

Multicast/Broadcast Technologies for the Mobile Video Market

2 Convegno nazionale sulla Mobile Television

Presented by

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Agenda

Multicast/Broadcast Technologies

Mobile TV Services

Available Technologies

Deeper in Technologies

Market Deployments

Summary

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Mobile TV \neq Normal TV

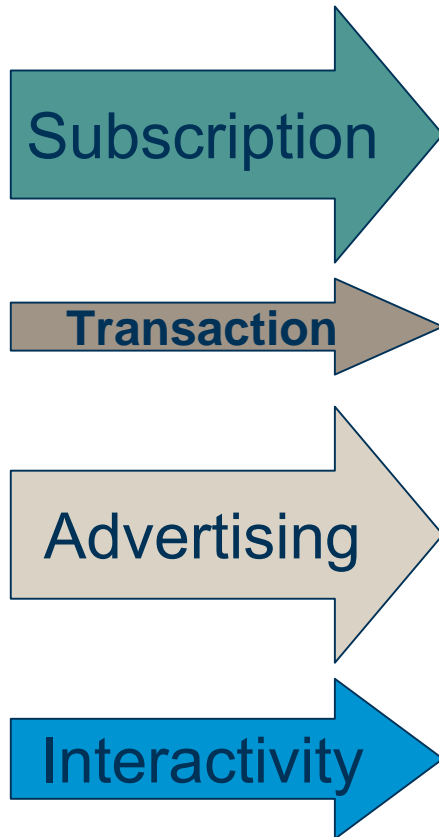


Family Watching



Personal Watching
Different user behaviour
→ Different Use Cases

Different revenues for Mobile TV



- Subscription and Advertising models are expected to be dominant
- Advertisement can be tailor made per user further provides an attractive advertising channel
- Interactivity provides additional revenues and a clear differentiator
- All combinations and extremes can be visioned
 - Free TV paid by advertising
 - Pure subscription based
 - Combinations

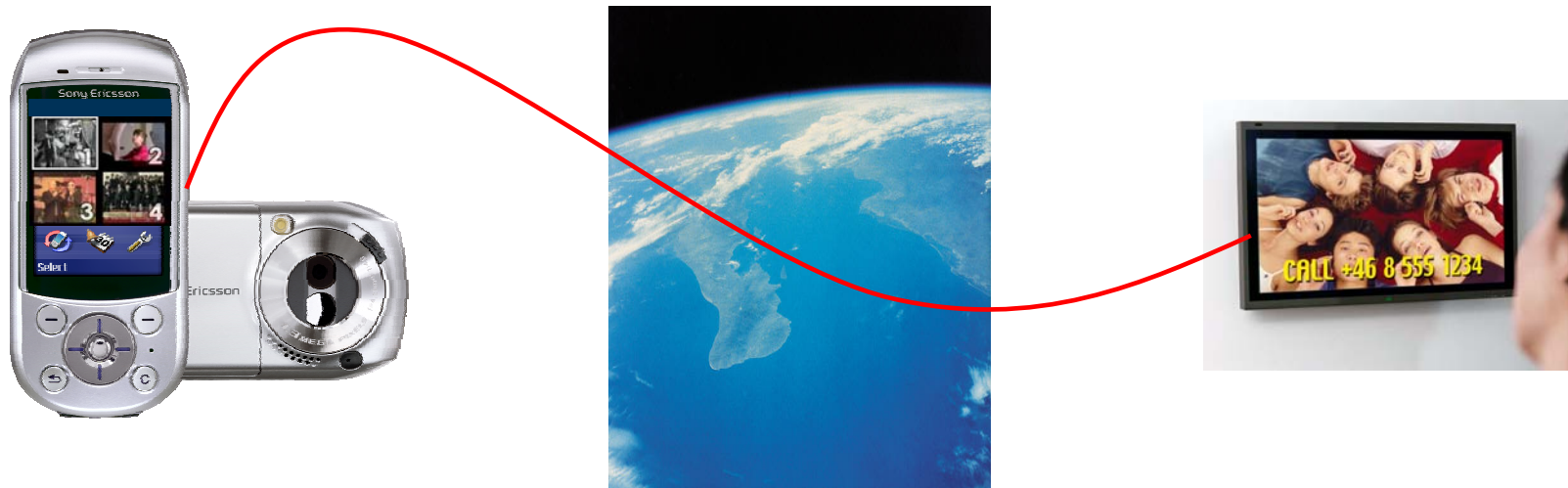
“La Tentazione”: il Mobile Triple Play



Examples of Converged IPTV – Mobile Remote Control

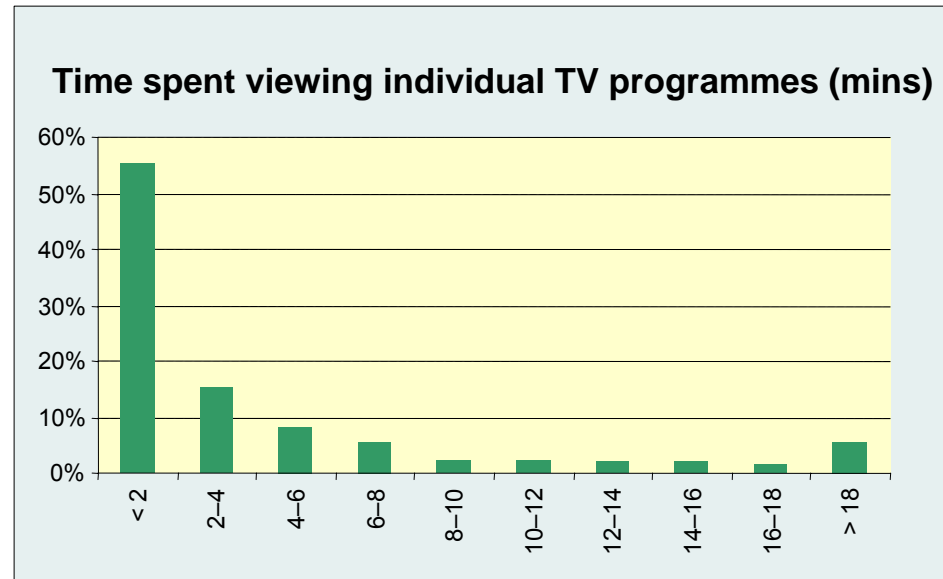
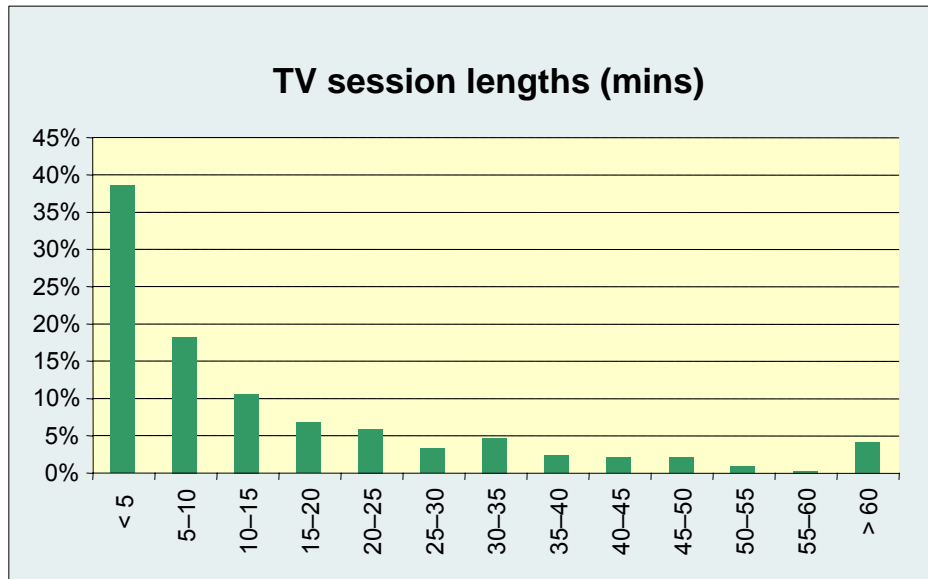
Make the Remote Control truly Remote and Mobile:

- Watch TV on Mobile (3G) with channels switching while on the go
- Switch channel on you home-TV (2G/3G) when at home
- Initiate network- or STB-based PVR recording / timeshifting (2G/3G) at home or while on the go
- Interactive TV both when Mobil (3G) and at home (2G/3G)



MobileTV Usage Pattern

... is different from traditional TV viewing



Source: Press release and study results from DVB-H pilot

Short sessions, little time spent on individual TV programs

Different Mobile TV services Analysis

Different Mobile TV services Analysis

TV-on demand
(streaming)

- "Video-on-Demand"

TV-on-demand
(download)

- "Video-on-Demand"

Different Mobile TV services Analysis

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Push-TV
(event based
download)

- Ex: MMS video
Breaking News

Push-TV
(schedule based
download)

- Ex: EZTV

Different Mobile TV services Analysis

TV-on demand
(streaming)
•"Video-on-Demand"

Live-TV-alert
•Ex: SMS alerting
CNN Breaking News

Live TV
•"Regular TV"
program on mobile

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Different Mobile TV services Analysis

User distribution control

TV-on demand (streaming)
•"Video-on-Demand"

TV-on-demand (download)
•"Video-on-Demand"

Live-TV-alert

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CNN Breaking News

Live TV

- "Regular TV" program on mobile

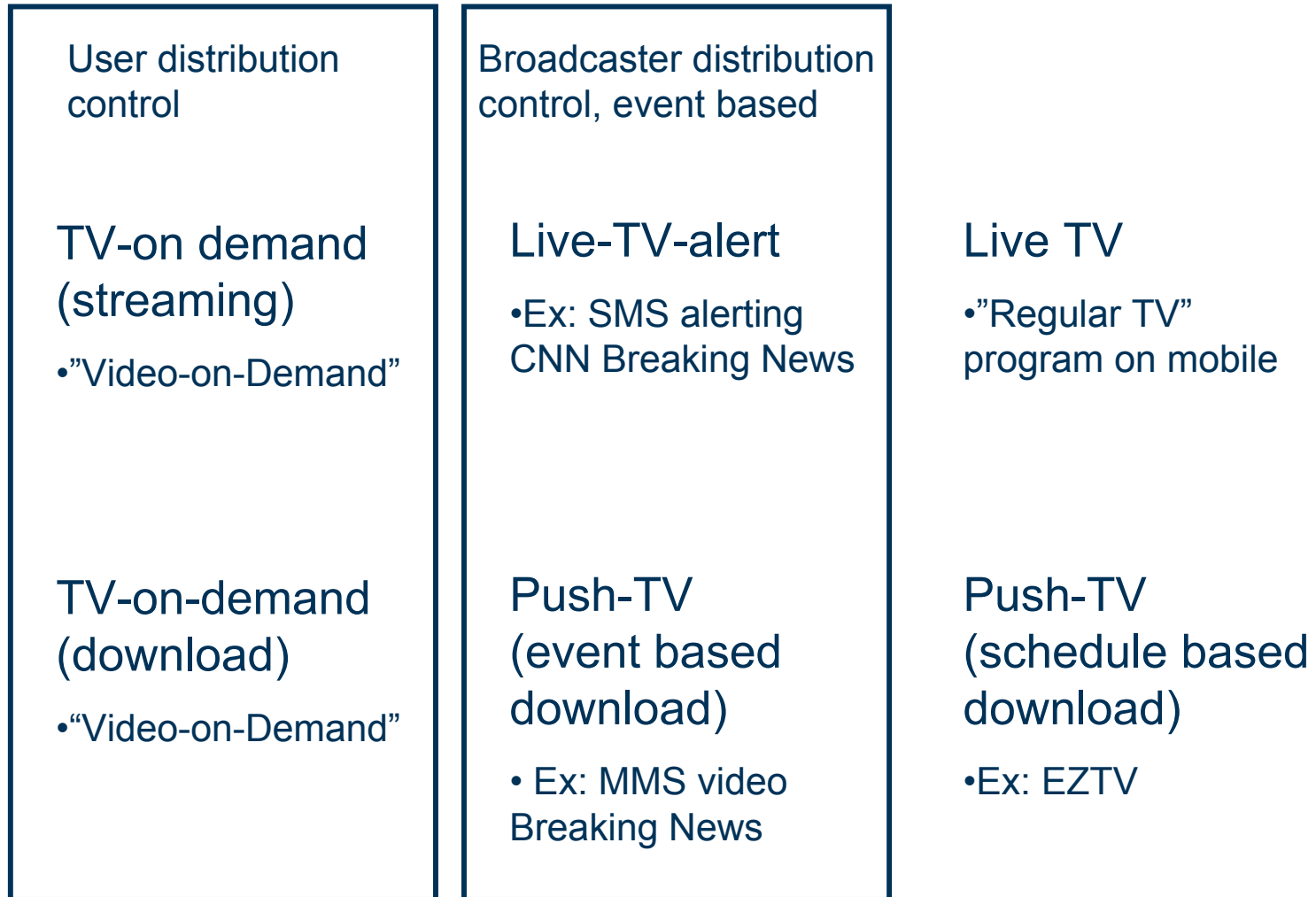
Push-TV (event based download)

- Ex: MMS video
Breaking News

Push-TV (schedule based download)

- Ex: EZTV

Different Mobile TV services Analysis



Different Mobile TV services Analysis

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Different Mobile TV services Analysis

	User distribution control	Broadcaster distribution control, event based	Broadcaster distribution control, schedule based
Consumption time = Distribution time	<p>TV-on demand (streaming)</p> <ul style="list-style-type: none"> •"Video-on-Demand" 	<p>Live-TV-alert</p> <ul style="list-style-type: none"> •Ex: SMS alerting CNN Breaking News 	<p>Live TV</p> <ul style="list-style-type: none"> •"Regular TV" program on mobile
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Mobile TV Services

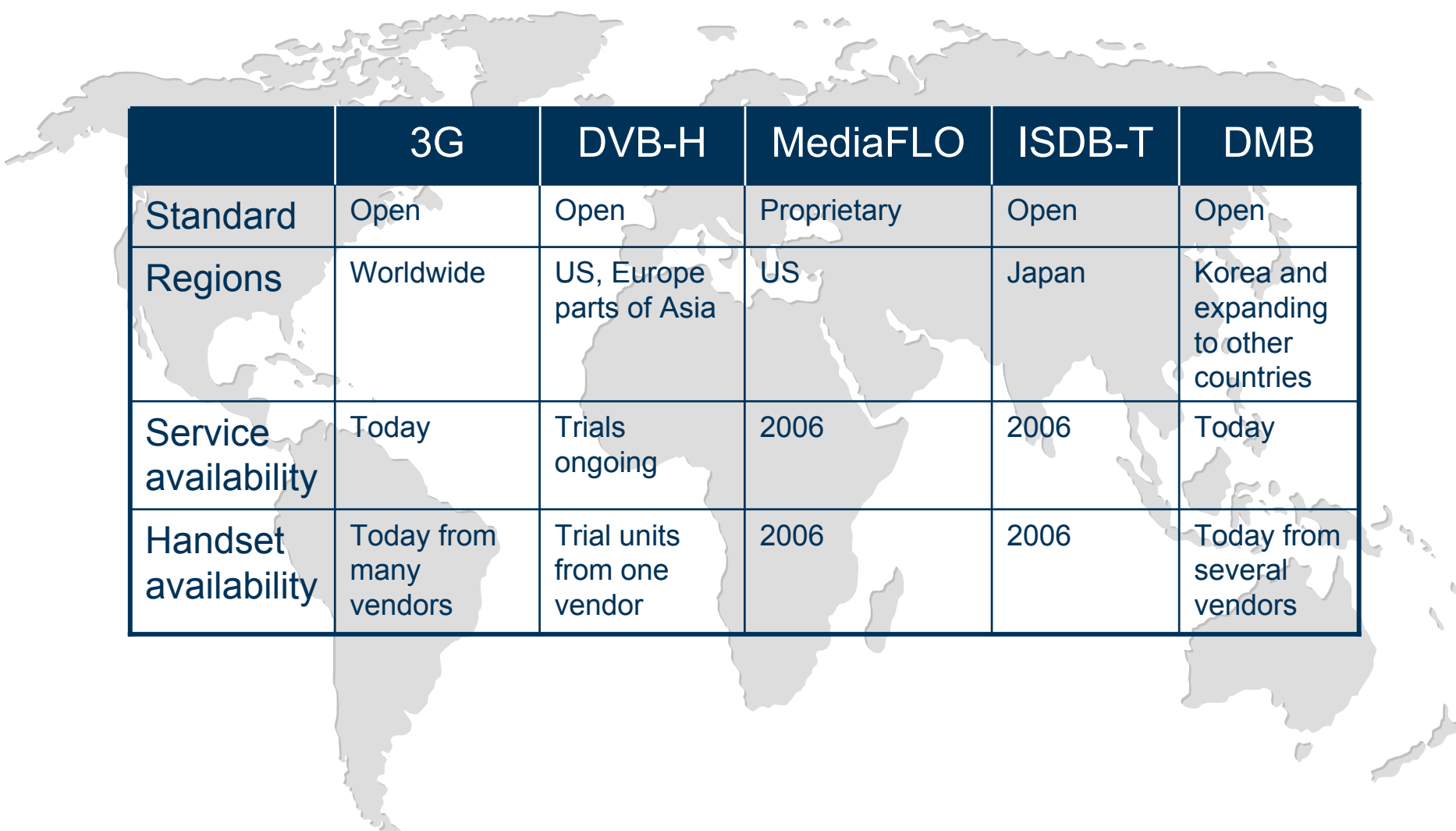
Available Technologies

Deeper in Technologies

Market Deployments

Summary

Mobile TV which standard?



