Taking TV innovation from operator speed to web speed

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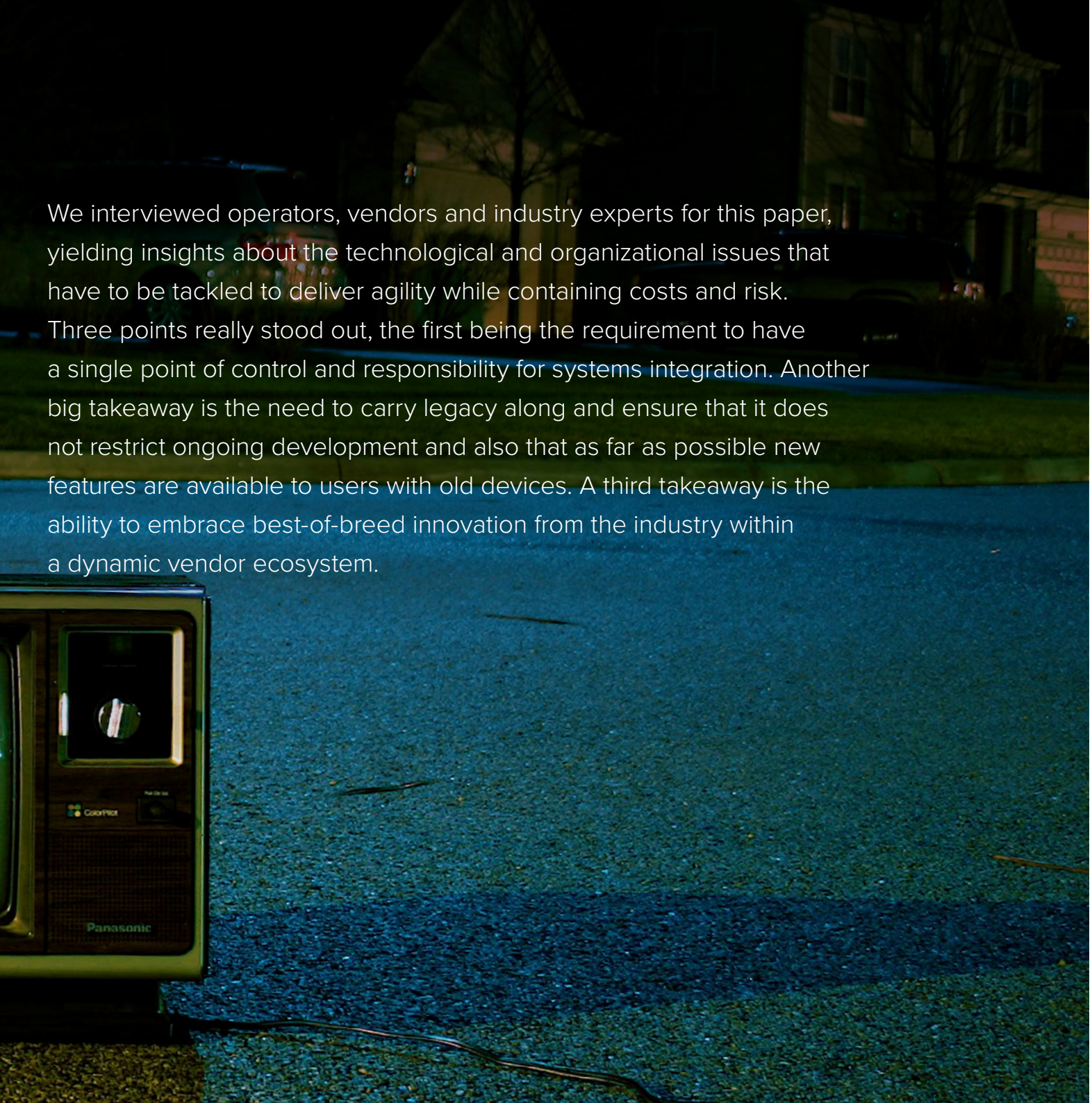
New approaches to development can bring TV innovation from operator speed to web speed with the right systems integration

An eBook by Ben Schwarz with additional writing from Philip Hunter

Agility and “web speed” have become rallying calls for pay TV operators in the multiscreen era where the rate at which services must evolve and new features appear has increased by an order of magnitude. Bringing on new customer-facing features within weeks was confined in the past to greenfield deployments but is now becoming essential even for operators encumbered by legacy. This was an impossible dream just a few years ago but is being achieved by a growing number of operators today, thanks to major innovations in software development, systems integration, operations and testing cycles. Just like virtualization and Cloud computing, these concepts have been imported from IT where they have been tried and proven, but have required adaptation for video distribution. The principle of DevOps, bringing development and operations closer together, plays a key role in enabling the required agility, along with a new approach to systems integration.

