



C2POWER

Cognitive radio and Cooperative strategies
for POWER saving in multi-standard mobile
terminals

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C2POWER Project at a glance



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Funding scheme: STREP
Total Cost: €5,14m
EC Contribution: €3,45m

10 Partners – 7 European Countries
2 Manufactures
1 Operator
2 SMEs
1 University
4 Research Institutes

- Global warming is now unprecedented
 - Rise in temperatures of global average air and oceans
 - Widespread melting of snow and ice
 - Rising of global average sea levels

- The global warming debate shifted
 - From: Whether man-made climate change is occurring
 - To: What atmospheric levels of Greenhouse Gases (GHG) is acceptable

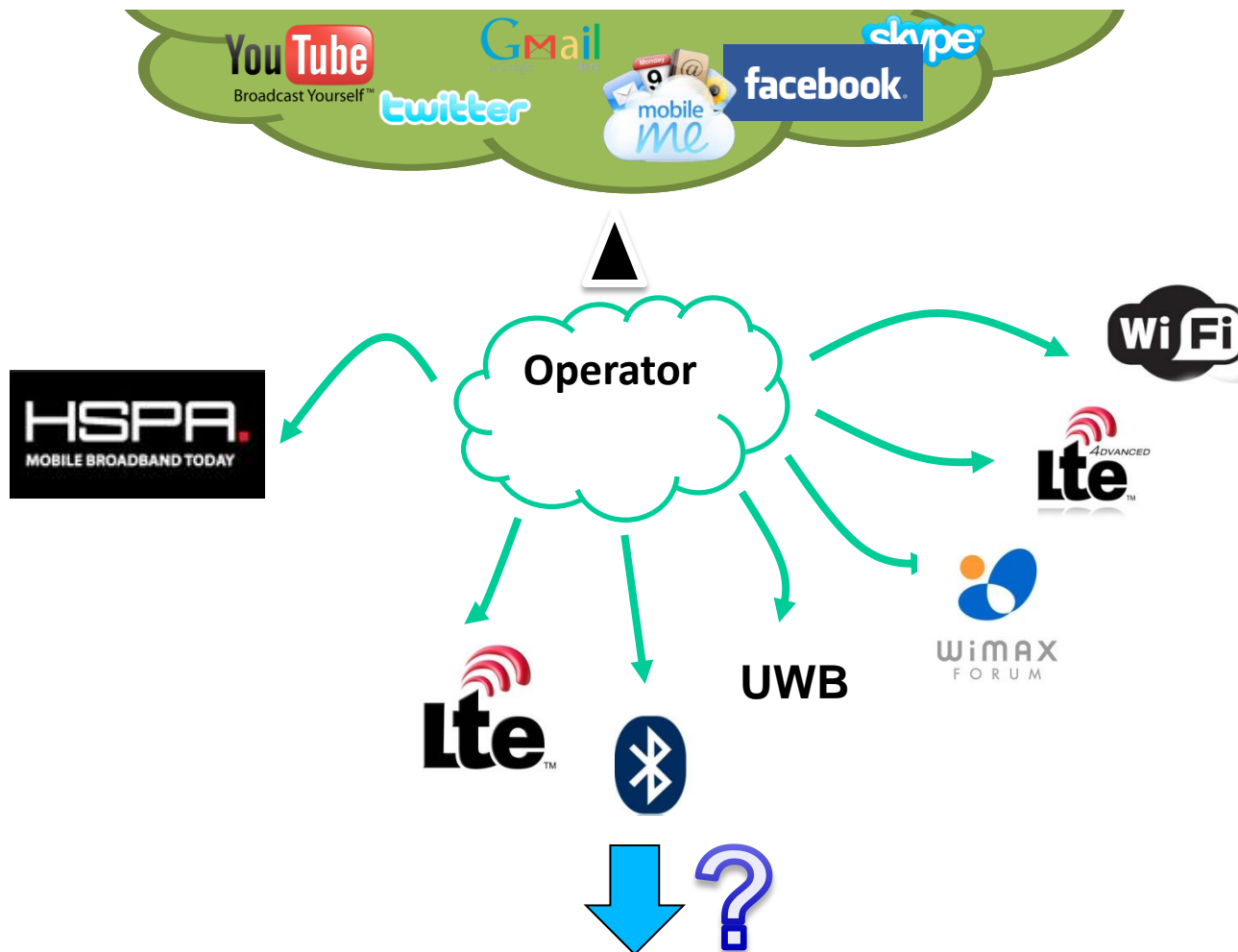
- A clear need for reducing CO₂ or GHG emissions

