

# **WiFi extension of DTT on in-home networks using SAT>IP**

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# **How to maintain and increase the relevance of terrestrial broadcasting?**

# Some desirable features of future DTT

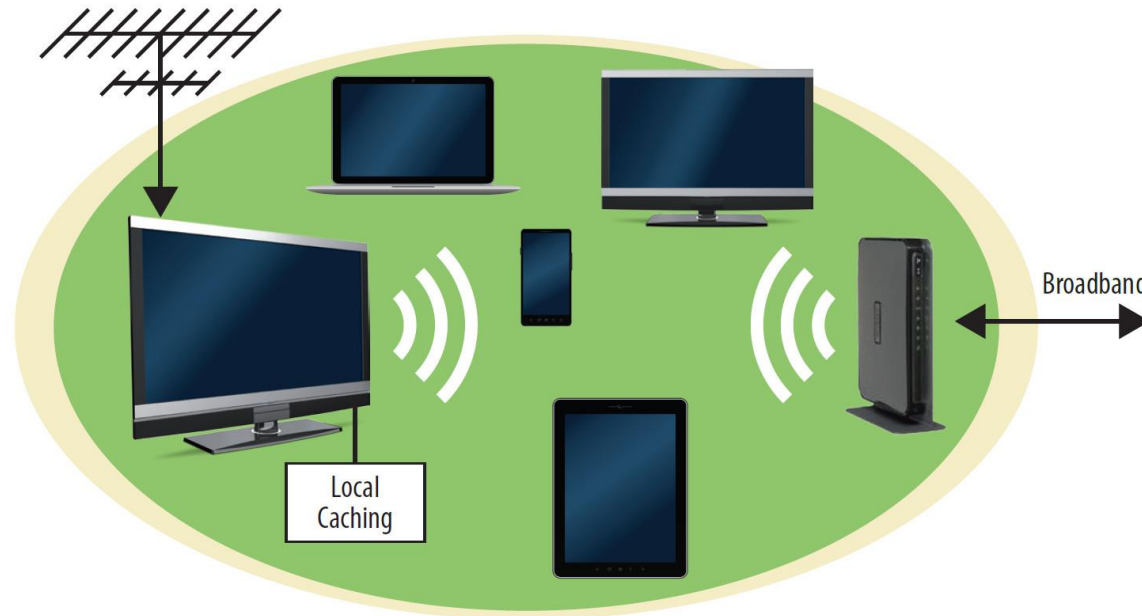
- In-door reception, anywhere in a home
  - Currently very high roof-top antenna coverage (98%-99.8%)
  - But in-door reception much more challenging (expensive)
  - Getting worse with modern buildings → “Faraday’s cage”
- DTT content displayed on any type of (existing) device
  - DVB-T/T2 normally supported by TV sets
  - But not by tablets, smartphones or PCs
- Wireless connection of TV sets (especially 2<sup>nd</sup>, 3<sup>rd</sup> TV etc)
- Access to a limited but wide range of linear TV, catch-up and push-VOD content without requiring Internet access
- Access to a potentially unlimited range of linear TV, catch up and VOD content when broadcast is combined with broadband
  - Role of broadcast is then: broadband offloading, QoS

# Key ideas

1. Separation of “outdoor broadband distribution” (=DVB T/T2) and “in-door distribution” (=WiFi)
  - Similar to broadband + WiFi
2. Server concept allows for separation of domains for RF, video coding and scrambling
  - No need for DVB PHY support on end devices (especially tablets, smartphones, PCs)
3. Broadcast allows for offloading of broadband
  - Access network (e.g. mobile broadband, AirFibre)
  - Core network/CDN
  - For flat rate broadband users broadcast/broadband is perceived as a single unified service
4. Local caching increases dramatically usefulness of broadcast
  - Without caching the broadcast content is only valuable at the time of reception
  - With caching the usefulness may extend indefinitely

