GeoIT Wherecamp Conferences

Technology Age
in IT and GeoIT

Prof. Dr. Roland Wagner, President of the
Association for Geoinformatics, GeoIT and Navigation e.V.
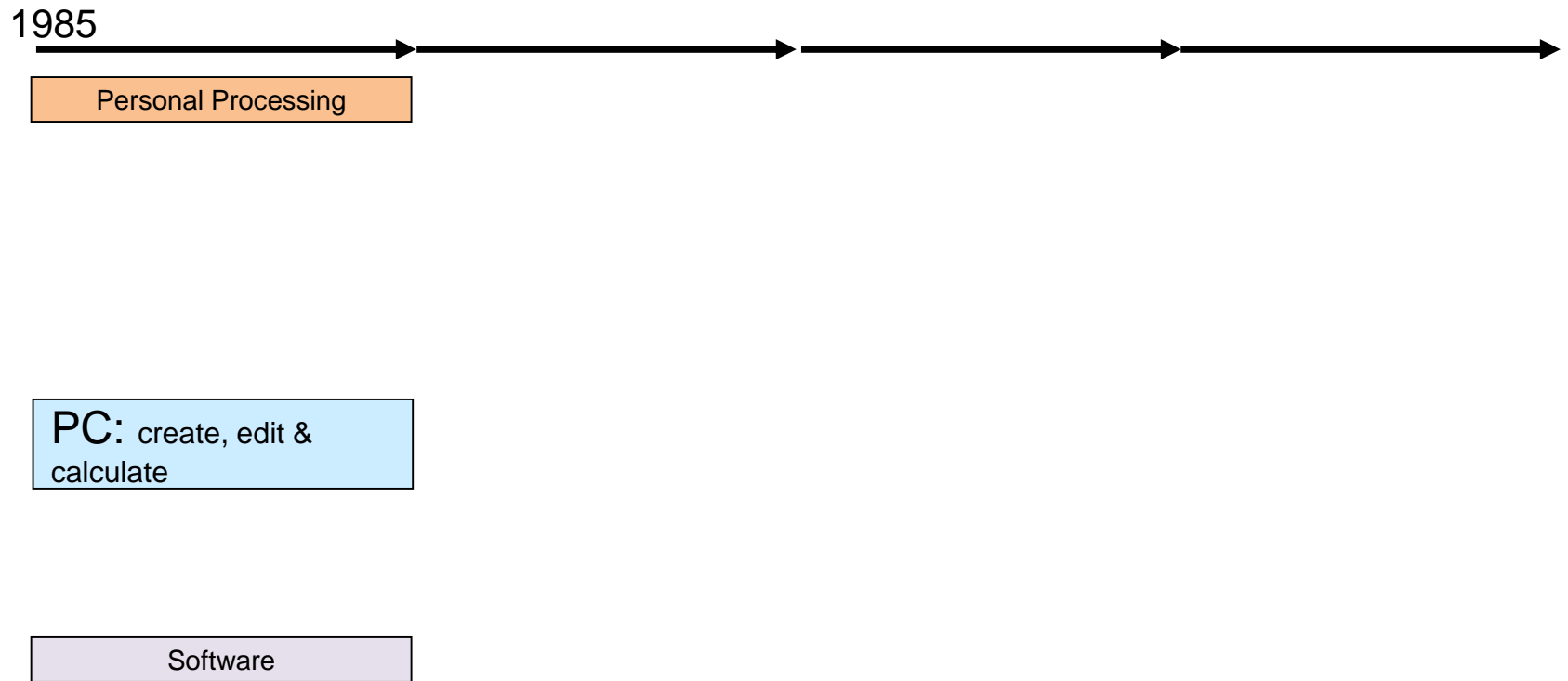and Professor at Beuth University, Berlin

president@geoit.org

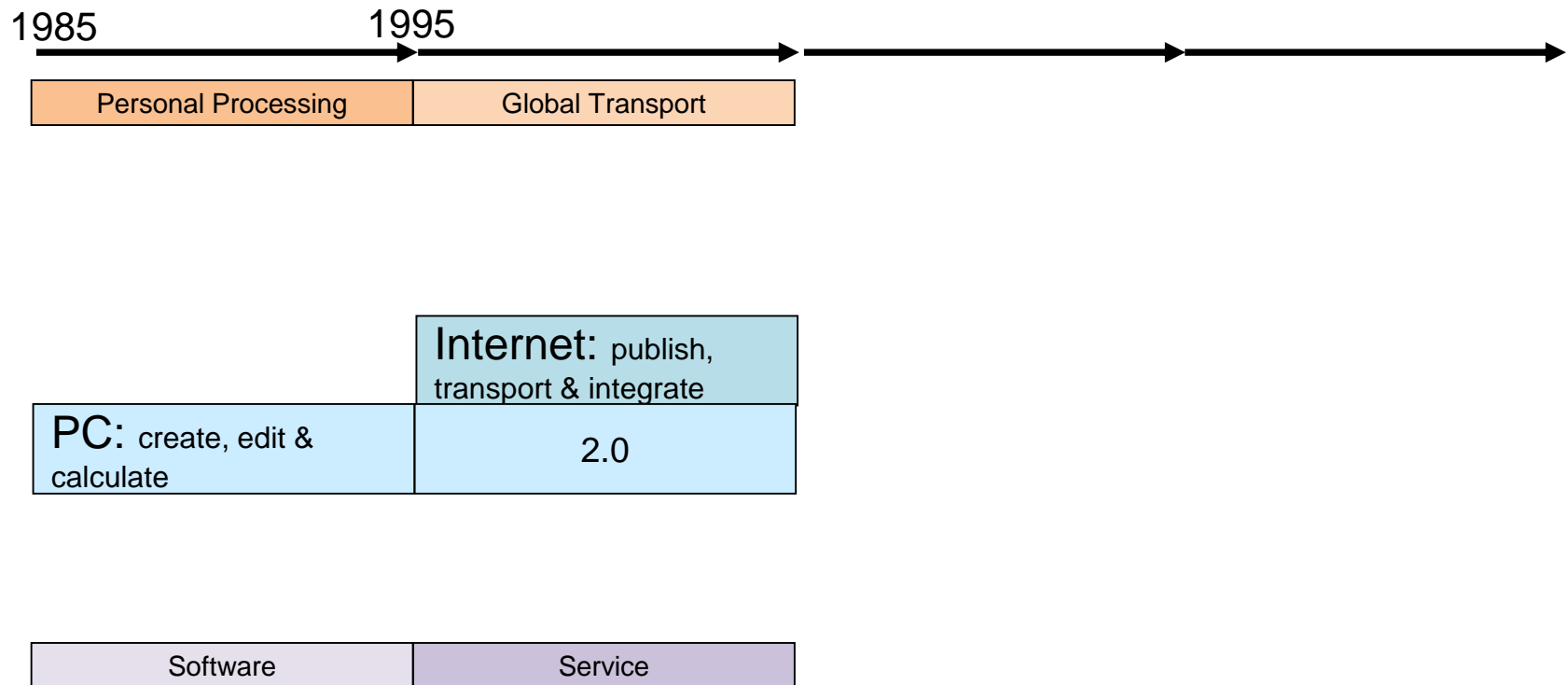**Harvard University,** Cambridge, MA, USA, 2018-06-27

Approach and overview

1. IT development cycles and main methods
2. Abstract and Technology Media Formats
3. IT and GeoIT Platforms and disruption of separated classic geoinformatics (governmental driven) by mainstream IT
4. Sectors
5. GeoIoT
6. Invitation to join our community
7. Conclusion

1. IT Platforms: PC Age

1985

Personal Processing

PC: create, edit & calculate

Software

1. IT Platforms: Internet

1985　　　　　　　　1995

Personal Processing	Global Transport

| PC: create, edit & calculate | Internet: publish, transport & integrate |
| | 2.0 |

Software	Service

1. IT Platforms: Mobile

1985	1995	2005	

Personal Processing	Global Transport	Mobile Processing

		Mobile: navigate,
	Internet: publish, transport & integrate	2.0 or Web 2.0
PC: create, edit & calculate	2.0	3.0

Software	Service	Hardware

1. IT Platforms: IoT

1985	1995	2005	2015
Personal Processing	Global Transport	Mobile Processing	Local Transport

			IoT: ?
		Mobile: navigate,	2.0
	Internet: publish, transport & integrate	2.0 or Web 2.0	3.0 or Internet III
PC: create, edit & calculate	2.0	3.0	4.0

Software	Service	Hardware	?

1. IT Platforms: IoT until 2025?

1985	1995	2005	2015	2025

Personal Processing	Global Transport	Mobile Processing	Local Transport

			IoT: ?
		Mobile: navigate,	2.0
	Internet: publish, transport & integrate	2.0 or Web 2.0	3.0 or Internet III
PC: create, edit & calculate	2.0	3.0	4.0

