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Digital Innovation

A brief vision of the CPE market for Broadband Access and Pay-TV

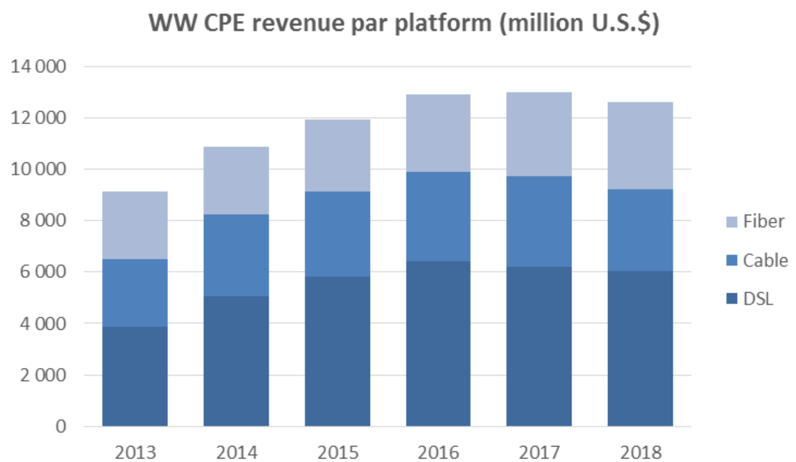
October 2015

An overall CPE market growth

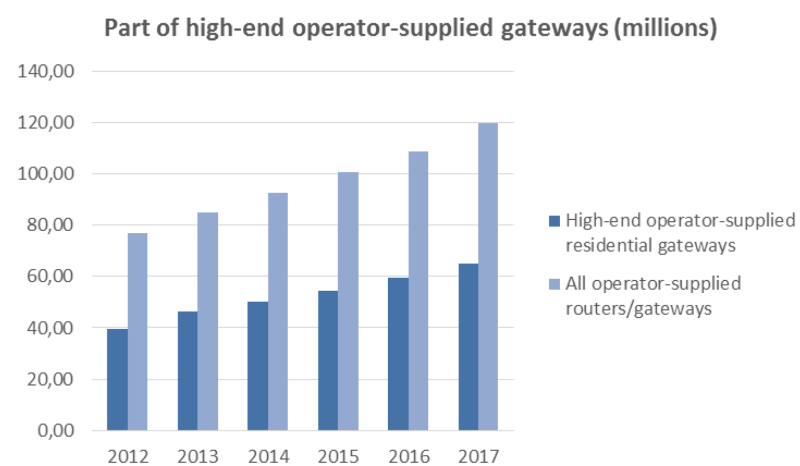
- **Need for Residential gateways**
  - Moving from ADSL2+ to **VDSL and to G.Fast**
  - Fiber deployment (**FTTB** in connection with G.Fast / **FTTH**)
  - Wifi performance (latest **Wifi 11ac** solutions)
  - **Higher performance gateways**, with ARM9 powerful CPU core for multi-purpose usages (shared DVR/services, multi-screen usage, smarthome services management….)
- **Need for Set-top boxes**
  - Moving from HD-DVR to **media gateways** and to **thin clients**
  - Deployment of **hybrid + HEVC** devices allowing better OTT and IP-TV deployment
  - Deployment of **UHD broadcast** for pay-TV operators (satellite, cable, telcos)
  - Integrating **additional services** (NetFlix) or following **Android** routes
  - This will not result in market growth in value (average selling price will decline) but we expect slight growth in volumes – price will be under pressure for OEMs
- **Emerging market for Smarthome and IoT**
  - Additional services will require additional terminals with new functionalities – they could be sold in retail distribution or sold/rent by service operators

Residential Gateways

Broadband Residential Gateways : operators need to supply high-end gateways



Source: IHS 2014



Source: Parks Associates 2012

Residential gateways market

- The market keeps on growing till 2017, then being quite flat/a bit recessing
- Cable should be stable, while Fiber will compete with latest copper standards (G.fast)
- The operators will have to push for high-end gateways, a.o. to face competition from Google/Apple

Google OnHub router

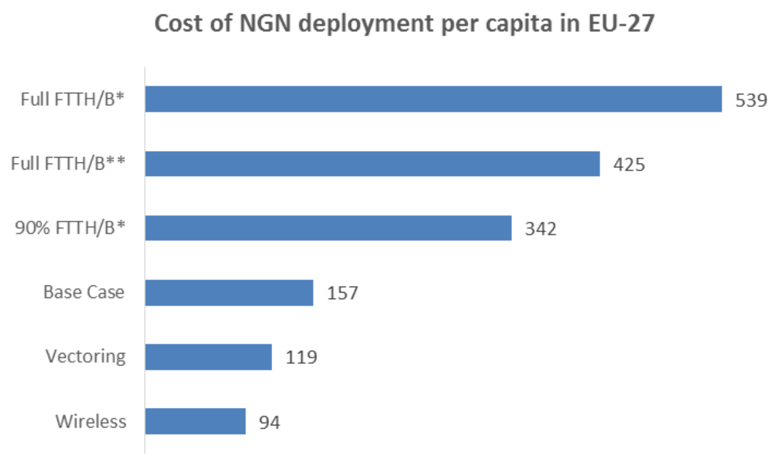
Standard Gateway

- Modem router for pure data access
- Triple play gateway offering as well VoIP and video broadcast services
- Wireless solutions based on 11ac (« x » or 4x4) for some gateways in this category

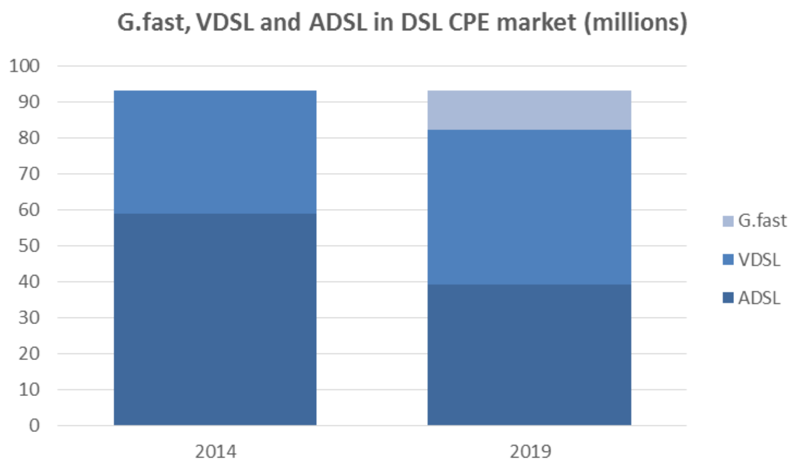
Advanced Broadband Gateway

- More CPU power for advanced applications (DLNA, shared storage/PVR…)
- USB3.0 ports for attached storage
- Systematic best-in-class Wifi 11ac (Video multi-screen usage)

