Why TCP/IP?

• It is the standard in INTERNET connection

• It allows a reliable communication between two nodes everywhere in the world

• It is able to manage commons problems in network communications (packet losses, packet rate negotiation, out of order packets, etc.)

• Possibility to use existing firewall and network policies
What is an FPGA?

- An FPGA is a programmable logic
- It is often used when we need to have the possibility to periodically update the behavior of an electronic circuit
- It offers higher performances (~10-100x) than a micro-controller and it allows native parallel elaboration
- It requires different programming and verification tools (VHDL / Verilog / System Verilog)
Why TCP/IP on FPGA?

Until now only UDP protocol was implemented

UDP is much simpler than TCP but misses many important features. We needs to re-implement some missing features with an increase of cost/time/reliability

But TCP is complex and it is a quite extensive work to implement it in pure VHDL / Verilog
Possible solution

Port existing opensource library from C to VHDL / Verilog and to have a complete support to the full TCP/IP stack

μIP  https://github.com/adamdunkels/uip

Conversion from C to VHDL using an automate source code converter:

Panda  http://panda.dei.polimi.it/
Pros/Cons

Pros:
1) We are using a validated open solution
2) We have full support to all TCP/IP features
3) The speed will be comparable to a native solution (higher than a microcontroller)

Cons:
It is possible the use of FPGA resources to be bigger than other solutions
We need to build a reliable build/testing system
Steps

Setup a build system (Makefile based)

Setup an integrated simulation system (currently based on Vivado simulator with automatic testing)

Integrate with existing IP cores for Ethernet interfacing (currently Xilinx gig_ethernet_pcs_pma on VC707 dev board)
Questions?

Thank you for attending