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DYNAMIC POSITIONING CONFERENCE
October 14-15, 2014

SENSORS

Moving Towards a Standardized Interface for Acoustic Inertial Reference Systems

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Moving towards a standardized interface for acoustic inertial reference systems

Dynamic Positioning Conference

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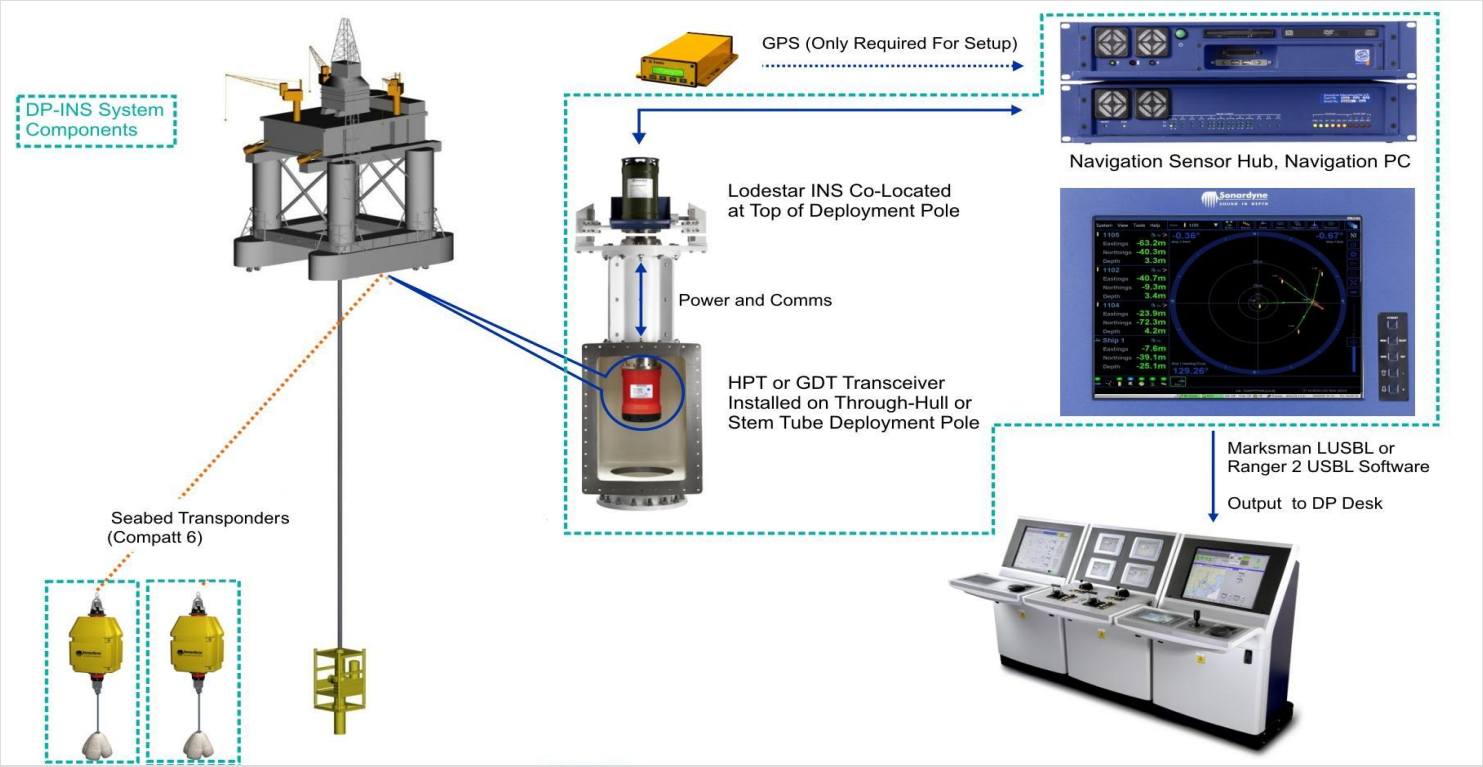
Marksman DP-INS