Ref: SMART 2020 report
Ref: Green Touch

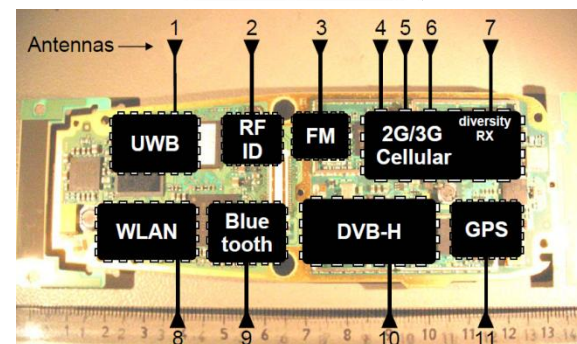
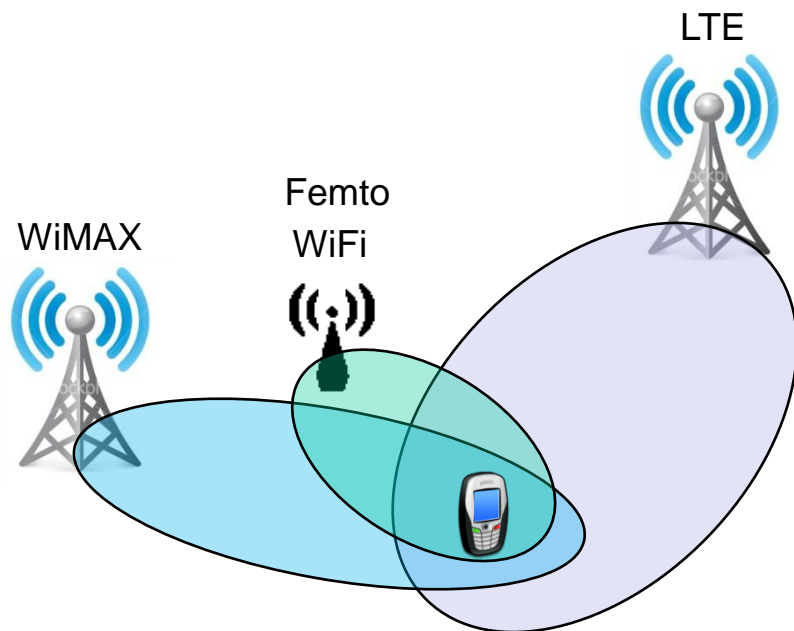
- ❑ ICT Contributions to CO₂ emissions are low
 - ❑ In 2007, ICT sector contributed to 2%

- ❑ Mobile communication technologies contribute to a low percentage of ICT CO₂ emissions
 - ❑ Mobile Communications produce 9% of ICT CO₂ emissions

- ❑ **Why Green Communications?**
 - ❑ ICT impact is rapidly rising
 - ❑ 72% increase in CO₂ emissions by 2020 compared to 2007
 - ❑ The decrease in CO₂ emissions in ICT sector will result in global decrease of CO₂ emissions of other sectors (Estimated 15% reduction)



- Demand for higher data rates
- Data rate performance of high mobility speeds
- High signaling overhead
- Need for better multimedia support
- High capital and operational costs

