



KEEPING CONTROL, IN THE AGE OF

androidtv



iFeelSmart

An **Broadpeak & iFeelSmart** eBook
authored by Ben Schwarz

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1. Executive brief



What

The White Paper addresses the strategic questions for a TV operator behind the choice to use Android TV (ATV).

How

We endeavour to provide the complete picture, looking into the advantages brought by ATV as well as discussing its potential drawbacks.

We spoke with over a dozen experts and operators in researching this paper. The central question was how to keep operator STBs at the centre of subscriber's homes and what role ATV plays. The interviewees included trailblazing Bouygues Telecom, that was the first significant operator that decided to use Android TV back in 2013. In a nutshell, the picture that arises is that Google has listened to operators' concerns and created an offer too compelling to resist, for mid-sized operators at least.

White paper structure

We start off looking into the context of Android's emergence in the TV space, focussing on parallels such as the emergence of Android on the mobile. We explore what we know has already changed in the TV market before briefly hazarding some guesses as to what more changes might be on the near horizon. We then describe how successful operators are responding to the challenging landscape and what role ATV is playing in that response. We wrap up with a short message from our sponsors and attempt to boil this white paper down into the key takeaways.

"Partner TV is the fastest growing TV service in Israel. This is mainly due to the advantages that ATV brings. In an era of super-aggregators our choice to go with Android TV was really simple and pretty one-sided".

Liran Dan, VP Strategy & Business at Partner TV.

2. The context of Android TV's emergence



2.1 Starting from a hard place

Most network operators come from the ISP business. Only a few decades ago, a fixed-line telephone operator had a monopoly in almost all markets. It's still the case in some places. As competition entered markets and revenue started to drop, the operators gradually realised that having to compete on price alone was a bad idea. So, they have been fighting to remain higher in the service food-chain for almost two decades. Many observers believe this not to have been a successful endeavour so far, let's see if Android TV

"When we started five years ago, there was the concern of getting too close to Google. CenturyLink was concerned about Google becoming a competitor. As Android TV was more of a European initiative back then, we started by talking to Bouygues Telecom, then Swisscom. Benefits appeared to outweigh our concerns: platform capabilities, economies of scale, differentiation thanks to the UI, the OEM community supporting ATV, lower costs, opportunities to position apps. Google have taken operator partnerships very seriously; they've been listening to make it a win-win relationship."

Steve Sklar, Vice President, Video Strategy & Development at CenturyLink 2011-2018.

spices up the game at all.

2.2 The mobile parallel

Naysayers will point to the mobile example as a reason to stay away from Android TV. Indeed, at the turn of the century, mobile operators owned the handset customer experience. Operators would typically lay down a set of guidelines any handset maker had to implement, before being taken into consideration for use on their network. The Orange book, for example, was over 200 pages long.

The mobile operators' world changed when iOS and then Android started making inroads. The Application stores proved to be a dominant feature. Even with hindsight, it's hard to see what other routes operators could have taken than embracing these new operating systems. Now that these two mobile environments have taken over the mobile world, the tables have turned. Android or iOS users will find it much easier to change mobile operators than to switch OS.

It is the mobile equivalent of "Cord Cutting" in the TV business and is now a fact of life.

From owning the whole experience, operators have become responsible for only a few parts of it. However, it is a vibrant future-proof environment, and it is preferable for most to be a small part of a large growing environment than to own a small dying one.

2.3 The music parallel

The music industry also has some important things to teach us about dealing with Android TV.

Filesharing took the world by storm at the end of the nineties. At its height, Napster was considered a threat to the whole music industry. When it was finally shut down through legal action, peer-to-peer filesharing programs like Gnutella took over, removing any viable target for the music industry. The remaining music majors at first resisted any digital filesharing schemes, unless accompanied by cumbersome security mechanisms that made files unplayable on all but one device. This resistance just accelerated the illegal filesharing, so in the end, they had no option but to accept offers from visionaries like Steve Jobs and to embrace streaming.

In today's TV business context, operators have the added challenge of needing to differentiate despite TTM and TCO being as critical as ever.

2.4. Other contenders

There is, however, some optimism despite all the doom and gloom above. Android is currently a compelling solution on the TV, but unlike in the mobile phone markets, it is one of many options.

Other contenders to bring a whole ecosystem to the TV include Microsoft that has tried and failed several times and so seems out of contention for now. Apple has a different approach with its vertical ecosystems based on much of its hardware. There are a few TV service launches around the world based on the Apple TV, but volumes are negligible in comparison to Android TV's 140 on-going projects in 60 markets as announced at IBC 2019, with half of them launched and the remaining in preparation. Apple's TV offering has strategic similarities with Google's but is several years behind. In a move very similar to ATV Operator Tier, Apple has just launched an « Operator TV » program to onboard operators' apps on Apple TV.

There is however a significant price difference, with Apple TVs retailing for 169\$ with its high-end specifications vs. ~70\$ for ATV devices. Apple also offers a vertically integrated hardware, software and services solution, whereas Google provides software and services only.

Perhaps the last big potential contender to not yet have fully shown their hand is Amazon, who is also preparing a program for Fire TV similar to ATV Operator Tier. From a business-model perspective, any fears of letting the fox into the chicken coop with Android should be even stronger with Amazon. Indeed, the latter is a steamroller into any sellable service or product.

RDK is another option for operators that has many merits. Perhaps the most significant one is that it is an initiative by Comcast, so it can claim to be "by operators, for operators".

SoftAtHome makes the same operator-centric claim, and there are still a few other vendors that offer Linux-based middleware platforms such as Wyplay, Oregon Networks, Zenterio, NAGRA, Synamedia. The arrival of ATV's Operator Tier has been perceived as an existential threat by many, Zenterio exiting the market and other adding ATV to their portfolios.

