RoweBots Limited

Software Data Sheet

Unison RTOS version 5.3

Ultra tiny embedded Linux™ or POSIX™ compatible RTOS

Wireless

Wireless is all about four things:

- Data rate
- Range
- Power
- Protocols

Different radio standards trade off these different values to target different applications. The diagram in figure 1 shows the various range and data rate tradeoffs.

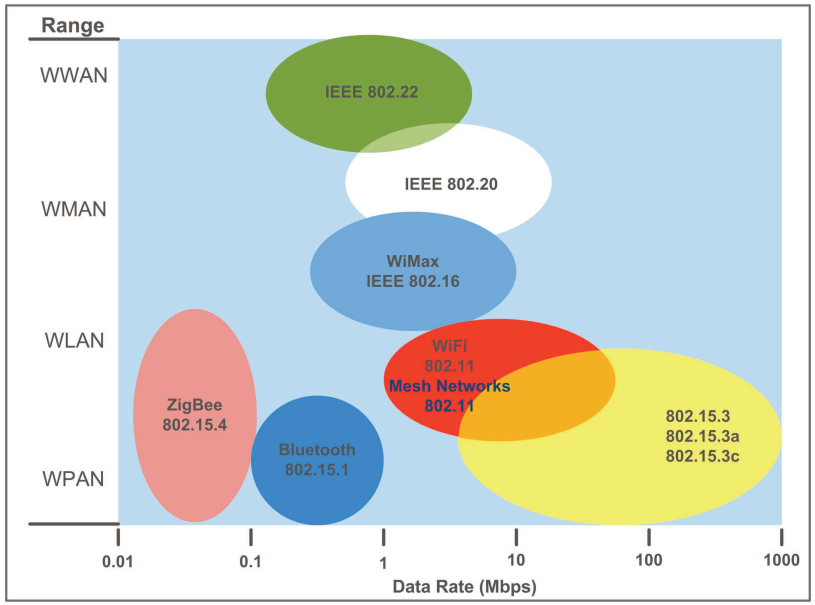

Figure 1: Wireless Network Data Rate and Range Comparison

At one level there is a radio interface for the link level traffic and above this there is a suite of protocols which offer various features. Some protocols are relatively simple while other protocols are more sophisticated and offer everything from link level to applications level capabilities. *Figure 2* shows the various protocols typically used and the support offered at the various levels.

The differences in the radios are shown in *Figure 1*. The power, data rate and range are the parameters which determine the correct radio for the application. The application protocol stack is then selected to support the radio choice.

The protocols can vary greatly. For example, Bluetooth Classic comes with a complete stack right to the application level in many profiles. Most other radios are married to a protocol stack that extends to the transport level but often without the transport protocol. UDP datagram service is the norm using 802.15.4 or UHF radios. High level protocols build on top of the UDP and TCP BSD sockets layer are optional if the BSD interface is available. In the Bluetooth world, access using sockets is also available which opens the solution up to the high level protocols of the networking world. The details of the protocol stacks are provided below.

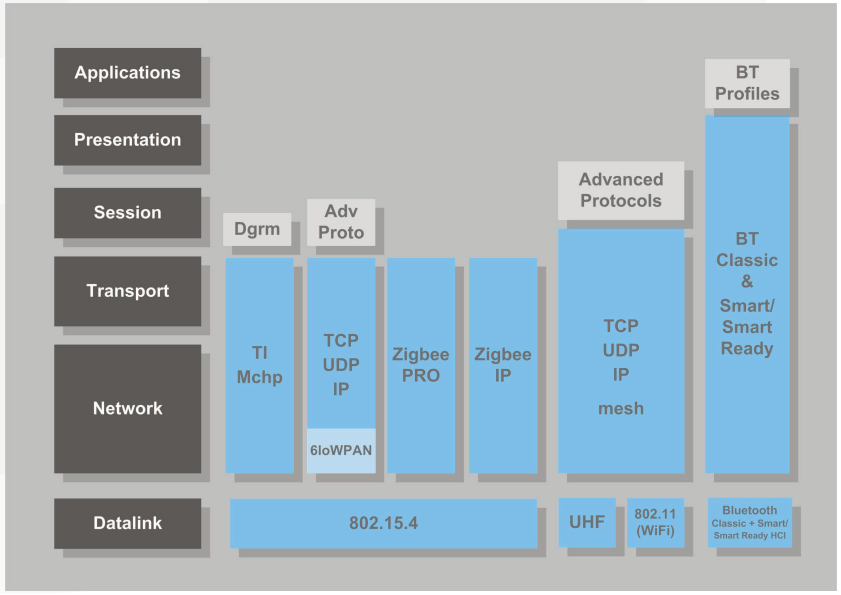

Figure 2: Radio interfaces appear at the link level while protocol stacks provide high/er level connectivity

Networking and Advanced Networking

Advanced Protocols and the details of the TCP/UDP/IPv4/IPv6 are discussed in the related document on Networking. Portions are presented here for clarity, but please refer to the sister document for further details.