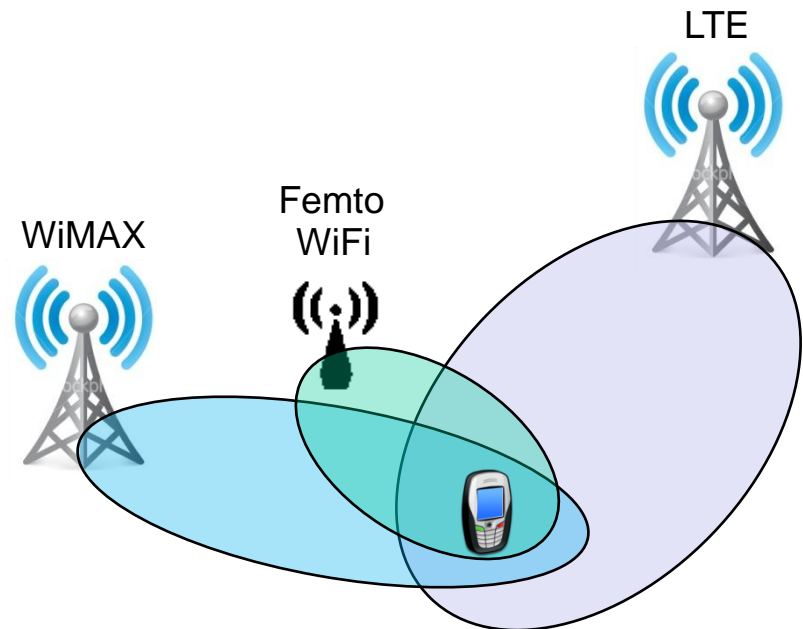
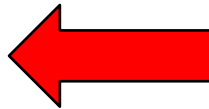
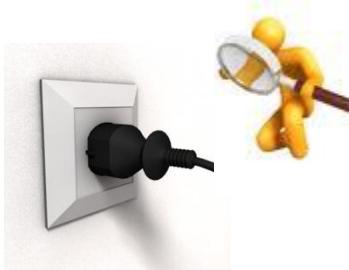


Increase in energy consumption

- Many researches are addressing energy efficiency on the network side

There is a continuously growing gap between the energy requirements of emerging radio systems and what can be achieved by

- Battery technology evolution
- Scaling and circuit design progress
- System level architecture progress
- Thermal and cooling techniques



- Short-range cooperation among mobile terminals
- Cognitive vertical handovers
- Context Awareness
- Energy-efficient Reconfigurable Radio Transceivers
- Business models

C2POWER aims at providing solutions for decreasing energy consumption of the wireless communications of multi-standard mobile devices, without jeopardizing the requested quality of services

C2POWER targets two complementary techniques within the framework of cooperation and cognitive radios:

- Cooperative strategies between mobile devices belonging to a cluster using advanced low power short range communications
- Cognitive handover mechanisms to select the RAT, which offers the best energy efficiency while providing the required quality of service

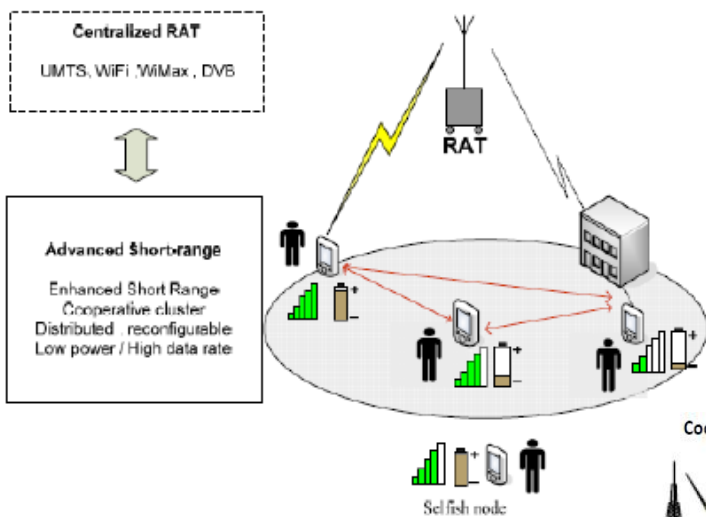
Technical

- ❑ Investigate how context information can be used by cooperative strategies to achieve power efficiency at the wireless interface of mobile devices.
- ❑ Investigate and demonstrate the potential of cooperative techniques based on advanced short range communications for the goal of power/battery lifetime saving of mobile wireless devices.
- ❑ Investigate and demonstrate minimum energy consumption handover procedures and policies between heterogeneous technologies and associated tradeoffs in realistic scenarios.
- ❑ Investigate, design and demonstrate energy efficient reconfigurable multi-standard transceivers able to switch from one standard to another according to a power saving strategy.