Ultra broadband : Fiber vs. Coax vs. Copper tw. pair
Performance of FTTH versus Cost



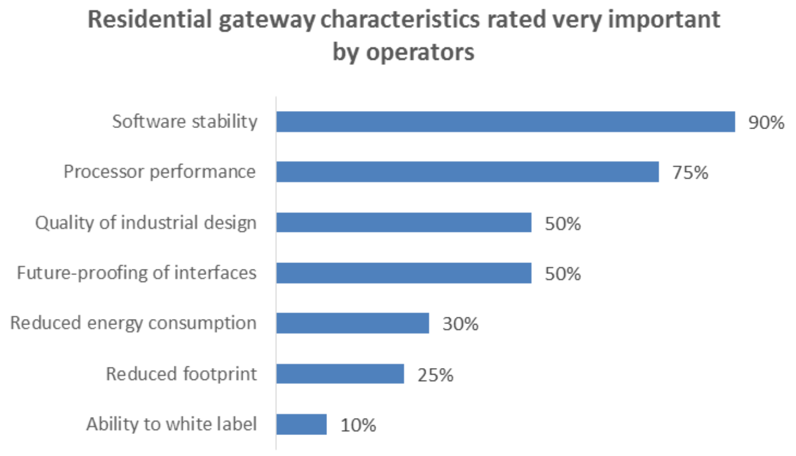
Source: Idate July 2013



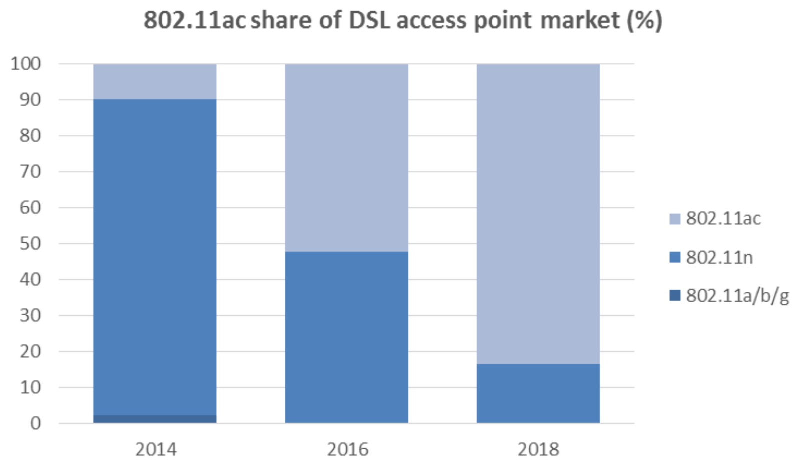
Source: IHS June 2015

- **Bringing ultra high-speed to the end user**
  - FTTH is always the most performing solution, but the most expensive as well
  - FTTH is about 3 to 4 times more expensive than improving copper solution
  - Beyond cost, putting fiber to the end user might not be possible everywhere (access inside the building, negociations with landlord associations…)
  - Cable operators have huge advantage in cost AND timing with DOCSIS 3.x (up to 5Gb/s for DOCSIS 3.1)
- **The next step for Telecom operators**
  - Vectoring brings quite good improvement but is not efficient at all in case of unbundling situations (e.g. in France)
  - G.fast is the way to compete with Docsis 3.x but technology in silicium is just being launched now. First market deployment will happen by end 2016 at the earliest. Performance will be nevertheless limited to 600Mb/s (maybe 1GB/s) over few hundred meters

High-end residential gateways, to bring more services to the subscribers



Source: Infonetics Research May 2014



Source: Infonetics Research May 2014

Supplying more performing gateways

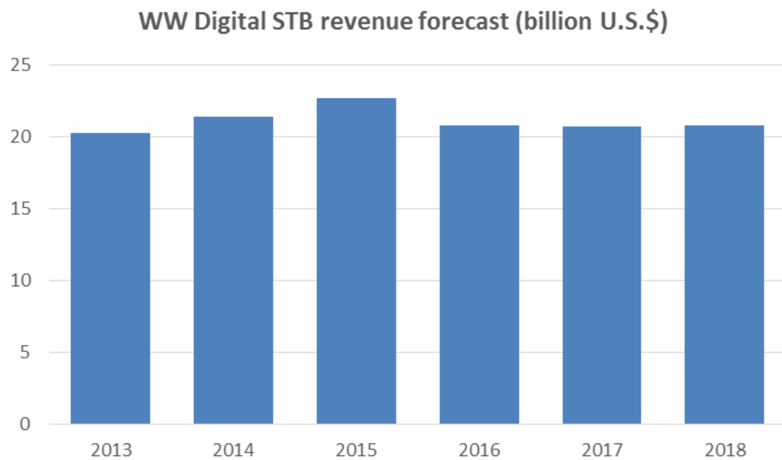
- Processor performance is mentioned as a very important feature – this for features that will require CPU such as
  - DLNA and centralized PVR
  - DRM management
  - SmartHome services
- This is happening now with latest xDSL chipset based on powerful ARM core architectures
  - Example with BCM63138 based on ARM9 dual core versus MIPS core for previous generation

Implementing new LAN interfaces

- Wifi 802.11ac is the solution required for supporting HD and UHD wireless video streaming
- 802.11ac is also need for end-to-end 1Gbps delivery chain
- The gateway will need to support as well several other interfaces for SmatrtHome services (ZigBee, Zwave, Enocean etc…)

Set-top boxes

The Digital STB worldwide market



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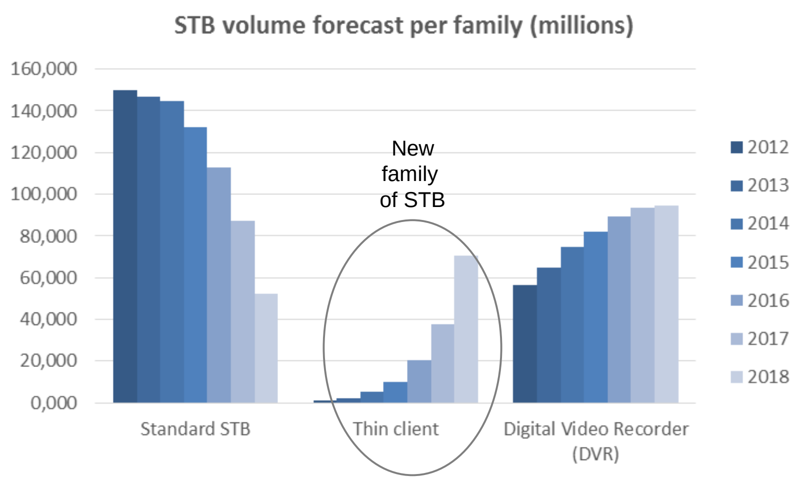


