

IF3210 Pengembangan Aplikasi pada Platform Khusus

Arsitektur Mobile Platform dan Mobile App



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Stationary vs Mobile



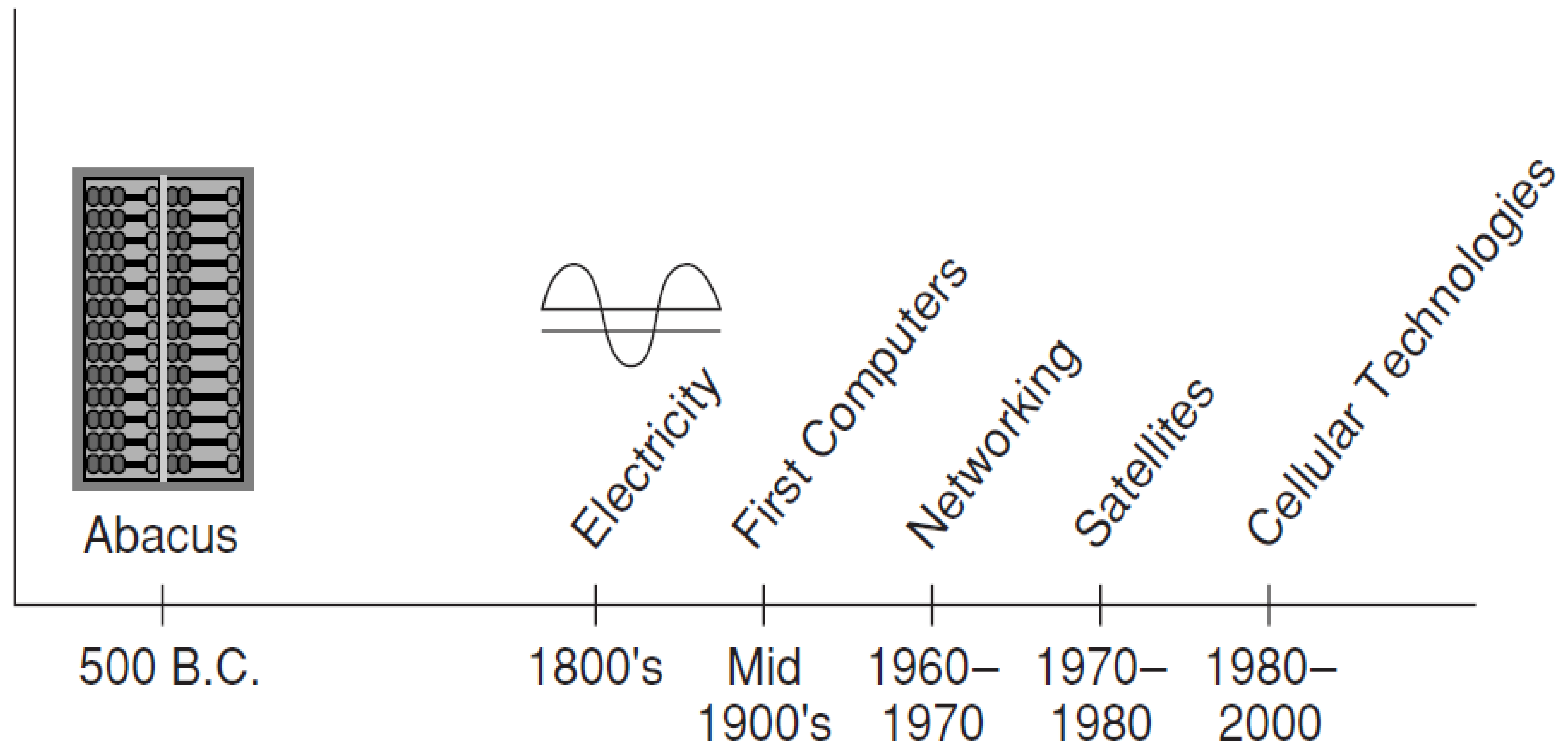
Definition & Distinguishing Aspects

- › Mobile Computing System
 - › Computing systems that may be easily moved physically and whose computing may be used while they are being moved
 - › Example: laptops, PDA, mobile phones
- › Distinguishing aspects (compared to stationary computing systems):
 - › Prevalent wireless network connectivity
 - › Small size
 - › The mobile nature of their use
 - › Power sources
 - › Functionality for mobile user

MC & Software Dev. Methodology & Tools

- › Software Development: Engineering/Science vs Art
 - › There are definite signs of maturation in software development: architectures, metrics, proven tools, and other methodology
 - › Many for stationary systems, **but** a few for mobile systems
- › The question: how to develop mobile application in an extensible, flexible, and scalable manner?

