STRATEGIC WHITE PAPER

Simple living in a complex world

Why Alcatel-Lucent for end-to-end systems integration of IP video solutions

The video ecosystem is becoming ever more complex as customers demand next-generation services and new entrants bring disruptive technologies and business models to the market. Operators are facing internal pressure to reduce costs at the same time they are being required to deliver increasingly complex projects in ever-shorter timeframes to remain competitive or seek advantage against rivals.

Alcatel-Lucent systems integration teams manage this complexity on behalf of our customers with video integration services that address the complete video ecosystem. This white paper presents the Alcatel-Lucent methodology and best practices for meeting this operator challenge while illustrating why Alcatel-Lucent is the leader in the end-to-end video systems integration of TV and video solutions

Alcatel·Lucent

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Introduction

Systems integration means combining different components and products and ensuring that they operate effectively together as a working platform. The goal is to meet a customer's requirements and acceptance criteria as an operable, deployed solution. While the actual integration is a technical task of design, build, test, and deploy, the overall activity cannot be successful without proper governance and technical project management.

Systems integration is not a goal in itself; it is a means to an end. The best video system integrators never lose sight of the fact that the primary objective in everything they do is to enable service and content providers to launch high quality, innovative video products and services. These services must excite consumers and truly embody the service value propositions so that service providers can grow their market share and ARPU while also strengthening their brand.

Alcatel-Lucent has considerable experience in delivering such success with more than 50 projects globally in which the company has served as the prime video systems integrator.

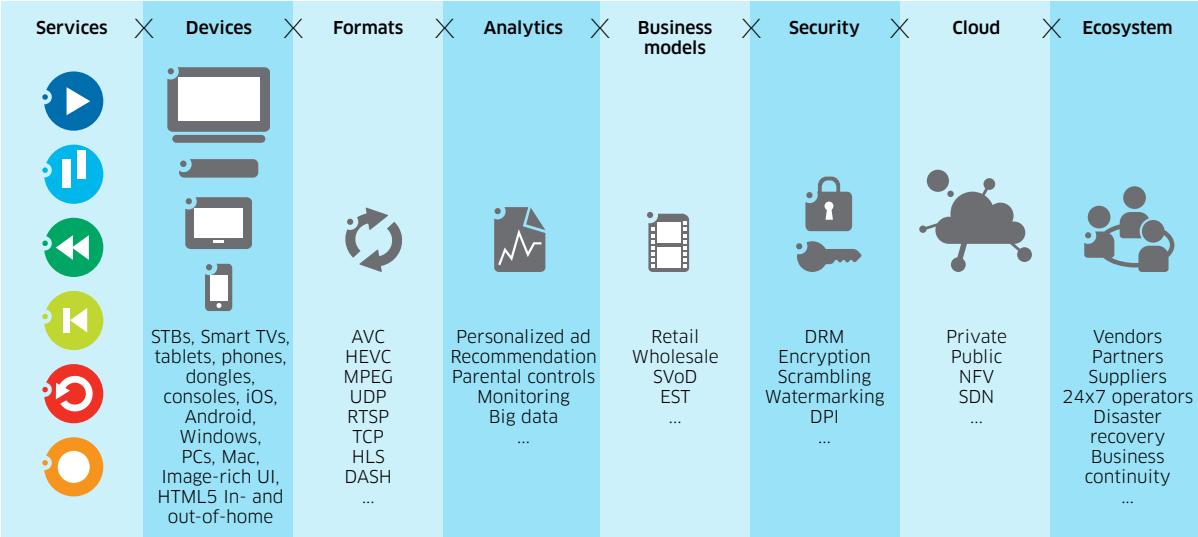
> "SingTel is confident in Alcatel-Lucent's system integration expertise in deploying end-to-end IPTV networks and integrating solutions from key partners.
>
> Our partnership with Alcatel-Lucent enables SingTel to pioneer advanced and innovative pay-TV features to the customers."
>
> – Allen Lew, CEO, Singtel