Source: Informa 2013

■ The market forecast

- Analysts expect a slight peak in 2015, and light recession with a flat market value from 2016 to 2018
- The situation may vary depending on the regions (e.g. Western Europe vs. Eastern Europe)
- The value recess can be explained by the need for thin client set-top boxes

■ 3 families of products on the market

- The traditional STB for traditional digital pay-TV, for live zapping, EPG, and optional external HDD
- The thin client for live TV, OTT content and personal media content
  - Several form factors : small box, HDMI dongle
  - Compatible with smartphones/tablets
  - Operators face competition from Apple, Google, Amazon

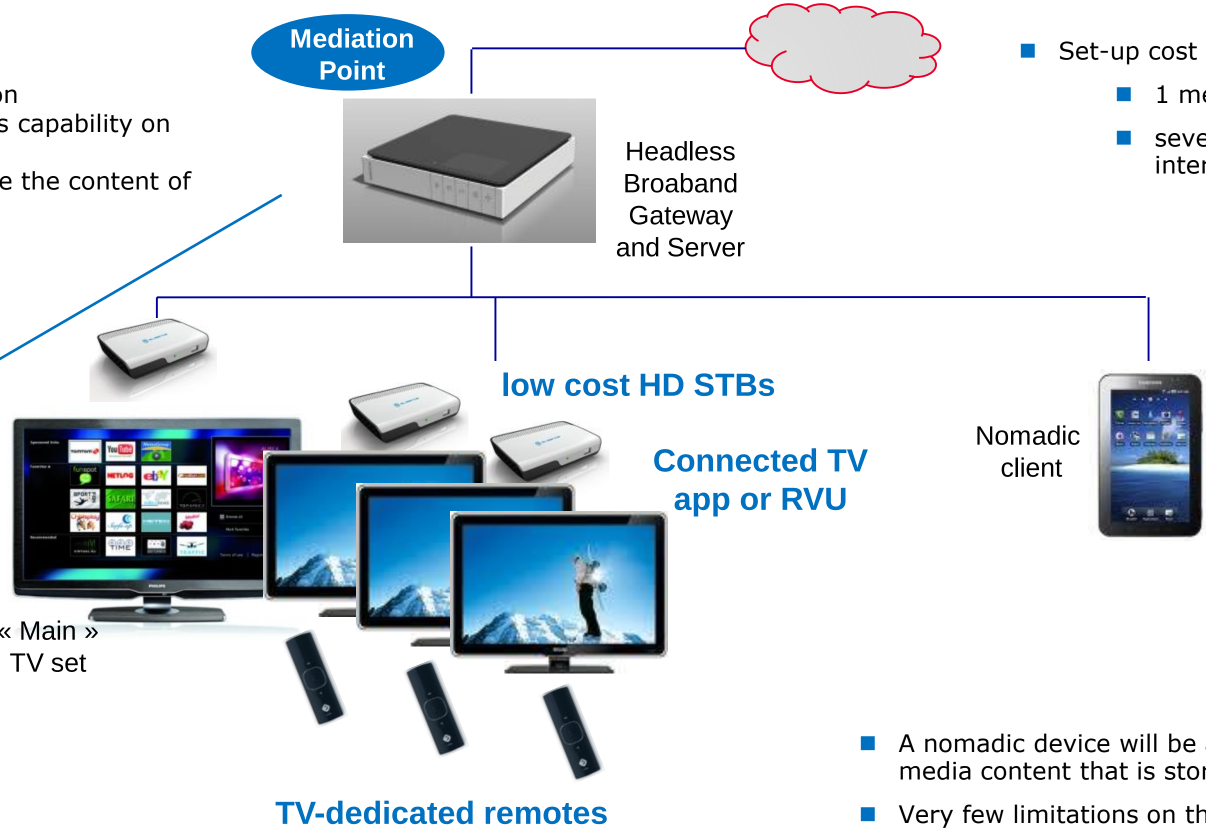
- DVR turning into Home Media Gateways (for instance for Satellite operators)
  - With huge HDD, Wifi 11ac, 4k, transcoding…

Further step in multi-room Pay-TV – Telecom view

- Subscription features
  - Several TV sets with IP reception
  - Watch and record simultaneous capability on each TV set
  - Reading from other DLNA device the content of each STB

Transfer of mediation functions from main STB to the gateway, allowing use of thin client STBs only

- The mediation gateway is capable to
  - Record HD IP channels and/or HD Satellite channels (attached HDD or network PVR)
  - Web based services (ads…)
  - to be a home server for recorded content on its HDD. For this it can also achieve transcoding to support several kinds of clients (H.264 STB, tablets etc…)
  - Server/client mechanism can be proprietary, or according to standards (Sat2IP, DLNA…)

