



Deployment of a Wireless Hybrid and Mobile Network for VoIP Services Based on Open Source Software

Danilo Freire de Souza Santos
José Luís do Nascimento
Olympio Cipriano da Silva Filho
Angelo Perkusich

Scope



- Introduction
- Goals
- M-VoIP Architecture
- System Implementation
- Final Remarks

Introduction

- ❑ **Advances on wireless/mobile communications technologies are crucial to provide Internet access to mobile devices**
- ❑ **VoIP (Voice over Internet Protocol) services promotes the possibility to reduce costs**
- ❑ **Integration of data and voice networks**
- ❑ **Solution => System that integrates VoIP services with support to mobility and multiple wireless networking technologies**

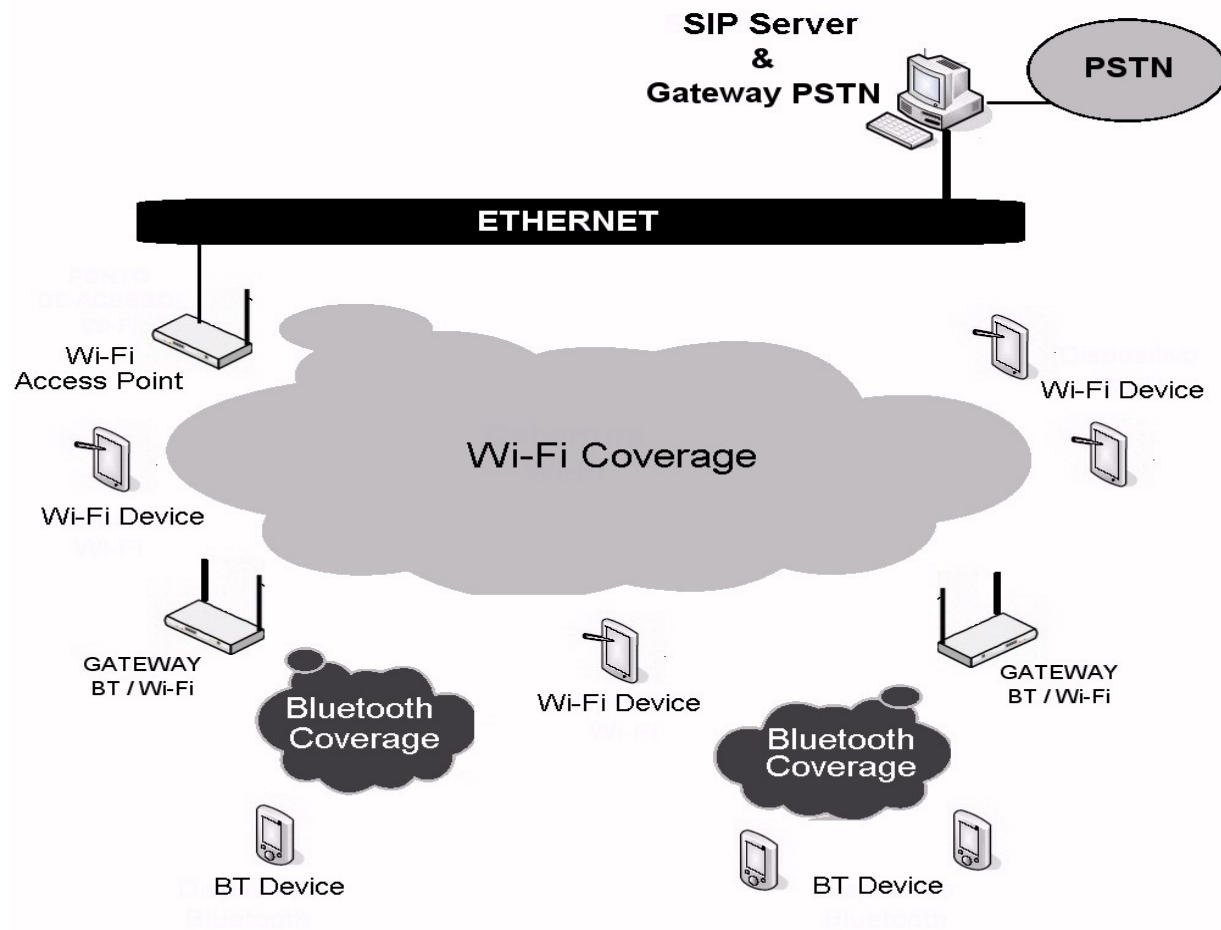
Goals

- Provide voice communication as well as traditional telephony services for mobile users
- Provide integration between different wireless technologies
- Support mobility between different networks
- Support user access to the PSTN

