Application lifecycle management solutions
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Best practices for delivering better software faster with ALM.

Steps for systems and software development

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Introduction

Application lifecycle management (ALM) has the potential to deliver productivity and quality benefits that are attractive to just about any software and systems development organization. But can ALM initiatives live up to their promise in an increasingly complex global development environment? The answer is yes.

A new generation of ALM solutions, which have been proven in many global development organizations, can support companies as they progress their ALM initiatives through multiple levels of maturity. These solutions enable organizations to build better systems and software while successfully innovating, responding to change, and meeting their business and governance objectives. The path to achieving these benefits can be broken into a succession of maturity levels, with specific practices and products that organizations should implement and adopt. These clearly defined steps in advanced systems and software development provide a roadmap for maturing processes beyond the initial steps of integrating requirements management, change and configuration management, and testing. This path to greater maturation can benefit business processes across the global enterprise.

This paper outlines the steps that organizations must take to improve their systems and software development processes, including key best practices. It discusses solutions for unifying fractured, global development groups with existing infrastructures as well as ways to expand on initial steps to bring more critical stakeholders into the ALM process while continually improving its efficiency.

The challenge of building better software

The combination of challenging economic conditions, budget cuts and a fiercely competitive global marketplace means that your company has to be able to build higher quality software more efficiently. The demand for complex embedded software in products is rapidly growing, turning many products into systems. Consumers want the most feature-rich mobile phones. They seek medical solutions such as remote home monitoring systems for implanted defibrillators that reduce the number of patients' office visits. They're demanding better fuel efficiency in their vehicles, which some auto manufactures are achieving through advanced, interconnected components. These innovations are creating "smarter products" that are more instrumented, interconnected and intelligent.

Highlights

In software and systems development, flawless quality, rapid response to changing customer expectations, and variants per region and platform are nonnegotiable.

Business, industry and government entities face challenges characterized by high-stakes risks to their customers and citizens. Sophisticated, high-tech systems in aerospace and defense projects must perform precisely and accurately. Medical devices with embedded systems must operate flawlessly to minimize risk of patient injury or death. Software and systems must be robust to minimize liability in the financial industry and to help prevent identity theft. In all of these examples, flawless quality, rapid response to changing customer expectations, and variants per region and platform are nonnegotiable.

What's more, improving quality of service and time to market to meet these demands requires seamless collaboration with partners, subcontractors, outsourcing organizations, global development teams and customers. Even if some or all of a software system is developed outside your organization, ultimately, you're still accountable. Quality issues are yours to solve, and legal responsibility is nontransferable. Deadlines don't become someone else's problem. It's a relentless environment in which only organizations with a focus on customer needs and the most mature development disciplines can survive.

Application lifecycle management coordinates people, processes and tools in a continually repeating cycle of interrelated activities: definition, design, development, testing, deployment and management.

Application lifecycle management (ALM) coordinates people, processes and tools in a continually repeating cycle of interrelated activities: definition, design, development, testing, deployment and management. Each of these steps should be visible to executive management—and provide a clear management process—throughout the application lifecycle to help ensure that ALM processes and goals stay on track.

Most important, the principles of ALM—connecting team members and stakeholders in an automated, integrated process to achieve traceability, visibility and coordination—are integral to mature development disciplines. ALM is not a "magic bullet." There is no single ALM product that can instantly meet all of the challenges. Rather, ALM adoption is a continual process of attaining escalating levels of process maturity as advanced development products are integrated and seamlessly deployed across global teams.

Highlights

Pursuing initial CMMI maturity levels is a logical first step for improving software process maturity.

Requirements definition and management processes help development organizations with multiple teams capture, define, validate, analyze and decompose the business and system requirements in a central repository.

Robust requirements definition and management solutions can give you confidence that all requirements are fulfilled, that every effort fulfills a requirement and that development resources are properly tasked.

Building a foundation for software process maturity

Adopting an integrated ALM approach on a global, organization-wide scale is a step-by-step process. But where do you start?

Pursuing initial Capability Maturity Model Integration (CMMI) maturity levels is a logical first step for improving software process maturity. Organizations must first address foundational process areas before embarking on an ALM initiative. The strategy involves adopting mature products and best practices in the following areas, which have proven to be a successful foundation for a mature ALM solution.

Requirements definition and management

Requirements errors that slip through the cracks early in the lifecycle have a costly impact on the development process further down the line—missed deadlines, poor product quality, and the expense in cost and resources of extending project milestones.

The practices of requirements definition and management help development organizations with multiple teams capture, define, validate, analyze and decompose the business and system requirements in a central repository. All of the teams can then create and manage the bidirectional traceability of these requirements throughout the project. By managing history and baselines, requirements management solutions limit scope creep and promote the understanding and commitment needed to fully meet the requirements.

To best support the growing needs of today's organizations, the requirements repository should include a process for managing changes to requirements and assessing the impact of change. It should help users identify and avoid inconsistencies to ensure that all stakeholders, regardless of where they are located, have access to the latest requirements.

With a robust requirements definition and management solution in place, organizations can be confident that all requirements are fulfilled, that every effort fulfills a requirement and that development resources are properly tasked. What's more, the maintenance of the final system or product can be more efficient, simple and less costly, an excellent scenario to facilitate success with a fully integrated ALM environment in the future.