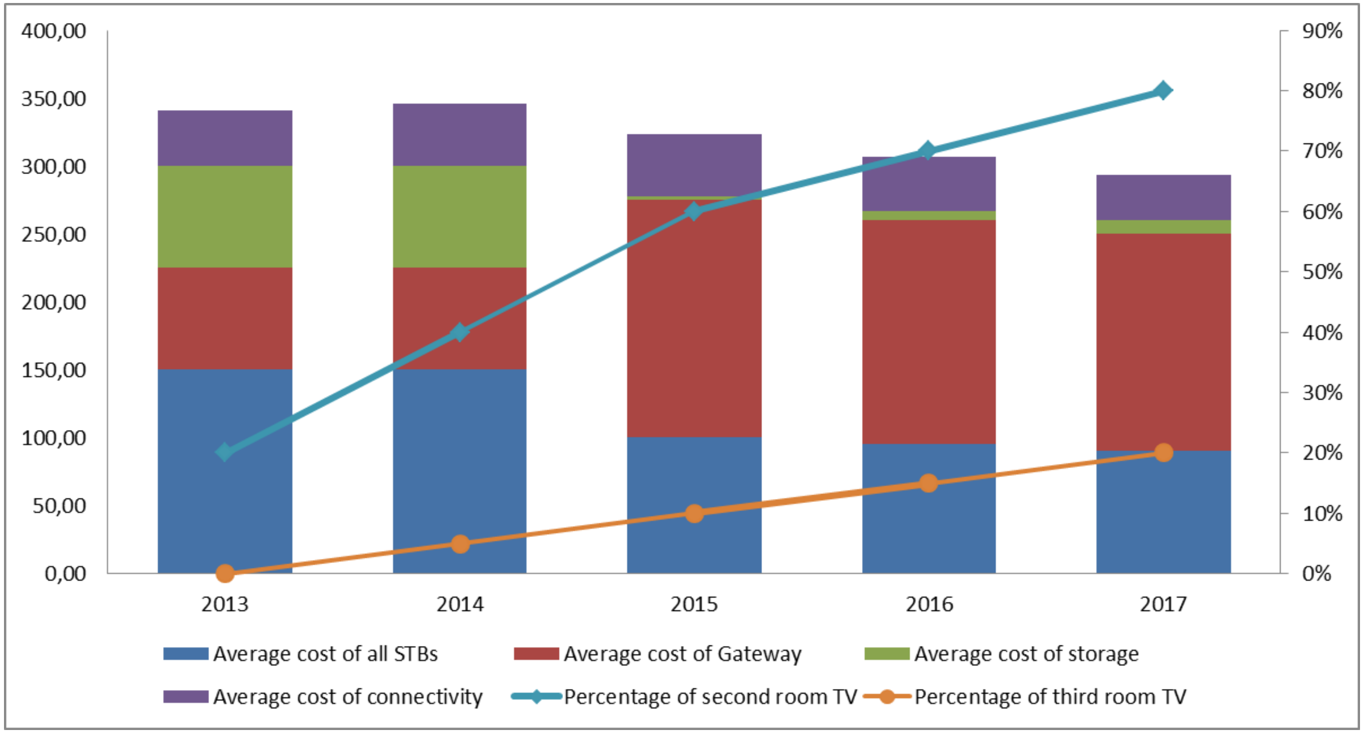


- Set-up cost
  - 1 mediation gateway
  - several interactive/Advanced STB

- The second TV sets are capable to
  - Receive HD IP channels
  - Watch IP and record IP
  - VoD
  - Web based services (ads…)
  - Have access to any content stored/recorded on the main STB HDD

- A nomadic device will be able to access the media content that is stored on the main STB
- Very few limitations on the device if the premium media server is capable of transcoding to support variety of clients
- This assumes that the recorded content has no DRM nor CA encryption, or that server is capable of CA to DRM transition
- Client/server protocol can be proprietary, or according to standards (Sat2IP, DLNA…). It will be available on nomadic devices via Apps

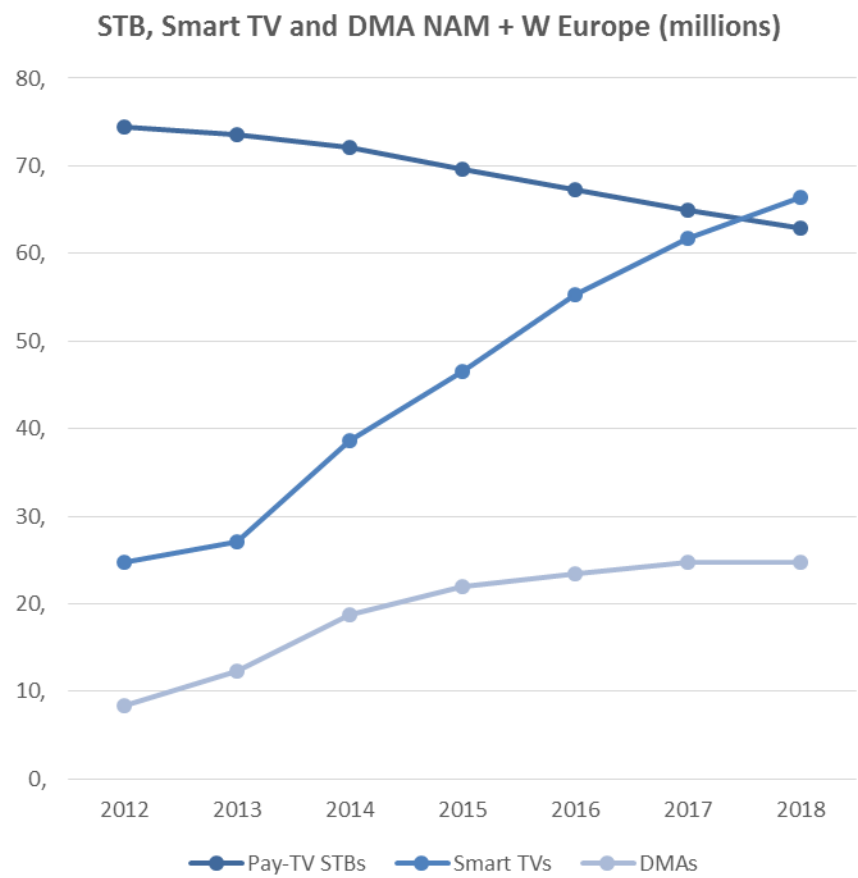
Multi-screen – Capex per user



Source: FiZ Study

- How to keep **CAPEX under control** when **multi-room** is increasing ?
- Two possible options
  - Transfer features from STB to the gateway (e.g. transcoding)
  - Transfer storage ownership to the subscriber or move to network PVR
- These options have been implemented by Swisscom with its latest IPTV offer

Functionality will sustain STB Market despite growth of Smart TV and DMAs

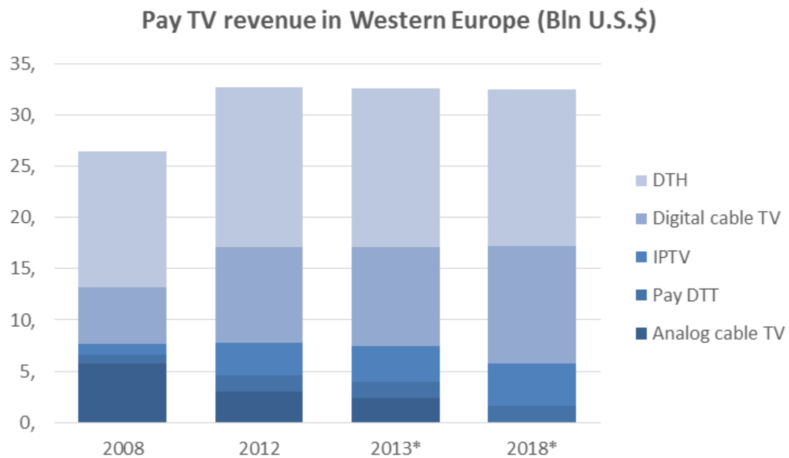


Source: Future Source 2014

- **STB functionality**
  - Reception/decoding of satellite and cable signals (*)
  - Interface to IPTV services with QoS
  - Analog/digital and HD upgrades
  - Pay-TV platform control : quality, UI, security, interactivity
  - Access to premium content, and especially to premium live content (Sport such as football league)
  - Value added subscriber features : EPG, « free » DVR, multi-room, VoD…
  - DVR as anti-churn
- **DMA functionality**
  - Access to OTT services for non-IP TV sets
  - TV interface to Apple or Google or Amazon eco-systems (movies)
  - Some value added features e.g. games
- **Smart TV functionality**
  - Access to OTT services
  - Value added apps e.g. info, comms, games, e-commerce