	3G	DVB-H	MediaFLO	ISDB-T	DMB
Standard	Open	Open	Proprietary	Open	Open
Regions	Worldwide	US, Europe parts of Asia	US	Japan	Korea and expanding to other countries
Service availability	Today	Trials ongoing	2006	2006	Today
Handset availability	Today from many vendors	Trial units from one vendor	2006	2006	Today from several vendors

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Providing Mobile TV in 3G network

The obvious choice for the mobile operator

- Unicast streaming is in service already today
 - TV-like services over the mobile network
 - Content providers are adapting to the small form factor for size and time
 - Unicast does not scale well to many simultaneous users

- Multi/Broadcast Multimedia Services (MBMS)
 - Capacity booster
 - Provides the same content to unlimited number of users via multicast or broadcast
 - Beneficial for a few number of channels that attracts many users
 - Services in the full control of the mobile operator
 - Relatively low available bandwidth per channel

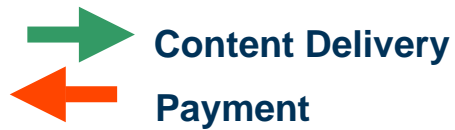
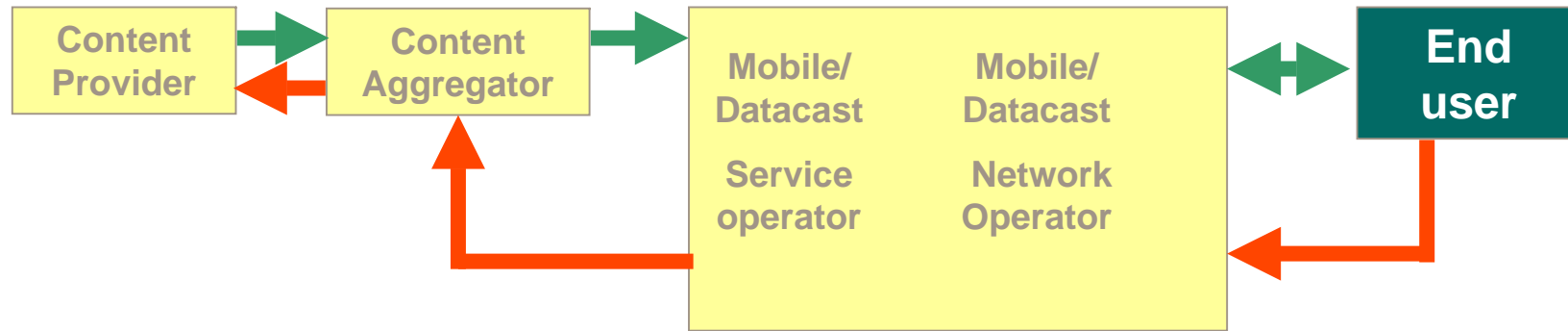
DVB-H and IP Datacasting

The non-cellular alternative

- DVB-H (Handheld) based on DVB-T (Terrestrial)
- Provides enough bandwidth for high quality audio and video broadcast to mobile terminals
- Does not mandate return channel, could be TV receiver without mobile telephone functionality
- DVB-H standardised, IPDC over DVB-H in final stages

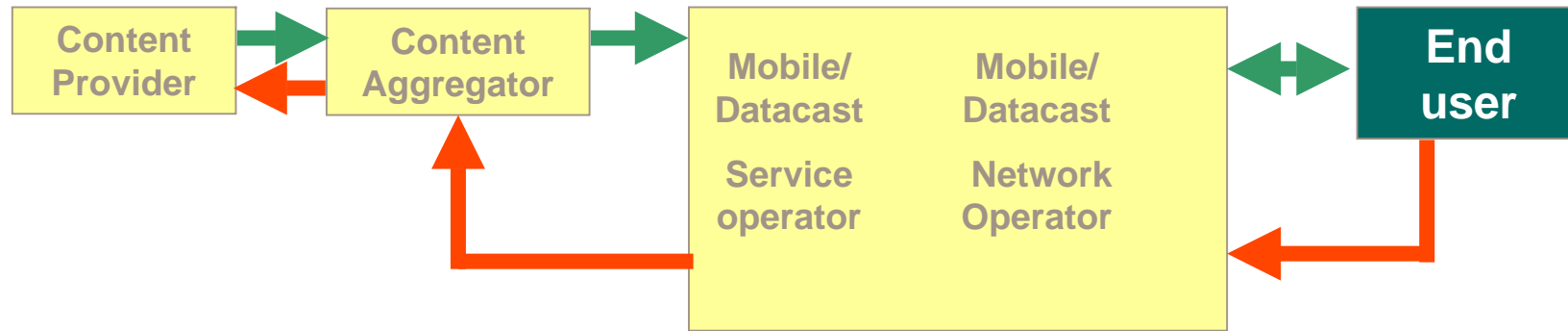
- Issues
 - Uncertainties about spectrum availability in several markets
 - Business model, including broadcaster and mobile operator
Existing terrestrial digital TV network is not enough
 - Gap fillers needed for indoor coverage
 - IPDC standard proposal could have been more stringent



Possible Business Model



Possible Business Model

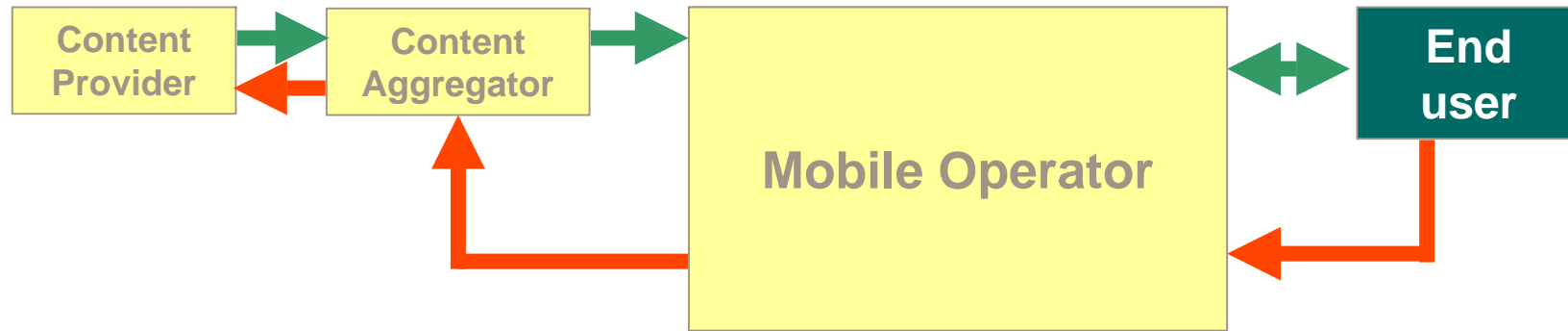
3G network enables simple Business model





 Content Delivery
 Payment

Possible Business Model

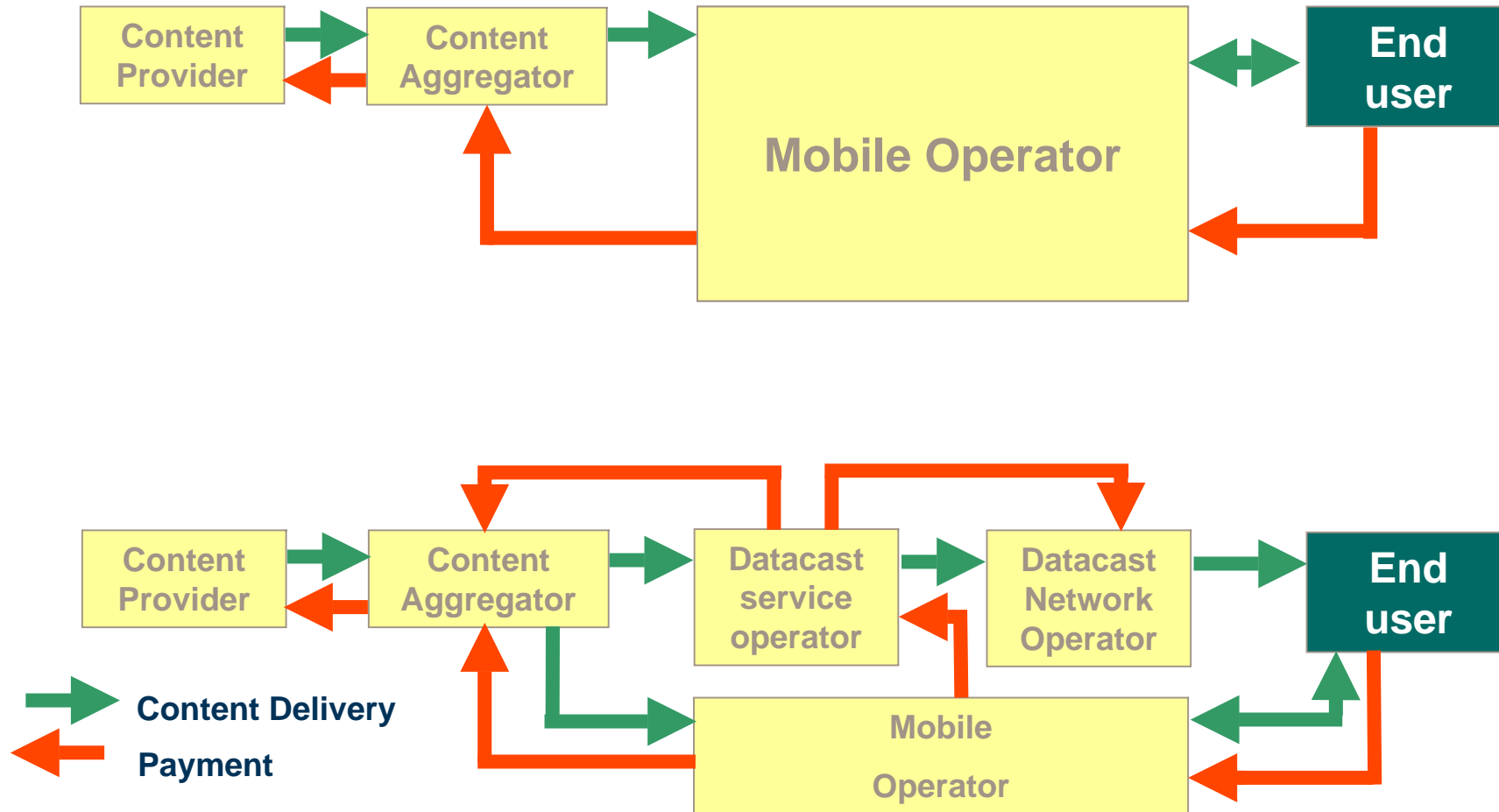
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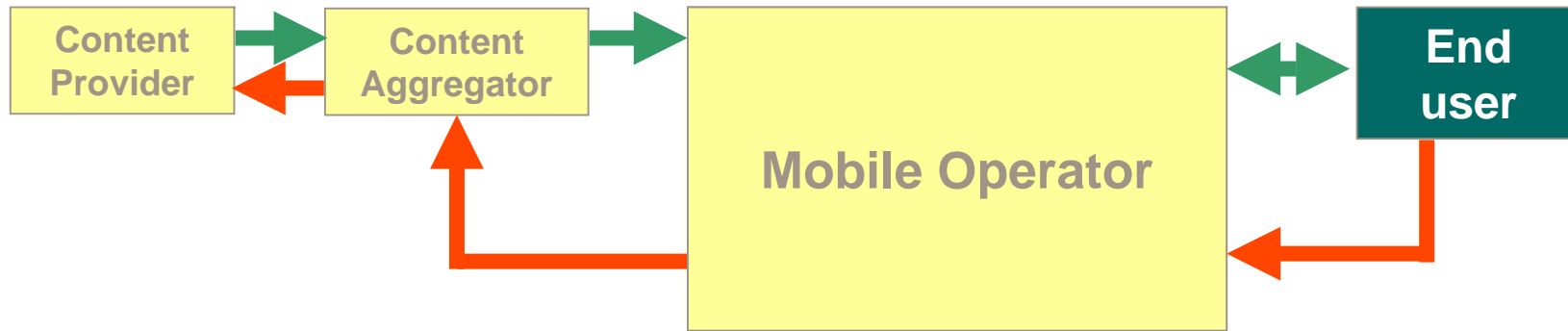
Possible Business Model

3G network enables simple Business model

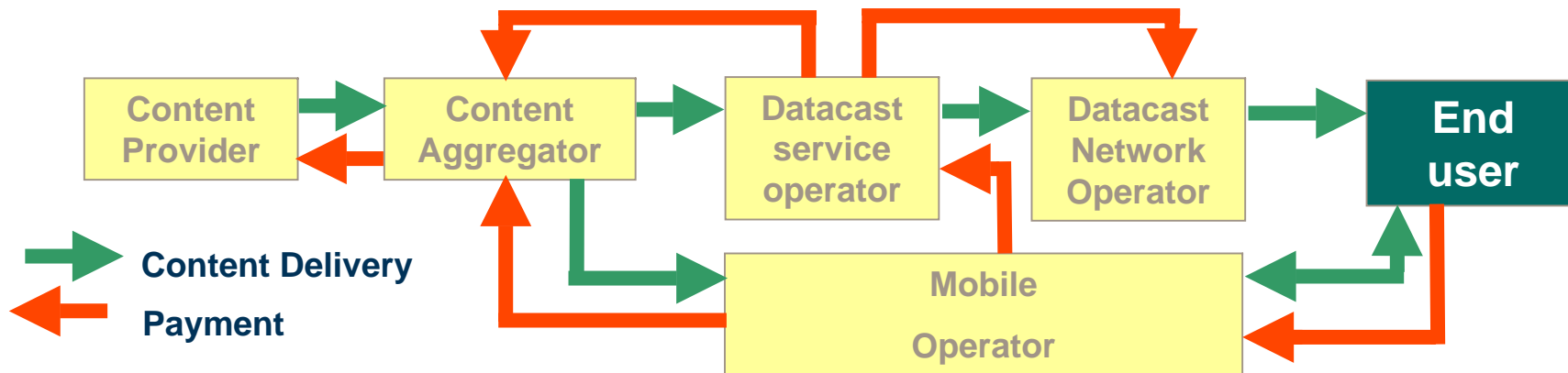


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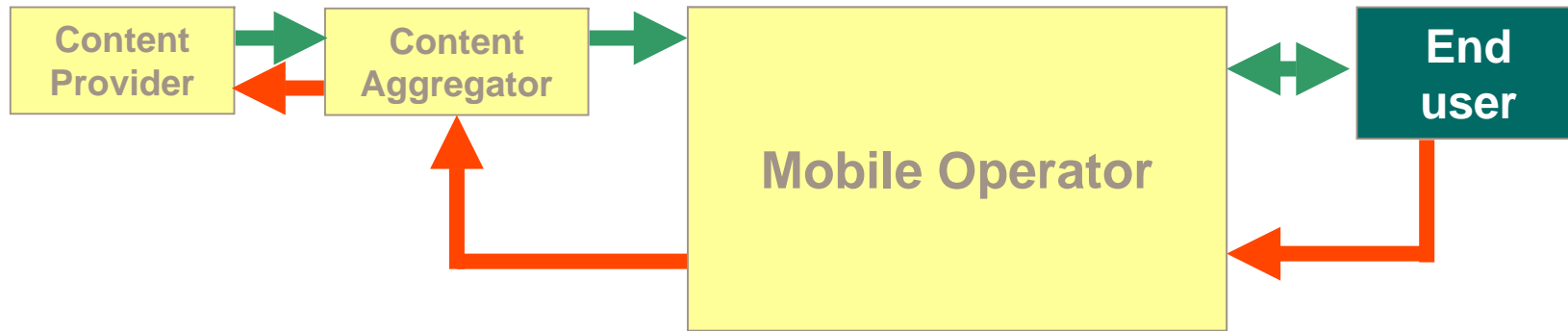


