

WARP: Wireless Open- Access Research Platform

Welcome & Overview

Rice WARP Workshop
Rice University
November 14-15, 2008



Agenda

- Overview of Rice University WARP
 - Hardware
 - Design flows
 - Applications
- Lectures & Hands-on exercises

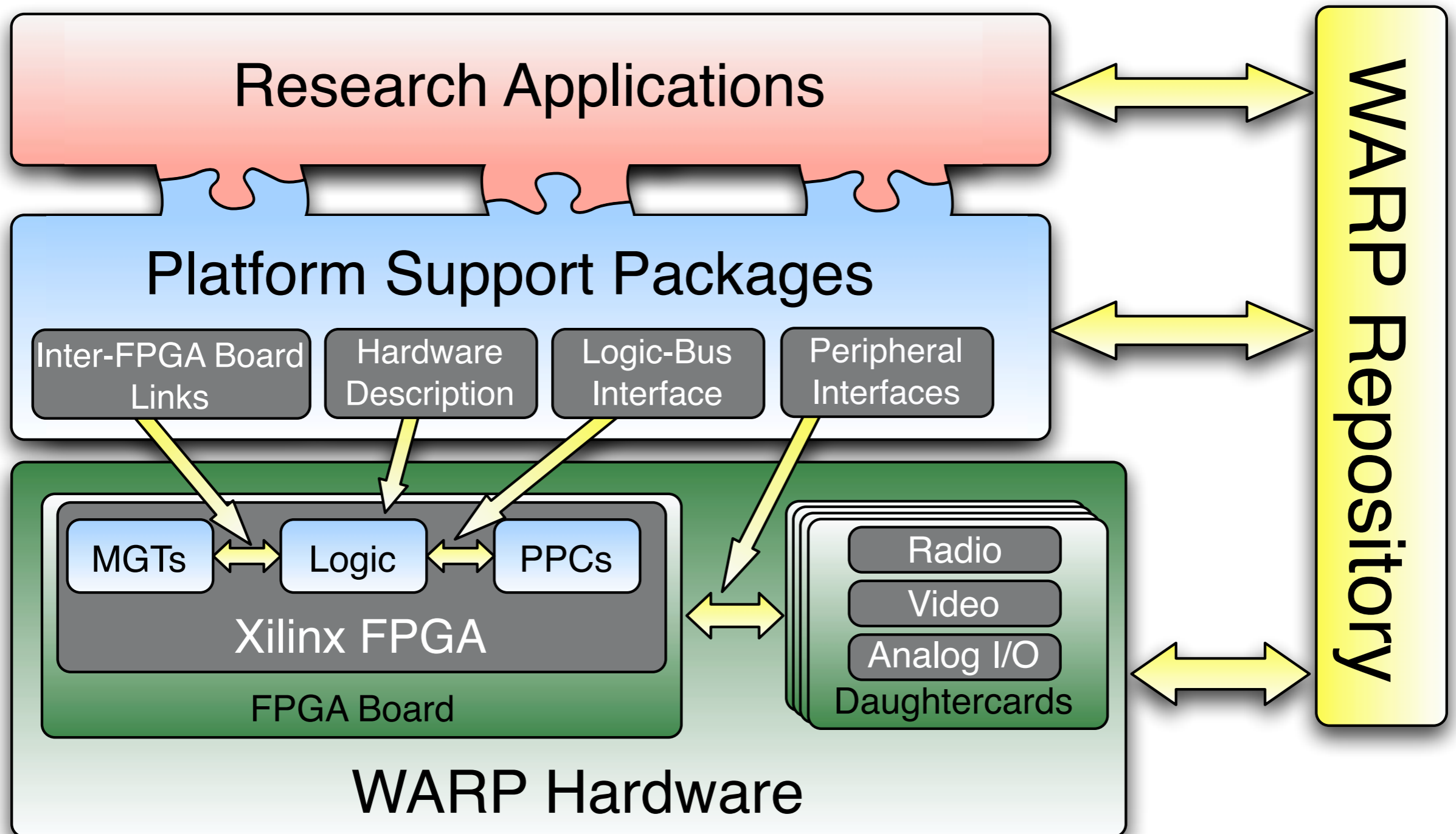
WARP Workshop Team

- Prof. Ashutosh Sabharwal
- Melissa Duarte
- Siddharth Gupta
- Chris Hunter
- Patrick Murphy

