Impact Study

In association with:

Diebold Nixdorf

Microservices Architecture: Future-Proofing Payments Technology

Finextra

Diebold Nixdorf

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01 | Introduction

It is high time for banks to move away from legacy thinking and embrace modernisation to remain competitive in the industry. Financial institutions have long been threatened by innovative, tech-savvy fintech firms that do not have to maintain decades-old back-office systems. Core banking systems within banks have evolved, but with additional pressure from incoming regulation and subsequent reporting, progression and modernisation has been sluggish.

Also forcing banks to evolve is the significant increase in new payment types and volumes, especially real-time. In the US alone, the real-time payments market is expected to grow at a compound annual growth rate of 31% until 2030. An institution's success in scaling their payment processing in response to this shift will rest heavily on how their systems are set up.

The zeitgeist is such that banks' infrastructures must be reviewed, and cloud-native services leveraged. There are many effective technological vendor offerings for consideration, also. While it may seem the most efficient means of migrating – due to the comparatively small amount of work required – simply ripping and replacing workloads is no longer tenable, causing significant disruption and cost for banks.

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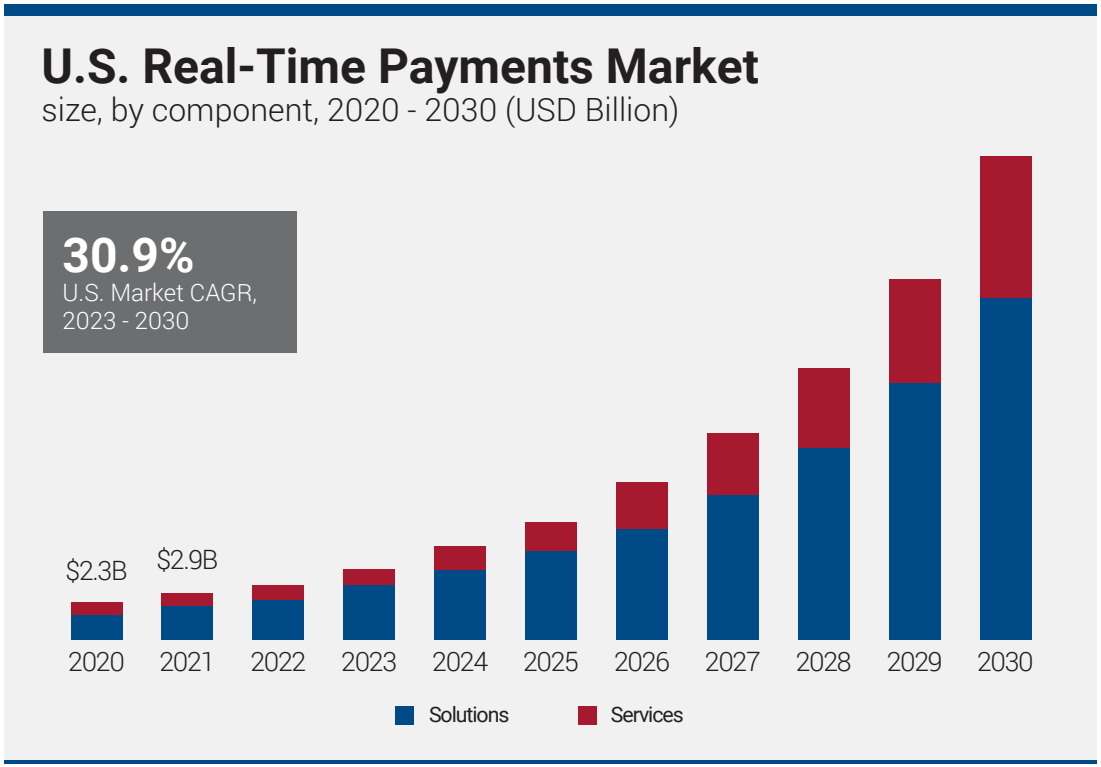

Source: Grandview Research

Cloud-native payments processing is the most viable option to keep pace with innovation demand and competition; enabling banks to build upon flexibility, at low cost and risk. These enablers also make cloud infrastructure – both public and private – attractive for banks that have struggled to streamline, maintain and upgrade their legacy infrastructures.

