White paper

CGI

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Rebuilding and replatforming legacy applications

Introduction

Many organizations are burdened by legacy software of many kinds, including enormous and excessively complex, monolithic applications. The 2019 CGI Client Global Insights[1] reveal that modernizing application portfolios is a high priority for the 1,500+ executives we interviewed.

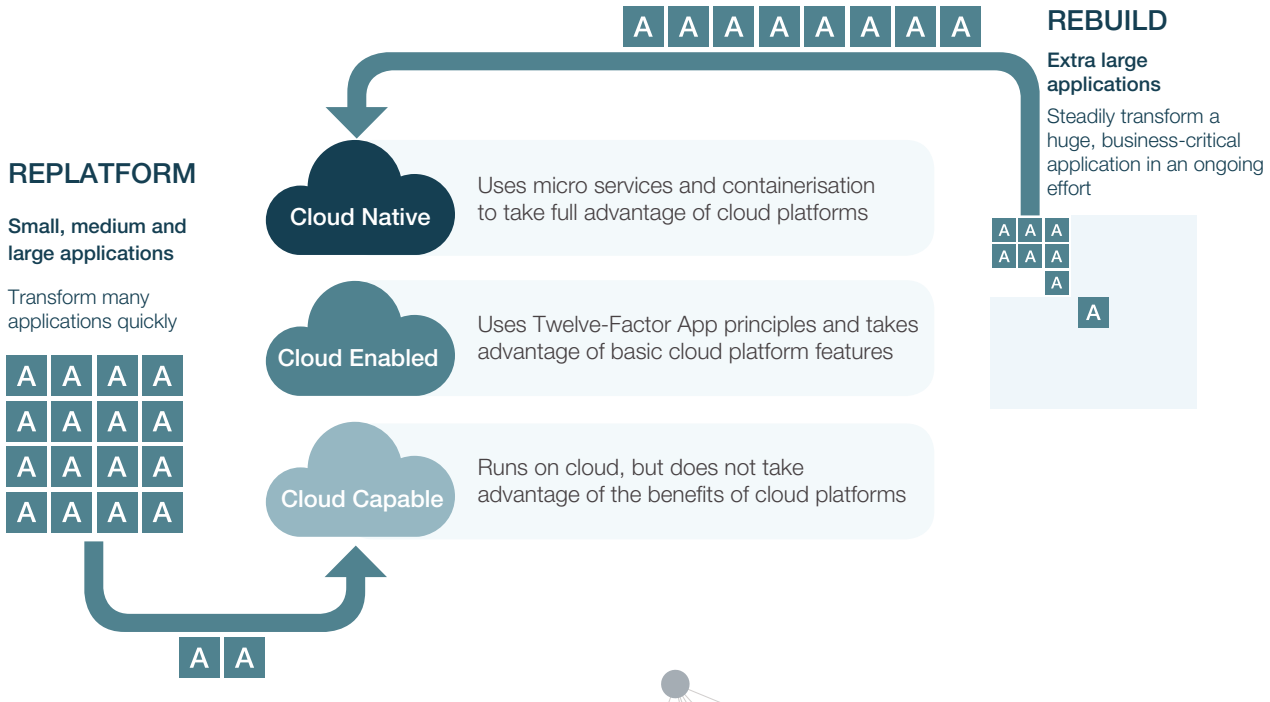
This whitepaper describes CGI's two-part approach for accomplishing this: (1) replatforming existing applications from bare-metal or virtual machines to containerized target environments and (2) gradually eliminating huge monolithic applications by rebuilding their functionality as native cloud services. Organizations can greatly benefit from this approach whether they own tens, hundreds, or even thousands of applications and need a streamlined approach for containerization. Those that recognize it is time to modernize a large business-critical backbone system that still has years of usefulness left in it but has run up against its limits in terms of manageable complexity also can benefit from this approach. In both scenarios, organizations require a partner who knows how to tackle "big ball of mud" applications—i.e., applications that are cobbled together from spaghetti code without a discernible architecture—and how to rebuild them piece by piece while applying state-of-the-art practices and principles.

