
Artificial Intelligence for Financial Services Proofs of Concept



Microsoft



Atos

Foreword

I am delighted to present three Artificial Intelligence Proofs of Concept for financial services firms in wealth management, general insurance and personal lending.

Built by Atos Syntel India in association Microsoft and Dell EMC in Q1 2019, each demonstrates the capabilities of a range of AI tools and technologies working in combination for practical business value.

This briefing covers each Proof of Concept in a common format:

1. Abstract
2. Business context
3. Success criteria
4. Business benefits
5. Functionality
6. Demonstration process flow
7. AI technologies and infrastructure
8. Onward development
9. Glossary of terms

I hope you find these Proofs of Concept throw new light on how AI could benefit your financial services business in many different ways and look forward hearing your feedback and suggestions.



Chris Darlington
Head of Financial Services
Atos UK and Ireland



Deal 22,015 1,107.53/1,098.53 10/06/11

1 Day

Proof of Concept 1

Wealth Management: Digital Assistant

1. Abstract

An artificially intelligent, self-learning, text- or speech-based natural language-based Digital Assistant which fulfils a wide range of customer enquiries and requests, providing in-context, personalised responses including illustrative investment information. Positioned to enhance client service and distinguish the regulated accountabilities of Financial Planners and Investment Managers.

2. Business Context

Acquiring and managing the investment portfolios of Medium and High-Net-Worth individuals consumes much high-cost professional time. Wealth Managers everywhere are under pressure both to cut delivery costs and deliver the digital customer services that clients now expect. Deploying an artificially intelligent Digital Assistant enables prospects and clients to interact where and when they choose, and increases the productivity of regulated Financial Planners and Investment Managers by enabling them to focus more of their day on higher value revenue-generating activities.

3. Success Criteria

Business

That the Digital Assistant:

- Releases high cost professional resources from basic interactions to focus on complex interactions and other value-added activities.
- Removes a source of customer dissatisfaction and so risk of customer loss.
- Continuously improves capabilities resulting in higher customer satisfaction by broadening the set of requests which can be handled.

Technical

That the Digital Assistant:

- has the ability to associate the correct meaning with customer statements in the context of investment goals and context.
- is robust in its ability to understand many ways in which a customer may word enquiries and the way information is provided so the conversation is experienced as natural by the customer.
- will retain the context of what has been discussed including the ability to recognise when the customer drives the conversation down a different route.
- associates the intended meaning and needs of the customer with a proper and relevant response in the context of the conversation.

4. Business Benefits

New channel to acquire new clients and transparently gather usage data about the bank's customers using electronic channels, the type of questions asked, business opportunities and trends of each, so enabling the bank to evolve its business plan.

Revised business processes that enable customers to interact with the firm 24/7.

Increased client / prospect interaction through continuous availability.

Better defined client investment enquiries and requests for regulated Financial Planning Manager attention.

5. Functionality

Available as an online text or voice interactive service, Digital Assistant 'Nestor' responds to a wide range of requests and enquiries, from simple, fact-based questions to highly personalised requests, including:

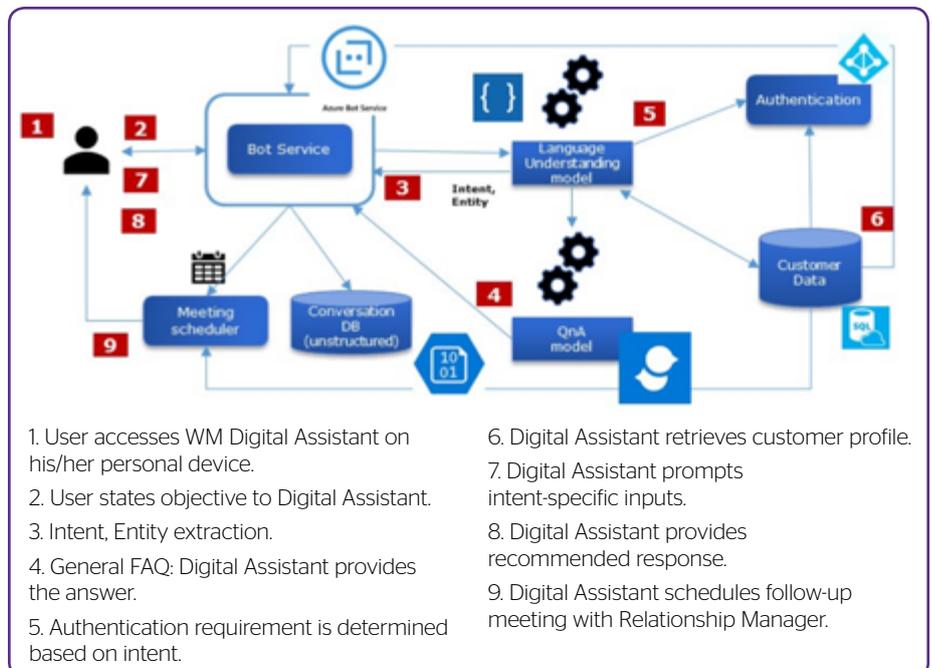
- Prospective customer information request.
- Portfolio composition, reports and valuations.
- Risk appetite management.
- Investment, pension and tax regulations.