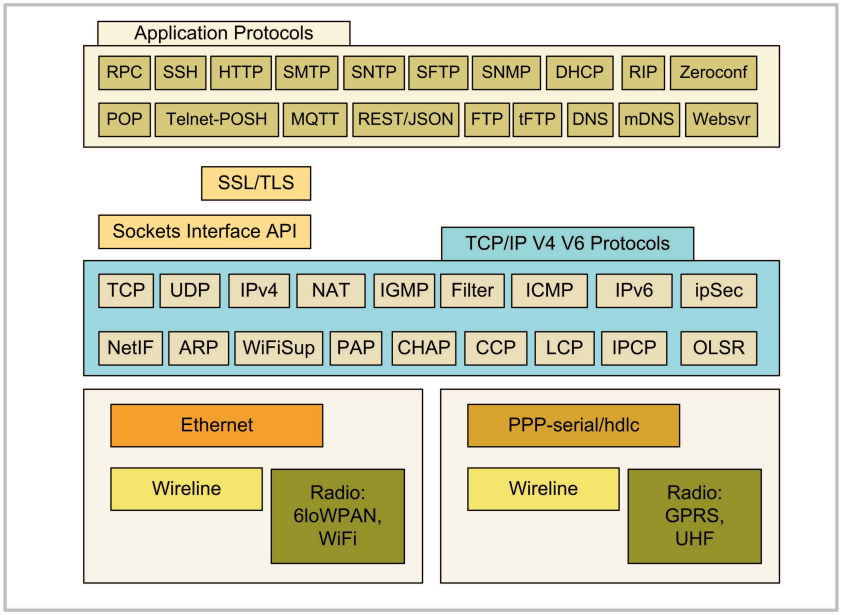

Figure 3: Networking including IPv4 and IPv6 along with wireless and higher level protocols work together to provide a systems solution.

Networking and Advanced Networking

Solutions which provide TCP/IPv6 access over low power, short range, low data rate networks use the 6loWPAN protocol to compress the packets for the network. There is some additional complexity to consider for this networking:

- L2 networking is offered below the compression protocols and offers proprietary routing of packets in the lossy radio network. Due to the proprietary nature, RoweBots does not support this solution.
- L3 networking protocols used today are specifed in RFC 6282, 4944 and 4919. RoweBots 6loWPAN provides comprehensive implementation.

GPRS, GPS and UHF

By adding a GSM data radio (GPRS) or a UHF link, and using PPP or point to point protocol, an entire networking solution can be connected. This includes GPS in most cases. Setup is done using GSM 7.10 protocol to separate the data and control channels.

WiFi

The network solution provides multiple network interfaces including WiFi and a WiFi supplicant. This is sufficient support to provide a wireless hotspot or wireless router using mixed IPv4 and IPv6. Applications can either connect as an end node or become a router node.

A broad set of security protocols are included along with a broad set of networking protocols. These protocols are network radio chip specific and the software supports the chip's options in general.

- WiFi protocols a, b, g, and n support are typical.
- WPA, WPA2, AES, and other security protocols are provided off the shelf.

A separate API is used to allow the program to select which networks or nodes are connected and these lists update automatically.

WiFI mesh technologies are offered by RoweBots and eliminate the network configuration with adhoc automatic algorithms based on Optimal State Link Routing (OLSR). With the ability to update the dynamic state of the network and eliminate expensive wiring and configuration during deployment, WiFi mesh networking is ideal for a broad set of industrial, building and home automation applications.

Zigbee

Zigbee networks were defined to cover low power, short range, low data rate networks for a broad set of applications like building automation. The radio specification is 802.15.4. The number of potential nodes in a network is 64K. With this very large network target there is coverage for any application. Additionally, a set of specialized higher level protocols were developed to better suit specific applications. Examples of these protocols are:

- Remote control
- Building automation
- Smart energy
- Health care
- Home automation
- Input device
- Retail services
- Telecom services
- 3D Sync

Today, RoweBots has a prototype Zigbee stack, off the shelf module solution, and the production version is on our roadmap. Please consult the factory for details.

Proprietary Radio Protocols

Proprietary radio protocols are used to replace Zigbee to make the network smaller, lower cost and simpler. Examples of this type of radio protocol stack are:

- Texas Instruments SimpliciTI
- Microchip MiWi
- Anaren UHF

The greatest difficulty in using these protocols is the non-standard interfaces and configuration of the software.