[1] 2019 CGI Client Global Insights: www.cgi.com/en/client-global-insights

Two approaches

We take two main approaches to modernizing applications: replatforming and rebuilding. The replatforming approach is depicted on the left in the figure below. It involves migrating a large number of applications running on virtual or bare-metal machines to cloud-ready containers on a cloud platform. The rebuild approach is shown on the right. It modernizes a large monolithic application by extracting parts of its functionality and rebuilding them as cloud-native services. We have well-defined approaches for both scenarios, along with the appropriate methodologies, technologies, and engineering skills. They are described in the following pages and illustrated in the diagram below.

REBUILDING AND REPLATFORMING LEGACY APPLICATIONS



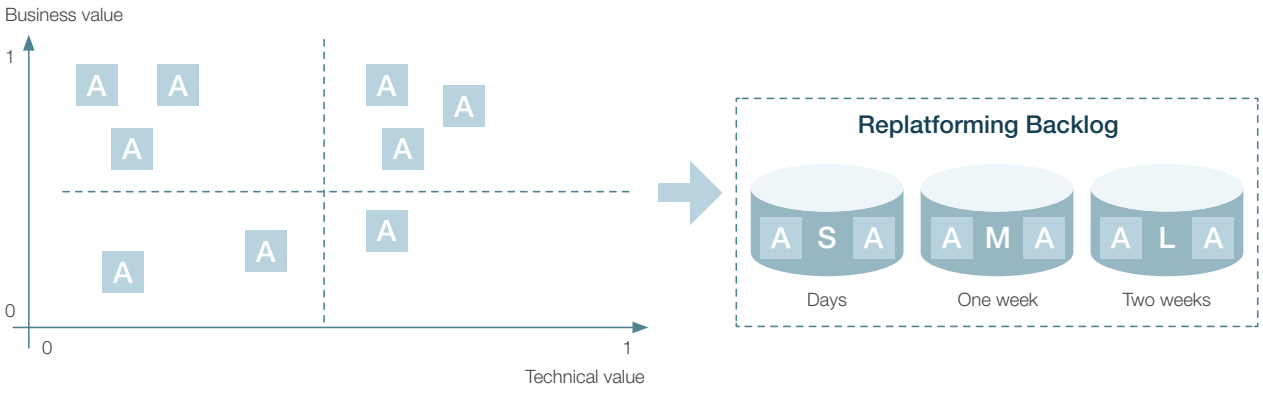
The replatforming approach

In replatforming projects, we usually take the first of the two mentioned approaches: namely, migrating a large number of applications to a cloud-native runtime environment. Here the goal is not necessarily to completely rebuild applications. Instead, the applications are only altered to the extent required to ensure they run in the target environment.

Before starting, we assess your cloud and business strategies to make sure that we are on the same page and will be migrating the right applications for the right reasons. We strive to understand your cloud strategy, your current data center setup, the level of maturity of your organization's cloud-native development practices, and various other aspects. The CGI client proximity model is hugely beneficial for this. If your organization already has a relationship with CGI, it is very likely that we already possess much of the required information as well as a good understanding of your overall environment. This saves time and allows us to dive quickly into the replatforming work. Our methodology for this has components: a continual assessment stream and a continual replatforming stream.

Business value	WF	App1	App2	App3	App4
Business criticality	0.4	8	8	8	8
Revenue generation	0.2	8	8	8	8
Client touchpoints	0.4	8	8	8	8
…	…	…	…	…	…
		5.4	5	6.2	3.8
Business Index		**0.18**	**0.17**	**0.21**	**0.13**

Technical value	WF	App1	App2	App3	App4
Code base	0.6	3	5	3	1
CI/CD	0.2	3	2	4	5
Dependencies	0.2	4	8	6	4
…	…	…	…	…	…
		3.2	5	3.8	2.4
Technical Index		**0.11**	**0.17**	**0.13**	**0.08**

