

Infosys Mortgage Solutions

Jan 2021

FS Industry Solutions Group



Mortgage Origination Solutions

Automation of Document-Centric Processes

Origination Lifecycle

AI-Based Guided Automation

Highlights

- 8 Industry Solutions
- 8 Implementations

These solutions have been implemented for US-based Mortgage Banks / Service Providers

Document Package Indexing

Targets the huge volumes of documents of diverse nature received as input during Mortgage processing



70% Savings
140 Doc types configured

Post Closing Audit

Covering Conventional, Govt Loans, TRID reviews, Final Docs. ~65+ doc types, 500 business rules



~40% AHT Savings
Projected \$5 Mn Savings
Live at a large US Regional Bank

Underwriter Due Diligence

Automation of tasks to validate Borrower docs – identify missing docs, locate missing / wrong data, Verify Borrower Income etc.

Base Version Ready
- Deployment with a Mortgage Originator to commence shortly

Correspondent Lending

Automation covering the different stages of the Due Diligence for onboarding Correspondent loans

Base Version ready for Deployment

Mortgage Servicing Solutions

Automation of Document-Centric Processes

Servicing Lifecycle

AI-Based Guided Automation

Highlights

- 8 Industry Solutions
- 8 Implementations

These solutions have been implemented for US-based Mortgage Banks / Service Providers

Loan Boarding

Multiple document based audit of loan docs and business rules



\$3.5 million in Savings
~ 1.5 m Loans processed
70% Reduction in Boarding Time
+50% Savings: Time & Effort

Predictive Customer Servicing

Providing Business Insights to the Bank to enable proactive measures towards Customer Satisfaction



- 50% accuracy in identifying dissatisfied borrowers*
- Prediction Model on ~6.5mi data points

Due Diligence

Enabling significant automation for Underwriter Due Diligence



50-60% Savings
~ 140,000 loans processed

Payment History Analytics

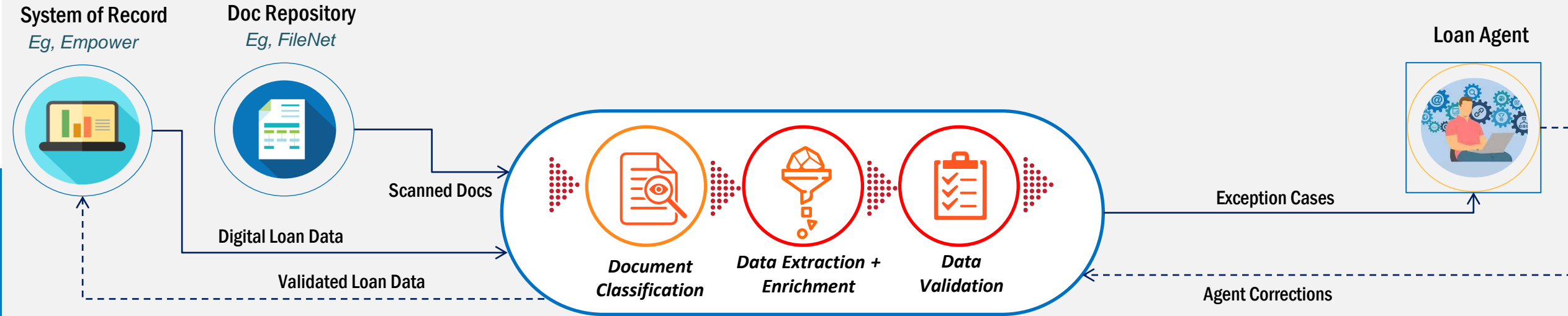
Analytics of Borrower Payments through Data Extraction & Data Transformation



70-80% Savings
~26 Mortgage (60+ Doc formats)

Loan Audit Solution: Schematic View (Covers Post Closing, Loan Boarding etc.)

Computer Vision | Natural Language Processing | Machine Learning



Objective: Automate the process from: *Doc Retrieval – Data Extraction from Doc – Apply Audit Rules – Raise Exceptions*
Deliver significant savings to the Business process

*Machine Learning - driven **Doc Classification** for identifying the right doc types & versions | Intelligent **Data Extraction** & NLP | **Data Enrichment** and standardization | **Smart UI** for Efficient validation of Exceptions | Corrected Data fed back into System of Records.*

Sample UI Snapshots

Infosys Document Classification and Review

Deals / Test_Deal / 0023679046

Doc Selection Doc Validate Summary

Showing Top 5

CLOSINGDISCLOSURE Documents (3)

CD_vers1-0001.pdf

Zoom in Fit Zoom out Rotate Open Document

Closing Disclosure

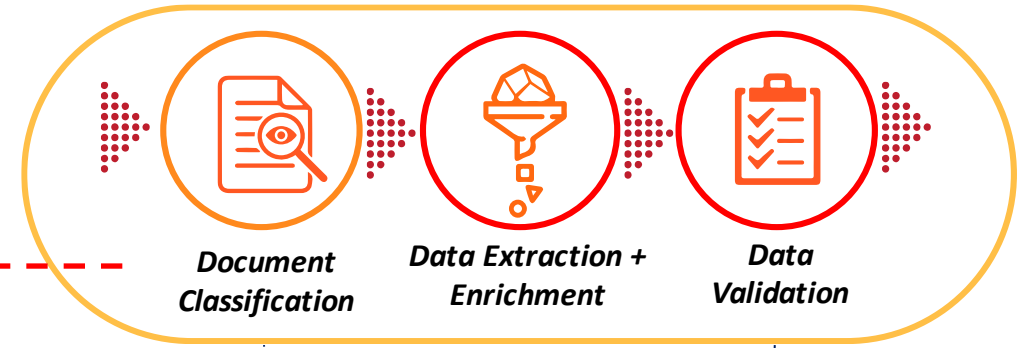
This form is a statement of final loan terms and document with your Loan Estimate.

