NMEA International Conference & Expo

Standards Update
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Steve Spitzer
For more information
www.sspitzer@nmea.org
425 417-8042

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What’s on the Menu?

Updates to:

NMEA 0400
NMEA 0183
NMEA 2000
NMEA OneNet

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Who is NMEA

• Born 1957
• Over 600 members worldwide
• 40 countries represented
  • Manufacturers
  • Dealers, Installers
  • Academia
  • Government Administrations
• Trade
• Boat Builders, Shipyards
• Industry Associations

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ANSI Standards Developer

• ANSI Accredited Standards Developer
  • NMEA 0400 Installation Standard
• Interface Standards
  • NMEA 0183
  • NMEA 2000
  • NMEA OneNet

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NMEA 0400
Installation Standard

NMEA 0400
INSTALLATION STANDARDS
FOR
MARINE ELECTRONIC EQUIPMENT
USED ON
MODERATE-SIZED VESSELS
Version 3.0

National Marine Electronics Association

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The Evolution Continues

2001 Version 1.00
2006 Version 2.00
2008 Version 3.00
2012 Version 3.10
2015 Version 4.00

+50%
311 pages
NMEA 0400
Installation Standard

2 Years in Development

• Process
  • More than 20 marine electronic manufacturers
  • Developed working group
    • 26 CMETs, subject matter experts, international (BMEA, Sweden, New Zealand, ISO)
  • Web meetings
  • Reviewed all sections (20 + 2(new))
References - International

- **ISO 10133** Small craft -- Electrical systems -- Extra-low-voltage DC installations
- **ISO 13297** Small craft -- Electrical systems -- Alternating current installations
- **ISO 10134** Small craft-- Electrical devices – Lightning protection systems
NMEA 0400
Installation Standard

Glossary -

• Wiring standards for ISO recreational craft directive
• Metric cable size to AWG conversion tables
• Voltage drop calculations
• NMEA 0183 Talker ID’s
• NMEA 2000 Parameter Group Numbers
Sections

• Coax Cables
• NMEA Interfaces
• Autopilots

New Sections

• Security and Cameras
• Black Box
NMEA 0400
Installation Standard

Sections

• Coax Cables
<table>
<thead>
<tr>
<th>Nominal O.D.</th>
<th>RG58U</th>
<th>RG8X</th>
<th>RG8U</th>
<th>RG213</th>
<th>RG-214</th>
<th>LMR240</th>
<th>LMR400-50</th>
<th>RG-174</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.18in / 4.76mm</td>
<td>0.25in / 6.35mm</td>
<td>0.40in / 10.32mm</td>
<td>0.40in / 10.32mm</td>
<td>0.425in / 10.8mm</td>
<td>0.25in / 6.35mm</td>
<td>0.40in / 10.32mm</td>
<td>0.1in / 2.54mm</td>
</tr>
<tr>
<td>Conductor (AWG)</td>
<td>20</td>
<td>16</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>9</td>
<td>26</td>
</tr>
<tr>
<td>Impedance</td>
<td>50</td>
<td>50</td>
<td>52</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Velocity Factor %</td>
<td>66</td>
<td>78</td>
<td>80</td>
<td>66</td>
<td>66</td>
<td>84</td>
<td>85</td>
<td>66</td>
</tr>
</tbody>
</table>

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Coax – stripping

1. Cut the cable perpendicular to the length of the cable using a sharp cutting tool. A tool designed specifically for cutting coaxial cable is recommended to reduce cable distortion during the cutting process. Use care not to cut the cable at an angle.

2. Squeeze the stripper handle to open the tool jaws, then insert the cable until it hits the positive stop. Release pressure on the stripper handle to close the tool around the cable.

3. To create the cable preparation, rotate the stripper forward three rotations around the cable, then reverse for three additional rotations. Be careful not to cut through the cable braid.
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Installation Standard

Coax – TNC

Step 1
Place nut, washer (when supplied) and gasket over cable and strip jacket to dimension a shown in table above.

Step 2
Comb out braid and fold out. Trim insulation off center conductor to dimension c shown in table above. Tin center conductor. Pull braid wires forward and taper toward center conductor. Place clamp over braid and push back against cable jacket.

