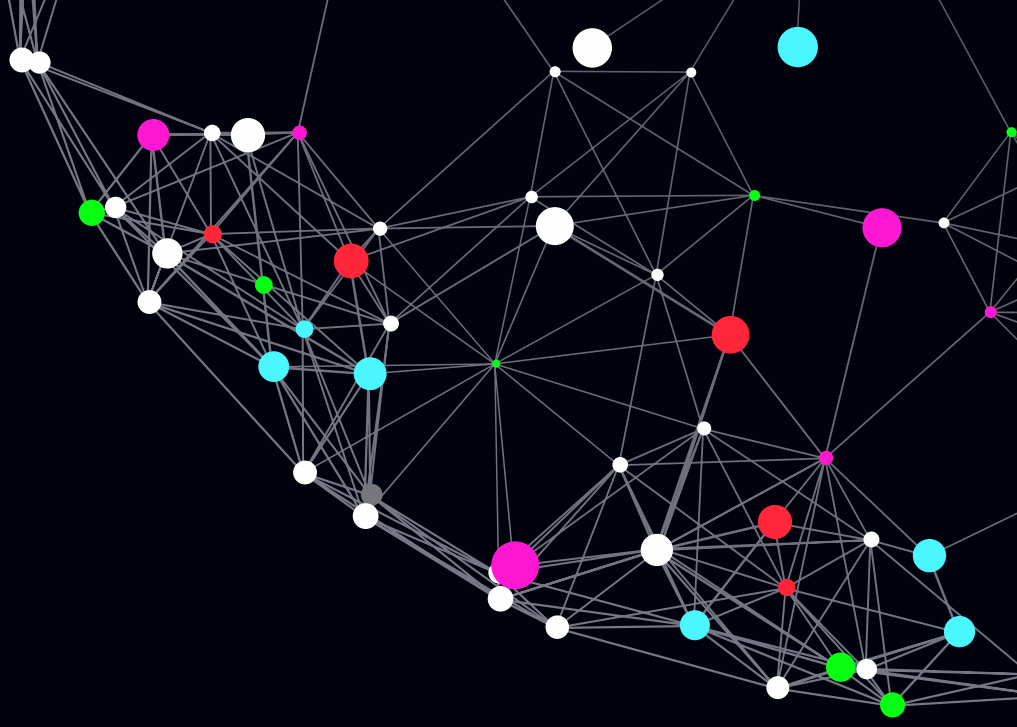
ably

REPORT

The State of Edge Messaging Infrastructure

Engineering leaders reveal whether it is better to build or buy infrastructure for edge messaging capabilities to deliver live user experiences.





v1.0 • May 2022

About The State of Edge Messaging Infrastructure report

Ably surveyed over 500 engineering leaders about the challenges they faced when building their own realtime, event-driven, edge messaging infrastructure to create shared live experiences for end users, such as chat, order delivery tracking and document collaboration.

This report is the first of its kind about edge messaging infrastructure. It reveals and analyses the survey data, giving insights into the current state of edge messaging infrastructure and describing current trends within the landscape of live experiences.

Please get in touch if you'd like to share feedback for future reports or have any questions about edge messaging infrastructure.

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Gartner® on Edge Messaging

In a 2021 report[1], Gartner® defined four types of event-driven architectural use cases:



USE CASE 1

Enterprise messaging



USE CASE 2

Application messaging



USE CASE 3

Event streaming



USE CASE 4

Edge messaging

According to Gartner®:

> “
>
> Treating event-driven architecture as a single paradigm, selecting a single technology, can lead to scalability and performance issues or disappointing business outcomes. Software engineering leaders must select the right combination of technologies and instances to fulfill each of the four typical high-level use cases.

Gartner® defines edge messaging as follows:

> “
>
> Edge messaging aims to provide reliable event distribution between devices and data centers — both from the device to the data center and from the data center to the device. It is delivered as a localized service within an application domain, lending itself to federated ownership.

[1] Gartner, “How to Identify Your Event-Driven Architecture Use Cases to Select the Best-Fit Event Broker”, Keith Guttridge, W. Roy Schulte, July 27, 2021

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Executive summary

As technology and customer experience rapidly advance to meet the dynamic requirements of a volatile socio-economic landscape, clients and customers have increasingly high expectations, seeking realtime information, interactions and solutions from businesses.

To meet this demand, the increasing capabilities of the digital devices we rely on at work and in our personal lives power new applications developed to connect and inform us. These include realtime financial and sports updates; live 1:1 and group chat; GPS location tracking; notifications; quizzes, polls and leaderboards; and collaborative charts and dashboards. These live experiences are underpinned by a realtime, event-driven infrastructure which we will refer to throughout this report as "edge messaging infrastructure".

What is edge messaging?

Across the spectrum of event-driven architecture, there are different types of event broker. Edge messaging brokers facilitate the distribution of information between users' devices and data centers in the cloud. Much as content delivery networks (CDNs) were introduced to significantly reduce web page load times, the demand for low latency live experiences has created a need for messaging services that exist close to user devices.

Edge messaging distributes at the edge, meaning that the service operates in greater proximity to the client than a conventional single-region service. The result is a global edge messaging network that provides the low latency required to power predictable, high performance live experiences at scale.

Edge messaging forms the backbone of live experiences such as:

- Tracking a taxi driver's GPS location on a map as you wait for your ride home.
- Cross-device multiplayer gameplay features that enable a group of friends to play in the same game environment at the same time.
- Communicating with customer services or chatting to friends on a chat app.
- Receiving instant live updates about how your favorite sports teams are performing.



- Bi-directional chat, reactions, tipping and more as live streamers interact with millions of viewers on social platforms.
- The live quiz that gets feedback to ensure a class of students understood a lesson.

Edge messaging also enables synchronized and collaborative experiences such as:

- Simultaneously working on an interface design with a colleague.
- Collaborating in the same Google Doc with colleagues while you chat to them in an online call.
- Whiteboarding in Miro to brainstorm during a meeting.

Ably state of the edge survey

As an edge messaging platform, Ably facilitates the exchange of events in realtime to drive live experiences. It also provides APIs to deliver a set of features to enhance the experiences with presence information, message history and rewind, third-party integrations and user authentication.

Ably provides an edge messaging infrastructure that often runs tens of millions of concurrent, long-running WebSocket and HTTP streaming connections. We power live and collaborative applications on millions of simultaneously connected devices. Today, Ably reaches more than 300 million devices across 80 countries each month and is on track to power live digital experiences for one billion devices per month by 2024.

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In January 2022, Ably conducted a survey of 500 engineering decision makers in the UK and USA. Our purpose was to discover their priorities and challenges when building edge messaging infrastructure in-house to support live and collaborative experiences for their end users. The survey uncovered and this report analyses:

- Cost to build edge messaging infrastructure.
- Time to build edge messaging infrastructure.
- Cost to expand and deliver edge messaging at scale.
- The benefits of purchasing a PaaS solution over building edge messaging infrastructure in-house.

Key findings



89%

of engineering decision makers say scalable edge messaging infrastructure gives a competitive advantage.

41%

indicate that missed deadlines and extended timelines are significant problems of self-build.



60%

who switched to PaaS said improving live UX with stable infrastructure was the top reason.

50%

cite reliability and 50% availability as the most important quality of good infrastructure.

46%

of respondents identify escalating project costs as a major challenge during development.



65%

of DIY solutions had an outage or significant downtime in the last 12-18 months.

56%

ranked risk reduction as the second most compelling reason to swap to PaaS.

55%

said the third critical reason to move to PaaS was to redeploy engineers into core product work.

10.2

person-months is the average time to build basic infrastructure, with limited scalability, in-house.

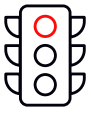


69%

of self-build projects lasted more than 3 months.

38%

of those surveyed acknowledged that their final solution was too complex to use or update.



2/3

of respondents see the challenges of self-build slowing down future deliveries.



Edge messaging infrastructure trends analysis

In our analysis of the results of the edge messaging infrastructure survey we uncovered several significant trends:

- Reliability and availability are critical factors for live and collaborative experiences underpinned by realtime data.
- Building edge messaging infrastructure takes a significant amount of time and resources - 10.2 person-months on average.
- Firms that underestimated the time and resources required to build edge messaging infrastructure were more likely to experience outages.
- Organizations are moving to PaaS providers, in favor of building edge messaging infrastructure themselves, to deliver a better user experience.
- Ensuring continuity of service will be a primary challenge over the next few years.
- Challenges with edge messaging infrastructure are expected to slow down the delivery of live and collaborative online experiences.
- Edge messaging infrastructure issues will have a negative impact on product delivery.

