Luther Case Study

Mortgage Loan eClosing end-to-end process operations

Fannie Mae

Luther Systems

1. Executive Summary

Fannie Mae is a public-private enterprise with the primary objective of purchasing and guaranteeing mortgages on the secondary market by converting them into mortgage-backed securities (MBS). With around $4.3 trillion in assets, Fannie Mae is the largest company in the United States[1]. The goal of guaranteeing mortgages is to create liquidity in the market for lenders, which in turn allows them to underwrite or fund more mortgages. In 2023, Fannie Mae provided $369 billion in liquidity to the U.S. mortgage market[2], and annually purchases or guarantees 30-40% of all mortgages that originate in the United States[3]. Fannie Mae generally purchases two kinds of mortgage loans to issue mortgage-backed securities: single-family loans, for properties of 1 to 4 units, and multifamily loans, for properties of over 4 units, that are usually rental properties with over 50 units such as apartment buildings. Fannie Mae purchased roughly 900,000 single family mortgage loans at an average price of $320,000 per loan and 2,500 multifamily mortgage loans at an average price of $18 million per loan in 2023[4]. The majority of these multifamily loans have over 50 units.

To carry out their mission of providing liquidity to the mortgage market, Fannie Mae raises capital by selling MBS to investors. To provide MBS, Fannie must purchase mortgage loans on the secondary market to package into MBS. A key component of purchasing mortgages on the secondary market is the mortgage loan eClosing process. The eClosing process is a partially or fully digitized process that performs a traditional closing process: create and sign a mortgage loan agreement between a homebuyer and a lender to provide a homebuyer with a mortgage, and notarize these documents. After the eClosing process, Fannie Mae will often purchase the loan to package it into MBS. While Fannie Mae purchasing the loan is not strictly part of the eClosing process, the two are closely linked. Fannie Mae typically purchases a loan soon after it is originated, but Fannie Mae will purchase older loans if the loan is performing well.

Every year, Fannie Mae spends more than $600 million in administrative costs purchasing and managing multifamily mortgages alone[5]. Operating this whole process end-to-end (eClosing + Fannie purchasing the loan) takes an average of 40 working hours, but can take up to 90 hours in case of errors or problems such as incorrectly filed closing documents or changes of operations between parties, which require lengthy and costly reconciliation between the parties.

Annual single family loan purchases 900,000	Average single family price per loan $320,000	Annual multifamily loan purchases 2,500	Average multifamily price per loan $18 million

[1] https://fortune.com/ranking/global500/search/
[2] https://www.fanniemae.com/about-us/esg/learn-about-our-business
[3] https://www.bankrate.com/mortgages/fannie-mae-vs-freddie-mac/#what-are
[4] https://www.fanniemae.com/media/50736/display
[5] https://www.fanniemae.com/media/50336/display

The process involves the lender (a commercial bank) which originates the mortgage loan, the borrower (a homebuyer) who purchases the mortgage loan, a settlement agent who facilitates the purchase process between the lender and borrower as well as keeping and filing records with the Registrar of Deeds, a warehouse bank who provide the lender with loan purchase funding (for selling the mortgage to Fannie), and Fannie Mae who purchase the loan from the lender. The eClosing process starts with the lender creating the closing documents. The settlement agent and borrower reviews the documents. Then the lender and settlement agent notarize and review the closing documents. The lender creates the eNote (a digital promissory note) and transfers control of it to a warehouse bank. The warehouse bank certifies the eNote and transfers control of it to Fannie Mae.

Luther worked with Fannie Mae to operate these two processes as one continuous process, the end-to-end mortgage loan eClosing process for Fannie Mae. This use case also describes the transfer of ownership of the loan to Fannie Mae so Fannie can package the loan into mortgage-backed securities. Luther engaged in the operations of a small portion of these multifamily purchases to develop a minimum viable product.

The estimated commercial impacts of implementing the Luther Platform for Fannie Mae are:

ROI 14X	Cost reduction 65%	Avg. Speed increase 5X

This mortgage loan eClosing process has the following participants: The borrower, the lender, the settlement agent, the warehouse bank and Fannie Mae. This process involves 9 teams; i) the lender's document preparation team, ii) the settlement agent's closing team, iii) the borrower, iv) the lender's administration team, v) the settlement agent's registration team, vi) the warehouse bank's finance team, vii) the warehouse bank's delivery and certification team, viii) Fannie Mae's verification and certification team, and finally ix) Fannie Mae's payments team. A full breakdown of teams and their roles can be found in section 2.4.

The mortgage loan eClosing process involves several key steps: the lender prepares and checks the closing documents, which are then sent to the settlement agent for review. The borrower signs the documents, and the settlement agent notarizes and completes post-closing tasks. The lender requests funding from the warehouse bank, which releases it and registers the eNote with MERS eRegistry. The closing documents are filed with the Registrar of Deeds, and the eNote is sent to Fannie Mae, which verifies, stores, and certifies it, before transferring funds to the lender. For a full breakdown of the process see section 2.5.

Fannie Mae operates the mortgage loan eClosing process, as part of the mortgage value chain. This process operates across 9 teams & 19 software systems and includes 211 tasks end-to-end. For the purposes of clear and concise illustration, process images in this case study will show the operations of 6 teams and 16 software systems, but importantly this process does operate across 9 teams and 19 software systems.

Teams 9	Software systems 19	Tasks 211

To operate the process end-to-end, each team operates a number of functions. Each function performs the same Operations Cycle (series of steps); i) send data & info to the system, ii) receive response from system, iii) compute & validate response, iv) share & store execution of step, v) evaluate & initiate next step.

Operational Silos

Fannie Mae operate the Process across
9 teams & 19 Software Systems

each team & system performs a function for the Process (draft docs, sign docs, ...)

these teams & systems are siloed,
they have separate ops, tech & governance

but the end-to-end process operates across them

For reliable operations, all teams & systems involved should operate the same end-to-end process. However, they often don't ! This leads to operational & technical challenges, which make process operations unreliable. The opportunity is providing a platform to reliably operate the end-to-end process, across all teams & systems involved. Traditional solutions to end-to-end process operations are unreliable & expensive.

Enterprise Operations are generally function-first, which means they continue to focus on improving functions & systems, but processes are considered secondary. The thinking is that if we have great functions & systems, the business can operate any process! Traditionally enterprises use bespoke connectors & local operations scripts for process operations, which are fragmented, siloed, and change separately, and so are ineffective for reliable process operations.

Enterprises primarily focus on the operations of
individual teams & systems,
and continuously improve them

operations of the end-to-end process
across 9 teams & 19 systems
is of secondary focus,
especially as the process evolves

This costs the enterprise
millions in operational costs, and days in delays

For Fannie Mae's eClosing process, this leads to

Practical Problems in the eClosing process

- Less liquidity for primary lenders
- Less mortgage availability for borrowers
- Fewer MBS for investor purchase
- Late repayments to warehouse banks slow operations
- Increased difficulty preventing fraud
- Smaller income from MBS for Fannie
- Difficulty adhering to mission for Fannie

To remedy this, enterprises use automation tools. However, they are ineffective at end-to-end process operations, due to their limited scope and scale, and stitching them together also doesn't solve the problem.

Luther's platform is designed process-first, & primarily focuses on end-to-end processes. Reliable end-to-end process operations include consistent operations, and great functions & systems.

Luther's platform takes a Process First Approach

focusing on reliable operations of the end-to-end process across all teams & systems,

instead of cobbling & stitching together the separate & siloed functions

of 9 teams & 19 software systems

The automated mortgage loan eClosing process, built on the Luther Platform, uses Deep Process Automation Technology to automate the eClosing process for mortgage loans from initiation to completion. The Luther Platform provides standard connectivity and a Common Operations Script shared by all participants. The platform reliably operates the end-to-end process across all teams and software systems from the common operations script. The scope of the collaboration between Luther and Fannie Mae included loan document preparation, closing and delivery and certification, for a portion of multifamily mortgage loans.

Luther's unique value for reliable end-to-end Process Operations is providing i) standard connectivity, ii) a common operations script, across all teams & software systems.

Luther's unique value for reliable end-to-end Process Operations is providing

standard connectivity
a common operations script

across all teams and software systems.

Luther's platform vertically integrates i) distributed system technology ii) optimal resource allocation & management, iii) real time event ordering & streaming, iv) deterministic event processing & execution, for reliable end-to-end process operations.

Luther's platform vertically integrates

distributed system technology
optimal resource management
real time event streaming
deterministic event execution

To make reliable end-to-end process operations possible.

Luther's platform does this by i) connecting systems to standard platform nodes, rather than to each other, and ii) teams & systems can change the common operations script but all teams & systems have to know & agree to the change, so all teams & systems involved operate the same end-to-end Process all the time!

Finally the Luther Platform reliably operates the end-to-end mortgage loan eClosing process across 9 teams, 19 software systems & 211 tasks.

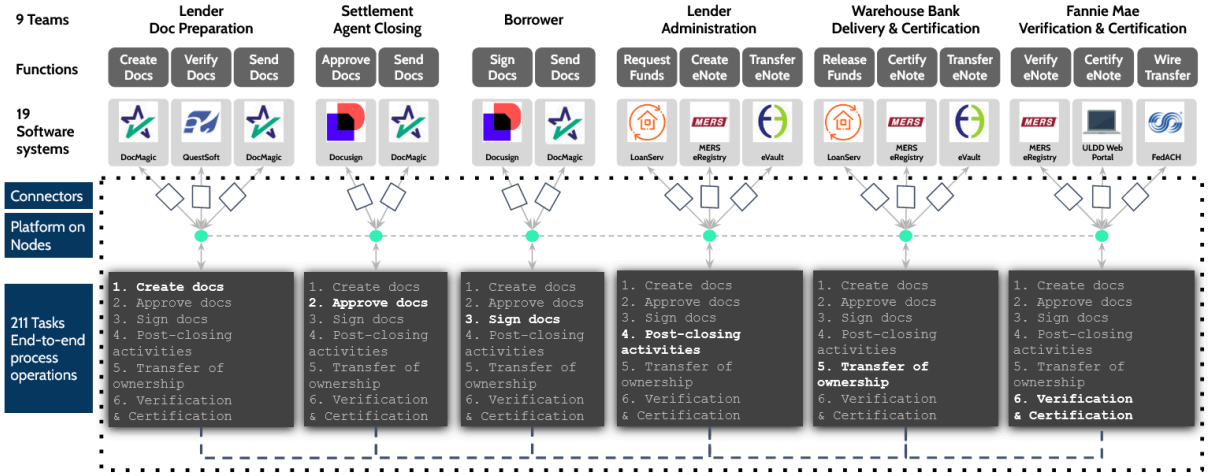


Fig 1. Mortgage loan eClosing process operations built on the Luther Platform

To implement the platform, i) Luther's team mapped the Process, ii) Identified teams & software systems in the process, iii) allocated nodes (servers) to teams, iv) connected nodes to the participant's systems, v) set up the Platform on the nodes, vi) Fannie Mae's team along with Luther's team developed the Common Operations Script (code) for Process Operations, vii) the process went Live.

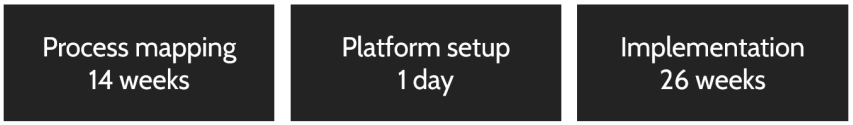


Fig 2. Implementation timeline of the mortgage loan eClosing Process.

The results have been highly impactful. Thanks to increases in efficiency and operations reliability, a process that traditionally took more than 40 hours can now be completed in 8 hours and operational costs have been reduced by 65%. Reduced timescales result in smoother operations for lenders and warehouse banks, providing them with liquidity. Beyond the commercial results, this led to operational benefits in production, as well as, technical benefits during development:

Operational benefits in production	Technical benefits during development
Consistent Ops: across the process	Standard development process
Consistent Ops: over time	Devs focus only on development of process Ops
5X smaller Ops teams	Eliminate DevOps teams, 5X smaller Dev teams
Real-time monitoring	Consistent, standard process connectors
Enforced compliance checks	Consistent process Ops scripts across teams
Real-time & consistent updates across teams	Standard infra., connectors, dev. env. setup
Reduction of reconciliation	Real-time & consistent updates across operations

The automated mortgage loan eClosing process demonstrates a reliable and effective system built on the Luther platform to standardize and automate the eClosing process operations for mortgage loans, by seamlessly integrating all participants into a more efficient process and a common end-to-end operations script. Luther's platform operates the end-to-end operations of the eClosing process without adversely affecting the operations of the participants: lenders, settlement agents and warehouse banks see reduced operating costs and timescales without changing their responsibilities in the process. The network could be expanded to include more of the many lenders Fannie Mae has a relationship with, and the Luther platform could also be utilized to automate delivery of the created mortgage-backed securities to investors.

Fig 3. Estimated results of implementing the Platform for the mortgage loan eClosing process.

2. The Process

2.1. Process Operations

Different teams have different operations, rules and governance and they also utilize and operate a variety of software systems in different ways. Each system operates a specific function for the process. To operate the process end-to-end, each function performs the same cycle of steps: i) **Send**: send data & information to the System, ii) **Receive:** receive response from the System, iii) **Validate:** compute & validate response, iv) **Store:** share & store execution of step, v) **Initiate:** evaluate & initiate next steps.

