



NorDig T report to Excom

NorDig Excom meeting 18th February 2016 Stockholm, Sweden

Report from NorDig T to Excom

NorDig Excom Agenda 29th September 2015:

Place: Arlanda Hotel, Arlanda in Stockholm, Time: 10:00 to approx. 16:00

1. Agenda and report from previous meeting
2. Organizational matters
 - Membership situation
 - Finance matters
3. **Report from NorDig/T**
 - Specification and work status
 - Special issues, HEVC questionnaire
4. Report from Industry
 - Report from Nordic Product Manager meeting
 - Report from industry members
5. **Invited presentation: DVB > IP home streaming, Erik Stare, Teracom**
6. Reports from members, DVB and other organizations
7. Any other business

Green Text: text highlighted for Excom (waiting Excom decision, major change since last meeting etc)



NorDig T report - Overview specification work

NorDig Excom meeting 18th February 2016

Overview NorDig T specification work :

- Rules of Operation
 - v2.x target: Q3 2016
 - Draft 22 presented inside NorDig T group
- Unified IRD specification
 - *v2.5.1 has been published July/Aug 2014 (v2.5 and then correction to v2.5.1)*
 - New version target “v2.6” mid/**end** 2016 (corrections/debugging and some new)
 - *HEVC and related other parts, waiting Excom decision before starting work inside NorDig T*
- Test Plan
 - Test Plan v2.5.0 published (28 Jan 2016)
 - Addendum to Test Plan v2.5.0 for HbbTV (NorDig Hybrids) planned for Q1.2016 (originally Nov/Dec 2015)
- HbbTV
 - Maintenance of NorDig’s HbbTV test cases (NorDig contribution to HbbTV organization for HbbTV test specs, Sofia Digital consulting for maintaining/updating our NorDig HbbTV test cases).
- Website and admin
 - Work with new structure (*work not yet started*)
 - Alt: Continue hosted by Labwise or use external host (WordPress CMS, Content Management System)
 - Templates, meeting calendar, mail reflector etc (*ongoing and preparing*)



NorDig T report - Work and subgroups

NorDig Excom meeting 18th February 2016

Overview

NorDig T – *active*

NorDig T subgroups – status

- HEVC/Video – *active* (questionnaire HEVC interest/need, prepare CR for HEVC IRDs)
- Audio – *active* (audio related for IRD, Test Plan and RoO. Working together w Accessibility group)
- Test – *active* (Test Plan)
- RoO – *active* (RoO spec)
- Accessibility – *active* (accessibility related for IRD, Test Plan and RoO)
- API/PVR – *active* (HbbTV testing, API+PVR related for IRD, Test Plan and RoO)
- EPG/Event metadata – *active* (common NorDig format for exchange EPG metadata for broadcast and OTT)
- SSU – *planned to restart Q1.2016* (add sending notifications to IRDs with very large SW size)
- CA/CI+/Sec – *dormant* (CI+ v1.4/v2.x...)



NorDig T report - Work and subgroups

NorDig Excom meeting 18th February 2016

Organisation and status

NorDig T – *Per Tullstedt, Teracom*

NorDig T subgroups – status

- HEVC/Video – *“no” chair (Per Tullstedt)*
- Audio – *Johan Lindroos, SVT,*
- Test – *Pasi Toiva, Labwise,*
- RoO – *Des Mac Giolla an Chloig, RTÉNL,*
- Accessibility – *Kjell Norberg, NRK,*
- PVR/API – *Erik Vold, NRK,*
- EPG/Event metadata – *Peter Mølsted (consultant NorDig tech secretary),*
- SSU – *Per Tullstedt, Teracom*
- CA/CI+/Sec – *dormant (CI+ v1.3, CI+ v1.4)*



NorDig T report - Meeting calendar 2016

NorDig Excom meeting 18th February 2016

NorDig T (main group) meeting calendar 2016:

- 2nd February 2016, webinar, 10:00-15:00 CET
Informative: NorDig Excom 18 Feb
- 15th March 2016, physical Oslo NRK , 10:00-16:00 CET
Informative: NAB 16-21 April
- 26th April 2016, webinar, 10:00-15:00 CET
- 14th June 2016, webinar, 10:00-12:00 CET
- 25th August 2016, webinar, 10:00-14:00 CET
Informative: IBC 8-12 Sep
- 16th Sep 2016, webinar, 10:00-15:00 CET
Informative: NorDig Excom 29 Sep
- 18th October 2016, physical TBD, 10:00-16:00 CET
- 8th December 2016, webinar, 10:00-12:00 CET



NorDig T report - consultancy & costs 2016

NorDig Excom meeting 18th February 2016

NorDig T, proposed consultancy and costs 2016 – input to budget:

- **Technical secretary** – *Peter Mølsted, shared w Labwise 350kSEK/~38kEUR*

Updated workplan 2016 (from 2015), continue work as 2015 with following update of mission:

(a) Maintaining and running the NorDig.org web site

- Remake of NorDig Website, design+impl new structure, e-mail reflector, member groups, calendar, templates for NorDig T, contact with external companies for hosting and impl.

(b) Acting as the main editor for the NorDig Specifications, initially mainly referring to Unified IRD and companion Rules of Operation (RoO)

(c) Maintaining and release management of the NorDig Specifications (Unified IRD and RoO specifications).

- RoO, common NorDig EPG metadata interchange format, API help w mix broadcast & OTT, support Test group.

(d) Support and compile result from NorDig/T investigations and questionnaires among NorDig members and others.

(e) Participation to the NorDig/T and relevant sub-group meetings

- **Editor & Test Plan** – *Labwise (Pasi Toiva), shared w Peter M 350kSEK/~38kEUR*

- Test group, test plan, editor etc

- **HbbTV test cases, maintenance** – *SofiaDigital, 70kSEK/~7kEUR*

- Continue update & correction of our NorDig created HbbTV test cases

- **Website upgrade** (according to 2015 proposal)

- Alt 1: hosted by Labwise (as today)

- Alt 2: hosted by external professional CMS: *WordPress 50kSEK/~5kEUR* and then yearly costs of *280EUR/year* (porting and basic setup by ST Digital 3.35kEUR, WordPress CMS hosting 2016: 0.28 kEUR/year, any other related 1.5kEUR, text content and daily updates included in Peter Mølsted assignment/costs above for 2016)



NorDig T report - mandates for 2016

NorDig Excom meeting 18th February 2016

NorDig T mandates:

- Mandates established for 2015-2016 (Excom approved Jan 2015)
 - See Annex for details
- Minor updates related to API (Excom approved Sep 2015)
 - Removal of tasks regarding
 - Portable devices and
 - Guidelines on Operators and broadcasters use of HbbTV
- HEVC monitoring status & separate slides (questionnaire)
 - waiting Excom decision
- Status today – no proposal from NorDig T for changing mandates that is waiting on Excom decision.



NorDig T report - RoO

NorDig Excom meeting 18th February 2016

Rules of Operation – status report

- v2.x target: Q2/Q3 2016
- New draft (#22) presented inside NorDig T 27 Jan 2016, to all broadcasters/operators
 - “60%” ready
 - Audio and video part some remaining parts
 - Asking all for comments/inputs to this draft
 - Re-broadcast in cable networks of DTT and DTH signal, might be something for future RoO



NorDig T report - Test plan

NorDig Excom meeting 18th February 2016

Test Plan

- Test Plan v2.5.0 published (28 Jan 2016)
- Test Plan v2.5.0 addendum - NorDig HbbTV test requirement,
 - still drafting, coming soon (originally plan Nov/Dec 2015) .
 - Proposal: **approval by Excom via e-mail (Feb/March)**, otherwise next Excom (Sep'16)
- After Test Plan v2.5.0 - debugging/corrections, make tests more efficient to test etc, review audio test cases (“no” new missing test cases planned for IRD spec v2.5.1).
- Future, goal is to publish IRD and Test specs at the same time or at least Test Plan short after new IRD spec.

Note: NorDig HbbTV test requirements intended to describe that HbbTV testing based on HbbTV organisation test suits, describe which tests are mandatory, describe NorDig specific test cases are mandatory and maybe incl 1-2 NorDig classical test cases. Similar as already described in IRD spec but more detailed.



NorDig T report - Accessibility

NorDig Excom meeting 18th February 2016

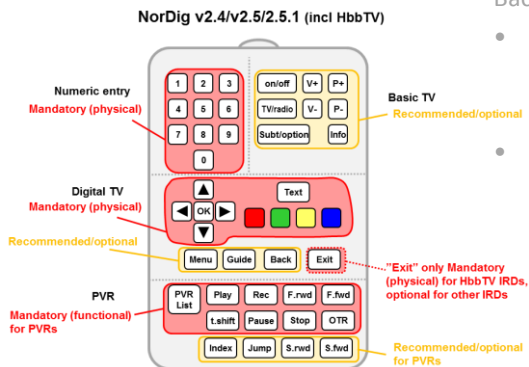
Accessibility status report

- Remote Control (RC)

- Review/update old text (see separate slide)
- Checked with all NorDig T members if OK to change from mandating RC keys to instead mandate functions, a basic proposal for an updated chapter has been sent out 18 Dec:
 - No disagreement for changing to functions (responses from RTENL, LG, Sony, TP/Vision, Samsung and Teracom).
 - Some comments related to mandatory functions.
 - E.g. Color keys (basic IRD used for Teletext) change from mandatory to optional?
 - Separate IRD between STB and iDTV.
- Excom view? OK to continue draft from key to functions?
- RC for accessibility settings (if possible collect all accessibility settings: HoH subtitling, AD audio etc)

Background

- Review Remote Control (very old text 1997/1998, some text unclear, update recommended):
 - Accessibility, to make it easier for these viewer to access these settings.
 - Requirements today for physical keys (arrows, numeric, OK etc...).
- NorDig Excom 26 May 2015: Needs more inputs from members and investigation





NorDig T report - API/HbbTV and PVR

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HbbTV and PVR - status report

- HbbTV 2.0 NorDig survey
 - Prepare a survey to get NorDig members interest & need for HbbTV 2.0 features
- HbbTV test cases
 - Maintenance now ongoing
- RoO input related to HbbTV made
- Test Plan addendum - HbbTV test cases
- PVR Lite / TV Recorder – no input proposal from industry, closed (OK?)
- *Helping accessibility group with Remote Control (related to HbbTV and PVR)*



NorDig T report - IRD

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NorDig Unified IRD spec

- No major updates or new requirement foreseen, **proposal v2.6 mid 2016**
- Maintain and update current requirements for NorDig (22 items on bugzilla list).
- *Codecs (separate issue: MPEG-H HEVC video, MPEG-H audio, Dolby AC4 etc) - **questionnaire***
- Update guidelines wordings in GUI and translations (mainly related Accessibility and Audio)
- Review and improve IRD's auto update for network changes
- FE (DVB-T/-T2) review if 800MHz scanning can be removed (NRK) and add optional requirements for 700MHz LTE immunity (hopefully via reference to ITU/ETSI) - **started**
- IPTV – ComHem launching IPTV and has some interest to updated current IPTV IRD requirement.
- IRD surveillance (like using TR069), some interest to investigate this more.
- SSU, add alternative for broadcasting SSU notification in accordance with new DVB SSU spec 2015 for IRDs with very large file size – **(DTG D-book v8 has incl this)**
- Recommendation Remote Control related to accessibility settings, check if possible to get a RC key for changing Accessibility setting or modify current requirements and recommendations. (Ensure RC can be via Smartphones etc) - **started**
- HbbTV – investigate and prepare update IRD spec for latest HbbTV v1.5 (i.e. latest errata) - **started**
- TV recorder – closed. No need to define TV Recorder (PVR lite) unless someone volunteer to come with a more concrete text proposal – (Vestel and Samsung interested – no input/proposals – **closed (OK?)**)
- Mix of broadcast and OTT (ideal/intension one common channel list of broadcast and broadband/OTT services for hybrid receivers, viewers should ideal not notice zapping diff between zapping among broadcast or OTT services)



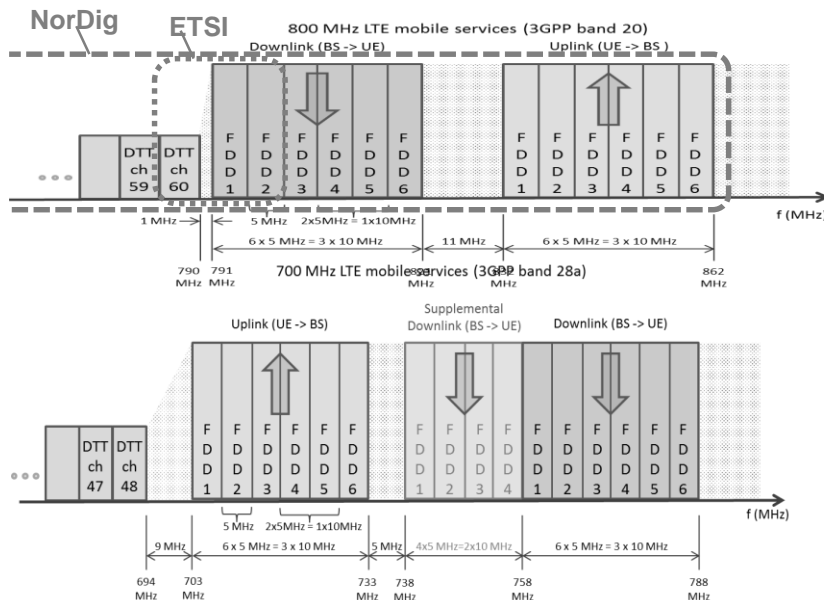
NorDig T report - IRD: 700MHz LTE interference

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Informative:

- Teracom has 13 May 2015 presented inside NorDig T first draft proposal for DTT IRD requirements for immunity against 700MHz LTE interference signals, based on extending existing 800MHz LTE immunity requirements.
- Requirements are “sanity check” level to stop poor IRD impl, requirements reasonable easy to pass
- 18 Jan Feb 2016 status: Teracom has now got approval to use same reference test signal as ETSI spec (EU RED directive) from “owner” and Teracom will now, spring 2016, propose details requirements for IRD and Test Plan (for next releases och specs)
- Industry (some TV manufacture) asking NorDig to remove requirement, since (almost) covered by the mandatory EU RED / ETSI specification. (ETSI requirements are lower than NorDig, but new updated ETSI will incl new requirements not (yet) incl I NorDig.
- Discussion ongoing in NorDig T

	NorDig	ETSI
Sensitivity	X	X
Adjacent ch	X (whole freq)	X
Receiver Blocking		X (coming)
Overloading		X (coming)



- New EU Radio Equipment Directive 2014/53/EU (RED) states: “Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference”.
- ETSI has drafted a harmonised standard that incl IRD requirements, test cases and test signals to be used (partly based on NorDig).
- ETSI requirement only for first adjacent channel interference and closest LTE FDD (2x)block
- ETSI level quite low (but higher than current NorDig)

Teracom proposal:

- Keep NorDig 800MHz LTE requirements + add 700MHz
- Keep requirements for the IRD’s whole freq range and for all LTE blocks (both 700 and 800MHz)
- First align (raise) levels to ETSI now and from 2017/2018 raise again resulting in slightly stricter than ETSI.
- Test cases and test signal still under preparation



NorDig T report - CI+ v1.4

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- DVB standardise CI+ v1.4 (PCMCIA), Sep 2013 (*cook book for "all" possible solutions*)
 - More than 1 input: watch & record
 - Input: DVB + IP/OTT, Output: to decoder + to IP/LAN streaming
 - I/O: still PCMCIA
- DVB standardise CI+ v2.x (USB)
 - still drafting
- CI+ LLP organization (*approve impl, CI+ logo, certificate, providing cert*)
 - New CI+ v1.4 "implementation requirements", minimum (8 dec 2015)
 - Latest from 1 July 2017 all IRDs with CI has to support CI+LLP's minimum CI+ v1.4 impl requirements.
 - IRD (TV manufactures); still investigating, no comments yet
 - IRD (TV manufactures); no comments/protest (yet) if NorDig would follow CI+ LLP ("it would be redundant if NorDig would
- **Excom, any action for NorDig?** (earlier NorDig has followed CI+ LLP)