A Timeline of Mobile Computing



- › Yes, abacus and calculator is a kind of mobile computing system! (without storage & wireless net)

Wireless Communication Systems

- › Four pieces of the mobile problems:
 - › Mobile user, mobile device, mobile application, mobile network
- › Is wireless mobile or is mobile wireless?
 - › Mobility and wireless connectivity is orthogonal

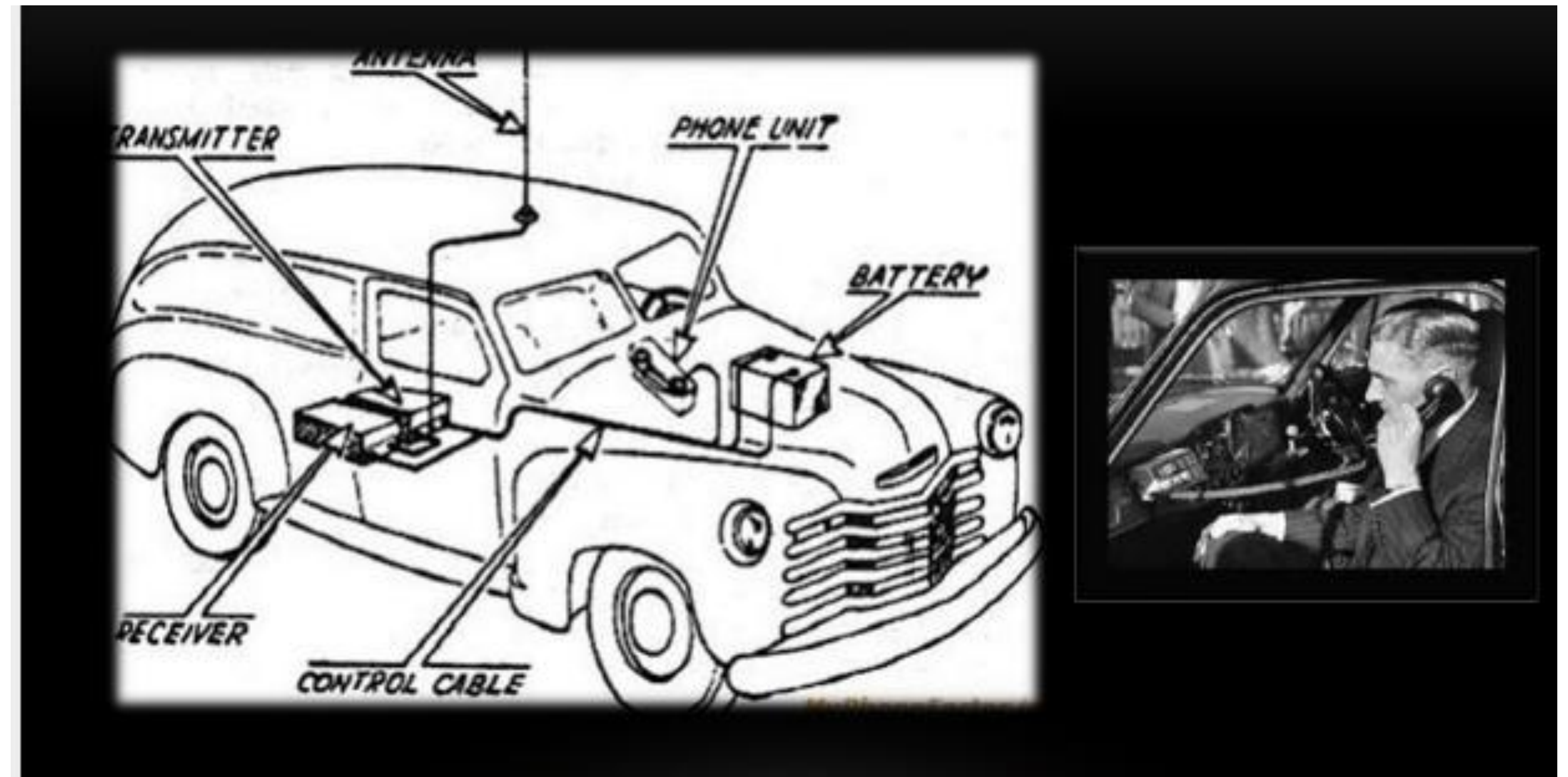


History of WIRELESS COMMUNICATION SYSTEM

Those who do not learn history are doomed to repeat it.

0G (1946 – 1980's)

- › Early mobile phones
- › Expensive
- › In cars/trucks/briefcases
- › Voice only



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1G (1980's – now)

- › Introduced in 1980's, completed in early 1990's.
- › Speed was up to 2.4kbps.
- › Allows voice calls within a country.
- › Uses Analog Signal.
- › Technologies: AMPS/DataTac.
- › First Blackberry (850).



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2G (1990's – now)

- › Second generation cellular networks.
 - › GSM was launched in Finland, 1991.
- › Speed was up to 64kbps.
- › Allows digital voice + SMS + circuit-switched data.
- › Uses digital signals.
- › Technologies: GSM, iDEN, CDMA, TDMA.



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2.5G (1990's – now)

- › A marketing term, sometimes described as 2G + GPRS.
- › Speed: 64 – 144 kbps, i.e. 6 to 9 mins to download a 3 mins MP3.
- › Technologies: GPRS, HSCSD, WiDEN, EDGE, CDMA-2000 1xRTT.

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3G (2000's – now)

- › Third generation cellular networks.
- › Speed: 114kbps – 2Mbps (11sec to 1.5mins to download 3 mins. MP3).
- › Broadband data, more security, streaming, video, etc.
- › Technologies: W-CDMA (UMTS, FOMA), 1xEV-DO.