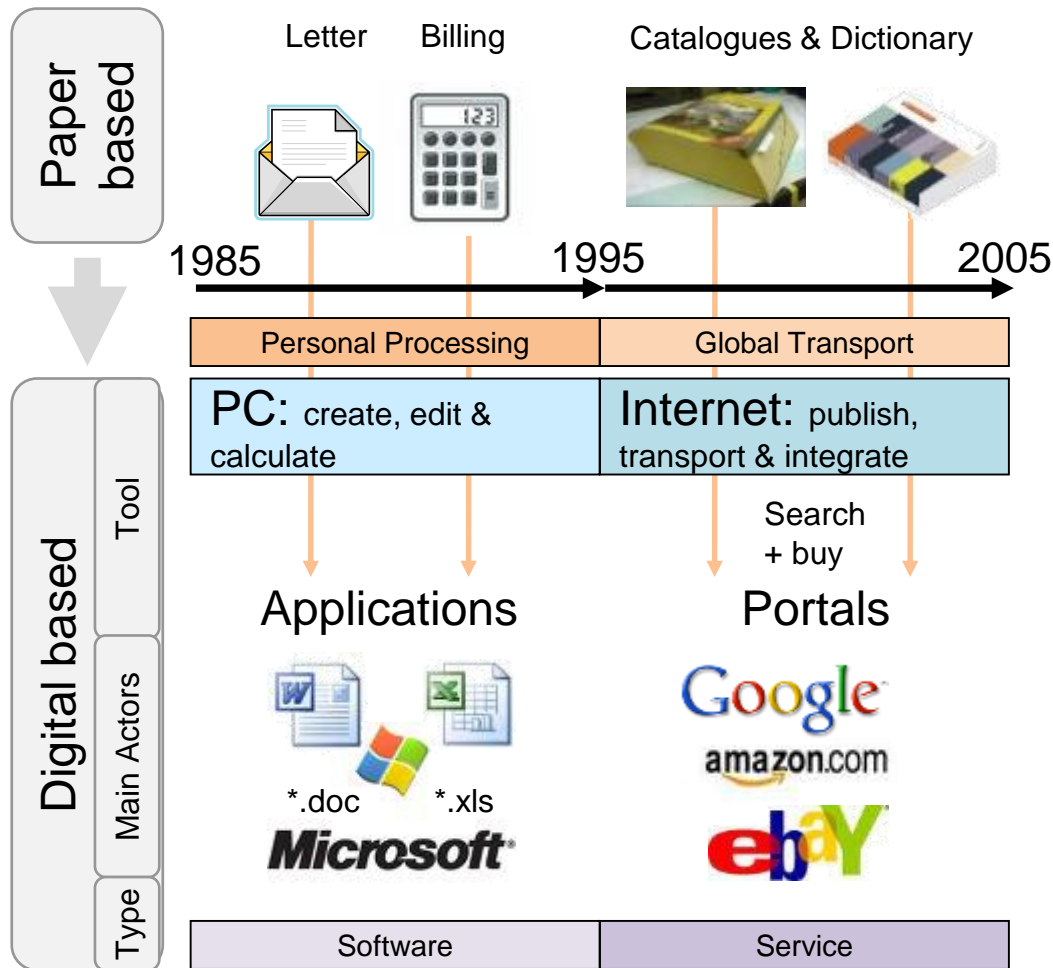| Software	Service	Hardware	?
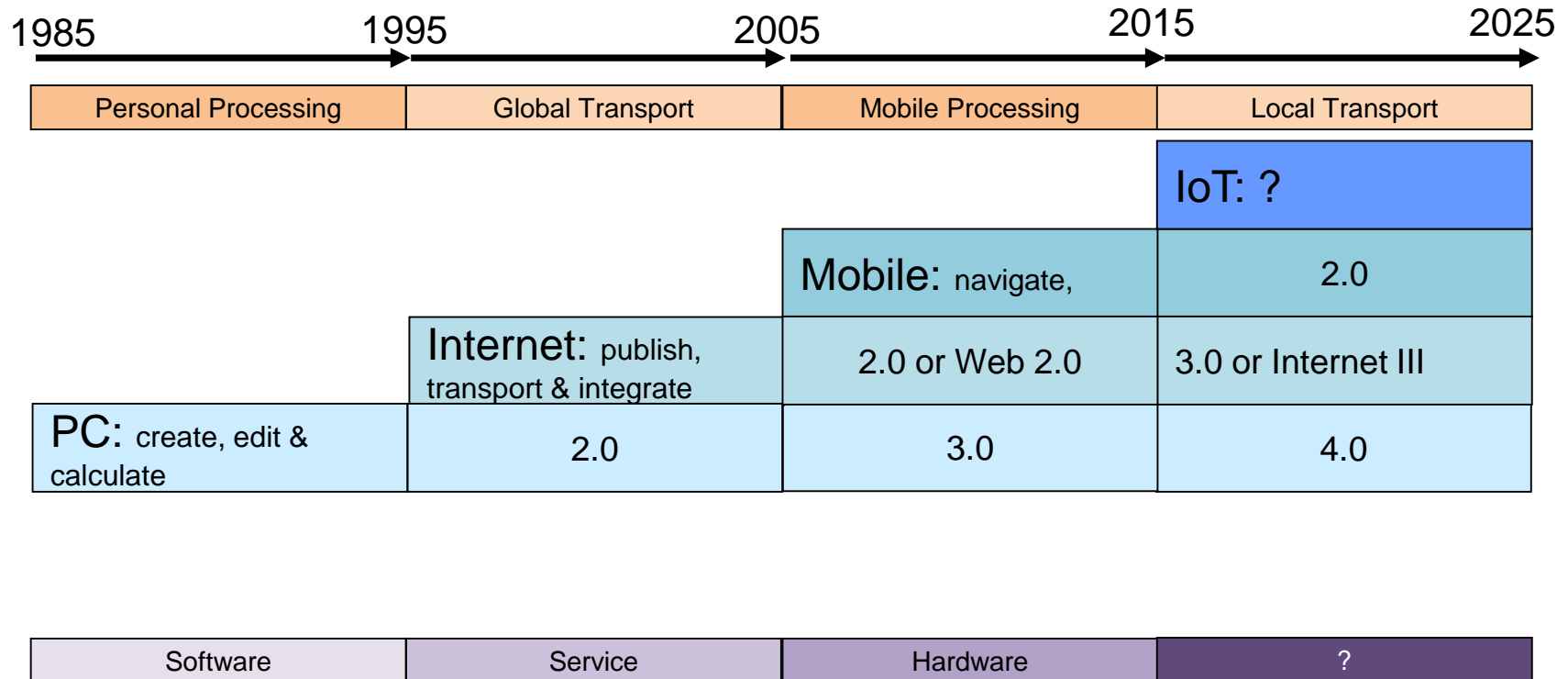
2. Conversation of Media Formats

- Human basic needs do not change or expand very much
  - More change in tools
  - New technologies replace older technologies, e.g.
    - Paper technologies
    - Digital technologies
- Example:
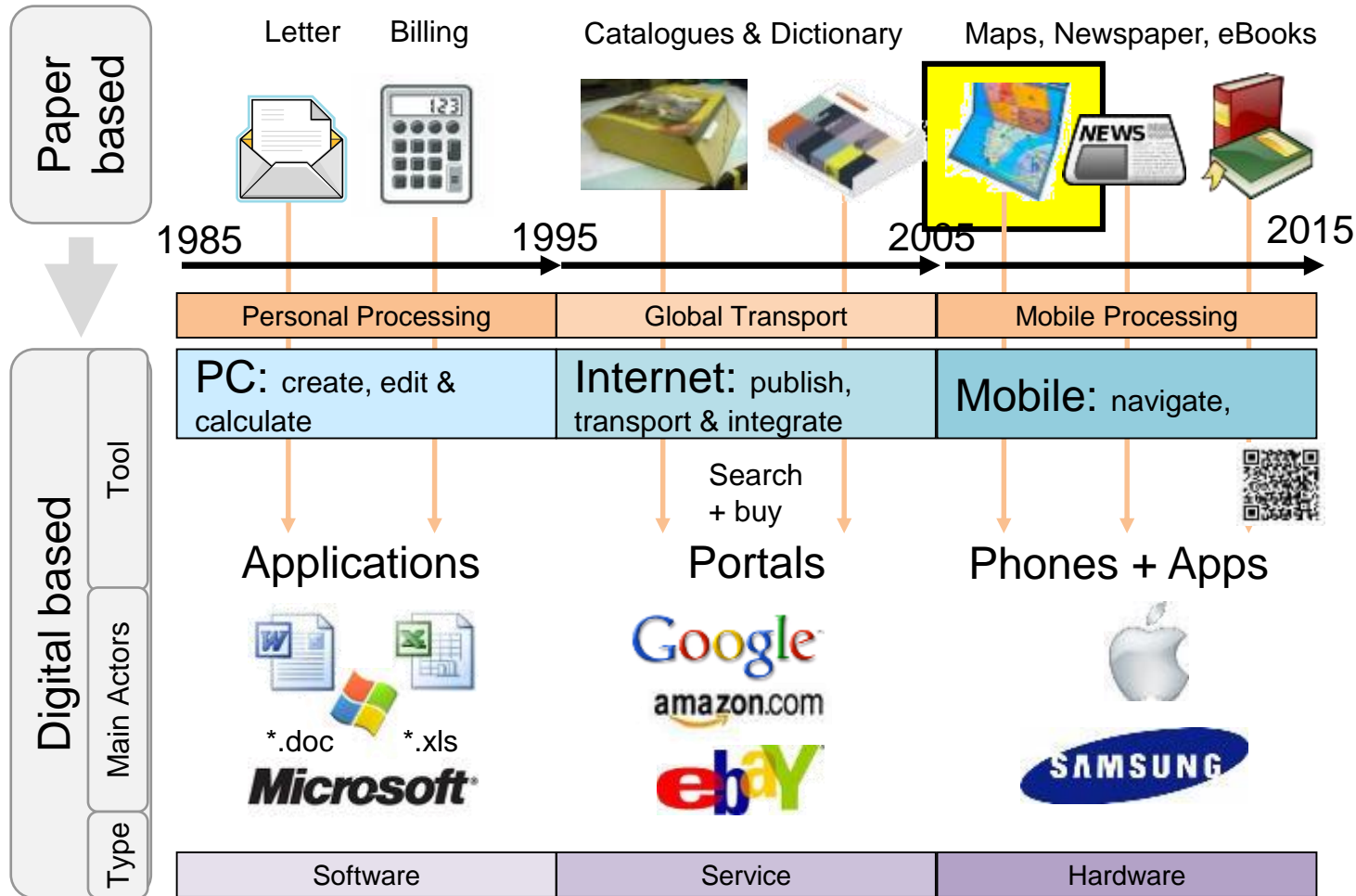 - Paper Maps
  - Digital Maps
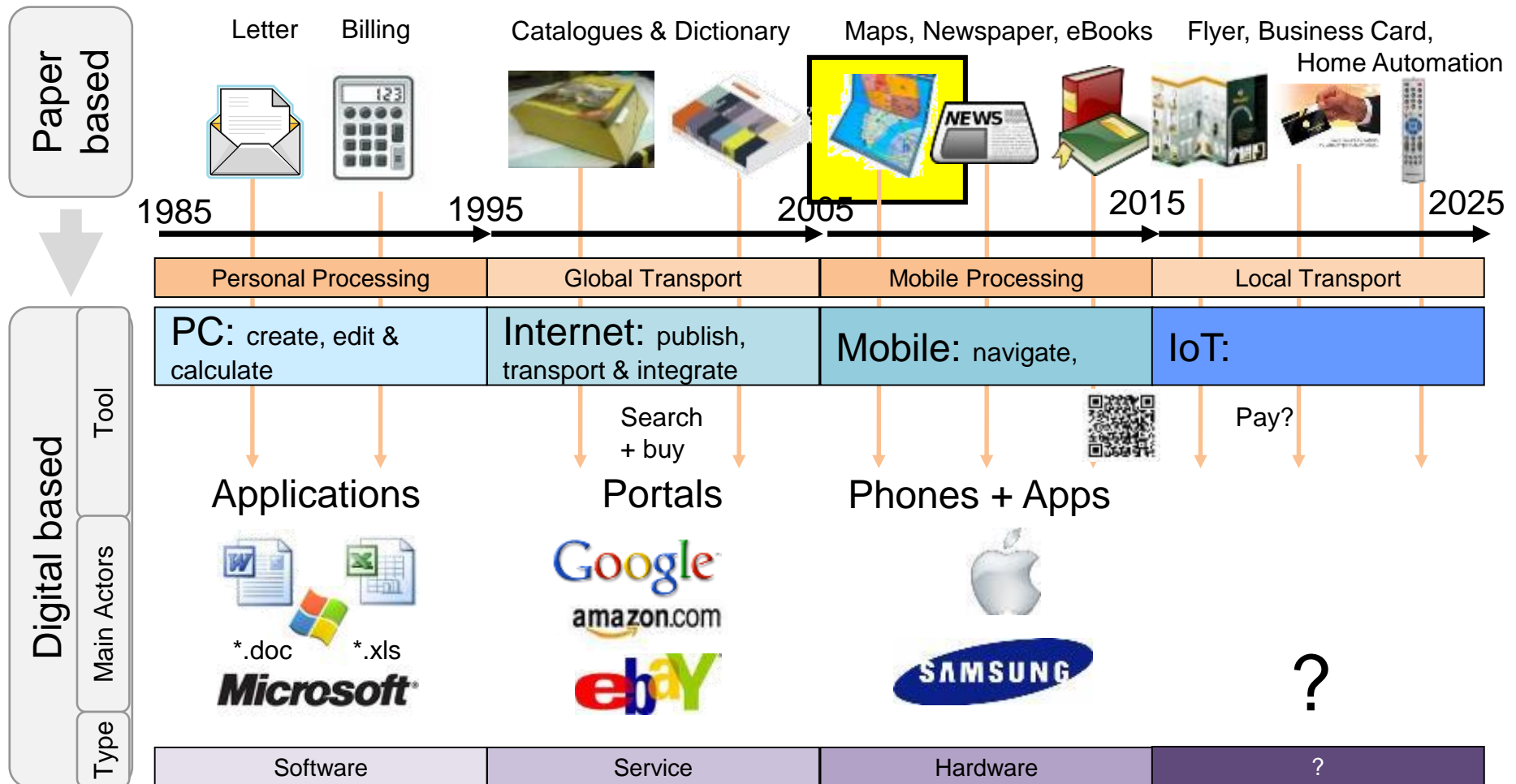
2.1 Abstract Media: Letter