- Product features and eligibility.
- Future investment requirements.
- Life events and implications.
- Fees, terms and conditions of service.
- Corporate governance and regulatory record.
- Corporate investment strategy and methodologies.
- Service interruptions and resolution.
- Sector and market investment forecasts.
- Interest rate forecasts.

The Digital Assistant 'Nestor' learns continuously from the questions it is asked, so continuously improving the breadth and depth of its artificially intelligent responses and the customer's perception of utility, value and trust

6. Demonstration Process flow

Powered by Microsoft Azure Cognitive Services, the Digital Assistant draws as needed on existing customer product holdings and portfolio information; authenticates according to the level of data sensitivity; interacts with email and other social media channels to provide confirmatory information including time, dated telephone appointments with the client's relationship manager.



1. User accesses WM Digital Assistant on his/her personal device.
2. User states objective to Digital Assistant.
3. Intent, Entity extraction.
4. General FAQ: Digital Assistant provides the answer.
5. Authentication requirement is determined based on intent.

6. Digital Assistant retrieves customer profile.
7. Digital Assistant prompts intent-specific inputs.
8. Digital Assistant provides recommended response.
9. Digital Assistant schedules follow-up meeting with Relationship Manager.

Wealth Management: Digital Assistant

7. AI Technologies and Infrastructure

This Proof of Concept was built using Azure cognitive services tabulated here and is demonstrated in an Azure environment.

Services	Azure Services	Purpose
Language Understanding module	LUIS	Build Language Understanding Model
Question and Answer module	QnA Maker	Build Question Answer Model
Speech Service	Azure Speech Service	Voice Service
Storage & File System	Azure Blob Storage	NoSQL storage of conversation transcription
SQL DB	Azure SQL DB	Persistent Storage of customer data
Streaming Service	Azure Streaming Analytics Job or HDInsight	Retraining in real time. Conversation sent to back end processing to extract unanswered questions
Hosting environment	Virtual Machine (Medium)	Host the services
Bot framework	Microsoft bot framework	Bot framework

9. Glossary of Terms

Terms	Details
Nestor	Wealth Management AI-based chatbot.
Transcript	Conversation logs available for download.
HNWI	High-Net-Worth Individuals.
Client/Customer	The consumer of the wealth management services, a HNWI person having a Wealth Management account.
Suspect	A potential customer of the bank's wealth management services, prior to qualification/invitation.
Prospect	A prospective client who has been invited to consider consuming the banks wealth management services.
Relationship Manager	The person assigned by the wealth management firm to interact with the customer whenever required to discuss services, answer enquiries and fulfil requests. The Relationship Manager may not interact with the Digital Assistant himself but will have access to reports of interaction between the Digital Assistant and the client.

8. Onward Development

Depth: increasing capability of existing interactions.

Width: adding new customer intents.

Adjacent areas: other areas in Wealth Management or High-Net-Worth Banking.

Robustness: improved ability to handle better questions asked, in terms of language and diction.

Usability: introduce auto-completion of questions, offer predictive choices and proactive alerts with recommended actions.

Live Proof of Value: development and testing of a Proof of Value exercise followed by live pilot with a live Financial Services bank, Wealth Manager or Private Bank or other regulated provider of tailored investment services.

