

Wireless Integration and Consulting Engineering Services



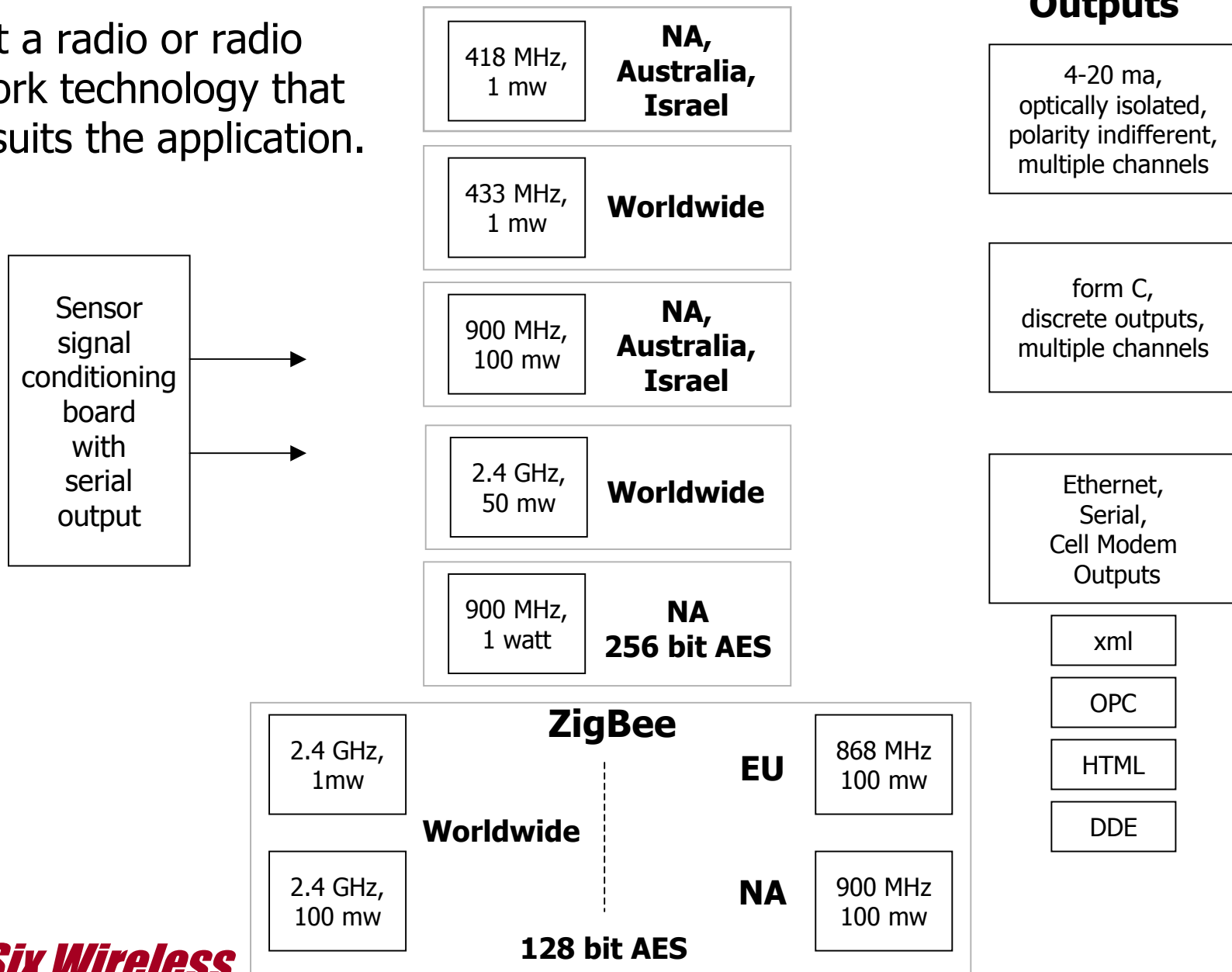
Wireless Integration Services

- Customer wishes to incorporate wireless technology into their product offering and selects a preferred radio network technology (Dust, Ember, Millennial Net, MaxStream, Linx, etc.) to use.
 - Customer chooses the best fit among various radio suppliers and technologies
 - Point Six offers consulting services to help determine the optimum solution
- Point Six will develop an interface that enables the customer's product to communicate over the selected radio network.
- Point Six will provide the interface to decode the radio transmissions into analog/digital outputs or serial radio packets
- Point Six can provide the radio chips for any radio node or the customer can deal directly with the radio manufacturers
- Point Six will work with the customer to develop chips that leverage future radio technologies



Selecting the Conduit – popular radio choices

Select a radio or radio network technology that best suits the application.