Report conclusions

The three options open to organizations that want to utilize live experiences as a competitive differentiator are self-build, managed service provider and PaaS. All have potential benefits and drawbacks that businesses need to consider before making their choice. The survey demonstrated that the vast majority of those that chose to build their edge messaging infrastructure in-house ran into cost, time and functionality challenges.

These are the top three reasons engineers would switch or have switched to a platform as a service provider to manage their live and collaborative applications:

1. Improve the existing live user experience with a more stable and dependable infrastructure.
2. Redeploy engineering bandwidth away from infrastructure and into core products to work and move faster.
3. Reduce the risk of delivering new user experiences that require reliable realtime capabilities.

In the following sections, the report will take a deeper dive into the opportunities and challenges of delivering live experiences and explore what the survey statistics uncover about the state of edge messaging infrastructure.



PREFACE

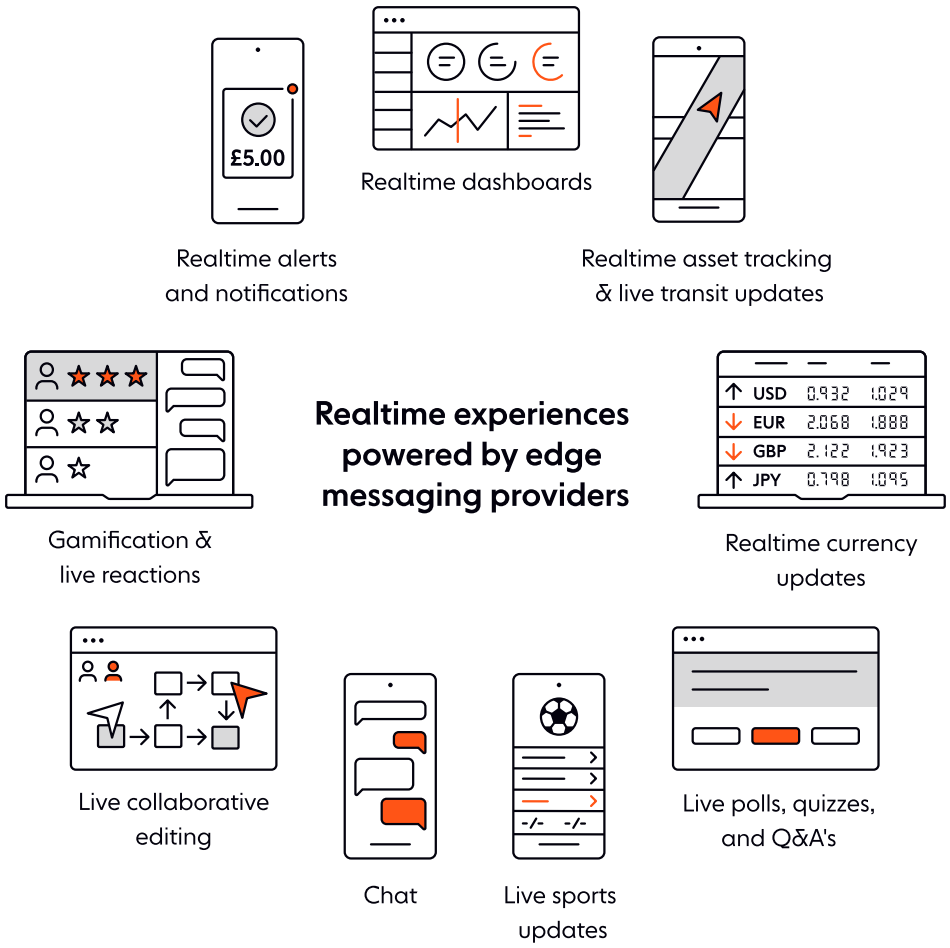
Opportunities and challenges of delivering live experiences

In our “always on” and increasingly fast paced world, corporate clients and consumers expect live experiences and immediate feedback from the businesses that serve them.

In a typical day they might attend a live, virtual corporate event with polls and a Q&A; collaborate synchronously on work documents; check their personal online banking; and monitor the progress of their online food order. These customers expect live, personalized interactions with bi-directional communication or an instantaneous response. They become loyal to the businesses that provide the fastest and most reliable realtime features like 1:1 and group live chat; GPS location tracking and signaling for VoIP and video streams. The realtime data that underpins these experiences provides potentially lucrative opportunities for organizations, but it also ramps up the technical challenges, particularly for those that choose to develop the infrastructure in-house, as the survey and the following sections of the report reveal.

> The realtime data that underpins live experiences provides potentially lucrative opportunities for organizations, but it also ramps up the technical challenges, particularly for those that choose to develop the infrastructure in-house.

The move to an event-driven system to handle realtime data causes a significant increase in complexity. Without a strong understanding of what is required to create a fit-for-purpose realtime capability, numerous reliability, scalability and performance issues can emerge.



Many businesses don't realize there are easy to integrate platform as a service solutions available to power live and collaborative applications. Others mistakenly believe they can only get the flexibility and customisation they require by building their own edge messaging infrastructure in-house. However, by offloading this type of infrastructure project to an edge messaging PaaS provider, organizations can save time and money; eliminate development complexity; and benefit from global low latencies and immediate scale. In turn, engineers are freed up to focus on their company's core product, enabling them to innovate, stay relevant to customers, and gain a competitive advantage.

Underestimating the time and resources required to build edge messaging infrastructure can impact the performance of your system and, ultimately, your competitiveness in the marketplace. Conversely, if organizations use appropriate infrastructure, they can gain an advantage.

Knowing what it takes to deliver a live experience and what products and technologies to use can be extremely challenging. We have created this report to help organizations better understand the landscape of technologies, trends, and challenges in edge messaging.



SURVEY FINDINGS

Critical success factors for edge messaging

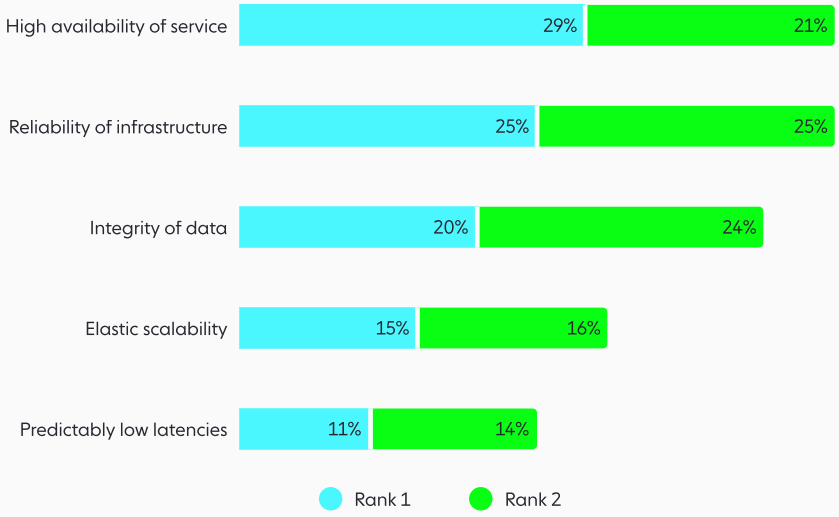
Infrastructure is key to delivering premium digital experiences, but what is the key to success? We asked engineers what they consider to be the most critical factors for edge messaging infrastructure.

Reliability and availability

It is critical for the edge messaging infrastructure that supports realtime data to be reliable. Outages lead to poor customer service and lost revenue. With 50% of the vote each, high availability of service and infrastructure reliability were deemed to be the most critical factors for a fit for purpose edge messaging infrastructure. The criticality of edge messaging infrastructure is that it underpins the services users depend on. An outage of those services can completely undermine the applications with which they are integrated, leading to a bad user experience, low adoption and customer churn.

