



Universal Plug and Play im digitalen Heim
Möglichkeiten und Grenzen der digitalen Heimvernetzung

Universal Plug and Play in the Digital Home

***Pros & Cons of the
Next Generation Home Networking Middleware***

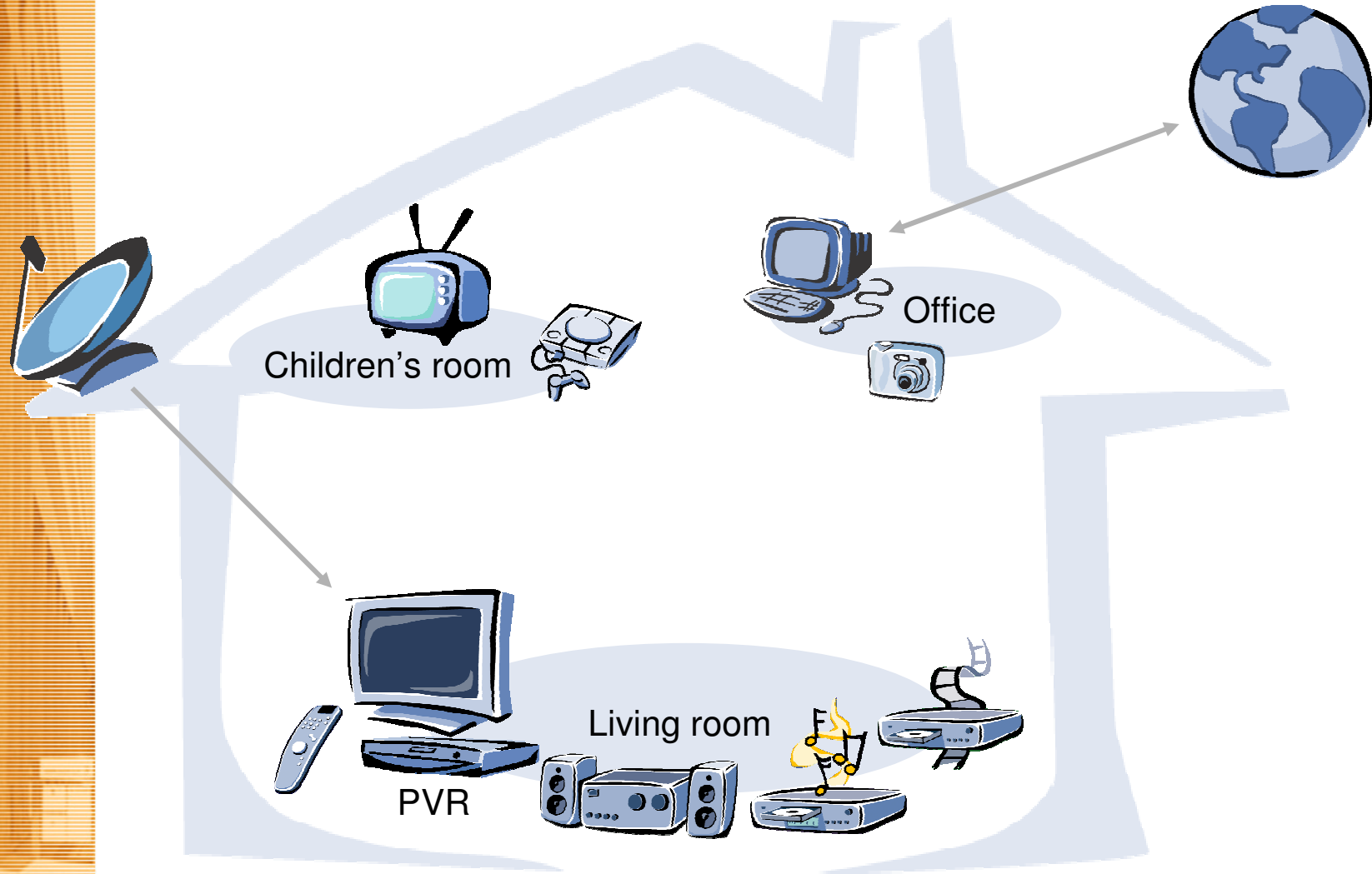
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The battle for the living room: today's home



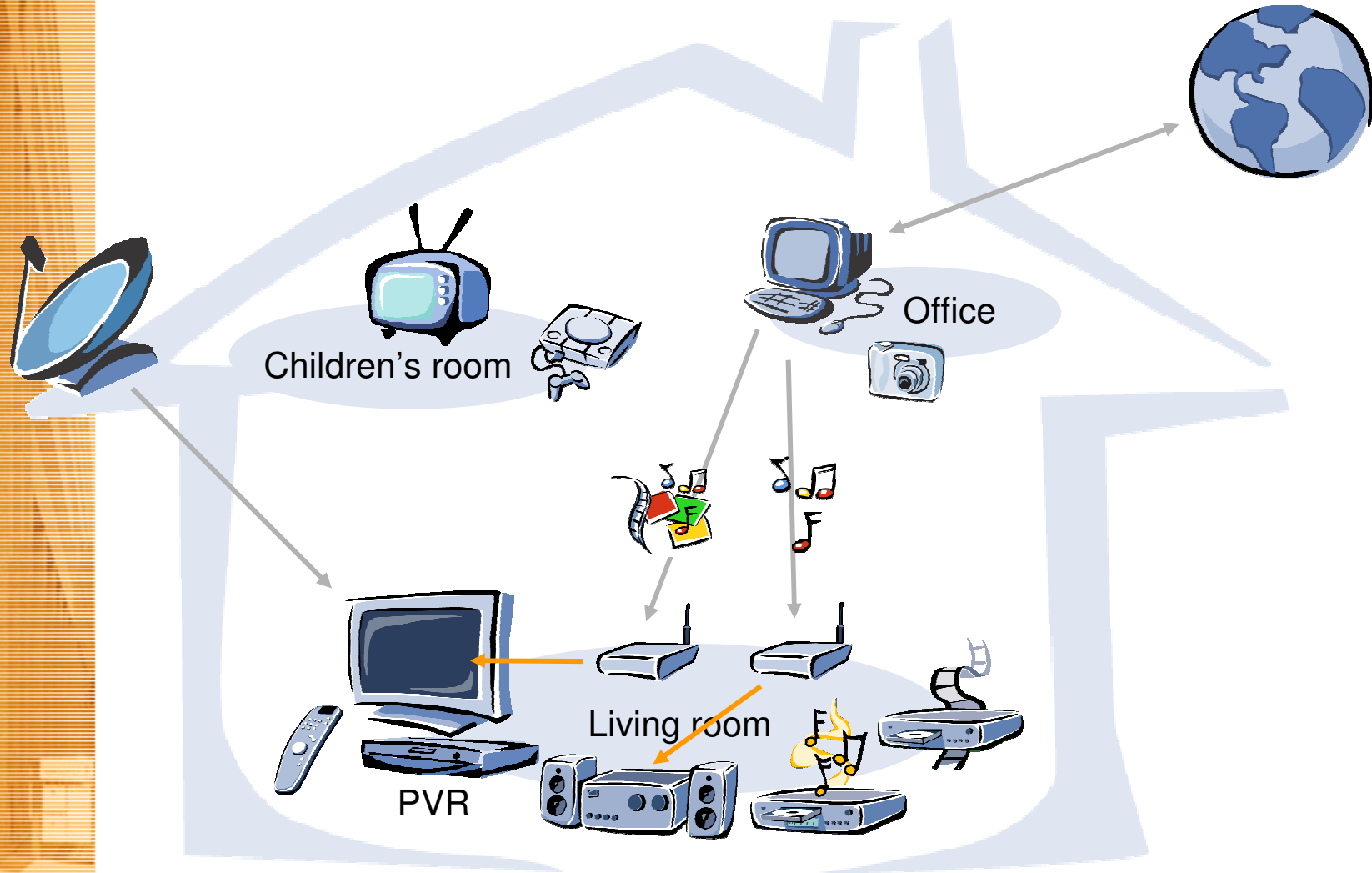
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The battle for the living room: media adapters



