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22-23
SEPTEMBER
2020

Grant Jennings
GOWIN Semiconductor

MIPI to Bluetooth LE: Leveraging Mobile Technology for Wireless IoT Applications

MOBILE & BEYOND

MIPI.ORG/DEVCON

MIPI and IoT Ecosystems at a Glance

1. MIPI Standardization in mobile has made many new mobile influenced products possible
2. Many of these new products “retro-fit” MIPI sensors from other more mature markets
3. Many of these products are wireless

FPGA's influence on MIPI Adoption

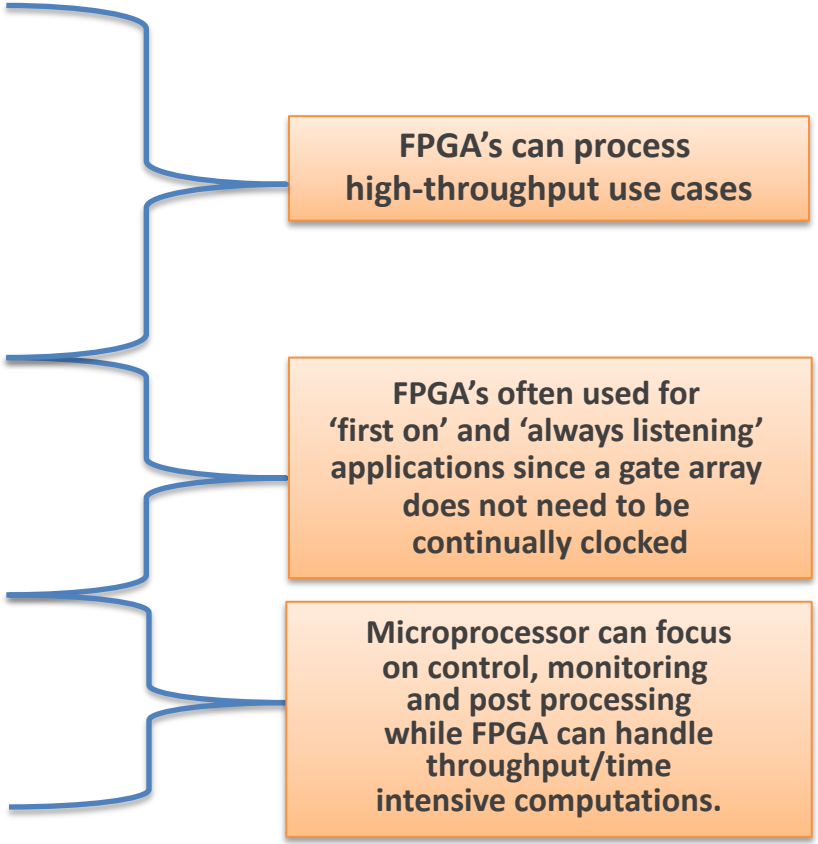
- FPGA's have historically been a critical part of MIPI interface adoption
  - Interface and bridging
    - Mobile multi-camera, display replacement, VR, Drone, Automotive, Industrial
  - Early interface and link layer adoption
  - Prototyping

- FPGA's have dramatically changed over the last 10 years
  - Power: Sub mW
  - Cost: Sub $1
  - Size: Sub $4mm^2$