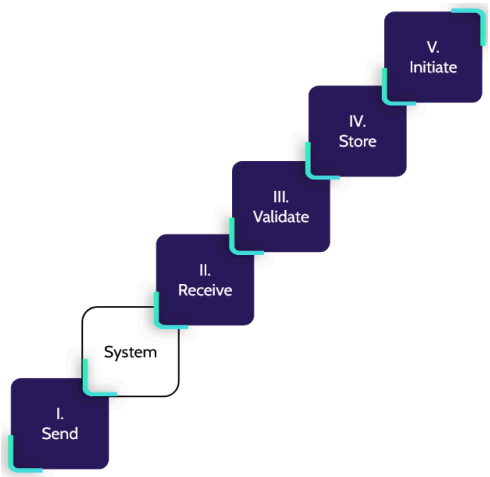


Fig 4. These are the requirements that repeat for all functions across the end-to-end Process Operations.

Enterprises operate a set of specific functions based on their objective. For example, an investment management company's functions help it to manage investment portfolios. While the functions and systems may change, the process remains the same. However, expecting processes to be efficient because of efficient individual tools simply does not work for enterprises. Luther empowers enterprises with a process-first approach to remove these inefficiencies.

Tasks are simple events that are localized to one team involving one or two software systems, for example retrieving data from a database. Workflows are more complex, involving 10-20 tasks between one to two teams, and two to three software systems. An example of a workflow is onboarding a new employee. Processes are complex, involving 50+ tasks, 3 or more teams, and multiple software systems. Mortgage loan eClosing is an end-to-end process.

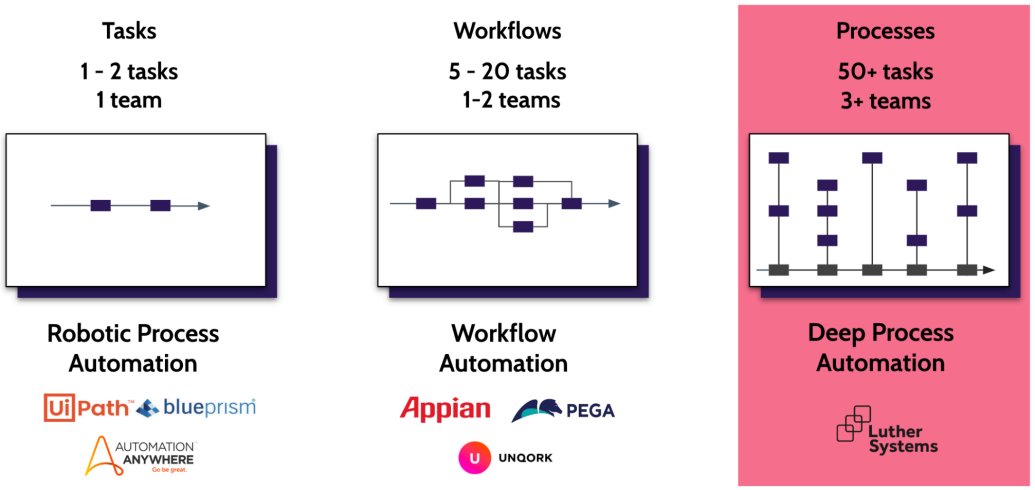


Fig 5. Different tools are used to automate different levels of complexity.

2.2. Function First Operations and its limitations

Generally, enterprise operations are function-driven. They have a large collection of software systems each operating a specific task. Tasks often have dedicated software systems and are operated by specific teams. By developing, purchasing and maintaining efficient systems, most enterprise tasks operate highly reliably.

Enterprise processes, however, operate across multiple teams and software systems, and involve many tasks. This means reliable end-to-end process operations require efficient teams and systems, as well as efficient connectivity and operations across these teams and systems.

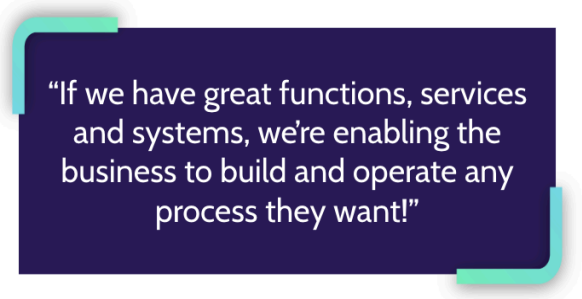
Enterprises generally take a "function-first" approach to process operations. Great individual teams and systems provide the required ingredients for great process operations, so they focus on enhancing and improving the performance and efficiency of individual teams and software systems. A good analogy of this approach is "if we have great ingredients, anyone can cook anything they want and it'll be of great quality!" Processes are considered secondary to functions and systems, as they are considered ever changing, and efficient functions and systems can enable any process that the business may envision. The problem is, efficient functions do not necessarily create an efficient process.

Efficient software systems and functions are not enough to reliably operate a process end-to-end

In practice, most enterprises have a defined charter and mission, particularly if they are in a regulated industry. They provide specific products and services which are generally enumerated and these rarely change. These form the basis of the value streams provided by an enterprise. For example, Fannie Mae and Freddie Mac both analyze the mortgage market, acquire mortgage loans on the secondary market, package them into mortgage-backed securities, and distribute these to investors. The majority of "enterprise operations" are in operating these value streams. Each value stream has a set of processes, which are generally enumerated and these rarely change. The details might vary over time but the process functions remain the same. For example the mortgage loan acquisition value stream includes these processes: warehouse bank management, lender communications, loan origination & signing, eNote transfer, eNote verification & certification, loan servicing & management, default management, and eVault management. These are well known processes with well known functions, the details and data in these processes might change over time, however the functions of these processes remain the same.

The majority of processes and their functions (what each process does end-to-end) are enumerable for an enterprise. In fact a large deviation from these processes and venturing into new areas that are drastically different from the enumerated processes within an enterprise is a major event at an enterprise and is a multi-year plan. The vast majority of enterprise processes (what the process does) are enumerable and remain largely the same.

The prevailing view is if we build or purchase efficient teams and systems, then any process can be built on top of these great teams and systems. Processes are secondary to these functions and systems, as they are considered ever changing, and functions and systems are there to enable any process that the business may envision or desire to build!



Enterprises continue to optimize and improve, and incorporate better functions and systems. Example functions include contract signing, eNote submission, customer onboarding, finance, payments, settlement, fraud, compliance, reconciliation. Example software systems include databases, CRMs, RPA, Workflow tools, cloud services, microservices, data lakes, and others.

The problem is i) the majority of an enterprises' operations are running a specific and small set of processes, ii) efficient teams and systems are not enough to build efficient end-to-end processes.

For enterprise operations the process and its function (end-to-end operations) are equally as important as the individual teams and systems and their individual technology and functions (what they each do).

Each enterprise generally operates a specific set of value chains and processes, in particular in regulated industries, as explicitly stated by their primary activities. An insurance company insures!

For each enterprise most processes are already known and don't change.
For most processes, the majority of the process operations are already known and don't change.

It's time to take a Process first approach in the enterprise!

2.3. Process First Operations

Luther's platform is designed process-first. For efficient enterprise operations, effective end-to-end operations are as important as effective individual services and teams and systems, primarily since enterprises' core value is delivering a specific set of processes and value streams, particularly in regulated industries, where most value streams & processes are explicitly enumerated!

Enterprise Operations are generally function-first.
They continue to improve functions & systems. Processes are considered secondary.
If we have great functions and systems, the business can operate any process!

Luther's platform is designed process-first.
Primary focus on end-to-end processes.
Reliable end-to-end process operations include consistent operations, & great functions & systems

The most important attributes of process first operations are i) standardized connectivity between all systems involved in the process, ii) Common Operations Script operating the end-to-end process.

Luther's unique value for reliable end-to-end Process Operations is providing

standard connectivity
a common operations script

across all teams and software systems.

2.4. Mortgage loan eClosing process in context

Fannie Mae has multiple Value Streams involved in creating multifamily mortgage-backed securities. One of these value streams is the "mortgage loan acquisition". This value stream includes multiple processes. Acquiring mortgage loans from lenders on the secondary market is a key process for Fannie Mae, as it allows them to fulfill their company goals of providing liquidity to the mortgage market as well as creating mortgage backed securities for investors.

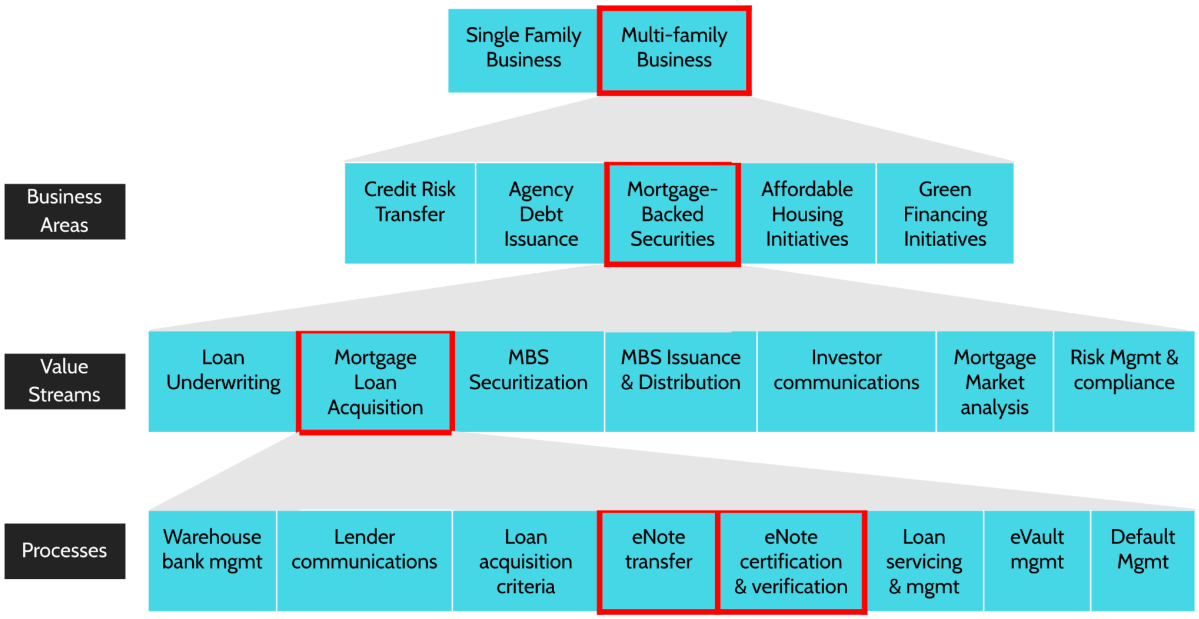
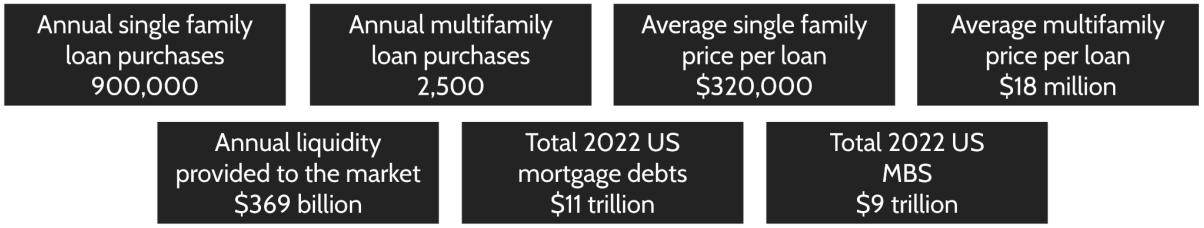


Fig 6. Fannie Mae operates many value streams as part of their operations in multifamily mortgage-backed securities. Each value stream contains many processes. Mortgage loan acquisition is a value stream. It contains many processes, including mortgage loan origination.

Guaranteeing mortgage loans on the secondary mortgage market is a key part of the mortgage value chain, and important for enterprises of all sizes in the mortgage market. To retain liquidity and continue operating, mortgage lenders (commercial banks or private lenders) will sell mortgage loans and servicing rights to enterprises like Fannie Mae or Freddie Mac, who package these loans into mortgage-backed securities, which are then sold to investors in return for interest income. Fannie Mae tends to purchase mortgage loans from larger, commercial banks. This process is vital, as it maintains liquidity for primary lenders who provide mortgage loans to borrowers, and this liquidity allows them to continue operating. It is such a vital part of operations that 70-80% of all mortgage loans are securitized and sold on the secondary market: In 2022, the total outstanding value of mortgage debts in the US was $11 trillion[6] and the total outstanding value of mortgage-backed securities was $9 trillion[7]. This demonstrates that without the secondary mortgage market, lenders would only be able to provide a fraction of the mortgages that they do, and homeownership would be far more difficult. In 2022 alone, Fannie Mae provided $369 billion in liquidity by purchasing 900,000 single family loans and 2,500 multifamily loans from lenders[8], making them the largest single contributor to liquidity and demonstrating how important an effective eClosing and delivery process is.



