

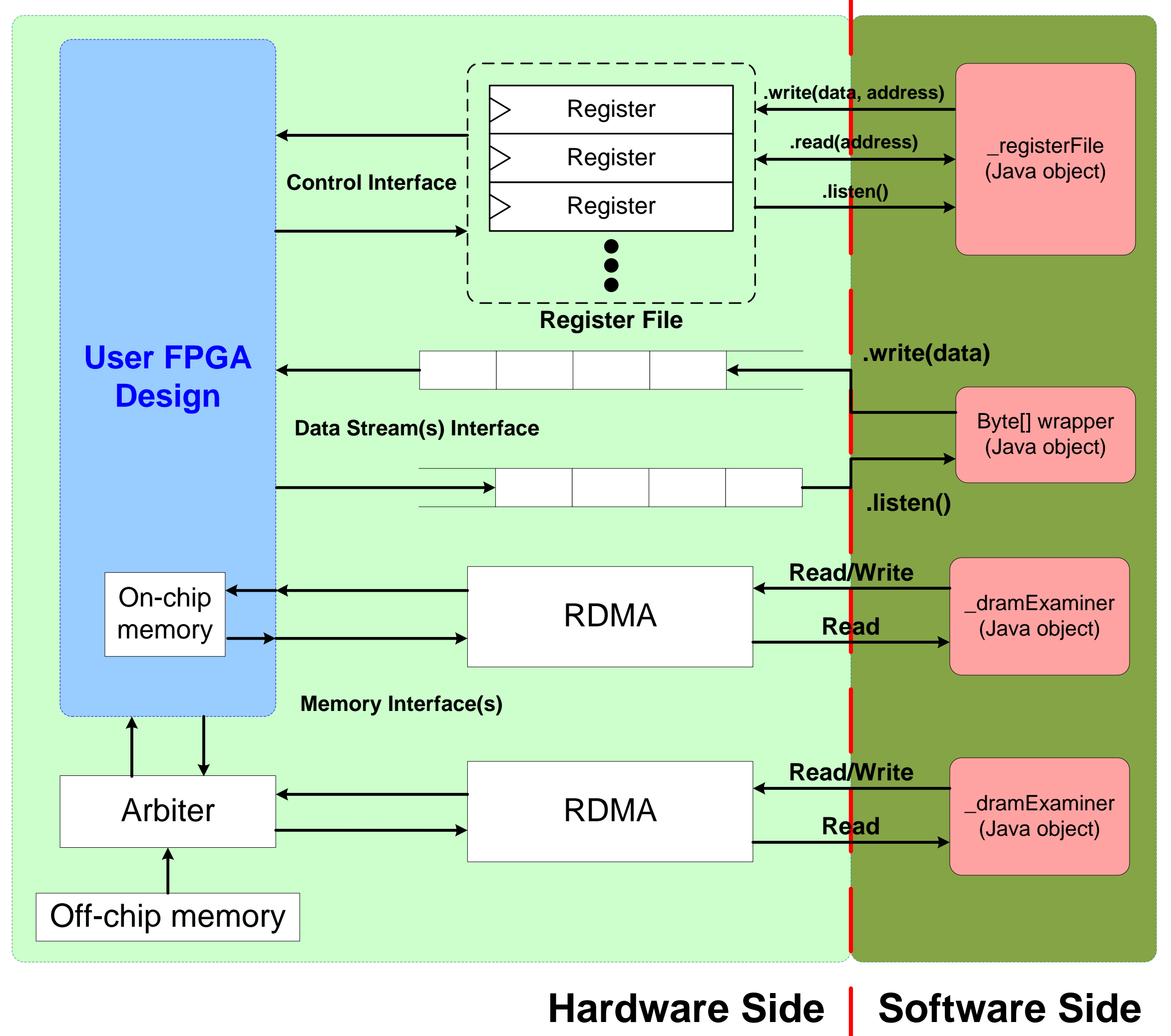
Introduction to RCBIOS

- **RCBIOS: Reconfigurable Cluster Basic I/O System**
Framework enabling communication between front-end PC and FPGA
Abstract register file, DRAM, and stream access
Network on Chip (NoC) based
- **Why RCBIOS?**
Scalable in performance and size
Physical-link independent
Standard interfaces to other components in GateLib

