

MBMS – Broadcast / Multicast in UMTS Networks



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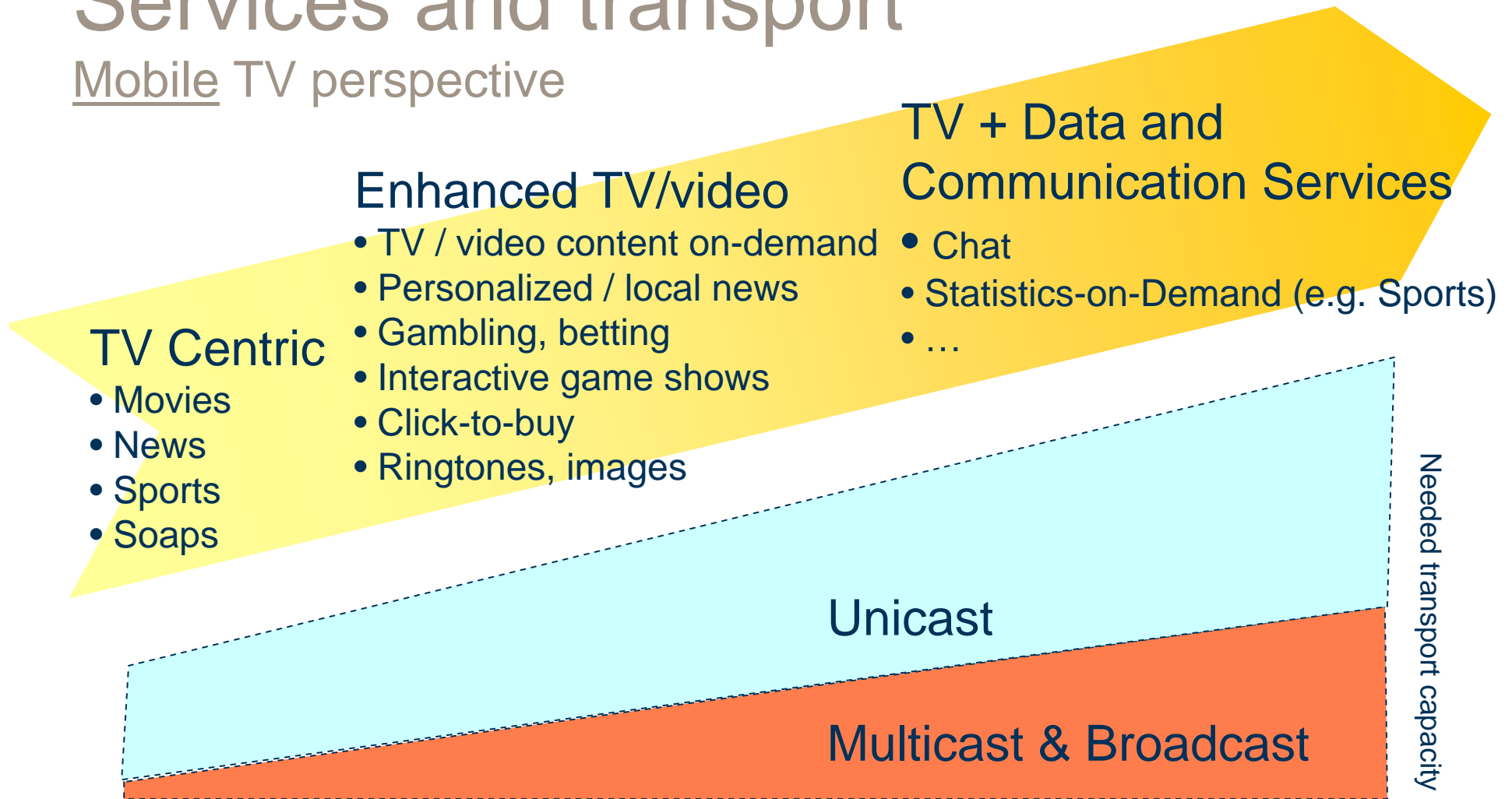
MobileTV is not ...

