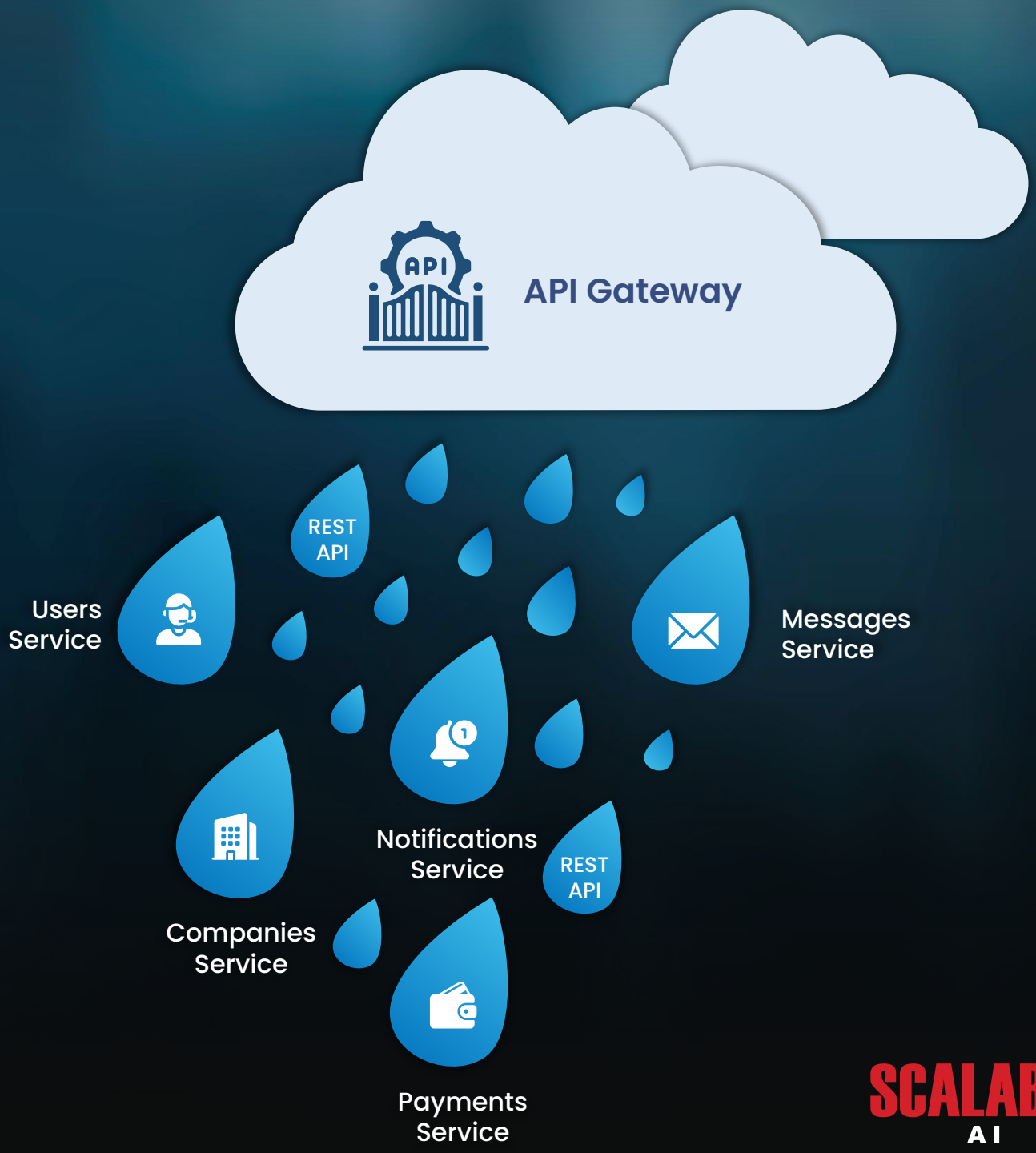
MICROSERVICES DISRUPTION

Transforming Business with Agility

A SCALABLE WHITEPAPER

CATEGORY : DATA, CLOUD



SCALABLE AI

TABLE OF CONTENT

INTRODUCTION

Over the last half-century, it is hard to argue that any other entity in our society has been more influential than the development of computing technology. From simple binary computing systems to countless lines of computer code that make the world an easier place to live, the amount of growth software computing systems have undergone is astounding. The amount of time it takes to deploy a simple application in a few minutes today would have taken thousands of hours to accomplish a few decades ago.

