Finance industry

Proofs of the expertise

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Executive Brief

Due to rapid technological development and how it has changed the way the finance industry operates today, it is not surprising that the BFSI (Banking, Financial Services and Insurance) sector is one of the biggest customers of IT services.

Financial firms need to focus on new digital products and services, keeping strict government regulations in mind.

It can be very challenging to choose software development partners that fit FinTech needs and requirements. To make this easier, we have prepared a document with a brief overview of our own expertise in the finance industry.

For the sake of our NDA, we won't name any of our customers. Nevertheless, this document will address the main FinTech topics that we do have a say in:

- **DevOps Principles Implementation**
- **Online Banking**
- **PSD2 – Open Banking**
- **Instant Payments**
- **SAFe Methodology for Lean Enterprise**
- **From Legacy Monolith to Modern Microservices**
- **New Microservices Application**

- **Shortcut to the fast BPM**
- **GDPR Adoption**
- **Card Management Platform**
- **Maintenance and Upgrades of the Core Banking System**

Ever since our foundation in 2007, we have worked on more than 20 projects for many different clients in the finance industry. All mentioned clients are market leaders in retail banking, corporate clients, and asset management. They deal with a billion end users globally on a daily basis and across different branches. Some projects were more technically complex and required specific knowledge, but all of them were looking for a partner who has in-depth knowledge of the banking industry and who can provide a consultative approach to assist them in solving problems that may appear during the process of digital transformation.

We have clients from many different industries, but it's financial organizations that are dealing with emerging digital trends and looking for top-notch FinTech solutions that will meet real business needs. BFSI companies need to both remain compliant and implement new offerings, so they are typically looking for a reliable and flexible partner that can shorten their time to market.

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DevOps Principles Implementation

This is business case where we participated in the implementation of DevOps principles in several areas for a client that is a part of international group as an important financial transaction processor and provider of cutting-edge services and solutions for banks. The client uses a wide range of technology when developing their services and, as an enterprise organization, they systemize departments to maximize the efficiency of the system itself. Software development is organized in departments, such as architecture, development, build management, application management, testing, data warehouse, etc.

We have been hired to significantly expand the existing development team, implement DevOps principles, and expand the client's testing team. The goal was to implement and increase the degree of automation of the core application development cycle and the development of event-driven systems for developer support. To be more specific, we joined to improve the efficiency of financial processing in every possible way (enhancement, caching, parallelization, etc.), to upgrade automation of business process, enable parallelization of the entire distributed solution by automatic instantiation, ensure compliance with GDPR, take care of encryption of sensitive data and data anonymization.

DevOps principles were implemented in the following:

- **CI/CD pipeline of the distributed system**

- **"Zero downtime" of the core application**

- **Deployment destination-dependent config transformations implementation**

- **Encrypting sensitive parts of configuration files**

- **Versioning the master database, tracking model changes and data in the database**

- **Automating the rollback of models and data in the database**

- **Automating the setup of an unattended installation of a distributed application's new instance on a set of servers with a clean OS (one click)**

- **Event-driven integration of high-level business planning and estimation, operational monitoring, and developer workflow**

Since we helped this client to improve existing software, to raise the level of automation, and to achieve the final goal to capture a large part of the European market we became a reliable partner. Furthermore, we contributed by stabilization existing teams through teamwork and proactive and assertive approach supported by transparent and joint mastering of project phases.

After getting acquainted with the specifics of user requirements and expectations, the cooperation extended to fixed-price projects where we take care of the whole development process of new applications.

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Online Banking

Online banking, also known as internet/web banking, has become the standard in the banking sector. Due to this, our client wanted to beat their competitors by launching comprehensive, best-in-class digital banking solutions for citizens as well as for corporate clients. Apart from a shorter time to market, the client asked for the quality to be at the highest possible level. Furthermore, the client is dealing with new types of customers who want to have access to their bank account 24/7 from different types of devices, with one username and with the highest level of protection. Not to mention that the application needs to be able to work with different types of bank accounts, currencies, and types of transactions.

According to the technical and business requirements, the architecture of the application is based on a wide range of different technologies such as Oracle Database with business logic in procedures (PL/SQL), Java Spring Framework, IBM WebSphere Application Server, Bootstrap, and KnockoutJS. The development scope pans from the database to the user interface.