Closing Information	Transaction Information	Loan Information
Date Issued: 4/15/2013	Borrower: James Doe	Loan To: [Redacted]
Closing Date: 4/30/2013	123 Anywhere Street	Purpose: Prepaid
Disbursement Date: 4/30/2013	Anytown, ST 12345	
Settlement Agent: Epsilon Title Co.	Seller: Steve Cole and Amy Diez	Loan To: [Redacted]
File #: 12-3456	321 Somewhere Drive	Loan ID: [Redacted]
Property: 456 Somewhere Ave	Anytown, ST 12345	MIC #: [Redacted]
Lender: ABC Mortgages		
Sale Price: \$120,000		

Loan Terms

Loan Amount	\$15,900	Can this amount increase after clos	NO
Interest Rate	3.875%		NO
Monthly Principal & Interest	\$704.23		NO
Prepayment Penalty	YES - As high as \$3,240 if you pay first 2 years	Does the loan have these features?	
Balloon Payment	NO		

Document types identified by the Classification Engine



Document Classification and Review

Deal / 0023679046

Doc Validate Summary

Extracted Data

Field Name	Type	Document	Application
1st Payment Date	E-R	04/01/2003	04/01/2003
Maturity Date	E-R	03/01/2033	03/01/2033
Orig IR	I	6.125	6.125
Loan Term	D-RW	360	360
Note Title	I	NOTE	
Orig PI	I	704.23	704.23
Note Date	E-RW	02/28/2003	02/28/2003
Borrower Name	E-R	James Doe	James Doe
Co-Borrower Name	E-R		
STREET NUMBER-DI...	D-R	151, Wonderland Drive	151, Wonderland Drive
CITY-STATE ADD1	D-R	PARAY, OH	PARAY, OH
ZIP4 ADD1	D-R	44615	44615

0023679046_Closing Documents_201-0040.pdf

Zoom in Fit Zoom out Rotate Open Document

in return for a loan that I have received, I promise to pay U.S. \$ 115,900.00 (this amount is called "Principal" plus interest, to the order of the Lender. The Lender is Free Mortgage Services

I will make all payments under this Note in the form of cash, check or money order. I understand that the Lender may transfer this Note. The Lender or anyone who takes this Note by transfer and who is entitled to receive payments under this Note is called the "Note Holder."

2. INTEREST
Interest will be charged on unpaid principal until the full amount of Principal has been paid. I will pay interest at a yearly rate of 6.125%. The interest rate required by this Section 2 is the rate I will pay both before and after any default described in Section 6(E) of this Note.

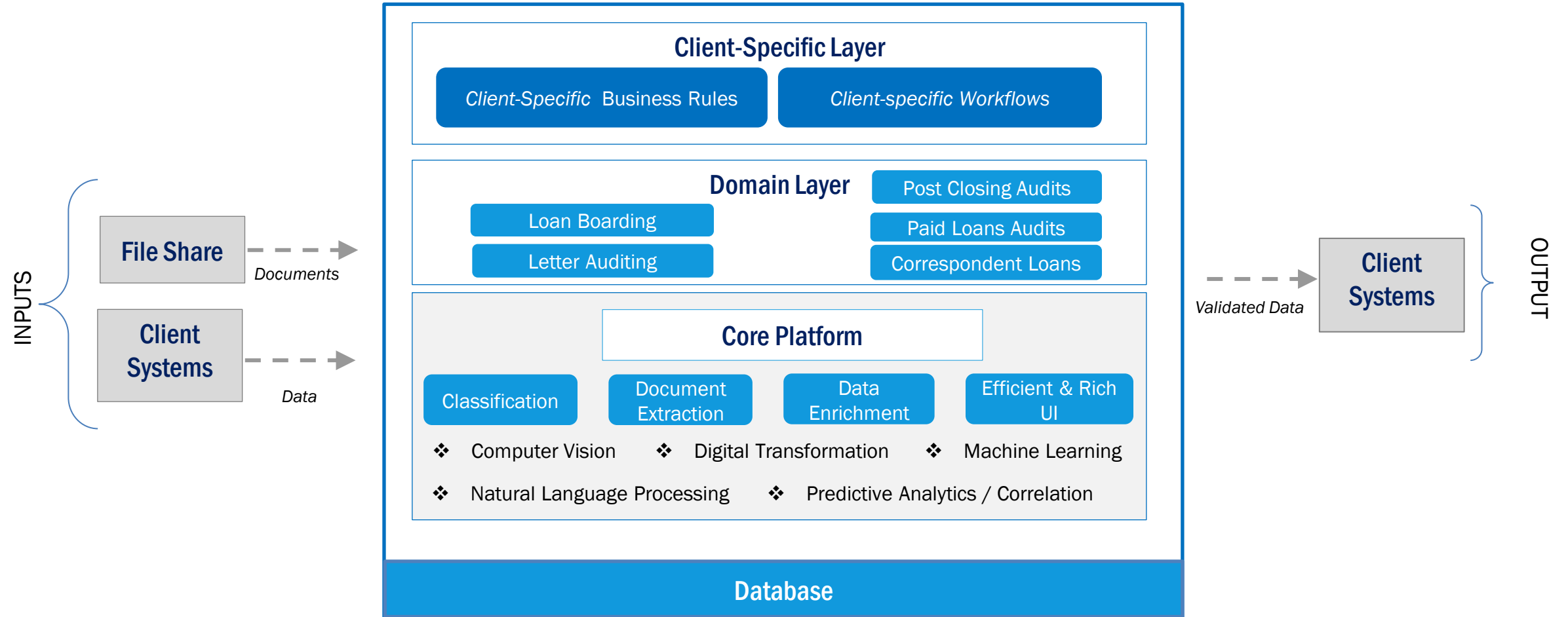
3. PAYMENTS
(A) Time and Place of Payments
I will pay principal and interest by making a payment every month.
I will make my monthly payment on the 01st day of each month beginning on April 1st, 2003
make these payments every month until I have paid all of the principal and interest and any other charges described below may owe under this Note. Each monthly payment will be applied as of its scheduled due date and will be applied to interest before Principal. If, on March 1st, 2033, I still owe amounts under this Note, I will pay those amounts in that date, which is called the "Maturity Date."
I will make my monthly payments at 3000 Overdrive Road, Mount Summit, NJ 08054 or at a different place if required by the Note