# The WiFi eXtension (WiX) concept

- DVB-T/T2 is received via a rooftop antenna (98-99.8% coverage)
- After DVB-T/T2 demodulation a selected service is retransmitted over IP/WiFi to any requesting WiFi-enabled device
- With local caching linear TV content may be stored for later access by any device
- With broadband access the broadcast content may be complemented by additional content only available over broadband
- “WiX” is a Teracom acronym

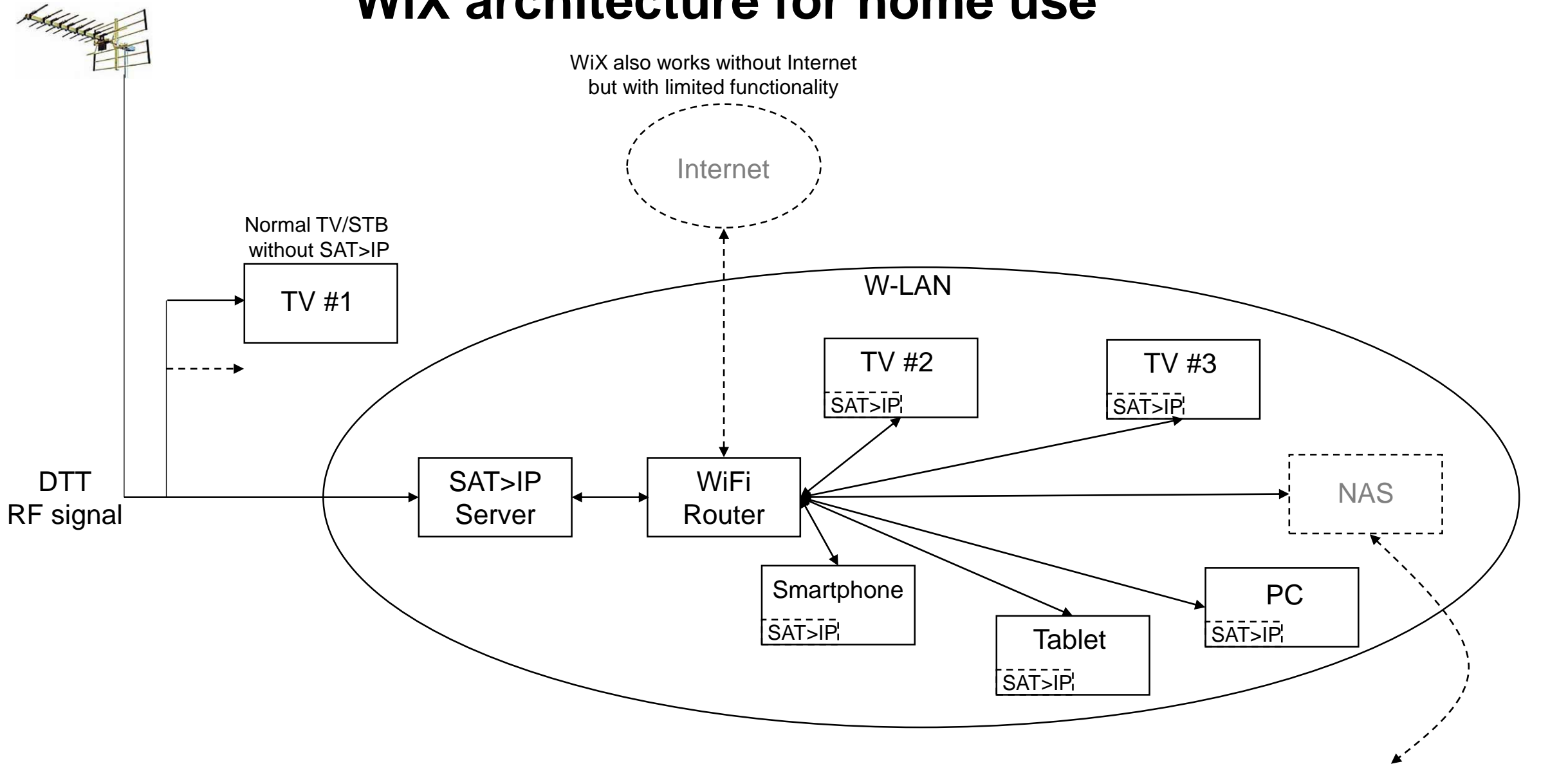


# SAT>IP

- SAT>IP Alliance is an industry forum that has specified an open “WiX” standard: [CENELEC EN 50585](#)
- SAT>IP was originally only for satellite distribution (“SAT” in the name) but has widened the scope to include support also for DVB-T/T2 and DVB-C/C2
- Server/client solution
  - Single SAT>IP server
  - Multiple SAT>IP clients (one client in each presentation device)
- A SAT>IP server may either create its own local WiFi network (SSID) or connect to an existing WiFi network (router)
  - When an Internet-connected WiFi network already exists connecting also WiX to this is normally preferred
  - Allows Internet access and TV consumption without changing WiFi network!

# WiX architecture for home use

WiX also works without Internet  
but with limited functionality



WiX also works without NAS/cache storage  
