



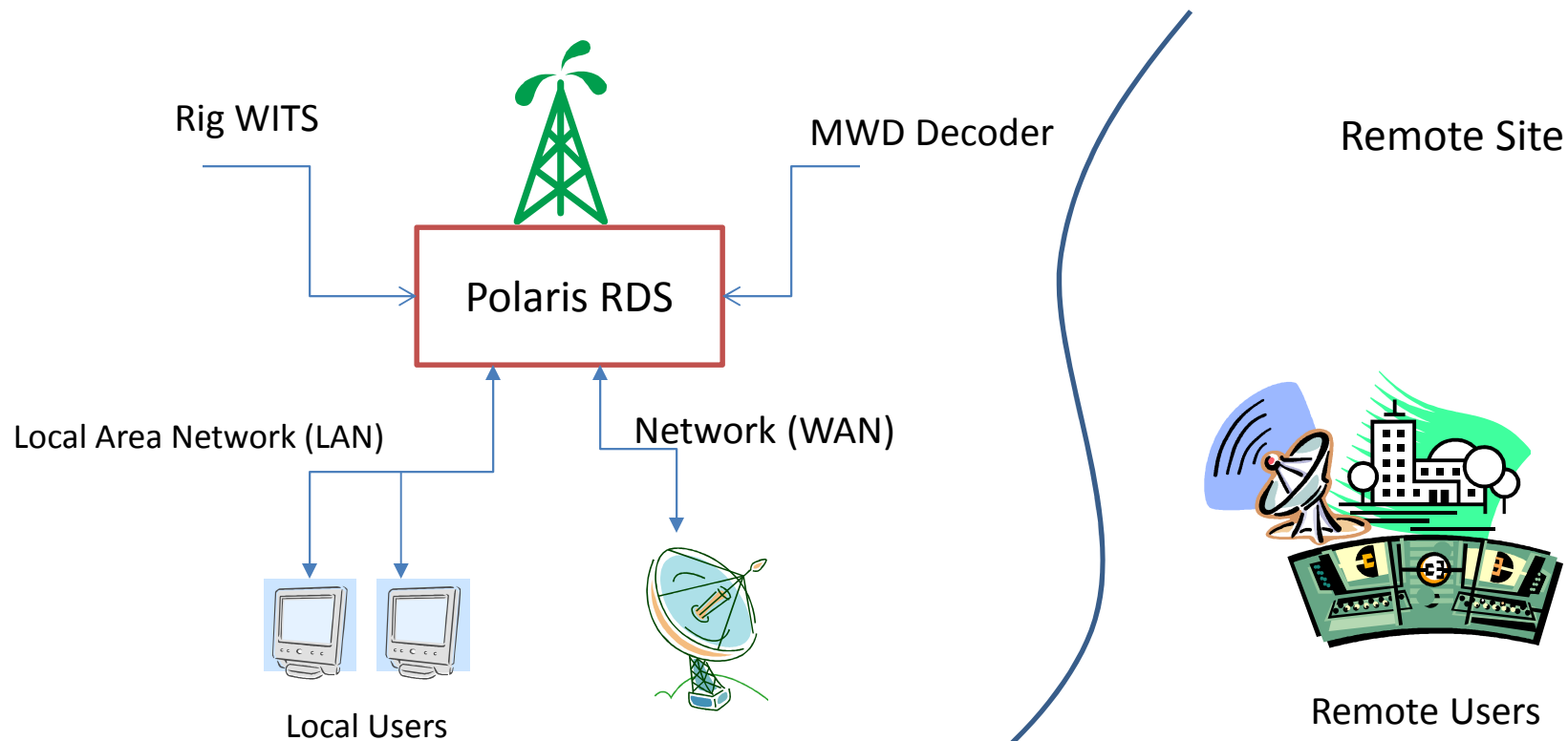
Polaris RDS – WITSML Integration

About Polaris RDS

- The Polaris Remote Directional System (RDS) is a rugged, embedded data logging system designed to facilitate directional drilling and MWD data logging services.
- RDS includes several industry standard features in a very intuitive and easily mastered interface.
- All data aggregated is available for export and full backup in more than one way via options on the RDS screen. All these can be downloaded and/or emailed to clients as needs arise.