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With the future of the payments sector being instant and agile, open technologies must be prioritised, since they provide access to and from channels, and to and from core banking and back-office platforms. Small, re-useable components, available as configurable services, as well as common services, should be available in different places across the enterprise. To remain agile these services do not have to be centrally located in the same way that middleware hubs were historically. For example, consumer authentication in legacy systems is built around card and PIN as the sole means of authentication. It is typically a bundle of many executables that does not lend itself to efficient or easy scaling. The addition of new service capabilities in a micro service-based architecture – such as new forms of consumer authentication from digital channels using tokens or biometrics – can be introduced, tested, and deployed more easily, quickly and with lower risk. These are unattached from any back-end system and can be easily distributed, scaled, and updated as necessary with no operational downtime. Further to this, as market conditions shift, emerging technologies such as artificial intelligence (AI) can be integrated – again to enable innovation as well as keep pace with others within the space.

Service-based architecture can also provide service-based processing. With isolated data units and the advantage of microservices, changes can be worked on in smaller units depending on the specific function. For example, if a security policy changes, new regulations are enforced, or the business wants to change customer limits, these updates can be consistently applied across the enterprise with specific variations clearly identified and limited to a small configuration tweak or a small set of specific code. This approach allows the enterprise to implement change securely, at speed, and scale.

As banks approach the next era of payments, such strategies offer increased speed to market, ease of customisation, reduced support costs, and scalability. And, by modifying the origination and verification interface, banks can enjoy improved authentication of customers, improved risk-based determinations, and improved customer personalisation.

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02 | Then & Now: Monolithic vs. microservices architecture

In days of old, every financial institution relied on a monolithic technological architecture. This is a software engineering philosophy that seeks to group together processes in large, tightly coupled applications. As such, it is often the go-to choice for personal finance applications or even word processors, since they are self-contained and support users in completing one task, start to finish. Larger financial institutions may take a monolithic approach too because of its availability, as well as its relative simplicity.

However, the problem comes when a bank's business begins to grow, and operational tasks increase in complexity. If, for instance, there is an upsurge in demand for a particular service, the entire system must be scaled up. Likewise, if one of the services falls over, so too does the entire application. Perpetually coding for these eventualities quickly becomes a drain on creativity, experimentation and technological progress.

Today – in the face of new competitors, new regulations, tighter reporting requirements, and evolved end-user demands – many institutions are opting for an engineering approach inspired by Robert C. Martin's 'single responsibility principle'. It proposes to "gather together those things that change for the same reason and separate those things that change for different reasons." Thus was birthed 'microservices architecture': a means to loosen an application's coupling by running multiple, siloed services that can work together via software interfaces, called application programming interface (API)s. In such a scenario, each service, performing a single function, can be managed by a discreet, self-contained service.