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4G (late 2000's – now)

- › Fourth generation cellular networks.
- › Speed: 100Mbps – 1Gbps.
- › MAGIC:
 - › **M**obile Multimedia
 - › **A**nytime Anywhere
 - › **G**lobal Mobility Support
 - › **I**ntegrated Wireless Solution
 - › **C**ustomized Personal Services
- › Technologies: LTE, WiMAX



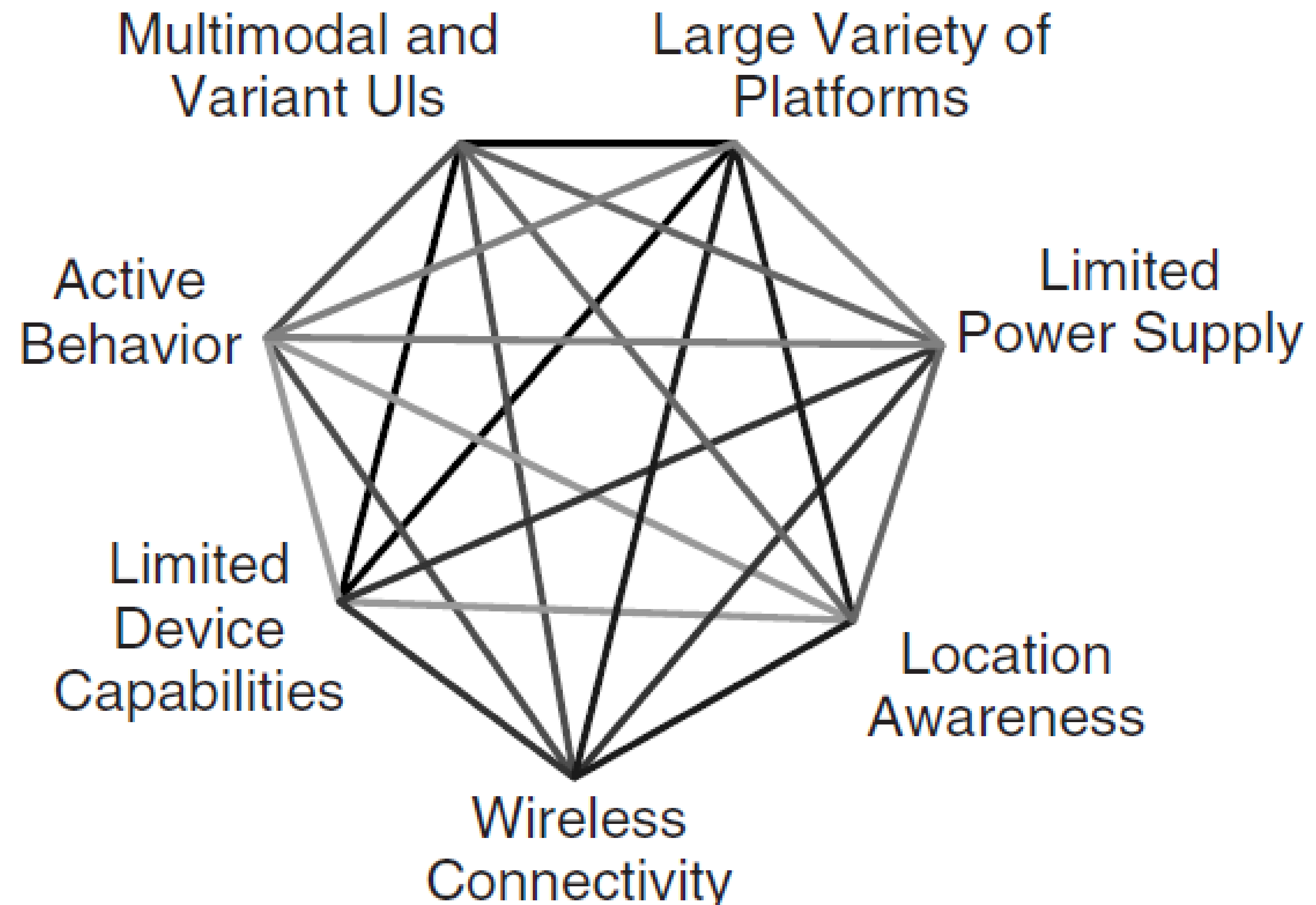
5G (the future!)

- › Fifth generation cellular networks.
 - › Started in late 2010's, not common yet.
- › More speed & capacity.
- › More than phones – CPS/IoT, edge computing.
- › Can be “sliced” into different networks.