Site Reliability Engineering (SRE) brings operational agility alongside reliability. This eBook explores how the systems integration and project management processes have adapted and made it possible to drastically reduce time to market.

Keywords: Systems Integration, DevOps, Site Reliability Engineering, Agility, TTM, Ecosystem, Microservices, Orange, Telefonica, Nokia, NOS, Oregan networks, CCS Insight, V-Nova



We interviewed operators, vendors and industry experts for this paper, yielding insights about the technological and organizational issues that have to be tackled to deliver agility while containing costs and risk. Three points really stood out, the first being the requirement to have a single point of control and responsibility for systems integration. Another big takeaway is the need to carry legacy along and ensure that it does not restrict ongoing development and also that as far as possible new features are available to users with old devices. A third takeaway is the ability to embrace best-of-breed innovation from the industry within a dynamic vendor ecosystem.

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Agility: the new survival skill for operators

In my first involvement in an IPTV project in 2002 as an employee of France Telecom (now Orange), we had no set standard to adhere to, so trial and error was how we got most things done. A new idea would be discussed in a meeting and then see its way to a customer facing feature in just a couple of weeks. Concepts like backwards compatibility or non-regression testing were far from our minds. Then in late 2003 we went live and the party was suddenly over. Within the first few years of launch, as we crossed our first 100k subscribers, typical time from decision to implementation of a customer facing feature crept up inexorably from below 3 months to as much as 2 years at the apex.

We reacted as best we knew how in the old Telco way and proudly stabilized time-to-market (TTM) to just under 18 months. When a senior executive would realise that some new feature was an urgent "must-have" that could get top priority and jump the queue, non-top-priority features then went stale under ever-longer development. As a result, there was even a short time when all features became top-priority, defeating the whole purpose of prioritization.

That was a decade ago and this eBook looks into what has changed since then and how at least some operators have overcome these issues, but first, in this chapter we take a deeper look into what created this need for speed.

Agility or nimbleness is the ability to change the body's position efficiently, and requires the integration of isolated movement skills using a combination of balance, coordination, speed, reflexes, strength, and endurance.

Regulation and competition

Monopolies formed naturally in Telecoms leaving incumbents owning most of the wired infrastructure in many markets. Regulatory bodies then played an important role in enabling new entrants. As a result, for the first time in their history, incumbent operators faced significant competition and pressure to get new features to market faster and faster.

Web speed

The Internet had taken full root by over a decade ago, when it became apparent that the Web was here to stay. When services such as Gmail were first launched as betas and stayed that way for years, operators saw that as a sign of weakness since they would only ever launch something fully tested.

By the time they realised their mistake, that "beta" was well entrenched as a new mentality around "web speed," and so deep changes were needed in their practices and organisation.

"Telcos will get better at launching services more quickly as they embrace SDN and virtualization. But they have been stuck on longer development cycles and now need to move at web speed."
- Paolo Pescatore, Director Multiplay and Media at CSS Insight.

Content owners

Most stakeholders from the content production side, like Fox for example, are buoyant about new technologies and formats such as UHD. The Hollywood giant's CTO, Hanno Basse, is the founding president of the UHD Alliance and a great advocate of future immersive experiences.

All of Fox's new releases from mid-2015 are in UHD. Having fought a cat–and-mouse battle with pirates for decades, content owners also see the arrival of UHD as an opportunity to raise the security bar for operators, making life harder for pirates but also making agility more difficult to achieve for operators.

Consumer pull

The Web has not only been pushing operators to move faster, but has also put competition just a click away. Geographic market boundaries have become permeable. The consumer pull for change now combines with market/ technology push, as we shall see in the next section.

Orange, the biggest French operator, launched a new TV service based on new hardware. Setting up the UHD services took just a year.

The need for speed

As local and global competition increase, operators must be able to create and deploy new services and components quickly. The ease of integrating them into existing systems is critical. This is where ecosystems and systems integration are key factors.

"Time To Market (TTM) has been the big challenge for IPTV. We had 5 to 6 releases a year so there was plenty of scope for change, but the issue was the time from the moment you start defining something to the moment it is deployed. But now things have improved since Nokia, our prime systems integrator, has upgraded the STB architecture. We were able in 40 days to deploy an innovative feature which allows users to switch between cameras when watching Formula 1, using the Nokia Fast Channel Change solution. "

- Jose Maria Villalva, Head of TV Product and User Definition, Telefonica Spain.

Key drivers of operator transformation

The smartphone driver

Application stores and the reduction of smartphone lifecycles to 18 months have together changed the way consumers perceive technology-based products. They have come to expect a wider choice of applications from any device with features and services that stay up to date with the latest trends.

