

A novel cognitive engine towards geo-location based vertical Handoff decision

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Outline

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Scope

Positioning and Cognition

Horizontal Handover

Vertical Handover

Conclusions

Scope of work

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The **scope** of this work is:

To present a use case scenario in indoor environments, regarding position based **Horizontal Handoff** decision and execution.

To present **Vertical Handover scenario** that results by considering a cognitive engine where Positioning data and sensed environmental metrics are used for the Cognitive Decision to be initiated



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Positioning

Geo-location steps leading to handover

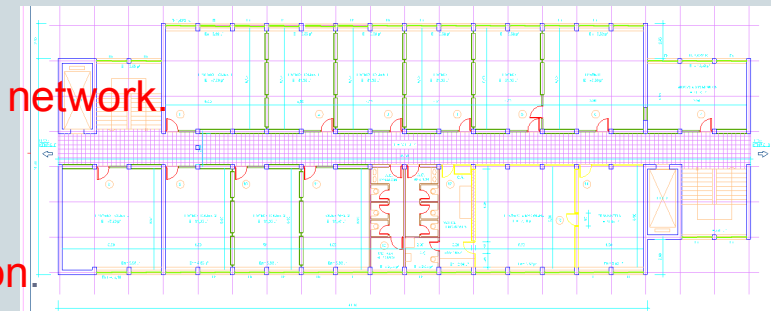
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- **Learning Phase**

- Creation of a database with position, radio and performance map.

- **Cognitive Decision Engine Integration**

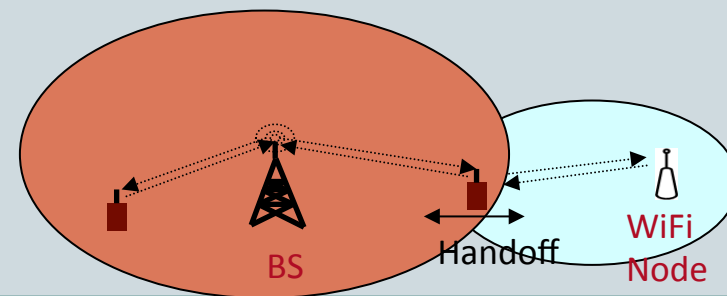
- Monitoring in a periodic way the holistic view of the network.
- Identification of imminent handoff event.
- Decision of the appropriate Access Point association.



Positioning

- **Geo-Location based handover**

- Execution of the handoff decision.



Cognitive cycle

Geo-location of a user's terminal

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Positioning:

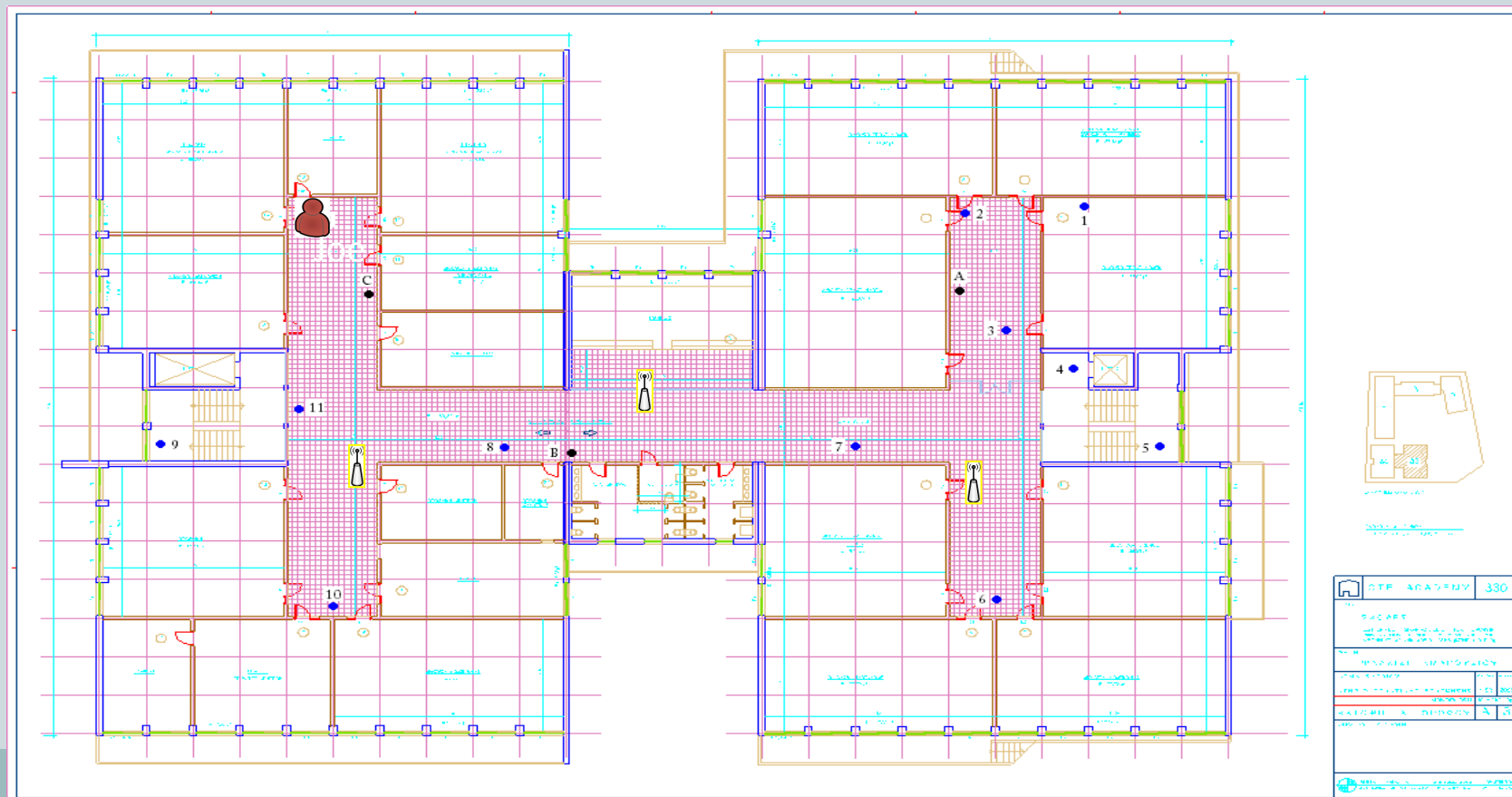
Enable **indoor** user location

- ➡ To offer him proper services
- ➡ To improve network efficiency
- ➡ To help user find his way



