

# FRMS COE & TMS UPDATE

**An Open-Source Software Transaction Monitoring Solution for Fraud Detection**

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November 2023

**FUNDED BY THE BILL & MELINDA GATES FOUNDATION**

 **NEW NAME**



**EKUTA**



# SWAHILI

**EKU** – equity (fairness) – not Swahili

**UKUTA** - means wall typically built to provide protection

**KUTAZAMA** – means to watch (i.e. observe)

If we overlay them and take some liberties with KUTAZAMA we get

**EKUTA** – a wall of protection where we watch and observe your transactions to find or discover fraud within your system.

# EKUTA

**An Open-Source Software Transaction Monitoring Solution for Fraud Detection**

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**The EKUTA TMS**

November 2023

**FUNDED BY THE BILL & MELINDA GATES FOUNDATION**

## OUR TEAM



Greg McCormick  
*Executive Director*

Reica Rampersadh  
*Director of Programmes*



Justus Ortlepp  
*Product Manager*

## OUR DRIVERS

### Financial inclusion

“

An estimated 293 million scam reports were filed and \$55.3 billion was lost in scams in 2021 worldwide. ”

— **GASA Global Anti-Scam Alliance**

Just Scams

Payments system cyber attack  
could cost the world \$3.5 trillion

Just 1

Protecting people, business, and government.

# THE EKUTA FRMS

## OUR PRODUCT

2



Open Source



Scalable – up and down



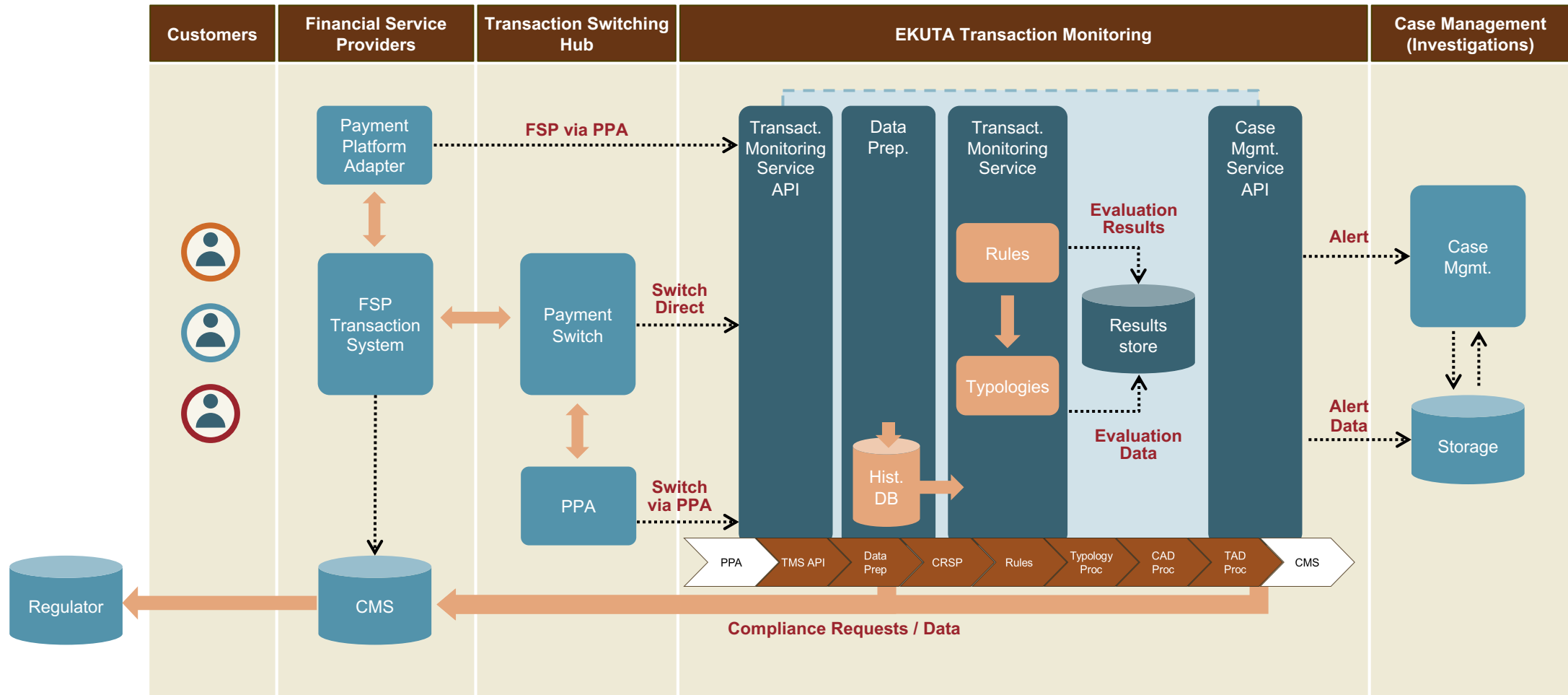
Real-time



Transaction Monitoring

# EKUTA IN CONTEXT

*EKUTA is a software engine that provides transaction monitoring-as-a-service*





# EKUTA FEATURES

*What are the system's capabilities?*

## Real-time

**Transaction monitoring is performed in real-time**

- Evaluate transactions before they are completed
- Prevent fraudulent transactions without degrading performance

