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OMEGA**



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Omega Platform for Showroom

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Abstract

This document presents the implementation of Omega demonstrator in the Showroom in FT premises. It is the result of all WP7 works and adaptations to other WP deliveries.

Final showroom demonstrator uses Linux PCs as Omega nodes, and as many various Omega technologies as possible.

Keyword list

Omega, InterMAC, demonstration, Showroom

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Cyrille	Bezard-Falgas	0.1	Initial draft
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List of Acronyms

Acronym	Meaning
AP	Access Point
ASIC	Application Specific Integrated Circuit
AV	Audio Video
CP	Control Plane
DP	Data Plane
DPA	Data Plane Adapter
FIFO	First In First Out
FPGA	Field-Programmable Gate Array
Fr	Framer
HAL	Hardware Interface Layer
ICMP	Internet Control Message Protocol
LAN	Local Area Network
ME	Monitoring Engine
OMEGA	hOME Gigabit Access
PLC	Power Line Communications
PSE	Path Selection Engine
QE	QoS Engine
QoS	Quality of Service
RLC	Remaining Link Capacity
RSSI	Received Signal Strength Indicator
RTT	Round Trip Time
TMA	Technology MAC Adapter
UDP	User Datagram Protocol
UPnP	Universal Plug and Play
WLAN	Wireless LAN

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1 Presentation

1.1 Overview

Omega platform for showroom is the result of many inputs, which has been stabilized late 2010:

- InterMAC implementation on Linux PC [OMD74]
 - o 6 PC have been provided for platform: 4 embedded PC from FT, 1 laptop from FT, 2 CP from Technicolor. All are running Linux InterMAC and are therefore acting as Omega nodes.
- User scenarios as defined in OMEGA Berlin meeting in October 2010:
 - o Meshed network
 - o Proof of reliability over handovers
 - o Use of PLC
 - o Extend network with 802.11n
 - o More than one stream in the network: video streams played by TCL STB or FT mobile PC, and TiD UPnP equipments.
- Available technologies for demonstration
 - o PLC plugs have been provided by FT. PLC demonstrator has not been integration in showroom platform.
 - o Optical wireless (VLC, IR) has not been integrated in showroom platform.
 - o 802.11n has been provided by Lantiq as miniPCIe cards. Two of them are part of Technicolor PCs, the last one in the FT laptop.
 - o 60GHz demonstrator has been provided by IHP and is integrated in showroom platform.

1.2 Limitations

According to [OMD74], main limitation is for multicast streams : Omega network cannot handle several instances of multicast streams. Consequently:

- Channels lists for STB will be made specific to each STB, without any stream in common
- Discovery phase for UPnP demonstration cannot occur.

2 Topology

Omega platform for showroom is made of, as presented in Figure 1:

- FT Showroom:
 - o Office, for gateway access
 - o Lobby, with a TV
 - o Kitchen, with management PC
 - o Library, with a TV
 - o Game room, with a TV
 - o Living Room, with a TV
- Omega node 1, using Technicolor PC, marked O1 TCL:
 - o 4 Ethernet connection points
 - o 1 wireless 802.11n Lantiq base (Wifi1-3)
 - o Acting as gateway, connected to FT Livebox and stream server
- Omega node 2, using FT embedded PC, marked O2 FT
 - o 4 Ethernet connection points
 - o Used for connection to legacy STB2 and lobby TV
 - o Used for connection to legacy UPnP equipments (lobby TV)
- Omega node 3, using FT laptop PC, marked O3Mobile
 - o 1 wireless 802.11n Lantiq access point
 - o Used for playing videodirectly