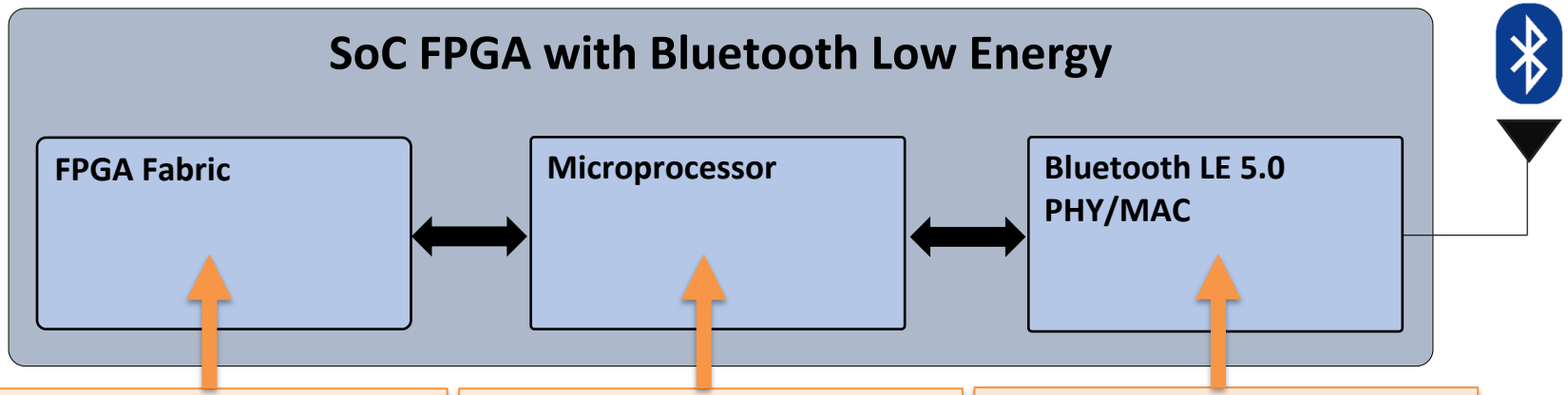
- FPGA's provide a great path to implement differentiated, non-native SoC features. Still dependent on the SoC; not a standalone solution.

New Feature Driven FPGAs

- Extended memory FPGAs
  - 4-8MB extended RAM
    - Video frame buffer
    - Audio spectrogram buffer
    - Instrumentation data buffering
- Security FPGAs
  - PUF for unclonable system firmware
  - Asynchronous Key Pairs
- SoC FPGAs
  - FPGA + Microprocessor
  - FPGA + Bluetooth + Microprocessor



Bluetooth LE Enabled FPGA Concept



Interfacing
(MIPI D-PHY/CSI-2/DSI, I3C, VGI, SLIMBus/SoundWire)