System overview

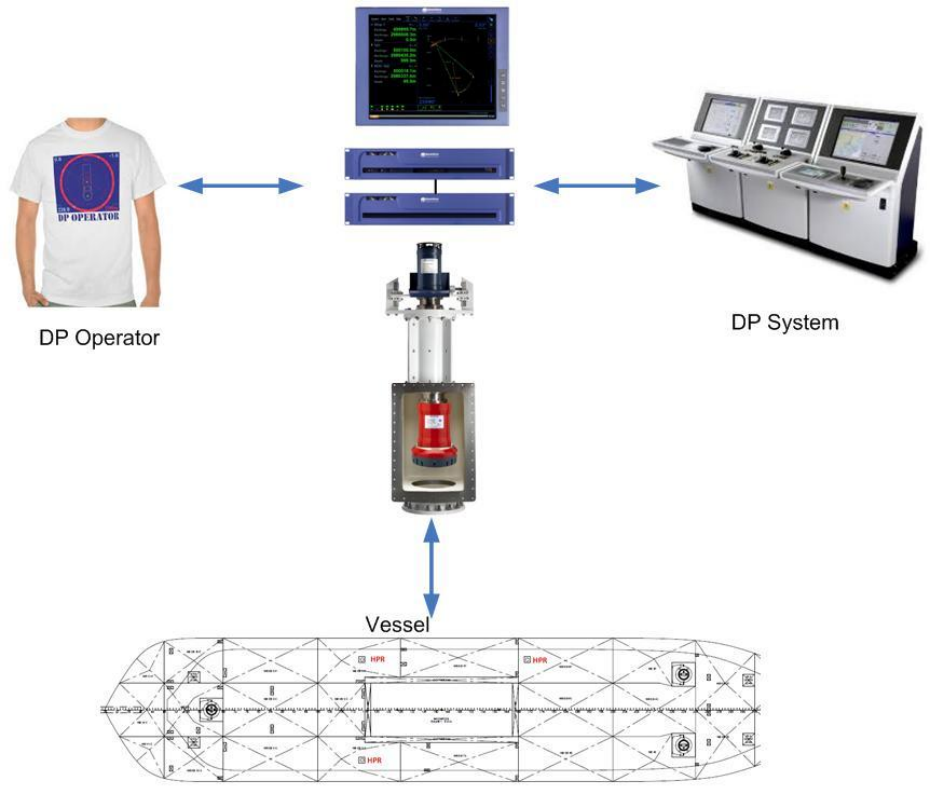


Integration challenges

Technology has moved forward

Picture courtesy of GE Energy

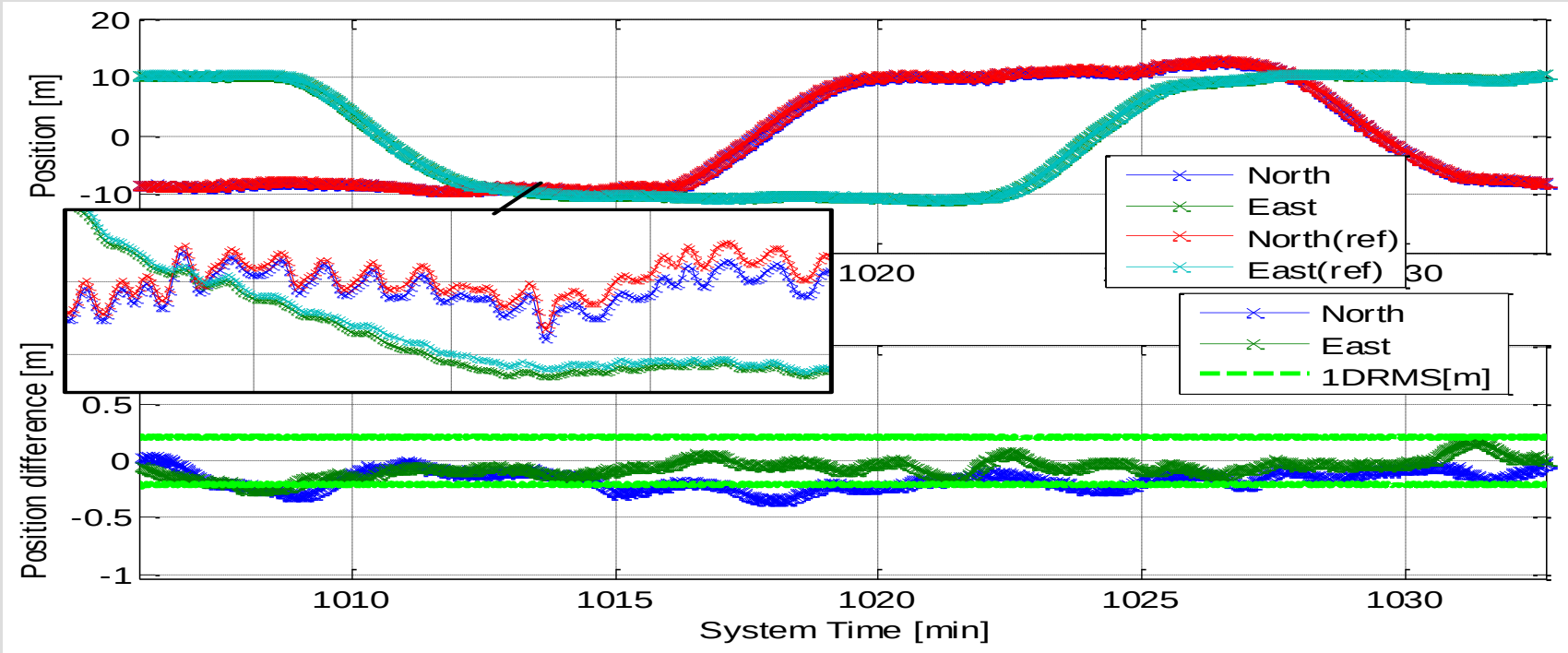
System interfaces



- Marksman DP-INS is accurate enough but…..
- The pieces fit but integration can be improved
- Legacy / proprietary interfaces are becoming a limitation
- Reference system integrity information is not being used
- As technical complexity goes up are we doing enough to ensure ease of use?