Feature	NMT	GSM	UMTS (3GSM)	IS-95 (CDMA one)	IS-2000 (CDMA 2000)	LTE
Technology	FDMA	TDMA and FDMA	W-CDMA	CDMA	CDMA	OFDMA
Generation	1G	2G	3G	2G	3G	4G
Encoding	Analog	Digital	Digital	Digital	Digital	Digital
Year of First Use	1981	1991	2001	1995	2000 / 2002	2009
Roaming	Nordics and several other European countries	Worldwide, all countries except Japan and South Korea	Worldwide	Limited	Limited	Limited
Handset interoperability	None	SIM card	SIM card	None	RUIM (rarely used)	SIM card
Common Interference	None	Some electronics, e.g. amplifiers	None	None	None	None
Signal quality/coverage area	Good coverage due to low frequencies	Good coverage indoors on 850/900 MHz. Repeaters possible. 35 km hard limit.	Smaller cells and lower indoors coverage on 2100 MHz; equivalent coverage indoors and superior range to GSM on 850/900 MHz.	Unlimited cell size, low transmitter power permits large cells	Unlimited cell size, low transmitter power permits large cells	
Frequency utilization/Call density	Very low density	0.2 MHz = 8 timeslots. Each timeslot can hold up to 2 calls (4 calls with VAMOS) through interleaving.	5 MHz = 2 Mbit/s. 42Mbit/s for HSPA+. Each call uses 1.8-12 kbit/s depending on chosen quality and audio complexity.	Lower than CDMA-2000?	1.228 MHz = 3Mbit/s	
Handoff	Hard	Hard	Soft	Soft	Soft	Hard
Voice and Data at the same time	No	Yes GPRS Class A	Yes ^[2]	No	No EVDO / Yes SVDO ^[3]	No (data only) Voice possible though VoLTE or fallback to 2G/3G

Dimensions of Mobility

- › The set of properties that distinguishes the mobile computing systems from the stationary computing



Mobile Application Development

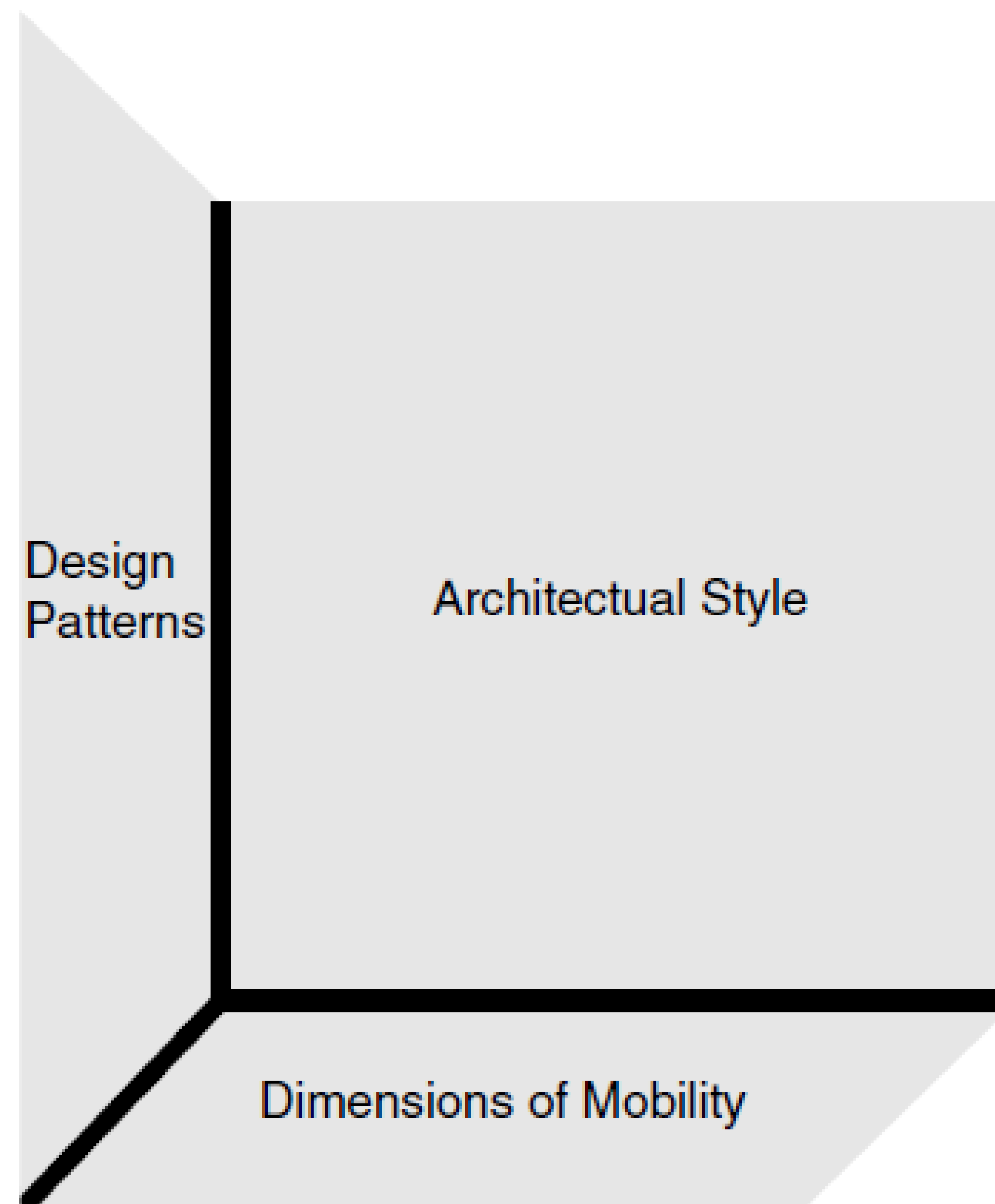
- › Definisi Mobile Application
 - › Laptop termasuk kategori mobile device?
 - › Web yang diakses via smartphone termasuk kategori mobile app?