(B) Amount of Monthly Payments
My monthly payment will be in the amount of U.S. \$ 704.23

4. BORROWER'S RIGHT TO PREPAY
I have the right to make payments of Principal at any time before they are due. A payment of Principal only is known as "Prepayment." When I make a Prepayment, I will tell the Note Holder in writing that I am doing so. I may not designate

UI showing Extracted data along with Corresponding document with Snippets indicating where the data was picked up from

Solution Construct Schematic



01

02

03

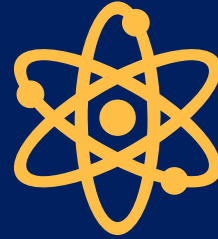
04

The Need	Key Challenges	Benefits	Highlights
<p>While the Client was processing 4000 loans per month; however, it faced the crucial challenge of being unable to scale due to the high effort intensive nature of the process. Further, the required for training Loan agents was also high, preventing rapid scale-up of volumes. Finally, the processing time was also high</p>	<ul style="list-style-type: none"> ▪ Multiple and fragmented audits with duplicate tasks being carried out by teams ▪ Continuous changes in the operating procedures ▪ New templates being introduced requiring changes 	<ul style="list-style-type: none"> ▪ AHT reduced by 70% from 58 min. to 18 min. ▪ 50% reduction in headcount on a base of 70 FTEs. • Automation enabled integration of multiple audit fragments ▪ Process able to scale up to 3 times 	<p>~ \$ 3+ Mil Save (Over 3 years) +500k loans processed</p> <p>As part of a large initiative (at the client-end), 78,000 loans were on-boarded in a 36-day period – 24 days ahead of the regulatory deadline</p>

Requirement: The Client had completed an acquisition and was expecting its servicing portfolio size to grow from ~200K loans to ~500K+. With such an increase in volumes, a solution was required to achieve seamless onboarding of loans, ensure regulatory compliance and provide adequate scalability to sustain future growth.

Key Challenges

- Multiple Systems involved
- Multiple Document types & variation
- High Manual Dependency
- Checks and Validations required at different stages



Document Review Solution

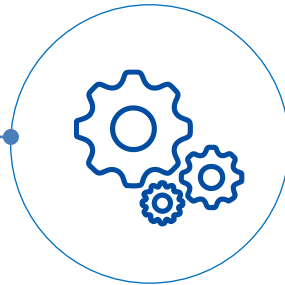
- Integration with various systems
- AI based OCR extraction of relevant data
- Auto-match functionality, customized workflow, significant reduction in manual review
- In-built checks and validation.

Success Summary



01 Saves on Manpower requirement

Over 40% reduction in effort required by the users to onboard loan documents on an on-going basis.



02 Compliance & Controls

Loan on-boarding was achieved within 60 days. Validation and controls built in the system made various audits redundant.
270k Bulk loans boarded to meet Compliance requirements



03 Commercial Benefits

Over **\$1.3 Million** savings projected over a period of 3 years of contract term
~300k loans processed (till date)

Document Package Indexing



Document Package Indexing - *The Business Context*

- Targets the huge volumes of documents of diverse nature received as input during Mortgage processing
- Most technical solutions for Document Classification depend on rule-based approaches and / or on meta-data - not very accurate and / or scalable

Document Classification / Package Indexing

High Costs \$\$\$

High Turnaround time



Target pdf file with bookmarks to the document types to be created



Customized target configuration: *Document file naming conventions, Bookmark conventions Loan number mapping etc.*

