

Next generation networks - are we prepared for this?

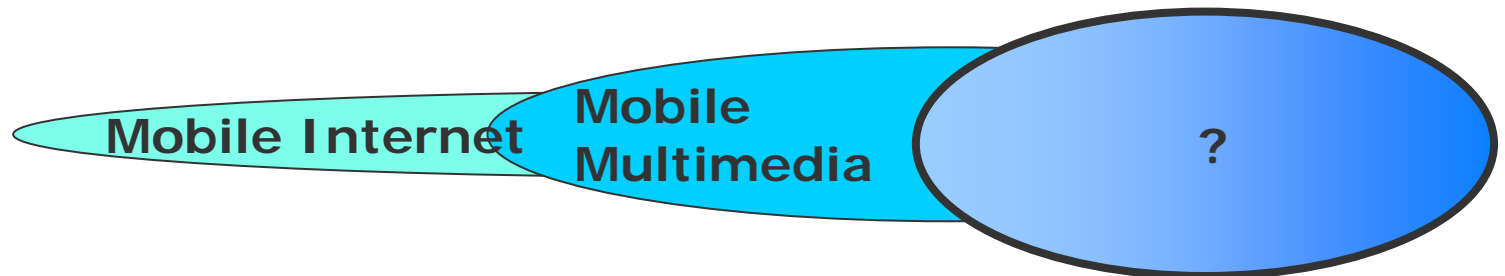
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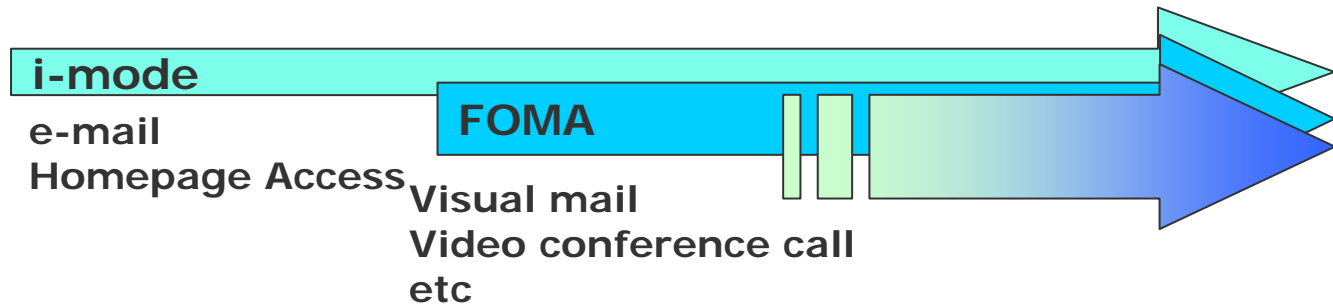
**Next generation networks
- will they make a happy customer?**