But in many cases, as something rapidly grows, such as an industry like software development, humans face an inherent challenge to keep up and manage that growth. From an organizational perspective, creating a deployment strategy for new computer systems is one of the largest problems large enterprises face. Fortune 500 companies that have been around since the 20th century have been trying to catch up to the innovation that technology giants like Amazon, Facebook, and Google have brought about. They face some of the largest business challenges when learning to adopt new ways of incorporating technology to affect operations positively.

Thus, organizations need technology leaders with brilliant minds for businesses to scale and remain flexible. Automation is creating more efficient business processes, and if you are a business leader today, you must consider implementing effective systems to stay competitive.

So, how can we choose a technology deployment strategy that will allow businesses to remain flexible and scale? The answer lies in the emergence of Microservice-based software architecture, a systems engineering and software development philosophy that has made building, testing, deploying, and scaling new applications a more manageable and successful process. Technology leaders like Amazon, Netflix, Paypal, and Uber have all adopted this philosophy. And technology-driven organizations that are looking to stay competitive for the long term and scale effectively businesses are following suit. In a recent survey, 67 percent of companies adopting microservice-based architecture saw benefits to the adaptation within 12 months of switching over.

But there has also been another revolutionary change in cloud computing that adds another caveat to the complexity enterprises will have to deal with moving forward. In the last decade, the commoditization of data storage has led to the ability to build and deploy effective algorithms for making sense of massive datasets. This has led enterprises to lead digitization initiatives and strive to become data-driven organizations. This means that companies see the value in all the data they are accumulating and plan to rely on automated data models to make better decisions by deploying analytics applications. A great example of this can be found at one of the United States' most successful and long-standing companies in its history, General Electric. For the longest time, GE was solely a manufacturer of machines. Now they are marketing themselves as a data-driven technology organization with a business division called GE Digital, which is currently scooping up some of the top data science talent and most experienced technologists in Silicon Valley to build their digital platform that allows machines to talk to one another.

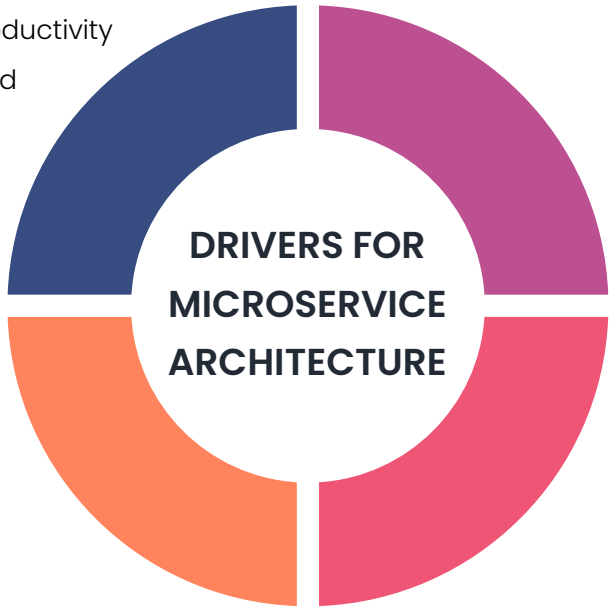
MICROSERVICE BUSINESS DRIVERS

TIME TO MARKET

- Enables short development cycles for greater agility
- Enabler for continuous delivery
- Reduced size and risk of changes enables faster time to market
- Reduced code complexity enhances developer productivity enables quick turnaround

TECHNOLOGY STACK INDEPENDENCE

- Technology best suited for a business need
- Deployed onto supported software and hardware configurations
- Quick adaption to Technology changes



DIGITAL TRANSFORMATION

- Connected devices
- API based service invocation
- Cloud based deployments

GOVERNANCE DECENTRALIZATION

- Governance decentralized to specific Business Units
- Quick Decisions

WHERE DID MICROSERVICES COME FROM?

