

Social based self adaptive RAN for flexible service composition and improved efficiency

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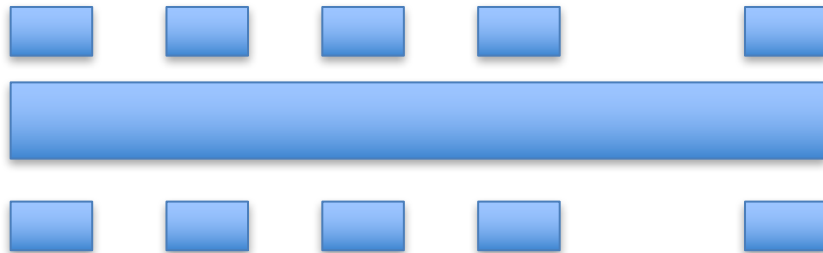


Going back to Goldsmith, Hecker and Davoli presentations...





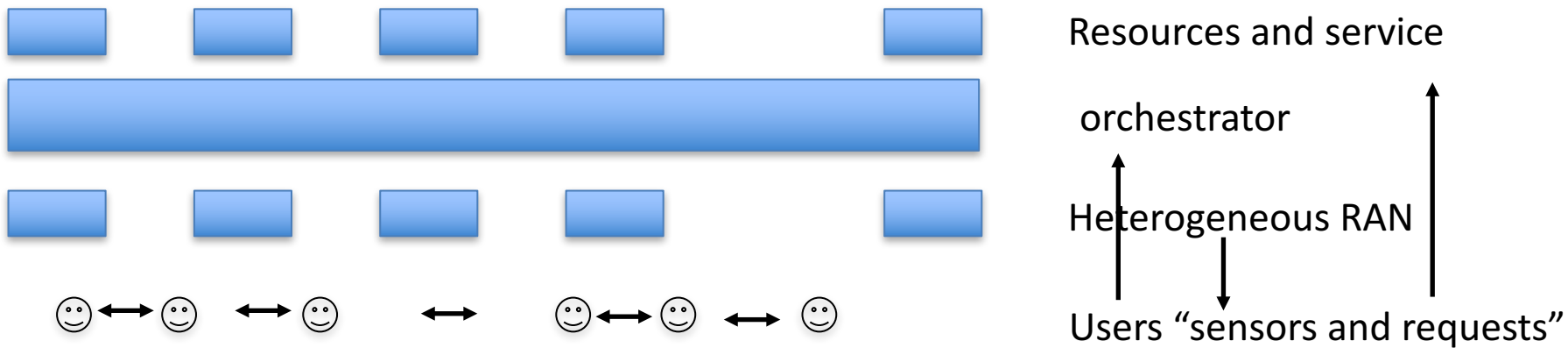
- There was a nice picture about orchestration



- To point out the problem is np-really-hard and energy matters



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We believe to solve this problem we need a change in perspective at the network level by involving the users' devices providing and sharing information to be used for control and optimization



- Cognitive radio.
Not just for spectrum management
- Direct device-to-device (D2D) communications
Energy efficient avoid use of network resources
- Local (“edge”) distributed computation
Keep the problem as local as possible
- Social networks
Effective means to share info without direct communication