**Next generation networks
- can we make money from them?**



Service



Challenge for B3G cellular networks

- High data rates

↓ require

- High carrier frequencies

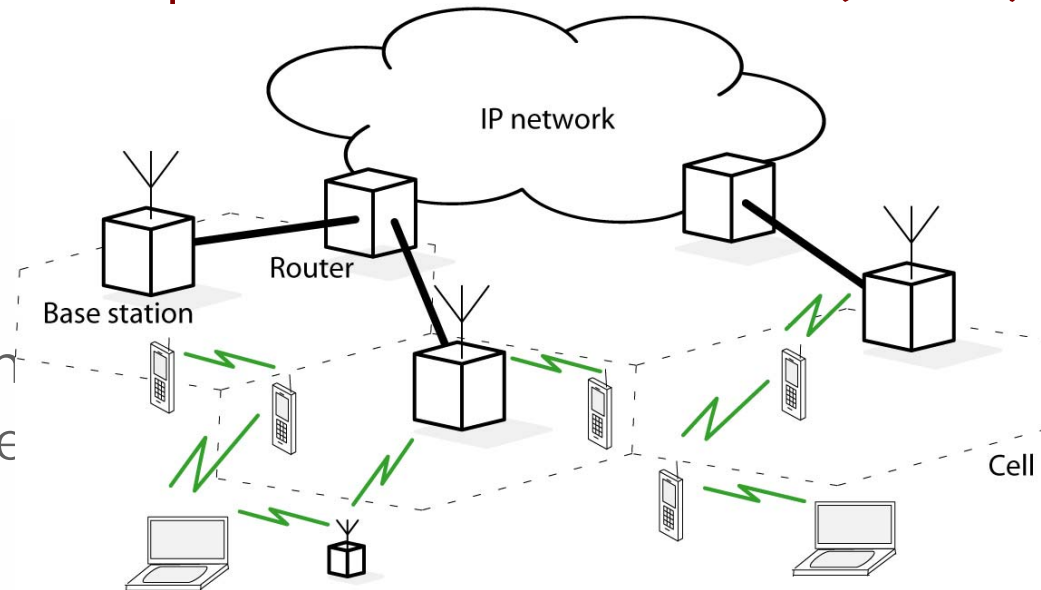
↓ result in

- Small cells, many base station
- Shadowing caused by obstacle

↓ result in

- Poor radio coverage and/or
- High deployment costs

Multihop Radio Access Network (MRAN)



Mobile devices and fixed stations act as relays for traffic of other devices.

Some ingredients for future wireless networking

- Find and understand new business **opportunities** beyond 3G.
- Develop technologies and protocols for networking of **ubiquitously** embedded tiny devices and sensors.
- Develop protocols that help to master the increasing **complexity** and **heterogeneity** in mobile communications.
- Find novel approaches for **spectrum** allocation and sharing.
- Develop service platforms and applications for **ambient intelligence**.

Nutrition Facts	
Serving Size 1 oz. (28g)	
Servings Per Container 16	
Amount Per Serving	
Calories 190	Calories from Fat 150
% Daily Value*	
Total Fat 17g	25%
Saturated Fat 2g	10%
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 6g	2%
Dietary Fiber 3g	13%
Sugars 1g	
Protein 7g	

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- More and more everyday items will have embedded wireless interfaces.
- New interesting business opportunities:
 - Life support
 - Healthcare
 - Logistics
 - Robotics
- Problem: Items are often power constraint
⇒ Long links to base stations not feasible
- Approaches and DoCoMo Euro-Labs contributions:
 - Ad hoc networking
 - Interconnection of ad hoc networks to fixed networks
 - QoS
 - Provider-assisted ad hoc networking



"Internet of things"

