



HELSINKI UNIVERSITY OF TECHNOLOGY
Department of Communications and Networking

Access alternatives to mobile services and content: analysis of handset-based smartphone usage data

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Outline

- Introduction
- Mobile service usage measurements
- Handset-based measurement method and data
- Panel description
- Results: Usage of access alternatives
- Summary



Introduction

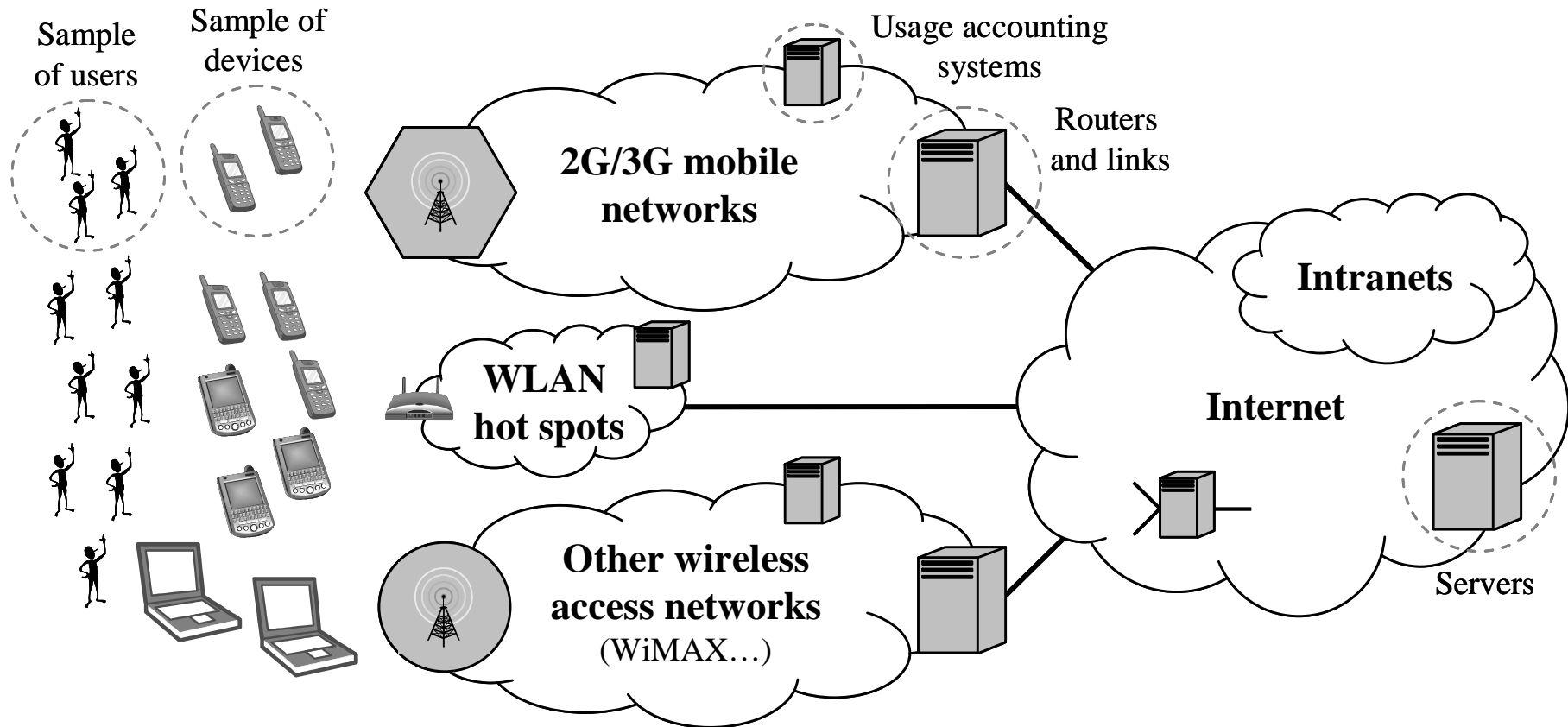
- Number of radios in mobile devices increasing
 - GSM, WCDMA, HSPA, LTE...
 - Bluetooth, WLAN, DVB-H...
 - >> Uncertainty exists regarding the dominant ways of accessing mobile services and content in the future
- Usage data regarding the alternative accesses is often not available for decision-makers
- Goal of the paper: Demonstrate the possibilities of a handset-based measurement platform in collecting data about the usage of alternative access methods

