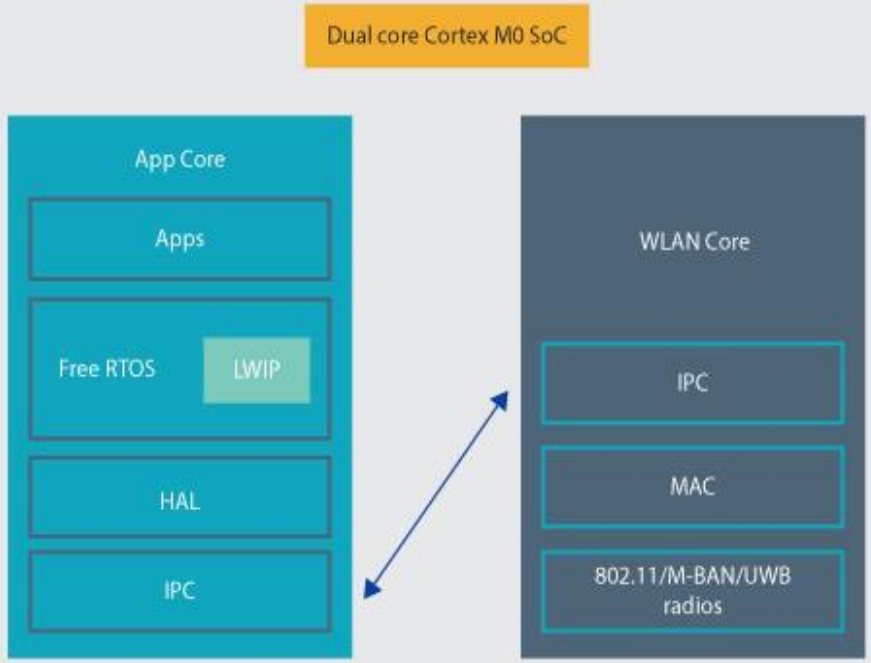

GadgEon
Engineering Smartness



Wireless Stack Customization for a Multi-Radio SoC

A Fabless semiconductor company wanted to customize a WiFi Stack to work on coin cell operated device and add Multi-Radio capabilities in Medical-Band and UWB Spectrum.

Project Size: 15 members
Project Duration: 2 years
Technology Used: Arm Cortex M0, 802.11 MAC, M-BAN, UWB, TDMA, IPC,

Challenge

- Typical WiFi requires over 200mA of current to do transmission, requirement was to customize a WiFi Stack to work with less than 50mA
- Add Multi-Radio communication protocol to do real-time switching between WiFi, Medical Band and UWB radios

Outcome

- Modified a Split WiFi MAC architecture based code working on Cortex-Ax to work as FullMAC single chip architecture solution on Cortex-M0 processor
- Developed highly optimized Power save features to make WiFi work from Coin Cells
- Developed TDMA based solution to switch between Multi-Radios

WHAT DID GADGEON DO?	PLATFORMS/ TECHNOLOGIES USED
1) Understood existing Split-MAC architecture and converted to FullMAC 802.11 MAC solution that runs on Cortex-M0 processor	802.11 MAC stack, Cortex-M0 processor
2) Designed IPC between Multicore SoC for Application stack to interface with WLAN stack	Developed Polling and Interrupt based Multi-Core Chip communication IPC using Message Queue architecture
3) Customized IEEE Power save mechanism to operate with very low Tx Power consuming Radio with Rx/Tx consuming <50mA compared to standard Wi-Fi solution consuming over 200mA	Developed WiFi Power save scheme to work with stringent power restrictions and special battery properties of Coin Cells in production version of solution
4) Developed and integrated WiFi Security Stack like WPA2 in the smallest footprint in less than 20kB compared to 150+kB of standard implementation	WPA2-PSK, ECDH Security
5) Altered Pairing scheme in WiFi to make it work like NFC for proximity pairing, using Novel techniques like ECDH for Security to avoid user inputs in keyboard less devices	ECDH, custom pairing scheme
6) Developed a TDMA prototype to prove feasibility of Multi-Radio chip for enhancing capacity of network without loosing reliability	WiFi, Medical Band, Ultra Wide Band radio operations
7) Provided Linux and Windows Custom development environment similar to KEIL, integrated with cross compilers, debuggers, custom eclipse development mode and other tools needed for easy development	Customized eclipse environment, Serial wire debugger, compilers, python based log analysis and plotting libraries

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