Step 3
Fold back braid wires as shown, trim to proper length [.125” (3.2mm)] and form over clamp as shown. Solder contact to center conductor.

Step 4
Insert cable and parts into connector body. Make sure sharp edge of clamp seats properly in gasket. Tighten nut.

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Coax – TNC Detail

<table>
<thead>
<tr>
<th>Amphenol Number</th>
<th>Conn. Type</th>
<th>Cable</th>
<th>Stripping Dimensions, in.(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>79875</td>
<td>TNC Plug</td>
<td>RG-58</td>
<td>a: .281(7.1) c: .109(2.8)</td>
</tr>
</tbody>
</table>
Coax – F Connector Installation

1. Grip the connector at the nut or between the nut and compression die. Insert prepared cable into the connector and push firmly.

2. The plastic center conductor guide will emerge from the end of the connector as the cable is inserted. Remove the plastic center conductor guide and discard.

3. Lift the compression tool handle to retract the plunger.

4. Seat the nut of the connector on the head of the plunger and lower the cable into the groove of the tool.

5. Squeeze the tool handle to compress the connector onto the cable.

6. Lift the tool handle to retract the plunger. Remove the finished connector assembly from the tool.
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Installation Standard

Interfaces 0183

• Improved explanation between RS232 and RS 422

RS-232

RS-422

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## NMEA 0400

### Installation Standard

## Interfaces 0183

- Color code wiring labels – follow the NMEA 0183 Standard

<table>
<thead>
<tr>
<th>Name</th>
<th>Color</th>
<th>Twisted Pair</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talker A</td>
<td>White</td>
<td>Talker Pair</td>
<td>Data-H</td>
</tr>
<tr>
<td>Talker B</td>
<td>Brown</td>
<td></td>
<td>Data-L</td>
</tr>
<tr>
<td>Listener A</td>
<td>Yellow</td>
<td>Listener Pair</td>
<td>Data-H</td>
</tr>
<tr>
<td>Listener B</td>
<td>Green</td>
<td></td>
<td>Data-L</td>
</tr>
<tr>
<td>NMEA 0183-HS C</td>
<td>Black</td>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td>Shield</td>
<td>Bare</td>
<td></td>
<td>See Section 3.3</td>
</tr>
</tbody>
</table>

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**Interaces 2000 - Update wiring diagrams**

- **Electrical Distribution Panel**
  - From Battery, Battery Switch, or Other Distribution Panel
  - Conductors Sized for < 3% Voltage Drop at Interface
  - Breakers in Accordance With Manufacturer's Specification

- **Fuse in Accordance With NMEA 2000® Specification**
  - May be Integral With Power Tap

- **NMEA 2000® Power Isolation Interface in Equipment**
- **To Other NMEA 2000® Devices**

- **To Other NMEA 2000® Devices**
## Interfaces 2000 - Update wiring chart

<table>
<thead>
<tr>
<th>Cable Name</th>
<th>Lite Cable</th>
<th>Mid Cable</th>
<th>Heavy Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signal / Data Wire Gauge</strong></td>
<td>24 AWG min .205 mm² min</td>
<td>20 AWG min .518 mm² min</td>
<td>18 AWG min .823 mm² min</td>
</tr>
<tr>
<td><strong>Power Wire Gauge</strong></td>
<td>22 AWG min .326 mm² min</td>
<td>16 AWG min 1.31 mm² min</td>
<td>15 AWG min 1.65 mm² min</td>
</tr>
<tr>
<td><strong>Cable Type</strong></td>
<td>Lite</td>
<td>Mid</td>
<td>Heavy</td>
</tr>
<tr>
<td><strong>Connector type</strong></td>
<td>Micro</td>
<td>Micro or Mini</td>
<td>Mini</td>
</tr>
<tr>
<td><strong>Current Capacity</strong>**</td>
<td>3 Amps</td>
<td>4 A Micro</td>
<td>8 A Mini</td>
</tr>
<tr>
<td><strong>Cable Resistance</strong></td>
<td>.057 Ω per Meter</td>
<td>.015 Ω per Meter</td>
<td>.012 Ω per Meter</td>
</tr>
<tr>
<td><strong>Max Backbone Length</strong></td>
<td>100 Meters</td>
<td>250 Meters</td>
<td>250 Meters</td>
</tr>
<tr>
<td><strong>Max Drop Length</strong></td>
<td>6 Meters</td>
<td>6 Meters</td>
<td>6 Meters</td>
</tr>
</tbody>
</table>
NMEA 0400
Installation Standard