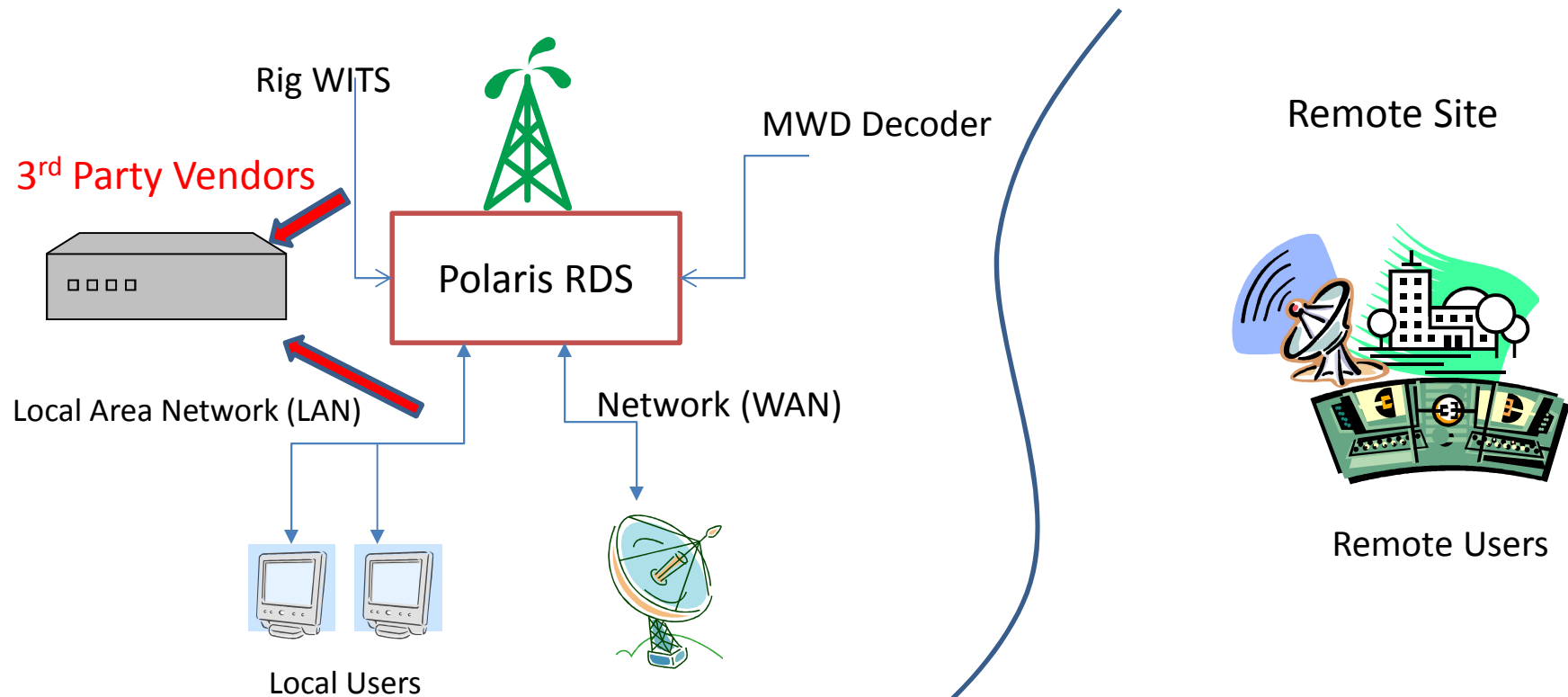


Typical Rig Site setup



Data is collected at the RDS and saved locally, Users (either local or remote) connect to the RDS using network IP address.

3rd party Vendors at Rig site



Third Party Vendors tap into various feeds at rig sites, collect data and push data via their proprietary ways to their own servers. Remote users utilize these third party viewers to view the data.

Complications!