Multi-screen

Smartphones, tablets, games consoles, watches and newer IoT devices like wearable monitors are all connected and expected to deliver part of our overall online experience. Subscribers expect video based services to be available on all these devices as they gain market traction.

I have just taken delivery of the latest Orange 4K capable set top box and was impressed by the breadth of features. However, disappointment was strong when I realised that although I could see the list of what I had recorded on my set-top box (STB) from all my devices, I could only access video on the TV. I'm sure there are many valid reasons, particularly around content rights, but as a consumer I don't care. I just expect it all to work everywhere.

Delinearization

Delinearization has become commonplace in most competitive TV markets where all broadcasters have no choice but to offer catch up TV (CUTV). The BBC's iPlayer was one of the first platforms to establish the wide appeal of these services. A year after its launch in 2007 the iPlayer was already serving over 50 million requests per month for TV programs. In 2016, that number is often above 250 million. Beyond making programs available on demand, operators are under pressure to reduce the time to prepare content. France TV for example announced earlier this year that all CUTV content would be made available within 15 minutes of program ending.

Converging live and on-demand

The example of CUTV highlights the blurring of boundaries between live and on-demand TV. Of course live sports and news have intrinsic live value, but for almost all other content types, many users, and certainly all millennials, don't really care where it comes from; they just want it to be readily available. Subscription VoD (SVoD) has had much greater commercial impact than transactional VoD, at least so far. One reason is the greater simplicity of the product value in consumers' eyes.

Simplicity

With the iPhone, then the Apple TV, simplicity is now a user expectation for content services. Personal devices such as smartphones have led consumers to expect the interface to be personalized so that their preferences are always readily available. The challenge of personalizing a TV experience still has not been adequately met by any vendor or service provider, but the advent of machine learning and Siri-like conversational interfaces will go a long way to resolving the UI challenge.

"Meeting user expectations of smartphone-like graphics on legacy set tops and traditional remotes has proved challenging. But we have done the best we can with for example a filtering feature controlled by just one colour, green, allowing users to find what they want quickly from 25 pages of content. They can filter by genre, alphabet, time or relevance."
- Jose Maria Villalva, Head of TV Product and User Definition, Telefonica Spain.

Sufficient quality OTT

In the early days of the Internet, it was fine for Web TVs to offer lower quality than broadcast. It was a brave new world of early adopters. But as the rise of Netflix has proven, delivering premium content over the open Internet has become big business. Today's audiences don't care how services are being delivered to them as long as it "just works." The chart from the US-based website "outage.report" shows how almost 1,000 viewers reported Netflix outages for a single day on March 9, 2016. Yahoo similarly suffered a bruising incident in October 2015. Service downtime can cost operators more than it used to, as with over-the-top (OTT), competing services are always just a click away.

"As we can see with the EE focus on video for 4G and wired rollouts, Telcos are having to reach TV levels of quality, including in terms of simple must-haves."

- Paolo Pescatore , Director Multiplay and Media at CSS Insight.

Security issues with OTT

File sharing took the content industry by surprise at the turn of the century, as exemplified by the meteoric rise of Napster, prompting a violent revolution in the music business. A decade and a half on, there is still no consensus over how to turn this threat into an opportunity for rights holders.

Video rights have traditionally been sliced and diced very finely to maximize revenue both from each territory and every device type.

However, the Internet has made geographic rules harder and harder to enforce and allow new players like Amazon, Netflix and Apple to operate globally.

Operators today are pressured to launch services without having a clear vision of what rights will be available at what cost. Rights owners are using the arrival of UHD content to raise the bar for security, insisting on watermarking and hardware based solutions. This is another reason why operators have to stay agile.

"Watermarking poses privacy issues, and is not cost effective at launch when the market is small. In France, operators must comply within 48 hours to requests to take down content."
– Leading T1 operator in Europe.

Technology driving change

Disruptive technologies are driving change and the need for greater agility. They include:

- Adaptive Bit Rate (ABR) streaming, which ushered in the OTT video revolution
- More advanced compression to handle 4K
- High Dynamic Range (HDR) (a must-have)
- New security solutions must work on legacy STBs,
- Incorporating Virtual Reality (VR) into services is challenging, as use cases beyond demos are elusive
- HTML5, which enables true device portability
- Agile methods to enable perpetual innovation

Technology solutions

Virtualization and the Cloud

Virtualization is a fantastic enabler of agility. In a data network it is a process of abstraction, separating high level control from lower level components or functions. It divorces processes and/or resources, such as storage and CPUs, from their point of control, and distributes them across surrogate components that can be located in different places.

The motivation is to enable greater flexibility and scalability while reducing costs, all through the use of commodity hardware components that can be mass produced and added or removed rapidly on demand. In this way, virtualization enables agility.

