

FireHound: Wide-bandwidth Distributed Spectrum Sensing Platform

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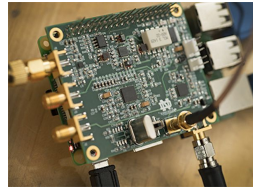
BACKGROUND

- Wireless devices are everywhere (**Bluetooth, WiFi, 5G**)
- More devices leads to **unreliable, interfering** communications
- Need a way of sensing **how signals move** in order to **share spectral resources** and **reduce interference**

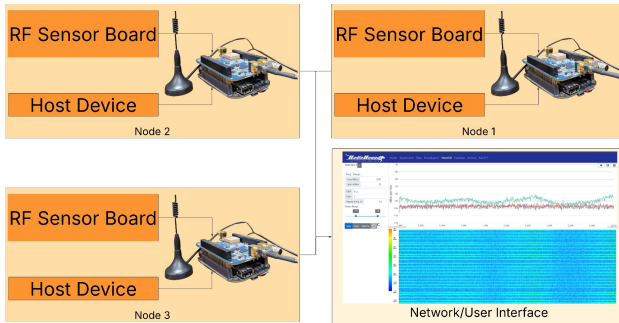


EXISTING SOLUTION

RadioHound is a **low-cost, low-power network of sensors** to create maps of spectrum usage in dynamic environments (hospitals, stadiums, etc)



SYSTEM DIAGRAM

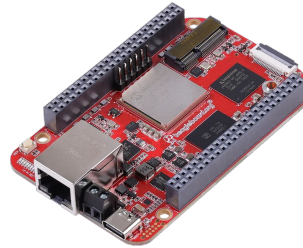


Signals are received by the **Radiohound Sensor Board**, processed through the **Host Device**, and displayed for the user via the **User Interface**

CURRENT BOTTLENECK

- Existing Host Device has fundamental limits:
 - **Bandwidth of captures are small**
 - **Resolution of captured data is limited**
 - **Ability to improve the host is exhausted**

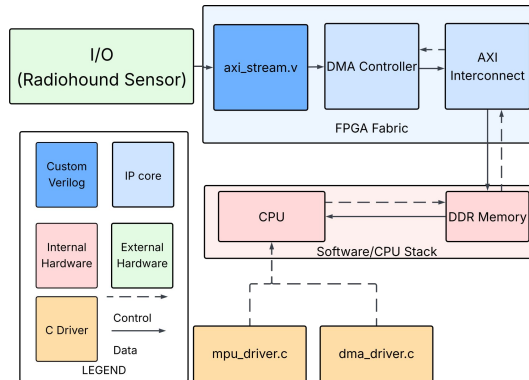
INNOVATION: FPGA-ENABLED DESIGN



BeagleV Fire is a new Host Device with **FPGA-Enabled hardware**, allowing vast data acquisition improvements

- **FPGA** allows for **adaptable and low-power** hardware design while **keeping costs low**
- **High-speed transfer protocol** moves data through the system at blazing speeds
- enables **High-Bandwidth captures** to see more signals at once

HOST ARCHITECTURE



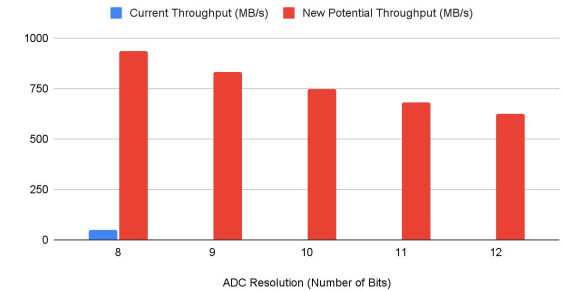
PERFORMANCE METRICS

	Existing Architecture	FPGA-enabled Architecture
Max. Data Rate	50 MB/s	936 MB/s*
Adaptability	Fixed Performance	Highly modular, designed to expand
Data Interface	GPIO (~100 MB/s)*	M.2 (~700 MB/s)*



WIRELESS INSTITUTE

Bandwidth Capture Potential between Solutions



RESULTS AND IMPACT

- The newly developed datapath enables nearly **20x the previous bandwidth**
- New platform **maintains the low-cost, low-power** scheme to keep Radiohound scalable and accessible
- New platform **expands research possibilities** to explore **spectrum sharing** and management tools

ACKNOWLEDGEMENTS

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REFERENCES

Max Datarate Figure (MSPS= Megabytes Per second):
<https://github.com/polarfire-soc/polarfire-soc-documentation/blob/master/benchmarks/dma-benchmarking/README.md>