Microservice Architecture is quickly becoming the foundational philosophy for how technology organizations create scalable cloud-based applications. However, it is important to understand why it is being so heavily adopted within the industry.

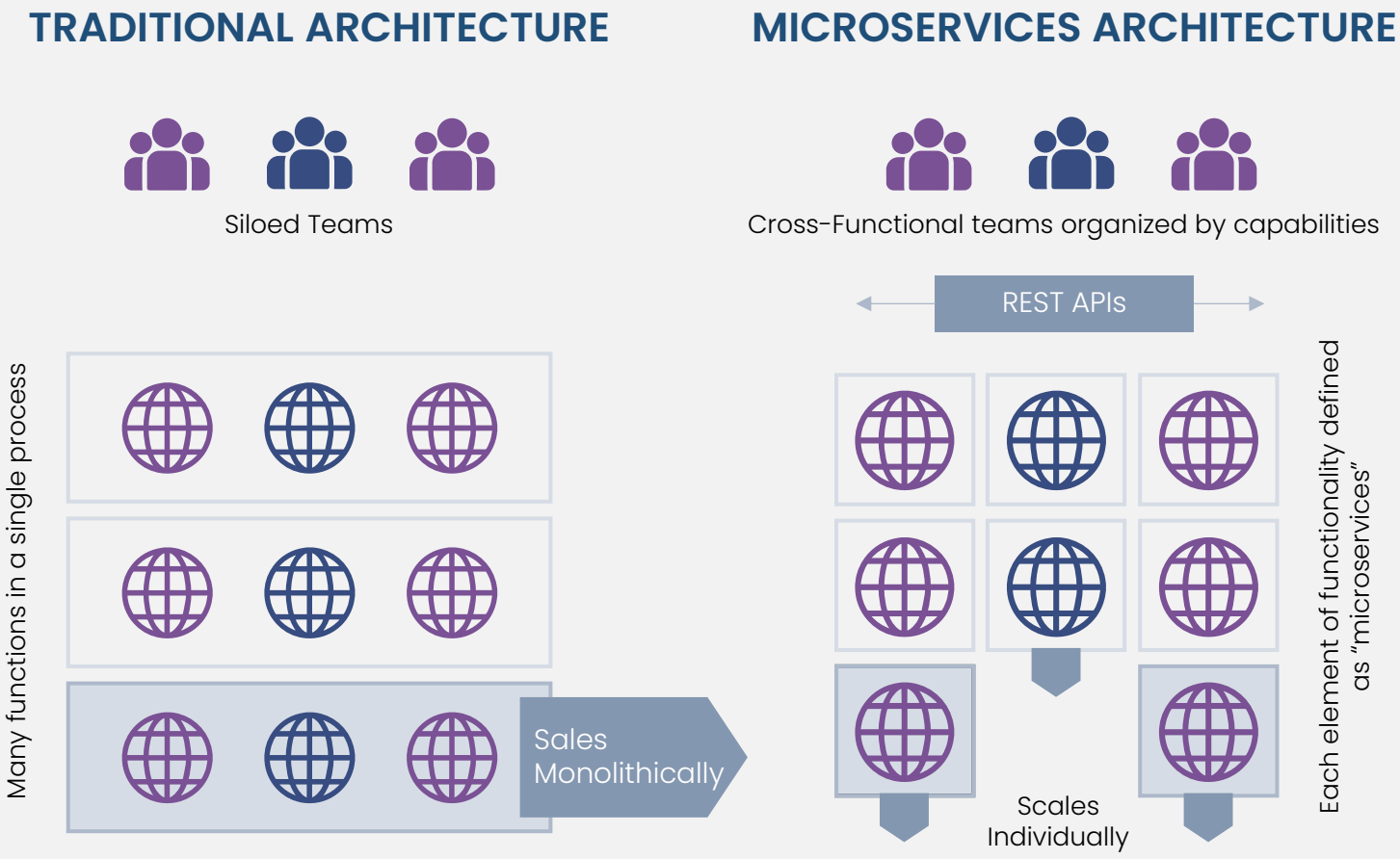
First, let's start with a little bit of history. For the longest time, web applications were built essentially using three components; a database, mostly a relational database, a server-side application, and a client-side application consisting of HTML, Javascript, and CSS markup. As the server-side components became more complex, the number of dependencies for each service within the application remained in one code base. This made it incredibly difficult to troubleshoot when bugs arose within the application. Thus, engineering teams could not be segmented into sprint teams to optimize each service's functionality. This is how applications that were built as a monolith functioned.