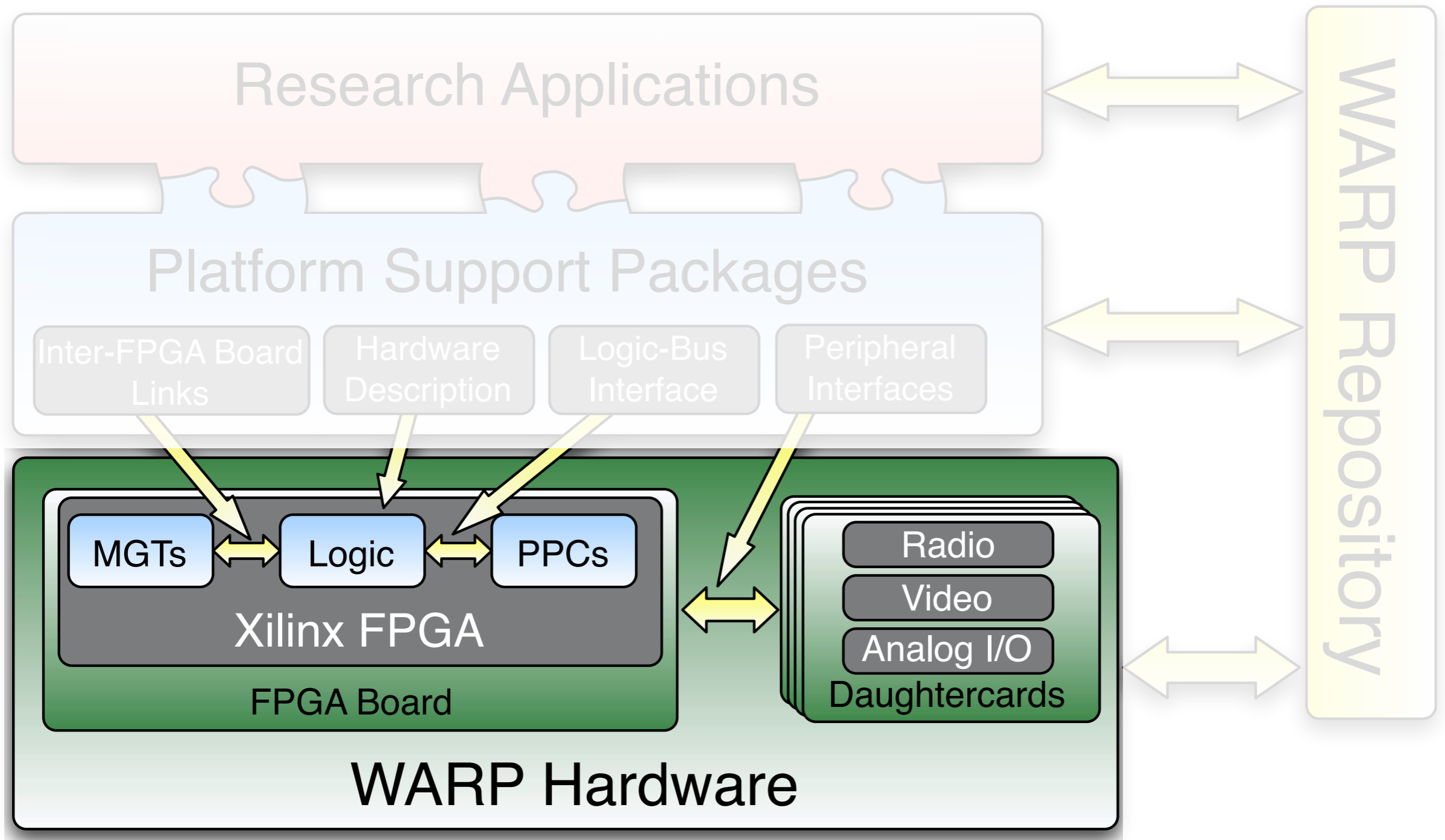
WARP Goals

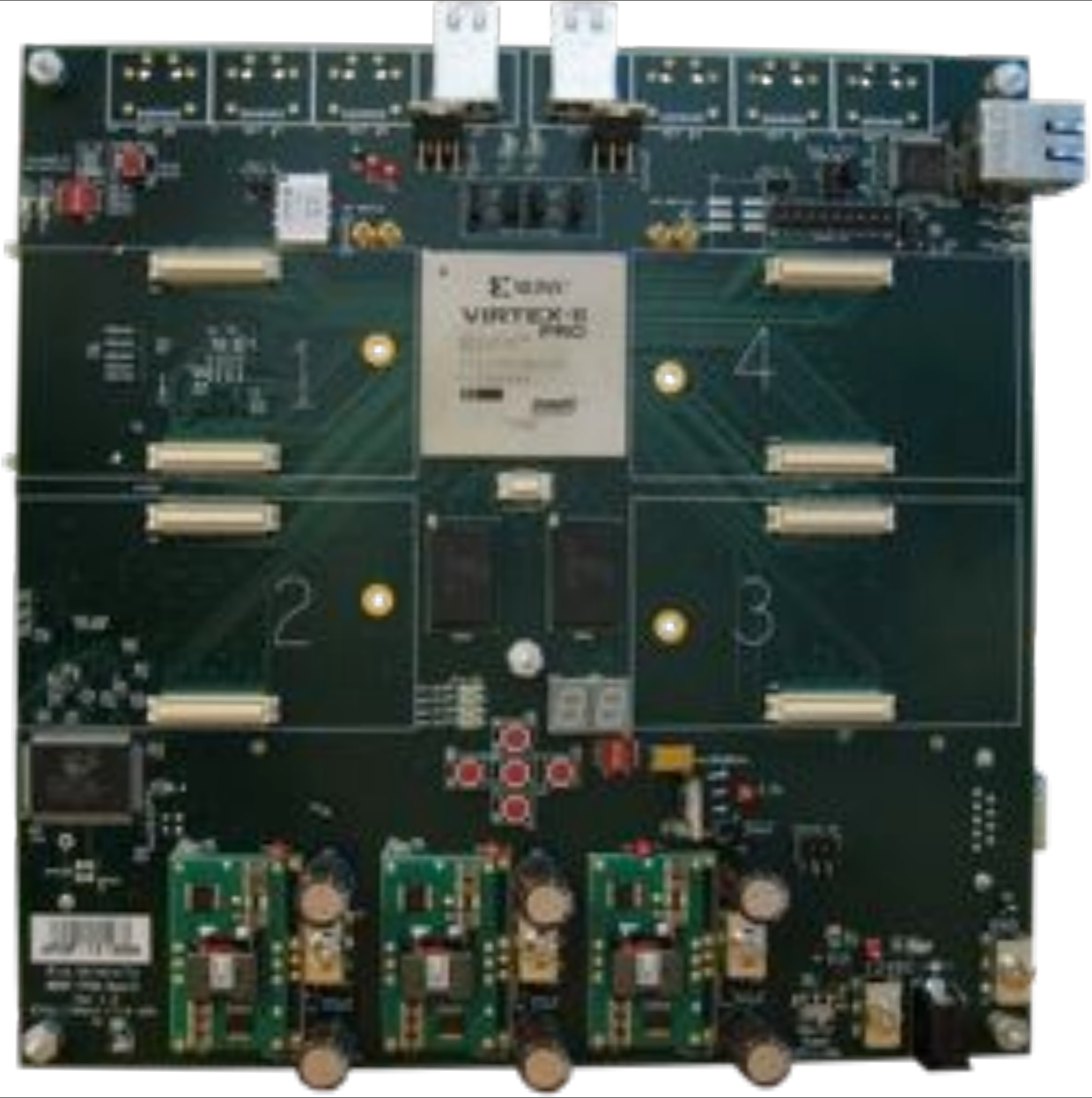
- Custom wireless *network* research
 - Programmable at every layer
 - Useful for users at just one layer
- Open access throughout
 - Free access to all designs & results
 - Community access
 - Hardware available to other researchers