In pay TV, operators are looking towards virtualization to lower costs as hardware commoditization improves CapEx, while using the same hardware for multiple services reduces energy consumption for better sustainability. OpEx is reduced thanks to the greater flexibility in resource allocation that is becoming dynamic and real-time, especially with SRE.

In helping to lessen dependence on vertically integrated vendors, virtualization encourages new entrants for innovation. The DevOps approaches described below depend on concepts that came from the virtualization movement, such as software containers and Virtual Machines (VMs), to implement microservices. Taking this flexibility right into the operator home is possible now, thanks to virtualization techniques used on Customer Premises Equipment (CPE). There is a trade-off in that some of the UI and animation can only work on the new platforms, but in terms of the core middleware, the same API means almost the same feature richness can be achieved, even with older chipsets.

Much has been said about virtualization, but perhaps the most important aspect here is that it lets development teams adapt how services are delivered without needing to change hardware. The location of TV delinearization services is a good example, where such flexibility makes for the best user experience. Simple time shifting like pausing a live stream for a few minutes can be done locally on the STB. Longer recordings can be stored on the STB, the home gateway or in the cloud. Rather than the cloud taking over CPE-rendered services altogether, agile operators are talking more of the “cloudification” or “cloud-enablement” of CPE.

VIRTUALIZATION LETS DEVELOPMENT TEAMS ADAPT HOW SERVICES ARE DELIVERED WITHOUT NEEDING TO CHANGE HARDWARE.

Standards are critical for innovation and interoperability

Being innovative isn't primarily about being different. The large scale of a project like an OTT TV platform requires multidisciplinary teams to collaborate. Standards are not just a necessary evil for quality and cost management but will enable these teams to interact seamlessly.

A more resilient platform will be more scalable and bring more innovation than trying to be different ever will. There is a subtle balance to reach here, for some standards bodies can slow innovation down and vendors then offer proprietary workarounds. Remaining competitive sometimes requires leaving the fully standardized technology space behind, but this should always be done with a clear roadmap of how to maintain interoperability to avoid vendor lock-in, which inevitably results over time in less innovation.

"We need to standardize the interfaces but not the functions. It can take 10 years for MPEG to standardize and meanwhile operators have to innovate (faster than before)."
- Fabio Murra, SVP Product & Marketing, V-Nova Ltd.

Standards also play a key role enabling operators to plug emerging best-of-breed components into their environments. Adhering to standards should ensure interoperability between all components.

Organizational issues

Contstant innovation needs cultural change. Traditional development cycles are shortened and the processes involved more tightly integrated. For pay TV in particular legacy systems must be embraced within the culture and here technical expertise is important to overcome inherent limitations in chipsets and boxes.

Internal resistance to agility

The sequential process of specification followed by coding, integration and system testing is too rigid. Problems are identified late and are more expensive to fix. This discourages continuous innovation because subsequent updates and changes are also costly and disruptive to existing services. Resistance to the modern DevOps approach must be overcome.

Nurturing legacy

The objective is first to minimise drag on innovation imposed by legacy then to ensure that new features are available even to users with the old boxes.

"With new features and apps becoming available at shrinking intervals, the STB hardware and OSs deployed to subscribers are more prone to obsolescence, which relentlessly speeds up the costly CPE replacement cycle."

The company has implemented a major migration strategy for British Telecom.

"Sound legacy hardware management is key to successful next-gen transition projects. Operators must limit service disruption and deliver OTT and non-linear content to existing platforms in the field. To enable a smooth transition, a new client middleware is installed on STBs from a remote server, with no disruption to the service."
- Mark Perry, CEO of Oregan Networks.

Leveraging legacy postpones upgrades and reduces capital costs as a result. Perry cited BT as an example, where Nagra CAS and Harmonic encoders were retained, cutting the cost of integration as well as ownership.

"Cloud storage extends benefits previously only available on advanced STBs to our legacy boxes with no hard drive. Our legacy users can record as many programs as they want simultaneously, which was an issue when we had a local disk."

- Jose Maria Bravo, IPTV Senior Project Manager, Telefonica.

Internal organizational response

Analytics underpins testing under DevOps

Testing can become a bottleneck when DevOps methods are used to accelerate software development. Quality Assurance processes, traditionally done manually, must be automated to keep up. The key role advanced analytics plays in automated testing as well as in customer-facing functions was stressed by a leading Portuguese Telco:

"It's impossible to do human testing like in the past because this meant we needed three weeks just to do the internal QA. Now everything with the STB is done automatically. We have scripts that interact with the STB analysing its output in the different software layers. As a result, we run more than 5,000 different use cases in just 4 or 5 hours for basic interactions, and 48 hours for longevity tests." - Pedro Miguel Bandeira, Head of Product Development for TV, Internet and Voice, NOS.