Autopilots

• 2x the pages and new drawings

Typical Block Diagram
NMEA 0400
Installation Standard

Autopilots

Linear Rudder Reference

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Installation Standard

Autopilots

• Course Computer Installation
• Compass and Satellite Compass
• Rudder Reference Installation
• Drive Types and Installation
• Installation Considerations
NMEA 0400 Installation Standard

Black Box Installations

- Examples -
  - Fish finder transceiver boxes
  - Autopilot course computer boxes
  - NMEA 0183 / NMEA 2000 Interface boxes
  - Radar processor boxes
  - AIS Receiver boxes
- Mounting Locations and Orientation
NMEA 0400 Installation Standard

Black Box Installations

- Mounting Locations and Orientation
NMEA 0400
Installation Standard

Security and Cameras

• Tracking Antennas
• Equipment Installation Requirements
NMEA 0400 Installation Standard

Camera

- Equipment Control Requirements
NMEA 0183
Still Going Strong
World’s most installed marine electronic interface

- **1980** – with 0180 transmission at 1200 baud RS 232
  - Loran, Decca GPS to autopilot
- **1982** – with 0182 transmission at 1200 baud RS 232
  - Included lat/long and other position indicators
- **1983 - 1991** – with 0183 transmission at 4800 baud
  - 36 pages of text in 1983
World’s most installed interface

- **1992** – Version 2.00
  - 90 pages
  - RS 422 introduced
  - 126 pages
  - 256 pages
- **2002** – 0183 Hi-Speed 38,400 baud

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Number of pages

- 1980
- 1983-1992
- 1992-2000
- 2000-2008
- 2008-present

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NMEA 0183

Current Version 4.10

• 2012 Published
  • Requires RS 422
  • Shipboard and Non-Shipboard Applications
  • Interconnecting Wires (New Section)
    • Consultation with USCG, RTCM and Manufacturers
    • Ribbon, flat cables or coax and cable assemblies prohibited
    • Establishes specific wiring color-code labels (GPS and DSC)
    • Identifies Talker and Listener Connections
## Current Version 4.10

### Color Coded Labels

<table>
<thead>
<tr>
<th>Name</th>
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<td>Listener Pair</td>
<td>Data-H</td>
</tr>
<tr>
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<td>Green</td>
<td></td>
<td>Data-L</td>
</tr>
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<td>NMEA 0183-HS C</td>
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<td></td>
<td>Ground</td>
</tr>
<tr>
<td>Shield</td>
<td>Bare</td>
<td></td>
<td>See Section 3.3</td>
</tr>
</tbody>
</table>
Current Version 4.10

• Connectors

  • Manufacturer shall include the male and female
    • Attached or not attached directly to the device chassis
  
  • The mating connector cable assembly shall be minimum of one meter in length
  
  • Cable mounted chassis connectors shall not exceed 30 centimeters from the device.
NMEA 0183

Current Version 4.10

NMEA 0183 (TIA 422)
Connector Options

Option 1: Chassis Mounted Connector (Preferred)

Option 2: Cabled Connector
NMEA 0183

Current Version 4.10

• GNSS sentences updated for Galileo
  • New talker ID
  • Additional requirements

• New Sentences
  • HBT – Heartbeat Supervision Sentence
  • GEN – Generic Binary Information
Current Version 4.10

- AIS updated sentences:
  - ABK, AIS Addressed and Binary Broadcast Acknowledgment
  - ABM AIS Addressed Binary and Safety Related Message
  - ACA, AIS Regional Channel Assignment Message
  - AIR, AIS Interrogation Request
  - BBM, AIS Broadcast Binary Message
  - MEB, Message Input for Broadcast, Command
Collaboration with IEC TC80 Working Group 6

