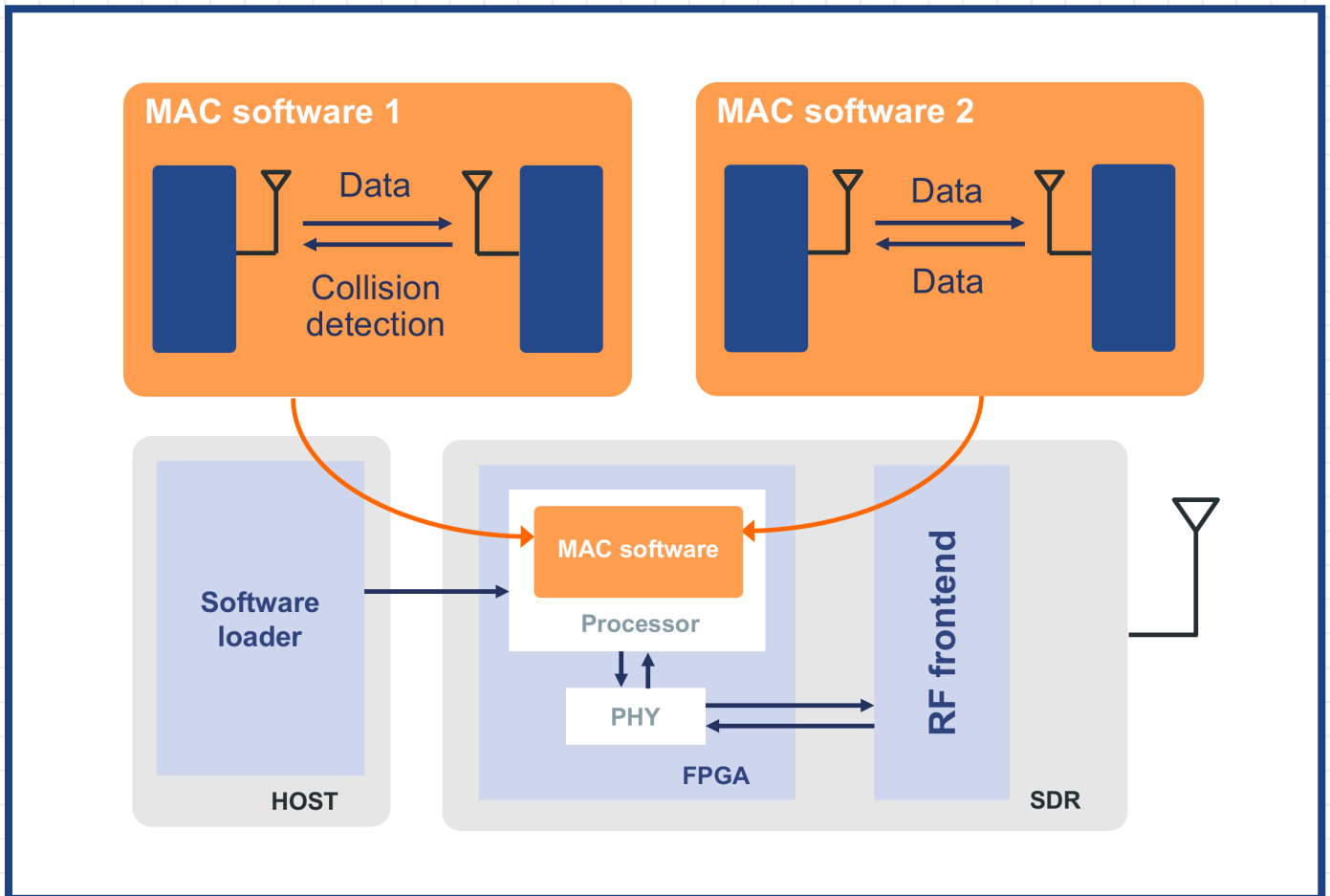


ADVANCED SDR CONTROL AND MANAGEMENT FUNCTIONALITY

Advanced reconfiguration and modular design:
Runtime reconfiguration of full duplex MAC



- Switch between:
- > Full duplex collision detection for energy efficiency.
- > Bi-directional full duplex transmission for high throughput.
- > Custom MAC.
- Loading of software possible without recompile or reloading of FPGA image.



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CONTEXT

In-band full duplex has many use-cases, from decreasing the energy consumption and delay to increasing the reliability and throughput. Each use-case has different ways of accessing the wireless medium. Therefore, runtime MAC reconfiguration is necessary to switch between an energy efficient full duplex collision detection MAC, a high bi-direction throughput MAC or a totally custom MAC built by the experimenter.

Our architecture allows to easily switch the full duplex MAC algorithm at runtime by reloading the Xilinx MicroBlaze on the NI USRP RIO with new software. The reloading can be done over the PCIe connection or the JTAG interface of the USRP.

UNIQUE SELLING POINT

- Easy reconfiguration of the MAC software without recompile of the FPGA image.
- Fast tuning of MAC parameters without shutting down experiment.

OPPORTUNITIES

Runtime reconfiguration of the MAC allows experimenters to switch MAC protocols without recompiling the whole FPGA image or shutting down the experiment. This is useful for:

- Fast debugging of new MAC algorithms.
- Experiments in dynamic environments where switching between MAC protocols is needed.

REFERENCES

The architecture is programmed in LabVIEW communications system design suite and detailed in [1].

1 Van den Bergh B., Vermeulen T., Verhelst M., Pollin S. 2014. CLAWS: Cross-Layer Adaptable Wireless System enabling full cross-layer experimentation on real-time software-defined 802.15.4. EURASIP Journal on Wireless Communications and Networking.