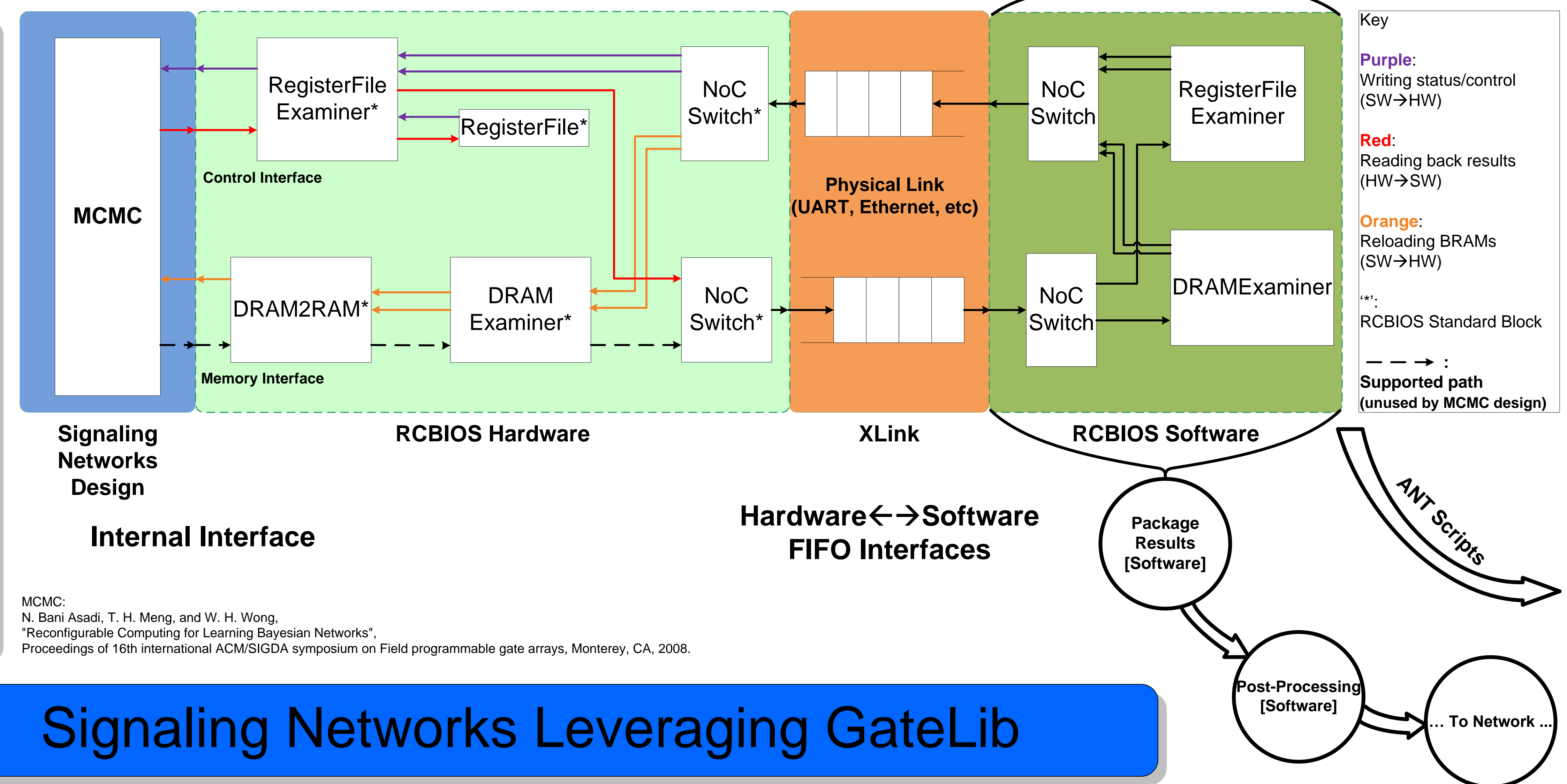
RCBIOS Application: Learning Bayesian Networks

- **Biological & Statistical Perspective**
Objective: learn the structure of Bayesian Networks
Motivation: model cell signaling networks to solve larger problems in molecular biology
Technique: Markov Chain Monte Carlo (MCMC) sampling
- **Technological Perspective**
Software {Pre, Post}-Processing
Computationally intensive (NP-hard) core algorithm
Algorithm kernel requires hardware (FPGA) acceleration

