



Open Sensor Interface Needs for the US Navy

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The Need for Open Sensor Technologies



- **Challenges for future surface combatants**
 - Maintaining operational readiness with smaller optimized crew
- **Automation systems will be utilized to their fullest extent**
 - Open architecture interface standards are key to keeping these systems technologically current and affordable
- **Open Sensors/Network Interfaces (OSNI) project**
 - Examine and explore various open architecture sensor (transducer) technologies
 - Test these approaches
 - Transition these technologies to new Navy surface combatant programs (e.g. DD(X) and LCS)

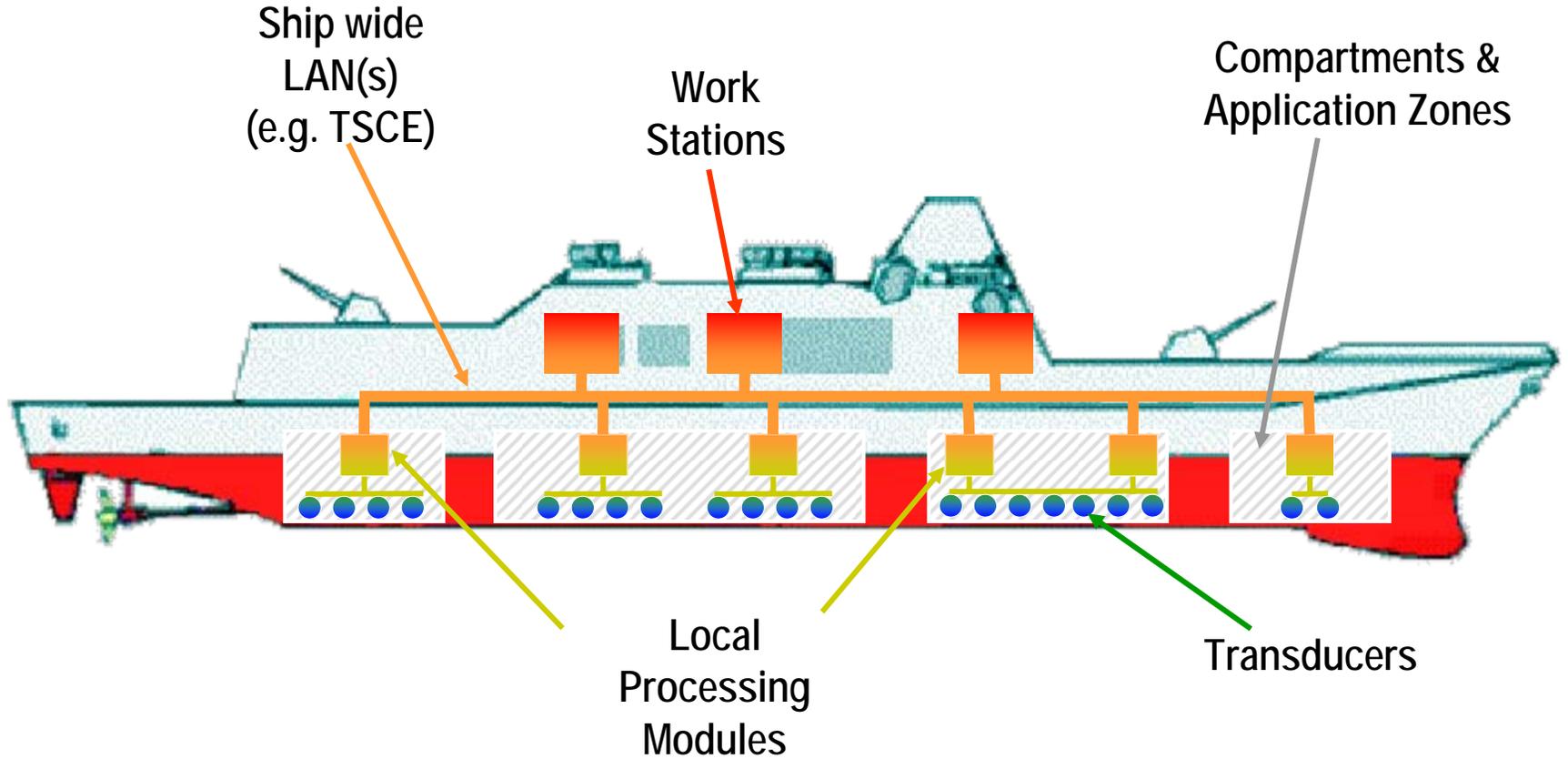


- **Enhance Shipboard Automation**
 - Must be Modular, Scalable, Interoperable & Adaptable
- **Explore & identify a migration path to standardized transducer networks & interfaces**
 - From legacy & proprietary standards to open standards
 - Interface stand-alone & integrated transducers to common network
- **Transition standardized transducer networks & interfaces to acquisition programs**
 - Future Naval surface combatants
 - Also look into retrofit for current systems