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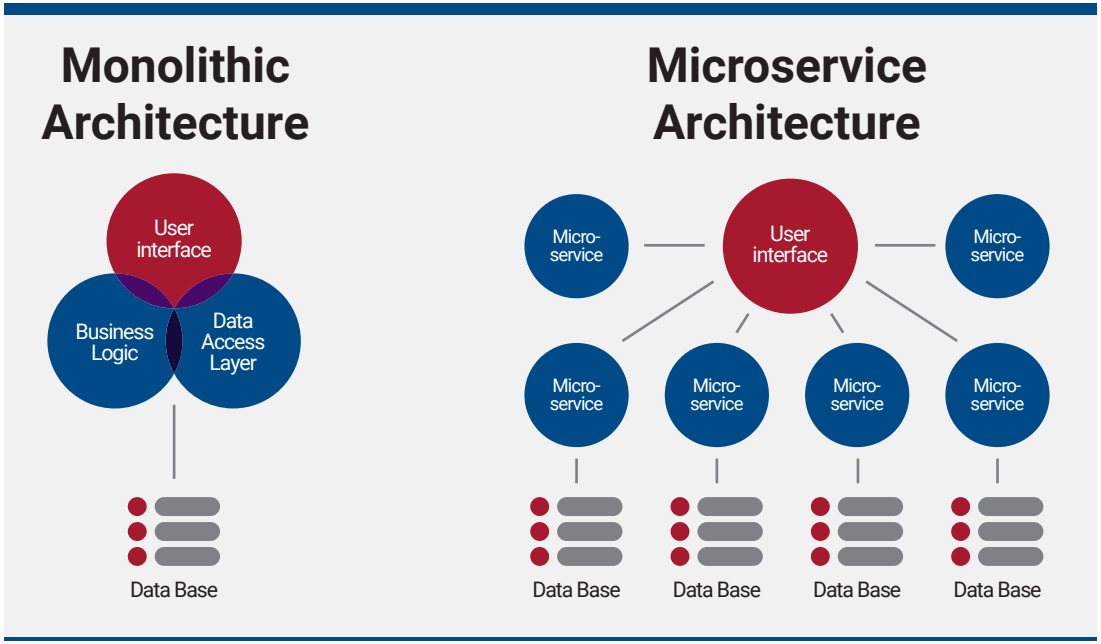

Source: Medium

Engineers are increasingly opting for this strategy because of the obvious scalability in line with demand and time-to-market benefits. Of course, if any feature runs afoul of a bug along the way, it is only that feature which requires attention.

Microservices are characteristically autonomous, meaning changes made to an individual service should not impact the rest of the application. No code, in other words, need be shared. There is a customisable amount of specialisation with this kind of architecture, too. For example, if a service evolves to become exceedingly complex or impractical, then it too can be split up into smaller services.

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Overcoming microservice challenges

Naturally, there are challenges for banks to consider when it comes to implementing microservices.

First is the challenge around data consistency. A well-resourced microservices architecture is fed by data, particularly that which is spread and easily flowing between the features. Tactics to manage this include event sourcing or distributed databases.

Another difficulty is security. How should institutions address the risk of opening numerous entry points into their architecture? Classic answers include encryption, role-based access control (RBAC) and multi-factor authentication (MFA).

Thirdly is complexity. Many banks, migrating from their legacy monolithic structure to a more compartmentalised solution, will have to undergo a cultural shift, which sees a reduced reliance on the monolith experts, who have grown old maintaining the beast. Fortunately, the complexity involved is more perceived than real. While running microservices can necessitate complex tools, as well as a robust monitoring and orchestration system, recruiting the support of a trusted technology vendor is a failsafe option.

For other institutions, the prospect of propping up a multi-faceted architecture – each with its own data silo, functionality and code – while also meeting the demands of regulations like the Digital Operational Resilience Act (DORA), ISO 20022, the third Payment Service Directive (PSD3), the EU Artificial Intelligence (AI) Act, or the Payment Card Industry Data Security Standard (PCI DSS) – can be hard to stomach. As we shall soon see, however, the organisations with the most nimble and cutting-edge systems are the ones best placed to flex in the winds of a regulatory storm.

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The final sticking point when it comes to the microservice approach is the cultural adaptation that must occur on every floor of the bank. Engineers, in particular, must begin thinking in terms of DevOps, and encourage closer collaboration between the operation and development factions.

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03 | The benefits of a micro-approach

The good news for banks is that these implementation challenges are surmountable – testament to the large numbers of institutions already having moved to the 'Swiss-Army-Knife' model, exchanging their blunt-edged toothpick for a modern, multi-tool workhorse.

Here are 5 benefits that make the journey worthwhile:

1. Snowballing efficiencies

Breaking architecture down into discreet modules has the hidden benefit of being able to deploy a function for several purposes. For instance, a given service could be expanded upon to be used, in parallel with the original, as another. Herein lies an efficiency that simply snowballs, since the need for developers to write code from scratch is circumvented.