DVB-H overlays current 2G/3G generating a complicate model

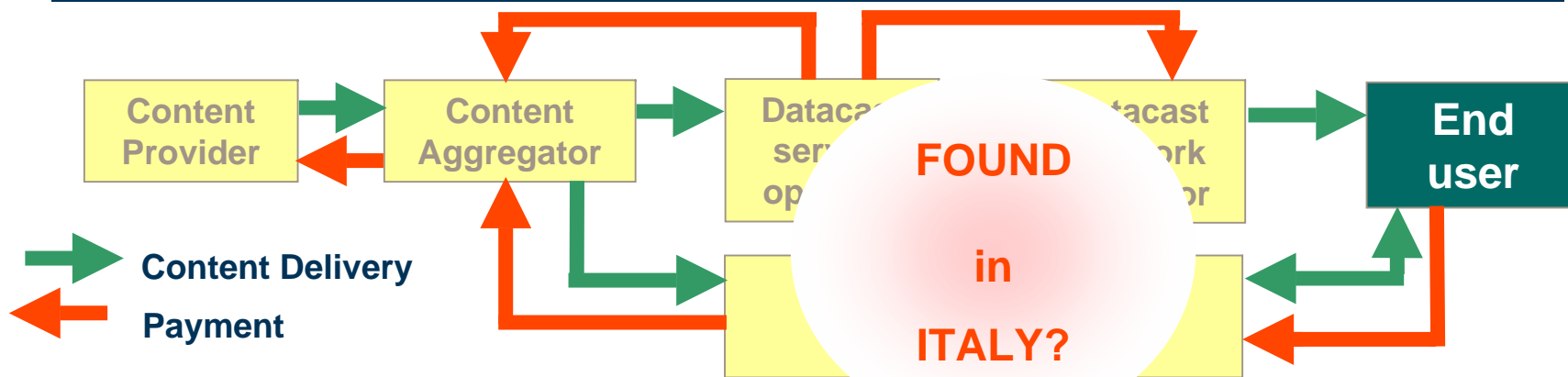


Possible Business Model

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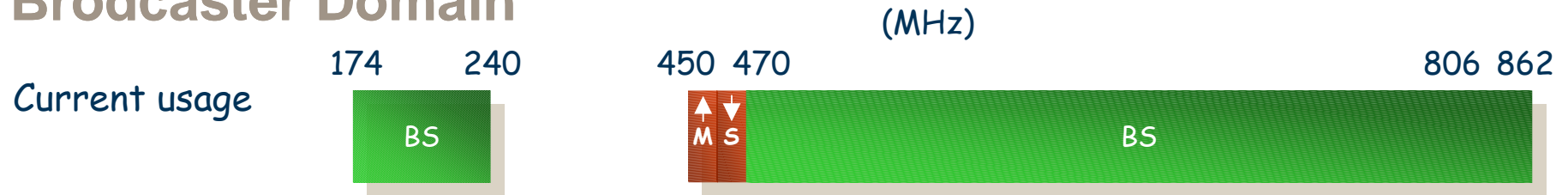
Spectrum Aspects

“Broadcaster Domain”

“3G Mobile Operator Domain”

Spectrum Aspects

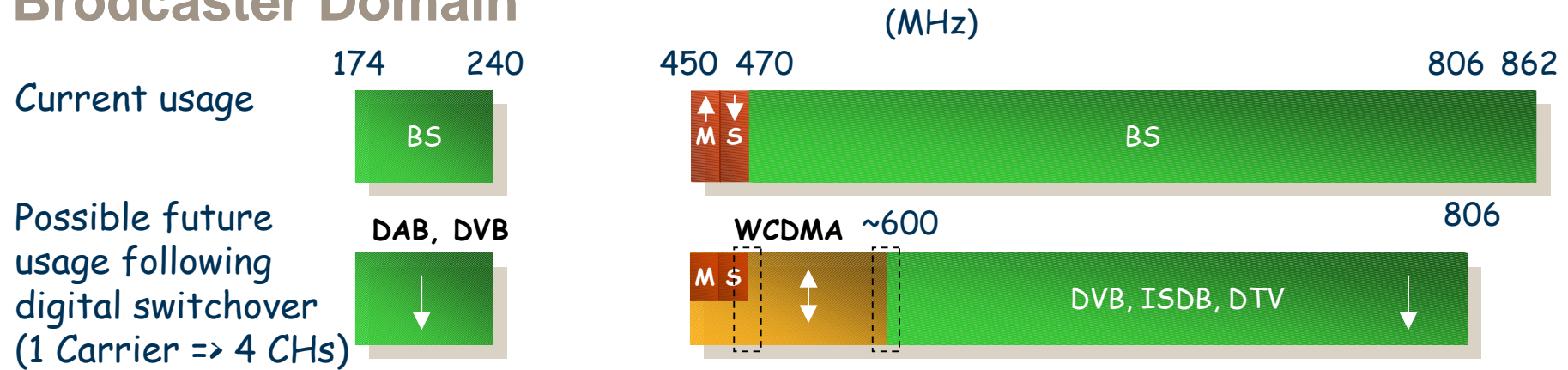
“Broadcaster Domain”



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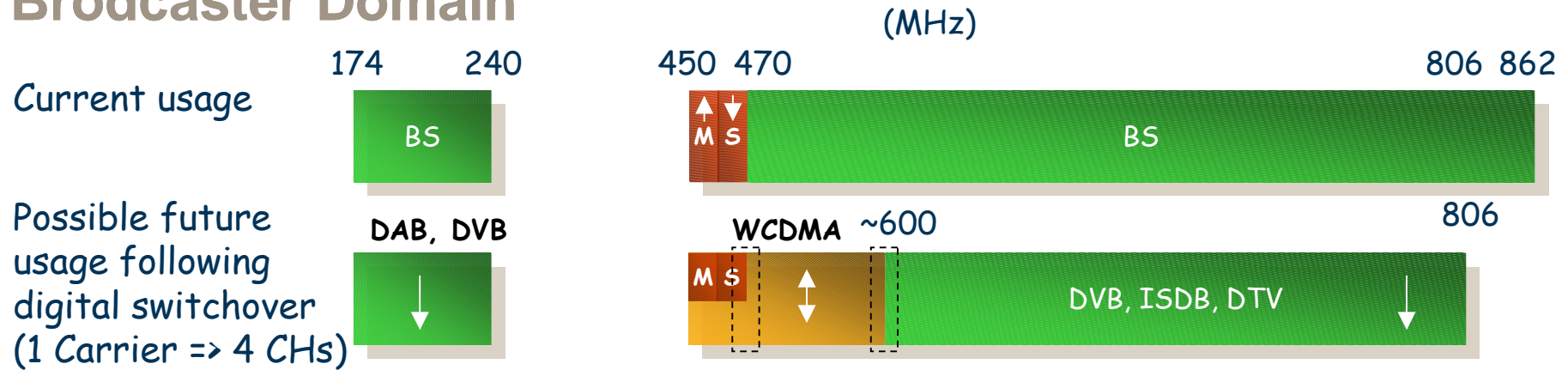
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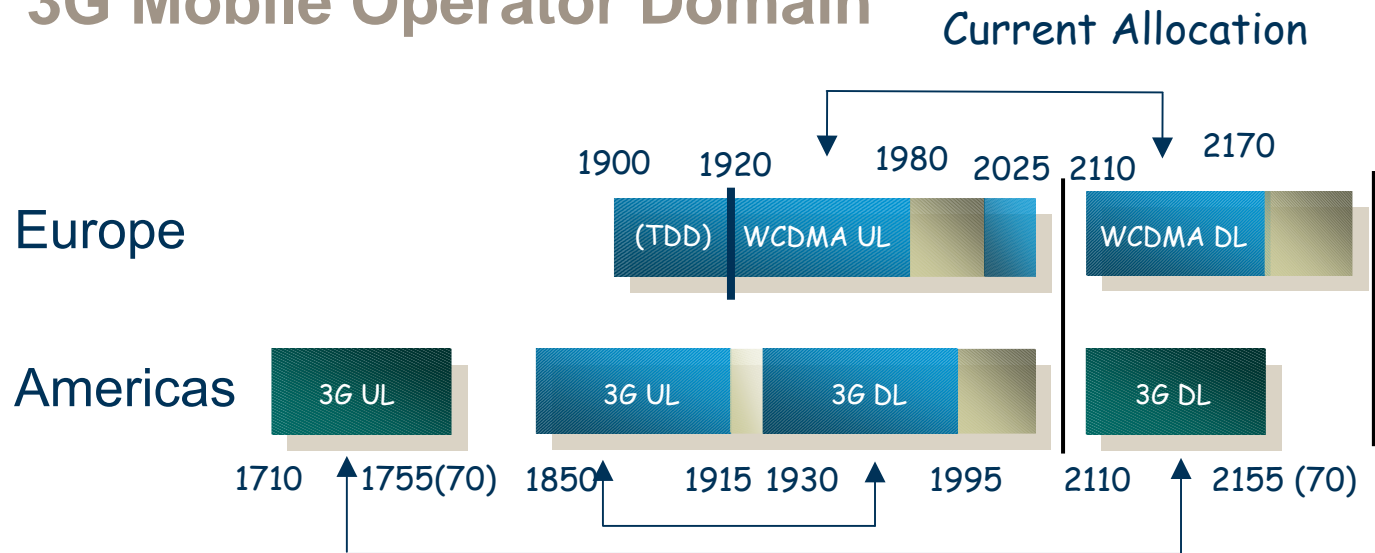
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Spectrum Aspects

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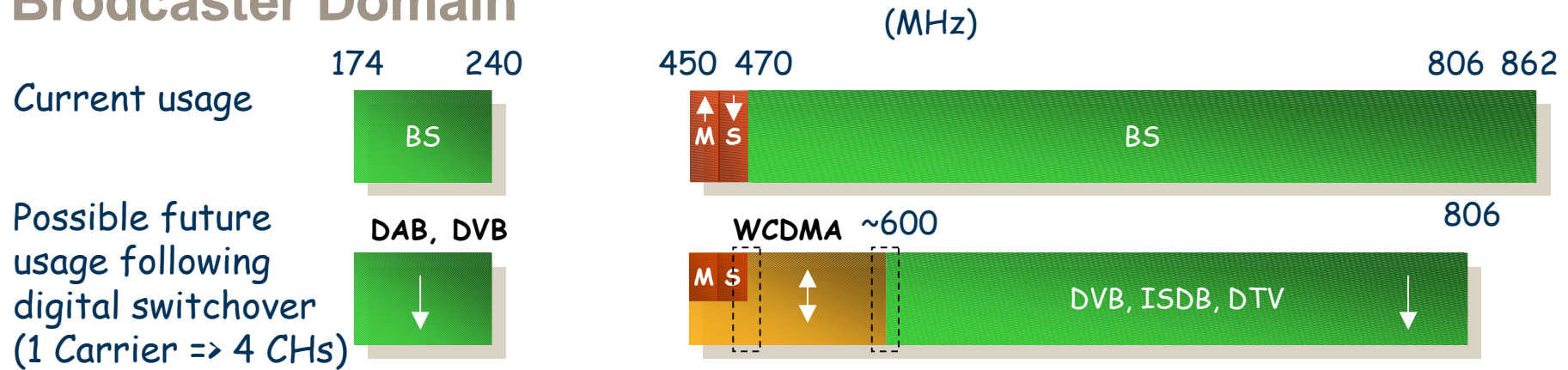


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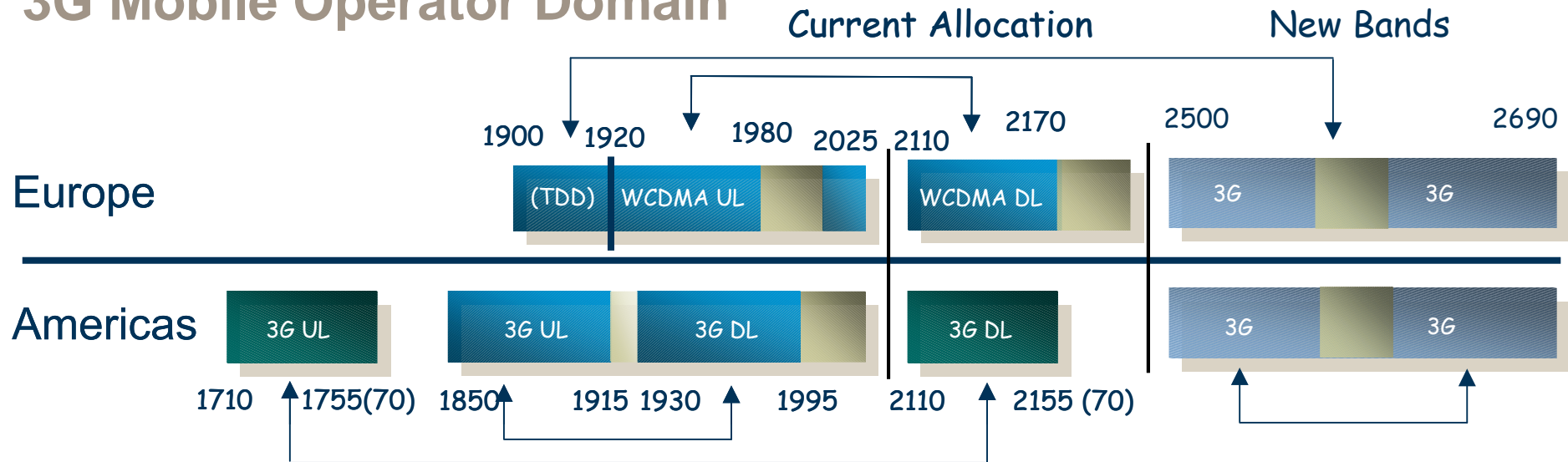


Spectrum Aspects

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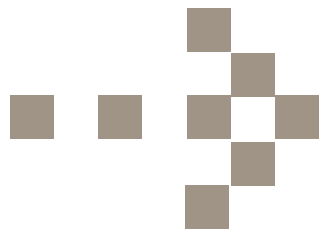
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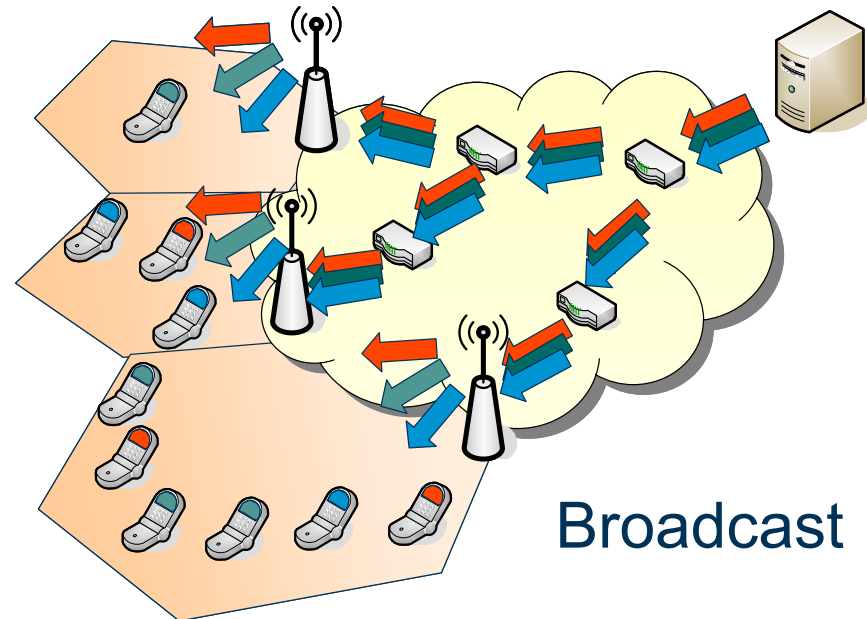
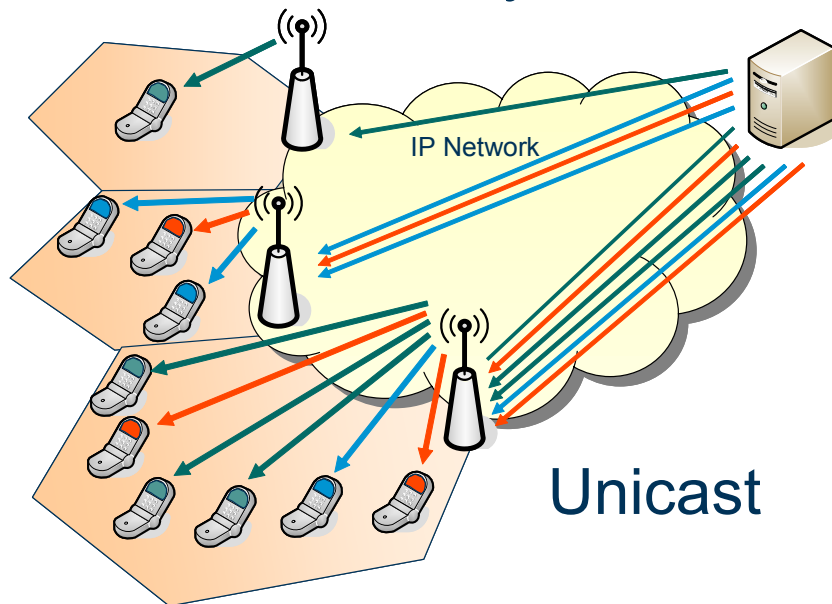
MBMS

(Multimedia Broadcast
and Multicast Services)

3G (HSDPA)