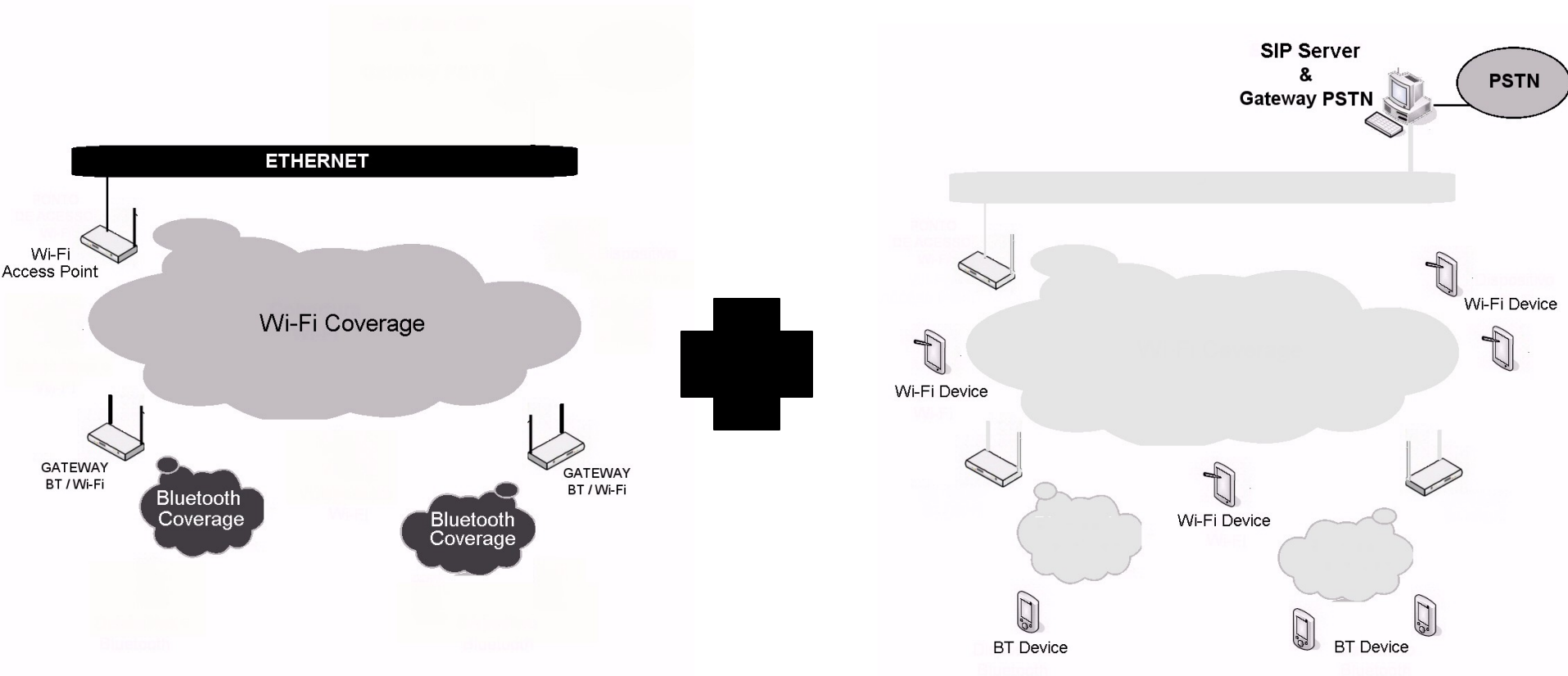
M-VoIP Architecture

- Make use of Bluetooth and Wi-Fi to support VoIP applications based on open source software**
- Gateways Bluetooth/Wi-Fi are used on the wireless network architecture**
- An infrastructure with a Mobile IP system was installed together with the gateways**
- Creating a mobile hybrid network that makes connectivity available to users**
- The network infrastructure is connected to a VoIP PBX (Private Branch eXchange)**