Highlights

When integrated with change management systems, SCM gives teams a central repository in which to implement a repeatable process across the organization for change control not only for software but also for all configuration items.

An advanced configuration management solution can help you create a more successful end product that satisfies marketplace demands and delivers higher profits.

Software configuration management

Software configuration management (SCM) provides the process backbone for software development teams because it coordinates changes, versions and configurations. When integrated with change management systems, SCM gives teams a central repository in which to implement a repeatable process across the organization for change control not only for software but for all configuration items. Most important for global ALM initiatives, SCM unifies distributed teams by helping to ensure that all team members are working from the same information—regardless of their location.

An advanced configuration management solution is critical for tracking not only configuration items but also work orders and implementation assignments, or the tasks that result in software creation and modification. After tasks have been created and assigned, developers see them as a to-do list. Developers then just indicate which task they're working on, and the system creates the traceability automatically. The task comprises a consistent set of changes and helps other team members understand the reason for change. In this way, development activities are automatically related to customer needs and the latest decisions and priorities. The result is a more successful end product that can satisfy marketplace demand and deliver higher profitability.

Enterprise change management

The best practice of enterprise change management (ECM) is the cornerstone for supporting sustainable compliance as well as causal analysis and resolution. ECM solutions enable organizations to implement a repeatable, documented and reliable process for capturing and processing not only defects but also urgent and minor change requests from customers and internal teams, on

Highlights

An ECM system must provide an efficient means for capturing, communicating, tracking and managing change requests occurring within every discipline of the planning and development lifecycle.

software and hardware. The ECM system must provide an efficient means for capturing, communicating, tracking and managing change requests occurring within every discipline of the planning and development lifecycle, such as:

- *Enterprise architecture and business processes planning.*
- *Requirements definition and management.*
- *Modeling.*
- *Implementation, to provide clear traceability for all implementation processes, including agile processes with rapid iterations.*
- *Testing and quality management.*

An ECM system in an ALM environment should be able to provide integrated change management for each of the areas above as well as an enterprise-level view. In addition, it should provide flexible, customizable processes for change management to meet the needs of the business as well as the needs of each organization or group involved.

ECM solutions with Web interfaces can simplify adoption across global enterprises.

By offering a Web interface, ECM solutions can ease adoption across the global enterprise. A Web interface also facilitates collecting data that can be analyzed to identify trends and causes that can help your teams learn from past mistakes. This corporate knowledge database can help you improve quality not only on current projects but also on your overall development process.

Test management and QA

Systems and software must be proven to deliver on expectations via the test management practices of verification and validation. Both are needed because they answer different questions about how well the requirements have been met.

Highlights

Testing and QA should be linked closely with requirements.

Verification is an internal check and proves that the requirements analysis and technical implementation traceability is correct. Validation, on the other hand, aims to demonstrate that the product meets the operational need and fulfills its intended use when placed in its intended environment. It answers the question, "Did we build the right product?" Although validation activities are similar to those of verification—test, analysis, inspection, demonstration and simulation—the end users are also often involved in the validation process.

Testing often includes additional activities that help screen for defects and capture them in the most cost-efficient way. Unit testing, integration testing and test-driven development practices are proven approaches.

As we will see later in this document, testing and quality assurance (QA) should be linked closely with requirements, which should be testable. Test strategy and test cases should check that requirements are met. Of course, QA should also check the quality of the requirements themselves.

By integrating your foundational processes, ALM can provide traceability, automated processes and consistent reporting across the lifecycle.

Integrating processes enables the benefits of ALM

Although improved processes in each of the above areas are important, the greatest benefits can be realized when ALM brings them together, providing consistency, cross-team process and more powerful analysis capabilities. By integrating these foundational processes, ALM can provide traceability, automated processes and consistent reporting across the lifecycle.

Highlights

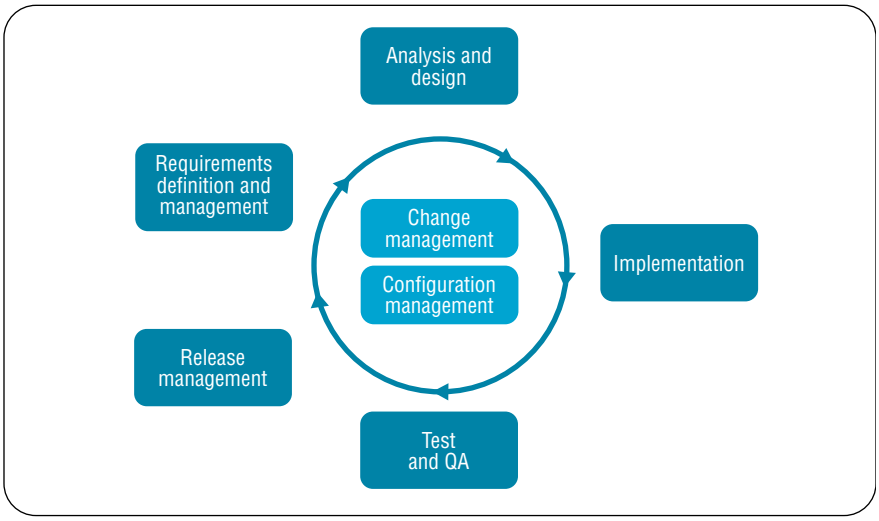


Figure 1: ALM unites development silos.