but with reduced functionality

# SAT>IP servers

- For a selected service: performs DTT demodulation, demuxing, re-encapsulation into IP and connects to the LAN (WiFi or Ethernet cable)
- SAT>IP is currently transparent to DVB CA
  - Server may forward scrambled signal with ECMs/EMMs to client
  - Requires CA HW support from client device (e.g. CI + smartcard)
  - Soft CA operator extension may use “transscrambling”
    - Terminate current over air DVB CSA and use local CA with CSA 3 (AES) to clients
    - Generic SAT>IP server may support arbitrary CA system via DVB CI 2.0 (USB)
- Optionally a SAT>IP server may in addition perform
  - Transcoding of video (when WiFi bit rate is low or when client capabilities are limited)
  - Handling of recorded linear TV and push-VOD files
- In the future a TV set may include SAT>IP **server**/client support as a **Standard** function
  - Already supported by premium range Panasonic TV sets
- Alternatively, a SAT>IP server may be
  - a dedicated unit
  - integrated in a STB/PVR
  - integrated in a WiFi router
- A SAT>IP server will typically need to include several tuners
  - For parallel viewing/recording (same requirement as for PVR), unless from the same mux
  - To support linear TV on multiple devices simultaneously, unless from the same mux
  - Access from cache does not involve the DVB tuners

