

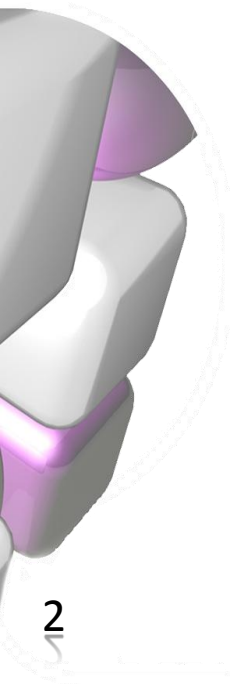
# DLNA

Het delen van multimedia in huis

erik@twiyo.nl

maart 2012

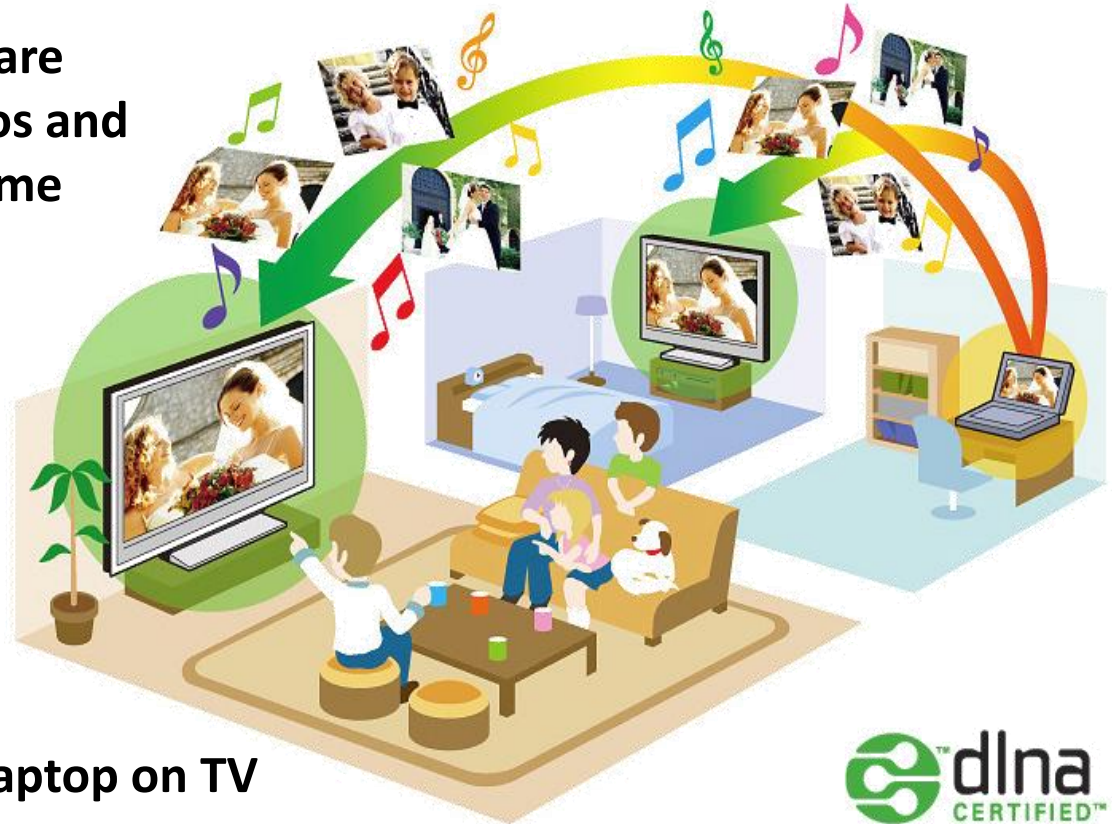
*Examples in this presentation are just examples*



# WHAT IS DLNA ABOUT?

## In home media sharing?

Set of protocols to share and play music, photos and movies within the home network



- play movies from laptop on TV
- show pictures from phone on TV
- play music from NAS on receiver
- play recorded TV show from DVR on tablet
- ....



# DLNA defines roles a device can play:

## media libraries (DMS)



## media controllers (DMC)



control

customer LAN

Play to

pull

## media players (DMP)/media renderers (DMR)



## Main roles

- Server, Player, Renderer, Controller, Printer
- Mobile versions (M-DMP, M-DMU)
- Interoperability devices
- a renderer is a player without a GUI  
(plays pushed media from server)
- Software/device can play multiple roles
- Software does not always provide all roles



# What can you do with DLNA?

The screenshot shows a mobile application interface with a dark background and a status bar at the top. The status bar includes icons for a calendar, email, messaging, and a green robot icon, along with Bluetooth, Wi-Fi, cellular signal, and battery indicators, and the time 09:23. The main content area is divided into three sections, each with a blue rounded rectangle callout on the left. The first section shows a smartphone icon connected to a monitor icon, with the text 'Bestand van mijn telefoon afspelen op een andere speler'. The second section shows a server rack icon connected to a smartphone icon, with the text 'Bestand van server afspelen op mijn telefoon'. The third section shows a smartphone icon connected to a server rack icon, which is then connected to a monitor icon, with the text 'Bestand van server via mijn telefoon afspelen op een andere speler'. At the bottom of the screen are two buttons labeled 'Help' and 'Instellingen'.

