



Multicast/Broadcast opportunities in Beyond-3G Networks

F. Meago – *Siemens* - francesco.meago@siemens.com,
A. Bria - *Royal Inst. of Technology (KTH)*,
I. Karla - *Alcatel*,
P. Magnusson - *Ericsson*,
R. Litjens - *TNO Information and Communication Technology*,
H. Tang – *Nokia*

This presentation has been produced in the context of the Ambient Networks Project. The Ambient Networks Project is part of the European Community's Sixth Framework Program for research and is as such funded by the European Commission.

All information in this presentation is provided "as is" and no guarantee or warranty is given that the information is fit for any particular purpose. The user thereof uses the information at its sole risk and liability.

For the avoidance of all doubts, the European Commission has no liability in respect of this presentation, which is merely representing the authors view.



Contents



- ❖ Ambient Networks project,
- ❖ Motivation and focus of the paper,
- ❖ M/B fundamentals, services and RRM related issues in AN.



Ambient Networks

organisational perspective



Ambient Networks:

- ❖ part of the EU's IST program 6th framework
- ❖ 41 organizations from Europe, Canada, Australia and Japan
- ❖ running in 2004-2005 in its first phase - conceptual
- ❖ Complete project spread over 6 years.
- ❖ www.ambient-networks.org



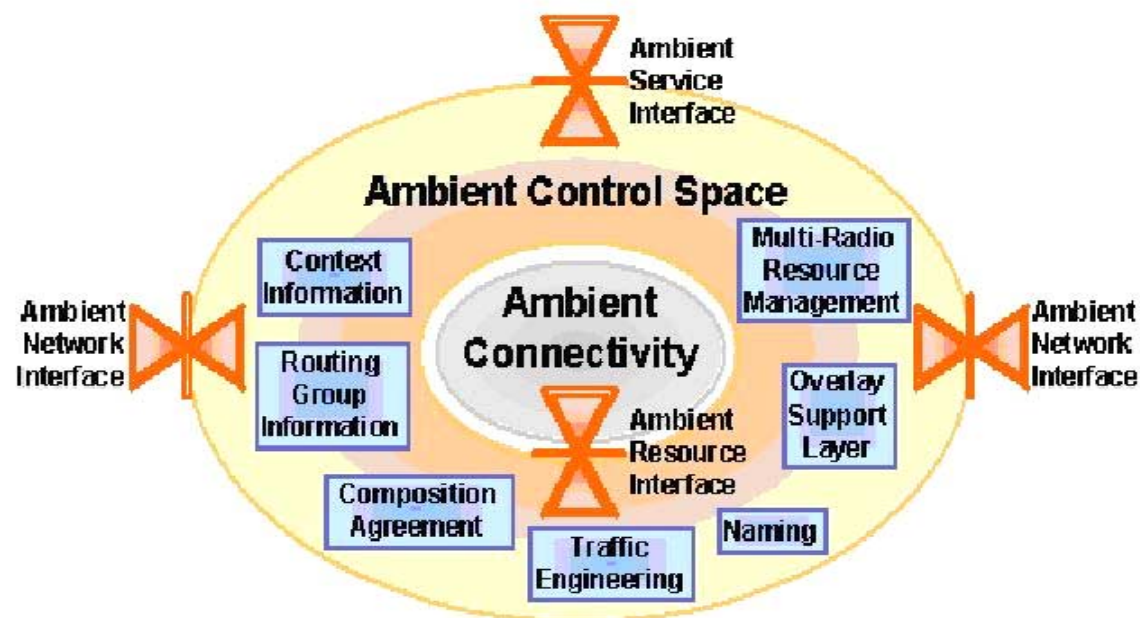
Ambient Networks

technical perspective



- ❖ Pre-4G standardisation research
- ❖ Paradigm “everything is a network”: i.e. everything can be seen as an “Ambient Network”, or “AN”.
- ❖ New networking vision based on dynamic composition of ANs into composed ANs through establishment of inter-network agreements.
- ❖ AN approach: harmonise usage of all access technologies instead of defining a new one.
- ❖ Support for multi-hop, multi-access, multi-operator, multi-domain, multicast/broadcast.
- ❖ Supporting a number of scenarios including local access providers, PANs, peer-to-peer, moving networks, sensor networks, competitive scenarios with cost-based access selection.

- ❖ It defines an “Ambient Control Space” as a control stratum realising the AN vision.



- ❖ It still allows for different implementation options regarding how this networking realm should be realised.



Ambient Networks

focus of the authors



Multi-Radio Resource Management concepts within AN:

- ❖ Architectures,
- ❖ Functionalities,
- ❖ Characteristics,
- ❖ Exchanged information...



Ambient Networks

focus of the paper



Multicast/Broadcast services within AN, from a radio resource management viewpoint:

- ❖ M/B “actual” services,
- ❖ M/B service provisioning issues,
- ❖ M/B characteristics of B-3G RRM.



Why a paper on M/B for B-3G?



- ❖ GSM: originally designed for voice
 - ❖ UMTS: any unicast content
 - ❖ TV, DVB-T,: for M/B
-
- We are missing something that is originally designed for unicast and M/B services (assuming today's IP does not suffice).



M/B fundamentals applied to AN



Definitions:

- ❖ Multicast: towards a group within service area
- ❖ Broadcast: towards all within service area
- ❖ Service Area: typically a coverage area, but impacted by concepts of multi-domain, moving networks, PANs, multi-hop.