NorDig T - DVB Protecting IRDs Against Attacks

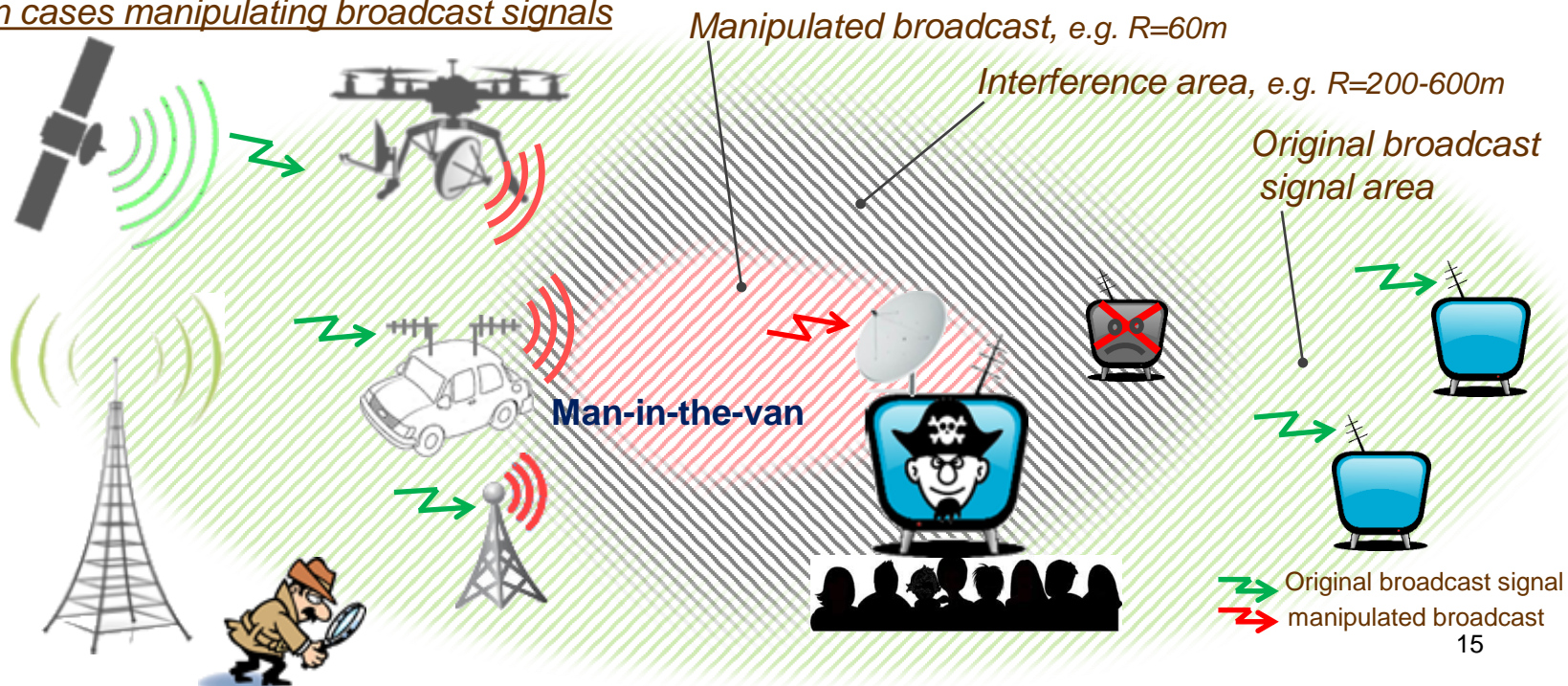
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(1/2)

Extract from Jon Piesing (TP Vision) presentation DVB TM-MIS:

- TV/broadcast (chain) has normally very high trust at viewers
- Several demos on attacks at TV broadcast
 - In the demos, the hacker delivered an exploit for an opens source library (ffmpeg) used by a particular IRD. This gave the hacker "root" access on successfully attacked devices. This is more serious than just delivering a different image or different HbbTV website.
 - Today not very difficult to make modifications to original broadcast signal, e.g. HbbTV signaling/autostart interactive apps (e.g. simple demod+mod for a couple of 100EURs, using Raspberry Pi or similar to mod MPEG stream before re-transmit).
- DVB has id & work on protecting IRDs against Attacks on broadcast signal
 - DVB & HbbTV has defined requirements for interactive services (espec hyperlinks)
 - DVB working on the solution for this

Examples on cases manipulating broadcast signals





NorDig T - DVB Protecting IRDs Against Attacks

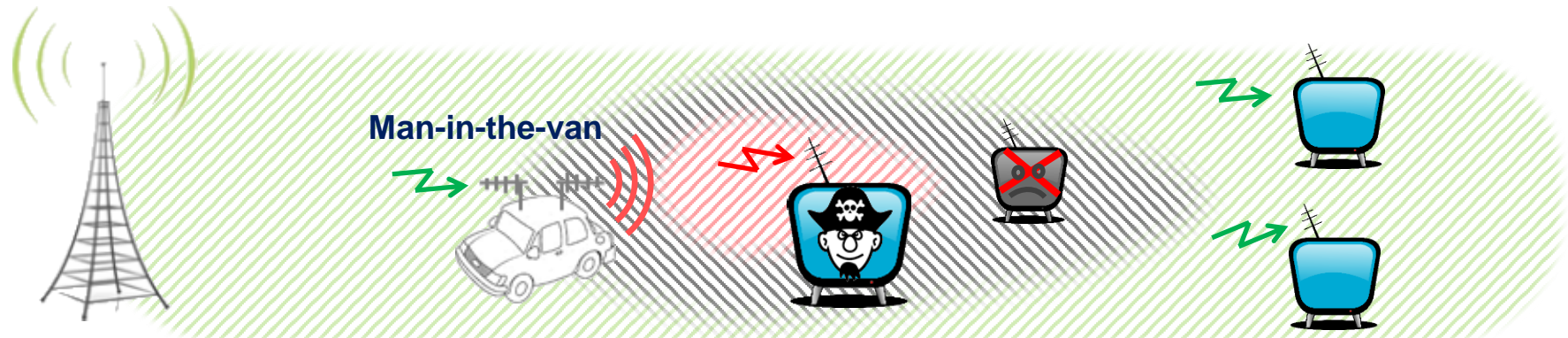
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(2/2)

Extract from Jon Piesing (TP Vision) presentation DVB TM-MIS:

- DVB has id & work on protecting IRDs against Attacks on broadcast signal:
 - Made estimate of how many people might be effected.
 - Example: London (5900 people/km²), man-in-the-van attack, 60m attack radius (i.e. 29 households), statistic that TV is on, tuned to attacked service/channel, HbbTV/MHP IRD etc, 10s attacks/every 30s at 4.5h/day -> ~14 victims/households
 - DVB draft proposal (first step incl interactive apps/MPEG sections)
 - Add authentication message in broadcast that incl hash of AIT &/or sections + Signature to validate hash values (same or separate PID)
 - IRDs cache and match hash with AIT &/or section data
 - How to establish trust (which certificates to trust), DVB still working on this
 - E.g. broadcaster(s) issue certificates and IRD trust over time
 - E.g. platform/network operator are trusted and issue certificates for broadcasters
 - DVB solution more a insurance policy, impl will have some cost
 - DVB will not test, up to HbbTV, NorDig, DTG and others
- **NorDig, any action (specify IRD support this or)? Monitor? Risks?**

More info: DVB document CM-SEG2116: MITM-Security-Threat-Study-V1.0 (also known as CM1629 and SB2338)



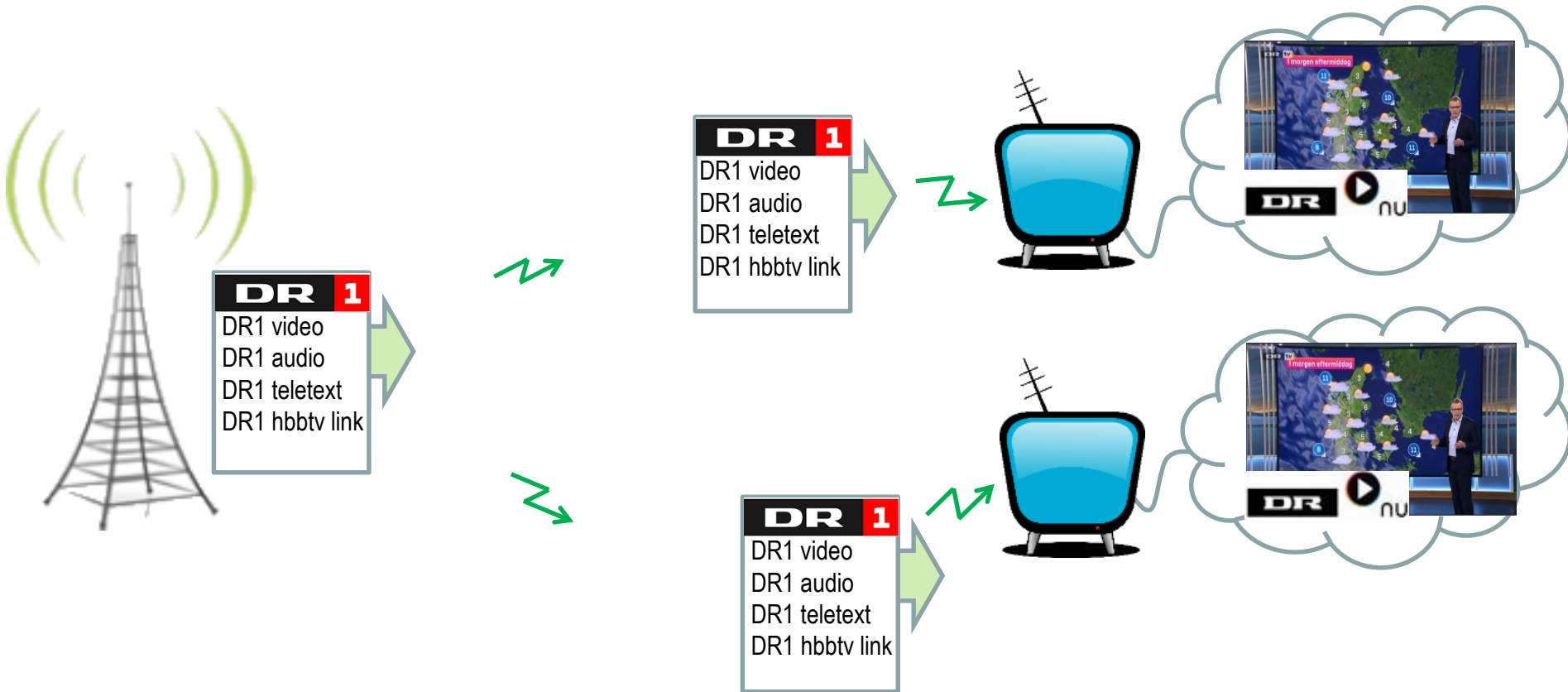


NorDig T - DVB Protecting IRDs Against Attacks

NorDig Excom meeting 18th February 2016

Example (1/3)

Example “man-in-the-van-attack” and DVB proposed protection for links



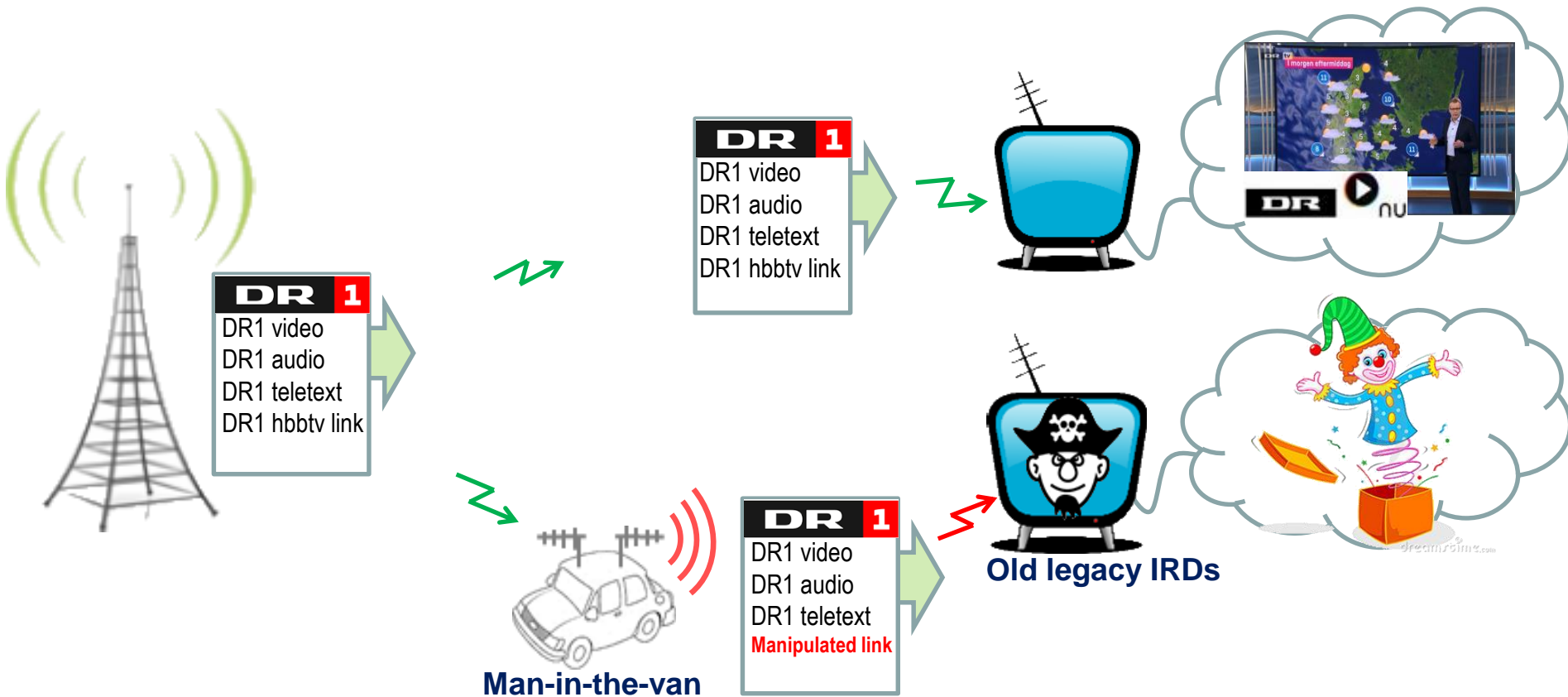


NorDig T - DVB Protecting IRDs Against Attacks

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Example (2/3)

Example “man-in-the-van-attack” and DVB proposed protection for links



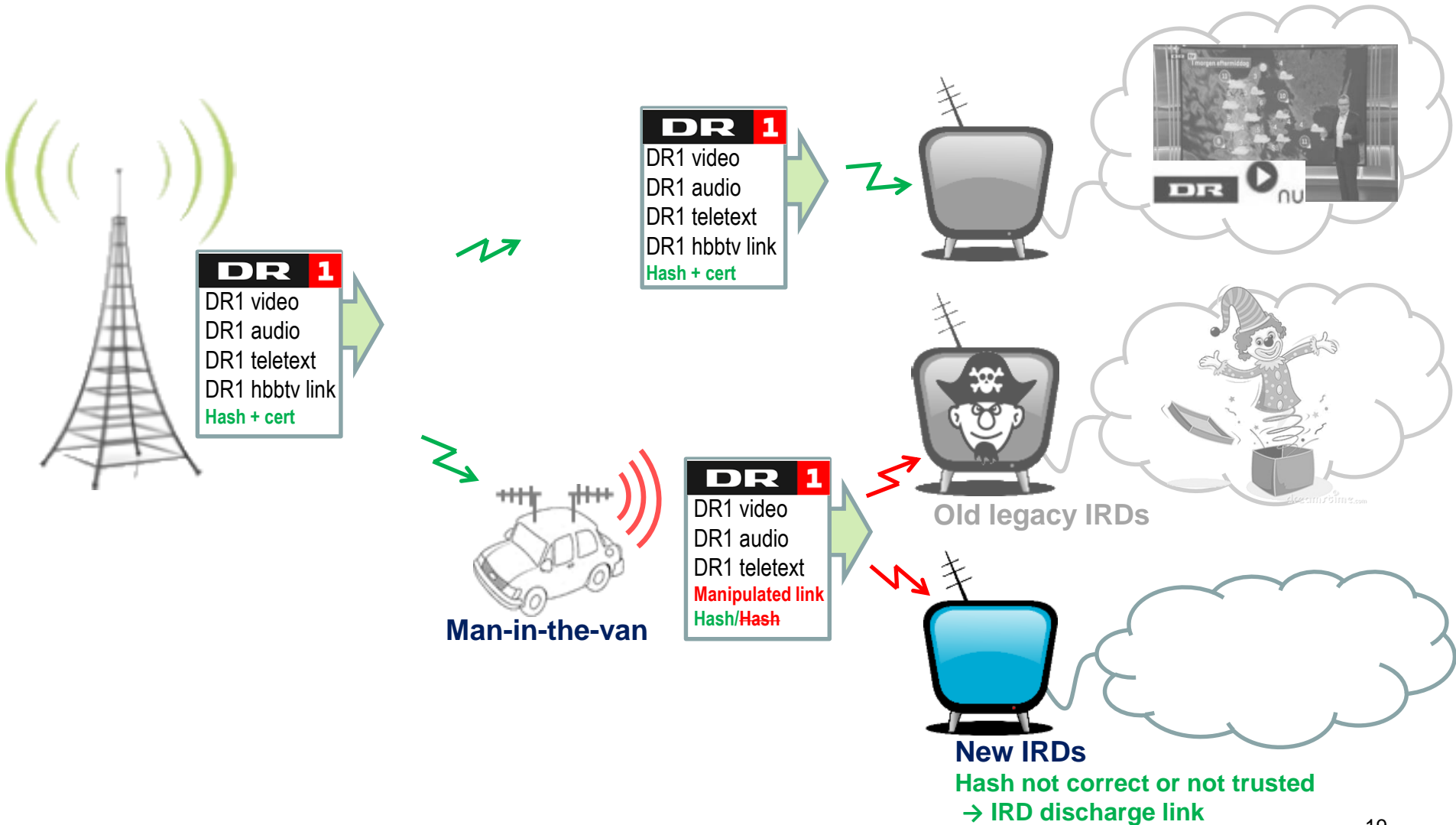


NorDig T - DVB Protecting IRDs Against Attacks

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Example (3/3)