	Home	Office	Elsewhere, on-the-move
<p>Voice calls Alternative devices / services</p> <p>Alternative accesses for mobile devices</p>	<p>Mobile* / circuit-switched Mobile / VoIP Fixed phone / circuit-switched Fixed phone / VoIP PC / VoIP</p> <p>Mobile networks WLAN</p>	<p>Mobile / circuit-switched Mobile / VoIP Fixed phone / circuit-switched Fixed phone / VoIP PC / VoIP</p> <p>Mobile networks WLAN</p>	<p>Mobile / circuit-switched Mobile / VoIP (Fixed pay phone)</p> <p>Mobile networks (WLAN)</p>
<p>Messaging Alternative devices / services</p> <p>Alternative accesses for mobile devices</p>	<p>Mobile / SMS Mobile / Email Mobile / IM PC / Email PC / IM</p> <p>Mobile networks WLAN</p>	<p>Mobile / SMS Mobile / Email Mobile / IM PC / Email PC / IM</p> <p>Mobile networks WLAN</p>	<p>Mobile / SMS Mobile / Email Mobile / IM</p> <p>Mobile networks (WLAN)</p>
<p>Browsing Alternative devices / services</p> <p>Alternative accesses for mobile devices</p>	<p>Mobile / Web Mobile / WAP PC / Web</p> <p>Mobile networks WLAN</p>	<p>Mobile / Web Mobile / WAP PC / Web</p> <p>Mobile networks WLAN</p>	<p>Mobile / Web Mobile / WAP</p> <p>Mobile networks (WLAN)</p>
<p>Multimedia Alternative devices</p> <p>Alternative accesses for mobile devices</p>	<p>Mobile Portable media player PC Radio, television</p> <p>Mobile networks WLAN FM-radio Off-line playback (DVB-H)</p>	<p>Mobile Portable media player PC Radio</p> <p>Mobile networks WLAN FM-radio Off-line playback (DVB-H)</p>	<p>Mobile Portable media player</p> <p>Mobile networks (WLAN) FM-radio Off-line playback (DVB-H)</p>



Service usage measurements

COIN 2006-2007, MoMI 2008-2009



Source: Kivi 2007



Handset-based measurements

- Software client installed to a panel of Nokia S60 handsets
- Collects rich data about all handset usage
 - Complemented with questionnaires
- Data is used for studying e.g.:
 - Service and technology adoption
 - Location and context dependence of service usage
 - End-user segmentation



Source: Verkasalo, 2008



Panel description

- Recruited by an SMS campaign organized by the three Finnish mobile network operators, TeliaSonera, Elisa, and DNA Finland.
 - Randomly selected Finnish citizens, having an age of over 18 and owning a Nokia S60 smartphone.
- 644 people successfully installed the measurement software
 - 106 were excluded due to too few active days in the panel
 - 253 panelists with S60 3rd edition devices were included in this study
- Context algorithm was able to find all the three main locations (home, office, and elsewhere) for 98 panelists
 - some people e.g. not working regularly, or working from multiple locations
- Panel biased towards more advanced users
 - Mostly young men
 - Willing and capable to install the measurement software to their devices



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Results



Where do people spend their time?