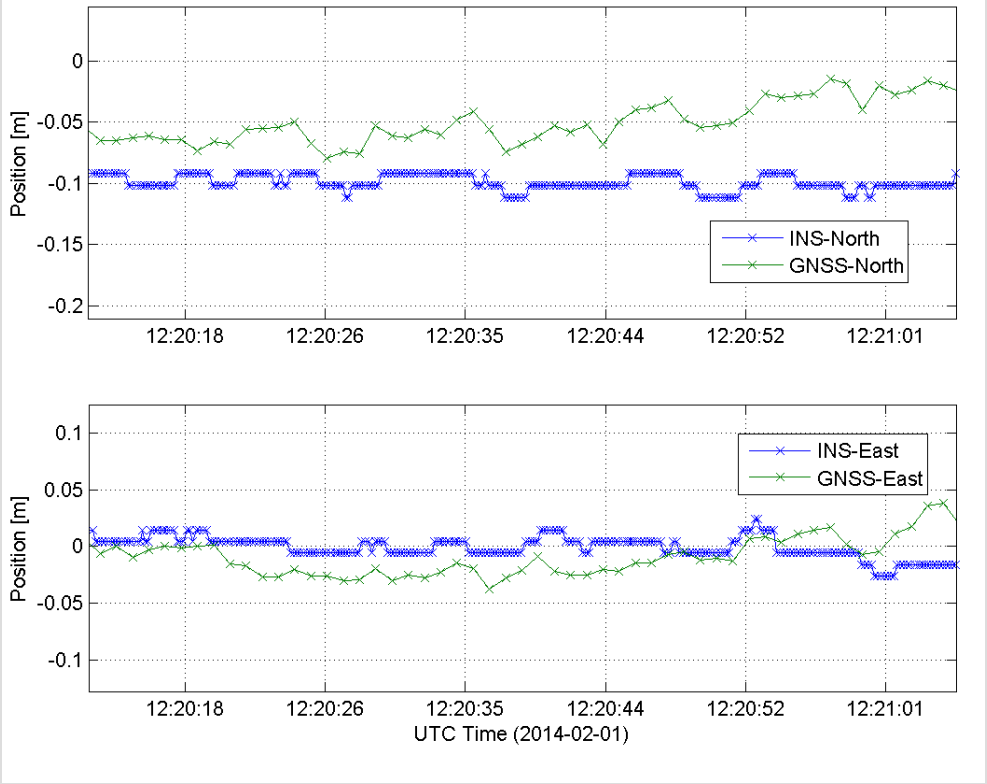
Accuracy

- GNSS levels of performance from 3 transponder DP INS is accurate enough

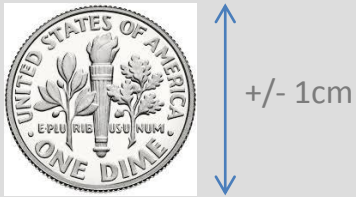


Accuracy

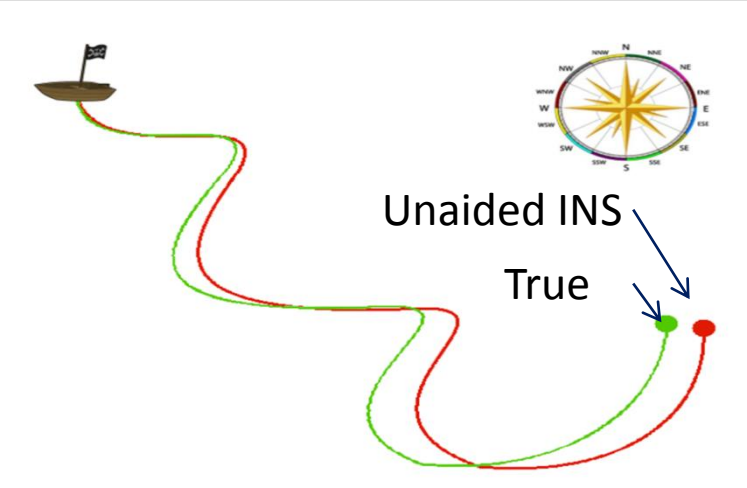
Freeze alarms due to precision

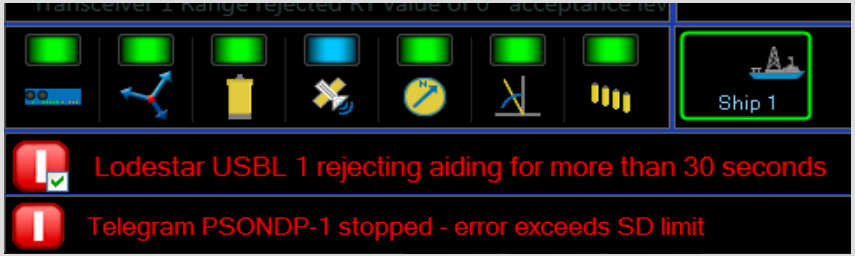


- Deepwater drillship
- Sonardyne Marksman DP-INS
- Benign conditions
- Acoustic inertial position references are extremely precise
- Marksman position only changing by +/- 1cm for 20 seconds (
- Freeze alarms are triggered in some DP systems
- This is due to a legacy failure mode where a failed PRS can continue to output old data