Example “man-in-the-van-attack” and DVB proposed protection for links

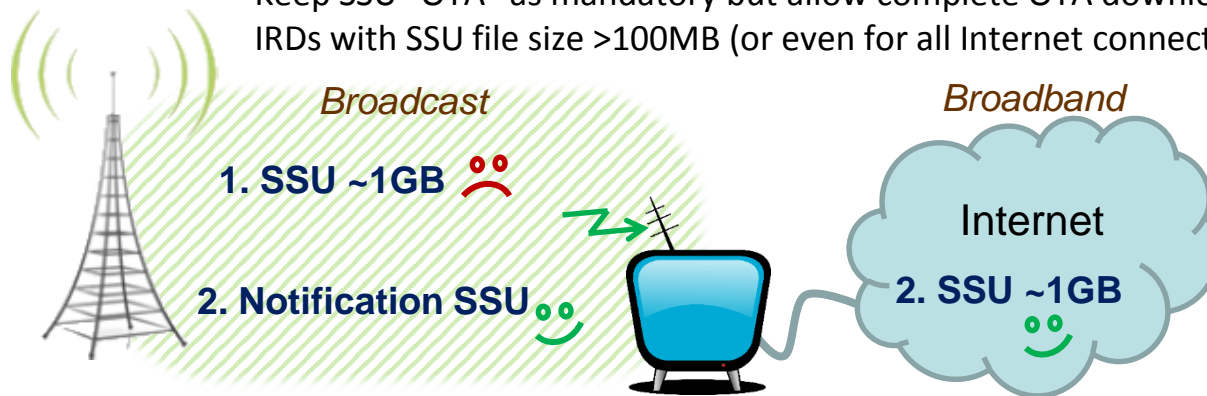




NorDig T - SSU

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- NorDig SSU today requires support for broadcast SSU (“over-the-air” download).
- SSU SW/image size has grown, some TV sets today around 1 GB size, too much normally for using broadcast for download.
- DVB updated SSU spec (after inputs from DTG and NorDig) to enable sending info/notification over broadcast that new SW is available (too reach all IRDs also connectable IRDs that for some reasons are not connected, >50%) but actual SSU download via broadband/Internet.
- DTG plans now (spring 2016) change requirements to:
 - SSU OTA download &/or
 - **(new)** SSU OTA notification (option for IRDs with SSU file/image size >100MB)
- Some TV manufactures ask for removing “OTA” requirement as only option (incl any coming OTA notification) and ask for allowing using only “over-the-Internet” download. (SSU OTA download for TV set very seldom used, but is as a insurance for the broadcaster/operators to reach all IRDs of a certain model for important update).
- **Proposal NorDig (Excom to decide):**
 - Add alternative SSU “OTA” notification (similar as coming DTG)
 - Keep SSU “OTA” as mandatory but allow complete OTA download and/or just OTA notification for IRDs with SSU file size >100MB (or even for all Internet connectable IRDs)?



SSU: System Software Update, DVB standard for updating/upgrading IRDs.

OTA: Over The Air, here refer to sending SSU over the broadcast channel (satellite, terrestrial, cable, IPTV)



NorDig T report - EPG interchange format

NorDig Excom meeting 18th February 2016

Common EPG/Event interchange delivery file format

- Started (4 meetings so far)
- subgroup inside NorDig T, chaired by Peter Molsted (supported by the API subgroup)
- Big interest so far work, invited/participants also external (Nordic and Irish) broadcasters and operators (Viasat, Telia, SBS, TV4, June etc).
- Study current used formats (no intension to re-invent the wheel if not needed) study to see if any current format can meet our NorDig requirements/need (e.g. Swedish 'Public Schedule' format seems reasonable frequent used). NorDig format could be (still very early):
 - based an existing file (XML) format with some updates, push/pull between studio and network operator/platform or
 - API (more adv solution)
- Some interest around unique program ids.
- Some interest also for Shared metadata/EPG repository: Shared metadata repository to which everyone could send their data and from which it can be made available to third parties, only Nordig members or all globally.



NorDig T report – NorDig and DTG

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Harmonise NorDig Unified IRD spec and DTG D-book spec

- DTG (CTO Simon Gauntlett) shown interest to harmonise with NorDig. Propose regular meetings to identify and share information/work.
- One meeting so far (startup), chairmen NorDig T & subgroups
- Both NorDig and DTG will benefit corporation, examples from past
 - DTG > NorDig: PVR, SSU
 - NorDig > DTG: FrontEnd
 - Simultaneous: MPEG4, SSU
- DTG (due to their financial model) can only share chapter-by-chapter (after DTG board approval)
- Proposal is to continue
 - General – on regular basis (e.g. 2-3 times/y), chairmen NorDig T
 - Specific topic/case – directly contact with NorDig subgroup(s)



NorDig T report – website update

NorDig Excom meeting 18th February 2016



NorDig website update and mail reflectors (inputs from Peter Molsted)

- As presented to Excom 26 May 2015 and accepted by Excom to modernize the NorDig website.
(see Annex slides of plan for new structure for website from May 2015)
- Status: "not started"
- Delayed due to Labwise's subcontractor (Peter M was ready to start from April/May 2015)
- Originally plan: NorDig website hosted by Labwise
- Alternative: use web hotel/external CMS, WordPress (approx 3350 EUR one time + 280EUR/y + Peter's time). Estimate 3-4w (2w for port + 1-2w new)



NorDig T report – NorDig countries/networks

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List of Countries using NorDig specifications (outside NorDig members), Several IRD manufactures and other mentions that several other territories and DVB networks refers or uses NorDig as basis for their IRD specs (especially “newer” networks). Among reasons seems open spec and content (T2, HbbTV, subtitling etc).

First list:

Country / Network	Status
Turkey DTT	Confirmed via Vestel
Several eastern Europe countries	Indications, not confirmed
Malaysia (<i>blue copy</i>)	Digita
Germany DTT (Media broadcast/TDF)	Based on/reference to NorDig IRD
Georgia DTT	Based on/reference to NorDig IRD (v2.2)



NorDig T report - HEVC

NorDig Excom meeting 18th February 2016

HEVC and TV format: investigation and commercial requirements

- Questionnaire among NorDig members and observers (manufactures etc)
 - *Intention as input to NorDig's Commercial Requirements for HEVC IRDs*
 - Done, 18 (17) replies (see separate slides summary and in annex full report)
 - **Interest for HEVC, interest for phase2, interest to combine HEVC with other thing at the same time.**
- Comments so far inside subgroup:
 - (SVT etc) DVB much still remains for phase 2, difficult for NorDig to start drafting (espec video details)
 - General similar view, but (DR) there are some differences in view/interest for HEVC inside NorDig
- Basic frame for Commercial Requirement for NorDig HEVC IRDs (not started)
 - Video: TV format, Video codecs,
 - Other related: Audio codecs, HDMI, FE, security (HDCP), PSI/SI signaling, CA/DRM, FE
- DVB (and MPEG) still working UHD phase 2 (HDR, higher frame rate, “better pixels”...)
 - DVB/MPEG has still multiple proposals for HDR&WGC (Philips, Technicolor(Thomson), BBC, Dolby...)
 - Scare scenario: DVB specifies multiple toolbox and let NorDig, DTG... select which that shall be used for each markets.
- Future work inside NorDig
 - NorDig T expects quite long time to draft NorDig HEVC IRD profile, ~12 months (if nothing is prepared inside NorDig before DVB finalise specs for phase 2).
 - Some work could probably be started now in NorDig (CR, phase 2 and/or 1, identifications of which part of spec need update for NorDig HEVC IRD profile)
 - Some work difficult to start before DVB finalise (phase 2) (video, audio and codec details)
 - **Excom view? Wait w all work, discuss profiles (phase1 &/or 2), prepare CR....**

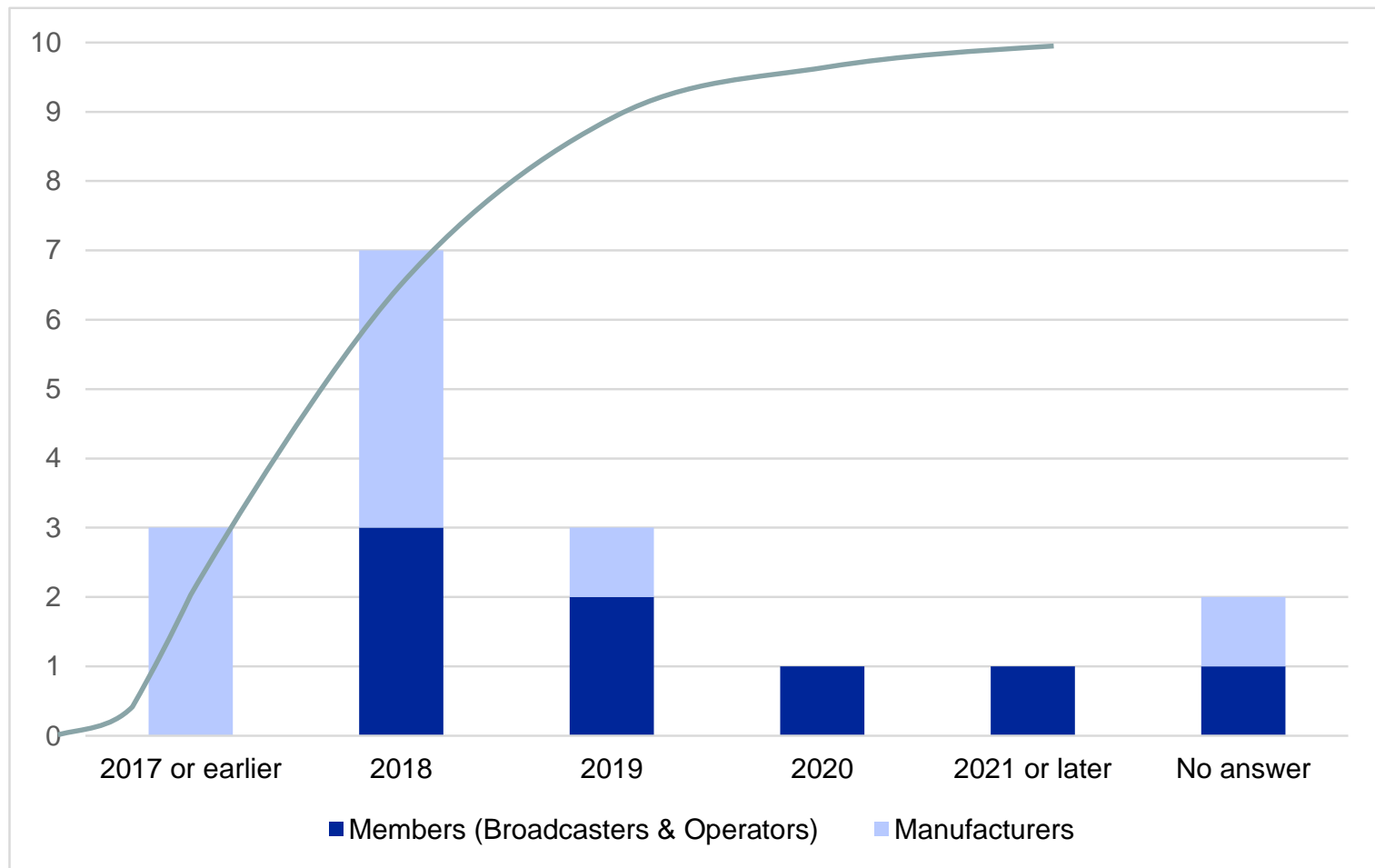


NorDig T report - HEVC

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NorDig HEVC Questionnaire – summary (full result at the end of the presentation, annex)

Timing – Regardless the motive you see for an introduction of HEVC based services in your market, when do you feel the need to have NorDig HEVC IRDs available?



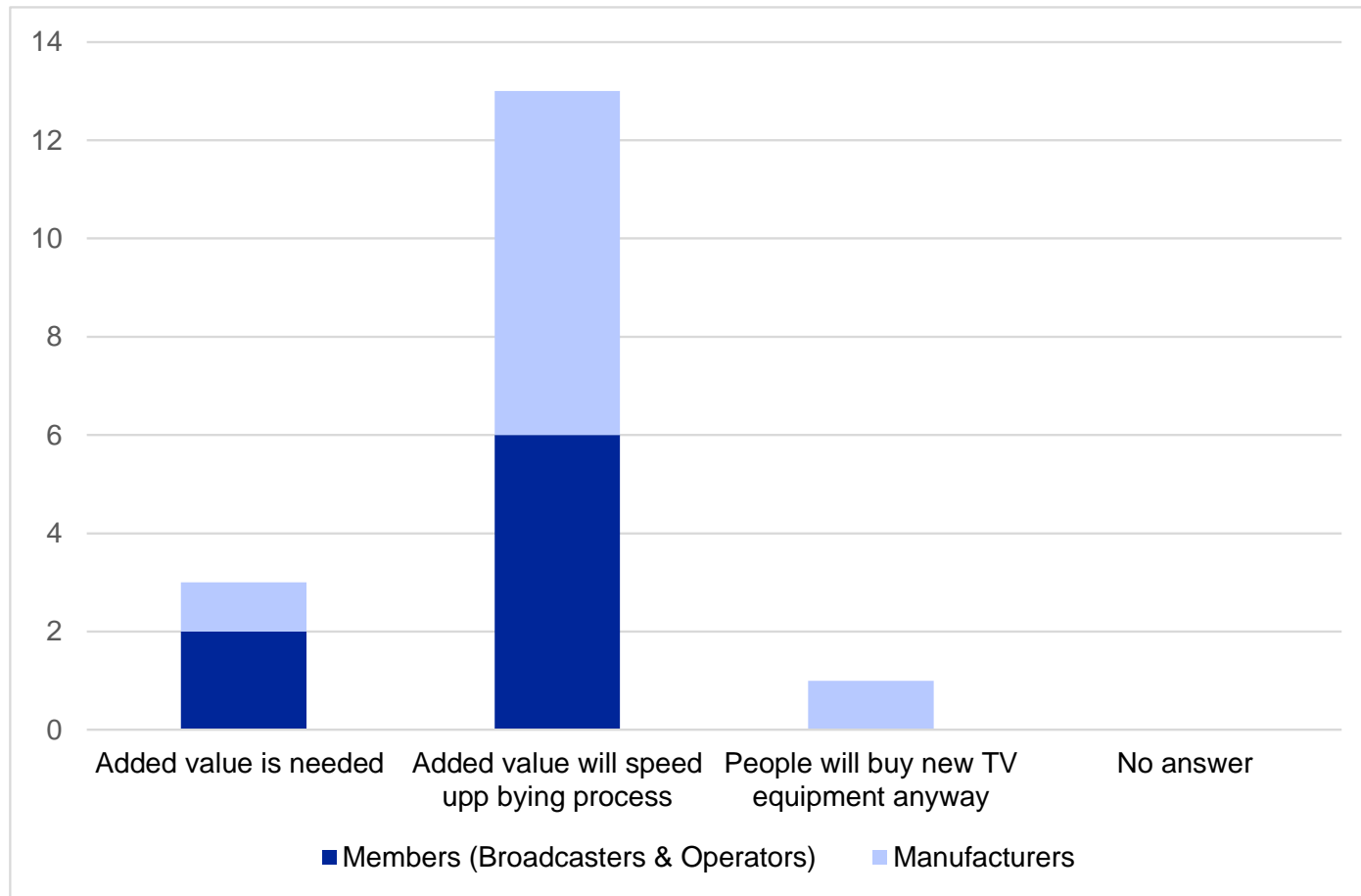


NorDig T report - HEVC

NorDig Excom meeting 18th February 2016

NorDig HEVC Questionnaire – summary (full result at the end of the presentation, annex)

Viewer perspective – Is it possible to convince the viewers to invest in new HEVC capable receiver equipment without offering them some added value compared to existing TV services?