Paper based

Letter   Billing

1985   1995

Personal Processing

PC: create, edit & calculate

Digital based

Tool

Applications

Main Actors

*.doc   *.xls

Microsoft

Type

Software
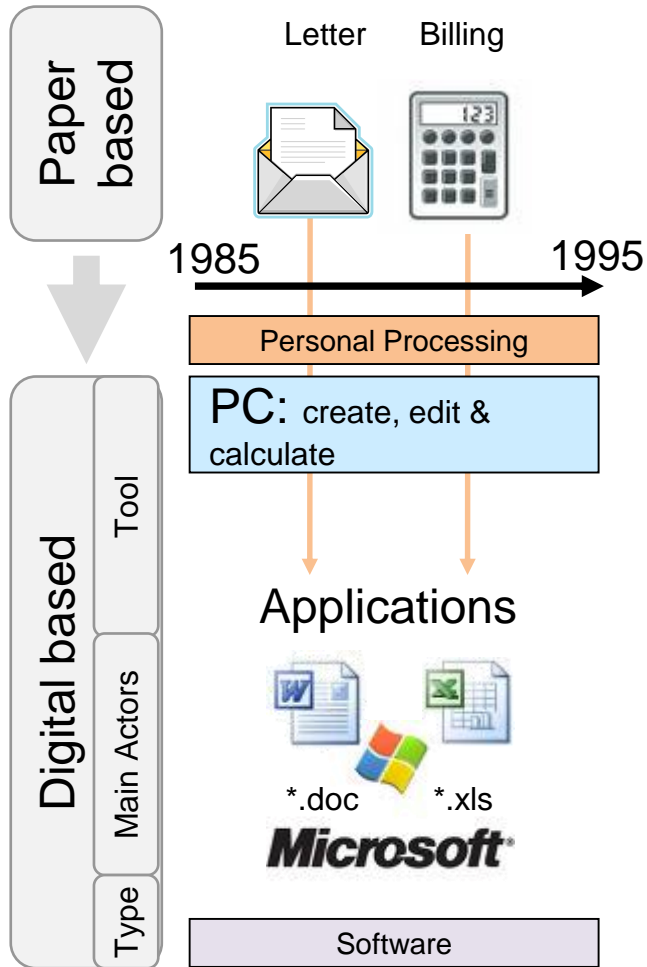
2.1 Abstract Media: Catalogues

Paper based

Digital based

Letter | Billing | Catalogues & Dictionary

1985 — 1995 — 2005

Personal Processing | Global Transport

PC: create, edit & calculate | Internet: publish, transport & integrate

Tool

Search + buy

Applications | Portals

*.doc | *.xls

Main Actors

Google
amazon.com
ebaY
Microsoft

Type

Software | Service

2.1 Abstract Media: Map, eNews…

Paper based

Letter	Billing	Catalogues & Dictionary	Maps, Newspaper, eBooks

1985 ——————— 1995 ——————— 2005 ——————— 2015

Digital based

Personal Processing	Global Transport	Mobile Processing

Tool

PC: create, edit & calculate	Internet: publish, transport & integrate	Mobile: navigate,

Search + buy

Applications	Portals	Phones + Apps

Main Actors

*.doc   *.xls

Google
amazon.com
Microsoft
ebaY
SAMSUNG

Type

Software	Service	Hardware

2.1 Abstract Media: …

Paper based

Letter   Billing   Catalogues & Dictionary   Maps, Newspaper, eBooks   Flyer, Business Card, Home Automation

1985 — 1995 — 2005 — 2015 — 2025

Personal Processing	Global Transport	Mobile Processing	Local Transport

Digital based

Tool

PC: create, edit & calculate | Internet: publish, transport & integrate | Mobile: navigate, | IoT:

Search + buy

Pay?

Main Actors

Applications   Portals   Phones + Apps   ?

*.doc   *.xls
Microsoft

Google
amazon.com
ebaY

SAMSUNG

Type

Software	Service	Hardware	?

3. Umbrella Terms and "Where"

- Computer science (informatics) vs. Information technology (IT)
- Geoinformatics vs. GeoIT

- Geo-"": "Where" question as the main focus with positions and functions
  - GIS is not an umbrella term for multiple ages, but a sub umbrella term for the PC Age with commercial main instance ArcGIS by ESRI and open source main instance QGIS

3.1 IT and derived GeoIT

- The spatial functions require some (later) main stream age features and therefore a time shift of about 5 years can be detected, e.g.

- PC / GIS: Graphical Display

- Internet / GeoWeb: More bandwidth for maps (images)

- …until ca. 2005

Mobile: GeoAPI already in Android API level 1

3.2 IT/GeoIT – GeoWeb Infrastructure

- Traditional community view and expectation

1985	1995	2005	2015	2025
Personal Processing	Global Transport	Mobile Processing	Local Transport

| PC: create, edit & calculate | Internet: publish, transport & integrate | Mobile: navigate, | IoT: |

Separat Domain
Time shift:
ca. 5 years

| PC/GIS: create, edit & calculate with spatial data and functions | Internet/GeoWeb: publish,…integrate with spatial data and functions |
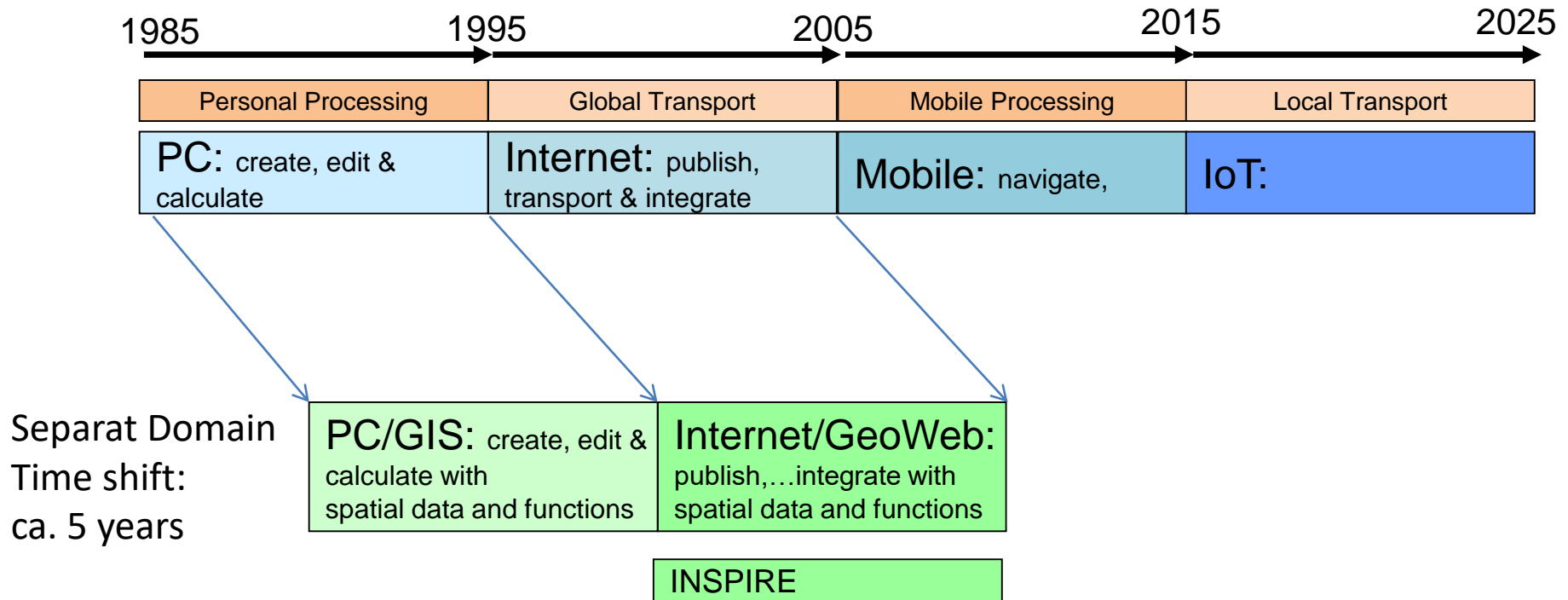
INSPIRE

Geoweb Infrastructure: term to include all sector infrastures, e.g. google maps, INSPIRE,.