Presentation of critical status information

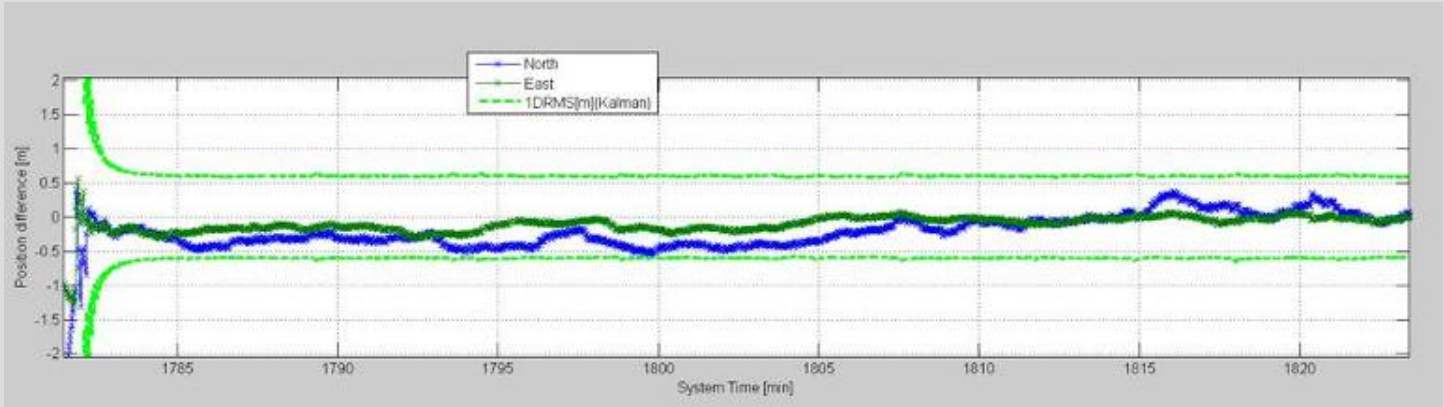




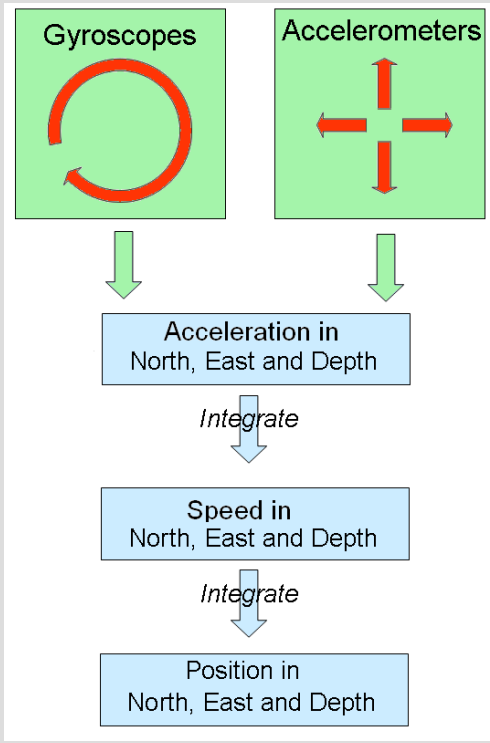
- Legacy telegrams do not fully support Inertial navigation systems (INS)
- If INS aiding is lost the INS can drift
- Logic is needed to monitor
  - position error
  - aiding source
  - time since last aided
- Currently this is done in the reference system not the DP system
- The reference system stops outputting which sets of another alarm (cascading alarms)
- Multiple critical alarms and thresholds set / displayed in multiple places creates usability problems

Beyond Accuracy

- Conservative error estimates to ensure Integrity
- Internal integrity monitoring



Beyond Accuracy



- When station keeping net vessel forces needs to be zero to hold station
- INS measures force but converts it to position to send to the DP system
- DP system receives position information and converts it back to force required
- Limited use of position error information
- We can send position, velocity, attitude and acceleration to the DP for added integrity (the “navigation state”)

