

Whitepaper

Repository Intelligence: Accelerating Application Discovery for Modernization

Unlocking Application Knowledge
to Drive Faster and Smarter
Modernization Decisions

Author

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Executive Summary

Many modernization projects are initiated with the belief that migrating applications to new technologies or platforms is the most challenging thing. Often, the bigger challenge is understanding existing applications before development begins. Over the years, knowledge about applications has spread across different places such as code, project documents, tickets, architecture, and experienced resources. When modernization starts, industry studies indicate that application discovery and assessment can require significant effort in modernization programs, especially for large and complex applications. The discovery phase is mostly a manual process and depends heavily on experienced resources who understand the application well. In most cases, documents are outdated or not easily available. As a result, teams need to spend a lot of time gathering information before they can plan their modernization activities. In many organizations, engineers need to review code, check existing documents, and discuss with experienced resources to understand how the application works. Understanding the correct picture of the existing system landscape can take substantial effort, especially when information is spread across multiple sources.

Application discovery frequently affects the speed and success of a modernization initiative. Without visibility into existing systems, teams may spend weeks gathering information before transformation activity can begin.



Repository intelligence helps to address this issue by bringing together organized information that is usually spread across different places. By analyzing source code repositories and related information, it creates an overall view of the application. This enables teams to quickly understand application architecture, technology stacks, application workflows, APIs, dependencies, and overall structure, avoiding weeks of manual source code review.

Instead of spending significant effort collecting and organizing data, engineers can focus on analysis, execution, and planning. Repository intelligence provides information in a structured, easy-to-understand format, enabling teams to quickly familiarize themselves with applications, minimize onboarding effort, and improve productivity.

As organizations continue their cloud adoption and modernization initiatives, repository intelligence can simplify the initial discovery process and provide appropriate visibility into existing applications. This allows teams to make more informed decisions and move forward with confidence.

At the same time, engineering knowledge and experience remain important. Repository intelligence is not a replacement for engineering expertise. It helps teams access relevant information faster, allowing teams to spend less time searching and more time understanding, analyzing, and modernizing their applications.