General Guidelines – Proprietary versus ZigBee

Proprietary

- Topography
 - Lower density
 - Point to Point, Star, Hybrid
 - Some Mesh
- Data rate
 - 9.6 – 115 kbps
- RF range
 - More high power choices
- Data Security
 - Proprietary modulation techniques
 - Network IDs and Vendor codes
 - Some AES
- Moderately Scalable
 - 1000s of nodes
- Acceptance
 - Over 30 million in operation

ZigBee Standard

- Topography
 - High Density
 - Auto Routing, self healing
 - Mostly Mesh
- Data Rate
 - 20 – 250 kbps
- RF range
 - Generally shorter ranges
- Data Security
 - 128 bit AES
 - Authentication and encryption
- Highly Scalable
 - Up to 64,770 nodes
- International Standard
 - Product Interoperability Goal
 - Standardized Protocols



Unlicensed Frequency Guidelines

- Narrow Band – Single Frequency
 - 315 MHz
 - Remote Keyless Entry (RKE) and garage openers
 - Very Crowded
 - FCC requires lower power than 418/433 and limited performance antennas
 - 418 MHz
 - Not crowded, less interference, good performance
 - FCC restrictions on transmission duration, interval and duty cycle
 - 433.92 MHz
 - Primarily used in Europe
 - Undesirable in the US due to potential interference from amateur radio and nearby pager band
- ISM Band - Spread Spectrum
 - Direct Sequence, Frequency Hopping & Frequency Shift Keying Modulation Techniques
 - Very versatile, FCC only specifies output power and harmonic levels
 - No restrictions on the type or duration of data sent
 - Great deal of application freedom, but getting more crowded

 - 868 - 870 MHz (not technically in the ISM band)
 - Unlicensed in EU
 - 902 - 928 MHz
 - Unlicensed in NA, Australia & Israel
 - 2.4 - 2.4835 GHz
 - Only unlicensed band approved worldwide
 - 5.725 - 5.875 GHz
 - Higher data rates but more vulnerable to LOS conditions

The industrial, scientific, and medical (ISM) bands were originally reserved internationally for non-commercial use of RF electromagnetic fields for industrial, scientific and medical purposes.



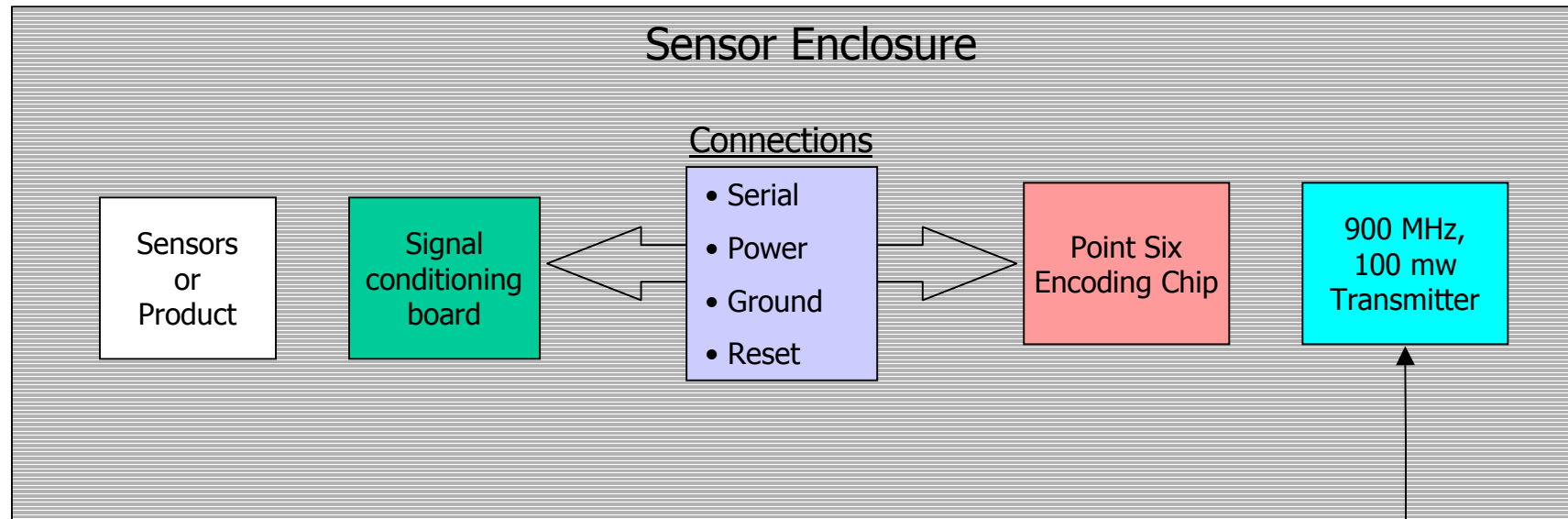
Sample Proposal

Sample proposal to wirelessly transmit sensor data and produce analog outputs that correspond to the sensor measurement.