Complexity

A common theme in the industry at the moment is the increasing complexity of video platforms. Whereas previously the goal was to deliver on-demand and linear content, as well as metadata to existing and legacy set-top boxes (STBs), today's challenges include:

- Multiple device types (some of which dictate particular formats)
- Consumption out of the home
- Personalization and recommendation of content
- Multiple providers of on-demand content
- New security requirements, such as watermarking for 4K content
- Decisions over whether to leverage cloud deployment benefits
- Multi-DRM
- New services such as Start Over, Start Again, Digital Video Recorder (DVR), together with the content rights and management issues that these services entail.

Figure 1. Increasing complexity of video platforms



Equally important, new entrants are supplying the market with disruptive technologies and business models that operators are keen to leverage. They want to quickly achieve first-mover advantage while also reducing the on-going pressures of cost and operational complexity. As the leading provider of end-to-end video systems integration of TV and video solutions, Alcatel-Lucent relieves this two-fold burden from customers at every phase of the integration process.

What is systems integration?

At the most basic level, systems integration can be defined as ensuring that the interfaces among different components are aligned so that data can flow correctly between systems in order to enable functional use cases. The reality, however, is that good systems integration goes far deeper than this. The broader scope includes:

- Meeting non-functional use cases, such as speed/performance/responsiveness, security, operability, as well as resilience/redundancy and scalability (peak load). Additionally, systems integration requires tying these use cases into operational processes for the on-going identification and management of areas, including a capacity management plan. It also means meeting these non-functional use cases in the best ways to optimize cost efficiency.
- Anticipating 'unhappy path' scenarios where customers don't use the product as expected, and building these paths into testing scenarios in order to ensure the user experience remains positive.
- Identifying ways in which the end-to-end ecosystem (not just the TV platform) could break, and how to reduce the chances of this happening. This can be done by running 'war gaming' scenarios in which the operations team tests their fault fixing workflows. Handover to operations teams must also include training on required actions in case each alarm is triggered.
- Identifying and making available the data needed by customer services representatives (CSRs) when they are on the phone with customers to enable speedy fault resolution and maximum customer satisfaction.
- Building security into every aspect of the platform such that a penetration and other security tests are met, giving content partners the confidence they need to trust an operator with their assets.
- Examining how caching can be used at different points to make the platform as network efficient as possible.

Beyond this goal-oriented thinking, there are other aspects of a systems integration project, which a good systems integrator must oversee. This is to ensure that the goals just listed are reached as quickly as possible:

- To begin with, governance and project management is required to keep all stakeholders informed of progress and engaged in the project. Among other things, this includes providing assistance for escalation where required, as well as frequent demos with product teams to ensure alignment with the product vision.
- Collaboration between all parties involved in the systems integration is also critical. The required data must be shared in a timely fashion and the right people must be able to access it.
- Rigorous testing of the integration points and use cases (functional and non-functional) is necessary, too. Conducting this testing early in the project is key to de-risking downstream activities, and pushing the boundaries of what is achievable to front-load the work.
- Where component changes need to be made in order to ensure that the system works end-to-end, these should be implemented to best meet project needs from both an architectural and delivery perspective. For example, these changes might include assigning tailored development tasks to a third party.

Single-vendor versus multi-vendor

The onus of systems integration changes depends on whether a single-vendor or multi-vendor platform approach is chosen. Where a single vendor provides the solution end-to-end, the onus is on proving the external interfaces to existing systems, such as OSS/BSS. The onus also includes the deployment of a pre-integrated and complete solution into the ecosystem.

This document does not discuss the merits of single-vendor versus multi-vendor platforms; even so, it is worth noting that Alcatel-Lucent believes that a multi-vendor video platform gives service providers and content providers the most flexibility in quickly driving products to market. The multi-vendor approach also enables rapid responses to changing conditions, such as new entrants, without being locked into a single vendor's roadmap. It also permits maximum access to feature competitiveness across the ecosystem. Assuming this, the Alcatel-Lucent strategy is aligned with the multi-vendor model as reflected in the remainder of the document.