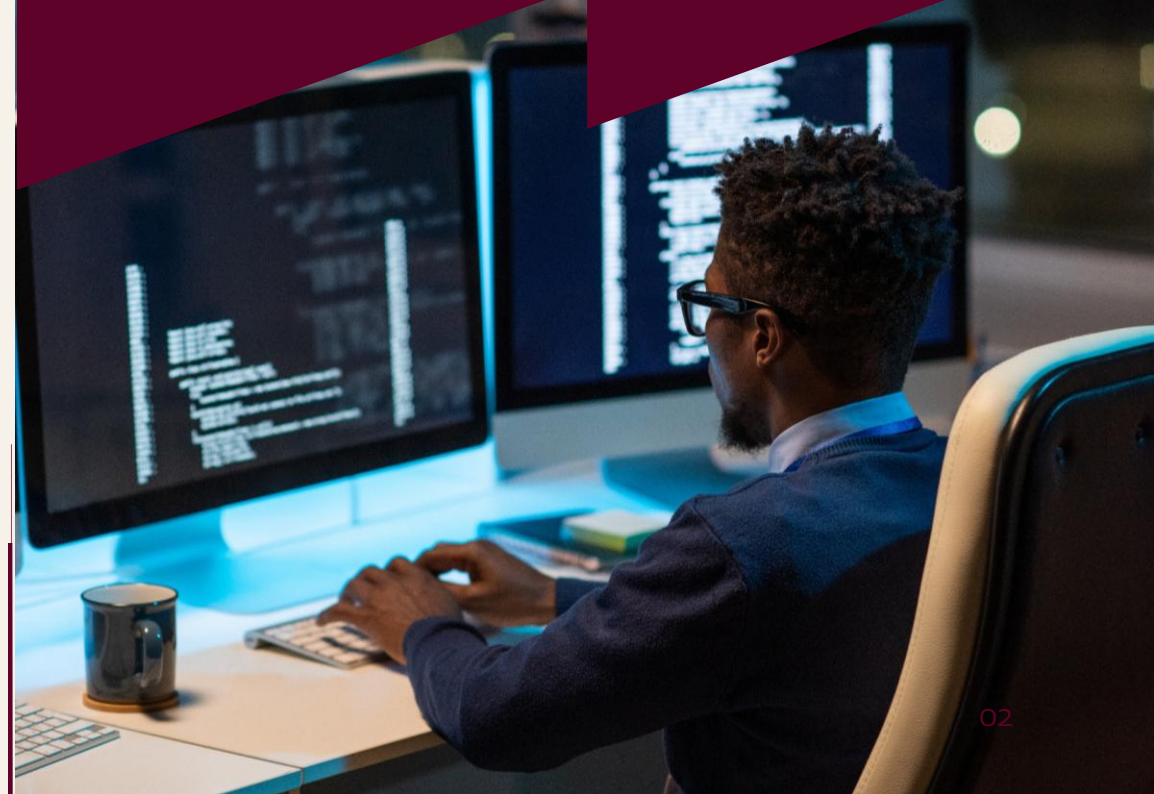


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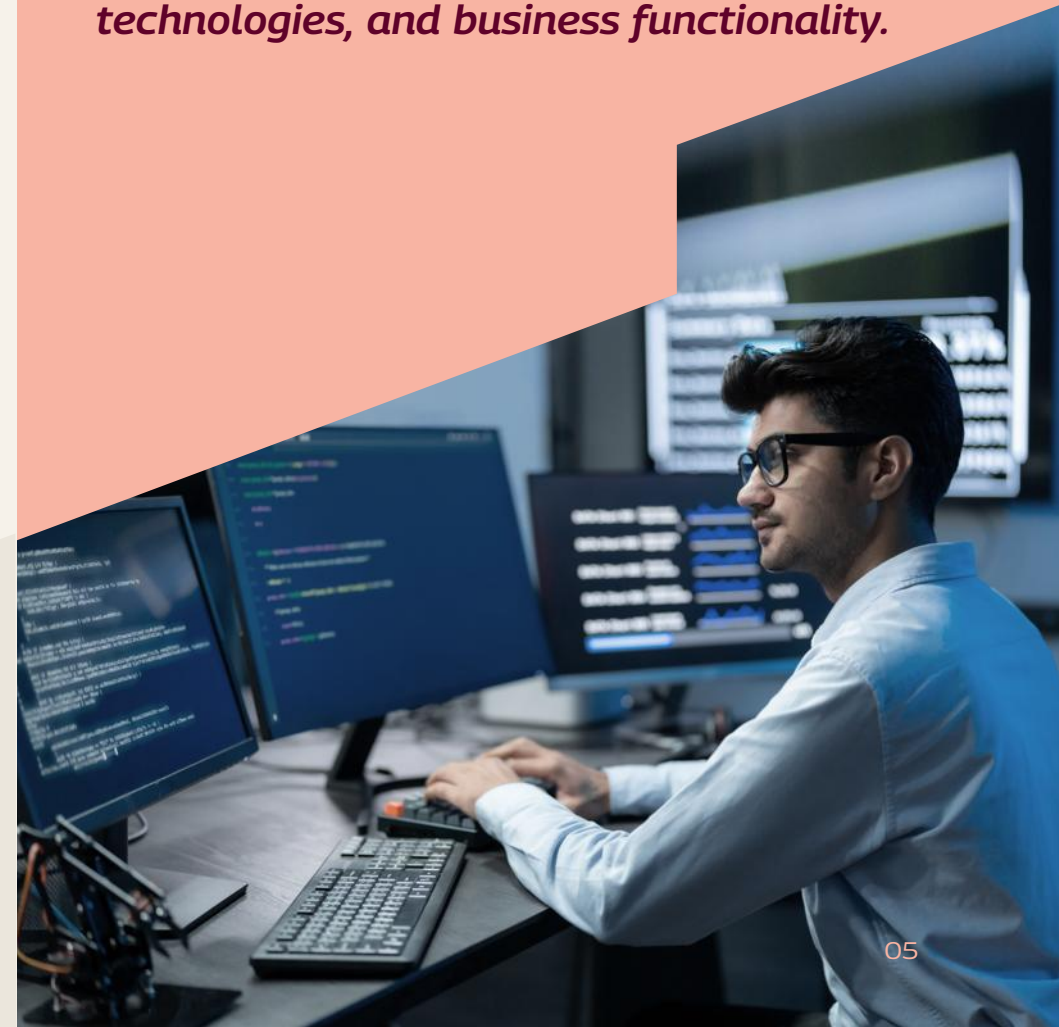
