, etc.
- Cloud Based System
 - Deployable internally, externally, private-externally.
 - On-rig site deployment
 - Custom deployments
- HTML5 web (browser) interface compatible with:
 - PC, Mac, Tablet, Phone



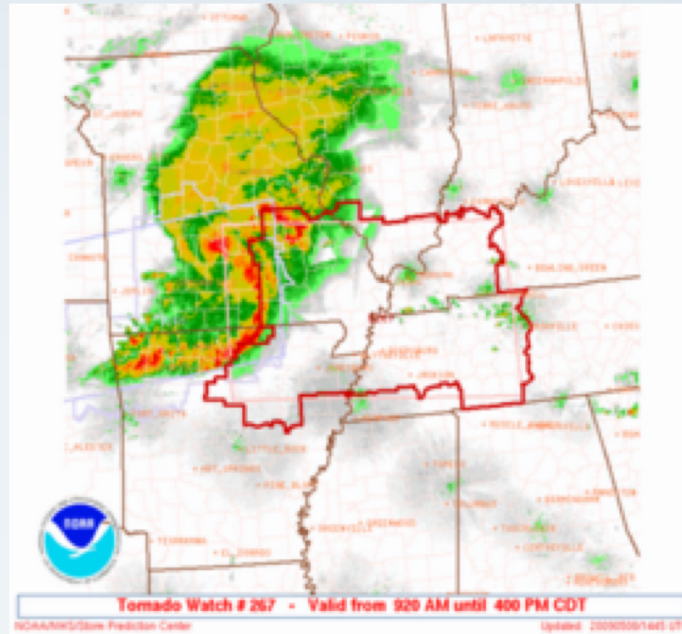
RTAS provides unique *Proactive* Watches, Not *Reactive* Alarms

Alarms from most existing RTD systems are reactive – based on thresholds or limits. Provides limited warning and response time.

The Weather service issues tornado “watches”, akin to an alert when the *physical* behaviors of the atmosphere are conducive for the formation of a tornado; atmospheric pressure, wind currents, humidity, and temperature variations.
Proactive.

RTAS uses this similar “watch” approach by scanning for a multitude of conditions conducive to an evolving well bore problem.

Based upon a deterministic approach that identifies deteriorating well bore force balances – imbalances conducive and likely to cause a major problem- proactive.



Watches are easily configured. Can also use suggested templates or RTAS and well histories to determine best watch parameters.



An Industry First: Supplier Neutral WTSML System

- Digital Import Capabilities from ANY Supplier WTSML Stream
 - Import pore pressure and fracture gradient model predictions
 - Measure models against real-time data
 - Imports directional data
 - Imports ASCII digital data
 - Analog capable for data such as wellbore cuttings analysis
 - Analyze any historical WTSML well file - an in-depth analysis in minutes
 - Capable of “data mining” any source to determine patterns, trends, relationships
 - Real time generation and synchronization of regulatory filings/forms; such as LOT/FIT, tubulars testing, BOPE testing, Safe Drilling Margin, etc.
 - Heat mapping for hazard study / archived for permanent tracking by time or depth
 - Material balance capabilities for flow monitoring during tripping and tubular running operations

Potential Customers and Value Opportunities

RTAS was designed to provide real time monitoring and data management capabilities for current RTD and RTC users but also for many groups that are not using RTD due to costs and difficulty in implementation.

Offshore Operators - especially those subject to the new BSEE regulations regarding RTD systems

Onshore Operators – any size – RTAS is easily implemented without setting up a RTC or separate staff to monitor

Drilling Contractors – typically unable to adequately understand or monitor evolving downhole conditions making it difficult to fully protect company assets and crews and Operator's well from serious well bore problems.

Drilling Foremen / Representatives – provides a low cost fully capable system to supplement well site experience and provide an additional layer of real time monitoring.