Where there is a multi-vendor, modular, best-of-breed solution, the dynamics of the project are different. There is more onus on ensuring that the requirements and design are accurately baselined at the start of the project, allowing the rest of the delivery to flow smoothly. Care needs to be taken to ensure that integration points are tested using stubs and mocked data as early as possible. This mitigates many commonly found delivery risks because most of the harder-to-fix problems can be discovered while their impact is still much smaller, and much faster to rectify. Here, too, ensuring open and frequent multi-party communication becomes a key lever of project success.

As with any project, planning is key for expectation setting. For all resources to be prioritized at a detailed level, it is critical to understand when each supplier will be in a position to deliver key functionality. Each epic should be considered, but also each user story acceptance criteria per environment, bottom-up from the requirements list. Where vendors' plans don't align, which to some degree is likely on a large, complex project, it is important to ensure designs are harmonized in detail between all components. This can be done by mapping which interfaces are used in each user journey, as well as by baselining a definition of each ecosystem interface. Change requests can be

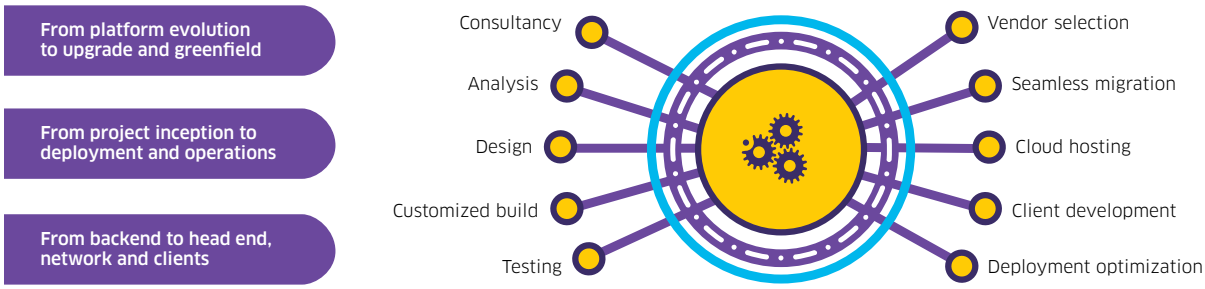
accommodated later, if there is a gap between initial design and build. Publishing APIs early also allows for early stubs to be spun up in labs by different partners. This resolves the issue of remote access to multiple environments, which can often take time to set up.

Planning activities feed into the test approach, where testing of components is scheduled for immediately after they are due to be released. This ensures that on-going integration testing always takes place against the best possible code. Long gaps between code drops are clearly undesirable; however, even where vendors employ a waterfall methodology, it is usually possible to arrange dot releases in order to tackle specific issues for important customer deployments. In an agile methodology, it is also possible to plan the backlog and structure dependencies to allow for development to be optimized properly and for the planning to be fed to the test teams and suppliers well in advance.

The Alcatel-Lucent systems integration services and methodology

Until now, our focus has been systems integration. We shift now to a summary of the Alcatel-Lucent video systems integration services suite. As illustrated in Figure 2, the suite addresses the entire video ecosystem — whether it be a platform evolution/upgrade, or a greenfield platform launch.

Figure 2. The Alcatel-Lucent video systems integration services suite



Alcatel-Lucent systems integration services fall into three main categories:

- **Platform evolution** - Designing and building migrations from existing platforms to new or upgraded components or platforms, ensuring not only that data, service, and customer migration occur seamlessly but also that platforms or components can run in parallel throughout the migration period.
- **New/greenfield platform** - Designing and building end-to-end, best-of-breed modular, flexible TV and OTT platforms to launch new services to market, usually where there is no established customer base and often with a requirement to scale flexibly with a high degree of agility.
- **Next-generation headend** - Designing and building headends based on off-the-shelf hardware with virtualized machines running to ensure maximum service flexibility at the lowest possible price point. Leveraging efficient encoders and powerful security combined with scalable storage and streaming capabilities is also part of the Alcatel-Lucent offering.