> “
>
> In a high-stake, highly competitive industry, we need infrastructure to transport live data to end-users via a complex, multi-hop process. We operate in a world where there's zero margin for error.
>
> 
>
> **Joe Antonio**
> CIO, VITAC
>
> VITAC™

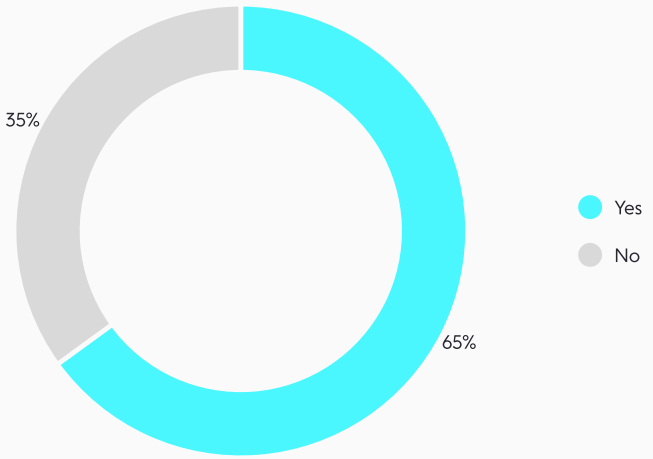
Most critical factors for realtime (edge messaging) infrastructure



Outages over the past year and a half were not uncommon

In spite of respondents identifying reliability and availability as critical factors, almost two-thirds (65%) have experienced outages in the past 12-18 months. This disconnect between the importance of reliability and an organization's ability to deliver it exposes a growing challenge in the market.

Has your self-built realtime (edge messaging) infrastructure experienced an outage or significant downtime in the last 12-18 months?





SURVEY FINDINGS

What does it take to build and maintain edge messaging infrastructure?

The challenges of realtime data services require complex architectures and infrastructures that need to be reliable and available. Organizations should consider offloading the capability and only commit to creating infrastructure from scratch when fully aware of the complexity.

Edge messaging infrastructure requires substantial resources

Building edge messaging infrastructure requires a significant amount of time and resources. While costs ran high, the vast majority of respondents reported costs that were relatively consistent throughout development. The survey data shows that over 80% of projects lasted more than six months and nearly 93% of projects had 4-10+ engineers working on them.

> We spoke to engineers at LinkedIn, Slack, and Box who had already built edge messaging infrastructure themselves - they told us it would take non-trivial upfront engineering with significant operating costs to build and operate this in-house.



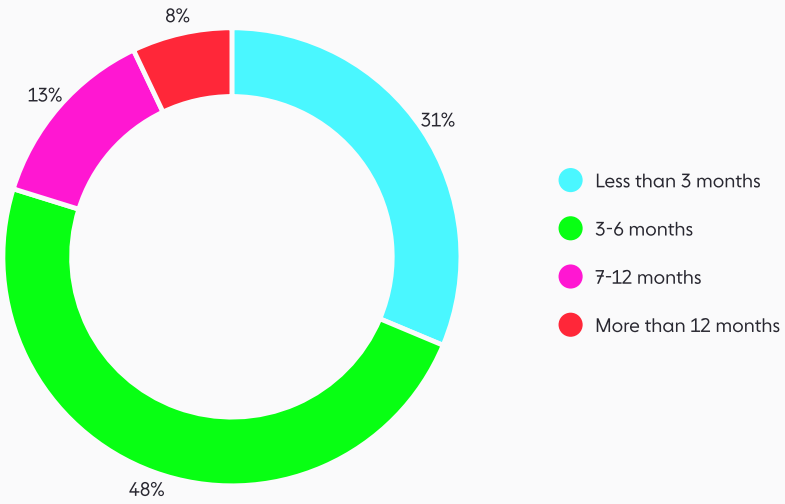
Pato Echagüe
CTO, Split Software

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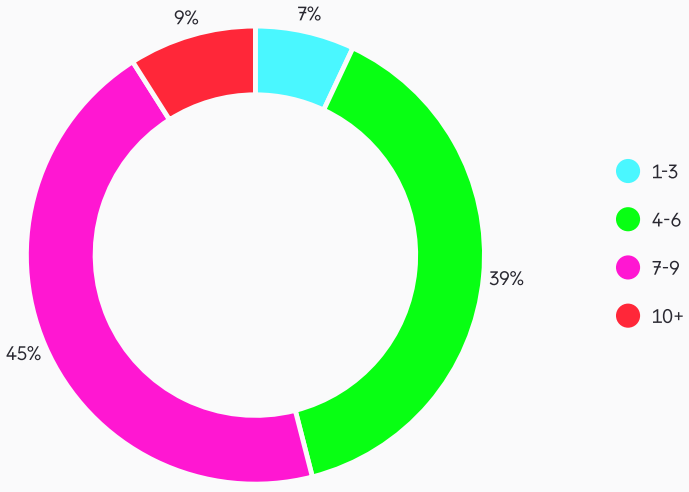
KEY FINDING

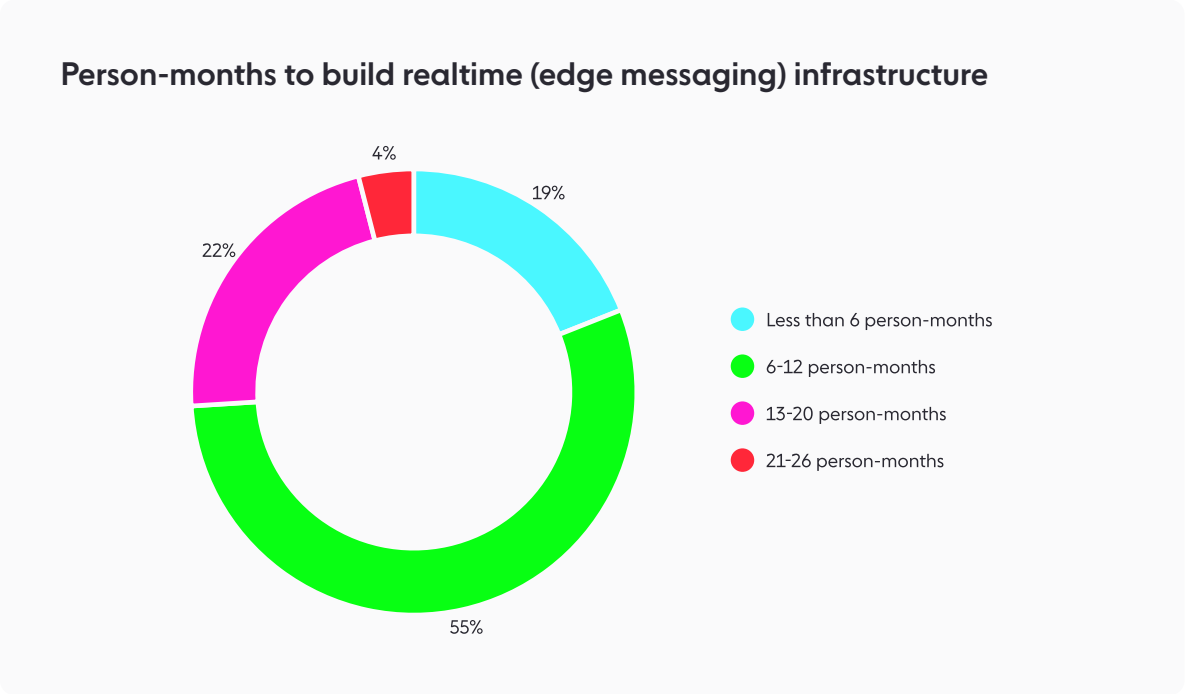
The survey data shows that nearly 70% of edge messaging infrastructure projects lasted more than three months and over 90% of projects had 4+ engineers working on them.

Time required to build first version of realtime (edge messaging) infrastructure



Number of engineers working on realtime (edge messaging) infrastructure project





Detailed analysis provides further insight into how operations are balancing time and resources. On average, we discovered that 93% of projects required at least 4 engineers to build realtime edge messsaging infrastructure in-house. In addition, 69% of projects took over 3 months to build and 20% took over 6 months to build. For 4% of projects, more than 10 engineers were required to keep the timeline under 3 months and for 5%, more than 10 engineers were required to keep the project between 3-6 months in duration.

Edge messaging infrastructure is costly to maintain

The infrastructure to support live and collaborative experiences can be costly to build and very expensive to maintain. Half of all self-built realtime data platforms require $100K-$200K a year in upkeep, according to survey respondents.

