Project Description:

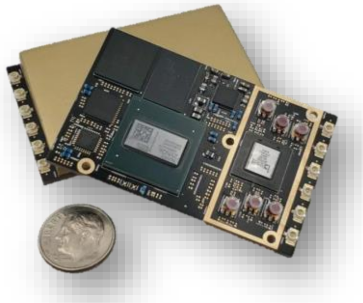
NextGen RF Design is a provider of wireless communication products and design services. One of our products, the BytePipe x9002, is a software defined radio System on Module (SOM) which utilizes a Xilinx Zynq Ultrascale+ System on a Chip (SoC) and an Analog Devices ADRV9002 integrated transceiver. This platform allows our customers to rapidly create a custom radio using off-the-shelf hardware.

This project is about making the BytePipe x9002 much more developer-friendly through the creation of wiki-style documentation, a reference implementation for a build environment, and full support for integrated drivers. An optional "stretch" goal is to great a GUI interface to send Industrial I/O (IIO) commands to the product's underlying (embedded) Linux operating system.

The project will focus on creating and documenting a standard build process for Xilinx Zynq processors using the Petalinux embedded operating system and associated Xilinx tool chains to build and configure the kernel. The project team will create wiki-style example documentation that shows our end customers how to set up the build environment, integrate Analog Devices' ADRV9002 IIO Driver, and customize the device tree to our target device. As a stretch goal, the project team will provide users with the ability to validate the Linux system and drivers by creating a cross-platform GUI (using GNURadio) that allows users to issue IIO commands to the underlying O/S.

As a starting point, the Analog Devices has provided a Kernel along with build instruction on their GitHub page, https://github.com/analogdevicesinc/linux along with a wiki https://wiki.analog.com/resources/tools-software/linux-drivers-all#building_the_adi_linux_kernel with further detail.

NextGen has extensive knowledge of the embedded software development process, however students will need to be self-starters and willing to become immersed in order to troubleshoot problems as they arise. We do not have experience with this particular build process, so students will need to work as a team to accomplish the project goals.



BytePipe SDR SOM

ZYNQ UltraSCALE+

ANALOG DEVICES
AHEAD OF WHAT'S POSSIBLE™

Linux™

Deliverables	Type of work	Activities	Resources	Tech Skills	Priority
Set up a functional build environment on a Linux host with the specific version of build tools required to replicate a released build of ADI Linux from source	Embedded Software Engineering, Computer Engineering, OS	Research, install, and configure build environment	Github reference: https://wiki.analog.com/resources/tools-software/linux-drivers-all#building_the_adi_linux_kernel	Linux, Embedded Systems, Vivado, Petalinux, Cross-compiler toolchains	High
Configure and build the Kernel with BytePipe as the target, including HDL and boot image.	Embedded Software Engineering, Computer Engineering, OS	Research BytePipe SOM, create custom device tree and integrate into the working build process	https://github.com/NextGenRF-Design-Inc/bytepipe_sdk/blob/main/src/petalinux/README.md	Linux, Embedded Systems, Vivado, Petalinux, Cross-compiler toolchains, Bash or Python scripting	High
Driver Testing	Embedded Software Engineering, Computer Engineering, OS, Documentation	Create Software Verification Test Plan Execute testing and report results	IIO Oscilloscope ADRV9002 Control IIO Scope Plugin	Debugging and troubleshooting, Documentation	High
GNURadio Integration (optional)	Embedded Software Engineering, Computer Engineering, OS	Install GNURadio on a windows or linux host, and configure it to use a BytePipe SOM as a target device via IIO commands	https://www.gnuradio.org/	Linux, Digital Signal Processing	Low
Create detailed build process documentation in a Wiki style	Embedded Software Engineering, Computer Engineering	Document the entire build process for inclusion in our Github page.	Reference: https://github.com/NextGenRF-Design-Inc/bytepipe_sdk	Linux, Embedded Systems, Vivado, Petalinux, Cross-compiler toolchains, Bash or Python scripting, Github, Documentation	Medium