Unicast versus Broadcast

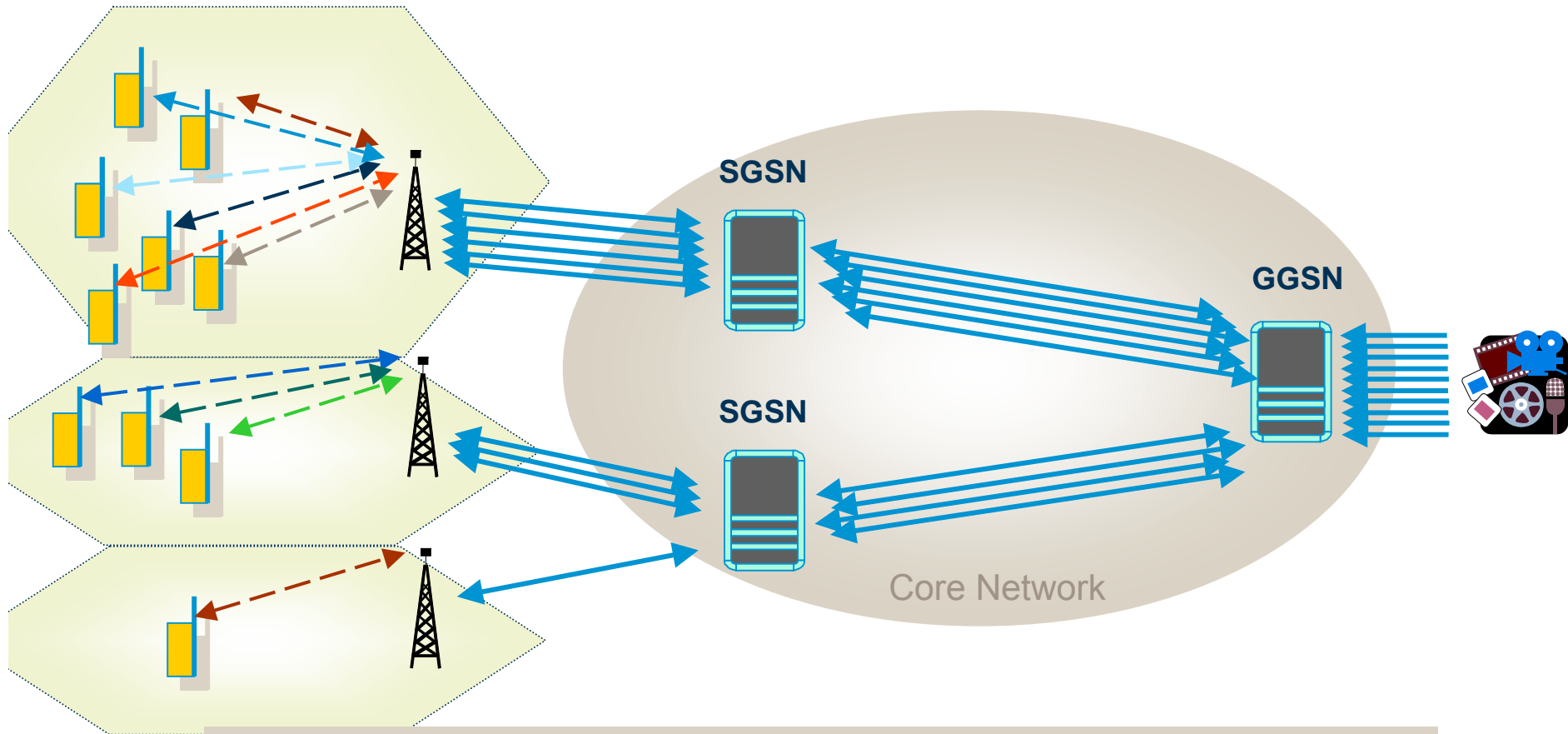
Mobile TV today



- Unlimited number of content channels
- Transport channel only used for the duration of a session, transmission can be optimized per user
- Does not scale well with the number of users

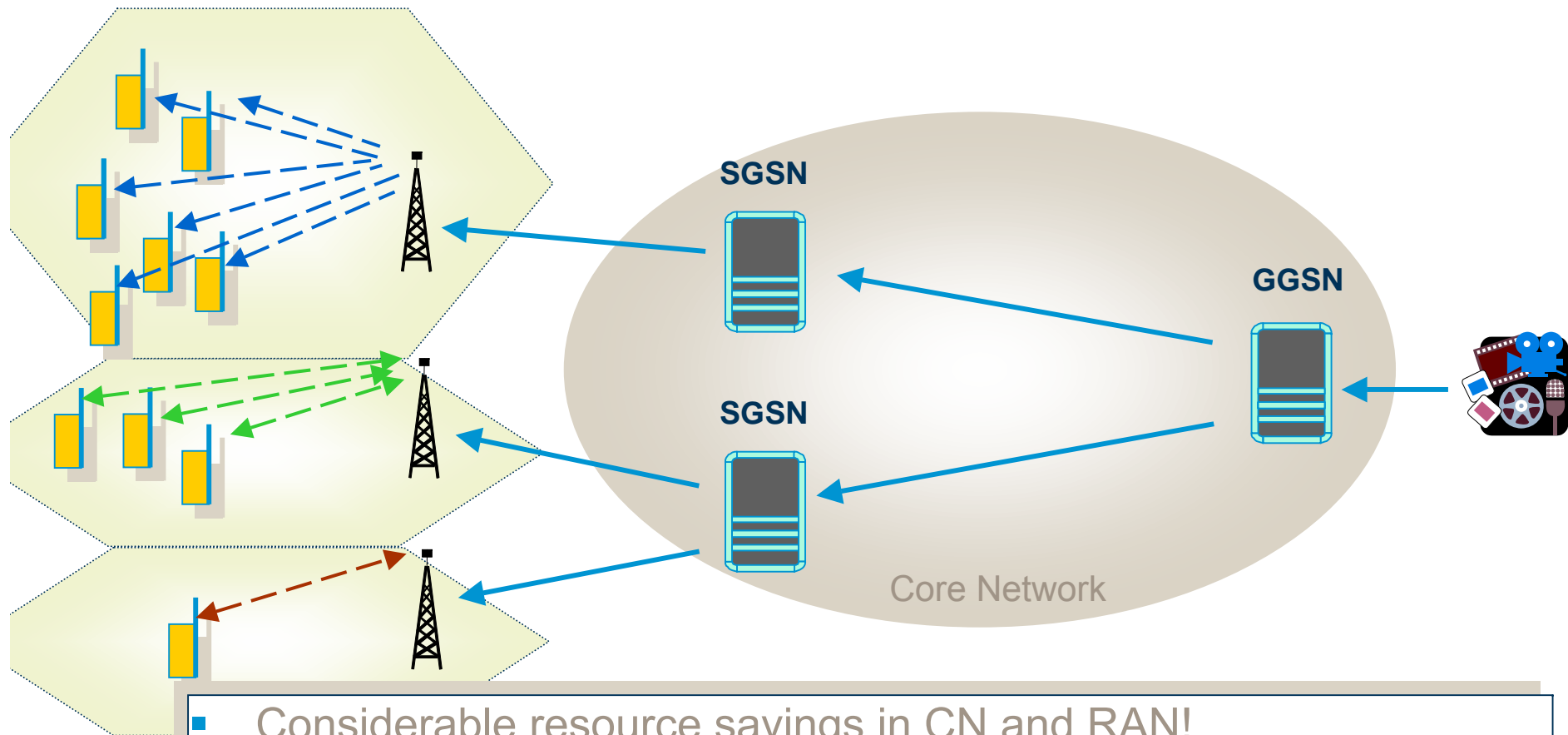
- Number of content channels is limited
- Each content channel allocates one transport channel even if no user is watching
- Resource consumption independent from number of users

Channel delivery today

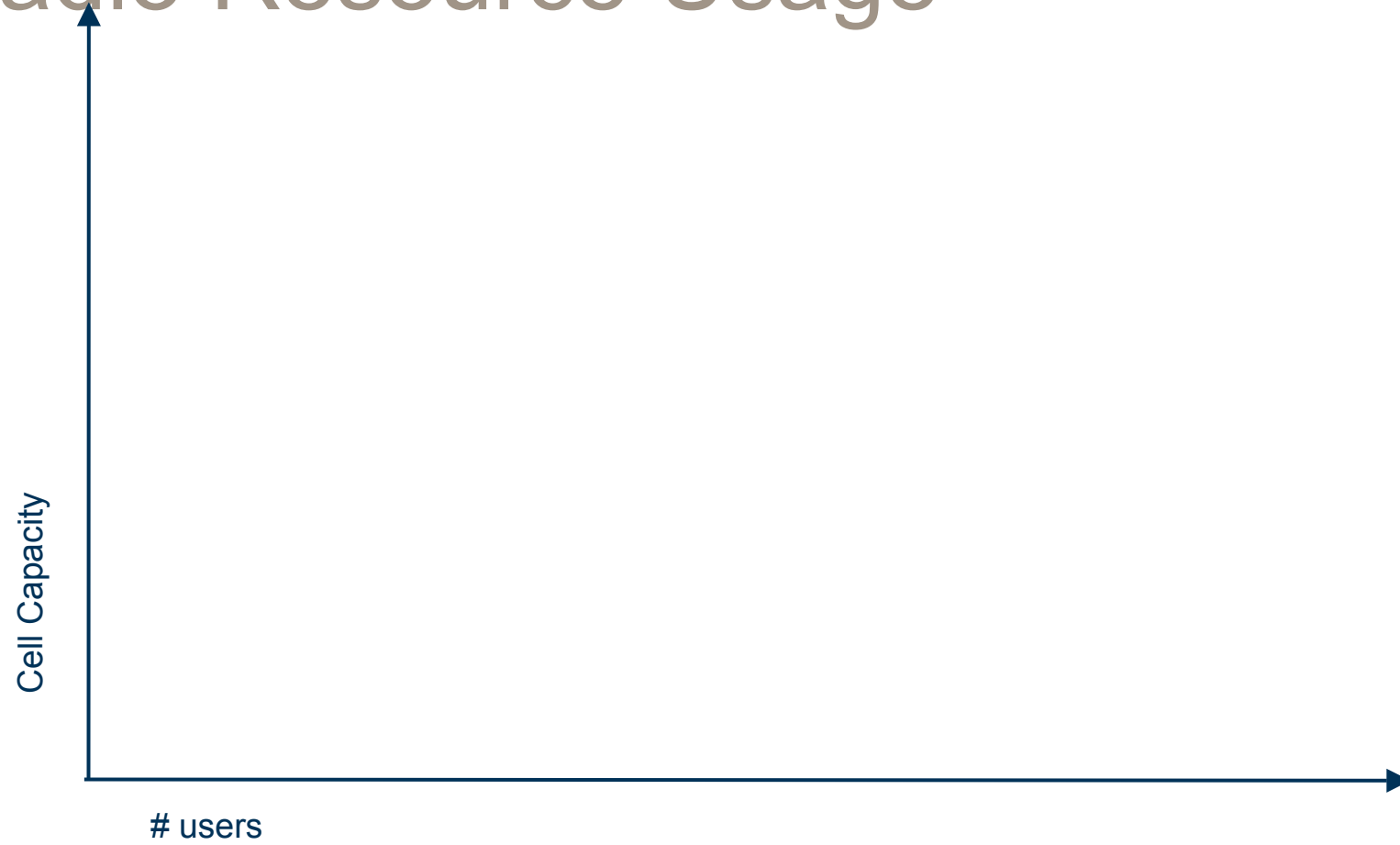


- Required resources depend on number of users
- Does not scale for large number of users (> 100.000)