An ALM environment can help organizations demonstrate compliance and produce metrics to help management understand which requirements are the most important and which requirements will drive product success more efficiently.

In essence, ALM is all about building better software and systems—as well as better processes—to help improve the quality, productivity and management of the development lifecycle. The ALM environment is rich with additional benefits to help organizations demonstrate compliance and produce metrics to help management understand which requirements are the most important and which requirements will drive product success more efficiently.

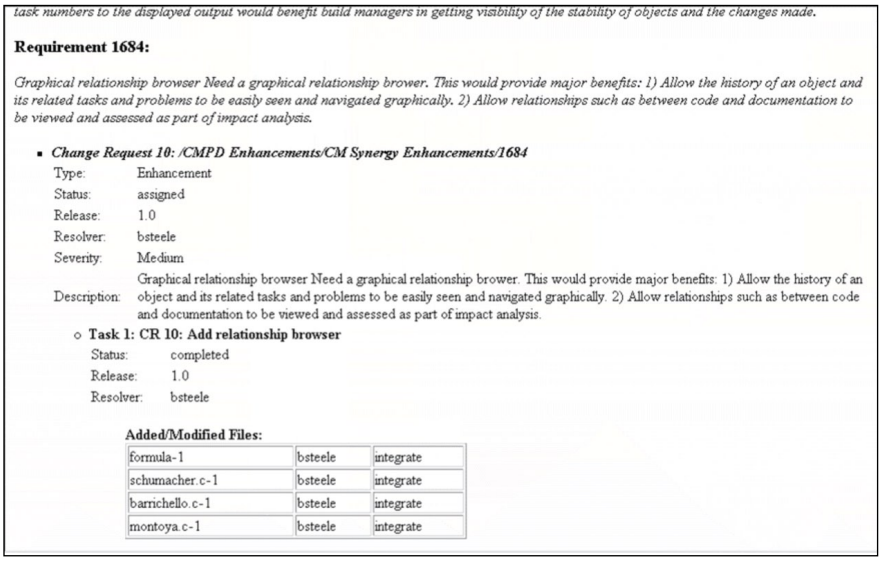
Integrating the foundational processes enables your teams to benefit from higher level best practices, as we will now see.

Highlights

The foundational processes of ALM are requirements management, change management and configuration management.

Requirements-driven development

The foundational processes of ALM are requirements management, change management and configuration management. Requirements are traced to their implementation requests, which, in turn, are linked to the development tasks and objects. This enables the key best practice of requirements-driven development, which helps ensure that developers are focused on the right priorities, have the latest updated information and have access to the full context of their assignments. Analysts, business managers and auditors alike can have real-time visibility into implementation.



task numbers to the displayed output would benefit build managers in getting visibility of the stability of objects and the changes made.

Requirement 1684:

Graphical relationship browser Need a graphical relationship brower. This would provide major benefits: 1) Allow the history of an object and its related tasks and problems to be easily seen and navigated graphically. 2) Allow relationships such as between code and documentation to be viewed and assessed as part of impact analysis.

- ***Change Request 10: /CMPD Enhancements/CM Synergy Enhancements/1684***

  Type: Enhancement
  Status: assigned
  Release: 1.0
  Resolver: bsteele
  Severity: Medium
  Description: Graphical relationship browser Need a graphical relationship brower. This would provide major benefits: 1) Allow the history of an object and its related tasks and problems to be easily seen and navigated graphically. 2) Allow relationships such as between code and documentation to be viewed and assessed as part of impact analysis.

  - **Task 1: CR 10: Add relationship browser**

    Status: completed
    Release: 1.0
    Resolver: bsteele

    Added/Modified Files:

formula-1	bsteele	integrate
schumacher.c-1	bsteele	integrate
barrichello.c-1	bsteele	integrate
montoya.c-1	bsteele	integrate

Figure 2: ALM provides traceability from requirements to code.

Highlights

A global requirements change management process can increase the efficiency of the change control board through capabilities such as Web review and approval functionality as well as impact analysis.

Traceability of requirements to test cases enhances the reliability of the testing process by helping to ensure that all requirements are tested against the correct versions.

Requirements change management

The change management process should extend to all work products; this is particularly critical for requirements where any unauthorized edit, mistake or miscommunication can have an extremely costly domino effect throughout the lifecycle. A global requirements change management process can increase the efficiency of the change control board through capabilities such as Web review and approval functionality as well as impact analysis.

Integrated test management and QA

Verification, validation and requirements naturally go hand in hand. This traceability is one of the easier, but still critical, steps of ALM to implement. Traceability of requirements to test cases enhances the reliability of the testing process by helping to ensure that all requirements are tested against the correct versions. Tests, then, can match project specifications, meet customer demands, and comply with regulations and standards. Organizations should also describe the tests associated with each requirement as soon as these are defined. Ensuring testability is a best practice for writing better requirements.