- NMEA Category A Liaison with IEC
- IEC 61162-1 5th Edition (NMEA 0183)
  - IEC members are voting to approve
  - If approved: IEC 61162-1 5th Edition reference NMEA 0183
  - Benefit:
    - One document worldwide publishing interface sentences
    - IEC TC 80 WG6 and NMEA closer together
Collaboration with IEC TC80 Working Group 6

- NMEA is Task Leader for IEC 61162-1 (NMEA 0183)
- Lee Luft of USCG is Task Leader for IEC 61162-2 (NMEA 2000)
NMEA 0183

Works in Progress for next version

- Safety Net
- Man Over Board
- Heave
- AIS Updates
- AIS Repeater
- Return Link Message (Copas/Sarsat)
- Heel and Roll Measurements
- ROV (3 axis speed and position)
- New Talker IDs (new satellites)
Inmarsat SafetyNet Sentences - Collaboration included the USCG, Inmarsat, NMEA, IEC, and additional maritime industry partners

Five sentences convey Maritime Safety Information (MSI) from Inmarsat-C and Mini-C terminals supporting Enhanced Group Call

- SM1 – SafetyNet Message, All Ships/NavArea
- SM2 – SafetyNet Message, Coastal Warning Area
- SM3 – SafetyNet Message, Circular Area Address
- SM4 – SafetyNet Message, Rectangular Area Address
- SMB – IMO SafetyNet Message Body
MOB - Man Over Board

- May be used to set a MOB waypoint, or to initiate an alert process.

HVE - Heave

- Reports the vertical distance perpendicular to (smooth, wave-free water on) the earth’s surface

AIS Updates

- ABK, AGA BCL for new ITU message

AIS Repeater

- EPV – provides a method to command and report specific equipment settings
- SPW – can be used for authentication
- TRL – specific to AIS Class A stations. Intended to support the retrieval of the AIS non-functioning log information
RLM - Return Link Message
  • will be used to inform the person(s) in distress that their Distress Beacon signal has been received by SAR

HRM - Heel and Roll Measurements
  • for ISO specified Inclinometer equipment

ROV - containing three-axis speed and position information for underwater vessels.

New Talker IDs for new regional GNSS
  • GB - Beidou Navigation System (Chinese)
  • GQ - QXSS - Quasi Zenith Satellite System (Japanese)
  • GI - IRNSS - Indian Regional Navigation Satellite System
NMEA 0183
Implementations Worldwide
Shipboard
Terrestrial
Work with NMEA 0183 is not stopping
Brief History

- NMEA 2000 Standards Committee established in 1994
- Developed by more than 40 academic, industry and international collaboration
  - Academia - Kansas and Oklahoma State, networking and computer industry, marine electronic companies, U.S. Coast Guard Research & Development Center
  - Multi-national marine electronics committee under NMEA guidance
- 5 years in development
- Beta tested – 18 months
- 2001 commercially released
- 2008 adopted by IEC (61162-3)
Today more than 120 companies worldwide
Europe, Asia, Australia, New Zealand, N.A.
USCG R&D, USCG Engineering Center,
Canadian Coast Guard,
IEC TC80 Working Group 6

NMEA 2000 Standards Committee

By Laws Standing Sub Committee

PGN Standing Sub Committee

Certification Standing Sub Committee

Category Working Group

Category Working Group

Product Assurance Compatibility Sub Committee

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<table>
<thead>
<tr>
<th>NMEA 2000</th>
<th>NMEA 0183</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built for networking</td>
<td>Single talker, multiple listener</td>
</tr>
<tr>
<td>Standard cables &amp; connectors</td>
<td>Bare wire connections</td>
</tr>
<tr>
<td>All devices can access all network data</td>
<td>Limited network data access</td>
</tr>
<tr>
<td>Data is prioritized</td>
<td>Data is not prioritized</td>
</tr>
<tr>
<td>Gateway needed for PC connection</td>
<td>Direct connection to a PC serial port</td>
</tr>
<tr>
<td>Operates at 250k Bits / Second</td>
<td>Bandwidth limitations (4,800 &amp; 38,400)</td>
</tr>
</tbody>
</table>
3 Types of cables / connectors