Proof of Concept 2: AI-assisted Claims Framework for Commercial or Personal Auto Insurance

1. Abstract

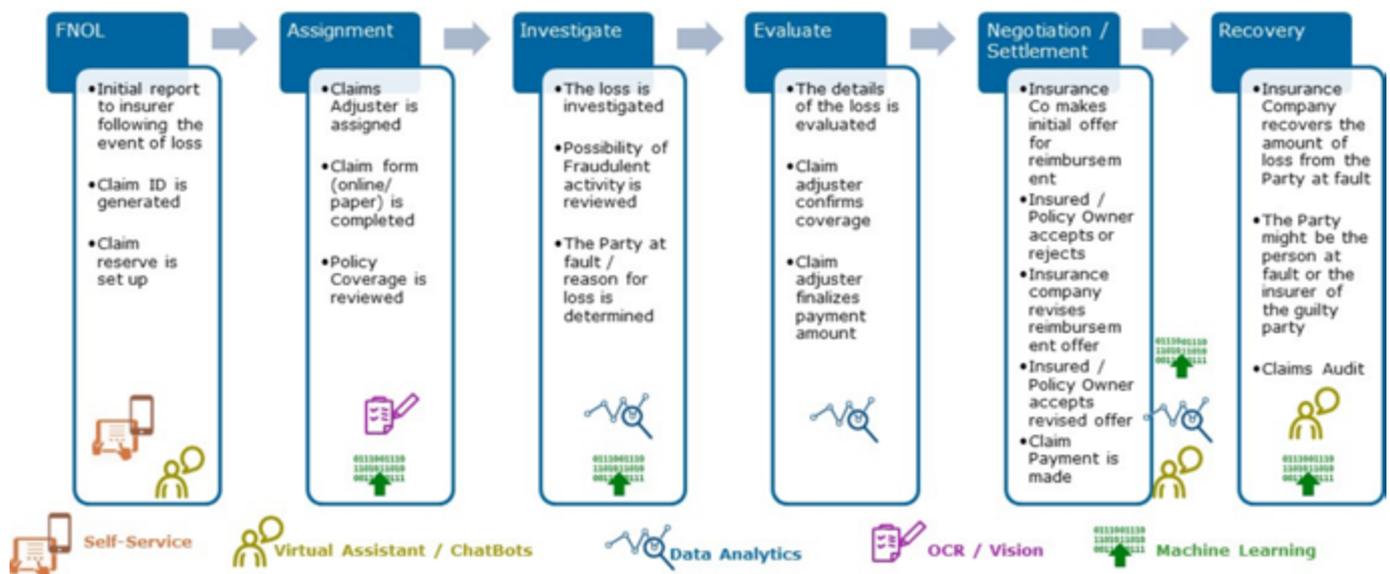
The purpose of this exercise is to understand how AI may be implemented across the six phases of the Commercial or Personal Auto Claims life cycle to improve customer satisfaction and reduce the overall claims operational time and cost.

The Proof of Concept automates, using an artificially intelligent Virtual Assistant, the First Notification of Loss business process, enabling policyholders to communicate, via a text or speech dialogue, all the key details needed to initiate a claim, generate a unique Claim ID and set up a Claim reserve.

It sits within a fuller suite of AI-enhanced functions across the Claims Framework which are capable of equally rapid development in collaboration with an insurance client.

2. Business Context

Claims management is the major operational cost centre of the insurance value chain. The Commercial / Personal Auto Insurance Claims life cycle contains six phases: First Notification of Loss, Assignment, Investigation, Evaluation, Negotiation / Settlement and Recovery, each of which can be enhanced through the application of artificial intelligence.



First Notification of Loss is a major consumer of experienced contact centre resource time and a critical process in the customer/insurer relationship to get right, both to maintain customer trust and to capture all the relevant information to enable the insurer to assess the claim promptly, accurately and fairly. It comprises three activities:

- Initial report to insurer following the event of loss
- Generation of a unique Claim ID
- Set up of a Claim Reserve to provide for estimated cost of meeting the claim.

3. Success Criteria

Business

That the Virtual Assistant enables:

- improved customer experience in terms of eliminated wait times with increased choice of ways to communicate details of the insured incident.
- improved completeness of relevant data

captured in the First Notification of Loss process.

- quicker registration of the claim through direct integration with the Claims Management System.
- immediate provision of unique Claim ID to the customer with integration to email or another selected digital interface.

Technical

That the Virtual Assistant:

- understands and responds accurately to policyholder's questions, demonstrates that understanding through verbal or text confirmation and guides policyholder through the process.
- provides guidance to the policyholder on any essential actions that need to be taken for example, emailed provision of photographs of damage to vehicle.
- integrates seamlessly with subsequent AI-enhanced processes in key aspects of the six-stage process of Claims Management, namely:

- Assignment: AI-assisted decisioning on need for Claims Adjuster assignment.
- Claims Priority and Severity Indicator: Analytics and machine learning-assisted determination of severity of claims in progress.
- Claims Fraud Indicator: Machine-learning-assisted prediction of fraudulent claims.
- Claims Optimum Settlement Value calculator: Analytics and machine learning-assisted determination of optimum claim settlement amount.
- Sentiment Analysis for improved claims experience: analytics and machine learning-assisted determination of Policyholder's sentiment during the claims management process.

