A Framework for Joint Optical-Wireless Resource Management in Multi-RAT Heterogeneous Mobile Networks

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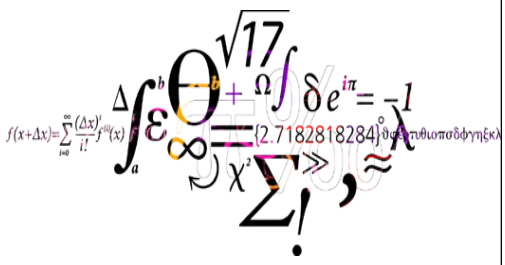
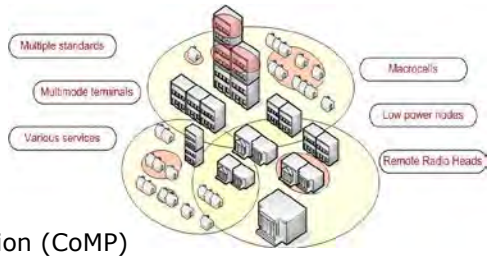


Motivation

- Network management challenges
  - New network **architecture**
    - Multistandard
    - Multi-tier
    - Distributed Base Station and C-RAN
  - New **functionalities**
    - Coordinated Multipoint Transmission and Reception (CoMP)
    - Carrier aggregation (CA)

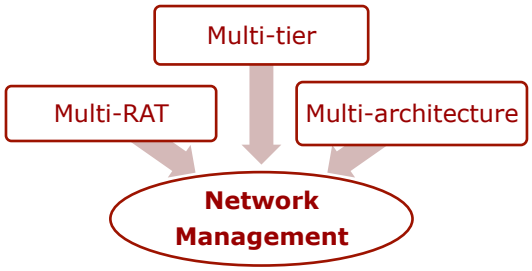


- Network resource management systems need to be **adapted to the new environment**

Agenda

- Motivation
- Related work
- Management framework
  - Functionalities
  - Structure
  - Self-organizing and cognitive aspects
- Example: Inter-RAT scenario
- Communication between modules
- Summary

Related Work

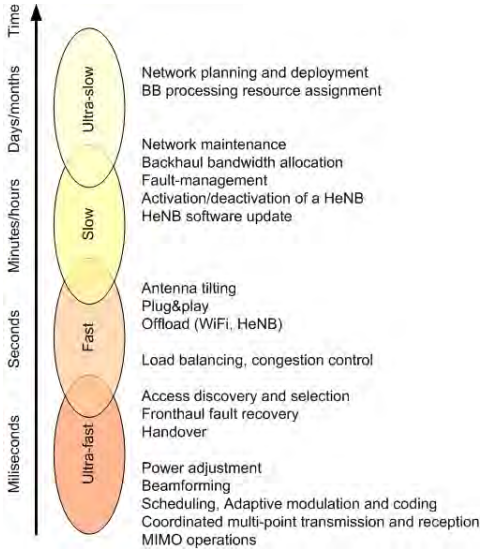


- Existing platform proposals and their limitations
  - Common RRM (CRRM)
  - Joint RRM (JRRM)
  - Multi-access (MRRM)

→ - Radio resources only
- Introduced at the new RATs (GPRS/UMTS) rollout
- Not applicable to current networks

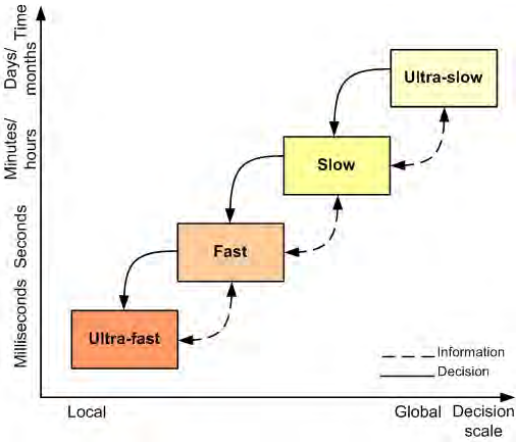
Management Framework: Functionalities

- Division of functionalities according to time needed to perform a control action
- Division based on average timing
- Granularity level-implementation specific