(*) TV integration trend in some countries (NL, D)

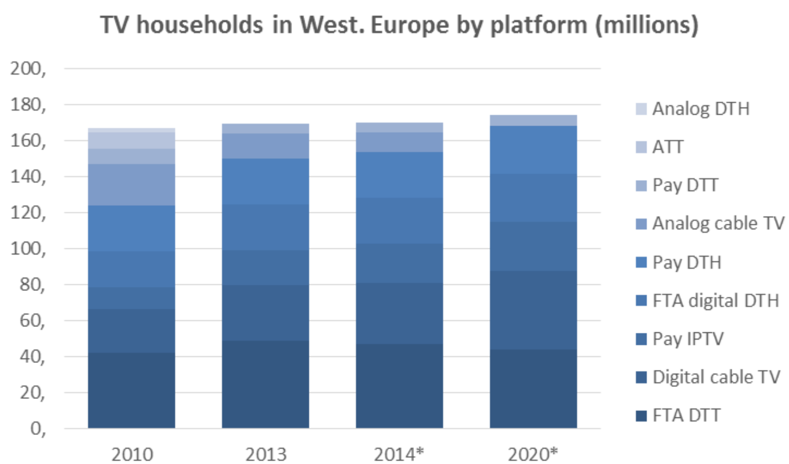
Western Europe STB market overview



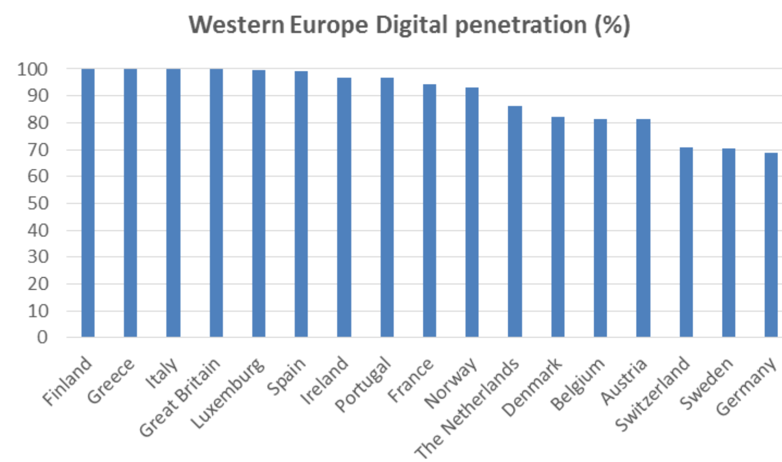
Source: Digital TV Research June 2013

Western Europe

- Highly digitalized market – just remain some countries with analog cable (NL, B, D, DK, CH)
- High value market, with high-end STB moving towards both Media Home Gateway and to DMA
- Digital cable and IPTV are the main growing technologies, the latter thanks to increase of bandwidth (VDSL, Fiber, G.fast) or compression efficiency (HEVC)
- Next step will be the move towards HEVC for both HD and UHD

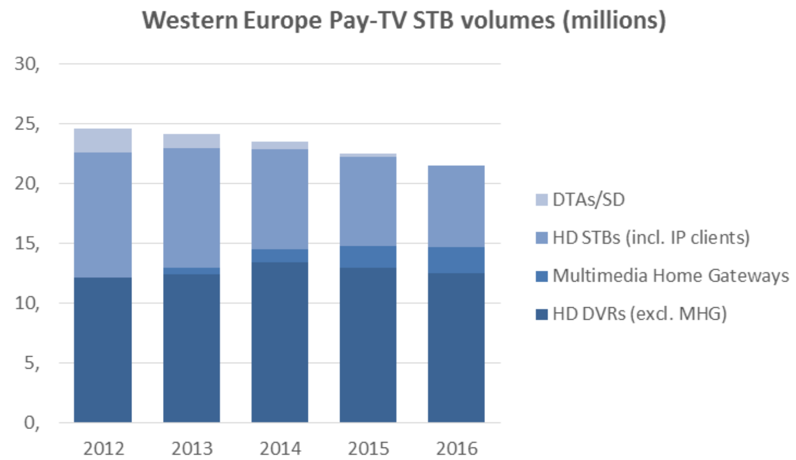


Source: Digital TV Research May 2014



Source: IP Deutschland September 2014

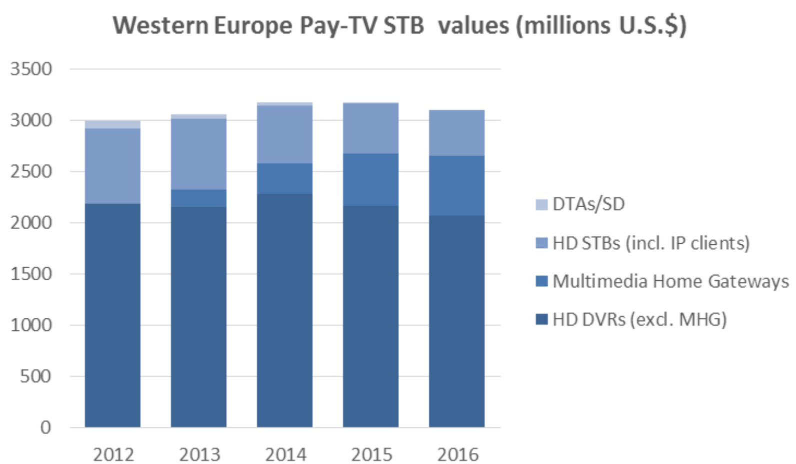
Western Europe STB market : where is the value ?