Harnessing the power of DevOps and Site Reliability Engineering

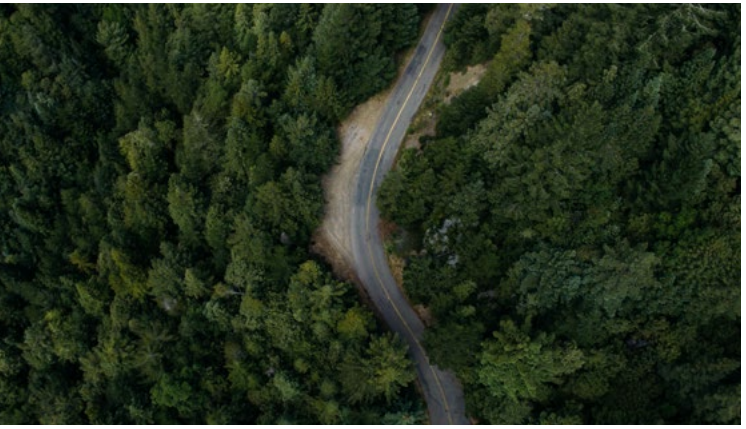
The concept of continuous innovation is enabled by DevOps methods that came out of the enterprise IT world. But it took the big Internet companies, especially Amazon, Netflix and Google, to apply them to online services. Indeed one of the early competitive edges that both Google and Amazon achieved was in their operations management. Google was very secretive in the early noughties about how they managed to run a thousand cheap server blades in a single facility. Amazon has now spun out a dedicated business unit in AWS. This is at the crux of the new SRE (Site Reliability Engineering) buzzword. In an SRE setup, customer-facing services have Service Level Agreements (SLAs) such as uptime. So if a service has a 99.9% uptime target, that means its maximum permitted downtime is 0.1%, or 43 minutes a month.

DEVOPS CREATES AGILE RELATIONSHIPS BETWEEN DEVELOPMENT AND OPERATIONS TEAMS

DevOps is a continuous and collaborative delivery model fostering closer interworking between development and operations teams. This is now being adopted in broadcasting and pay TV to reduce the time needed to bring new features from conception to delivery after final field integration testing.

More innovative operators are implementing agile methods in line with the DevOps model, even if they do not follow the model down to the last detail. That is the case for the leading Asian Telco we spoke to, which is looking to DevOps methods to inject agility into its mature IPTV platform. Their Director of IPTV Planning told us how it had become a challenge to introduce new capabilities quickly enough for its IPTV service.

"In specific areas we have started to work with that model and we are now looking at a transformation plan for IPTV towards DevOps."
- IPTV manager, Tier 1 Asian Operator.



"The dev team can spend this error budget in any way they like. If the product is currently running flawlessly, with few or no errors, they can launch whatever they want, whenever they want. Conversely, if they have met or exceeded the error budget and are operating at or below the defined SLA, all launches are frozen until they reduce the number of errors to a level that allows the launch to proceed."

- Patrick Hill, Site Relability Engineer, Atalssian.

Microservices for continuous innovation

Development teams are adopting a microservices approach, with a shift away from code-heavy monolithic applications to smaller, self-contained processes that can be introduced with minimal disruption and low risk. A team of one to five people will typically manage all aspects of a microservice.

Freedom to experiment

Agility and microservices give operators greater freedom for trial and error. The ability to prototype and test new features without committing a service to them is essential for innovation to tell which ones will succeed or catch on with customers.

Portugal's leading operator NOS believes in trying out features with customers without having to conduct extensive market research, which tends to slow down the pace of innovation. NOS was keen to highlight the benefits of being in charge of the platform, rather than relying on less flexible legacy middleware such as Mediaroom.

SRE INCORPORATES ASPECTS OF SOFTWARE ENGINEERING TO OPERATIONS TO CREATE ULTRA-SCALABLE AND RELIABLE SYSTEMS.

"Compared with our competitors who needed solutions from Microsoft and later Ericsson, with our open platform, we (our ecosystem partners) can react in a few days to develop a new module or service, where it takes them months. Now, if our people have a clever idea they'd like to try, I can implement that too in a couple of days."
- Pedro Miguel Bandeira, Head of Product Development for TV, Internet and Voice, NOS.