Overview



WARP Hardware

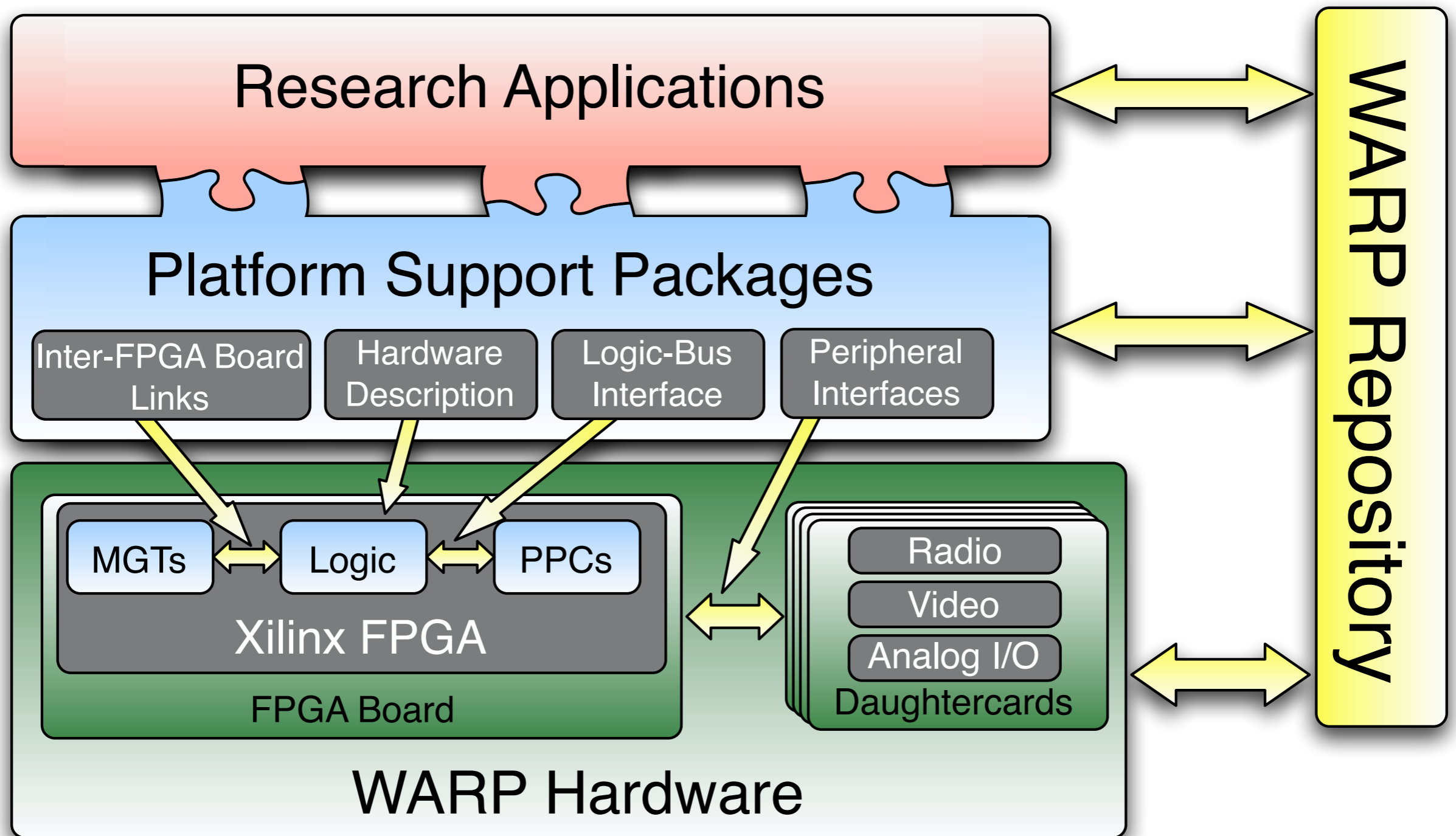


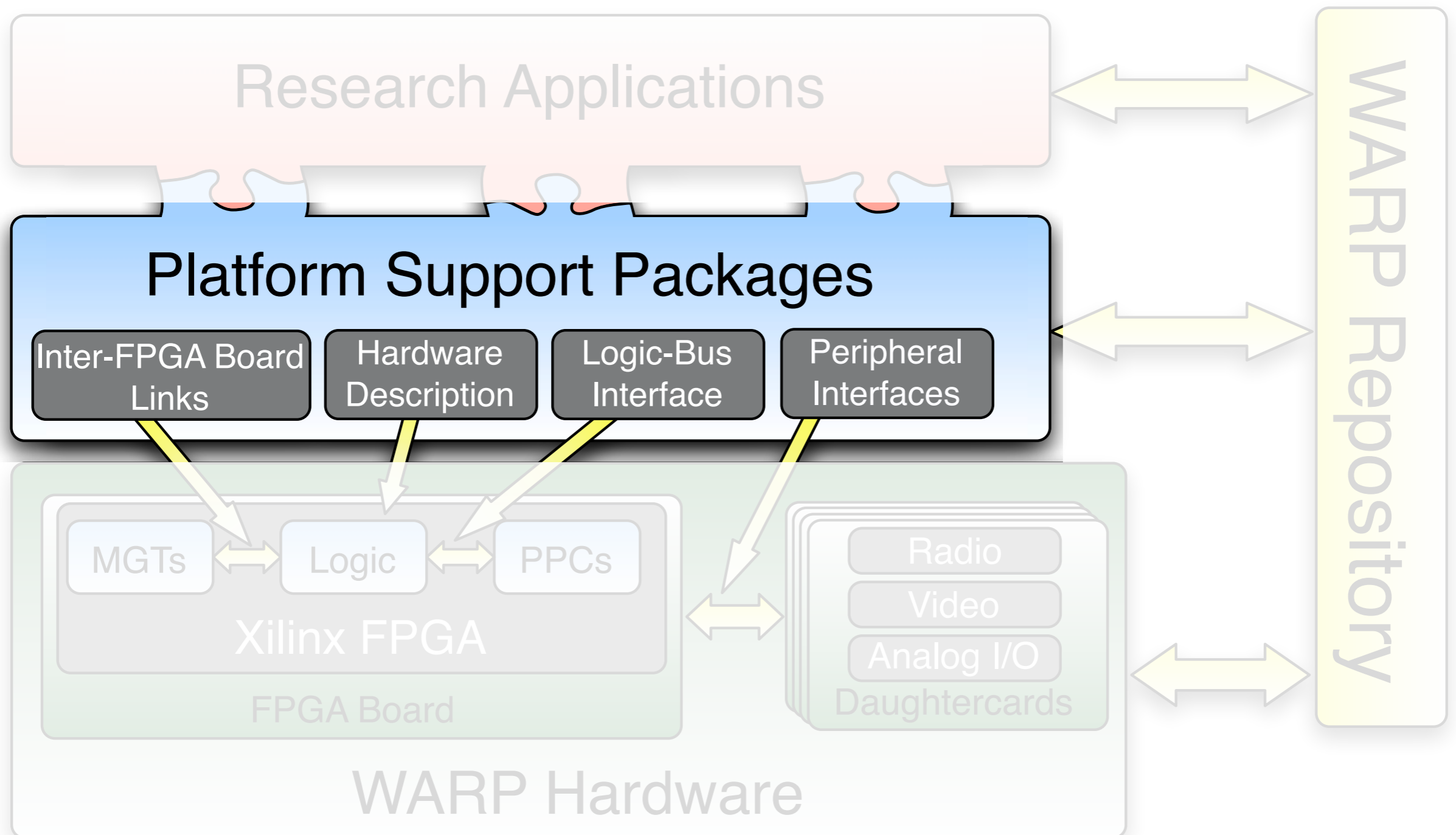




Rice University
WARP Radio Board
- ver 1.4

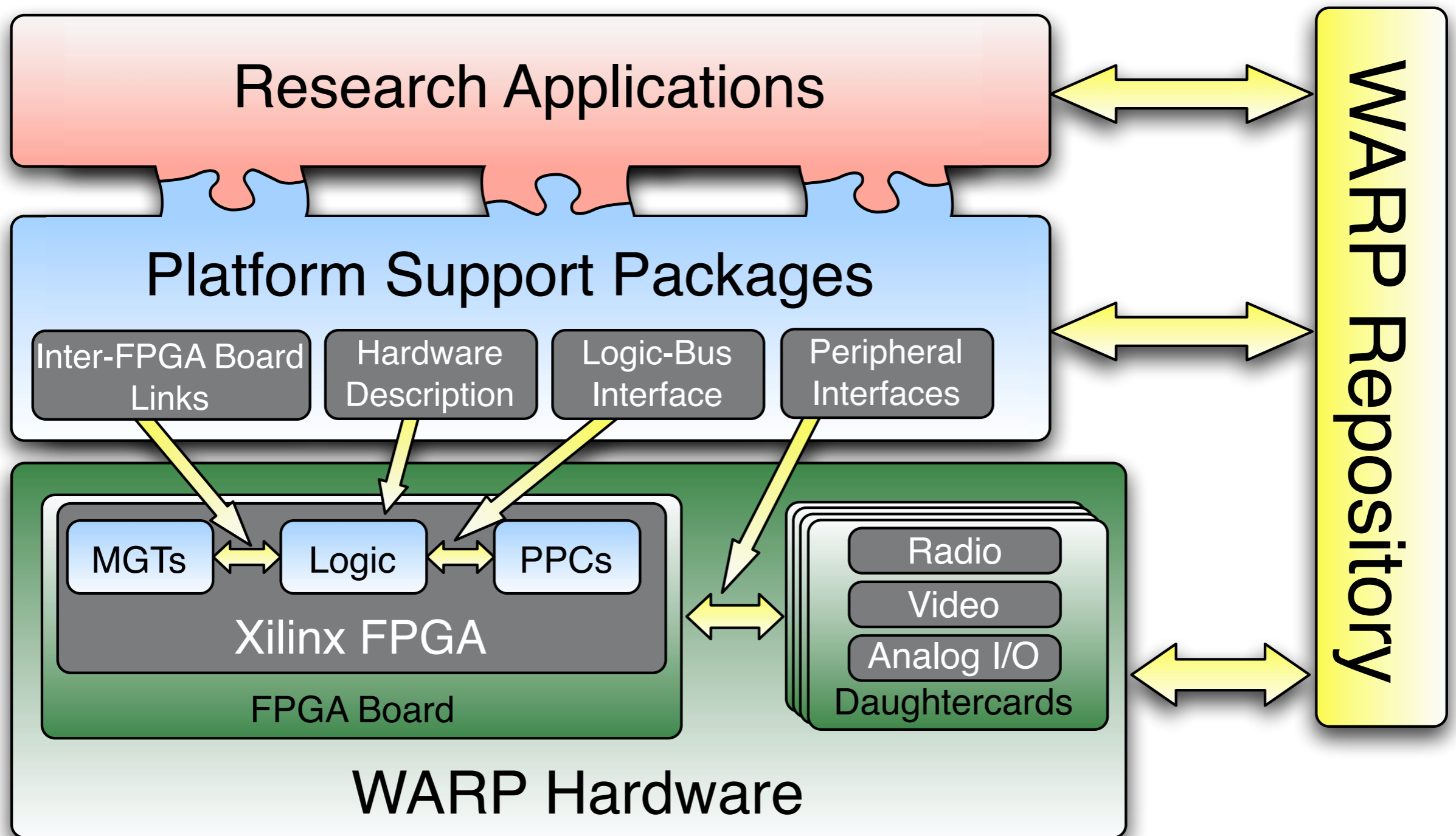