Mobile vs Stationary Users

- › Moving between known or unknown locations
- › Not focused on the computing task
- › Require high degree of immediacy and responsiveness
- › Change tasks frequently and/or abruptly
- › Require access to the system anywhere and at any time



Mobile Application Design Consideration Space



Mobile Application Dev Aspects

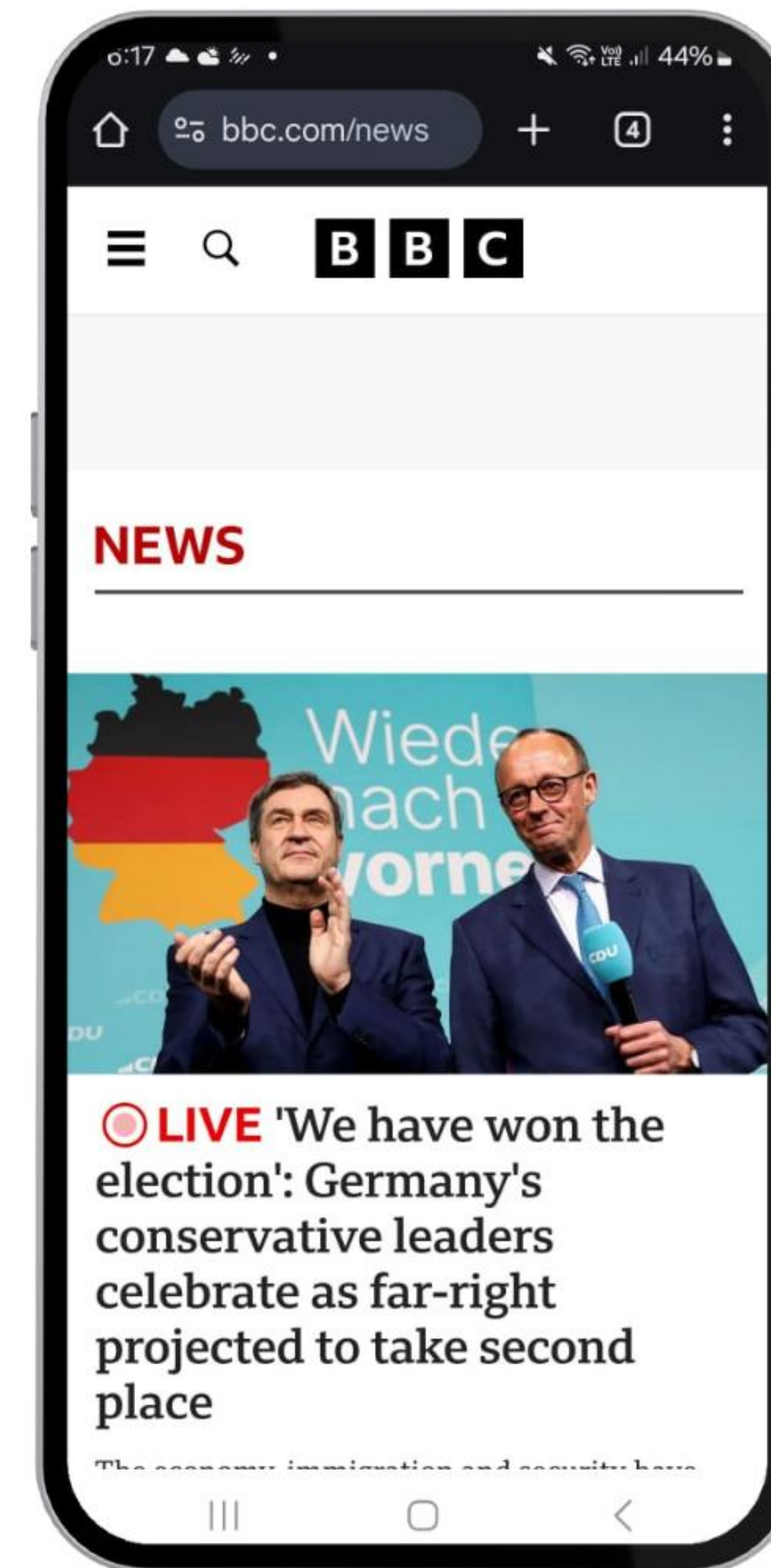
- › The fact: different hardwares, different OSs,
- › Code portability and mobility
- › Hardware Abstractions vs Performance
 - › Virtual Machine abstracts the specificity of hardware
 - › Performance consideration is more in mobile
- › Architectural style:
 - › Thin-client wireless client-server
 - › Thick-client wireless client-server
 - › Stand-alone applications

Mobile Application Development

- › Mobile settings:
 - › penggunaan device yang memiliki kemampuan terbatas
 - › context-based
 - › task oriented
 - › situasi/kondisi penggunaan aplikasi
 - › portable, personal, dibawa kemana-mana