M-VoIP Architecture

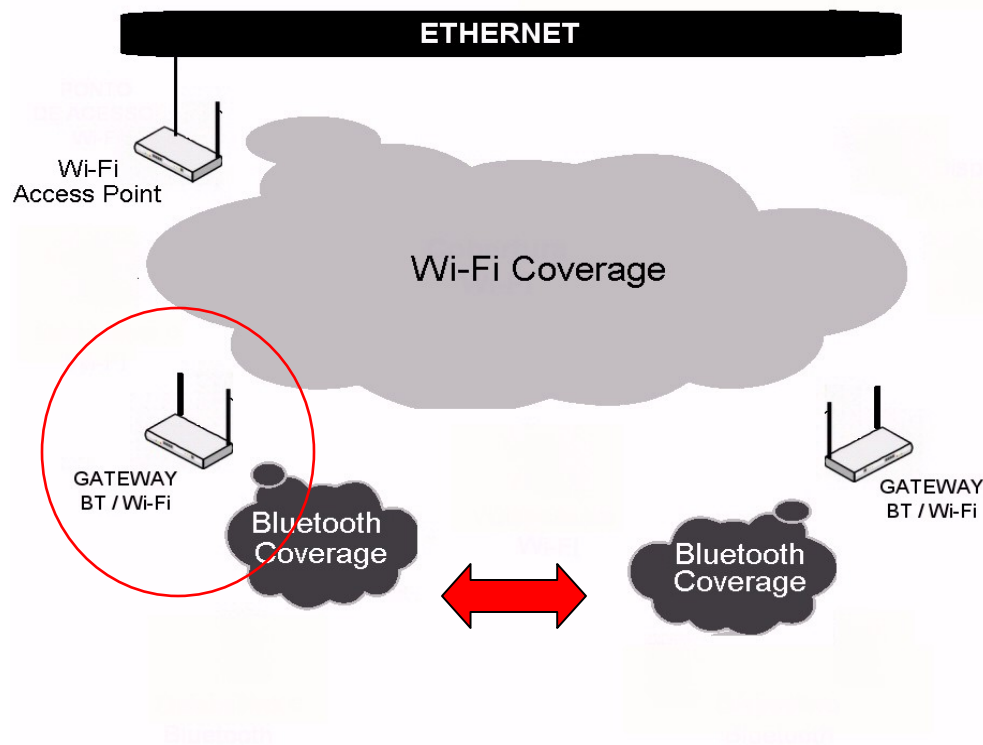


M-VoIP Architecture

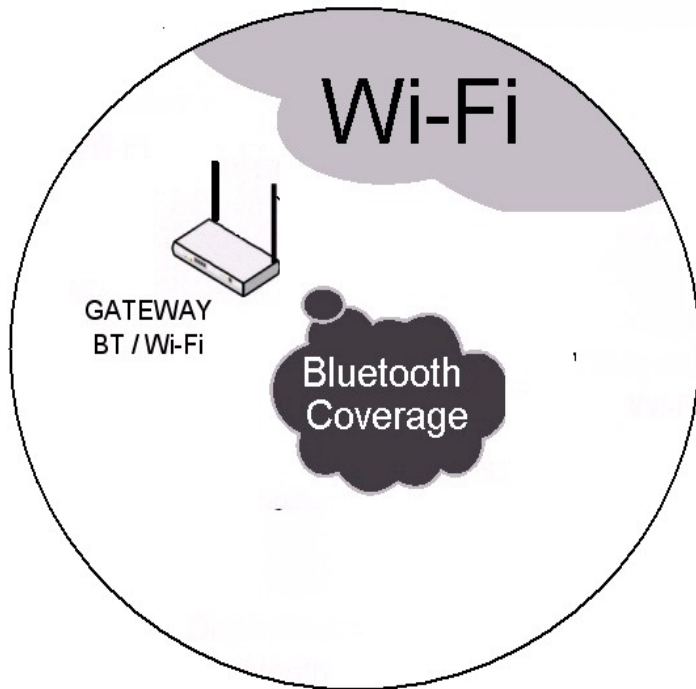


Hybrid Network Architecture

- The architecture can be divided in two different groups
 - the gateways between two mobile technologies: Bluetooth and Wi-Fi
 - the Mobile IP system which supports the mobility between different networks