... mobilizing linear TV



Services and transport

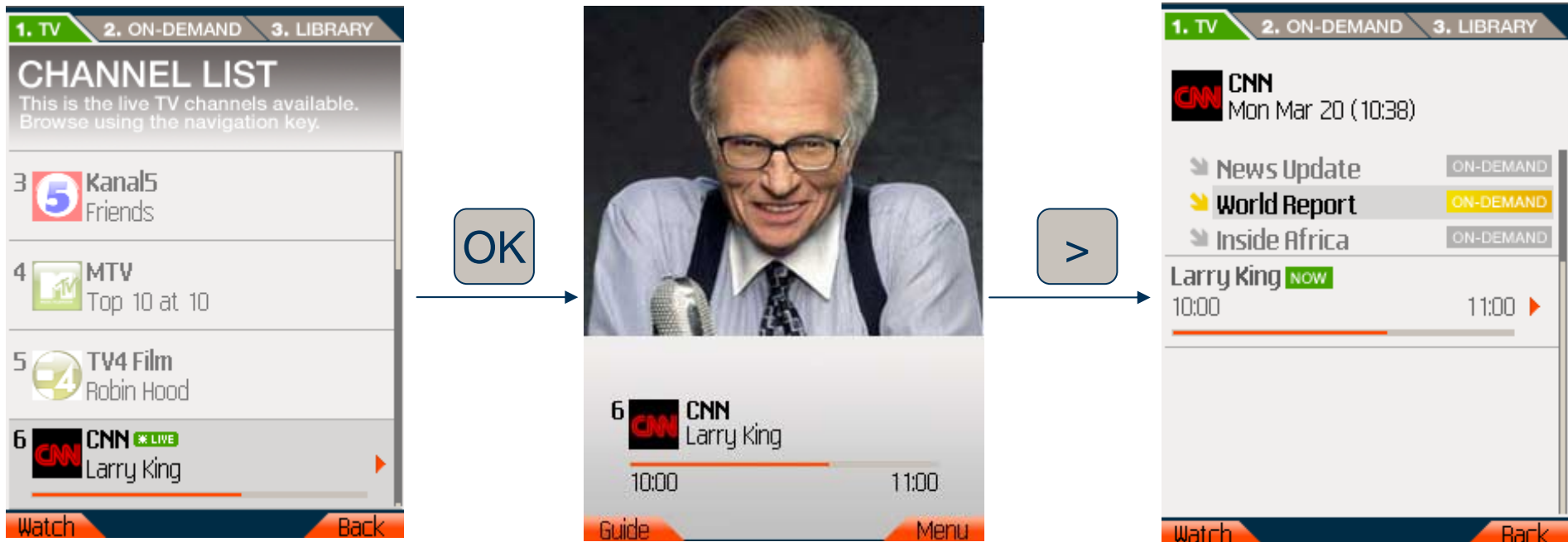
Mobile TV perspective



Future services require a mix of broadcast and unicast

Linear TV / on-demand integration

Invisible to end-user



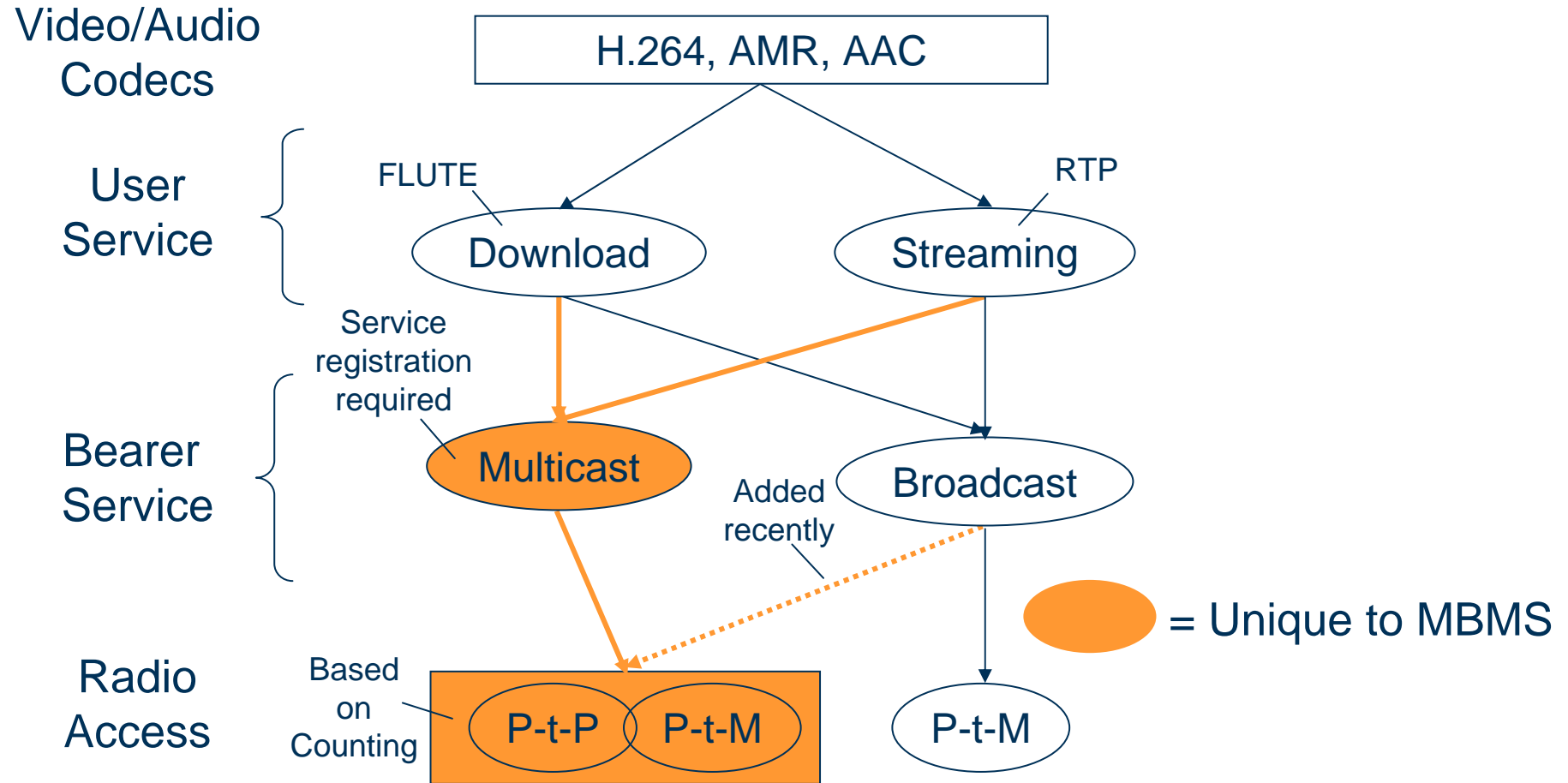
EPG

LinearTV