Finland as whole vs. panelists

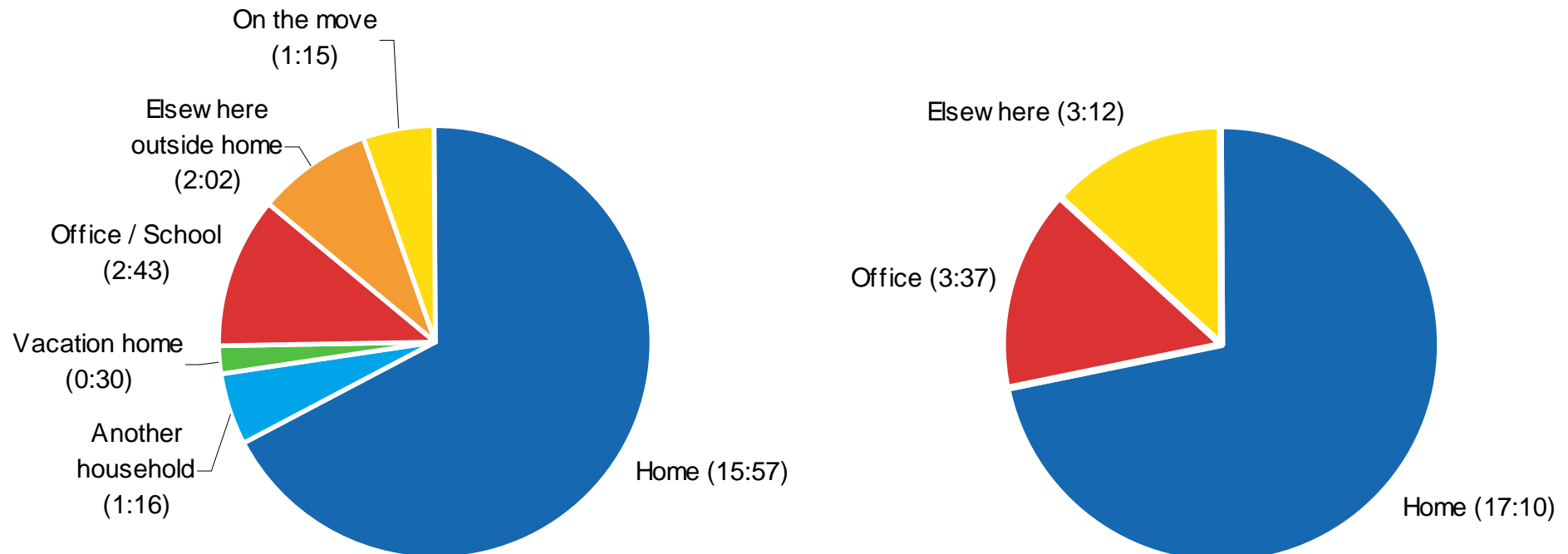


Figure 1: Left: Time use of Finnish people, > 10 yrs, average over Mon-Sun, whole year (Statistics Finland 2001)
Right: Time use of panelists, average over Mon-Sun, November-February 2007. N = 98.