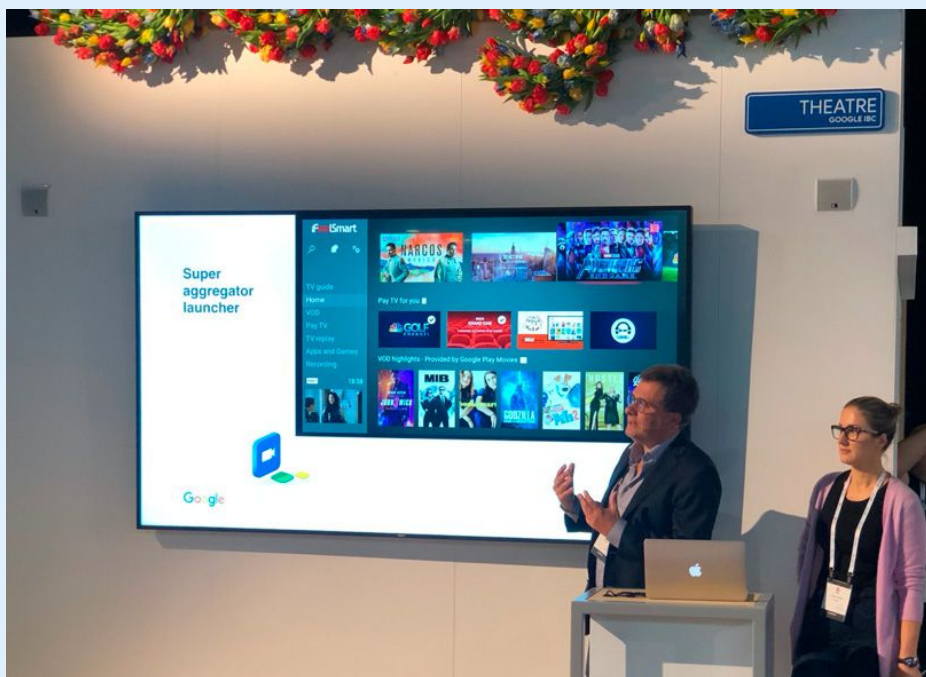
A significant drawback, when compared to ATV is that RDK is more of a toolkit than a complete product (according to CenturyLink's Steve Sklar, it requires much more "heavy lifting"). It is thus more suitable for Tier1 operators with significant R&D power. By its very nature, RDK allows for fragmentation (while the antifragmentation policy of ATV is one of its key strength).

However, there is undoubtedly a remobilisation of the leading RDK players with the recent launch of an RDK Accelerator program and the first pre-integration of an app store with Dutch company Metrological (which has recently been acquired by Comcast).

Partner TV sees a competitive advantage in offering a combination of Live, on-demand and catch-up services.

"Half of the current usage is for live TV with the other half almost evenly split between streaming services such as YouTube or Netflix and time-shifted TV. It is the seamless combination of the three that creates the perfect storm. This blend is our formula for being a super-aggregator, and ATV is the only platform to be fully tuned to this requirement"

Liran Dan, VP Strategy & Business at Partner TV



The emergence of the “super aggregator” model

When a company keeps up-to-date information on services or content that other companies own the rights to distribute, it is called an aggregator. In that sense, an internet search engine is an aggregator. Even if they have to leave the service to consume the desired content or service, users will always come back because they know they can find what they are looking for from there.

A supermarket where you can buy products from many different brands isn't an aggregator because the retailer needs to stock the physical goods.

There is no standardized definition of the expression “super aggregator”, which is more recent, suffice it to say that it implies a mix of content from different providers, which in our case must include live TV and on-demand content such as catch-up TV and VoD. Deep linking, which we

will get into later, enables this model.

It is associated with the introduction of technologies that are relatively new to the TV space. For example, AI can be used to refine analytics to optimize the overall customer journey. Indeed, early adopters of this model found that a purely app-centric approach doesn't work. For once, Steve Jobs was wrong in one of his visions that the future of TV was the App. Beyond the initial discovery phase, when user will try out lots of different things, navigation cannot be based primarily on App selection. The reality of multiple apps for multiple content sources on multiple devices makes the customer journey too complicated. In this context, TV viewers want aggregation. So, although we just said that traditional supermarkets aren't aggregators, operators can learn from Walmart on how to monetize real-estate.

Today's super aggregators, like Partner TV, see themselves as Pay TV 3.0 operators that offer a unified customer journey through fully featured premium live TV and third-party service content.

2.5. Is a dominant player a bad thing?

There can be a certain unease about any single company dominating a market. Some of this comes from what history has shown us about how monopolies can behave. The “do no evil” adage of Google's early years is a fading memory! But naysayers will need to deal with the fact that Android TV, as a platform, is here to stay. Dominant companies or even sometimes monopolies also have some positive attributes. In the case of a TV platform, scale brings improved support and ever more apps to name just two benefits. When Microsoft owned the PC market for over a decade, start-ups had a much bigger ocean to swim in. This market enabled innovation in its time.

As Google's rise continues unabated, we see similar opportunities for technology disrupters in the TV space. Access to a market of countless millions of devices will be available to established vendors and garage startups alike.

One of the goals of a good technical architecture is to future-proof the whole system so that any vendor can be replaced if needed.

An abstraction layer brings independence from many vendors, making it easy to swap in or out any one of them.

However, in the ATV case, the operator can become dependent on Google for some aspects of their TV project. An example from early 2019 can be seen in the trade war between the USA and China, where Google, despite its positive intent, can currently no longer provide Android updates to Huawei. HiSilicon, the chipset maker belonging to the Chinese giant, was one of the two leading Google-approved suppliers. Operators that had chosen that platform were left in the lurch, often just weeks before launch.