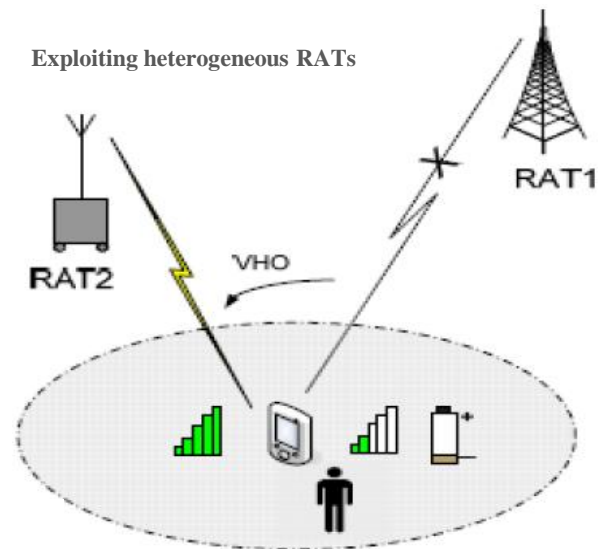
Business

- ❑ Investigate methods and incentives to encourage cooperation and develop attractive business models for the network/service provider (Stimulate and motivate cooperative networking among users and between heterogeneous networks , e.g. financial incentives / bio-inspired reputation mechanisms).

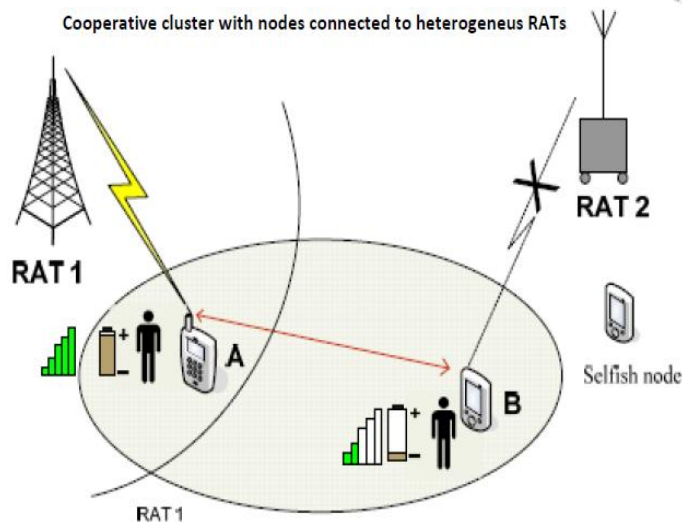
Cooperative cluster in a homogeneous network