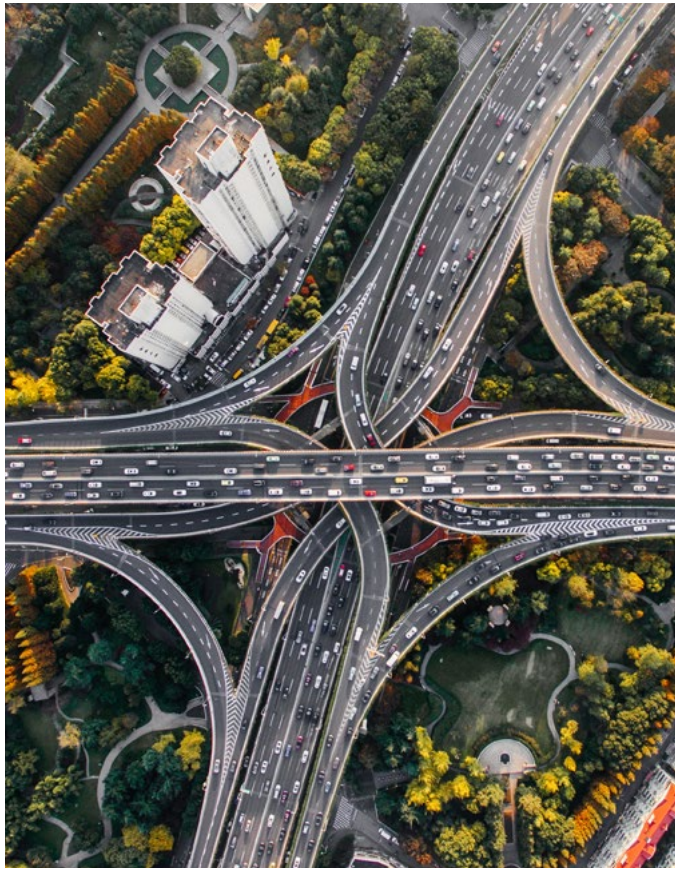
Lowering risk aversion

Continuous innovation and agility for pay TV operators require a change of culture associated with DevOps, which we have already discussed. A key part of this cultural change should be a reduction in aversion to risk, which will be encouraged by the lower barriers to introduction of new features and greater freedom to experiment. This means that the risks are reduced in any case, so by definition, aversion to try things out and innovate is less, in turn bringing on a virtuous circle of enterprise. Properly applied DevOps methods will reduce risk across the whole software cycle.

"We 'de-risk' projects by finding major problems much sooner than was the case with the waterfall approach. One important benefit of DevOps over the waterfall approach is that it avoids the risk of waiting 4 months to see if something works."
- Pav Kudlac, Service Line Director for Video Systems Integration, Nokia.

Catering for best-of-breed

One consequence of increasingly rapid innovation is a growing demand by operators for the ability to mix and match components and modules from different vendors. A best of breed approach enables operators to seize opportunities with disruptive technology so as to give their subscribers the optimum experience for the lowest cost. The overall ecosystem approach and the systems integrator must enable this.



Start-up mentality

Operators are attempting to adopt the same dynamic and creative culture as start-ups to exploit agile development methods most effectively. Start-ups tend to recognize mistakes and learn from them. But all too often in established organizations, the culture incites teams to ignore if not hide mistakes. Operators such as NOS and Orange are addressing this head on by getting internal teams, ecosystem partners and systems integrators to adapt to a combination of DevOps, SRE and associated methods.

External response: leveraging an ecosystem

Systems integration is critical

Effective systems integration (SI) is crucial for success in pay TV and should be an ongoing process under the control of a single entity, whether this is an external provider or the operator itself. Given its importance for the whole operation, we examine the steps involved in selecting and managing systems integrators, as well as the underlying agile methods, in the next sub-sections.

"The issue here is not so much user satisfaction today, since our feedback from customers is good. But the problem we have is that we don't have a single platform yet and don't have all the integration we'd like to have. This means, for example, that the bookmarks inserted when you play a TV show won't work when you want to continue watching later on an iPad. We need to integrate further to make that happen and keep delivering the features our users want and expect." - Jose Maria Bravo, IPTV Senior Project Manager, Telefonica.

Should operator be lead systems integrator?

In the olden days of vertically integrated vendors, operators could test new systems in a dedicated testing environment and put pressure on the single vendor to get it right before planning an operational launch. In an ecosystem approach the responsibility is taken over either by operators themselves or the systems integrator.

Portugal's NOS strongly believes that the operator should take sole charge of systems integration even when partners may have responsibility for specific areas, such as Nokia for OTT development in its case. NOS's Bandeira argues that distributed responsibility does not work well because it can be unclear who is in charge of some borderline aspects of the project and can lead to tension between the various teams.

"Operators will tend to be the main systems integrator and have different suppliers in specific areas, as with Nokia for us on the OTT side."

- Pedro Miguel Bandeira, Head of Product Development for TV, Internet and Voice, NOS.

During the OpenStack summit in Paris, as far back as 2014, Orange spoke of the need for a new approach with Thierry Souche, Senior VP, Orange Labs Products and Services, talking about "instilling an agile and DevOps methodology and mind-set in our teams."

