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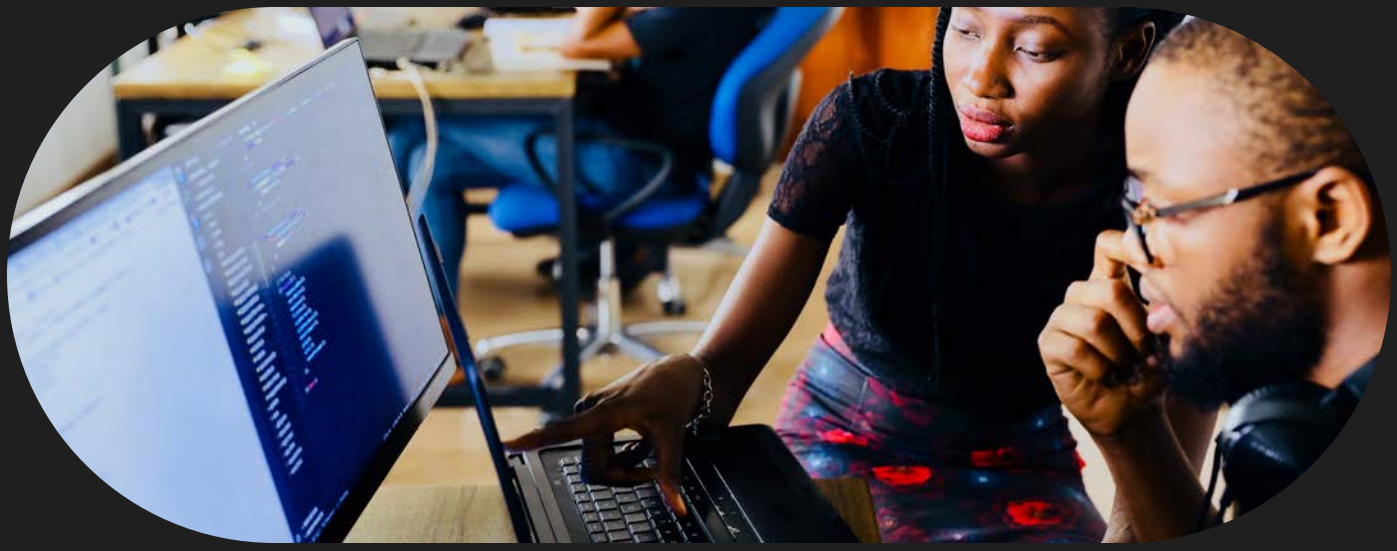
White Paper

Cloud-Native Development Report:

The High Cost of Ownership



Cloud-native application development is one of the fastest-growing trends in tech today.

Some of the biggest names in business take advantage of cloud-native infrastructure for development and all its trimmings — microservices, Kubernetes, containers, serverless, and infrastructure as code — to deliver popular applications that everyone uses. Think Netflix, Lyft, Capital One, and Amazon. Each of these companies is a dominant force in its market.

It's no wonder, then, that Gartner and IDC predict that 90-95% of apps will be cloud-native by 2025 and that nearly two-thirds of enterprises will become prolific software producers that deploy code daily.

These companies know that cloud-native applications have potent advantages over legacy software — specifically, availability and agility, massive scalability, elasticity, easy geographic distribution, and resilience. These apps enable companies to react to changes in the market faster, provide better experiences for their customers, and deliver a competitive advantage. Once developed, cloud-native applications can be deployed, rapidly evolved, and scaled worldwide across cloud environments.

In a world where marketplaces and verticals are more prone to upheaval than ever, cloud-native applications enable companies to thrive and dominate. So, if you are interested in using cutting-edge tech to drive and maintain a competitive advantage, this is the way to go.

However, it would be an understatement to say that developing cloud-native apps represents a fundamental change in software development. The complexities and risks of jumping to cloud-native development are why today few companies — beyond the Netflix and Ubers of the world — have fully embraced cloud-native computing.

