



Heterogenous Tools for SDR

Easier, More Collaborative Development with Open Source Tools

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So What's Missing?



- Powerful open source radio development environment
- Low cost prototyping and deployment hardware platforms
- Development environments to make real-time embedded radios as easy as desktop simulations
- Open reference designs
- A community and a platform to make collaboration and sharing easier



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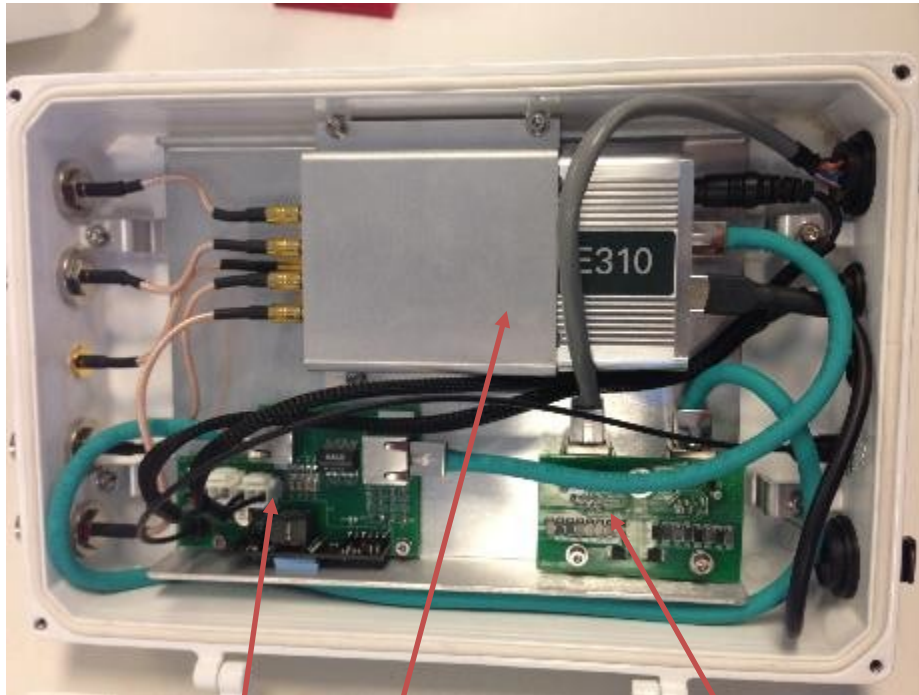
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Third Generation USRP Devices



E313 -- Ready-to-Go ESC?



E310 SDR

Power Over Ethernet
(POE) DC-DC

Lightning Protection

Waterproof/Dustproof
Enclosure



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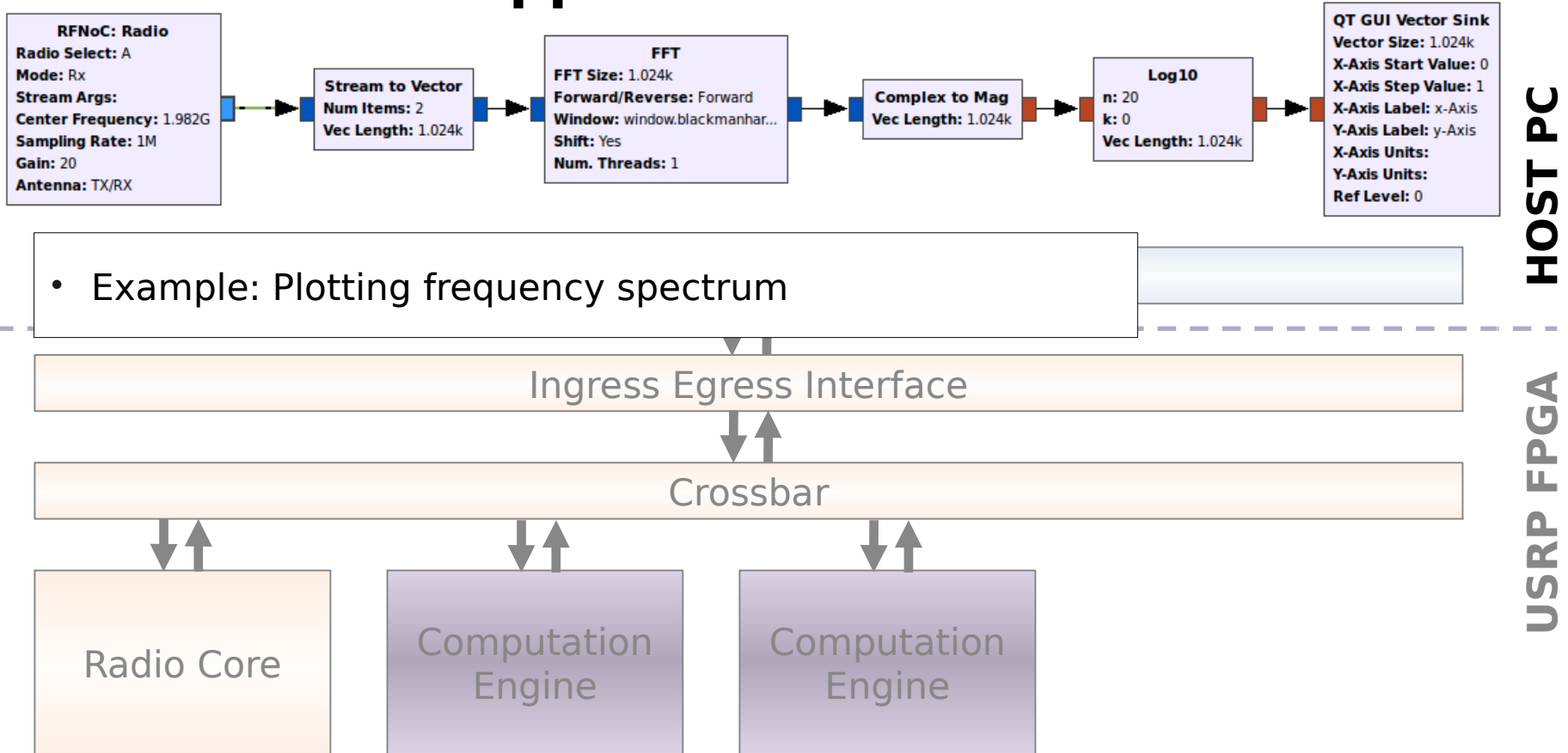
RFNoC: RF Network on Chip