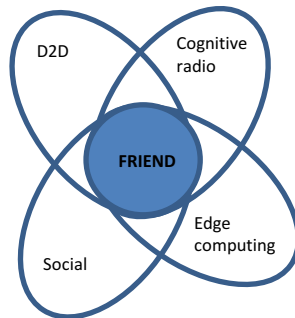
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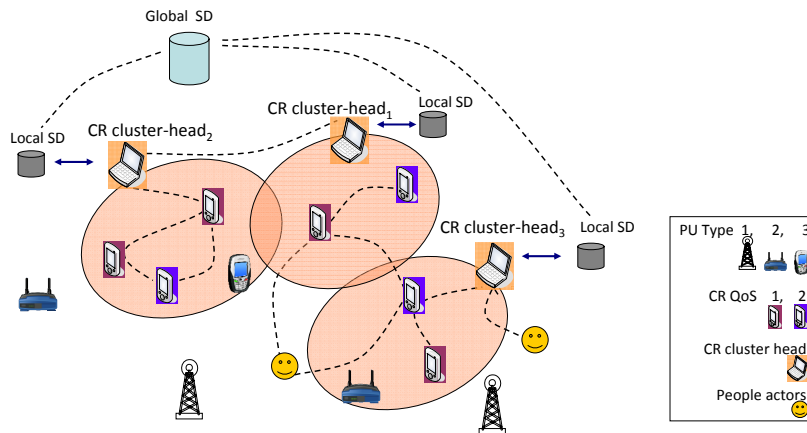
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Flexible social shaRInG for grEeN Distributed resource allocation



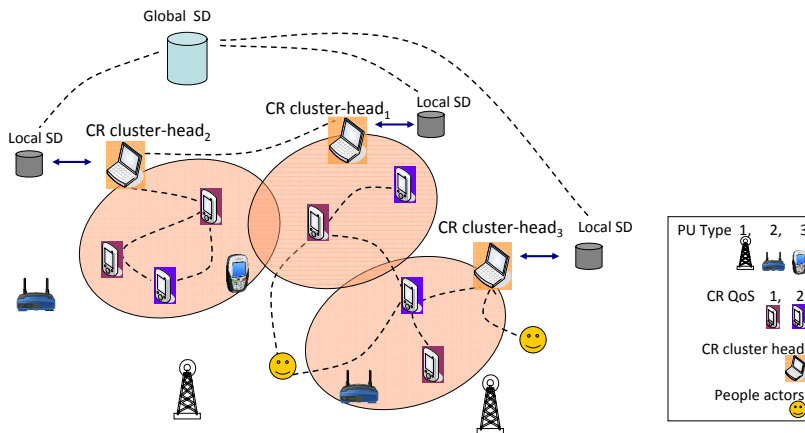
Mobile devices may perform tasks independently from their owners



- Mobile devices:
 - Collect measurements
 - Exchange with peers
 - Exchange with network nodes
 - Make isolated decisions
- Network nodes
 - Collect mobile devices measurements and requests
 - Store users' (devices) profiles
 - Perform distributed computations to optimize resources



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Exploit this ability to collect management data related to the actual current environment and user requests