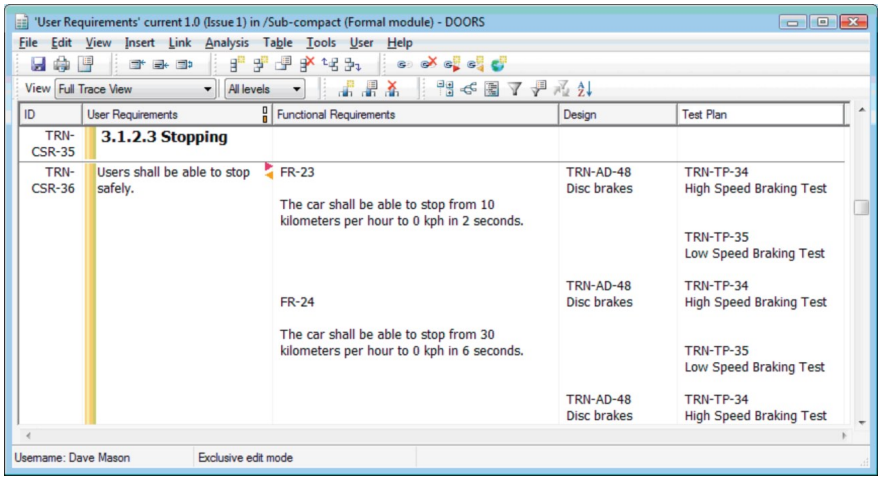


Figure 3: Traceability from requirements to tests helps improve quality.

Highlights

Your ALM framework should also provide an integrated test management process, so defects identified by the quality assurance (QA) team are automatically transferred to the development team for resolution. This integration can help ensure that both teams are synchronized, that data and priorities are consistent, and that all stakeholders have real-time status reports.

Round-trip traceability

Round-trip traceability is one of the most valuable ALM practices organizations can adopt.

Round-trip traceability is one of the most valuable ALM practices organizations can adopt. ALM platforms with more advanced functionality can analyze the contents of each build, baseline and release provided by the development team, detailing exactly which requirements change requests and development tasks have been implemented, either fully or partially, and which are missing. They can also display the differences between different baselines, pinpointing exactly what has changed.

Round-trip traceability can provide management with a reliable, on demand view of project progress, which is fundamental for both agile development initiatives and more traditional waterfall development approaches.

This functionality is a critical enabler for many benefits of ALM. Round-trip traceability can provide management with a reliable, on demand view of project progress, which is fundamental for both agile development initiatives and more traditional waterfall development approaches. The ability to prove what is present and what isn't present in a configuration is necessary for compliance requirements, audits and accountability. Testing teams can check exactly what new functionality has been added, to focus functional testing, and what hasn't changed, for nonregression testing.

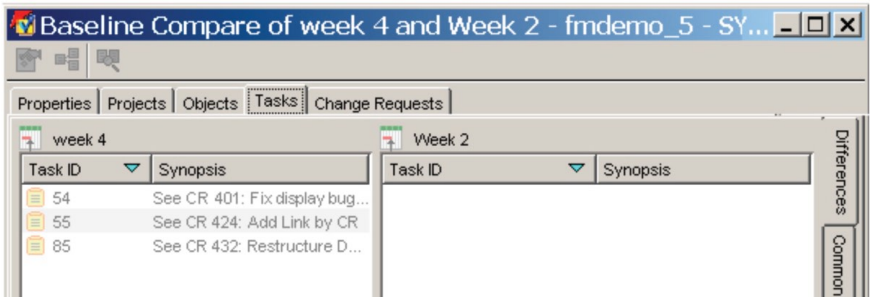


Figure 4: ALM demonstrates project progress.

Highlights

Because process improvement enhances effectiveness and development tools increase efficiency, improving technology and process together is much more effective at increasing productivity than improving technology alone.

By reusing proven best practices, you can ensure that your teams repeat a best practice and not just any practice.

Integrated process guidance

To help optimize your development lifecycle, you must closely link people, best practices, processes and products. Improving technology and process together is much more effective at increasing productivity than improving technology alone. Why? Because process improvement enhances effectiveness, while development tools increase efficiency. Together, they can significantly improve productivity and quality.

By reusing proven best practices, you can ensure that your teams repeat a best practice and not just any practice. Therefore, you should choose libraries that are the result of years of experience with real projects. For instance, the Eclipse Process Framework is an open source project that aims to provide exemplary and extensible process content for a range of software development and management processes; some vendors have extended this content based on their own customer deployment experience. Furthermore, it should be easy to tailor these libraries of best practices to meet specific organizational and project needs; in our example, this would be achieved with the Eclipse Process Framework Composer tool.

With integrated process guidance, you can promote best practices, processes and products across your organization. The result is systems and software that better meet your customers' needs.