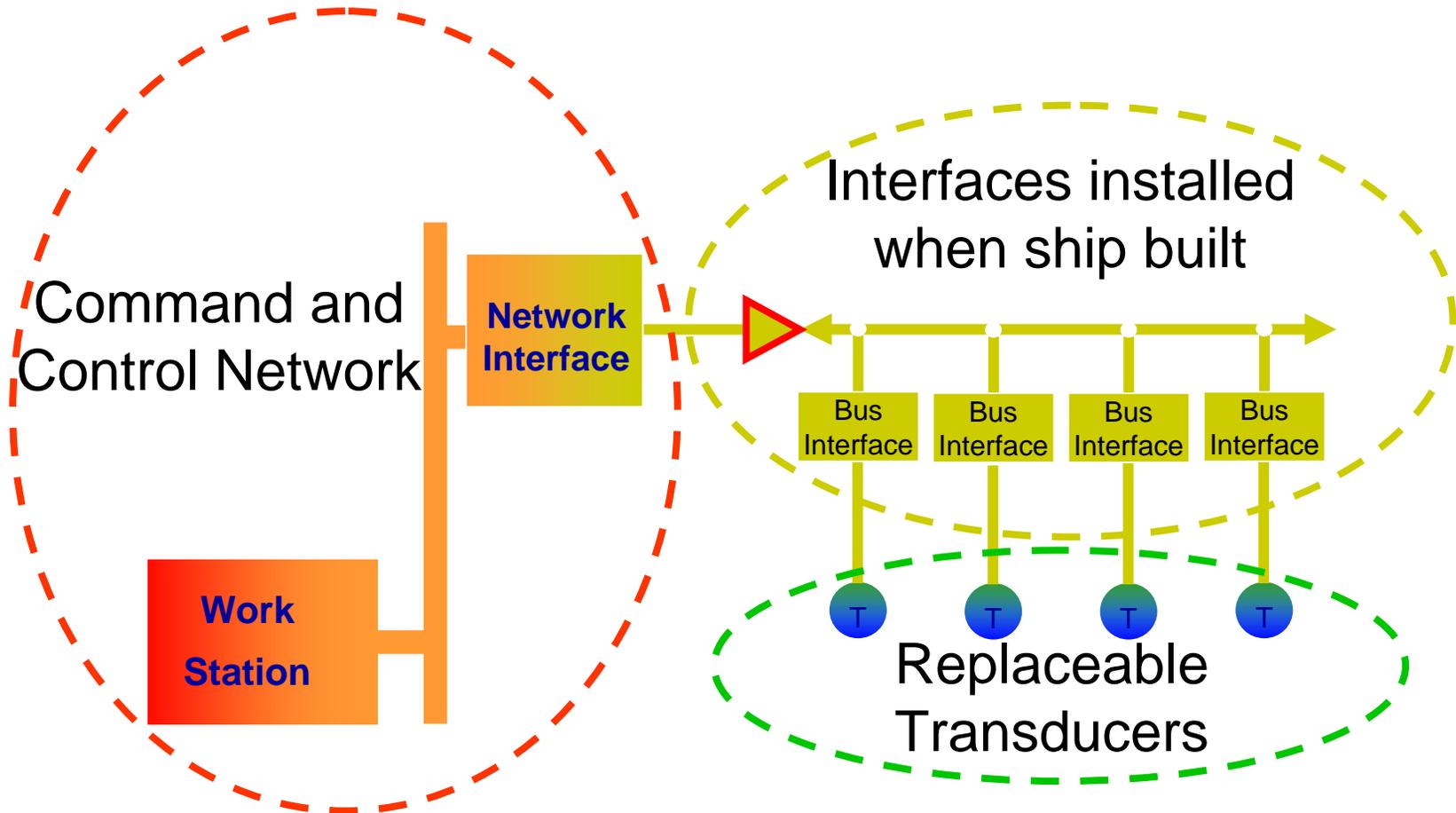


- **Develop smart methods of interfacing thousands of transducers**
 - Maintaining availability is a major challenge
 - Must divide into compartment or application “zones”
 - Use real time auto-reconfiguration with self-inventory
- **Open to allow multiple protocol standards**
 - Upward migration to a single standard – IEEE 1451 family
 - Allows legacy systems to connect to a common bus
- **Standardized network wiring**
 - Use standardized physical and electrical interfaces