Time distribution between locations

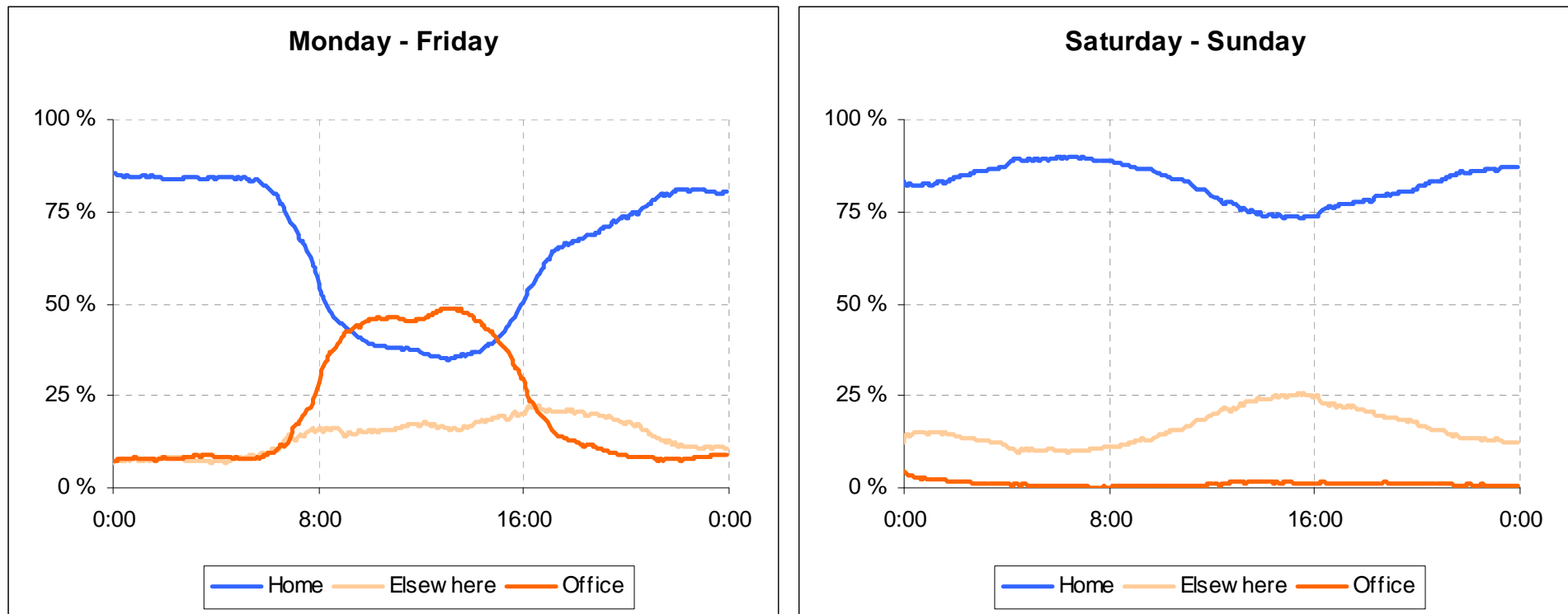


Figure 2: Time distribution of panelists, average over Monday – Friday (left figure) and Saturday – Sunday (right figure), in the time period between November 19th – December 23rd, 2007. N = 98.