But nowadays, monolithic is a swear word when architecting a new platform for many software engineers. As outlets started to offer more and more services within their whole product offerings, the monolithic approach started needing to be updated and a detriment to the future of some of these technology giants. Imagine if Google's full suite of office solutions was held within one code base, with each service dependent on another. It made no sense for any ambitious organization that wanted to scale. The monolithic approach was archaic.

Then a few years after the turn of the millennium, technology organizations began to champion change in standard systems architecture strategies. Studies held at Hewlett Packard Labs, and paradigm shifts in strategic thinking for companies like Microsoft and Netflix, began to signal the first changes in the industry. Computer science and software development leaders saw the benefits of having independently deployable web-based services focused on more specific, isolated purposes that contributed to applications as a whole. Platforms started to be developed that featured the creation of independent services such as accessing particular databases, making recommendations, and even completing operational tasks such as billing.

As organizations saw the flexibility of this type of software development philosophy, large technology organizations started to catch on. More importantly, fail-fast and fail-forward kind companies saw the way this type of microservice architecture allowed for faster speed to market for innovators across all different types of industries.

And it caught on at the most opportune time for entrepreneurs with a data-centric mind. The meteoric rise of Big Data in the late 2000s contributed to the adaptation of microservice architecture and gave rise to some of the most successful technology companies today. Tech giants like Uber, Twitter, and Groupon emerged as companies that use Big Data and Analytics as core business strategies while championing microservices. Amazon, established before the turn of the millennium, has grown by orders of magnitude since both Big Data and Microservice architecture have caught on. Through these shifts in thought, we are now seeing a continuation of the growth of Analytics based platforms, with even more growth to come.



HOW MICROSERVICE ARCHITECTURE BENEFITS BIG DATA ANALYTICS

With a new philosophy taking over the software development world, one can see the potential benefits presented to technology-driven organizations in the long run. It is especially important for technology-driven organizations that are also data analytics-driven. Companies across industries are deploying applications to use massive amounts of data, and the two in tandem can be incredibly powerful for large enterprises.

PAVING THE WAY FOR ANALYTICS

As technology spreads and becomes more accessible, our lives grow easier yearly. This is especially the case in the business world, where processes that once took either hour of human effort or vast computer resources are replaced by advanced autonomy and artificial intelligence.

A large push in the recent advancement of cloud computing has come about due to Big Data. Big Data is a common buzzword thrown around these days. Still, the term describes the ability to store massive datasets and analyze them to determine valuable trends, patterns, and insights for businesses and consumers. Technologies such as Hadoop and MapReduce are at the forefront of this phenomenon and have streamlined access to this data.

CHARACTERISTICS OF MICROSERVICES ARCHITECTURE

Split Into Numerous Components

Robust And Resistance To Failure

Simple Routing Process

Decentralized Operations

Built For Modern Business

Big Data in itself has been a revolution of sorts. It has opened the door for all different kinds of innovation. Technologists who now know how to make sense of all of this data can build applications that create value from the massive amounts of available data rather quickly. Systems can now track users' activity on web applications through clicks and web search forms. As more and more people spend time online, this gives analytics businesses a great opportunity to understand their customers through insights from this data.

But with any innovation comes even more layers of complexity. How can software engineers develop systems that wrangle and make sense of these new data sources? Microservice architecture comes into play, creating a model where new services that use a Data Lake can be spun up independently to test and deploy new ideas. Now instead of having to layer on different dependencies within the same application to serve those functions, computer scientists had the option of spinning up new applications independent of each other to make use of the data as many ways as possible.