- Makes FPGA acceleration easier
 - Transparently move computation between CPU and FPGA
 - Common Software API + FPGA infrastructure
 - Handles FPGA – Host GPP communication / dataflow and control
 - Provides the user simple software and HDL interfaces
- Fully integrated system-level FPGA/GPP development and debugging
- Scalable design, from small embedded devices up to massive distributed processing systems with 100's of FPGAs
- Fully supported in GNU Radio and other frameworks
- Very low latency and low overhead
- Distributed asynchronous implementation of Kahn Process Networks (aka GNU Radio blocks)
- Allows users to concentrate on algorithms and systems, not low level details

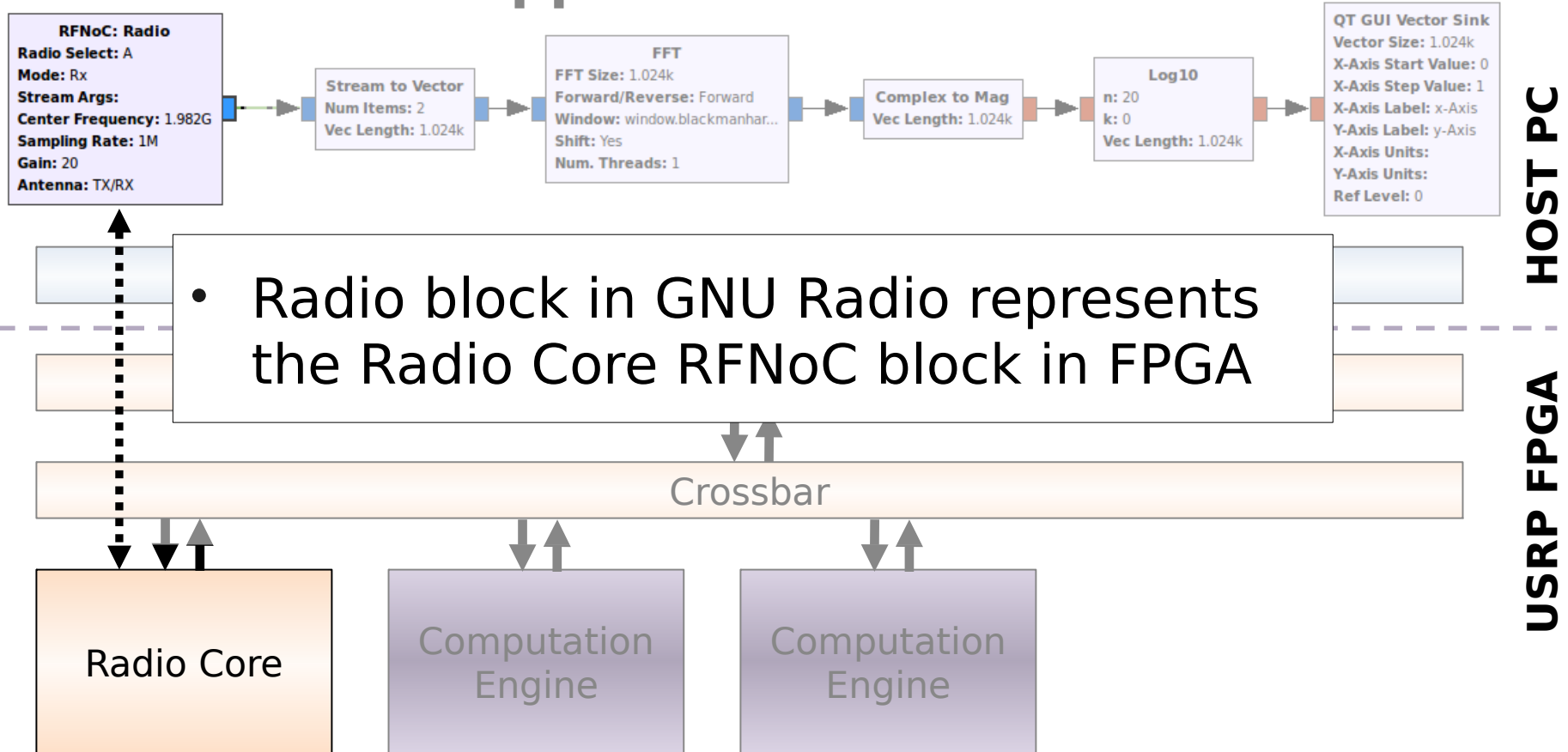
RFNoC Architecture

User Application - GNU Radio



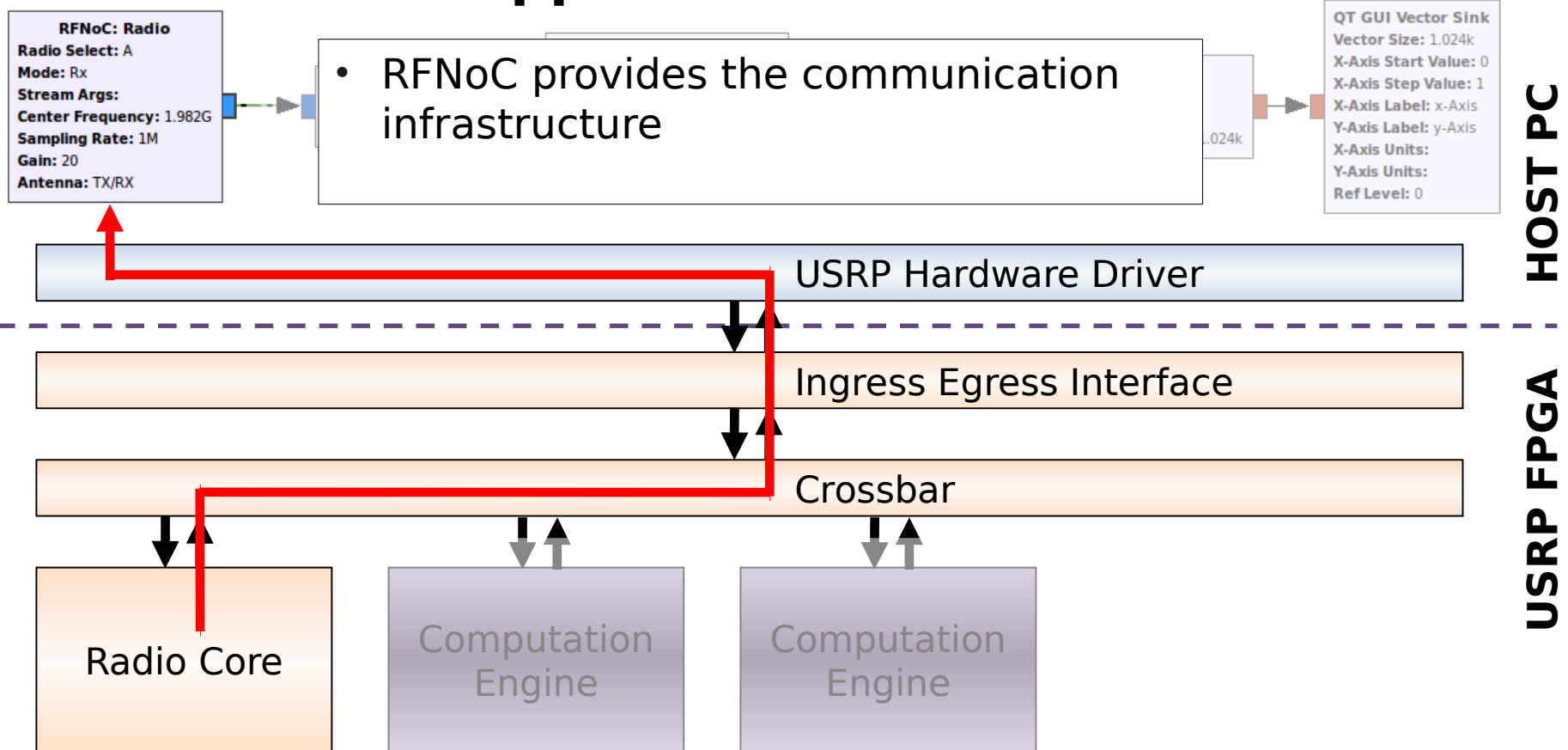