Usage vs. location

Home usage

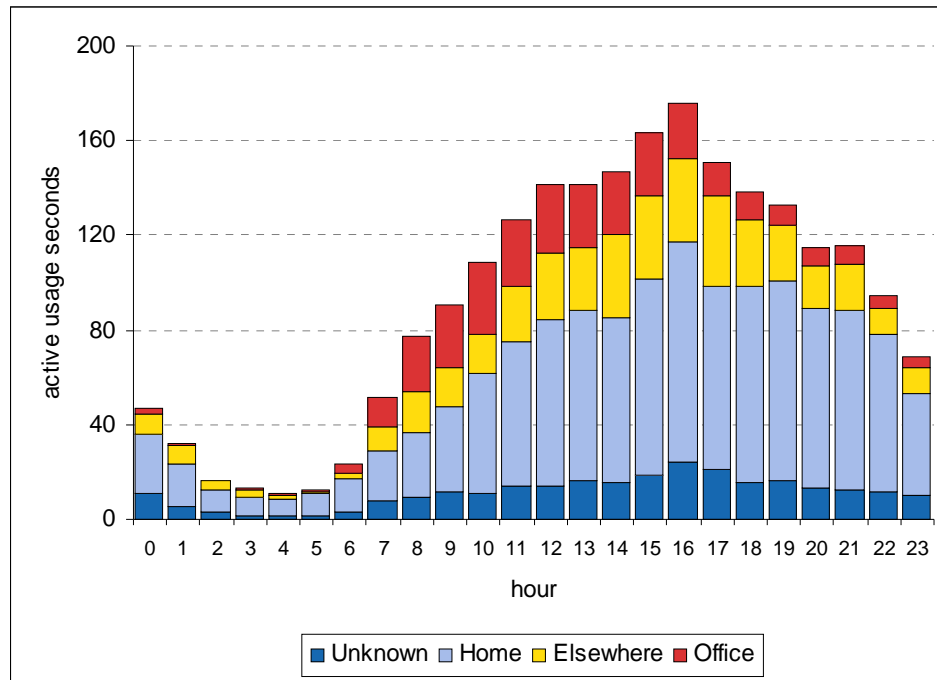


Figure 4: Distribution of active smartphone usage time between contexts and hours of day. N = 98.

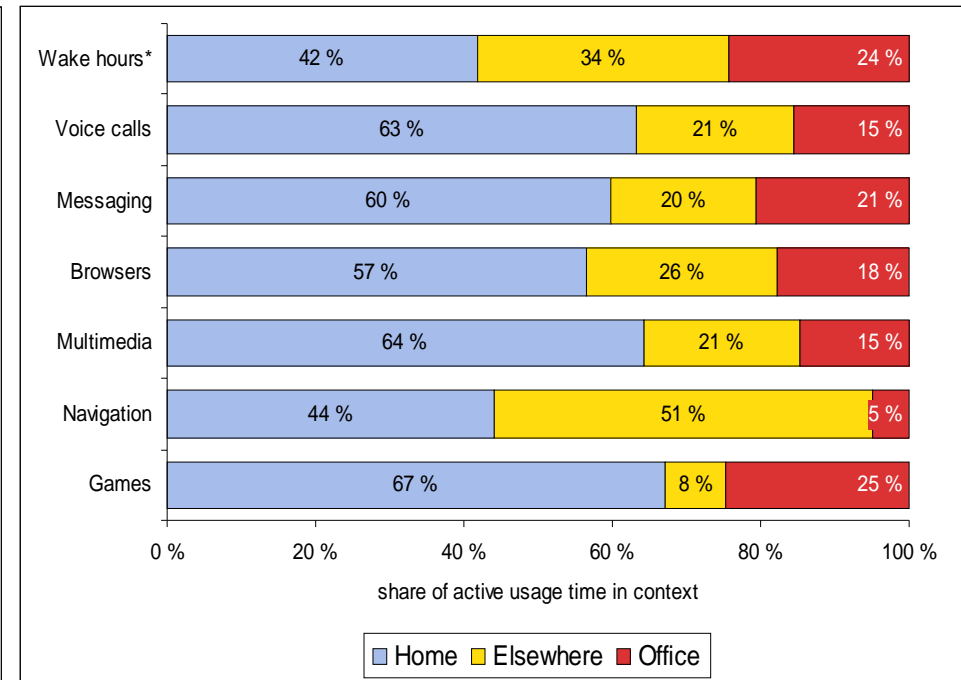


Figure 5: Distribution of active usage time between locations for different application categories. N = 98.



