

Luther Case Study

Mortgage & Insurance Policy Sourcing



1. Introduction

Buying a new home is one of the most significant decisions a person can make. Yet, the mortgage sourcing process remains slow, opaque and fragmented. For this reason, over 70% of people choose to rely on a broker to source and apply for their mortgage. However, the sourcing process remains a complex one which currently takes several months to complete. It is highly manual, fragmented, involves many siloed functions across the process and includes a high number of compliance checks. As a result of having separate parties involved, the whole process involves many different documents and data formats, the manual work required continues to increase and the customer experience increasingly falls short of expectations.

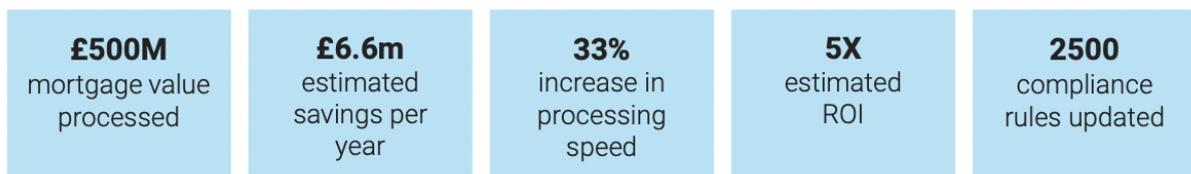
Acre Software is simplifying the way we buy houses. They are reimagining the end-to-end mortgage sourcing process by combining their deep industry knowledge with modern technology, to provide an informed and satisfying consumer experience. Acre is working with one of their major customers, Sesame Bankhall Group (SBG), a subsidiary of Aviva plc., to provide its product to a large network of brokers which serves over 10,000 financial advisors¹ across the UK and facilitate £42B in mortgages annually.

Through its modern technology Acre automates the complex mortgage sourcing process across multiple separate participating teams, with hundreds of tasks, thousands of compliance rules and numerous software systems. Acre selected Luther's Deep Process Automation platform as the back-end engine on which to build their automated complex mortgage sourcing process.

Through this transformative initiative, Acre has already redefined the mortgage sourcing experience for hundreds of brokers and their customers. Within its first year of operations:

- Over 2750 cases have been created on the platform, handling over half a billion pounds worth of mortgages
- 2500 compliance and process rules were encoded into the platform's engine
- Brokers have been able to serve their customers 33% faster, doubling their revenues
- Brokers have reduced their operating costs, amounting to an estimated £6.6m savings per year

With Luther's reliable technology powering its platform, Acre is set to accomplish its mission of simplifying home buying.

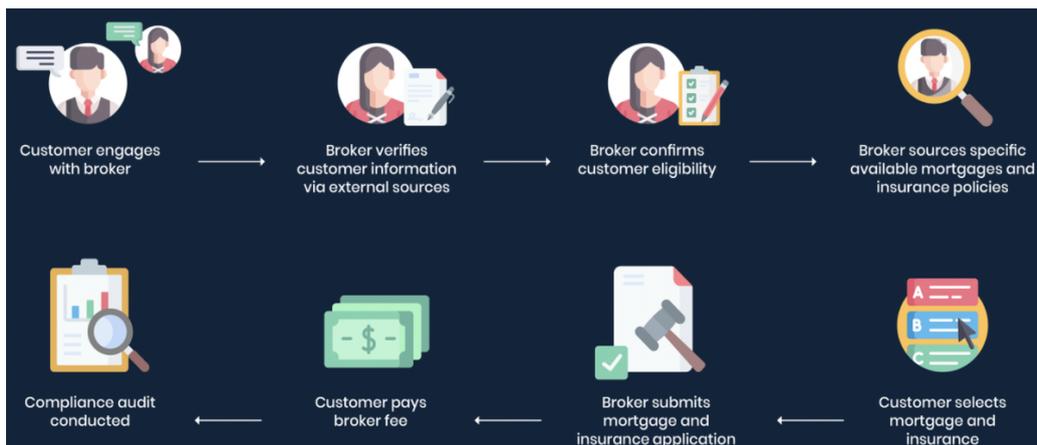


¹<https://www.mortgagefinancegazette.com/fintech/sesame-bankhall-group-aviva-invest-5-million-acre-software-mortgage-blockchain-technology-02-04-2019/>



2. Mortgage and Insurance Sourcing Process

The mortgage and insurance sourcing process involves the following steps:



1. **Collect customer information:** the broker collects the customer's details including identification, financial history, income and preferences for the type of property and mortgage that they are looking for
2. **Verify information:** the customer information is verified via external systems and services such as credit checks agencies and KYC services

3. **Request mortgages:** the broker requests a list of available mortgages from an aggregator
4. **Return list of mortgages:** the mortgage aggregator returns a list of available mortgages from multiple lenders
5. **Select mortgage:** the broker provides the list of products to their customer along with their recommendation, such that they can select the preferred mortgage
6. **Apply for mortgage:** the broker completes the mortgage application with the lender
7. **Confirm offer:** upon review of the application, the lender confirms a mortgage offer for the consumer
8. **Pay:** with a signed offer, the consumer completes the payment for the brokerage services provided through their personal banking provider
9. **Close case:** finally the broker acknowledges receipt of funds and closes the case

This process is done at an immense scale. In 2018 the FCA reported² that there are about 50,000 people in the UK approved to advise consumers on their mortgage. SBG alone facilitated £42 billion in mortgage completions in 2018 representing 230,000 mortgages across 10 products.

£42bn in mortgages processed annually

230k mortgages processed annually

£205k average mortgage size

10 products

Throughout this process, brokers and in some cases specialised compliance teams must ensure that the mortgage sourcing and advice process was completed according to regulations and that all appropriate checks have been performed. This is done by manually verifying the sourcing journey and checking for compliance at every step. SBG also dedicates a team of 60 people to compliance checks in support of their appointed brokers.