90-95% of apps will be cloud-native by 2025

The Challenges of Cloud-Native Development

Despite its many benefits, transitioning to a cloud-native dev approach is not always straightforward. At the core of this approach is containerization and Kubernetes, the container orchestration platform of choice for most enterprises today. Kubernetes, however, is extraordinarily complex, and experienced practitioners are scarce resources.

Organizations that deploy it find they must dedicate significant resources to configure and run it properly. Kubernetes is just one of the challenges IT leaders need to consider when building cloud-native apps from the ground up. Others include:

- Retraining teams on microservices architecture
- Assembling and learning all the individual cloud-native services required for security, networking, data, secrets, etc.
- Retooling DevOps processes for the rapid cadence of cloud-native dev

All these challenges combine to exponentially increase complexity. And the inevitable byproduct of all those overlapping layers of complexity is cost.

In this research report, we examine the math — diving into the true costs of architecting your cloud-native infrastructure as you navigate your way through myriad options (Kubernetes, containers, microservices) and the expertise required to get you there. You will also learn how you can develop cloud-native applications easier and at a lower cost.

Cloud-Native Development TCO Methodology

The costs of hiring a team of cloud-native dev experts, building the environment, and scaling it depends on many variables. These include company size, in-house skills, the country where the team is hired, the current operating model of the teams, and the app portfolio being modernized. Since the application development phase impacts infrastructure costs, both phases are covered here.

To calculate the total cost of ownership (TCO) of a cloud-native dev approach, we analyzed a composite organization: Atom, a U.S.-based insurance company with global operations.[1]

Company name	Annual revenue	Employees
Atom	**$3 billion**	**10 thousand**
Industry	IT budget	Customers
Insurance	**$190 million**	**10 million**

Although Atom has a wide portfolio of apps that need to be modernized, the focus of this study is its web portal, a mobile companion to that portal, and a supporting back-office app. The front-end offers some interaction with subscribers, agents, brokers, and carriers. Some simple logic is solved by the front-end. The back-end runs business logic and is connected to the CRM, ERP, and policy administration system.

The IT department at Atom has a large team of U.S.-based developers, but there is no in-house expertise in cloud-native technology. The development teams use a traditional, linear waterfall model rather than a rapid, iterative style (e.g. Agile) common to cloud-native developers.[2]

With gaps in their cloud-native dev and engineering expertise, Atom hires an external consultant to support the IT manager during the planning phase. Four main initiatives span two phases: infrastructure environment and application development (see Fig. 1).