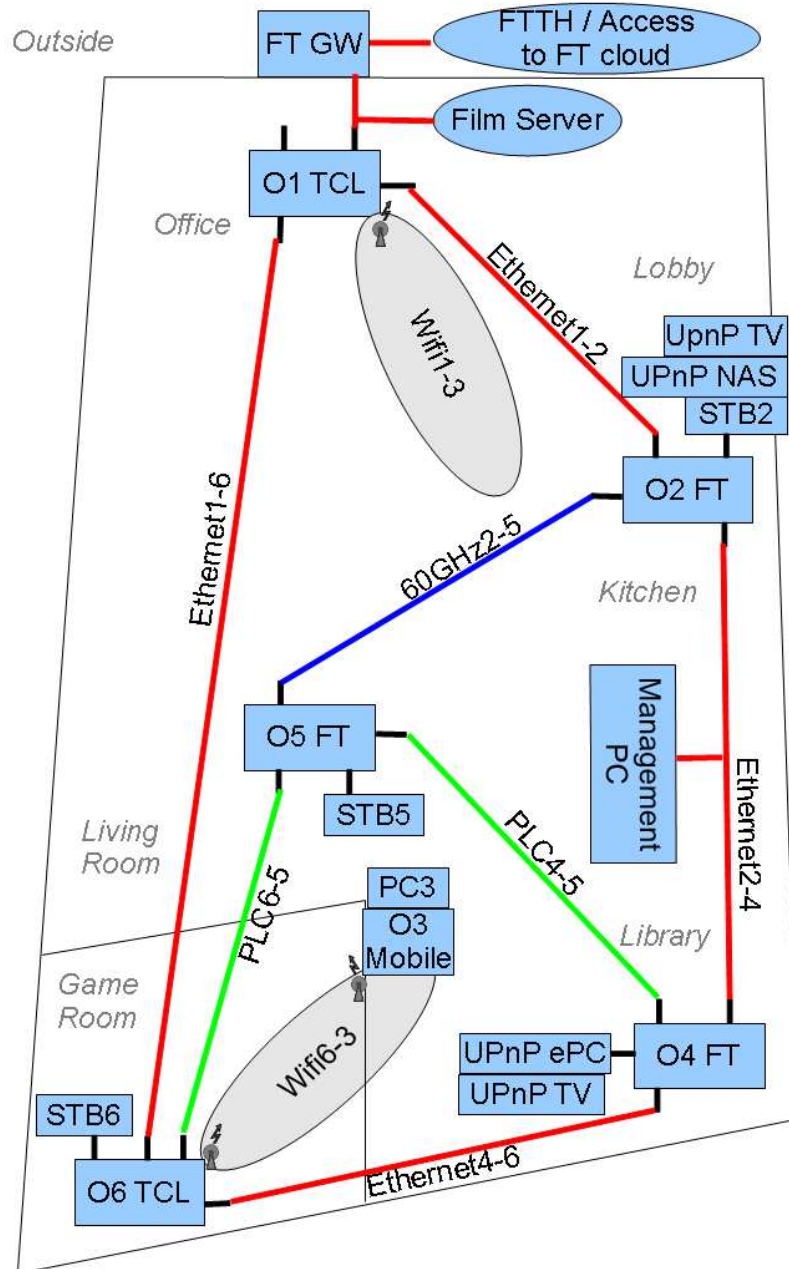


Figure 1: Omega platform for Showroom topology

- Omega node 4, using FT embedded PC, marked O4 FT
 - o 4 Ethernet connection points
 - o Used for connection to legacy UPnP equipments (library TV)
- Omega node 5, using FT embedded PC, marked O5 FT
 - o 4 Ethernet connection points
 - o Used as not Ethernet connected
 - o Used for connection to legacy STB 5 and living room TV
- Omega node 6, using Technicolor PC, marked O6 TCL:
 - o 4 Ethernet connection points
 - o 1 wireless 802.11n Lantiq base (Wifi6-3)

- Used for connection to legacy STB 6 and game room TV
- An Ethernet backbone, connecting:
 - O1 to O2 through Ethernet1-2
 - O2 to O4 through Ethernet 2-4
 - O4 to O6 through Ethernet 4-6
 - O6 to O1 through Ethernet 6-1
- 60GHz emitters / receivers, connecting O2 to O5 through 60GHz2-5
- 2 x 2 PLC connectors, connecting:
 - O4 to O5 through PLC4-5
 - O6 to O5 through PLC6-5
- Management PC connected between O2 and O4

3 Scenarios implementation

Based on this topology, scenarios can be implemented as shown in Figure 2:

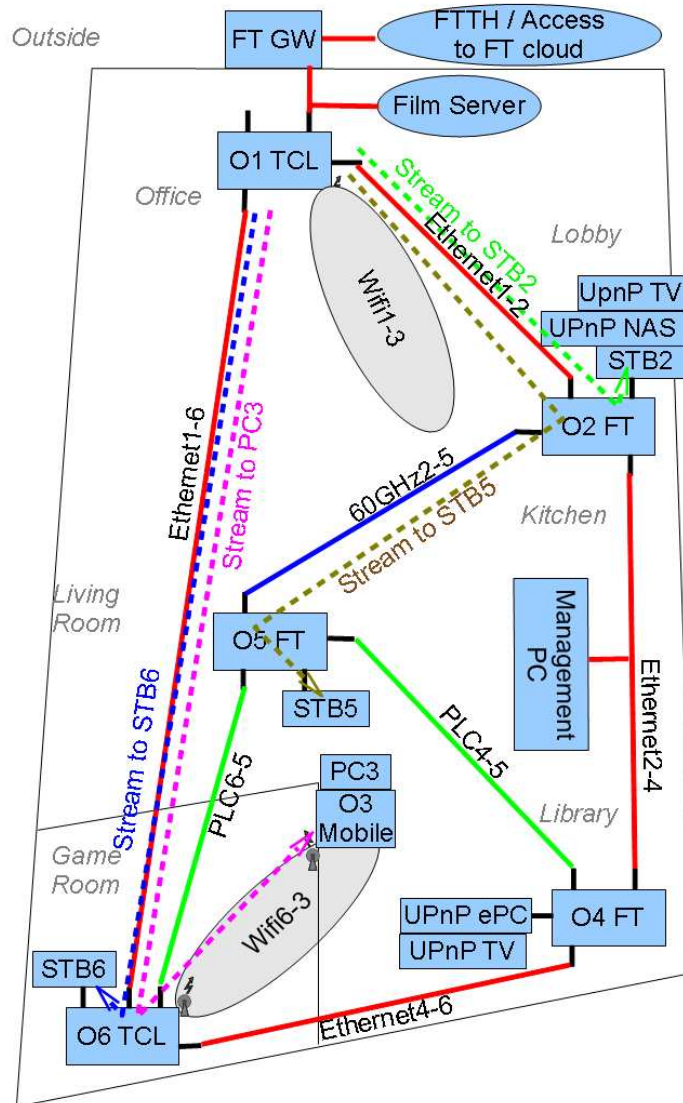


Figure 2: Streams view for Omega scenarios

- Meshed network: O5 makes it, as connected to O2 by 60GHz2-5, to O4 by PLC4-5, to O6 by PLC6-5,
- More than one stream in the network: video streams played by TCL STB or FT mobile PC, and TiD UPnP equipments:
 - o 4 video streams: to STB2, to STB6, to STB5 and to PC3 (Figure 2)
 - o UPnP streams between O2 and O4 (Figure 3)