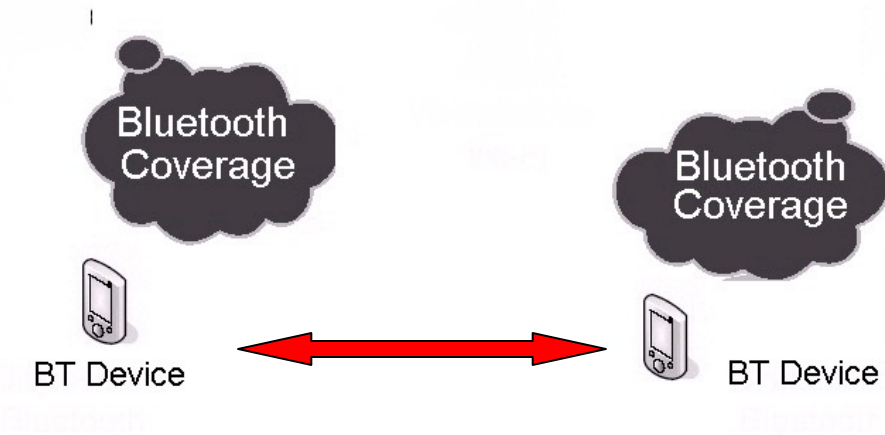


Bluetooth/Wi-Fi gateways



- ❑ Make available Bluetooth coverage for devices without Wi-Fi interfaces
- ❑ These gateways were called **Base Modules**
- ❑ They are easy to install and maintain