AI-assisted Claims Framework for Commercial or Personal Auto Insurance

4. Business Benefits

Reduced operational cost by eliminating manual contact centre resource effort at point of claim notification. The details provided by the Policyholder will automatically be entered in the Claims Management System.

Reduction in turnaround time, since the Virtual Assistant will immediately enter the loss details in the Claims Management System and provide a Claim Reference ID.

Improved customer satisfaction by eliminating wait times at the call centre, especially during the stressful time following an accident.

5. Functionality

Actors: Policy Holder, Insurance Company, Virtual Assistant.

Pre-condition: Driver has an active vehicle insurance policy with the Insurer.

Trigger: An accident causing damage to the covered vehicle or bodily injury to driver and/or others, or all of these.

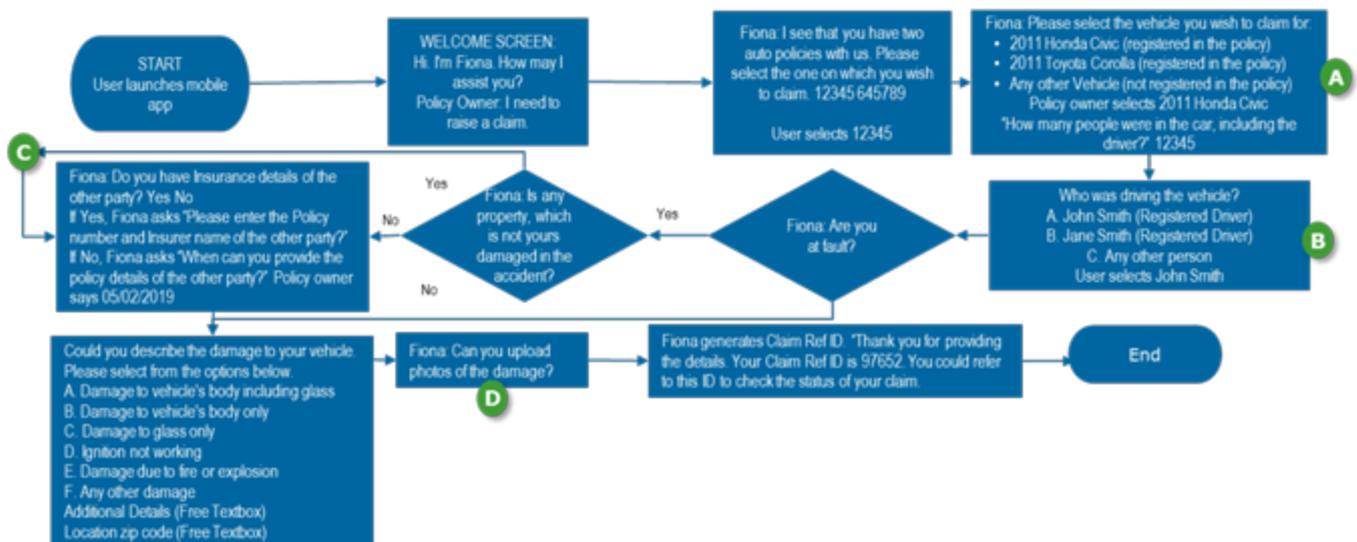
At present the First Notification of Loss is initiated when the Policyholder calls the insurance company and provides details of the incident. The insurance company representative takes down the details of the loss and forwards it for further processing. This process can be revolutionised with the use of Virtual Assistants.

Instead of calling the insurance company to notify the loss, the Policyholder would invoke the Virtual Assistant and enter the details of the loss. Based on the details of the loss provided by the Policy Owner, the Virtual Assistant will ask questions related to the loss in order to capture all the details needed to be able to process the claim smoothly. The Virtual Assistant can operate in either of two modes:

- via smartphone using voice command. The policy owner will enter all the details through voice dialogue with the Virtual Assistant.
- in desktop on the insurer's website. The policy owner will type in all the details of the loss, through text dialogue with the Virtual Assistant.

6. Demonstration Process Flow

The proof of concept process flow is detailed below, showing the question and response paths to complete the first notification of loss.