² <https://www.fca.org.uk/publication/foi/foi5530-response.pdf>



3. Problem

The process detailed above involves siloed participants working on separate steps for several months. Bespoke documents are created and multiple data formats are exchanged between the various participants and organisations. Despite this being a long-standing industry process, there remains little to no automations of scheduling and running of tasks nor a common view of rules and data. As a result these teams spend a considerable portion of their time performing manual tasks and reconciliations. Participants do not have visibility over where they stand along the end-to-end process nor have a common view of status or execution history. This lack of visibility and of standardisation across processes, documents and connectors leads to a lack of flexibility and ability to quickly adjust to changes in regulations or market demands.

Furthermore, a specialised team is required to review the process and all its documentation to verify that it is compliant with current regulations. In practice, the immense number of cases and the high complexity means that individual cases are reviewed by exception only, and that only a small percentage of sourcing journeys can be individually reviewed. Compliance issues are often identified by this team late in the process cycle and lead to costly and lengthy reconciliations needed to be carried out.

Ultimately, this complexity leads to low customer satisfaction, prolongs the processing times and results in high costs, of which some are passed on to the end customer and some have to be borne by the company.

Process Problems

Siloed participants operating separately

Scheduling & running tasks not automated

No automatic adjustment to changes

No common view of case status & execution history

Manual compliance checks

No standardisation across docs, data & connectors

Process Complexity

Each case processed by **8** separate participants

100 tasks

2500 compliance rules

Business Problems

Millions in operational costs

60 FTE dedicated to compliance checks at SBG

2 months average end to end sourcing process

Compliance checks are performed on only a small percentage of cases

No visibility over the E2E process for customers

Brokers cannot support returning customers automatically (e.g. remortgage)



4. Objectives

Acre Software and Luther Systems collaboratively embarked on the development of a fully integrated mortgage & insurance sourcing platform with the objective of redefining the end-to-end process and working towards a vision of:

- A fully automated, transparent and integrated service across all industry participants
- A product that easily adjusts to changes in systems, participants and rules in the ecosystem
- An efficient process that is compliant by design
- An ecosystem where brokers are empowered with the tools they need to focus their time where it matters: advising and serving their customers



5. Solution

5.1. Solution overview

Building the world's best mortgage and insurance sourcing process, best for end consumers and best for industry participants, required automation that could handle the inherent complexity of a multi-entity process involving hundreds of people. It was equally important that the new process could be built and maintained by Acre's own developers and subject matter experts and updated easily when regulations changed.

Acre also wanted to ensure that the new product was built upon a future-proof technology suited to cross-organisational and distributed processes. The product had to:

- Ensure each process step is executed and verified according to predefined business logic
- Keep a transparent, tamper-proof and auditable record of transaction to enable frictionless collaboration
- Enforce strong data integrity in exchanges between participants as well as standardisation across the traditional organisational boundaries
- Allowed for Acre and network participants to quickly scale operations without jeopardising the above benefits

This was far beyond the scope of traditional workflow automation technology which provides process automation for workflows with tens of tasks and one or two separate operational participants. Furthermore, connecting and coordinating multiple instances of workflow automation presents a number of challenges,

including much longer development time, far less efficient code, limited permissioning for different users, limited visibility, and maintenance overhead.

This is why Acre used Luther's LEIA platform to automate and operate the mortgage and insurance sourcing process. Luther's LEIA platform provided Acre with the operating system to run the process while providing the rails for orchestrating, executing and monitoring their complex workflows. It also gave them the development tools to achieve rapid development times.

Together Acre and Luther developed a new product that uses Deep Process Automation to:

- Bring together all the components of the mortgage application process into one unchangeable 'record of events'
- Express the sourcing journey into a single business process script (smart contract)
- Consolidate consumer, property, product, criteria and consumer preference data into a complex but detailed and standardised data model
- Incorporate compliance rules at each step of the workflow
- Connect multiple legacy systems to a common platform and script (smart contract)

With this new platform, Acre enabled the automation of a mortgage and insurance-sourcing process with built-in automated compliance checking and verification, as well as KYC, AML and credit checks. This led to the creation of a simpler and clearer user journey for each broker and end customer, ultimately resulting in a simple, streamlined process with automated real-time compliance checking, that massively reduced processing times and operating costs.

5.2. Application & Demo

Please find a demo of the solution [here](#) demonstrating a typical user journey for a broker creating and completing a mortgage application (case) on Acre's CRM platform .

A demo of the full Acre CRM product is also available [here](#).

Each step of the process is validated in the smart contract and stored as a transaction on the blockchain using Luther's LEIA platform. The compliance gates enforced by the smart contract prevent the case from progressing to the next stage until all predefined criteria have been met.

As of Oct 2021, 10 mortgage products are already supported by the Acre product, each presenting their own complexities:

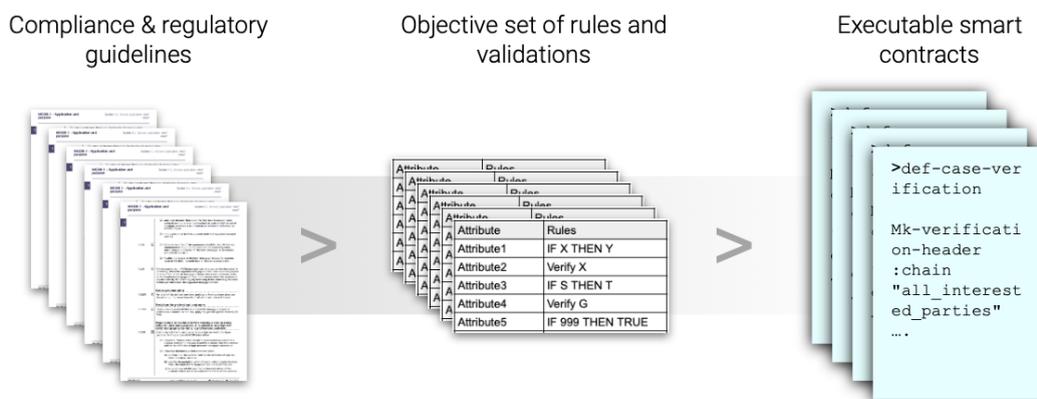


5.3. Automated compliance by design

The Acre product utilises Luther's compliance by design capability, which provides its users with execution certainty and the systemic assurance that the process is executed as per custom compliance rules. In the case of Acre, the compliance rules developed were bespoke to the Mortgage Advisory industry. For example, the FCA publishes and maintains a set of regulatory guidelines for UK brokers to adhere to. Some of these regulations readily translate into objective instructions (e.g. IF this THEN that) whereas others leave room for interpretation.