New Applications: Wearable Computing

European project on wearable computing



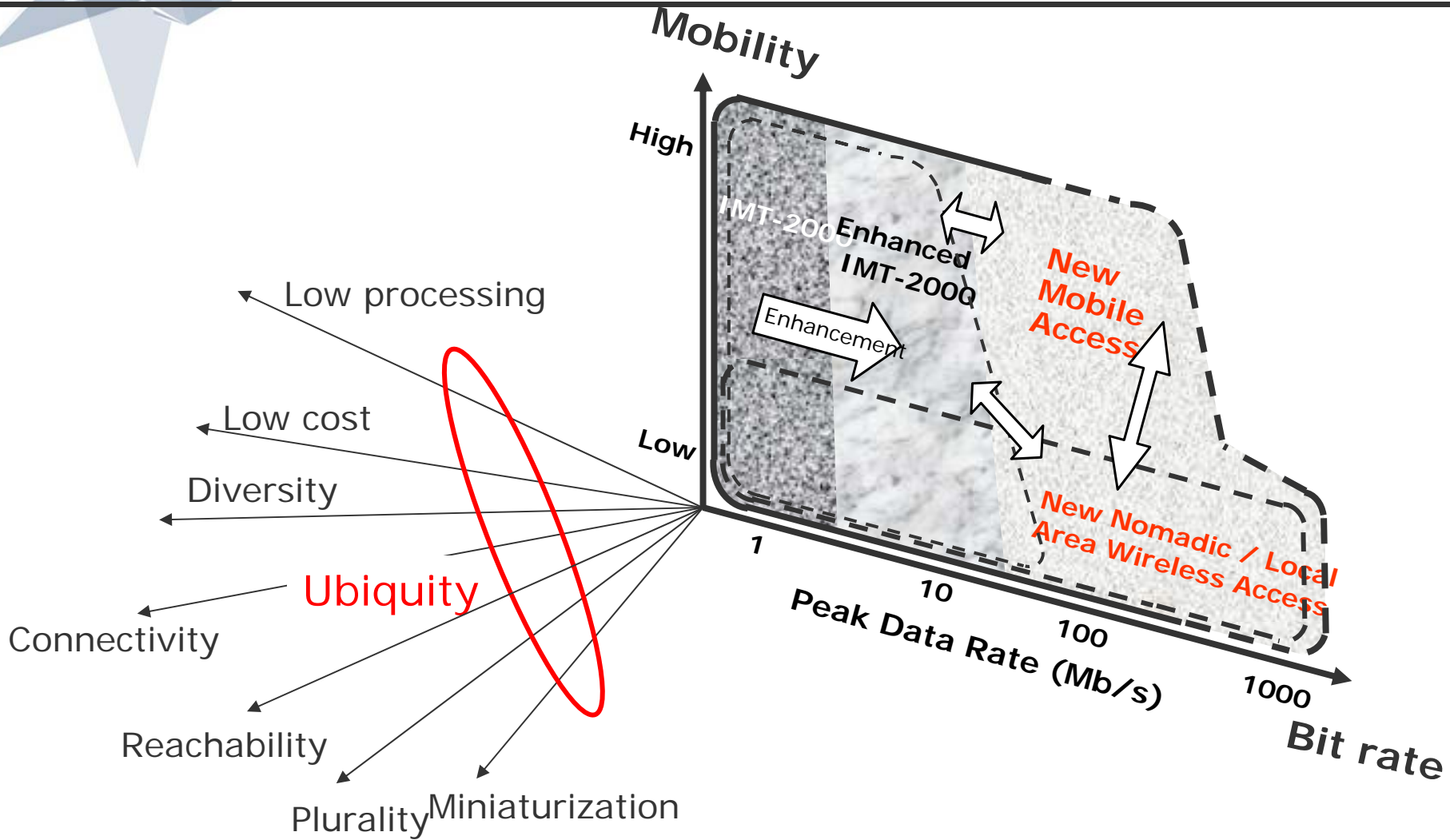
Integrated project funded by EU
36 partners, 4.5 years

Project goal:

- Develop wearable computing systems supporting mobile workers in their tasks
- Implement prototypes for emergency, hospital, plane maintenance, car production



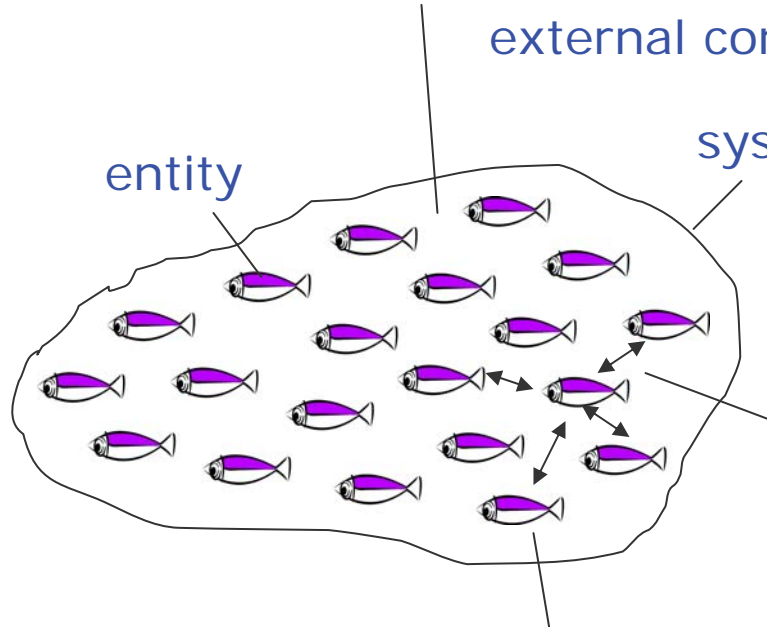
New axes in 4G Network – Ubiquity



How to organize ubiquitous networking environment ?