> For any leader seriously considering building a product reliant on an edge messaging infrastructure, it quickly becomes apparent that the human and infrastructure costs of maintaining it are going to be top of mind.



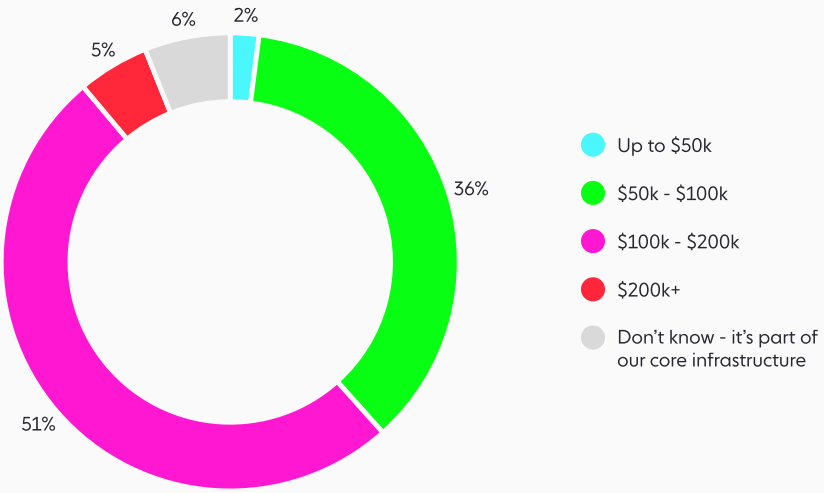
Tejas Dinkar
VP of Engineering, Quintype

KEY FINDING

Half of all self-built realtime data platforms require $100K-$200K a year in upkeep, according to survey respondents.

Maintaining complex architecture is expensive and scaling these systems also requires additional investment.

Annual cost to maintain realtime (edge messaging) infrastructure



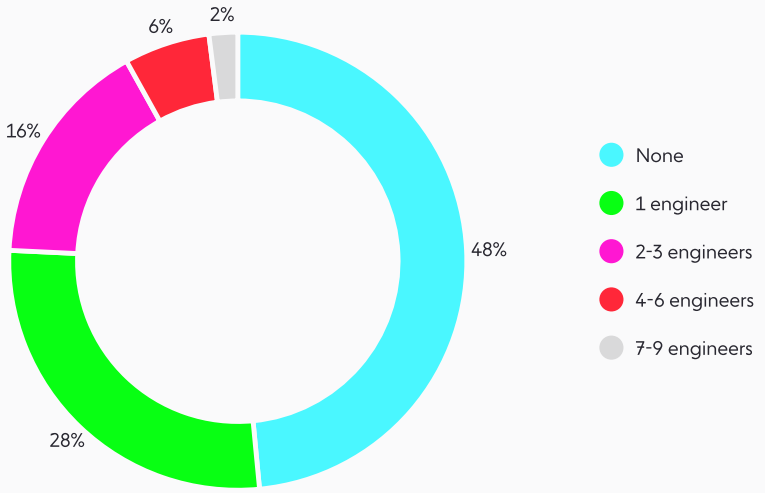
Don't forget opportunity costs

Not only does the infrastructure require significant resources to build and maintain, but it can drain resources from other areas of your business. The results of the study show that 69% of infrastructure projects take over 3 months to complete and on average projects require 10.2 person-months. Using an edge messaging PaaS provider means the infrastructure that enables realtime data delivery is taken care of, so you can continue to put resources behind developing your core product.

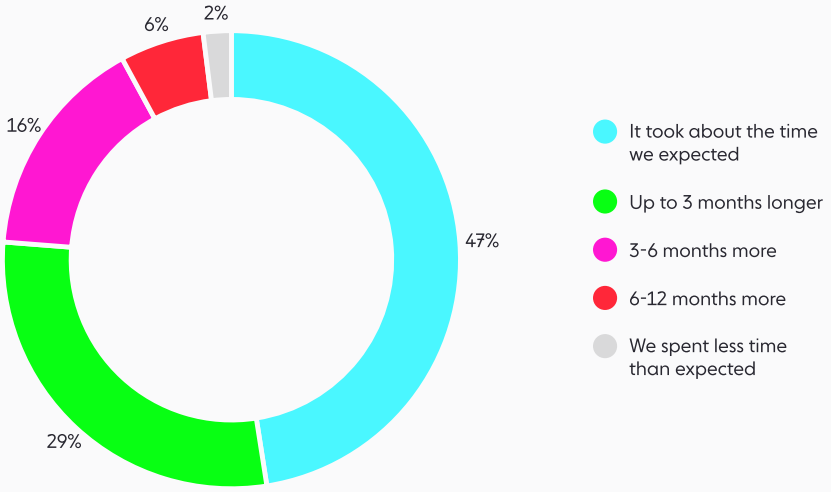
Estimating resource requirements proves difficult

Planners tend to underestimate what is required to build reliable realtime data infrastructure; they not only miss deadlines, but also require extra resources. Of the respondents, 52% said projects required more engineers while 53% required more time than originally anticipated.

Additional engineers required to complete realtime data project



Extra time required to complete realtime data project



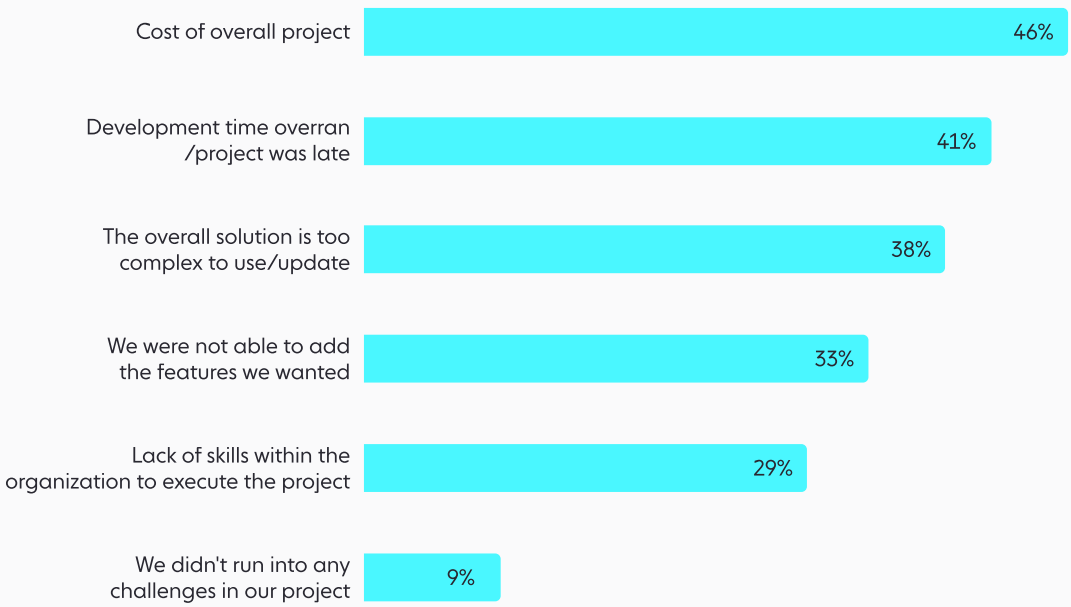
Only 47% of planners estimated the appropriate number of resources and were able to stick to their timeline. An experienced 2% of planners were able to spend less time on their projects without adding any engineers. The remaining 51% of miscalculated projects includes 16% of projects that required at least an additional 3-6 more months and 2-3 more engineers to complete.

KEY FINDING

53% of those surveyed said it took longer to build realtime edge messaging infrastructure in-house than they had orginally anticipated.

High costs and missed deadlines are clearly problematic: 46% of respondents reported the cost of the overall project as a major challenge and 41% reported missed deadlines and extended timelines. Only 9% of respondents reported no problems in building edge messaging infrastructure to enable live experiences.

Main challenges faced in development of realtime (edge messaging) infrastructure



Note: respondents were given the option to choose more than one answer



SURVEY FINDINGS

What tools, products and protocols are engineers using to build edge messaging infrastructure?

Developing edge messaging infrastructure is complex and engineers are using a variety of products and services. We asked respondents about 30 specific technology products and services. The average number of products used lies between four and five.