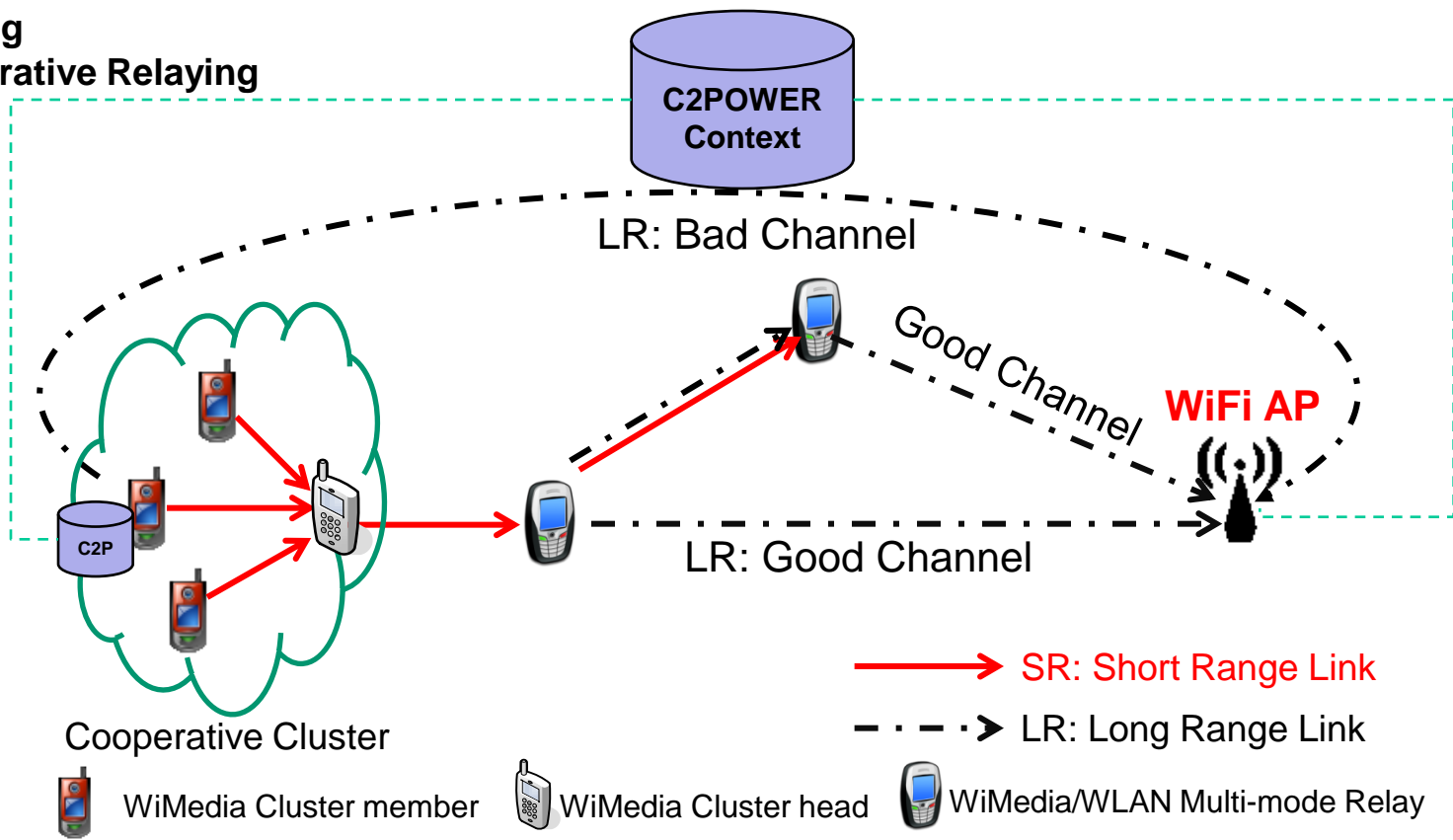
Exploiting heterogeneous RATs



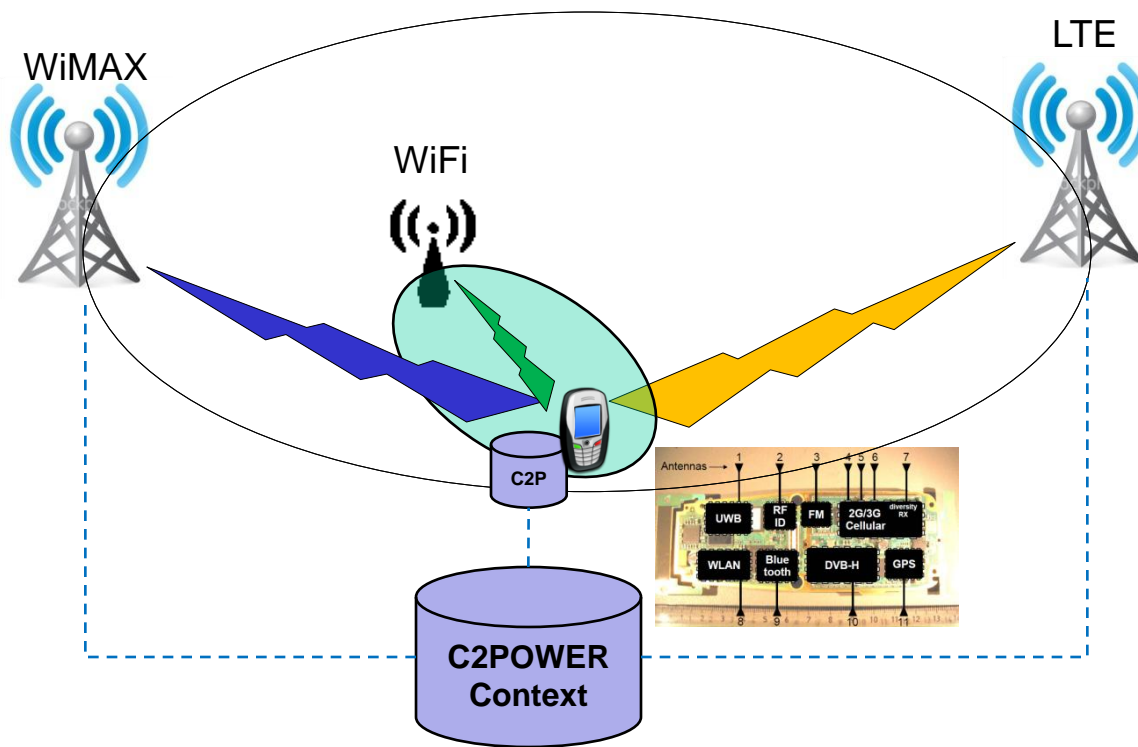
Cooperative cluster with nodes connected to heterogeneous RATs