NorDig T report - HEVC

NorDig Excom meeting 18th February 2016

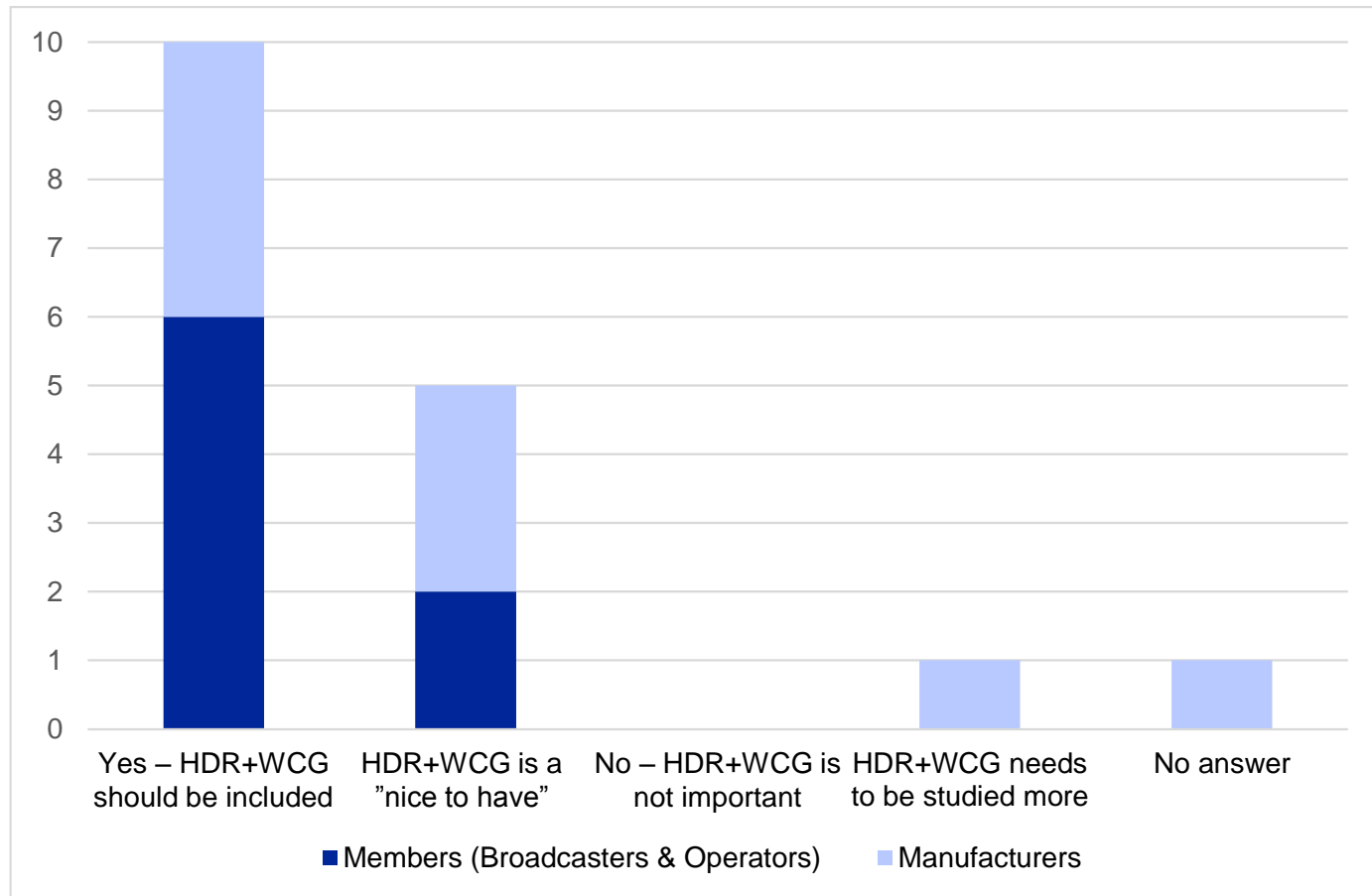
NorDig HEVC Questionnaire – summary (full result at the end of the presentation, annex)

High Dynamic Range (HDR) plus Wide Color Gamut (WCG) – Is it important to include High Dynamic Range accompanied by Wide Color Gamut in the NorDig HEVC IRD capabilities?

HDR+WCG
- new TV format
with
"better" pixels

Utilising High Dynamic Range video with Wide Colour Gamut would mean introducing an new TV format focused on delivering "better" pixels rather than just more pixels.

Tests has shown HDR+WGC is perceived as bigger improvement than just more pixels (4k)





NorDig T report –

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END presentation NorDig-T report

After here some detailed informative slides

ANNEX

- HEVC questionnaire (Feb 2016)
- NorDig T mandates 2015-2016 (Jan 2015)
- Website remake (May 2015)



NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (1/15)

17 answers (so far, one more replied but too late for this presentation)

8 from members (broadcasters & operators)

9 from manufacturers

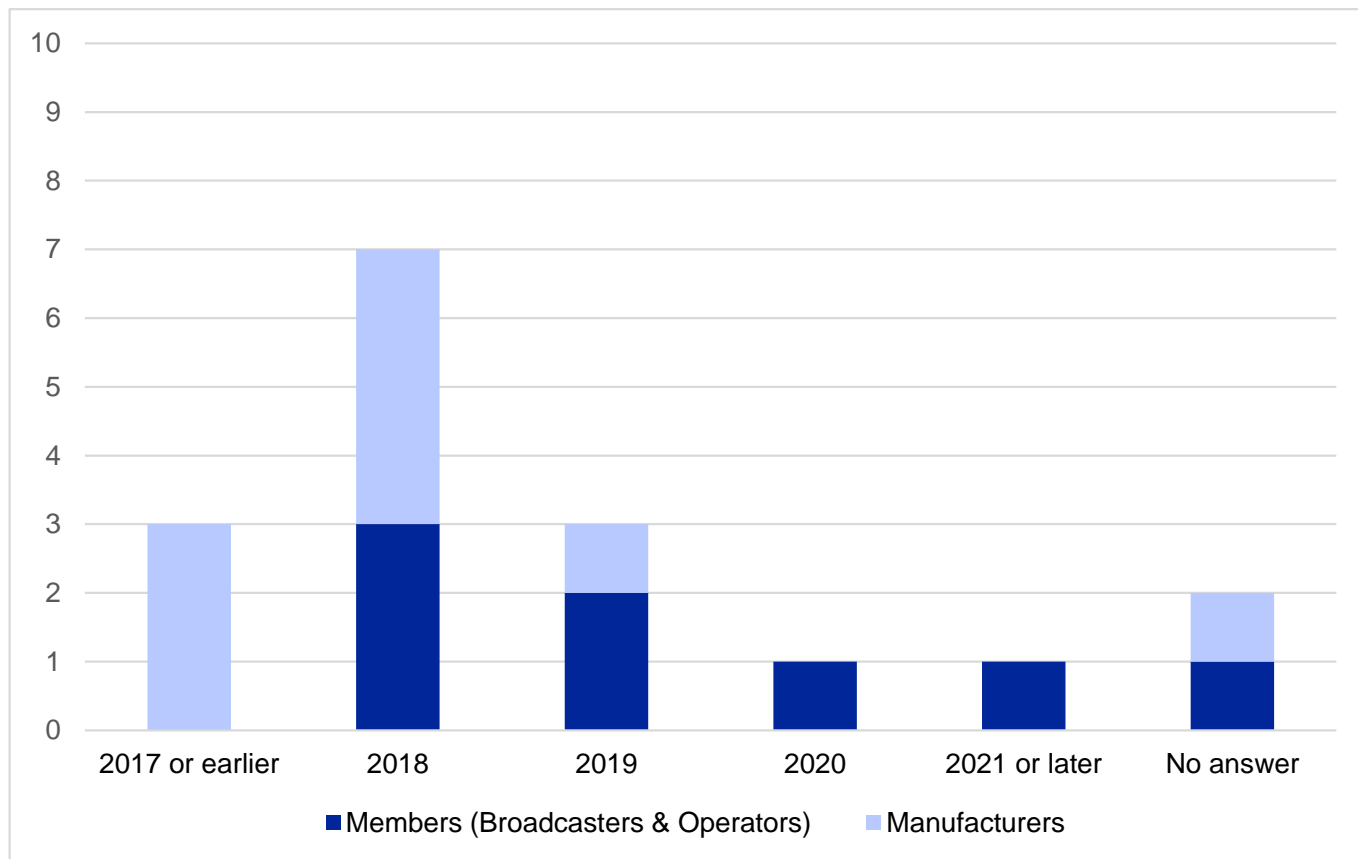


NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (2/15)

Timing: Introducing a new HEVC capable NorDig IRD including HEVC decoding offers a number of possibilities. As well as offering bitrate reduction due to the high compression efficiency of HEVC, higher video resolutions (up to 2160p) can be reached. In addition to this, new features as higher dynamic range and more vivid colors as well as higher frame rate could be utilized to improve the viewing experience.

Regardless the motive you see for an introduction of HEVC based services in your market, when do you feel the need to have NorDig HEVC IRDs available?



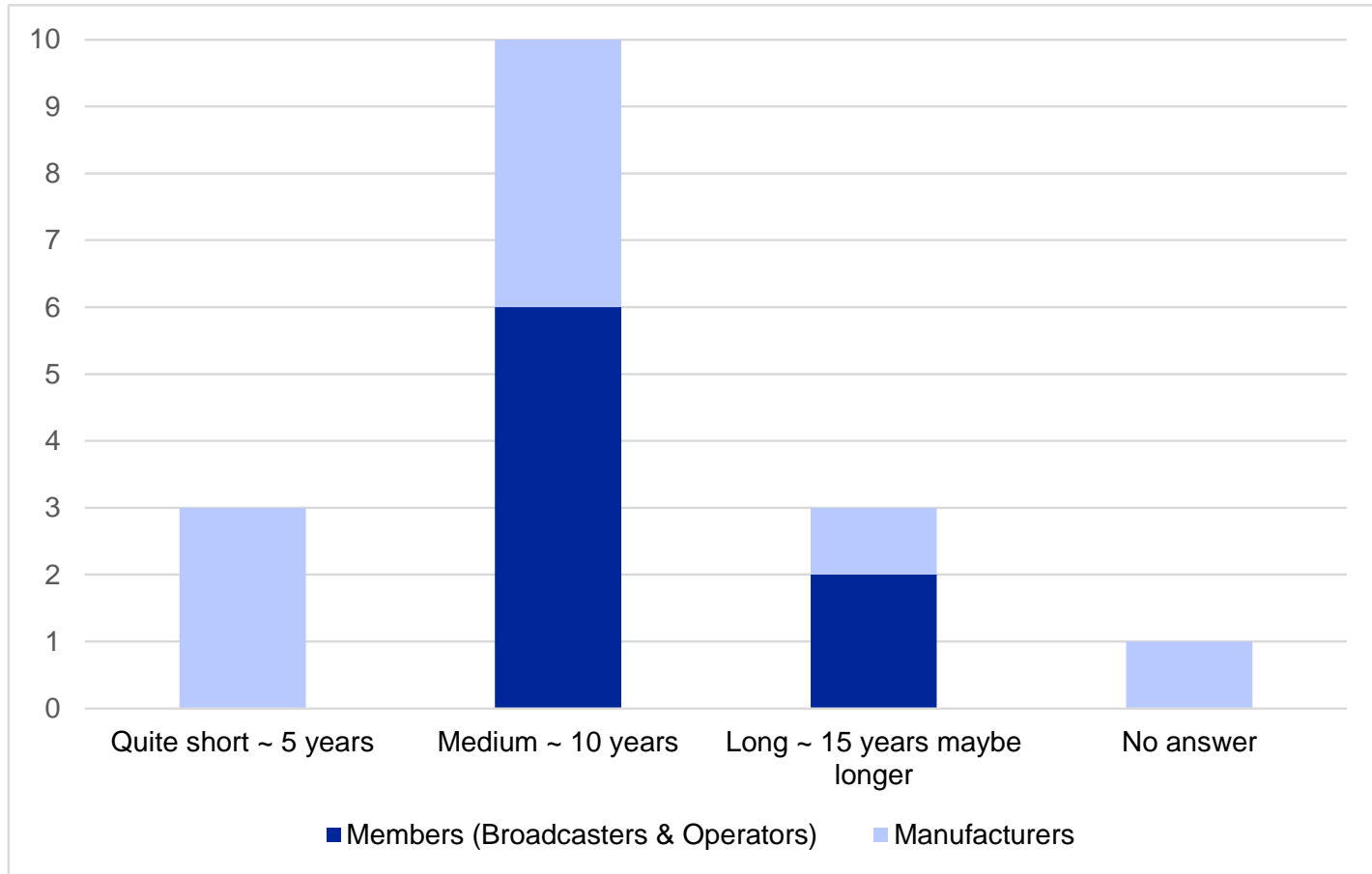


NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (3/15)

Lifespan:

What lifespan do you expect for the NorDig HEVC IRD requirements?



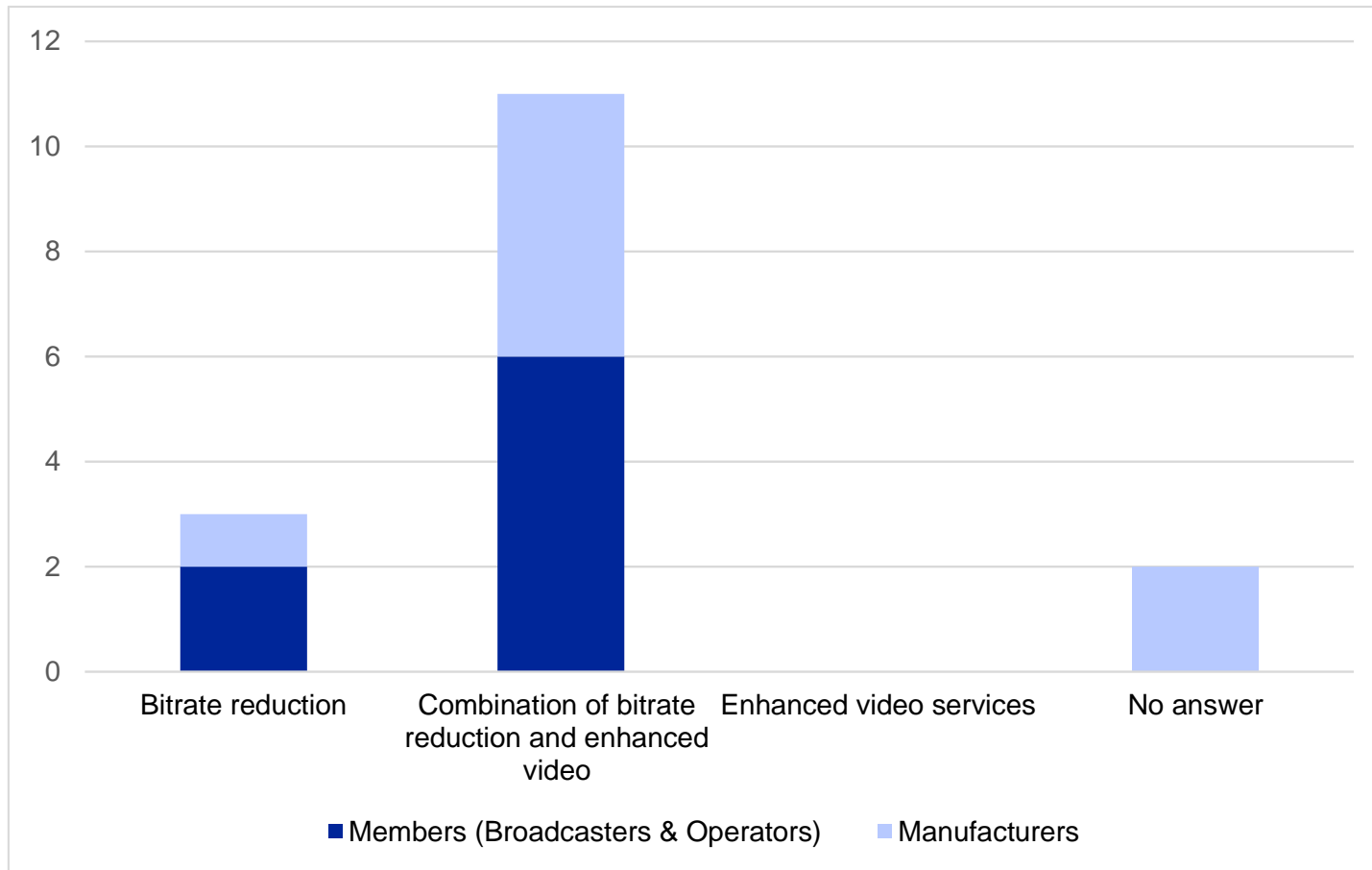


NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (4/15)

Broadcaster / operator perspective: A TV service encoded with HEVC is expected to consume approximately half the bitrate than using MPEG-4 AVC reaching the same quality. This is of course a strong motive for using the HEVC codec. As already mentioned, the introduction of HEVC also makes a new video toolset available, comprising higher resolutions than HD, video with higher dynamic range including a larger color space than today and also frame rates >50Hz.