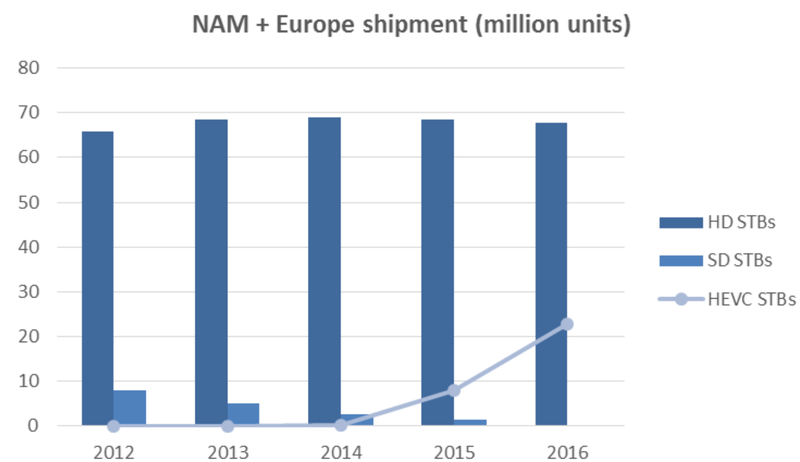
Source: Future Source 2014

Western Europe : value of STB

- The main market value is coming from DVR and from Multimedia Home Gateway
- Multimedia Home Gateway is a DVR that is capable to be used as server for the home – will be equipped with high-end wireless 802.11ac
- UHD will bring also strong added value by 2015, in the form of DVR/Multimedia Gateways after 2015 (especially for satellite operators e.g. Canal+ which will launch UHD channels in 2016)
- Pure IP HEVC boxes will be required by Telcos



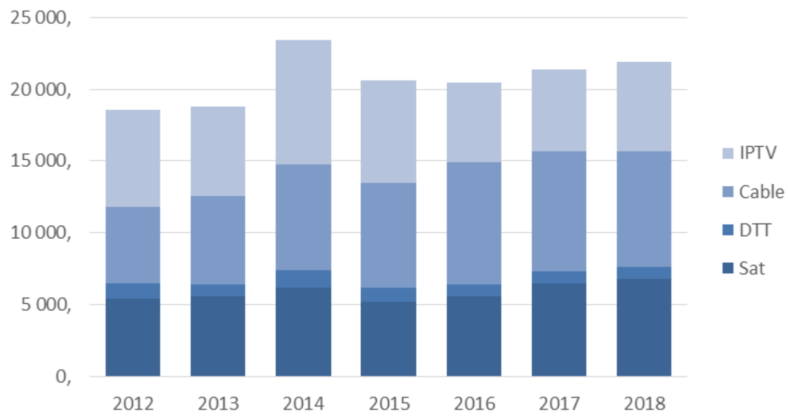
Source: Future Source 2014



Source: Future Source 2014

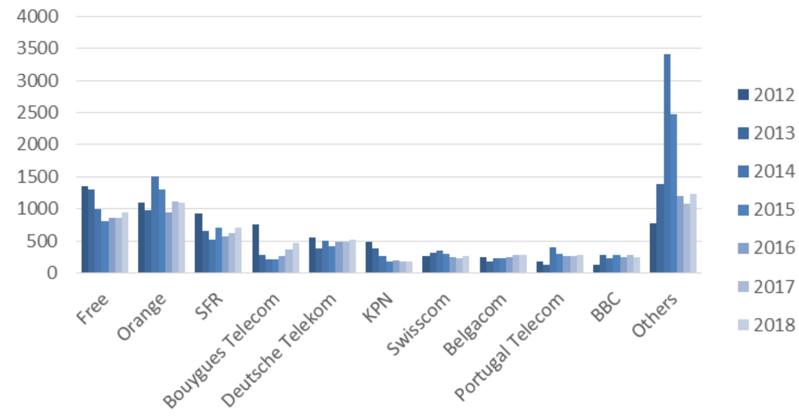
Western Europe Pay-TV STB market : main operators

Western Europe Pay-TV STB shipments (thousands)



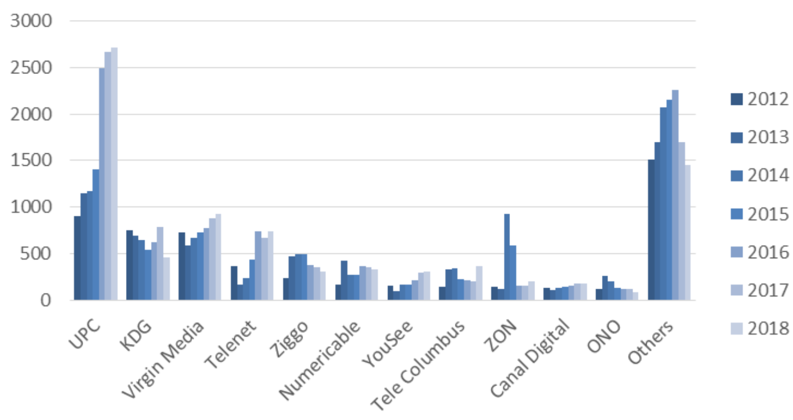
Source: IHS 2014

Western Europe Pay-TV IPTV STB shipments (thousands)



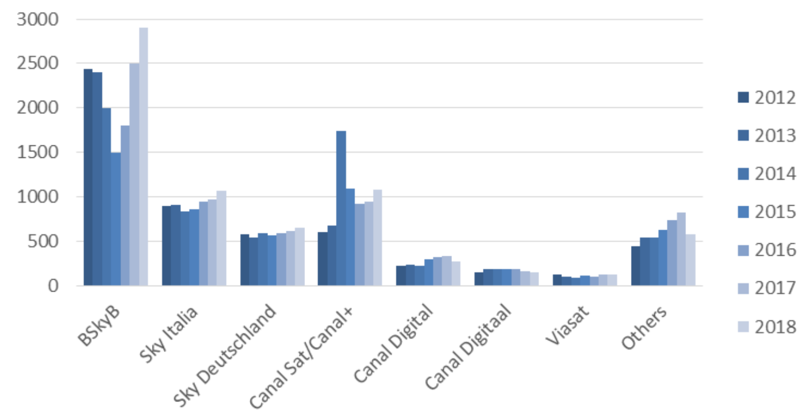
Source: IHS 2014

Western Europe Pay-TV Cab. STB shipments (thousands)



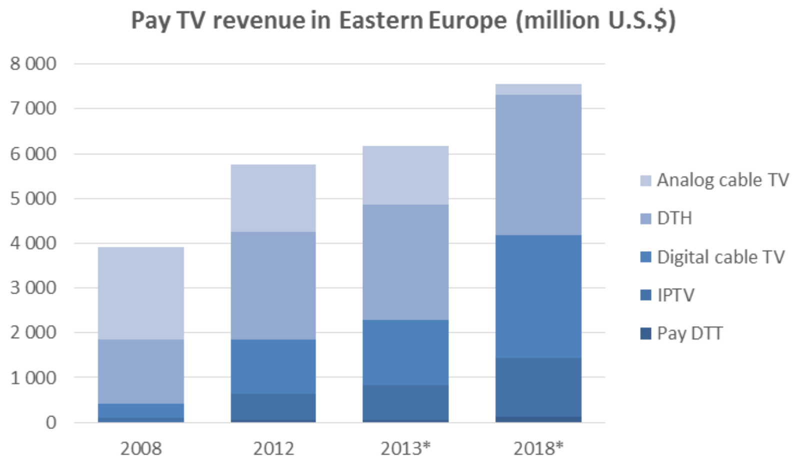
Source: IHS 2014

Western Europe Pay-TV Sat STB shipments (thousands)