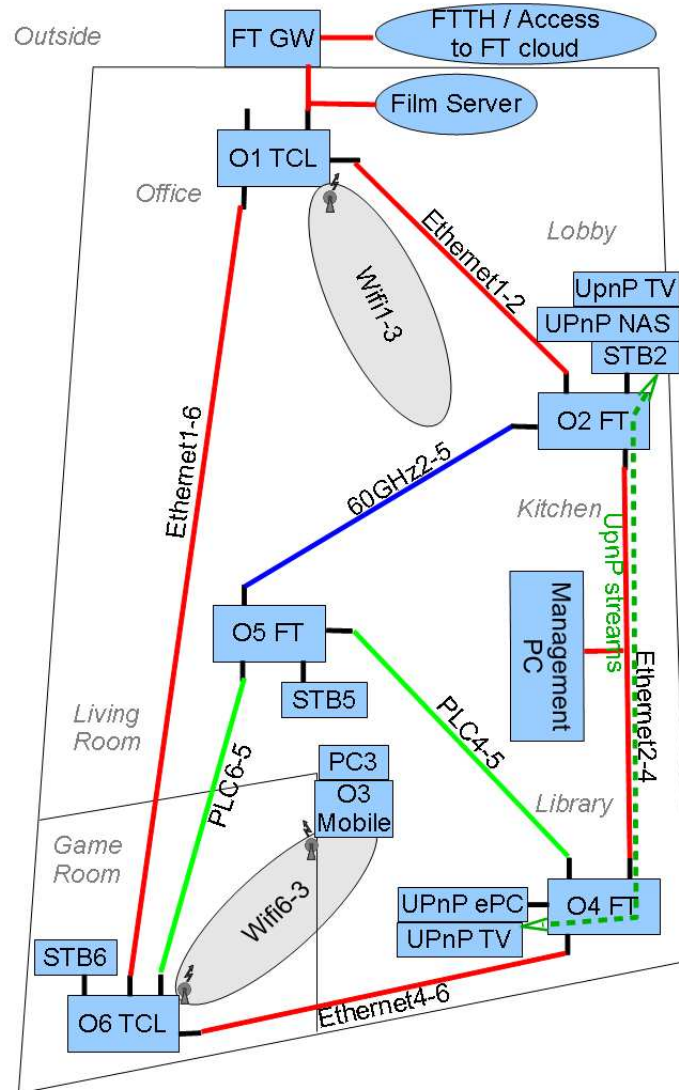


Figure 3: UPNP streams in Omega scenarios

- Use of PLC: PLC4-5 and PLC6-5. Use of 60GHz also (60GHz2-5).
- Extend network with 802.11n: interfaces Wifi1-3 and Wifi6-3
- Proof of reliability over handovers: following links could be broken:
 - o 60GHz2-5, by putting hand in front of the beam. Removal of hands restores the link (immediate effect)
 - o PLC6-5 and PLC4-5, by unplugging plugs. Replugging restores link after some time (to be avoided for immediate effect)
 - o Wifi1-3 and Wifi6-3, by moving O3 Mobile from one Wifi area to other. Wifi InterMAC integration in Omega node monitors 802.11n signal quality. Connection to the best signal enables one link versus the other.

4 Demonstration scenarios: More than one stream in the network

Four streams are played simultaneously during the demonstration on 3 STB and one PC:

- STB2: HD stream from stream server
 - o 2 more streams available for zapping, 'Rugby' is the best one (2h long)
- STB6: HD stream from stream server
 - o 1 more stream available for zapping, 'Football' is the best one (2mn long)
- STB5: HD stream from stream server
 - o 2 more streams available for zapping, 'Opera' is the best one (1h long), except some issues with streaming occurring sometimes (stream to be restarted at video server level)
- PC3: HD stream from FT live video (TF1)

5 Demonstration scenarios: Reliability to handovers - PLC and 60GHz

In these scenarios, handover is shown by disabling the link.

STB5 is used to show handover reliability:

- 60GHz2-5 beam can be blocked at any time, e.g. with the hand and somebody blocking.
 - o Figure 4 shows this: Stream to STB 5 is redirected through PLC6-5
 - o Restoring the link would not change this, as long as PLC is available.