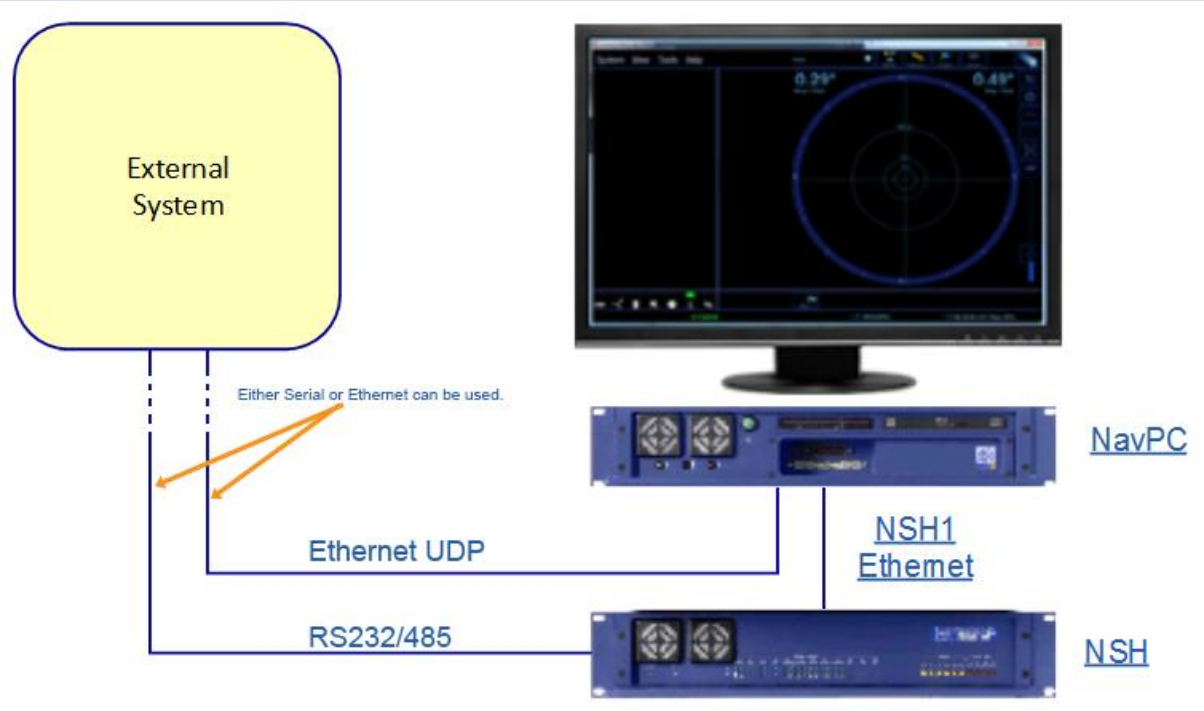
High integrity DP telegram

	Existing Telegram	High integrity telegram	Comment
Header	Y	Y	
Time	Y	Y	
Target ID	Y	Y	
Integrity	N	Y	PRS can flag loss of integrity
Last aided	N	Y	Time since last acoustic update
Position	Y	Y	Resolution to reflect precision of latest systems
Position error	Y	Y	Used by the DP system to weight inputs
Depth	Y	Y	
Speed	N	Y	Speed information can refine control
Speed error	N	Y	
Pitch	Y	Y	
Roll	Y	Y	
Heading	Y	Y	
Aiding source	N	Y	Check for unaided INS

Moving towards a standardized interface for acoustic inertial reference systems

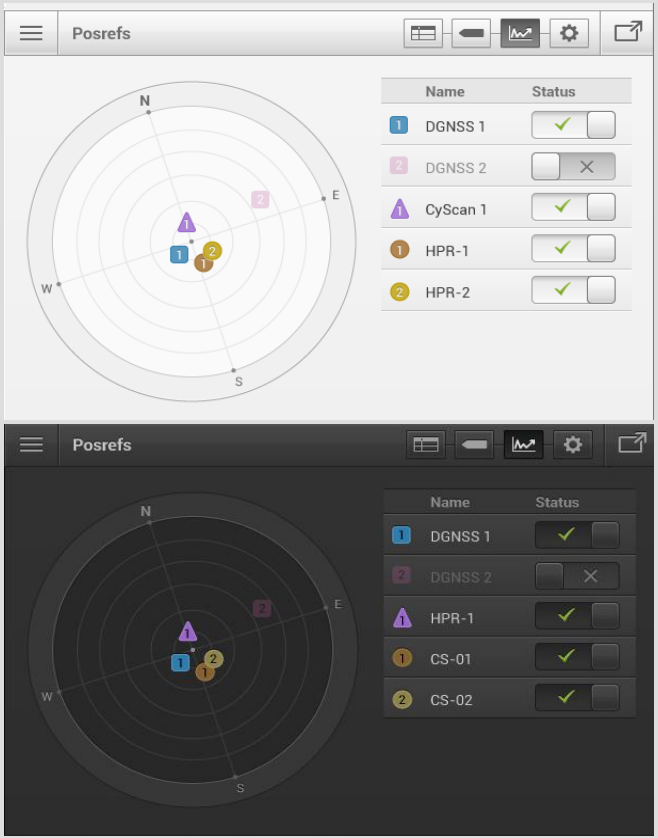
1. Marksman DP-INS
2. Integration challenges
3. DP System Interface
4. Human Machine interface
5. Vessel interface
6. Summary