We have appointed a team of developers that have different skills and knowledge needed for the banking domain and the result was that our developers have managed to quickly and effectively assist the client in achieving their business goals. After successfully planning, designing, developing, and initiating the production, our team was also engaged in system maintenance, upgrades, new features development, and urgent support management. Cooperation with us enabled our client to provide one of the best and most advanced Internet banking solutions that has resulted in an increase in the number of users.

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PSD2 – Open Banking

Especially in the eurozone, PSD2 and open banking have become major factors going forward. PSD2 essentially obliges banks to offer public interfaces in their system, i.e. open APIs. This opening of APIs means that FinTechs can connect to the extensive and reliable customer databases of different banks. The transmitted information can help them provide creative solutions in the area of customer identification and credit scoring. Furthermore, it can help enterprise merchants, independent sales organizations (ISOs), and payment service providers (PSPs) to process transactions at significantly lower costs.

One of our clients asked us to help them deal with this. An additional challenge was the fact that they had a legacy platform that possessed valuable data. In order to be able to rapidly adapt to changes and redefine the client's business model, we agreed to implement modern microservice architecture. The new platform became scalable and the runtime for the development and deployment of new features is now shorter.

Furthermore, we prepared this platform to be ready for a diverse scope of business features like a new internet banking application.

The new platform consists of components for different purposes and types: outer and inner architecture. Outer architecture includes the components serving as a runtime environment for running business features implemented as microservices. Inner architecture involves business features, API gateways, or backends for frontends that enable the exposure of business features (microservices) to end users, mobile applications, or third parties.

Overall, this was a project in which we helped our client find the best solution to deal with their constantly increasing regulations requirements and be ready to innovate and implement new services in a cost-efficient and progressive way.

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Instant payments

Thanks to the instant payments there is almost real-time money transfer between bank accounts. From the moment the transaction is initiated, within seconds the funds will be in the payee's account, just like a confirmation of the successful transaction.

On a technical level, instant payment solutions are different in each country although most of them are based on ISO20022 payments messaging standard. Our client is from a foreign country and an institution with a long history and billions of clients. Of course, this means that they are dealing with numerous instant payments and they were looking for a proven partner that can help them with the maintenance as well as with further development and deployment.

This is where we came with our developers that are quite familiar with the industry itself and became a team that can handle their Change Requests regarding Instant Payments. Maintenance of such a system requires the duty of our developers 24/7 because there is no time for down-time.

Change Requests can include different things like APIs, host-to-host channels, native internet banking channels, ATMs, mobile banking, or even manual payments initiated at the counter. So, any alteration of Instant Payments is managed by our team. Our approach is based on an agile methodology which means that our team cooperates with the client actively so things can be changed fast. This approach came into focus especially in a time of COVID-19 crisis when there was a huge rise of Instant Payment transactions and Change Requests should be solved even faster.

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SAFe Methodology for Lean Enterprise
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One of our clients – a huge corporation in terms of revenue, employee count, number of locations, and product portfolio – is reorganizing their business according to the SAFe methodology. To be more precise, they are introducing Portfolio SAFe, which provides portfolio strategy and investment funding, Agile portfolio operations, and Lean governance. This initiative is conducted with the aim to become a leading provider of financial services in Europe and to have a customer-oriented framework.

SAFe is an acronym, referring to the Scaled Agile Framework methodology. In other words, our client is introducing scaled agile methodology guidelines for their product, solution, and portfolio management. This process is going to enable our client to become a Lean Enterprise and to achieve Business Agility. As their software development partner, we supported this reorganization process with expert developers. Our developers are distributed in different teams and different value streams.

Within the defined value streams, EPICs are assigned to specific ART leaderships which ensure that one feature is successfully finished in the defined Product Increment, all while taking care that the development of one feature is covered by one team. EPIC can be a customer request or a business requirement. Each EPIC is composed of one or more user stories. That's why they can create output in a single sprint.

Since development requests can involve different value streams, as well as different teams, cross-stream dependencies are planned carefully on the Program Board. Thanks to the SAFe methodology, developers are more included in product development because each team itself can collocate development requests based on the technical specification that is prepared by their Tech Lead. Since every EPIC must be finished successfully within one quartal, Sprints are used for more detailed task planning. Integration between teams is better and developers are beyond the process.