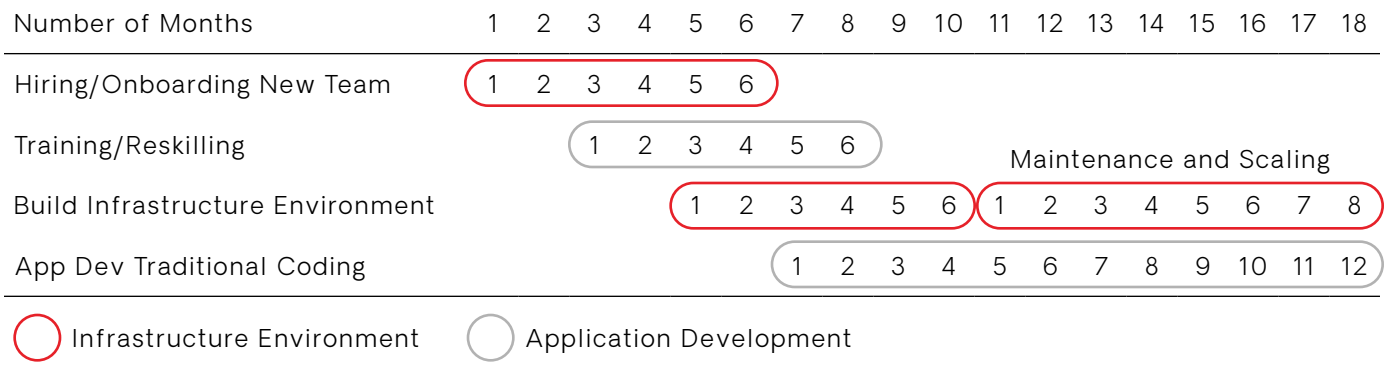


Figure 1: Application modernization initiatives for Atom

Phase 1: Calculating Infrastructure Environment Costs

Before Atom can begin building its applications, they have to design, build and deploy the underlying cloud-native dev infrastructure. This is the platform on which apps will be built, tested, deployed, managed, and monitored, and it must be managed for the life of the applications.

This first phase includes hiring and onboarding, building and configuration, and maintaining and scaling for the infrastructure only — **totaling $2.7 million.**

Hiring/onboarding new team: $663 thousand

To successfully launch the infrastructure for its new web portal, mobile companion, and back-office app, Atom needs to hire 12 new team members in the U.S. with specific expertise in cloud-native technologies. The team required to build and scale the cloud-native dev infrastructure includes:

- 2 skilled cloud architects
- 4 DevOps/site reliability engineers
- 2 platform testers
- 2 security experts
- 1 program manager
- 1 agile coach

The hiring/onboarding costs cover:

- Recruiting agency fees
- External consultant fees
- The support of an HR manager for 6 months
- Time spent interviewing candidates selected by the agency
- Time spent providing new hires with support from in-house developers and the IT manager supporting the new hires during onboarding

Infrastructure as code, Kubernetes, cloud architecture, DevOps, and CI/CD are the most difficult skills to hire for and command the highest salaries.[3] To speed up the process and free internal resources, Atom uses a recruiting agency — even though their fees represent more than 50% of the costs in this category.[4]

Note that other costs — such as the cost of delaying projects due to in-house developers supporting the onboarding process or interviewing candidates and the costs associated with the planning phase — are not included in the total.

Building and configuring the infrastructure environment: $1.2 million

This cost assumes the adoption of a managed Kubernetes service from a cloud service provider with 85% of the costs corresponding to fully loaded salaries and 15% to software licenses, tools, and services. Here's how it breaks down:

- 10 developers/architects with cloud-native skills, plus 2 managers over six months
- 50% of the IT manager's time
- Software licenses, enterprise-grade support for some of the open-source tools, and 20% of the cloud services costs used during the application development phase

This is the most critical and challenging stage. It involves defining and building the infrastructure and selecting numerous tools.

The breadth and complexity of the tools, services, and architecture are mind-boggling. For databases, there are 63 different options. For security, there are 90 different services and tools. The Cloud Native Computing Foundation (CNCF) Landscape has 25 categories (see Fig. 2) with over 800 tools in all.

This dizzying array of choices customers must contend with is why there are more than 250 Kubernetes Certified Service Providers and 60 Kubernetes Training Partners listed in the CNCF Landscape.[5]