For smaller operators lacking the expertise to assume full control of systems integration, the whole infrastructure should be outsourced to a systems integration specialist with the necessary skills and experience, Bandeira contended. But again that integrator should have sole charge, with other partners reporting to it. "It's very difficult to have a hybrid. Either do it yourself, or have someone else in total charge."

Avoid blame culture

It follows that passing the buck for problems between suppliers should be avoided. The importance of escaping from the pitfall of blame culture, which has inhibited development for many pay TV operators in the past, is well known.

"It is vital to have one throat to choke, one integrator who is responsible for all delivery even if contractual arrangements are with individual suppliers."
- Pav Kudlac, Service Line Director for Video Systems Integration, Nokia.

Use best-of-breed

Just as much as for internal systems such as monitoring it is important that the delivery ecosystem can benefit from the best components available, even if this means working with a variety of suppliers and partners. But suppliers themselves need to step up to the mark and ensure that their products support relevant standards and will interoperate with other parts of the delivery chain. Encoding vendor V-Nova, whose Perseus product has emerged to improve on the MPEG series of codecs including HEVC, was well aware of this necessity.

"Working with the relevant vendors such as Harmonic, Broadcom, Pace and Wyplay, our raison d'être is the speed with which we can integrate something disruptive into the industry." - Fabio Murra, SVP Product & Marketing, V-Nova Ltd.

Without sufficient focus on SI from the outset, a best-of-breed approach can lead to long and expensive integration projects that stifle agility. The onus is then on operators and their lead systems integrator to identify which best-of-breed components are most appropriate for their ecosystem, and which are not yet ready to fit in.