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SAFe Methodology for Lean Enterprise

Developers have learned how to report in such an organizational system, they have gained better insight into what they are doing, and they are more motivated because they can negotiate about the type of tasks they take on. In addition, one of our developers has been recognized from the client-side and promoted to an ART Leadership function.

For a successful development team, it is advantageous if the developers are familiar with the finance business specifics in general and if they speak the stakeholders' language. Based on our expertise, our finance experts and Scrum Masters as a key role in the team can recognize the right moment to approach the customer, the sponsor, or the executive.

The Scrum Master with financial knowledge is the one who should lead the team in situations where issues arise and who should make sure that the issue is solved. In Scrum environment, the Product Owner oversees managing the product backlogs. A finance expert as a Scrum Master can guide the Product Owner in resolving the issue of backlogs.

Such an organizational type of development department resulted in cost reduction, great team engagement, and increased customer satisfaction. This methodology allowed our client to increase their customer satisfaction by reducing costs, achieving great team engagement and a productive collaboration, and meeting the deadlines.

In addition, the SAFe methodology enabled our client to manage all joined corporate units in the same way. Furthermore, this led to profitability reporting and monitoring being mould in the same way for every part of the organization, as well as to overall higher profitability.

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From Legacy Monolith to Modern Microservices

To be a global leader in the payment solutions arena means providing a myriad of digital products, services and solutions. Among other things these include mobile token & mobile wallet while at the same time providing access to online payment systems such as Google Pay and Apple Pay, cardholder and card managment, personalization bureau, issuer authorization service, cardless cash withdrawal, POS solutions, transaction processing, ATM solutions, e-commerce support, call center service, data monetization services, dispute and chargeback management, strong authentication, fraud detection solutions, statistical predictive modelling, loyalty, reporting etc.

In order to provide this functionality, the company needs two crucial pillars - business and IT, which both need to be strong and agile. On the IT side, this requires reliable, robust, scalable and yet flexible information systems and related infrastructure. This is the story of one of our major clients in the financial sector.

Since the information systems evolve together with the business capability, it usually starts with a monolithic architecture which provides quick results. As the information systems become larger and more complex it's more difficult and costly to maintain them, rapidly change and expand their functionality to meet new market needs, scalability and reliability become an issue etc. In such a situation, breaking up a large monolith into properly sized and functionally logical set of microservices presents itself as a solution. The complexity of the whole information system is divided into functionally logical parts represented by their respective microservices which communicate using well defined interfaces (APIs). This approach removes unnecessary coupling between them, allowing for each microservice to be modified, maintained and scaled separately. Furthermore, it's possible to transfer the functionality from the monolith into microservices gradually using appropriate techniques (e.g. Strangler pattern).

Exactly this approach was taken for one of our major clients, a global leader in the payment solutions segment.

Experienced team from Serengeti communicated with the client's stakeholders on a daily basis, following state-of-the-art techniques and best practices while performing design and development tasks to facilitate a smooth and gradual transition from their core information system with monolithic architecture into the new system based on microservice architecture. Depending on the functionality and purpose of a given microservice, both relational and NoSQL databases were used. Microservices were developed in .NET Core, containerized in Docker, deployed on RedHat's OpenShift platform (Kubernetes, Istio) and are communicating with each other via async event-based communication based on IBM MQ and Kafka.

New Microservices Application

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This client is a large banking group that operates worldwide and serves more than 16 million customers through 2.200 business outlets in corporate and private customer segments as well as in investment banking. As expected, they had a huge legacy system that was doing well but it started to be an obstacle. To be able to become an agile bank, upgrading to microservices architecture is a logical step. But they were looking for a partner that has experience whit this modern architecture and that can help them solve the main challenges.

Since it's a large company, different remote teams were working on it. So, we assigned our microservices experts to the client's teams. They were working closely together on the architecture design, development, deployment, and testing. All teams had to work together to deliver a lot of new and modern functionalities.

In addition, every new microservice had to be able to pick up the data from the legacy system which serves as invaluable source of data. Every microservice had its own database and Apache Kafka, Apache Flink and Qlik Replicate were used as a data streaming and replication solutions.