In a similar vein, third party App certification such as Netflix certification can also be dependent on a specific player in an operator's chosen ecosystem and

According to **Chem Assayag**, EVP Sales and Marketing, Viaccess-Orca:

“In many respects Android TV is becoming the main industry standard for STBs, and we are seeing interest and a growing number of deployments especially with Tier 2 and Tier 3 operators.”

[<https://www.viaccess-orca.com/blog/android-tv-platforms>]

so potentially become problematic if the third party App in question were to remove that certification.

2.6. AOSP, Android TV and Operator Tier

There are three versions of TV environment available from Google.

AOSP (Android Open Source Project) is a fully open source operating system designed for mobile and TV devices. It provides complete freedom of design especially with respect to the User Interface.

Standard Android TV ('Retail Tier') adds the Google TV Services (GTVS) to AOSP and comes with a standard user interface (also called the launcher) offers less opportunity for personalisation.

Android TV 'Operator Tier' is Google's most recent offering of Android TV, allowing operators the possibility to benefit from Google TV services while replacing the standard launcher / UI with their own UI.

	AOSP	RETAIL TIER	OPERATOR TIER
GOOGLE TV SERVICES	No, plain Operating System	All	All
FREEDOM OF UI DESIGN	Complete	Restrictive	Almost complete with a few guidelines to follow
APPSTORE	No	Yes	Yes
DRM (WIDEVINE)	No	Yes	Yes
GOOGLE CERTIFICATION	Self-certification	Required	Required
DRIVERS/ INSTALL WIZARD	No	Yes	Yes
TTM	Long	Fast	Medium

3. What we know has changed



When OTT video services first burst onto the scene over a decade ago, pundits debated whether such on-demand services would become mainstream and TV operators saw them as a minor threat. Five years ago, we started questioning how long it would take for them to become mainstream and operators saw them as a significant threat. Those debates are now over. OTT already is mainstream, and most operators see OTT as an opportunity. They can use OTT delivery to spread their services, but also to incorporate or aggregate other services into their own, thus widening their appeal.

So should operators see Google as an existential threat? Merrick Kingston thinks not:

“Google builds solutions wherever there’s an audience they can track. Pay TV and the living room is but one such opportunity. I don’t see Android TV as an overture to lay the groundwork for Google becoming THE trusted supplier of all technology to the TV market. Android TV is simply a mechanism to access an audience. In that sense, it’s not a means to an end, but is already an end to a means. Indeed, Google doesn’t fill all the gaps such as middleware customization, proprietary signalling or unicast-multicast harmonization.”

The question is of how to survive in an era of DTC (direct to consumer). Our most straightforward answer to that complex strategic question is:

1. Leverage your knowledge of YOUR client,
2. Where appropriate, manage the network to guarantee the Quality of Experience (QoE),
3. Offer the best User Interface / User Experience to retain control of HDMI 1, integrating both linear and ALL on-demand services,
4. To do that, if you don’t have a significant content business and are not in competition with Netflix, one of the more natural platforms is Android TV.

3.1. The growing importance of Live TV for OTT services

A new element is entering the mix: live TV. Live TV has become an OTT differentiator. In markets with a very varied subscriber base, carrying hundreds of channels can be a differentiator. Qatar's Ooredoo, for example, carries over 500 live TV channels that are already integrated into a full service offering delivered from an Android TV-based device.

If live TV is to become an OTT differentiator, once two competing services have similar content, what aspect of live TV could differentiate them?

- The User Experience (UX) must seamlessly integrate live TV streams into the overall User Experience. Content navigation & recommendation must harmoniously mix live and on-demand content. The choice of User Interface (UI) and UI designers are critical to succeed here.
- The Quality of Experience (QoE) is where the network operator has an opportunity to shine by being able to offer the best picture quality, latency, uptime or channel change time, for example. It is reliant on many infrastructure issues, such as having the right CDN.
- For any given demographic, the number of essential channels rarely exceeds 10. However, channel line-up is a more critical factor in markets with a more diverse population.
- Latency is the delay between the live-action and its appearance on the screen; it should be low at all times, but it is especially crucial in cases like top-rated live sports (e.g., world cup matches) and can be critical for few use cases like interactive live TV shows.

Broadpeak CEO **Jacques Le Mancq**, stated:

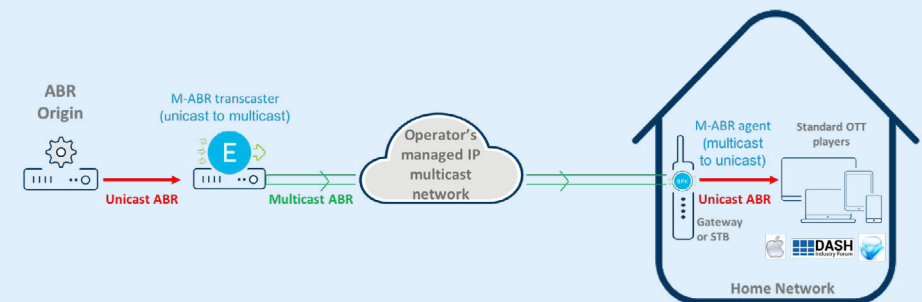
“To be used for primetime content on the main screen, live TV OTT definitely requires a broadcast-like user experience with respect to latency and zapping time.”

Blending the best of IPTV & OTT with multicast ABR

The two principal issues explaining why HTTP Adaptive Bit Rate (ABR) still struggles to replace broadcast TV are scalability and quality of experience (QoE). By adding the efficiency and improved reliability of multicast to the new multiscreen and personalized experience of ABR format, multicast ABR (M-ABR) elevates IPTV to the next level. With this new full-ABR generation of IPTV, viewers can navigate between live and time-shifted TV, on any device and get personalized content without compromising quality of experience.