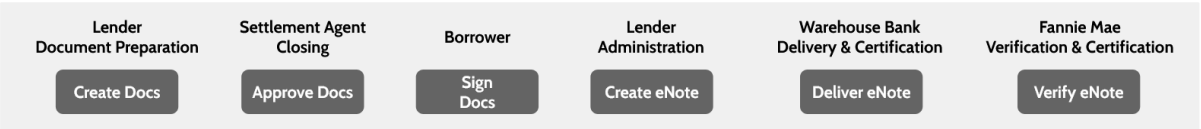
[6] https://www.federalreserve.gov/releases/z1/dataviz/z1/balance_sheet/table/
[7] https://www.sifma.org/resources/research/us-mortgage-backed-securities-statistics/
[8] https://www.fanniemae.com/about-us/esg/learn-about-our-business

Fannie Mae generally purchases two kinds of mortgage loans to issue MBS: single-family loans, for properties of 1 to 4 units, and multifamily loans, for properties of more than 4 units. Fannie Mae are key players in this industry, owning or guaranteeing 1 in 4 of all single-family mortgage loans and 1 in 5 of all multifamily mortgage loans in the United States[9]. The process for acquiring single-family loans and multifamily loans is broadly the same, but differs in the kinds of lenders who participate in the process. Warehouse banks are also important for Fannie Mae to acquire mortgages from lenders. Warehouse banks provide short-term credit to lenders to allow them to originate loans, using the loans as collateral. Warehouse banks also store eNotes in their vaults as an intermediary between the lender and Fannie Mae. Fannie Mae buys mortgage loans directly from lenders, but only after Fannie Mae has verified and certified the eNote (digital promissory note).

Consequently, it is vital that the mortgage eClosing process operate smoothly and reliably. This ensures that Fannie Mae can fund lenders in a timely manner to allow lenders to repay warehouse banks and maintain liquidity. If the process is too delayed, or there are data errors that require excess reconciliation, liquidity in the market falls which can threaten lenders, which in turn makes it more difficult for borrowers to purchase homes. Additionally, delays in repayments to warehouse banks threatens their ability to operate effectively, further damaging the mortgage markets.

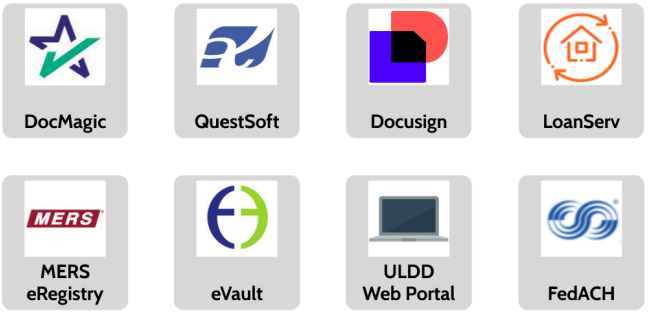
This process has 9 teams and 19 software systems. These 9 teams are: i) the lender's document preparation team who prepare the mortgage loan closing documents, ii) the settlement agent's closing team who approve the closing documents, iii) the borrower who signs the closing documents, iv) the lender's administration team who conduct post-closing activities including creating an eNote and registering it, v) the settlement agent's registration team who register the closing documents with the Registrar of Deeds (a public official responsible for managing official records relating to real estate transactions), vi) the warehouse bank's finance team who handle the release of loan purchase funding to the lender, vii) the warehouse bank's delivery and certification team who certify the eNote and deliver it to Fannie Mae, viii) Fannie Mae's verification and certification team who verify and certify the eNote before storing it, and finally ix) Fannie Mae's payments team who purchase the loan from the lender.

Here, we illustrate 6 teams each operating a function for the end-to-end process operations:

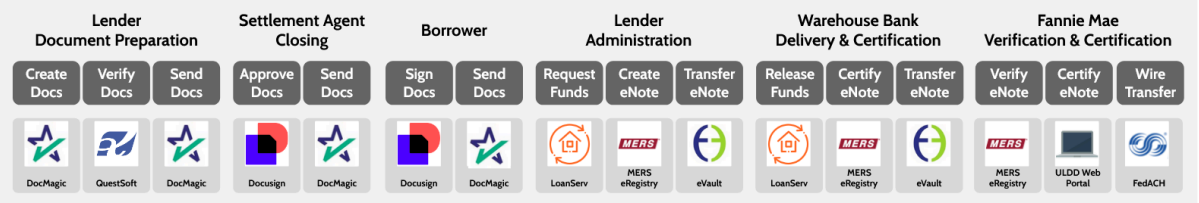


[9] https://www.fanniemae.com/media/50336/display

Each team has a number of software systems. These systems include: DocMagic, QuestSoft, Docusign, LoanServ, MERS eRegistry, ULDD WebPortal, FedACH.



Each software system is used by a team to perform a specific function in the process. For example, the Lender Document Preparation team uses DocMagic to create the closing documents.



2.5. Mortgage Loan eClosing Process Operations before Luther

Borrowers (homebuyers) can acquire mortgage loans from various lenders. Fannie Mae tends to acquire mortgages from larger, commercial banks. The lender draws up the initial closing documents, which are for the borrower to sign to complete the loan agreement. These documents must be reviewed by both the settlement agent and the borrower before they are approved. Once the borrower has signed the closing documents, the documents must then be notarized by the settlement agent to ensure both parties are legally bound by the conditions. At this point the documents are sent to a recorder at the relevant government entity to be registered. Next the eNote (digital promissory note) must be notarized with the MERS eRegistry. The eNote is vitally important to modern mortgage transactions, acting as a source of truth for downstream verification, compliance and financial activities. Control of the eNote is then released to the warehouse bank, an organization that collects many eNotes for easier transfer to Fannie Mae's ownership. The warehouse bank verifies the eNote. Finally, control is transferred to Fannie Mae who perform their own set of certification and verification checks, including against the ULDD (Uniform Loan Delivery Dataset) before storing the eNote in their eVault.

1. Lender creates closing documents for review by the settlement agent & the borrower
2. Lender performs compliance checks on the closing documents
3. Lender sends the closing documents to the settlement agent
4. Settlement agent reviews the closing documents and approves them
5. Settlement agent sends closing docs to borrower (homebuyer) for approval and signing
6. Borrower signs the closing documents
7. Settlement agent notarizes these documents and conducts post-closing activities
8. Lender makes a funding request to warehouse bank & warehouse bank releases loan funding
9. Lender creates & registers eNote with MERS eRegistry & MERS eRegistry acknowledges it
10. Lender sends a copy of the closing documents to the settlement agent
11. Settlement agent registers these docs with the Registrar of Deeds office
12. Lender sends eNote to warehouse bank's eVault & transfers control to the warehouse bank
13. Warehouse bank performs verification on the eNote
14. Warehouse bank send eNote to Fannie Mae's eVault & control is transferred to Fannie Mae
15. Fannie Mae receive the eNote and perform initial certification
16. Fannie Mae receive the ULDD from the lender
17. Fannie Mae verify the eNote against the ULDD
18. Fannie Mae store the eNote in their eVault
19. Fannie Mae initiate wire transfer to the lender

For the purposes of clear and concise illustration, we have omitted certain steps from the process image below, however to understand the full process please read the enumerated steps above. Process images in this case study will show the operations of 6 teams and 16 software systems, but importantly this process does operate across 9 teams and 19 software systems, which are laid out fully in section 6.2.

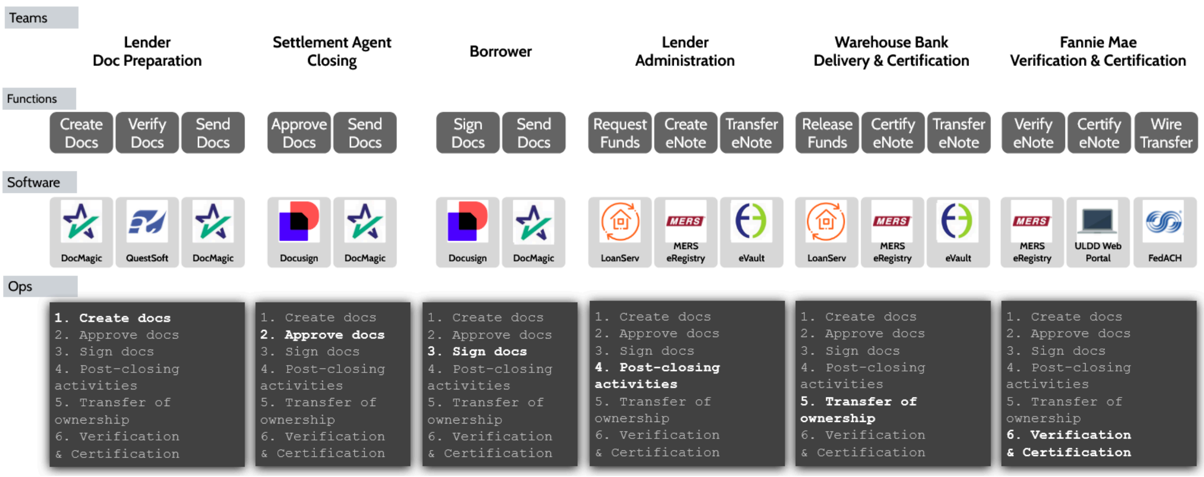


Fig 7. Illustrates the process of reviewing long-term leases and the participants and systems involved.

3. Problem

3.1. Enterprise Process Operations Problems

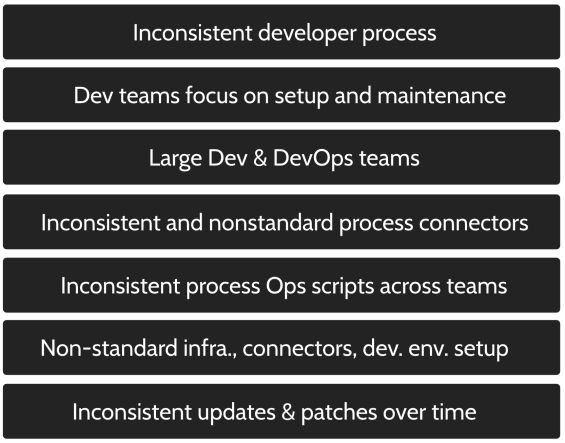
Enterprises are complex organizations operating many processes. Enterprises operate processes across fragmented and siloed teams and software systems. This means that teams change their operations as functions and information change, but other teams operating the process are not made aware of that change. Consequently, other teams are operating on constantly changing and incorrect information, resulting in disjointed, inconsistent, inefficient end-to-end operations which lead to high costs, delays and errors. As a result, disjointed process operations require monitoring and reconciliation to correct errors, and this also increases operating costs.

Operational Silos

Specifically, operating processes across fragmented and siloed teams and software systems affect process operations both i) technically during the development phase and ii) operationally once they go live in production.

On the technical side, for process changes, enterprises set up case-by-case projects, which includes large development and DevOps teams, and set up non standard case-by-case infrastructure and development environments, as well as bespoke connectors between different systems. Further, as the teams and systems change over time they deploy local updates which usually impact the end-to-end operations, requiring further updates and patching.

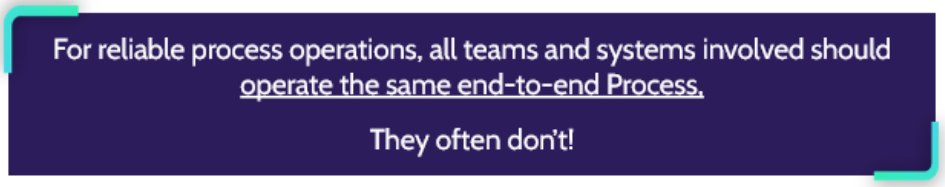
Technical hurdles in development



Operational problems in production (live)

Once the process is live, the fragmented and separated teams and systems result in non-standard operations across the process and over time as the teams, operations, and systems change. The fragmentation also results in a lack of execution visibility and operations monitoring. This further results in the execution requiring reconciliation, which is often lengthy and expensive. This could also result in compliance issues and violations. All of this requires large operations teams to run the processes and fix their recurring issues.

3.2. Problem Overview



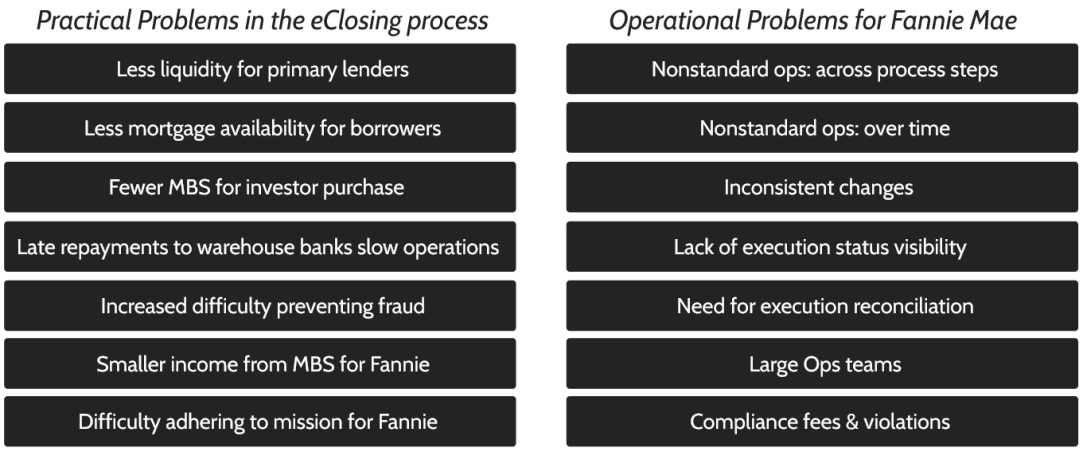
Fannie Mae's eClosing process encompasses multiple participants, who are fragmented and siloed throughout the process. This creates an inconsistent and unreliable process. Due to the siloed nature of the participants, teams will often change their operations without the knowledge of other teams operating the process. This often requires monitoring and reconciliation by Fannie Mae to correct errors and ensure the process functions correctly, increasing operational costs of the process.