What is the main reason to adopt HEVC in NorDig?





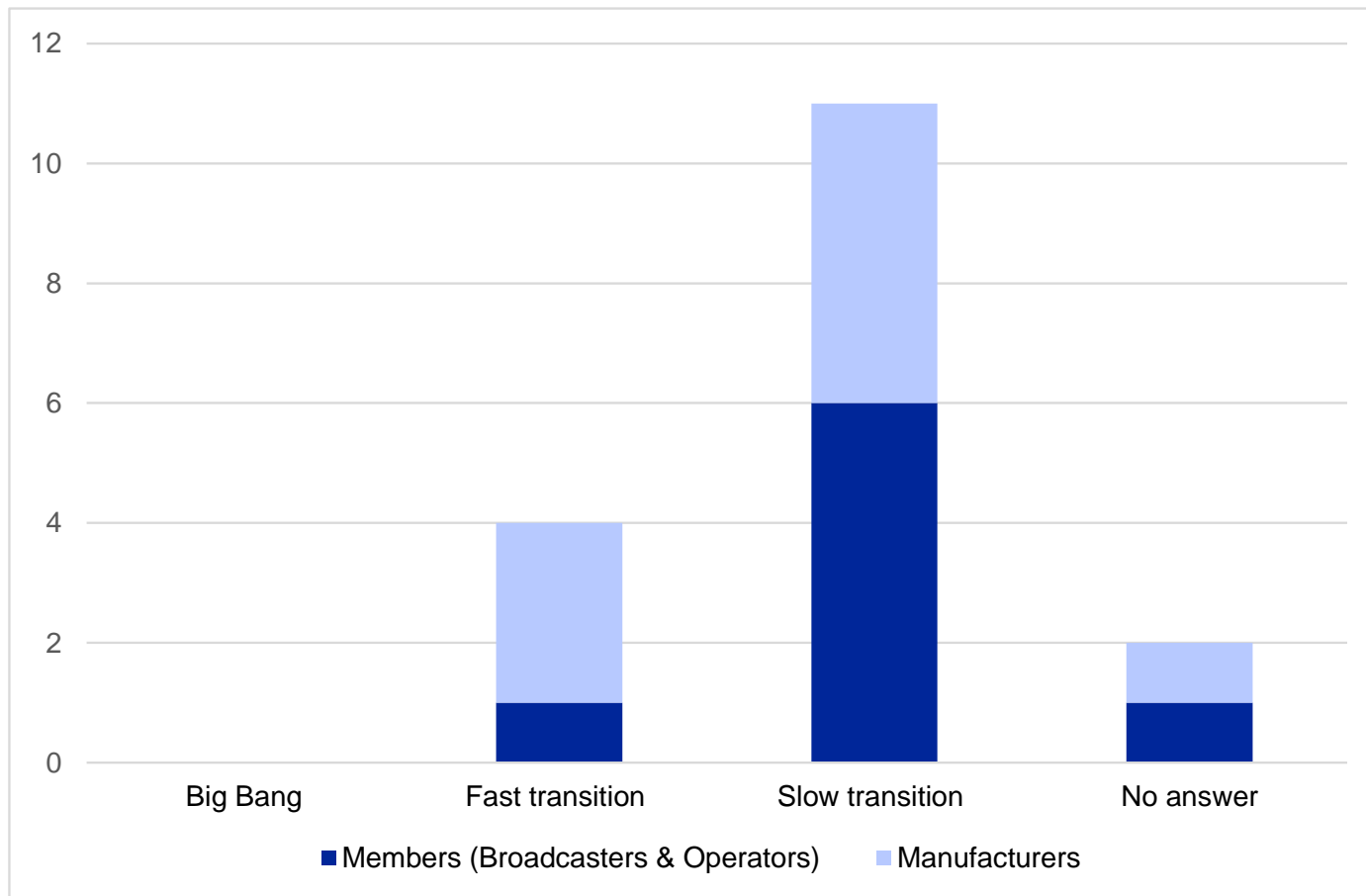
NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (5/15)

Introduction and migration:

As was the case going from MPEG-2 to MPEG-4, the introduction of and migration to HEVC may differ greatly from country to country and platform to platform depending on local circumstances.

How do you expect the introduction of and migration to HEVC will happen in your market / platform? Please tick the option closest to your opinion.





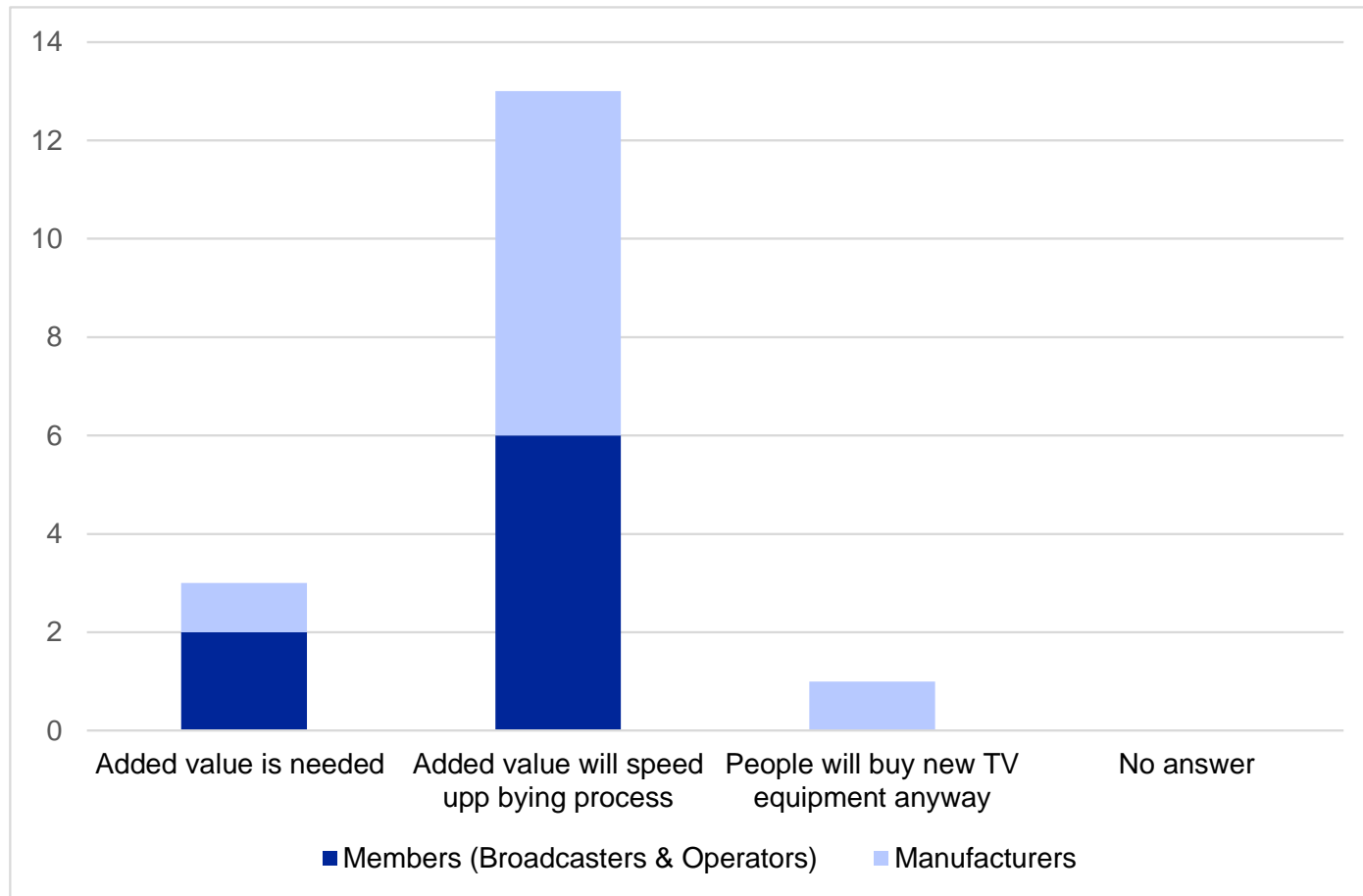
NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (6/15)

Viewer perspective:

The technology evolution steps of TV transmissions has so far been accompanied by features bringing added value to the viewers. The transition from analogue to digital television, using MPEG-2, offered more channels. The introduction of MPEG-4 AVC gave access to HDTV.

Is it possible to convince the viewers to invest in new HEVC capable receiver equipment without offering them some added value compared to existing TV services?





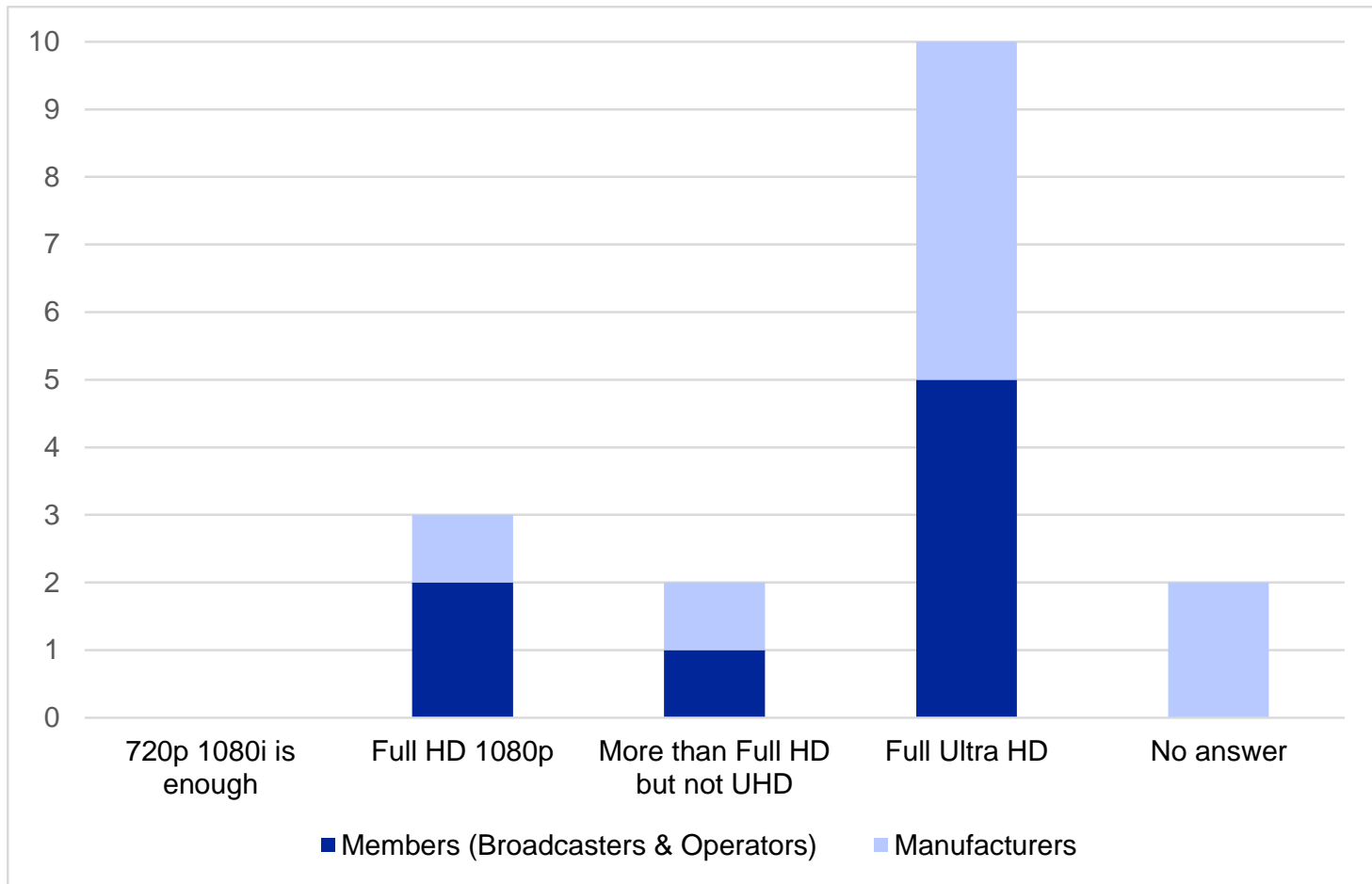
NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (7/15)

Resolution:

Even though HDTV sets will dominate the homes for quite some time, Ultra HD television sets with the ability to reproduce image formats up to 3840x2160 pixels are now introduced in the market. In addition to this, Ultra HD content has already been available for a while on streaming services like Netflix and Amazon and are now followed by Ultra HD Blu-ray discs.

In this environment still dominated by HDTV equipment and services in SD and HD but with Ultra HDTV gaining terrain, what resolution should a NorDig HEVC IRD be able to receive and decode?





NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (8/15)

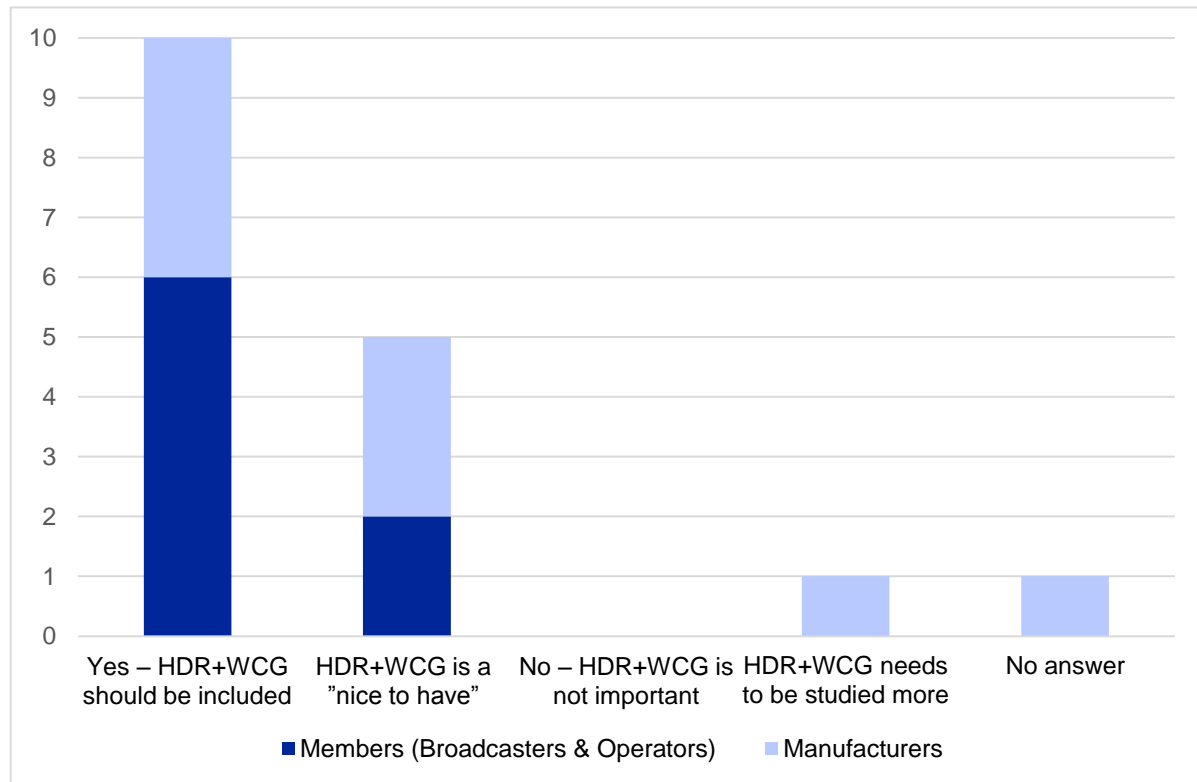
High Dynamic Range (HDR) plus Wide Color Gamut (WCG):

Independent of the resolution, an increased dynamic range accompanied by a wider color gamut for the video will offer the viewers an enhanced experience. Subjective tests are showing that the perceived improvement is significantly larger increasing the dynamic range and color gamut than stepping up the resolution from Full HD to Ultra HD. Although improvements with HDR+WCG are resolution independent, the use of HDR+WCG is by DVB mandated to be linked to encoding of produced 2160p-video. (HDR+WCG could though be transmitted via the, during encoding downsampled, sub-resolutions 1800p, 1440p, 1080p, 900p, 720p and 540p as well as the originally produced 'full' 2160p.)