Jenis Mobile App

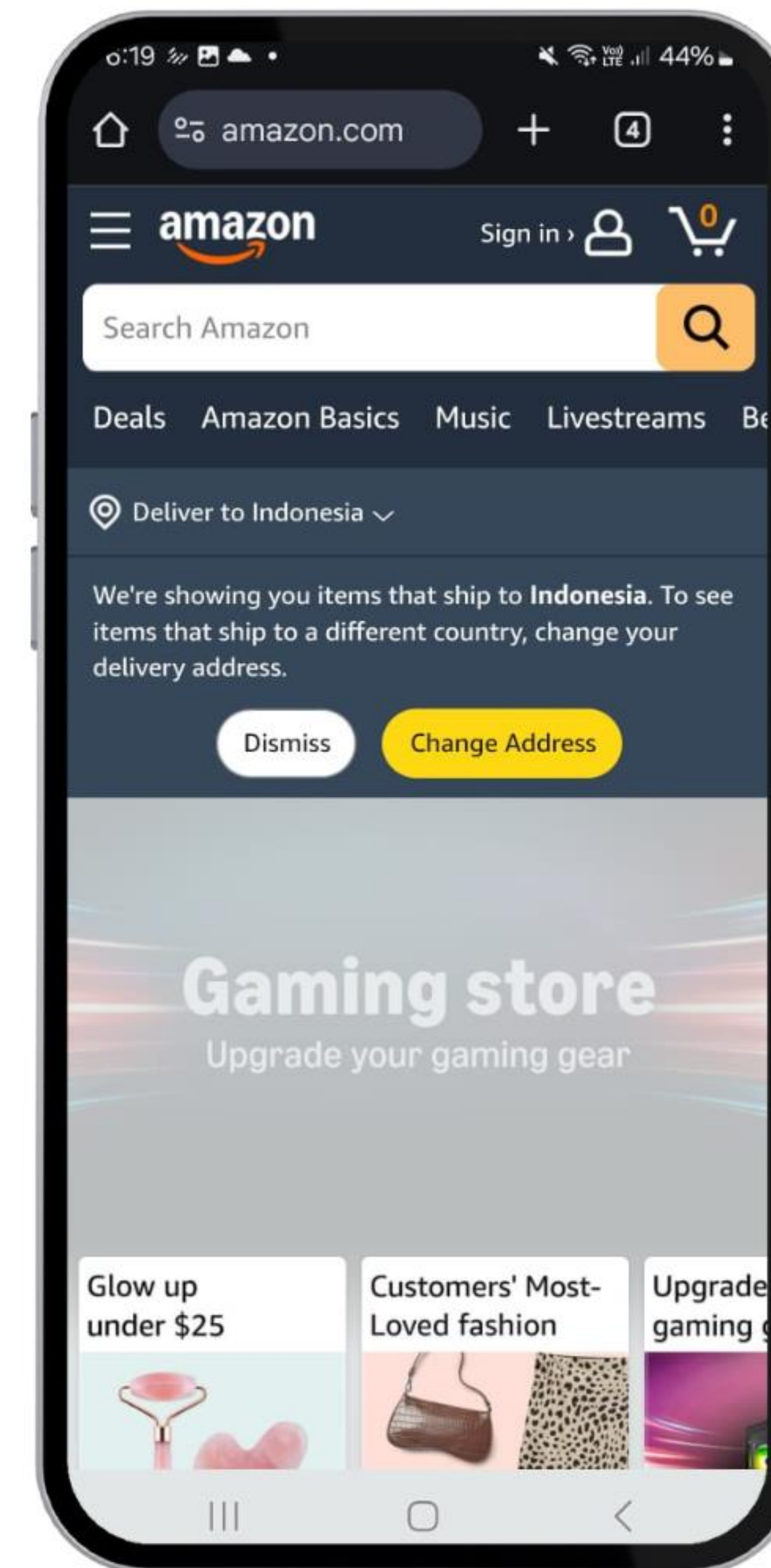
- › Text-based app
 - › content provider
 - › SMS alert
 - › USSD code
- › Mobile websites
 - › fokus pada content
 - › interaksi sederhana



Fling, B.
Mobile Design and Development: Practical concepts and techniques for creating mobile sites and web apps (Animal Guide)
O'Reilly, 2009