3.3 Disruption in 2005/2008

- New GeoIT Infrastructures in Mainstream

1985	1995	2005	2015	2025
Personal Processing	Global Transport	Mobile Processing	Local Transport

| PC: create, edit & calculate | Internet: publish, transport & integrate | Mobile: navigate, | IoT: |

LBA: navigate

OpenStreetMap

Google-HERE

Separat Domain
Time shift:
ca. 5 years

| PC/GIS: create, edit & calculate with spatial data and functions | Internet/GeoWeb: publish,…integrate with spatial data and functions |

INSPIRE

Geoweb Infrastructure: term to include all sector solutions,
e.g. google maps, here maps, OpenStreetMap and EU INSPIRE

3.4 Industrialization of "Where"

- Serve large number of customers/users, e.g. 500 Million

| 1985 | | 1995 | | 2005 | | 2015 | | 2025 |

Personal Processing	Global Transport	Mobile Processing	Local Transport
PC: create, edit & calculate	**Internet:** publish, transport & integrate	**Mobile:** navigate,	**?:**

LBA: navigate

GeoWeb Infrastructures
- OSM
- Google
- HERE

Separat Domain Time shift: ca. 5 years

| **PC/GIS:** create, edit & calculate with spatial data and functions | **Internet/**... publish,…inte... spatial data a... | ...BA: navigate ...nd functions | ?: |
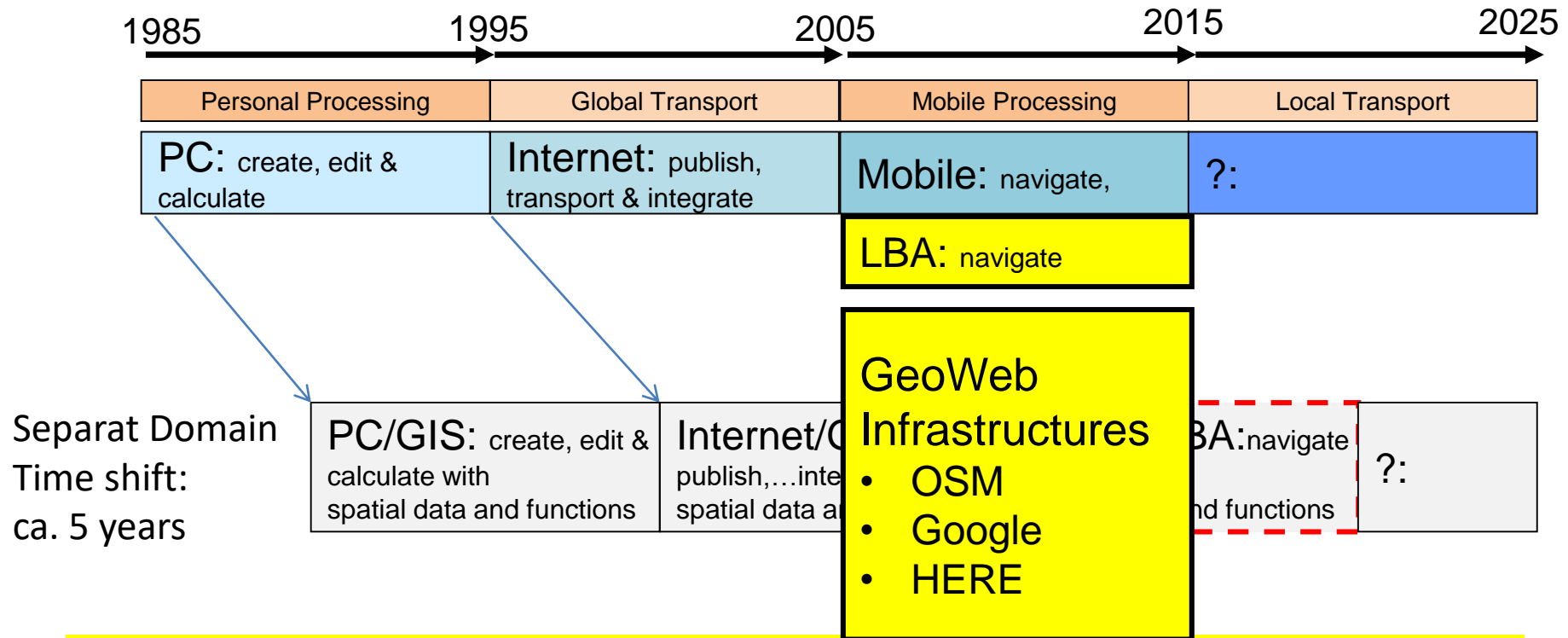
Full integration and industrialization to IT/GeoIT

3.5 Mobile Navigation

- Android API 1 with android.location API and com.google.{maps}

| 1985 | 1995 | 2005 | 2015 | 2025 |

Personal Processing	Global Transport	Mobile Processing	Local Transport
PC: create, edit & calculate	Internet: publish, transport & integrate	Mobile: navigate,	?:

Separat Domain
Time shift:
ca. 5 years

| PC/GIS: create, edit & calculate with spatial data and functions | Internet/S... transport & in... spatial data a... | ...BA: navigate ...nd functions | ?: |

LBA: navigate

GeoWeb: OSM & google..
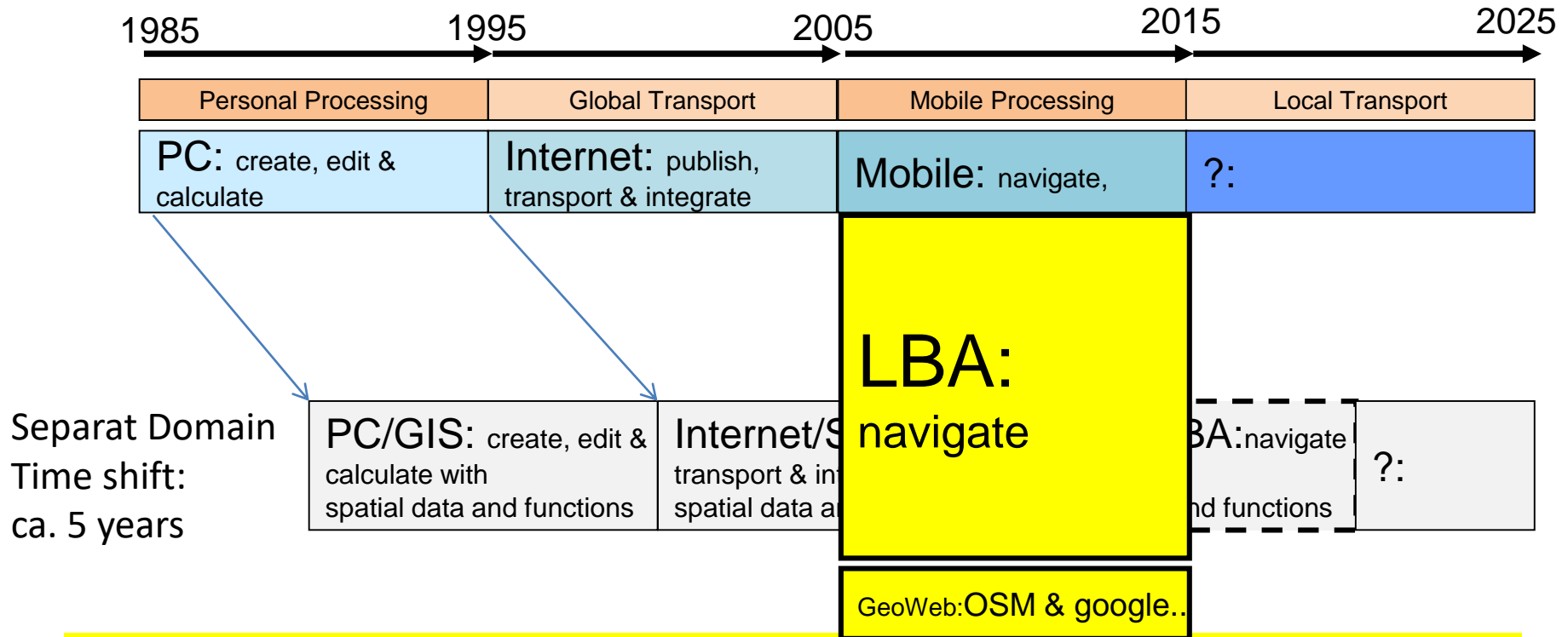
Full integration and industrialization to IT/GeoIT

3.6 IoT/ GeoIoT Age: Outlook

- New trends are difficult to detect beforehand

| 1985 | 1995 | 2005 | 2015 | 2018 | 2025 |

Personal Processing	Global Transport	Mobile Processing	Local Transport
PC: create, edit & calculate	Internet: publish, transport & integrate	Mobile: navigate,	IoT:
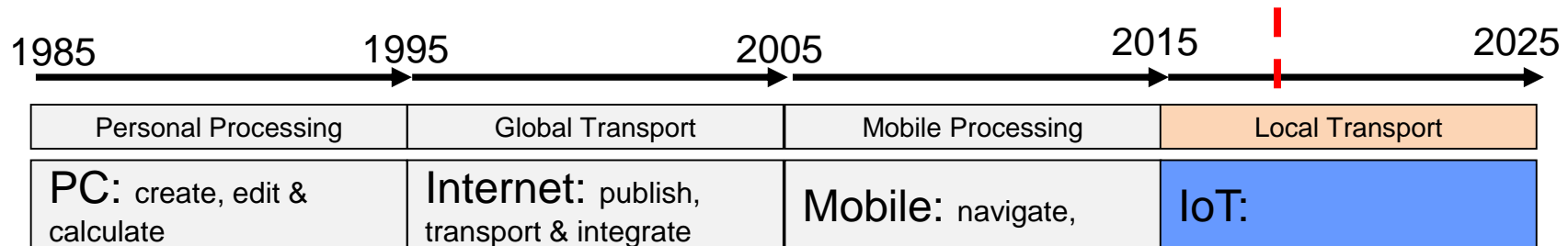
2018