Every systems integration project differs at least slightly from every other due to the unique set of requirements and circumstances of each service and content provider. There is no ‘one size fits all approach’. Nonetheless, there are some typical features of the Alcatel-Lucent video systems integration methodology – together with associated best practices.

Alcatel-Lucent has a strong global track record in complex, multi-vendor video systems integration projects, working alongside a large number of third-party component suppliers. This experience and the lessons learned have directly shaped our approach and methodology. Central to our approach is the understanding that, with a video systems integration project, we are not simply ensuring that systems can communicate across APIs – the task is considerably more complex. To address this complexity, the following six principles are applied to each of our projects:

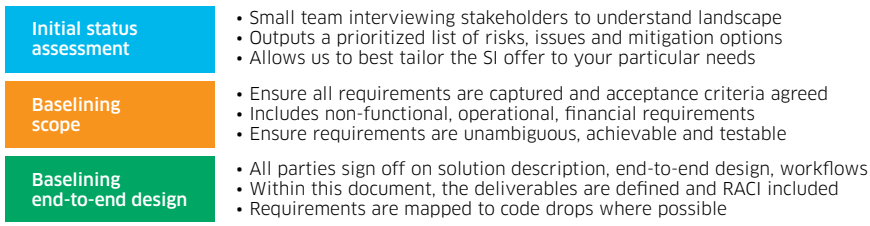
1. Systems should be integrated the right way. This means optimizing end-to-end workflows to run efficiently at scale, placing manageable loads on hardware and networks in order to meet customer requirements.
2. All aspects of the system should perform at peak, be resilient to failure, easily operable, hardened and secure. Operations teams and third parties, such as content partners, need to have full confidence in the platform – with the evidence to demonstrate this.
3. During the course of a project, all parties need to be aligned and ambiguity minimized. Documentation and strong collaboration can achieve this, with each supplier signing off to ensure accountability through scope agreement, design definition, and build/test.
4. Robust project management with rigorous planning, execution and tracking is vital. In all of these areas, the Alcatel-Lucent video systems integration methodology provides an excellent framework to ensure risks are identified and mitigated, and that stakeholders and parties remain aligned. Throughout project delivery, objective confidence markers also enable accurate tracking of real progress and status.
5. Expertise is required and available across many disciplines, including back-end (service delivery platform, content management system, metadata), networks (core, content delivery network, caching, last-mile fixed and mobile), headend (encoding, DRM, acquisition), client (STB, mobile, web), applications, security, operations, OSS/BSS and more. This expertise, however, need not be treated as a dedicated cost on a single project. Subject-matter expert (SME) time can be made available on a flexible basis in order to provide even more expertise without significantly impacting the budget.
6. Complex video system integration projects require scalable resources, which Alcatel-Lucent can provide across the globe. Customers need experienced project managers, architects, integrators, SMEs and testers to ensure first time right deployment. Alcatel–Lucent can deliver this broad range of staff, and at speed.

Underpinning the TV-specific expertise, best practices, and templates used by Alcatel-Lucent systems integration teams is the Advanced Integration Methods (AIM) methodology. AIM is a detailed, in-house systems integration project delivery framework and methodology with an on-line tool for our staff. It provides a wealth of task guides, templates, reusable assets and so on. AIM also provides standardized ways of working, and is tailored towards repeatability of the basics to ensure rigor, as well as the freeing up of time to focus on the most complex parts of a project. In addition, AIM supports software integration, network integration, and the development of migration capabilities. It draws on the cumulative knowledge and experience of expert practitioners globally, leveraging industry best practices as defined in ISO/IEC15288, INCOSE, CMMI and PMI standards.