- Open Devicenet Vendor Association (ODVA) Specification
  - Heavy Cable (8 Amps), Mid Cable (4 Amps) Light Cable (3 Amps)
  - IP67 rated, 65 lb pull strength
  - Key screw-on connectors
  - Accepted by Lloyd’s Register
  - Meets U.S.C.G. CFR 46 regulated vessel-wiring requirements
  - Meets UL Class 2, UL 1677 oil resistance and NEC CL2 FT 4 flame rating specifications
NMEA 2000

Message Database Architecture

• Follows International Standards Organization (ISO)
• Based on ISO 11783 parts 3 and 5, harmonized with SAE J 1939.
• Auto Addressing
• Bit by Bit arbitration
• Priority messaging embedded
## New Messages (PGNs)

<table>
<thead>
<tr>
<th>Alarms and Alerts Messages</th>
<th>Man Over Board Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Suite of messages</td>
<td></td>
</tr>
<tr>
<td>• Over 900 alert codes</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heartbeat Message</th>
<th>Power Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CAN node diagnostic</td>
<td>• Suite of messages</td>
</tr>
<tr>
<td></td>
<td>• Power distribution</td>
</tr>
<tr>
<td></td>
<td>• Power generation</td>
</tr>
</tbody>
</table>

| Label Message | Water Maker Message |
NMEA 2000

Message Enhancements

• Digital Selective Calling (DSC) Message
• Inverter Message
• ISO Address Claim Message
• Command Group Function Read and Write Message
• AIS Messages
• Galileo Message
NMEA 2000

Additional Messages to be Published

- New DSC Messages
- New AIS Messages
- New Heave Message
- New Return Link Message
- New Safety Net Messages
- New Regional Satellite Messages
- Conversion of legacy NMEA 0183 to NMEA 2000
NMEA 2000

Standard Enhancements to be Published

• Improved clarity to minimize ambiguity
  • i.e. Device instance and Data instance
• Removal certification levels of A and B
• New requirements for proprietary PGNs
  • Condition 1: The message is device specific such as, unique calibration or special configuration.
  • Condition 2: Data is being used for test purposes.
  • Condition 3: Data PGN is not available in the current NMEA Network Message Database
Standard Enhancements to be Published

• New reporting for proprietary PGNs

  • Manufacturers shall disclose the following confidential information:
    • PGN number
    • PGN title and or purpose
    • PGN priority
    • PGN update rate
    • PGN acknowledgement requirements
    • PGN data field descriptions
Standard Enhancements to be Published

- New Mandatory PGNs

<table>
<thead>
<tr>
<th>PGN Name</th>
<th>PGN Number</th>
<th>Previous Level A</th>
<th>Previous Level B</th>
<th>All Products No Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Claim</td>
<td>ISO 60928</td>
<td>ISO 60928</td>
<td>ISO 60928</td>
<td>TX – RX</td>
</tr>
<tr>
<td>Product Information</td>
<td>126996</td>
<td>126996</td>
<td>126996</td>
<td>TX</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>ISO 59392</td>
<td>ISO 59392</td>
<td>ISO 59392</td>
<td>TX</td>
</tr>
<tr>
<td>Request</td>
<td>ISO 59904</td>
<td>ISO 59904</td>
<td>ISO 59904</td>
<td>RX</td>
</tr>
<tr>
<td>Request/ Group Function</td>
<td>126208</td>
<td>126208</td>
<td>126208</td>
<td>RX</td>
</tr>
<tr>
<td>Command/Group Function</td>
<td>126208</td>
<td>126208</td>
<td>126208</td>
<td>RX</td>
</tr>
<tr>
<td>Acknowledgment/Group Function</td>
<td>126208</td>
<td>126208</td>
<td>126208</td>
<td>TX</td>
</tr>
</tbody>
</table>
Standard Enhancements to be Published