**media server (DMS)**  
play to renderer

Bestand van mijn telefoon afspelen op een andere speler

**media player (DMP)**  
play from DMS

Bestand van server afspelen op mijn telefoon

**media controllers (DMC)**  
play to renderer from another DMS

Bestand van server via mijn telefoon afspelen op een andere speler

Help Instellingen

# Software examples

In random order and size

## Windows



Windows Media Player

TWONKY™

a||share™

tiversity



TVmobili



DVB VIEWER

## Android



BubbleUPnP



UPnPPlay

TWONKY™

a||share™



iMedisShare



shareme

zappo!tv

## Mac



medialink

TWONKY™

serviio



TVmobili



Eyeconnect

## iP\*

TWONKY™

zappo!tv



iMedisShare



Media:connect



8player



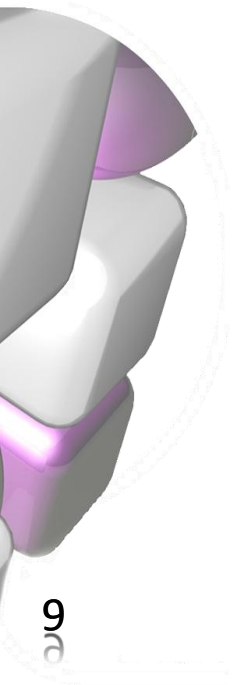
# WAT IS DLNA?



**DLNA is...**

## **Digital Living Network Alliance**

- **An organization with contributing members**
- **A set of standards**
- **Certification**
- **Interop guidelines**





Play a Video from your DLNA Certified laptop

View a Photo from your DLNA Certified camera

Listen to Music from your DLNA Certified Smartphone



### What is DLNA?

DLNA (Digital Living Network Alliance) seeks for more convenience, choices and enjoyment of your digital content through DLNA Certified® devices

[Digital Living in two Steps](#)

### Is my product DLNA Certified®?



You'll find the DLNA Certified® logo on all kinds of digital devices - TVs, PCs, mobile phones, DVRs, NAS servers, Stereos, Printers and DMAs.

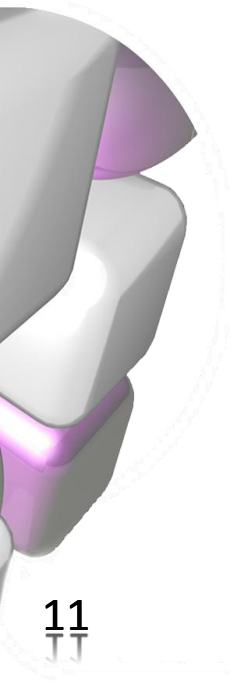
[Search for DLNA Certified® Products](#)

Download our free mobile product search application.



## History & versions

- 2003: Started (21 companies)
- 2004: 1.0
- 2006: 1.5, 1.5 expansion
- 2011: 200+ members
  
- On the roadmap:
  - More formats (MPEG4)
  - More transport technologies (RTP, bluetooth)
  - More device classes
  - More content protection
  - More quality measures (QoS)



## Why DLNA? Options for enabling in home media sharing

- UPnP (AV)
- DLNA
- Apple airplay ([DAAP](#))
- Network file sharing (SMB)
- FTP, NFS etc
- bluetooth
- zigbee



- **Why DLNA?**

- standardized
- widely adopted:  
<http://www.dlna.org/consumer-home/look-for-dlna/product-search>
- Certification
- Interop guidelines
- lots of (open source) tools



# DLNA USE CASES & DEMOS

## Example of $\alpha$ GUI: Samsung Allshare & DLNA as a DMP, DMS and DMC

The screenshot shows the Samsung Allshare & DLNA interface on a mobile device. The interface is divided into three main sections, each with a corresponding annotation box on the left:

- media server (DMS) play to renderer:** This section shows a smartphone icon connected to a monitor icon. The text below reads "Bestand van mijn telefoon afspelen op een andere speler" (Play content from my phone on another player).
- media player (DMP) play from DMS:** This section shows a server icon connected to a smartphone icon. The text below reads "Bestand van server afspelen op mijn telefoon" (Play content from server on my phone).
- media controllers (DMC) play to renderer from another DMS:** This section shows a smartphone icon connected to a server icon, which is then connected to a monitor icon. The text below reads "Bestand van server via mijn telefoon afspelen op een andere speler" (Play content from server via my phone on another player).

At the bottom of the interface, there are two buttons: "Help" and "Instellingen" (Settings).