This is becoming a perfect storm for data scientists and technology entrepreneurs alike. With data storage becoming a commodity, entrepreneurial minds can use the technology available to test different ideas (web-based services) without much risk to the core application. Due to this phenomenon, technology organizations became even larger breeding grounds for independent and creative thought. This has given rise to the new innovative and exciting career of the data scientist, and the number of people starting careers in data analytics is truly a testament to how microservice architecture is helping Big Data-driven applications scale. The growing demand for data analytics professionals is a telltale sign that technology companies will need computer scientists and data scientists who know how to build and deploy analytics-based services quickly using a new philosophy of microservice architecture. The technology industry's fail-fast and fail-forward nature can't allow for outdated strategies like monolithic architectures. Thus, adopting a philosophy like microservice architecture that allows these companies to stay competitive in this new and exciting industry is paramount.

CROSS-FUNCTIONAL SCALABILITY

The sheer amount of code being written today can be intimidating. But before even writing a new line of code, engineers have to think long and hard about what they are building and how it will interact with the application as time progresses. Project management and product development philosophies like Agile do a great job of constantly asking the right questions. Still, an architectural perspective is needed here, especially for data-driven technology applications.

Millions of users depend on Spotify to receive recommendations for new music based on their listening history and those of others like them. This service has been wildly successful for Spotify and other Music streaming services like it. However, as the online experience expands and Spotify enters new platforms on mobile interfaces and wearables, that recommendation service will have to interact with new technology stack layers. If that engine is tied too tightly to a platform that fails, it risks the company's profitability. And then millions of users miss out on new favorite artists recommended by Spotify. Managing the complex nature of these interactions can only be accomplished if you have a philosophy that decouples that recommendations engine from any other piece of the puzzle.

This is just a simple case. Now let's take an insurance company with hundreds of different products and thousands of customers with varying life situations. This means you have all kinds of data you need to store in databases. Companies need to access this data and figure out new and inventive ways to make value out of the data with analytics. Suppose you don't have processes to build and deploy new services year in and year out. In that case, your engineering organization will be caught up in fighting fires from past failures. Before you know it, you will become a dinosaur within your industry instead of a thought leader and an innovator.

ADAPTABILITY TO LEGACY SYSTEMS

Since the mid-20th century, database technology has gone through many changes. One major difference is how we store unstructured data in video, photo, or complex data models. Thus, different new and innovative database technologies have emerged. One major shift has been Hadoop technology and MapReduce, a programming methodology that allows for massive scalability across other databases and easy access to that data. But even though new data storage methods are emerging each decade, legacy systems still have value. Technologists are still finding a use for relational database technology that has been around for decades. Databases like MySQL and PostgreSQL are still widely used since their inception in the 1990s.

These older database technologies won't go away. So the question remains, with the ushering of new ways to store data and the remnants of database technologies of the past, how will we ensure that there is a methodology that can retrieve data from all of these different sources without being too loosely tied to the applications?

The answer is with RESTful microservices, or what many call RESTful APIs. REST, short for Representational State Transfer, is a standardized technique that allows developers to set up interfaces to access data enabling third parties, whether within or from outside your organization, to make practical use of data within a database. The REST interface can then be made useful across several different microservices. A great example of publicly available REST services is what Twitter has managed to develop. Twitter has one of the most well-used REST APIs, allowing developers to access data from user tweets to use them within their applications. For data scientists, this can be in the form of creating Natural Language Processing models that evaluate what public feedback is based on identifying trends from thousands of tweets.

This is just a simple example, but developing microservices in RESTful APIs within a large organization can also be useful. Giving your developers and data, scientists access to data and allowing them to experiment in thoughtful value-adding ways can be a great way to foster creativity and innovation, something that technology companies like Google have stood by for years.

The REST model is another great way that microservices have given the tech world a great way to make value out of the systems already intact. They are a great way to ensure legacy systems aren't rendered obsolete while still using your modern and up-to-date database systems.