OSNI Distributed Sensor-bus Networks

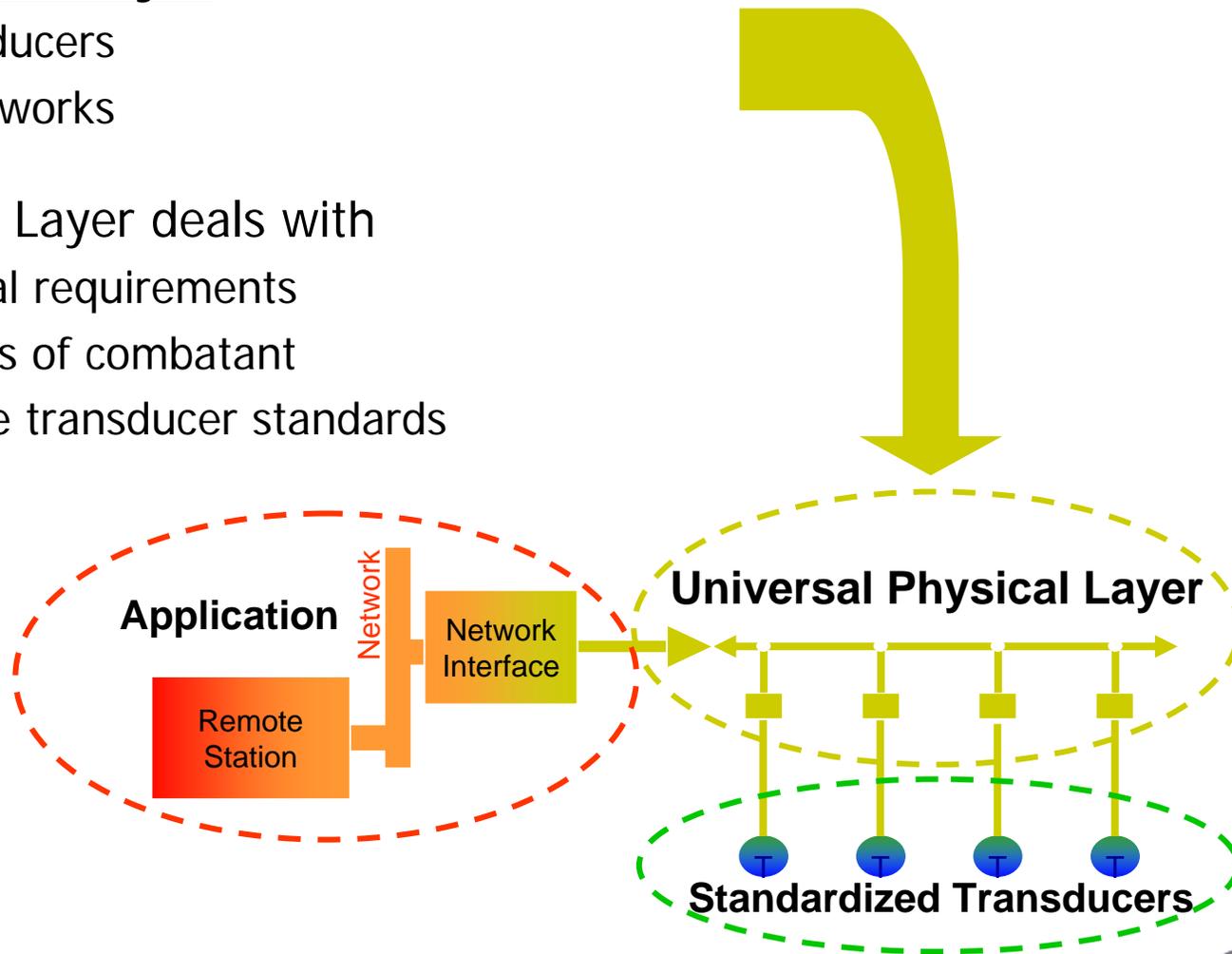


**Need to address large sensor populations
(thousands of sensors)**





- **Universal Physical Layer** - a standardized interface between
 - Low level transducers
 - Higher level networks
- Universal Physical Layer deals with
 - Navy operational requirements
 - Unique demands of combatant
 - Present & future transducer standards