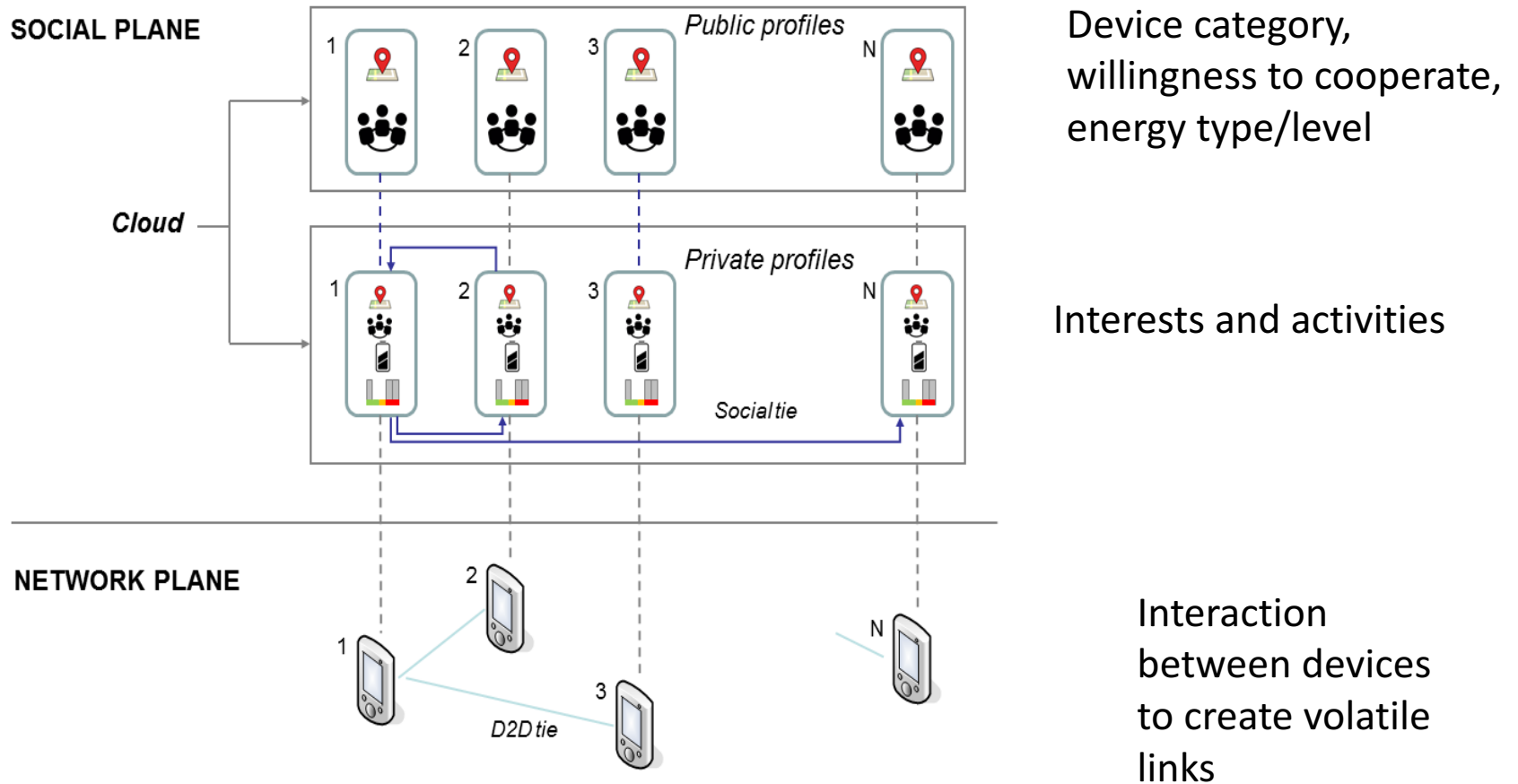


- “**Social**” differs from “**Cooperative**”:
 - Not only sharing of a environment info (i.e. channel availability) but also Device/user profile (battery, data rate, trust,..) to allow different levels of optimization
- Another **social feature** is the **LIST OF CONNECTIONS**:
 - the list of other users with whom the users share a connection: *the list enables viewers to traverse the network graph moving through the lists.*
 - what makes social network sites unique is not that they allow individuals to meet strangers, but rather that they *enable users to articulate and make visible their networks.*