Memory Buffering

High Speed Processing/Rendering

IO Expansion

Control/Data Management

Buffered Data Post Processing

BLE Stack

Power Control

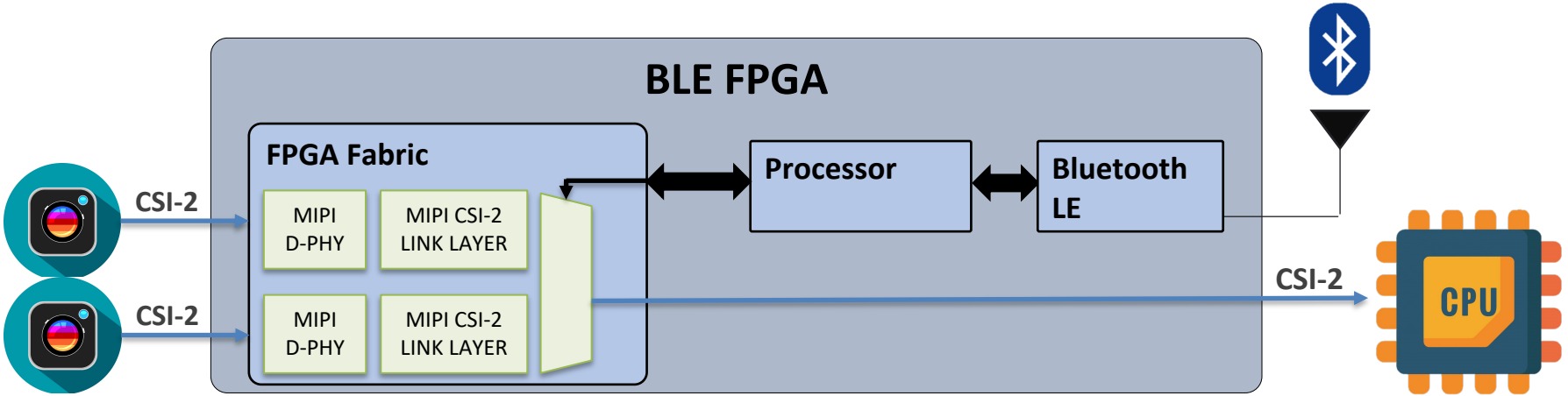
Security

Wireless Communication

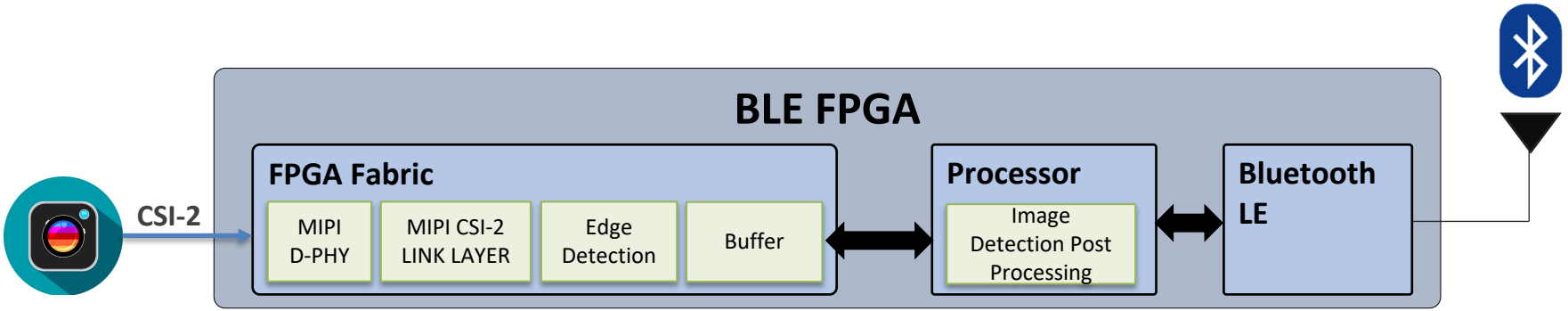
Global Attributes:

- Small Footprint
  - 6x6mm QFN
- Low Power
  - 5nA Power Gate
  - nA-uA Power Management
  - Built-in LDO for Battery Operation
- Security
  - AES-128, RNG, Key Generation