Multiple destinations reached:

- ❖ In parallel (through single/multi-access/domain)
- ❖ In sequence (multi-hop)

Typical transmission channels:

- ❖ Common
- ❖ Dedicated



M/B service classification example



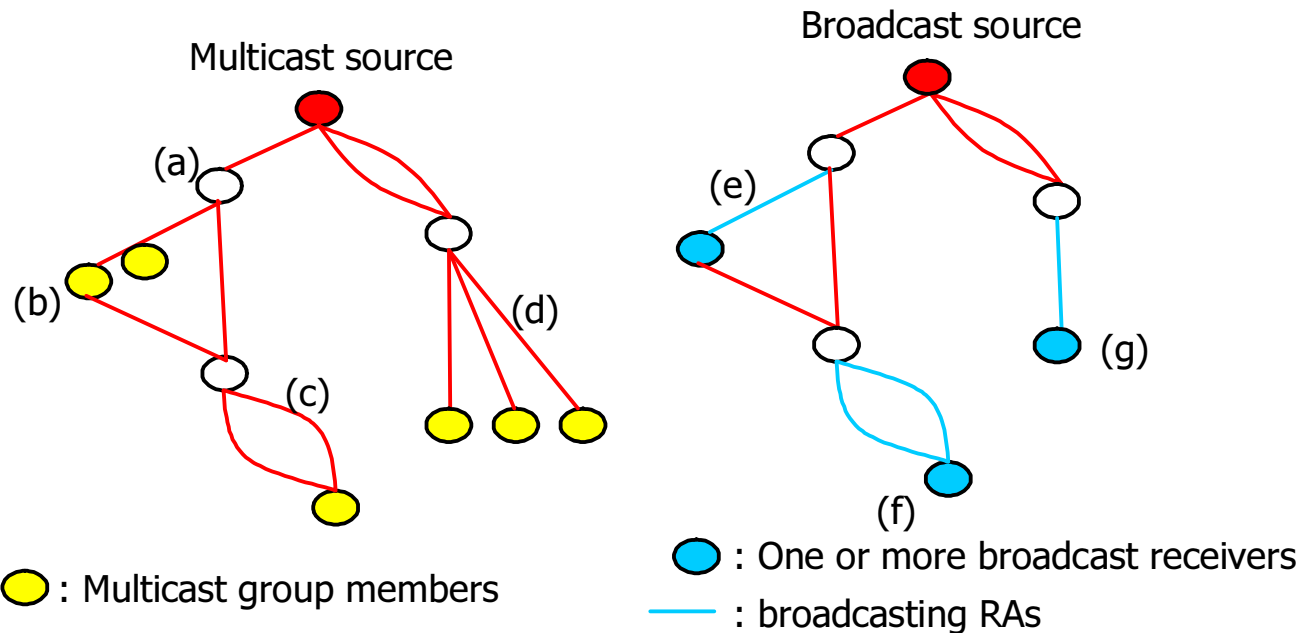
- ❖ **No-delay streaming:** M/B services running on reserved resources that may be booked in large advance. E.g.: movies.
- ❖ **Streaming:** streaming running on resources that are booked at service availability (some delay). E.g.: news.
- ❖ **Download:** content distributed in different sub-parts of the service area – error and delay tolerant. E.g.: adverts.
- ❖ **Error-free download:** further retransmissions allow for error-free download – delay tolerant. E.g.: Software updates.
- ❖ **Hybrid services:** combinings of the above



M/B service provisioning methods



- ❖ **Advertising:** may be M/B itself over the same or different service area, may require user interaction.
- ❖ **Joining:** may take place over multiple accesses and hops, as well as included in the previous negotiation.
- ❖ **Polling and tracking:** signalling implied by polling, and specially tracking, becomes complex and expensive with the increasing number of access technologies and hops, maybe not suitable to large networks.



- ❖ Any 'oval' represents a generic AN, which could be an operator server, an infrastructure relay node, a user terminal, ...
- ❖ Every line represents a transmission channel over a Radio Access (RA), which here identifies a link of any possible technology.
- ❖ The flow is transmitted from the M/B source downwards to the receivers.



M/B flow transmission characteristics



Characteristics:

- a) In the **distribution tree** some ANs can function as **repeaters** only, not belonging to the target multicast group or to the intended broadcast receivers. **Possible economical impact.**
- b) **Common channels** may be used for transmission towards users, a number of which may function as a repeater e.g. due to particular access capabilities or other agreements.
- c) A multicast group member can receive the flow from two different RAs in **multi-radio (or even multi-route) diversity.**
- d) within the same 'cell', **dedicated channels** can still be used for transmission e.g. when this improves resource efficiency.
- e) Broadcast "novelty": **specific broadcast receivers need to be known** and selected for multi-hop forwarding.
- f) **Transmission combining** may happen for some broadcast receivers.
- g) Broadcast transmissions may use **dedicated channels.**



M/B Impacts on RRM



Distribution side:

- ❖ Operates on a new concept of service area (multi-hop, multi-access)
- ❖ fixed/dynamic resource reservation strategies
- ❖ Identify/use spare resources in sub-areas
- ❖ Poll/track users before distributing content

Receiver side:

- ❖ May take part in content distribution
- ❖ May join services coordinately through any access
- ❖ Support access diversity



Conclusions



Vision for M/B support in a B-3G AN environment:

- ❖ New network concepts supporting both unicast and M/B services
- ❖ A new service classification for M/B services
- ❖ Service provisioning schemes integrating the ones of both classical cellular systems as well as classical M/B systems.
- ❖ Meaning of Service Area is extended (probably corresponding to a domain)
- ❖ RRM able to set up appropriate distribution trees through new M/B “bearer services”
- ❖ Difference between broadcast and multicast tends to vanish.