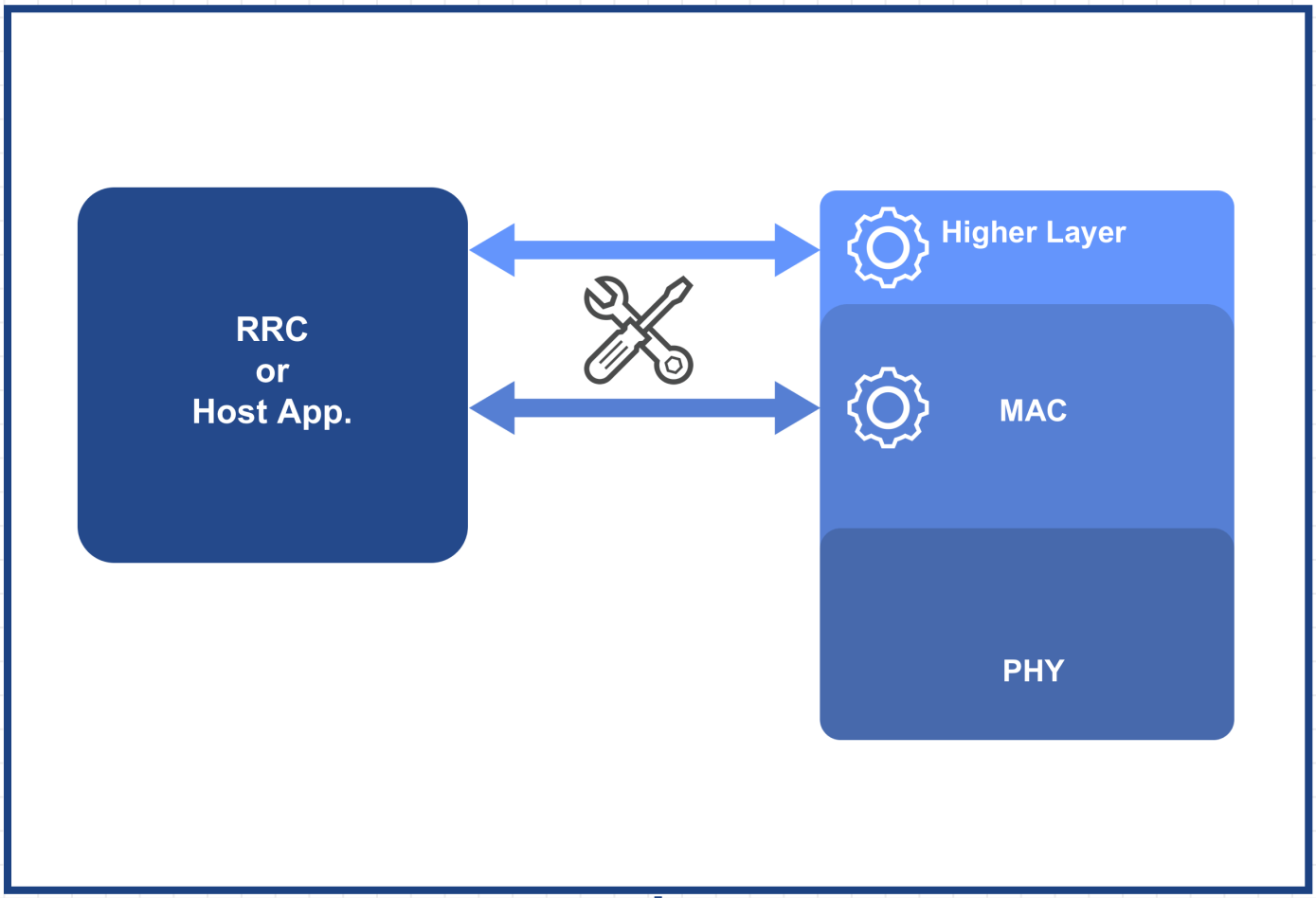
Orca

Orchestration and Reconfiguration Control Architecture

BASIC SDR CONTROL PLANE FUNCTIONALITY

Build SDR control plane:

Parametric control of higher MAC and upper layer network protocols



Interface to provide configuration access to upper Layers of communication protocol stacks in order to realize

- Parameterization
- Configuration
- Monitoring

BASIC SDR CONTROL PLANE FUNCTIONALITY

Build SDR control plane: Parametric control of higher MAC and upper layer network protocols

CONTEXT

As explained in the previous subsection, the configuration of many networking protocols remains static over the lifetime of a device. In many cases the network would benefit from parametric changes in the MAC layer, as well as on the layers above it, to optimize network behaviour. By intelligently updating parameters on the device several performance statistics (e.g. network throughput, battery life, packet loss, jitter, etc.) can be improved. To setup a wireless communication protocol stack all different layers needs to be configured, parameterized and monitored. Here the focus is on the higher layers such as higher MAC (802.11) or MAC/RLC/PDCP (LTE/5G-NR). The term higher MAC for 802.11 represents the MAC portions which have less time-critical requirements and could be potential executed on a microcontroller or host. The parametrization can be triggered via the testbed or adaptive through a Radio Resource Control layer (RRC) as applied for LTE.

UNIQUE SELLING POINT

- Required element for building up a complete control plane.
- Flexible access to configuration and setup of higher layers, which allow inspection of different scenarios.
- Devices will provide a set of parameters that form a programming interface. This programming interface can make changes to higher MAC protocol behaviour as well as other networking layers.
- Decisions on parameter changes can be made node-level (local controller). These are limited to minor changes, since these changes should not leave the network in an incoherent state.
- A central controller (remote) has the ability to make more impactful changes to the network. This needs to happen simultaneously on all nodes, to keep the network in a coherent state.

OPPORTUNITIES

Different higher layer parameters can be changed on initial configuration time such as:

- NS3-LTE: Setup MAC scheduler model and configuration.
- NS3-LTE: Setup and configuration of MAC and RLC through RRC.
- NS3-WIFI: Setup Adhoc or Infrastructure mode, configure various rate control algorithms.
- NS3: Several instantiations of LTE and/or 802.11 modules.
- This offer will allow for a high level of flexibility in terms of protocol behaviour, as a large number of parameters will become available that can freely be configured. A user can thus have a big (at runtime) impact on the protocols deployed on his devices.
- This offer will provide an intelligent framework where a central decision can be made to optimise protocols parameters. The user has the ability to create logic for network control.

REFERENCES

Higher layers of communication protocol stacks will be implemented by NS-3 LTE [1] and NS-3 WiFi [2] models. In addition, for TAISC related features, implementation can be found at the following git repositories consist of the contiki tree, and the existing MAC creation framework (TAISC):

- TAISC is free of charge for academic usage, for more information please refer to [3] and http://www.wishful-project.eu/taisc

1 NS-3 Project, "LTE-Module", Website, https://www.nsnam.org/docs/release/3.10/manual/html/lte.html , March 2017.

2 NS-3 Project, "Wi-Fi Module", Website, https://www.nsnam.org/docs/models/html/wifi.html , June 2017.

3 Jooris, B., Bauwens, J., Ruckebusch, P., De Valck, P., Van Praet, C., Moerman, I., & De Poorter, E. (2016). TAISC: A cross-platform MAC protocol compiler and execution engine. Computer Networks, 107, 315-326.