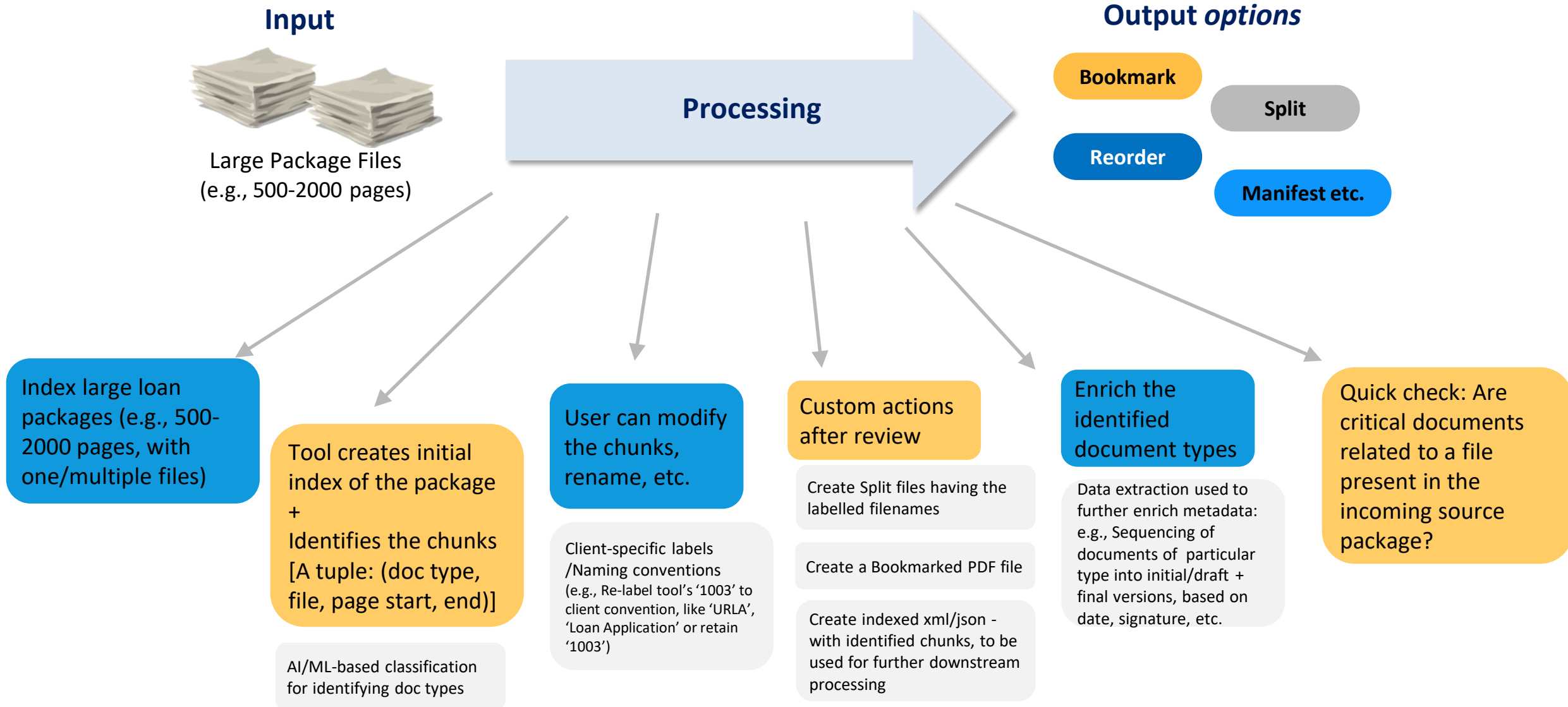
Source large bulk/catch-all files to be split into target files

Source filenames from prior to be mapped / renamed to the target filenames

Critical documents Presence Check

Standardized representation of documents, content, metadata ensures automated down-streaming processing and enables faster retrieval

Document Package Indexing - *The Solution*



Origination
**Underwriter Due
Diligence**



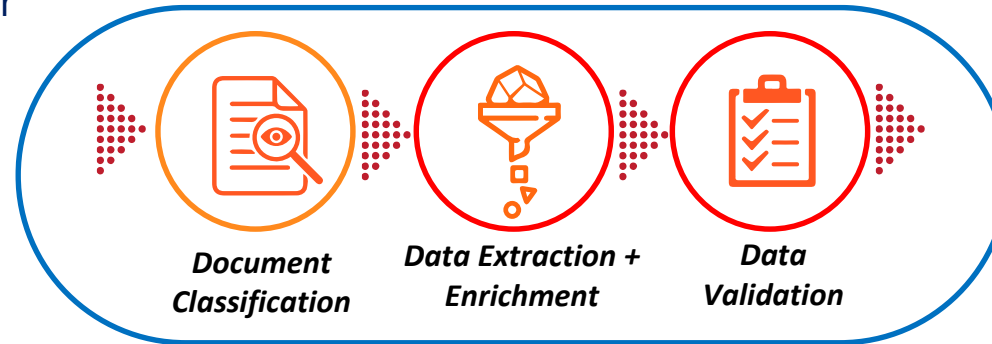
Origination Underwriter Due Diligence

Automation of Document verification for streamlining Underwriting process

- Focuses on the tasks of the *Pre-Underwrite / Underwriter team* to check and correct Borrower docs as they come – identify missing docs, locate missing / wrong data
- These set of tasks are highly manual and very time-sensitive as it directly impacts the time-to-close for a new loan deal
- Reduce risk to the bank and be compliant with investor guidelines

Solution Highlights

- **Validate a Loan** with respect to the Underwriter Review Checklist to assess the Loan
- Solution comprises capabilities of
 - Classification
 - Extraction
 - Enrichment and Rule Engine
 - Raise Stipulations & Clear Stipulations
- **Integration with LoS data** is available as part of the adapters
- **Larger set of Business Rules/Stipulations** can be configured
- **Smart UI Workbench** for Underwriter Solution User Interface



- Tags versions of documents to the underwriting decision
- Validate checks under the 4 C's – Credit, Compliance, Collateral, Capacity related parameters & monitors progress
- Enable long running transactions wherein missing documents are fetched from different external websites and sources
- Integration features with LoS systems like Encompass , Empower etc.
- Cloud enabled

