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StormTest

Best Practices for Set-Top Box Product Development and Management

Contents

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Industry Landscape

Video Service Providers are under constant pressure to retain their customer base and generate an increasing return on their investments.

The Set-Top Box (STB) continues to be the central device in the digital home, and features such as PVR functionality and home networking now mean more flexibility for users to choose when and where they view their favourite content. The addition of full Videoon-Demand also gives the consumer significantly more choice in what they want to watch.

The speed of change in the industry means that service providers must move rapidly to remain competitive. They must be efficient in their service, product delivery and maintenance. Ultimately they must strive to create a management process for their platforms which is reliable, scalable and proven so that their business can be future proofed. New features must be regularly delivered to keep their subscriber bases interested in their products and reduce churn rates.

The management of the platforms to support these features can become a problem over time when there are multiple variations of platforms in the field. It can often be difficult to test and maintain new software releases.

This white paper addresses the challenges of managing software platforms over the entire STB lifecycle, and suggests some best practices and approaches to adopt.

The STB Lifecycle

STBs from pay TV service providers are different to many other consumer electronic (CE) devices because they are actively managed with the operators retaining an interest in the device after it has been supplied to the consumer.

This gives rise to a lifecycle for this category of product. This section details the many challenges to be addressed at each stage of the lifecycle.

"Service providers depend heavily on suppliers to provide accurate information about their components, delivery timescales and quality of deliverables".

Options for STB Rollouts

Most service providers depend heavily on suppliers to provide accurate information about their components, delivery timescales and quality of deliverables. With independent analysis and verification from experts who work regularly with these components the operator can make sense of the choices available. There are always trade-offs to be made. For example a lower specification chip may be available now but with stable drivers, service providers must ask themselves about what the impact might be on drivers and on other embedded software if they wait for a new specification. Expert consultancy can provide a roadmap to navigate you through the options.

Some products will require a prototype to be made to prove the concept or select the best solution from a number of choices. This is a great way of understanding the issues involved in a particularly tricky technical problem. In the context of a large project it may prove to be of great value for the limited effort spent. Such projects are best done by engineers knowledgeable about the options available. If left to an inexperienced engineer then all of the technical challenges may not be explored fully. The information gleaned from a prototype can be used to identify the strengths and weaknesses of the solutions available and to extract the correct commercial value from suppliers.

Plan
Technology Consultancy
Define Feature List
Project Planning
Estimation

Explore
Technology Consultancy
Feasibility Study
Prototyping
Technology Investigations
Key Component Definition
Architecture Definition
RFT Creation

Select
Requirements
Management
RFT Creation
Candidate
Selection
Processes and
Templates

Buy/Build
Project Management
Systems Integration
CA Integration
Component Development
Issue Resolution
Test and Verification
Supplier Management
Lab Integration Labs

Accept
Formal Acceptance Test
Issue Resolution
End-to-End Test
Field Trails
External Certifications

Use
Issue Investigations

Maintain
Issue Resolutions
Automated
Regression Test
Release
Management
Cost Reduction
Diversity Management
Third Party App Testing

Upgrade/Replace
Test and Verification
System Integration
Automated
Regression Test

Product Development

Customer Service

End Users

Figure: The Set-Top Box Lifecycle and related development activities

Every product needs a master technical plan or architecture. This architecture is derived from the feature list for the product. It may encapsulate decisions about future requirements and roadmap issues. It creates a language that all managers and engineers working on the project may use to reach a common understanding of technical goals and to create communication shorthand. As poor communication is often a cause of project failures, a well written concise architecture report is a very worthwhile investment. At a minimum the architecture should define all of the key subsystems and the interfaces between those subsystems.

Ownership and control of the product architecture is vital to broadening your future technology choices.

"One of the most difficult decisions in any product platform is how much to future proof the product – how much to invest now to save time and money later"

Selecting the Solution

When it finally comes to choosing the suppliers, asking the right questions is of crucial importance. The Request for Proposal (RFP) will state your mandatory requirements. Mandatory requirements are usually features which underpin the business model. The RFP should also state your optional requirements and roadmap issues to guide your suppliers. In some cases suppliers can seek an advantage by having a solution which addresses some of your optional requirements and which is future proofed in some way.