Working with SBG and subject matter experts, the Acre and Luther team followed a rigorous process to turn somewhat subjective guidelines into objective executable programs:

- The regulatory guidelines were studied with Acre and SBG industry experts to extract a pool of both subjective and objectives guidelines
- All guidelines were then turned to logical instructions that leave no room for interpretation and approved by industry experts
- These logical instructions were finally developed as programmable scripts (smart contract) for the Acre product to execute

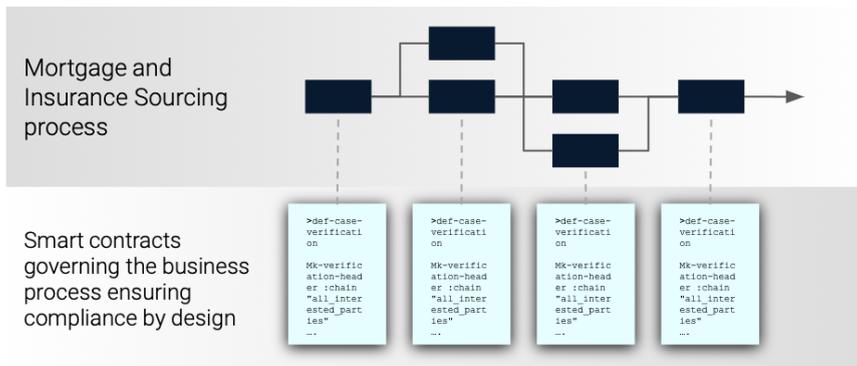


Below are two examples to bring this to life. The first tackles an objective guideline while the second requires a degree of interpretation.

1. *Where guidelines instruct that if the loan value exceeds a specified percentage, then additional document evidence must be provided by the consumer and verified by an authorised broker.*
A mandatory data field was used to capture the total mortgage value. The product checks the value of this attribute. If the threshold value is passed then mandatory tasks are created in the product instructing that the additional evidence be submitted and reviewed by a whitelisted user. The product will not allow the broker to proceed without these tasks being completed.
2. *Where guidelines require that customer communications are written in "plain and simple english".*
The team standardised the communication sets and had them reviewed and approved by subject matter experts. These standardised communications are now automatically issued to the customers, ensuring that the customer is well informed and regulations are complied with in all forms of regulatory communications.

In total, Luther's platform was used to compile over 2500 rules encoded into an executable script (smart contract).

These scripted rules act both as gateways for the process, ensuring that the right sequence of events is followed, but also provide guardrails for the brokers that safe-guard them from the risk of inadvertently breaking compliance due to their interpretation of guidelines.



Through the smart contract execution, the process - and by extension its participants - is compliant by design.

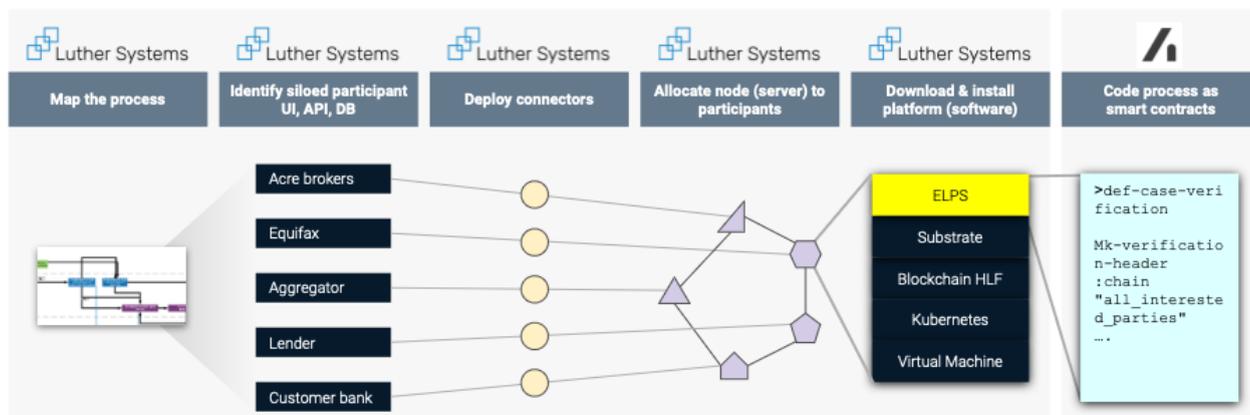
Further technical documentation is available on request to detail how smart contract and data validations are developed, orchestrated and executed on the Luther platform.

Finally, and for additional assurance, the solution's ledger also keeps a tamper-proof record of events that can be consulted retrospectively by any compliance team or regulator.

