E-navigation – and the role of hydrographic data

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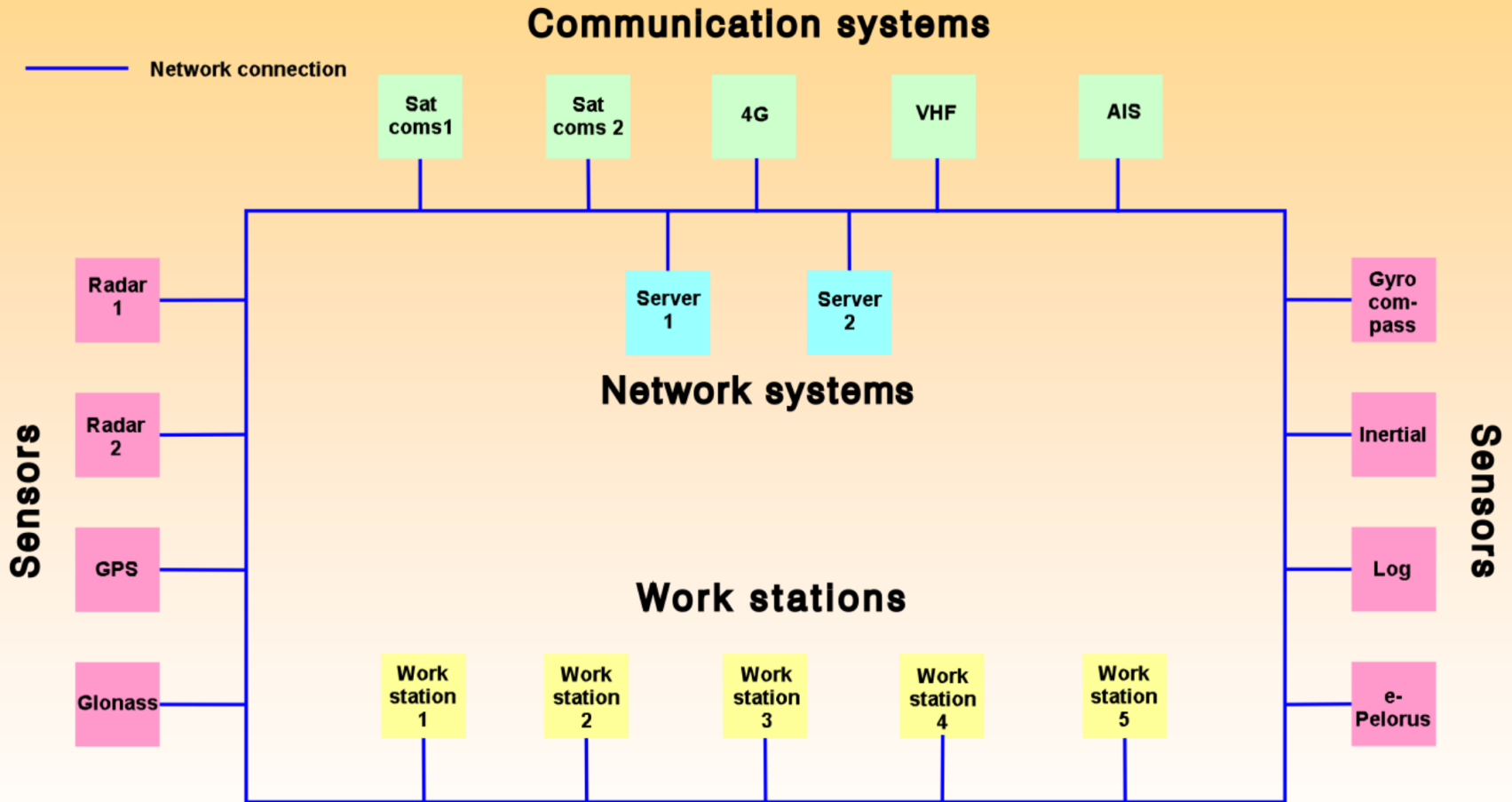# A useful description of e-navigation?

E-navigation facilitates the transmission, reception, integration and use of data from unlimited sources in a manner that enhances safety, environmental protection and efficiency.

'use' – by human operators and automatic processes

'data' – from depositories and sensors

'unlimited sources'   – but recognises integrity

– future proof

E-navigation: conceptual onboard structure

Communication systems

Network connection

| Sat coms1 | Sat coms 2 | 4G | VHF | AIS |

Sensors

Radar 1
Radar 2
GPS
Glonass

Network systems

Server 1
Server 2

Gyro compass
Inertial
Log
e-Pelorus

Sensors

Work stations

| Work station 1 | Work station 2 | Work station 3 | Work station 4 | Work station 5 |

E-navigation applications – 3 levels?

Level 1 Apps

Meet detailed IMO requirements for statutory fit equipment, eg ECDIS, radar, INS and a GMDSS equivalent

- Fundamental tools of navigation and communications
- Slowly evolving requirements
- More standardised user interface would be highly useful (S-mode?)
- Comprehensive type approval, somewhat similar to today's

[Hardware, including navigation sensors, display, etc would also meet stringent type approval requirements]

E-navigation applications

Level 2 Apps

The display and basic use of official data from IHO members, IALA members, national governments, etc.

- Meets minimum requirements for such apps laid down by IMO
- Meets any further type approval as required by issuing source
- Potential compulsory use in defined waters

E-navigation applications

Level 3 Apps

Privately issued applications

- Non-compulsory purchase and use
- Minimum statutory approval to show compliancy with the essential requirements of e-navigation and compatibility with other apps
- Allow innovation and fast evolution
- Aimed at providing commercially attractive packages, eg:
  - Fuel reduction
  - Navigational improvements
  - Improved company-level reporting

Data definition

- Testable data standards
  - The body defining the data element, should define its test parameters, following internationally agreed guidance
    - Eg, each S-101 definition from IHO should include test requirements

- Testable equipment standards
  - The body defining the equipment standards should define tests for functionality that uses or displays data in a special way

Equipment testing

- By the manufacturer
  - The manufacturer should develop data handling software following agreed methodology (ISO/IEC)
  - Fully documented formal tests shall be applied to the issued software and hardware
- Formal type approval
  - To include verification that the manufacturer has appropriately used the agreed design methodology
  - To include verification that the manufacturer has successfully completed and documented tests
  - To perform adequate independent tests, randomly chosen, to give confidence that all tests have been successfully completed by the manufacturer (Performance, environmental and interconnection)

Advanced testing concepts

As far as possible:

- Apply test data stream at the appropriate input interface(s)

- Monitor resultant effects at the appropriate output interface(s), including that to the display monitor

- Use dedicated test software to apply the data streams and check for the desired effect

- Test software will command tester to select the required user settings for all tests and to signal any dedicated response, (such as the presence of a warning light)

But who funds the test software?

Conclusions

- A need to also define equipment tests when data is being defined
- Comprehensive and documented testing is performed by manufacturer meeting type approval requirements
- Type approval includes vetting the manufacturer and the design process
- Type approval vets the equipment design documentation
- Type approval repeats 'random' selection of tests to help ensure compliancy
- Possible creation of test software for e-navigation systems to be used by manufacturer and at type approval
- Manufacturers will have to bear higher responsibilities