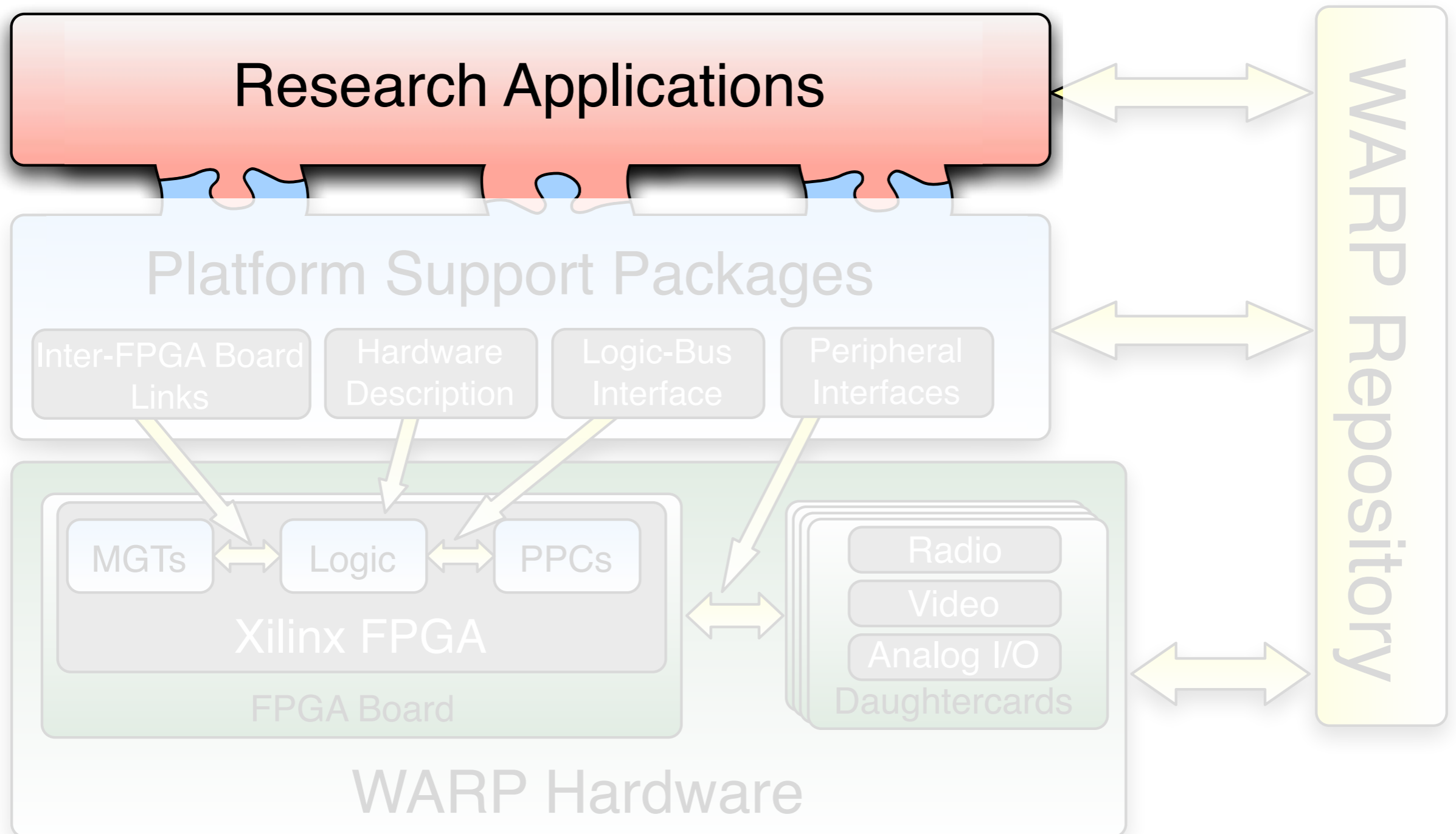




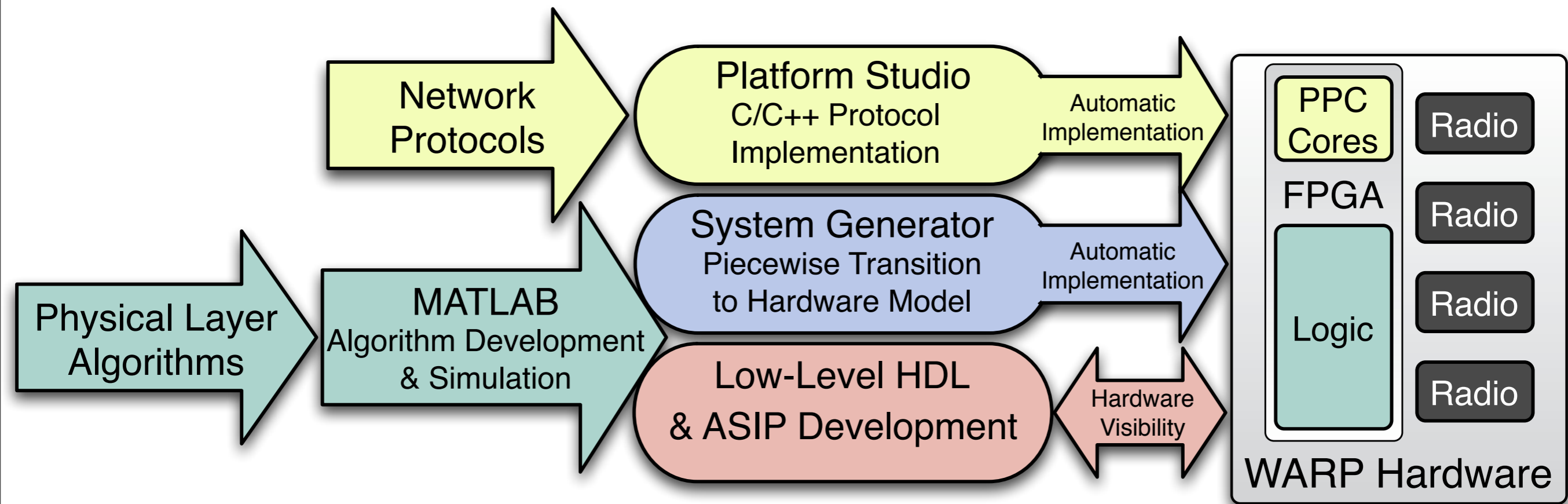
Platform Support

- Hardware needs support libraries
 - Mask complexity of underlying hardware
 - Easy interfaces & APIs for low-level functionality
- Research applications built on top of packages
 - PHY needs radio interface
 - MAC needs packet interface with PHY
 - Networks need packet interface with MAC
 - No one should have to build it all