(Broadcasted over MBMS, DVB-H,...)

On-demand
(3G Unicast)

Multimedia Broadcast Multicast Service

MBMS from a bird's-eye view



MBMS can deliver the same TV quality as DVB-H

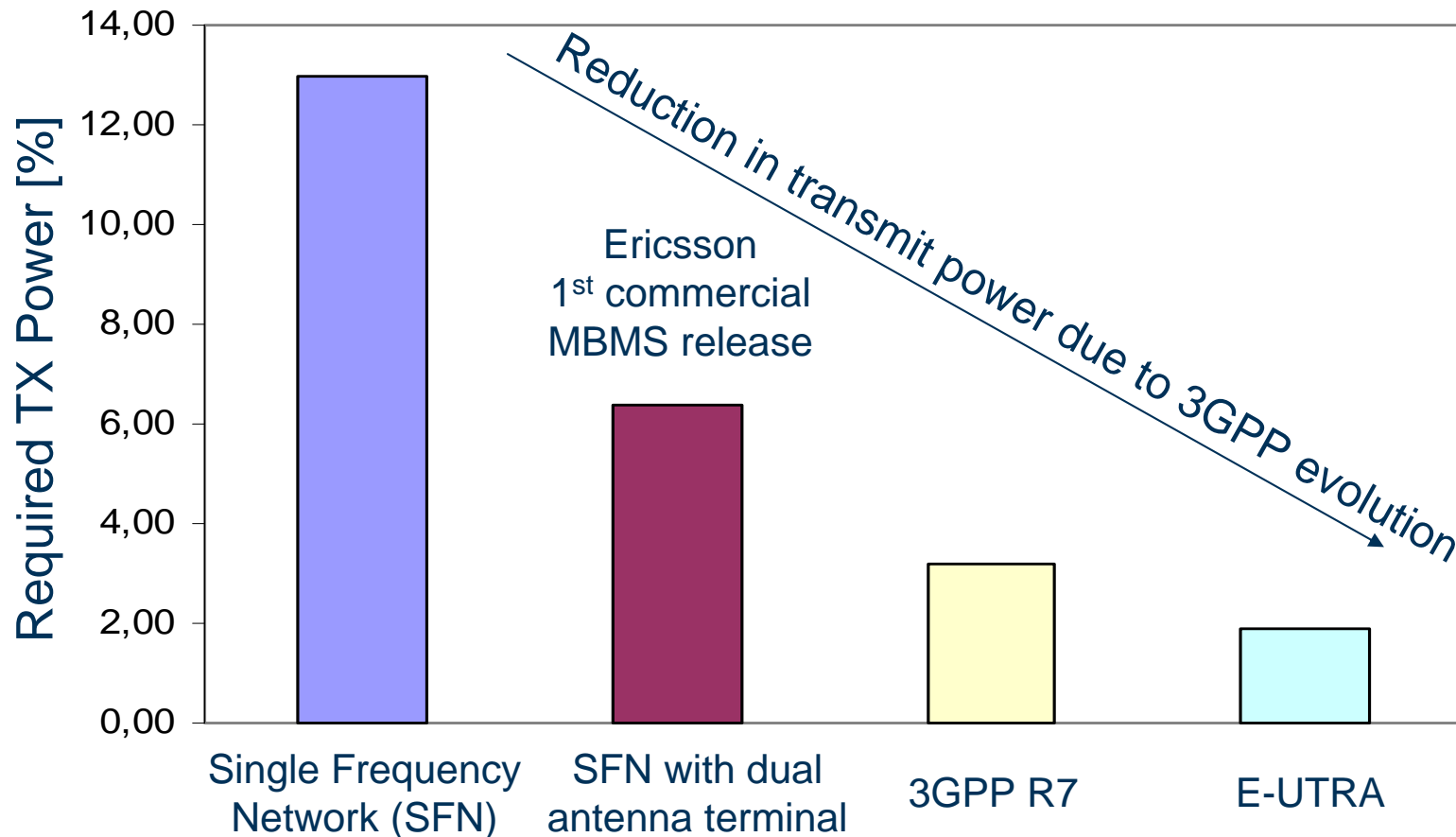
MBMS allows flexible control about time and geographical area

