Maretron

Leading the way in NMEA 2000® technology

The International WorkBoat Show

December 2, 2004, New Orleans, LA

Session F08

Electrical Systems: Working with Marine Databus Systems

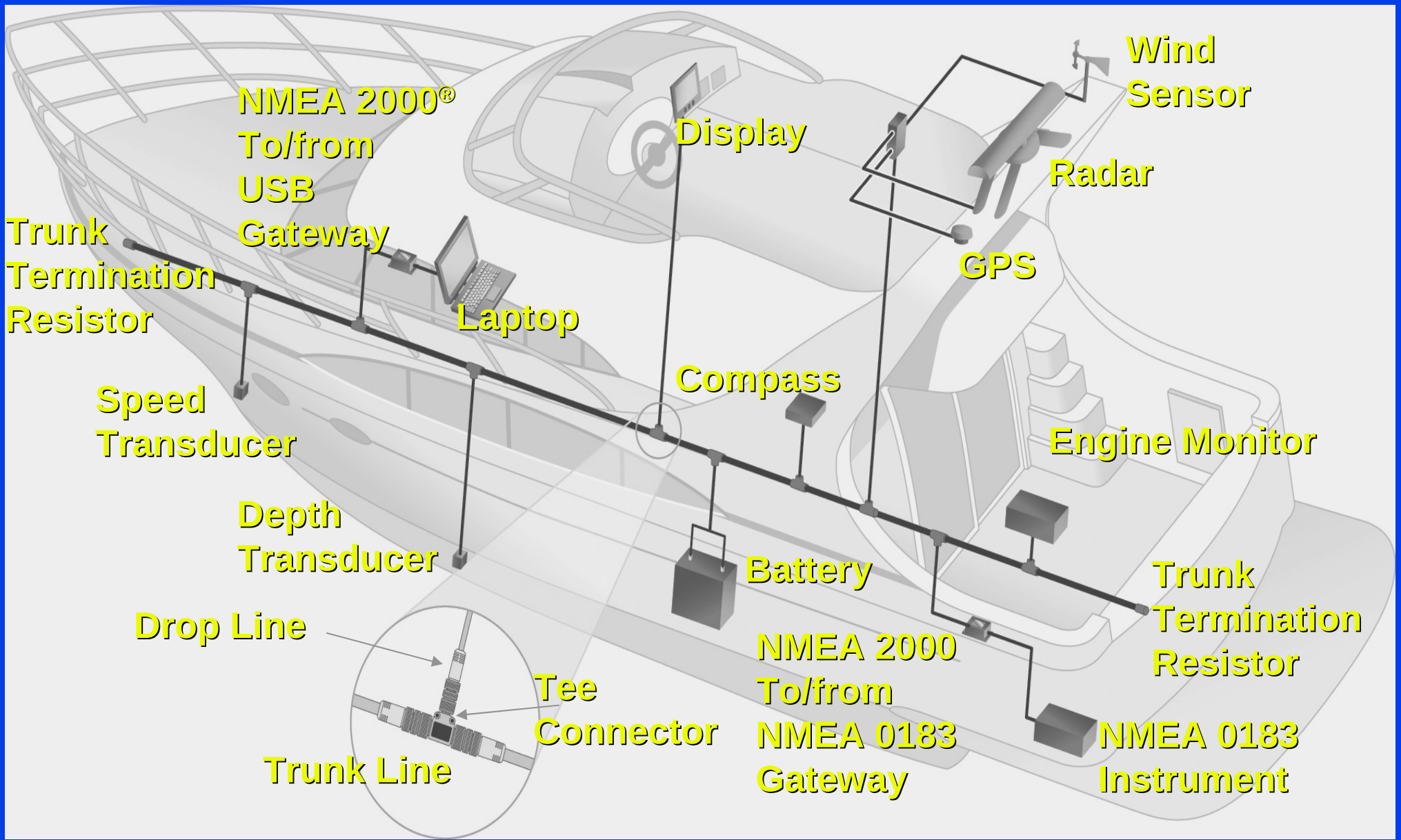
Presentation Overview
Thursday, December 2, 2004

- What is NMEA 2000®
- Example NMEA 2000® Installation
- Physical Problems
- Electrical & Data Interface Problems
- Demonstration
- Service and Support
- Why isn’t it bigger?
- Why NMEA 2000® will succeed
- Future Directions

What is NMEA 2000®?