Bluetooth Classic

Bluetooth Classic is unusual as a network stack in that it is totally self-contained with bridges to other advanced networking protocols. The support that is offered includes the complete core stack protocols, some profiles off the shelf, and low cost/fast turnaround protocol extensions. The overall Bluetooth Classic offering is shown in *figure 4.*

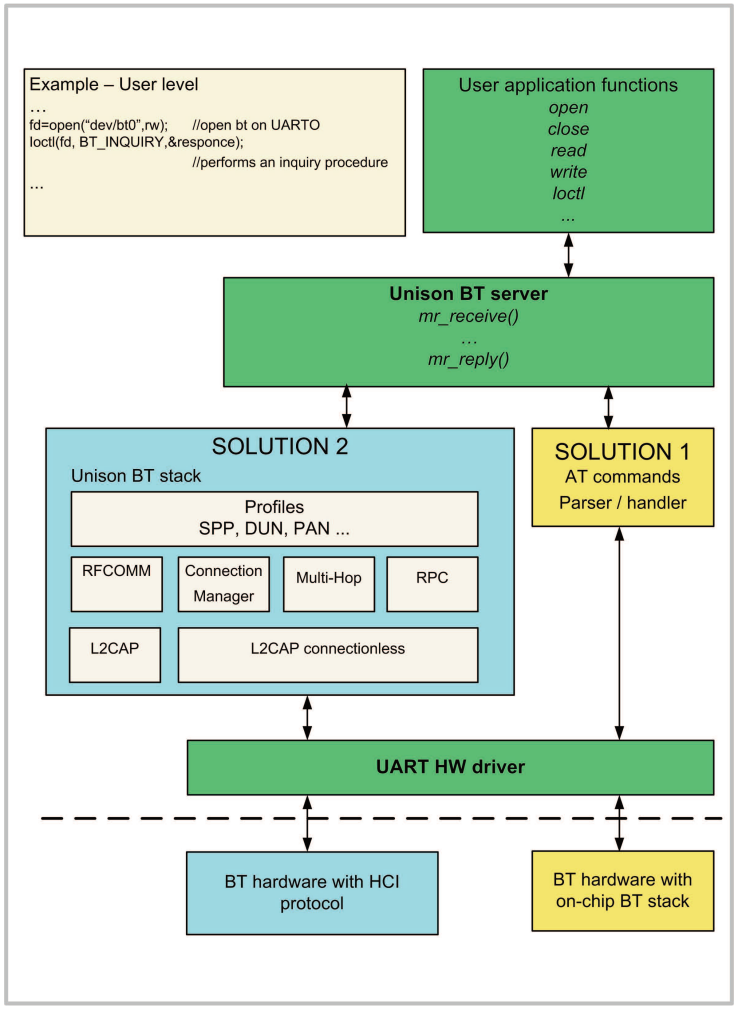

Figure 4: Bluetooth Classic operation

The Bluetooth Classic internal architecture is shown in the figure. The various profiles are listed below. Security is included.

Bluetooth Classic Profiles

The off the shelf protocols include:

- Serial port profile (SPP)
- Headset Profile (HSP)
- Handsfree profile (HFP)

The current roadmap profiles include:

- Health Data Profile (HDP)
- BNEP or TCP over Bluetooth
- Proprietary health profiles

The on demand profiles include the following:

- Advanced Audio Distribution Profile (A2DP)
- BNEP
- Dial Up Network (DUN)
- File Transfer Protocol (FTP)
- Headset profile (HSP)
- Human Interface Device (HID)
- Hard Copy Cable Replacement (HCRP) or Printer
- Intercom Profile (ICP)
- Personal Area Network (PAN)
- Object Push Profile (OPP)
- Service Discovery Application Profile (SDP)
- Synchronization Profile (SYNC)
- Video Distribution Profile (VDP)

Please consult the web site or the factory for further details.

Bluetooth Smart and Smart Ready

Bluetooth Smart and Smart Ready are the new marketing names for Bluetooth Low Energy Client and Server. These protocols are really almost completely separate from Bluetooth Classic but to better match hardware offerings, RoweBots offers a combined Bluetooth Classic / Smart / Smart Ready protocol stack.

Both protocol stacks interface at the HCI level if using a complete Rowebots implementation. Other implementations for Bluetooth Smart and Smart Ready similar to the ones for Bluetooth Classic which use on board protocol stacks are also available.

Bluetooth Smart and Smart Ready were designed to enable fast, low power sensor measurement. For this purpose, they work well but sacrifice bandwidth to accomplish this. For this reason, this approach has limited utility.

Profiles for Bluetooth Smart and Smart Ready are limited to sensor related devices and related features. Health care devices, simple data communications and other profiles are available.

Software Version • Unison 5.3

Availability • Now

Additional Information

Other seperately available RoweBots files for Unison OS:

- File Systems
- System Security
- Remedytools
- USB
- IoT or M2M Communication
- Internet Protocols
- Unison for Specific Processor Families

Contact: sales@rowebots.com
+1 519 279 46 00

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