# Example of a GUI: WMP12 & DLNA as a DMP, DMS and DMC media player (DMP) media server (DMS) media controllers (DMC)

Enable DLNA

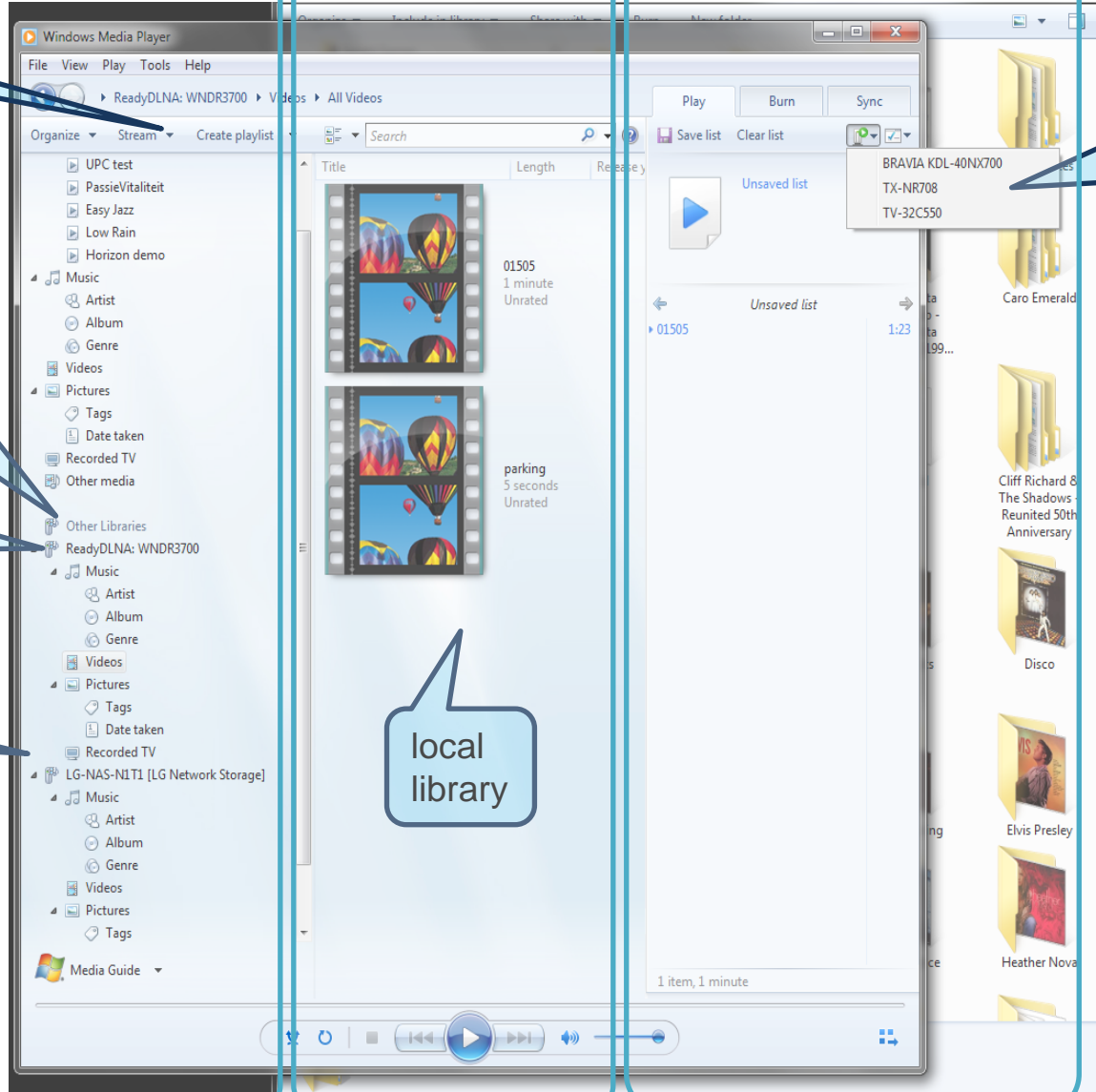
DLNA servers that were found offering libraries

home router with USB stick

NAS

local library

DLNA players that were found for 'play to'