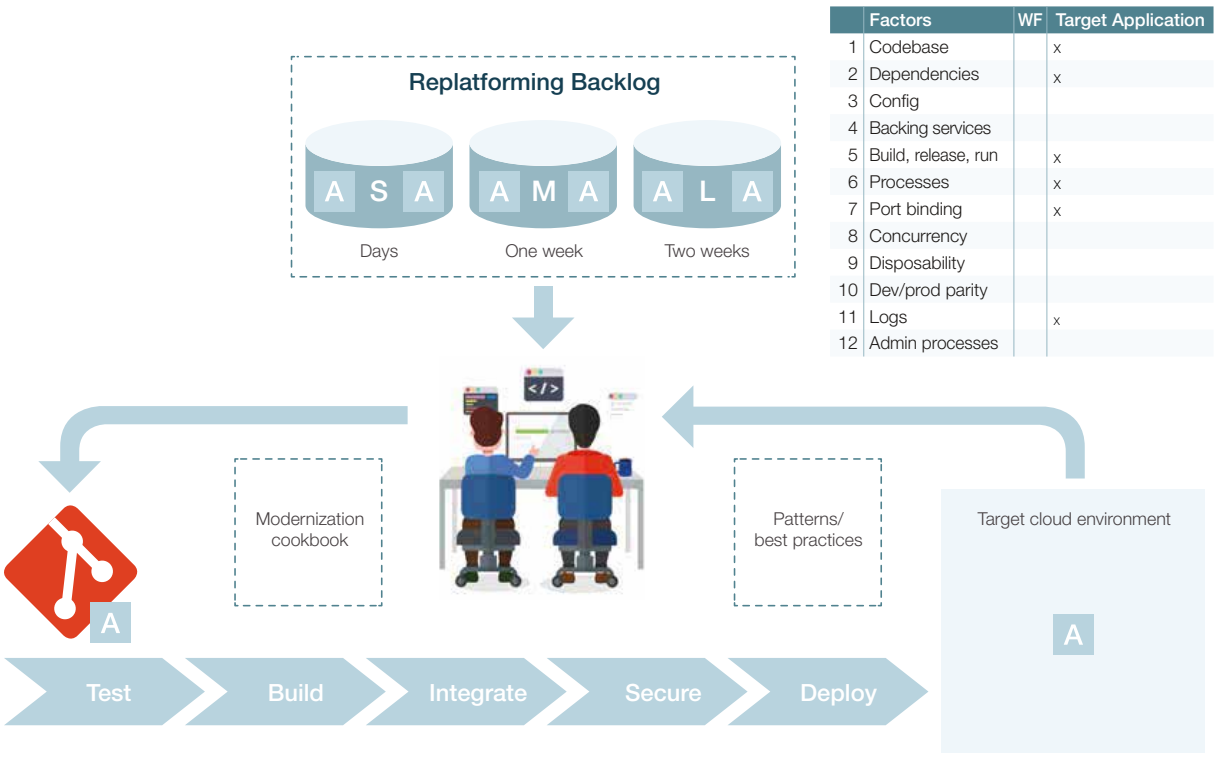


83% of executives we interviewed cite legacy technology or agility constraints as a top challenge to digital transformation.

(Source: 2019 CGI Client Global Insights)

The team responsible for the continual assessment stream assesses one application at a time according to predefined criteria. The focus is on understanding each application's business and technical value. This is accomplished with a combination of structured interview sessions and facilitated workshops in which we use state-of-the-art methodologies such as Snap analysis or event storming to gather the required information. Results of the assessment are added to a replatforming backlog, where we typically group applications by labelling them as Small (S), Medium (M) and Large (L) (analogously to clothing sizes) to get an idea of how long it will take to migrate them.

Once the first applications have been analyzed and data on them has been placed in the replatforming backlog, work on the continual replatforming stream can begin. A group of experienced engineers takes applications out of the backlog one at a time along with the corresponding data. To improve overall quality and accelerate the work, we use extreme programming practices and techniques, especially programming in pairs: two developers, both from CGI or one from CGI and the other from the client's side, work at the same computer to replatform one application at a time.



	Factors	WF	Target Application
1	Codebase		x
2	Dependencies		x
3	Config		
4	Backing services		
5	Build, release, run		x
6	Processes		x
7	Port binding		x
8	Concurrency		
9	Disposability		
10	Dev/prod parity		
11	Logs		x
12	Admin processes		

To do so, we put the application in version control, install CI/CD pipelines, target the release process to the runtime environment, and make as few changes to the application as possible while ensuring it will run in its new environment. Automating the build, test, and release process allows us do this by trial and error. As soon as the application runs without any errors, the modification and migration process is completed, a release pipeline is in place, and your application can be deployed in the target environment with full automation. It is now cloud-ready. In a further step, if there is a business need, the cloud maturity of an application can be increased by applying more of the Twelve-Factor App principles to make it more resilient, add more mature application programming interfaces (APIs) and so on. This modernization path leads to a cloud-friendly, cloud-resilient, and ultimately cloud-native state.