- New Mandatory PGNs

<table>
<thead>
<tr>
<th>PGN Name</th>
<th>PGN Number</th>
<th>Previous Level A</th>
<th>Previous Level B</th>
<th>All Products No Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX/RX List</td>
<td>126464</td>
<td>126464</td>
<td></td>
<td>TX</td>
</tr>
<tr>
<td>Transport Protocol/Data Transfer</td>
<td>ISO 60160</td>
<td>ISO 60160</td>
<td></td>
<td>RX</td>
</tr>
<tr>
<td>Transport Protocol</td>
<td>ISO 60416</td>
<td>ISO 60416</td>
<td></td>
<td>TX - RX</td>
</tr>
<tr>
<td>Heartbeat</td>
<td>126993</td>
<td></td>
<td></td>
<td>TX</td>
</tr>
<tr>
<td>Commanded Address</td>
<td>ISO 65240</td>
<td></td>
<td></td>
<td>RX</td>
</tr>
<tr>
<td>Configuration Information</td>
<td>126998</td>
<td></td>
<td></td>
<td>TX</td>
</tr>
</tbody>
</table>
Standard Enhancements to be Published

• Appendix D – Application Notes
  • 60 pages to 138 pages
  • Implementations:
    • Power
    • Alerts
    • Firmware updating
    • Data instance configuration

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Standard Enhancements to be Published

• Appendix C – Certification Criteria and Test Methods
  • Updated with the new requirements
  • Select group of manufacturers assisting with upgrades

• Appendix A – Parameter Group Definitions
  • Part of NMEA Network Message Database
    • Formerly known as Appendix B – NMEA 2000 Database
Standard Enhancements to be Published

- Redundancy
  - IEC 61162-3 is NMEA 200
  - NMEA and IEC TC 80 Working Group 6 collaborated to meet the specific SOLAS requirements
    - Redundant network interface circuits
    - Dual network
Standard Enhancements to be Published

- Redundancy - achieved in two ways
  - Class 1 devices (one interface)
    - Identical devices on two buses
    - Two buses with functions duplicated on each bus
  - Class 2 devices (two interfaces)
    - One device two interfaces on two buses
    - Two buses with function duplicated on each bus
Example One

NMEA 2000

Heading Device #1
Heading Device #2
GPS Device #1
AIS Device #1

BUS 1
Speed Log Device #1
61162-1
Class 2 ECDIS

BUS 2

Heading Device #3
Speed Log Device #2
GPS Device #2
AIS Device #2
NMEA 2000

Class 2 Heading Device #1

Class 2 Speed Log

Class 2 GPS Device #1

Class 2 AIS Device #1

Class 2 ECDIS

BUS 1

Heading Device #2

BUS 2

Heading Device #3

GPS Device #2

AIS Device #2
SOLAS Ship Approvals

- BSH German type approval organization
  - Accepted NMEA 2000 validated tests results for 61162-3
  - Type approval has begun for 61162-3 products
NMEA 2000

Young and Still Growing
NMEA OneNet
NMEA on IP

NMEA OneNet
Staying Ahead of the Curve

Internet of Things (IoT)
IPv6
Internet Applications

© 2013 NMEA
The World has finally caught up with the Marine Electronics Industry
NMEA OneNet
NMEA on IP

- Internet of Things (IoT)
• Internet of Things (IoT)
• Internet of Things (IoT)

<table>
<thead>
<tr>
<th>World Population</th>
<th>Connected Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3 Billion</td>
<td>500 Million</td>
</tr>
<tr>
<td>6.8 Billion</td>
<td>12.5 Billion</td>
</tr>
<tr>
<td>7.2 Billion</td>
<td>25 Billion</td>
</tr>
<tr>
<td>7.6 Billion</td>
<td>50 Billion</td>
</tr>
</tbody>
</table>

More connected devices than people:

- 2003: 0.08
- 2010: 1.84
- 2015: 3.47
- 2020: 6.58
• Draft Standard / Not for Publication

• NMEA 2000 (NMEA Network) Messages on Ethernet Standard
  • Provides Common Infrastructure

• DOES NOT REPLACE NMEA 2000

• Compliments NMEA 2000

• Committee – 80+ members

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• Main Objectives
  • Transport NMEA Network Messages on Standard Ethernet Protocol (IEEE 802.3) in a uniform common manner
  • Utilize Standard Internet Protocol (IP) Addressing
    • IPv6
    • Internet Integration
  • Establish Gateway rules
  • Support high-bandwidth applications
Key Features

- **Speed**: up to 10 gigabit – > 40,000 times NMEA 2000
- **Scalability**: backbones may be other media such as such as Fiber
- **More Devices**: No practical limit
  - NMEA 2000 - 52
- **More Power** – POE will provide a minimum 15.4 Watts
- **Video** – Uses internationally recognized standards
NMEA Standards
NMEA OneNet Digital Interfaces

NMEA OneNet Common Message Header

<table>
<thead>
<tr>
<th>IPv6 Header</th>
<th>UDP Header</th>
<th>NMEA Network Message Data Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Message Sequence Number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Priority</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PGN #</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NMEA OneNet Message Signature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Must be 31, 4E, 54, 30 (hex)</td>
</tr>
</tbody>
</table>

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Why IPv6?