Broadpeak's M-ABR, called nanoCDN, is optimised for low latency such using the Chunked Transfer Encoding (CTE) mechanism of HTTP and the Low Latency Chunk (LLC) option of CMAF, making post-encoding latency negligible. TV operators can finally unify delivery to the main screen and all other screens into one single full-ABR IPTV system.

How nano-CDN works



- At the head-end side, a transcaster retrieves the ABR sources from any OTT origin server and wraps them into multicast
- At the client-side, a lightweight agent in the CPE, typically an IP gateway or a set-top box, receives and unwraps the multicast to make the ABR content available in unicast to all devices in the home
- The technology integrates easily into any existing ecosystem and is compatible with any delivery mode: DSL, FTTH, Cable, Satellite and Terrestrial

EMI

EMI is IFeelSmart's cloud-based service for the management and the editorialization of the User Interface.

The native code of the UI frontend brings high performance while remaining controllable and customizable in real-time by the Operator without any application update or (re)certification. EMI solves the age-old issue needing efficient nifty code on the client while still needing to keep the whole system maintainable.

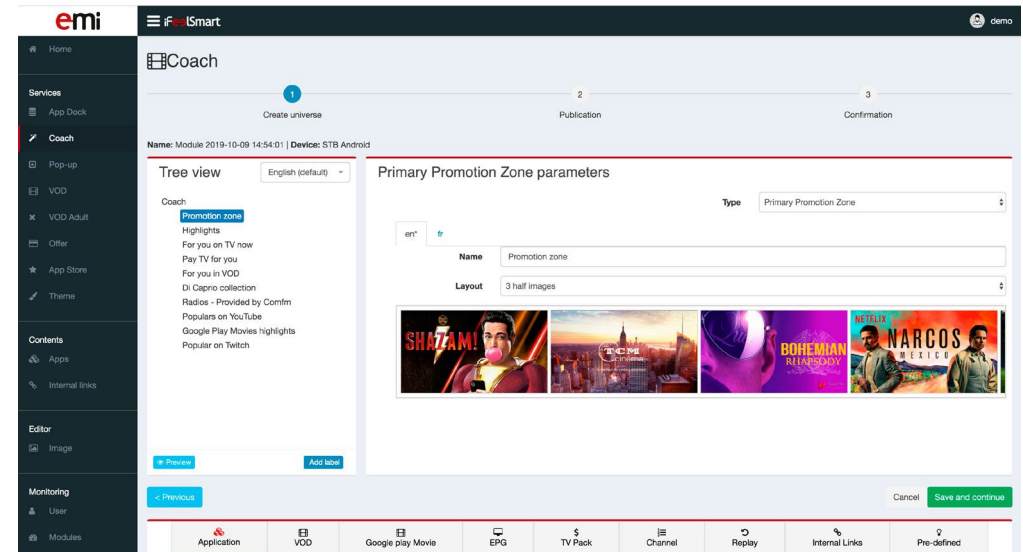
It is an intermediation tool between the operator's own content services and third-parties so that subscribers have a seamless, rich experience.

In today's world of super-aggregation, EMI lets Operators dynamically update their UI and the content they are promoting in-line with their business goals and partnerships

Editorialization and animation of the user experience are essential in:

- [The home page](#)
- [VoD aggregation](#)
- [The promotion of specific offers](#)
- [Contextual app selection](#)
- [Popup management to help push new services throughout UI](#)
- [More features, including replay TV and nPVR, are scheduled for release soon.](#)

An EMI-powered UI can be set up in a few minutes, defining target subscribers (e.g., just those with 4K TV sets). For deep linking with Netflix, for example, the operator can cut & paste a URL. When integrating an app, there is a smart feature where you insert a URL from the app and EMI works out most of the required metadata.



Editorialization can create scalability issues for larger operators. We commonly see deployments start without any proxies (cache). When performance issues arise, a proxy is usually used in the device (STB), which worked great at first but turned out to be challenging to maintain. The learning for our deployments is that the most cost-effective location for the content editorialization proxy is in the network.

3.2. The need for editorialization

Another new differentiator that has appeared in TV services is editorialization, which has now become critical for operators to retain an intermediation role. Despite progress over the past few years, content navigation and recommendation tools haven't delivered on their promises. The ATV environment lets operators use all the latest content navigation tools, but doesn't fundamentally change this issue. It is still too often a daunting task to find something to watch, whether you're looking for a specific movie or a recommendation. Service operators have the opportunity to enrich the subscriber experience through editorialization, which also offers them a means to optimise catalogue monetisation.

Operators that are leveraging this opportunity have assembled dedicated teams, often recruiting outside talent. Privacy and competition regulation vary from market to market, but some operators can leverage a deeper knowledge

of their subscriber by collecting information from multiple services.

Operators will need dedicated marketing staff and tools to manage editorialization successfully. Embracing this sort of animation tool is critical for operators to maintain an intermediation role. Newbie operators or smaller T2s need to get to grips with the whole issue of editorialization – possibly by hiring an external agency or consultants at first. Larger TV operators that have been editorializing their content for years need to learn how to add other people’s content and services to their animation within a unified experience.

A smart tool will enable contextualization of an app’s appearance depending on where you are in the UI, using triggers such as goal, time of day, or target population to launch. This way, an ad or promotion to order a pizza would only appear to potential customers at the right time.

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3.3. Ad insertion

Targeted advertising is another one of the long-promised changes in the TV landscape that is finally here, well at least in the US market whose TV channel affiliate structure is particularly well suited to ad insertion. Google is the largest ad company in the world by far, and a central goal of the ATV initiative was always to reach the main screen in the living room. Operators that use Android TV may, therefore, have reservations about letting Google capture too much of the ad revenues, but there are alternatives to Google’s advertising tools from the likes of Nielsen, Cardant, Freewheel or ComScore. It is therefore essential that the technology ecosystem that an operator assembles remains agnostic to the ad server solution to avoid potential vendor lock-in.