Predictive Customer Servicing



The Challenge

& the Opportunity



**LEVERAGE
&
GENERATE**

the rich and highly Diverse Data sources pertaining to a Customer-Borrower

Actionable Business Insights & Predictions related to likely Customer Behavior

UNCOVER TRENDS, PATTERNS | CORRELATE DATA |
INSIGHTS INTO FUTURE CUSTOMER ACTIONS | SATISFACTION
LEVELS



**AI-based Guided Automation
for**

**Loan Servicing Excellence &
Borrower Satisfaction**



Inputs

- Dispute Filings
- Customer Contact History
- Customer Call Transcripts
- Payment History
- Letter Content
- Escalations Made
- Letters Sent
- IVR History
- Web Activity



Processing



Predictive / Correlation Analysis



Sentiment Analysis



Search Capability

Learnings from 1000s of past loans



Actionable Insights

Customers likely to file Disputes



Potential Default / Bankruptcy

Unhappy Customers

Towards Excellence in Customer Service

Predictive Customer Servicing – Solution Highlights & Benefits

Implemented for a leading US-based Mortgage Servicing Company

Solution Highlights

- **Extraction & Transformation** of structured & unstructured Data from different sources
- **Sentiment Analysis** gleaned from Customer Interactions (Contact History & Voice Transcripts)
- **Search capabilities** of historical data across multiple data sources
- Prediction Model based on **learning** from ~**6.5mil data points**

Implementation Highlights

- Ingestion of data configured across over 10 data sources
- Each Prediction run involves millions of transactions per data source spanning complete portfolio
- Prediction Model configured to run every 2 weeks or / on daily basis (horizontally scaled out deployment)
- Prediction Model improved based on past learnings

Benefits



50% accuracy in identifying Dissatisfied Borrowers

Early Warning Insights for Bank Executives for Proactive Actions



Higher

Customer Satisfaction

Lower

Lower Disputes / Defaults / Bankruptcy

*Service*Due Diligence Solution



- Evaluation of the Loan Portfolios by the Loan Underwriter
- Involves analysis of data from a varied set of documents (involves browsing through 100s or 1000s of documents)
- Highly manual, time-consuming and difficult to scale.

Mortgage Servicer Due Diligence of Loan Portfolio

High SME costs \$\$\$

*(Health / Risk Analysis)
Decision on purchase of New
portfolio / Evaluation of existing
portfolio)*



Time-Consuming

Requires
processed data
from...



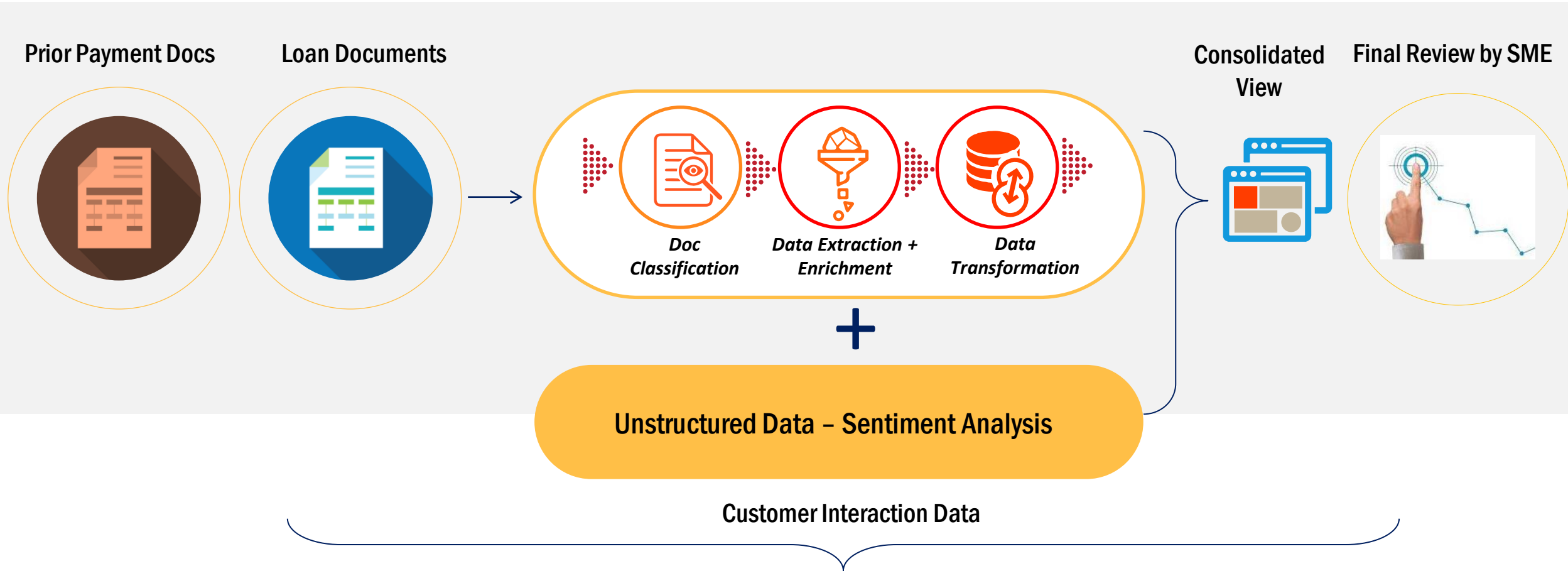
**Loan Documents +
Prior Payment Docs**

*Multiple Versions
Large, Jumbled Files
Complex Data
Extraction*

Customer Interaction Data

*Identifying Customers with
issues - Unstructured Data*

Due Diligence Solution – *Schematic View*



High degree of automation with minimal human assistance

Faster deal review through *Automation* of human intensive tasks

Scaling up to handle large # of new deals

Due Diligence Solution – Case Study & Benefits

Implemented for a leading US-based Mortgage Servicing Company

Solution Highlights

- **Document Classification** identify correct document types + versions
- **Extraction** - multiple Loans Document types
- **Extraction** - multiple Payment History documents types (structured & unstructured)
- **Sentiment Analysis** - unstructured *Customer Interaction Data*
- **Combined and Correlated view**