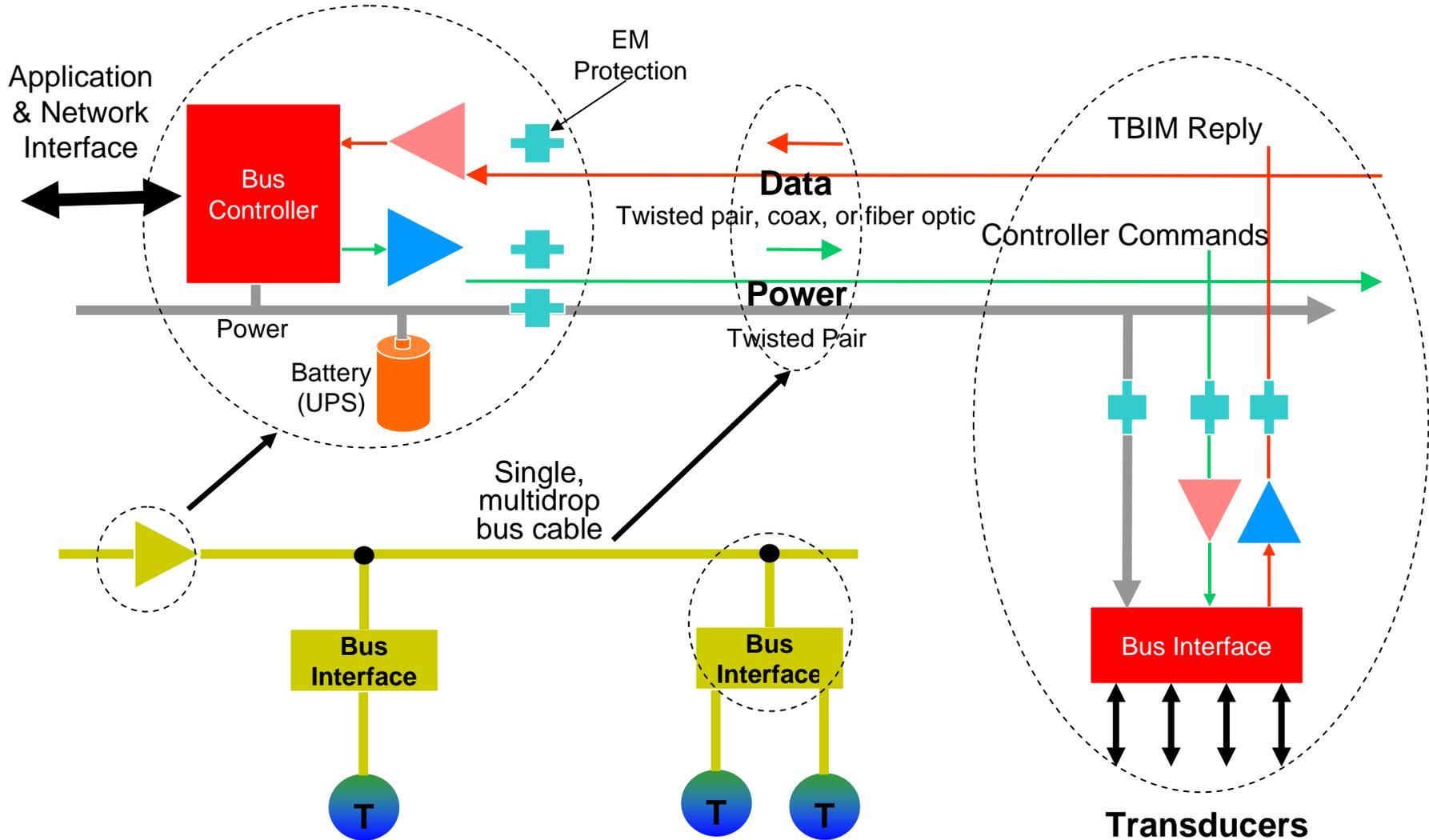




High levels of automation and unmanned spaces make *transducers vital to ship's operation and even survival*

- **EM harden physical layer and critical transducers**
 - Various sources of electromagnetic radiation
 - EMI, EMP, & EM bombs
- **Damage Control**
 - Graceful degradation, no single point failure