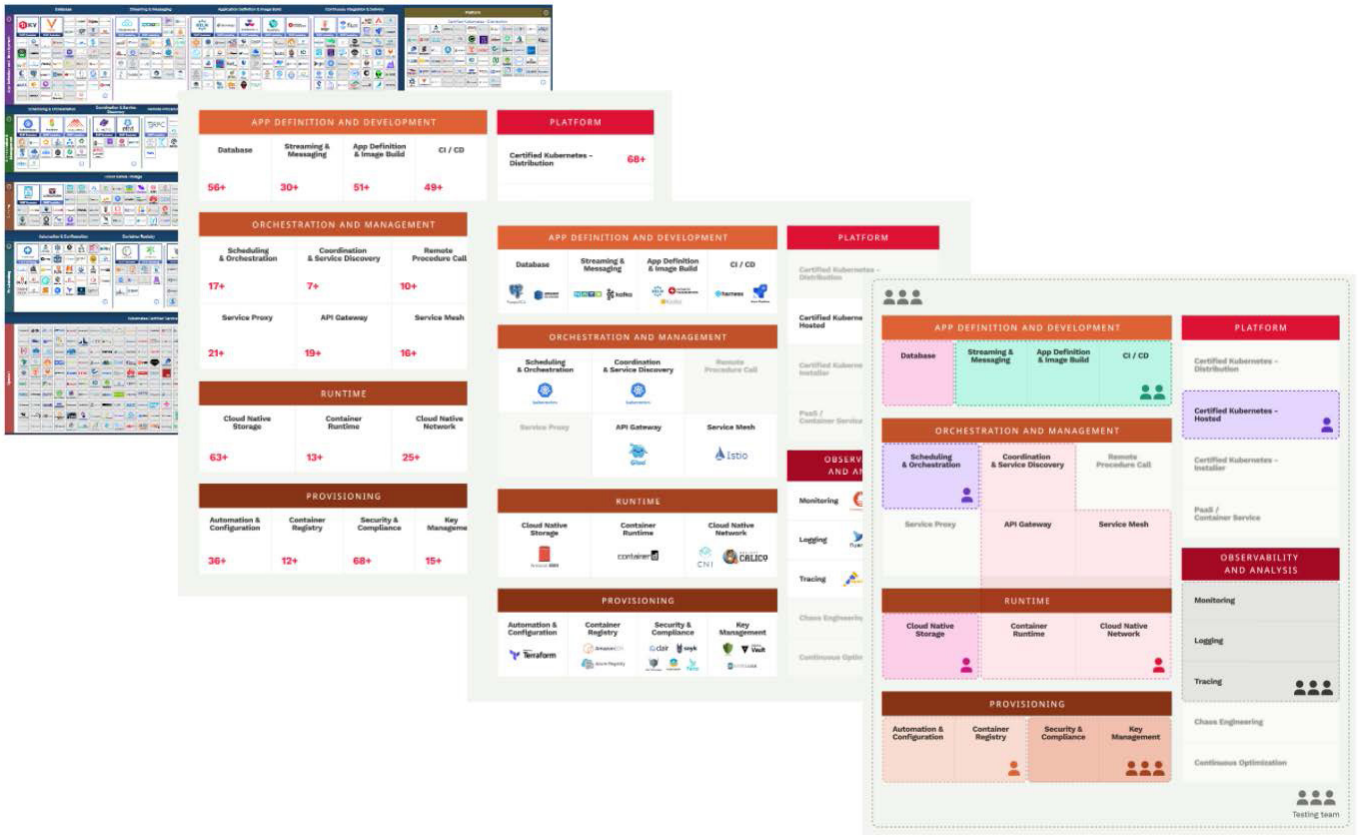


Figure 2: Screenshots of CNCF Landscape

To build out the architecture of its infrastructure, Atom decides on 35 different tools and services, and its team of developers and architects needs to have the expertise to work with each.

The vast majority of the tools are open source, and the team begins with no paid support for most of them. A few tools require special support and features, but costs are not significant during this stage.

As the application portfolio grows, the environment gets more complex, and costs coming from enterprise-level support for open-source tools might be considerably higher. Note that paid enterprise-level support is the preferred method when it comes to an organization's cloud-native ecosystem.[6]

Atom opts for managed Kubernetes services and uses cloud platform services from Amazon Web Services, Microsoft Azure, or Google Cloud. The costs allocated to this phase are based on the proper management of the cloud services, and therefore, they are relatively low.

Database storage and the content delivery network (CDN) costs are allocated to the application development phase. As such, only 20% of the total annual costs of the cloud services during app development, testing, and production phases are allocated to the building of the infrastructure environment phase.