With adaptive bitrate (ABR) technology used for multiscreen distribution, ad insertion or replacement is facilitated by the technical architecture itself. Indeed, a manifest file is used to tell client software in which order to reassemble the different chunks of video. CDN vendors such as Broadpeak

can add value between the Origin server and the caches by manipulating the manifest file to insert new ads or replace existing ones. Targeted ads can be inserted in the manifest or even a playlist of VoD assets used to create a linear channel. The manifest file can also indicate if an ad is skippable or not.

Personalisation based on location, network type, device or user profile could be provided from elsewhere. Server-Side Ad Insertion (SSAI) is simpler to integrate than Client-Side Ad Insertion (CSAI) which can be deployed over weaker networks as the targeted ads can be prepared in advance and integrated even into a multicast stream, but are less robust overall, requiring higher maintenance. SSAI is particularly well suited to catch-up and nPVR services where content owners can have their say on what ad is shown and control the overall interface leading to better user experience. If a gap appears in the manifest, a still image can be inserted to keep the stream up. SSAI also offers more robust responses to ad-blocking software.

Independently of a platform like Android TV, ABR and unicast delivery are slowly pushing the market towards a web type of experience where ads are already personalised.

Successful ad-insertion requires granular analytics, which needs data from both the server and the client-side app.

3.4. Speed, speed, speed

As monopolies crumble and competition enters TV markets, reducing time-to-market has become an adage of our times. The last decade in particular has also seen major organisation changes. Concepts such as agility have become a major focus and brought about open ecosystems. Open source development was for decades limited to research, now all corporations leverage its advantages.

Deploying or upgrading a TV service has always been a significant undertaking for an operator of any size. With the advent of Android TV, the “make or buy” and best-of-breed ecosystem questions must be re-addressed. Android TV changes the situation by becoming a de facto standard. So, for example, whereas integrating Netflix on a small stand-alone project is a big deal, there are no technical challenges with ATV. The system integrator’s role now becomes primarily testing, with much less coding required for integration.

According to Partner TV's VP Strategy & Business Development **Liran Dan**,

“Android TV is the easiest way to launch a new service. We took our decision mid-2016, announcement it in December 2016 – to our competitors’ derision – and launched commercially in June 2017, with first active subscribers by August.” Dan added: “the weight of legacy TV infrastructure is higher now than at any time in the past, so new operators have an advantage.”

Because of all the available HW and innovation, Android can be considered a more open ecosystem.

Over time Google has tackled all the typical pitfalls of a TV project. They have co-designed and pre-certified devices; they will include a broadcast stack (that will itself be pre-certified with the major CAS vendors) within ATV; they are continually hardening the test suites used for certification. Whereas the typical TV project’s TTM was traditionally between 12 to 18 months, the aim is to decrease the duration to 3 to 6 months for an ATV project.

Of course, Google’s TV platform has some “take it” or “leave it” features, especially around search. So, for example, for an operator wanting the full benefits of Android TV, even using Operator Tier, only Google’s voice assistant may be used.

TTM for new features is also reduced, for example, if an operator decides to target eSports fans in the future, they could offer deep links into Twitch from their home screen, without any specific development.

3.5. Device agnostic – at last

Operators have been sold “open” solutions for decades, where software layers we’re supposed to provide the abstraction needed so that different vendors could be swapped in or out. This openness unfortunately only usually worked on paper. In an operational context, some vendor lock-in always crept back in as there were still some adaptations carried out on devices. Swapping devices

would remain possible but costly. With the end-to-end control by Google, a certain level of device agnosticism is possible for the first time.

There are, however, some clouds on the horizon when deploying an Android TV solution. Google has to certify critical components such as chipsets. Google takes care to ensure multiple certified vendors, however, in the chipset case, no one predicted that one vendor would be blacklisted by government authorities, taking them out of play and creating a de facto partial monopoly.

Google state that their motivation in developing ATV includes a consistent distribution of services (YouTube, Playstore, ...) and the reduction of fragmentation.

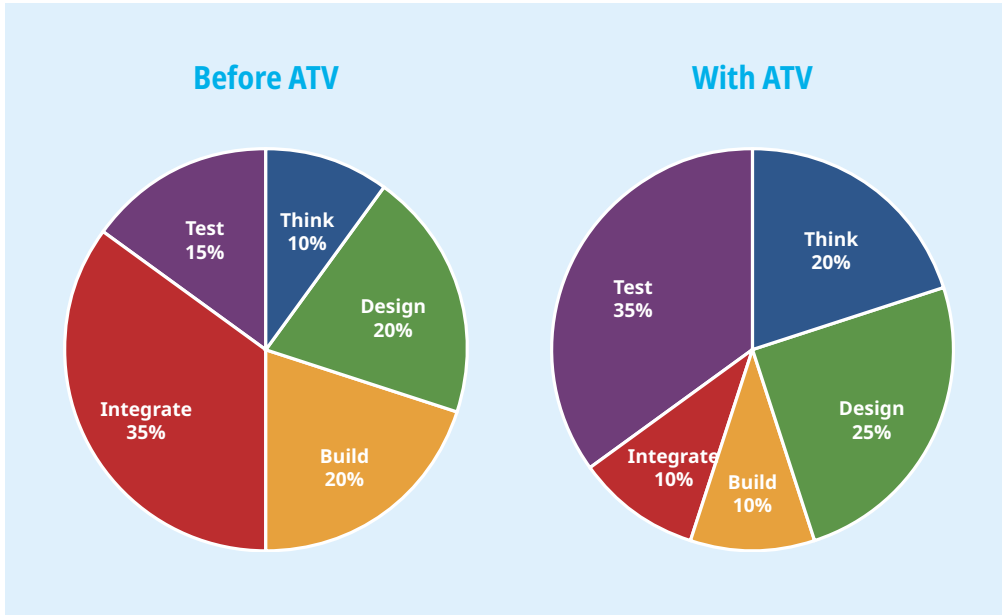
A particular allure of the Android TV platform is the ease of adapting the user experience to STB, mobile phone, tablet and smart TV. Google’s reach makes it easier to ensure all services are available everywhere than with previous developments environments such as Linux