WHAT ARE THE ADVANTAGES OF MICROSERVICES?

88% of the 1,056 IT executives, developers' executives, and middle-level executives surveyed by IBM in 2021 either "agree" or "agree completely" that microservices offer many benefits.

Image: IBM's Microservices in the enterprise, 2021: Real benefits worth the challenges

HOW DO MICROSERVICES ENABLE DIGITAL TRANSFORMATIONS?

As more businesses make digital transformation an imperative, many have found microservices to be integral to meeting that goal. Here are six ways a microservices architecture enables digital transformation.

BETTER APPLICATION MANAGEMENT

A microservices architecture allows you to start and stop one part of an application without affecting the rest.

EFFICIENT SCALABILITY

Scaling a monolithic application up as your needs change can be challenging because you have to increase the capacity of the entire application, even if only one part of it needs to be scaled.

IMPROVED SECURITY

In a well-designed microservices architecture, an attacker who is able to gain control of one microservice will not automatically be able to compromise the rest of the application.

APPLICATION MODERNIZATION

Modernizing monolithic legacy applications requires rewriting the entire application, which is often not feasible to do in a single go.

CODING FLEXIBILITY

Microservices also make it possible to write part of your application in one language and other parts in a different language.

INCREASED SERVICE AVAILABILITY

With a microservices architecture, a failure in one microservice doesn't necessarily mean your entire application stops working.

THE BUSINESS CASE FOR MICROSERVICES

From a technical standpoint, microservices architecture makes a ton of sense. It creates a software development ecosystem that sets up engineering organizations to succeed in the long run and grow innovatively.

But we have only skimmed the surface of the overall benefits of the software development philosophy. The advent of a software development paradigm that allows for the quick deployment of value-added services means big things for businesses. With microservice architecture benefiting the bottom line of companies everywhere, technology organizations are adopting this methodology increasingly across industries, and the change is being ushered in by business leadership.

INCREASING PRODUCTIVITY

Microservices architecture allows for a much more scalable development model when scaling across different enterprises. With a monolithic approach to software development, software engineers worked in very large groups, as there were many dependencies between services when developing an application under this model. From an operational perspective, this meant organizations needed to have multiple stakeholders' buy-in to change certain product features. If we know anything about large companies, this can create blockades to getting things done. In a time when developers constantly push out code and software updates, innovative organizations can't afford these hold-ups.

In monolithic applications, other features were affected when a bug was found in one function of the application. This meant engineers with different focuses were sucked of their time and creativity just from a simple bug from a dependency on a certain part of the application that didn't have much to do with the part of the app they were building. Engineering talent and human resources were wasted on these types of problems that could have been spent either strategically thinking of new services that would add value or of could have been spent building software.

With the advent of microservice architecture and Agile project management philosophies sweeping Silicon Valley, engineering organizations could assign small groups of 4-6 engineers to a particular microservice. Since these microservices were mostly independent of other services, sprint teams were left to stay out of each other's way and do what skilled software engineers do best - build. A tech organization like Spotify is a great example of this team structure; they call their small, self-organized teams "squads," where each squad focuses on a different platform component to add value. Enterprises need to adopt these types of team structures to stay competitive in the 21st century.

DECREASING RISK

Big Data analytics and the meteoric rise of the technology industry have given birth to a generation of some of the most creative entrepreneurs the world has ever seen. From phone applications that make life easier to new and innovative ways to communicate with family, friends, and colleagues, these new and exciting applications are being developed daily utilizing Analytics and Big Data. This has largely come at the vast decrease in overhead that it takes to store data. In 1967, it cost a whopping $1,000,000,000 to store one megabyte of data on a hard drive. Today, it costs an incredible 2 cents to keep the same amount.

As the capital cost to store data continues to decrease, and platforms like Google, Apple, and Amazon Web Services make it easier for startups to test and deploy applications on the fly, it will only pave the way to more innovation opportunities.