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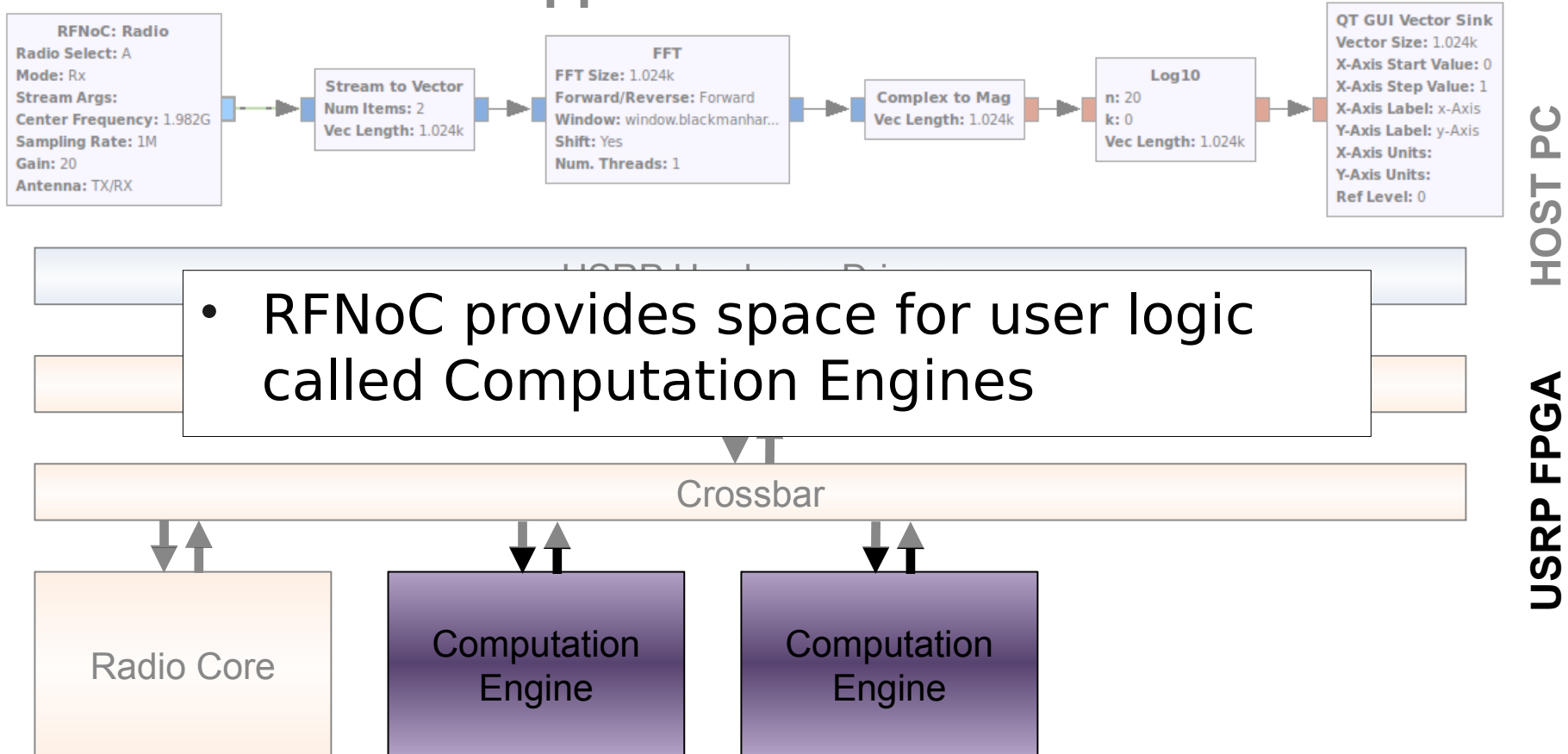
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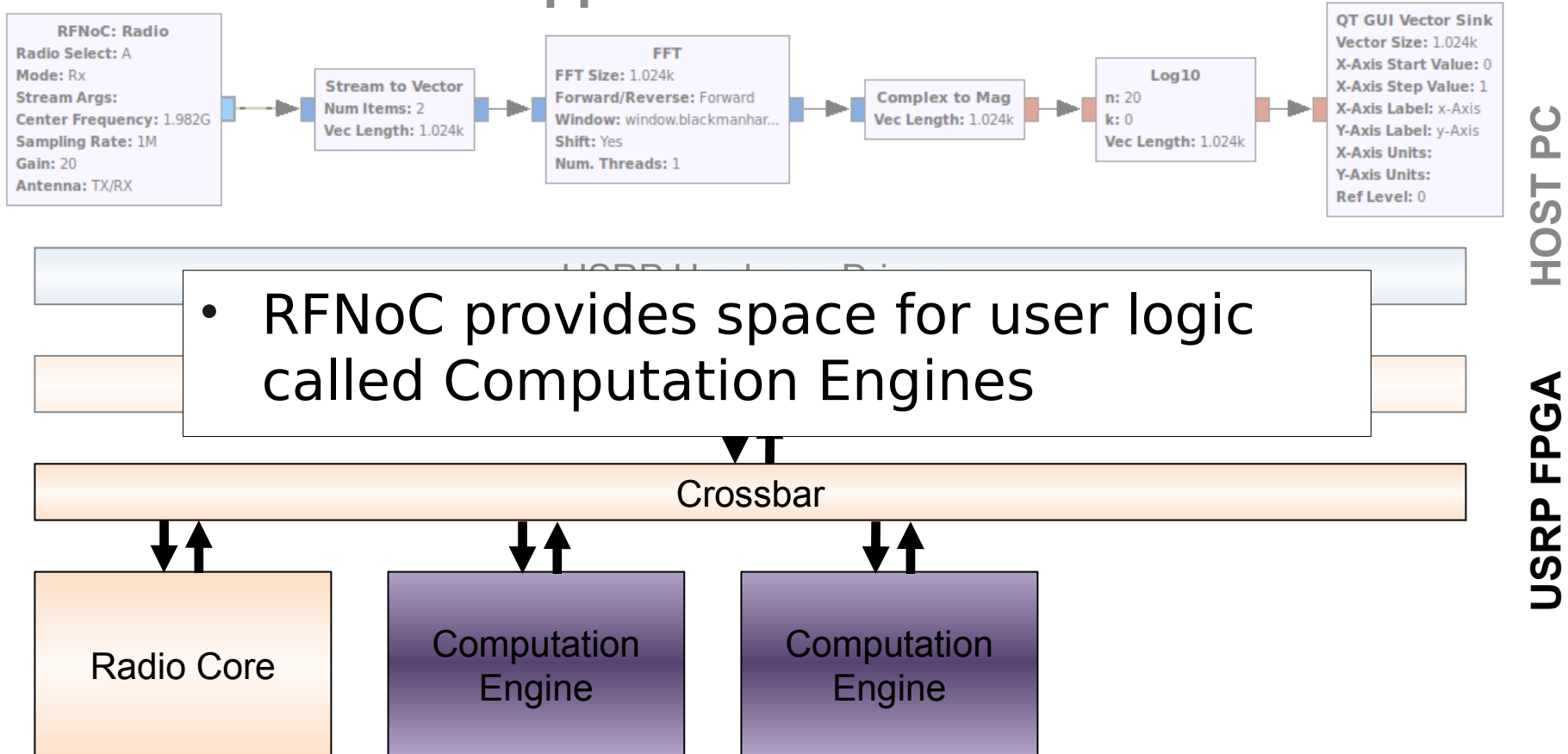
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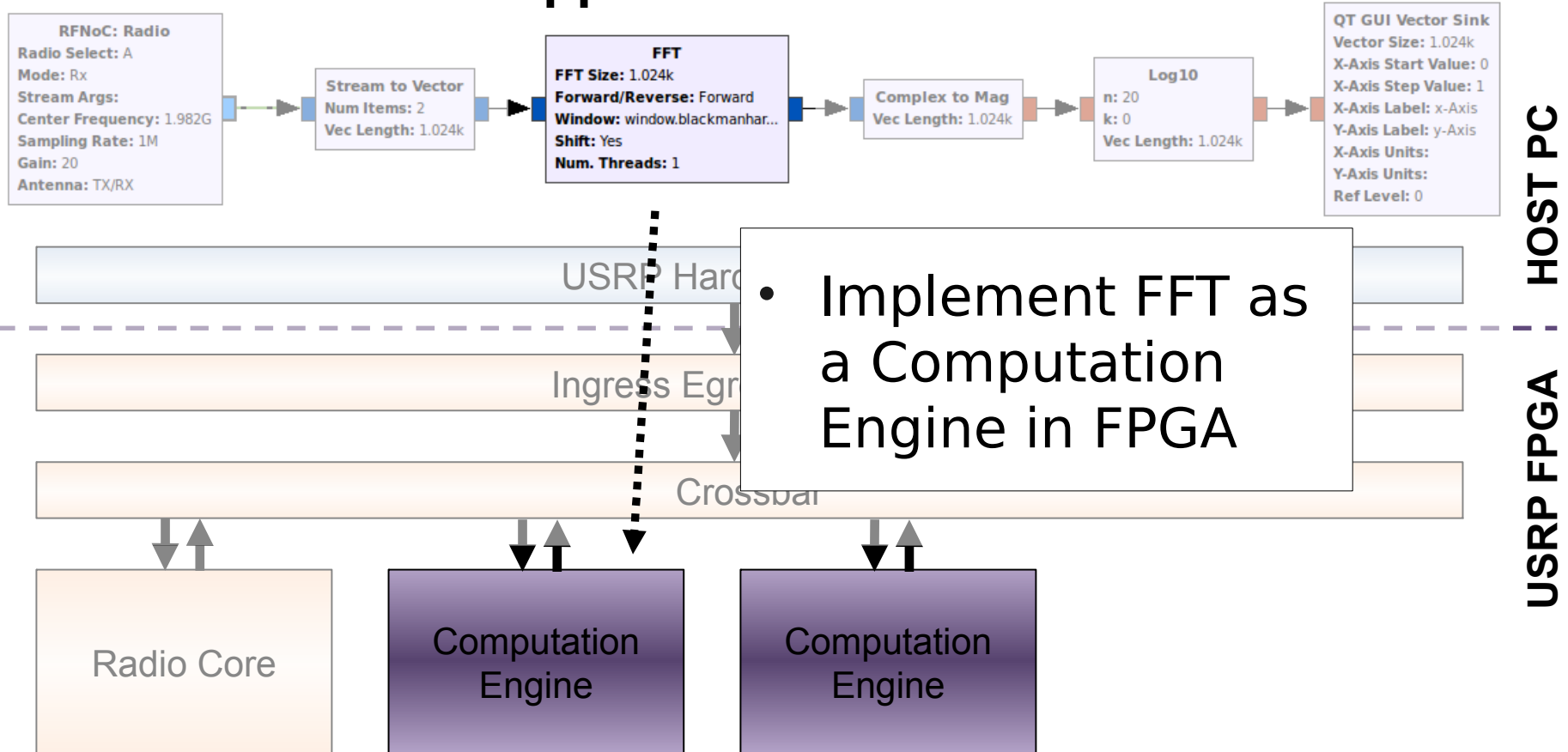