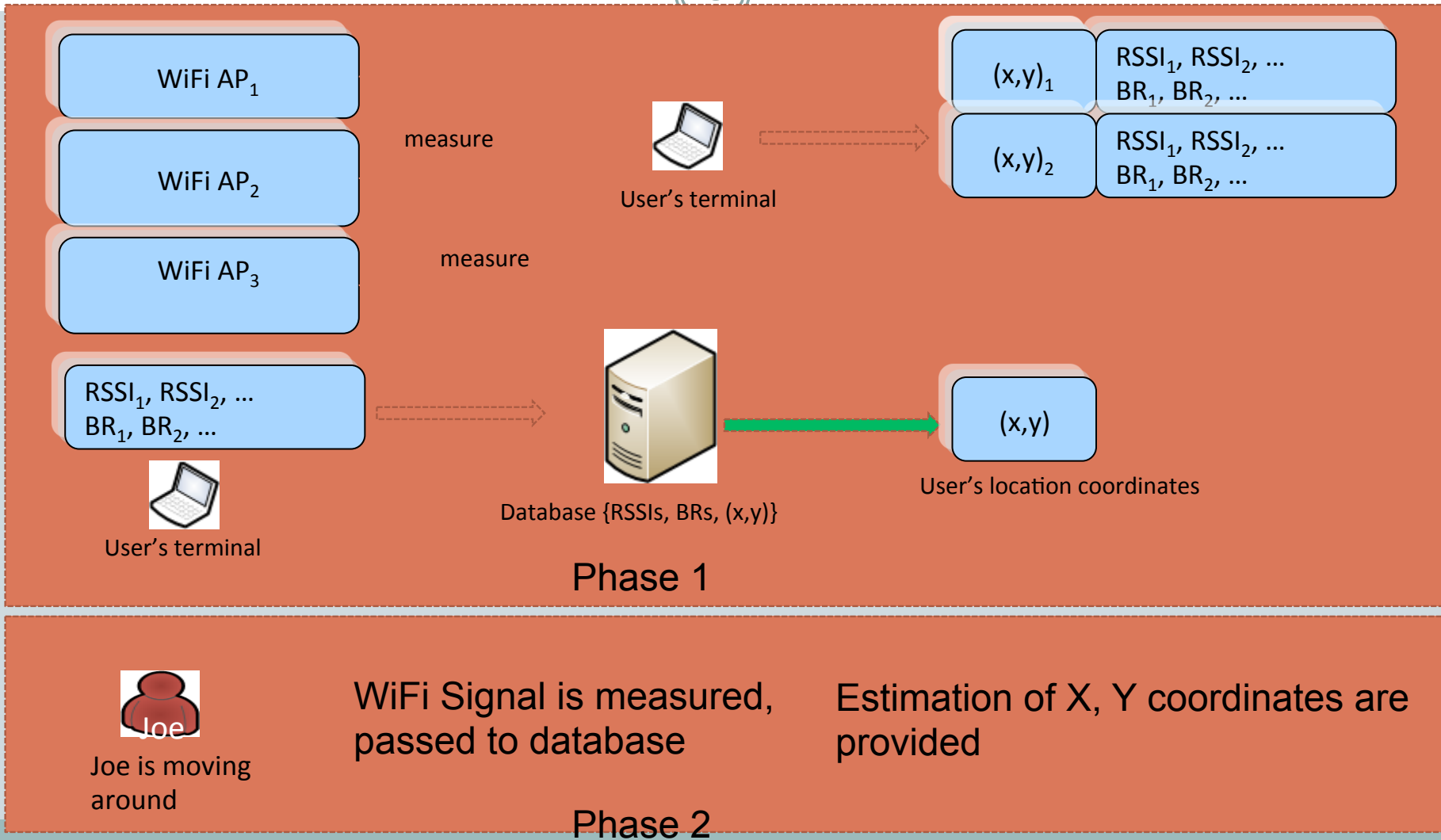
Algorithms for estimating the position

Use **localization** algorithms for predicting the user position. Fingerprinting method was used for various **WiFi**s 11g,n by measuring **RSSI**, **bit rate (BR)** and the distance of the user from three different WiFis for LOS and NLOS cases.