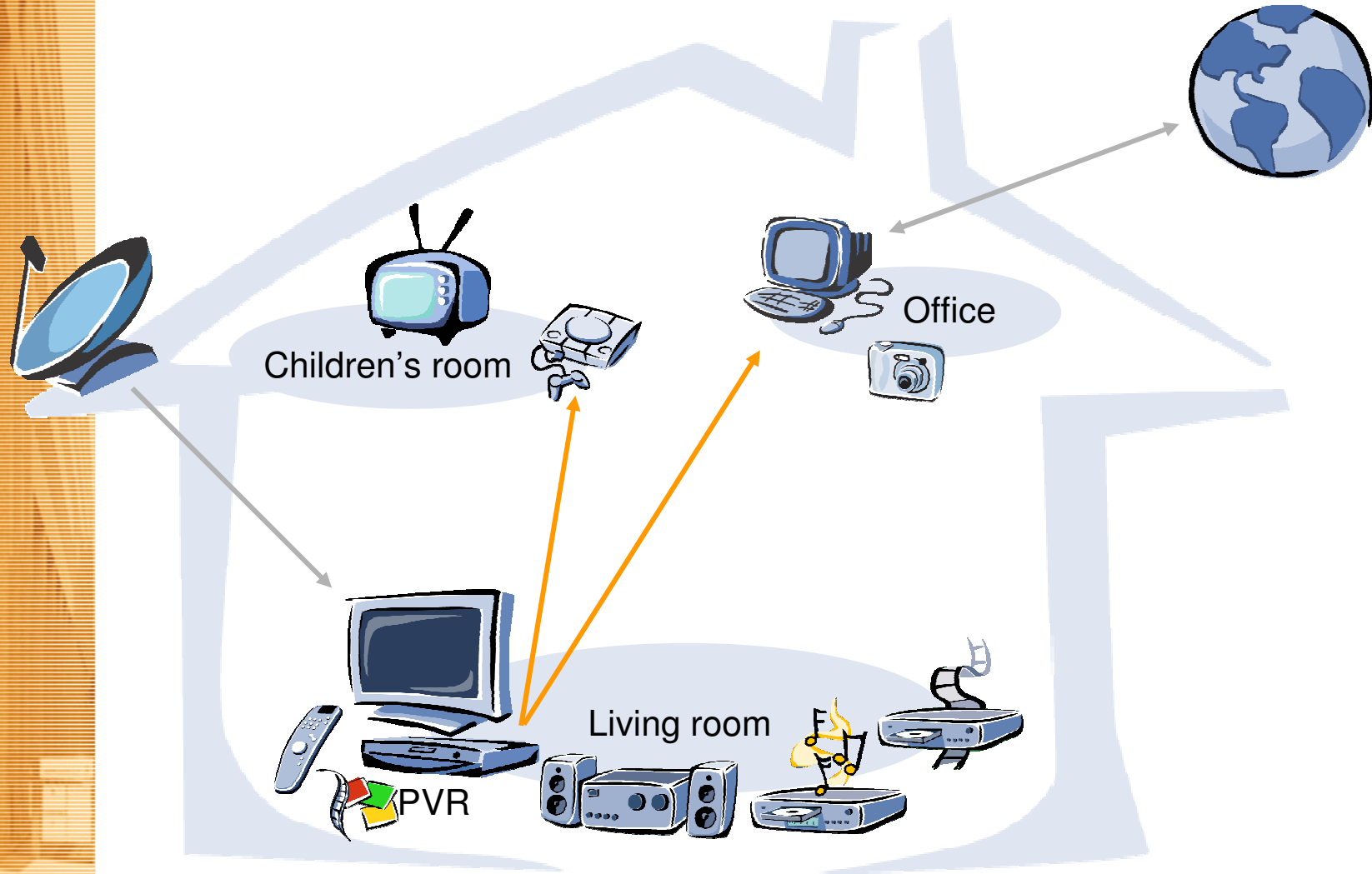
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The battle for the living room: PVR-centric