JavaScript is most popular and Java is an important skill in edge messaging infrastructure development



JavaScript is the most popular programming language in the world, so it is not surprising that 61% of engineers are using it when building apps to deliver realtime data.

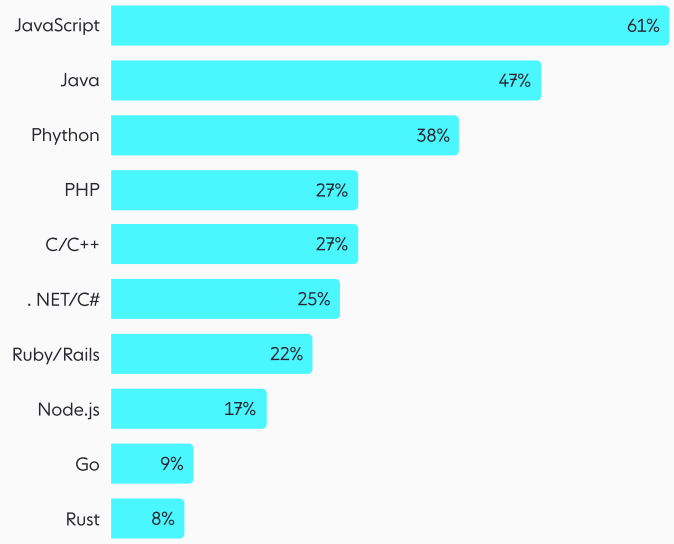


Python has moved into the second most popular language globally, but engineers creating edge messaging infrastructure are more likely to be using Java than Python.



47% of respondents are using Java for realtime data delivery, which performs well in large, complex and dynamic applications.

Programming languages used when building realtime (edge messaging) infrastructure

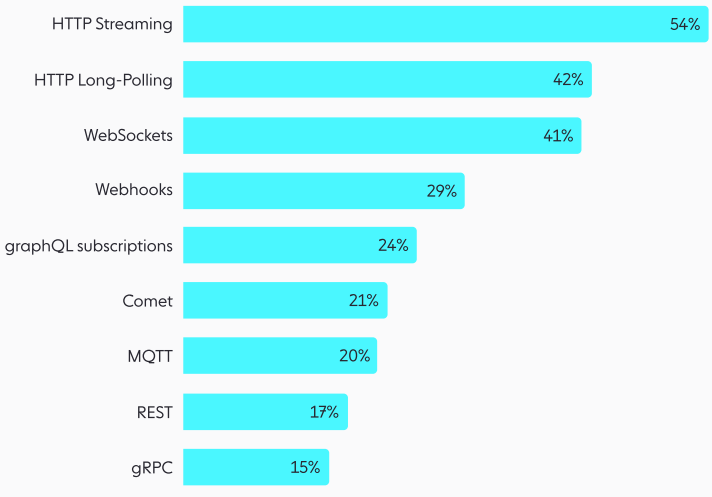


Note: respondents were given the option to choose more than one answer

HTTP push protocols are the most popular

HTTP streaming is a popular protocol for delivering realtime data. It is very efficient and uses existing and universal HTTP connections. HTTP Long Polling, another workaround of the client request mechanism of HTTP, is also popular. The WebSocket protocol, with its two-way streaming capabilities, is the third most popular protocol in supporting edge messaging infrastructure. 41% of respondents were using a WebSocket solution.

Protocols used when building realtime (edge messaging) infrastructure



Note: respondents were given the option to choose more than one answer

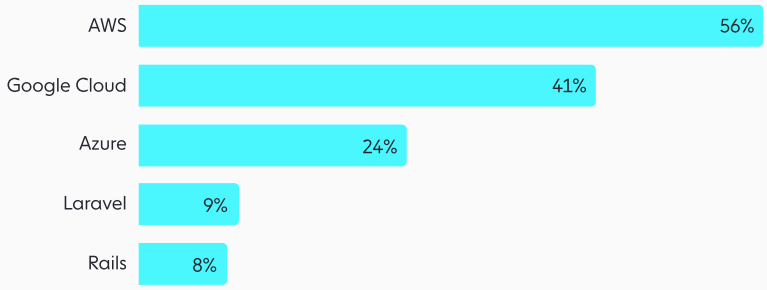
Many respondents are very focused on HTTP with 18% using only HTTP-based protocols such as HTTP Streaming or HTTP Long Polling and none of the other protocols asked about in the survey.

Ecosystems

Survey respondents were asked to name their preferred cloud platforms and technology providers, with many selecting more than one option. AWS was the most popular, with 56% using it.

Microsoft Azure typically competes well with AWS but, in this survey, only 24% of respondents were using it compared to the 56% using AWS.

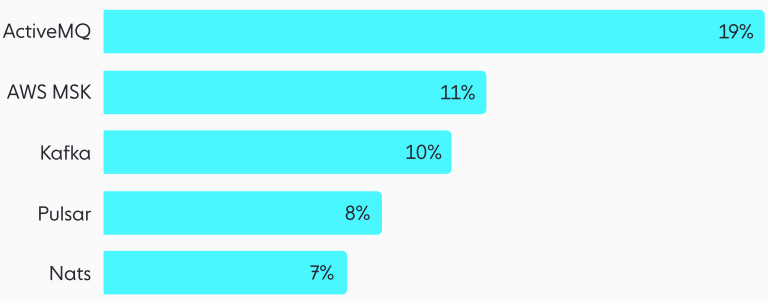
Most popular ecosystems among respondents



Event streaming services

ActiveMQ is the most popular event streaming service, although other Kafka-based services are also very popular. Notably, Pulsar and NATS are used less often than Kafka services.

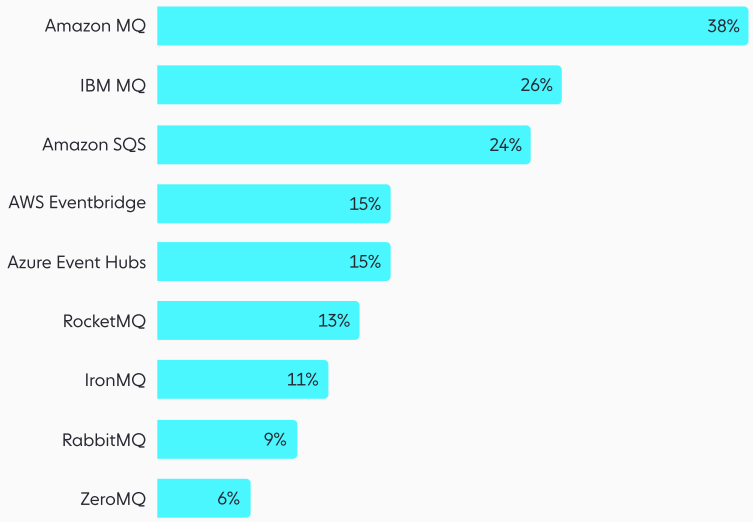
Top 5 most popular event streaming services among respondents



Message brokers

Amazon provides the most popular message brokers, but IBM MQ is also quite popular, beating out some of AWS's messaging offerings. RocketMQ, originally developed by Alibaba, is the most popular independent messaging technology.

Most popular messaging brokers among respondents

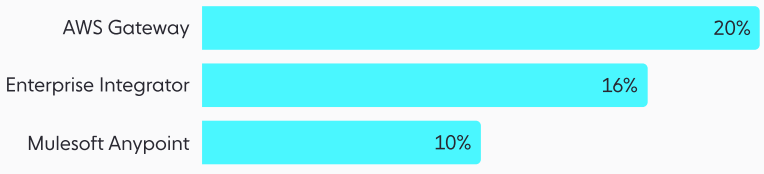


Note: respondents were given the option to choose more than one answer

API gateways

Again, AWS leads as the most popular API gateway. WSOS's Enterprise Integrator is also very popular and provides an alternative outside the AWS ecosystem.