5.4. Acre Network overview

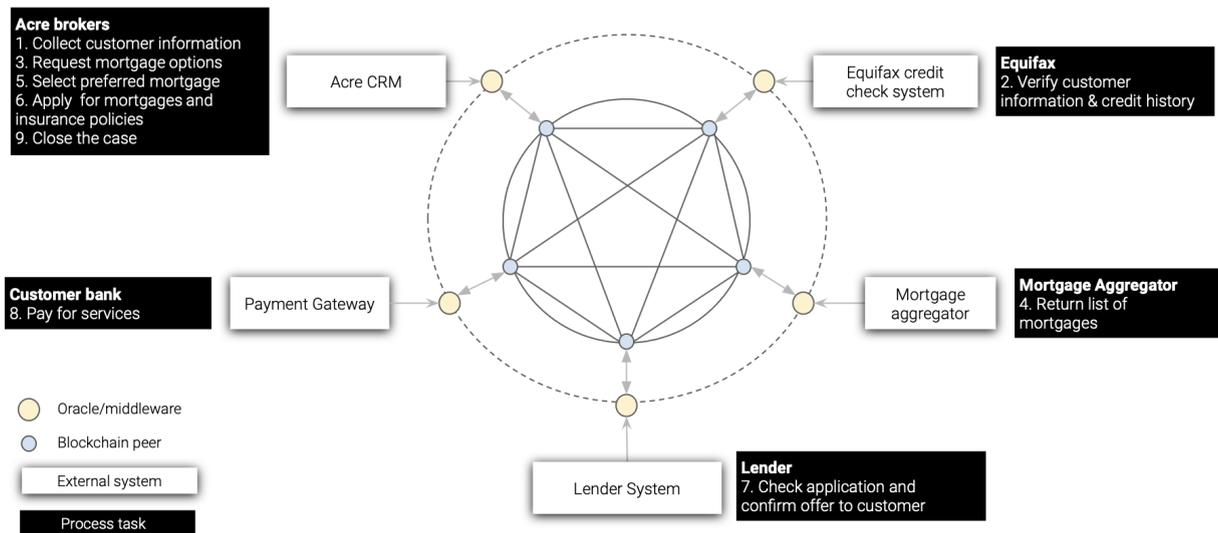
In order to describe the required functionalities of the product, Luther worked with Acre's subject matters experts to develop detailed process maps and identify all the participants involved:

- Acre brokers
- Verification agencies (such as Equifax for credit checks)
- Mortgage aggregators
- Mortgage lenders
- Banks



Each of these participants plays a specific role in the end-to-end mortgage process which can be seen as a series of logical steps, each of which includes a number of tasks and business rules. The participants continue to use their local systems (e.g. Lender system, Equifax's credit check tool, etc...) which are connected to the common network via APIs and Oracles.

While every participant remains free to shape their respective operations internally and to decide how to best perform their duties, the Acre product ensures that all participants share a common set of scripts (smart contracts) running on a network of blockchain peers for critical interdependent process steps. These scripts act as guardrails for the operations while leaving a transparent and tamper-proof trail for auditability.



5.5. Blockchain Architecture Benefits

The choice of a blockchain based architecture sets the platform on a strong footing for the future:

- Enables cross-organisation automation with process execution certainty
- Provides real-time event-based architecture with multi-organisation support
- Allows each current or future participant to have their own independent technology stack with a complete copy of all processing history, events, and transactions for their products
- Participants specify their data storage and model requirement according to which all the network operates
- Enforces strong integrity protection of each participant's data
- Enforces data dissemination policies to meet compliance rules through Private Data Collections
- A federated architecture allows each participant to operate independently (operations and technology) while participating in the execution of the Mortgage and Insurance process

Most importantly, the chosen architecture enables Acre to continue growing the network over time, adding new participants (e.g. lenders, regulators, multiple geographies, etc...) while preserving process and data integrity, fast scalability and data privacy.

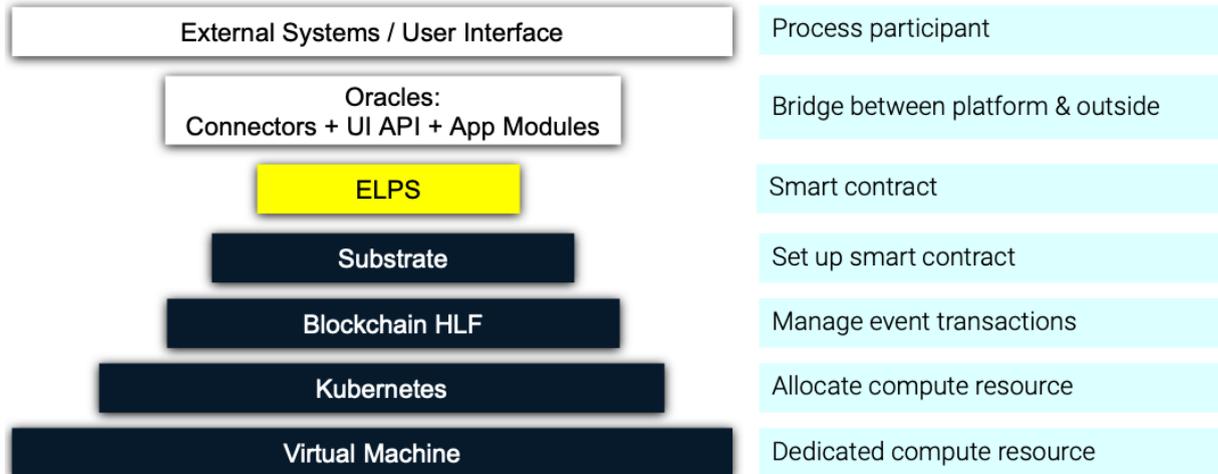


6. Technology Insights

The network developed with Acre is a collection of virtual machines, running on Kubernetes in AWS Cloud. The network uses the open Hyperledger Fabric protocols to establish a distributed ledger, which manages transactions. Luther's platform runs the business logic held within smart contracts which orchestrate and execute the mortgage application and sourcing processes.

6.1. Luther Technical Stack

Below is a closer look at the technical components that make up this Hyperledger Fabric network starting with an overview of the software stack.



6.2. Kubernetes to manage compute resources

Kubernetes, used here, is the standard cloud-native container orchestration platform.