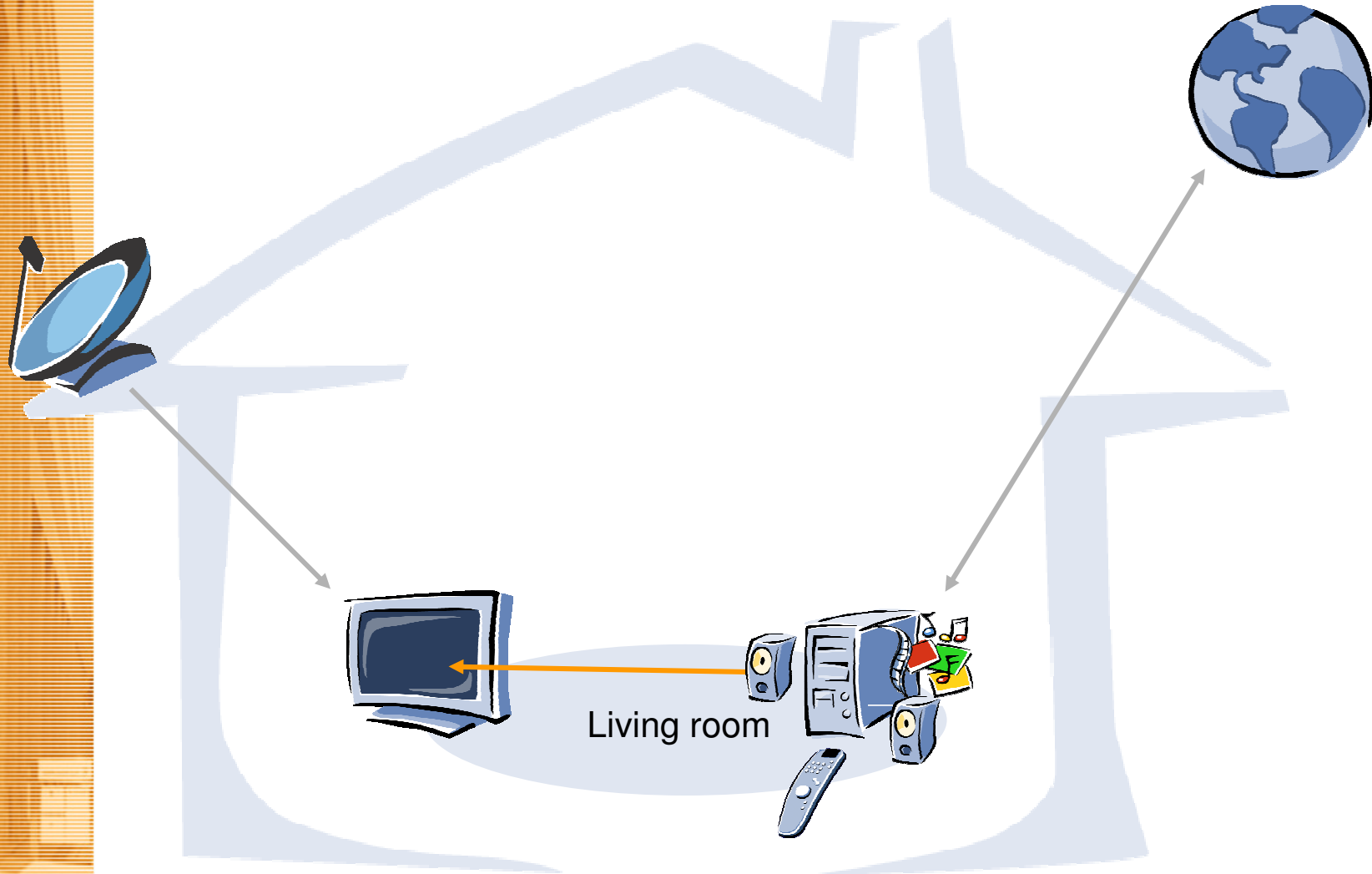
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The battle for the living room: PC-centric



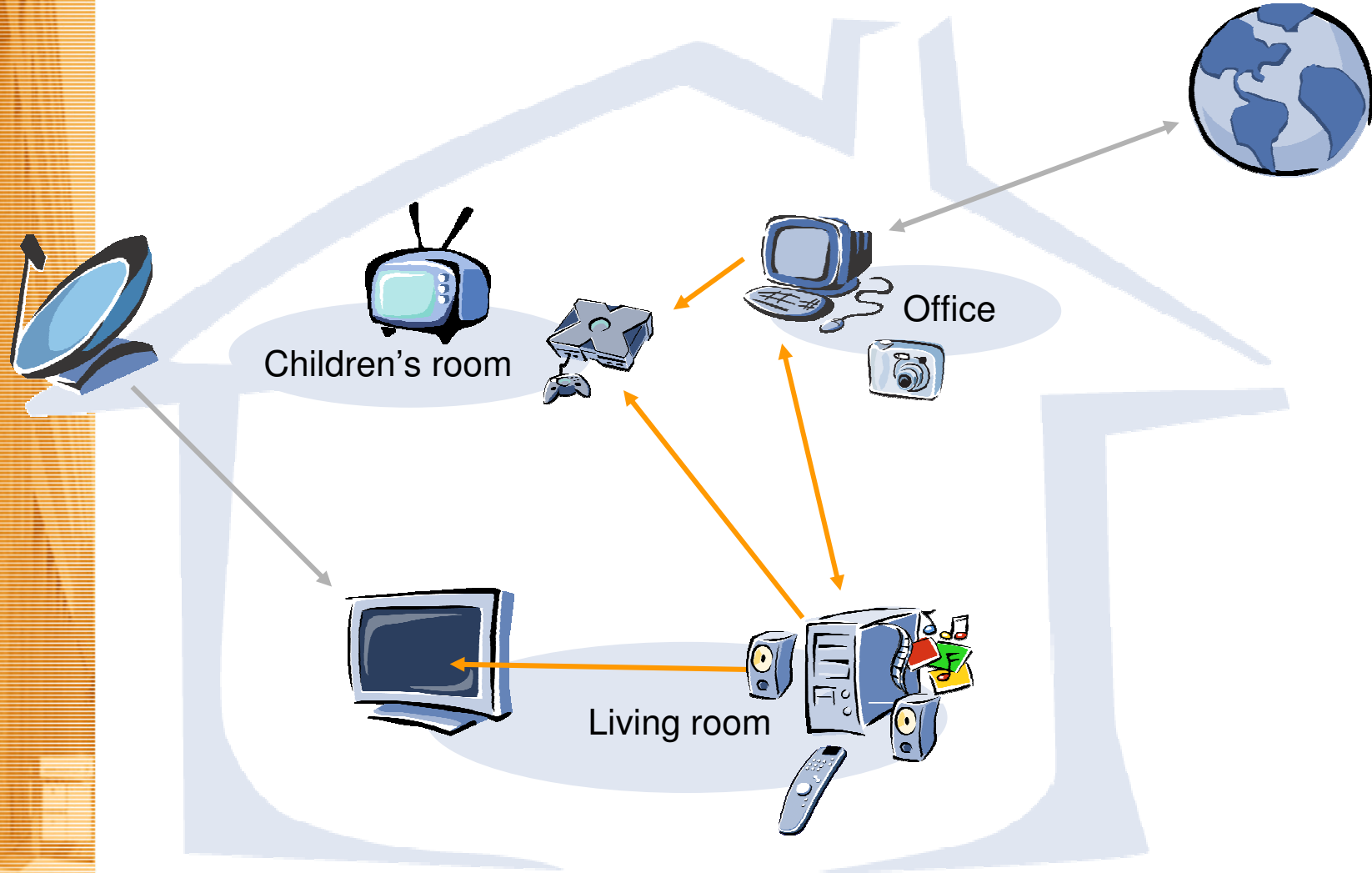
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The battle for the living room: PC-centric