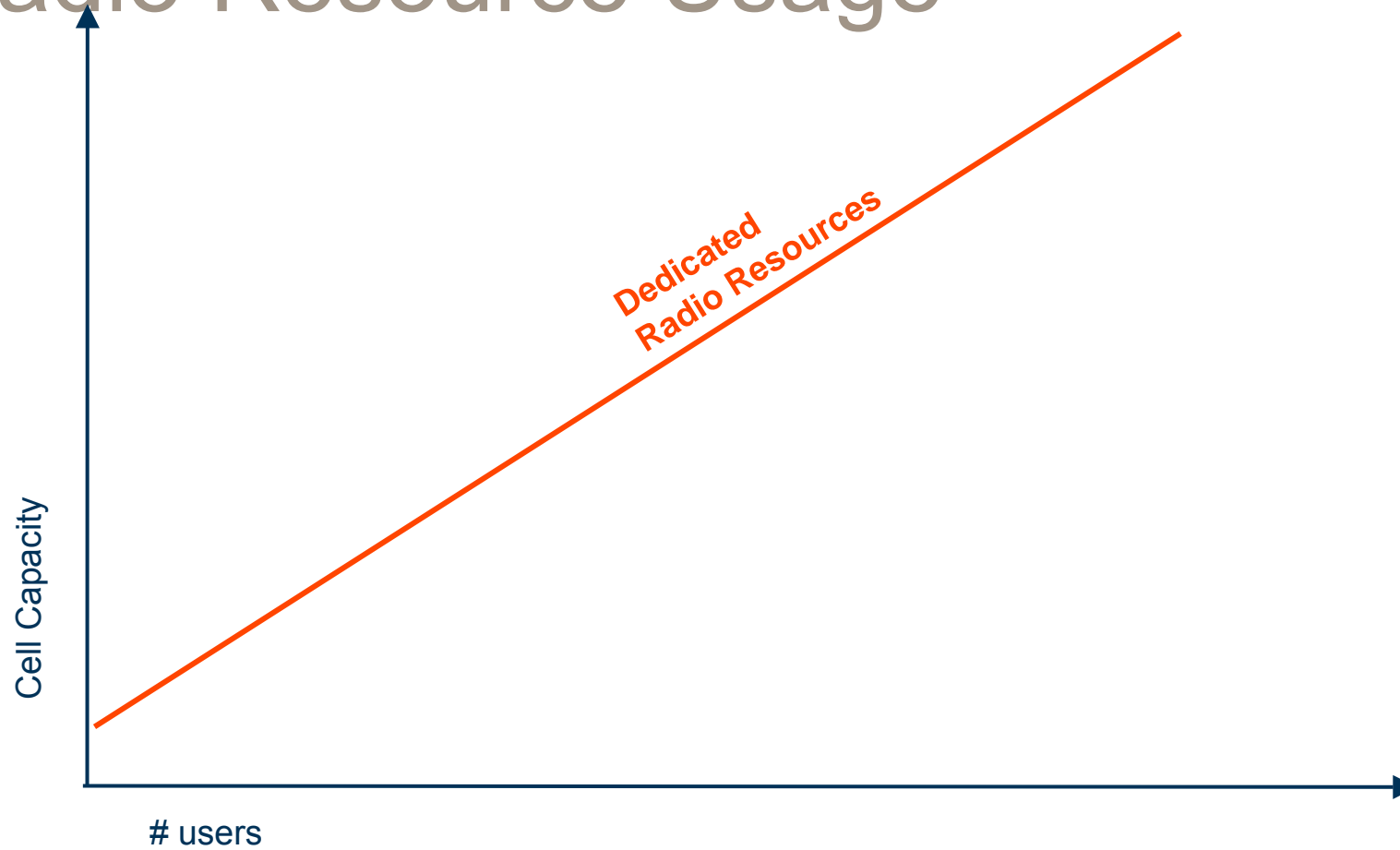
Channel delivery via MBMS



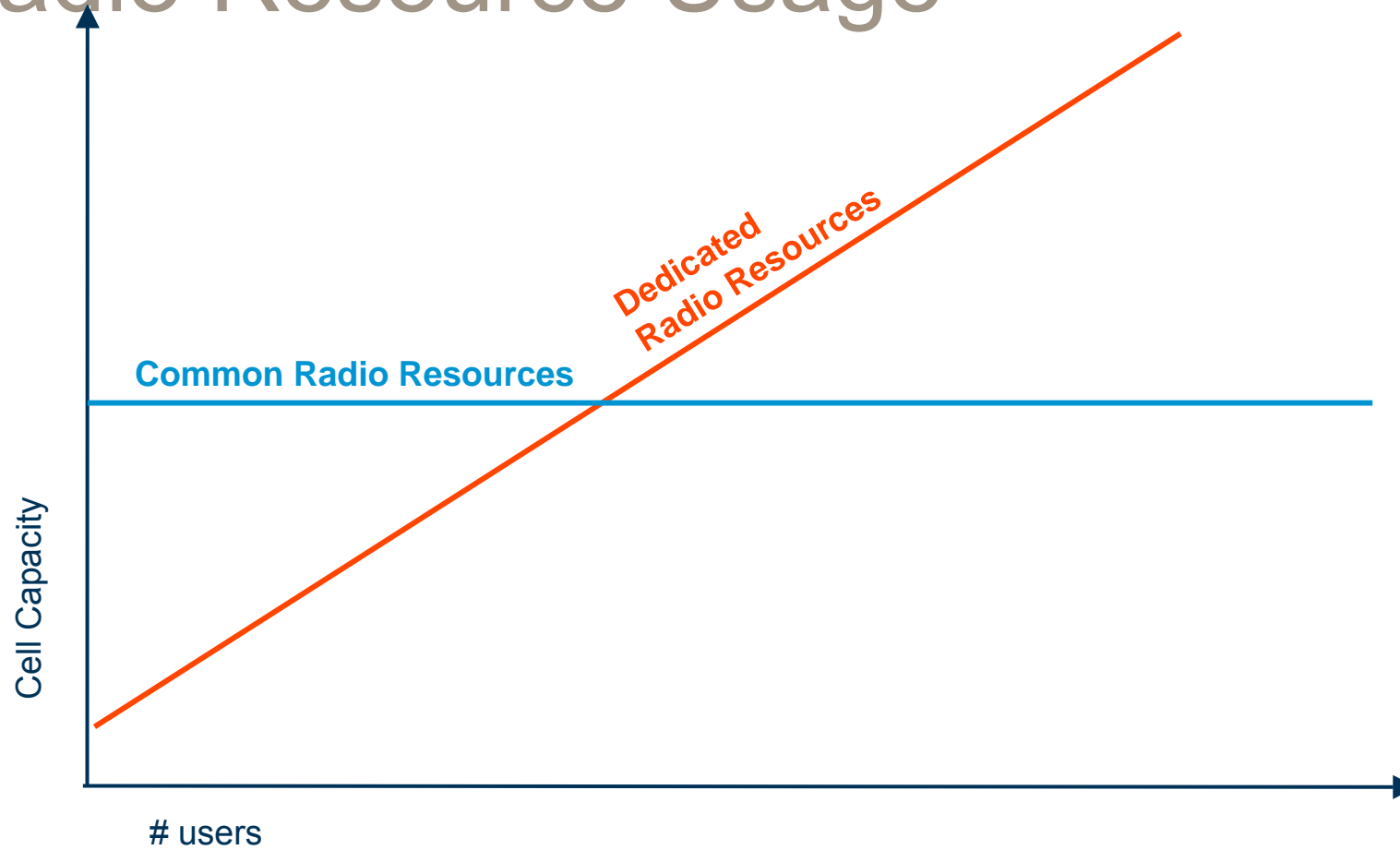
Radio Resource Usage



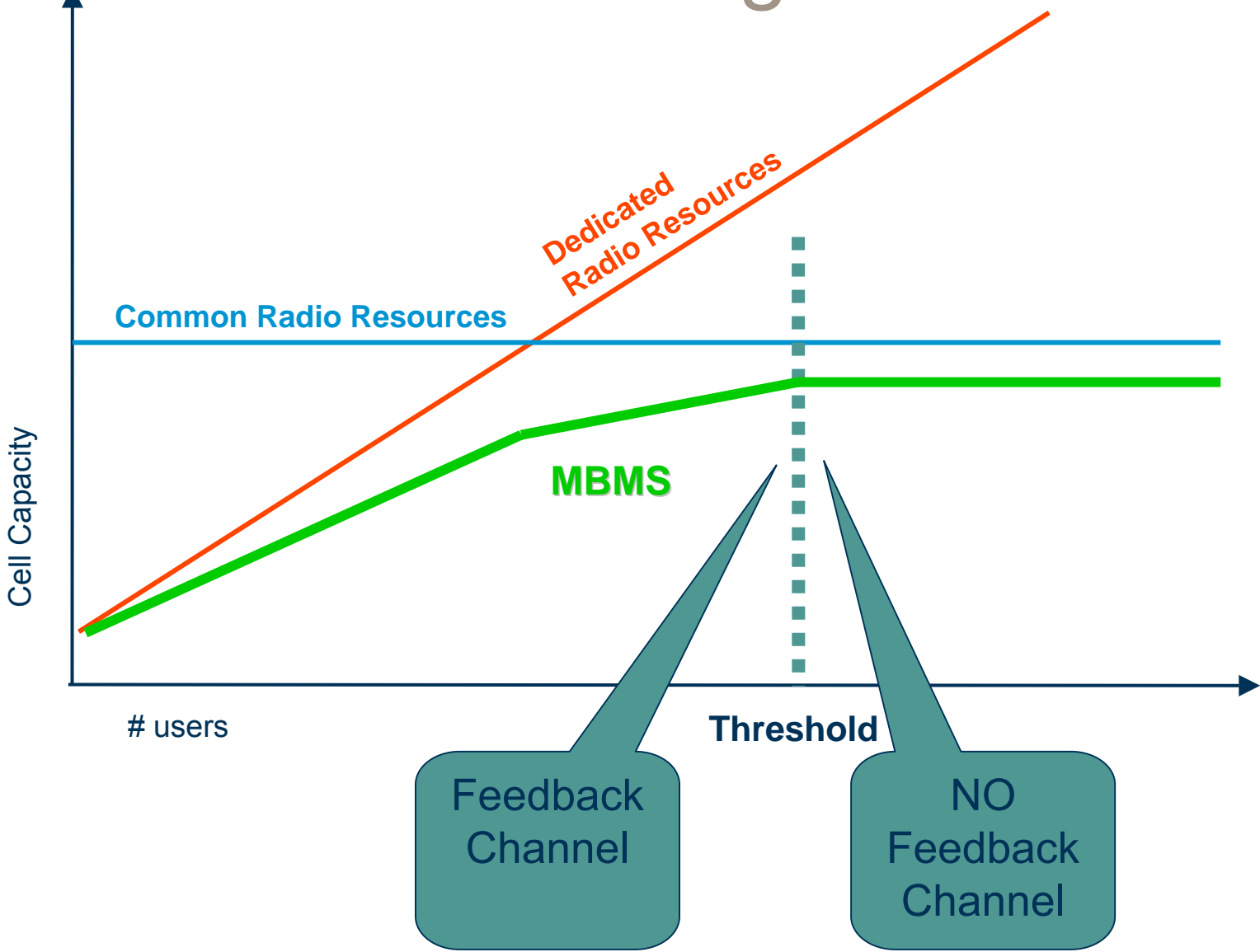
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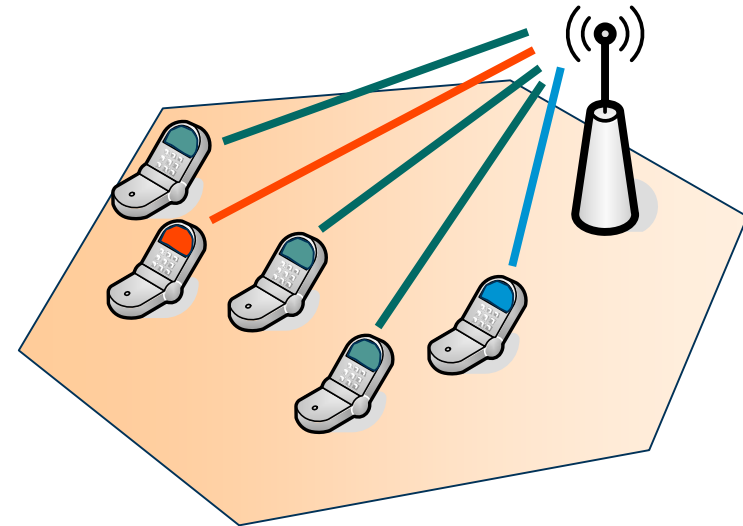
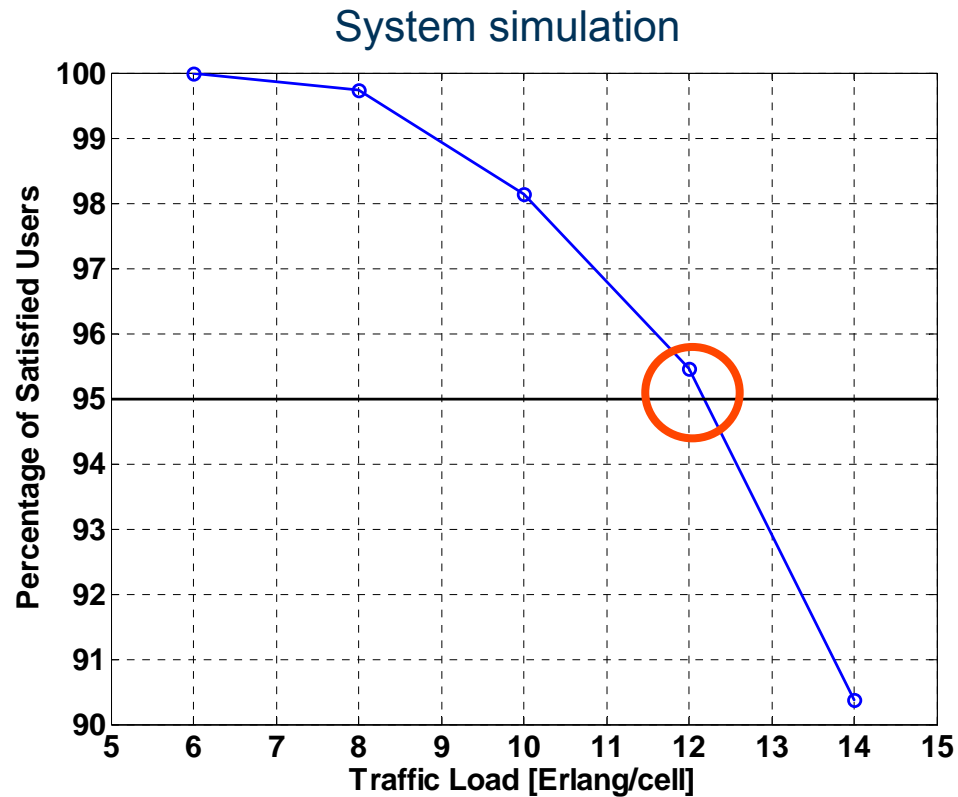
UTRAN – Below and Above the Threshold

- Below the Threshold: **DEDICATED CHANNEL**
 - using RLC ack mode
- Above the threshold: **COMMON CHANNEL**
 - FACH (Forward Access Channel)
 - Use of higher TTI (Time Transmission Interval) for optimizing transmitted power
 - Use of SC (Selective Combining) for deploying cell coverage overlapping
 - LATEST ENHANCEMENTS (now in TR 25.803 v6.0.0):**
 - Use of RAKE combining (when applicable) and Soft Combining will further enhance the performance (by 2dB or more)
 - Use of RX diversity in the terminal can further enhance the performance (by 3dB)

GERAN - Below and Above the Threshold

- Below the Threshold: **COMMON FEEDBACK CHANNEL**
 - Data are broadcasted on assigned Time Slots to all the UE's.
 - PDAN (Packet Data Ack Nack):
Up to 16 UE's can report the data reception on an common uplink shared channel
 - A repetition pattern is generated accordingly
- Above the threshold: **BLIND BLOCK REPETITION**
 - Data are broadcasted on assigned Time Slots to all the UE's
 - For guaranteeing the correct reception data are repeated N times
 - Bitrate vs. coverage has to be balanced.

Capacity of Mobile TV over HSDPA



12 Erlang available for dimensioning MobileTV at 128 kbps

How many MobileTV users on unicast?

Flat usage scenario

- Available capacity: 12 Erlang / cell (HSDPA, 128 kbps per channel)
- Assumed user density per cell in densely populated areas: 600

Usage per day (0700 - 1900 = 12 hours)	Load [Erlang]	Max users density per cell	Share of total subscriber base
Low (e.g. 2x 5 min)	~0.014	~857	~140 %
Medium (e.g. 5x 12 min)	~0.083	~144	~24%
High (e.g. 4x 20 min)	~0.111	~108	~18 %

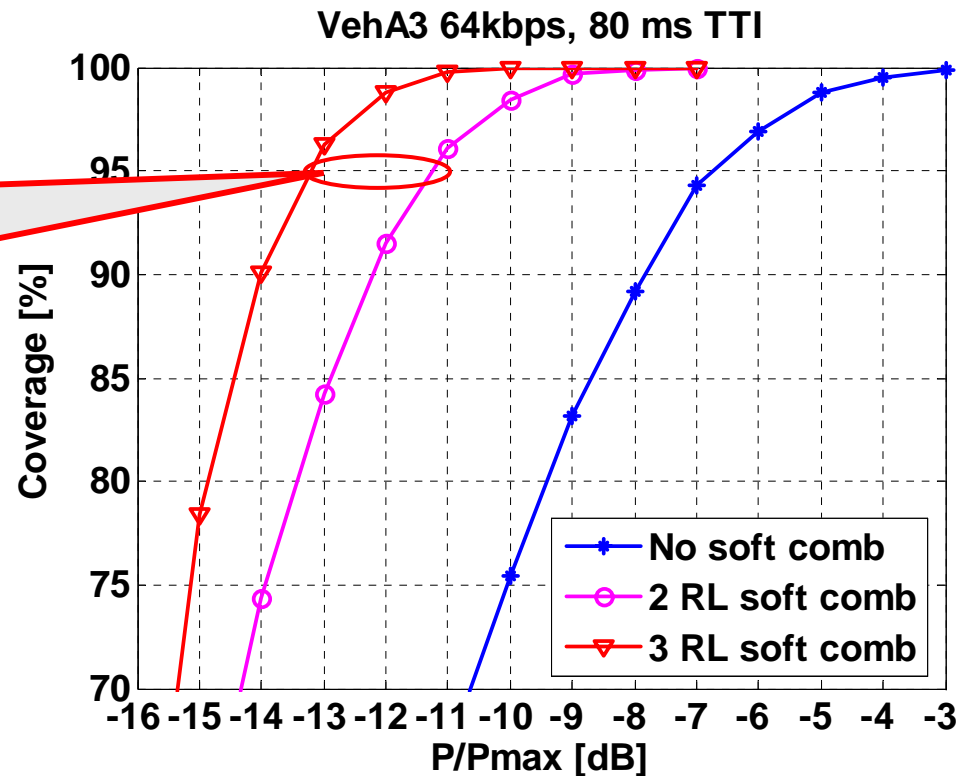
Unicast: 25% of the subscribers can use Mobile TV for 1 hour/day in a flat usage scenario

MBMS Performance

Source: 3GPP TR 25.803 v6.0.0

One 64 kbps MBMS channel uses 5 – 8 % of the carrier power

- One 128 kbps MBMS channel uses 10 – 16% of the carrier power
- ~80% of cell power available for MBMS

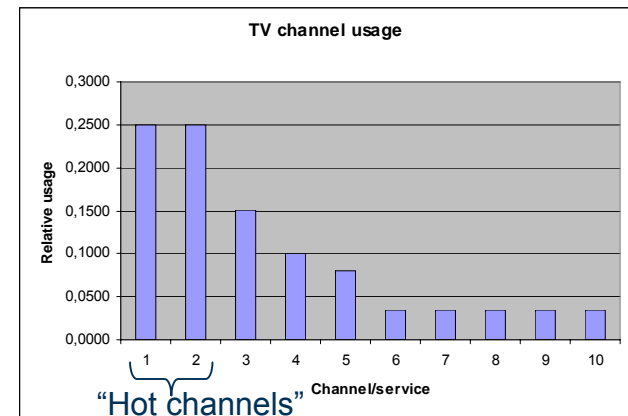


6x 128 kbps MBMS broadcast bearers
on one WCDMA carrier

Combined HSDPA / MBMS broadcast

“Hot channels” scenario

- “Hot channels” = channels requested by many users at the same time
- Traffic model
 - 25% of all customers (= 150 users/cell) are subscribed to MobileTV
 - “Hot channels” attracts 50% (= 75 users/cell) of the MobileTV subscribers



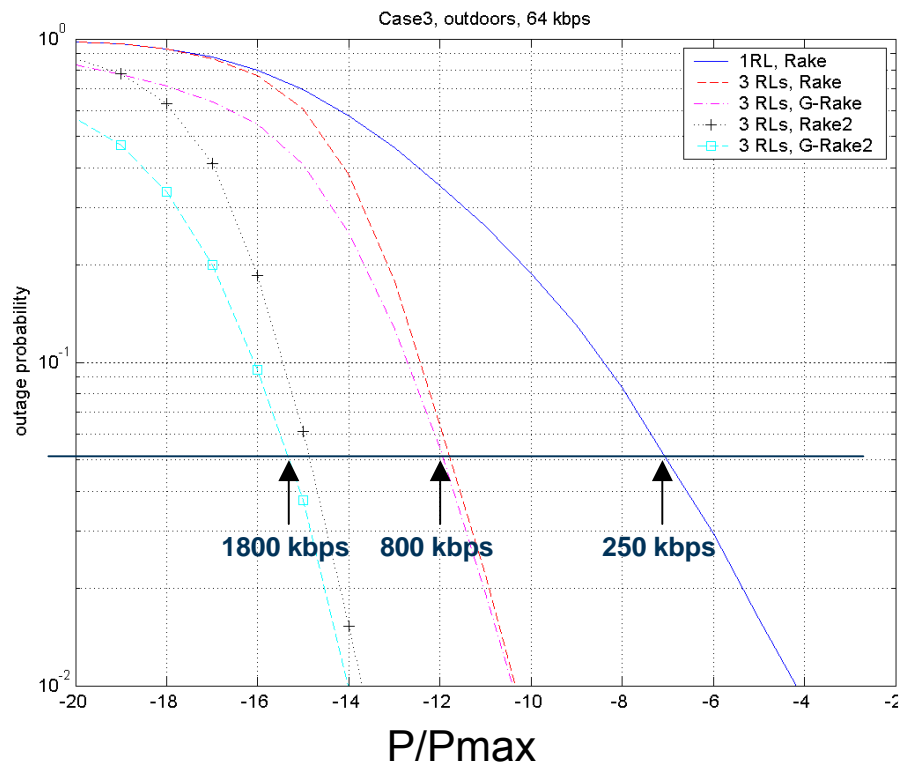
- Two MBMS Broadcast bearers per cell for delivering the “hot channels”
 - Around 8 Erlang/cell can be used for unicast
- Remaining 75 users not watching the hot channel can still generate additional traffic of ~50 mE (corresponding to “medium load” scenario)