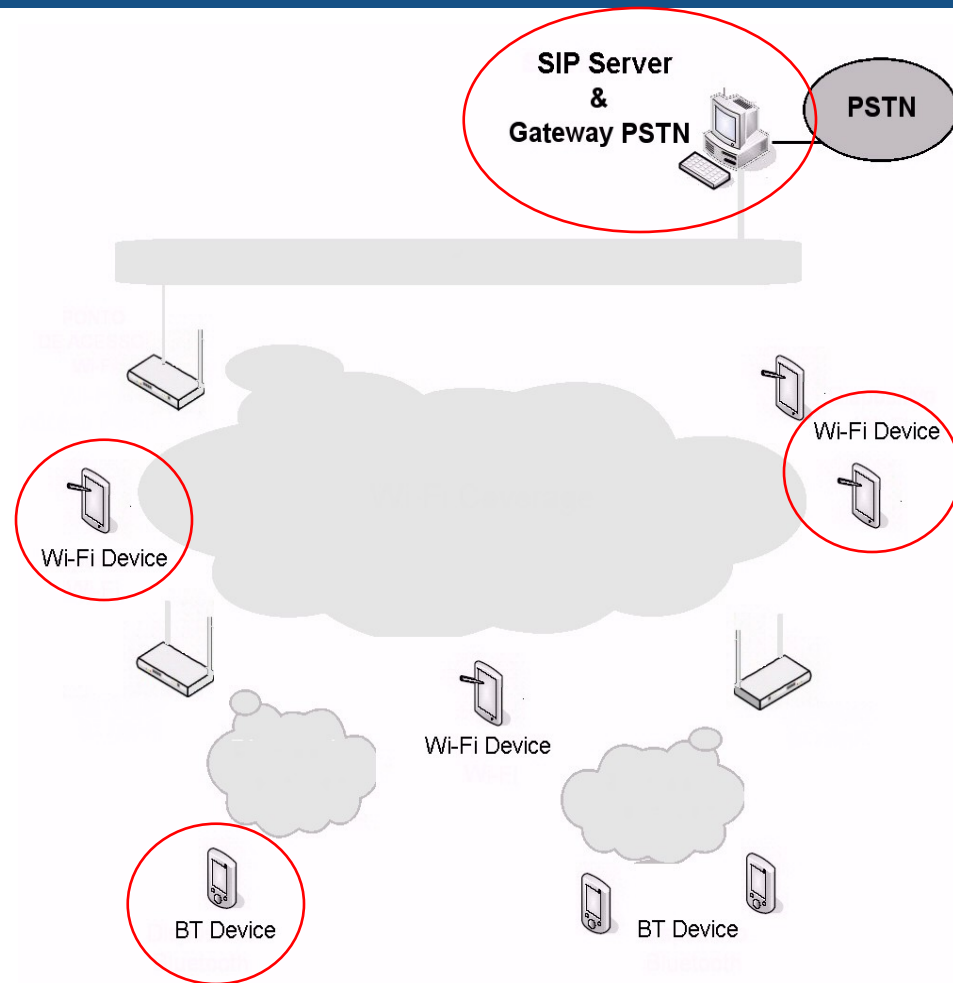
Mobile IP System



- ❑ Mobile IP system was implanted to maintain connections when the user moves between distinct networks, doing a handoff.
- ❑ This is a major issue, because normally the IP address changes, and therefore the connection is lost
- ❑ With the Mobile IP, the user can change the connection point (network) transparently
- ❑ The Mobile IP is defined in the RFC 2002 by the IETF