AI-assisted Claims Framework for Commercial or Personal Auto Insurance

7. AI Technologies and Infrastructure

This Proof of Concept has been developed with Google tooling tabulated below and is demonstrated in a Google environment.

Services	Services Type	Infrastructure	Purpose
Language Understanding, Q&A module	Google	Provided by Google dialogflow	Build Language understanding and Q&A Model
Speech Integration Service	Google	Provided by Google dialogflow	Voice Service, both speech-to-text and text-to-speech (Google assistant, Phone gateway)
Storage & File System	Custom	Windows 64-bit VM	For session logging and transcripts
Cloud SQL	Google	Storage by GCP	Persistent storage of customer data
Reinforcement service	Custom	Google dialogflow + VM	Retraining in real time. Conversation sent to back end processing to extract unanswered questions
Hosting environment	Custom	64 bit, windows or, with python3 installed, 8GB RAM, 500 GB HD	An environment to host the back end services and front end web application
Firebase Realtime database service	Google	Storage by GCP	NoSQL database to store and sync data in Realtime
Blob storage service	Google	GCS + VM	To store images and transcripts as blob

This Proof of Concept has also been developed with Google and Azure services on an Azure Virtual Machine:

Services	Services Type	Infrastructure	Purpose
Hosting environment	Azure	64-bit, windows OS, with python3 installed, 8GB RAM, 500 GB HD	An environment to host the back end services and front end web application
Language Understanding, Q&A module	Google	Provided by Google dialogflow	Build language understanding & Q&A Model
Speech Integration Service	Google	Provided by Google Dialog flow	Voice Service, both speech-to-text and text-to-speech (Google assistant, Phone gateway)
Storage & File System	Azure	Windows 64-bit Azure VM	For session logging and transcripts
Reinforcement Service	Google + Azure	Google Dialog flow + Azure VM	Retraining in real time. Conversation sent to back end processing to extract unanswered questions

8. Onward Development

In collaboration with a live insurance client, build out the full AI-enhanced solution scope for which business rules have been defined where indicated:

- Assignment: AI-assisted decisioning on need for Claims Adjuster assignment. Awaits client to define parameters and provide datasets.
- Claims Priority and Severity Indicator: Analytics and machine learning-assisted determination of severity of claims in progress. Data elements and business rules identified. Awaits client data to enable model build.

- Claims Fraud Indicator: Machine-learning-assisted prediction of fraudulent claims. Data elements and business rules identified. Awaits client data to build model.
- Claims Optimum Settlement Value calculator: Analytics and machine learning-assisted determination of optimum claim settlement amount. Awaits client to enable development of parameters and datasets.
- Sentiment Analysis for improved claims experience: Analytics and machine learning-assisted determination of Policyholder's sentiment during the claims management process. Model already built. Awaits adaptation to client requirements.

9. Glossary of Terms

Terms	Details
FNOL	First Notification of Loss.
SSN	Social Security Number.
OCR	Optical Character Recognition.
VPA	Virtual Personal Assistant.
Fiona	Virtual Assistant Persona.

Proof of Concept 3: Fraudulent Loan Default Prevention

1. Abstract

An AI Agent-assisted fraudulent activity detection solution which uses multiple sources of data, including external data sources, to identify suspicious loans as, or more accurately than, existing detection methods:

- Algorithms instruct an AI Agent to interrogate a loan book data set including loan holders, the size, duration, repayment type and frequency, repayment behaviour to date.
- The AI Agent continuously interrogates the dataset to discover common fraudulent default indicators from historic fraud cases in the dataset.
- The AI Agent uncovers loan records which have similar fraudulent default indicators in the loan data set.
- The AI Agent looks for external data from authorised, mandated sources (e.g. non-loan account behaviour; unusual product purchase behaviour; residential address) to seek corroborative data to suggest either that the loan holder is likely to be fraudulent or simply unfortunate.

Fraud investigation or defaulter prevention workflows in the solution can be initiated by an expert Fraud Analyst resource.

The Artificial Intelligence Agent continuously learns from Fraud Analyst decisions and improves its ability to identify 'false positive' detections of apparently fraudulent behaviour.

For different business contexts, different risk profiles can be created. To satisfy regulatory compliance requirements and maintain transparency in business requirements, the AI Agent also presents the factors which most strongly contribute to its identification of a suspicious activity and the actions it then recommends be taken.