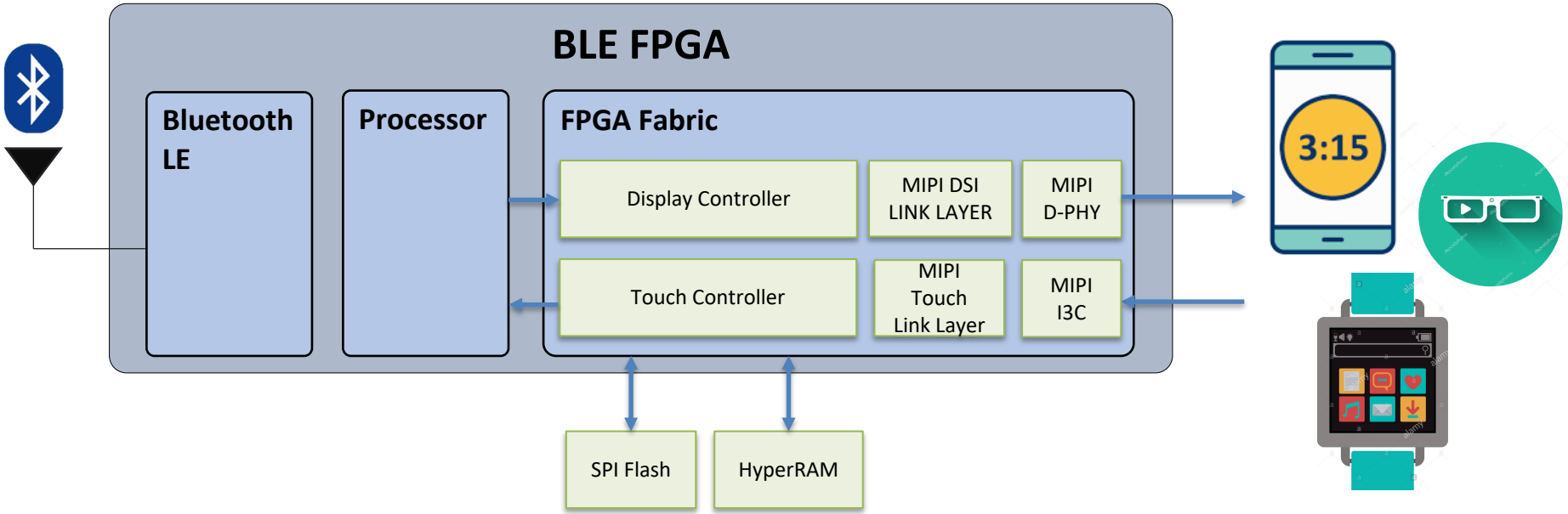
MIPI CSI-2℠ Camera Application Example



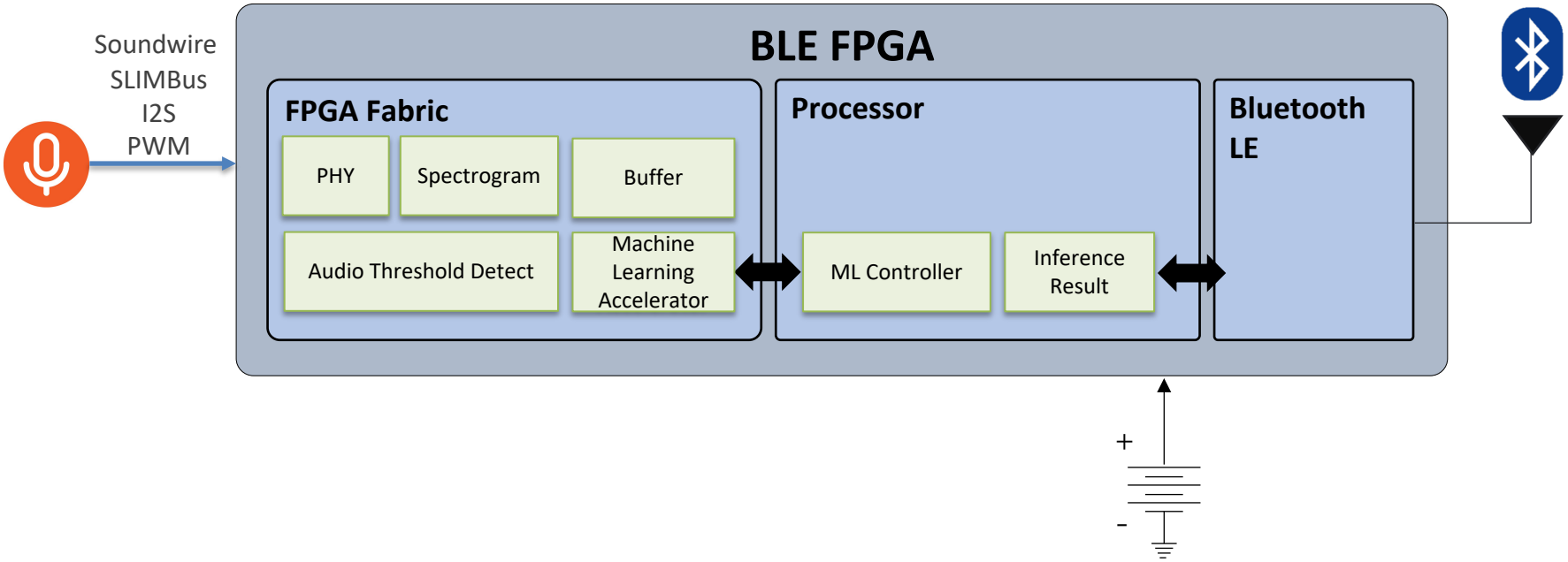
MIPI CSI-2 Camera Application Example



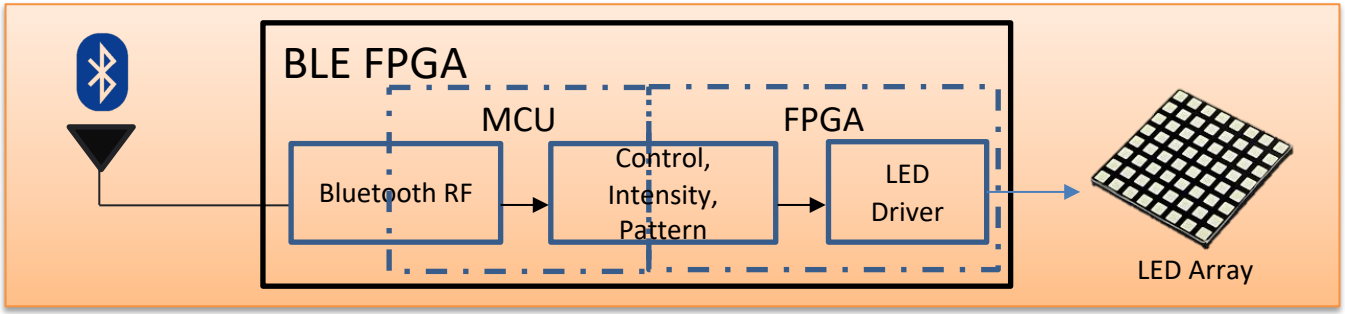
MIPI DSI℠ and Touch Display Application Examples