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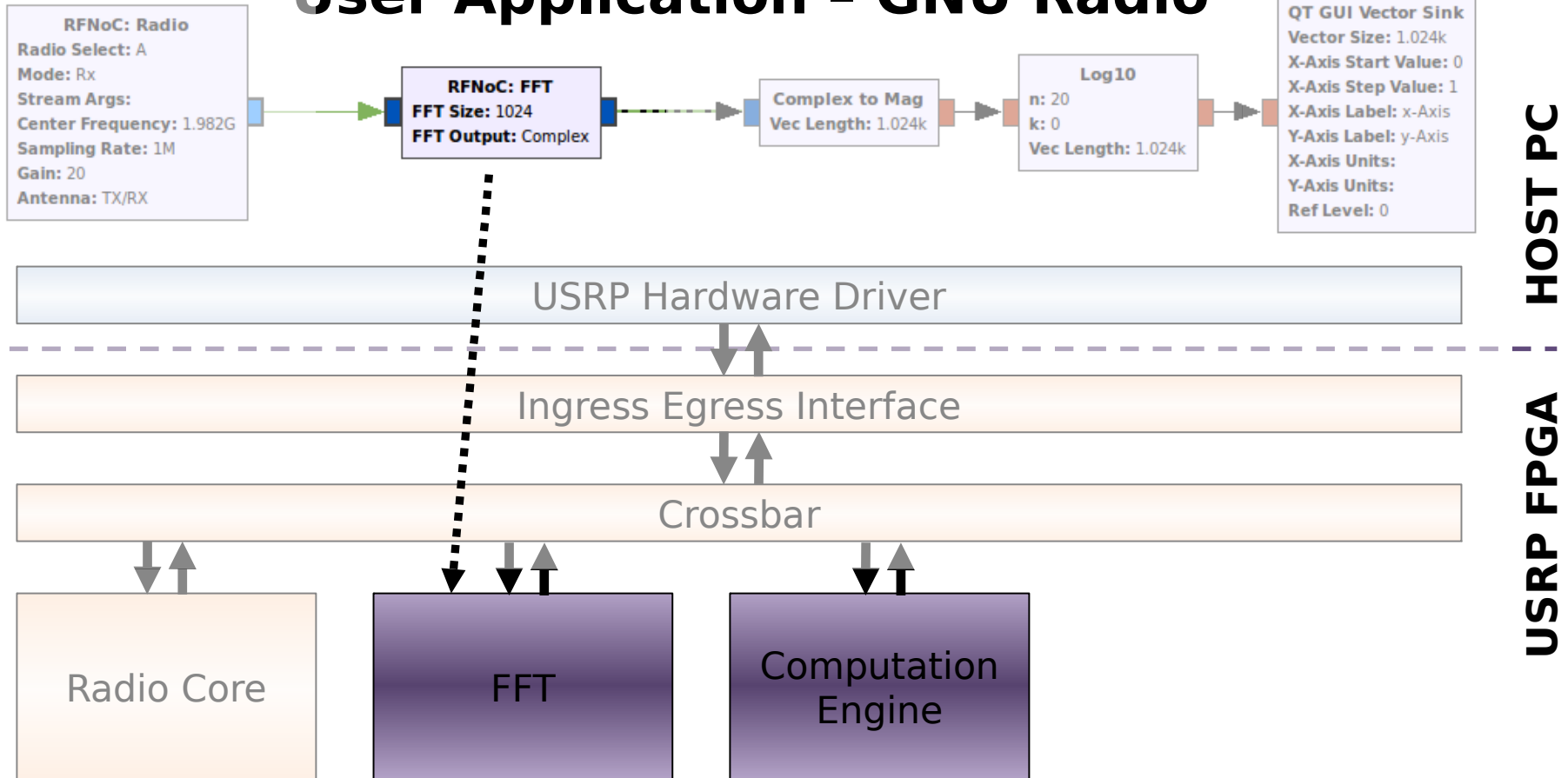
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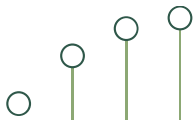
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RFNoC-based Spectrum Sensing