After we migrate a few applications, patterns typically emerge. These are specific to your business and applications. Our engineers record these patterns in an application modernization “cookbook” that we create during the replatforming project. Later you can use this cookbook and the “recipes” it contains to involve more of your people.

The rebuilding approach

While small- and medium-sized applications can feasibly be rebuilt from scratch, our rebuild modernization approach is very effective for modernizing very large monolithic applications that have evolved over the course of decades and are crucial for the success of your business. A project of this kind requires great attention to detail and a reliable partner who is able to support an ongoing modernization effort and make sure the required resources are consistently available.

25% of executives we interviewed indicate they have 500+ applications in their portfolio

(Source: 2019 CGI Client Global Insights)

Rebuilding an application this way is a major project that can take many months or even years to complete. We generally start by creating a work structure. Like in our replatforming modernization approach, the key elements include a continual assessment stream and a continual replatforming stream. One major difference here is that we do not have to search for applications that can be minimally modified to run in a native cloud environment. Instead, all of the involved people (business, IT, management etc.) are guided through the process of defining business domains, bounded contexts, entities, value objects and so forth. We apply strategic domain-driven design at the program level to identify the priorities and requirements for the next three to six months.

Next, we hold event storming workshops to apply tactical domain-driven design techniques together with IT and business people. This generates enough detailed information to populate an agile backlog with epics and user stories. Multiple teams then start rebuilding (mimicking) the functionality of the existing legacy application as a cloud-native micro-service running in a cloud-native environment. This service is then integrated with the existing application via APIs (the functionality is rebuilt outside of the legacy application). We use all the same cloud-native application development best practices for the rebuilding work as we do in our replatforming approach.

Everything is automated with evolved CI/CD pipelines, and the resulting newly created software is cloud-native based on Twelve-Factor App principles. Service by service, the existing application's functionality is gutted. This process is repeated until either all of the functionality has been moved out and rebuilt or there is no business reason for rebuilding any leftover functionality in the old legacy application.

Modernization on a global scale

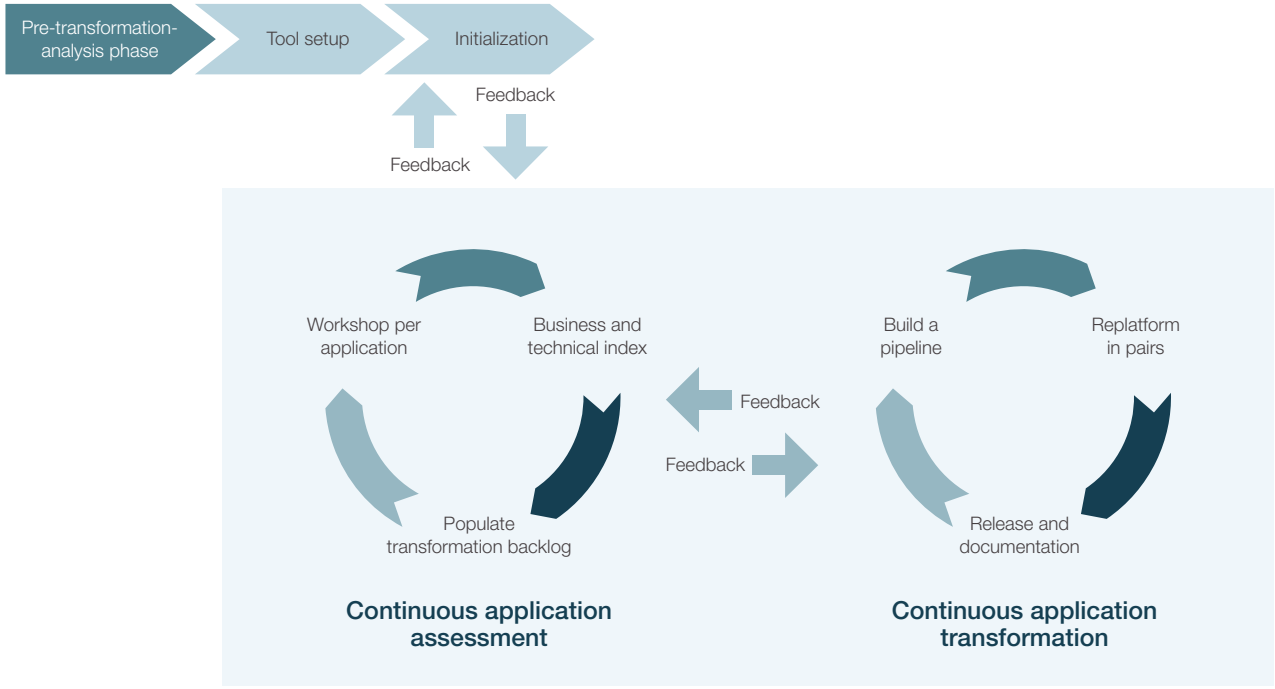
It is not easy to carry out high-quality replatforming and rebuilding modernization work. It is even harder to do so on a global scale while delivering consistently high-quality work at an attractive price. The described replatforming and rebuilding approaches are CGI solutions that we are continuously improving and evolving. All of our IT modernization units—in the United States, Europe, India and elsewhere—take the same approach and share the same dedication to delivering quality work to clients all over the world.