Learn from nature

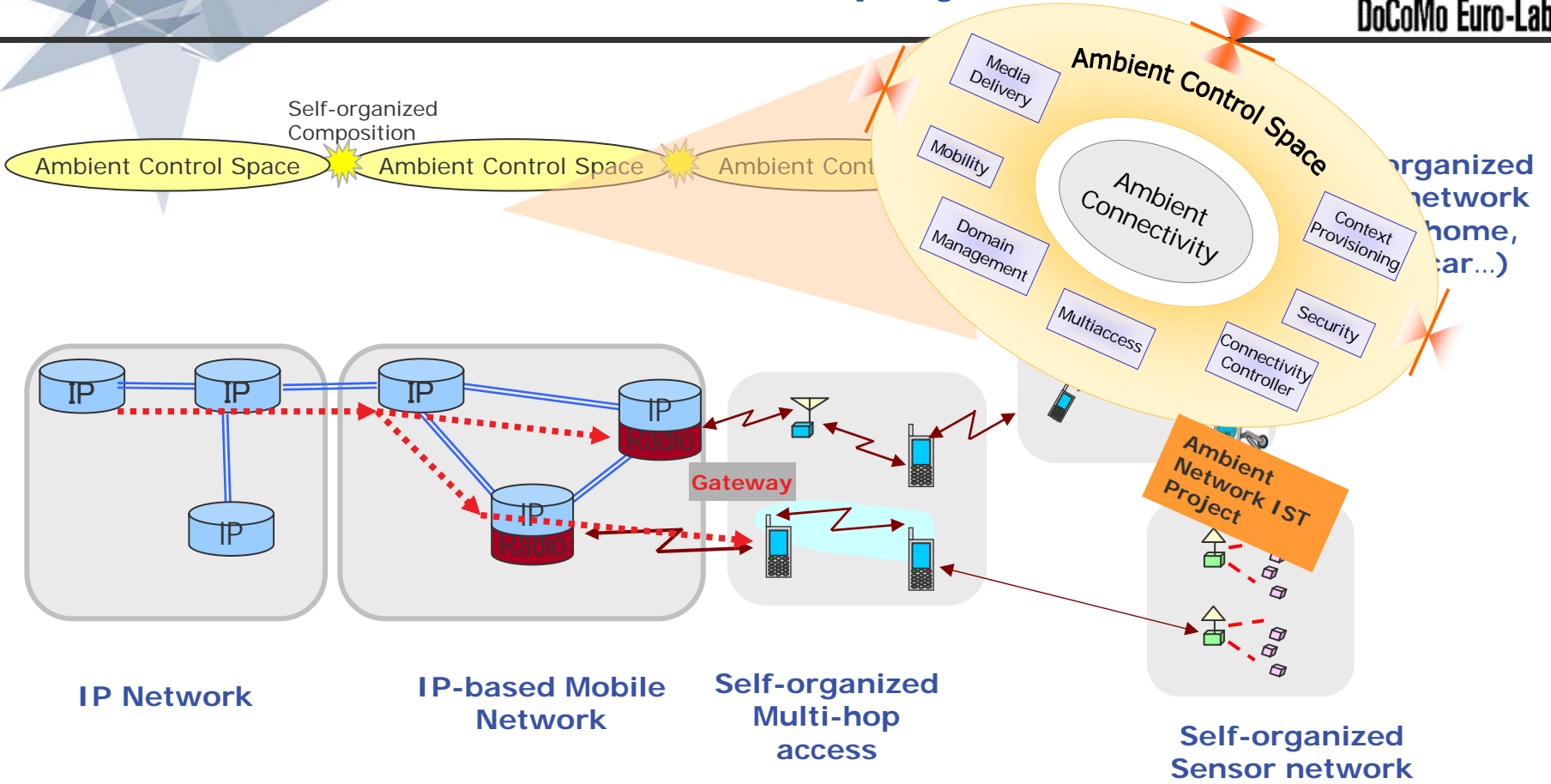
a) Order and structure is achieved in a **distributed** fashion, i.e., no central or external control is needed.



b) Only interaction with nearby entities, i.e., behavior is based on **local** information.

c) **Simple** behavior rules.