One of the most difficult decisions in any product platform is how much to future proof the product – how much to invest now to save time and money later. Often future-proofing turns out to be feature creep, or over-engineering, never to be used by the end customers. While on the other hand usability of basic features can be easy to ignore. Are frequently used features hidden in layers of menus? How long do simple functions take? In reality 80% of people only use 20% of the features of a STB. These should be the ones where effort is spent to make them work well. This will reduce customer support costs over the lifetime of the product.

Buy or Build?

Most companies rely on suppliers to provide the specialized technology they need. But can they be trusted to deliver? What is the value of a penalty clause in a supplier's contract versus a lost business opportunity? In order to assess this - a deep understanding of the suppliers' capability to deliver is necessary. A new system-on-a-chip may contain many untested components. For example when the STB industry started moving from standard definition (SD) to high definition (HD) TV technology it suffered many delayed projects. It was brand new technology from most vendors but many estimated lead-times as if it was just a new iteration of an SDTV product. The industry underestimated the problems of working with new basic decoding technologies. The result was unexpected delays to key projects. Clearly a better outcome can be obtained by making a deeper assessment of a supplier's track record of delivery across the industry and of their current actual capabilities.

System Integration – Putting it All Together

Many factors comprise successful system integration. For the purposes of this paper we have concentrated on just three namely communications, configuration management and integration sequencing.

Communications

Typical CE projects require several hardware and software vendors. Due to the nature of our globalized world these are likely to be separated by geographical and other logistical barriers. Indeed it is often the case that within a single vendor there may be multiple separate sites supporting you. It is essential for any multi-site project of this nature to have a central communication tool, for raising and tracking issues, for making releases of documentation and software and for storing easily accessible project information. A tool which enables any project member on any site to raise, track and solve issues is required. A skilled system integrator may triage the issues and speedily diagnose the best treatment for the problem. All the information should be accessible 24/7. Automated text messaging and emails can enhance resolution of urgent issues. Many weeks of development and integration can be saved by the speedy resolution of blocking issues.

Configuration Management

The second major factor in a successful system integration project is configuration management which can be summarized as knowing exactly what version of each component is in the system during the integration phase. While it is relatively straightforward to control hardware configurations, software has proven to be more elusive to contain.

In a typical STB or PVR there are many millions of lines of source code spread across dozens of components. During the initial stages of development there may be many tightly spaced releases of components from suppliers - each of which addresses some new features and/or fixes known problems. There is coupling between components where a component can only be used with certain known versions of another. Interfaces between components may change or have specification problems. There may also be dependencies between software components and versions of hardware.

All these issues are addressed by software configuration management. It allows you to move confidently through the integration cycle – always knowing what components are in your latest test image – and always allowing you to remove components which are not of a high enough quality. Putting together a workable multi-site configuration management setup is a highly skilled job which requires experience of projects of similar size and complexity. These problems become more complex when an operator establishes a common codebase which covers several products. Having a single codebase has many advantages including reducing maintenance costs, however it does require much more careful configuration management processes.

Integration Sequencing

This requires the combination of project management skills with detailed technical insight. It involves creating a plan for the intake of each component into the system integration. The study of coupling between components, suppliers' delivery schedules and project commercial objectives is required in order to achieve a balanced and workable sequence. If you get this wrong then some integration stages will be stalled and waiting for deliverables while others will be under extreme schedule pressure.

Accenture Digital Video (ADV) approach is to assemble the components into a number of subsystems as defined by the system architecture. These subsystems partition the task of integration into a number of smaller more easily managed systems. The focus of the subsystem test will be to verify the external interfaces of each component rather than an exhaustive test of the functionality of the component itself. This should be proven by the test plan and test reports from the component suppliers.

"While it is relatively straightforward to control hardware configurations, software has proven to be more elusive to contain"

Acceptance – Is It Finished?

The only way of knowing when a product has reached sufficient quality to be released is to have a complete acceptance test suite. In order that this is as comprehensive as possible it is important that it is completely automated. A completely automated system, such as Accenture StormTest, enables regression test of the STB software. It can use a sophisticated method of video capture to perform black box testing (with the final STB software image and no modifications). Using such a system enables an operator to control quality closely and to have complete confidence in what their suppliers are delivering.

