

TCP/IP in hardware

- using SME

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Background and Motivation

Dedicated hardware needs to transmit data in real time, but OS network stacks are usually not enough!

Dedicated Network cards are not perfect either:

Weaknesses of network cards

- Only basic programmability
- Incompatible APIs
- Licensed VHDL code blobs
- Seldom swap-able
- **Price!**



Figure: An Intel FPGA NIC

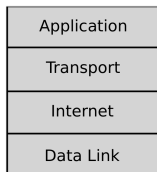
A performant, efficient, and flexible network stack in FPGA!

How? Using SME!

- Easy & intuitive hardware modelling
- Implicit clock
- Built-in simulation utilities
- VHDL code generation
- Verification by comparing VHDL signals with C# simulation

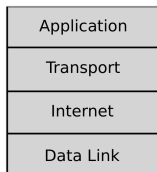
Skip this if SME has been covered

Internet Protocol Suite (TCP/IP)



Application FTP, DHCP, SSH, etc.

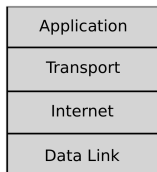
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Transport TCP, UDP, DCCP, etc.

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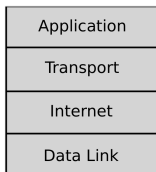


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Internet IPv4, IPv6, **ICMP**, etc.

Internet Protocol Suite (TCP/IP)



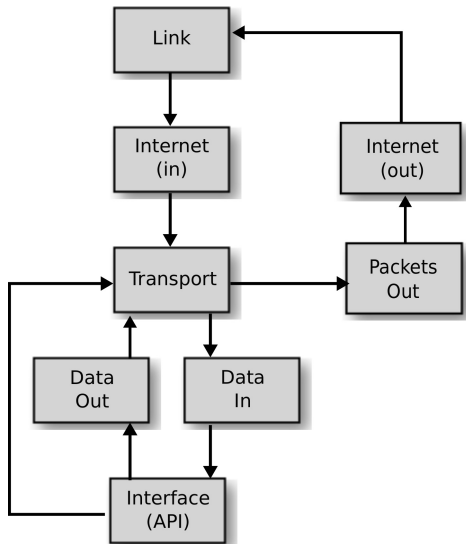
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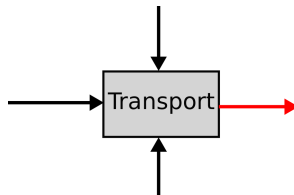
Data Link ARP, MAC (Ethernet, Wi-Fi),
etc.

Architecture



Challenges

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- Information sharing is by design hard in SME

Questions

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