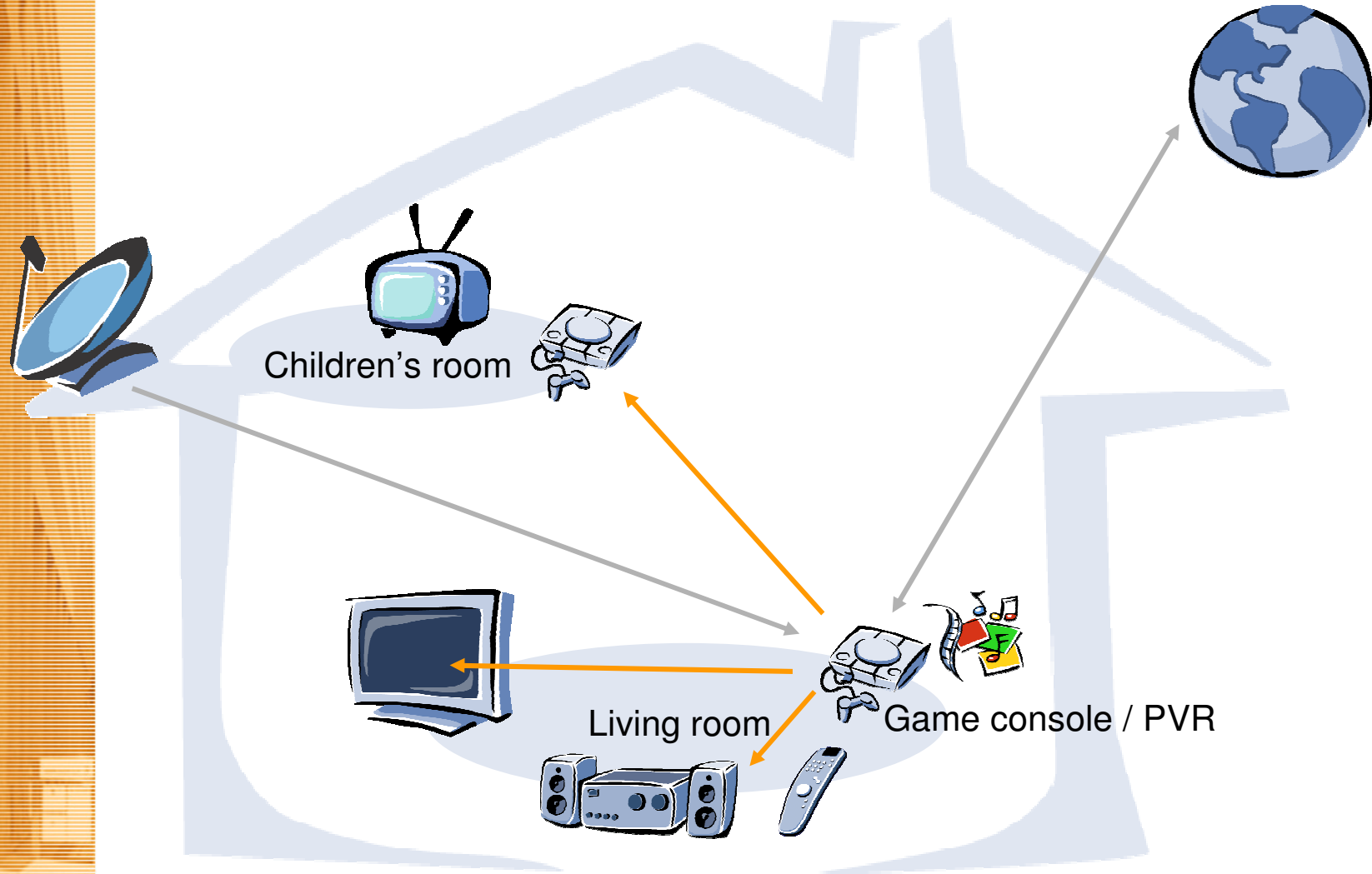
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The battle for the living room: game console



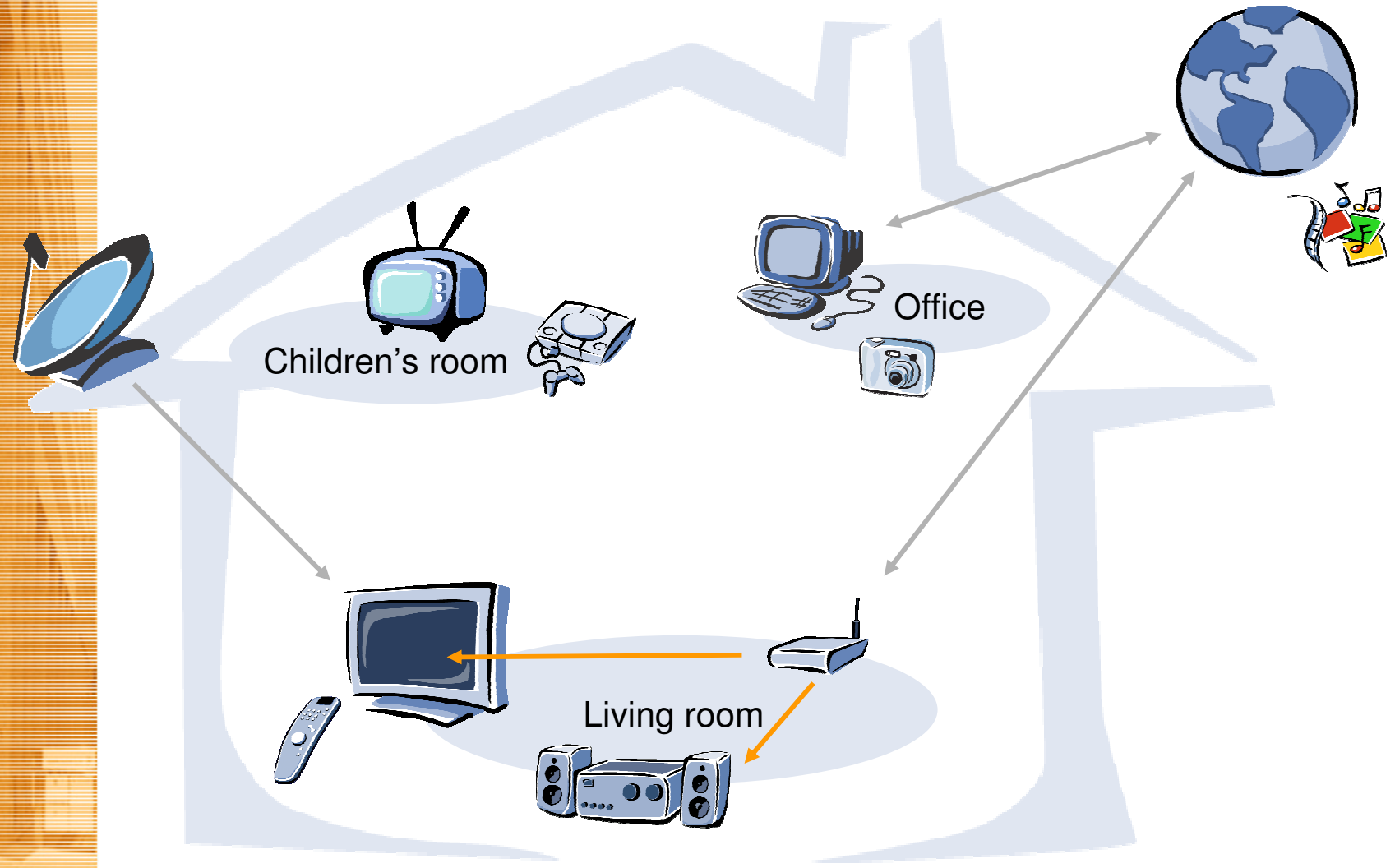
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The battle for the living room: service provider's view