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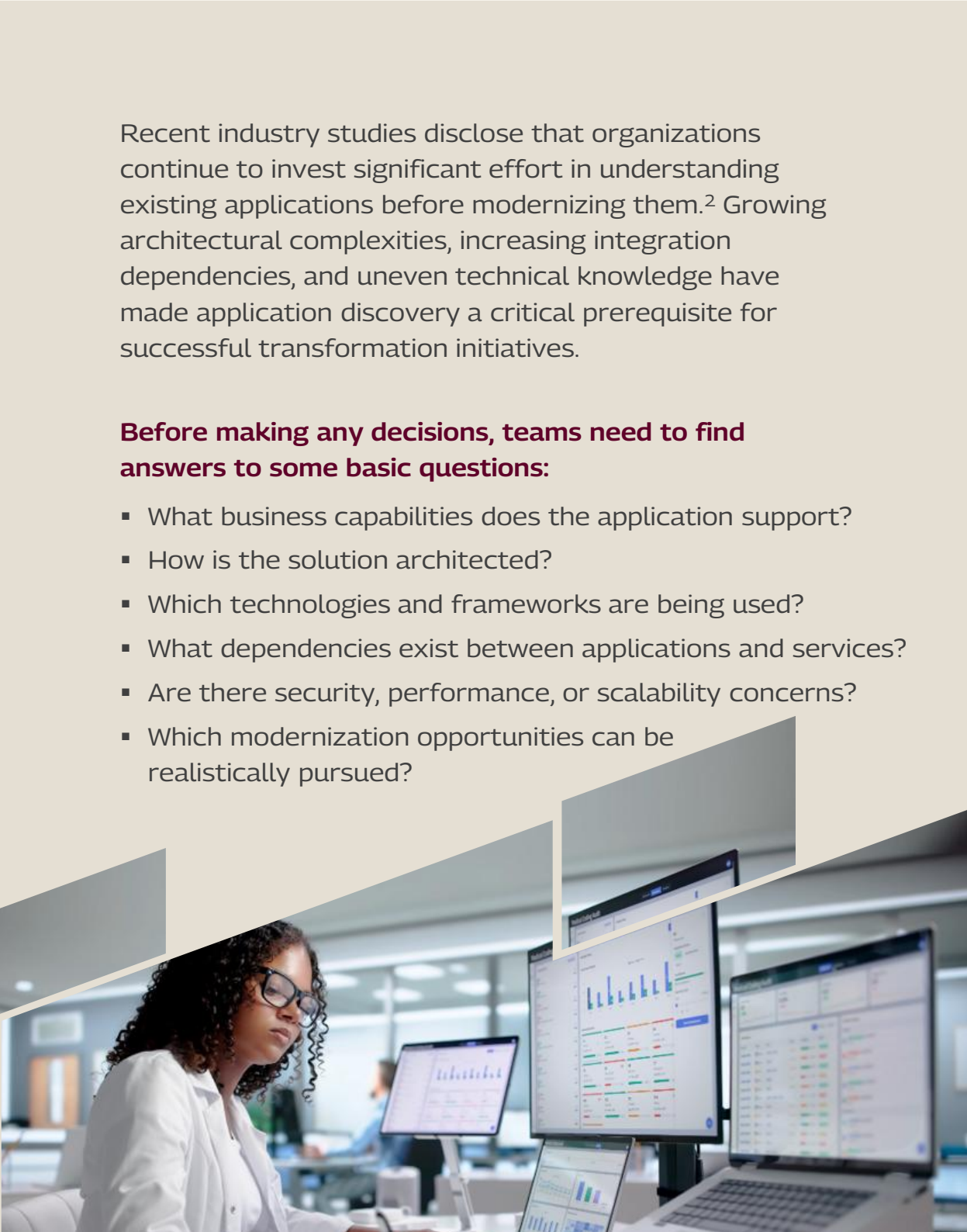
Introduction