- **Marine Networking Standard**
  - **Developed by an open industry committee coordinated by NMEA**
  - **Single-bus architecture**
  - **Based on Controller Area Network (CAN) bus technology**
    - » **Heavily used in automotive and industrial applications**
  - **Up to 50 physical nodes on one network**
  - **Up to 200m total network length**
  - **Multiple talker – multiple listener – no master node**
  - **Optimized for real-time control and sensing**
    - » **Critical data always gets through first**
  - **NOT for ultra-high bandwidth applications**
    - » **Video, radar, raster chart data**

Example NMEA 2000® Installation



Physical Problems

- Traditional Boat Wiring Prone to Failure
  - » Corrosion
  - » Vibration
- Complex Wiring
  - » Single Conductors
  - » Point-to-point connections
- Poor Wiring Practices
  - » Wire Nuts
  - » Splices
  - » Corroding Connections

NMEA 2000® solves physical problems

- NMEA 2000® wiring standard based on DeviceNet (ODVA)
  - Many years of use in factory automation
  - Oily, wet environments
  - Run over by factory equipment
  - Cleaned with high-pressure spray
- Watertight, shielded cable
  - Twisted pair data and power
  - Three shields: data, power, overall
- Watertight, shielded connectors
  - Threaded connectors
  - Gold plated pins and sockets

Electrical & Data Interface Problems

- Data available but not shared
  - –Separate GPS units, heading sources for different equipment
- Incompatible / Obsolescent Protocols
  - –Proprietary Protocols
    - » Buying devices from one manufacturer locks you in for future purchases
    - » Communication between different manufacturer's products, if possible, only through lowest-common denominator (NMEA 0183)
  - –NMEA 0183 (not a network, but a serial interface standard)
    - » Single-talker, multiple listener
      - Lots of wires
      - Multiplexers
    - » Interoperability
      - Ambiguity in NMEA 0183 specification leads to NMEA 0183 devices that don't work together
      - Many ways to express same data (heading, for example)?
    - » Low Bandwidth (4800 Baud)
      - 5-6 messages per second

NMEA 2000® Solves Data Interface Problems

- **Shared Data**
  - **All data available everywhere, all the time**
    - » **Engine, navigation, AIS, tank levels, temperatures, depth, speed, heading, electrical system status**
    - » **With a single cable, all data is available at any location**
    - » **Use a single heading sensor for autopilot control and radar image stabilization**
    - » **Use a single GPS for navigation, AIS, autopilot**
  - **Optimized for Real Time Control**
    - » **250 K bits per second -- Up to 2,000 messages per second**
    - » **Priority system ensures most critical data transmitted before less critical data**

Demonstration

- **Navigational Software**
  - **Nobeltec Navigation Software**
- **Instrumentation Display**
  - **Maretron DSM200**

Service and Support Issues

- **Design and Installation**
  - **Technical dealers, same as before**
  - **NMEA 2000 is plug and play (also configurable)**
    - » **No “master node” to configure**
    - » **No pre- installation configuration required, such as setting of device addresses or polling rates**
- **Service – who to call when things go wrong?**
  - **Technical Dealer, same as before**
    - » **Tools exist to isolate failures to the component level**
  - **Rigorous certification process ensures that new devices won’t cause problems with existing devices**

So why isn't it bigger?

- **In the past:**
  - **Established manufacturers wanted to maintain proprietary interconnect to lock in customers and maintain market share**
  - **Limited selection of NMEA 2000 products available**
- **Now:**
  - **Over 20 companies/governmental agencies currently involved in NMEA 2000® working group**
    - » **USCG, Furuno, Raymarine, Simrad, Teleflex, Maretron, Yamaha, Volvo/Penta, etc.**
  - **23 certified products currently – 80% certified in last half of 2004**
    - » **Depth/Speed/Temperature**
    - » **Autopilots**
    - » **Tank Senders**
    - » **GPS Receivers**
    - » **Compasses**
    - » **Diagnostic Tools**
    - » **Gateways**
    - » **Displays/Gauges**
    - » **Shift/Throttle Controllers**
  - **12 more products in the certification process**
    - » **Engine/Generator Interfaces**
    - » **Intelligent Power Converters**

Why NMEA 2000 will succeed

- Solves marine networking problems
  - Physical
  - Electrical & Data Interface
- Universal and open standards win
  - Internet, Ethernet, Telephone System, Wi-Fi, USB
- Allows use of best-in-class components
  - Use the best compass, autopilot, etc. regardless of manufacturer
- NMEA 2000 adopted as the international standard for marine electronics interfacing by IEC (IEC 61162-3)
- NMEA 2000 will be the protocol of choice for AIS products
  - Data sharing allows economical implementation of wide variety of data required by AIS transceivers

Future Directions

- New products continue to be certified
  - Maretron predicts 50 certified products by end of 2005
- NMEA 2000® continues to evolve to support new technologies in an open manner
  - Recent additions include support for transfer of waypoint and route data, AIS, intelligent power converters

For More Information…

http://www.maretron.com