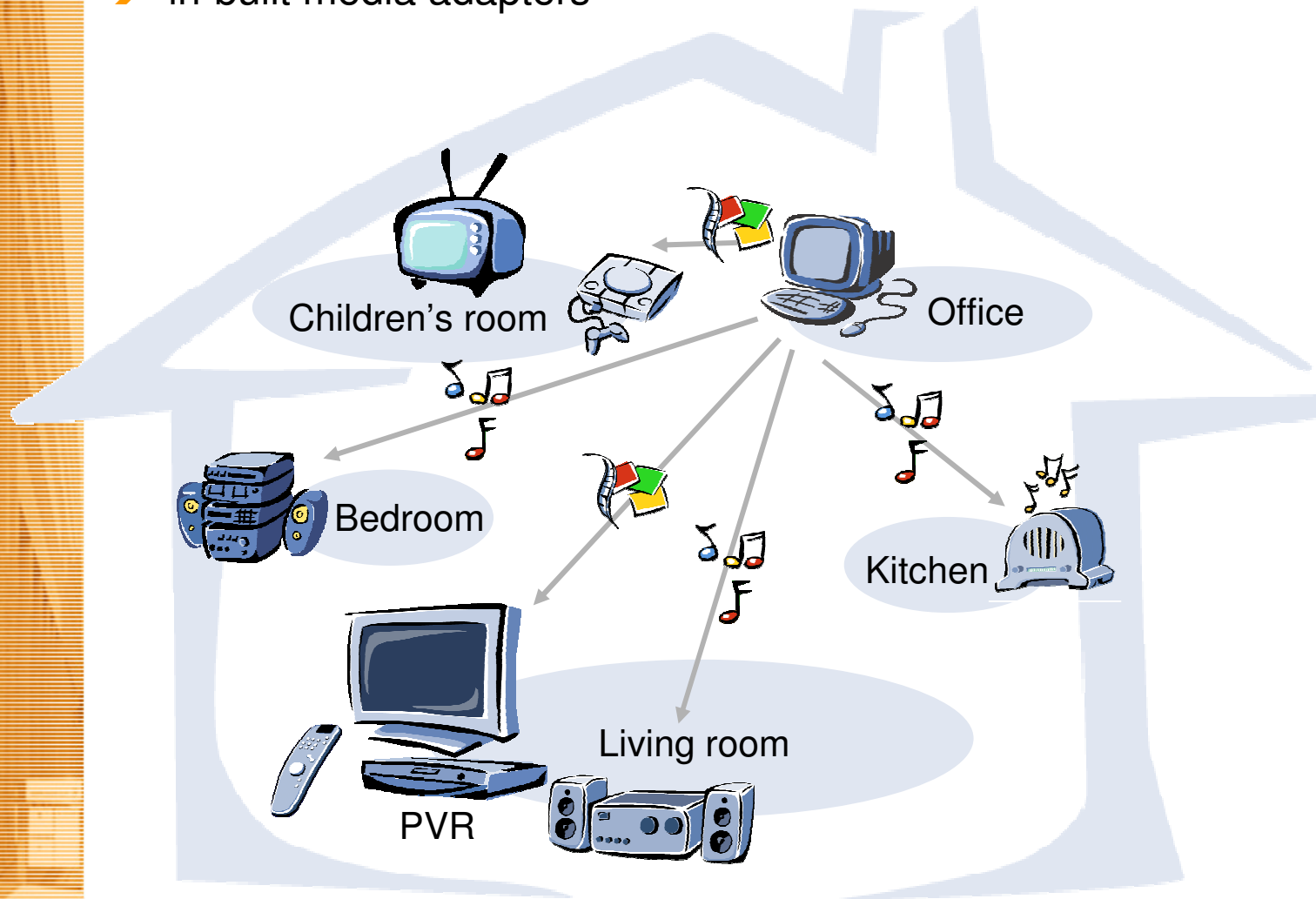
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The battle for the living room: the user's view