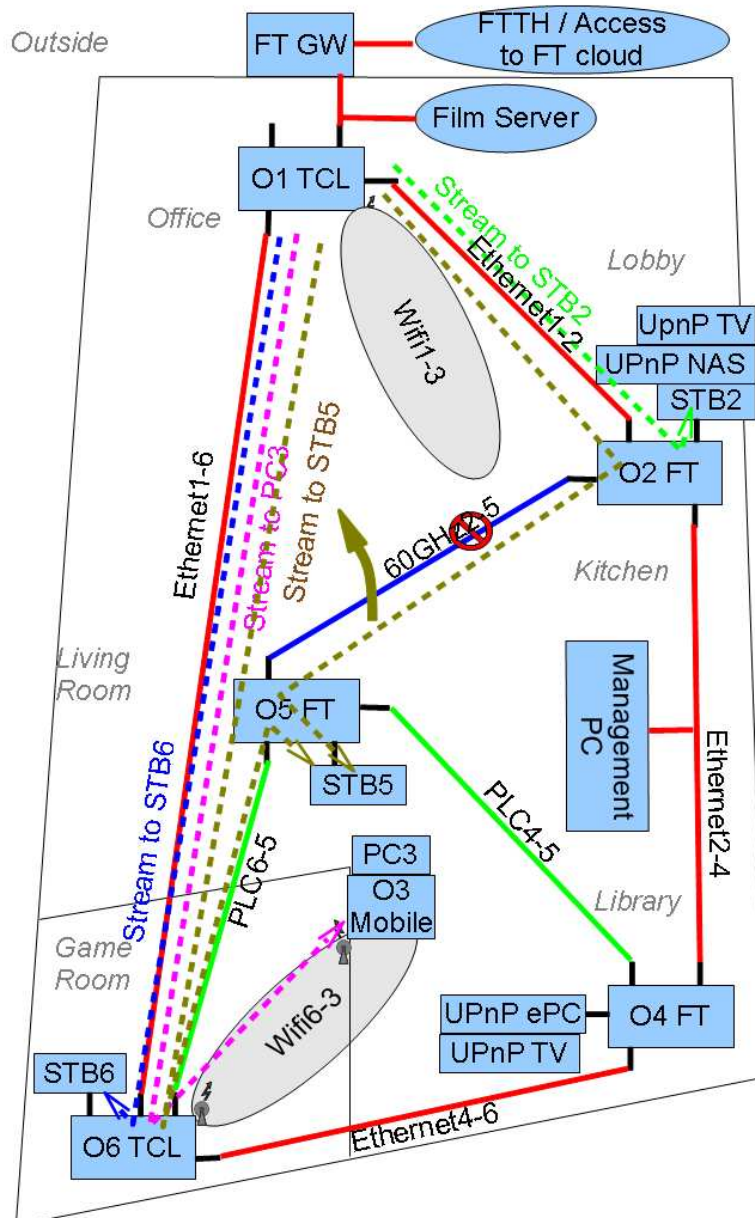


Figure 4: Handover on 60GHz

- When unplugging PLC6-5, stream can be redirected over 60GHz2-5 if available, or over the second PLC, as shown in Figure 5.

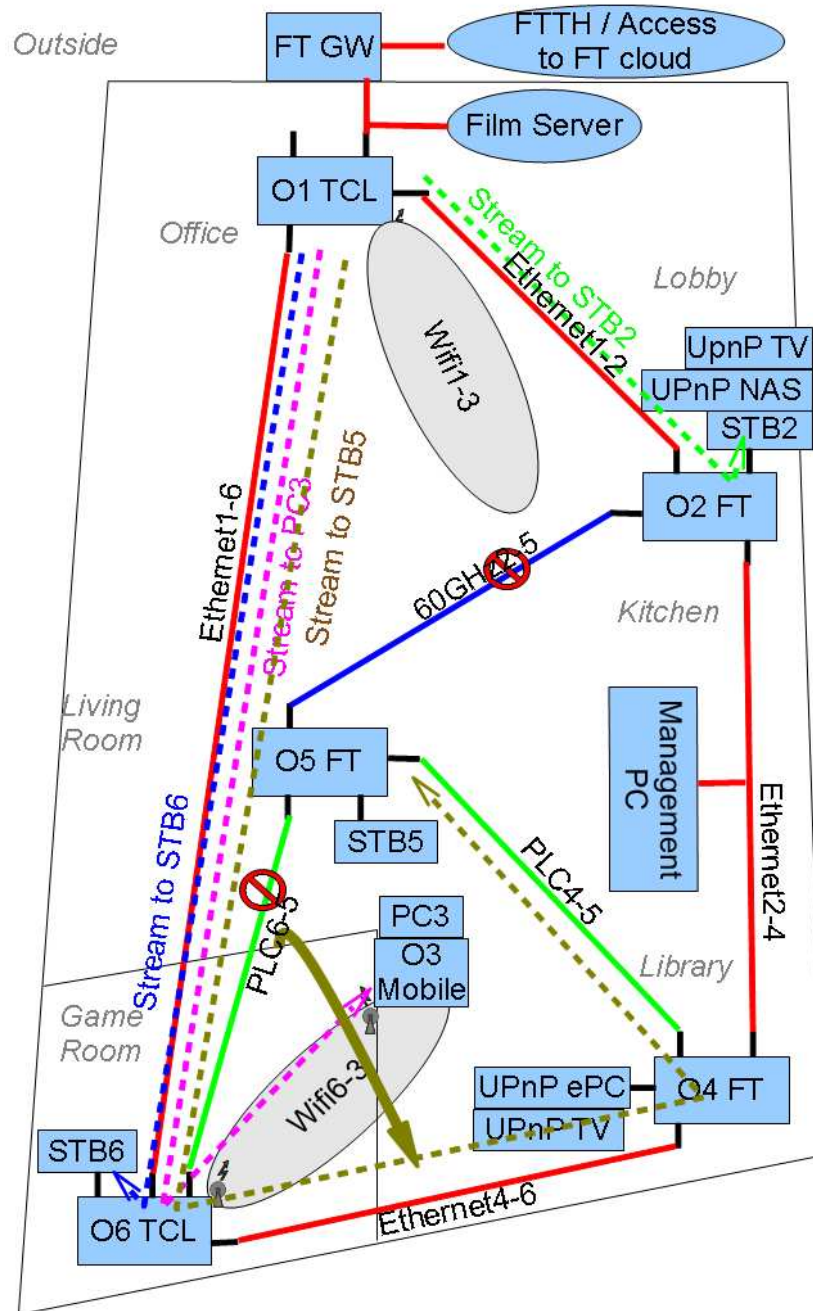


Figure 5: Handover on PLC

All these behaviours can be observed on the Management PC.