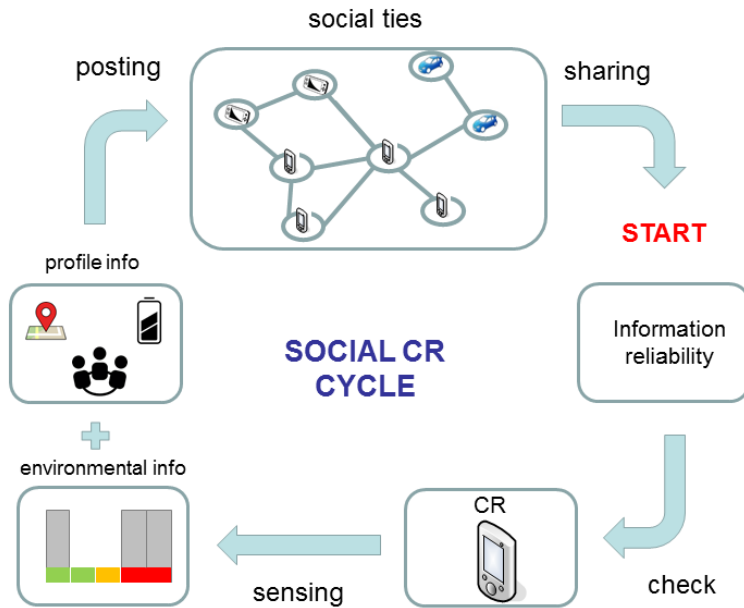


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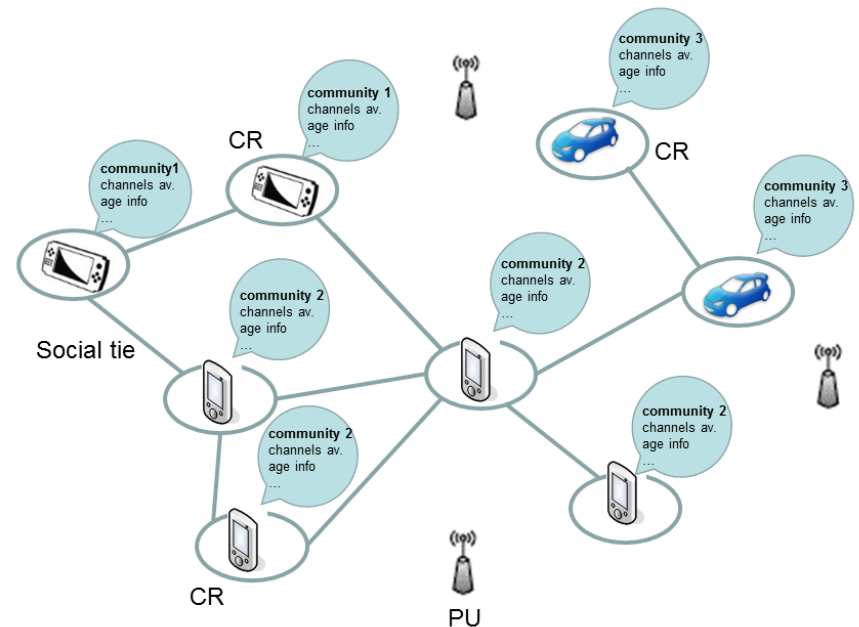
What do we get: a completely flat network with a rethinking of the cellular concept as fully self organizing