In addition, for certain middleware, conditional access products and connectivity solutions and certification may be required. Usually this is done in cooperation with the supplier. It may require booking a slot at the suppliers test site and will require knowledgeable engineering resources to guide the product through certification.

Since this is a very intensive process picking the right stage to go to certification is important. Go too early and the STB may require a retest, go too late and the overall STB delivery schedule may be unnecessarily delayed giving rise to additional cost.

In The Field

When any product is released to the general public we can expect a steady stream of issues from customer service. Whether this becomes a raging torrent or a steady trickle is largely a measure of how previous phases have been approached. If corners are cut then this is where the price will be paid. Customer service is an expensive part of any operation. A carefully managed product development lifecycle, which addresses the underlying quality of the product, will reduce the extent of this overhead, produce higher customer satisfaction and lower churn rates.

"Upgrades to legacy equipment can be one of the most cost effective solutions to many problems"

Maintenance – How To Deal With Legacy

Upgrades to legacy equipment can be one of the most cost effective solutions to many problems. Not all new features require additional hardware support or replacement of existing STBs. During the lifecycle of a product there may be numerous minor and major upgrades. Some upgrades may be the result of commercial changes, such as replacing a compromised conditional access system, rationalizing software images of two populations of STBs after a company merger or changing the basic middleware running on the STBs. Other changes can be of a minor nature such as EPG changes or software bug fixes.

The impact of introducing new features into a live and operational system needs to be carefully assessed. Test and verification is more an issue now than any other time. One poor release can destroy a hard earned reputation for reliability. It is not just enough to test the new features; all existing features should be retested. Because of the huge difficulty in retesting everything, many service providers cut their cloth to measure and only test the new features followed by some limited regression testing. Complete regression testing can be achieved in a short time span. The use of a combination of customized test hardware and software is a way to eliminate the manual effort associated with STB verification.

The impact of any changes on the end-user needs to be assessed carefully. Any step change in customer support calls need to be avoided or anticipated.

It is clear that most of these ongoing test and verification efforts are best done as part of a continuous box maintenance program where the cost of test setup is spread over several releases. If previous phases of the product development have been correctly executed then maintenance can be run efficiently and smoothly and can result in a long in-field lifetime for a series of boxes.

Moving On!

Even when STBs are being retired there is a need for careful analysis since for some time both the old and new boxes will exist in the field and customers will pay for and expect their services to work. Nothing in the new features should affect the operation of the older boxes. This is a transition that needs to be planned and actively managed. Any over-the-air transmissions need to be compatible with the entire population of STBs.

In Conclusion

Adopting a lifecycle management approach offers a number of important advantages.

- Cost: Lifecycle management focuses on total cost of ownership. It advocates careful management of each stage of the lifecycle to minimize overall costs. This is clearly advantageous over an approach which tries to minimize the cost of some phases of the lifecycle but usually at a greater overall cost. Achieving the right balance is a corner stone of a successful business model.

- Quality: Lifecycle management seeks to build-in quality through carefully controlled development cycles which span the whole lifetime of an STB.

- Control: Pursuing lifecycle management as an independent activity gives an operator more control over suppliers. Activities are managed by experts who have world class knowledge of the problems and solutions in their field.

- Predictability: When the lifecycle is managed then the number of unanticipated problems can be reduced and costly emergency solutions avoided.

- Features: During the managed lifecycle new features are added only in a controlled and disciplined fashion. And because less time is spent in fire-fighting problems - more development time is devoted to designing and rolling out new features.

ADV has a long history of working with Product Management and Engineering teams to develop and maintain STBs to a high standard.

About Accenture Digital Video

Accenture Digital Video is a business unit within Accenture. We deliver business results for companies where video is of strategic importance, helping them pivot to capture new growth opportunities in an ever changing market. Partnering with clients, we use our agile methodologies, deep skills, and open technology platforms and apply them in every phase of a change journey—from thinking to doing. The end result: more predictability in the face of a complex and volatile landscape. Accenture Digital Video has a 20 year track record in driving video innovation through a global workforce of more than 2,000 dedicated professionals across strategy, delivery, business services and operations, all dedicated to helping clients grow profitably.

About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world's largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With more than 375,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.

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