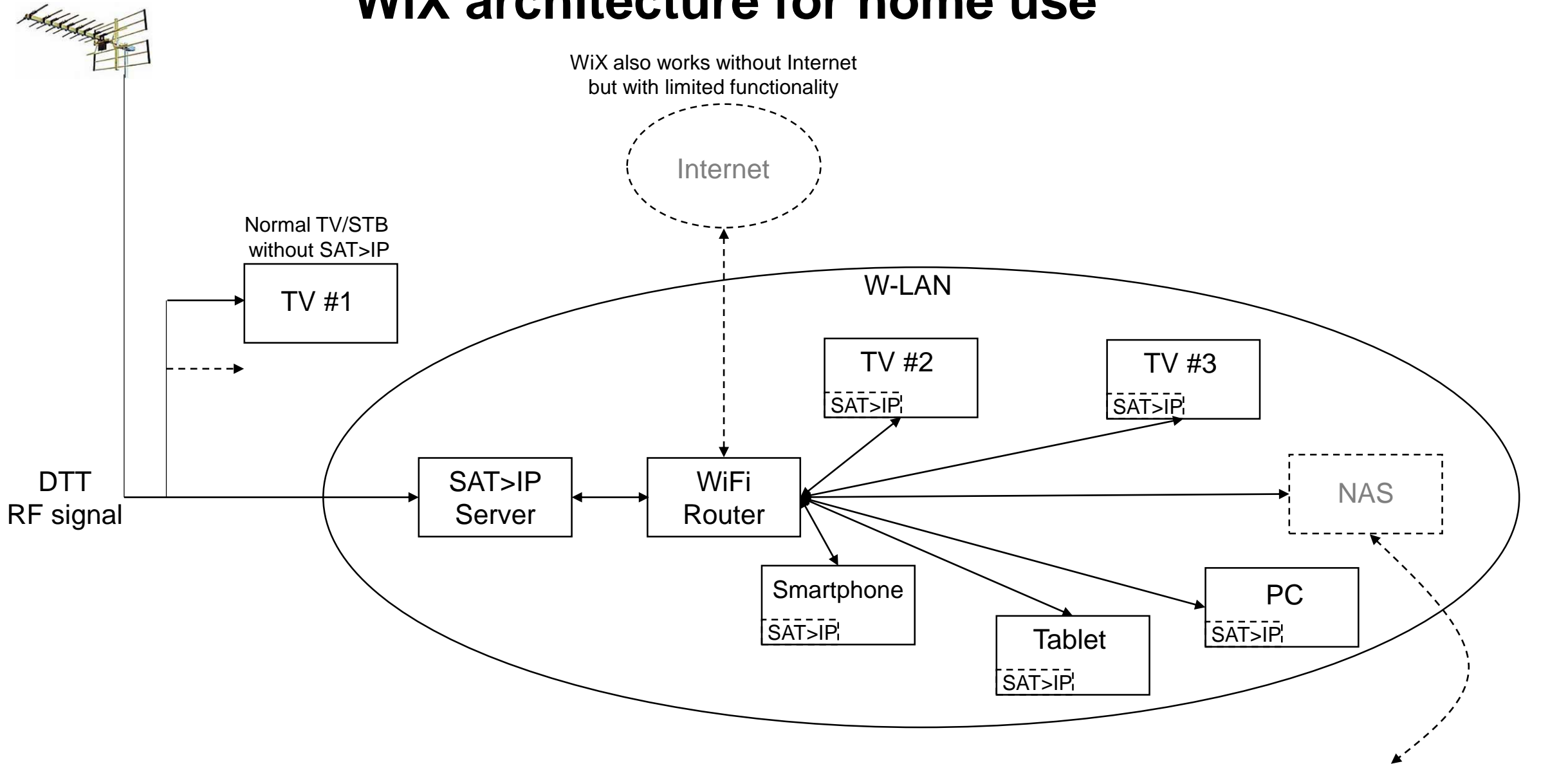


# SAT>IP clients

- Future TV sets may include SAT>IP server/**client** support as a standard function
- Existing tablets, smartphones and PCs may download a SAT>IP app or use a web browser interface
- TVs without native SAT>IP client support may be upgraded to support SAT>IP via
  - a downloaded app (HbbTV, Android) to the TV set
  - a downloaded app to an external device
    - Apple TV
    - Chromecast
    - ...
  - CI 2.0 (USB support)
- Potentially all TVs could be wirelessly (WiFi) connected
  - Allowing free positioning of TVs
  - Avoiding coax cables

# WiX architecture for home use

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# Caching

- Local caching is an optional extension of the WiX concept
- Similar idea to traditional PVR but allowing access by any device
- Catch-up
- Push VOD (e.g. during underused or unused broadcast time)
- May be implemented in different ways
  - USB storage attached to TV set, server or router
  - Part of PVR with SAT>IP support
  - Stand-alone Network Attached Storage (NAS)
    - Connects to LAN via WiFi or Ethernet cable
    - May already be available or can share benefits with other uses (home cloud)
- Automatic recordings (e.g. series)
- Automatic deletion of old recordings (unless tagged as “do not delete”)
- NorDig function: “Broadcast record list” may be used for this

# What about broadband?

- For some users broadband
  - may be too expensive to use for large video consumption (e.g. mobile broadband)
  - may have a too low basic bit rate (picture quality) as a replacement for broadcast (e.g. ADSL/mobile broadband)
  - may have insufficient/unreliable QoS (delay, stability)
  - may have too low picture quality due to cost-driven bit rate limitations (e.g. CDN costs)
- Even broadband via fibre is partly affected by this (last point)
- Many consumers would therefore benefit a lot from using a combination of broadcast and broadband
  - where broadcast is used whenever possible and broadband otherwise
- Especially in summer cottage areas broadband is often very poor (or non-existent)