- **Logistics** – Have to keep third party vendors in loop.
- **Logistics** – Third party vendors need equipment and rig site trips to rig up and rig down besides trips for fixing cabling issues.
- **Data issues** – Any error correction done by MWD hand – either log data or surveys – are not sent out automatically to third party vendors.
- **Manual intervention** – Either clients or real time operators need to manually request and import data into their system. This is not only time consuming but also results in delays for the clients.
- **Data Storage fragmentation** – Data sent out multiple times during the course of drilling to one or more clients makes it difficult to keep track of good vs. bad data.
- **Data Security** – Chances of data getting into the wrong hand – perhaps an old mailing list or incorrect auto complete by email client – is quite high.
- **Data Quality** – Entire possible for third party vendors to manipulate data (intentionally or unintentionally). If this happens, data does not truly represent the service company.

Solution

- Have Polaris RDS push data outwards to server(s) – third party vendors, operators, anyone else.
- Make sure any and all error corrections or data updates are automatically pushed in real time as well – without any user intervention.
- Completely automate data push with built-in error recovery in case of network failure and/or system malfunction.
- Have minimal change in current MWD hand workings – do not add to already a big TO DO list for the MWD hand.
- Allow data security – all data moving outwards need to be encrypted.
- Minimize addition to rig network bandwidth.
- Ensure consistent data quality on RDS as well as remote servers.
- Push data to any server – Third party and/or operator.
- How?

