NMEA OneNet Ethernet Standard
A Review
September 2013
NMEA/RTCM International Conference

For More Information
www.sspitzer@nmea.org
425 417-8042

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NMEA OneNet
NMEA on IP

OneNet Standards Committee (as of Sept 2013)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Firma</th>
<th>Institution</th>
<th>Institution</th>
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<tbody>
<tr>
<td>Airmar</td>
<td>Furun</td>
<td>Maretron</td>
<td>Rosepoint Navigation</td>
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<tr>
<td>Actisense</td>
<td>Garmin</td>
<td>Maritime University of South Korea</td>
<td>RTCM</td>
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<td>Actisense</td>
<td>Furun</td>
<td>Microsoft</td>
<td>United States Coast Guard</td>
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<td>Canadian Coast Guard</td>
<td>Garmin</td>
<td>Molex</td>
<td>United States Coast Guard R&amp;D Center</td>
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<td>Jeppesen</td>
<td>Naviocom</td>
<td>Veddins</td>
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<td>Cisco</td>
<td>Johnson</td>
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<td>Vidtron Energy</td>
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<td>Digital Yacht (UK)</td>
<td>Kramer</td>
<td>KITI Systems</td>
<td>Raymarine</td>
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<td>ETRI South Korea</td>
<td>Kramer</td>
<td>KITI Systems</td>
<td>Raymarine</td>
</tr>
</tbody>
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The World has finally caught up with the Marine Electronics Industry

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NMEA OneNet
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- Internet of Things (IoT)
  - Means Lots of Things to Lots of People

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- Internet of Things (IoT)
- Industrial Internet
- M2M

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• Internet of Things (IoT) - Information Overload

Information from the Internet of Things:
We have gone beyond the decimal system

Today data scientists use Brontobyte to describe how much government data the NMEA or FIB have on people altogether.

In the near future, Brontobyte will be the measurement to describe the amount of data that will be generated from the IoT (Internet of Things).

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• Internet of Things (IoT) - Info Storage Overload

Brontobyte
• 1,000,000,000,000,000,000,000,000,000,000,000
• 1 followed by 27 zeros
**NMEA OneNet**

- Internet of Things (IoT)

**Main Objectives**
- Transport NMEA Network Messages using the IP protocol suite over 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: IPv6 support essentially unlimited
- More Power – POE will provide a minimum 15.4 Watts
- Video – Uses internationally recognized standards

**Draft Standard / Not for Publication**
- NMEA 2000 (NMEA Network) Messages over IP on Ethernet Standard
  - Provides Common Infrastructure
- **DOES NOT REPLACE NMEA 2000**
- Compliments NMEA 2000

**Mobile Stats**

- Source: Google
Why IPv6?

- More robust set of address management capabilities
  - All nodes required to form link local address
  - More efficient addressing and routing
  - Embedded security
  - Enhanced quality of services

IPv4 vs IPv6:

- **IPv4**: Deployed 1981

<table>
<thead>
<tr>
<th>Address size</th>
<th>32-bit number</th>
<th>128 bit number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Format</td>
<td>Dotted Decimal Notation</td>
<td>Hexadecimal Notation</td>
</tr>
<tr>
<td>192.149.252.76</td>
<td>3FFE:F200:0234:AB00:0123:4567:8901:ABCD</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Addresses</th>
<th>$2^{32}$</th>
<th>$2^{128}$</th>
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<tbody>
<tr>
<td>IPv4</td>
<td>4,294,967,296</td>
<td>340,282,366,920,938,463,463,374,607,431,768,211,456</td>
</tr>
<tr>
<td>IPv6</td>
<td>2^{128}</td>
<td>2^{128}</td>
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</tbody>
</table>
Why IPv6?
- New Header Format – minimum overhead

<table>
<thead>
<tr>
<th>Ver = 4</th>
<th>IHL</th>
<th>Type of Service</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Identification</th>
<th>Flags</th>
<th>Fragment Offset</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TTL</th>
<th>Protocol</th>
<th>Header Checksum</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Source Address</th>
<th>Destination Address</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Options</th>
</tr>
</thead>
</table>

Why IPv6?
- Global movement underway
- Service providers IPv6 enable today
- Avoid legacy and transition issues
- Manufacturers use “off the shelf” protocols
- Provides a platform for new and yet-to-be imagined services for vessels
- Allows OneNet to ride this wave

Standard Concepts
- Proposed Connector for speeds up to 100Mbs
- IP 67 Rated
- Standard Connector ([IEC 61076-2-101])

<table>
<thead>
<tr>
<th>Proposed Connector for speeds greater than 100Mbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP 67 Rated</td>
</tr>
<tr>
<td>Recommend Connector ([IEC/PAS 61076-2-109])</td>
</tr>
</tbody>
</table>

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• Proposals Concepts
  • Standard Concepts
  • Proposed Cables
    - Cat 5e up to 100 Mbs – ANSI/TIA/EIA 568-A
    - Cat 6 or 6A up to 10 Gigabit – ANSI/TIA/EIA 568-B

• Cat 5e or 6A up to 10 Gi – ANSI/TIA/EIA 568-A

• OneNet Proposes Ethernet Switches
  • Power over Ethernet Capable
  • 15W (IEEE 802.3af) (15Watt)
  • Or 30W (IEEE 802.3at) (30Watt)
  • Layer 2 Managed Switch

• OneNet Proposed Bi-directional OneNet Gateway
  • NMEA Network Messages to OneNet Bus
  • OneNet Messages to NMEA 2000 Bus
  • Global and addressed messages
  • Translates appropriate PGNs
  • Strict requirements

• Current Internet Applications
  • 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

• Safety and Security Add on
  Electronics and Telecommunications Research Institute of South Korea (ETRI)
Thank You

Any Questions?