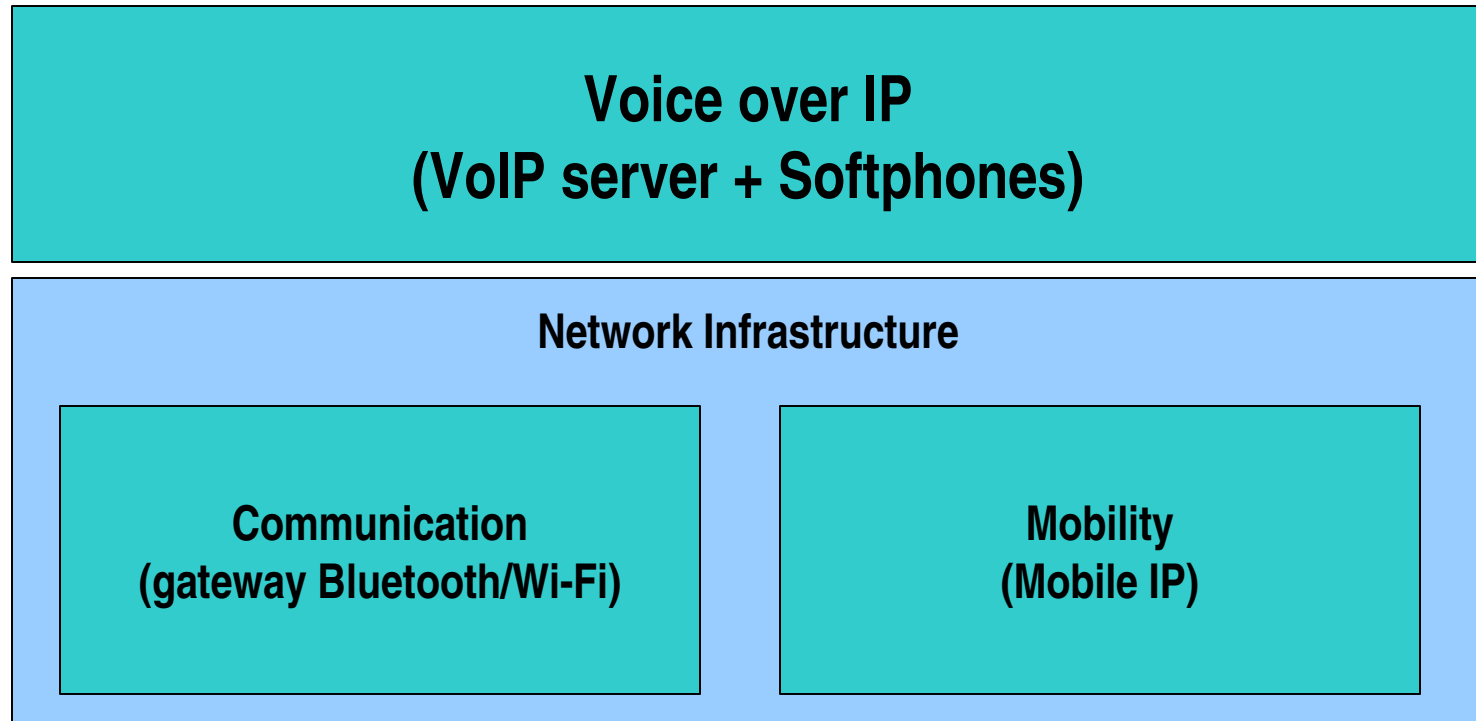
VoIP System

- ❑ An open source server
- ❑ Sofphones running on a mobile devices
- ❑ Two options to the deployment
 - SIP from IETF and H.323 from ITU
- ❑ SIP (Session Initiation Protocol) was chosen
 - simplicity,
 - ease of implementation,
 - open source solutions already implemented.



