Radio Virtual Machine (RVM)
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Software-Defined Radio (SDR) technologies
- A lots of promise
  - Lower costs
  - Faster time to market
  - Faster prototyping of new products
  - Easier upgrade/upgradation of SDR products
  - Interoperability between SDR devices

- SDR implementation challenges
  - Reconfigurability = multi-standard radios
  - Portability = multi-platform radios

- Need for an adaptation layer
  - Expresses the convergence of PHY standards
  - Meets hard real-time constraints
  - Hides Platform complexity
  - Extensible

Models and Proposals for the RVM
- New programming model for PHY Layer description
  - Abstract component view hiding implementation details

  PHY Layer Description Program (PLDP) expressed in a programming language dedicated to the description of physical layer protocol (sometimes called waveform language)

  (BLK) => resource allocation
  dma = dma_engine.allocate()
  phaseestim = phase_estimator.allocate()
  rotor = rotor allocating
  dma_engine.connect(dma.out, phaseestim.in)
  phase_estimator.connect(phaseestim.out, dma2.in)

- Execution model
  - RVM is able to access the data-flow
  - Configurations could be sent:
    - Directly from the RVM
    - RVM sends requests to IPs to get their configurations from system shared memory

- Ongoing Work
  - Real Time implementation of the RVM concept on the CEA-LETI MAGALI chip
  - Development of a MAGALI specific RVM environment upon F2 API (FAUST2/MAGALI HAL)
  - Experimenting RVM API using a lightweight Lua VM
  - Experimenting RVM with Squawk JVM (Java VM)
  - RVM runs on ARM1176 core with DBX (Direct Bytecode Execution) feature

With RVM concept SDR meets its challenges
- RVM concept principles
  - RVM supports present and future radio standards

- RVM advantages
  - Isolation of radio application from its execution platform
  - Dynamic software download
  - Maintenance and deployment of only one bytecode per platform
  - Implements processes with low computational requirements when no hardware support

A RVM prototype running on PC: 802.11a PHY Layer On Lua RVM

- Components are implemented in software on standard PC
- Other standards
- Hardware-software co-design

References
- 802.11a RX PLDP
  - CC
  - ASIP
  - RX_bit
- 802.11a TX
  - CC
  - ASIP
  - Try to implement in hardware
- 802.11a TX
  - CC
  - ASIP
  - Try to implement in hardware
- 802.11a RX
  - CC
  - ASIP
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  - CC
  - ASIP
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