3.3. Mortgage loan eClosing Process Operations Problems

Fannie Mae's mortgage loan eClosing process is fragmented, a problem caused by an unstandardized process and compounded by the large size of the enterprise. Fannie Mae's eClosing process encompasses multiple participants, who are separate and siloed. The siloed nature of the teams means data is often entered twice which can result in errors. These errors must be corrected. A lack of data visibility and consistency throughout the process requires manual reconciliation by Fannie Mae and other participants, increasing operational costs of the process. Additionally, the eClosing process is complex and costly. Setting up and maintaining eClosing infrastructure, such as eVaults, is challenging and expensive, which can be prohibitive to lenders. As a result, lenders may prefer to use different systems and data formats, including paper documents. The lack of consistency in the process, as well as the lack of any centralized source of truth, means that intensive, manual reconciliation must be carried out to ensure the quality of loan data. These checks of loan data quality are vitally important to prevent wire fraud and data entry mistakes, which increases downstream efforts and costs.

The checks increase processing timeframes and costs for Fannie Mae, but also for lenders. Increased costs for lenders means less liquidity in the mortgage market, which prevents them from providing more mortgage loans to borrowers. Additionally, longer timeframes for the process delay the issuance of mortgage-backed securities, preventing the generation of income for Fannie from the purchase of these securities, which further limits the flow of capital in the mortgage market. Therefore, it is of vital importance to find a solution that lowers processing costs and timeframes, standardizes the process, and provides a centralized source of truth. The problem of reconciliation is compounded because data in the process must be checked against multiple source documents: often, the lender, settlement agent, and borrower will have their own sets of documents that must be reconciled.

Ultimately, the large amount of reconciliation caused by siloed teams and their changing operations at all stages of the mortgage loan eClosing process increases timeframes and introduces more errors, which necessitates more reconciliation, increasing operational costs of the process for Fannie Mae. This problem is compounded by scale: Fannie Mae purchased more than 900,000 single and multifamily mortgage loans in 2023. This means that Fannie Mae, lenders, and warehouse banks employ large, siloed teams and use internal and external systems to operate this process, resulting in uncertainty around data quality, long timeframes, increased reconciliation, and increased downstream costs.



4. Traditional approaches to process operations and automation solutions don't work

4.1. Approach to Process Operations today

Enterprises typically establish dedicated projects and project teams to set up process operations. This involves mobilizing large development and DevOps teams, as well as large operations and support teams. They create custom, often non-standard project infrastructure, connectors, and development environments, which require dedicated ongoing maintenance once the process is live. The project team writes bespoke operations code to manage the end-to-end process, including code that links the operations of various software systems.

As the process moves into production, developers must continuously write custom local code to adapt to the evolving landscape of team operations, process rules, and software systems. Additionally, the project team or other development teams need to develop and integrate separate execution monitoring software and reconciliation software. These tools are essential for detecting errors and inconsistencies, determining root causes, and correcting the issues. Furthermore, they deploy multiple distinct application systems, such as compliance software systems, to support the overall operation.

This demonstrates the bespoke, fragmented nature of process operations development, in addition to multiple auxiliary systems required to keep the operations going. Most importantly, this approach cannot keep pace with the ever-changing process operations.

Enterprise process operations are unreliable!

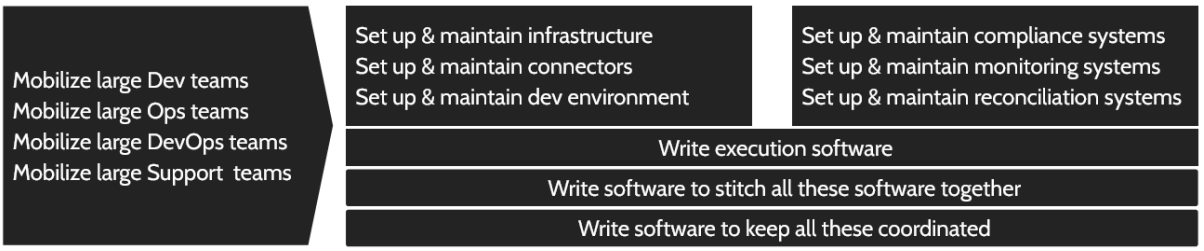


Fig 8. Enterprises generally carry out all of the above to run a process.

4.2. Bespoke Connectors and Operations Scripts & why they don't work

To manage the mortgage loan eClosing process, Fannie Mae typically; i) sets up local connectors between directly linked systems involved in the process, ii) Develops and updates local operations scripts to manage the process end-to-end. Both the bespoke connectors and operations scripts require regular updates and modifications as teams, process operations, and software systems evolve. These updates are reactive and localized, addressing immediate changes without fully considering the entire process.

The problem arises because these connectors and scripts are integral to the end-to-end process, where each step depends on others and assumes specific functions from other parts. Local changes alter the immediate local operations, but the rest of the process continues to rely on outdated assumptions about those functions. This results in a gradual drift and fragmentation between different parts of the process.

This drift and fragmentation requires further patches and updates, which will require further patches and updates in other parts of the process, and the cycle continues!

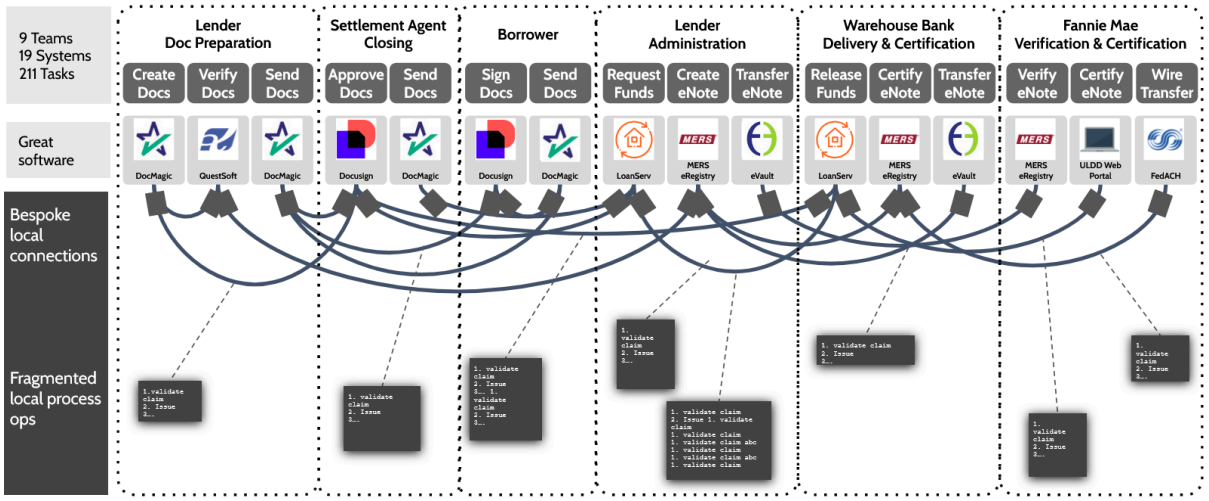


Fig 9. Fragmented local operations scripts and bespoke local connections across the end-to-end process implemented by the enterprise.

4.3. Local Automation (RPA, Workflow) tools & why stitching them together doesn't work

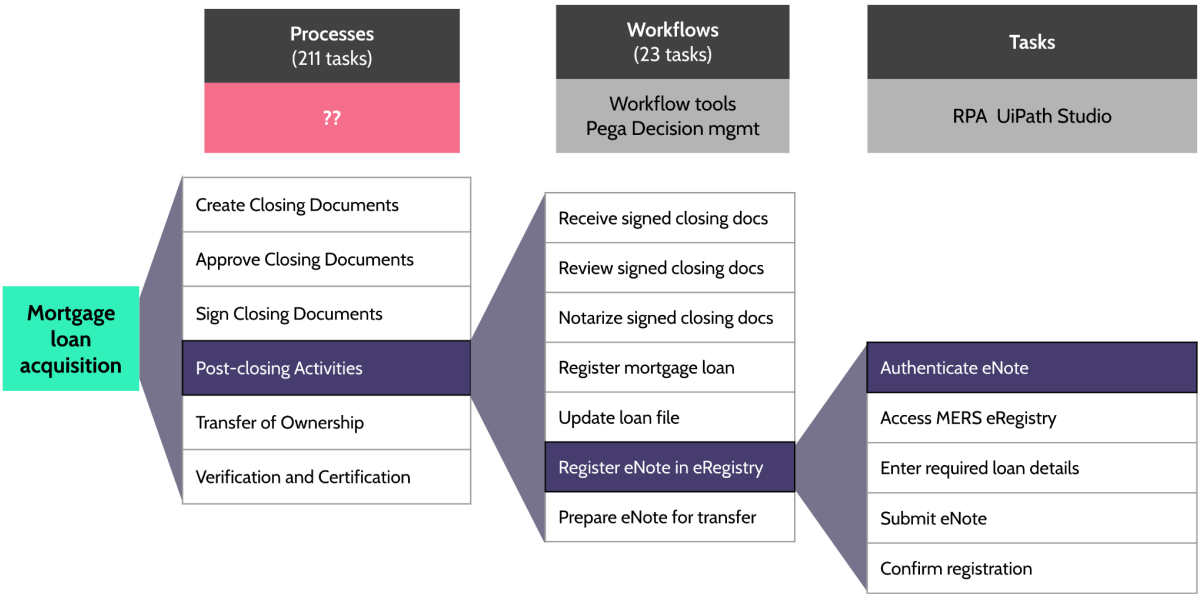


Fig 10. Today there are no traditional tools which effectively automate processes.

Enterprise processes consist of numerous operations (tasks). Each process includes a collection of workflows, and each workflow is a collection of multiple tasks. Tasks are simple, localized events involving one team and one or two software systems. For example, authenticating an eNote is a task. Workflows are more complex, comprising 10-20 tasks that span one to two teams and involve two to three software systems. For instance, registering the eNote in the eRegistry is a workflow consisting of 23 tasks. Processes are complex, involving over 50 tasks, three or more teams, and multiple software systems. An example of a process is the acquisition of a mortgage loan, which includes 211 tasks.

Enterprises utilize Robotic Process Automation (RPA) tools to automate individual tasks. RPA tools have evolved into highly effective solutions for this purpose. However, for automating workflows (comprising 10-20 tasks), enterprises turn to Workflow Automation tools, as individual RPA bots are not scalable to handle such complexity. Workflow Automation tools have similarly advanced, becoming highly effective at automating entire workflows. These tools leverage a diverse array of technologies, including traditional ones like Workflow tools, ERPs, and BPMs, as well as modern innovations such as Hyper Automation, Intelligent Automation, and various developer tools.

RPA tools and Workflow tools do not scale to operate end-to-end processes

To overcome the limitations of the traditional approach, enterprises deploy numerous RPA and Workflow tools across the end-to-end process, and then connect and orchestrate these tools to function reliably. This integration and coordination are typically developed internally by the enterprise.

Process orchestration approaches integrate combinations of RPA and workflow systems using point-to-point message passing techniques. These services often employ a batch scheduler or workflow system, which effectively coordinates tasks within a single team. However, this method falls short for processes involving multiple teams. Each team tends to create bespoke code for their tasks, leading to "script bloat" — the proliferation of numerous, often redundant, and poorly documented scripts. This complicates maintenance and scalability. Furthermore, there is a lack of transparency between participants in the process. This lack of coordination and integration results in inefficiencies and errors, causing delays and operational friction. For a full explanation of traditional process operations and Luther's solution, request access to the Deep Process Automation Primer.

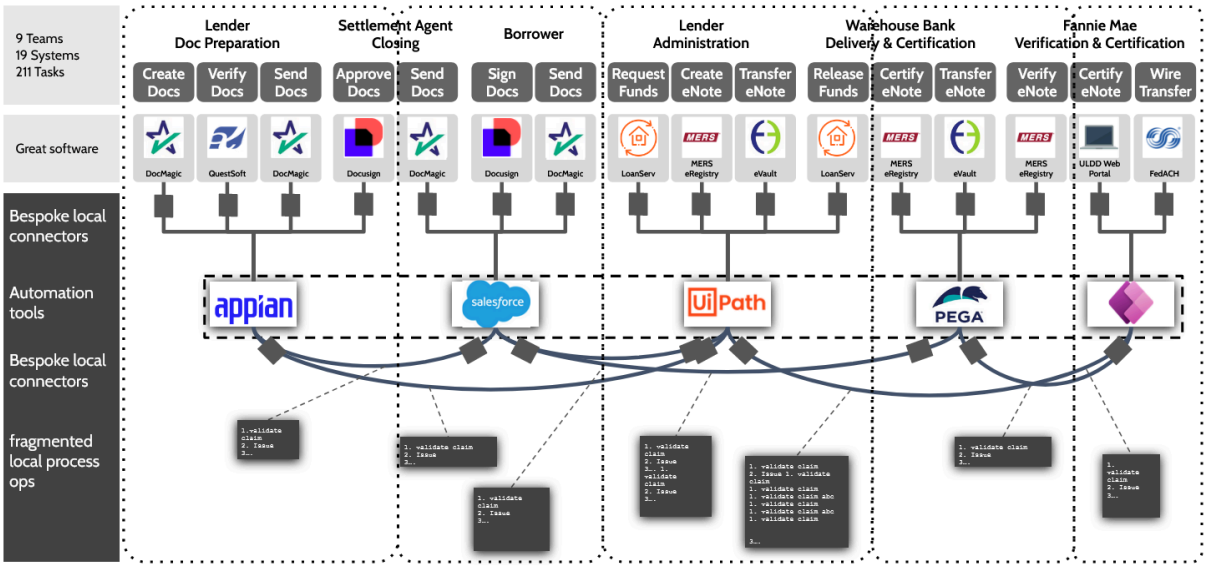


Fig 11. Stitching together local automation tools through local RPA and workflow tools is messy, localized and ultimately unreliable.