Business department defined what functionalities they want to serve to their customers. Then Product Owners defined project roadmaps. Then Business Analysts together with an Architect defined technical specifications and documentation. The whole development process has been very flexible and agile thanks to the Scrum methodology. Furthermore, each module has been assigned to one development team.

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New Microservices Application

For this specific project, we could highlight three main challenges:

1. Appropriate CI/CD architecture

As the microservice architecture consists of a large number of microservices, it was necessary to assemble a CI/CD architecture that automates the process to deploy to the pre-production and production environments. In this way, pipelines were created for each microservice that allows each team a safe and stable deploy independently of other development teams.

2. Data access and update

As all microservices rely on data from the legacy system, it is necessary to provide each microservice with the necessary data and possible change of individual data in real-time. Distributed streaming platforms and integration technologies were used for this purpose.

3. Architecture and data storage

When a monolithic architecture is broken down into smaller modules this entails an increase in network complexity and data storage. So, it is needed to harmonize the network architecture in a way that microservices communicate smoothly with each other and in an optimal way. It is also necessary to provide a much larger space for storing information because each microservice works in isolation on its own copy of the data.

In order to increase revenue, this client had to move from the monolith legacy system to the new one. This new system with the microservices architecture decreased maintenance cost because now each module can be maintained developed and deployed independently of the other modules. Now they have a scalable and flexible architecture that allows them to increase or decrease resources of each module in real-time. Also, the delivery time of new business functionalities has been much shortened.

Shortcut to the fast BPM
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The client was looking for a partner that can find a way that combines the power of BPM and low code in order to produce a new solution faster. To achieve this, they needed a partner that have engineers with industry knowledge and that is certified partners with the Appian. The right software solution improves efficiency by reducing bottlenecks and enabling human resources to focus on more complex value-added tasks since software solution takes over those activities that can be automated, and that is what this client was looking for.

Business Process Management Software or Suites (BPMS) and, more recently, Intelligent Business Process Management Suites (iBPMS) have been a key software solution for business process management. Since we at Serengeti are certified partners with Appian and we have certified Appian BPM developers we helped this client to achieve additional benefits of Appian:

• It is a leader in process automation
• Easy upgrades and automation of
   manual operations
• Enables faster development
• Solves the dilemma about buying vs. building
   a new solution
• Easy onboarding
• Faster and flexible creation of initial application
• Better collaboration of business and IT

Appian is a low-code platform, and this means that it gives transparency and minimizes technology impedance to foster innovation. Appian combines the power of BPM with the speed of low code. Low code allows building new solutions faster, which is exactly what the financial industry needs to stay in line with continuous regulatory changes, financial demands, and customer expectations for enhanced services, and this client too.

In the end, the client got the solution with fewer developers that still are crucial for project success since they are focused on innovation instead of coding similar functionalities or interfaces again. Still, there are architecture challenges for which the client was looking for experienced developers. In the end, the client was satisfied with the shorter time of producing a system that covers business processes in a specific order and by a specific group of users since integration between multiple systems, data, and document processing was covered by Appian that gives flexible and easy-to-develop capabilities.

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GDPR Adoption

Another strict regulatory law that needs to be followed in all European countries as well as non-EU companies that have users in the EU. So, we worked with our client to align their CRM system with GDPR. Basically, there were some principles that the CRM system must adopt; data minimization, integrity, confidentiality, data portability, to be informed, the right to rectification, the right to restrict processing, and the right of access.

This means that all personal and confidential data inside the system has to be encrypted before they are stored in the database. In other words, data need to be encrypted in transit, at rest, and at backups. Of course, when the end user wants to access their personal data, they should be detokenized to protect data integrity. Log access to personal data demands that any access to confidential data must be logged, in order to know exactly who, where and when has accessed someone's personal data.

For tokenization, we used the comforte SecurDPS tokenization engine and its APIs. Other technologies that were used in the project are .NET (C#), ASP.NET Web Forms, ASMX/WCF for the service layer/business logic layer, and IBM DB2 as the database.

Within this project, we enabled our client to make conscious decisions when processing personal data. Rather than implementing a completely new CRM system that would require more resources, the data model, storage, data flow, and API calls of the existing CRM system were adjusted to the new regulation prescribes.