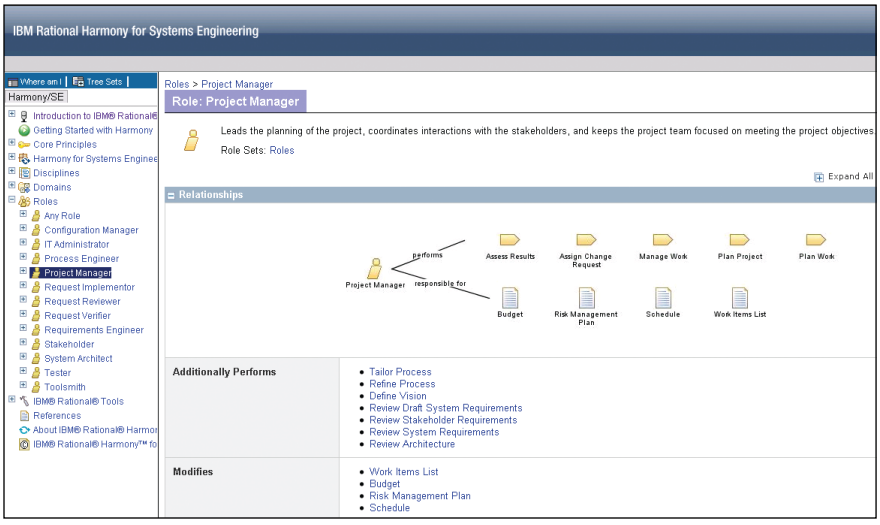


Figure 5: Process guidance promotes best practices, processes and products.

Highlights

Using model-driven development, organizations can respond with greater agility as the pace of business changes.

MDD allows teams to manage system complexity by focusing on the high-level design and development of application architecture and software.

Incorporating MDD into the ALM environment can further reduce the gap between the project requirements and the final implementation, delivering a number of benefits.

The best of both worlds: ALM with MDD

Model-driven development (MDD) is another natural fit within an ALM framework, from embedded systems to service-oriented architectures (SOAs), because this integration allows the fast, accurate and coordinated design and development of architectures, IT applications and products. With MDD, organizations can respond with greater agility as the pace of business changes.

MDD allows teams to manage system complexity by focusing on the high-level design and development of application architecture and software. It promotes the use of a graphical language to translate the requirements into a representative system model depicting the application's functionality. The model can then be leveraged to simulate the system and validate and verify its completeness and intended behavior. The results are analyzed and used as the basis for developing more detailed specifications and requirements, iteratively extending the requirements into a comprehensive application design. After the application's systems architecture is fully specified, the model becomes the basis for future activities, including application software development, testing and implementation/deployment. The model can be used to specify and even generate application software, unit and integration tests, and published documentation.

Incorporating MDD into the ALM environment can further reduce the gap between the project requirements and the final implementation. You can visualize system requirements and trace these requirements throughout design, code development and testing—formally extending requirements engineering throughout the development lifecycle. This can improve understanding and project-wide impact analysis, which helps teams develop complex, critical systems within their deadlines. The change management process is facilitated because edits can be pushed rapidly and seamlessly through the model all the way to implementation. This enterprise agility helps teams deliver high-quality systems and software faster. Potentially reusable assets can be identified and made available with full usage context details.

Highlights

The benefits of ALM

A successful ALM implementation can help increase productivity as the team focuses on current business requirements, minimizes rework, avoids unnecessary activities through automation and makes better decisions faster. ALM can improve quality by reducing the number of defects due to miscommunication, catching inconsistencies between requirements, enabling efficient testing, and generally helping to ensure that the final application meets the needs and expectations of users.

ALM helps organizations meet many other critical business goals, such as lowering the cost of development, designing and delivering innovative offerings, and embracing change at lower risk and cost.

ALM helps organizations meet many other critical business goals, such as lowering the cost of development, designing and delivering innovative offerings, and embracing change at lower risk and cost. All these benefits help the organization become more competitive and agile. Additionally, ALM helps enforce processes, trace development to requirements, generate traceability reports and produce company-wide metrics. For many organizations, ALM is a solution to the levels of governance, compliance and accountability they need to demonstrate.

Deploying ALM principles on a single project is relatively straightforward, but many vendor offerings do not live up to their promises when faced with modern development challenges.

ALM solutions can provide out-of-the-box processes for key Capability Maturity Model Integration (CMMI) activities to help organizations attain tangible benefits and a clear return on investment. Although deploying ALM principles on a single project is relatively straightforward, many vendor offerings do not live up to their promises when faced with modern development challenges. In the following section, we will discuss strategies for helping teams achieve these benefits by taking the next step in software development maturity—to global ALM.

Highlights

ALM can help companies striving to improve their software development processes in today's complex global development environments.

Global ALM for the global enterprise

New initiatives take the proven project benefits of application lifecycle management to map out a new, cohesive path to global ALM for the entire organization. The results can include building better software and systems while at the same time improving business processes. ALM can therefore help companies striving to improve their software development processes in today's complex global development environments.

Unite geographically distributed development

For many organizations, development is carried out across the globe. Teams distributed across multiple sites, countries and software factories are just a few of the factors that increase the complexity of team coordination and communication. Additionally, projects need to incorporate changes made by developers in home offices and consultants at customer sites. Development might even be carried out by teams that are not part of the organization, such as partners, outsourced and offshore groups, and subcontractors.

Global ALM solutions provide Web- and WAN-enabled capabilities that control the flow of assignment and change request information across the globe.