- Point Six will provide a starter kit, consisting of:
 - Reference design for front end (signal conditioning board)
 - Serial number generation, energy management, timing, etc.
 - Reference design for the Transmitter Encoder
 - Energy managed
 - Reference design for Receiver Decoder
 - Reference design for Analog IR Decoder
 - Reference design for the Analog Output Circuit
 - Loop powered, optically coupled & isolated, polarity indifferent
 - All schematics and documentation
 - Requisite engineering support
- Starter kit price is typically between \$5000 - \$18000
- Point Six can obtain FCC and CE marks, as required, and bill customer
- The customer will provide all other parts, components, enclosures, etc. to complete and manufacture the product
 - Point Six has design engineering and manufacturing capabilities and is willing to assist as required by the customer



Sample Module Layout



 customer provides

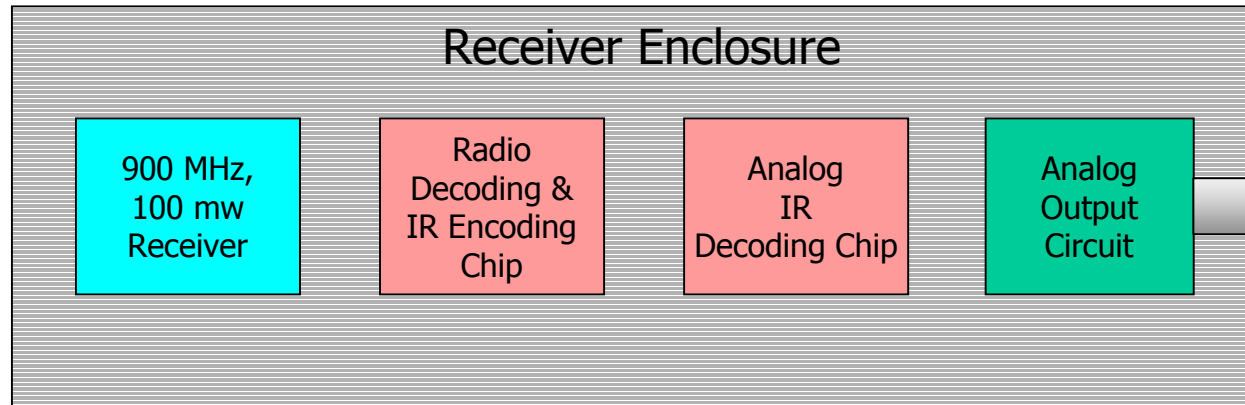
 customer can build or buy from P6

 must purchase chip from Point Six




 can purchase directly from the manufacturer or from P6

Can substitute a variety of radio technologies

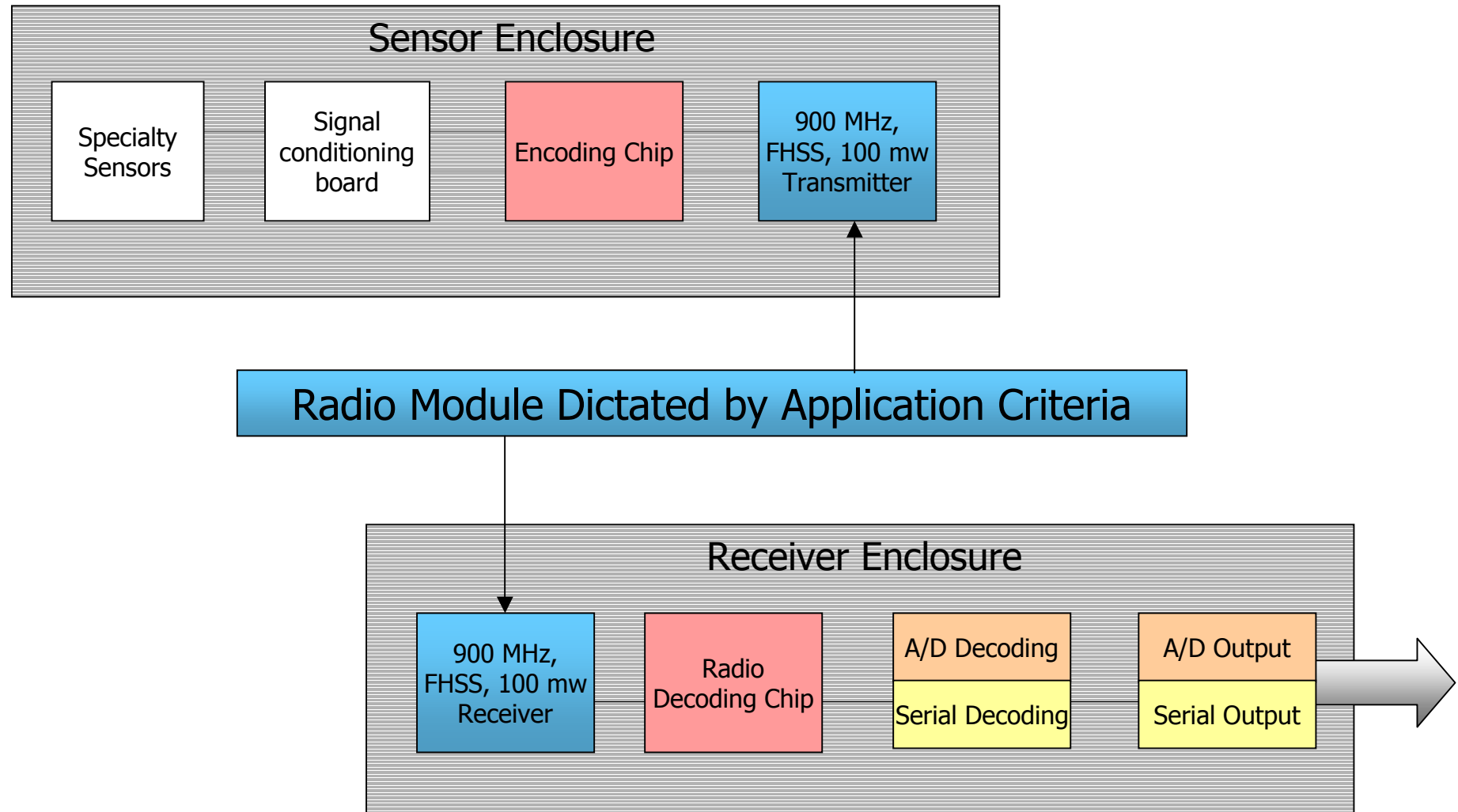
Sample Module Layout



- ✓ 4 – 20 ma outputs
- ✓ Loop powered
- ✓ Polarity indifferent
- ✓ Multiple channels
- ✓ Optically isolated

-  can purchase directly from the manufacturer or from P6
-  must purchase chip from Point Six
-  can build or buy from P6

Sensor Integration Layout Methodology



Sample Prices

<u>Radio Products</u>	<u>Pricing</u>
Linx Transmitter 418/433	\$5 - \$7