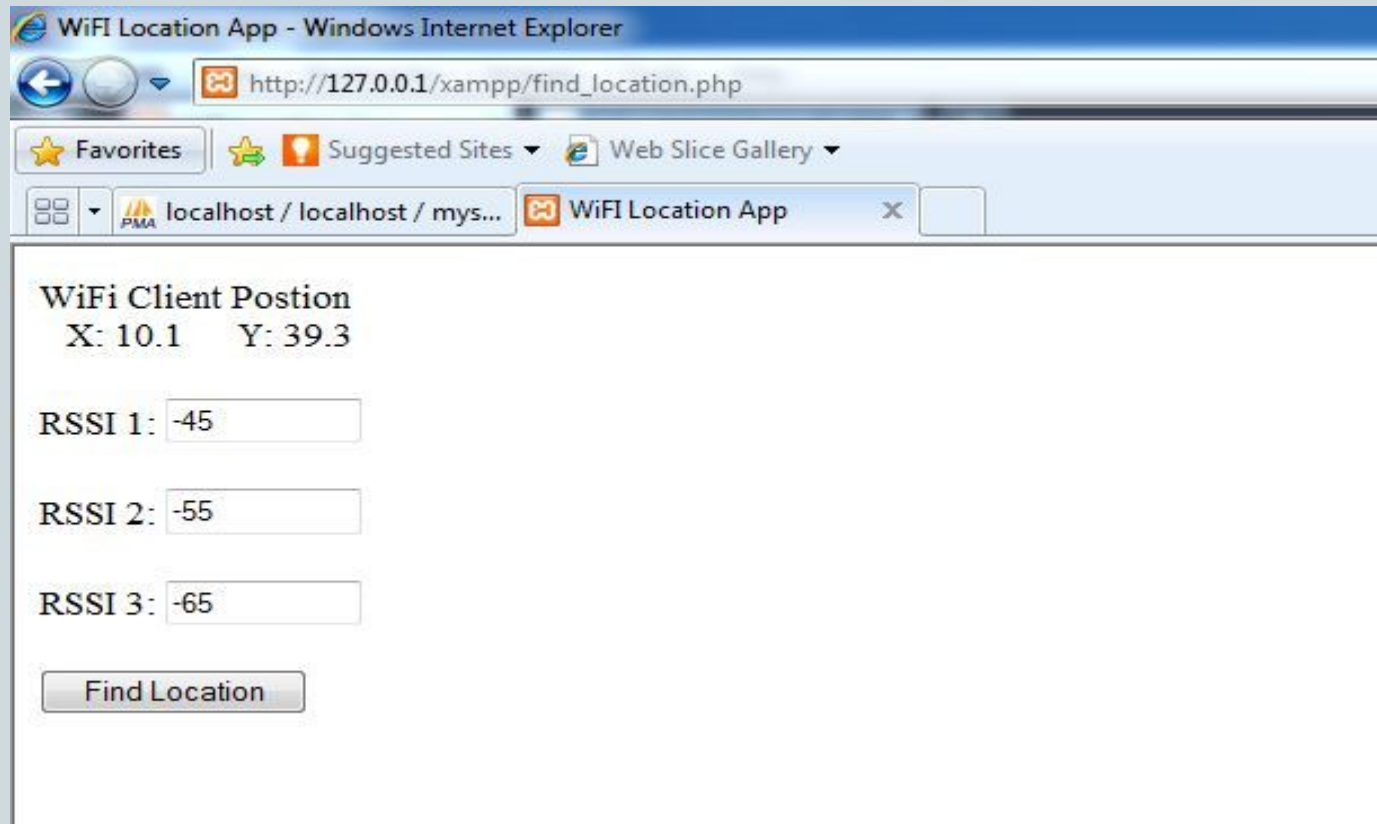
Fingerprinting phases

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Positioning: Communication of terminal with database for the prediction of terminal's position

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The screenshot shows a web browser window titled "WiFi Location App - Windows Internet Explorer". The address bar displays the URL "http://127.0.0.1/xampp/find_location.php". The browser's toolbar includes "Favorites", "Suggested Sites", and "Web Slice Gallery". The address bar also shows "localhost / localhost / mys..." and "WiFi Location App". The main content area of the browser displays the following information:

WiFi Client Postion
X: 10.1 Y: 39.3

RSSI 1:

RSSI 2:

RSSI 3:

Features:

- **Status** Wifi networks (RSSI, SSID, channel, frequency, mac, etc.)
- **Change** (connect to the AP (i.e., channel) with best RSSI)
- **Finger** (RSSIs from specific Aps, insertion of those in MySql DB)

HHO between different WiFis

rss_i_finger	Επεξεργασία	Αντιγραφή	Διαγραφή	1363106757	0c:d9:96:bf:d6:30	-69	0	-52
rss_i_position	Επεξεργασία	Αντιγραφή	Διαγραφή	1363106764	0c:d9:96:bf:d6:30	-78	0	-52
rss_i_position2	Επεξεργασία	Αντιγραφή	Διαγραφή	1363106769	0c:d9:96:bf:d6:30	-45	0	-52
servers	Επεξεργασία	Αντιγραφή	Διαγραφή	1363106951	0c:d9:96:bf:b0:b0	-51	0	-50
slow_log	Επεξεργασία	Αντιγραφή	Διαγραφή	1363107003	0c:d9:96:bf:b0:b0	-51	0	-55
tables_priv	Επεξεργασία	Αντιγραφή	Διαγραφή	1363107036	0c:d9:96:bf:b0:b0	-51	0	-60

```

Where2
Finger Change Status Exit

-- WiFi current status --
SSID: WHERE2
RSSI: -53
Net id: 2 MAC: 0c:d9:96:bf:b0:b0

Channel with best RSSI: 1
SSID: WHERE2 RSSI: -51 frequency: 2412
SSID: WHERE2 RSSI: -55 frequency: 2462
Successful insertion to database!
Channel with best RSSI: 1
Channel with best RSSI: 1
Channel with best RSSI: 1
Channel with best RSSI: 1
SSID: WHERE2 RSSI: -51 frequency: 2412
SSID: WHERE2 RSSI: -60 frequency: 2462
Successful insertion to database!
Channel with best RSSI: 11

-- WiFi current status --
SSID: WHERE2
RSSI: -17
Net id: 8 MAC: 0c:d9:96:bf:d6:30
  