Global ALM solutions provide Web- and wide area network (WAN)–enabled capabilities that control the flow of assignment and change request information across the globe. With more advanced solutions, all teams can work out of a single common data repository over the network, without the need for repository replication. Using a single repository helps ensure that all teams work from the same information, which can reduce errors and rework. Traceability is available for the project team as well as for the rest of the organization, present and future, to share knowledge and lessons learned. This global repository promotes asset reuse and component-based development, which helps lower the cost of development and helps teams build complex projects faster.

Highlights

A global ALM backbone must integrate with any software configuration management solution developers might use.

Connect fractured development organizations

ALM should also extend to all developers, regardless of their location or tool. A global ALM backbone not only connects a vendor's own product but also integrates any software configuration management solution the developers might use, such as IBM Rational® Synergy, IBM Rational ClearCase® and CollabNet Subversion software. This helps avoid the burden and risk of migrating all developers immediately, while generating early return on investment and ensuring stakeholder buy-in. Through open, standards-based integration capabilities, global ALM enforces a common, consistent set of processes across the organization, a fundamental step needed to increase the maturity of software processes. Only through consistency can your set of processes be continually refined and optimized.

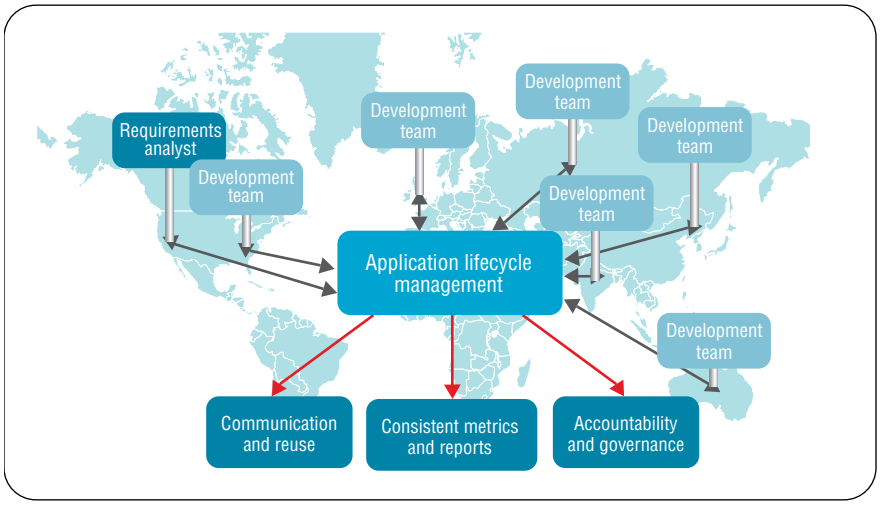


Figure 6: Global ALM helps connect distributed teams, regardless of the tools they're using.

Highlights

Management by exception, a powerful management tool that highlights problem areas, enables managers to identify areas in need of attention and to drill down to the level of detail needed to assess the situation.

Manage and educate global teams

To drive organizations and projects toward success, executive teams and project leaders need timely, focused information. They need reports and metrics adapted and relevant to their role. Management by exception, a powerful management tool that highlights problem areas, enables managers to identify areas in need of attention and to drill down to the level of detail needed to assess the situation. To help them manage by exception, managers need urgent indicators to be displayed prominently. Global ALM metrics dashboards integrate with multiple existing products (even those provided by competitors) to extract the appropriate information from each product, combining with other ALM indicators to display important current status views and historical trends.

Successfully rolling out process improvement initiatives on a global scale is a challenging task. The cost of educating and mentoring all users is compounded by the effort required to continually inform them of updates and modifications in the process and how these changes may affect the way they use their products. Numerous organizations have failed at this hurdle as end users stop following the process (or worse, use the products poorly) due to lack of understanding and commitment, or as the training becomes updated. This failure can jeopardize the ALM initiative as metrics become meaningless, governance is no longer possible and compliance with regulations cannot be guaranteed.

For successful ALM, team members should receive process guidance when and where they need it.

Support sustainable training

It is difficult to educate new team members on a project's tools and processes. And there is often a gap between when users receive training and when they are asked to exercise it. For successful ALM, team members should receive process guidance when and where they need it. Interactive process guides, the open source Eclipse Process Framework and solutions built on it provide a means for representing the organization's global ALM processes. Tool mentors can provide Web-based manuals that explain exactly how to carry out each activity. This approach can provide an easily maintained, efficient solution to help ensure that all the users across the globe understand their role in the process and how to fully benefit from the ALM platform.

Highlights

Each organization is unique, so each organization requires its own unique development process.

Continually improve your ALM process

Each organization is unique. Therefore each organization requires its own unique development process. The adoption of ALM must grow and adapt as you identify weak process points and address new business strategies—and as development methodologies change and teams grow and learn.

The best practice of enterprise change management (ECM), deployed in the initial steps toward better process maturity, can be leveraged to capture information on where defects were found in the lifecycle, where they were introduced and what it cost to fix them. This allows ALM solutions to calculate targeted process improvement metrics for what is known as "Strategic QA," which helps pinpoint the weaker process areas and where budgets should be focused for the highest return on investment.