High Dynamic Range content with WCG is now becoming available on streaming services as Netflix and on Ultra HD Blu-ray discs.

Is it important to include High Dynamic Range accompanied by Wide Color Gamut in the NorDig HEVC IRD capabilities?

HDR+WCG
- new TV format
with
"better" pixels





NorDig T report - HEVC questionnaire

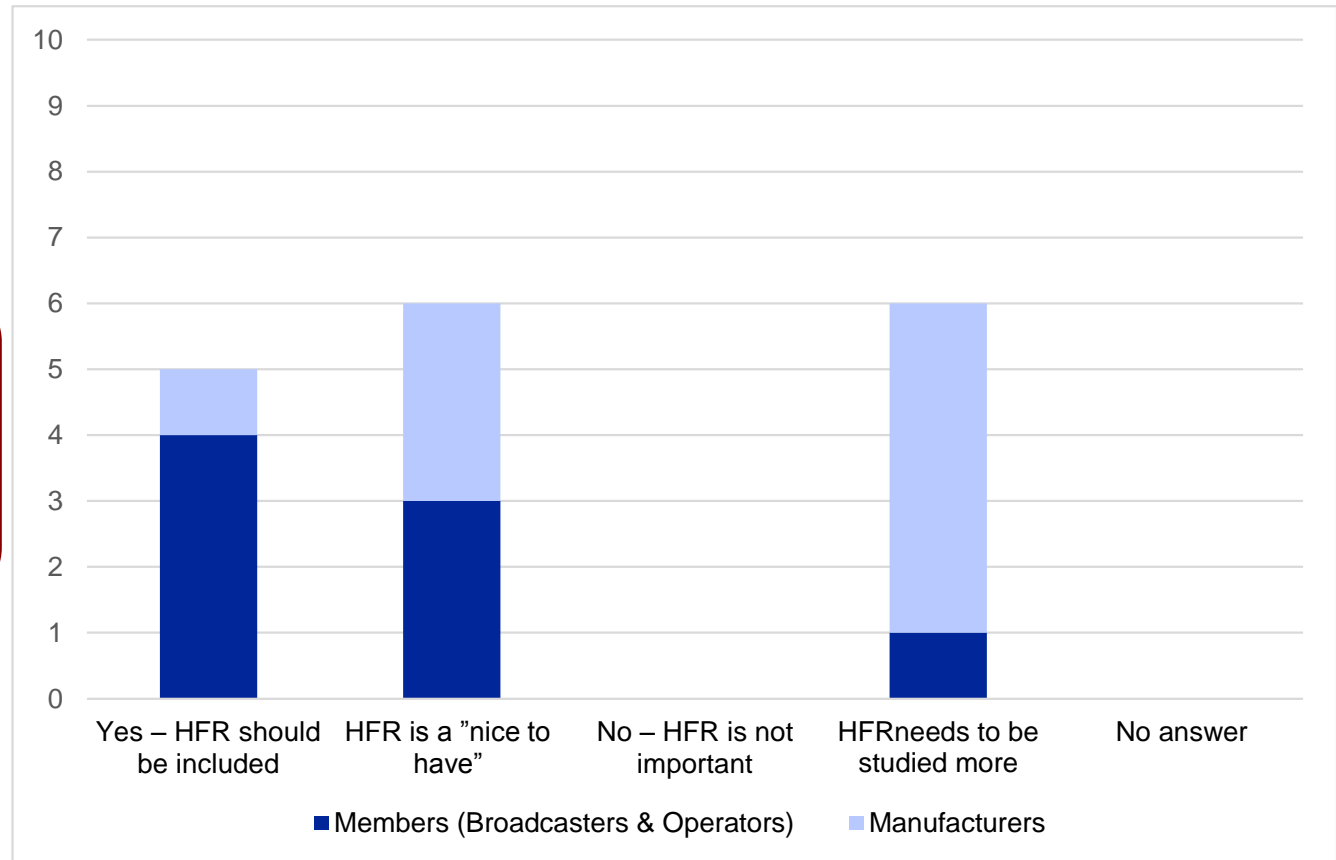
NorDig Excom meeting 18th February 2016 Annex (9/15)

High Frame Rate (HFR):

Increasing the frame rate from 50 to 100 Hz will improve the perceived image quality by reducing motion blur or jerky motion portrayal on scenes with fast movements. HFR can be used for any resolution, but is increasingly important with higher resolutions and larger screen sizes. There are however a concern that the combination of doubled frame rate and increased image resolution will cause data volumes that are complex and costly to handle in production and will add complexity and cost to consumer equipment.

Should the NorDig HEVC IRD be capable of handling High Frame Rate?

HFR
- new TV format
with
"better" pixels





NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (10/15)

Compatibility of existing HEVC iDTVs (ie early HEVC IRDs) – (1/2):

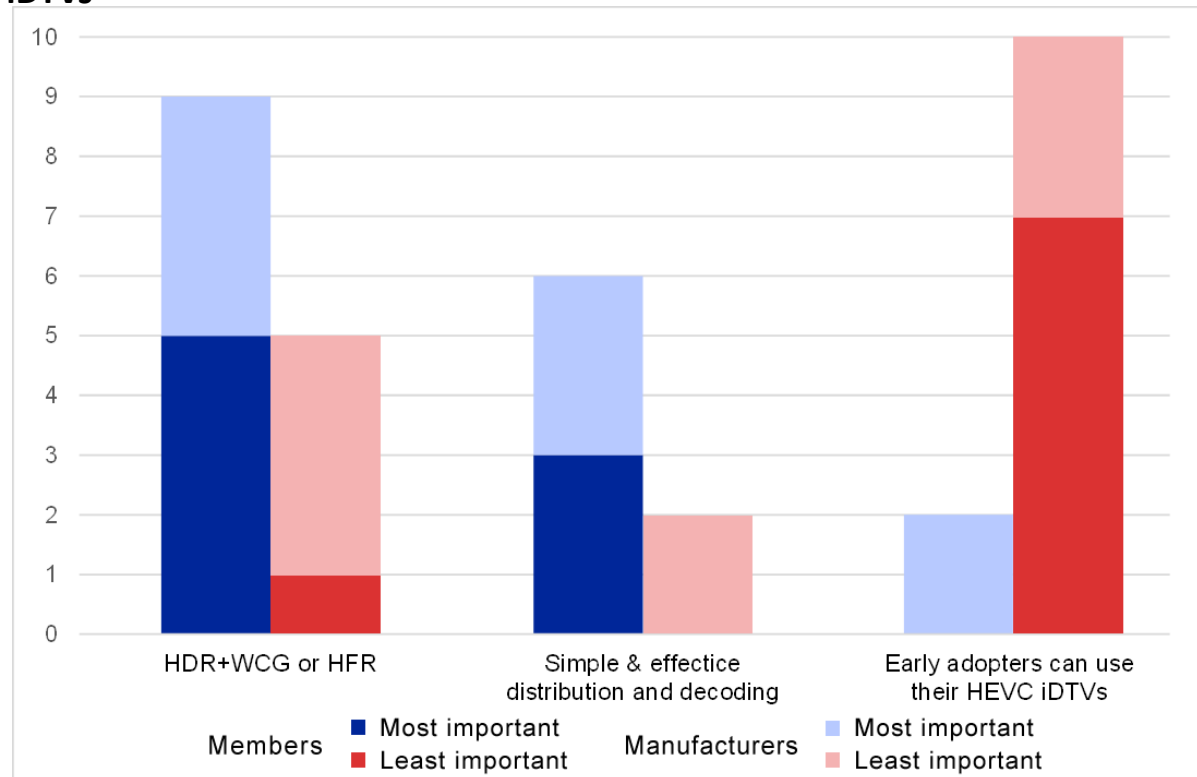
iDTVs, capable of receiving, decoding and displaying 10-bit HEVC encoded video, have already found their way into consumer homes. Many of these iDTVs lack the ability to present HDR, WCG or HFR. Addressing these receivers requires some compromises to be made. The compromise might be to avoid the use of HDR, WCG or HFR altogether, to tolerate additional cost and complexity in distribution and decoding or to simply avoid addressing these HEVC iDTVs directly by requiring viewers to add a set-top box.

From the following three requirements, please indicate the most important and least important to your business:

Requirement 1. Ability to make use of HDR, WCG or HFR

Requirement 2. Simplicity and cost effectiveness in distribution and decoding

Requirement 3. Early-adopting consumers being able to make full use of their investment in HEVC decoding iDTVs



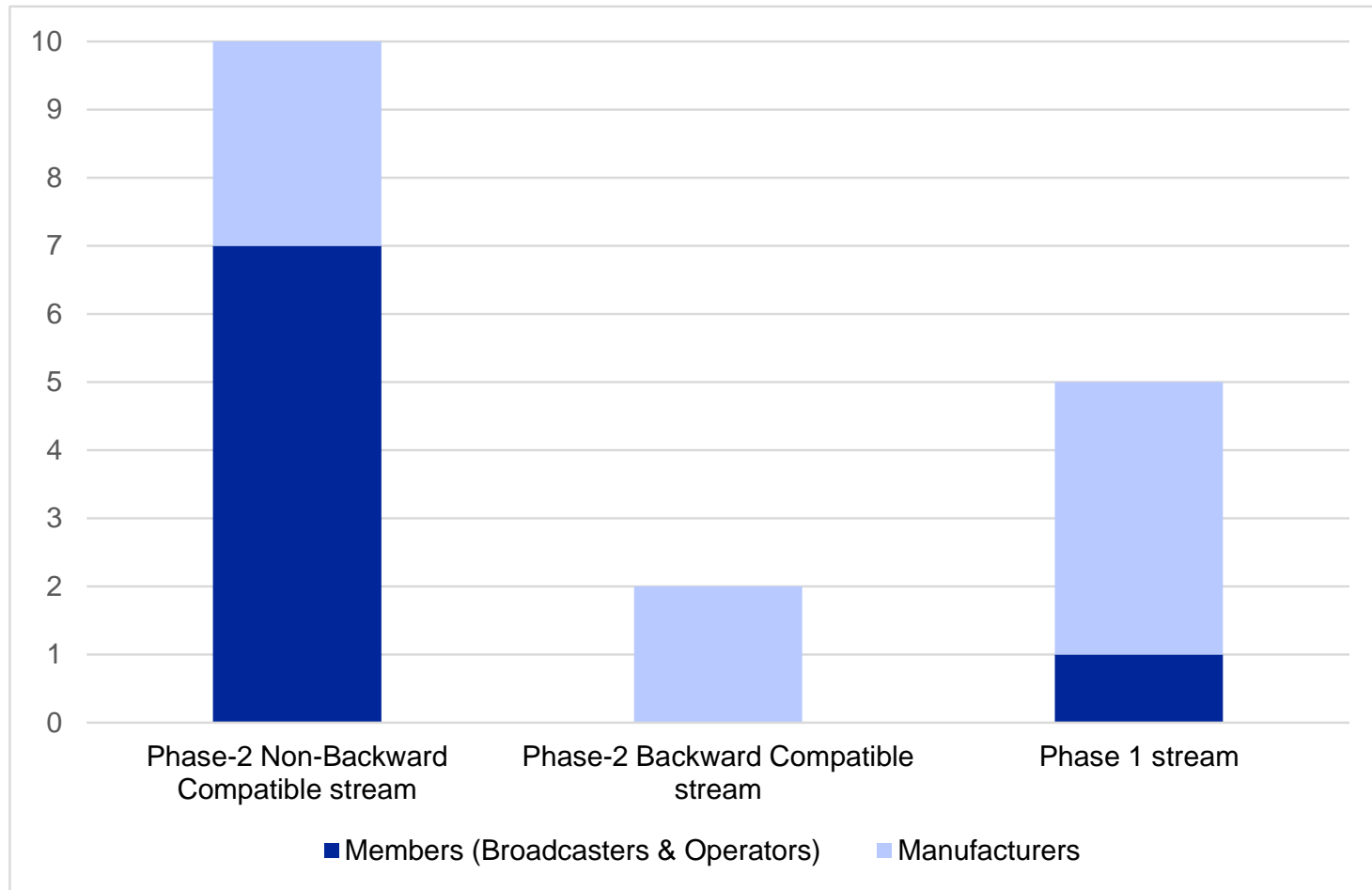


NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (11/15)

Compatibility of existing HEVC iDTVs – (2/2):

Preference for "Backward Compatibility" (compiled from the answers of the previous question.)



Phase 1(2): DVB's H.265/MPEG-H HEVC phase 1(2). Phase 1 current TV format more pixels, while Phase 2 also incl HDR+WCG+HFR
Phase 2 Backward Compatible stream: broadcast a Phase2 (HDR+WCG+HFR) that Phase1 IRD can decode and skip HDR+WCG+HFR
Phase 2 Non-Backward Compatible stream: broadcast a Phase2 (HDR+WCG+HFR) that early Phase1 IRD can't decode.
Phase 2 Non-Backward Compatible stream would typically be more encoding efficient (or equal) than Backward Compatible, but is still unde40
development in MPEG and DVB



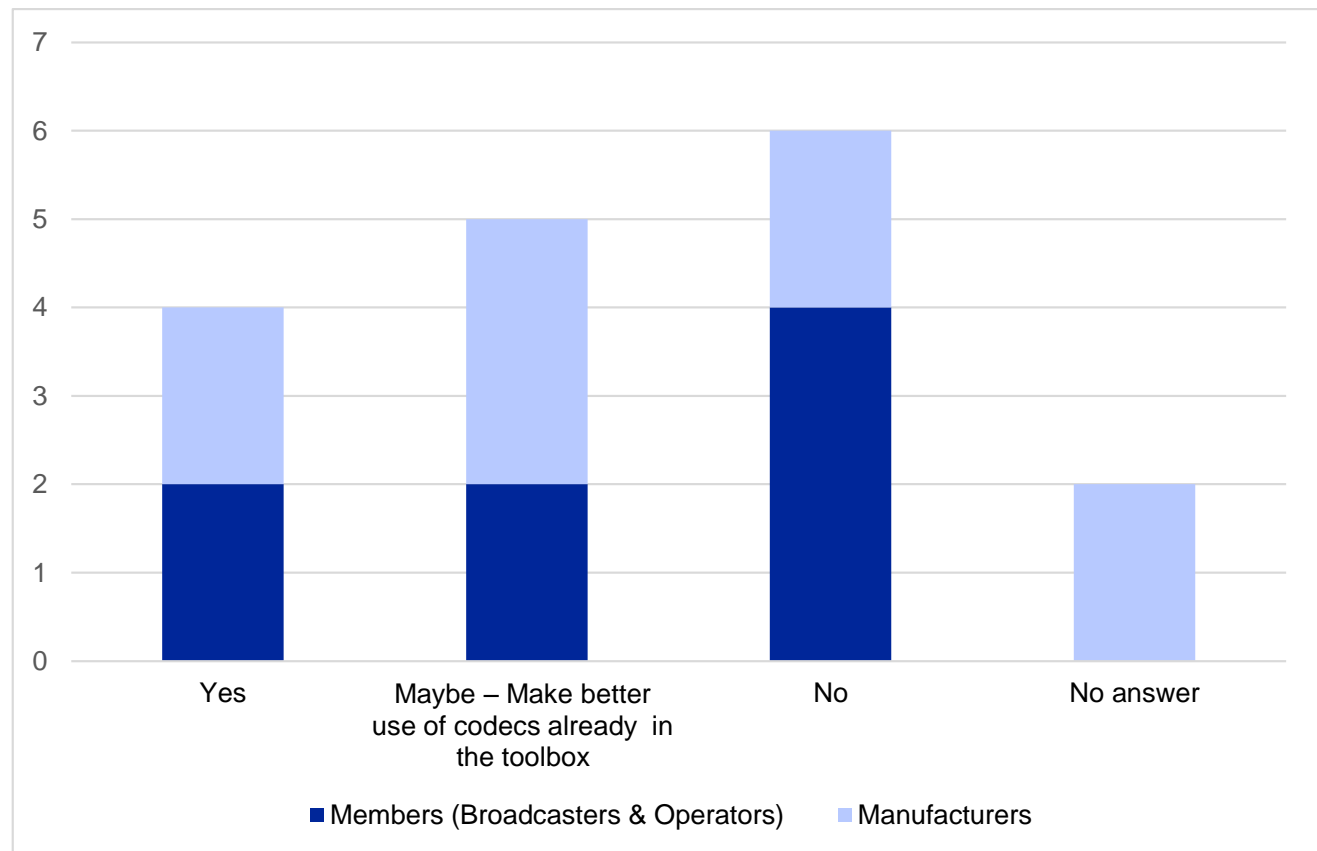
NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (12/15)

Next Generation Audio:

Incorporating HEVC as a video codec in the NorDig IRD specification also means an opportunity to include additional audio functionality. The “Next Generation Audio” codecs (as defined by DVB) are offering broadcasters the possibility to deliver improved audio experiences and will handle object and scene based as well as channel based audio streams. The NGA codecs have an extensive set of features including handling of multiple audio tracks (multiple languages, audio description, spoken subtitles and so on), handling of production metadata, good control of loudness and down-mix, the possibility for the listener to personalize the listening experience, support for binaural stereo and more... The performance of NGA codecs that are candidates to be included in the TS 101154 specification are now evaluated by DVB.