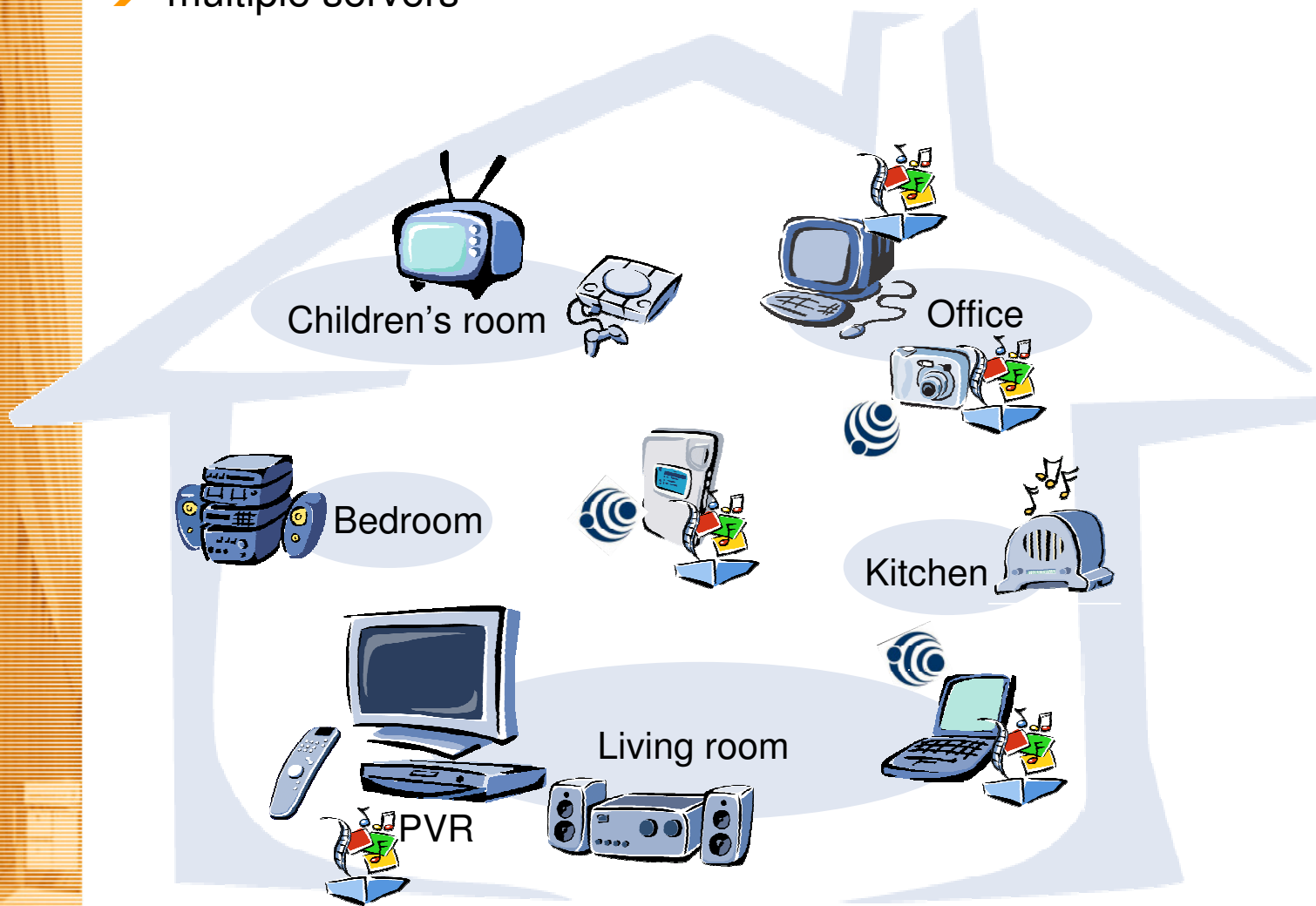
→ in-built media adapters



The battle for the living room: the user's view



→ multiple servers



- Interoperability between devices from different manufacturers
- Plug&Play
 - No software/driver installation required
- No need for separate media adapters
 - Devices should directly communicate with each other
- Multiple servers interworking with every client
 - No central device
- Hidden network
 - Networked devices should behave like traditional CE devices
- Adaptability to renderer capabilities
- Distributed content management
 - Unified access to all available media
- Integration of mobile devices
- Remote access

→ Common middleware

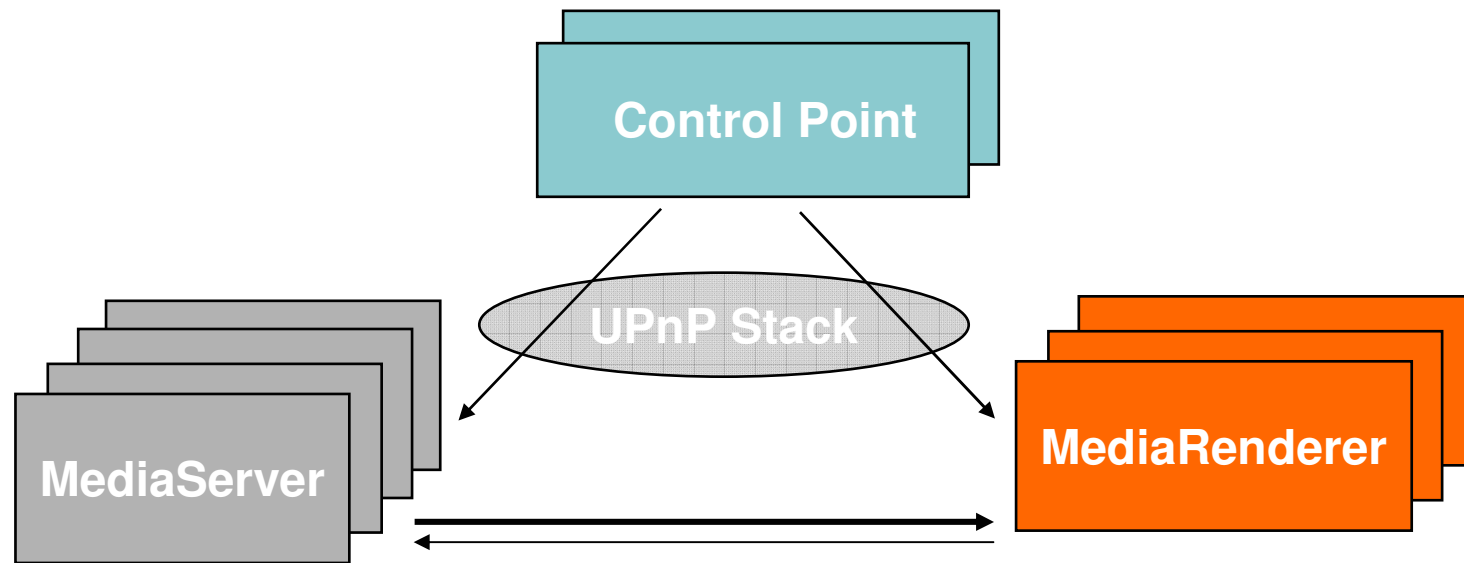
The Solution: Standardized UPnP Middleware

- Defined by the UPnP Forum
 - Industry initiative with more than 720 members
- UPnP provides
 - Platform independence
 - Device and service descriptions
 - Common base protocols
- UPnP is based on established Internet technologies
- Current device specifications
 - Basic Device
 - Printer, Scanner
 - Internet Gateway
 - WLAN Access Point
 - HVAC, Lighting Controls
 - UPnP AV

UPnP AV Architecture



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- Open standard
 - many options
 - semantics often not specified
- True interoperability will require profiles, e.g.
 - Selection of content formats
 - Selection & extension of protocols for content transfer
 - Streaming protocols
 - Provision of local functions through the network, e.g. trick modes
- For further study
 - Scheduled Recording Service
 - QoS
 - Robustness
 - Security
 - DRM