Application Design Flows

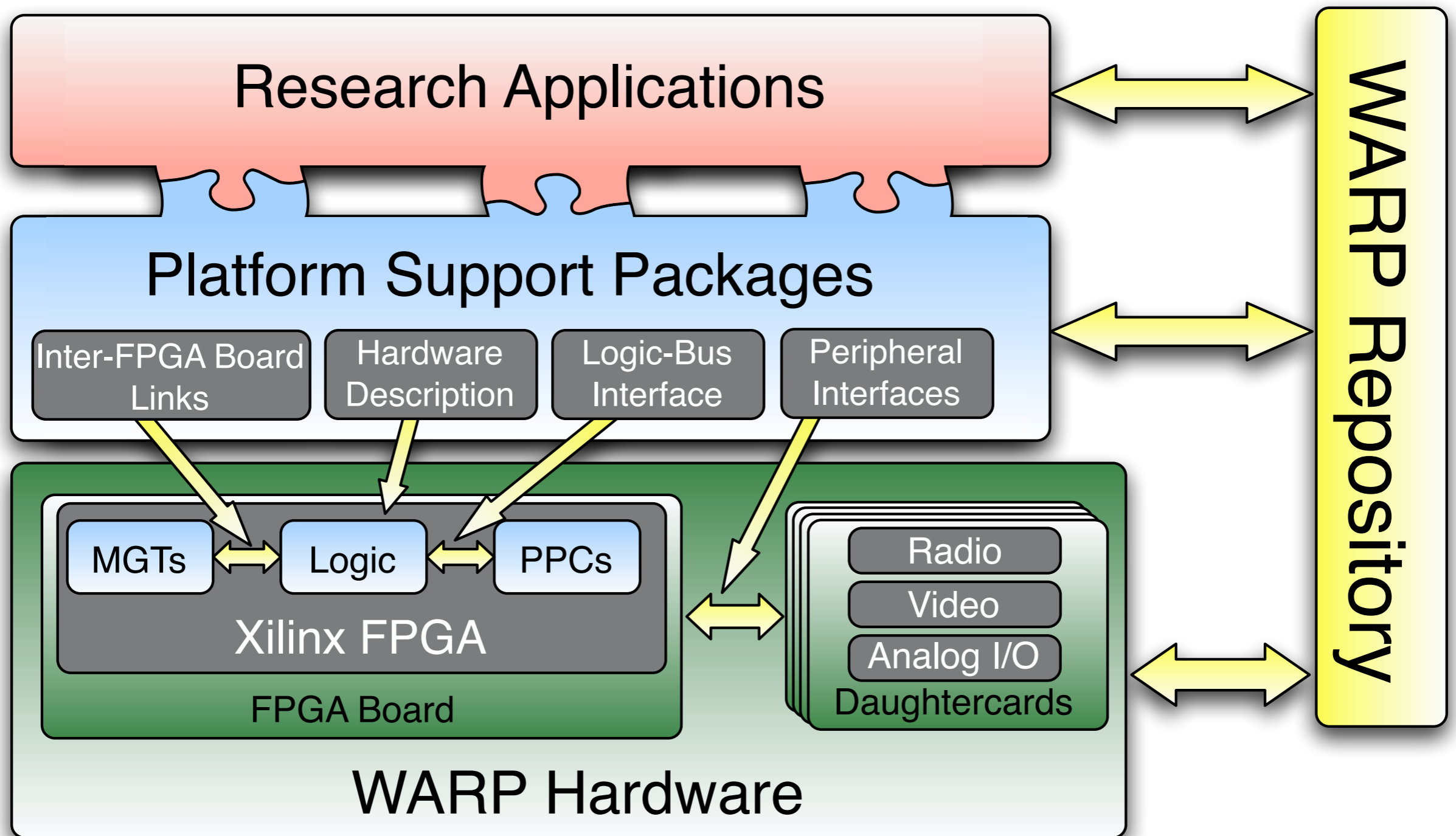


Physical Layer Designs

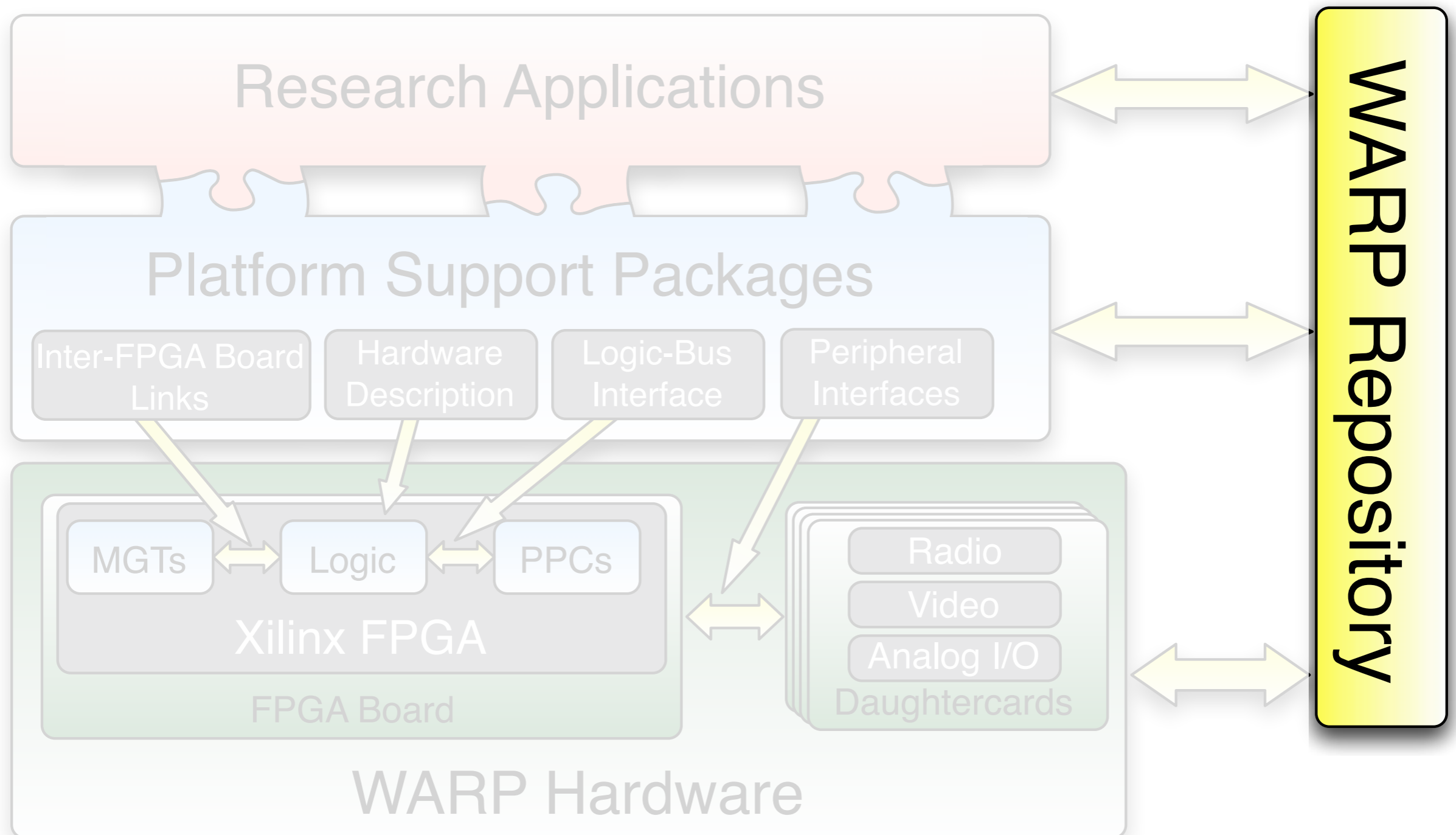
- WARPLab
 - MATLAB-based PHY prototyping
 - Very fast design cycle
- Real-time PHY designs
 - Multiplexing MIMO OFDM
 - Alamouti MIMO OFDM
 - Cooperative OFDM

Networking Designs

- WARPMAC framework
- Carrier Sense Multiple Access (CSMA)
- RTS/CTS MAC
- Scheduled MACs in progress



WARP Repository



WARP Repository

- Integral part of WARP effort
 - Open-source access to all our designs
 - Schematics, code, models & results all available
- Version control of all source files
- Wiki-based documentation
- BSD-based open-source license
- Repository is live
 - <http://warp.rice.edu/trac/>

WARP: Wireless Open-Access Research Platform

See videos of WARP in action at ([YouTube](#))

WARP Repository

- [Read the WARP open-access license](#)
- [Read more about repository access](#)
- [Browse the repository](#)

Support Resources

- [WARP Forum](#)
- [WARP users mailing list](#)
- [WARP Documentation](#)

Documentation

- [Hardware Users Guide](#)
- [Software Users Guide](#)
- [Frequently Asked Questions](#)
- [API Documentation](#)

Workshops

- [WARP @ Rice - March 2007](#)
- [WARP @ University of Utah - July 2007](#)
- [WARP @ Rice - November 2007](#)

Lab Exercises

- [Introduction to the WARP FPGA Board](#)
- [Introduction to WARP Software Stack](#)