- IoT with Smarthome applications
  – Amazon Alexa / others (based on NLP)
  – Philips Hue / others (based on zigbee)
- GeoIoT might add the "where"
  – E.g. (Hue) lamps/printer/beamer/TV selection by "physical pointing to" with indoor position and indoor data model

4. Sectors: Mix changes

- Different sectors dominate: Adapt curriculums
- Main "Market" for students now companies
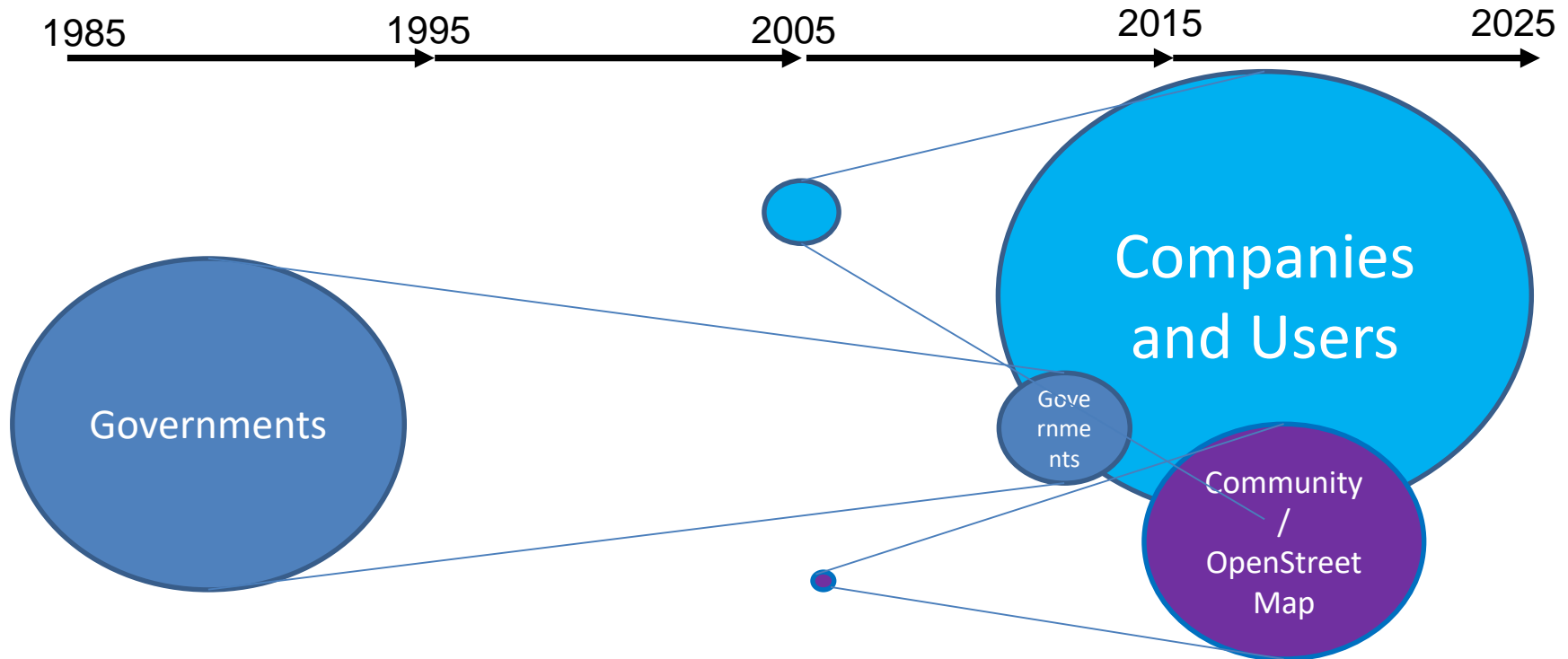
1985   1995   2005   2015   2025

Governments

Companies and Users

Governments

Community / OpenStreet Map

5. GeoIoT:

5.1 OpenStationMap.org Project

- Indoor Maps for GeoIoT
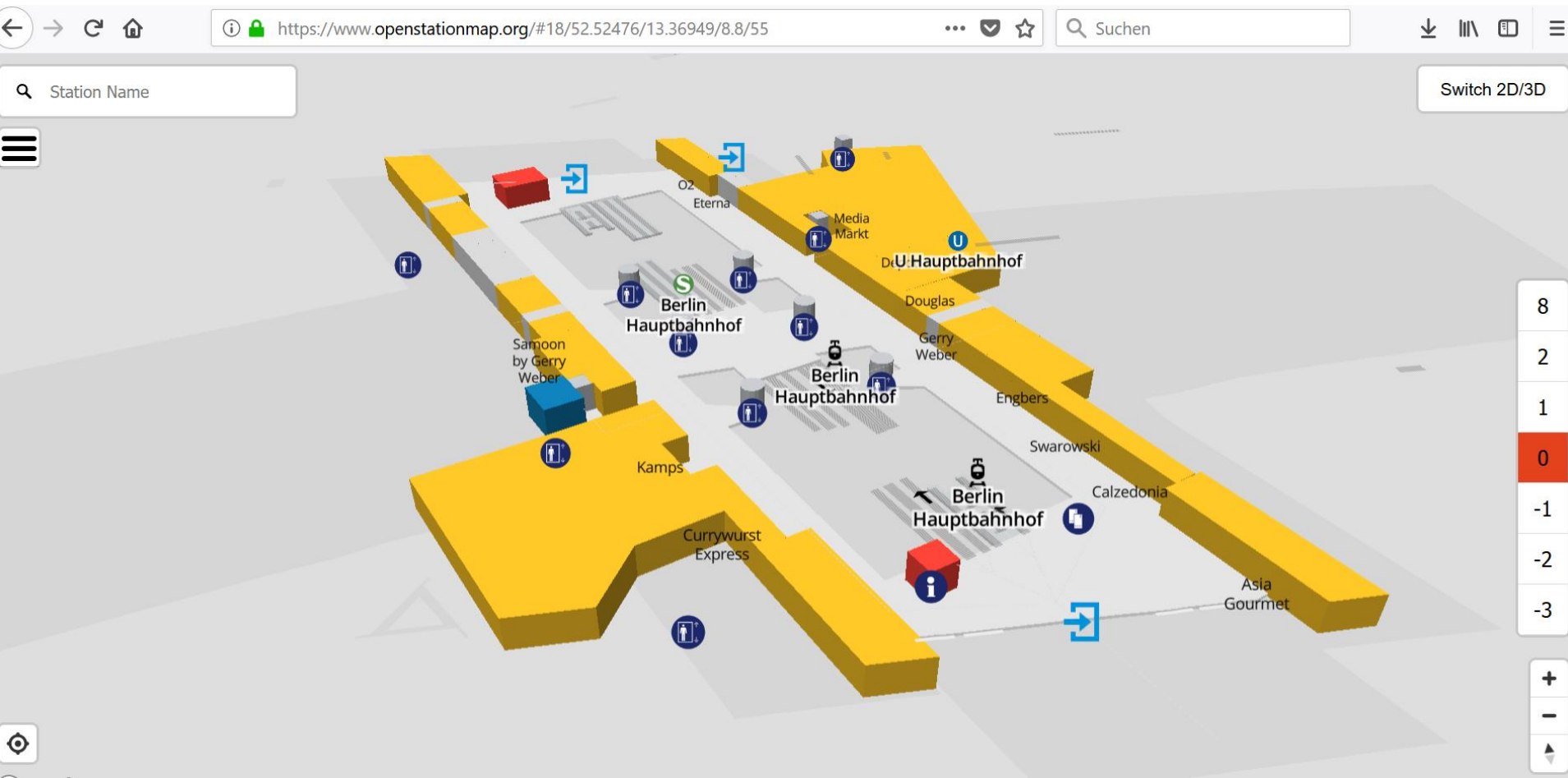
5.2 Some other though…

- More (underground) stations and general buildings (like Universities) numbered exits …

Outdoor meets Indoor at Numbered Gateways

Considerations about a cooperative Gateway Numbering Approach
for multiple GeoIT-providers and for multiple building operators
via an organisational and technical Infrastructure

Roland Wagner
Geoinformatics, GeoIT and Navigation
Beuth Hochschule für Technik Berlin
Berlin, Germany
roland.wagner@beuth-hochschule.de

Masaki Ito
Institute of Industry Science
The University of Tokyo
Tokyo, Japan
mito@iis.u-tokyo.ac.jp

Abstract—This paper is a collection of early thoughts to refine last meter navigation based on observations in highly urbanized cities via numbered and published gateways (including entrances and exits). A new organizational and technological infrastructure can solve the distribution requirement from building operator via internal or external editors to the GeoIT providers and finally

B. General Observations

In opposite to the general observation of much lowed usage of voice communications with the introduction of smartphones, travelers in stations still need it to meet their partners due to a lack of indoor orientation, together with crowded rush hours

5.3 Seven Side Method
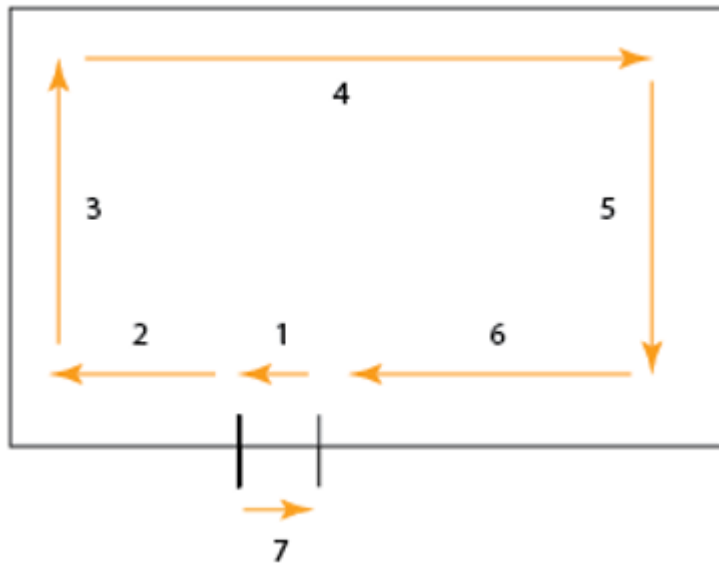
b.txt - Editor

Datei   Bearbeiten   Format   Ansicht   ?