5. Solution

5.1. Luther Platform

Luther's Platform was used by Fannie Mae's development team to build a world-class eClosing system. This required a system that could effectively process multiple internal and external validation steps as well as automatic compliance.

Luther's unique value for reliable end-to-end Process Operations is providing

standard connectivity
a common operations script

across all teams and software systems.

This is very difficult and costly with traditional automation tools and workflows. Automation of the eClosing process requires Luther's Platform and Deep Process Automation Technology. The automated mortgage loan eClosing process is the result of this work and is an end-to-end eClosing system that standardizes the process with minimal manual intervention while reducing closing timeframes, increasing transparency and eliminating errors from manual input.

Luther's solution simplifies the process and lowers operational costs for all participants, which will allow more lenders to be integrated into the system. Additionally, Luther's solution does not adversely affect the operations of the participants: lenders, settlement agents and warehouse banks see minimal revenue impact and reduced operating costs. Luther's platform demonstrates the potential for a viable, scalable product for Fannie Mae's multifamily loan purchases, automating the operations of the eClosing process.

5.2. How it works on the Luther Platform

1. The lender inputs loan closing data to the platform creating the closing documents
2. The platform performs compliance checks based on a predetermined set of rules in the Common Operations Script
3. The lender sends the closing documents to the settlement agent
4. The settlement agent reviews the closing documents and approves them
5. The settlement agent notifies the platform which sends the closing documents to the borrower (homebuyer) for approval
6. The borrower signs the closing documents
7. The platform notifies the settlement agent & lender and sends the closing documents to them
8. The settlement agent notarizes these documents and conducts post-closing activities
9. The lender requests funding from the warehouse bank and the warehouse bank releases the funding
10. The lender creates the eNote on the platform and registers the eNote with the MERS eRegistry and the MERS eRegistry acknowledges it
11. The settlement agent registers closing documents with the Registrar of Deeds
12. The lender transfers control of the eNote to the warehouse bank
13. The warehouse bank releases funds to the lender
14. The warehouse bank certify the eNote
15. The warehouse bank transfers control of the eNote to Fannie Mae
16. Fannie Mae receive the eNote and the platform performs initial certification
17. The Lender submits the ULDD to the platform
18. The platform verifies the eNote against the ULDD
19. Fannie Mae store the eNote in their eVault on the platform
20. Fannie Mae releases payment via wire transfer to the lender

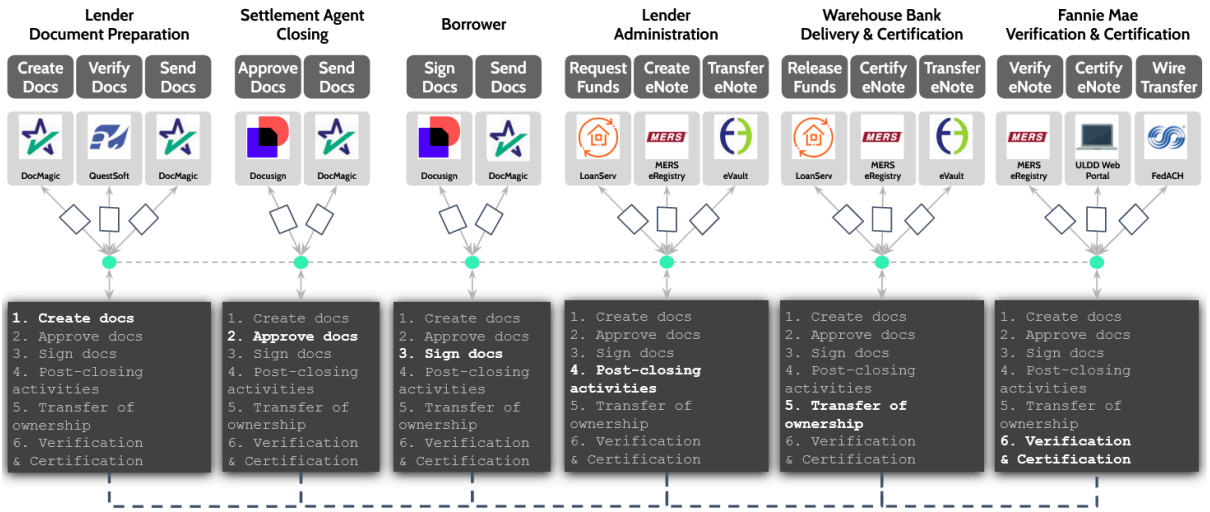
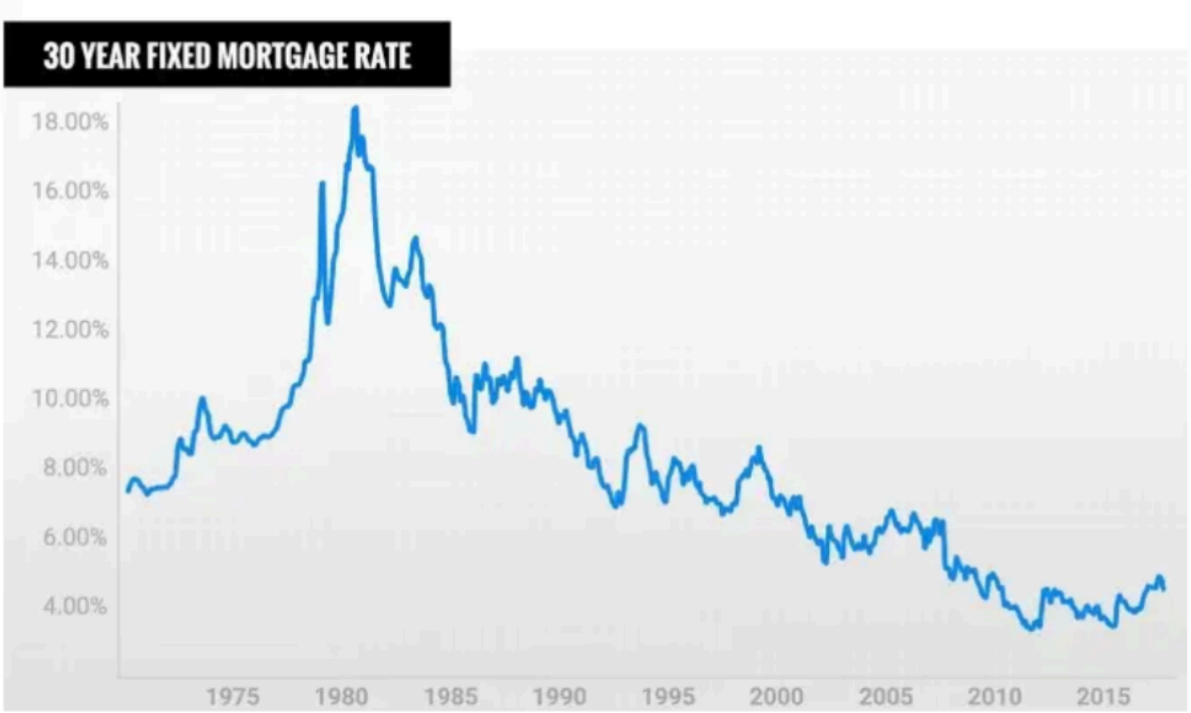


Fig 12. Overview of the Luther Platform automating the eClosing process.

For a more detailed view of the steps operating the Luther Platform, please view the appendix.



6. Implementation

Luther's team worked with the Fannie Mae team to implement the automated mortgage loan eClosing process on the platform.

First, Luther's team worked with the teams at Fannie Mae to map the process. View a process map here. Luther then identified all teams and all software systems involved in the operations of the process. Luther then allocated a node to each team, deployed the platform on all nodes, and connected the nodes to each of the software systems, through Luther's standard connectors. Then Luther's team worked with Fannie Mae developers to develop a robust common operations script for process operations. Then the application goes live.

For more information please visit these links, for implementation steps, implementation in general, and sandbox.

Customer Team		*Business Owner, Application Owner, Technical Lead*	*Day 1*
Discover	*Phase 1*	*Describe process operations*	*12 weeks*
	Phase 2	*Describe systems & technical requirements*	
Process mapping		*Map the process*	*2 weeks*
Platform set-up		*One-time platform set-up*	*1 day*
Build application		*Develop (code) application operations*	*26 weeks*

Fig 13. Implementation timeline for the automated mortgage loan eClosing process.

To implement the mortgage loan eClosing process, Luther and Fannie Mae followed these steps:

6.1. Process mapping

Luther's team worked with multiple Fannie Mae teams to map the process operations. The process map includes i) functions, ii) data inputs and outputs at each step, and iii) rules and decisions at each step. Teams are operationally separate entities involved in the process. As part of process mapping, Luther identified the exact set of software systems and teams involved in operating the end-to-end process.

6.2. Identify teams and software systems

Luther's team identified the teams and participants involved in end-to-end process operations. These teams and participants are: Lender Document Preparation Team, Settlement Agent Closing Team, Borrower, Lender Administration Team, Warehouse Bank Delivery and Certification Team, and Fannie Mae Verification and Certification Team.

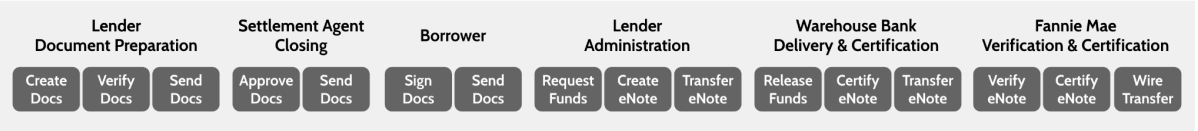


Fig 14. Luther's team worked with Fannie Mae to map the process including 6 teams involved in end-to-end operations.

Luther's team identified the software systems involved in end-to-end process operations. These systems are: DocMagic, Docusign, QuestSoft, Notarize, LoanServ, MERS eRegistry, eVault, ULDD Web Portal and FedACH.

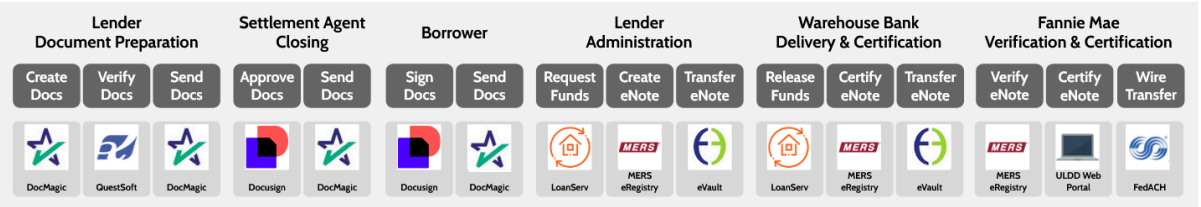


Fig 15. Luther's team identified the software systems involved in the end-to-end process operations.

6.3. Nodes and Connectivity through distributed system for end-to-end team connectivity

Luther's team assigned a dedicated node to each team involved in the process by allocating servers to their respective teams. These servers are cloud-native and can be deployed on either public or private clouds, depending on security requirements. All nodes are interconnected through a distributed system, which facilitates the sharing and validation of operational functions and data among all teams.

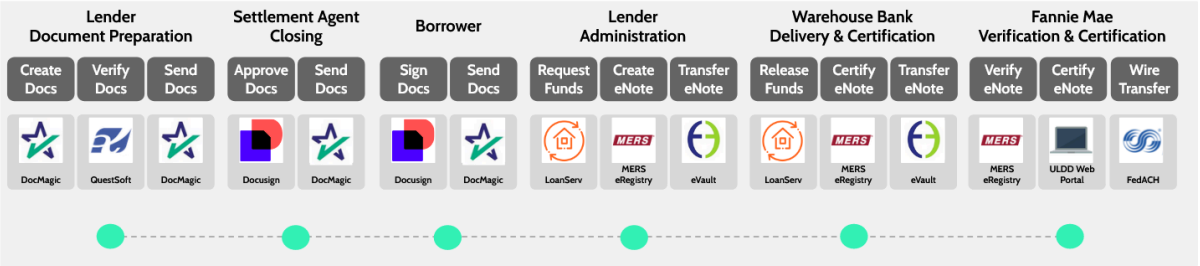


Fig 16. Nodes are connected via a distributed system on the Luther Platform.

6.4. Connectors to software systems

Each team has a number of software systems involved in its operations, as identified in the process map. For each team, Luther's platform connects its node to all software systems involved in its operations. Luther has a set of standard connectors across a wide range of enterprise systems, which the Luther platform deploys to rapidly connect to the systems involved in operating the process. This is done by determining the technology, type and system of the connector to connect to each system in the process.