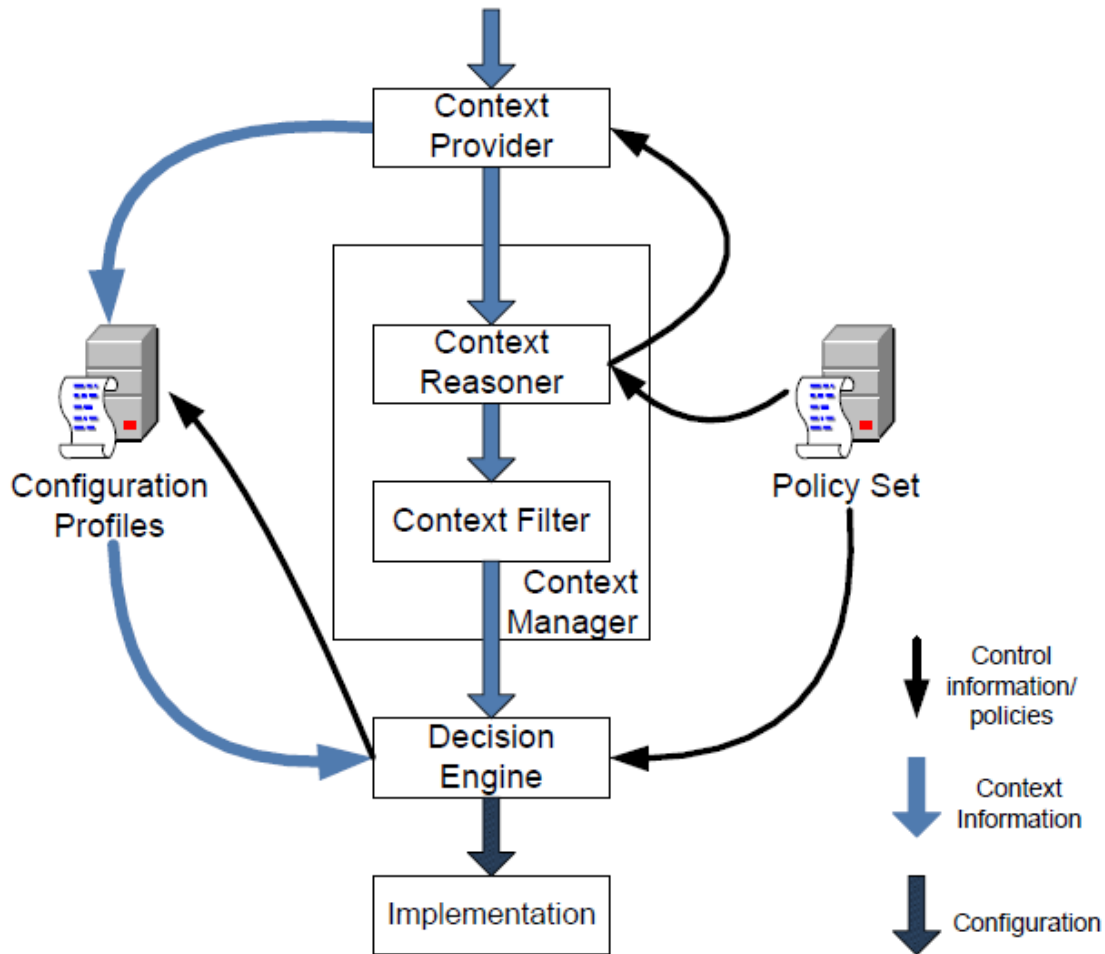


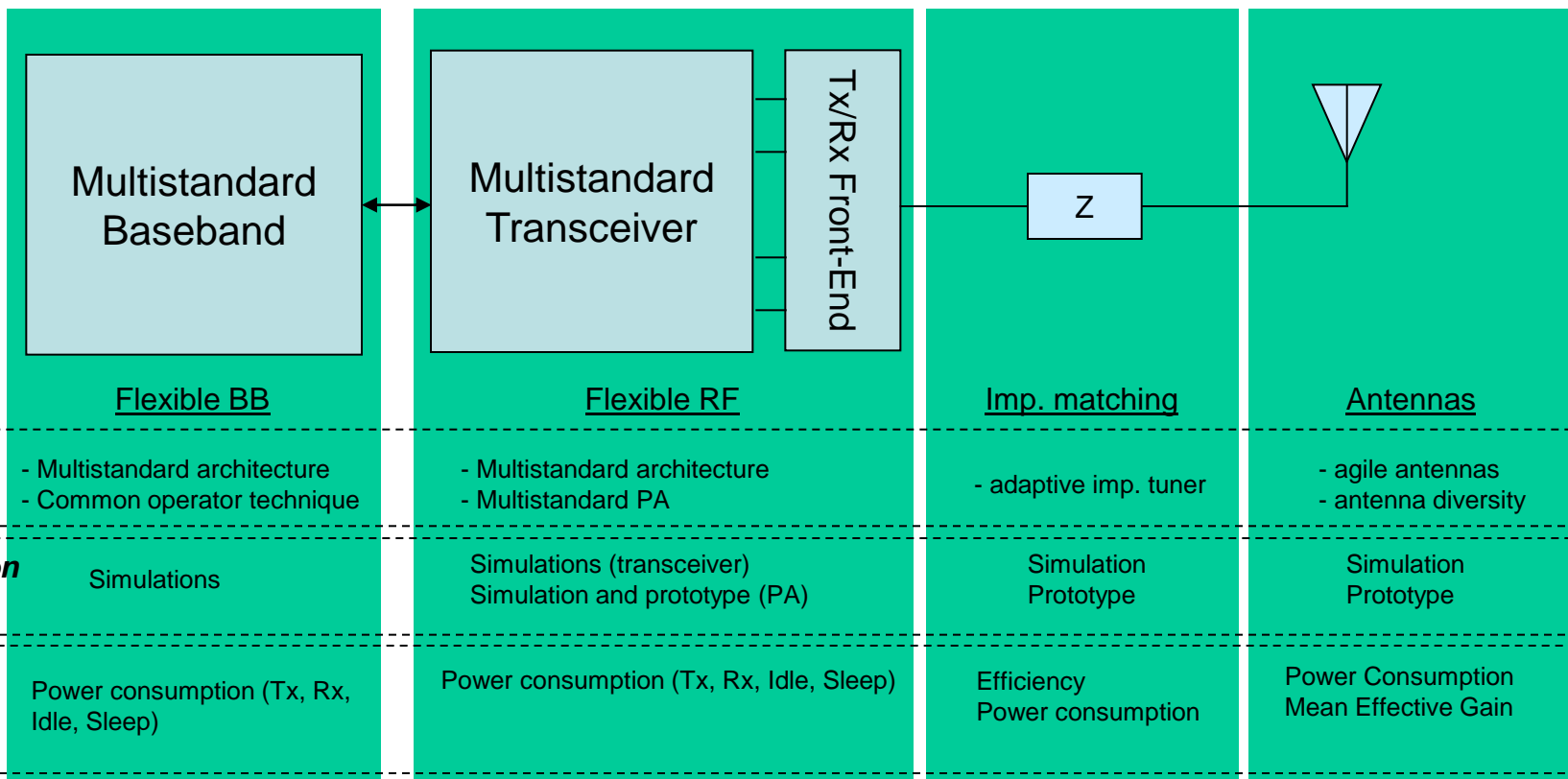
- Node discovery
- Context Awareness
- Cluster formation
- Node Selection
- Routing
- Cooperative Relaying