1,0;4,8;8,4;7,4;8,4;1,5;1,1
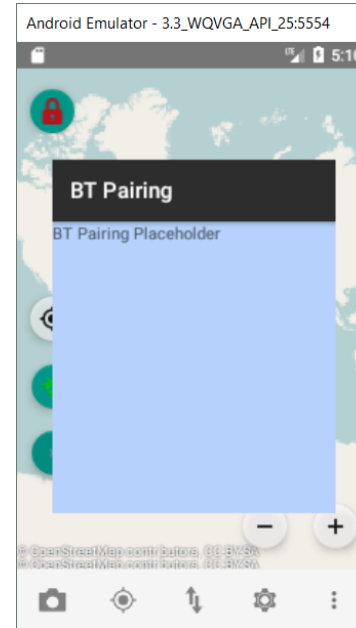
Figure 4 In editor the measurements are entered
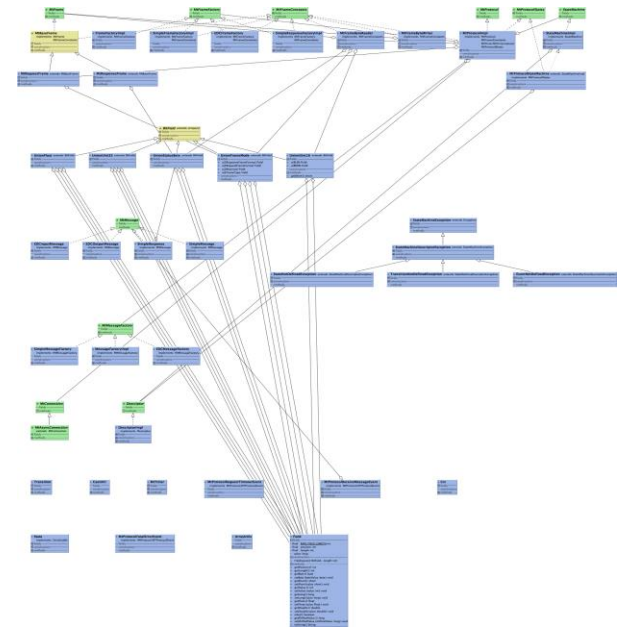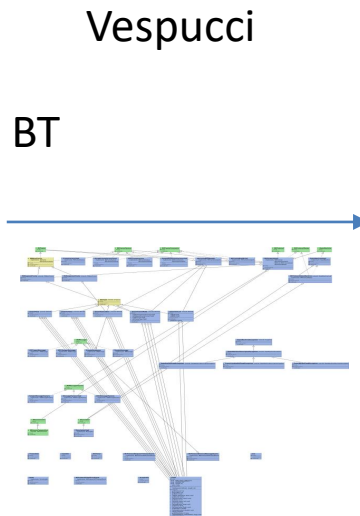
Bluetooth API of (propriety)
Bosch Laser Distance Measurement Device
and similar Leica

5.4 Seven Side via BT to OSM Vespucci

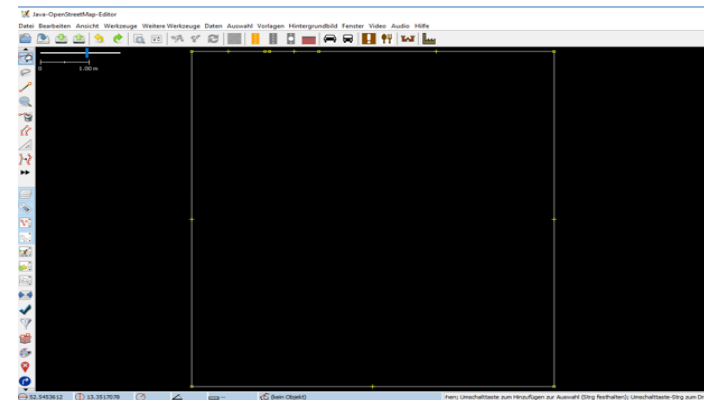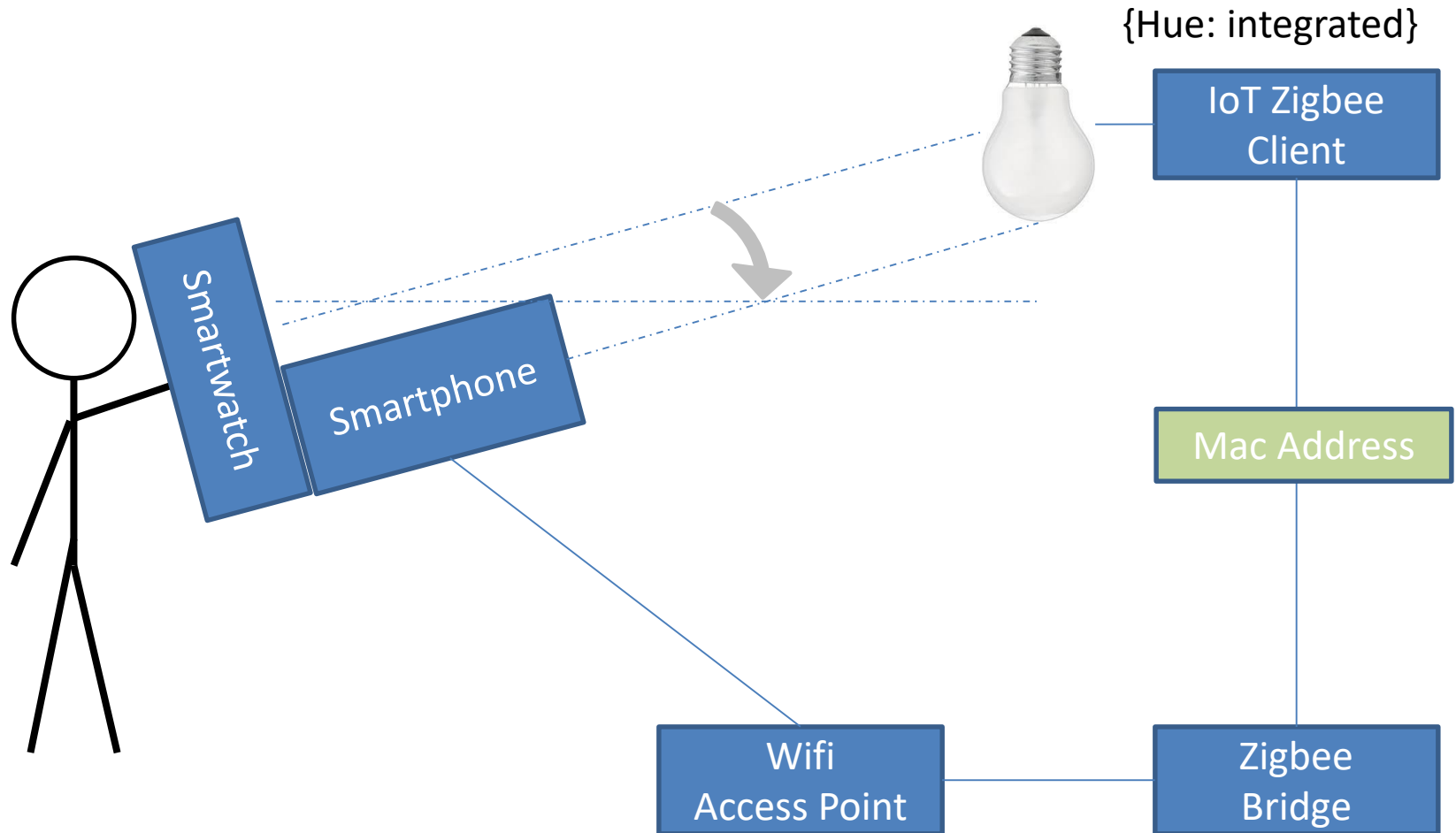Vespucci

BT

Figure 1 The Bosch laser distance meter
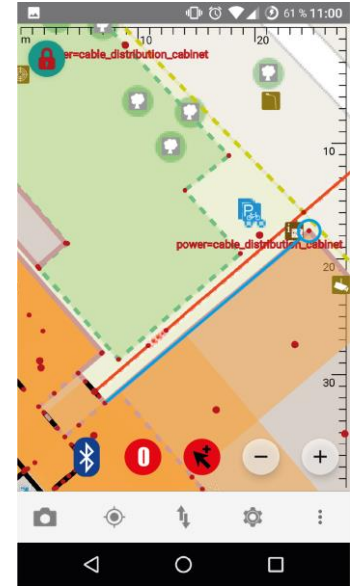
JOSM