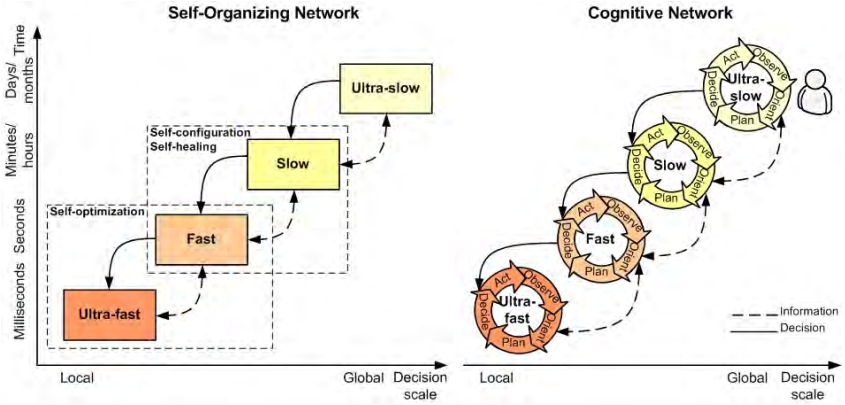
Hierarchical Approach

- Scale of a decision increases with the time it takes: fast local actions and slower global ones
- Management decisions executed locally or sent to a lower layer (execution command or recommendation)
- **Fractal property**: from an overall network view (inter-RAT) to a single management entity



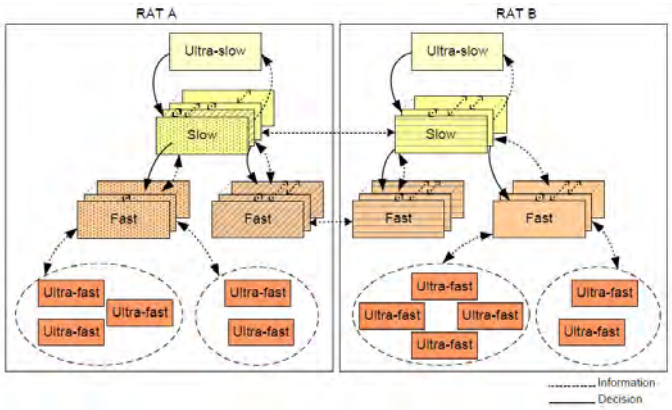
SON and Cognitive Compatibility

- Dense small cell deployment- high requirement for self-organization
- Autonomous modules can employ cognitive behavior



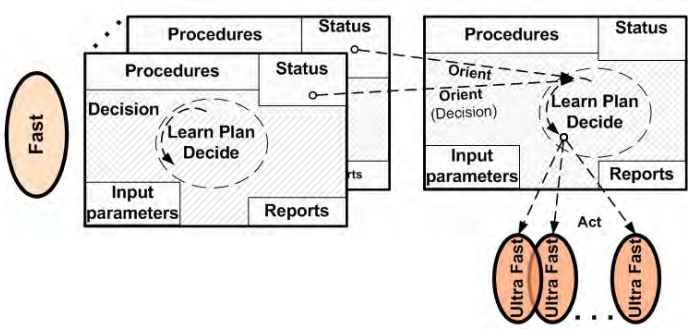
Realization Example: Inter-RAT

- 1:N tree structure
- Middle layers for inter-RAT information exchange



Module Communications: Same Level

- Input parameters: thresholds, number of UEs, etc.
- Status: performance indicators, e.g., utilization
- Reports: e.g., CQI reports
- Decision: decision taking scheme based on available information
- Procedures: particular actions, e.g., power adjustment



Summary

- **Novel hierarchical approach** to network resource management division into different management levels based on the needed for a control action
- Universal approach- multi-RAT, multi-tier and multi-BS architecture covering **wireless and optical resources**
- Can be enhanced with **SON** and **cognitive** functionalities
- **Generic framework** covers all phases of network operations: from planning and deployment to operations and maintenance
- Future work: simulation-based evaluation to demonstrate feasibility and advantages of the framework

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