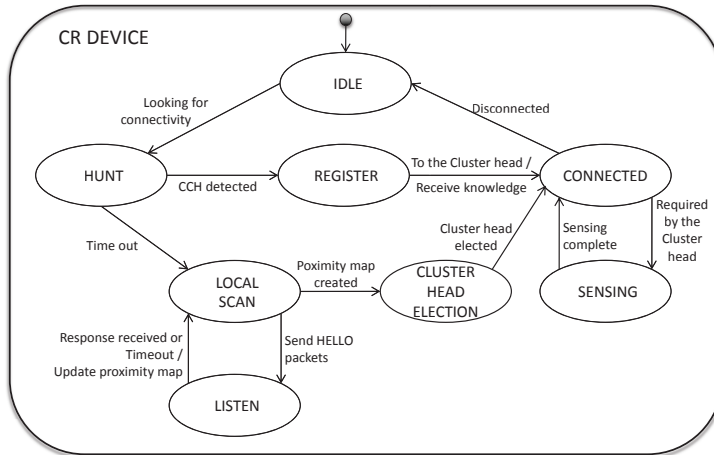
Also look at Carrozzo's presentation



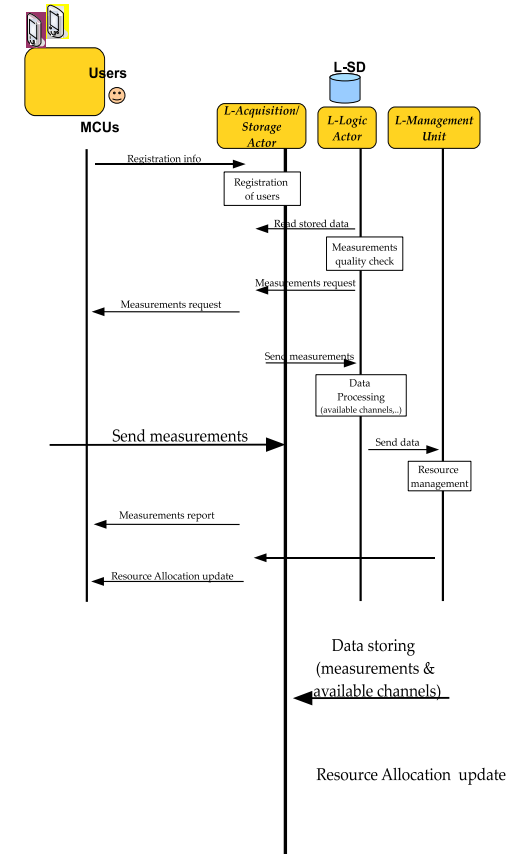
Proposal is independent from any new transmission technique. Rather this is just a new network structure for signalling and monitoring



Ideally this would enable a completely flat network structure somehow losing the concept of “provider” in the traditional sense

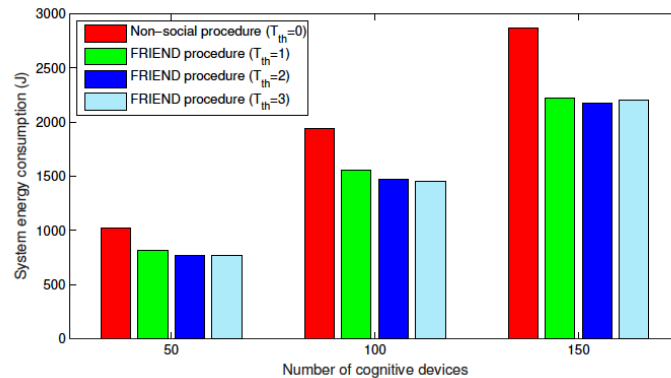
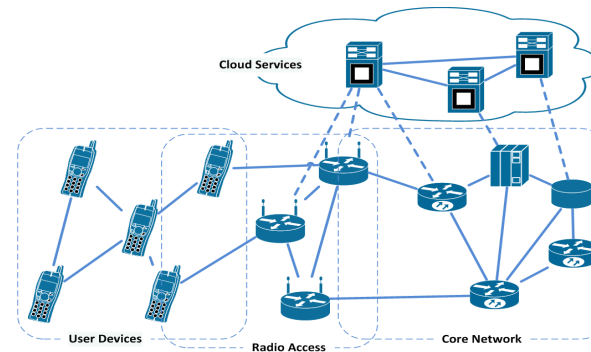


We defined some initial messages and state machines to define node and network operations





Based on on these protocol definitions we implemented simulations to verify performance



Result here shows improved efficiency in terms of energy consumption to achieve a generalized consensus (Vizziello, Amadeo, Favalli "Social Cognitive Cooperation for Device to Device Communications")



- Joining social networks and D2D has been demonstrated to reduce latency in spreading information (not our work: *Ioannidis et al. Optimal and Scalable Distribution of Content Updates Over a Mobile Social Network, INFOCOM 2009*)
- Joining social/cognitive/D2D reduces energy requested for network status understanding (our work)
- A new network with improved efficiency and flexibility? To be proved



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- CHALLENGES
 - decoupling between user's identity and device identity with privacy preserving algorithms
 - public vs. private profiles definition and corresponding privacy issues
 - fast discovery modes for community creation and information sharing
 - distributed computation in edge nodes for route/spectrum management
 - dynamic and proactive resource allocation based on profile knowledge
 - interaction with other types of networks