# WiX outside the home

- The same WiX concept could be applied outside the home:
- Using a guest WiFi network to access ones own WiX home network via the Internet
- Using a guest WiX network to directly access DTT content using ones own subscription (but not ones own WiX network)
- Relevant places
  - Being the guest in somebody else's home
  - Public buildings and places (e.g. parks)
  - Hotels
  - ...
- Mobile access within vehicles
  - Broadcast to the vehicle, WiFi internally
  - Public transport (bus, underground, local train, taxi, boat/ferry, ...)
  - Private cars/boats
  - Vehicle-mounted external (diversity) antennas and redistribution via WiFi within the vehicle

# Migration aspects

- Migration to new standards is a painful process, especially
  - Video coding
  - Physical layer
- Long transition period
- Expensive equipment replacement (several devices per home)
- With servers supporting HEVC-to-MPEG-4 transcoding, HEVC video coding could be introduced “painlessly” for users with WiX
- With most TVs supporting SAT>IP only one piece of equipment in the home would need to be replaced to change modulation standard: the SAT>IP server
  - Possibly just using a USB stick supporting the new modulation standard
- The above does not imply that WiX would make migration painless, but it may significantly reduce the pain

# Consequences of WiX for the broadcast network

- Existing DTT network and setup may directly be used for WiX
  - Home reception
  - Linear TV + catch up
- For enhanced features some additional signalling may be required
- For push-VOD the same network may be reused but capacity must be reserved for push-VOD (e.g. during nighttime)

# Consequences of WiX for the consumer equipment

- Consequences depend heavily on use case
- In the simplest case the user may get basic WiX functionality “automatically” by new TVs implementing SAT>IP server/client support
- A WiFi router with Internet access is likely to be available almost everywhere
- The user may even benefit from WiX caching, without adding new equipment, if a NAS or other storage is already available
- Alternatively, the user may buy a NAS or some other storage equipment
  - A NAS may have a wider use than just WiX caching (home cloud)
- With the dedicated server approach this server is a new piece of equipment
- An app may need to be installed on smartphones, tablets and PCs
- Some additional equipment (Apple TV, Chromecast, Android clients, USB stick) may be required on legacy TVs not supporting SAT>IP



# Desirable for future DTT - revisited

- In-door reception, anywhere in a home YES!
- DTT content displayed on any type of (existing) device YES!
- Wireless connection of TV sets (especially 2<sup>nd</sup>, 3<sup>rd</sup> TV etc) YES!
- Access to a limited but wide range of linear TV, catch-up and push-VOD content without requiring Internet access YES!
- Access to a potentially unlimited range of linear TV, catch up and VOD content when broadcast is combined with broadband YES!

## In addition...

- WiX may facilitate migration to new standards
- The WiX concept lends itself very well to “outside-the-home use”, including mobile

# What is happening now?

- DVB has identified “DTT on in-home networks” (=WiX) and “Local Service Rebuild” (e.g. via caching) as prioritized short term items from the commercial point of view
  - DVB Long Term Vision report
- A DVB “fact finding mission” is about to start, run by CM-T
  - To identify relevant use cases and possible standardization gaps/need
  - Probably SAT>IP is assumed as a basis
- With something like a WiX standard (e.g. SAT>IP with DVB additions) TVs and STBs may start to support SAT>IP more generally
- NorDig may have an important role to play to make this happen!

# Summary and conclusions

- WiX combination of outdoor broadcast + in-door WiFi is very powerful
- Greatly enhanced by local caching
- Further enhanced by integration with broadband
- Almost no consequences for DTT network (home case)
- Limited consequences for consumer equipment
- NorDig may have an important role to play



# Questions?

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