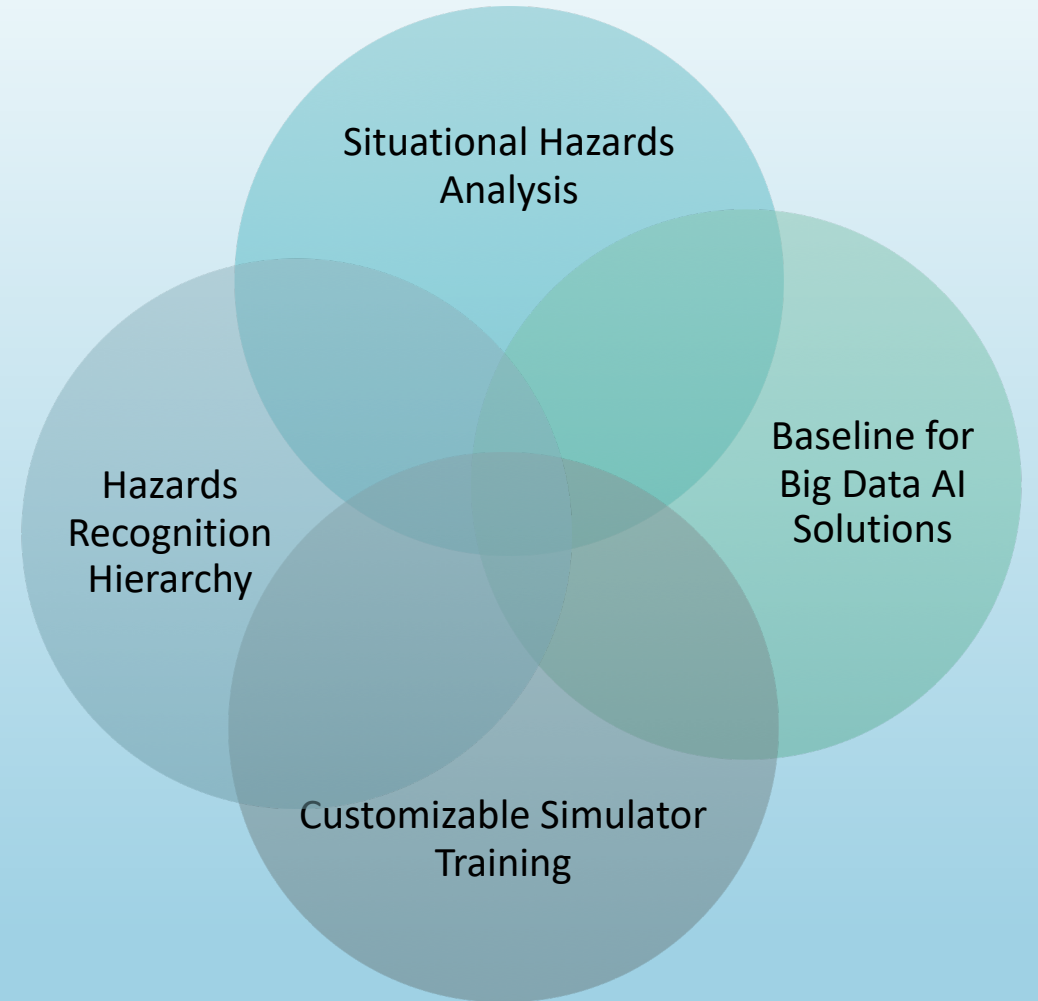
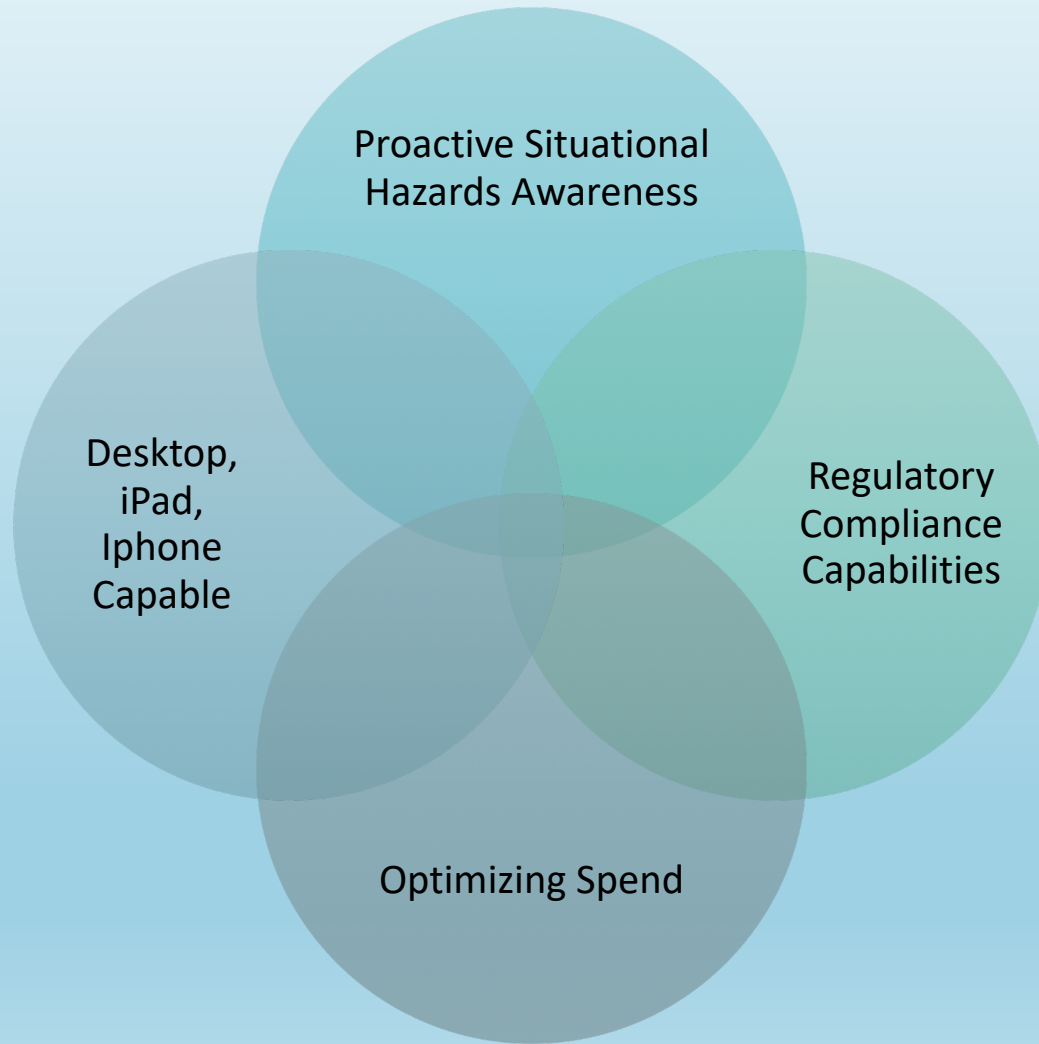
Drilling Engineers – typically stretched for time to adequately monitor, optimize, plan current and future wells.