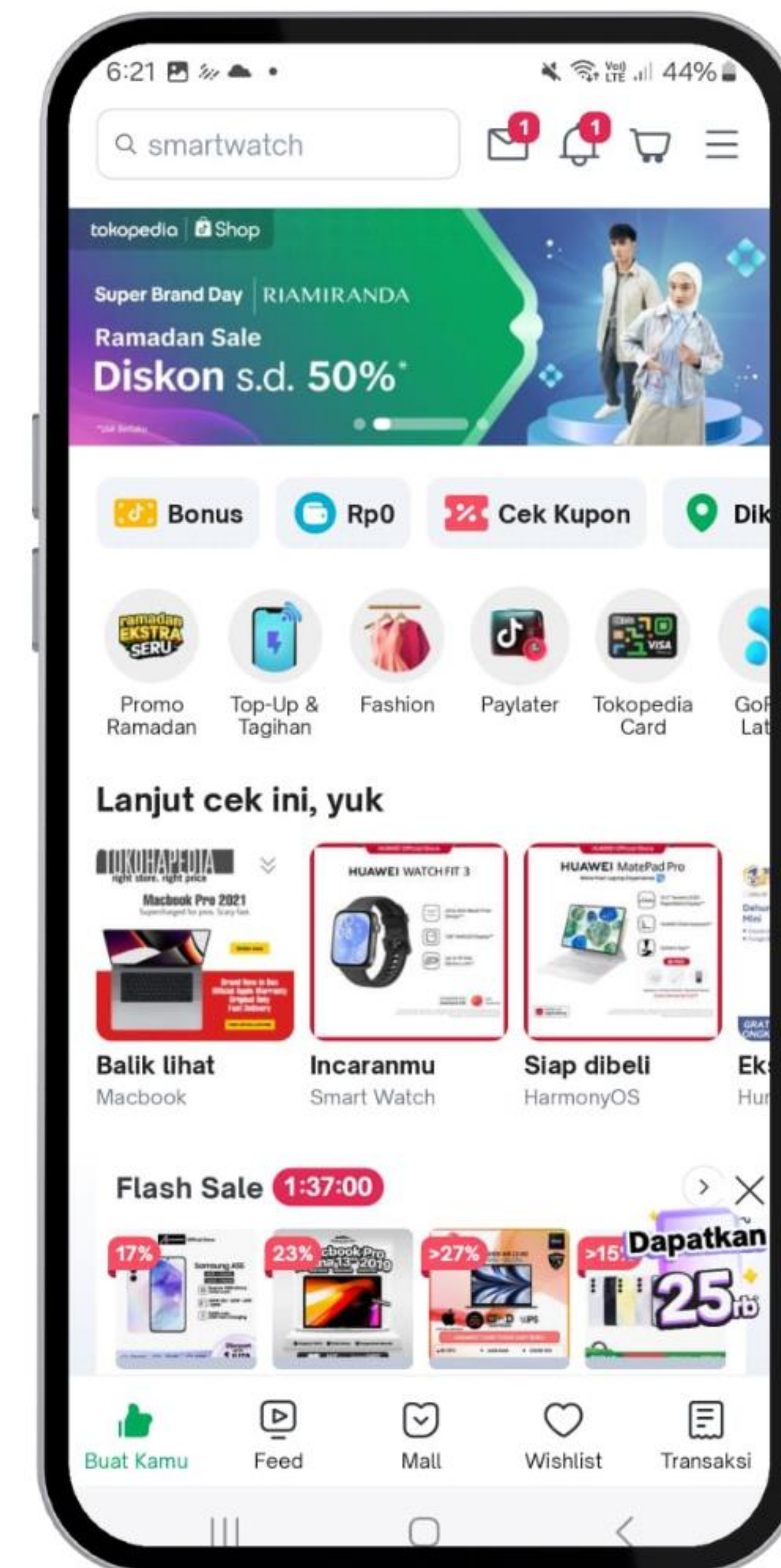
Jenis Mobile App

- › Mobile Web Apps
 - › web-based, namun menyediakan application-like experience ke pengguna
 - › HTML, CSS, Javascript
 - › facebook, gmail..
 - › Framework utk men-deploy pada sejumlah mobile platform
 - › (co: PhoneGap, Sencha, Titanium)



Jenis Mobile App

- › Native Apps
 - › platform applications, menggunakan specific mobile platform: iOS, Android, Java ME, Windows Phone, BB10, etc.



Native App vs. Mobile Web App

Native App

- › (+) Berjalan lebih cepat
- › (+) AppStore: kemudahan mencari App dan memastikan kualitas App
- › (+) Dukungan *toolset*
- › (–) Pemeliharaan: *code base*, *version*, dan sejumlah platform

Mobile Web App

- › (+) *single code base*
- › (+) tidak bergantung dg AppStore
- › (+) *seamless versioning*
- › (+) *reuse* Website yang telah ada
- › (–) tidak dapat meng-akses *device feature* selengkap native app
- › (–) harus berjalan pada sejumlah browser pada *devices*

Jenis Mobile App

- › Games
 - › umumnya berupa native app (namun, saat ini bisa saja menggunakan teknologi web, seperti HTML5 dan WebGL)
 - › berbasis grafis, dan sedikit menggunakan device API
 - › Bypass Java API framework



Jenis Mobile App

Table 6-1. Mobile application media matrix

	Device support	Complexity	User experience	Language	Offline support	Device features
SMS	All	Simple	Limited	N/A	No	None
Mobile websites	All	Simple	Limited	HTML	No	None
Mobile web widgets	Some	Medium	Great	HTML	Limited	Limited
Mobile web applications	Some	Medium	Great	HTML, CSS, JavaScript	Limited	Limited
Native applications	All	Complex	Excellent	Various	Yes	Yes
Games	All	Complex	Excellent	Various	Yes	Yes

Application Context

- › Utility Context:
 - › penggunaan app untuk short, task based scenario
 - › tampilan minimal, interaksi minimal
 - › e.g.: Timer, Calculator, Weather forecast
- › Locale Context
 - › penggunaan app berbasis lokasi
 - › peta, navigasi, discount pada supermarket

Application Context

- › Informative Applications
 - › app untuk menyediakan informasi
 - › news, directory, marketing site
- › Productivity Application Context
 - › task-based, terurut berdasarkan prioritas
 - › address book, message, online shopping
- › Immersive Fullscreen App
 - › fokus user pada aplikasi
 - › game

Application Context

Table 6-2. Application context matrix

	User experience type	Task type	Task duration	Combine with
Utility	At-a-glance	Information recall	Very short	Immersive
Locale	Location-based	Contextual information	Quick	Immersive
Informative	Content-based	Seek information	Quick	Locale
Productivity	Task-based	Content management	Long	Utility
Immersive	Full screen	Entertainment	Long	Utility, locale