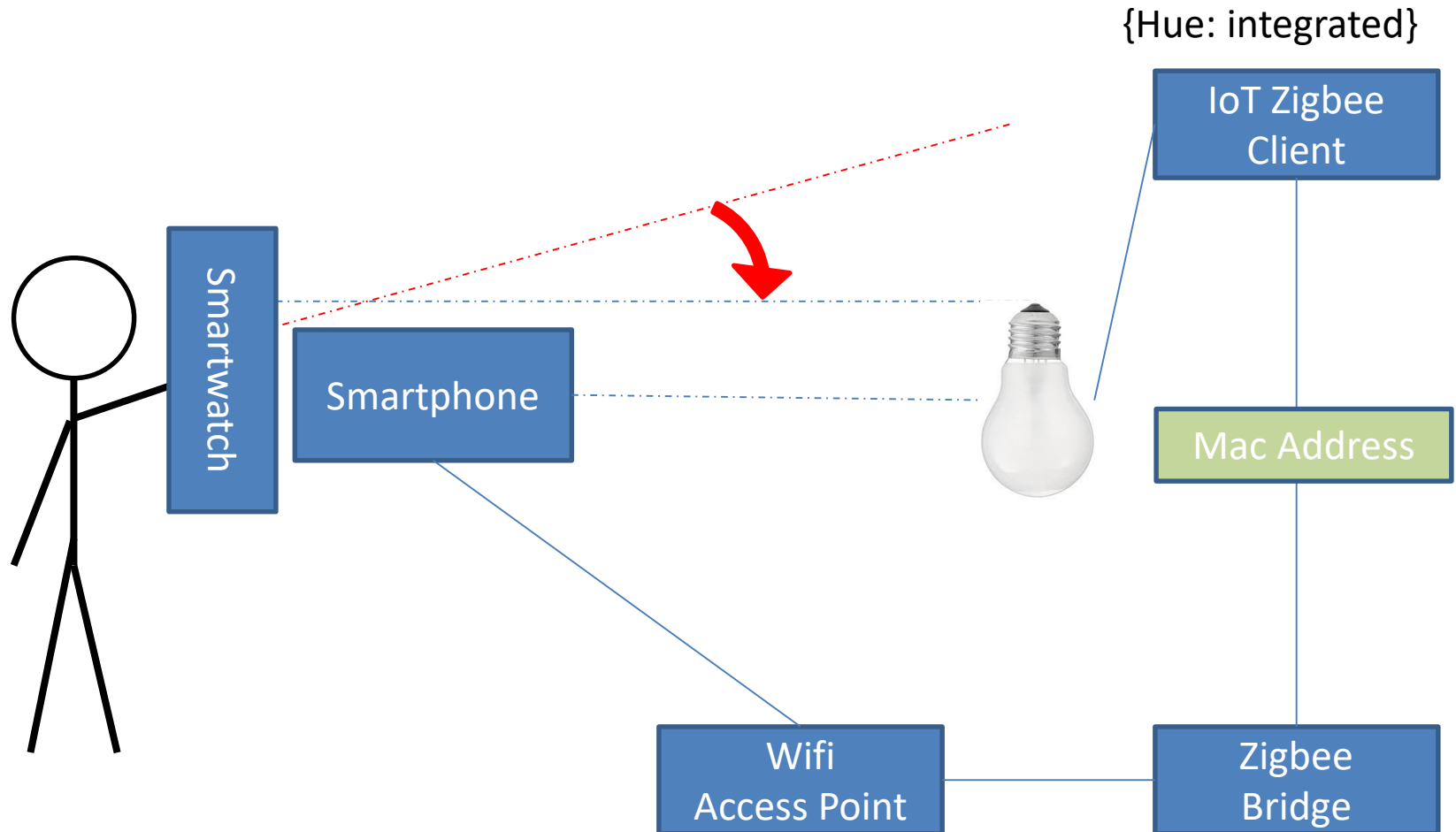Figure 3: The presentation of the space in JOSM

5.6 Approach GeoIoT example

- Spatial selection parallel to logical (list) selection
- Similar usage with "classic TV remote control with IR transmission", but without IR
- Assuming the indoor positioning is solved (which is more and more solved) smartphone and smartwatch "pointing" gets feasible via already build-in and very accurate sensors like gyroscope
- Reduction of possible devices via spatial distribution in rooms, e.g. only a single lamp under the room ceiling may reduce the required precision of indoor positioning
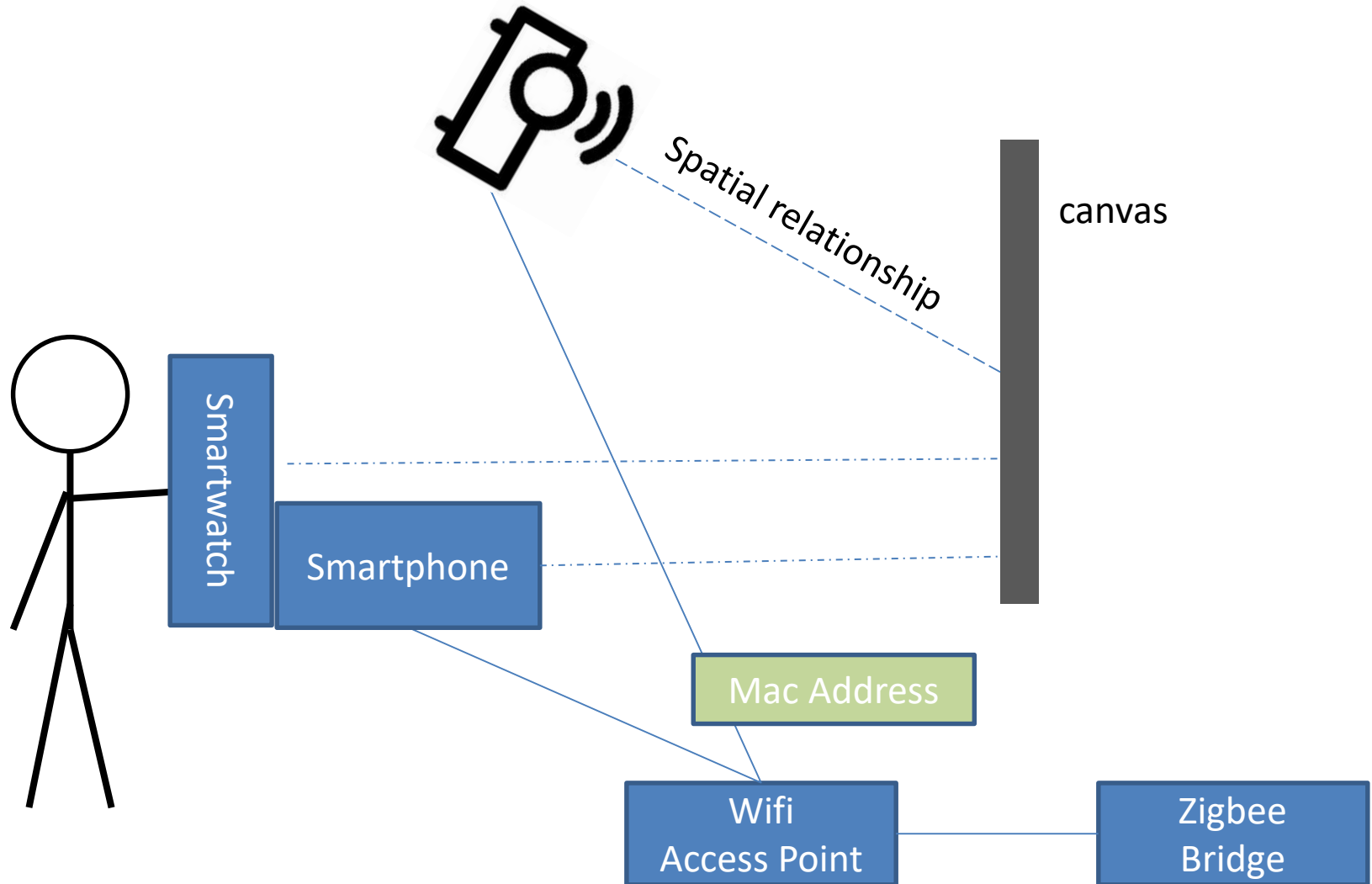
5.7 Use Case: Ceiling Lamp

{Hue: integrated}

IoT Zigbee Client

Mac Address

Smartwatch

Smartphone

Wifi Access Point

Zigbee Bridge

5.8 Use Case: Desk Lamp

{Hue: integrated}

IoT Zigbee Client

Mac Address

Smartwatch

Smartphone

Wifi
Access Point

Zigbee
Bridge

5.9 Use Case Beamer

Spatial relationship

canvas

Smartwatch

Smartphone

Mac Address

Wifi
Access Point

Zigbee
Bridge

5.10 GeoIoT example

- New indoor data model required,
  - e.g. indirect: projection for beamer
  - DeviceID (MacAdress) to spatial feature
  - Device extent
  - 3D
  - …
- New spatial selection thresholds need to be experimental identified for indoor position requirements, maybe even dynamic (if there is only a single lamp)

5.11 Android GNSS Raw Data

Trend to expand smartphones with additional hardware (dual frequencies, Broadcom 2019) and correction updates (dGPS)

Mass market outdoor measurement in cm

Ed Parsons, Google, at GeoIT Wherecamp 2016:
GNSS RAW measurements to develop innovative applications on Android
https://drive.google.com/file/d/0BytPQTDn3eCFQ1RqRWFtUmNnY0U/view

Up to date source: https://developer.android.com/guide/topics/sensors/gnss

https://developer.android.com/guide/topics/sensors/gnss

5.12 Mobile 2.0 with spatial "write"?

1995   2005   2015   2018   2025

Internet: publish, transport & integrate	2.0 or Web 2.0

READ => WRITE
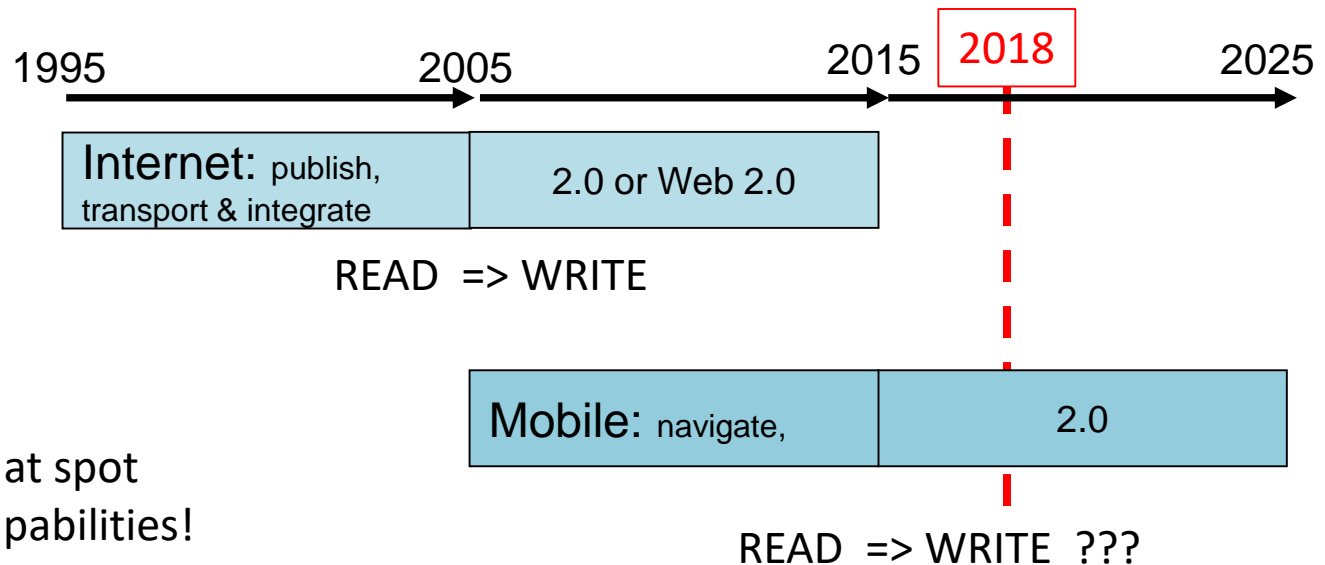
Write <=> edit()

Creating good maps at spot
with mass market capabilities!