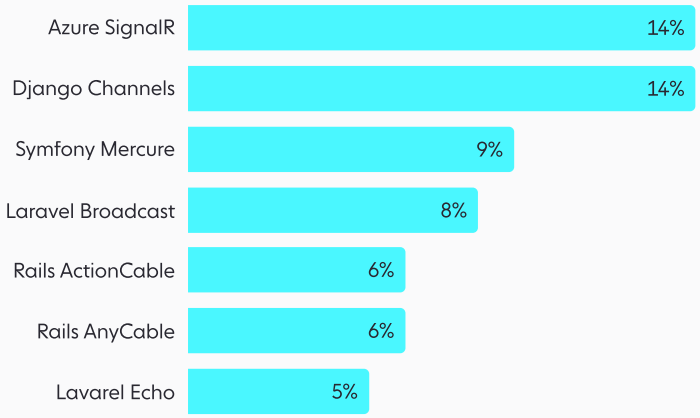
Top 3 most popular API gateways among respondents



WebSocket frameworks/plugins

Django Channels is a popular WebSocket framework, almost as popular as Microsoft's Azure SignalR. The popularity of Python as a programming language in building applications and data science is most likely a driver in the use of Django Channels.

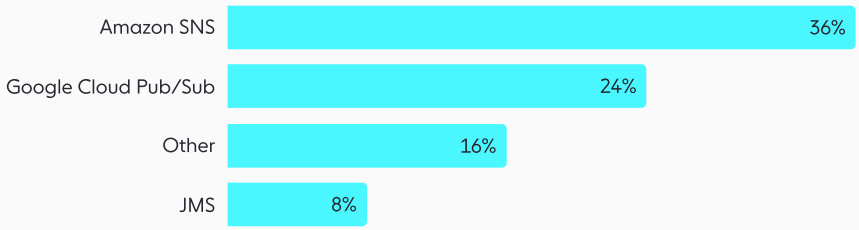
Top 7 most popular WebSocket frameworks/plugins among respondents



Application messaging services

The popularity of app messaging services line up with the strength of various cloud providers, with Amazon leading, followed by Google.

Top 4 most popular application messaging services among respondents





Who is building robust and resilient edge messaging infrastructure and how?

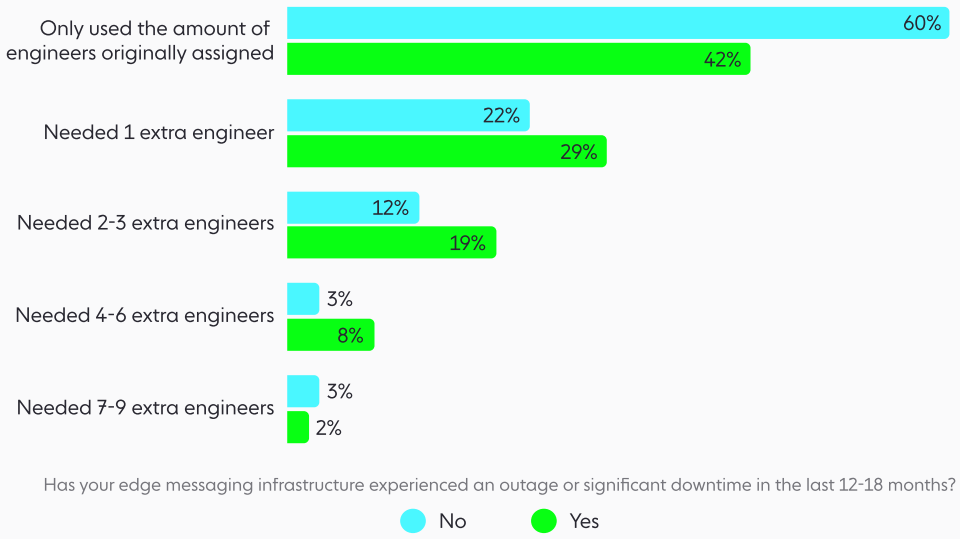
Outages are relatively common when the infrastructure that supports live data is built in-house. Almost two-thirds of survey respondents reported an outage or significant downtime in the past 12-18 months. Given that reliability and availability are critical to the provider's success and the end users' experience, it is worth considering what differentiates those who have experienced interruptions from those who have not.

Organizations that estimated their need for resources accurately built more reliable infrastructure

One factor that characterizes businesses that have managed to build resilient edge messaging infrastructure from those that have not, is the ability to estimate the resources required to build it. Of the respondents that did not have an outage, 60% estimated the required number of engineers accurately, whereas, for organizations that had a problem, only 42% were on point with their grasp of the resources required.

While this differential may be caused by a number of factors, a firm knowledge of realtime technology projects and what it takes to build them is an important requirement for success.

Did the actual amount of engineering resource used to complete the project match what you initially expected, and have you had an outage or downtime?

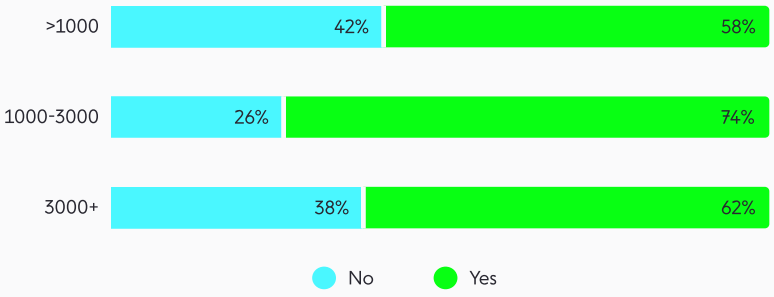


Firms with 1000 to 3000 employees tend to have less reliable infrastructure

Another indicator of infrastructure that is less robust is the size of the company that built it. From the survey data, we discovered that midsized companies with 1000-3000 employees were more likely to experience outages.

Almost three-quarters of firms with 1000-3000 employees have had an outage in the past 12-18 months. This compares to 62% of firms with 3000+ employees and 58% of companies with less than 1000 employees.

Percentage of firms that have had outages by company size



SURVEY FINDINGS

Who is moving to PaaS and why?

The complexity, costs and challenges around building and maintaining proprietary edge messaging infrastructure are pushing some organizations to use a platform as a service (PaaS) provider. There are many reasons to make the move to a PaaS, but some are more important than others.

Organizations are moving to PaaS for better user experiences

Our calculations suggest that an average organization can save thousands of dollars by moving to a PaaS versus building their own infrastructure. However, cost reduction is not always the primary reason that organizations are abandoning their DIY strategy. Motivation also includes the opportunity to improve their user experience and to reduce their time to market.

Out of six options, 60% of respondents ranked improving the existing live user experience with a more stable and dependable infrastructure as a top-three reason for switching to a PaaS. 18% ranked this as the most important reason to utilize a PaaS.

KEY FINDING

60% of respondents ranked improving the existing live user experience with a more stable and dependable infrastructure as a top-three reason for switching to a PaaS.

Risks around bringing new features and services to market were also identified as important reasons to move to a PaaS. 56% of respondents cited redeploying engineering bandwidth away from infrastructure and into core product work to move faster as a reason to move to a PaaS. 55% said moving to a PaaS reduces the risk of delivering new user experiences that require realtime capabilities.



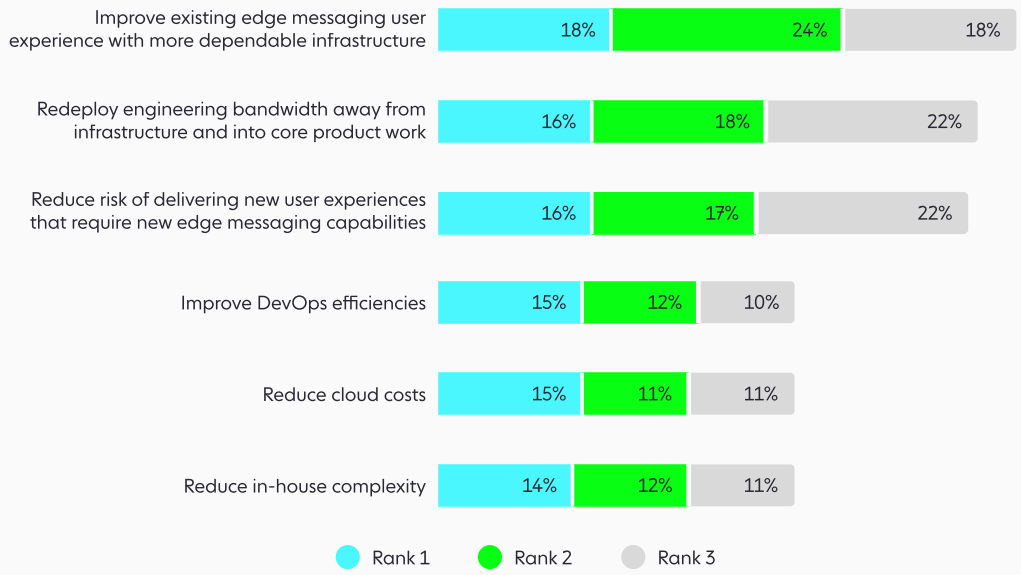
> Functionality that allows us to tailor realtime innovations to the user cases of our different customer groups is critical to our business.
>
> 
>
> **Ashley Friedlein**
> CEO and Founder, Guild
>
> GUILD