Every organization has diverse applications and technologies. Over the years, new features are added, teams change, and applications connect with many other systems. As a result, most organizations have a mix of old and new applications.

When modernization starts, the biggest challenge is not moving the application to a new platform but understanding the existing application landscape. Before any modernization work begins, the team needs to understand how the current application works, what technologies are used, how different modules/components interact, and what business processes it supports. In many organizations, this information is not available in a centralized system; some is in the source code, some is in the documents, and some is known only to experienced team members. Hence, teams spend a lot of time finding and understanding information before they can start modernization work.

Successful modernization starts with understanding. Before organizations can change, migrate, or improve an application, they need clear visibility into its architecture, dependencies, technologies, and business functionality.





Recent industry studies disclose that organizations continue to invest significant effort in understanding existing applications before modernizing them.² Growing architectural complexities, increasing integration dependencies, and uneven technical knowledge have made application discovery a critical prerequisite for successful transformation initiatives.

Before making any decisions, teams need to find answers to some basic questions:

- What business capabilities does the application support?
- How is the solution architected?
- Which technologies and frameworks are being used?
- What dependencies exist between applications and services?
- Are there security, performance, or scalability concerns?
- Which modernization opportunities can be realistically pursued?



Finding these answers is not straightforward. Teams often rely on code walkthroughs, architecture reviews, existing documentation, support records, and discussions with experienced team members who have worked on the application for years. For large and complex systems, this effort can take significant time before modernization planning can even start.

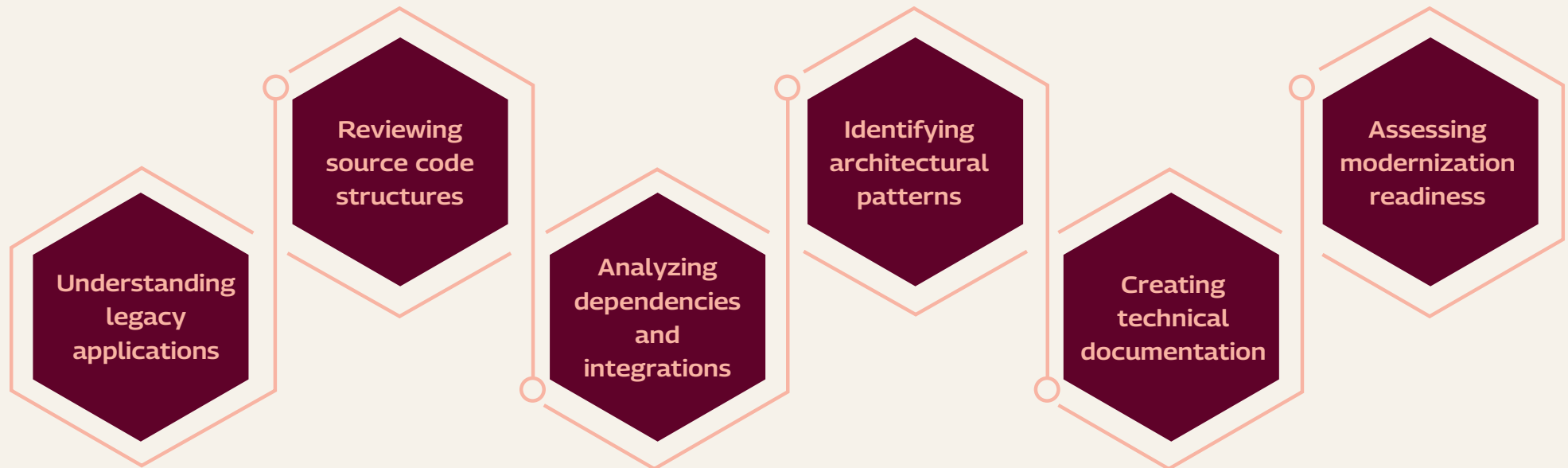
In most cases, documents are outdated, architectural decisions are not fully captured, and critical knowledge resides with a small number of team members. As a result, engineering teams spend valuable time understanding the application instead of focusing on modernization outcomes.

The repository intelligence solution simplifies this process. By analyzing code repository information and related sections, it is possible to automatically gain insights into the architectural design, technology stack, dependencies, operational aspects, and potential ways to modernize the application. While traditional thinking treats code as just a bunch of files, repository intelligence treats code repository information as a knowledge base that can be effectively analyzed by engineering and business teams.

Need for Repository Intelligence

When any team starts a modernization project, they cannot directly jump into migration or transformation. They first need to understand the application and how it supports business objectives. If the team does not have that understanding, planning can become challenging, and mistakes occur later in the project.

By understanding the application, teams can make sound decisions early, identify problems and risks, and plan the next step confidently. In large enterprise environments, application knowledge normally exists through multiple repositories, documents, support records, and individual SMEs. As engineering teams scale, maintaining consistent visibility into application architecture, dependencies, and operational behavior becomes challenging:



Repository intelligence helps improve understanding of current applications. Examining source code and other artifacts in the repository enables the capture of key aspects of the application, such as its architecture, technologies, dependencies, and other details. Instead of spending a lot of time looking into the source code and reading different documents and project history, one can obtain all the required information in a single window.