Such AI Agent recommendations can be used to enrich a customer's profile and credit ratings, which can be then be linked to real-time transactions such as credit card purchases, to take dynamic real-time decisions like denying a payment or decreasing a customer's borrowing limit to prevent apparently fraudulent usage.

The Proof of Concept is positioned to improve the management of fraudulent activities detection process in banking or credit card organisations, so cutting operational losses, improving regulatory standing and contributing to increased lending capacity.

2. Business Context

Financial services organisations incur huge revenue losses due to fraudulent activities or late detection of loan defaulters. Systems and processes in place to detect suspicious activities are largely rules-based.

Rules-based solutions are good as deterministic systems, but in an ever-changing business environment there is a need for a solution which can rapidly digest new data sources, learn from human decisions in investigation workflows, constantly improve its recommendations, so enabling less frequent human expert intervention due to false detections, and easily adaptable to new categories of fraudulent situations.

This Artificial Intelligence-based fraud detection solution overcomes the shortcomings of rule-based solutions and provides a robust framework to adapt to changing business contexts.

3. Success Criteria

Business

That the AI agent-assisted fraudulent activity detection solution can:

- detect suspicious loans through the application of algorithmically-based machine learning and bring it to Fraud Analyst's notice in his Workbench.
- enable an expert Fraud Analyst to understand contributory factors for loans to be classified as suspicious.
- analyse massive loan book datasets based on multiple risk profiles.
- display KPIs on accuracy of fraud detection both in absolute terms and relative to an unassisted fraud detection process.

Technical

- That the accuracy of the AI-assisted fraud detection increases continuously as it learns.
- That the speed of detection and validation is at least as quick and most often much quicker, than an expert Fraud Analyst's analysis.
- That multiple data sources can successfully be integrated into the AI-assisted Agent's analysis to provide ever-improving levels of accuracy and expert Fraud Analyst's trust.

4. Business Benefits

Financial services organisations can:

- improve the effectiveness of the fraudulent activities detection process
- reduce revenue losses with early detection and prevention actions
- decrease cost and human resource intensity in fraud detection processes
- decrease in cost of defaulter investigation by reduction in the volume of false positives
- improve business capacity and agility to deal with new types of fraud activities and data sources.

5. Functionality

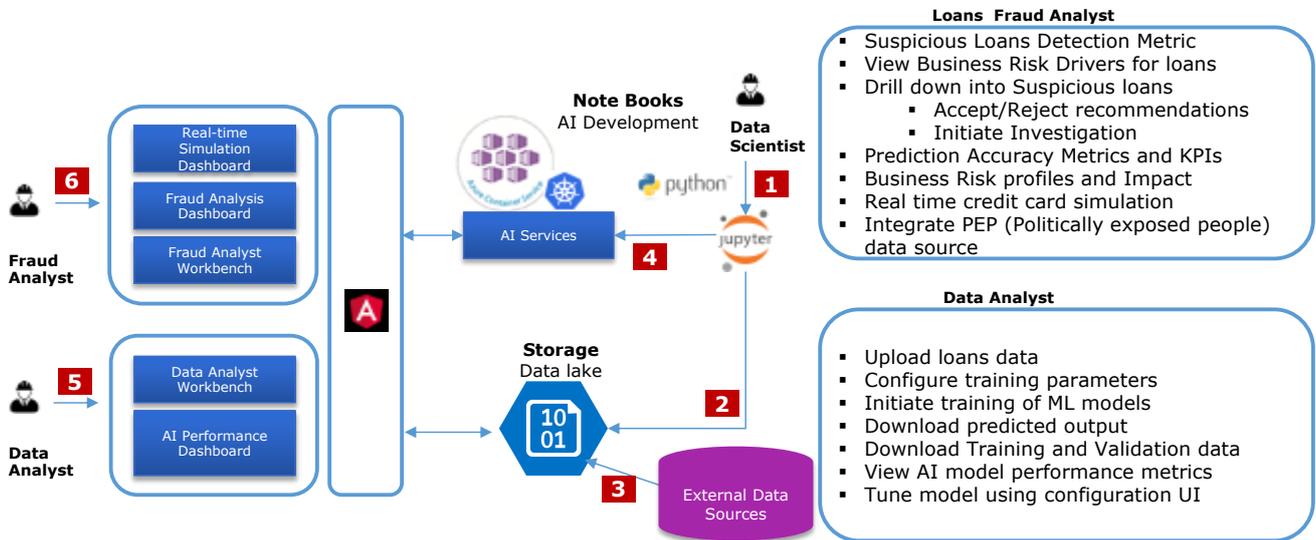
The solution functionality highlights are as follows:

- The AI Agent detects suspicious transactions and predicts potential fraudsters.
- An expert Fraud Analyst can view suspicious transaction details and over-ride machine recommendations.
- Easy to bring new sources of data on stream and to correlate them for fraud detection.
- Capability to configure different fraud risk profiles based on business needs.
- Machine can learn from human decisions and improve its fraud prediction accuracy.
- Transparency or basis of AI recommendations ('Explainable AI').
- KPIs and trends on AI prediction accuracy and improvements.