Client displays



- Marksman supports remote control and display from an external system
- Controls of basic acoustic functions
- Display of additional status information
- High level XML interface that is easy to implement
- Ethernet or serial

Client displays



- Any DP manufacturer can control basic functions through their own user interface
- Additional status information can be displayed in the DP system
- Improves ease of use as all important information is in one place
- Common “look and feel” reflecting DP manufacturer “styles”
- Compatible with global controls (brightness, day / night, etc)
- Increase flexibility and reduce risk

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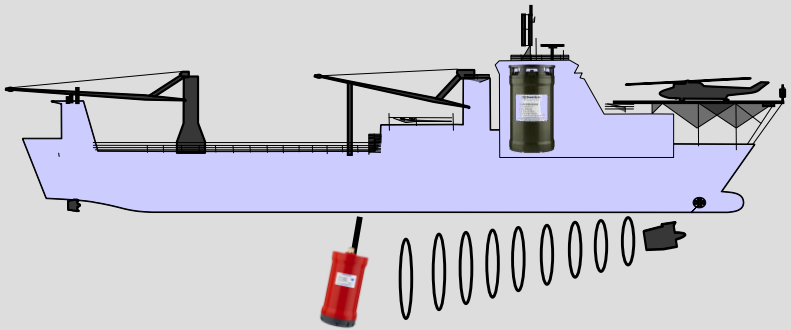
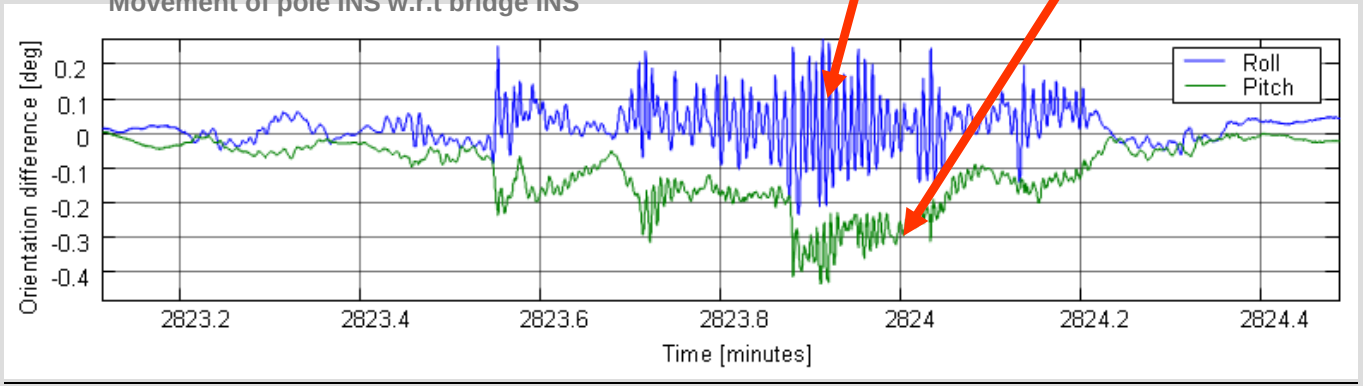
INS installation