Source: IHS 2014

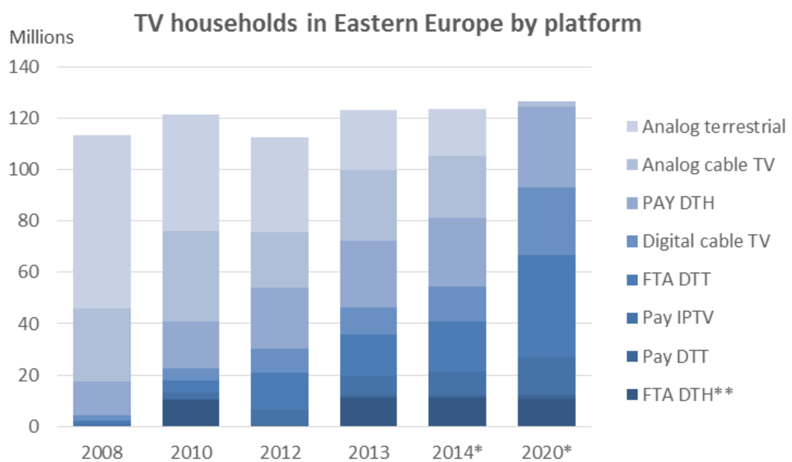
Eastern Europe STB market overview



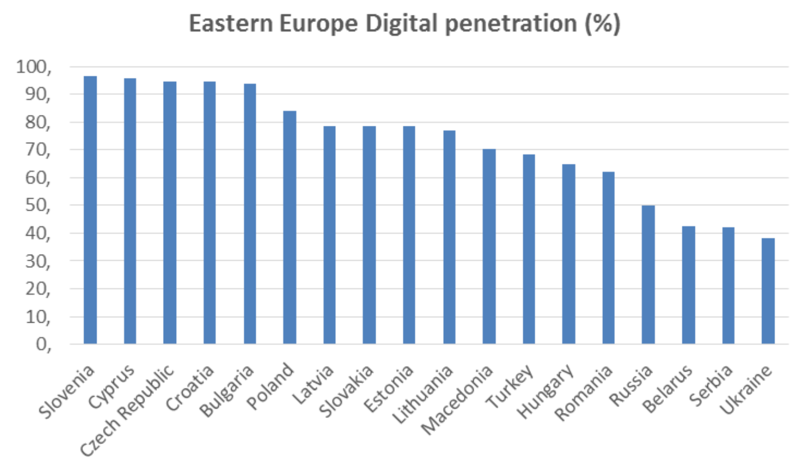
Source: Digital TV Research May 2013

Eastern Europe

- Many countries still below 70% of digital penetration
- Lower market value, looking for traditional HD STBs (mix of STB and HD-PVR)
- Main growth sectors for Pay-TV will be digital cable and digital satellite, followed by IP-TV
- UHD will not be a priority – question remains about HEVC HD

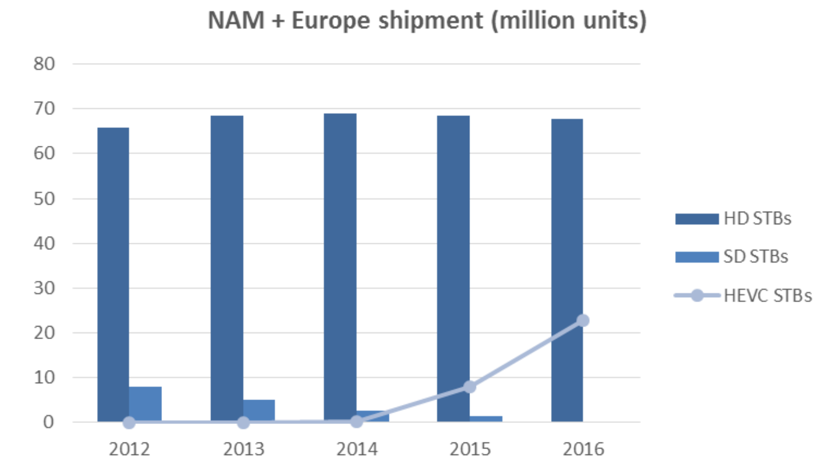


Source: Digital TV Research April 2014



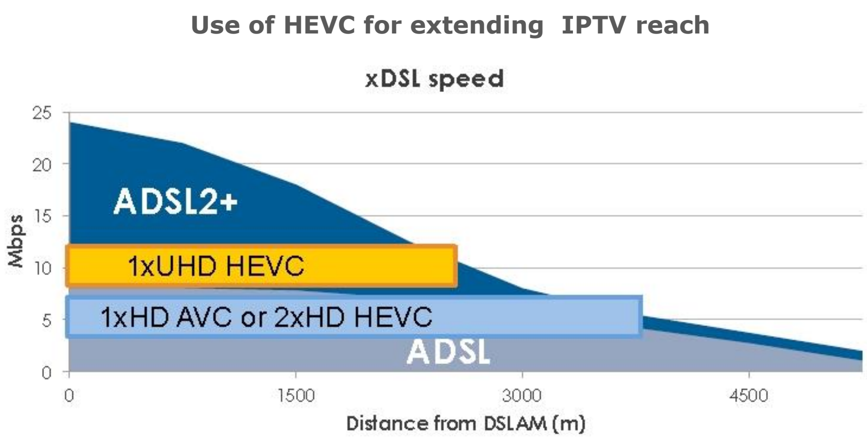
Source: IP Deutschland September 2014

Why HEVC will take off very quickly ?