```



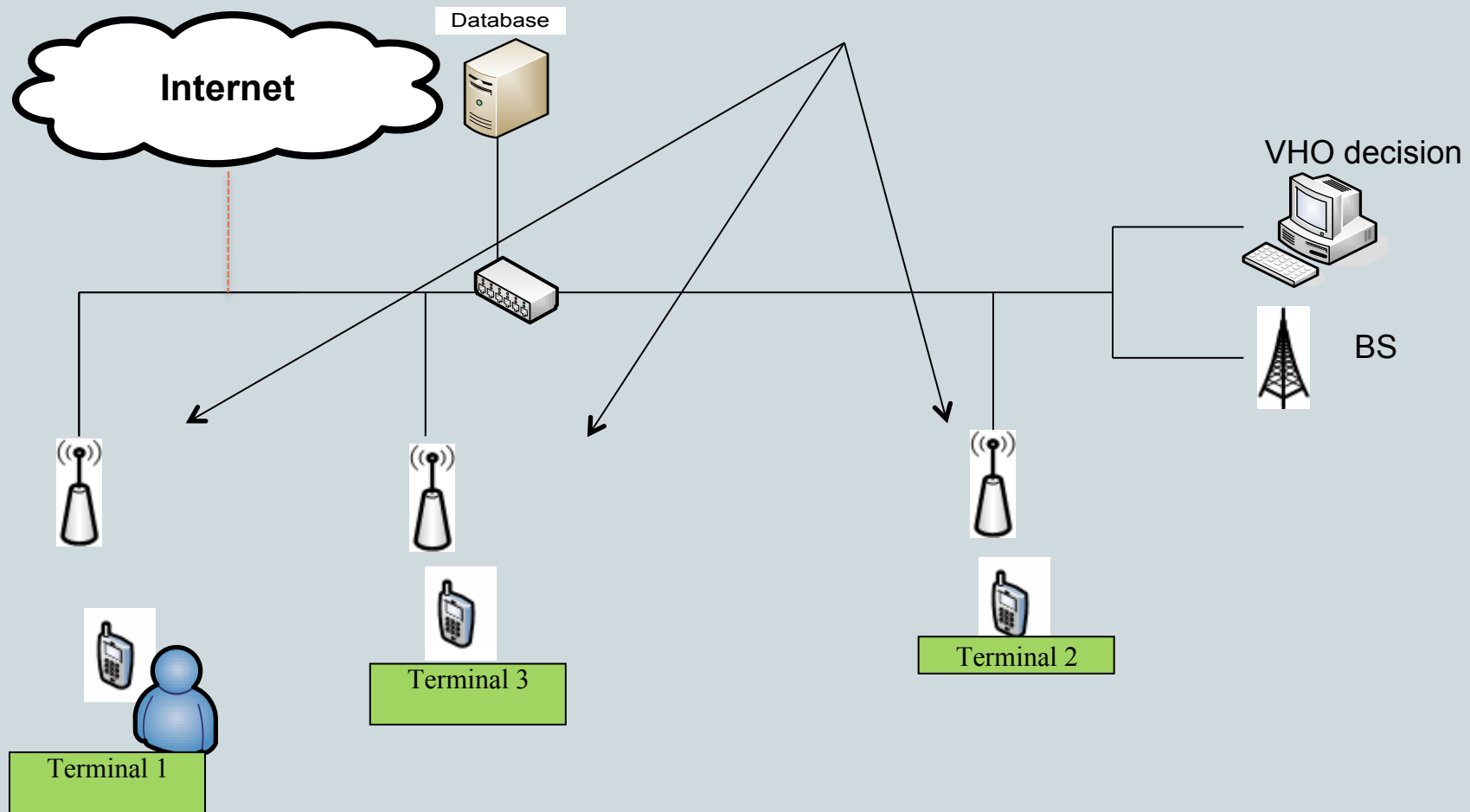
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Vertical handover

Vertical Handover

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- Coverage and Capacity Optimization of Wireless Access Network:
 - We performed:
 - The assignment of operating frequencies and/or channels to wireless network elements i.e. Access Points
 - Horizontal and Vertical assisted Handover of Multi-RAT (WiFi & mobile terminals)
- Testbed consisted of
 - WiFi access points and one Mobile base station for demonstrating the cognitive process

Danke

Thank you

Merci

Hvala vam

Obrigado

Ευχαριστώ

Gracias

Grazie