2. Service plasticity

By using existing modules as building blocks for new modules, the bank's end-user offering gains plasticity; in that it can maintain availability while being scaled up and down, in line with demand. What is more, because the services remain discreet, measuring the cost or return of a new feature is comparatively straightforward.

3. Catalysing creativity

The environment engendered by microservice architecture is one of radical creativity. DevOps teams can benefit from continuous delivery, integration and therefore experimentation. New features may be rolled in and out with speed and ease – not least because of the relatively low costs associated with updating code.

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4. Light on the toes

This 'creativity' piece feeds into an overall nimbleness in the IT team, which the entire business will feel the benefits of. By forcing each small, independent team to laser-focus on a single service, stark specialisms and efficiencies emerge. On the ground, this means that development cycles are compressed, which – ultimately – trickles through to the topline figures that are regularly perused by management.

5. Failing gracefully

The final benefit to banks breaking down their IT teams and architecture into focused units is about containing the damage of bugs or cyberattacks. Much like the rocky counterpart, an institution's lumbering monolith is vulnerable to cracking – placing the entire structure at risk of falling over. A polylith, on the other hand, has increased resistance to systemic breakages, simply because it is portioned and rationalised. DevOps teams involved in the management of microservice architecture need only patch up a problem service, rather than about the entire application crashing. Ultimately, this means customers' service is maintained and critical revenues are not drained.

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04 | Common services

In point of shedding some light on the practicalities, here are two examples of financial institutions, the typical challenges they face, and how each can be solved through the careful application of modern technology.

1. Acquirers

CHALLENGE

Acquirers' pain points typically revolve around meeting end-user demand for real-time data analytics, value-added functionality – such as digital wallets and tokenisation – top-of-the-range fraud protection, as well as cheap, secure transactions. Within the institution, teams must also keep an eye on compliance, regulation, rising transaction volumes and cybercrime trends. This is a complex burden to shoulder, so the solution should be streamlined and holistic.

SOLUTION

Cutting-edge acquiring solutions bypass legacy infrastructures by leveraging cloud-native, low-code microservices architecture – facilitating the delivery of payment services from a single hub. If this structure is used and re-used, transactional costs can be reduced. Most crucial is that payments' reliability, data security and regulatory compliance are not compromised.

Another key characteristic of this solution is increased integration between partners and infrastructural systems, via the utilisation of modern APIs.

The benefit here is that it places solutions back into the hands of the institution, as opposed to leaving them with service providers.

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Here are some other useful features for consideration:

- Automated teller machine (ATM), point-of-sale (POS) and e-commerce transactions – sundry methodologies must today be supported, be it card-based, digital card, or even card-not-present. Units must be able to verify a customer's identity efficiently so that sales are not lost
- Scheme connectors and interfaces – multiple message formats should be supported, facilitating connectivity between global and regional payment networks
- Terminal driving – machine management should be controllable in real-time, locally, if changes to self-service channels need to be made
- Intelligent decisions – the routing of transactions and flow of data should be orchestrated via the dynamic application of rules and steps. This means that parameters can be founded upon transaction type, terminal, or even merchant and customer
- Data intelligence – the best solutions will have a collection pool, where data is replicated at speed, via integrated services and APIs. This ensures that information is shared with support systems and third parties to boost operational efficiency and insight.

2. Issuers

CHALLENGE

Moving further along the transaction chain we reach issuers. The demands from businesses, however, are often no less stringent than those from consumers. The difference for the issuer is the added layer of pressure to contest new fintech competitors and cybercriminals, while also vying for the attention of big customers – particularly given the number of options that are now on the table. What is required of issuers is the technological strength and flexibility to ensure their transaction volumes continue to blossom.

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SOLUTION

The key to navigating these tricky waters is to loosely couple discrete business logic and supply a wealth of payment options – like wallets, contactless, and 'tap and go' – alongside improved security, data transparency, and authorisation.