As the process is adapted and refined, the interactive process guides mentioned above become a formidable asset to communicate, educate and enforce changes across the global organization.

Organizations can leverage their successful ALM implementation to move beyond integrating traditional development activities, and into those that help manage and grow the business, with enterprise lifecycle management.

Extending ALM to enterprise lifecycle management

Organizations can leverage their successful ALM implementation to move beyond integrating traditional development activities—define, design, develop and deliver—and into those that help manage and grow the business, with enterprise lifecycle management (ELM). ELM is essentially the business process of software and systems delivery aligned with ever-evolving business priorities and stakeholder constituencies.

ELM helps optimize development by:

- *Identifying the right projects for implementation.*
- *Integrating business processes, workflows and customer needs with the development lifecycle to help ensure positive business outcomes.*
- *Turning change into a competitive advantage by reacting more quickly and appropriately.*
- *Supporting effective governance and demonstrable compliance.*

Highlights

ELM solutions extend the reach of the ALM process to all teams and stakeholders via open integration APIs and standards.

Ultimately, ELM helps deliver greater value from your investments in systems and software.

ELM solutions extend the reach of the ALM process to all teams and stakeholders via open integration application programming interfaces (APIs) and standards. This makes it possible to provide production teams, mechanical and electronic design teams, product managers and business process managers access to the information they need.

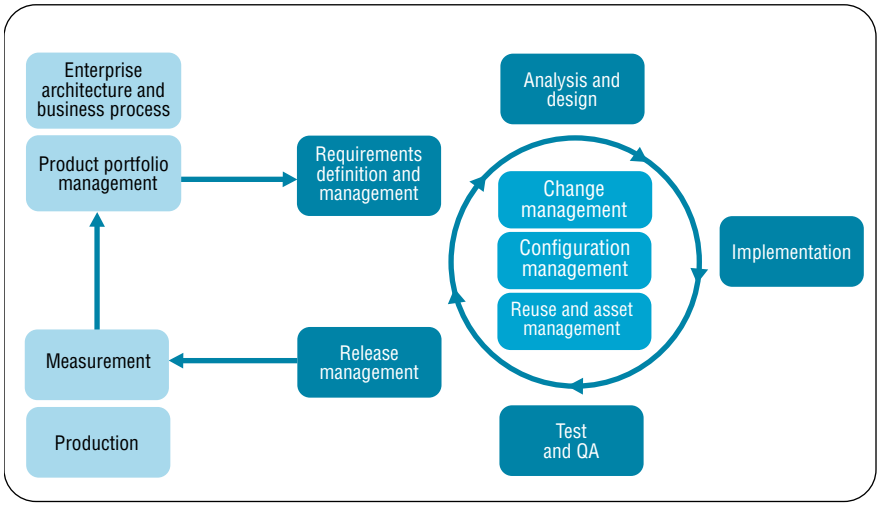


Figure 7: Bring business and engineering together with enterprise lifecycle management (ELM).

ALM naturally evolves into ELM as it empowers organizations to align business processes and strategies with development.

ALM and business process management

ALM naturally evolves into ELM as it empowers organizations to align business processes and strategies with development. Enterprise architecture and business process management solutions can be added to the ALM ecosystem to help business process managers understand the effect of change requests on both the software and the organization. Implementing a change request may require not only the modification of systems and software but also the modification of an organizational process. By providing an integrated change workflow, ELM can ensure the traceability and accountability necessary for governance.

Highlights

ELM promotes the integration of ALM with product and portfolio management to help organizations introduce value-based selection to the requirements process.

Products today are often "systems," combining software with mechanical and electronic components, so high-level business needs must be traced to the lower-level requirements for each of these disciplines.

ALM should be integrated with PLM to provide comprehensive visibility throughout development and maintenance across the system lifecycle.

Value-driven development

Enterprise lifecycle management promotes the integration of ALM with product and portfolio management to help organizations introduce value-based selection to the requirements process. These best practices help you focus on customer needs and customer value, creating the right products for your marketplaces at the right time based on marketplace analysis, competitive landscapes, customer needs, emerging technologies, regional strategies and risk assessments. ELM helps you bridge the gap between product management and engineering to optimize requirements from both perspectives.

Integrated systems development: combining ALM and PLM

Although software is a critical asset, products today are often "systems," combining software with mechanical and electronic components. High-level business needs must be traced to the lower-level requirements for each of these disciplines. Verification and validation activities and customer acceptance, for instance, are carried out on the entire system. Change requests and production teams must ensure consistency across these disciplines, as incompatibility can have disastrous and costly consequences.

ALM should be integrated with product lifecycle management (PLM) to provide comprehensive visibility throughout development and maintenance across the system lifecycle. Full traceability across requirements helps ensure that all system stakeholders are working on the same page, which can lower the risk associated with change. Enhancement requests and defect reports can be broken down into requests for each separate discipline, implemented in parallel, tested, validated and then deployed simultaneously.

Highlights

Reuse must be carefully controlled so that only approved assets are replicated or distributed, with appropriate notification and update rules for when a critical issue is detected or a new release is available.

ALM ecosystems can be extended to integrate with asset management solutions, providing a controlled process for submitting, tracking and updating assets across the organization.

