ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

Project Idea: Metamorphic Networks

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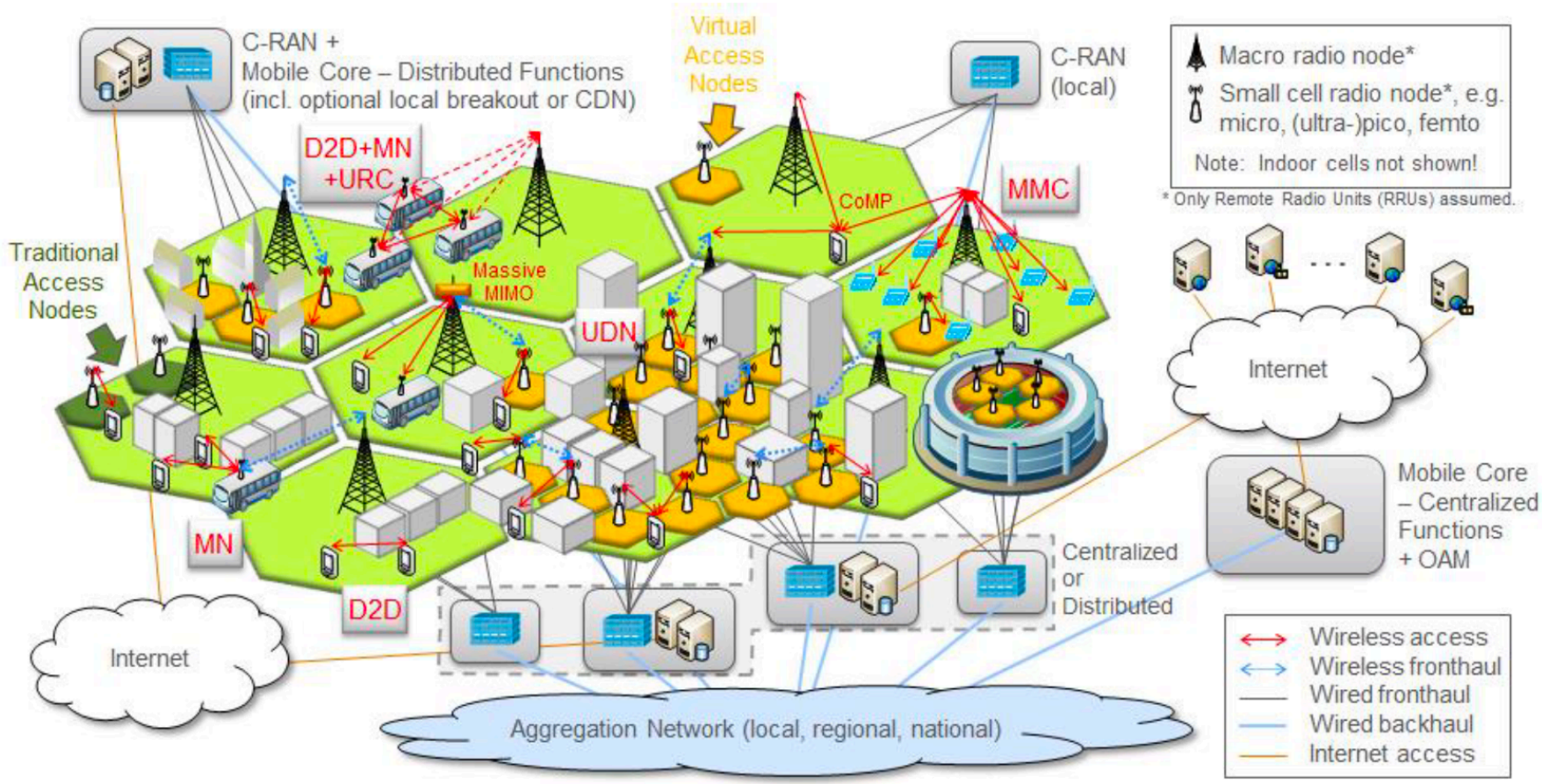
Paradigm Changes

Paradigm changes

The infrastructure of 5G will also be dynamic

- Density of base stations varies because of
  - Mobile base stations (e.g., drones, robots, D2D, etc.)
  - User-controlled base stations (e.g., small-cells)
  - Green operation (e.g., sleep scheduling)
  - Support fort various verticals (energy, health, ...)
  - Various scenarios (e.g., megacities versus low-ARPU regions)
  - Sporadic events (e.g, Olympics)
  - Gradual deployment of base stations

Motivation (METIS)



Metamorphic Networks: MORPHnet

Problem

Resources are wasted if we assume one-size fits all

Objective: MORPHnet

Metamorphic networks and density-adaptive FlexNet

Research Challenges

- Estimate density (gap: robust density estimator)
- Characterize environment (gap: dynamic infrastructure is not addressed)
- NP-hard optimization problem (gap: responsive heuristics)
- Adapt configuration to characterized environment and density
  - Waveform: bandwidth (subcarrier number and spacing), cyclic-prefix, code rate, modulation, transmit power
  - MAC: resource allocation, HARQ parameters, PDU size
  - RLC: ARQ retransmission count, mode selection
  - PDCP: Encryption with tweak-able ciphers
  - Core network: Function to resource mapping

Work Breakdown

Work Package 1: Management and Dissemination

Work Package 2: Density-awareness and Env. Characterization

Work Package 3: Mobile Base Stations

Work Package 4: Radio Access Adaptation

Work Package 5: Core Network Adaptation

WINS Lab @ Computer Engineering, METU

- WINS: WIreless Systems, Networks and Cybersecurity Lab
  - Density estimation and environment characterization
  - Mobile edge cloud
  - Cross-layer optimization
  - Efficient network control and performance optimization
- Related ongoing projects
  - Software-defined systems lab (250K TL)
  - Density-adaptive wireless networks (427K TL)
- For more information: `http://wins.ceng.metu.edu.tr`
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