The best-case scenario, then, generates a configurable payments platform that competes with fintechs by offering businesses a varied and trustworthy product list – supporting the best card programs and payment rails around the world.

But such solutions, powered by APIs, the cloud, and microservices architecture, are not just a reactionary band-aid – their flexibility is such that new payment methods, products, schemes and regulations can be easily onboarded; thus compressing the time to market. These 'build-once-but-use-often' designs naturally reduce operational costs.

The features that issuers should expect to pass down include:

- Authentication method options – from straightforward card security code to personal identification number and biometrics
- Risk management – the ability to set up custom alerts and notifications for fraud detection
- Data tokenisation – a choice to protect downstream systems and limit the ability of all those entities that interact with cardholder data to affect security
- Wallets – the provision of mobile payment applications and digital wallets, like ApplePay
- Stand-in processing – making available transactions 24/7, by storing copies of the latest consumer balance and account information, along with risk exposure and management algorithms

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05 | Case study

Diebold Nixdorf recently worked with a large global bank and a European payment processor to address some of their technological and operational pains and move them to a microservices infrastructure.

The bank required a cloud-native, common architecture to replace its legacy payment engine. As well as replacing the debit card authentication and authorisation flows, the new platform also needed to support self-service terminal driving, routing and switching, multi-channel authentication services and credit card authorisation flows.

The scale of the project was vast – not least because the bank operates many thousands of endpoints, shoulders a transaction volume of 50 million per day, and over 15 billion issuer transactions per year.

To address this, the bank's aging monolithic technology was replaced with modern processes and methodologies. The approach addressed resource constraints and niche skillset requirements. Common services were reused throughout the enterprise system.

Ultimately, the new platform provided a highly flexible, fully scalable, domain-driven, cloud-native architecture – leveraging modern technology stacks, microservices and APIs. The solution also allows for vendor-independent enhancements and support.

This strategy served to accelerate innovation through common architecture and enables the bank to exploit continuous integration capabilities.

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The European payment processor, meanwhile, is migrating to a similar, end-to-end cloud-based system, from its legacy platform. The challenge it had was rooted in the complexities of managing diverse payment systems. From supporting card-based ATM and POS transactions all the way to instant payments, and then delivering the basic rails for upcoming digital currencies. With an increasing array of platforms, functionalities, regulatory requirements, and solutions to support and maintain, added to the difficulty of successfully transforming its current legacy payment platform. Addressing these challenges involved evaluating their impact on development processes, including time, skills, tools, and total cost of ownership.

A modern architecture was essential – one that adhered to industry standards of today and tomorrow, that was cloud-native and designed as a collection of micro-services. The initiative allows for agile adaptation, positioning the organisation to efficiently handle future developments such as the introduction of the digital euro while providing the extra flexibility and scalability needed to handle the traditional acquirer, issuing and transaction-switching services for ATMs, POS terminals, e-commerce, and other systems, for 20 banks in southern Europe.

The technology, as provided to the aforementioned institution, is low-code and API-driven – delivered via multi-phased migration; thus minimising disruption to operations. What's more, with the increasing intertwining and integration of different payment services, it is a single comprehensive platform that can then support a wide array of payment services for today and the future, including the digital euro once it's introduced into the market.

Overall, the new system enabled both firms to become modern, compliant and agile – while creating a seamless and consistent experience for consumers, irrespective of the banking channel.

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06 | Conclusion

Faced with a landslide of changes and regulations from the payments space, banks are increasingly looking to modernise their core systems. Over all else, it is vital that any new approach is able to handle today's spike in payment volumes, in real-time.

Cloud-based payments processing is repeatedly proven to be the most popular recourse – enabling banks to streamline their systems, keep up with competition, and build on the technology's capacity for flexibility, at low cost. The microservices architecture is as ever the holy grail; allowing for dynamic scaling and portability, as a result of the compartmentalised architecture.

So, what does all this mean on the ground? With microservices architecture, banks can enter a new era of increased speed to market, fluid customisation, reduced support costs, and sheer scalability.

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07 | About

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