## Example of $\alpha$ GUI: Samsung TV as a DMP

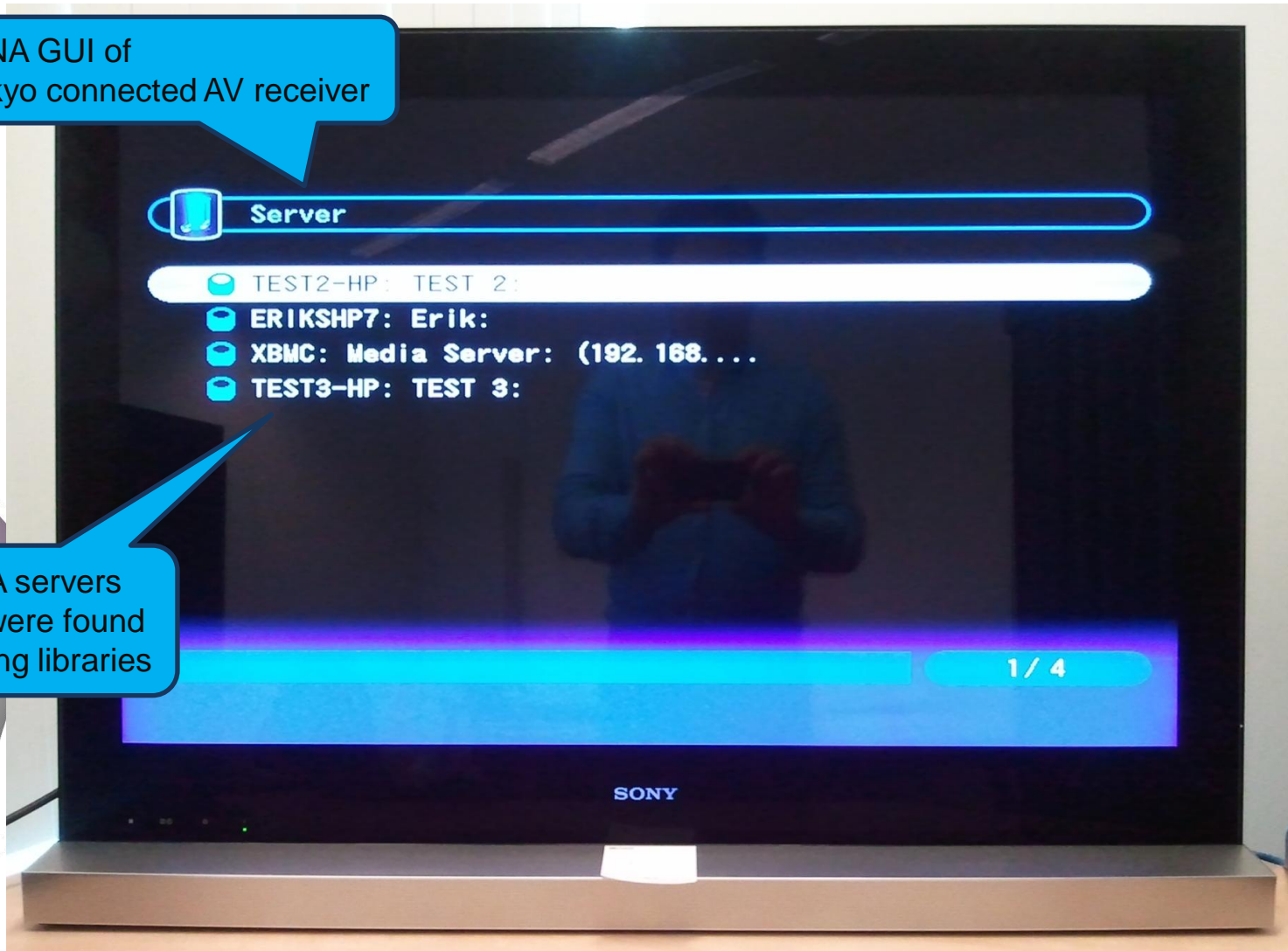


DLNA servers  
that were found  
offering libraries

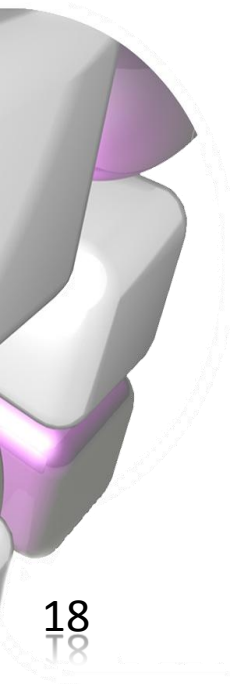


## Example of $\alpha$ GUI: Onkyo receiver as a DMP with the GUI over a TV

DLNA GUI of  
Onkyo connected AV receiver



DLNA servers  
that were found  
offering libraries



# DLNA TECHNOLOGY

## Ensemble of technologies

- **Network**
- **Device and capability discovery: UPnP (AV)**
- **Media Format and Transport**
- **Authentication**
- **Streaming: Media Management, Distribution and Control**
- **DRM: [DTCP](#) (closed)**
- **(Transcoding)**

# DLNA in the LAN

## 8: User

libraries on multiple devices, incoherent metadata, library structure, filenames, codecs, hibernation, privacy

## 7: Application layer

- DLNA software and GUI variations
- DLNA library representation
- codecs

## 4-6: Session layer

- HTTP (media transport)
- UPnP (device discovery)
- UPnP AV (content discovery)

## 3: Network layer

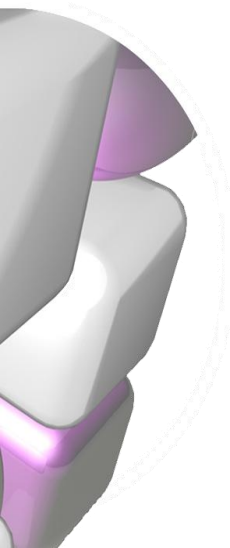
- IPv4, IPv6
- IP transparency
- Multicast transparency

## 2: Link layer

- One broadcast domain

## 1: Physical layer:

- 802.3 (wired) ethernet, powerline, wifi, MoCA
- Consistent (high) throughput, low latency