Implementation Highlights

- # of Prior Servicer (templates) configured:
 - 27 *Customer Interaction data* templates
 - 14 Loan doc types
 - 26 Payment History data templates
- Initial scope – Due Diligence for new purchase. Now extended to evaluation of existing portfolio
- New template configuration: within 1 week

Benefits

~50-60%

Savings

Human Effort

Processing Time



~140,000

Loans processed

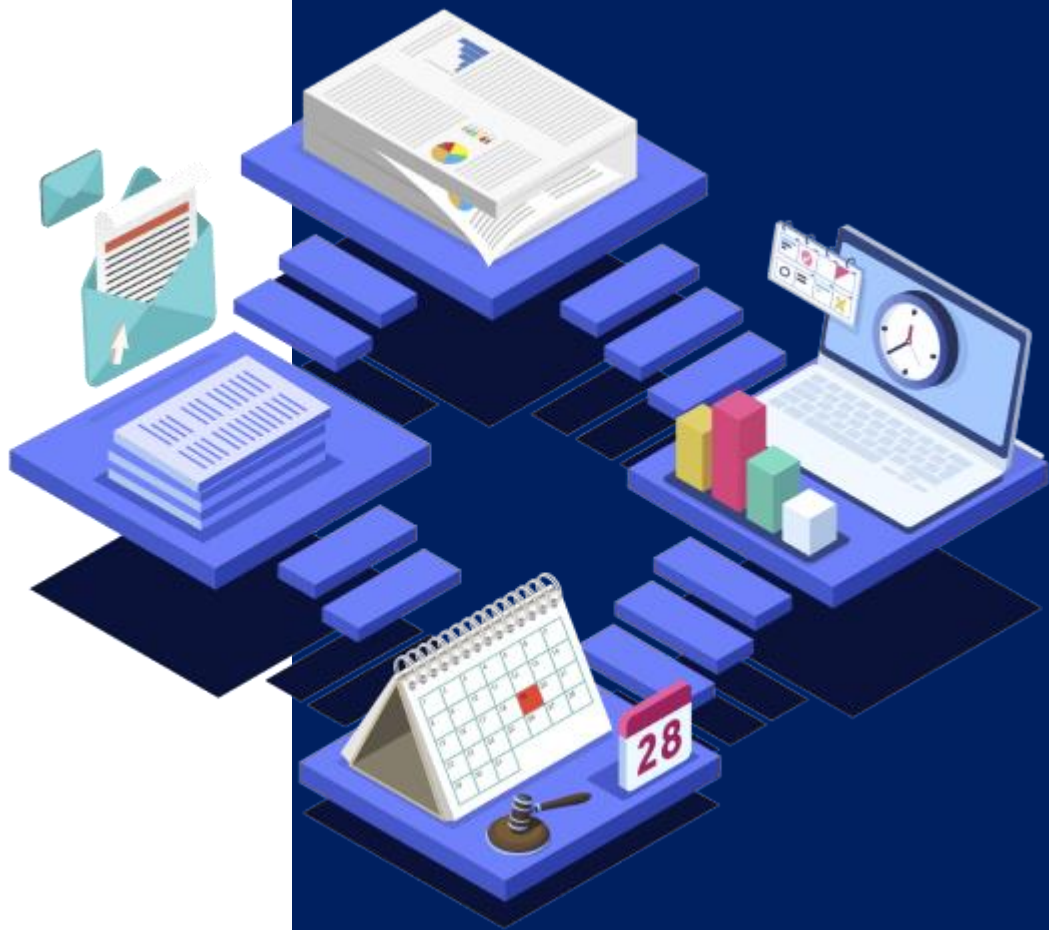
~30,000

Peak loans processed in a week

Enabled Client Ramp-up

Client able to take on more Deals & provide more services to their clients

Payment History Analytics



- Prior payments made by the Borrower important for several processes (Cash-flow, bankruptcy, foreclosure, call center etc.)
- Payment data contained in large, complex files. Extracting data from these is highly manual, time-consuming and error-prone.



Can you find...

a Needle in a Haystack



Processing PAYMENT HISTORY Documents

~ 45 mins manual effort to search and analyze details of a single borrower in a huge file