Fraudulent Loan Default Prevention

6. Demonstration Process Flow

The process flow and tasks executed by the Loans Fraud Analyst and Data Analyst are shown below.



Solution Process Life Cycle Explanation

Step No	Description
1	Data scientist does exploratory analysis, creates AI models and fine-tunes models. Multiple iterations of this step are carried out during solution development
2	AI models get trained and validated on baseline data set
3	External and internal data sources are integrated into a data lake by the data engineer. Steps (1) to (3) are repeated until all relevant data sources are integrated, AI models are tuned until the accuracy of AI models is acceptable
4	AI models are deployed as services and integrated with the UI layer
5	Business Data Analyst can review AI accuracy and Business KPIs during initial deployment and during operational phase post a hyphen ie post-deployment. Feedback can be used to improve models and algorithms' configuration
6	Fraud Analyst can review suspicious transactions, initiate fraud investigation, give feedback, simulate real-time transactions, view KPIs/trends. Fraud Analyst decisions on workbench will be used to initiate automatic re-training of AI models to incorporate self-learning behaviour in solution

7. AI technologies and infrastructure.

The solution architecture is developed in such a way that it can be deployed on private clouds or in public clouds. For this purpose, we have used and enhanced open source machine learning (ML) models.

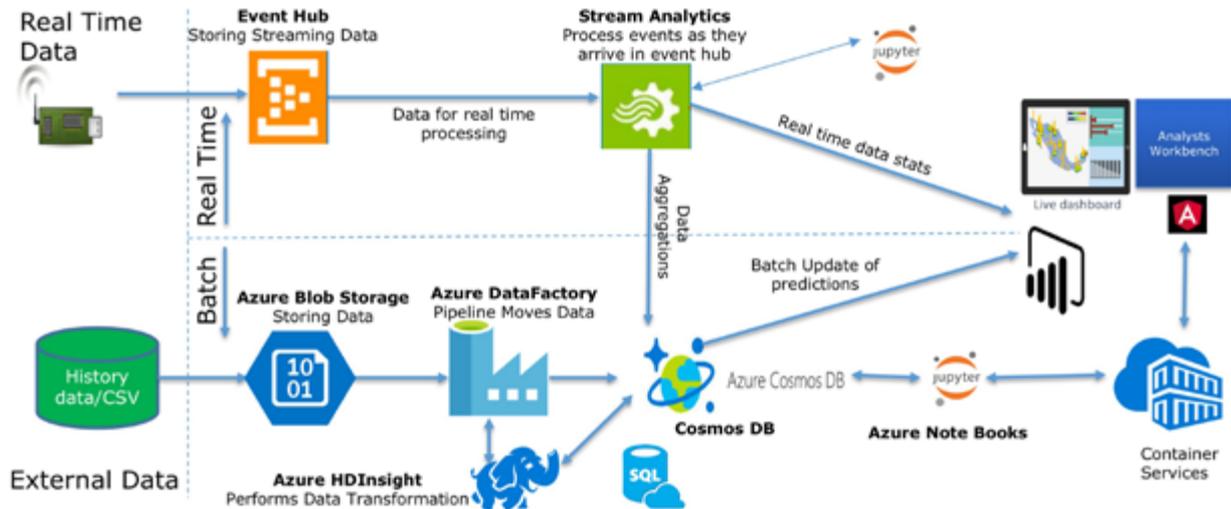
In public clouds like Azure we strive to benefit from native services available on it. In private clouds like Dell EMC's, we can benefit from frameworks available from the provider or deploy open source variants to deploy big data and machine learning services.

The solution is validated on Microsoft Azure and Dell/EMC. Services used and reference architecture for both clouds are shown below.