- MBMS Service Area defines a set of base stations over which a service is broadcasted
- Session Start / Session Stop command are used to decide when a service is multicasted / broadcasted
- Supports “broadcast on-demand” e.g. broadcast is only switched on if there are enough users demanding the same content

3GPP/MBMS broadcast capacity

Per 5 MHz carrier

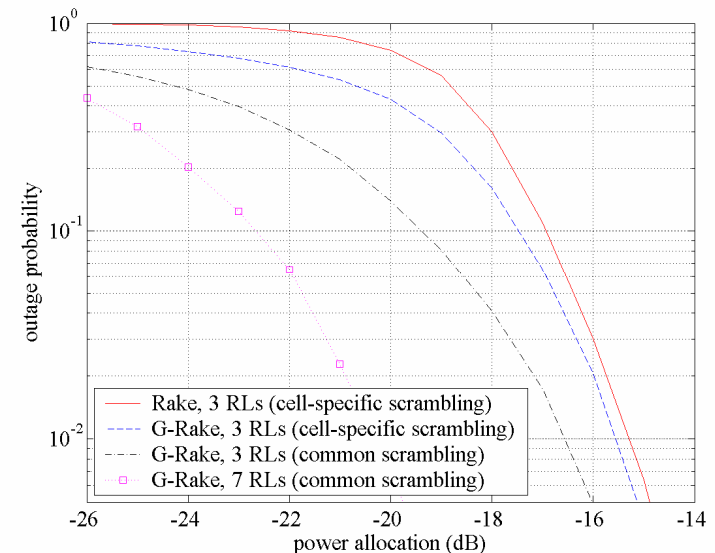
# of channels @ 128 kbps	6	12	24	40
# of channels @ 256 kbps	3	6	12	20



Cell Common Scrambling

Proposed for 3GPP R7

- In 3GPP R6 each cell uses its own scrambling code.
- Even if the same content is transmitted from multiple cells, their signals will interfere due to the scrambling.
- Cell Common Scrambling (Ericsson 3GPP proposal)
 - Superimposed signal looks like multipath
 - HSDPA terminals under development can constructively combine individual signals
- Capacity gain up to factor 3

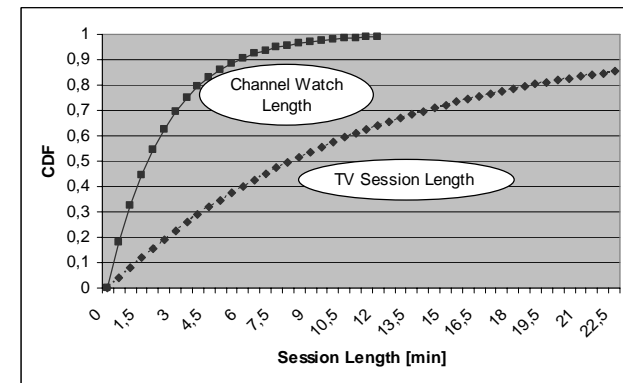
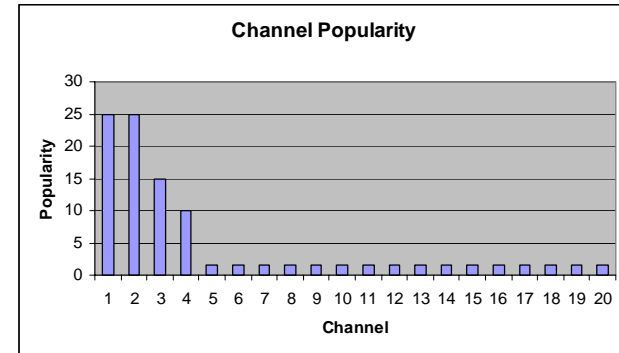