Challenges of Traditional Discovery Approaches

Traditional Approach	Common Challenges
Code Reviews	Time-consuming
SME Interviews	Knowledge dependency
Documentation Reviews	Often outdated
Spreadsheet Assessments	Difficult to maintain
Architecture Workshops	High coordination effort
Architecture Workshops	Time-consuming

AI-Powered Repository Intelligence Architecture

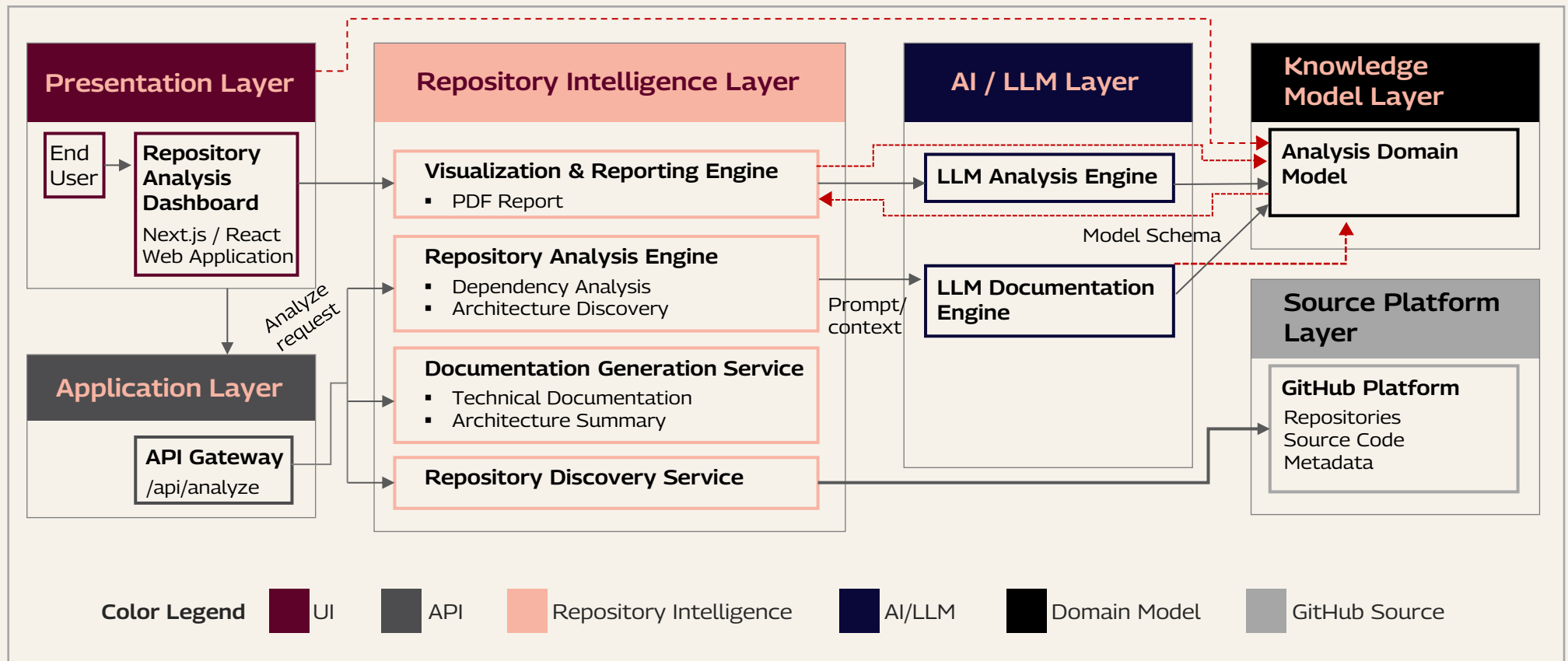


Figure 1: AI-Powered Repository Intelligence Architecture



Repository intelligence is an intelligent solution that helps identify applications, assess architectures, produce documents, and conduct modernization analysis. The first step involves analyzing a repository through a centralized repository intelligence dashboard, where users enter the repository name to search and view generated insights.

The data in the repository is then analyzed using an architecture for source code, dependency, configuration, and component analysis via APIs. The repository analyzer, powered by AI, uses configurable large language models to turn technical discoveries into knowledge.

This architecture provides a scalable and extendable framework capable of supporting a wide range of modernization, cloud migration, developer onboarding, production support, and engineering transformation initiatives.

AI-Powered Repository Intelligence

Framework: The framework consists of five interconnected layers that work together to transform source code into actionable enterprise intelligence. The key capabilities include:

- Repository analysis dashboard.
- Report visualization.
- Architecture review.
- Documentation access.
- Export and sharing capabilities.