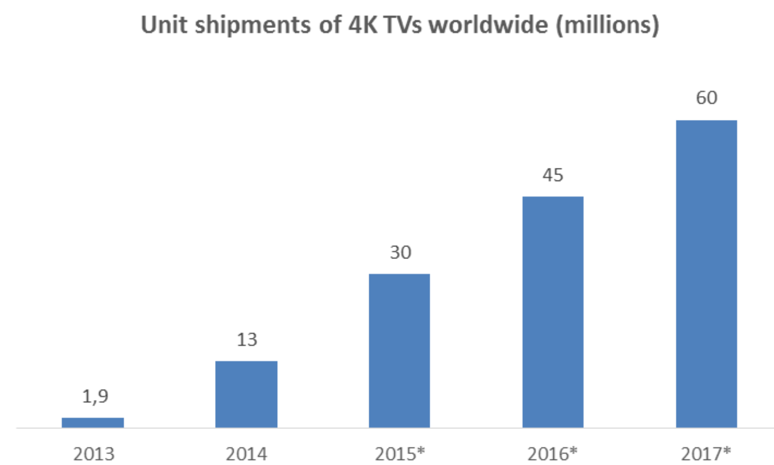


Source: Future Source 2014

- **Needed for UHD**
  - UHD will then require x2 bandwidth instead fo x4
  - Demand will come from end users equipped with 4k TV sets
- **HEVC is a huge advantage for IPTV and for OTT**
  - Today many broadband subscribers are not eligible to HD IPTV. Moving towards HEVC HD will allow to extend customer reach (caveat : that will be possible when there will a sufficiently consistent installed base of HEVC decoders)
  - Will help increasing QoS for OTT video



Source: Alcatel



Source: Display Search 2014

Android and Android TV short analysis

	Platform profile		
	Android L		Android TV
Customer Legal Framework	No license	Anti-Fragmentation Agreement (AFA)	AFA + Google Mobile Services (GMS) for « TV »
Android L – AOSP access (Android Open Source Project)	Yes - When public -	Yes - When public -	Yes - Early access possible -
Compatibility Test Suite (CTS)	Available (self certif. possible)	100% CTS compliance required	100% CTS compliance required
Google Mobile Services (GMS) : GooglePlay, Search (voice), Youtube, Gmail	Not accessible	Not accessible (unless negotiated with Google : default « non-TV » GMS)	Yes: Android TV services (specific UI/Launcher & GMS tailored for TV)
Google Test Suite (GTS) Certification enabling GMS	Not accessible	Not accessible (unless negotiated with Google)	Mandatory: Google certif. required for final product
Performance requirements	None	None	Yes AndroidTV requirements

What could be Android added value ?

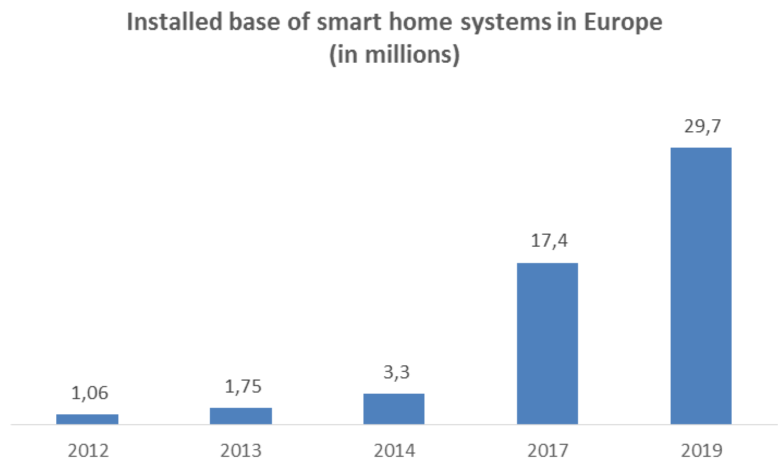
- Android by itself is just another operating system – different from Android TV
- Android TV is fully controlled by Google but can be v very attractive for some Pay-TV operators
  - Attractive UI
  - Access to Apps in PlayStore
  - Consistency with Android environment (phone,s tablets…)
- Till recently possibility to go for a mid-way between basic Android and full Google TV option was possible
  - Possibility to have access to Play Store without being full Android TV
  - Possibility to define from Android Apps your own Apps (Swisscom approach)

Is there still added value ?

- Full Android TV : depending on operator profile and strategy
- But a real market exists for a company capable to provide the right box

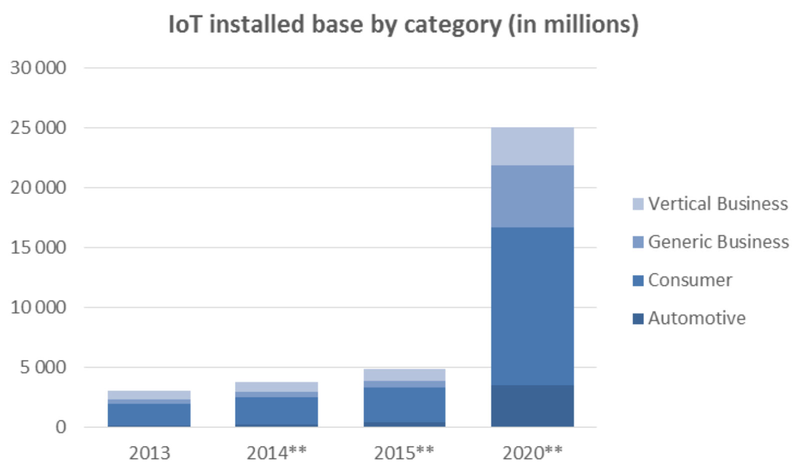
SmartHome / IoT

SmartHome/IoT market overview

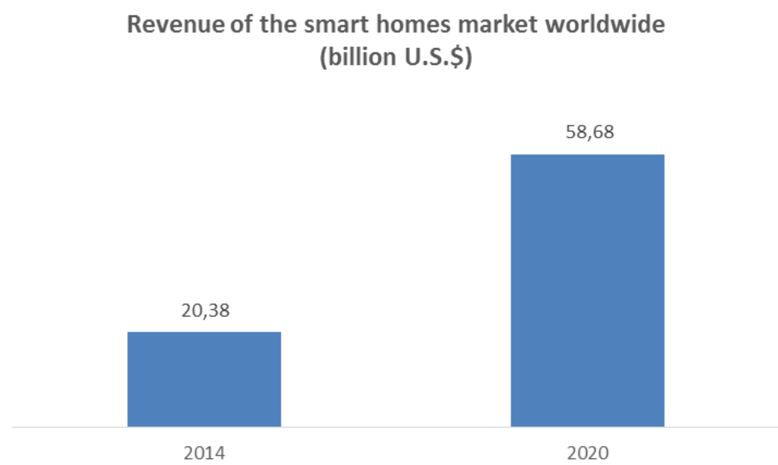


Source: PR Newswire January 2015

- All analysts forecast a huge market growth and high penetration rate in the next 5 years – this is true as well in Europe
- This covers both devices (IoT) and services (smarthome, smartgrid etc…). Consumer devices will represent about 50% of devices (watches, health monitors etc…) while 30% should be via service subscriptions (vertical/generic business)
- Telecom operators started to push in this domain (way to increase ARPU) and being a residential gateway vendor is an asset
- Energy is one of the growth topic clearly identified (SmartGrid)



Source: Gartner November 2014



Source: PR Newswire February 2015

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Thank you

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