3.6. Business modelling with Android TV

With so many market-specific issues, creating a business model is always a unique experience for each operator. The 10,000-metre view that we must take here, only lets us ask the important question of how much the Google platform actually costs to own. We all know that a catalogue price - even if it’s zero - doesn’t usually reflect the total cost of ownership (TCO). Indeed, no one knows the full TCO of Android TV. We mentioned above that by acting as a de facto standard Android TV lowers the risk and cost of integration.

There are other open-source alternatives to AOSP and ATV, but in the traditional model, middleware providers would take a licence fee per device. That is the cost that disappears with ATV, but note that it is a marginal cost, i.e. you only pay it if you are successfully deploying devices to paying customers. The business model impact of using ATV is more significant for smaller operators that can otherwise find the minimum orders challenging.

We also mustn’t forget that despite its growing scope, ATV still needs many other technology components to deliver a commercial service including, for example, all the video processing infrastructure. And, of course, content, often the highest cost for deployments is beyond the scope of this paper.



deliver this promise over time. However, DCB on mobile devices with Playstore is still small. DCB for third-party apps like Netflix offers other potential revenue streams.

Android TV detractors will use the mobile example we discussed above to ask if the platform is really free. Consumers have become savvy to the idea that if a service seems wholly free and without advertising, then it is them and their data that are the product. So, if there indeed is no free lunch, it seems legitimate to ask if this the same for Android TV.

According to **Merrick Kingston**, Associate Director for IHS Markit Technology,

“Google’s powerful ad offerings run parallel to their TV platform. It is unlikely they would try to shoehorn everyone into their offerings without regulatory alarm bells going off in most markets. If Google wanted to have a bigger impact in the ad-space, the company would need to enter the services market, which it doesn’t seem to want to do.”

Revenue share is a central promise from Google’s opening monetisation opportunities. When **DCB** (Direct Carrier Billing) is used, typically 70% goes to the content/app publisher, 15% to the operator and 15% to Google. There isn’t yet enough historical evidence we can use to guess whether Google will

4. What might change further



4.1. Disruptive new business models and use cases

By definition, we don't know what these might be, but already some ideas can be borrowed from other markets such as eSports. A possible business model could be based on leveraging a large community of fans around the world that are already interacting on different digital platforms to create enhanced metadata in near real-time. Some of this data could be scraped off a website or even subscribed to, to enhance an operator service.

In a different area, hands-free operation is already available although still a bit tricky to use. Once the voice technology matures, the inclusion of far-field mics will create new use cases, linking IoT devices such as a Nest thermometer or a doorbell. Multiscreen functionality will develop further also with in-home experiences being extended on-the-go, including in the car too.

4.2. BYOD – lose control of QoE – will come in a few years

According to Google, in early 2019, over 1000 devices could already cast to a Google TV. There is no way that quality assurance engineers can guarantee a homogenous level of experience with such an open platform.

This is where Apple's closed vertical

ecosystem contrasts most with Google's openness.

But the age-old question of changing generational perceptions is still wide open.

The flexibility offered by opening up platforms to so many devices will seem like a fair trade-off to many, even if operations aren't always as seamless as with closed ecosystems.

BYOD or Bring Your Own Device has another characteristic that is both counter-intuitive and also difficult to quantify. Many users will have an emotional investment in their device, especially when their equipment is used as part of a shared entertainment experience. They will be more tolerant if it takes more effort to set up and also perceive more value in the resulting experience.

4.3. Are Y and Z generations changing user perception of Quality?

Indeed, younger generations do have different expectations when it comes to traditional quality metrics. Today's youth grew up with the Internet, so the idea that any specific service should ALWAYS be available is foreign to them. It is a collective experience, when modern families gather around the TV, say to watch a Netflix stream, if there is lengthy

rebuffering incident, the parents would typically get upset and probably try to fix it while the kids would simply divert more attention to their mobile device – that was in all likelihood already out – while they wait for the situation to normalize.

The open question is then, how these young people will behave when they again have a home family entertainment experience, but this time they are the parents.

4.4. Is the decline of Linear TV over yet?

For the last decade, this has been a strategic question for operators, even an issue of survival. Whereas a decade ago, linear TV took up almost all of viewing time, it now takes up somewhere between 50% and 70%.

The question of whether it will continue to drop, even disappear, except for some news and live sports content, is still a burning one for many. However, operators that have a super-aggregator approach, as defined above, can be more relaxed; they will win whatever the outcome.

“According to HIS Markit, Cross-Platform Television Viewing Time 2019 report, total average daily video viewing time, excluding social media viewing, for the countries analysed stood at 273.7 minutes per-person per-day in 2018. This compares to a peak of 284.3 minutes in 2013, when linear viewing held an 87% share of total viewing in contrast to a 67% share in 2018.”