6 Demonstration scenarios: Reliability to handovers - 802.11n

In these scenarios, handover is shown by degrading link quality so omega nodes switch to a better quality link. If PC3 is close to O6 node, it uses Wifi6-3 link. When getting close to O1, Wifi6-1 link is used instead, as shown in Figure 6.

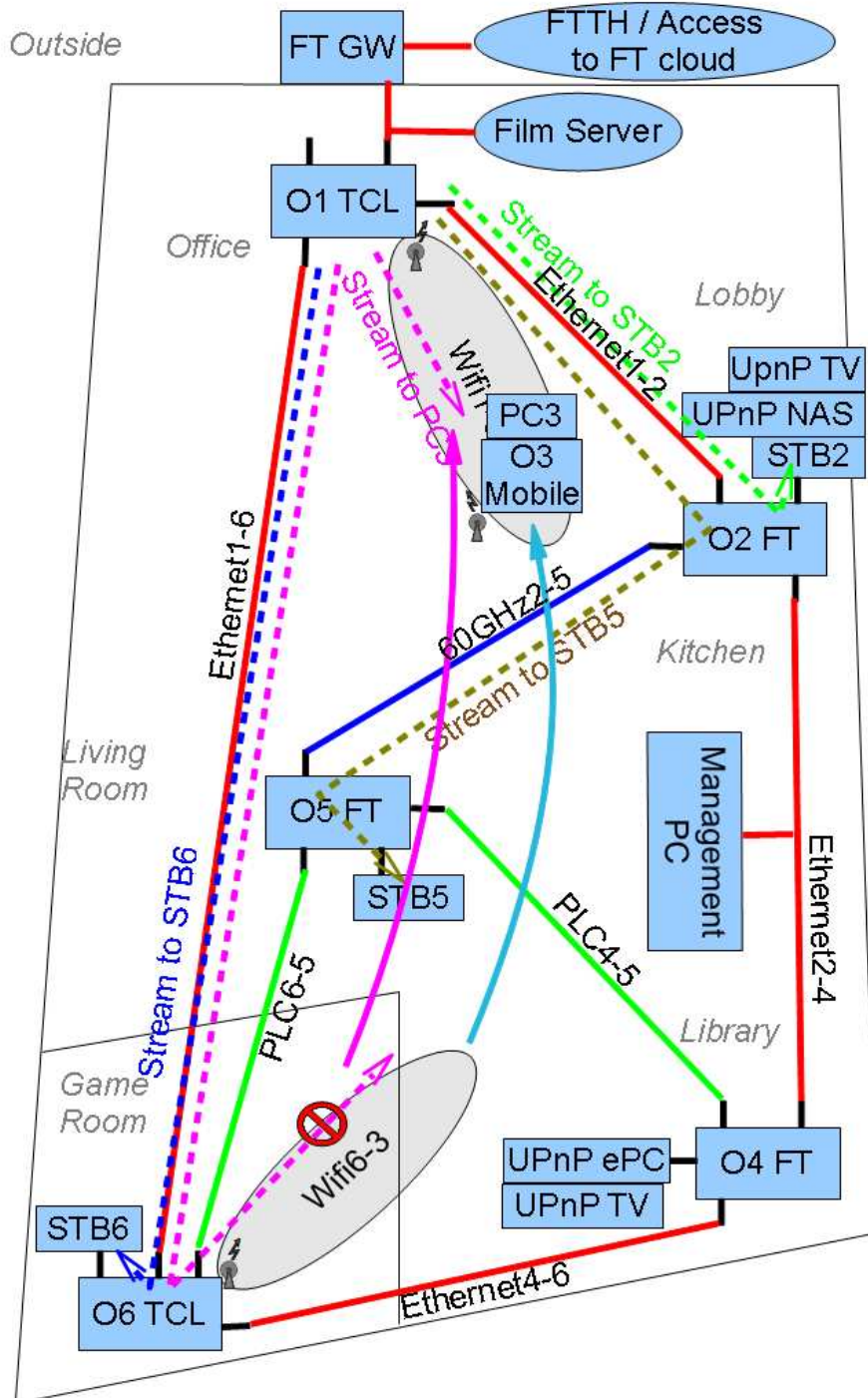


Figure 6: Handover on 802.11n

7 UPnP

In addition to other scenarios, UPnP is demonstrated (cf Figure 3), given UPnP discovery is made manually as UDP streams cannot be duplicated.

8 References

- [OMD74] OMEGA deliverable D7.4, “Omega platform based on Linux PCs”, October 2010, available at <http://www.ict-omega.eu/publications/deliverables.html>