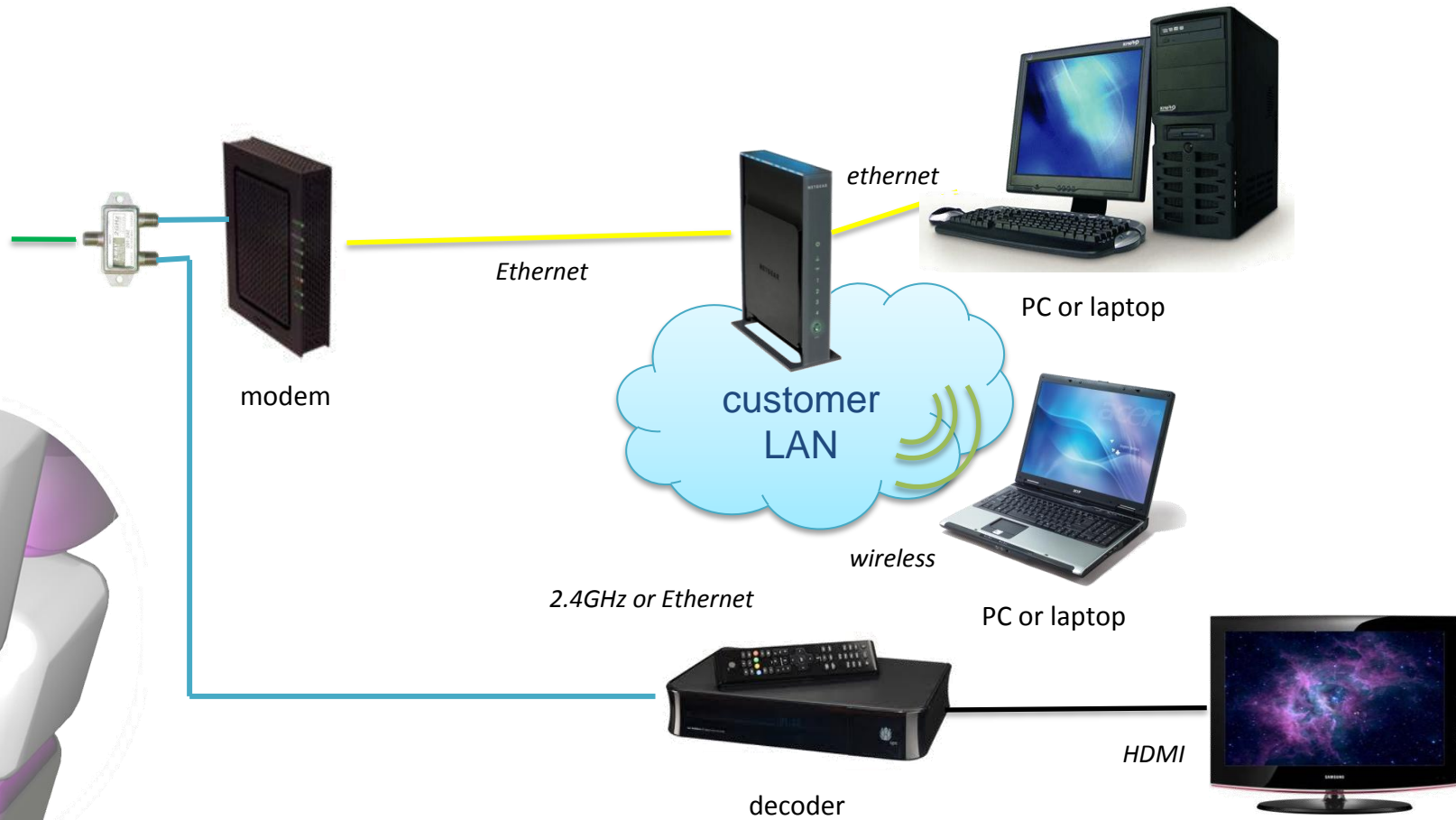
# Process



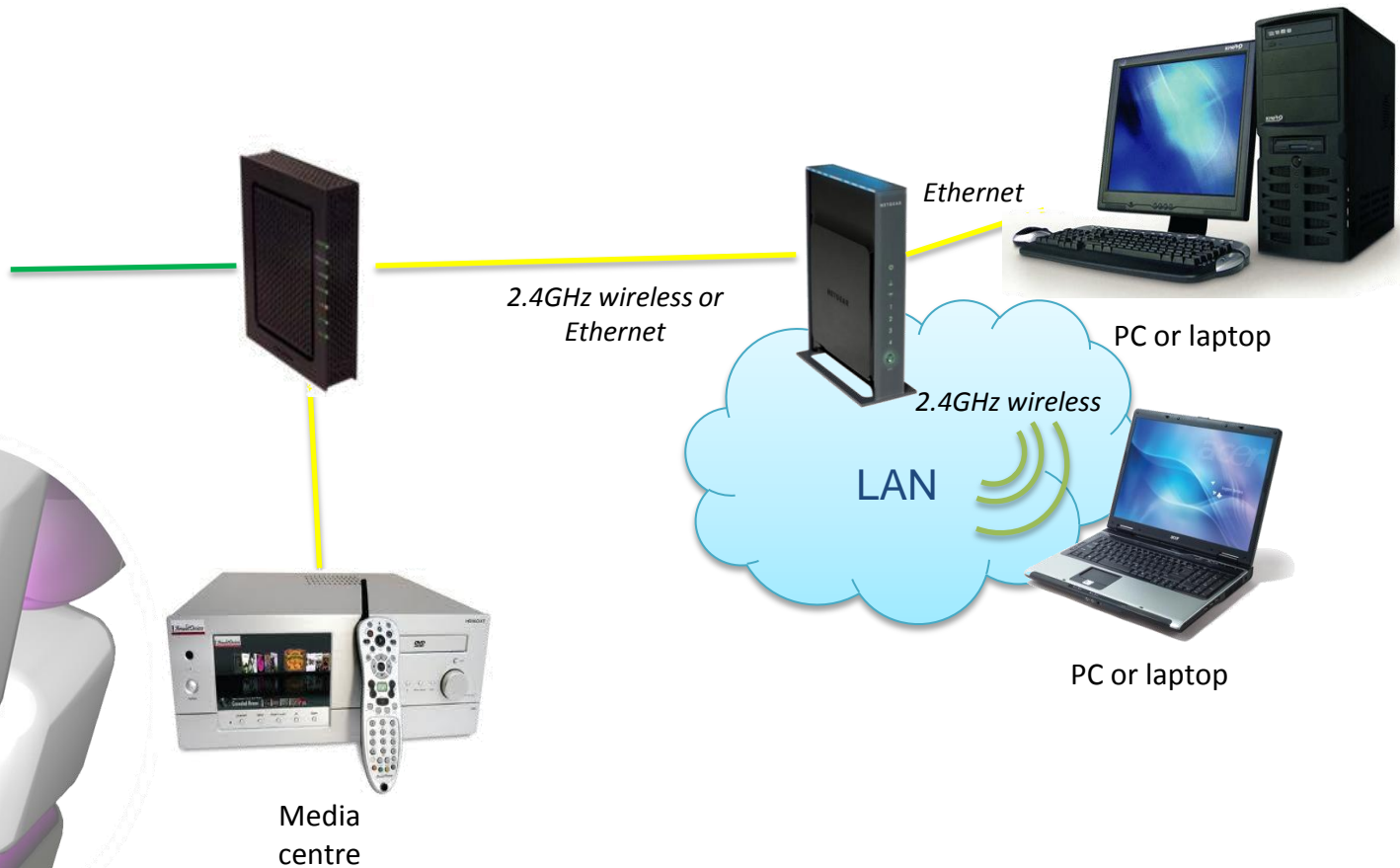
Title	Time	Artist	Album	Genre	Rating
A Rise of Passage (Instrumental)	8:36	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
A Nightmare To Remember (Instrumental)	15:39	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
To Tame a Land	7:15	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
Tenement Funster / Flick of the Wrist / Lily of L...	8:18	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
Starliner	8:11	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
The Count of Tuscany	19:16	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
The Shattered Fortress	12:49	Dream Theater	Black Clouds & Silver Linings	Rock Progressive	★★★★
Thoughts	7:10	Spock's Beard	V	Rock (Progressive)	★★★★
The Great Nothing	27:01	Spock's Beard	V	Rock (Progressive)	★★★★
Goodbye To Yesterday	4:39	Spock's Beard	V	Rock (Progressive)	★★★★
All On A Sunday	4:04	Spock's Beard	V	Rock (Progressive)	★★★★
Thoughts (Part 2)	4:39	Spock's Beard	V	Rock (Progressive)	★★★★
Revelation	6:05	Spock's Beard	V	Rock (Progressive)	★★★★
At The End Of The Day	16:28	Spock's Beard	V	Rock (Progressive)	★★★★
Reflection	2:49	Spock's Beard	Snow (CD 20f2)	Rock (Progressive)	★★★★★
Overture - Made Alive	5:32	Spock's Beard	Snow	Rock (Progressive)	★★★★
Strange World	4:21	Spock's Beard	The Kindness Of Strangers	Rock (Progressive)	★★★★
Crack the Sky	7:47	Spock's Beard	The Kindness Of Strangers	Rock (Progressive)	★★★★