The network runs on the managed Kubernetes offering by AWS, Elastic Kubernetes Service (EKS) driving the following benefits:

- Resilient and scalable container (docker) execution
- Seamless integration with AWS services including EC2, API gateway, and EBS
- Low maintenance effort to stay up to date with latest kubernetes releases

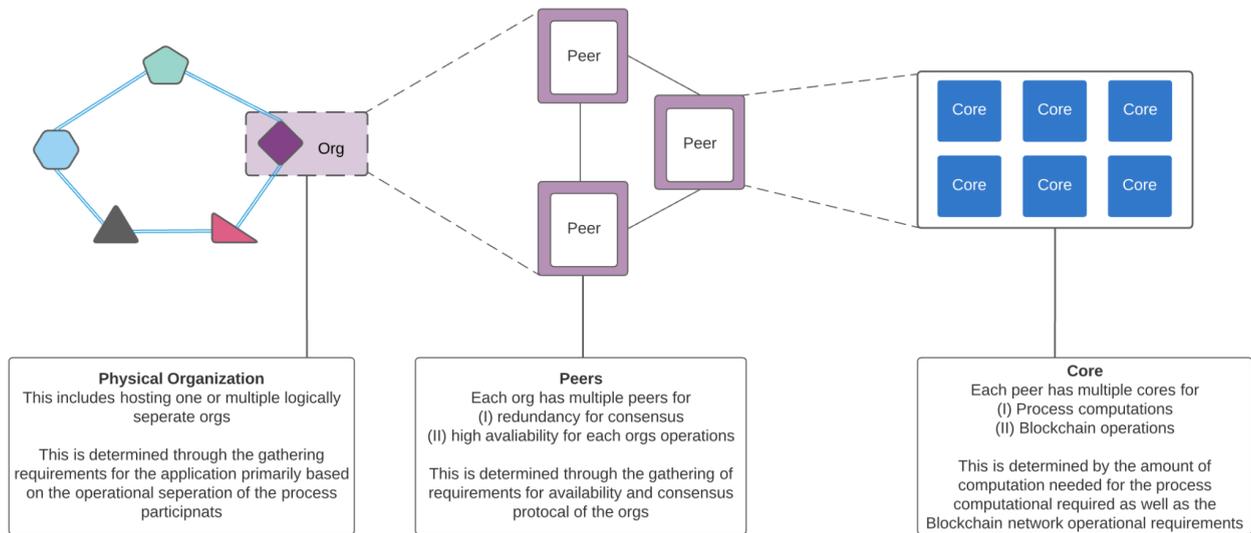
6.3. Blockchain peers and orderers

As of the end of the first production release of the platform, there are 5 peers on the Acre blockchain network:

- 2 x read-only peers hosted by Acre
- 3 x endorsement peers hosted by Luther

These peers are supported by 3 orderers hosted by Luther and one client application used by the brokers to complete the mortgage and insurance workflow.

All organisations in the mortgage sourcing process participate through the blockchain network to improve efficiency, security and auditability of the end-to-end process. Acre's software is the lynchpin to bring the processes together into one Customer Relationship Management toolkit.



6.4. Smart Contracts

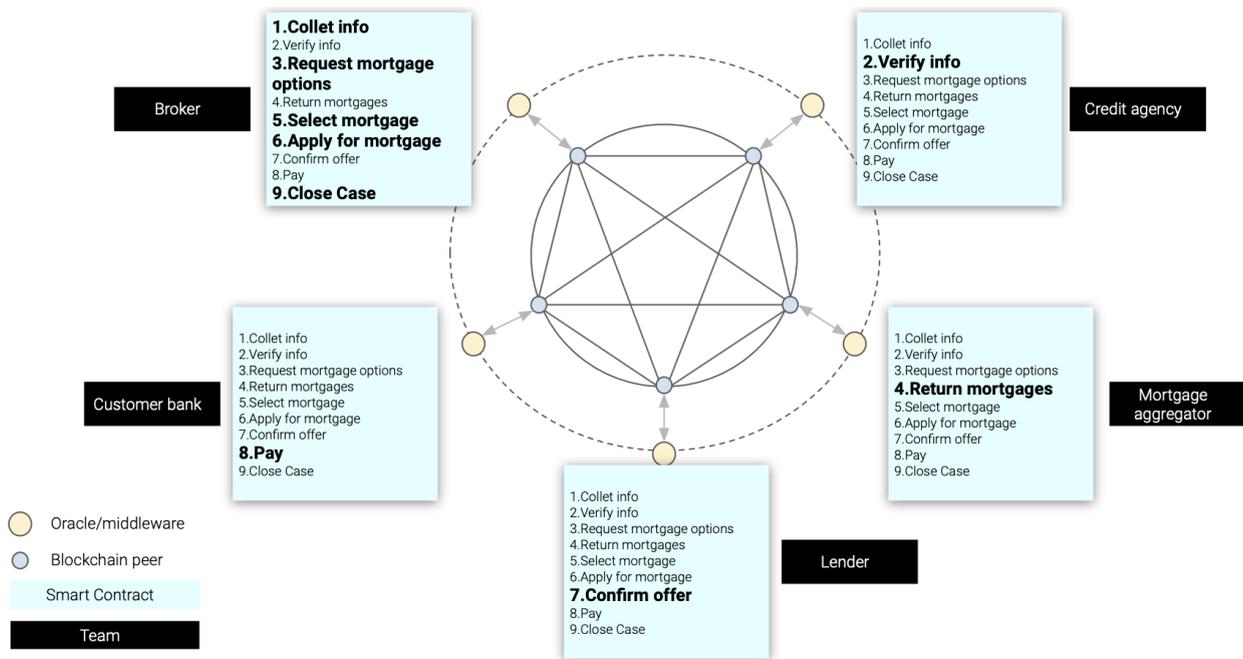
The process of mortgage and insurance policy sourcing is essentially a series of steps, each of which includes a number of tasks and business rules.

In the solution, process steps are referred to as events and every event is executed and stored as a transaction on the blockchain network.