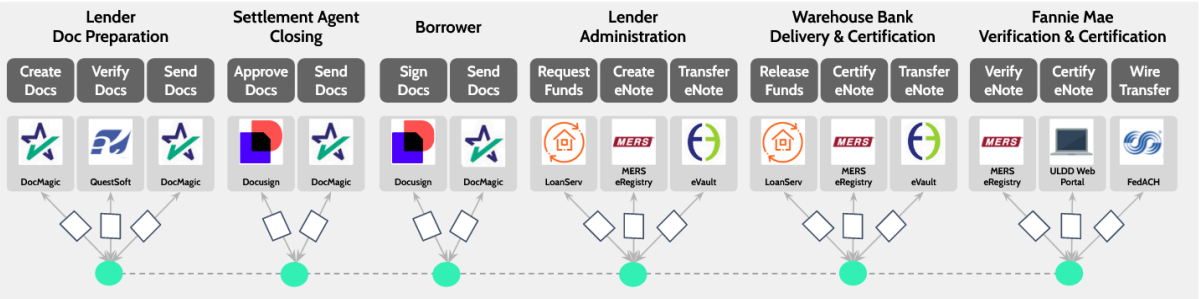


Fig 17. Luther's team set up connectors that link the processes together.

Luther, through numerous enterprise implementations has standard connectors to a majority of enterprise software systems across a range of processes and industries. For a full list of our connectors, please visit: *"Luther Platform Connectors"*.

6.5. Platform set-up

The Fannie Mae team selected a set of configurations for their platform specifications. This selection depends on i) the process complexity (number of tasks), ii) amount of data processed (KB) per process run, iii) number of participants, iv) reliability, availability and security requirements for the application. Based on these selections, Luther's team deployed the platform on all nodes. For more details on platform configuration specs please visit: *"Luther Platform Connectors"*.

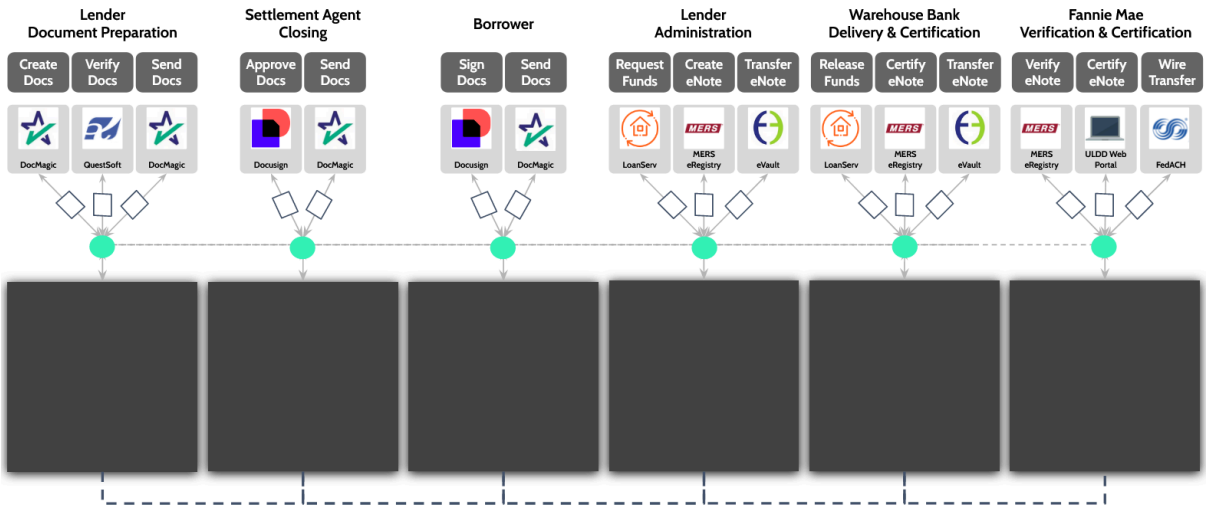


Fig 18. The platform is set up on each of the nodes, ready to reliably operate the end-to-end process at each step.

Luther's platform vertically integrates distributed system technology, optimal resource allocation and management, real-time event ordering and streaming (sharing), and deterministic event processing and execution, to provide a modern technology stack to reliably operate an end-to-end process across multiple software systems, at scale.

6.6. Common Operations Script for process operations

The platform is now fully set up and connected with all systems involved in the operation. The Fannie Mae development team, in collaboration with Luther, developed the Common Operations Script to manage the end-to-end process. Connectors translate data from local systems into a common data model utilized by the Common Operations Script. This script encapsulates the business logic, data, rules, and validations for each process step.

The Common Operations Script effectively codes and operates the process map, executing the Operating Cycle for each system across the entire process. To operate the process end-to-end, each function performs the same cycle of steps: i) send data & information to the System, ii) receive response from the System, iii) compute & validate response, iv) share & store execution of step, v) evaluate & initiate next steps.

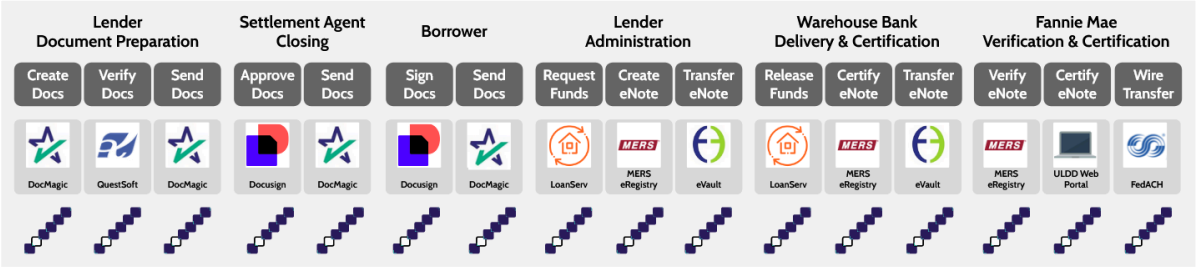


Fig 19. These requirements repeat for all functions across the end-to-end Process Operations.

For a more detailed description of how the Common Operations Script operates the Process please see the Appendix.

This script is shared by all participants and operates on the Luther Platform. Each participant can change the script through suggesting changes, once the changes to the script are approved by all participants the script is updated for all participants.

Teams & Systems can easily change the Common Operations Script

They propose changes
All other teams know and agree to the change upfront
The Common Operations Script is updated for everyone

The enterprise has full autonomy over the process operations to modify and change them, and it also ensures all participants are operating "the same process" at all times. When a team changes their operations, the operations for all participants are updated simultaneously. For a demo of the build process please visit our website.

All teams & systems involved operate the same end-to-end process all the time!
The enterprise has full autonomy over its Operations & Operational changes

So, consistent changes are not an afterthought in a memo
No need to call someone everytime you want to make a small change!

6.7. Go live (production)

Once the platform is set up and the Common Operations Script is coded, the application is ready to go live. Upon going live, it automates the operations of the end-to-end mortgage loan eClosing process by providing i) standardized connectivity between teams and systems, ii) the Common Operations Script, shared by all teams, ensures a consistent process operation at all times. For more information about Luther's platform please consult this video.

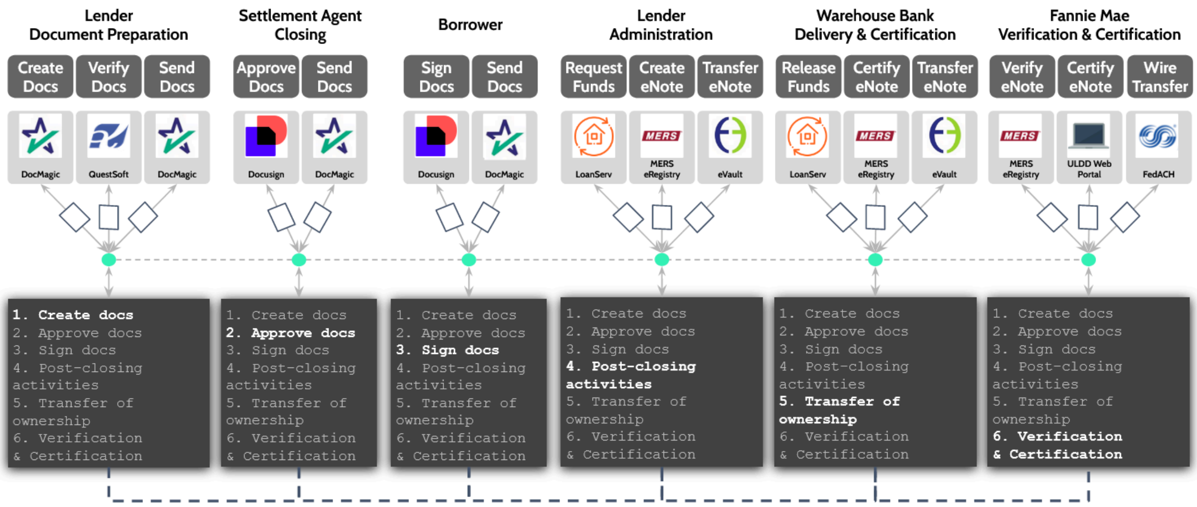


Fig 20. Luther and Fannie Mae developer teams work together to write the common operations script, converting tasks into an objective workflow that links every step in the process. The common operations script links independent systems into one cohesive process.

7. Results

7.1. Estimated Commercial results

ROI: 14X

Cost Reduction: 65%

Average Processing Speed Increase: 5X

Using Luther's Deep Process Automation and Platform, implementing the mortgage loan eClosing Process MVP is estimated to have reduced the processing cost of purchasing mortgage loans by 65%. This is primarily due to FTE savings in both ops teams involved in process operations as well as ops teams involved in monitoring and reconciling the process. It is also due to savings in devops teams who can now focus on developing better functions for the process instead of solving problems created by the siloed and fragmented nature of the old process. The average total working time for the closing of the loan and delivery to Fannie Mae was estimated to be reduced from 40 hours to just 8 hours, speeding up the average processing time by 5X. This results in an estimated return on investment of 1400%.

Specific commercial advantages:

- Average estimated time for the loan closing process reduced from 40 hours to 8 hours
- Cost savings of 65%, reducing the operational costs for the MVP from 7.25 million a year to just 2.5 million a year, resulting in an ROI of 1400%
- Reduced operating costs for other participants including lenders, settlement agents and warehouse banks
- Increased certainty around loan data quality means reduced risk of fraud and reduced downstream efforts and costs
- Shorter operational timeframes increase liquidity for lenders and warehouse banks

7.2. Operational benefits

Luther delivered a product that standardizes mortgage loan eClosing process operations, and demonstrated the potential for other lenders to be integrated into the network, while reducing inefficiencies, improving process transparency, reducing the size of operations teams, and improving compliance, which could not have been achieved without Luther's Deep Process Automation Technology.

General operational advantages

The Luther Platform streamlines operations across enterprise processes, reducing process time and cost while maintaining transparency and flexibility.

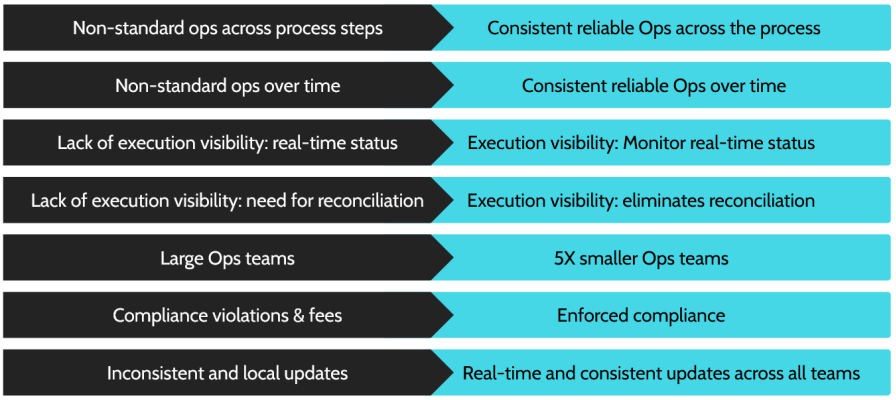


Fig 21. General results from implementation of the Luther platform

Specific operational advantages

Implementing the automated mortgage loan eClosing process on the Luther Platform has streamlined the operations of the eClosing process, making it more efficient, faster, and standardized all while requiring minimal manual intervention, and without sacrificing transparency or integrity of data. The platform is flexible & scalable to future changes to the process or regulations.

Enhanced closing documents and eNote processing:

- Provides enhanced data visibility and delivery for all participants ensuring faster timescales and reduced risk of fraud
- Closing documents are now all viewed and signed electronically via the Luther Platform, ensuring faster timescales

Enhanced operations:

- Standardization of the eClosing process reduces the need for labor-intensive reconciliation, ensuring faster timescales with lower costs
- Elimination of manual reconciliation means smaller operational teams at Fannie Mae
- Increased system reliability and flexibility reduce costs associated with last-minute changes in loan data

7.3. Technical benefits

General technical advantages

The Luther Platform makes process operations more consistent as well as standardizing the infrastructure used to operate the mortgage loan eClosing process. Real-time updates across the end-to-end process ensure less downtime in the process, improving efficiency. All this means that developer and developer operations teams can be reduced in size and that developers can focus on developing and improving process operations rather than focusing on handling inefficiencies in the process.