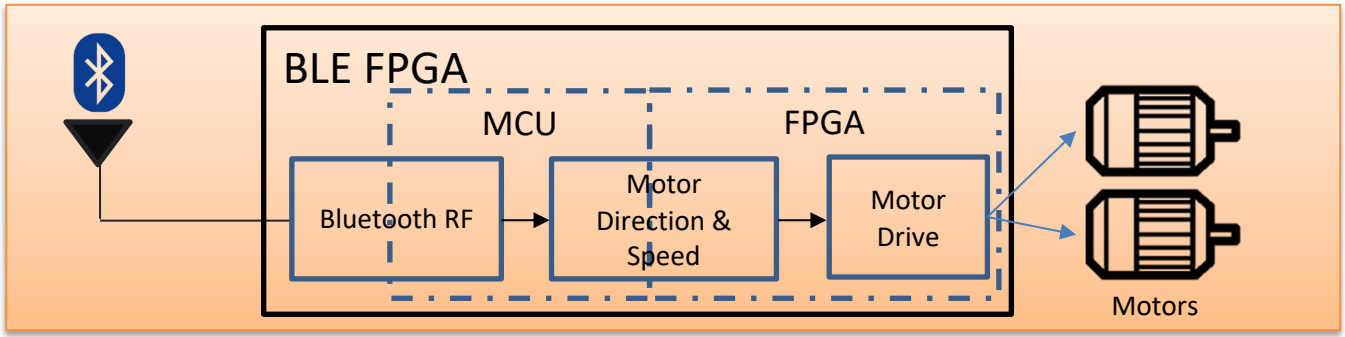


MIPI SoundWire/SLIMBus Audio Application Example



Other Interesting Use Cases





Summary – FPGAs Extend MIPI Related Use Cases

- Programmability of Mobile FPGAs enable new uses of MIPI sensors providing differentiated and innovative end products
  - High Speed Interfaces (Cameras, Displays)
  - Compute Intensive Cases (Machine Learning, FFT/Spectrogram, Computer Vision)
  - Data Buffering (Video Frame Buffering, Audio Buffering, Instrumentation and Test Equipment)
  - High IO Count (Camera Aggregation, Audio Beam Forming, Sensor Hub)
  - Always-On, Always Listening and Fast Wake-Up Cases