Controlled, systematic asset use and reuse

The different work products produced by the teams can eventually become reusable assets. This reuse is possible for software components as well as for parts of Unified Modeling Language (UML) models, requirements documents and test cases. Reuse must be carefully controlled so that only approved assets are replicated or distributed, with appropriate notification and update rules for when a critical issue is detected or a new release is available.

Many modern IT architectures are also based on the premise of controlled use and reuse. For service-oriented architecture (SOA) and Web services, for instance, it is necessary to manage who is allowed to use which assets.

ALM ecosystems can be extended to integrate with asset management solutions, providing a controlled process for submitting, tracking and updating assets across the organization. This helps improve traceability and governance while reducing the cost of development and deployment. In particular, a combined change management lifecycle can allow asset consumers to submit enhancement requests and bug reports and track their implementation and resolution to plan their own upgrade path. A notification and alert system can ensure that critical information—for example, a security issue in a Web component—is communicated to the right people in a timely fashion.

Highlights

Rational software provides ALM and ELM solutions designed to align product, systems and software development lifecycles with business objectives and customer needs.

IBM provides offerings for enterprise architecture and business process design, product portfolio management, requirements management, and lifecycle change management.

IBM solutions

Rational software provides ALM and ELM solutions designed to align product, systems and software development lifecycles with business objectives and customer needs, dramatically improving quality and predictability while significantly reducing time to market and overall costs.

IBM integrated offerings include the following areas:

- ***Enterprise architecture and business process design.*** *Provides an enterprise-wide and integrated view of strategy, business architecture, information systems and technology domains. This solution promotes agility by helping you better assess the impact, resources and risks associated with evolving your environment.*
- ***Product portfolio management.*** *Offers a comprehensive product portfolio planning solution that helps executives and managers make collaborative and objective investment decisions, react rapidly to marketplace changes and deliver the highest possible business value. By utilizing roadmapping and planning capabilities, organizations are better able to ensure that plans are innovative, valuable and achievable.*
- ***Requirements management.*** *Helps you manage system and software requirements and confidently track conformance to those requirements and compliance to regulations. This solution scales to support large and complex projects and enhances collaboration across engineering disciplines and between stakeholders.*
- ***Lifecycle change management.*** *Provides a Web-based, fully integrated change process management solution that improves communication and collaboration throughout the development lifecycle and across the enterprise. This solution supports improved quality and innovation for helping you capture, communicate, track and report on change requests of all types—from requests for business process changes and product enhancements to requirements changes and defects.*

Highlights

Integrated offerings from IBM also include solutions for configuration management, model-driven development, quality management and measurement.

- ***Configuration management.*** *Brings together your global, distributed development teams on a unified, collaborative platform with sophisticated version control, workspace management and parallel development support that can help you improve productivity. As an advanced configuration management solution, it can help you track and manage many types of configuration items and product variants as well as work orders and implementation assignments.*
- ***Model-driven development.*** *Enables graphically modeling the requirements, behavior and functionality of systems and software. The design can be iteratively analyzed, validated and tested throughout the development process and then automatically transformed into production-quality code.*
- ***Quality management.*** *Creates a collaborative, customizable central quality management hub that can unite your teams and provide an enforceable process workflow. This solution delivers a test management environment for test planning, execution, tracking and traceability and supports greater transparency via automated reporting.*
- ***Measurement.*** *Provides feedback to help manage delivery risk, development costs, quality, customer satisfaction and overall process improvement.*

Conclusion

When development teams have better visibility into what is actually needed, they can avoid unrealistic requirements and minimize the time wasted on unnecessary features.

ALM enhances communication, collaboration and coordination by breaking down existing information silos and tightly integrating all aspects of the systems and software development lifecycle. When development teams have better visibility into what is actually needed, they can avoid unrealistic requirements and minimize the time wasted on unnecessary features. As a result, you can deliver more value and achieve a greater overall return on investment. By creating bridges between all project disciplines, ALM solutions can help improve the flow of information and knowledge between the different roles working across the lifecycle to enhance the quality of work. Smooth transitions between teams can improve time to market, and deliberate (and purposeful) automation can ensure that only the necessary process steps are undertaken.

With globally distributed development now the rule rather than the exception, development organizations must be able to extend traditional ALM processes and benefits step-by-step. This extension unifies dispersed and fractured teams, explains and communicates process, provides a central repository for controlled asset reuse, and transforms the ALM framework into enterprise lifecycle management to the relevant business stakeholders, including product managers and business process managers.

ALM today presents bold, new evolutions with an integration framework that connects to existing solutions and helps organizations avoid the burden and risks of an all-at-once migration. The key to success is to embrace ALM as a continually evolving environment. If you're looking at solutions for requirements management today, for example, then you should be thinking one or two steps ahead—determine how each development solution you add can help you grow and expand your ALM environment. IBM can help you adopt, step-by-step, the types of products and integrations to build a software development process that can help you build better software and systems while improving business processes.

For more information

To learn more about how IBM can help you build better software and systems while improving your business processes, contact your IBM representative or IBM Business Partner, or visit:

ibm.com/software/rational/solutions/systems

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