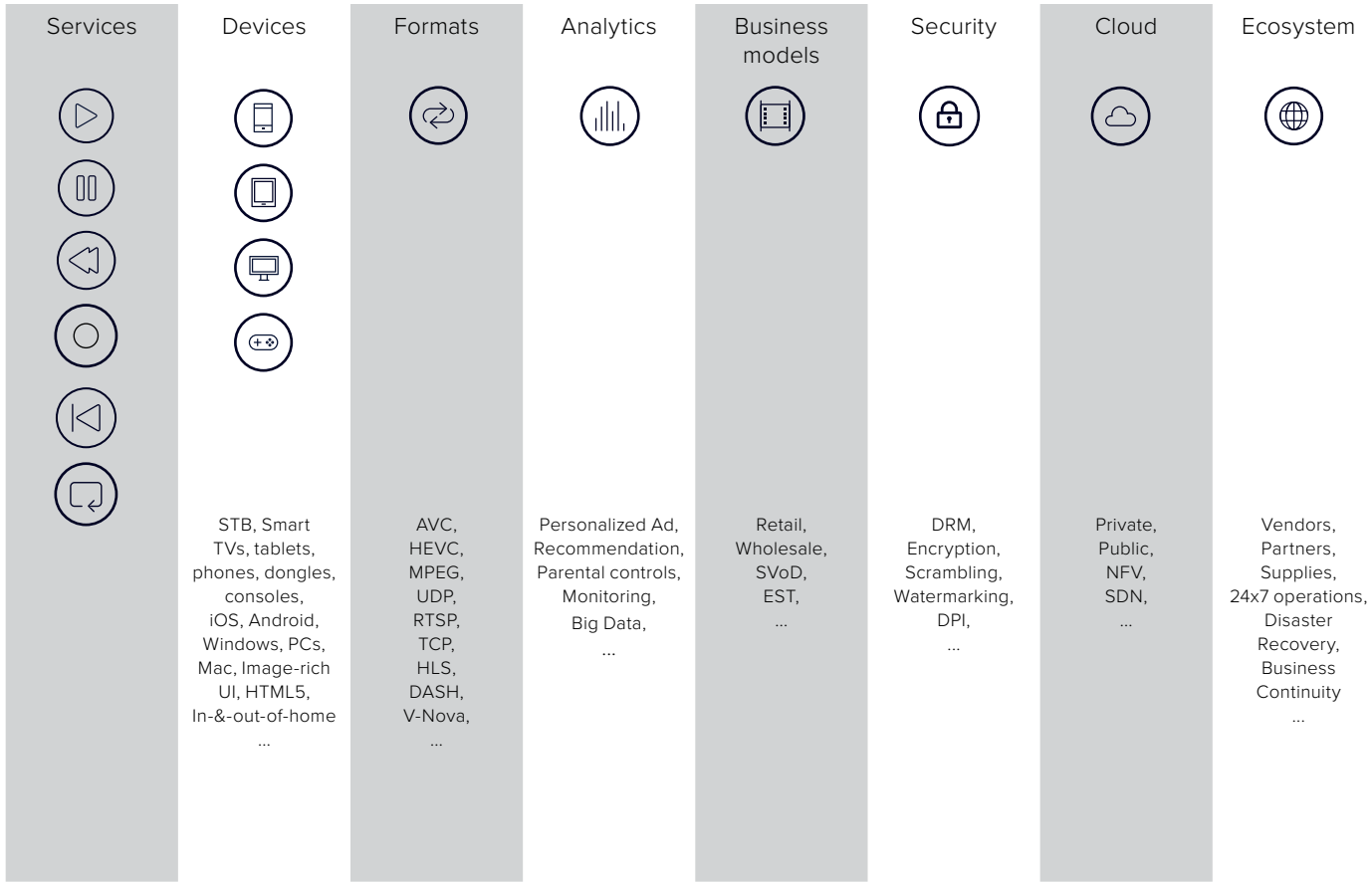
Contract flexibility

All stakeholders in a complex project that is focused on TTM must have some flexibility in their relationships. For example, they must be able to move from a co-contracting to a reselling model and find the right balance. In the same spirit the Systems Integrator must build internal Chinese walls and treat its own colleagues just like any other vendor if they are also contributing some components to the solution.

Systems integration

Systems integration is about combining the multiple components that make up an end-to-end IP video distribution system, as shown in the figure, and ensuring they operate effectively together. Solution architecture and design is complex for any modern system, and with multiple vendors, some level of custom development is often required to get components to talk to each other, either by integrating APIs or creating orchestration layers to manage workflows. When it comes to testing, expert analysis is required. And everything must be designed with an eye on the future, ensuring scalability. Although integration is a technical task, proper governance and project management are essential for success.

There is a risk that specialized software integration vendors who do not have any components in the ecosystem can develop a “pure integrator mentality,” where the integrator’s interest is for the project to last as long as possible.



"In our TV projects, Nokia acts as the master SI, providing a single point of contact throughout, owning the risk and complexity. We furthermore provide advice on project requirements and vendor selection, design, build, testing and deployment of all system components, subscriber and service migration and training."

- Pav Kudlac, Service Line Director for Video Systems Integration, Nokia.

Since in the end we believe that the most critical stakeholder in an operator's ecosystem is the systems integrator, the following is a checklist to help select the best partner: the right SI partner will simplify, enable scale and de-risk an ecosystem.

ABILITY	Y/N?
World-class expertise?	
Consultancy?	
Analysis?	
Design?	
Multi-platform development?	
Testing?	
Vendor selection?	
Migration?	
Hosting?	
Deployment?	
Monitoring?	
DevOps?	
Can be master SI?	

Having a single point of contact for the entire ecosystem, a rigorous methodology and appropriate governance reduces complexity. Scalability requires world-class technical expertise covering end-to-end workflows, integrated security processes and all operational aspects relating to performance (responsiveness, security, operability, resilience, redundancy, etc.).

De-risking project delivery can be achieved in SI by rigorously testing integration points, anticipating instances where customers don't use the product as expected, preventive tracking of possible breaks in the ecosystem and a proactive approach to analytics both to understand/anticipate usage and to provide the best customer support.

Implementing a modular architecture vs. a monolithic one, while not easy, remains within most operators' reach. However, keeping the right ecosystem in place with an SI function to maintain agility over time to react to new market entrants with disruptive technologies and/or business models is the real challenge.

Takeaways

Agility and innovation are often the hallmarks of the more successful companies, especially at times of change as they reinvent their industry or themselves. Big companies enviously look to start-ups for inspiration. Today we talk about “web speed.”

The whole media industry, worth hundreds of billions globally, is in flux, shaken by the opportunities and threats of OTT. Agility is no longer what it takes to be the best or the most reactive, but for many it’s what it takes to survive.

The drive for change comes on the one hand from users, with millennials for example thinking of linear TV as a joke and expecting everything to be available all the time, anywhere, at (almost) no cost. But it also comes from disruptive technologies that are already here, like virtualization and cloud computing or adaptive bitrate streaming, other technologies on the way, like UHD or even some that are just on the horizon maybe like VR. Innovating with VR in 2017 requires agility as we still don’t know if it’s the next 3D-like industry fad or the next big paradigm in user experience.

Established businesses need to be as agile in their internal organization as they want to be with their customer-facing propositions.

We learned from the interviews we conducted for this eBook that to successfully address this agility and innovation challenge, at least three fundamental ingredients are always present:

- A systems integration approach with a single point of control and responsibility
- For established players, a solution to turn legacy systems from weaknesses into opportunities
- A best-of-breed ecosystem to embrace emmerging innovation enabled by development and operational processes such as DevOps and SRE

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