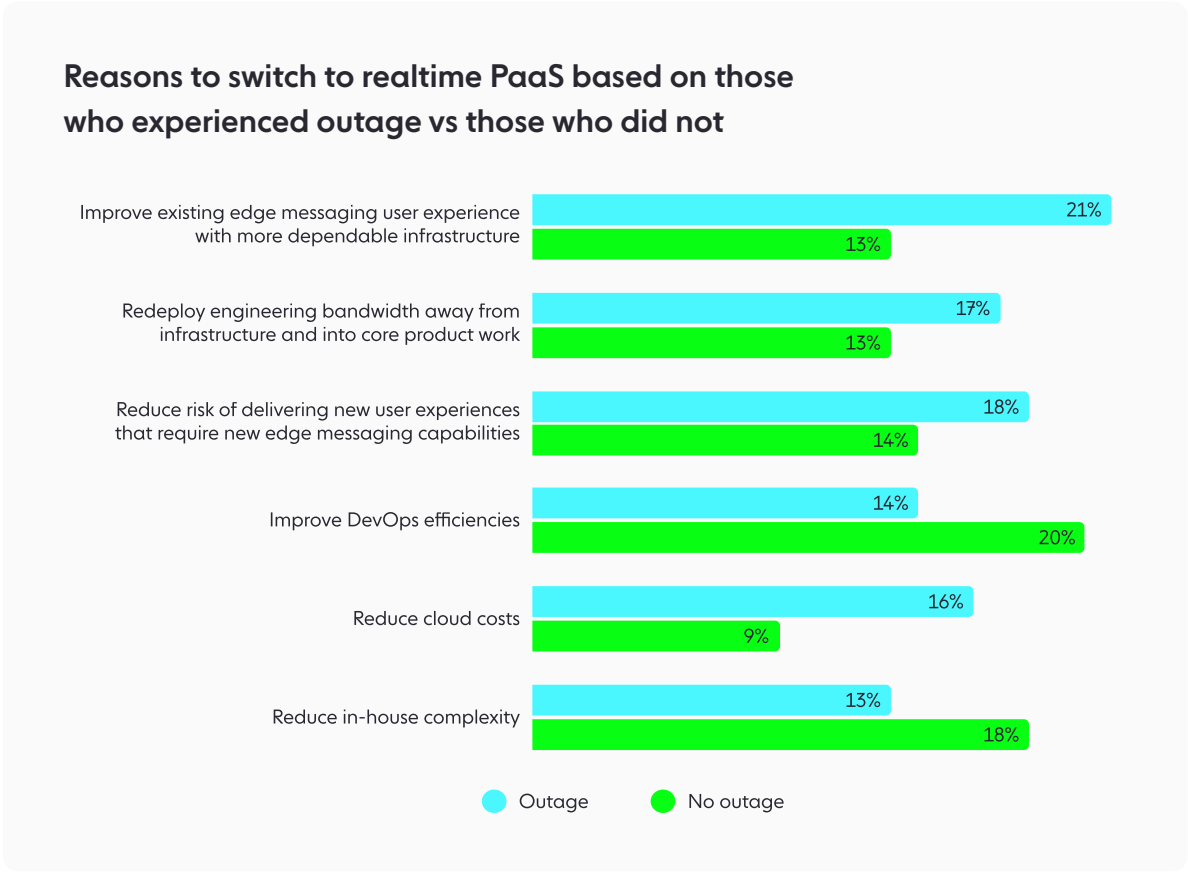
Top reasons respondents would switch to an edge messaging PaaS provider

Below are the top three reasons engineers would switch or have switched to a platform as a service provider to manage their live and collaborative applications:

1. Improve the existing live user experience with a more stable and dependable infrastructure.
2. Redeploy engineering bandwidth away from infrastructure and into core products to work and move faster.
3. Reduce the risk of delivering new user experiences that require new realtime capabilities.

Top 3 reasons for switching to a realtime, edge messaging PaaS





Engineers with more reliable infrastructure are more likely to move to PaaS to simplify

The majority of engineers who have not had an outage in the past 12-18 months ranked reducing in-house complexity and improving DevOps efficiencies as the top reasons to move to a PaaS. This demonstrates that, in the absence of reliability issues, simplicity is a key focus.

The data shows that 20% of engineers who have not experienced an outage ranked improving DevOps as the most important reason to move to PaaS. This is compared to just 14% of engineers who have dealt with an outage in the past 12-18 months. Similarly, 18% of respondents who did not experience an outage indicated that reducing in-house complexity was the most important reason to move to PaaS, compared to 13% of the respondents who experienced an outage.

The value a PaaS provides through greater simplicity helps organizations streamline their operations to get new products and features to market faster.

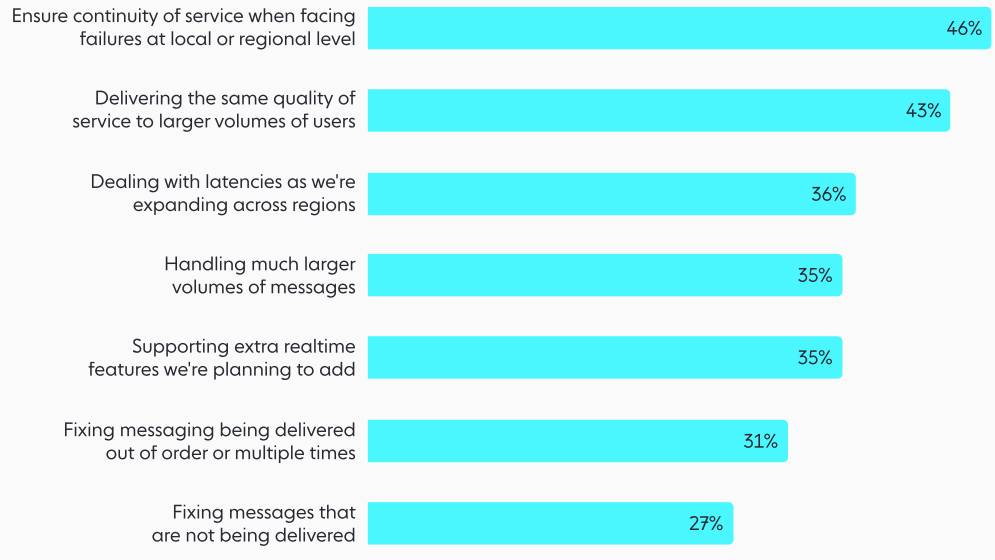
What challenges should we expect in the future?

The demand for realtime data will only grow in the coming years, putting greater pressure on edge messaging infrastructure. We asked engineers and managers what challenges they foresee and how infrastructure will impact the delivery of digital projects.

Continuity issues are a primary concern for the next few years

In the next 1-2 years, respondents expect to face continuity issues caused by failures. 46% of respondents cited continuity of service when facing failures at local or regional levels as the primary challenge. This could be a failure at an instance or data center, or a more widespread failure caused by capacity issues, DDoS attacks, or intervening network issues.