Sample Payment History Doc

7	42,499.34	.00	.00	.00	1,956.47	22,801.14	.00	.00	6349.99	.00	12-01-10	.00	00	F
8	O P & I 1ST P&I 2ND	CO TAX CITY TAX	HAZ INS	M I P	LIEN	BSC A & H	LIFE	MISC	REP RES	TOT PAYMT	INT RATE	DT	BM	
9	1400.05	.00	948.40	329.42	.00	.00	.00	0	.00	0	.00	0	.00	2677.87 .0387500 1 9
10	0 1ST ORIG MTG	2ND ORIG MTG	PRIN BAL BEG	INT IND	CAP FLAG	MTGR SSN	DEF INT BAL	PRIOR YR	PPD INT	PPD INT	IND	GPM	ORG	
11	212,000	0	55,473.70	2	XXX XX	XXXX	0.00	0.00	0.00	0	0	0	0	
12	OASSUM-DT XFER-DEED	FHA-SEC/NUM	LIP PAYOFF	FC-TRK-SW	YE-ACQ-RPT/DATE	SALE-ID	EXEMPT	PLGD-LN	FMT-OPT	CALC-METH	ELOC	BNKRPCY	CH/DT	
13	000				N/11-30-92	XXXXXXXXXX	6							
14	OPMT PERIOD	1098-DET-HIST	POINTS-PAID/RPTG	YR	SUPPR-MICR-STMT	DI-NOT-RPT-YR	REAS CAUS	RI-HDR-SW	1ST-DUE-DT	REO	STAT/COMPL	DT		
15	12		.00				1		08-83					
16	OIOE CREDIT YTD/W-H	SW/W-H	BALANCE	IORE CREDIT YTD/W-H	SW/W-H	BALANCE	CONSTR CD	NO PURGE	FLAG/YR	BNKRPT	STAT	LAST DEF	DUE	
17	.00	.00	.00	.00	.00	.00						07-13		
18	OREC CORP ADV BAL	3RD REC CORP ADV BAL	FORECL WKST	CODE/REINSTATE	DATE	INIT ESC	STMT	CODE /	DATE	LOSS MIT	STATUS/COMPL	DATE		
19	5,869.48	68.50	A	01-28-05						C		09-30-11		
20	O DUE PROC TP	SQ	AMOUNT	PRINCIPAL	PRINCIPAL	INTEREST	ESCROW	ESCROW	ADVANCE	STATUS	STATUS	UNEARNED	OTHER	CFD
21	DATE DATE	TR NO	RECEIVED	PAID	BALANCE	PAID	PAID	BALANCE	BALANCE	AMOUNT	BALANCE	INT-BAL.	AMOUNTS	DCT
22	BAL-FWD				55473.70			.00	16383.90		.00	.00		
23	01-11 01-14 3 13 1		CHECK #123456	MICR CHECK #0000000000	2939.92-	2939.92-		PAYEE CD	123456789					
24	01-10 01-14 1 61 2		2939.92	.00	55473.70	.00	2939.92	.00	19323.82	.00	.00	.00		1
25	00-00 01-26 6 31 1		.00	PROCES SAP	REASON FCIN FC	INSPECTION		CORP:SEQ	PAYEE 91R11	ORIG PAY	104769		9.00	AR
26				CHECK #99999	M									
27	00-00 02-28 6 31 1		.00	PROCES SAP	REASON FCIN FC	INSPECTION		CORP:SEQ	PAYEE 91R11	ORIG PAY	104769		9.00	AR
28				CHECK #99999	M									
29	04-11 04-13 3 13 1		CHECK #123456	MICR CHECK #0000000000	2939.91-	2939.91-		PAYEE CD	123456789					
30	01-10 04-13 1 61 2		2939.91	.00	55473.70	.00	2939.91	.00	22263.73	.00	.00	.00		1
31	06-11 05-12 3 51 1		CHECK #123456	MICR CHECK #0000000000	2528.00-	2528.00-		PAYEE CD	123456789					
32	01-10 05-12 1 61 2		2528.00	.00	55473.70	.00	2528.00	.00	24791.73	.00	.00	.00		1
33	00-00 05-24 6 31 1		.00	PROCES SAP	REASON FCIN FC	INSPECTION		CORP:SEQ	PAYEE 91R11	ORIG PAY	104769		14.00	AR
34				CHECK #99999	M									
35	08-12 06-28 3 52 1		CHECK #123456	MICR CHECK #0000000000	1770.00-	1770.00-		PAYEE CD	123456789					
36	01-10 06-28 1 61 2		1770.00	.00	55473.70	.00	1770.00	.00	26561.73	.00	.00	.00		1
37	00-00 07-29 6 31 1		.00	PROCES SAP	REASON FCIN FC	INSPECTION		CORP:SEQ	PAYEE 91R11	ORIG PAY	104769		14.00	AR
38				CHECK #99999	M									
39	01-10 08-08 1 73 1		26762.54	1125.92	54347.78	352.49	1277.82	1277.82	26561.73	.00	.00	.00		1
40													1956.47	W
41														
42														
43														
44	01-10 08-08 1 68 2		.00	.00	54347.78	.00	1277.82-	.00	25283.91	.00	.00	.00		1
45													1277.82	V
46														
47	02-10 08-08 1 73 3		.00	1133.08	53214.70	345.33	1277.82	1277.82	25283.91	.00	.00	.00		1
48														
49														
50														
51	02-10 08-08 1 68 4		.00	.00	53214.70	.00	1277.82-	.00	24006.09	.00	.00	.00		1
52	2J1062-831			IOB, N.A.										
53	LOAN-NO (CONT'D)				LOAN HISTORY Y-T-D	INV BDU CAT	003	INV#	8765432	T01	12/31/11			
54	OLN#	0022334455	JACK DOE		JILL DOE			EMP 0	POF2					
55	O DUE PROC TP	SQ	AMOUNT	PRINCIPAL	PRINCIPAL	INTEREST	ESCROW	ESCROW	ADVANCE	STATUS	STATUS	UNEARNED	OTHER	CFD
56	DATE DATE	TR NO	RECEIVED	PAID	BALANCE	PAID	PAID	BALANCE	BALANCE	AMOUNT	BALANCE	INT-BAL.	AMOUNTS	DCT
57													1277.82	V
58														
59	03-10 08-08 1 73 5		.00	1140.27	52074.43	838.14	1277.82	1277.82	24006.09	.00	.00	.00		1
60														