Two broadcast bearers sufficient to cope with “hot channels”
(= channels watched by many users at the same time)

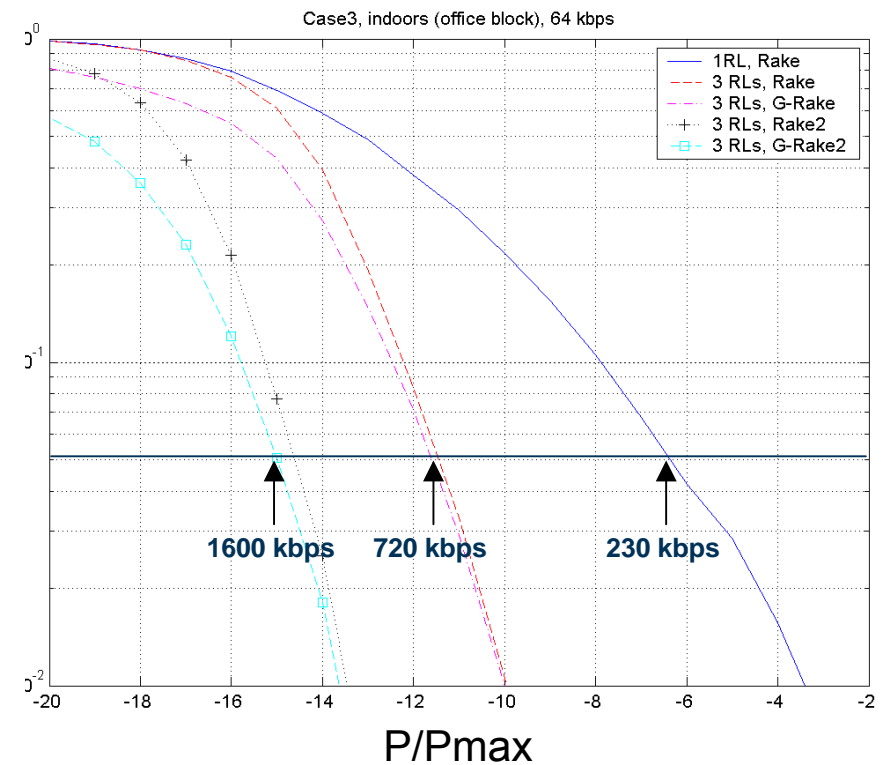
Indoor Capacity

Simulation results

Outdoor



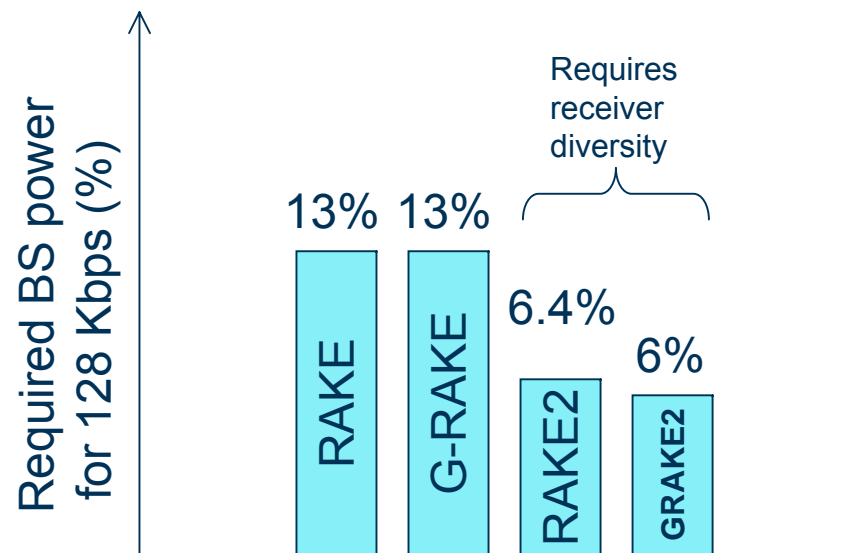
Indoor



Only marginal performance loss when indoor

Future MBMS capacity

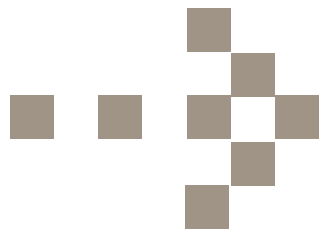
Advanced receiver techniques



- 128 kbps streaming
- ~80% of cell power available for MBMS

- 12 channels
- 6 channels

12x 128 kbps MBMS Broadcast bearers
with advanced receiver techniques



DVB-H

(DVB-Handheld)



Digital Video Broadcast-Handheld

(DVB-H)

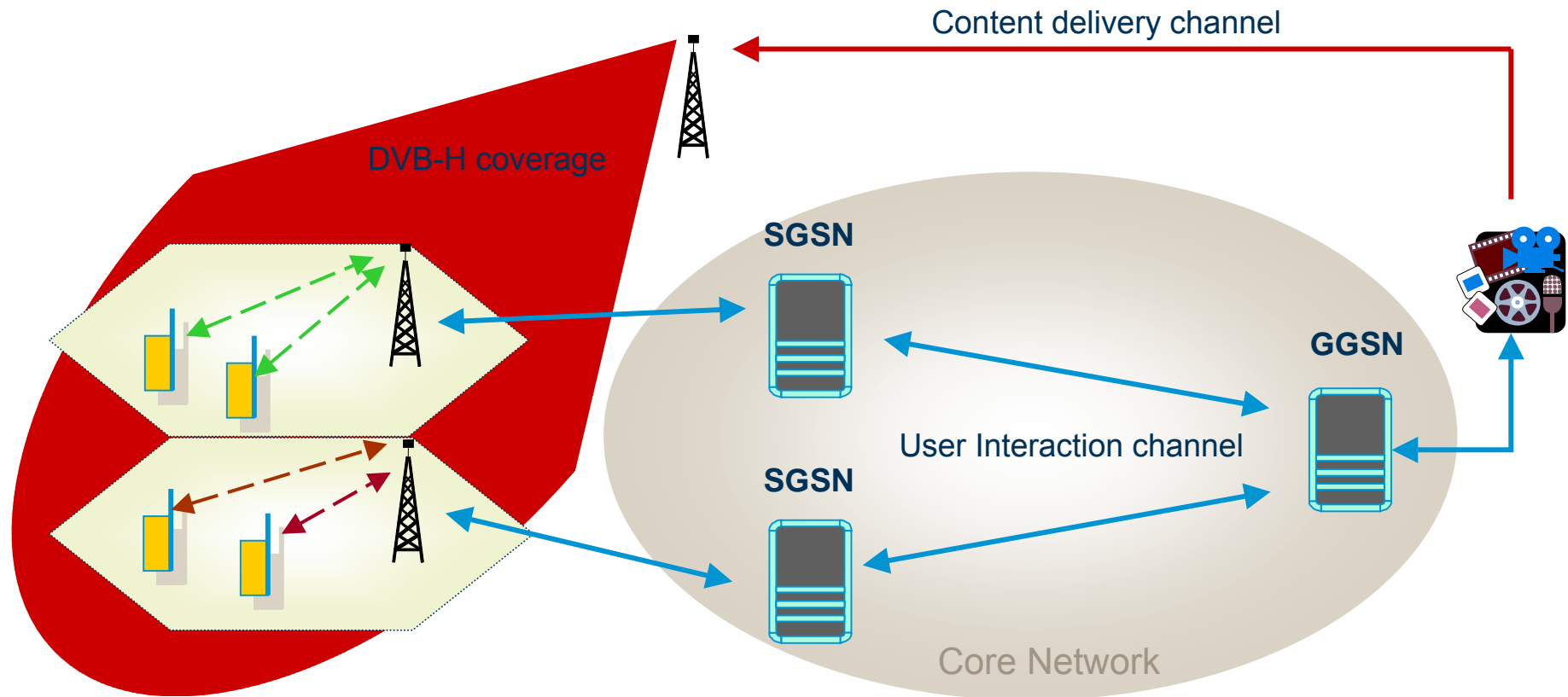
- Based on **ETSI DVB-T**
 - (European standard for Digital Terrestrial TV)
- Specific Requirements
 - **Same service environment as cellular systems** (2G and 3G)
 - **Mobile and indoor reception, cellular hand-set form factor**
 - Support of **IP datacasting** (IPDC) and TV over IPDC distribution
 - **Low power consumption** of receiver
(same battery life times as with current cellular phones;
frontend < 100mW)

Deploy with:

- **SFN** (Single Frequency Network) with **8MHz** channel (DVB-T/H)
 - 30-80 TV channels (128-384Kbps)
- **UHF frequencies**
 - UHF band (470-700 MHz)

Standard **approved by ETSI last November 2004** completion
expected end 2005

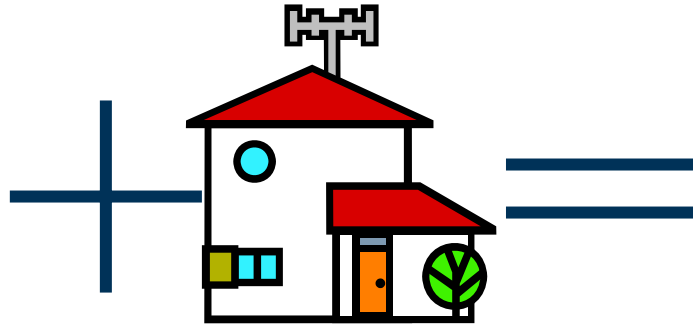
Channel delivery via DVB-H



- CN and RAN resources not used for content delivery
- Number of channels limited by available DVB-H capacity

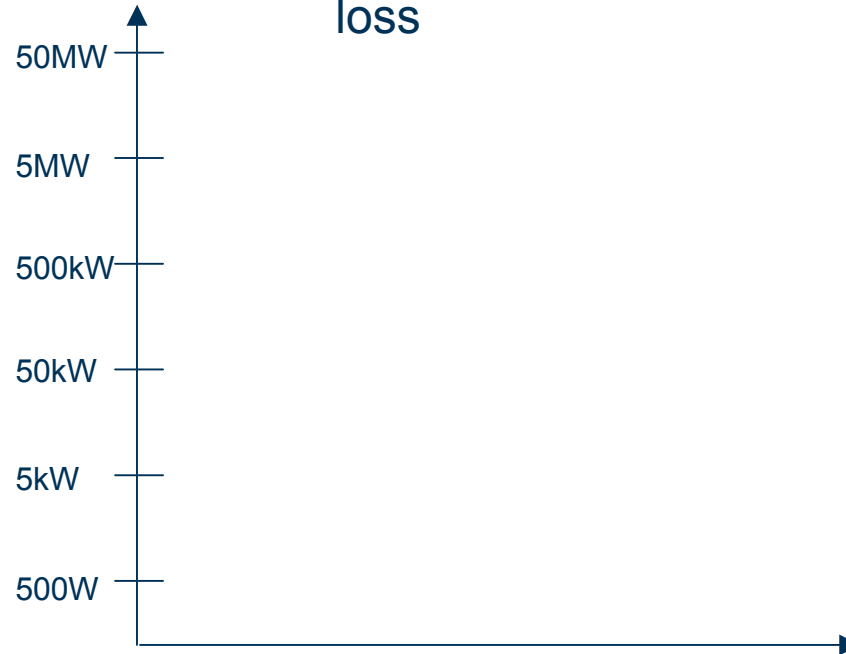
Broadcaster Network deployment

ILLUSTRATIVE



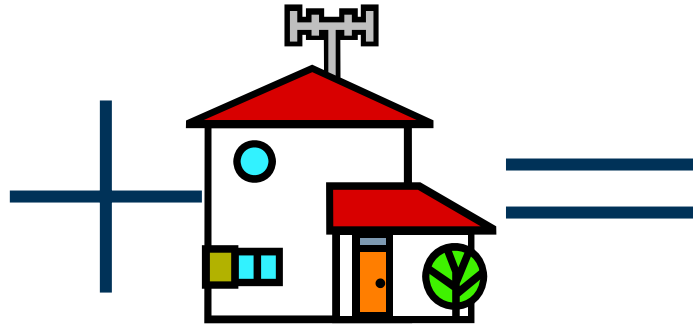
- Output power in DVB-H
- DVB-T the digital step for broadcasting
 - Cell radius > 50 km
 - 50 kW per channel
- High Antenna gain and no in-door loss

Power per Channel



Broadcaster Network deployment

ILLUSTRATIVE



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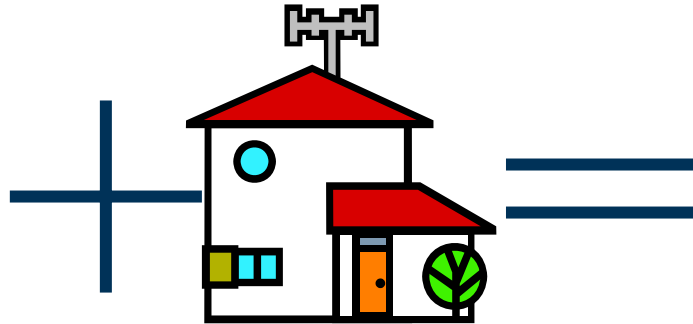
50MW
5MW
500kW
50kW
5kW
500W

Estimate power
per DVB-T
Channel

Baseline with
DVB-T (same
frequencies)

Broadcaster Network deployment

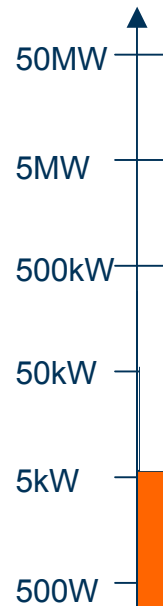
ILLUSTRATIVE



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Power per Channel

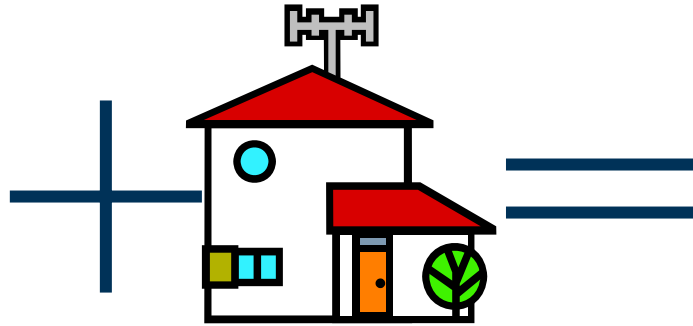


Less data per channel in DVB-H

Average power per channel due to less bits per channel

Broadcaster Network deployment

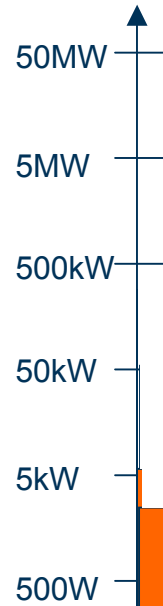
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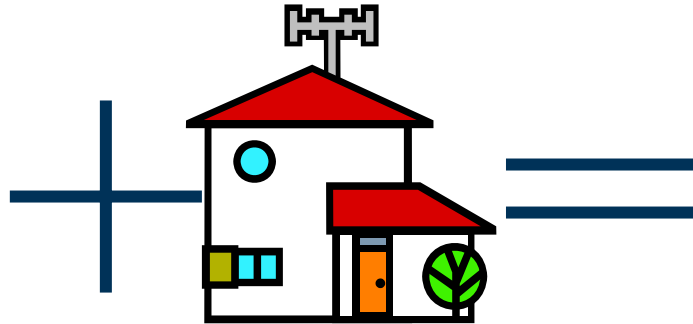


“Soft combining”

By combing the signal from several base stations 2dB

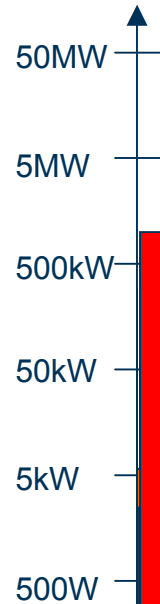
Broadcaster Network deployment

ILLUSTRATIVE



- Output power in DVB-H
- DVB-T the digital step for broadcasting
 - Cell radius > 50 km
 - 50 kW per channel
- High Antenna gain and no in-door loss