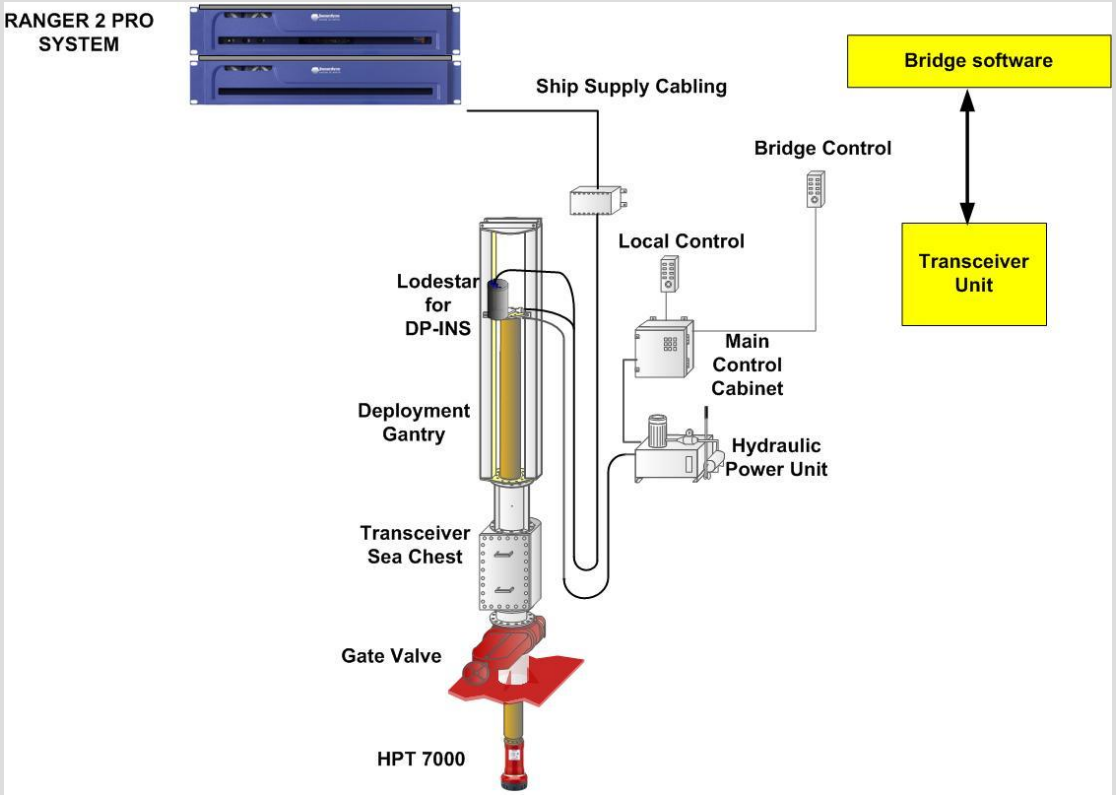


Pole resonates at 2Hz approx

Up to 0.3 degree pitch bias directly affects position accuracy



Deployment machine and gate valve



- Brand new vessel still in Shipyard
- Split acoustic supply between
  - Maximise technology diversity
  - Maximise compatibility with subsea operations
- 3rd party deployment machines
- 3rd party (yellow) system in diagram just to operate deployment machine and gate valve
- Complicated to install and difficult to use
- We need a standard, open interface for the remote control of gate valves and deployment machines

Moving towards a standardized interface for acoustic inertial reference systems

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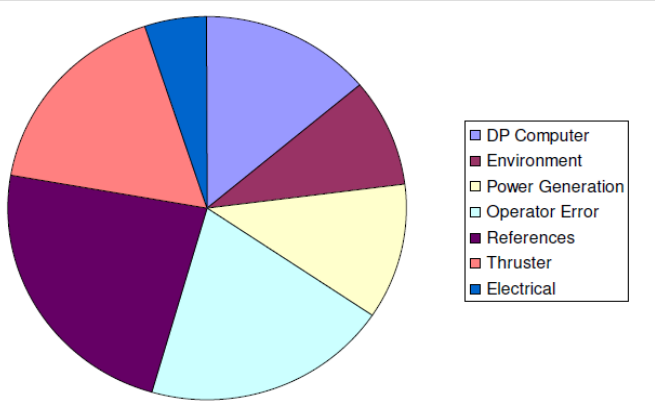
Incident free DP



DP Incidents by type

- Marksman DPINS is proven as a reliable DP reference
- Achieves GNSS levels of accuracy (10 cm is good enough for DP)
- We are now enhancing integration to reduce risk
  - New interface standards that exploit the benefits of the latest technology
  - Display and control standards that improve ease of use
- Any DPS, any vessel, any application
- We are working with the industry to specify and adopt these new standards
- This could help us in our quest for incident free DP

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Thank you.
Any Questions?

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