WLAN usage is concentrated

Heavy users and home APs account for most usage

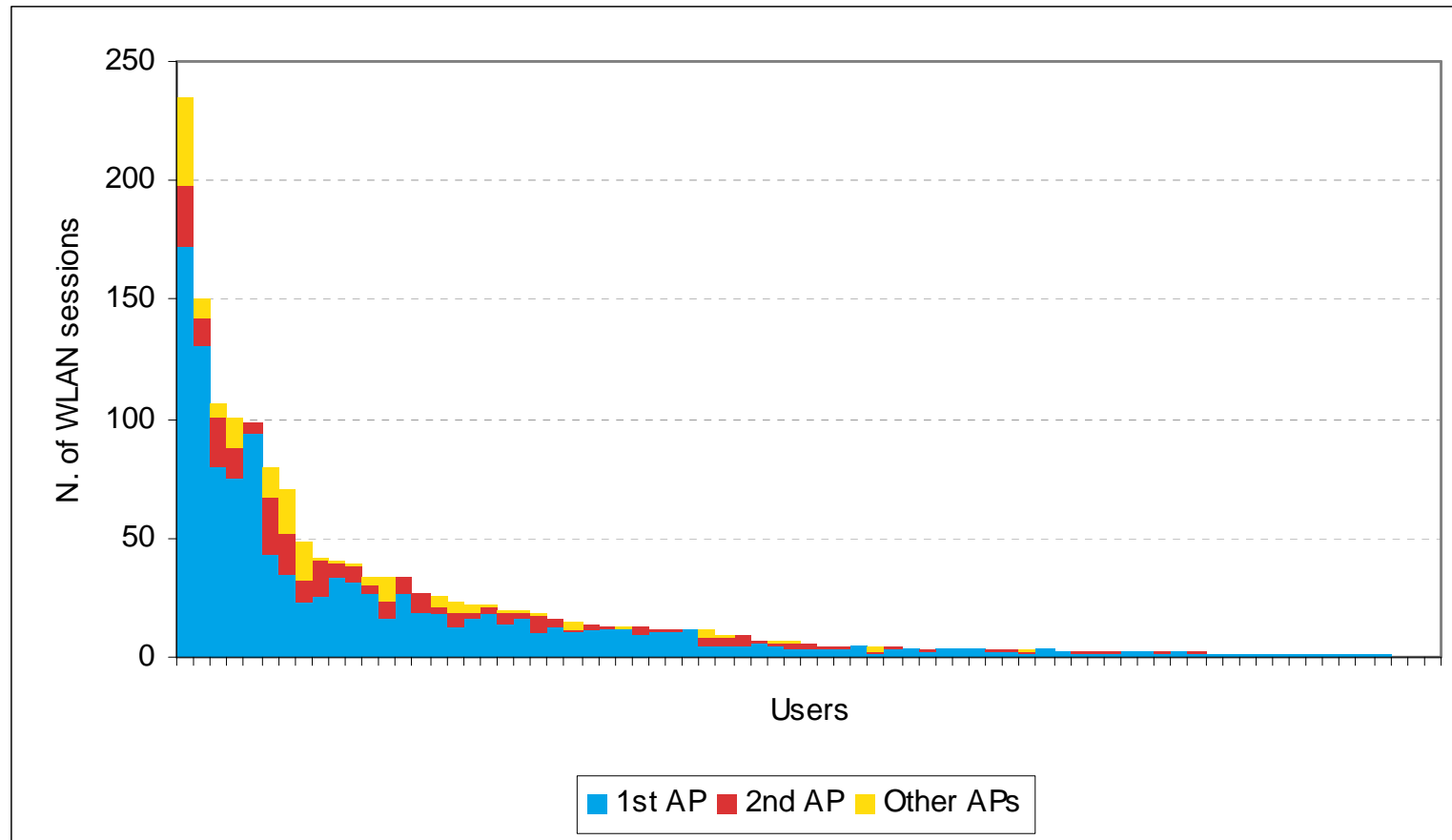


Figure 6: Distribution of WLAN usage events between users and access points, N = 73



WLAN used mostly for browsing

Application	Users (out of the 73 active WLAN users)	N. of sessions per user during the panel	Average data per session (kB)
Web browsing	70	18.4	611
Messaging or VoIP (e.g. email or Fring)	25	20.2	136
Multimedia (e.g. Internet radio, emTube)	15	6.4	3030