The smart contract is the script that:

- Captures the orchestration and execution events (steps) along the entire mortgage and insurance sourcing process
- Enforces the authorisation & permission logic for updating Acre's data
- Maintains the source of truth for Acre's data that remains common to all parties on the network
- Enforces a standardised & common data model and common process logic across the entire network
- Enforces the business logic rules to ensure these processes are executed accurately

The smart contracts developed specifically for this product automate the end-to-end mortgage sourcing journey from client lead generation to case completion, allowing all participants in the process to execute their steps from one common platform. The smart contract contains all the business logic and compliance rules necessary for a client to source a mortgage from an independent broker in a compliant manner, and acts as the guardrails to which third party systems can connect and integrate with.



6.5. Oracles

Oracles (middleware) are used to access off-chain data, user interfaces and local systems. They include a Distributed Ledger Technology client (SDK) to initiate transactions that read and write data from the ledger. This allows:

- Provision of data from external systems into the blockchain network for subsequent smart contract processing
- Response to events triggered by the blockchain network in response to smart contract processing

For Acre, two Oracles were built: one for the Client Portal and one for the broker Customer Relationship Management (CRM) system.

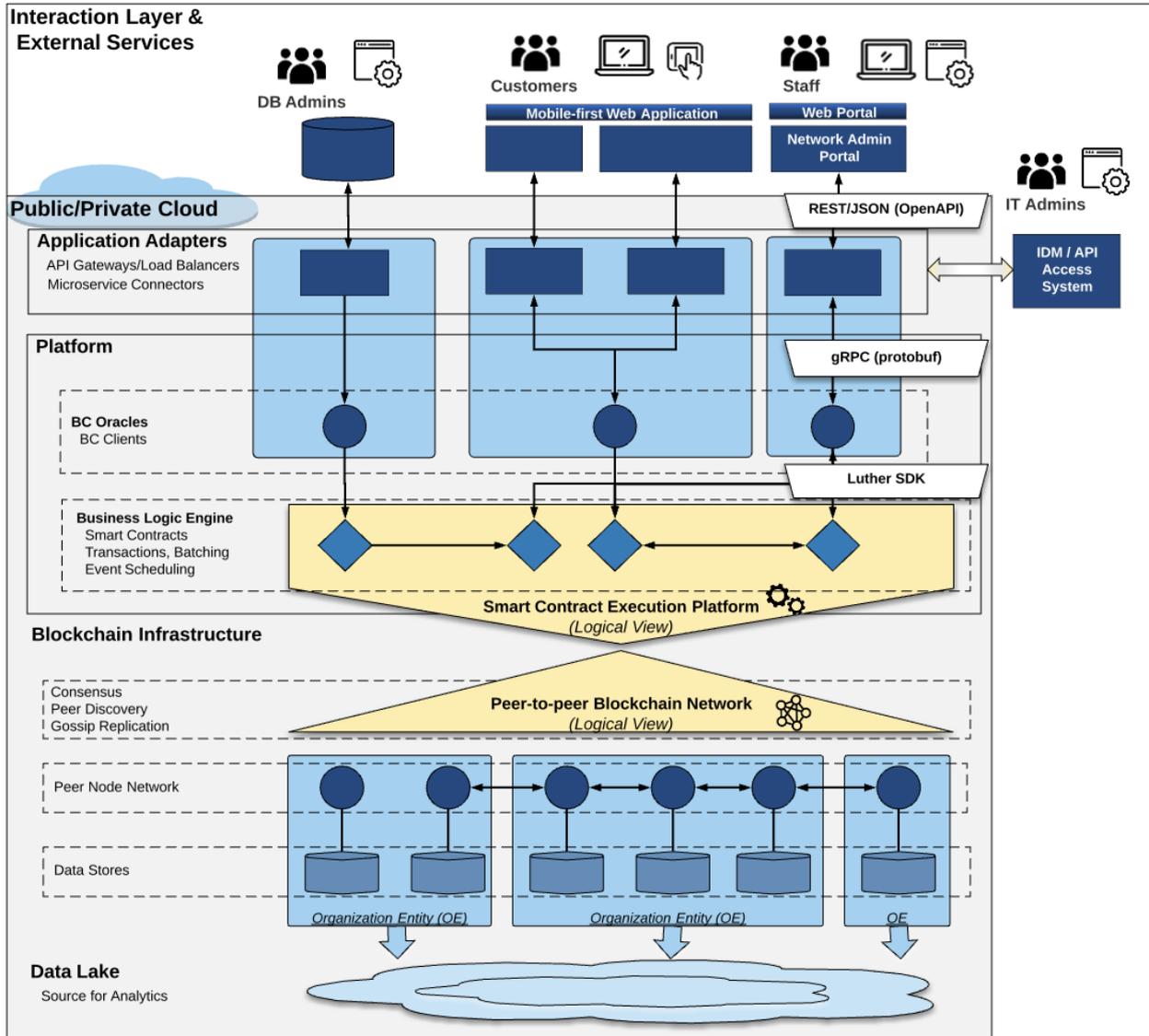
These Oracles provide a REST JSON API interface for the front-end of Acre to communicate with the smart contracts and issue blockchain transactions to the ledger. Additionally, they communicate with application modules and third party integrations to assist with, among other things, generating rich documents and searching for available mortgages.

6.6. Mortgage Data Model

In order to build a unified platform where independent parties can collaborate while maintaining a single record of transaction, the team developed a highly detailed Mortgage Data Model. In total over 1000 data fields were collected, analysed and harmonised covering domains such as Mortgage, Customer, Property, Case, Seller, Buyer and more.

6.7. Technical Architecture overview

The new product consists of a layered design where modules between layers communicate using APIs. It is built on the Luther Enterprise Infrastructure Architecture (LEIA). LEIA is a layered-microservice architecture that is built from the ground up on blockchain infrastructure. Multiple nodes owned by separate teams connect directly using permissioned blockchain protocols to form a decentralized blockchain network. In this way, processes spanning multiple teams and companies interconnect using blockchain as the underlying orchestration and data sharing infrastructure. Please refer to Luther's offerings and website for more information on the LEIA platform.