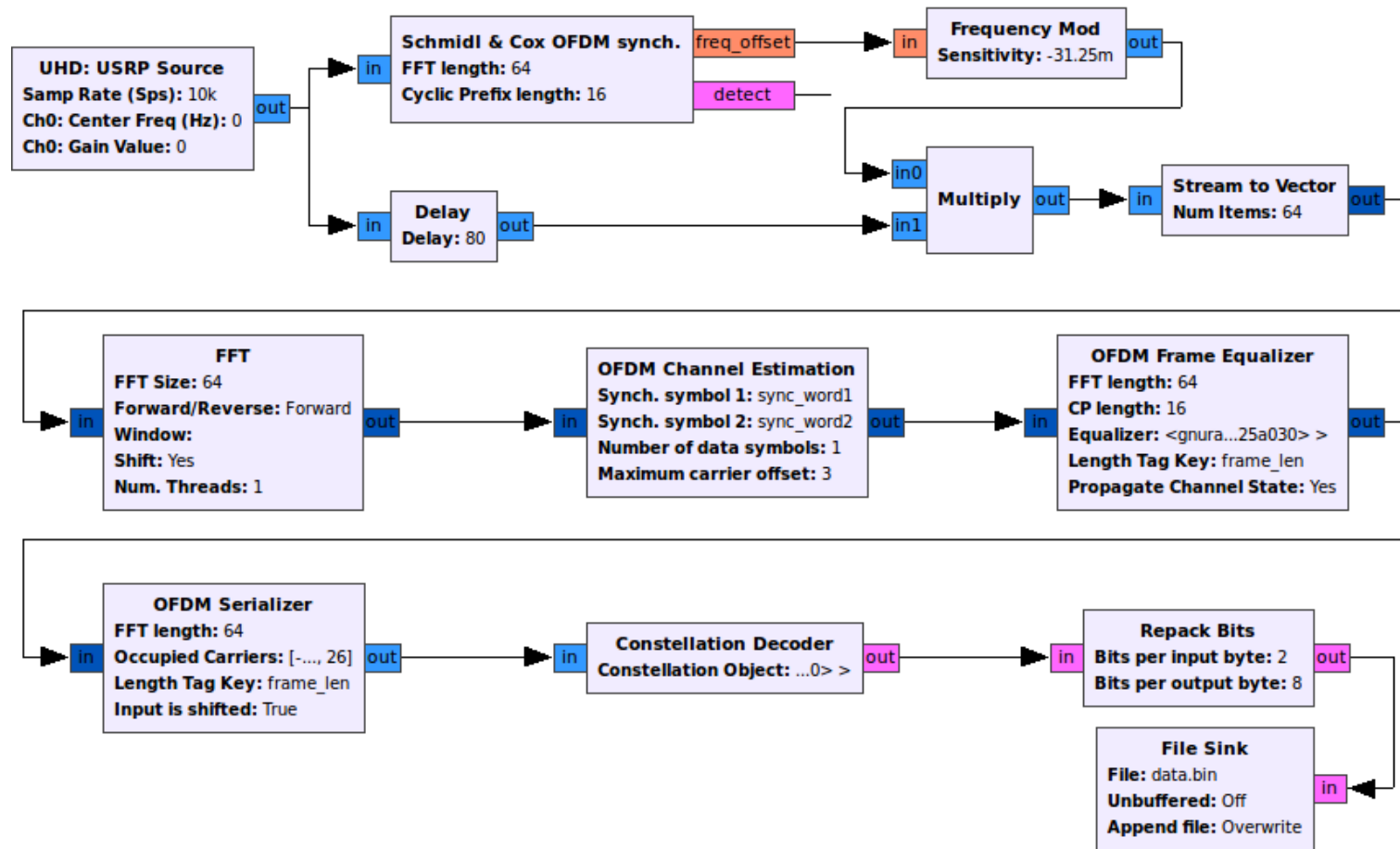


GNU Radio OFDM Reference Design

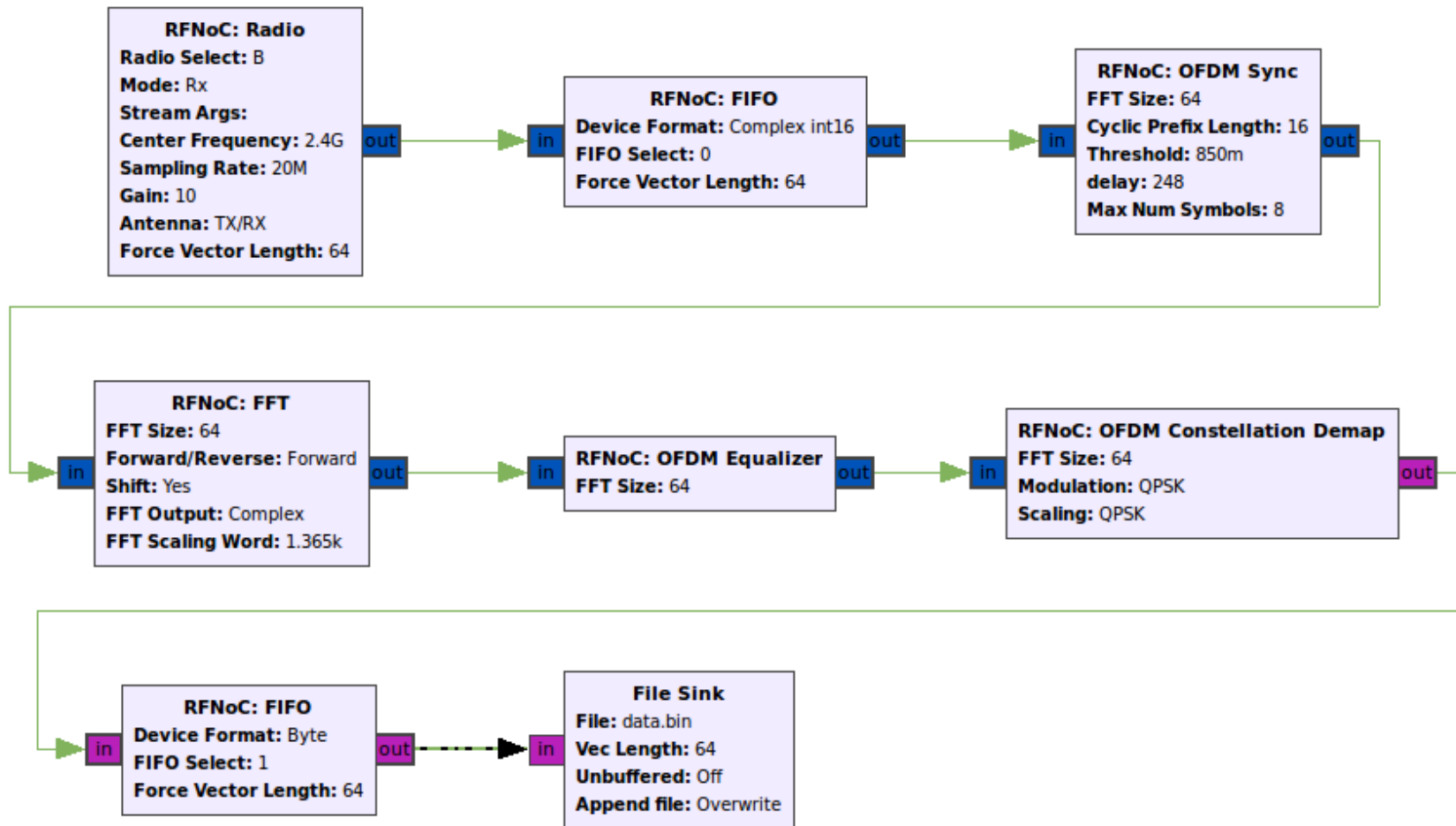
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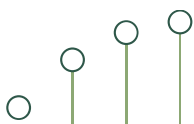
RFNoC OFDM Reference Design



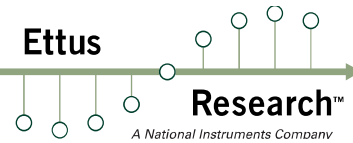
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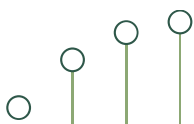
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Community and Collaboration



- **PyBOMBS**
 - GNU Radio 3rd-party module packaging system
 - Pain-free download/build/install process
 - Automatic dependency resolution
 - Cross Platform
 - Integrated with Git version control system
- **CGRAN.org**
 - Browse~Checkout~Hack
 - Centralized location for PyBOMBS GNU Radio modules
 - Currently 73 hosted modules
 - Standardized interfaces
 - Automated documentation and web pages
 - Free hosting
 - Pain-free sharing
- Together they form the App Store for SDR!



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Thank you!

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