WLAN usage correlates with overall data usage

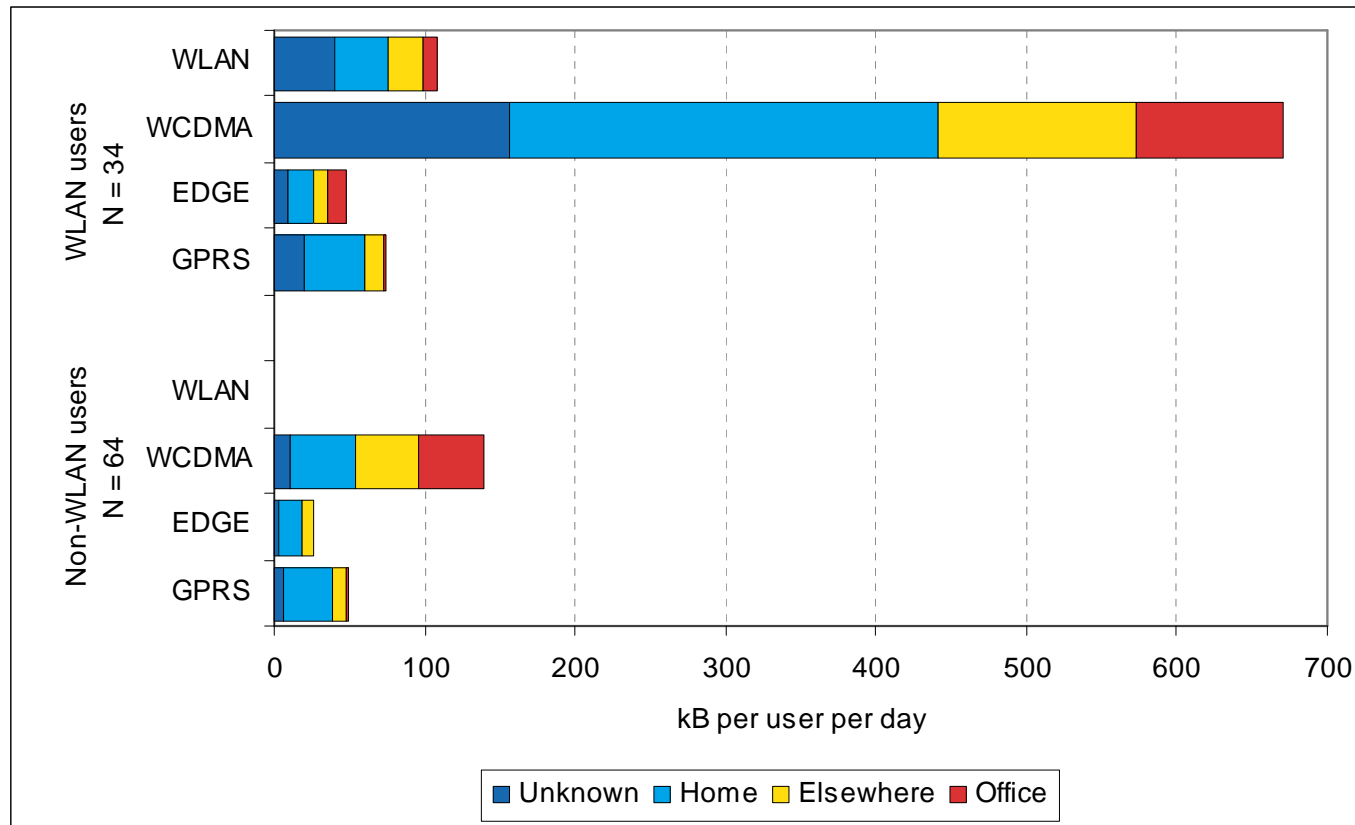
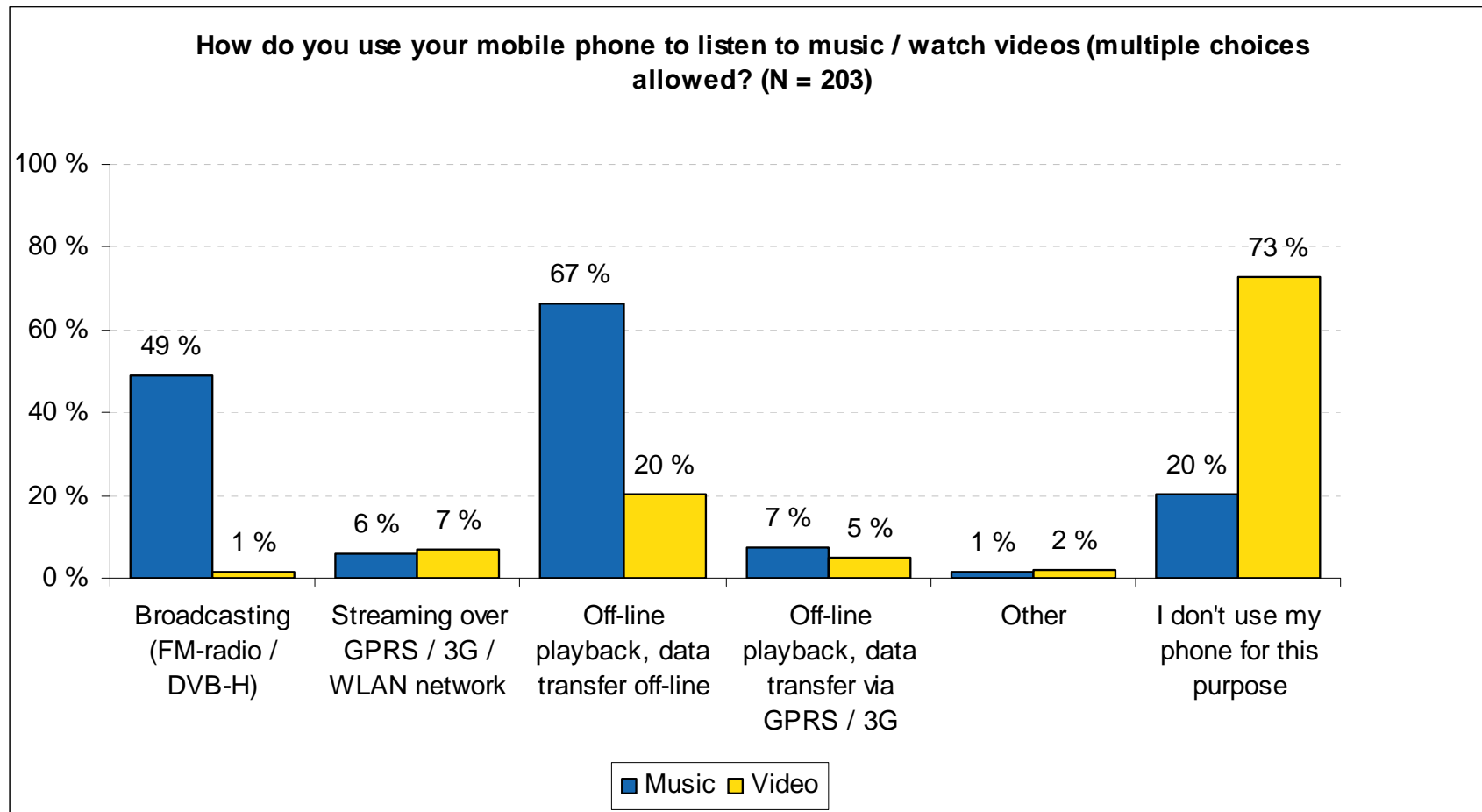


Figure 8: Daily data usage per bearer per location for panelists either using or not using WLAN. N = 98.



Multimedia usage is mostly offline





Summary

- Mobile usage is diverging to many alternative accesses, e.g. 3G, WLAN, broadcasting, offline use
- Handset-based measurements make it possible to collect data about the usage of the access alternatives
- Homes are the most important place of mobile service usage, increasing the importance of good indoor coverage and capacity
- Usage of WLAN with mobile phones is emerging
 - mostly used for web browsing at home, by heavy data users in general