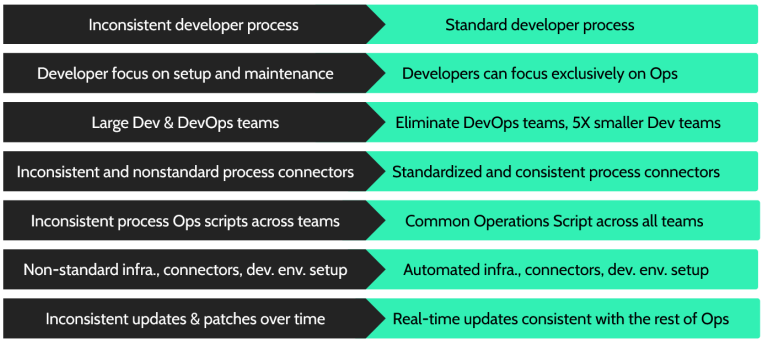


Fig 22. General technical results from implementation of the Luther platform.

Specific technical advantages

Improved operating efficiency:

- Automatically provides verified execution to increase system reliability and reduces processing errors
- Common execution visibility to all participants reduces troubleshooting effort and quickly identifies processing bottlenecks
- Automatically supports Common Operations Script updates for new data/document formats or verification/validation rules

Improved data storage and management:

- All participants can access their data and can remove their data from the system easily if they wish
- Data is automatically verified and then stored on the platform

Reduced technical complexity:

- Standardized process that reduces complexity reduces troubleshooting and makes the eClosing process more accessible for more participants

8. Expansion

This project demonstrates a streamlined system built on the Luther platform that standardizes and automates the eClosing process for one lender. The network could be further expanded to encompass other lenders and warehouse banks that Fannie Mae has a relationship with. It could also expand to include more of Fannie Mae's enterprise operations, such as the management and sale of mortgage-backed securities to investors.

Potential areas of expansion to further integrate Fannie Mae's operations into a single platform include:

- Streamlining pre-closing activities including loan underwriting
- Streamlining post-closing activities such as data management and compliance
- Delivering mortgage-backed securities
- Managing mortgage-backed securities using the Luther Platform

9. Luther Company & Offerings

9.1. What Luther does

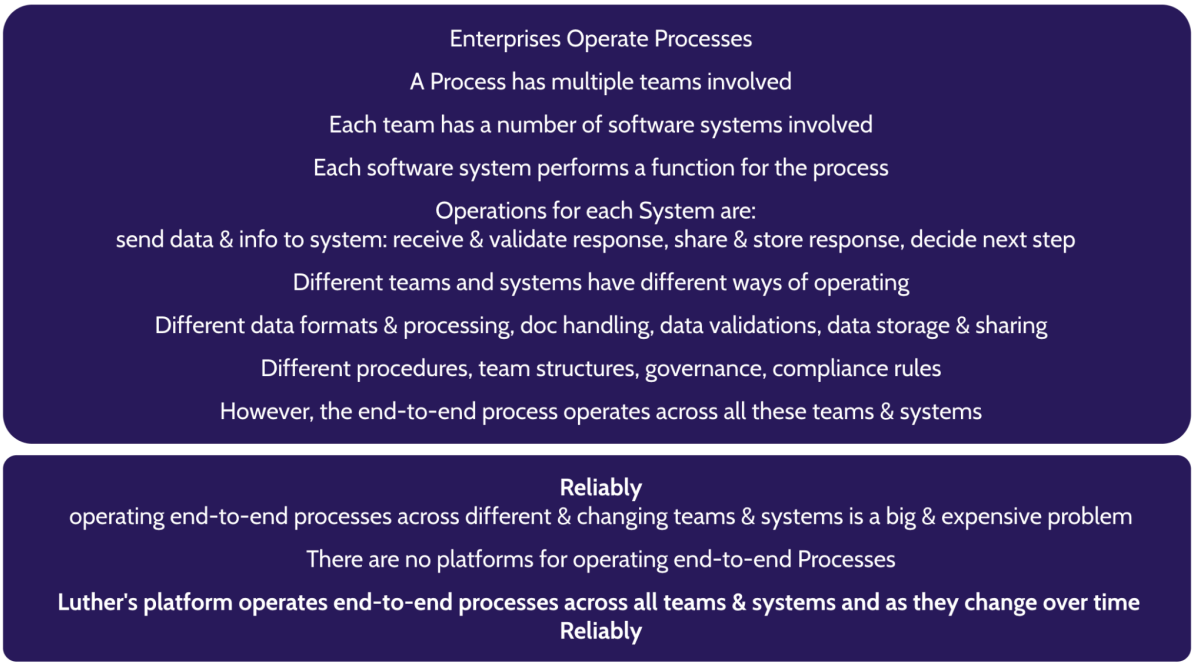


Fig 23. Luther's platform solves the complicated problem of end-to-end enterprise process operations.

For more information about Luther, please visit our website.

9.2. "In a nutshell" - Luther's unique value

Luther's platform vertically integrates

distributed system technology
optimal resource allocation and management
real time event ordering and streaming (sharing)
deterministic event processing and execution

To make reliable end-to-end process operations possible.

Luther's unique value for reliable end-to-end Process Operations is providing

standard connectivity
a common operations script

across all teams and software systems.

Luther automates the operations of the end-to-end process
across multiple teams and systems

9.3. Platform implementation

To implement the Luther Platform, organizations work with Luther through an implementation process - laying out objectives and expectations for the project, then mapping the process and setting up infrastructure. After this, enterprise developers build code that will execute the agreed process.

Customer Team		*Business Owner, Application Owner, Technical Lead*	*Day 1*
Discover	*Phase 1*	*Describe process operations*	*2-4 weeks*
	Phase 2	*Describe systems & technical requirements*	
Process mapping		*Map the process*	*1 week*
Platform set-up		*One-time platform set-up*	*1 day*
Build application		*Develop (code) application operations*	*4-8 weeks*

Fig 24. Implementation timeline for an application operated on the Luther Platform.

Enterprises working with Luther fill in the details of all software systems and connectors for their processes. These documents are used to build the process map and subsequently, the application.

Item	Software System	Type	Category	Connector Technology
System 1	DocMagic	Sink	Agreements	DocMagic API
System 2	QuestSoft	Sink	Specific Industry Connectors	NContracts API
System 3	Docusign	Both	Agreements	Docusign Integration
System 4	Email (SMTP)	Sink	Notifications	SMTP/IMAP
System 5	LoanServ	Sink	Specific Industry Connectors	Sagent Care API
System 6	MERS eRegistry	Sink	Specific Industry Connectors	Fannie Mae Portal
System 7	eVault	Sink	Specific Industry Connectors	eVault API
System 8	ULDD Web Portal	Source	API Inputs	JSON API Gateway
System 9	FedACH	Sink	Payments	FRB Services API

Fig 25. The list of software systems involved in end-to-end mortgage loan eClosing Process operations.

Build Distributed System

Item	Detail	Description	Input	Comments
Network	Number of organizations	Separate Ops teams that may be internal or external to the enterprise.	9	Each team is allocated its own separate organization.
Network	Number of peers per organisation	Determines the reliability of executing the process.	2	Each team runs 2 peers for high availability.
Network	Number of peer cores	Determined by the complexity of the process.	4	Each worker has 4 cores to process 10 loans per second max throughput.
Orderer	Number of Orderers	Number of orderer service instances.	3	Spread orderers across 3 availability zones for high availability & over 99.9% uptime
Orderer	Number of orderer cores	Number of cores allotted for each orderer instance.	2	Allow enough cores to support 10 loans per second throughput.

Resource Management

Virtual Machines

Item	Description	Input	Comments
Number of Cores per Instance	Number of cores per instance in the cluster worker pool.	4	Ensure each peer has 2 cores for parallel event processing.
Ledger Size (GB)	Size of volumes used to store the ledger.	100	Provide enough storage for a years worth of transactions without resizing.
Number of Worker Instances	Number of worker instances to utilize in the cloud region, distributed across availability zones.	9	One worker per participant.

Cloud

Item	Description	Specifications	Comments
Cloud Provider Name	Cloud Service Provider that the platform is deployed into.	AWS	Deploy on AWS.
Cloud Service Account	What cloud service account will be used for deployment?	141812438321	Use existing AWS account.
AWS Role ID	Only necessary for AWS.	arn:aws:sts::343039485463:role/admin	Use role that requires MFA for InfoSec requirements.
Cloud Provider Region	A cloud-specific string identifier for a geographic region.	us-east-2	Closest to customers.
Cloud Provider Domain	A string identifier for a company domain.	ford.luthersystemsapp.com	

Fig 26. A sample list of connectors and infrastructure, similar to one an enterprise building an application on the Luther Platform would fill out.

9.4. Results of the Luther platform for Process Operations Automation

At Luther, we recognize that enterprise processes of today are complex and challenging to automate. We provide a platform for successful process automation.

The results are incredible. Enterprises working with Luther see an average return of 10 times their investment. Time is saved everywhere, with development of process applications and automation technology sped up by 2.5 times, and processing times 7 times faster. Find out more about Luther's core platform features here.

- 2.5X faster development
- 10X less operational costs
- 7X faster processing time
- 10X ROI
- 1000s of compliance rules automated

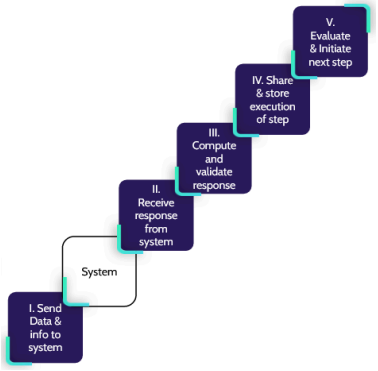
9.5. Luther's platform architecture

For a more detailed introduction on the Luther platform please request access to the "*Luther Deep Process Automation Primer*".
For a detailed introduction and documentation examples please see the Luther Platform site.
For more information about Luther's platform please visit luthersystems.com.

10. Appendix

10.1 How the platform operates an end-to-end process: Application walkthrough

Below is a more detailed walkthrough of the process operations, across the teams and software systems. Each step in the process follows the exact same 5 operational substeps which the Platform executes:
i) **Send:** Platform sends data & information to the System,
ii) **Receive:** Platform receives response from the System,
iii) **Validate:** Platform computes & validates the response,
iv) **Store:** Platform shares & stores execution of step,
v) **Initiate:** Platform evaluates & initiates next steps.



The Common Operations Script ensures that these operations cycle steps are carried out for all systems involved in the process to ensure reliable process operations.

The Platform operates the Process by standardizing the execution of each step in section 5.2. "How it Works on the Luther Platform"

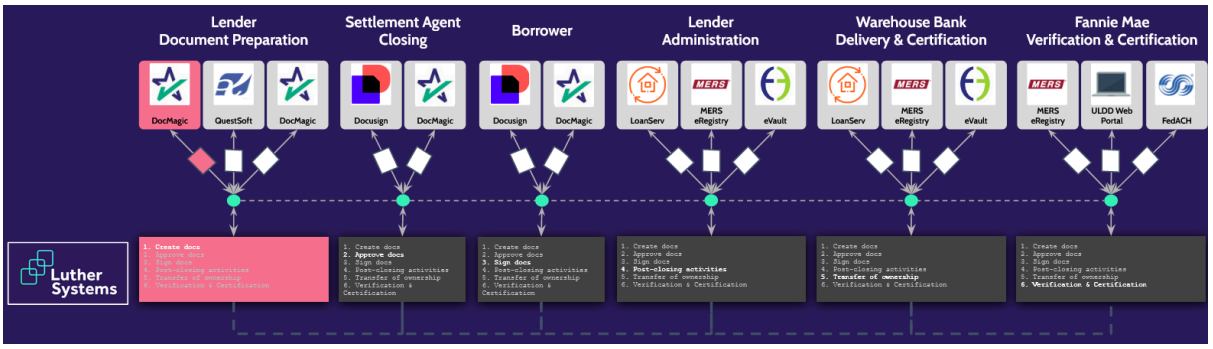
The process involves 9 software systems, the systems' functions are as follows:

- DocMagic: in Step 1 it creates closing docs, in Step 3, 5, and 7 it sends closing docs
- QuestSoft: in Step 2 it verifies and performs compliance checks on the closing docs
- Docusign: in Step 4 it is used to sign and notarize the closing docs, in Step 6 it is used to sign the closing docs
- Notarize: in Step 8 is used to notarize the closing documents
- LoanServ: in Step 9 it is used to request loan funding, in Step 12 it is used to release loan funding
- MERS eRegistry: in Step 10 it is used to create and register the eNote, in Step 13 and 15 it is used to certify the eNote
- eVault: in Step 11 and 14 it is used to transfer control of the eNote, in Step 18 it is used to store the eNote
- ULDD Web Portal: in Step 16 it is used to submit the ULDD, in Step 17 it is used to verify the eNote against the ULDD
- FedACH: in Step 19 it is used to initiate a wire transfer to the lender

Step 0: Lender Document Preparation team initiates the process by sending the Loan Details to the Platform

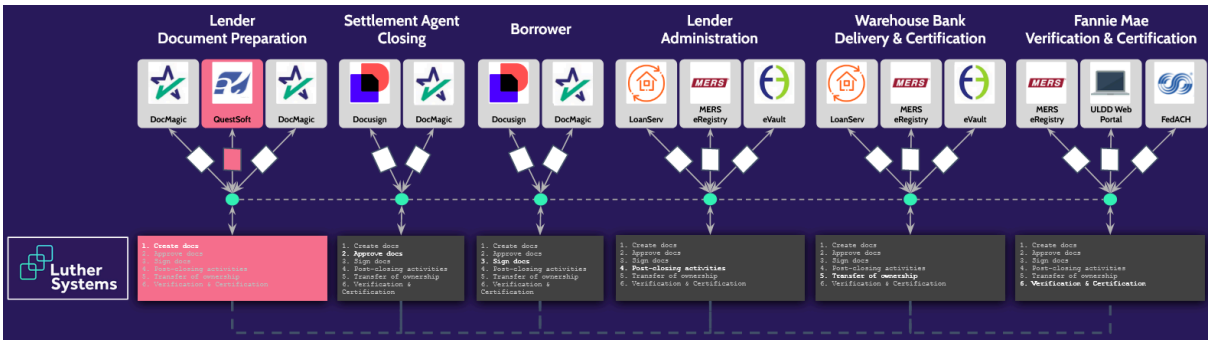
Step 1: Lender Document Preparation Team executes Prepare Closing Documents, specifically Create Closing Documents