Maintaining and scaling the infrastructure environment: $870 thousand

The team responsible for building the underlying infrastructure also maintains and updates the infrastructure. Therefore, 40% of this team's effort is allocated to the costs of infrastructure maintenance and scaling during an 8-month period (see Fig. 1). [7]

As the team progresses with the development of the applications, the cost associated with cloud services increases. For example, more database storage is needed during the testing phase, and CDN services for different regions are required. Tools and services costs correspond to 44% of the costs in this category — which come largely from the cloud service provider. Note that if the application development team takes more than 12 months to rebuild the app portfolio, the cost in this phase increases.

Phase 2: Calculating Application Development Costs

This phase includes training and reskilling in-house developers, as well as app development with traditional coding — **totaling $2.9 million.**

Training/reskilling existing developers: $340 thousand

According to McKinsey, the cost of reskilling an internal tech employee is approximately $20 thousand.[8] Although McKinsey also notes that reskilling is less expensive than hiring, the recommendation for Atom is to do both. The company needs highly skilled new hires with demonstrated cloud-native development or engineering experience to ensure a successful transition. At the same time, existing developers can offer critical insights and value because they understand Atom's business and know its application portfolio, especially its modernization needs.

Atom chooses to reskill in phases. An overwhelming 95% of IT processes need to be updated to enable cloud-native value.[9] Therefore Atom allots 6 months of training to focus on technical skills and new processes.

Traditional application development: $2.6 million

The 12-month development period requires 17 traditional coders working in 3 teams: one responsible for the web portal, one for the back-end app, and Android and iOS experts for the mobile companion. The application development team collaborates closely with the cloud-native infrastructure team. As the app portfolio is being rebuilt, the cloud-native infrastructure team scales the environment and prepares it for the applications.

Total Cost = $5.6 Million

With an optimistic timeline for each phase, the total cost of ownership of rebuilding Atom's infrastructure and modernizing its app portfolio of medium complexity with traditional coding takes 18 months — including hiring the talent required to make it all happen — comes to **$5.6 million**.

Category	Cost with team in US
1. Infrastucture	$2,678,688
Hiring/Onboarding New Team	$663,206
Ops/Maintenance of Infrastructure	$870,188
2. App Dev Traditional	$2,890,433
Training/Reskilling	$340,000
App Dev Traditional Coding	$2,550,433

Beware of Risk Factors

The costs outlined in this report reflect an approachable timeline in which everything goes according to plan. If problems arise from delays, developer attrition, or a lack of cloud-native expertise, costs can rise quickly. Consider these two major risk factors:

Risk #1: Staffing

The job market for developers in general is volatile, and retention is a pressing issue. According to McKinsey, "new hires are not only hard to find, but also two to three times more likely to leave than those already on the payroll."[10] And in-house developers who do not successfully adapt to the new technology and new processes might decide to leave the company. More significantly, developers with these specific cloud-native skills are the most highly sought after and command the highest salary premiums.

Risk #2: Cloud costs

Although many tools can help companies with cloud cost reporting and optimization, skyrocketing cloud costs are not uncommon. And companies unaware of their cloud adoption mistakes overspend by up to 50%.[11] For example, if Atom's team over-provisions the required cloud services during the phase of building and configuring the infrastructure environments, $90 thousand could easily become $500 thousand — depending on the storage, the number of regions, or the CDN configuration.

Based on Atom's scenario, these risks represent around $4 million in losses, including salaries, costs of tools and services, and additional time and money spent on hiring and onboarding.

> "Our original timeline and budget looked pretty similar [to Atom's], and it ended up taking at least twice as long. And it was twice as expensive."
>
> – Senior VP, real estate investment trust

Other TCO Variables

The complexity of the app portfolio is the variable with the highest impact on the costs. It defines the architecture and infrastructure environment requirements, the tools and skills required, and the team size. If a company needs a simple internal app, such as one for vacation planning, there is no need to move to a cloud-native infrastructure or for a new team of a dozen upskilled developers. Even one or two developers with the right skills can handle the requirement.