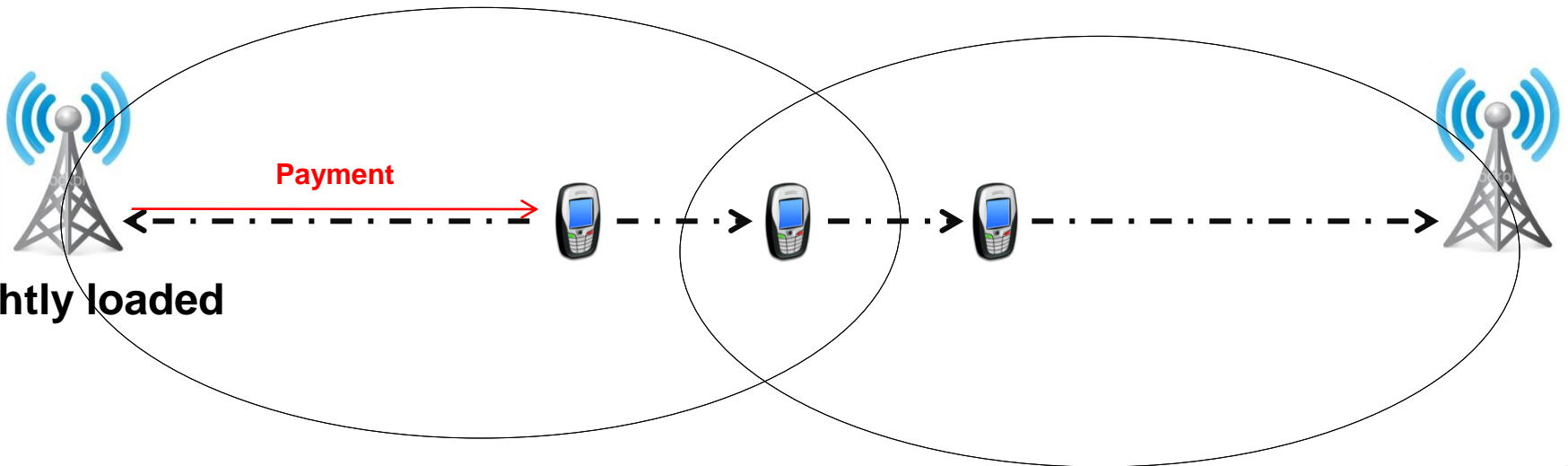
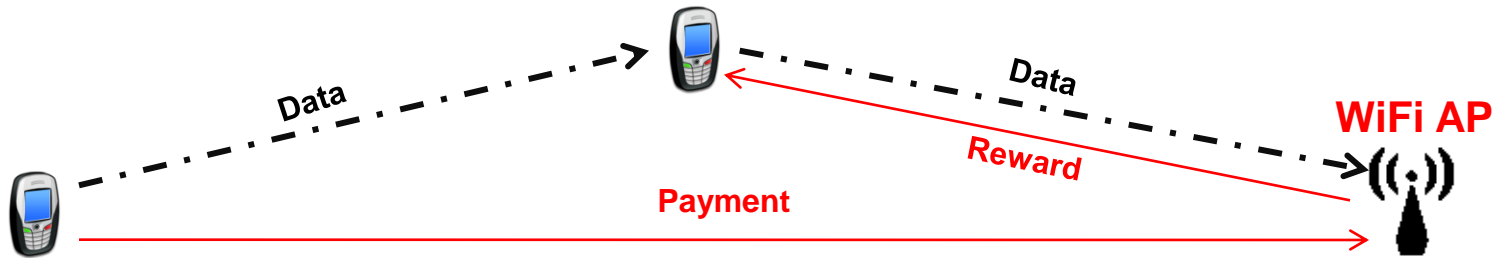


- Network discovery (using context)
- Energy efficient HO









- Growing gap between energy requirements and battery industries.
- Disruptive techniques for energy saving
 - Context Awareness
 - Short range cooperative communication
 - Cognitive vertical handover
 - Energy efficient reconfigurable radio transceivers
- Business Models and incentives for cooperation
- How can these techniques be integrated with other projects and concepts for global energy saving in Wireless Mobile Networks?

- Context awareness
- Cooperation
- Energy Efficient Handover
- Energy efficient Reconfigurable Radio Transceivers
- Business models for incentives



**50 % reduction in Energy reduction
in multi-standard MTs**