WARP FPGA Board

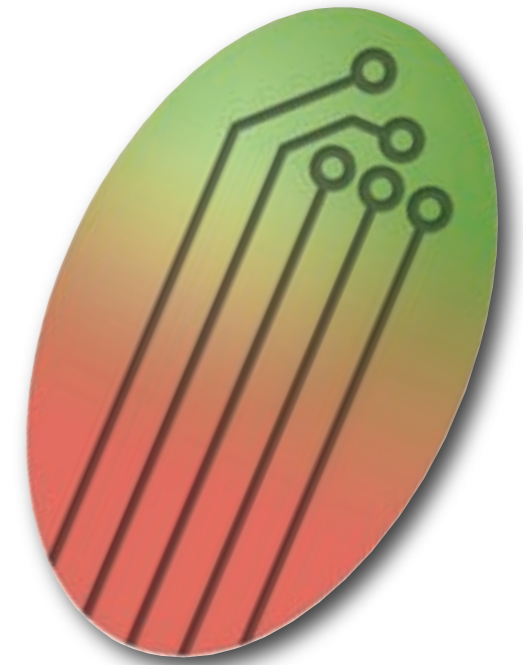
WARP Community Forums

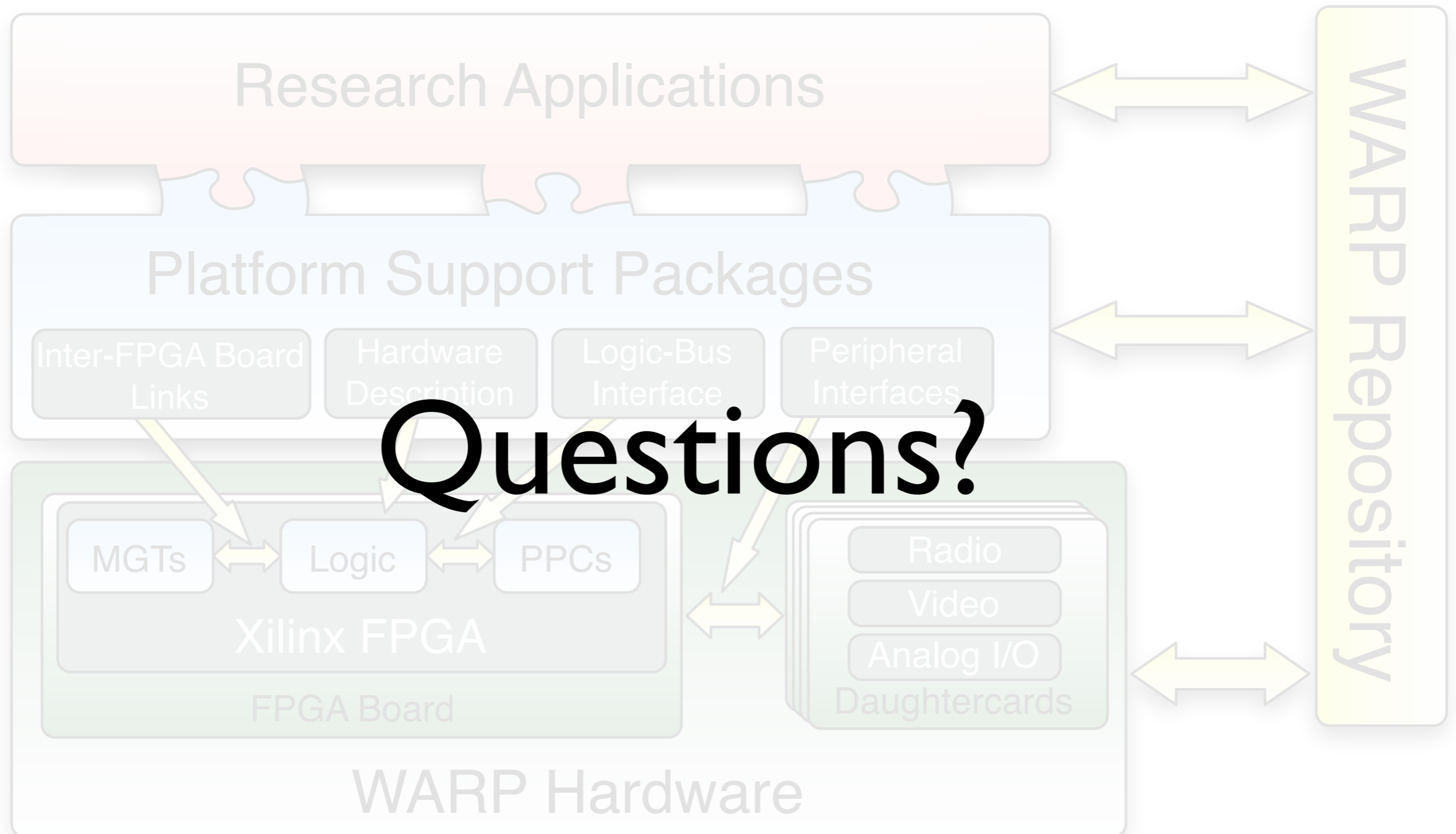
- Primary source of WARP support
- Online since July 2006
- 140+ users
- 1500+ posts



WARP Hardware Purchases

- WARP hardware available from Mango Communications
- Shipments started in September 2008
- Visit <http://mangocomm.com/> for details





Workshop Outline - Day 1

- Physical layer prototyping - Melissa Duarte
 - WARPLab PHY design flow
 - **Lab 1**: using WARPLab for PHY design
- Introduction to Xilinx tools - Patrick Murphy
 - **Lab 2**: XPS/Base System Builder
- Physical layer design - Siddharth Gupta
 - Physical layer basics
 - Real-time PHY design
 - **Lab 3**: designing a simple transmitter

Workshop Outline - Day 2

- MAC layer design - Chris Hunter
 - Medium access control basics
 - WARPMAC framework
 - How to build custom MAC protocols
 - **Labs 4-6:** Building 3 simple MACs

Logistics

- Everyone sharing 3 applications servers via RDC
- Keep your files in C:\workshop\userN\ on server
 - Your monitor has a label showing your N
 - W:\ mapped to your working directory
- Please be careful with your WARP hardware
- All slides & handouts will be on WARP site
 - <http://warp.rice.edu/trac/wiki/Workshops>

<http://warp.rice.edu/>

WARP

Questions?

**Sponsored by the National Science Foundation
& Xilinx Advanced Systems Technology Group**

**Thanks also to Maxim Integrated Products,
Analog Devices & Texas Instruments**