6.8. Discussion on Technical Architecture

6.8.1. Scalability

The Luther platform and infrastructure is managed entirely using Infrastructure as Code (IaC), for rapid scaling of resources. It provides full container orchestration via Kubernetes, allowing automated and low-friction scaling of compute and storage resources across all microservices.

Moreover, gossip protocols are tuned for unique network configuration to readily support current and future peers.

Within a month of go-live, the solution was recording 7k endpoint calls (excluding health check services) and within 8 months over 1,000 cases were created and under management on the platform.

6.8.2. Best technology fit for the use case

The Acre team provided considerable experience with mortgage CRM and industry expertise which aligned perfectly with Luther's technology to enable a rapid scalable delivery.

Luther has considerable experience building and operating large scale Distributed Ledger Technology (DLT) networks in production - with backgrounds from bleeding edge Silicon Valley companies (Tesla, Apple, Palantir, Akamai).

Luther's platform was a perfect fit for the distributed nature of the mortgage and insurance sourcing process: a distributed problem that requires a distributed solution. HyperLedger Fabric, which uses an Execute Order Validate (EOV) architecture, is well suited for general execution of standardized business logic across the network. It is the right underlying DLT for orchestrating a process with medium transaction volume but high transaction logic complexity executed using smart contracts.

Finally, Luther's modules and accelerators enabled a rapid on-boarding of the Acre Software team members, without requiring DLT experience. Acre is now self-sufficient with the platform and has continued to independently onboard additional team members onto the platform.



7. Results

The new services provided by Acre and enabled by Luther System's technology have seen astounding success so far. The overall workload has significantly reduced for both the independent brokers using the platform and the compliance teams where manual checks have been virtually eliminated.

As a result independent brokers who switched to the Acre product have been able to handle 33% more cases per month. Thanks to the tight integration with Acre's CRM system, they have also continuously generated cross-sell opportunities, encouraging sales of insurance products to end consumers.

Compliance teams no longer rely on periodic random sampling and instead achieve 100% compliance coverage, eliminating all non-compliance risks in addition to their operating cost reductions.

The simplified delivery of compliance services to their mortgage network is estimated to save SBG £6.6m a year. More recently, Acre has also started working with Directly Authorised (DA) brokers, delivering the same kind of outcomes to their internal compliance teams who no longer need to interpret regulatory guidelines.

6 months development to production

£6.6m estimated savings per year

33% increase in processing speed

500% estimated ROI

2500 compliance rules updated

10 product types fully supported

2750 cases created and managed

£205K average mortgage size

£500M mortgage value processed

7.1. Automated Acre Product - Commercial performance and results

The project has been a commercial success for Acre and their customers. Within the first 8 months post launch, the solution had already seen an average weekly mortgage volume of £5.7m handled through the platform and over 1000 cases had been created on the platform.

Utilisation rates are increasing and as of October 2021 there has been over £500 million of mortgages processed on the network.

With over 2500 compliance automation rules built into the platform's back-end and an average mortgage size of £205k, the project's ROI is estimated at 500%.

Finally, it is estimated that brokers who have shifted to using the Acre platform have on average more than doubled their revenue, by handling more cases faster and unlocking cross-sell opportunities with insurance products.

	After	Before
Cost and Revenue	60% FTE workload reduction	Hundreds of FTEs
	50% operational cost reduction	Millions in operational costs
	100% broker revenue increase	Lack of cross-sell opportunities for brokers
Processing speed	33% increase in end to end processing speed	Average of 6 cases handled by each broker
	90% account approval time reduction	2 months average end to end sourcing process
Compliance	100% manual compliance check reduction	60 FTEs dedicated to compliance
	Reduced risk of compliance rules violations & fees	Small percentage of cases checked for compliance
ROI estimated at 5X		

7.2. Automated Acre Product - Product results

The team developed a network to standardise separate processes, data and documents, and record every step in an auditable, immutable manner. The solution developed demonstrates breakthrough characteristics that could not have been achieved with centralised architectures.

Automation of processes and integrations

Transparency of transactions

Auditability and integrity of operational data

Scalability for expanding core biz processes

7.3. Automated Acre Product - Technical results & benefits

The LEIA platform has enabled the delivery of future-proof technology demonstrating the following technical characteristics:

Auditability	Credibility and integrity of data for API calls
Scalability	Network effect provides ecosystem with opportunities for expansion
Efficiency	Process automation reduces manual steps and data reconciliation
Security	No proxy - API calls are made directly between participants
Tamper-proof	Removes risk of duplicate entry or data tampering

Moreover, the application is supported by unique infrastructure such as:

- Over-the-Air updates
- Rapid scalability & inclusion of new participants
- Stable & resilient service
- Cloud native application
- Fully automated CI/CD pipeline

Critically, after the initial Acre team was on-boarded by Luther Systems, they quickly became self-sufficient, onboarding and training additional subject matter experts independently to expand their applications.



8. Expansion

Through this project, the partners have demonstrated that there is a better way to manage the mortgage and insurance process for added benefits to both the industry participants and the end consumer. The team is looking to further expand the network, by bringing in participants from other countries operating in similar regulatory frameworks but also by engaging other types of industry participants such as Lenders, Surveyors, Conveyancers, Mortgage Networks, Large Brokers and Regulatory Authorities. By bringing in more participants onto the network, further economies of scale, automation and standardisation across the industry can be achieved.