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Card Management Platform

Card Management Platform is a system used to manage different types of bank cards through their lifecycle. Basically, this system is responsible for card management operations and card transaction processing.

One of our clients needed a platform that would be developed and designed on the microservice architecture. The platform had to cover different card management tasks such as issuing/reissuing of cards, card status changes and updates, account status updates, authorization of sale transactions, monitoring of card data by the customer, monitoring of card data by the employee, balance inquiry, cardholder updates such as change of cardholder or delivery address. Although the frontend was created in Angular 8, every microservice has an exposed Rest endpoint and the whole backend is based on Event-Driven Microservice Architecture implemented using the Spring Cloud Stream API.

For another client, we created a module that implements a clearing functionality for cards used on their terminals and in their core system. The module has several functionalities: exchanging data between two included parties, generating outgoing files, and processing incoming files.

We have also upgraded the existing data review webpages to support new cards. For this project, we used .NET, Oracle and IBM DB2 technologies, and Visual Studio, SQL developer and SQLDBX development tools. Furthermore, we optimized and improved the performances of card transaction postprocessing for another client. The optimization process was focused mainly on code issues and misuse. On the other hand, the design and architecture were built on a good basis by separating the application on multiple functional tiers. Most of the issues occurred due to the inability of the middle tier to process a large number of the client's requests, which resulted in the application's resource starvation. Because of that, the optimization was directed towards data transfer through the application, so the performance improvement was realized by using the best practices for ADO.NET, preparation of data, optimization of SQL queries and ways of data transfer object propagation through the application, as well as the correction of concrete implementation errors.

All three described projects were realized in a timely manner using development cycles typical for agile methods, progress monitoring, and task assignment processes appropriate for the integrated development environment.

Maintenance and Upgrades of the Core Banking System

This client is the oldest financial institution in their country. Their core banking system consists of over 70 products that can be divided into three main units which also have their own sub-divisions. For such cooperation, it is crucial to have a team of experienced developers that are experts in banking products and the banking business domain.

This legacy system is one of their biggest IT assets and they were looking for a partner that has the knowledge to maintain it and to develop new functionalities, as well. The system is monolithic, which means that the products are very inter-connected, and every update includes the entire application. Due to that, the chosen developers had to be specialized to deal with the system.

Since we have a lot of Senior Developers, some of which are specialized in legacy applications and the business logic behind it, we maintain the client's core banking system through handling user requests, incidents and service requests.

Our team also oversees the development of new functionalities based on change requests, which include the development and testing of the functionalities.

When we were developing the new functionality, the old Cobol logic and screens were rewritten to a combination of PL/SQL and .NET. In addition, our developers have been actively participating in defining user requirements and taking on all actions in the development cycle, from estimations to implementation and stabilization. The connection between the .NET frontend and business logic goes through the web services mid-layer (ASMX or WCF), where there is no business logic; only the backend modules are invoked.

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Final Thoughts

The projects mentioned in this document are but a brief overview of the hottest banking tech trends. We tried to underscore what is happening in the finance industry overall, as some of the biggest banking/finance tech trends for 2020 and beyond include digital account opening, APIs, cloud computing, and person-to-person (P2P) payments. Operational fluency, incident reporting, and modernization of technology are also of crucial importance in this sector.

With the right custom software development partner, BFSI companies can provide creative solutions in the area of customer identification and credit scoring, while also helping enterprise merchants, independent sales organizations (ISOs), and payment service providers (PSPs) process transactions at significantly lower costs.

To stay on top of today's progressive industry, companies must have the right strategies, software, and systems in place. Appropriate software can automate and streamline processes, save a lot of time and money while increasing productivity and efficiency.

As one of our clients said:

"**Serengeti has proven to be a stable, reliable, and scalable partner from the beginning.**

In a short time of collaboration, they have established themselves as one of our key software development partners"

Who are we?

An international nearshoring and offshoring software development and consulting company. With our unique Team Extension Model, we help companies with each stage of the development lifecycle, not only with development but also with consulting services. Technical consulting in different domains like Architecture Design, Automated Testing, DevOps and SCRUM was recog-nized in 300+ projects across different industries such as finance, logistics, hospitality, industrial manufacturing, healthcare, energy, and retail.

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