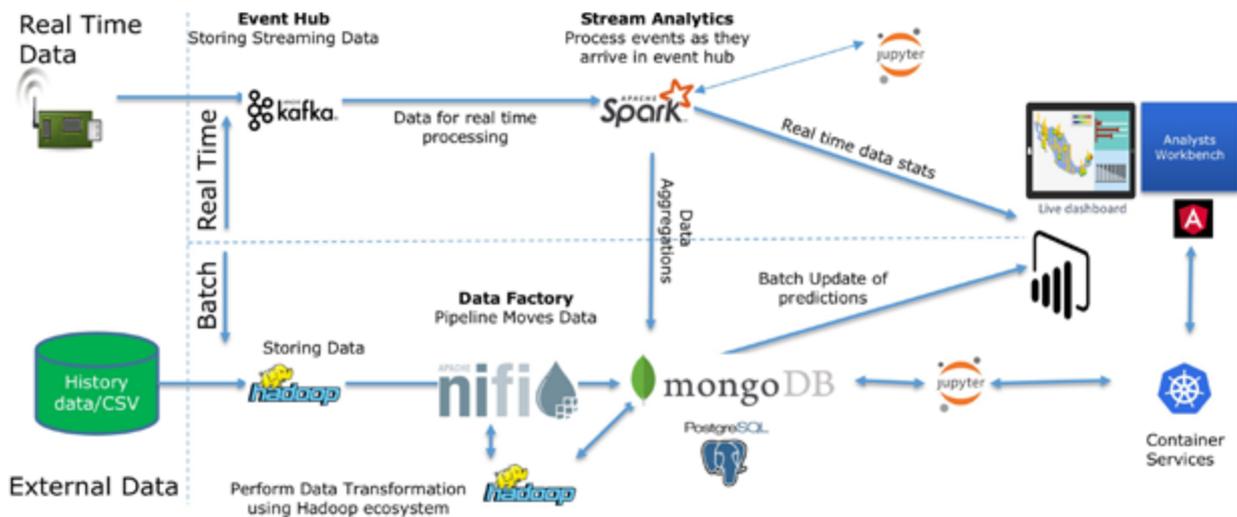
Services	Services in Dell-EMC env.	Azure Services
Dev workbench - Jupyter	Jupyter	Azure Notebooks (Jupyter)
Kubernetes Container Service	Kubernetes	Azure Container Service (Kubernetes)
Storage & File System	NFS/HDFS	Azure Blob Storage
Data Pipeline	Apache NiFi and Hadoop ecosystem	Azure Data Factory
NoSQL DB - MongoDB	MongoDB	Azure Cosmos DB
Business Intelligence & Analysis	Angular JS libraries	Angular JS libraries
Stream Analytics - Spark	Spark	Data Bricks (Stream Analytics/Spark)
Messaging and Events - Kafka	Kafka	Azure Event Hub
RDBMS	Postgres	SQL Server

Fraudulent Loan Default Prevention

Reference architecture on Microsoft Azure



Reference architecture on Dell EMC private cloud



8. Onward development

We foresee considerable demand in usage of AI in the area of fraud detection, so we will continue to expand the Proof of Concept in the areas below:

- Expand the solution to cover more external data sources, such as financial crime network data sources.
- Grow the solution in the direction of anti-money laundering.
- Include Know Your Customer topics such as customer due diligence.

9. Glossary of Terms

Terms	Details
Confusion Matrix	A Confusion Matrix is a table that is often used to describe the performance of a classification model (or "classifier").
Fraud Analyst	A Fraud Analyst investigates forgery and theft within customers' accounts and transactions on behalf of a bank or other financial institution.
Data Analyst	A Data Analyst is responsible to gather, investigate and represent data and filter out useful information from it.
PEP	Politically Exposed Person.
Explainable AI	Explainable AI (XAI), Interpretable AI, or Transparent AI each refer to techniques in artificial intelligence (AI) which can be trusted and easily understood by humans.

About Atos

Atos is a global leader in digital transformation with 120,000 employees in 73 countries and annual revenue of € 13 billion.

European number one in Cloud, Cybersecurity and High-Performance Computing, the Group provides end-to-end Orchestrated Hybrid Cloud, Big Data, Business Applications and Digital Workplace solutions through its Digital Transformation Factory, as well as transactional services through Worldline, the European leader in the payment industry. With its cutting-edge technologies and industry knowledge, Atos supports the digital transformation of its clients across all business sectors. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and operates under the brands Atos, Atos Syntel, Unify and Worldline. Atos is listed on the CAC40 Paris stock index.

Find out more about us

atos.net

atos.net/career

Let's start a discussion together