• OneNet way into the Future
• Support of multiple IP addresses per 1 MAC Address
• Eliminate legacy addressing issues later
• More robust set of address management capabilities
  • More efficient addressing and routing
• Embedded security
• Enhanced quality of services

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NMEA OneNet
NMEA on IP

• Other Items
  • Discovery Services
    • Simple Service Discovery Protocol (SSDP)
    • Bonjour (mDNS)
  • Universal Plug and Play (UPnP)
  • Internationally Recognized Video & Audio Standards
• OneNet Device Certification
  • Model NMEA 2000
<table>
<thead>
<tr>
<th></th>
<th>IPv4</th>
<th>IPv6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployed</td>
<td>1981</td>
<td>1999</td>
</tr>
<tr>
<td>Address size</td>
<td>32-bit number</td>
<td>128 bit number</td>
</tr>
<tr>
<td>Address Format</td>
<td>Dotted Decimal Notation</td>
<td>Hexadecimal Notation</td>
</tr>
<tr>
<td></td>
<td>192.149.252.76</td>
<td>3FFE:F200:0234:AB00:0123:4567:8901:ABCD</td>
</tr>
<tr>
<td>Number of</td>
<td>$2^{32}$ 4,294,967,296</td>
<td>$2^{128}$</td>
</tr>
<tr>
<td>Addresses</td>
<td></td>
<td>340,282,366,920,938,463,463,374,607,431,768,211,456</td>
</tr>
</tbody>
</table>
Safety and Security

Major Contributor

Electronics and Telecommunications Research Institute of South Korea (ETRI)
<table>
<thead>
<tr>
<th>Source Address</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Group</td>
<td>Marine (4)</td>
</tr>
<tr>
<td>System Instance</td>
<td>0</td>
</tr>
<tr>
<td>Device Class</td>
<td>Internetwork Device (25)</td>
</tr>
<tr>
<td>Device Function</td>
<td>Gateway (130)</td>
</tr>
<tr>
<td>Device Instance</td>
<td>0</td>
</tr>
<tr>
<td>Manufacturer ID</td>
<td>Actisense (273)</td>
</tr>
<tr>
<td>Unique ID</td>
<td>109232</td>
</tr>
<tr>
<td>NMEA Database Version</td>
<td>1.300</td>
</tr>
<tr>
<td>Load Equivalency Number</td>
<td>0.6 Watts (1)</td>
</tr>
<tr>
<td>Manufacturer Product ID</td>
<td>28199</td>
</tr>
<tr>
<td>Manufacturer Model ID</td>
<td>NMEA OneNet Device (NOD)</td>
</tr>
<tr>
<td>Manufacturer Software ID</td>
<td>1.090, 2.196</td>
</tr>
<tr>
<td>Manufacturer Hardware ID</td>
<td>NOD-hv1.03</td>
</tr>
<tr>
<td>Manufacturer Serial ID</td>
<td>109232</td>
</tr>
<tr>
<td>Installation Details, Field 1</td>
<td>Useful description of location: Panel 8, portside galley</td>
</tr>
<tr>
<td>Installation Details, Field 2</td>
<td>Powered from breaker 23, starboard panel 3</td>
</tr>
<tr>
<td>Manufacturer Information</td>
<td>[Company name] [Company telephone] [Company website] [Tag line]</td>
</tr>
</tbody>
</table>
What’s Next

• Complete Publication of the Standard (Draft V.65)
  • Resolve minor technical details
    • IPv6
    • Switches
    • Web page

• Beta testing

• OneNet Certification documentation

• OneNet Certification Tool development
Thank You

Any Questions?

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