Alcatel-Lucent firmly believes that a strong foundation for a project is critical to its success. Documenting, agreeing on, and widely circulating the three items below is the best way to ensure that the project is completed on time and on budget (although these are not the only initial activities).

A project is typically started by a small team on-site that conducts a status assessment. The assessment produces a document outlining a systems integration (SI) approach, mitigation strategies for identified risks, as well as information on dependencies and tasks to feed into a project plan. As illustrated in Figure 3, the engagement setup and foundation phase enables Alcatel-Lucent to tailor the SI offer to a particular service or content provider's specific needs.

Figure 3. Engagement setup and foundation



Once a project is fully kicked off, RACI models ensure that all parties are aligned on project responsibilities. Clearly these responsibilities differ between projects, but Figure 4 provides an example:

Figure 4. RACI model

	Customer	Alcatel-Lucent SI	Suppliers
Define product scope (functional, non-functional, acceptance)	A, R	C	C
Define product architecture and technical recommendations	C	A, R	C
Define low-level component design and deployment	I	A	R
Define launch plan for technical platorm	C	A, R	C
Define launch plan for marketing, logistics, content rights	A, R	C	C
Build required components	Heavily scope-dependent		
Integrate components from other suppliers	R	A	R
Run component testing and present report showing features meeting end-to-end test entry criteria	I	A	R
Manage end-to-end testing and defect resolution	C	A, R	C
Run product trial	A, R	C	I
Report program status to stakeholders, run governance	A	R	C

*Responsible, accountable, consulted, informed

While no single guide can ensure the success of a video systems integration project, success comes from having delivery experience embedded within an organization's DNA. This is the case with Alcatel-Lucent. Figure 5 lists the top five ways that Alcatel-Lucent de-risks project delivery.

Figure 5. Alcatel-Lucent's top five ways to de-risk project delivery

Alcatel-Lucent systems integration credentials

Alcatel-Lucent has been leading the way in video for many years from the development of the early video codecs in Bell Labs, to the deployment of massive-scale IPTV systems with multicast delivery, to leading in the development of unicast networks being deployed today. Hard-won experience and extensive expertise allows Alcatel-Lucent customers to leverage a proven methodology to accelerate time to market and deliver performance while reducing risks.

Alcatel-Lucent has a global team of more than 600 video experts across all aspects of service provider video. This includes IP video infrastructure, software, and professional services, including network design, head-end services, systems integration deployment, as well as maintenance and IP video research and development. With more than 50 deployments, Alcatel-Lucent is the leader in end-to-end integration of IP video solutions.

Worldwide video systems integration experience

Alcatel-Lucent's primary references as a systems integrator for IPTV platforms include: MiViewTV™ and Mediaroom™ in North America (e.g., ATT, Telus, Century Link, Windstream, Cinergy, MTS Allstream, Frontier, TDS, and nTelos), Latin America (e.g., Oi, Antel), Europe (e.g., PT, Slovak Telekom and HOL), Middle East (du) and Asia (Singtel). Alcatel-Lucent systems integration expertise covers all aspects of video infrastructure migration to an all-IP environment, including back-office systems for pay TV or OTT, headend, delivery infrastructure and end-user applications. Multiscreen deployments with Telecable, du, and Oi are just a few examples.

Glossary

AIM	Advanced Integration Methods
ARPU	Average Revenue Per User
API	Application Programming Interface
BSS	Business Support System
CMMI	Capability Maturity Model Integration
DRM	Digital Rights Management
IEC	International Electrotechnical Commission
INCOSE	International Council On Systems Engineering
IPTV	Internet Protocol Television
ISO	International Organization for Standardization
DVR	Digital Video Recorder
OSS	Operations Support System
OTT	Over The Top
PMI	Project Management Institute
RACI	Responsible Accountable Consulted Informed
SI	Systems Integration
SME	Subject Matter Expert
STB	Set-Top Box

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