

"Breathing New Life Into Legacy Navigation Systems"

A technical presentation for the Royal Institute of Navigation By Paul Sumpner CTO Of Digital Yacht Limited



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Latest Mobile Device Statistics

- 99% of devices use Android or iOS
- Q4/2016 sales
 - 350 Million Android Devices
 - 80 Million iOS Devices
- 77% of US adults own a Smart Phone and 51% own a Tablet
- Over 25 Billion iOS apps and 90 Billion Android apps were downloaded in 2016
- With stats like this, it is hardly surprising that so many boat owners have smart phones and tablets and want to use them onboard







Let us not forget the PC and Mac

- Smart phones and tablets have stolen the technology news headlines recently
- But many boat owners continue to use PCs and/or Macs
- Their larger screens, processing power and popular navigation software make them an equal to many dedicated marine MFDs
- Recently seen a renaissance in PC sales







digital YACHT

Why bother?

- The existing dedicated MFDs and other marine electronics are still as good as ever at what they do
- Mobile devices and Apps are becoming popular for many reasons;
 - Cost
 - Portability
 - Multi-Purpose
 - Back-up









The Connected Boat...

- Many of us will have seen the classic "NMEA2000" boat
- Although NMEA2000 is very common now on new and recently upgraded boats there are tens of thousands of legacy installations
- NMEA0183 and SeaTalk systems keep on going and many owners like their existing system and do not want the latest and greatest





Upgrading and Updating...

- If you want the additional functionality and convenience of using a Smart Phone, Tablet or PC on your boat how do you upgrade?
- Apps need the data in an understandable format, which in general is NMEA0183, either through wired or wireless interfaces



Different Interface Types...



- USB Interface
 - Create a "Virtual COM Port" that requires a compatible driver to be installed
 - Well proven method, but can suffer BIOS, Sleep and Crazy Mouse issues
 - Need to get the Baud Rate right
 - Some USB to serial chipsets are better than others
- Ethernet Interface
 - No drivers required
 - Some laptops are no longer having Ethernet sockets
 - Need a network switch/router and some networking knowledge
- Wireless Interface
 - No drivers required
 - Only solution for some devices (Smart Phones, Tablets, etc.)
 - Wireless Congestion in 2.4GHz range



USB Interfaces...

- Still sell many products with USB interface, which is further evidence that PC/Mac usage on boats is high
- Most of our USB interfaces use the industry leading Serial to USB chipset from FTDI
- Drivers for Windows, Mac and LINUX (including Raspberry Pi)





NMEA to Ethernet...

- Our latest iKommunicate interface has three NMEA0183 inputs and an NMEA2000 interface (future proof)
- Outputs NMEA over the network in TCP or UDP protocol
- Web interface for configuration





NMEA to Wi-Fi...

- Wi-Fi is wireless Ethernet
- The networking technology is the same as NMEA to Ethernet
- A device creates its own Wi-Fi network that other mobile devices can connect to





What is Wireless NMEA?

- Wireless NMEA is NMEA0183 data (ASCII) encapsulated in TCP or UDP network packets.
- This "open" standard is already supported by many apps and new apps are constantly being released that support this data format
- A complete NMEA0183 sentence is stored in one network packet for reliability...

IP Header	IP Payload
<header></header>	<\$GPRMC,092750.000,A,5321.6802,N,00630.3372,W,0.02,31.66,280511,,,A*43>

TCP versus UDP



- TCP is a reliable, "one to one", bi-directional connection with error checking and hand shaking – requires an IP address and Port number
- UDP is simpler, faster, broadcast connection on network address xxx.xxx.255 to multiple devices just requires a Port number

		•	TCP Segme	nt H	leader	Forma	nt		
Bit #	0	7	8	15 1	16	23	24	31	
0	Source Port				Destination Port				
32	Sequence Number								
64	Acknowledgment Number								
96	Data Offset Res Flags				Window Size				
128	Header and Data Checksum				Urgent Pointer				
160	Options								

UDP Datagram Header Format								
Bit #	0	7	8	15	16	23	24	31
0	Source Port			Destination Port				
32	Length			Header and Data Checksum				





Testing on iOS Devices...

- Testing of wireless NMEA systems can be performed using phones or tablets and there are a number of free and useful tools available
- For iOS devices our free iAIS app is probably the best and not just for AIS systems
- Simply connect to the wireless device's network, run iAIS, navigate to the TCP/IP screen and then select either TCP or UDP
 - + TCP = IP 192.168.1.1 and Port 2000
 - + UDP = Port 2000



Testing on Android Devices...

- Testing of wireless NMEA systems can be performed using phones or tablets and there are a number of free and useful tools available
- For Android devices the best free app is probably TCP/UDP Terminal
- Simply connect to the wireless device's network, run the app, click on "IP Port" and then select either TCP or UDP
 - + TCP = IP 192.168.1.1 and Port 2000
 - + UDP = IP 255.255.255.255 and Port 2000







Congestion in the Air...

- With so many boats with wireless networks and so many devices using Wi-Fi, the poor 2.4GHz RF Band is becoming very congested
- Generally the wireless interfaces in embedded devices and cheaper routers are less robust in congested environments
- It is highly recommended that you take a Wi-Fi survey of the vessel if you are having connection issues
- <u>Wi-Fi Analyser App</u> for Android or <u>NetSurveyor-Pro</u> for Windows are two very good free tools





Congestion on Devices...

- With more and more marine Apps, many of them using UDP or TCP data transfer, it is not unusual for conflicts to occur
- When an app creates a network connection it will often keep this open when the app is "sleeping" in the background
- It is good practice to only run one navigation app at a time and to close/quit any apps you are not using
- This is becoming a very common support issue



Best Marine Apps

- Things are constantly changing in the app world and keeping up to date takes time and commitment
- Digital Yacht maintain a list of the apps customers are using with our products which can be downloaded from here...
 - Best Marine Apps for iOS V1.06
 - Best Marine Apps for Android V1.06





"The App is dead, long live the App"



- What if you could create an App that could run on any device?
 - All mobile devices have an HTML5 compatible web browser and can run Web Apps written in JavaScript
- How do you get the Web App to the mobile device ?
 - Host it on a webserver
- How do I get a webserver on a boat ?
 - Install an iKommunicate
- How do I install my web app and data ?
 - Copy the web pages on to the iKommunicate's 8GB SD Card

How does it connect together?





On Board Web Server

- iKommunicate includes some web Instrument apps and room for plenty more on its 8GB micro SD card
- Any developer can create web apps for iKommunicate and its easy to modify the open source code we have published on GitHub
- Also possible to store manuals, drawings and photos of the boat, on iKommunicate and view on any device with a browser – great for boat builders
- Web pages can easily be branded and customised by any web designer



No more handbooks to clutter up the boat!





Watch Out... The Progressive Web App is coming...











You've been warned!