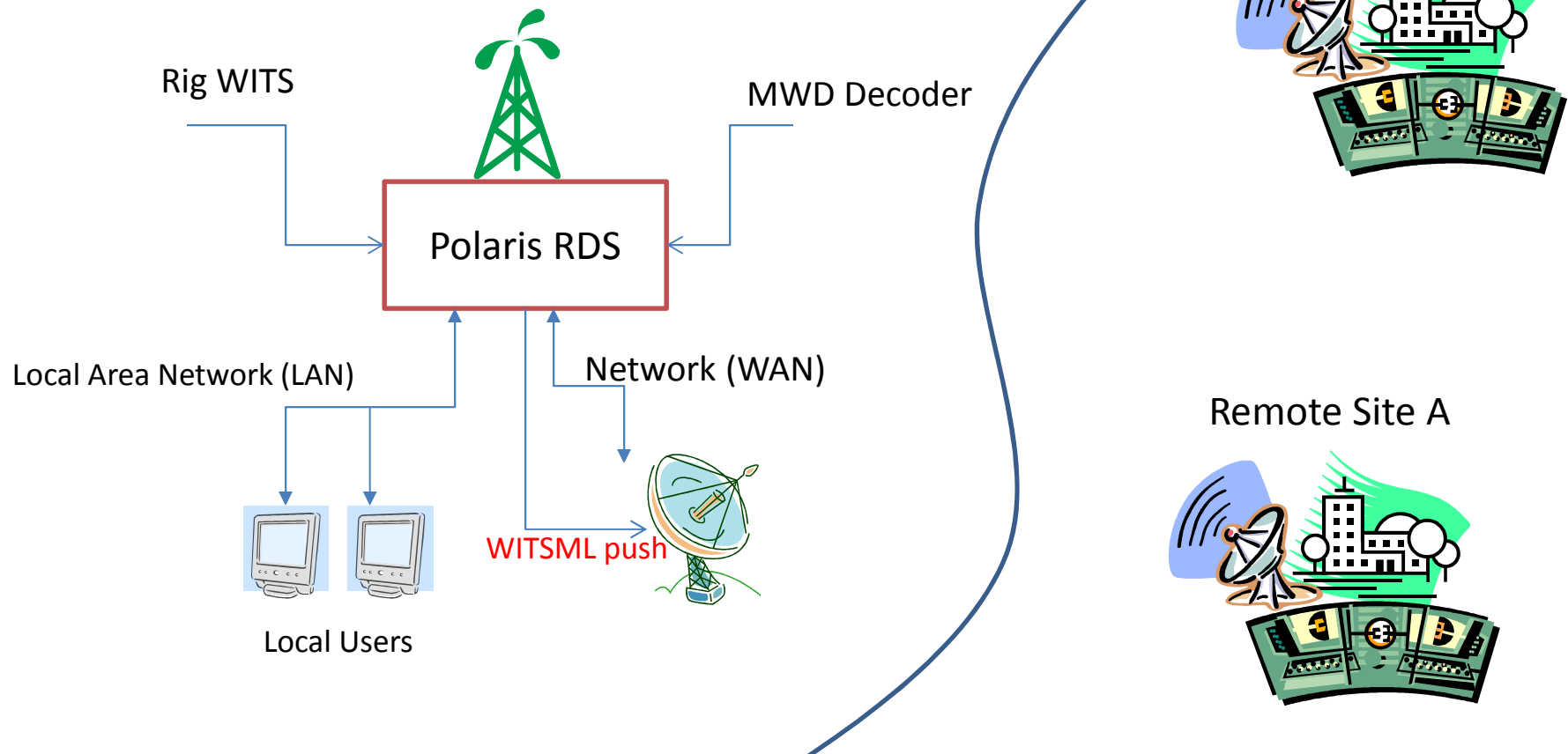
WITSML

Wellsite information transfer standard markup language (WITSML) is a standard for transmitting technical data among organizations in the petroleum industry. It continues to be developed by an Energistics facilitated Special Interest Group to develop XML standards for drilling, completions, and interventions data exchange. Organizations for which WITSML is targeted include energy companies, service companies, drilling contractors, application vendors and regulatory agencies. (source: Wikipedia)

How does it work?

- As soon as RDS powers up, a behind the scene software (RDS WML Client) starts up.
- On a new job (or new RDS), the client sits idling with no work to do.
- During rig up, the service company determines where they need to push data – Operator? Third party vendors? Data can be pushed to as many as four (4) different destinations simultaneously. The data feed can be configured at any time during drilling process – not necessarily rig up.
- Each of these vendors/operators provide the following three pieces of information:
 - WITSML server address – this is usually a HTTPS:// or HTTP:// address. The “S” indicates that the data will encrypted and pushed.
 - WITSML server login – a user name to login to the server.
 - WITSML server password – password required to login to the server.
- Typically MWD hand enters these information on the configuration page of the RDS. This page allows the MWD hand to verify the connectivity among other things.
- Using the interface, MWD then points the RDS to the WITSML server configured and picks the right well (job) data needs to be pushed to. A drop down list of all available jobs is provided to the MWD hand to pick from. The user interface provide multiple ways to confirm the well name picked.
- Finally, via click of a button, MWD starts the data push. From then on the RDS automatically takes care of pushing all the data it collects, including any correction/update that MWD hand makes on to the destinations configured.

RDS – WITSML client enabled



With in-built WITSML push, RDS can push data to multiple remote servers without additional presence at rig site and ensures true data representation and quality control.