 - Quick, automatic reconfiguring
- **Low Power Electronics**
 - Powering thousands of transducers becomes a ship level concern
- **Isolated Zones**
 - Allows for independent operation

OSNI Multi-Drop Sensor-bus Network Interfaces





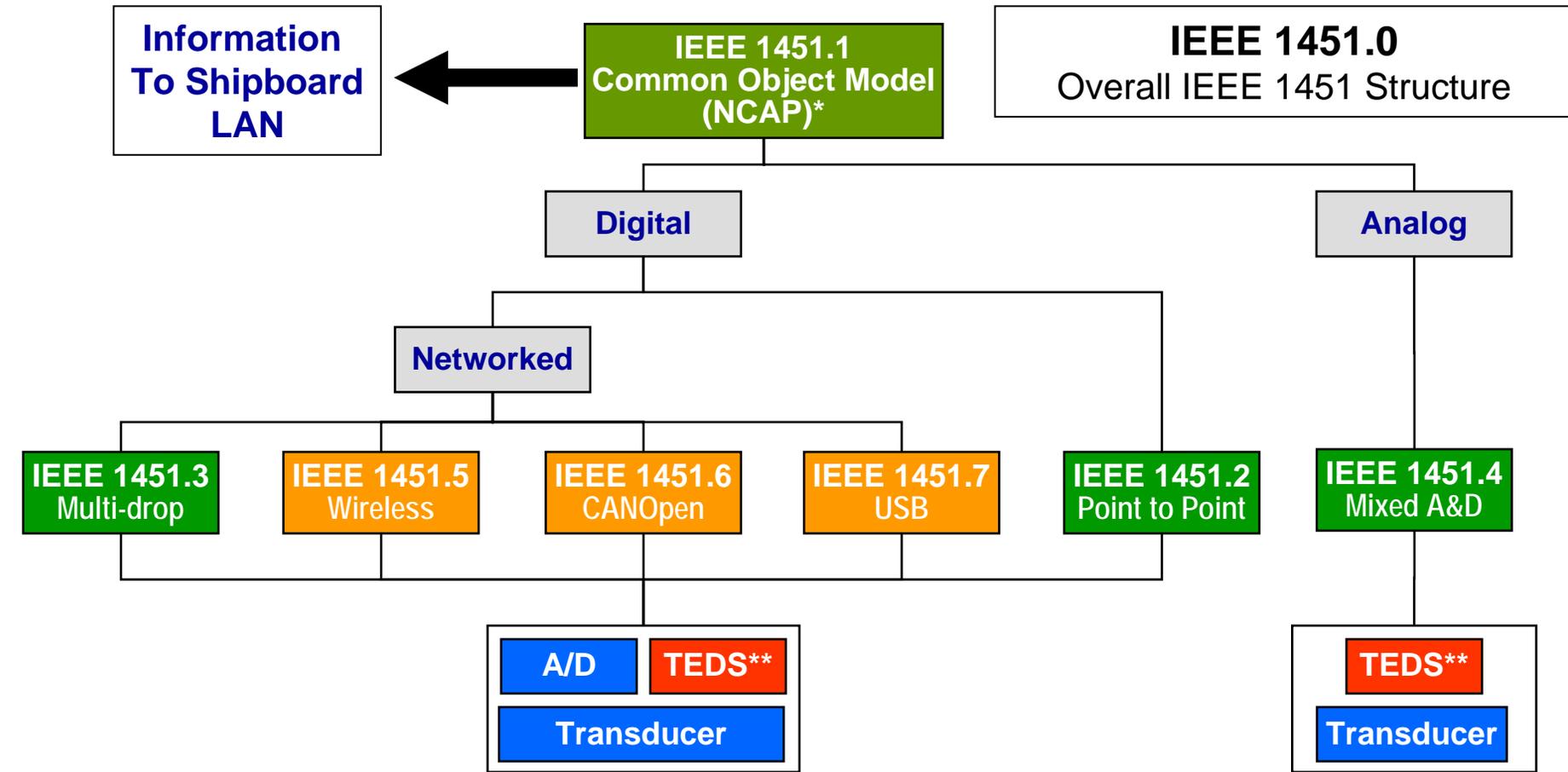
OSNI's Migration Goal: IEEE 1451 Family of Standards