<https://www.digitaltveurope.com/2019/07/02/total-viewing-time-dips-as-viewers-turn-to-non-linear>

4.5. Content protection is getting more accessible

Digital Rights Management (DRM) delivers content protection which can be a differentiator when competing for exclusive content. Organizations that represent the interests of content owners, such as Movie Labs, have set stringent requirements – that are not always met in the market. Operators that didn't want to become dependent on a single vendor have traditionally relied

on multi-DRM solutions over the last decade. But the security market's rapid evolution is making it hard to read for an outsider, so we referred to an expert here. Steve Christian, long-time CMO at Verimatrix is currently Principal at HTM Solutions, and we learnt from him that:

- Android security has become more and more tied to chipset level functionality as premium content requirements get addressed by the platform.
- 3rd party DRM security options have been less emphasized with each Android generation as Widevine DRM becomes more of a dominant component of the system.
- Widevine CAS, now being introduced, will address the security of DVB content as hybrid STB options are seen to be dominant in the operator market.

Vertical integration potentially reduces the integration hurdles for Android TV deployment in smaller or mid-sized operators. However, it certainly seems to be out of step with some industry security trends and precedents that are important to more significant players.

4.6. Automation

Pay TV 3.0 operators are focused on optimising TV screen real estate more than just raising Pay TV ARPU. The physical supermarket analogy is about knowledge of the client, billing, defining an enjoyable customer journey throughout the shop in a holistic approach. The operator's ability to control things is crucial, and as we will see, there are a lot of manual editorialization tasks to do. Within a few short years, we expect much of that to leverage AI and be mostly automated.

The aggregation of basic service metadata is already underway. A natural next step will be to use Business Intelligence to help automate the content curation and editorialization processes.

5. So how to respond?



There are some basic features that any user of a TV service will expect today.

According to **Merrick Kingston**, Associate Director for IHS Markit Technology,

“The critical features to consider for a next-generation TV platform like Android TV include: seamless navigation between live and on-demand TV, an Appstore, Multiscreen, Casting, Bluetooth and Voice support. Although many platforms offer all of these, none can match Google’s price points.”

Note that if multiscreen has become a must-have feature, so that the whole service can be accessed on different devices, the oft-touted companion screen approach – where the main video on one screen is complemented by other information on another screen – has still to take off.

5.1. Find the sweet spot between operator and subscriber motivation

The understanding of subscriber behaviour and intent relies on analytics (beyond the scope of this paper). Consumers can be flexible and enter into trade-offs such as quality vs. choice or money, for example. GDPR has raised

awareness of privacy issues, which also come into the trade-offs, especially where Google is concerned.

A critical issue to resolve is how to leverage personal data for a better user experience without compromising user privacy or risking data breaches. Operators have an opportunity to offer compelling value here. The Silicon Valley-based giants like Google don’t have good reputations when it comes to data privacy. Local providers will usually have physical customer touchpoints and a trusted billing relationship with subscribers. When they are also ISPs, they already have a device that they manage in people’s homes.

Associated with a local provider, Android TV can offer a sweet spot between high performance secure/safe system and an open, innovative environment.

5.2. Take advantage of Google’s firepower, innovation roadmap

First of all, the mere existence of a roadmap is favourable for many operators that don’t have their own. Larger operators will use the Operator Tier version and so be able also to follow their own roadmap.

Fierce debates still rage on the merits of being associated with Google’s roadmap. Note that this is only a significant criterion for tier one operators or the largest tier twos. Other operators are entirely

dependent on vendors roadmaps in any case.

Some will see leveraging Google's thousands of developers, as well as an order of magnitude more through the Appstore as outweighing any misgivings.

Several of the operators we spoke to had thought clearly about this aspect.

5.3. Deliver a seamless experience, simplicity

Partner TV's **Dan** said, concerning lack of control of innovation roadmap:

"Sure the lack of certainty can be frustrating, but the advantages far outweigh any disadvantages."

Bouygues Telecom's **Yves Legrand** said, isn't concerned about losing control of the innovation roadmap.

"Anyhow the key innovation features will always come from the operator – we control much of the services we offer starting with UI. Moreover, we have always been close to Google and still have regular roadmap discussions with them."

Merrick Kingston, Associate Director for IHS Markit Technology noted that

"Google makes few commitments – operators have no idea what might be beyond next release (i.e. they have at best 12 months of visibility). If anyone claims to have an idea of what ATV will look like in 36 months, don't listen. However, Google is incentivized to make the right moves, so I don't expect anything rash from them."

The best user experiences usually seem simple, generating reactions such as "oh well I could have designed that, there's nothing to it". That is the art and science of User Interface design.

Google, Apple, Netflix and others have indeed standardized many aspects of the user interface. Movie posters are presented in the same way, for example, and navigation paradigms have mostly converged. But don't let that fool you into thinking that offering a simple UX is now straightforward. Especially in a competitive market, UX and UI design are still needed.

We have stressed many times in this paper that live TV is a growing part of the new OTT offerings. The "seamlessness" of an offering will therefore also depend on how well the live experience is integrated, for example, with low channel startup times. The latest Adaptive Bit Rate technologies may seem simple to deliver deploy. Operators that want to shine here will need a dedicated CDN strategy.

5.4. Editorialize the user experience with rich metadata and deep linking

Deep linking has several levels.

1. With Android channels, since Android O, an app such as Netflix can expose its contents to be exploited by the UI developer. However, the original app decides what to show, which can often be nothing.
2. A content management system (CMS) such as EMI described below, can let operators manually import content from any app (Twitch, Netflix, YouTube, ...). The operator can then use this anywhere, including with deep linking. Metadata can be scraped from the web. Typically, only a dozen pieces of content are put up at a time with such a manual process.
3. The holy grail of deep linking is to integrate third-party service APIs directly. Only the largest Tier 1 operators such as Comcast, Sky, Telefonica or Vodafone are doing this through specialized companies like Neulion or Red Bee. Netflix is still in trial mode on this and only wants to deal with large operators to obtain actionable analytics. The deal must be directly between the large operator and Netflix and doesn't concern Android TV or Google. Google Play Movies is a much more accessible option for smaller operators.