- Complex Text formats
- Multiple Transactions for each loan
- 1000s of lines per document

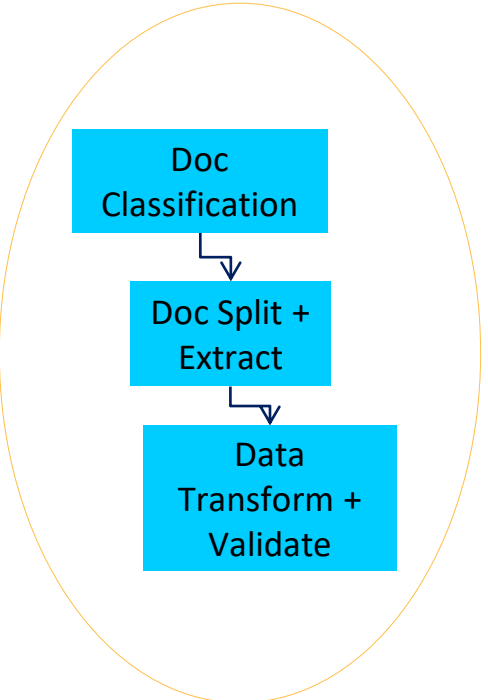
Multiple Loans in Single Document - upto 1000

Payment History Analytics Solution: *Schematic View*

Large Complex Payment History Doc

Data of 100s of borrowers
1000s of lines
Varying Docs and Data formats

Page/Loan Header	Transaction																												
<table border="1"> <tr> <th>DATE</th> <th>DATE</th> <th>TR NO</th> <th>RECEIVED</th> <th>PAID</th> <th>BALANCE</th> <th>PAID</th> </tr> <tr> <td>04-11-04-13</td> <td>3</td> <td>13</td> <td>1</td> <td>CHECK #123456</td> <td>MEICR CHECK #000000000</td> <td>2939.92</td> </tr> </table>	DATE	DATE	TR NO	RECEIVED	PAID	BALANCE	PAID	04-11-04-13	3	13	1	CHECK #123456	MEICR CHECK #000000000	2939.92	<table border="1"> <tr> <th>DATE</th> <th>DATE</th> <th>TR NO</th> <th>RECEIVED</th> <th>PAID</th> <th>BALANCE</th> <th>PAID</th> </tr> <tr> <td>04-11-04-13</td> <td>3</td> <td>13</td> <td>1</td> <td>CHECK #123456</td> <td>MEICR CHECK #000000000</td> <td>2939.91</td> </tr> </table>	DATE	DATE	TR NO	RECEIVED	PAID	BALANCE	PAID	04-11-04-13	3	13	1	CHECK #123456	MEICR CHECK #000000000	2939.91
DATE	DATE	TR NO	RECEIVED	PAID	BALANCE	PAID																							
04-11-04-13	3	13	1	CHECK #123456	MEICR CHECK #000000000	2939.92																							
DATE	DATE	TR NO	RECEIVED	PAID	BALANCE	PAID																							
04-11-04-13	3	13	1	CHECK #123456	MEICR CHECK #000000000	2939.91																							



Payment Data Extracted & Transformed to Standard formats

Payment History Explorer

Loan No.	Prior Loan No.	Validated	Missing PH	Missing Transactions (-3m)	Active
103333333	3333333	No	No	No	Yes

Pool	Unpaid / Total Principal Balance	Escrow Balance	Restricted Escrow Balance	Suspense Balance	Recoverable Advance Balance	Late Charge Balance (k)
DEM5VC001	184,636.28 / 184,636.28	-6,437.58	0.00	0.00	2,625.00	

Pool	Principal Balance	Escrow Balance	Restricted Balance	Suspense Balance	Recoverable / Total Advance Balance	Late Charge Balance (k)
DEM5VC001	184,636.28	-6,437.58	0.00	0.00	2,400.00 / 2,400.00	



All past payment data extracted and transformed for each Borrower

Payment History Analytics – *Solution Highlights & Benefits*

Implemented for a leading US-based Mortgage Servicing Company

Solution Highlights

- **Classification** of semi/un-structured payment history files by format
- **Splitting** – Loan-wise payment history from consolidated file
- **Extraction** – of transactions for a single loan
- **Transform** – transactions to desired format
- **Automatic validation** – of payment history against loan boarding details
- Complex Extraction processing:
 - Large files (~ 1GB+)
 - Multiple document formats from multiple loan sources - Partner Banks, Prior servicers
 - Various file types (such as csv, pdf, text,
 - Single file may contain data of multiple loans (100-1000 or more)

Implementation Highlights

- One-time Extraction & Processing - Use multiple times across processes
 - Enables automation of reports for bankruptcy, foreclosure and risk analysis of mortgage
- Client portfolio size - 968 K loans
 - Over 75% of Portfolio processed through this solution
 - Total transactions in solution - over 168 million
 - 15+ loan sources, 60+ formats configured
- Enables client to identify missing payment history details during loan boarding
- Allows quick access of prior history by call center operations while engaging the borrower

Benefits

~70-80%

*Human Effort
Processing Time*

~750,000

Loans processed

Improves efficiency of
the human in the loop

*Client can analyze loan
quality & provide services to
their customers faster*





THANK YOU

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