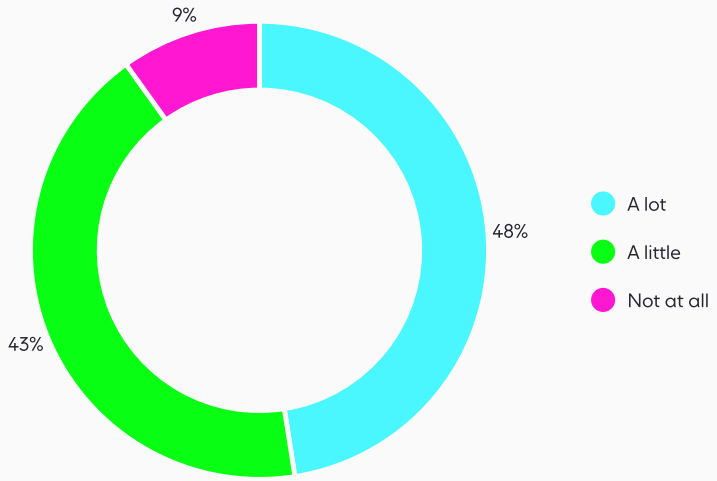
Main challenges for realtime (edge messaging) infrastructure in the next 1-2 years



Note: respondents were given the option to choose more than one answer

Scalability and the ability to deliver the same level of service to a larger volume of users was the second most common challenge expected in the next 1-2 years, with 43% citing this issue.

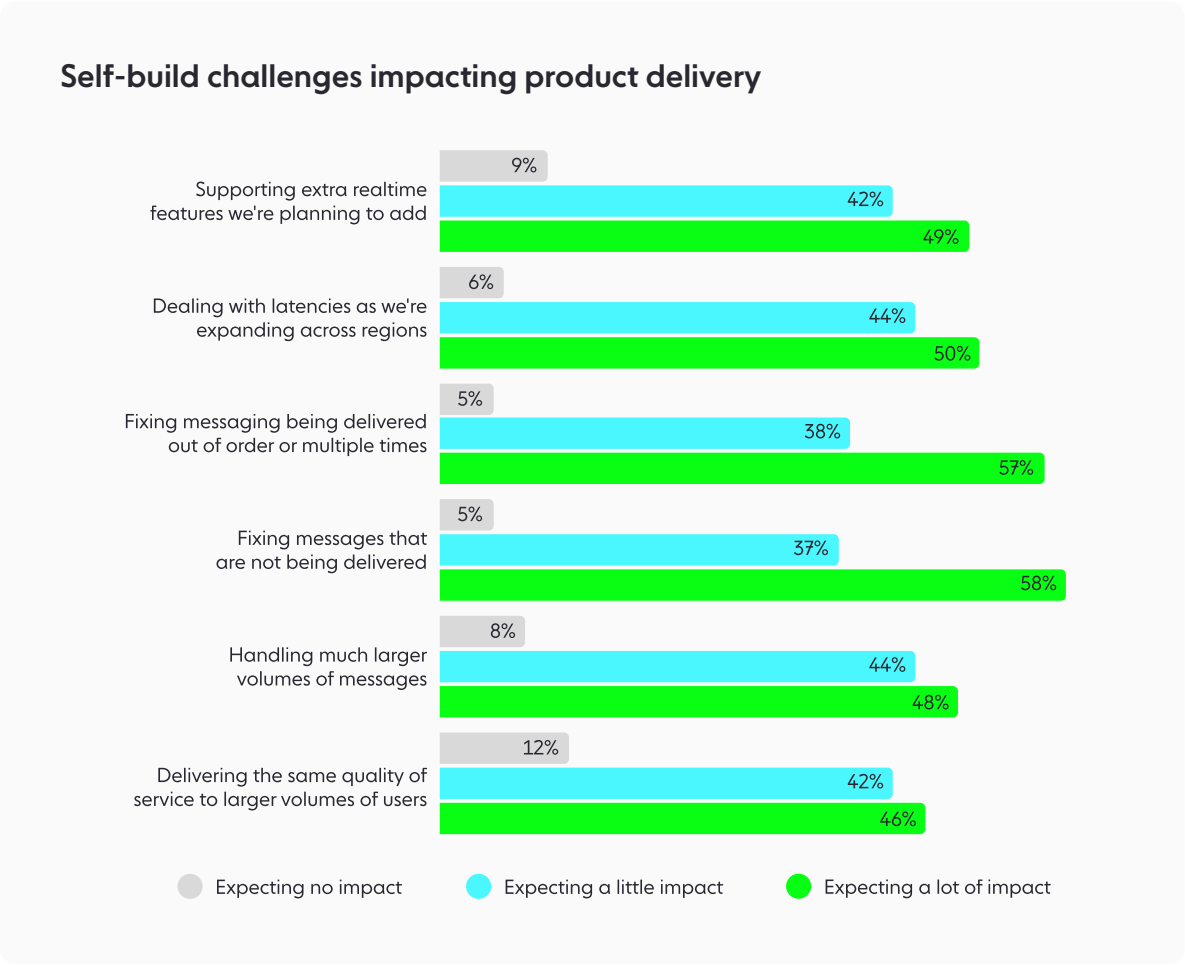
How much will realtime (edge messaging) infrastructure challenges slow down delivery of future projects?



The majority of respondents expect infrastructure challenges to slow down the delivery of digital projects. Only 9% of respondents do not think speed will be negatively impacted.

Messaging issues will have a negative impact on the delivery of digital products

Messaging issues such as non-delivery and out-of-order delivery were not as frequently cited as other issues as a foreseeable challenge in the next 1-2 years. However, 58% of the engineers who are struggling with messages not being delivered are expecting infrastructure issues to substantially reduce the speed of digital project delivery. This trend is similar to respondents who see messages being delivered out of order as a big challenge in the next few years. 57% of these engineers also expect infrastructure issues to cause significant delays in digital projects.



Scaling users and features has less of an impact on delivery speed. 9% of respondents that see supporting extra features as a challenge expect no impact. 12% of respondents that see scaling the same quality of service to more users as an issue expect no impact. This compares to 6% for the average of the other four categories.

> We chose an edge messaging infrastructure service in order to simplify our architecture and ultimately save us valuable engineering time to focus on our own product and user base.



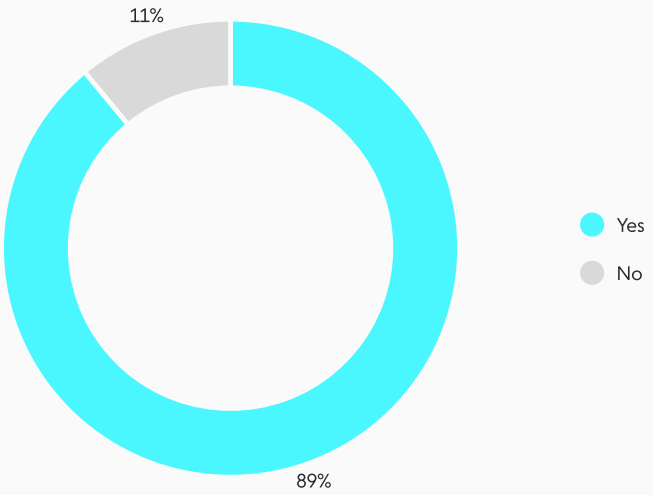
Neville Dastur
Co-founder and CTO, Hospify

Hospify

Capitalizing on a competitive advantage

89% of respondents agreed that scalable edge messaging infrastructure to power live and collaborative experiences will give them a competitive advantage in the future.

Do you think scalable realtime (edge messaging) infrastructure will give you a competitive advantage in the future?



In competitive markets, there are often two considerations that define success: strong product development and customer satisfaction. Working with a PaaS that specializes in edge messaging supports both considerations:

- Improving customer satisfaction by powering live digital experiences with scalable, resilient infrastructure to mitigate outages; and
- Giving developers more opportunity - in terms of time and money - to focus on their business's core competencies and bring new products and features to market faster.

Talk to an edge messaging expert

Before you begin building or scaling your own infrastructure to power applications in realtime, **book a free consultation with an Ably edge messaging infrastructure expert** and find out how a PaaS solution can benefit your business.

About Ably

Ably is an edge messaging platform for developers. There's no infrastructure to provision or manage, just an evolving suite of SDKs and APIs that give you the freedom and flexibility to power shared live experiences with a few lines of code. Our mathematically modeled system design provides a global edge network that brings users closer to your app; unique data ordering and delivery guarantees ensure a seamless end-user experience; a legitimate 99.999% uptime SLA is underpinned by fault tolerant infrastructure; and instant elasticity enables effortless scale.

Brands like HubSpot, Toyota, and Webflow trust Ably to power shared live experiences like business-critical chat, order delivery tracking, or document collaboration for millions of simultaneously connected devices around the world.

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