The deep link dilemma: Keep control of UX or set the user free?

Deep link is a link that points directly to the content being searched rather than to the service that hosts it. In that sense, most web links like google search results are deep links. There are several separate issues with deep linking

- The owner of the targeted content may want to take user there themselves, perhaps offering branding and advertising on the way (from this perspective, Netflix only allows deep links to content that it approves)
- The portal providing the deep link risks sending their user somewhere from where the user never returns
- The responsibility if the content is inappropriate (e.g., age restrictions or censorship)

Partner TV's **Liran Dan** said: "All providers are now struggling with customers wanting to use streaming services and devices where it's a free-for-all. The customer gets caught in the crossfire of marketing between all services. With ATV, the operator can provide customers with an excellent service, integrating other OTT services."

He added, "At Partner TV, we followed IFeelSmart's advice and pushed deep linking wherever it could improve the customer experience. The customer is king, our mission is to satisfy their desires. If they want to stay in a 3rd party app that's fine with us. As long as they are having a great experience on HDM1, they'll always come back, because we only take them on places they want to be. **Our mission and privilege is to make people happy and deep linking is a core part of that.**"

Deep linking can also take users to non-TV services. There are, for example, radio streams on Bouygues Telecom's service where users are taken directly to a ComFM program.

5.5. Deliver the best QoE for live TV OTT

OTT burst on to the market over a decade ago with on-demand services like YouTube. Netflix turned OTT into a money-spinner, but again with on-demand. Delivery of live video content OTT has now reached a level of technical robustness that it can be monetized. Live TV delivery has become a central tenet of any OTT TV offering – at the core of the super aggregator model.

According to **Merrick Kingston**, Associate Director for IHS Markit Technology, "Live TV will be part of core TV offering for years to come. Android TV, as an On-Demand-only platform, doesn't make sense to me. By playing a role in the migration to IP, Android TV creates CDN opportunities and reduces reliance on broadcast - especially satellite."

Live TV quality expectations are usually higher than for on-demand content – at least in terms of service uptime. Indeed, a rebuffering event during a VoD session is unpleasant but can be tolerable. A black or frozen screen during an important sporting event or newscast is less so. The issues of latency and channel start-up times are becoming more important to users as OTT delivery has now come up to broadcast standards.

Bouygues Telecom's **Yves Legrand** said: "Quality of live TV is critical, both in terms of choice, picture quality, and user experience. It is the first customer satisfaction criteria on the overall TV experience."

5.6. Leverage localization opportunities and differentiate however possible

We have seen above that security and privacy are growing concerns for

consumers. The impact of social media in recent elections has been a wake-up call for many. The Android Q release is heavily focused on these issues (mainly for location services, Google's core business still revolves around capturing and exploiting user data. Apple is trying to capture the new privacy Zeitgeist with commitments to protecting user data. More tech-savvy Y and Z generations will understand these issues. Global companies do not have a physical presence for most consumers, such as a number to call or a shop to visit). They will, therefore, have fewer opportunities to reassure older demographics about these issues, albeit subjectively.

This is where an opportunity exists for operators to embrace a platform such as Android TV for all its benefits, and to provide security and privacy commitments that only a local operator can do.

Localization is also about creating a French experience for the French market, and, for example, a Japanese one in Japan. There are market-specific niches, for example in France with independent cinema. A single global platform and content catalogue can only go so far in this respect.

6. IFeelSmart and Broadpeak offer



iFeelSmart

- Unified access (UI/Launcher) to all services including linear TV (integrated with Broadpeak)
- ATV expertise & experience with the largest worldwide deployment of Android TV Operator Tier launcher
- Pre-integration with various TV Platforms and end-to-end best-of-breed Android TV ecosystems
- Let operators influence/control how services are presented (including revenue share rules)
- A unique editorialization tool (EMI)
- separate content from UI,
- capability to modify UI from the Cloud,
- dynamic real-time control,
- powerful content aggregation.
- Netflix integration and certification for multiple operators and devices
- Super-aggregation of 3rd party content (Netflix, YouTube, Google Play Movies, Amazon Prime...)



- Flexible content packaging
- Video CDN: unicast delivery for both low-latency live TV and on-demand content
- Multi CDN (on-premises and Cloud-based) orchestration for cost optimization
- Multicast ABR delivery for low-latency live TV
- "Storage-assisted" time-shifted TV (pause / resume, start over, catchup, Cloud PVR)
- Video analytics
- Server-side ad insertion
- Infinite scalability
- Broadcast quality live TV OTT experience
- Technology based on ABR formats and DRM security schemes
- Pre integration within many end-to-end Android TV ecosystems

7. Takeways

In the end, the first operator to adopt Android TV at scale in the world has the most straightforward yet most compelling reason. They had previously chosen Android on the mobile phone with the same reasoning:

Bouygues Telecom's **Yves Legrand** told us:

"The choice for Android was driven in 2013 by features/services, quality and price, and that is still the case for 2020."

The two new operator roles that have emerged with the advent of ATV are first to simplify the linear TV experience by embracing the best OTT technologies, then to integrate on-demand content services leveraging ATV seamlessly. The operator can then contend for HDMI1, creating new revenues or just maintaining ARPU.

1. Leverage your knowledge of YOUR client.
2. Where appropriate, manage the network to guarantee the Quality of Experience (QoE).
3. Offer the best User Interface / User Experience to retain control of HDMI 1, integrating both linear and ALL on-demand services.
4. To do that, if you don't have a significant content business and are not in competition with Netflix, one of the more natural platforms is Android TV.