→ DLNA

- Non-profit organization aiming at a wired and wireless interoperable network of PCs, consumer electronics and mobile devices in the home enabling a seamless environment for sharing and growing new digital media and content services
- Interoperability framework of design guidelines (profiles)
- Based on open industry standards (UPnP, Wi-Fi, ...)
- Profile specification
 - Selection of content formats & sizes
 - LPCM, MPEG-2, JPEG
 - Streaming protocol
 - HTTP 1.1
 - Protocol extensions
 - HTTP Timed Range Seek (fast forward)
 - Further restrictions to enhance interoperability
 - MediaPlayer = Control Point + Renderer

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- UPnP Renderer cannot transmit capabilities
 - ➔ Renderer-specific server-side transcoding not possible
- Media Server offers
 - fixed list of content formats as defined by DLNA
 - fixed list of image sizes as defined by DLNA
 - One URL per image size
 - Control point has to select most appropriate one
 - Transcoding still to be done by the Renderer
- Open issues
 - Video scaling for mobile devices

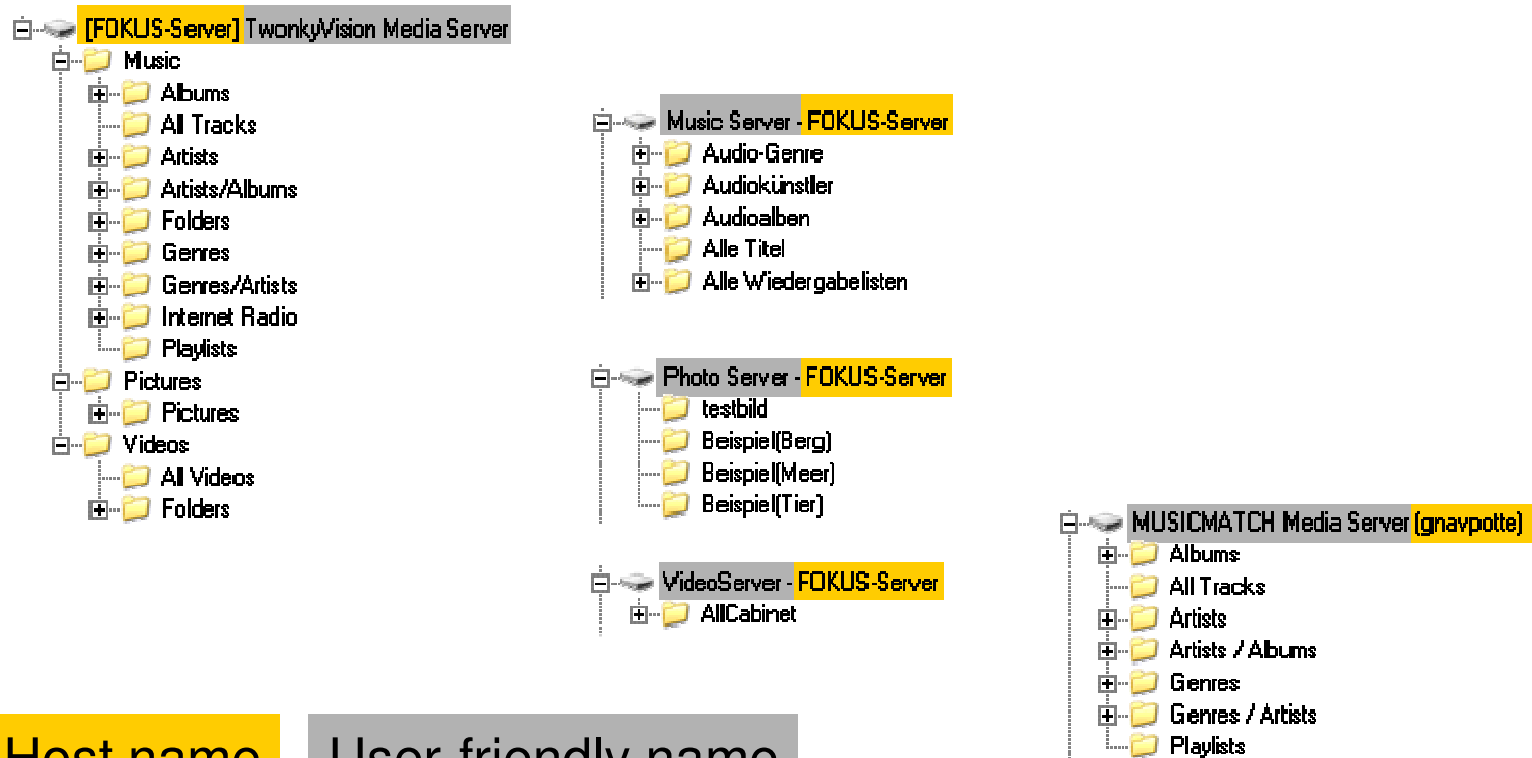
- Large amount of digital content in the future home requires user-friendly content management
 - Server-independent logical view of the content
- Metadata are the key pre-requisite to content management
 - metadata source varies for different content types
 - Music: 3rd party, Pictures: home grown, Video: both
 - Free 3rd party metadata often not reliable
- UPnP Content Directory Services specifies a set of metadata

- Partial lack of semantics
 - Most properties are just strings, e.g. genre
 - Extensibility vs. closed list
 - At least entry points for different content types to be specified
- Personalization missing
 - No user-related informationen (e.g. favorites)
 - No user-related access rights

→ Further standardisation required

Distributed content management

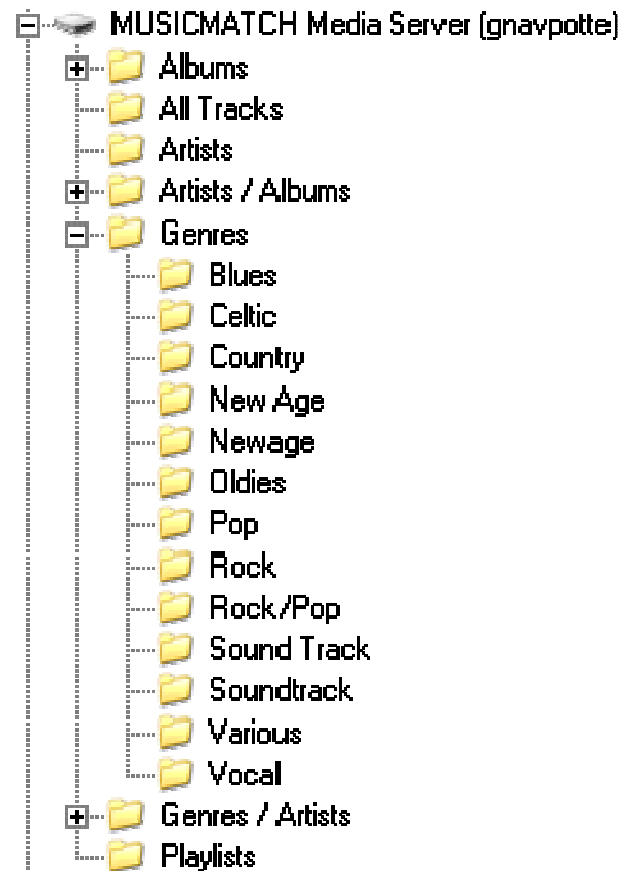
- Today the user first has to select a server
- Navigation structure is driven by server
 - Different servers provide different logical views
 - Unified access requires interpretation of metadata of every single item on the servers -> performance issue