But small businesses aren't the only ones taking advantage of this risk-free nature of software development and analytics these days. Large companies that have been around for ages also structure their technology organizations to become innovators. FIAT Chrysler is an example of one of many manufacturers using customer data to advance their business using a software application called EcoDrive. As a company not originally branded as a technology company, implementing a system such as microservice architecture is of the utmost importance. Chrysler surely isn't a grizzled veteran in developing interactive user software, so microservices architecture is key in allowing their organization to grow as a technology company. The digitization of large companies like General Electric and Chrysler is one of the main business trends occurring right now.

This is important because microservices give risk-averse companies a framework to build out a digital component to their enterprise. Leaders of Fortune 500 companies see the value in the ability of self-organized sprint teams to execute new ideas that could save time and energy across every level of Fortune 500 companies. But their hesitation always comes in evaluating the risk-reward component of any new initiative.

Microservices Architecture gives these leaders a framework to minimize that risk. Sprint teams can be assigned to developing a microservice; if that service becomes discontinued, it won't affect the overall platform. This is exactly the type of team structure that big companies need to introduce less risk and more flexibility as they figure out how to digitize their current operations.

No matter the company's size, this gives big data organizations and data scientists more room to innovate and create data science models with a large upside and less of a downside if any given project is a failure.

MICROSERVICES CHALLENGES

Although Microservices can be quite powerful if implemented correctly, with any massive shift in strategy in software development, more is needed. We need to face several challenges when shifting to the implementation of microservices. Designing a microservice architecture that can effectively scale takes time and effort.

FINDING THE RIGHT LEADERSHIP

The thinking that building a microservices framework that allows for scalability and flexibility takes a level of software architecture talent that is hard to come by. With the increased demand for technology professionals, the need for these leaders will only increase with time. In addition, a recent study found that 40% of job postings for tech talent on Indeed were posted by firms that wouldn't consider themselves technology organizations. This means more and more non-tech firms are shifting their focus to becoming more digital and tech-minded. As this trend continues, finding the right type of leaders that can design microservices platforms to allow for scalability will be harder and harder.

Also, as any system scales, it creates more of a challenge to manage the growth of different components. Integrating separate functions within a platform creates a high demand for developers skilled in all phases of software development and data analytics. As you can imagine, we arrive again at the challenge of finding individuals or teams of individuals who have the skill and experience to make sure that these components run smoothly in tandem. As any technology company will tell you, one of the biggest challenges these companies have is recruiting and keeping this type of talent within their organization, and as you scale a microservice-based platform, these challenges will arise.