Should we consider adding one or more of the “Next Generation Audio” codecs to the HEVC version of the NorDig specification?



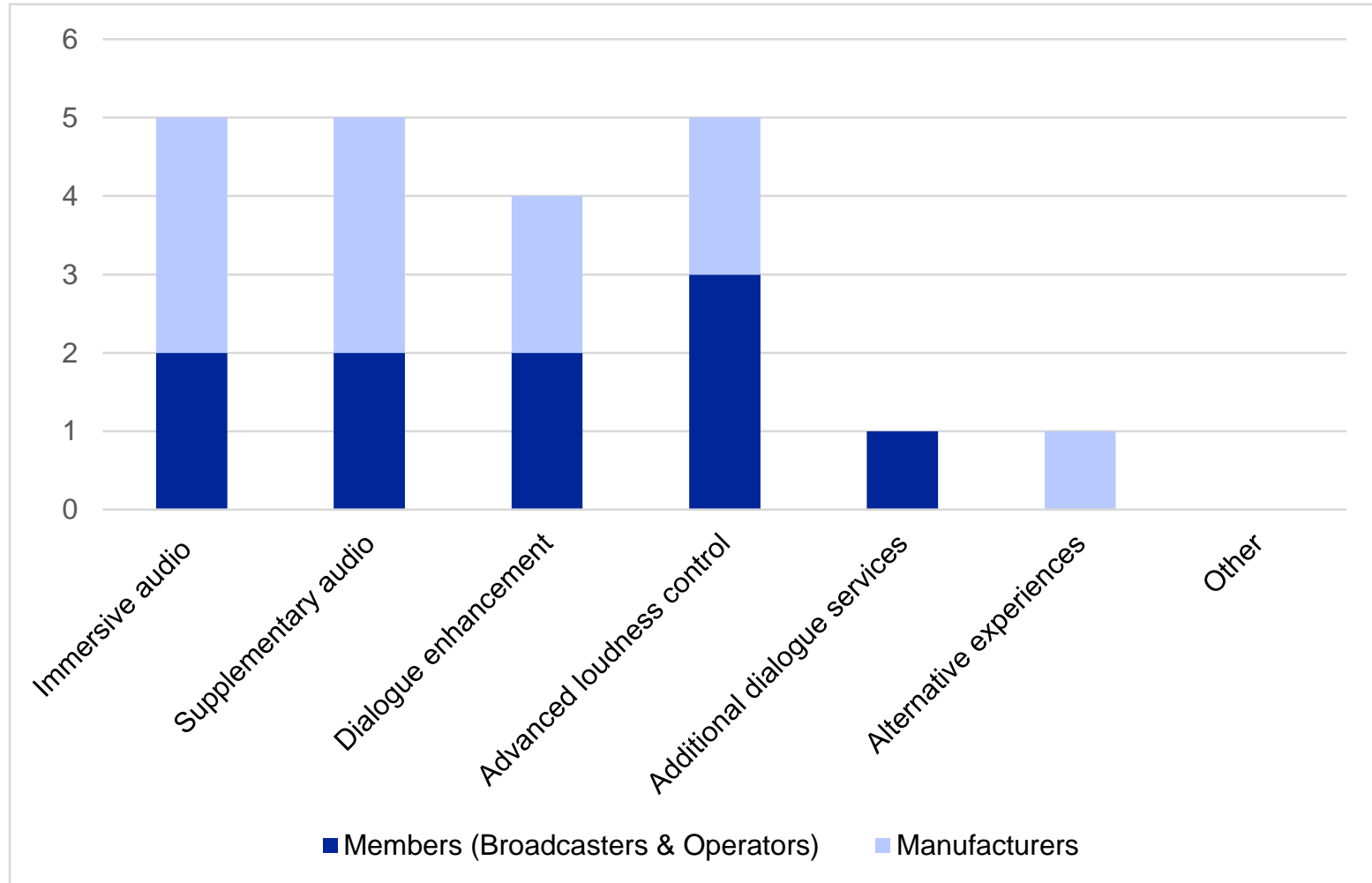


NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (13/15)

Additional or refined audio functionalities:

If yes or maybe to the previous question, which additional/refined functionalities would you intend to leverage? (Several options can be marked).





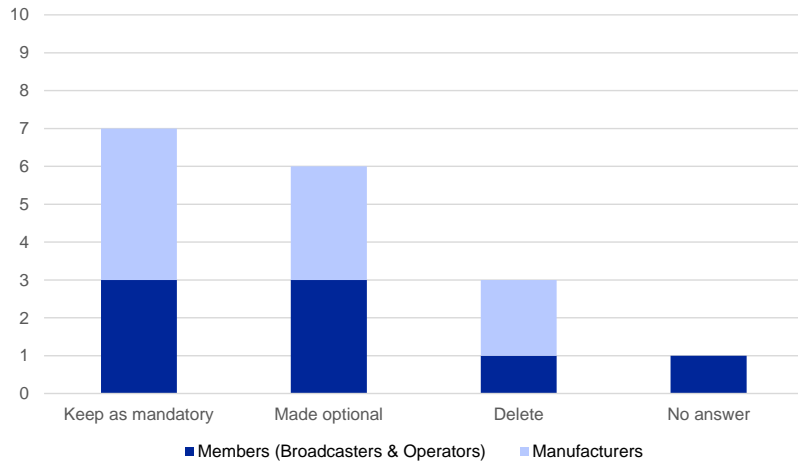
NorDig T report - HEVC questionnaire

NorDig Excom meeting 18th February 2016 Annex (14/15)

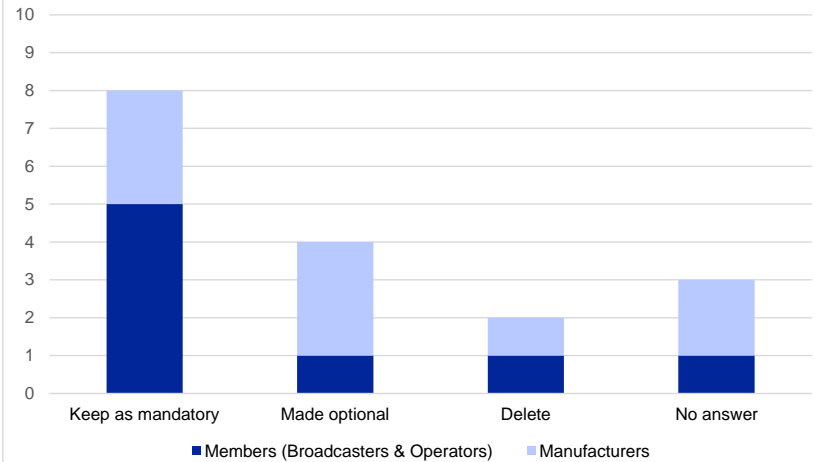
Removal of “legacy” functions/requirements:

By the time HEVC is introduced in NorDig, some of the functional requirements in the current version of the specification may have lost their importance. Such requirements could then be made optional or be totally removed from the specification.

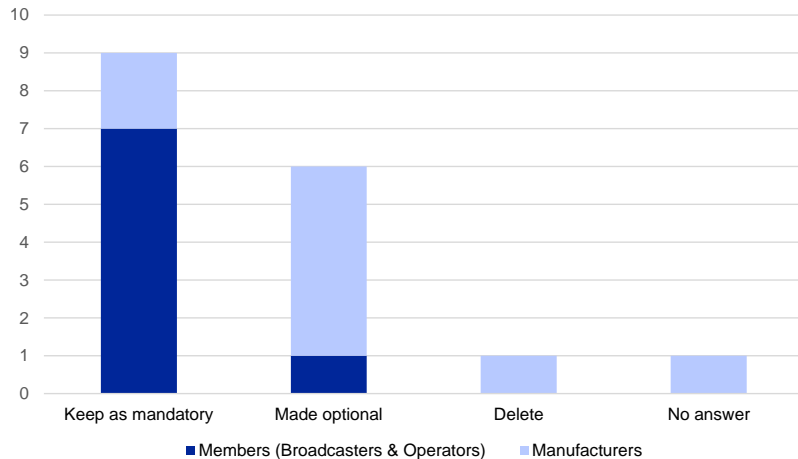
How should MPEG-2 video be treated?



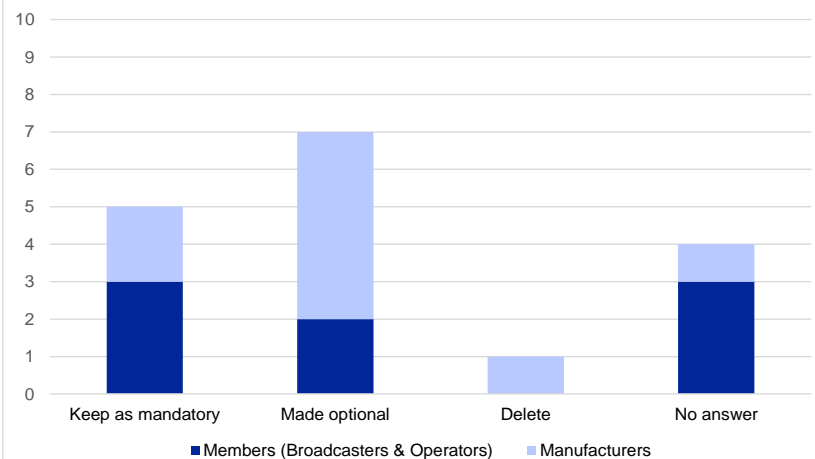
How should MPEG-1 L2 audio be treated?



How should DVB-T be treated?



How should DVB-S be treated?





NorDig T report - HEVC questionnaire

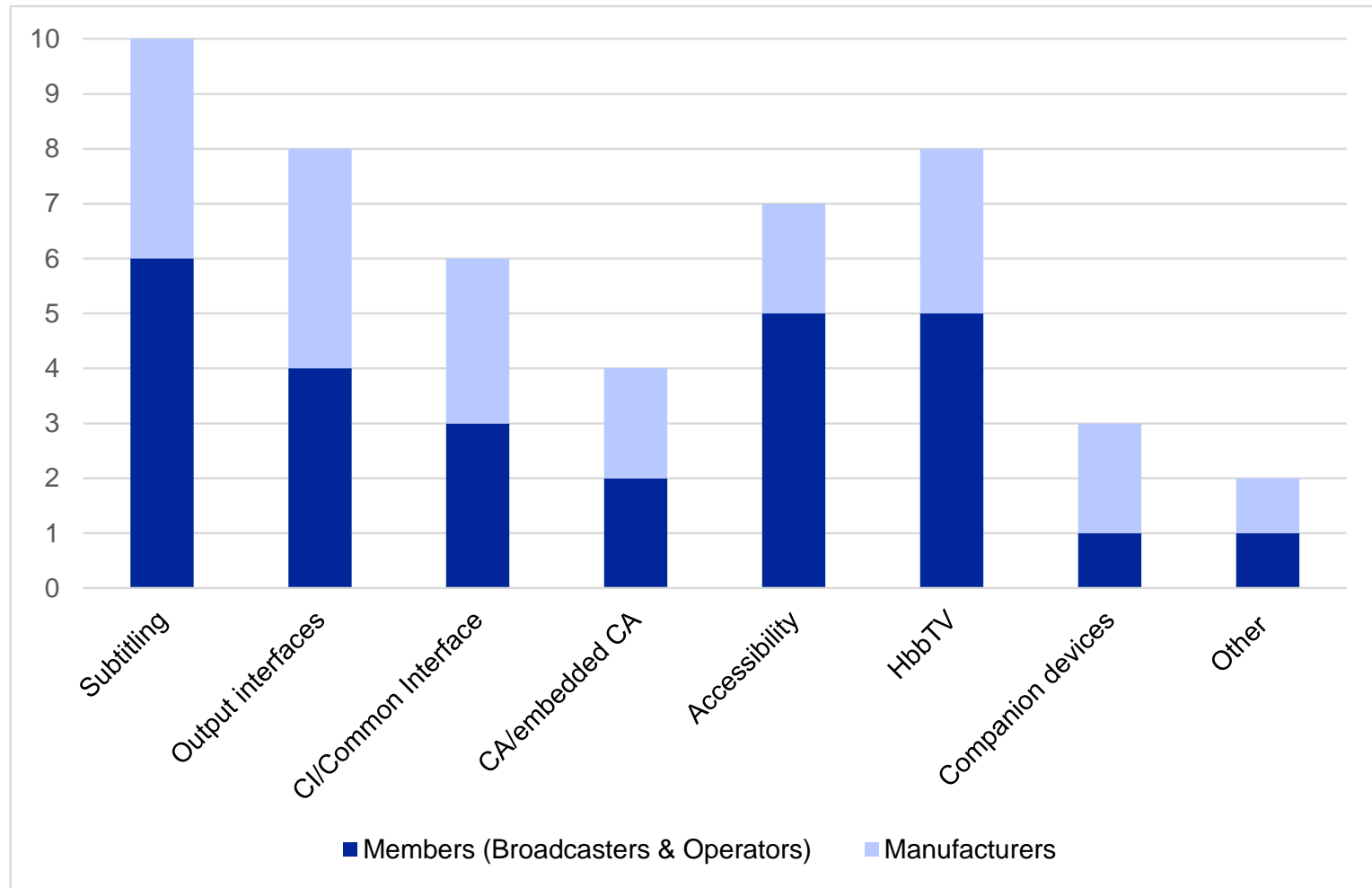
NorDig Excom meeting 18th February 2016 Annex (15/15)

Updates and additions to other IRD functionality:

Making a new NorDig version is also an opportunity to update and add specifications covering other IRD functionality.

Please tick the parts you think should be updated or added. ?