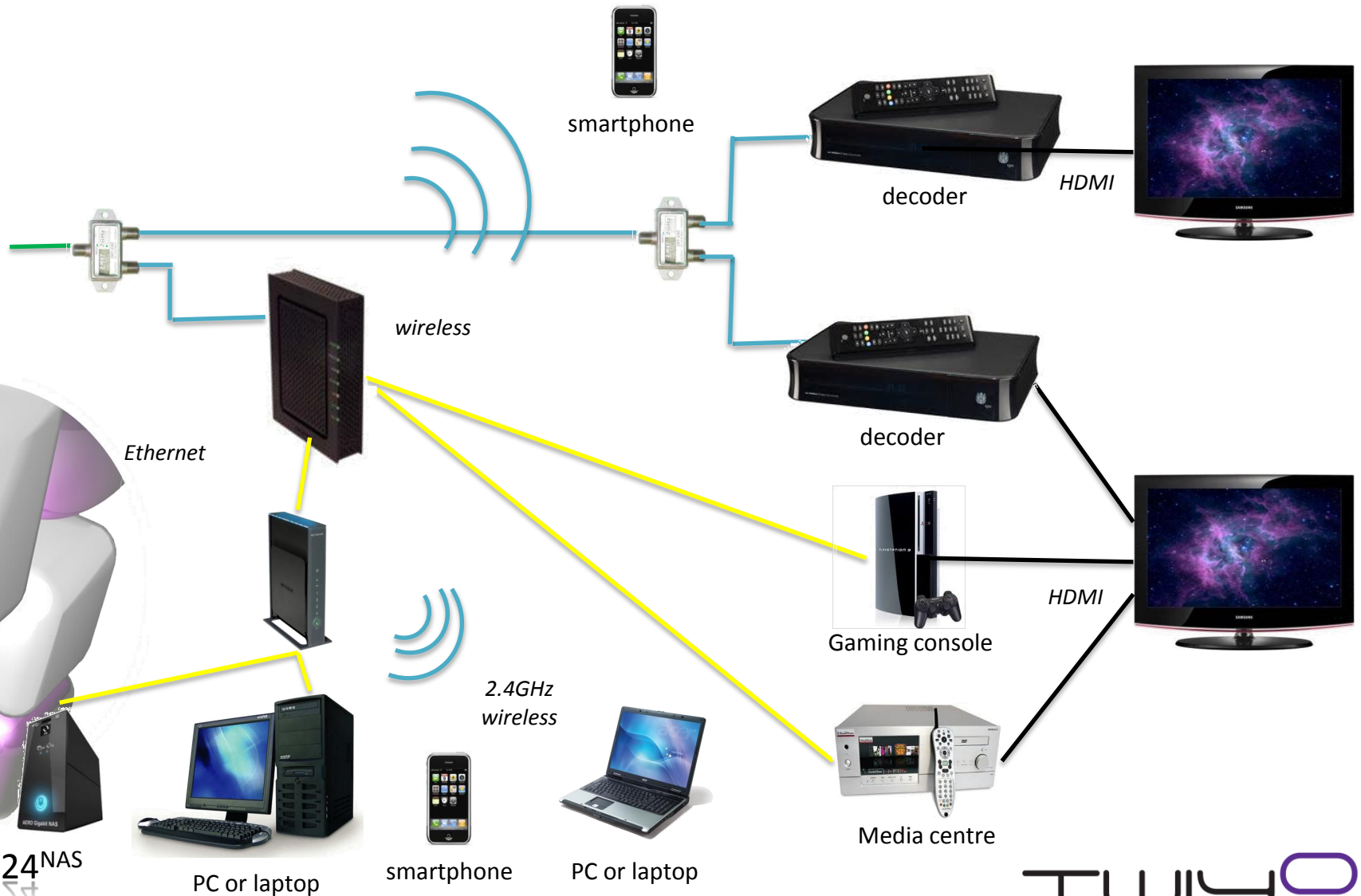
# Basic Home LAN



# Extended Home LAN - problem



# In home network – full blown scenario







# CHALLENGES

## General challenges to overcome

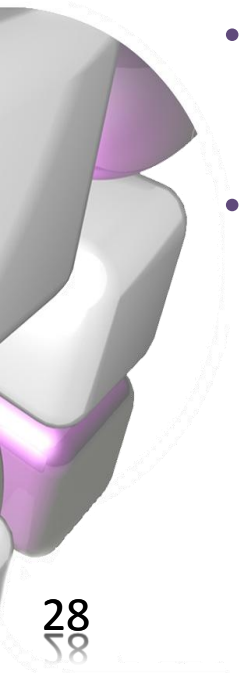
- DLNA does not standardize the *layout* and *representation*, only transport
- Libraries are presented based on *settings* and *capabilities* in the Server and Player
- GUI's differ. It is difficult to provide a user friendly overview of the available DLNA features
- Vendors...
  - Lock down their implementation (activation code)
  - of Android/iP\* app can browse, needs other player app for playback
  - Provides additional services (over the top streaming, shoutcast, DVB)
- My media do not play?!?
  - Most likely: codec issue

## Network challenges

- **Wireless**
  - Spectrum crowded (shared medium)
  - Distance
  - Obtrusions
  - Limited speeds
- **Wired**
  - recommended
  - not widely available through the household
- **One broadcast domain!**

## Challenges – DLNA discovery

- **Device discovery:**
  - are new devices shown automatically or is manual refresh needed?
  - are previously available devices still shown when unavailable?
- **Every DMP has its own way to display discovered devices**
- **Some DMP's seem to not show a device that does not share media, other show the device and library structure while it's empty**
- **Devices may show up multiple times if DMS and DMP support other technologies as well**
  - UPnP
  - Airplay
  - SMB network file sharing



## Challenges – DLNA library presentation

- **DMS may not serve media files based on capabilities**
  - many DMSs seem to determine codec support based on file extension
- **DMP may not show media files based on capabilities**
  - many DMPs seem to determine codec support based on file extension
- **Every DMP has its own way to display library structure**
  - sort by artist/date/file folders etc etc
  - even empty folders
  - media mixup: album art in music folders may show up in picture section
- **Responsiveness**
  - retrieve large library takes time, device seems not to respond

## What if...?

- **PC/NAS downloads arrive in directory that is shared by DLNA?  
(customer might be unaware that content is not what it seems and shows up on gateway)**
- **Media that a member of the household does NOT want to share shows up?**
- **Media downloads arrive in directory that is NOT shared by DLNA?  
(customer looks for media that cannot be found)**
- **Media are (legally) ripped and no metadata is filled in by ripper?**
- **Ripped media arrive in directory not shared by DLNA?**

### Awareness

- **DLNA player only *shows* what's there, you are in command**

## Challenges – DLNA media playback

- **Media support differs significantly per DMS/DMP/DMR**
  - minimal set is defined (PCM, MP3, MPEG2, JPG, TIFF, AVC mobile)
  - even media files in one of these may not play (correctly)
  - It's hard to find the exact set of supported codecs
- **DMP may show media files but is not able to play them**
- **DMS may decide to transcode files while serving them to player/renderer**
  - WMP12 converts AVCHD down to MPEG2 in SD to Sony