MONITORING

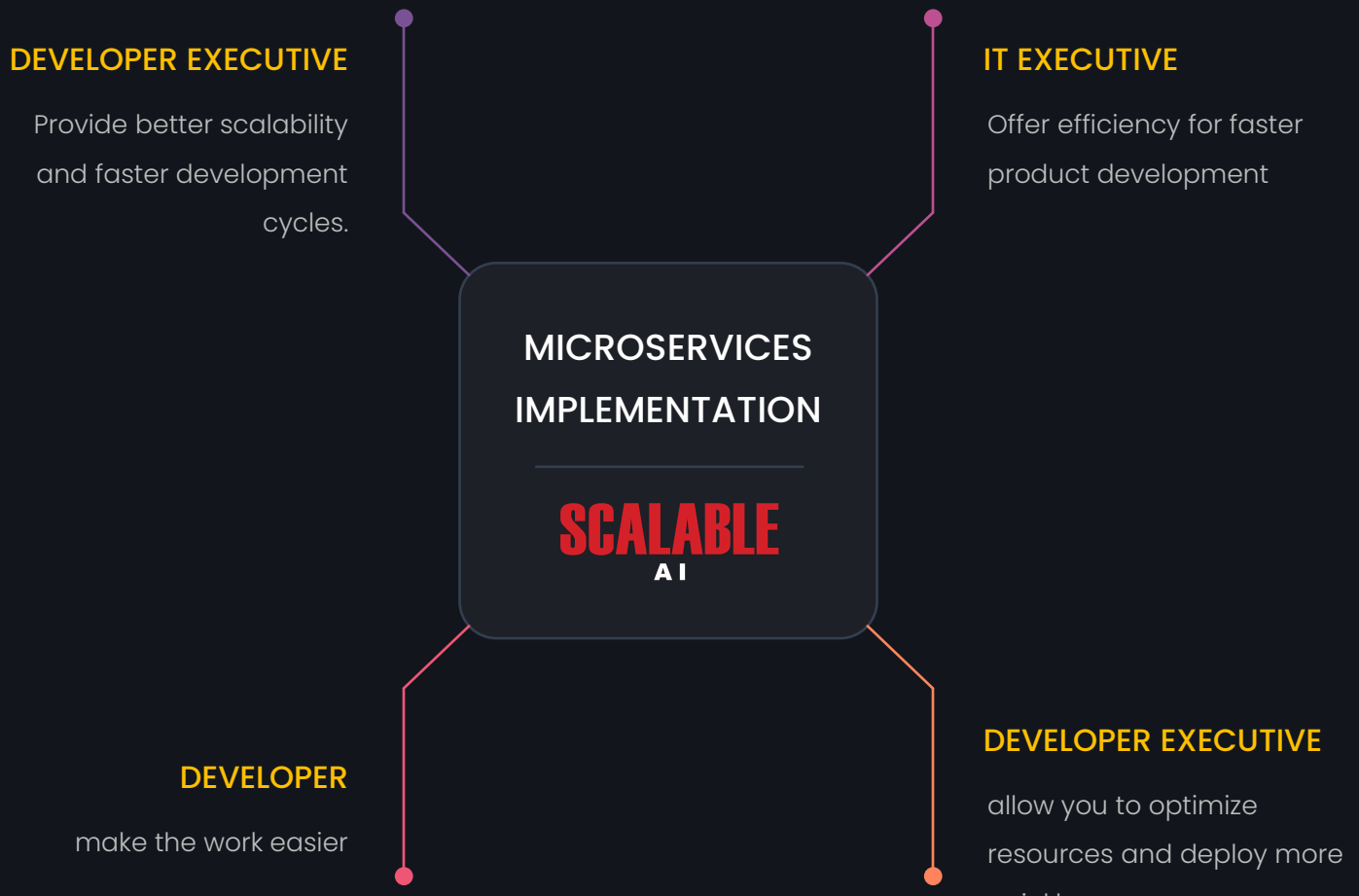
One of the major benefits of Microservices Architecture is the opportunity to scale your platform in ways you would have. Truly Never imagined. However, as your application grows and adds more and more microservices, this becomes challenging for DevOps to consistently monitor all of these different services and understand the root cause of a bug in each service. Although one of the main reasons any organization switches to this type of architecture is because it allows for more productive debugging, we are still talking about software here; We must be prepared for troubleshooting in any scenario. The debugging of different microservices has to start with a robust monitoring process so deficiencies across various services don't go unnoticed.

This can be tackled using advanced automated monitoring services that alert DevOps engineers when certain microservices are not performing as expected. This gives your team peace of mind and allows it to prioritize troubleshooting across different platform layers.

CONCLUSION

There is no question that cloud computing is growing more complex. The internet is still changing our lives, and there are bound to be other technologies that are introduced to the cloud computing world, which we will have to manage somehow. Additionally, more data than ever is being stored today; It is a telltale sign that we must keep preparing to deal with the complexities of this Big Data revolution.

Technology will bring many new fronts that accessing data will have a large impact on. Technologies like Artificial Intelligence and Augmented Reality will introduce new ways of interacting with computers, and in turn, new platforms to deploy software will emerge. The amount of new and complex data stored will exponentially grow, and we will need systems architecture to handle this growth. This will be the key to success for any leading technology organization.



About Scalable AI

We deliver actionable insights that organizations can use to identify opportunities, manage risks, achieve operational excellence, and to gain an innovative edge.

www.scalableai.com

About Scalable Systems

Scalable Systems is a Data, Analytics & AI Company focused on vertical-specific innovative solutions. By providing next-generation technology solutions and services, we help organizations to identify risks & opportunities, and achieve sales and operational excellence to gain an innovative edge.

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