Linx Receiver 418/433	\$10 - \$12
MaxStream 900 MHz, 100 mw, FHSS (XMIT only version of above)	\$33 - \$44 \$22 - \$33
MaxStream 900 MHz, 1 watt, FHSS	\$44 - \$99
MaxStream 2.4 GHz, 50 mw, FHSS	\$33 - \$44
MaxStream XBee, 1 mw, DSSS	\$15 - \$17
MaxStream XBee Pro, 100 mw, DSSS	\$24 - \$28
<u>Point Six Products</u>	<u>Pricing</u>
Radio Encode Chip – Sensor Side	\$4 each (min. 1000)
Radio Decode Chip – Receiver Side	\$4 each (min. 1000)
Analog Output Decode Chip	\$6 each (min. 1000)
Repeater Chip (2)	\$15 per pair (min. 500)

Radio pricing is approximately what an OEM would pay dealing directly with the radio manufacturers and is volume dependant. Point Six would help establish the business relationship.

Prices do not include the other components needed to complete the product (e.g., enclosure, antenna, assorted parts, battery, etc.)



Benefits of "Radio Agnostic" Integration Services

- Customer gets into the wireless business with a minimal investment and quick time to market
- This business model allows companies to offer wireless sensors at a value and performance level yet unheard of in the industry and establishes a clear competitive advantage
- Manufacturer can leverage their existing line of products and sensors and could integrate new products or sensors into the wireless product line and infrastructure on their own
- Companies have the flexibility, by using Point Six Integration Services, to adapt to the most attractive radio technology in the future, neutralizing the "what is the best RF technology" debate that is paralyzing much of the industry today