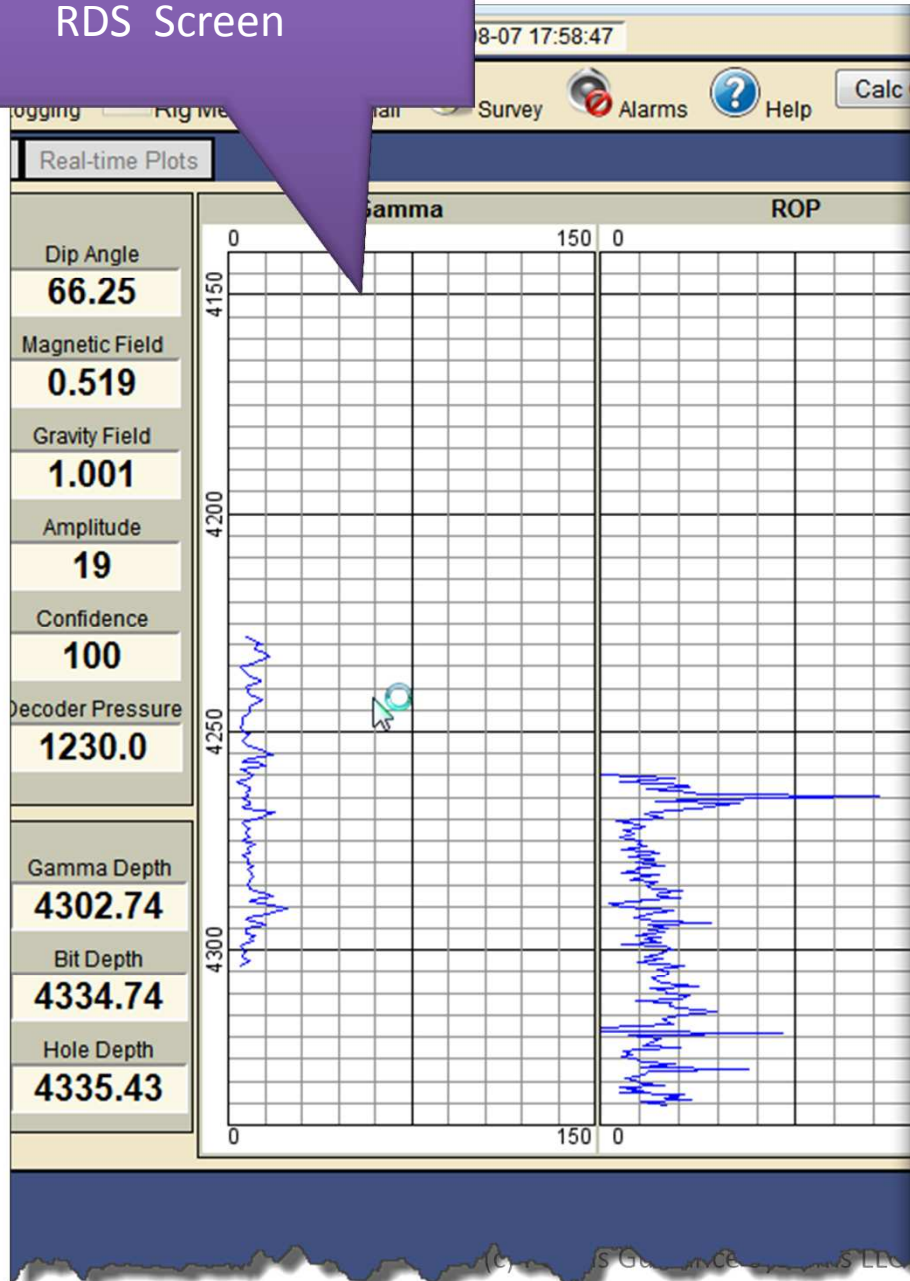
Automation and Error Handling

- The WITSML push client tries its best to automatically handle any kind of interruptions at the rig site – power failure, loss of satellite connectivity.
- The push client saves all its states at all times in an internal database so as to recover from any failed situations.
- A user interface is available to MWD hand in case they prefer to restart data push from any depth at any time.
- WITSML standard handles all the data duplication automatically – so data can repeatedly be sent in update mode without any collision issues.
- If the vendor/operator requests for repeat data or change in name of the survey pushed, etc., the MWD hand can follow it up using the user interface provided on the RDS.
- A complete self-help manual is included in every RDS for reference.