Power per Channel



From roof mounted antennas to Handheld in Near LOS

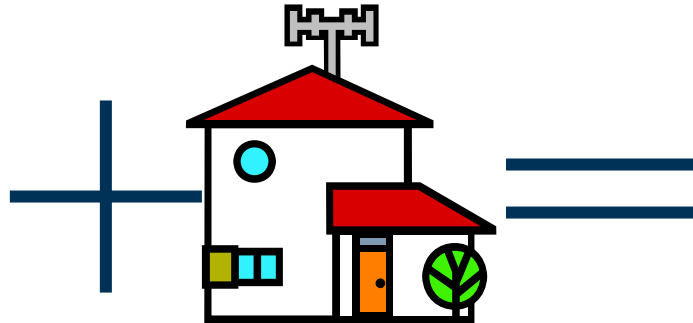
30 dB Gain and Near LOS vs. Handheld

stations 2dB



Broadcaster Network deployment

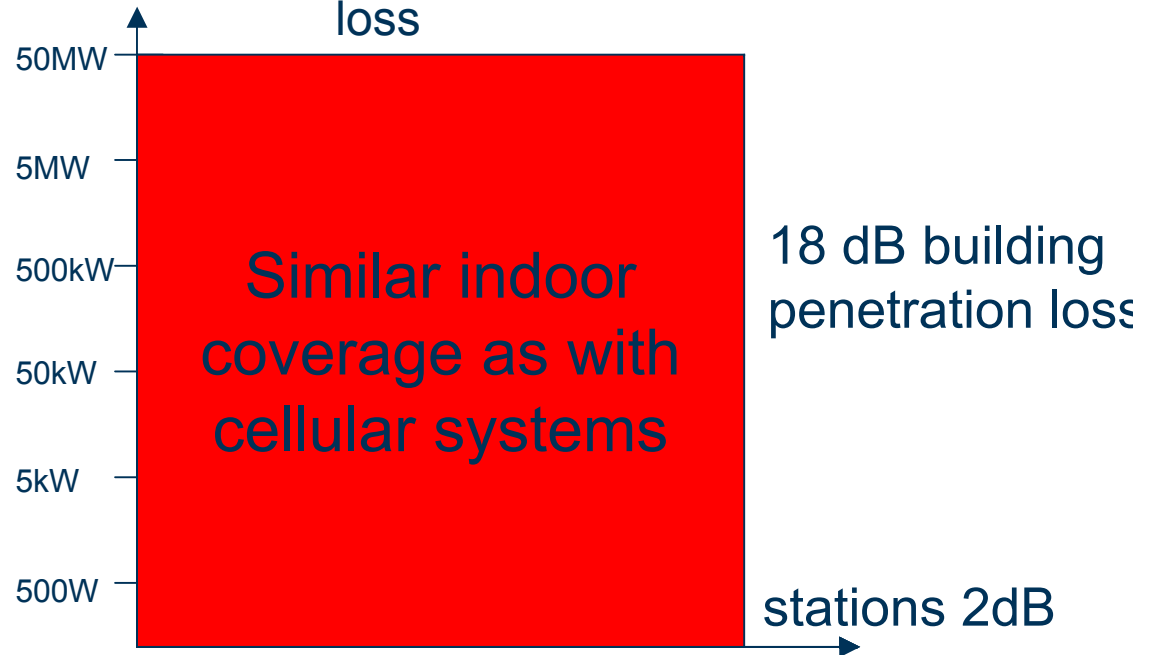
ILLUSTRATIVE



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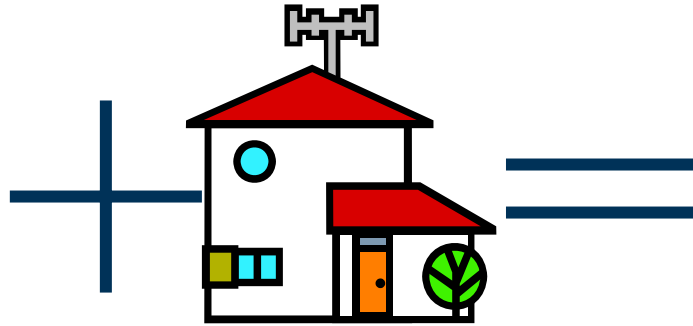