Areas of expansion are to further develop the network that underpins the mortgage and insurance sourcing process onto a single platform where:

- A transparent, automated & secure solution enables end-to-end execution and monitoring of the brokerage process
- A customer seeking a new policy is empowered to purchase their products faster, cheaper and more specific to their exact requirements and preferences
- Providers market their products and service more transparently, reliably and automatically with a complete immutable audit trail of events
- Automated end-to-end compliance allows the industry to continuously innovate in service of the end consumer



On a mission to simplify homebuying

9. Acre Software Company & Offerings

Make home-buying quick and easy for everyone involved

When it took our founder, Justus, over six months to complete the purchase of a house, he knew something needed to be done. With the help of [Aviva and Sesame Bankhall Group](#), we worked with advisors, lenders, and insurers to rewrite the rules on how mortgage applications should be done and make things fast, simple and less stressful for everyone involved.



Accelerating the advent of the automated enterprise

10. Luther Company & Offerings

10.1. Who we are

Luther Systems is a software company and a pioneer in Deep Process Automation: the business of automating, orchestrating and managing complex enterprise processes.

At Luther we build the next generation of enterprise computation technology for use by organisations with processes that have remained out of reach for prior automation platforms.

Through our platform, we enable organisations to reimagine the way they operate and unlock unparalleled levels of automation in a world where collaboration and flexibility across disparate organisations, geographies, regulations or standards are more important than ever.

10.2. Luther's platform for automation

At Luther we recognise that enterprise processes of today are complex and challenging to automate. They require orchestration across multiple participants, hundreds to thousands of tasks as well as non-standard systems and datasets. Their execution is filled with reconciliation, rework, delays and costs that have been unavoidable until now.

Luther's unique proposition lies in its ability to take on this complexity through a distributed technology architecture: a distributed solution for a distributed problem.

2.5X faster application development

10X Total Cost of Ownership reduction

7X process execution

10X ROI

Fully automated compliance by design

Highly scalable

Improved customer experience

With our proprietary LEIA platform, we provide our customers with:

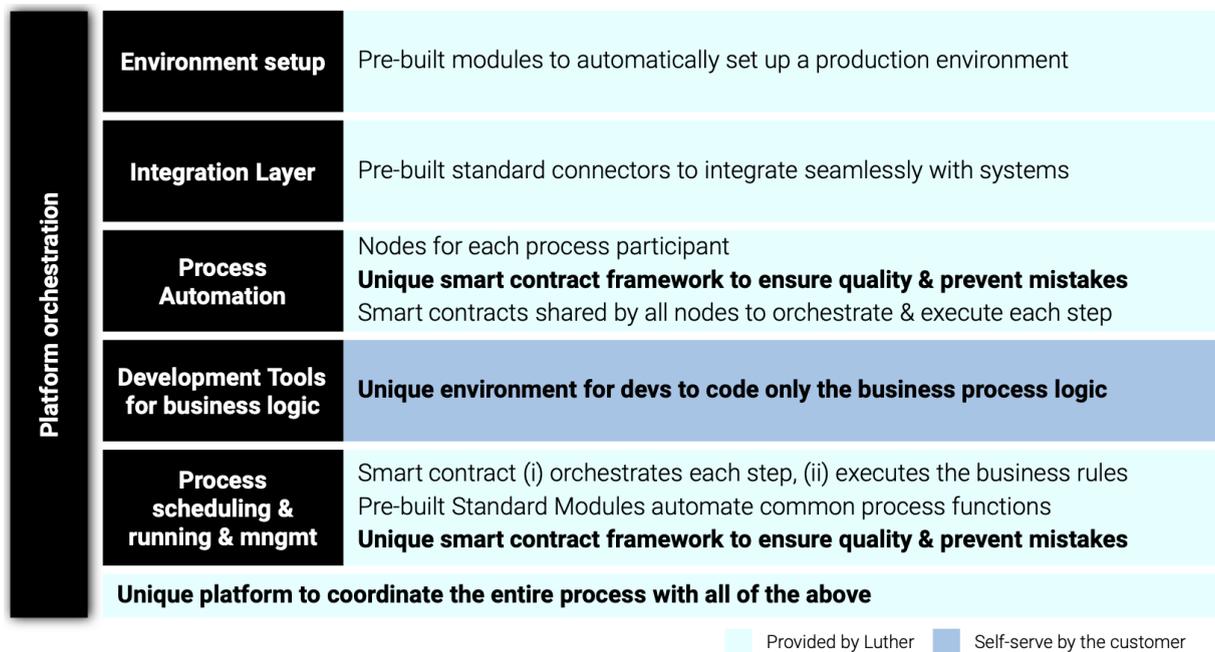
- Enterprise developers tools to automate their applications rapidly
- The operating system to orchestrate and execute their automated processes

Reports from the field have been staggering, validating our vision for the future of enterprise computing. Our customers span multiple industries and use our platform today to orchestrate complex processes such as Claims Settlement, Mortgage Sourcing, Asset Issuance or Customer 360 Views. Their execution cuts across siloed functions, teams or even organisations performing thousands of independent steps across UIs, APIs, databases, applications, workflows and Robotic Process Automations (RPA).

10.3. Luther's offerings

Luther's unique architecture combines and coordinates multiple layers of technology which enables enterprises to (i) develop enterprise grade automated processes and (ii) orchestrate & execute the automated processes in production.

Below is an overview of Luther's stack. Luther's LEIA platform automates and provides the majority of this stack so that enterprise developers can exclusively focus on developing their business process logic.



The Luther Platform is built around Luther's breakthrough insight that virtually all complex processes can be seen as a set of "smart contracts" between steps or participants in a process. Smart contracts are the rails over which the Luther Platform orchestrates, executes and monitors processes in real-time. With the LEIA platform, our customers are able to ensure that multiple steps across the entire process are executed and orchestrated in a way that follows a predefined & agreed upon business logic. This enables the Luther Platform to easily automate complex processes that were previously highly manual and non-standardised.

Luther's distributed platform also provides developers with the tools to achieve rapid development times and keep them in total control of the automation process. The LEIA Platform is designed to make the complex simple and can be used by developers with only a few weeks of training.

Luther's platform can be applied to numerous complex enterprise processes across industries.

For more information about Luther's platform please visit our [website](#).