Ambient Network Architecture for Mobile Ubiquity



IP Network

IP-based Mobile Network

Self-organized Multi-hop access

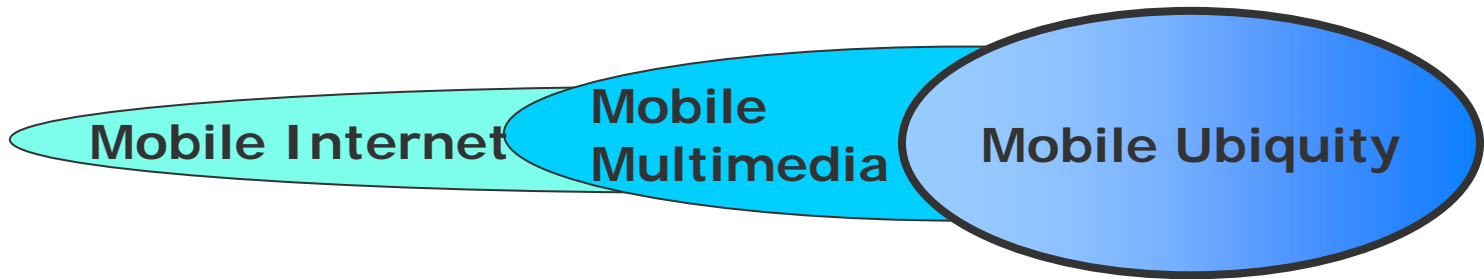
Self-organized Sensor network

Self-organized functions/control

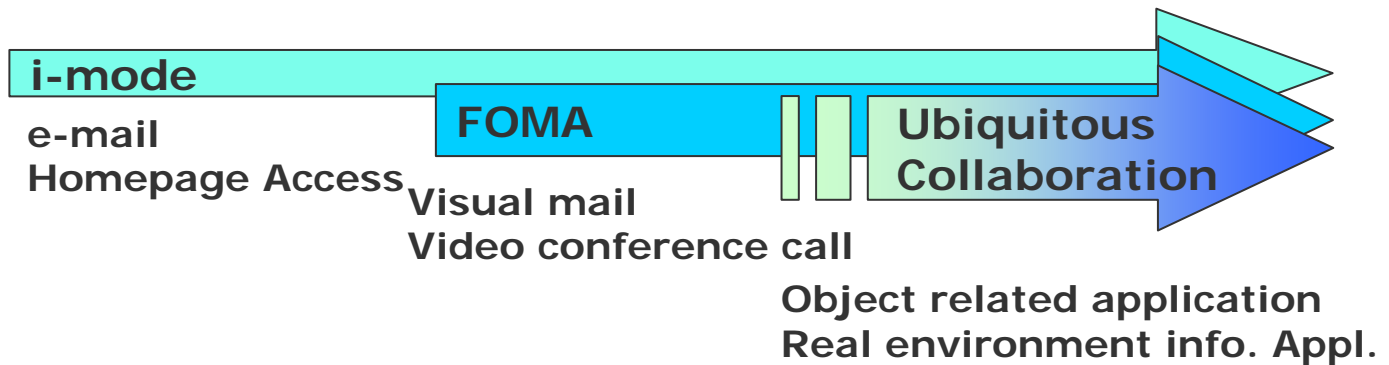
Degree of central control

fully self-organized

Dawn of Mobile Ubiquitous Environment



Service





Thank You

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