The Significant Cost of “Common” Drilling Problems

- Deep Water Example - Fast drilling, cuttings loading, ECD upward creep above LOT, fast ROP continued
- Massive losses, fractured wellbore, lost primary barrier.
- ECD was too low to counter-act the pore pressure, yet too high to avoid massive fluid losses.
- **Lead time from RTAS First Watch to wellbore failures: 13 hours**
- 12 days of Avoidable Lost Time, \$ 20,000,000 sidetrack.

- Unconventional – Eagle Ford Example
- Pump pressure trends began decreasing, flow losses detected. Torque increased. Lost primary barrier, stuck pipe.
- The signatures of impending stuck pipe were evident.
- **Lead time from RTAS First Watch to wellbore failures: 3 hours**
- \$1,600,000 direct, plus tools and service.

Back up slides



RTAS[©] Analyzed Case Histories of Avoidable Lost Time: The \$ Value Lost

Real Time Conditions	Real Time Facts	Cost of Avoidable Lost Time
Deepwater		
<ul style="list-style-type: none"> Fast drilling, cuttings loading, ECD upward creep above LOT, fast ROP continued Massive losses, fractured wellbore, lost primary barrier. 	<p>ECD was too low to counteract the pore pressure, yet too high to avoid massive fluid losses.</p>	<p>Lead time from First Watch alert to wellbore failures: 13 hours</p> <ul style="list-style-type: none"> 12 days of Avoidable Lost Time, \$ 20,000,000 sidetrack.
Canadian Rockies		
<ul style="list-style-type: none"> Standpipe, motor differential, torque and pressure increasing. Gas levels and flow increasing significantly, kick 	<p>Pressure transition was detected in RTD and drilling continued</p>	<p>Lead time from First Watch alert to wellbore failures: 1 hour</p> <ul style="list-style-type: none"> \$4,500,000, plus added casing, tools, and services Loss of well and drilling program cancelled
Conventional: South America		
<ul style="list-style-type: none"> WOB was almost doubled at tour change. Torque trend and pump pressure and ROP increased dramatically. 	<p>Signatures of cuttings loading, exceptionally fast ROP. Stuck pipe.</p>	<p>Lead time from First Watch alert to wellbore failures: 13 hours</p> <ul style="list-style-type: none"> \$1,400,000 direct, plus tools and service.
Unconventional: Eagle Ford		
<ul style="list-style-type: none"> Pump pressure trends began decreasing, flow losses detected. Torque increased. Lost primary barrier, stuck pipe. 	<p>The signatures of impending stuck pipe were evident.</p>	<p>Lead time from First Watch alert to wellbore failures: 3 hours</p> <ul style="list-style-type: none"> \$1,600,000 direct, plus tools and service.
Unconventional: Eagle Ford		
<ul style="list-style-type: none"> Differential pressure, pump pressure began decreasing, gas levels increasing Drilling continued at fast ROP, seal ruptured on the rotating control head. Sour gas and raw condensate blew over the derrick. 	<p>Impending kick evident</p>	<p>Lead time from First Watch alert to wellbore failures: 9 hours</p> <ul style="list-style-type: none"> \$450,000 direct plus tools and service.

OUR MISSION – GUIDING PRICIPLES:

We believe from our collective experience that effective use of real time data will deliver safer more efficient drilling operations and that all stakeholders associated with drilling operations will benefit.

For a real-time data system to be effective it must translate data into information and enable the user to utilize their information without requiring them to commit to other services or an inflexible data management system. It must have a high degree of flexibility but be fully secure and fully meet the users unique analysis, display and reporting requirements.

Real time data value depends entirely on the ability to be accurate, timely, and relevant to making quality, proactive operational decisions at the well site and by the larger well team.

All Operators regardless of size – onshore or offshore – will benefit from a cost effective real time data system that does not necessitate the significant costs of building and staffing a 24/7 real time data monitoring center.