Repository Intelligence Output

01	Executive Summary		02	Repository Overview		03	System Architecture	
04	Tech Stack & Dependencies		05	Core Modules / Components		06	API Documentation	
07	Database		08	Application Flow / Workflows		09	Application Runtime Flow	
10	Security Analysis		11	Performance & Scalability		12	Code Quality Assessment	
13	Design Patterns		14	Configuration & Environment		15	External Integrations	
16	Logging & Monitoring		17	Risks & Issues		18	Class-Level Design	

Figure 2: Repository Intelligence Output Section

Repository intelligence helps teams understand an application faster by reviewing the repository's source code and displaying important information in the dashboard. Instead of spending days reading/debugging source code, searching for documents, and speaking with different stakeholders, teams can get a clear understanding of the application in a short span of time.

This helps developers, leads, architects, support teams, product owners, and modernization teams understand how the application works and what technologies it uses. Information generated by the repository intelligence analysis solution is very useful when reviewing and planning application modernization. Information can be accessed from one central place, saving time that could otherwise have been spent looking for information elsewhere.

Enterprise Use Cases

Repository intelligence can support several key enterprise initiatives:

- **Application Modernization:** Helps teams understand applications faster before starting modernization activity.
- **Cloud Migration:** Assists in migration planning via architecture discovery and dependency analysis.
- **Developer Onboarding:** Reduces onboarding effort through application and architecture details.
- **Application Rationalization:** Helps identify duplicate, outdated, or less-used applications for better management.
- **Technical Due Diligence:** Helps review and understand applications during mergers, acquisitions, or large transformations.





Business Impact

During internal evaluations across multiple enterprise repositories, the solution exhibited noticeable improvements in application discovery and assessment.

Engineering teams were able to substantially reduce time spent on understanding applications, dependencies, and technology landscapes. Documents that traditionally required extensive manual effort could be generated within minutes, helping teams focus more on decision-making and planning.

Key observations included:

Metric	Outcome
Application Discovery Effort	Internal validation activities indicated a potential reduction of up to 30% in application discovery effort.
Repository Assessment Speed	Internal validation activities indicated assessment activities could be completed up to 45% faster.
Documentation Generation	Minutes instead of weeks.
Engineering Knowledge Accessibility	Significantly improved.
Modernization Readiness	Accelerated.

The framework has been evaluated on the following technologies:

- .NET
- Node.js
- Python
- Java
- React

Validation activities focused on:

- Application discovery.
- Architecture assessment.
- Dependency analysis.
- Documentation generation.
- Modernization readiness evaluation.

Future Outlook

Repository intelligence will evolve far beyond application discovery. As AI capabilities continue to mature, organizations will increasingly move toward continuous engineering intelligence where source code is continuously analyzed and developed with contextual knowledge.

Emerging capabilities may include:

- Continuous Architecture Intelligence.
- AI-Assisted Impact Analysis.
- Engineering Knowledge Assistants.
- Repository Knowledge Graphs.
- Automated Modernization Roadmaps.
- Intelligent Refactoring Recommendations.
- AI-Driven Technical Debt Management.
- Engineering Productivity Insights.

These improvements can help teams make better decisions earlier instead of waiting for problems to occur later.

The ability to understand applications quickly is becoming just as important as the ability to modernize them. Organizations that can turn application knowledge into actionable insights will be better positioned to speed up transformation initiatives and respond to changing business needs.





Conclusion

Modernization programs do not begin with migration. They begin with understanding. For many organizations, application discovery remains one of the most time-consuming and expensive phases of transformation. Critical knowledge is frequently spread across source code, documentation, support teams, and SMEs, creating delays and increasing delivery risk.

AI-powered repository intelligence offers a practical and scalable approach to addressing these challenges. By automatically analyzing source code and generating meaningful technical insights, organizations can accelerate discovery, improve engineering productivity, and build a stronger foundation for modernization initiatives.

As generative AI continues to mature, repository intelligence is likely to become a foundational ability within modern software engineering organizations, helping teams move beyond basic code analysis and toward continuous engineering knowledge management.



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About the Author

Rohit Jain is a technology leader with over 18+ years of experience in software engineering, application modernization, cloud transformation, and enterprise delivery. He has worked with global teams across India and the United States, including more than four years of large-scale initiatives for North American organizations. His areas of expertise include generative AI, engineering transformation, repository intelligence, application assessment, and modernization strategy. He is passionate about helping organizations improve engineering productivity and accelerate transformation outcomes through practical, AI-enabled solutions.

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