# Media formats





## Many codecs/formats/profiles around

MKV XViD DivX AVCHD X264 DTS FLAC  
3-7

WMV MOV MPEG4 H.264 AAC+  
7,8,9 FLV

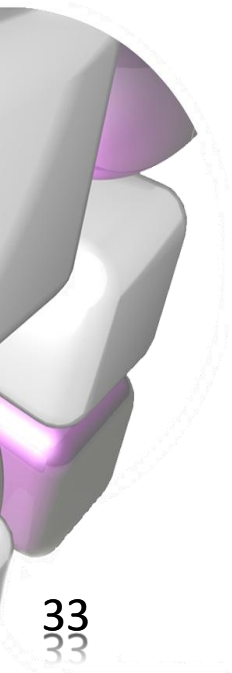
RAW PNG AVI H.263 WMA  
7,8,9,pro

JPG GIF MPEG2 AC3  
progressive PS AAC

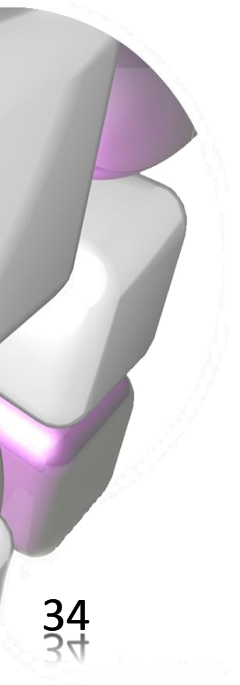
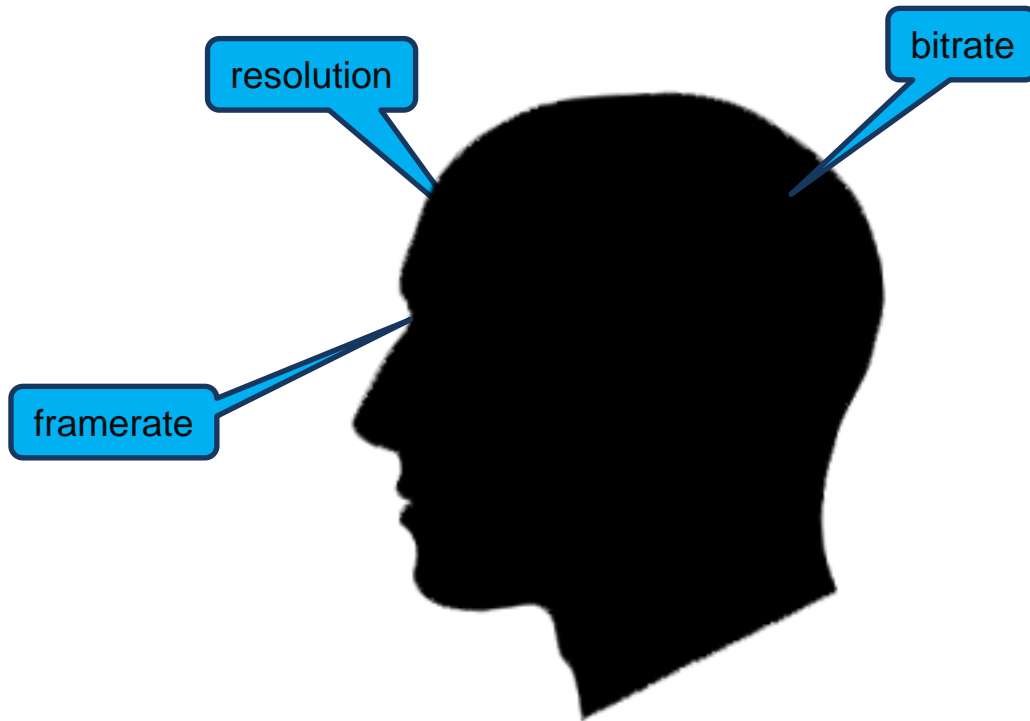
JPG non-progressive TS MP3 OGG  
MPEG1 MP3 AIFF

TIFF PCM

AVC mobile



## Media profiles

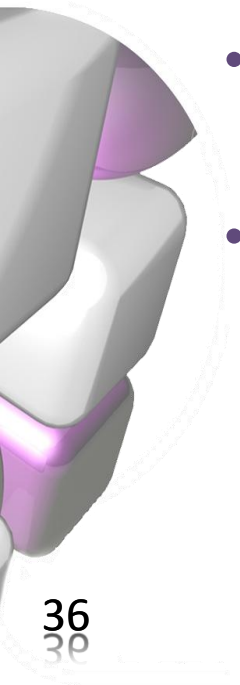


What happens if you need to support many media formats



## Usability

- What roles are supported? Is the player/app/device a (combination of) DMS/DMP/DMR/DMC?
- what use cases are supported?
- GUI's may overlap
- Language mix up



## Conclusion

- It's the best 'open' technology for (relatively) easy media sharing at this moment
- Still needs improvement in many areas
- More info:
  - [Wikipedia](#)
  - [MS presentation on DLNA & WMP](#)
  - [DLNA.org](#)
  - DLNA [whitepaper](#)