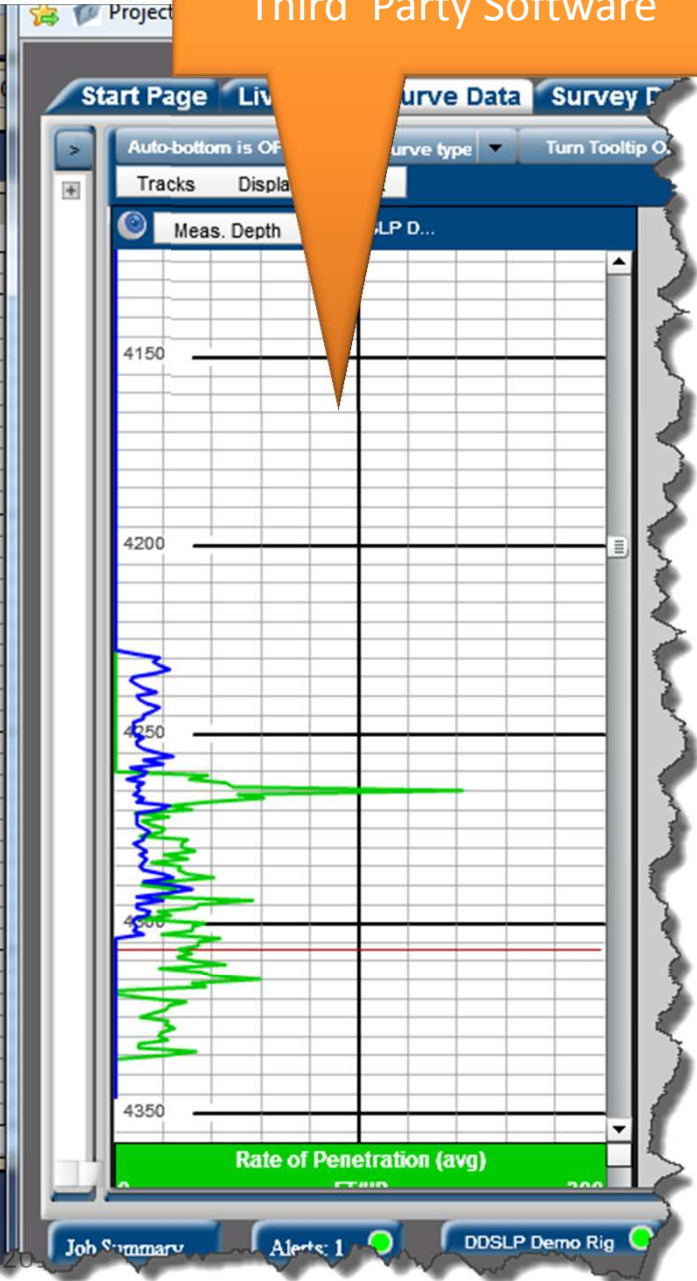
Functional Testing

- We have spend considerable time and effort in testing the WITSML push software.
 - Surveys were deleted, update and added for any point (including tie-in information) to validate the replication.
 - Log data was edited up to as far back as 200 feet to check for valid replication to destination systems.
 - Data push was tested with three different WITSML servers belonging to three different vendors – Petrolink®, ApolloDART®, WellStorm®.
 - All data push were verified both visually as well via LAS export comparison towards data quality and consistency.
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- The following diagram shows screenshot of RDS data and a third party visualization software pulling data from their own WITSML server (RDS was configured to push data to their WITSML server)

RDS Screen



Third Party Software



Screenshot of the WITSML configuration screen on RDS

The screenshot displays the WITSML configuration interface for a well named 'Demo Well'. The interface is divided into several sections:

- Navigation:** Monitoring, Data/Reports, Configuration (selected), System Utilities.
- Well Information:** Demo Well, Rig: Demo rig.
- System Status:** Pumps, Logging, Rig Message, Email, Survey, Alarm, Help.
- Configuration Tabs:** Well Information, User Login/Email, Surveys, WITS Ids, Decoder, WITSML Config (selected), System Info.
- Add/Edit WITSML Server:** Fields for Name, Server, Login, and Password. Buttons for 'Test WITSML access' and 'Add To List >>'.

Petrolink Server	RUN: ENABLED	CONFIG: VALID	CONNECT: OK
ApolloDART Server	RUN: DISABLED	CONFIG: VALID	CONNECT: -
- WITSML Servers:** A list containing 'Petrolink Server' and 'ApolloDART Server'. Buttons for '<< Edit', 'Remove', and 'Show Config' are present.
- Control Buttons:** Start Data Push, Stop Data Push, WML Settings..., Send Trajectory, Send Log Data.
- Status Bar:** Displays the status of the configured servers.

For detailed help, please see the WITSML help screen on RDS.