System Implementation

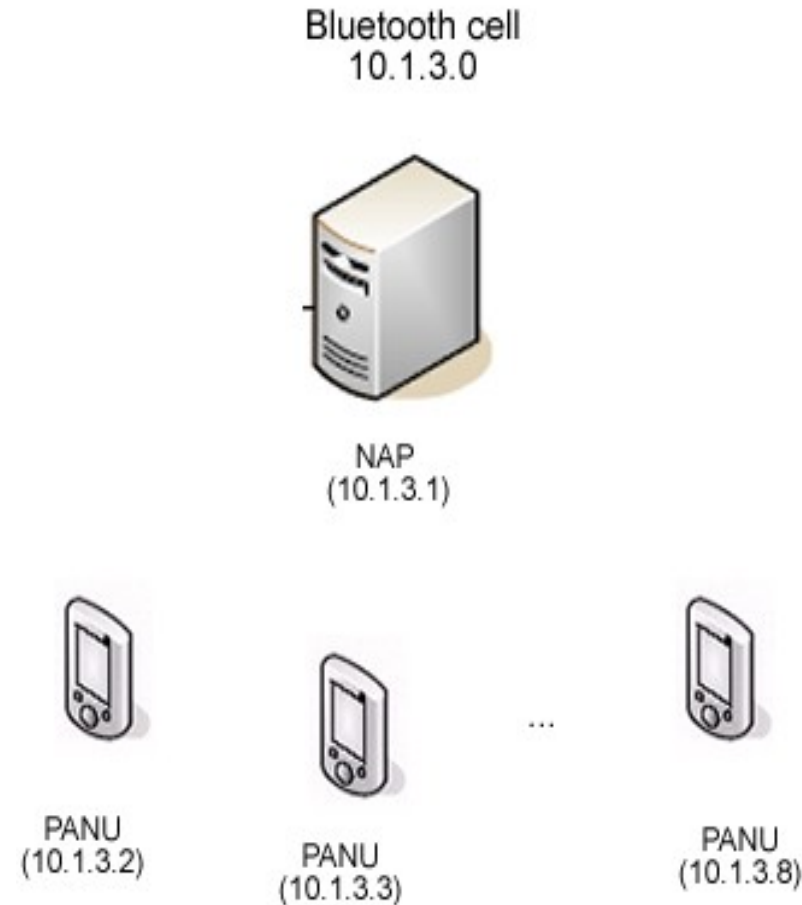
- Divided into three modules



Communication Module



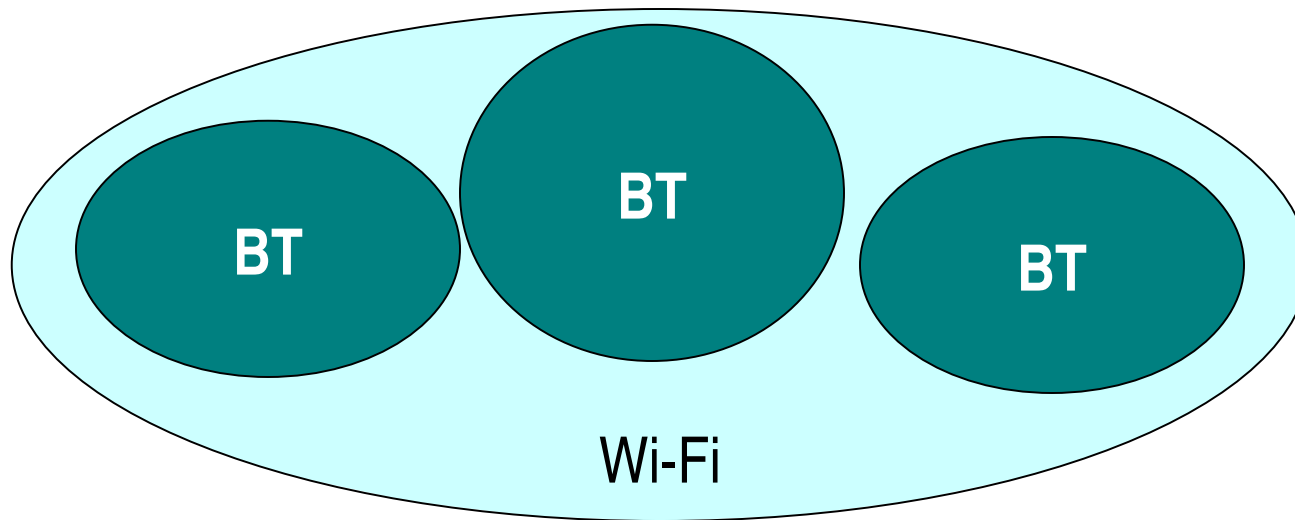
- ❑ Composed by Bluetooth/Wi-Fi gateways
- ❑ Bluetooth access points are established based on PANs (Personal Area Networks)
- ❑ Called picocell
- ❑ The profile implemented by the Bluetooth peers is called PAN, and it is supported by the open source Bluetooth implementation (Bluez)



Communication Module



- ❑ The Bluetooth cells are confined inside a Wi-Fi cell



- ❑ The connection is established using Wi-Fi bridges
- ❑ A private network was implemented using the Linux OS as a router to others networks

Mobility Module

- Issue when dealing with real time protocols
- The node physically changes its connection point
- The Mobile IP system has to make a search for an available address and register it as soon as possible
- Need to do handoffs efficiently, in order to maintain real-time data flow *without packet loss*
- The tunneling of packets have to be executed without losses

Mobility Module

- ❑ **Some Mobile IP implementations were investigated**
- ❑ **The chosen solution for Mobile IP was TMIP (Transparent Mobile IP), which is an open source Mobile IP system**
- ❑ **Its architecture avoids all the configuration needed in the mobile device**
- ❑ **The system was also designed to operate in a wireless network topology**

Voice over IP Module

- In the server side was chosen the Asterisk Platform
- The Asterisk is a convergent telecommunication platform
- It was designed to allow the use of VoIP, offering support for hardware connections with the PSTN
- Asterisk supports SIP, H.323 and translations between them
- Asterisk is an open source platform compatible with the Linux OS
- The Asterisk system was installed with a telephony board providing access to the PSTN

Voice over IP Module

- ❑ **From the client side, many different implementations of softphones were tested**

- ❑ **In the Linux OS were tested two opensource softphones:**
 - Linphone
 - KPhone

- ❑ **In the Windows OS was tested the X-Lite softphone, which is a freeware software**

- ❑ **SJPhone was tested on a HP iPAQ hx4700 PDA, which is a freeware software**

Final Remarks

- ❑ The development of this solution with open source tools and the Linux OS, made possible the development of a hybrid network infrastructure *with low cost, and high degree of interoperability*
- ❑ Field tests realized shows that our solution has some problems with vertical handoffs
- ❑ A specific daemon in the mobile device it is necessary to deal with the change between different technologies
- ❑ The deployment of the M-VoIP solution made possible the development of VoIP applications based on the open source philosophy

□ Thanks

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