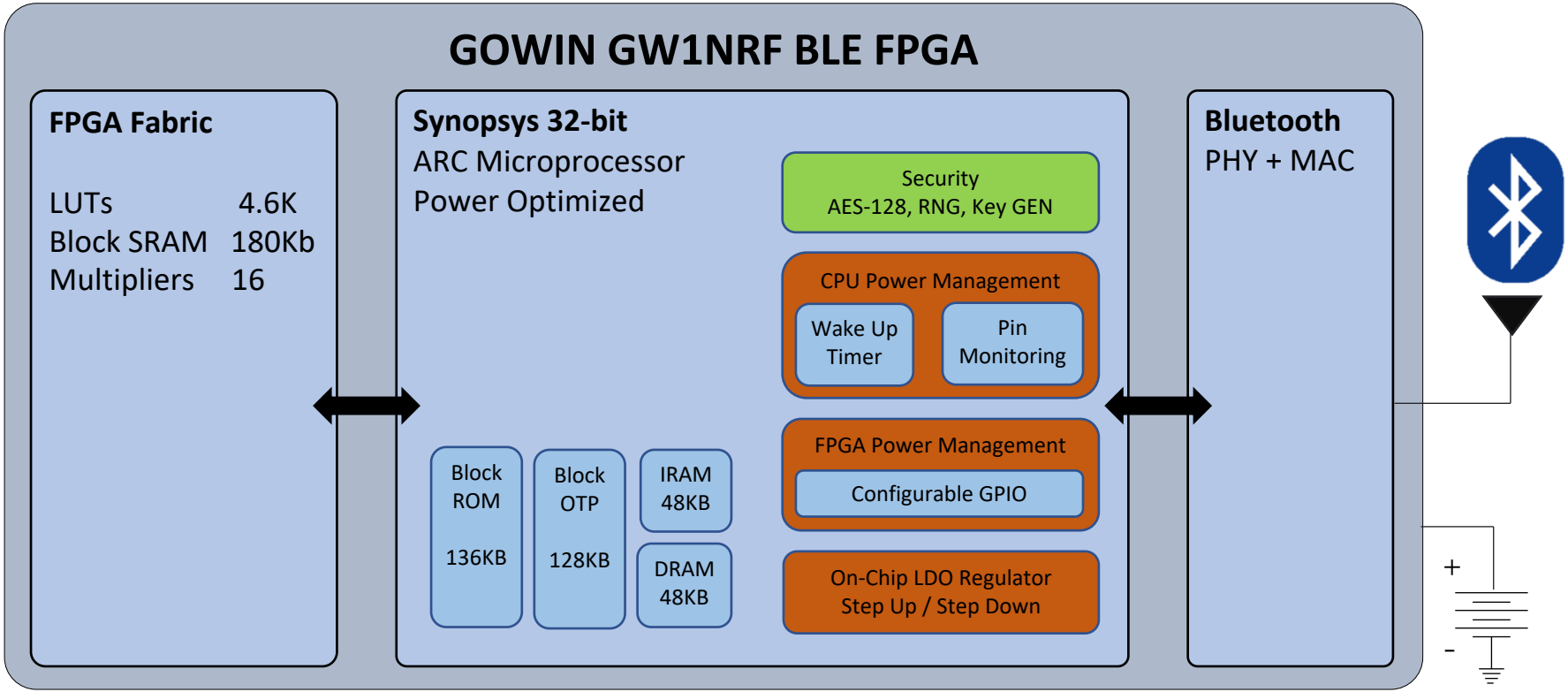
- SoC integration of MCU, FPGA and other key features such as Bluetooth Low Energy further extend usage of MIPI sensors

GOWIN enables MIPI by Manufacturing Unique and Differentiated FPGAs

		GOWIN *FPGA* Device Family		
		LittleBee Flash-Based FPGA **GW1N*** 1-10K Logic Element Density		Arora SRAM-Based FPGA **GW2A*** 20-55K Logic Element Density
Product Features	**Ultra Low Power** Device Power Management	***Z**		
	Hard MCU ARM Cortex M3 ARC EM4	***S**	***SR**	***SE** ***SER**
	Extended Memory On-Chip SRAM / Flash	***R**		
	Security SRAM PUF Root-of-Trust			
	Bluetooth Low Energy RF Transceiver	***RF**		

Product Series	FPGA Density (LUTs)	LittleBee Features	Arora Features
GW1N	1K, 4K, 9K	Flash-Based FPGA	N/A
GW1NZ	1K	Ultra-Low Power	
GW1NS	2K, 4K	Embedded Hardcore MCU	
GW1NR	4K, 9K	Extended Memory	
GW1NSR	2K, 4K	MCU + Memory	
GW1NSE	2K, 4K	MCU + Security	
GW1NSER	2K. 4K	MCU + Security + Memory	
GW1NRF	4K	MCU + Security + RF Transceiver	
GW2A	20K, 55K	N/A	RAM-Based FPGA
GW2AR	20K		Extended Memory

GOWIN GW1NRF Bluetooth LE 5.0 Enabled FPGA



ADDITIONAL RESOURCES

GOWIN GW1NRF Bluetooth LE FPGA Product Page:

https://www.gowinsemi.com/en/product/detail/2/

GOWIN GW1NRF Bluetooth LE FPGA Development Kit Page:

https://www.gowinsemi.com/en/support/devkits_detail/19/

Other Inquiries:

info@gowinsemi.com

GW1NRF Available in
6x6mm QFN48
or
Pre-Certified GW1NRF 20x20mm Module

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