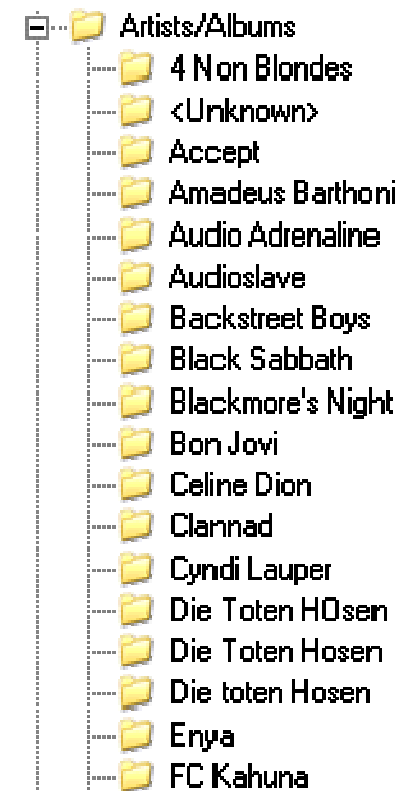
Host name

User-friendly name

extensibility vs. enumeration



3rd party metadata

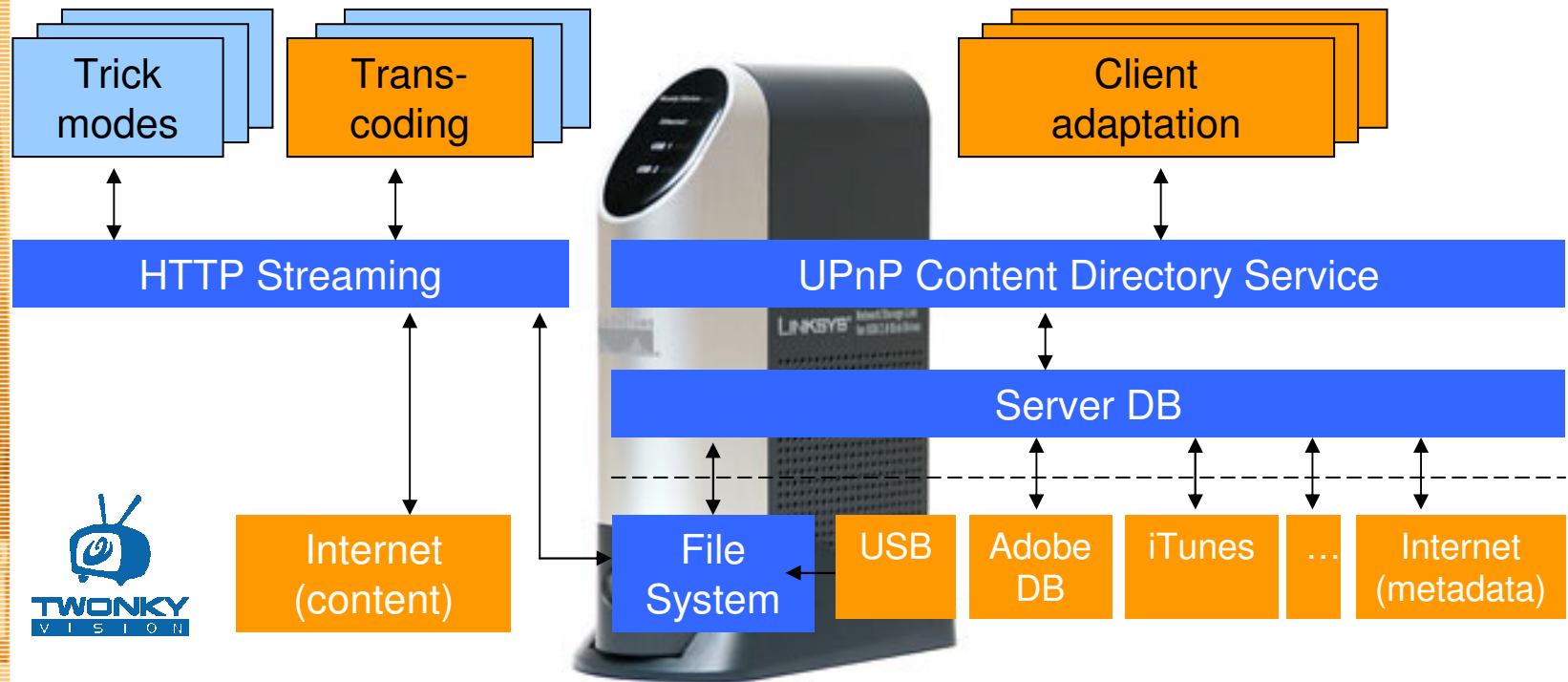




Our Media Server Architecture



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- Mobile servers require **synchronisation**
 - Exchange of Content between Servers
 - Copy pictures (digital camera -> home server)
 - Take music with you (home server -> MP3 player, car)
 - Modification/enhancement of metadata (e.g. preferences, playlists)
- UPnP provides several features to support synchronisation
 - Update object & create object
- Mobile UPnP devices not yet available
- Corresponding UPnP Features
 - are optional
 - not included in current profiles
 - not implemented in current servers

→ Further profile(s) needed

- Access to devices and content from remote not yet possible
 - Programming of PVR
 - Present your holiday pictures at a friends home
 - Listen to your home music in your summer house
 - ...
 - APIs for PVR in general (SRS) not defined in UPnP AV 1.0 (coming soon)
 - Security mechanisms not defined in UPnP
 - Firewalls block UPnP
 - ➔ Home-to-home not yet possible
- ➔ Security mechanisms and UPnP-aware gateway to be defined

- UPnP and DLNA will definitely take us a large step further towards the Digital Home
- Many interoperability problems are solved
- A number of open issues still remain, mainly usability issues
- UPnP 2.0 and further DLNA guidelines are under development

The Consumer`s View: Interoperability instead of Battlefield Home

Thank you for your attention!

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