MBMS in E-UTRA (LTE)

- OFDM downlink bandwidth 1.25, 1.6, 2.5, 5, 10, 15 or 20MHz
 - “Resource aggregation” supported to exploit even wider variety of channel bandwidth (e.g. 5MHz+2.5MHz could be suitable for 8MHz channels)
- MBMS designed into the system from the start
- Capacity gains achievable by multi-cell SFN broadcasting an essential design criterion
- Support of MIMO to increase achievable cell data rate in multi cell SFN broadcasts where cell edge SINR and diversity is high
 - Mandatory receiver antenna diversity
- Turbo coding (vs convolutional coding in DVB-H)

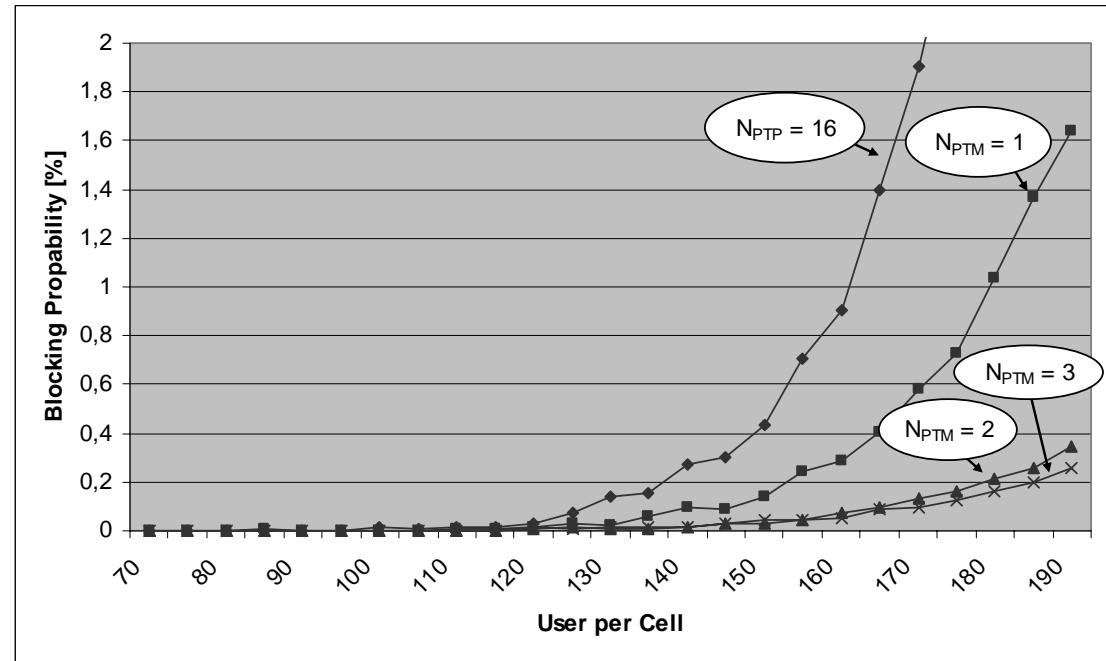
Traffic modeling for hybrid unicast / broadcast TV delivery

- Given a certain traffic pattern, what is the best unicast / broadcast mix?
- Input
 - Channel popularity and bitrate
 - Session length and zapping behaviour
 - Unicast capacity (expressed in Erlang)
 - MBMS capacity
- Outcome: blocking probability versus TV user density



Simulation results

Hybrid HSDPA / MBMS
TV service delivery for
20x 128 kbps channels



- Unicast works well for up to 170 TV subscribers per cell
 - Corresponds to almost 30% of the addressable market assuming a user density of 600 users per cell
- Significant drop in blocking probability from introducing just one broadcast bearer
- 2 broadcast bearers give the best compromise

Conclusion

- Future services require tight integration between unicast and broadcast, invisible to the end-user
- MBMS: 6 channels @ 256 kbps per 5 MHz during 2007/2008, ongoing MBMS evolution in 3GPP
 - Common cell scrambling code
 - MIMO, turbo coding
- Efficient approach for TV delivery: hybrid HSDPA / MBMS broadcast transmission
 - 2-3 broadcast bearers sufficient in the beginning

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