Open, Programmable Wireless Networks

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METIS-II (Key Innovation Pillars)

Common control and user plane framework
- Control / user plane integration on suitable level
- Introduction and potential virtualization of common control and user plane functions

Cross-layer cross-air interface access and mobility framework
- Common mobility control
- Common measurement handling
- Common system access

Agile resource management framework
- Air interface agnostic RM layer
- Abstraction layer
- Air interface 1 specific RM vs. Abstraction layer vs. Air interface 2 specific RM

Holistic air interface harmonization framework
- Harmonization of the design and functionalities of air interface variants, e.g. via parameterization,
- Parameterizable MAC 1 vs. MAC 2
- Parameterizable PHY 1 vs. PHY 2

Holistic spectrum management architecture
- Considering e.g. spectrum > 6 GHz, “novel user groups” and increased spectrum usage flexibility

Air interface variant 1 vs. Air interface variant 2 vs. ... vs. Air interface variant N

Air interface details studied in other projects, e.g. METIS, FANTASTIC-5G, mmMAGIC

Courtesy: METIS-II Consortium
OAI Strategic Areas

5G Modem
- new waveform
- Relaying
- Carrier aggregation
- Full-duplex Radio
- Massive MIMO

Software-defined 5G system
- Cloud-native RAN
- SDN/NFV
- Juju/OpenStack
- Ethernet Fronthaul
- MEC API

Heterogeneous 5G Network
- Ultra-dense network
- Coexistence and Aggregation
- Unlicensed bands

Large-Scale Emulation
- Realistic experimentation
- PHY abstraction
- Channel models
- Performance
- System Integration

Test and measurements
- Interoperability / Compliance
- System Integration
- Channel Sounding
- Design Validation

RF Platform
- Low cost BS
- Soft RRH

OSA Workshop (22/01/2016) - Bell Labs, France
Courtesy: Raymond Knopp, Euricomm
OSA Roadmaps Toward Software-define 5G Network

- **Cloud-native 5G networks**
  - Phase 1: Stateless through distributed shared memory, multitenancy
  - Phase 2: Mircoservice Architecture and NFV
  - Supported projects: FP7 MCN, FUI ELASTIC

- **Network Orchestration**
  - Approach 1) Openstack and heatstack orchestrator
  - Approach 2) Juju modeling for service-oriented deployment ([https://jujucharms.com/q/oai](https://jujucharms.com/q/oai))
  - Supported project: FP7 MCN, FP7 FLEX, Canonical partnership program

- **Network Programmability → network slicing**
  - Agent-controller protocol and southband API in support of SDN+MEC
    - agents: in charge of network function monitoring and programmability
    - Network controller: network abstraction (network state graphs), network application
      - realtime, standalone mode or as a plugin
  - Supported projects: H2020 Coherent, H2020 Q4Health, ETSI MEC PoC
Program Experimental License

New type of experimental license: “Establishes program experimental licenses for colleges and universities with an accredited graduate research program in engineering, research laboratories, manufacturers of radio frequency (RF) equipment, manufacturers that integrate radio frequency equipment into their end products and health care institutions to allow broad experimental authority under a single license.”

Eligibility

- ABET accredited college or university with a graduate research program in engineering
- A research laboratory (not limited to federally funded)
- A hospital or health care institution (non-clinical trial testing only)
- A manufacturer of RF equipment or a manufacturer that integrates RF equipment into its end products.
Special Requirements for:
- Restricted Frequency Bands
- Critical Service Bands
- Federal Spectrum

N (five?, ten?) days before each experiment*:
- “a narrative statement describing the experiment, including measures to avoid causing harmful interference to any existing service licensee in the proposed band”
- “contact information for the researcher in charge of the experiment;
- contact information for a “stop buzzer” point of contact – a person who can turn off the equipment if interference occurs”
- “technical details including frequency, power, bandwidth, modulation, location, number of units, etc.”
- “for commercial mobile, emergency notification, and public safety frequencies, a list of potentially affected licensees”

Rules have officially become effective as of **January 14, 2016**.

But: new forms and reporting WEB site are not yet up (will take a few more weeks according to “reliable sources”)

Perfect fit: intended to foster innovation

Has significant implication on wide area experimentation especially with SDRs and non-traditional RF front-ends.

(the rule also includes two other experimental licenses: the Medical Testing License and the Compliance Testing License)
“Missing Link”: Outdoor Deployable Wireless Units?

Modest power amplifier
RF “Firewall”
Wideband Antenna
SDR front-end
Local processing

(Open Programmable) COTS BS/AP

(GENI) Rack