- **IEEE 1451 family of standards inherently has:**
 - Plug & play (fit & forget)
 - Transducer Electronic Data Sheet (TEDS)
 - Provides embedded sensor and calibration information
 - Independence from physical layer
- **IEEE 1451 also allows for:**
 - Interoperability among different manufacturers
 - Modularity, Scalability, Extensibility, Upgradeability
 - Wired and wireless transducers using same protocols

**IEEE 1451 fits into OSNI's goals of open standard protocols
with an Universal Physical Layer**





Green – Complete
Orange – In Progress

* Network Capable Applications Processor
** Transducer Electronic Data Sheet



OSNI At-Sea Prototype Demonstration



- **Perform realistic at-sea testing of OSNI Technologies**
 - OSNI transducers installed on ONR* Test Ship (YP-679)
 - Test trial from June to September 2005
- **Uses prototype of an OSNI Universal Physical Layer**
 - Standardized cabling, plugs, sockets & electrical interfaces
 - RS-485 serial cable chosen for physical network
- **Upward protocol migration path from legacy to open standards**
 - Legacy transducers modified to IEEE 1451.3 multi-drop standard
- **Joint Venture Project**
 - Northrop Grumman Ship Systems (Prime)
 - Hyperfine/Moore Industries – Telemonitor/EDC - Anteon