The second key variable is the type of business and apps — meaning the number of users accessing the apps, the geographical distribution of the business, and areas of operations. These factors will determine:

- The need for geographical redundancy
- Number of billing regions for the CDN
- Number of firewalls
- Compute resources

The third key variable is the way the company's IT department operates. Costs may be impacted by:

- Location of the IT department
- Hiring strategy (in-house development, outsourcing, or a hybrid model)
- Existing development culture (waterfall, agile, DevOps)

Also, note that opportunity costs were not accounted for at any stage and therefore this is a conservative estimate of the total cost of ownership.

Low-Code for Cloud-Native App Dev: All the Benefits Minus the Cost and Complexity

The cost, complexity, and variability of building a cloud-native development infrastructure from the ground up should give any technical leader food for thought. Many IT departments struggle to fully embrace Kubernetes, cloud-native technologies, and microservices. It takes months to years and millions of dollars to implement a typical cloud-native application development platform — all before developers can even begin building their first application.

How, then, can organizations successfully take advantage of the power of cloud-native development without adding additional effort and resources to configure and manage it?

The answer is OutSystems, the only company that has integrated a state-of-the-art cloud-native infrastructure into its low-code platform. It allows you to harness the speed and high productivity of low-code and all the myriad benefits of cloud-native — agility, scalability, security, and availability – without the sky-high costs and special skills required to do it in-house.

A low-code platform uses visual development tools and automation that dramatically accelerates the entire application lifecycle. With the OutSystems high-performance low-code platform, your team can build on a ready-made, proven cloud-native infrastructure, and your existing teams are empowered to deliver applications much faster by eliminating the complexity that comes with traditional coding and the need for specialized cloud-native expertise. When you add cloud-native development to low-code, you can rapidly develop applications that drive revenue, reduce costs, and control risk — at internet scale.

Essentially, OutSystems has reimagined low-code for a cloud-native world. It is truly high-performance low-code, significantly ramping up developer productivity. You can begin writing mission-critical cloud-native applications on Day One — without the complexity, risks, and massively high costs of having to build your own platform from scratch.

Learn how.

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[1] The composite organization, Atom, is a simulation created with an aggregation of feedback from actual OutSystems customers.

[2] Cloud Native Maturity Matrix

[3] Gartner, "2021 IT Skills Roadmap," September 2021.

[4] Agency fees typically vary between 20 to 25 percent of the negotiated first year salary. Indeed.com, "FAQ: What Is a Headhunter Fee and How Much Does It Cost?" February 2021.

[5] CNCF Cloud Native Interactive Landscape

[6] Paul Nashawaty, "Distributed Cloud Series: Cloud-native Applications," February 2022.

[7] For cost allocation purposes, the Cloud Infra/DevOps team is estimated to work for 6 months building/configuring the infrastructure environment; the application development starts 2 months after the Cloud Infra/DevOps team and will be working in parallel collaboratively; the application development team will need 12 months to launch the web portal, mobile companion, and respective back-office apps; the Cloud Infra/DevOps team will be investing 40% of their time in infrastructure/architecture maintenance until the apps are delivered.

[8] McKinsey, "How companies can win in the seven tech-talent battlegrounds," October 2020.

[9] McKinsey, "Six practical actions for building the cloud talent you need," January 2022.

[10] ibid.

[11] Gartner, "4 Lessons Learned From Cloud Infrastructure Adopters," June 2020.

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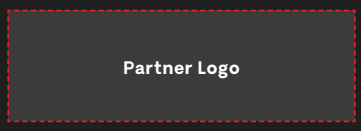

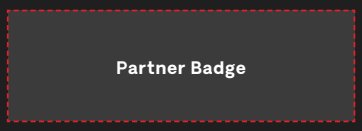

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