Abstract View



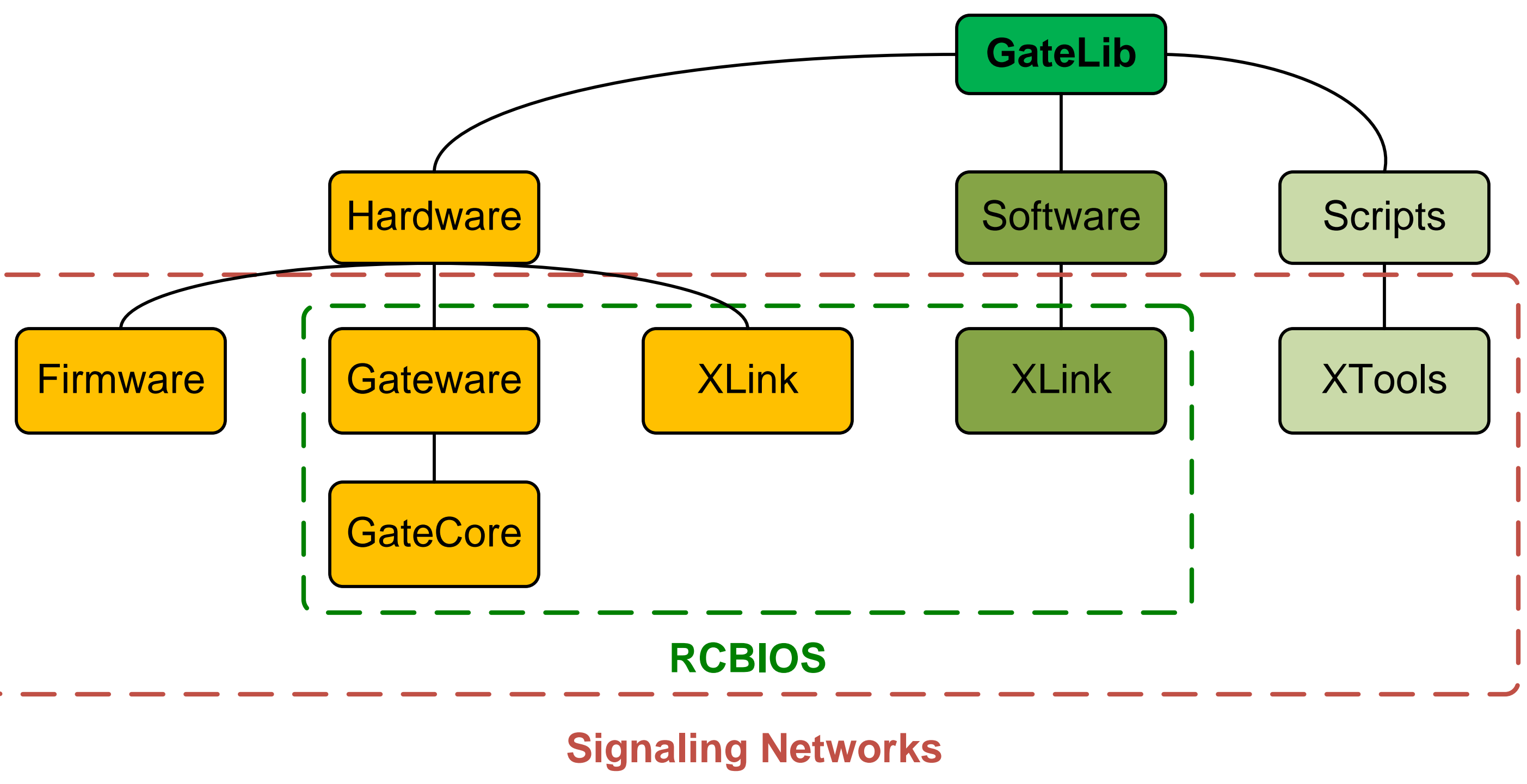
Actual Implementation



RCBIOS: Components in GateLib

- **GateLib: A standard library for hardware and software**
Hardware:
Basic elements (ex: Register, Counter)
Abstract blocks (ex: FIFO, Cache)
RCBIOS blocks (ex: RegisterFile, VirtualStream, NoC)
Software: data access/transport interfaces
Scripts: automate project flows and testing
- **Why GateLib?**
Interoperability: FPGA/board/front-end PC independent
Standardized interfaces across Hardware/Software
Code reuse & sharing

Signaling Networks Leveraging GateLib



MCMC requires ...	Implemented by ...
Initial control parameters	RegisterFile
Memory reloading	DRAMExaminer
Results sent back to front-end	RegisterFile (Virtual Stream)
	RCBIOS Components
System requires ...	Implemented by ...
System \leftrightarrow network layer communication	ANT Scripts
{Pre, Post}-Processing coordination	ANT Scripts
FPGA CAD toolflow automation	ANT Scripts
RCBIOS initialization	ANT Scripts
	GateLib Components

MCMC:
N. Bani Asadi, T. H. Meng, and W. H. Wong,
"Reconfigurable Computing for Learning Bayesian Networks",
Proceedings of 16th international ACM/SIGDA symposium on Field programmable gate arrays, Monterey, CA, 2008.