*ONR – Office of Naval Research



June 8, 2005



US Navy Open Sensors/Network Interfaces – Sensors Expo 2005



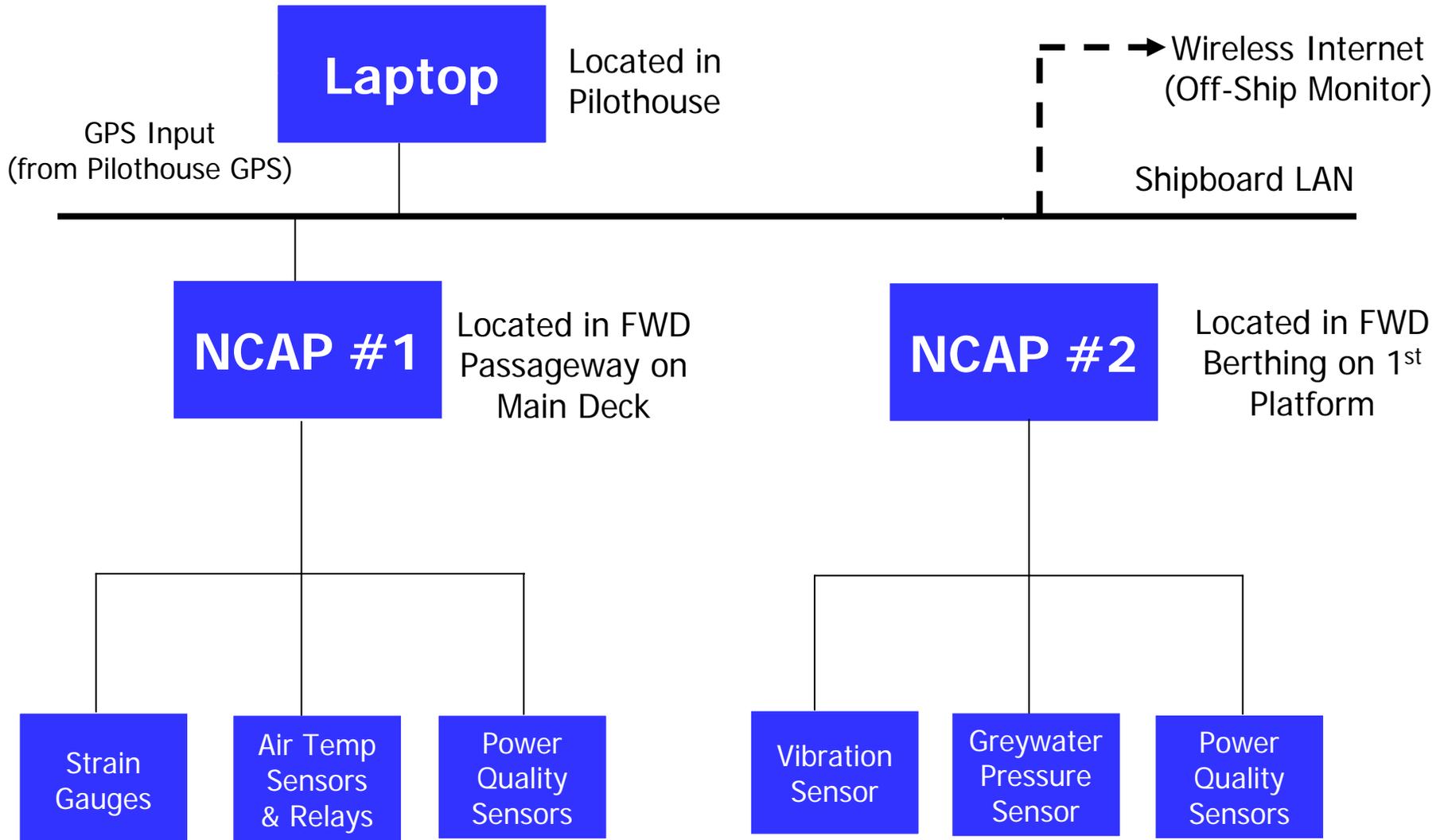


Afloat Lab (YP-679) is test platform for testing OSNI technologies



Owned by ONR Operated by Anteon
Based in Annapolis, MD

At-Sea Trial Demonstration System Design



Proposed OSNI Transition Schedule



Continuous: Work with Program Offices to help develop technical specifications for OSNI efforts



- **OSNI is important for future surface combatants**
 - Meets the needs of optimized manning and smart use of automation transducers by using open architecture standards
- **OSNI provides migration from legacy to open standards**
 - OSNI Universal Physical Layer
 - Migration from legacy protocols towards IEEE 1451
- **Transition OSNI concepts to acquisition programs**
 - Use prototype demonstration project as basis
 - Define physical & protocol interfaces for open architecture sensors
 - Help develop tech specs to ensure its use on future programs and retrofit for current programs