Mobile: navigate,	2.0

READ => WRITE ???

6.1 Invitation to GeoIT.org

- To speak at the next GeoIT Wherecamp 2018 Conference on October 24 at TU Berlin
- http://wherecamp2018.geoit.org/
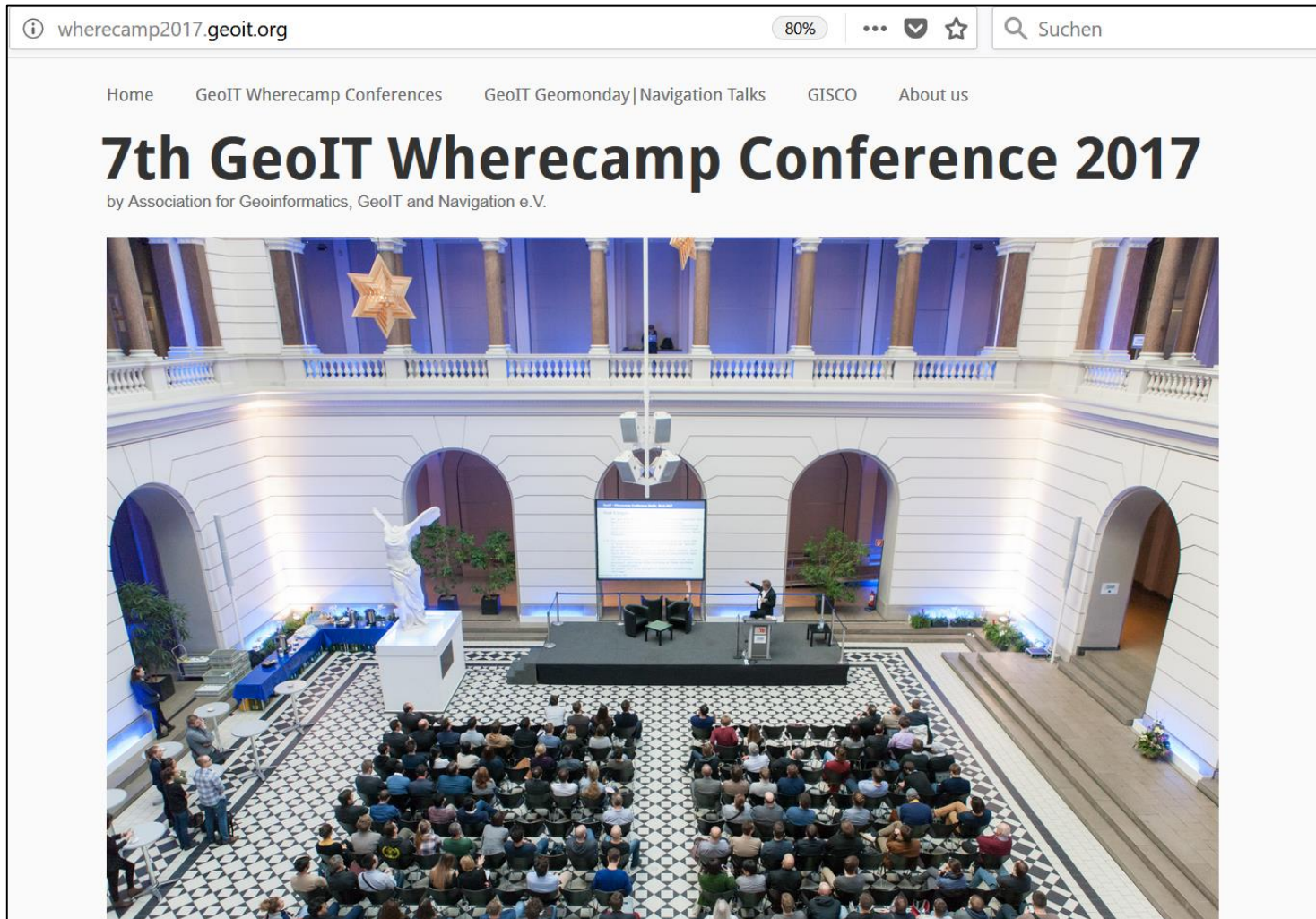
6.2 Impressions

Soon 16th GeoIT GeoMonday Edition
Soon 7th GeoIT Wherecamp Edition

6.3 EU Galileo Hackathon in 2016

6.4. Talks

6.5. Wearable Hackathon

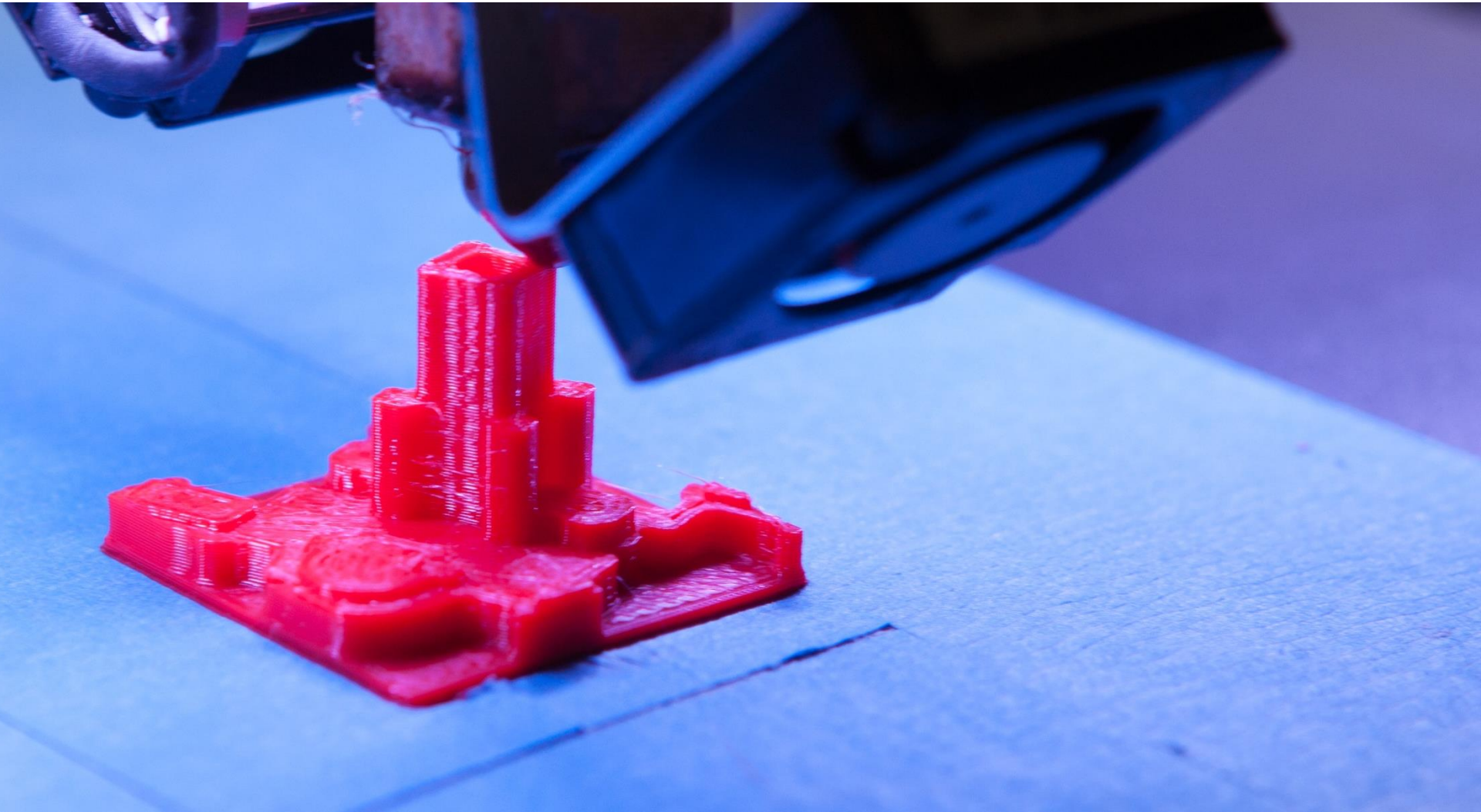# 6.6. "GeoIT originals":
Philipp Kandal (skobber/Telenav), Steve Coast (OSM), Roland Wagner, Christof Hellmis (HERE VP), Ed Parsons (Google)

7.1. Conclusion for GeoIT.org

- 2005: "Association for Geoinformatics" founded with an academic focus understanding two platforms (governmental Internet SDI and much less PC GIS).
- Stagnation (PC/GIS) vs. Growth (Mobile/LBA)
  - Governmental SDI (z.B. INSPIRE) vs. OpenStreetMap and Google/HERE GeoWeb infrastructures
- 2011: Where 2.0 / Wherecamp / Stanford new community
- 2015: Fusion to "Association for Geoinformatics, GeoIT and Navigation" with these understandings
  - Wish to join these groups to re-invent our self
  - Mobile was driving force, Internet intermediate, PC was done
  - Location Based Apps (LBA) and Industry & OSM "GeoWeb Infrastructures"
  - From academic to industry like "informatics" to IT"
  - GeoIT similar to e.g. HeathIT / CarIT / FinancialIT/... as an IT subdomain
  - Navigation as THE main application, most important invention of the ongoing 21st century.
- Similar discussions at Beuth University, but...

7.2. Conclusion

- GeoIT as an umbrella term
  - Not "GIS", because connected only to PC Age!
  - GeoIT as a specialization of IT
  - Reduce Geography
- Adapt curriculums
  - Technology driven, including Mobile and IoT
  - Industry driven – not government driven
- The abstract media format conversation rules

Contact

Prof. Dr. Roland Wagner

President of the Association for Geoinformatics, GeoIT and Navigation e.V.

www.geoit.org (join us!)
president@geoit.org
+491795307646

Beuth Hochschule für Technik Berlin
roland.wagner@beuth-hochschule.de