(Several options can be marked)





NorDig T report - HEVC

NorDig Excom meeting 27th January 2015

NorDig Video - Informative:

- **Multiplex layer**
 - Broadcast: MPEG2 Transport stream used for all types (SD, HD, UHD) and codecs (MPEG2, MPEG4 AVC and MPEG-H HEVC)
- **TV Format:**
 - Interlaced SDTV, up to 720x576i25fps, MPEG2 and subset of MPEG4 AVC HD – NorDig requirement
 - Progressive SDTV
 - Interlaced HDTV, up to 1920x1080i25fps, MPEG4 AVC and subset of MPEG-H HEVC HD “phase 1” – *NorDig requirement*
 - Progressive HDTV, up to 1280x720p50fps, MPEG4 AVC and subset of MPEG-H HEVC HD “phase 1” – *NorDig requirement*
 - Progressive “Full HDTV”, up to 1920x1080p50fps, MPEG4 AVC and MPEG-H HEVC HD “phase 1” (*not specified in NorDig*)
 - Progressive UHDTV phase 1, up to 3840x2160p50fps, MPEG-H HEVC UHD phase 1 (*not specified in NorDig*)
 - Under development: Progressive UHDTV phase 2, TBD (new TV format from SMPTE/ITU), MPEG-H HEVC (“phase 2”)
- **DVB’s Codec** (with relevance for us in NorDig using 25/50Hz systems):
 - MPEG-2, SD profile – *NorDig requirement*
 - MPEG-4 AVC, HD profile (for us HDTV which includes SDTV, but DVB has also defined an MPEG-4 SDTV) – *NorDig requirement*
 - MPEG-4 AVC, “full HD” profile (1080p50fps, only 8-bits) (*not specified in NorDig*)
 - MPEG-H HEVC “full HD” profile “phase 1”, (1080p50fps, 8 and 10-bits) (*not specified in NorDig*)
 - MPEG-H HEVC UHD profile phase 1, (2160p50fps, 8 and 10-bits) (*not specified in NorDig*)
 - Under development: MPEG-H HEVC “phase 2”, UHD phase 2, TBD (discussed features are more bits, HDR, HFR, more colours...)
- **Interfaces:**
 - SCART (SDTV, NorDig optional)
 - Analogue component (NorDig optional, max SDTV resolution)
 - HDMI v1 (HDTV, NorDig requirement: HDMI v1.4b incl ARC)
 - HDMI v2 (UHDTV phase 1) (*not specified in NorDig*)
 - Future: “HDMI vX” for UHDTV phase 2
- **IRD Support for MPEG-H HEVC** (short indicative check inside NorDig T with TV manufactures):
 - **Samsung:** support HEVC for higher model range, for OTT but also broadcast (future German market etc), uncertain if all UHD or HD
 - **LG:** support HEVC for broad range models (except entry level models), for OTT and broadcast
 - **Sony:** support HEVC for higher model range, for OTT and broadcast for some markets
 - **Vestel:** developing support for HEVC for higher model range, for OTT maybe broadcast



NorDig T report - HEVC

NorDig Excom meeting 27th January 2015

NorDig Video - Informative:

Short overview summary Video Formats and Video Codecs in DVB specs (as per Jan 2015):

	MPEG-2	MPEG-4	MPEG-H	MPEG-H	H x V t fps	SD	SD+	HD--	HD-	HD	HD	Full HD	UHD--	UHD-	UHD	UHDp2
	AVC	HD	HEVC	HD												
	H.262	H.264	H.265	H.265												
SD-			n/a	n/a	352x288i25	0,24	0,1	0,1	0,07	0,06	0,049	0,024	0,014	0,009	0,006	0,003
SD			n/a	n/a	720x576i25	1	0,4	0,4	0,27	0,23	0,2	0,10	0,06	0,04	0,02	0,01
SD+	n/a	n/a			960x540p50	2,5	1	1,0	0,67	0,56	0,5	0,25	0,14	0,09	0,06	0,03
HD--			n/a	n/a	960x1080i25	2,5	1	1	0,67	0,56	0,5	0,25	0,14	0,09	0,06	0,03
HD-					1440x1080i25	3,8	1,5	1,5	1	0,84	0,75	0,38	0,21	0,14	0,09	0,05
HD					1280x720p50	4,4	1,8	1,8	1,2	1	0,89	0,44	0,25	0,16	0,11	0,06
HD					1920x1080i25	5	2	2	1,3	1,1	1	0,5	0,28	0,18	0,12	0,06
Full HD					1920x1080p50	10	4	4	2,7	2,3	2	1	0,56	0,36	0,25	0,12
UHD--					2560x1440p50	18	7,1	7,1	4,7	4	3,6	1,8	1	0,64	0,44	0,22
UHD-					3200x1800p50	28	11	11	7,4	6,3	5,6	2,8	1,6	1	0,69	0,35
UHD					3860x2160p50	40	16	16	11	9	8	4	2,3	1,4	1	0,50
UHDp2					3860x2160p100	80	32	32	21	18	16	8	4,5	2,9	2	1

(MPEG-2 refers to DVB's MPEG-2 SD profile, MPEG4 AVC refers to DVB's MPEG4 720p/1080i HD profile, HEVC UHD refers to DVB's HEVC UHDTV phase 1 profile)

(UHDp2 refers to UHDTV phase 2 which is still very much under discussion in DVB, ie not defined by DVB CM and is here just an example of how it could become. For UHD Phase2 it is discussed to be based on a new TV format with more colors, higher dynamic range, higher frame rates etc.)



NorDig T report –

NorDig Excom meeting 18th February 2016

Extra slides

NorDig-T mandates for 2015-2016

(from Excom Jan 2015, updated Sep 2015)



NorDig T report - mandates and activities (1/4)

NorDig Excom meeting 18th February 2016

NorDig T - mandates & activities for period 2015-2016 - [approved by Excom Jan 2015](#):

- RoO
 - Continue major update of RoO spec and exchange experience (focus area within NorDig T)
 - Plan in basic have same structure to be same as IRD spec
 - Guidelines and recommend broadcast settings and levels (to reduce differences between NorDig networks)
 - examples
 - Include specific info related to different NorDig members networks/platforms
 - (after major update above) Maintain and update NorDig RoO.
- Test and Test plan
 - Test plan v2.5
 - Match IRD spec v2.5.1 (incl PVR crids, HbbTV and other today missing test cases)
 - Review and where possible combine similar test cases to make it easier and faster to test
 - “minimize” all redundant redundant test cases/combine test cases to speed up testing (without affecting test quality)
 - Missing audio/video test cases (e.g. metadata, video crop etc.)
 - Update and improve test cases
 - HbbTV test and test cases:
 - finalise development of already defined NorDig specific HbbTV test cases and maintain them (minimise NorDig unique specific test cases, based on open test cases). Propose new test cases to be developed if needed (keep to minimum).
 - add HbbTV test requirements into NorDig Test Plan (based on ref as much as possible to HbbTV test suit, clarify if HbbTV optional test is mandatory for NorDig Hybrids)
 - contribute to HbbTV org the NorDig developed HbbTV test cases for inclusion in HbbTV standard Test suits (include as much as possible in HbbTV standard test suits).
 - Propose budget for NorDig’s HbbTV activities (costs , descriptions, alternatives)
 - Supervise and manage any NorDig HbbTV consultancy work (currently Sofia Digital)



NorDig T report - mandates and activities (2/4)

NorDig Excom meeting 18th February 2016

continue - NorDig T mandate and activities for coming period 2015-2016:

- HbbTV IRD requirements
 - Monitor and report HbbTV spec development and usage, (HbbTV now close to release v2.0 spec w HTML5 etc).
 - Investigate additional HbbTV feature and requirements that are of interest for NorDig members (to be confirmed by –T and Excom before detailed proposal and any incl into IRD spec) like:
 - HbbTV 2.0 (functionalities, IRD manufactures implementation, when and how this could be incl into IRD spec, potential possibilities with v2.0 like HTML5, HEVC. Members interest for new feature/functionality with v2.0)
 - ~~Portable devices~~, Second screen, synchronisation etc (part of HbbTV 2.0)

- HbbTV implementation:
 - Monitor and report HbbTV implementation in NorDig networks and other networks,
 - Monitor and report implementation status on IRD side
 - Monitor and discuss experience and issues/problems with launching HbbTV services
 - ~~Write Guidelines on Operators and broadcasters use of HbbTV, possible cooperation~~

- HbbTV DRM
 - Monitor HbbTV DRM implementation, interest for common DRM requirements
 - Monitor technologies and functionality (common encryption, CAM/CI+ etc)
 - Review security requirements espec for 4k premium OTT content that has higher security requirements from content owners (interest from Telenor/CanalDigital and TV2 NO)



NorDig T report - mandates and activities (3/4)

NorDig Excom meeting 18th February 2016

continue - NorDig T mandate and activities for coming period 2015-2016:

- Video, audio, subtitling
 - Surround sound, is it possible to reduce the problems with down-mixing, especially investigate broadcast side.
 - Dolby AC4, monitor and get more info about its efficiency and functionality (not yet proposed to specify).
 - Monitor and report NorDig members interest for new audio and video codecs (HEVC, 3D Audio etc) and formats. Investigate how new codec can be introduced in NorDig specs. Check with industry support for new codecs (New codec like HEVC would probably also need review of HDMI, SI and maybe audio requirements etc).
 - Propose “commercial requirements” for HEVC and description of impact on IRDs other parts due to this
- Accessibility
 - Work with harmonization of broadcast and better describe current broadcast for IRD manufactures
 - Advanced Clean Audio / Dialogue Enhancement - investigate members interest for this and if they are able to broadcast this
 - Spoken subtitling, investigate how NorDig broadcasters today broadcast this and how much difference there is around this in NorDig broadcast.
 - HbbTV for Accessibility services – investigate how HbbTV can be used for Accessibility and if needed propose changes to IRD and RoO requirements
 - Investing new technology and equipment for accessibility services.
 - (SVT) Investigate more in to adjusting volume for receiver mixing (~~if needed~~)
- CA and CI
 - monitor and report Cplus LLP (CI+ v1.4 and v2.0) and DVB work (CI+ v2.0 etc) within these topics to NorDig Excom and Technical group.
 - Review security requirements espec for 4k premium OTT content that has higher security requirements from content owners (interest from Telenor/CanalDigital and TV2 NO)



NorDig T report - mandates and activities (4/4)

NorDig Excom meeting 18th February 2016

continue - NorDig T mandate and activities for coming period 2015-2016:

- NorDig Unified IRD spec
 - No major updates or new requirement foreseen for 2015
 - Maintain and update current requirements for NorDig IRDs (minor, all sections, references to other spec are up to date, requirements are up to date, clarification is added for FAQ etc, e.g. HbbTV errata).
 - Update guidelines wordings in GUI and translations (mainly related Accessibility and Audio)
 - Review and improve IRD's auto update for network changes
 - FE (DVB-T/-T2) review if 800MHz scanning can be removed (NRK) and add optional requirements for 700MHz LTE immunity (hopefully via reference to ITU/ETSI)
 - IPTV – ComHem launching IPTV and has some interest to updated current IPTV IRD requirement.
 - IRD surveillance (like using TR069), some interest to investigate this more.
 - SSU, add alternative for broadcasting SSU notification in accordance with new DVB SSU spec 2015 for IRDs with very large file size
 - Recommendation Remote Control related to accessibility settings, check if possible to get a RC key for changing Accessibility setting or modify current requirements and recommendations. (Ensure RC can be via Smartphones etc)
 - HbbTV – investigate and prepare update IRD spec for latest HbbTV v1.5 (i.e. latest errata)
 - (TV recorder – closed. No need to define TV Recorder (PVR lite) unless someone volunteer to come with a more concrete text proposal)
 - Mix of broadcast and OTT (ideal/intension one common channel list of broadcast and broadband/OTT services for hybrid receivers, viewers should ideal not notice zapping diff between zapping among broadcast or OTT services)
- Others
 - Common Event Info file format (Broadcast + OTT), interchange Content Providers to Distributers (e.g. based on “Public schedule”). Shall support event info and metadata for both broadcast (linear TV) and OTT (linear and on-demand/catch-up)



NorDig T report – website update (1/5)

NorDig Excom meeting 18th February 2016

Informative

NorDig website update and mail reflectors

(inputs from Peter Molsted)

As presented to Excom 26 May 2015 and accepted by Excom to modernize the NorDig website.



NorDig T report – website update (2/5)

NorDig Excom meeting 18th February 2016 - Annex

NorDig website new design and structur : Home / start page, public area

Informative: presented and accepted by Excom Jan 2015

Home	News	Specifications	Verifications	About NorDig	Organisation	Contact	Members
------	------	----------------	---------------	--------------	--------------	---------	---------

News:
List with Title,
head lines og date

General information about NorDig

Member login
Excom members
/
NorDigT members

Mail reflector:
Public reflector
with news
and
Specifications.

(mail list
administered
by webmaster)

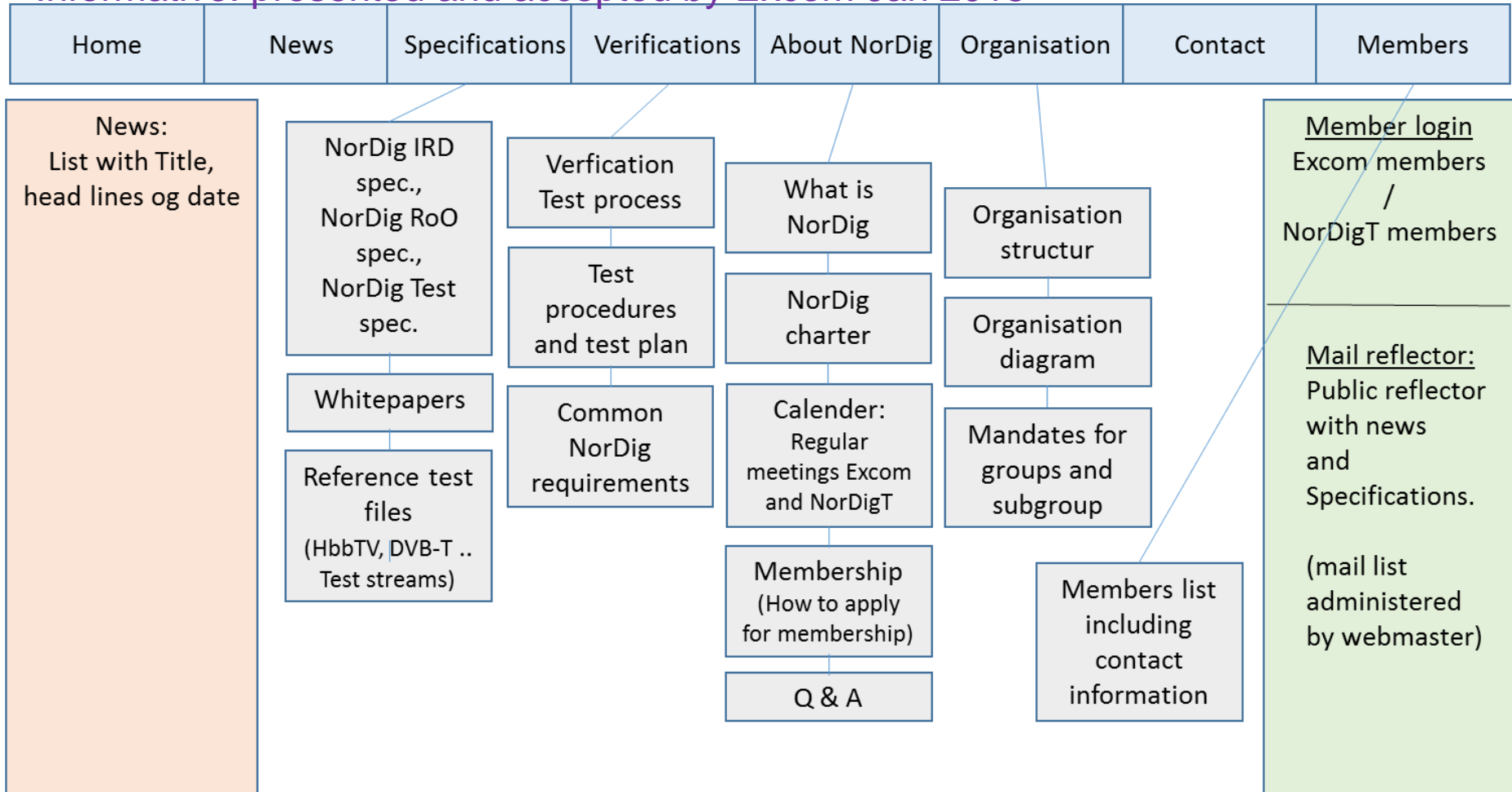


NorDig T report – website update (3/5)

NorDig Excom meeting 18th February 2016 - Annex

NorDig website new design and structure : Home / start page, public area

Informative: presented and accepted by Excom Jan 2015





NorDig T report – website update (4/5)

NorDig Excom meeting 18th February 2016 - Annex

NorDig website new design and structur : members area / Excom

Informative: presented and accepted by Excom Jan 2015

Home	Calender	Excom	NorDigT	API gr.	Audio gr.	RoO gr.	Test gr.	Access. gr.
------	----------	-------	---------	---------	-----------	---------	----------	-------------

Calender:
Meeting calender
Including all scheduled
meeting for Excom,
NorDigT and Subgroups.
All members have acces
to the calender

Excom
member list
with contact
information

Excom:
Minutes

Excom:
Documents

Excom:
Document
templates

NorDigT
member list
with contact
information

NorDigT:
Minutes

NorDigT:
Documents

NorDigT:
Document
templates

Mail reflector
for
Excom members:

mail notification
when new
documents is
uploaded, changes
in the calender,
Specifications and
News.

(mail list
administered
by webmaster)

Note: "Home" give access to home / start page



NorDig T report – website update (5/5)

NorDig Excom meeting 18th February 2016 - Annex

NorDig website new design and structur : members area / NorDigT and Subgroups

Informative: presented and accepted by Excom Jan 2015

Home	Calender	Excom	NorDigT	API gr.	Audio gr.	RoO gr.	Test gr.	Access. gr.
------	----------	-------	---------	---------	-----------	---------	----------	-------------

Calender:
Meeting calender
Including all scheduled
meeting for Excom,
NorDigT and Subgroups.
All members have acces
to the calender

Excom
member list
with contact
information

NorDigT
member list
with contact
information

NorDigT:
Minutes

NorDigT:
Documents

NorDigT:
Document
templates

API gr.
member list
with contact
information

API gr. :
Minutes

API gr. :
Documents

API gr. :
Document
templates

Audio gr.
member list
with contact
information

Audio gr. :
Minutes

Audio gr.:
Documents

Audio gr. :
Document
templates

Mail reflector
for
NorDigT and
Sub group
members:

mail notification
when new
documents is
uploaded, changes
in the calender,
specifications and
News.
Only Subgroup
members get
notification for activitys
in there group.

(mail list
administered
by webmaster)

Note: Same design and struktur for all subgroups

Peter Mølsted 22.09.2015