Power per Channel



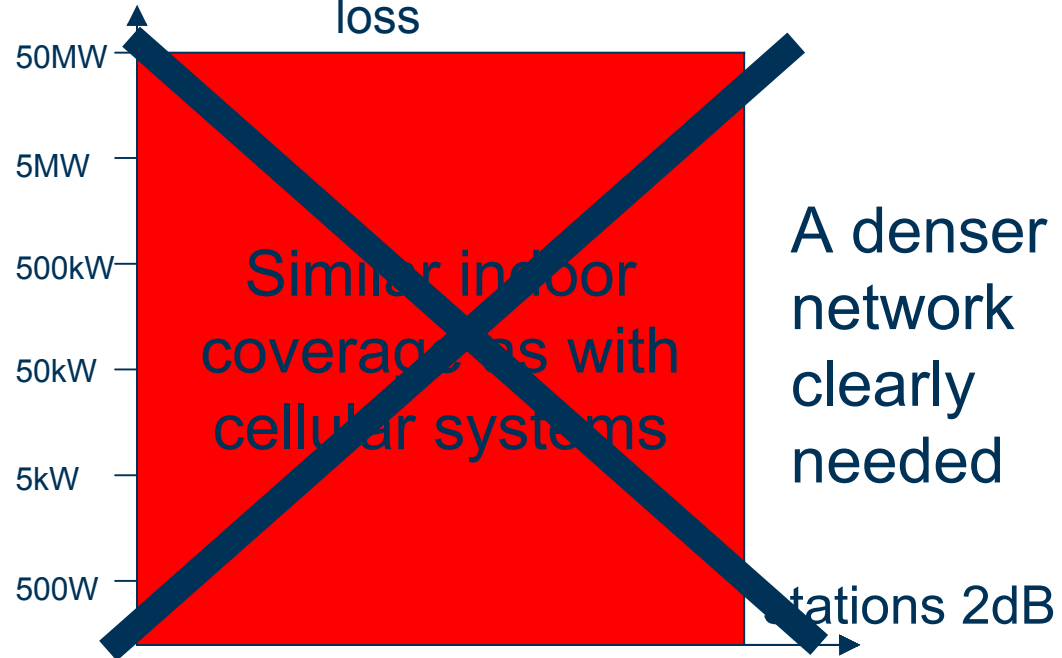
Broadcaster Network deployment

ILLUSTRATIVE



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Power per Channel



Agenda

Multicast/Broadcast Technologies

Mobile TV Services

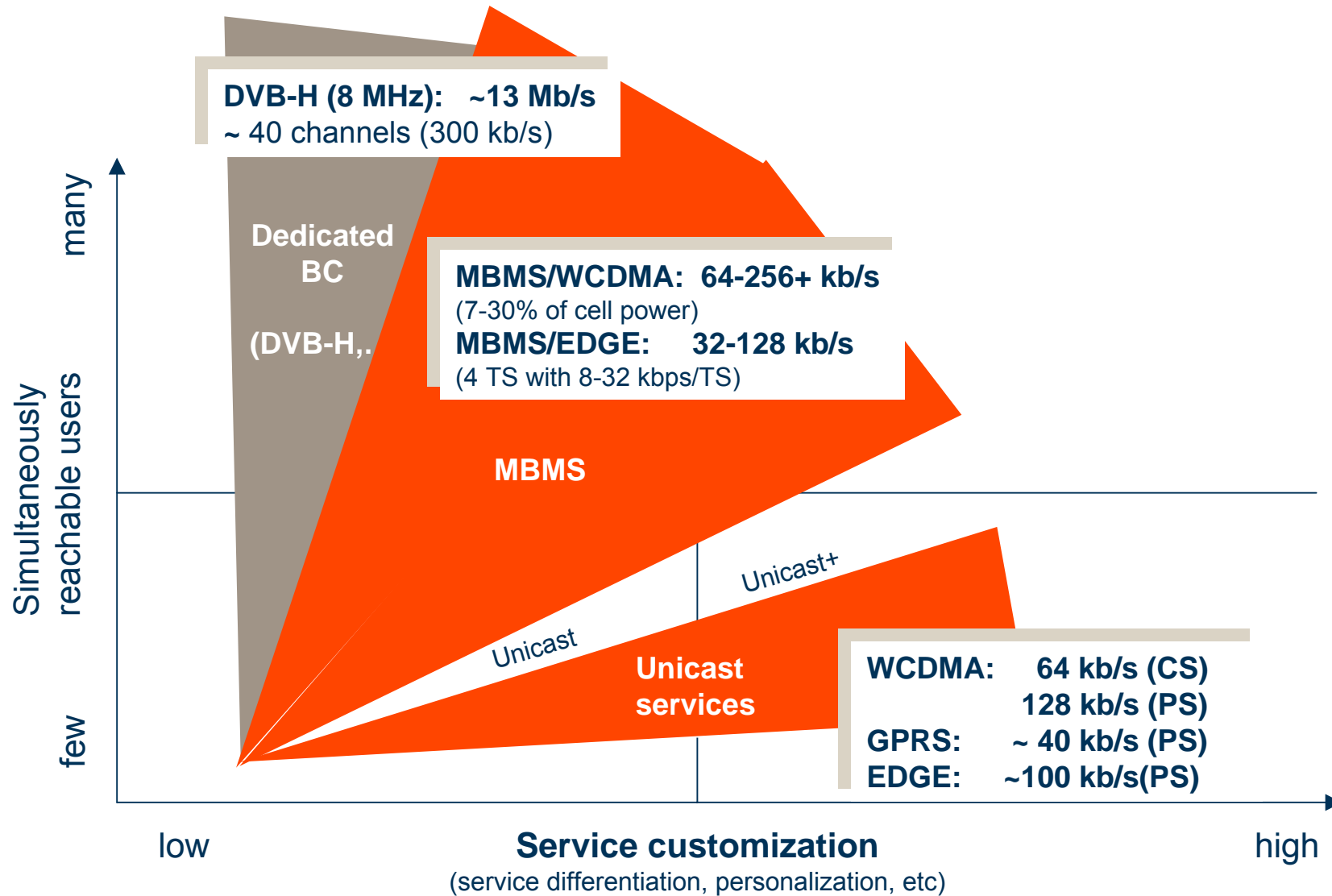
Technologies on the Market

Deeper in Technologies

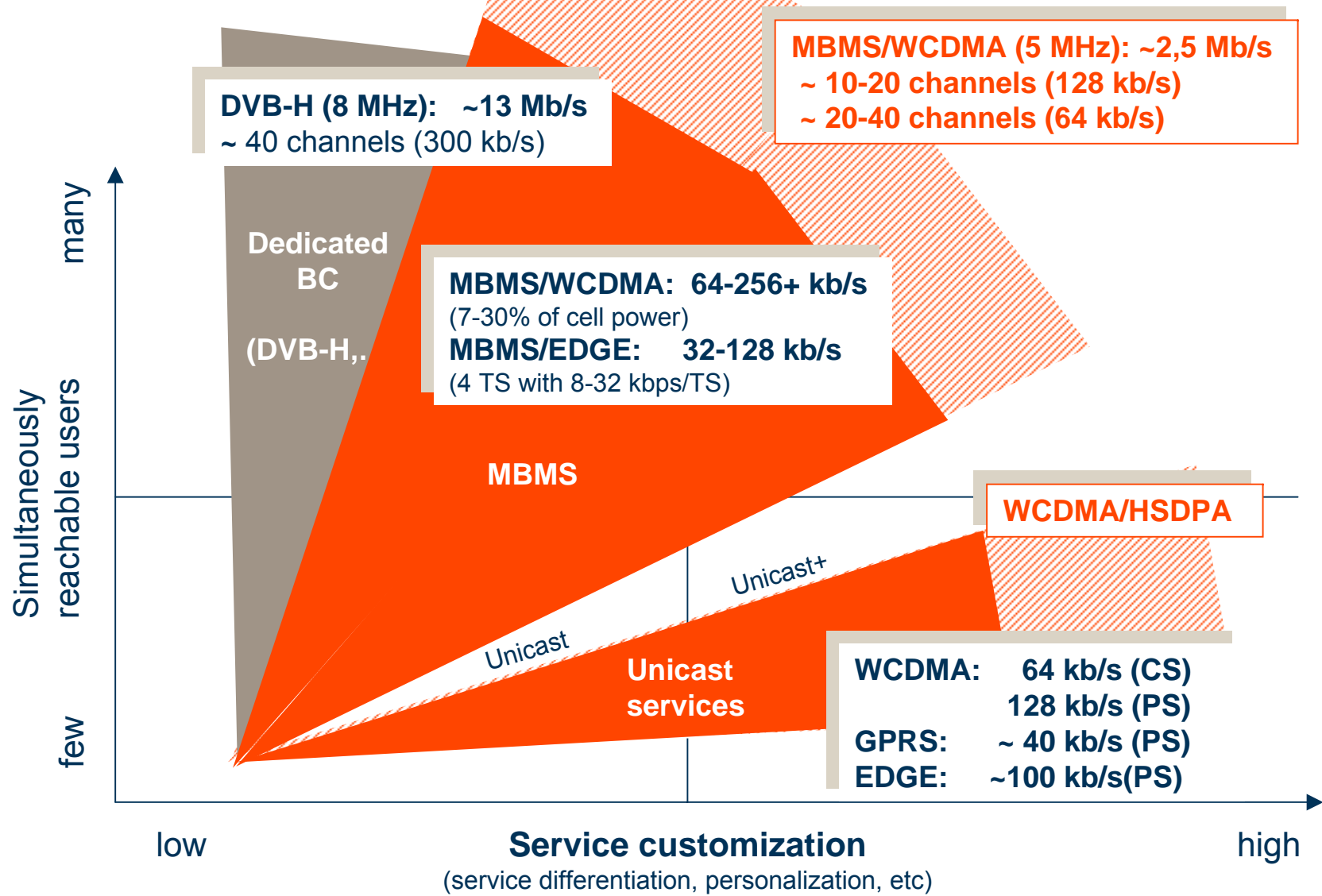
Market Deployments

Summary

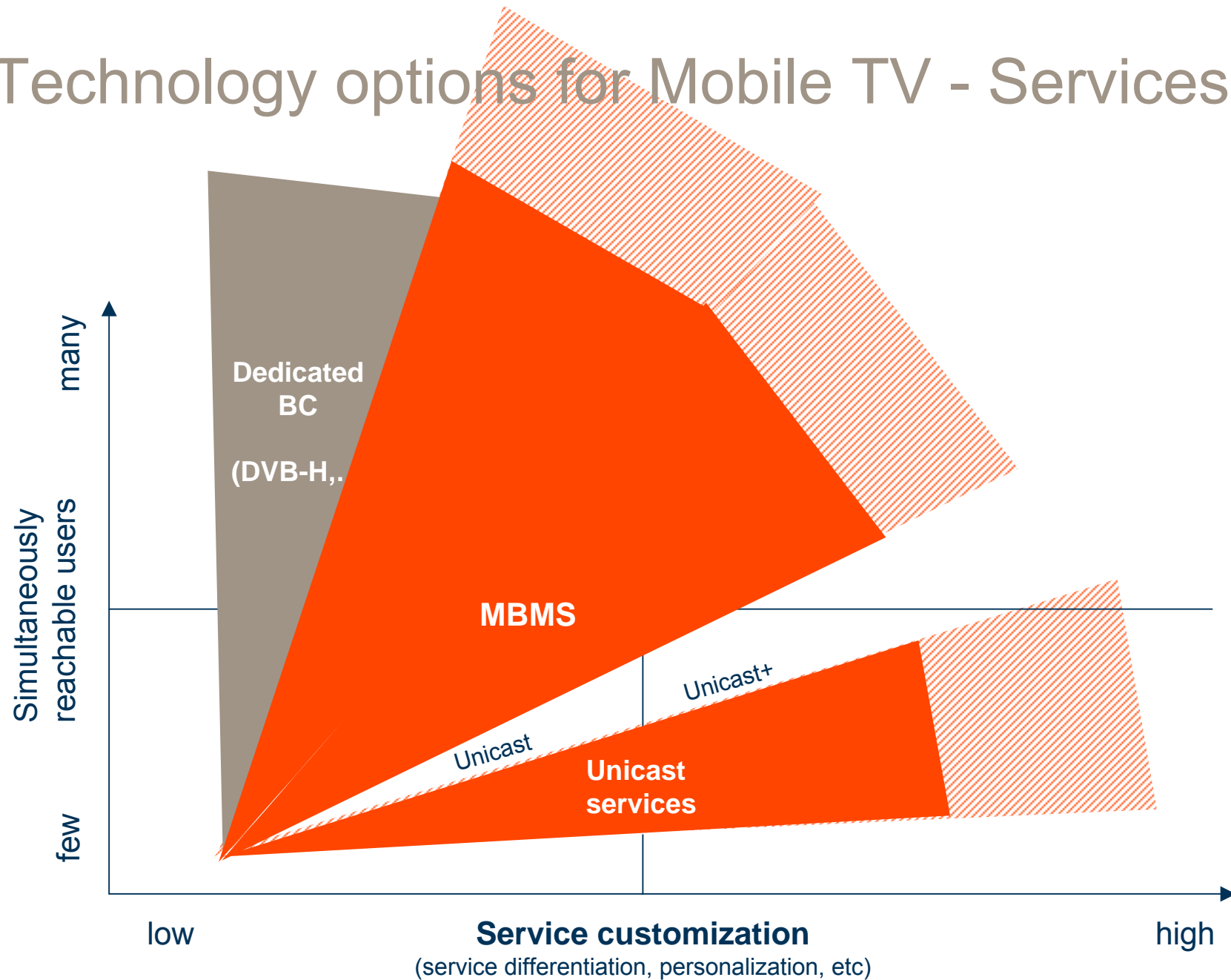
Technology options for Mobile TV



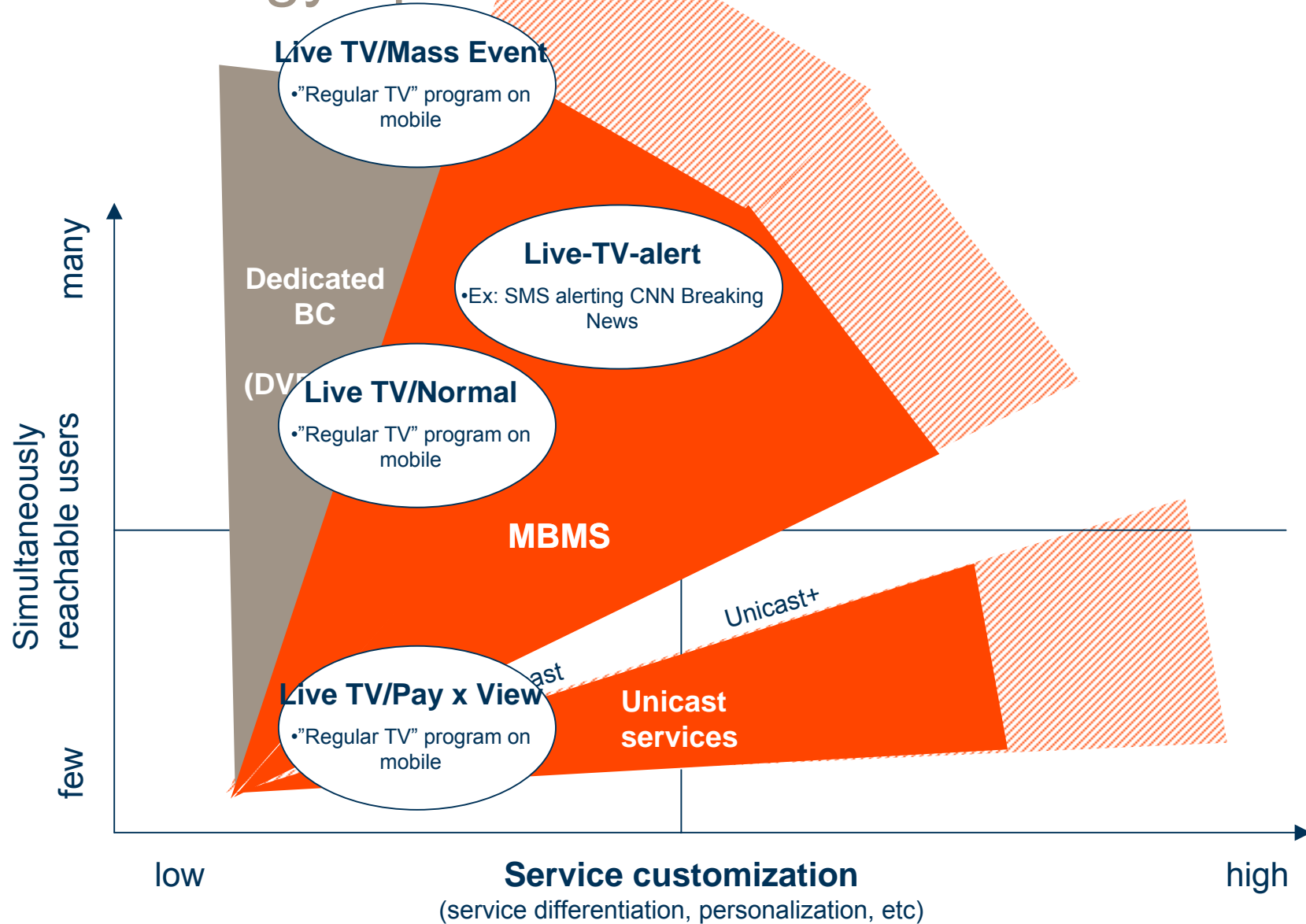
Technology options for Mobile TV



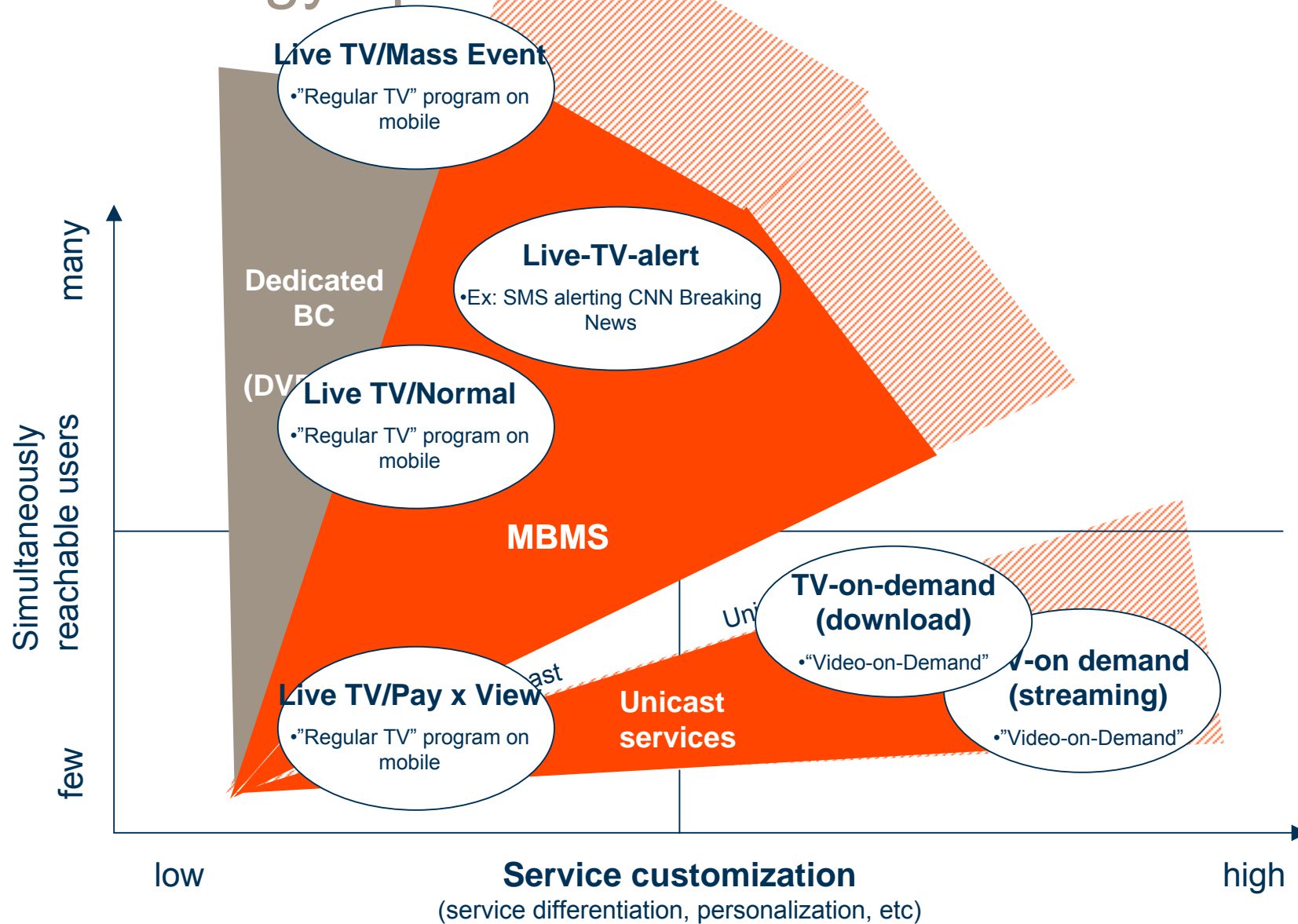
Technology options for Mobile TV - Services



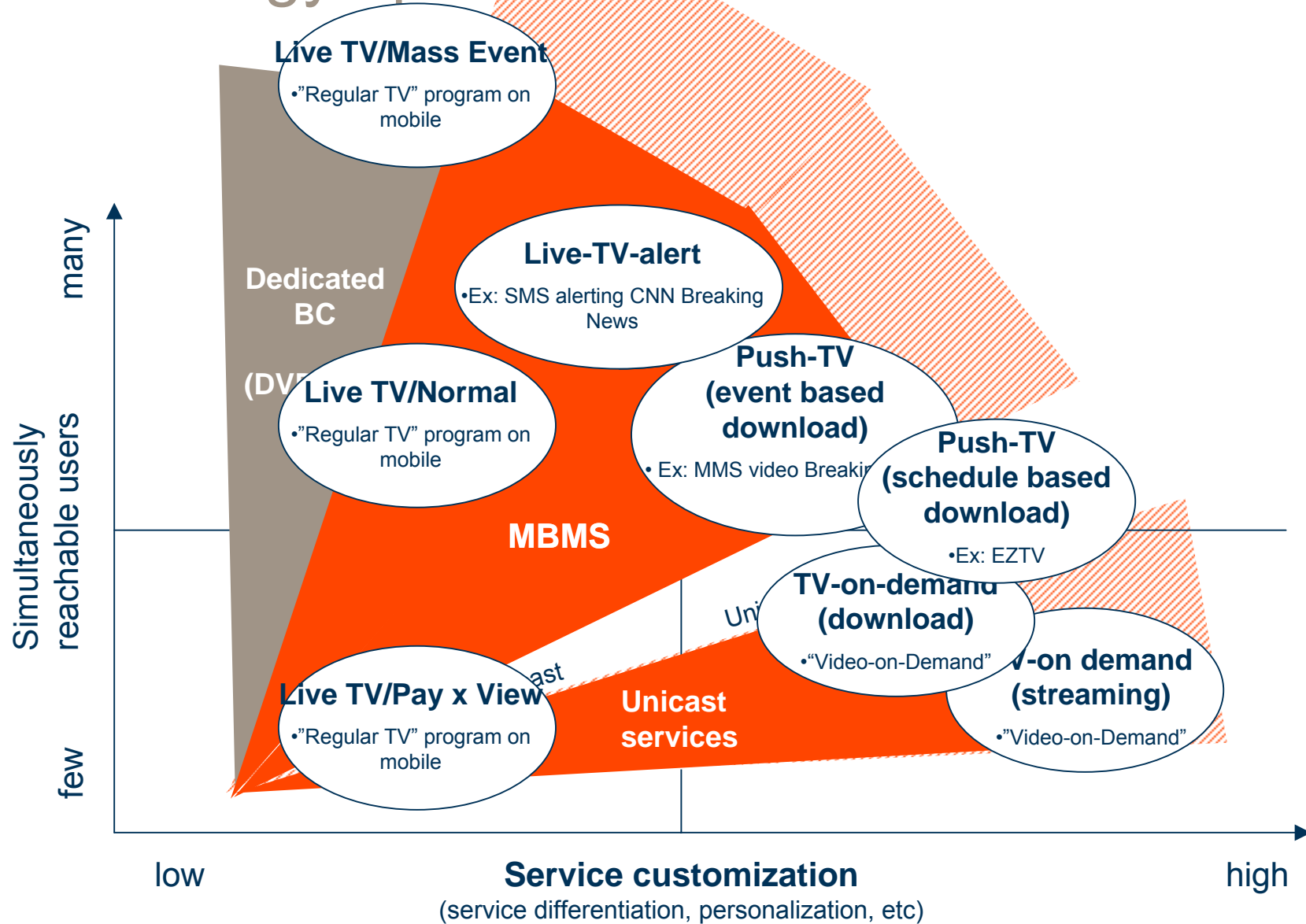
Technology options for Mobile TV - Services



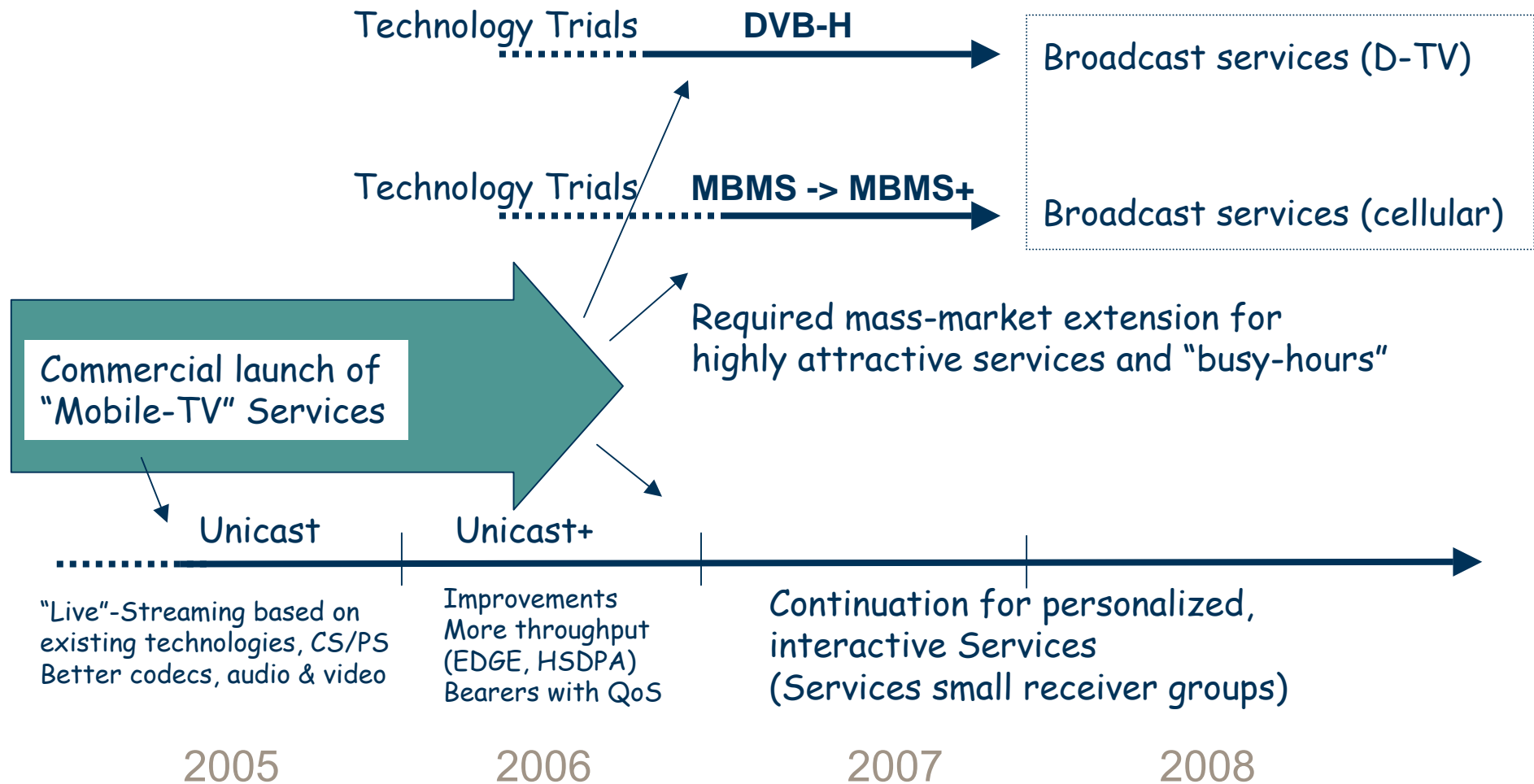
Technology options for Mobile TV - Services



Technology options for Mobile TV - Services



Technology evolution for "Mobile TV"



Agenda

Multicast/Broadcast Technologies

Mobile TV Services

Available Technologies

Deeper on Technologies

Market Deployments

Summary

Summary

- HSPDA and MBMS represent a baseline for evolving already existing Mobile TV services
- No indoor coverage extra requirements
- Combining unicast and broadcast a cost and spectrum efficient solution can be achieved
- DVB-H addresses specific usage cases and requires gap fillers for giving the same mobile coverage
- Both technologies make interactive channel available

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