Our unique IT modernization approach, deep familiarity with the "old" and "new" IT worlds, client focus, commitment to excellence, and ongoing efforts of cultivating long-lasting relationships are all good reasons to consider CGI as a partner to migrate to cloud-native solutions.

We help clients benefit from cloud capabilities with a balanced approach that addresses our clients' obligations to protect critical personal or commercial data, protect privacy, comply with regulation and mitigate commercial risk. Whether modernizing with cloud-native and DevOps methods, or ultimately managing and securing hybrid, multi-cloud environments, CGI has the expertise to support any cloud requirement, from strategy, roadmap and governance, to architecture and transformation, to secure operations and managed services.

Getting started

As Eric Ries recommends in his book, “The Lean Startup,” organizations should “Think big, start small and then scale fast.” We wholeheartedly share this view.



Starting small gives you the opportunity to better understand how applications are transformed with our IT modernization approach and how it meets your needs. In an initial assessment, we identify potential candidates for modernization, which are usually small to mid-sized applications that are about five to seven years old. Quickly transforming a few applications can generate a momentum that, if supported by the right measures, can grow, increase overall performance and deliver huge benefits.

Conclusions

Many organizations across most industries are now experiencing a need to modernize their applications. There are many reasons for this. Sometimes the biggest driver is the requirement to reduce infrastructure costs or it is the need to get products and services to market faster and achieve greater flexibility in the development process. In many cases, all of these reasons apply.

With our IT modernization services, we do more than help you migrate your applications to cloud environments. We also apply industry-specific expertise and best practices gained from project work around the globe to find the best approach for your specific situation. Optional programming in pairs by our experts and yours adds more value by injecting know-how into your organization. Whether your challenge is to migrate hundreds or thousands of existing legacy applications to cloud-based infrastructure or to rebuild highly complex large legacy systems, thanks to our engineering skills, application transformation approaches, global delivery capabilities, and client proximity model, we can guide you smoothly through even the most complex application transformation projects.

If you are interested in learning more and discussing your organization's path to cloud-native applications, please contact us at info@cgi.com.

CGI

About CGI

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world. Operating in hundreds of locations across the globe, CGI delivers end-to-end services and solutions, including strategic IT and business consulting, systems integration, intellectual property, and managed IT and business process services. CGI works with clients through a local relationship model complemented by a global delivery network to help clients achieve their goals, including becoming customer-centric digital enterprises.

We have the methodology and capabilities to assist clients in defining their digital strategies and cloud-native roadmaps, as well as the breadth and depth of experience to deliver their transformations. We have delivered success in over 75 cloud-native projects. We offer deep technical expertise with a boutique client relationship approach, backed by the global insights and local presence of CGI.