# Master Thesis: Application Specific Processor for DMA & Protocol handling

*Suitable for two master thesis students*

## Background

Today many protocols inside a PC/Servers are using the same physical signaling for chip-to-chip communication. This means that most IO units inside a PC/Server such as the network card, graphic card, hard drives all use the same type of signaling. However each unit has its own set of registers, instructions and protocols which are presented to the host OS through the PCI express bus. How units interact over the PCIe bus with the Host OS is similar, at least units using any kind of input/output behavior.

Since the physical signaling is the same, presentation to the host OS is the same, the primitives inside the different IO units are similar, then a custom processing unit with the correct software should be able to provide a way in which a unit can have multiple personalities depending on the software written to the unit.

## Work to be carried out

Derive a high speed processing architecture which allows a IO unit to act as different units, both to the Host OS and to the external unit it is controlling. With the help of a software image the programmable IO unit shall be able to act as a NIC card, a Serial ATA controller or a PCI express switch. All of the units share the same high speed DMA engine inside which is used to move data from the host memory to/from the unit. The proposed architecture needs to be able to move data at very high rates.

## Suggested work order

- Study existing research in this field of processor design, automated processor design & ASIP
- Study the protocols PCI express, Serial ATA and Ethernet NIC's
- Develop an architecture for the custom processor
- Implement the custom processor
- Write report

## Good to have knowledge

- Understanding of processor architectures
- Understanding of protocols such as PCI express, Serial ATA, Network interface cards
- Understanding of hardware design in Verilog/VHDL
- Programming in C / C++ / Python etc.
- Linux know-how
- Linux device drivers

**Packet Architects AB**

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