I. Platform sends *loan details* (request) to DocMagic
II. Platform receives *closing documents* (response) from DocMagic
III. Platform validates *closing documents* based on predetermined rules in the Common Operations Script
IV. Platform shares & stores *closing documents* from DocMagic
V. Platform evaluates & initiates next step



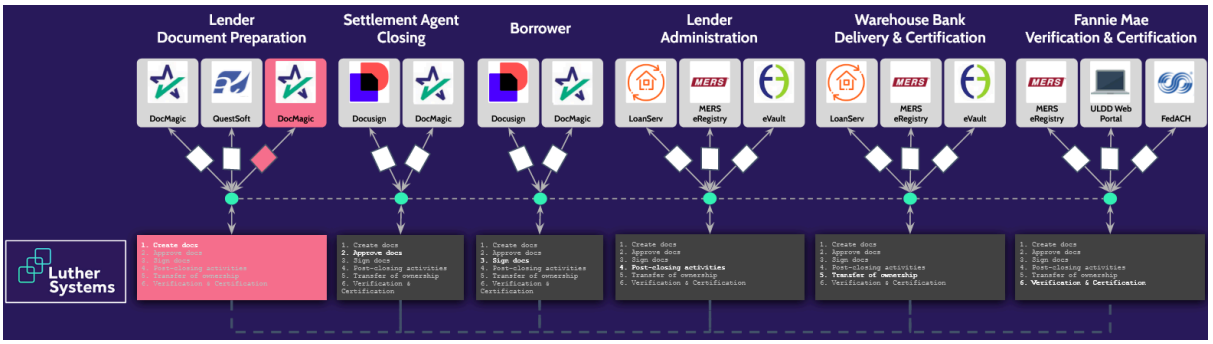
Step 2: Lender Document Preparation Team executes Prepare Closing Documents, specifically Verify Closing Documents

I. Platform sends *closing documents* (request) to QuestSoft
II. Platform receives *verification confirmation* (response) from QuestSoft
III. Platform validates *verification confirmation* based on predetermined rules in the Common Operations Script
IV. Platform shares & stores *verification confirmation* from QuestSoft
V. Platform evaluates & initiates next step



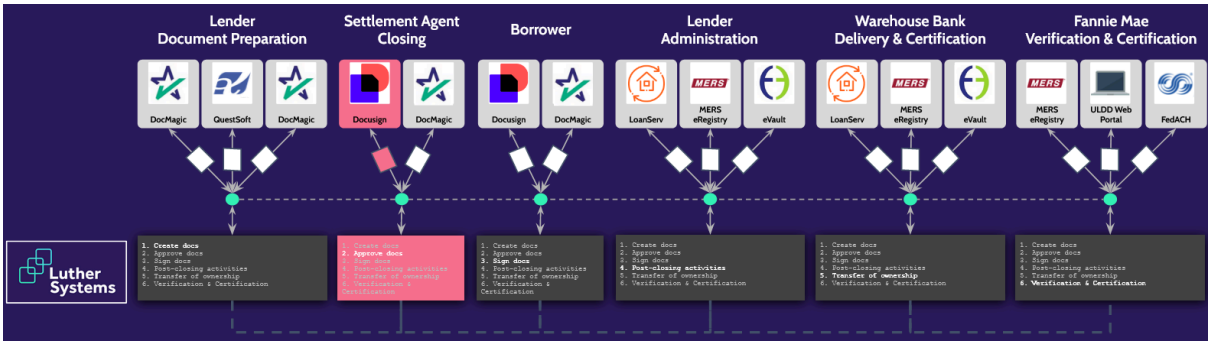
Step 3: Lender Document Preparation Team executes Prepare Closing Documents, specifically Send Closing Documents to Settlement Agent

I. Platform sends *closing documents* (request) to DocMagic
II. Platform receives *confirmation* (response) from DocMagic
III. Platform validates *confirmation* based on predetermined rules in the Common Operations Script
IV. Platform shares & stores *send confirmation* from DocMagic
V. Platform evaluates & initiates next step



Step 4: Settlement Agent Closing Team executes Approve Closing Documents, specifically Approve Closing Documents

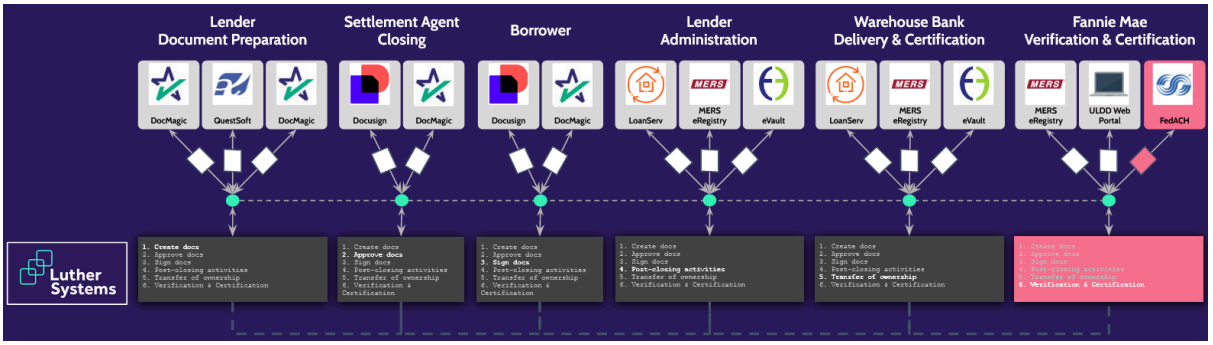
I. Platform sends *validation rules (request)* to Docusign
II. Platform receives *approved closing documents* (response) from Docusign
III. Platform validates *approved closing documents* based on predetermined rules in the Common Operations Script
IV. Platform shares & stores *approved closing documents* from Docusign
V. Platform evaluates & initiates next step



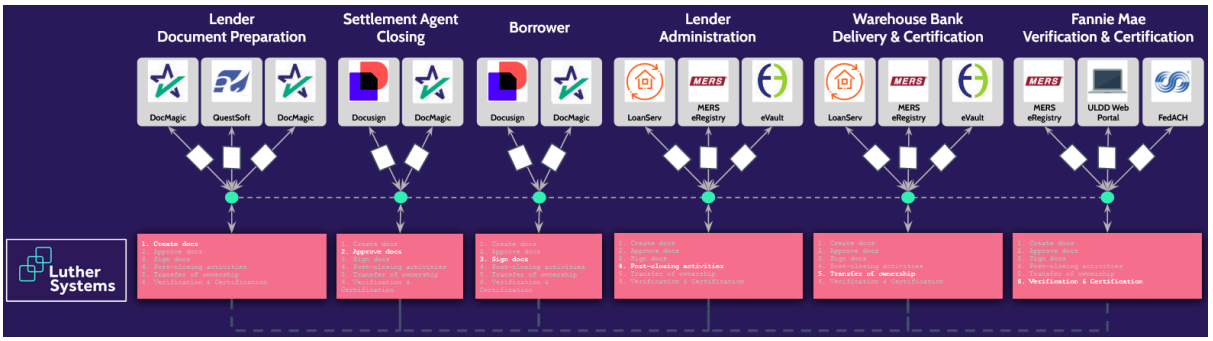
The steps operate in a similar manner until the final step is reached:

Step 19: Fannie Mae Verification & Certification Team executes Verification & Certification, specifically Initiate Wire Transfer

I. Platform sends *payment information* (request) to FedACH
II. Platform receives *payment confirmation* (response) from FedACH
III. Platform validates *payment confirmation* based on predetermined rules in the Common Operations Script
IV. Platform shares & stores *payment confirmation* from FedACH
V. N/A



Final Step: The Platform completes the process:



10.2. Definitions

Term	Definition	Examples
Task	Simple events that are localized to one team involving one or two software systems	Copying data between systems, retrieving data from a database, making a payment
Workflow	A series of 10-20 tasks involving 1-2 software systems and 1-2 teams	Collecting related data from several systems, onboarding a new employee
Process	A series of 20+ tasks involving 3+ teams and multiple software systems	The closing process for mortgage loans
Value Stream	A collection of processes delivering a business critical value	Mortgage loan acquisition
Participant	Operationally separate teams that have their own operations, governance and utilization of software systems and can make some autonomous decisions	The borrower, the lender's Document Preparation team, the lender's Administration team, the warehouse bank's Delivery and Certification team, Fannie Mae's Verification and Certification team
Team	As broadly defined by enterprises, otherwise known as departments, groups, units, etc.	All employees in the verification team at Fannie Mae
Function	A unit of operations performed by a single team	Verifying an eNote
Process Operations	End-to-end completion of process operations across multiple teams and software systems, to deliver a specific business objective	The end-to-end mortgage loan eClosing process

10.3. Process Journey vs. User Journey

The Process Journey involves all the systems and teams including interactions with the users of the process, which usually interact with the process through UI systems and specifically designed Apps, with their own interfaces. However, process operations run through a much larger set of systems and teams, most of which are not visible to the user.

The User Journey is a small subset of the Process Journey. For an optimal User Journey, the whole process must operate reliably, not just the systems involved in the user journey! They must all operate correctly to operate the process end-to-end.

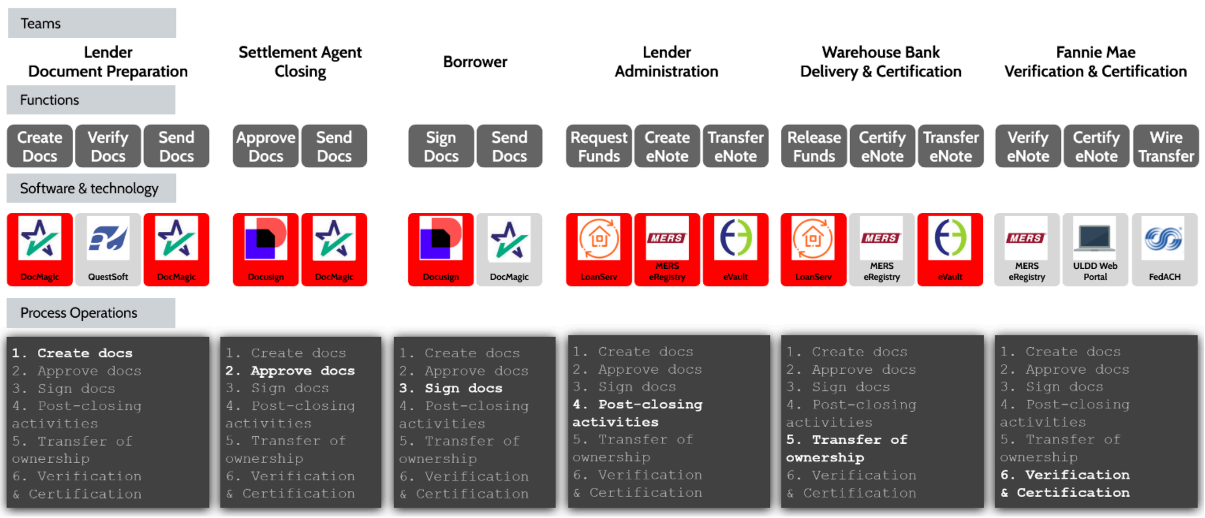


Fig 27. The process journey of the automated mortgage loan eClosing process. Systems highlighted in red directly interact with or require direct interaction from the lender, the settlement agent, the borrower or the warehouse bank.

10.4. Plaintext Links

6. Implementation

For a walkthrough of the implementation process, view the Luther Systems Sandbox Setup:
https://app.platform.luthersystemsapp.com/sandboxSetup

For a full explanation of the implementation process, view the Full Luther Platform Setup:
http://app.platform.luthersystemsapp.com

For a more detailed description of the implementation steps please visit:
https://www.luthersystems.com/platform/platform-overview

Request access to an example of a more detailed timeline here:
https://docs.google.com/spreadsheets/d/1jHSeFRhaWVkUiEtQ_crxGoyGFJ82eGUZ3rxhnYi4cro/edit?gid=1722375828#gid=1722375828

9. Luther's Company and Offerings

For more information about Luther's platform please visit our website:
http://luthersystems.com

Find out more about Luther's core platform features here:
https://app.platform-test.luthersystemsapp.com/features

For a demo of the build process please visit our website:
https://app.platform-test.luthersystemsapp.com/build

For more information about Luther's platform please consult this video:
https://www.youtube.com/watch?v=78H5m1aZZoU

For a more detailed introduction on the Luther platform and a full explanation of traditional process operations and Luther's solution please request access to the Deep Automation Primer here:
https://docs.google.com/document/u/1/d/103KIQUDuwMV0e5CzjNFMYoYnq7g_7AoU_qIHLOza_Tw/edit

For a detailed introduction and documentation examples please see the Luther Platform site:
https://www.luthersystems.com/platform/platform-overview