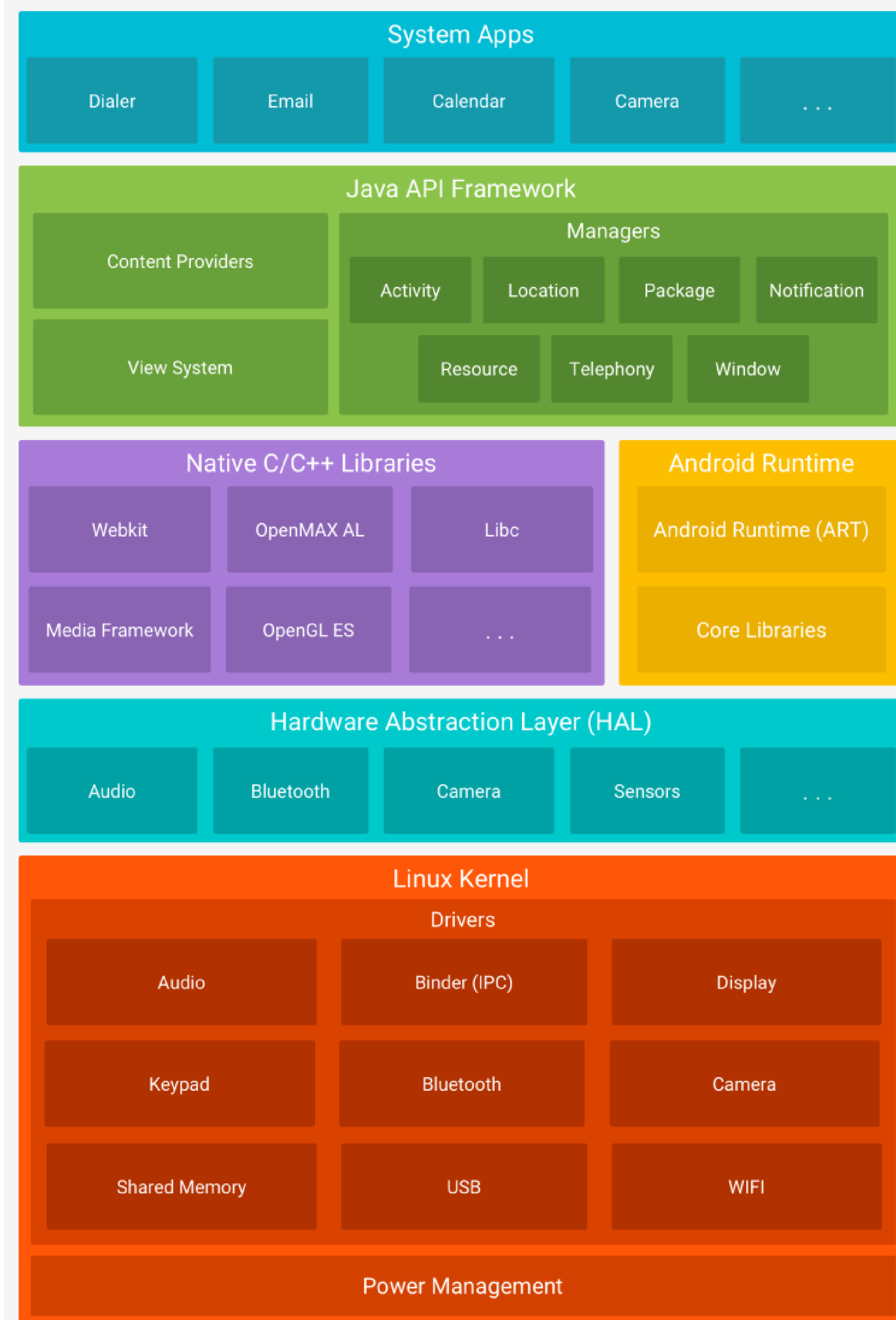
Mobile Platform

- › Arsitektur Mobile Device
 - › hardware
 - › software
 - › OS, kernel, micro-kernel
 - › low-level libraries: networking, file systems, multithreading, graphic rendering
 - › frameworks: high level UI toolkit, application structures
- › IDE
- › bahasa pengembangan
- › Emulator

Mobile Platform (Example)

- › iOS
- › Java
- › BREW
- › WAP
- › Windows (CE)
- › Symbian
- › Palm OS
- › Blackberry
- › Bada
- › Windows Phone
- › .. others

Android Platform Architecture



The Android software stack.

Linux kernel

Hardware abstraction layer (HAL)

Android runtime

Native C/C++ libraries

Java API framework

System apps

<https://developer.android.com/guide/platform>

Sumber

- › Reza B'Far. Mobile Computing Principles. Cambridge University Press, 2005.
- › Fling, B. Mobile Design and Development: Practical concepts and techniques for creating mobile sites and web apps (Animal Guide)
O'Reilly, 2009
- › Stefan Braehler. Analysis of the Android Architecture, 2010
- › Rick Rogers & John Lombardo & Zigurd Mednieks & Blake Meike. Android Application Development: Programming with the Google SDK, O'Reilly, 2010
- › <https://developer.android.com/index.html>