## Rules-based

**Designed with fledgling anti-fraud operations in mind, transactions are evaluated by a variety of rule processors that organize detected behaviour into typologies**

- Rules are discrete code modules that perform a single evaluation task
- Rules are parameterised via configuration files external to the rule code
- Rules deliver clear and explainable assessments for the behaviour witnessed in a transaction
- Rules can be enhanced with complex scripting

## Configurable

**Rule and typology are configurable via configuration files located outside the rule processor code**

- Authorised users can configure detection behaviour without changing the processor code
- Rules and typologies can be calibrated to keep up with changing trends in fraud behaviour

## API-driven

**Interaction with EKUTA is via RESTful APIs**

- ISO20022 messages are submitted as JSON-formatted objects
- Responses are returned via API once the evaluation is complete
- Evaluation data and message history can be retrieved via API by your in-house CMS

# WHAT ABOUT ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING?

*EKUTA is AI-ready*

- EKUTA does not currently include Artificial Intelligence or Machine Learning capabilities
- To cater for fledgeling operators and regulator resistance, EKUTA opted for more transparent and explainable results in the initial release
- There are some use cases where AI/ML would be useful

## AI Channel

**The EKUTA channel architecture could accommodate an AI/ML channel**

- The CRSP would route transactions to the AI/ML channel in parallel to normal rule execution
- AI/ML modelling results could post to existing or new typologies, or
- AI/ML modelling results could post to an entirely different fit-for-purpose typology processor equivalent
- Ultimately AI/ML modelling channel results would be aggregated into an over-all transaction result that will include the evaluation outcome of adjacent channels

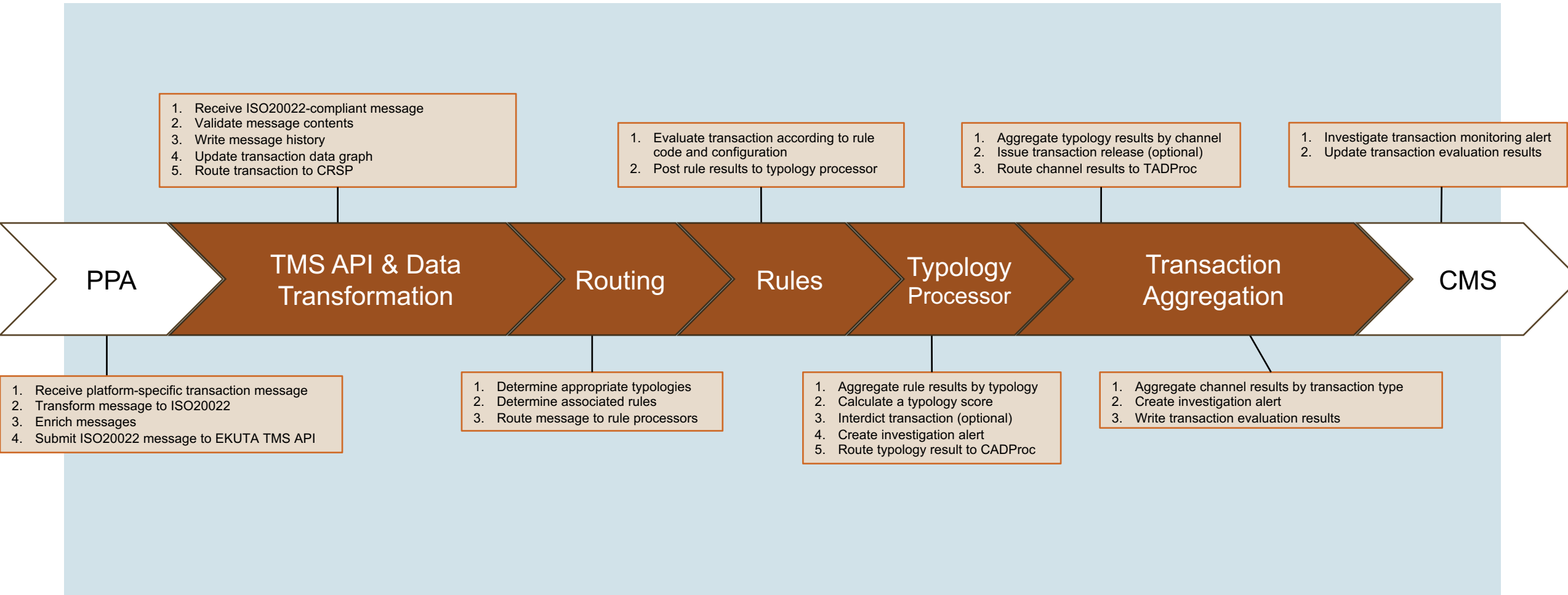
## Calibration

**Calibration is expected to be performed periodically and on a much larger scale than would comfortably meet real-time processing requirements**

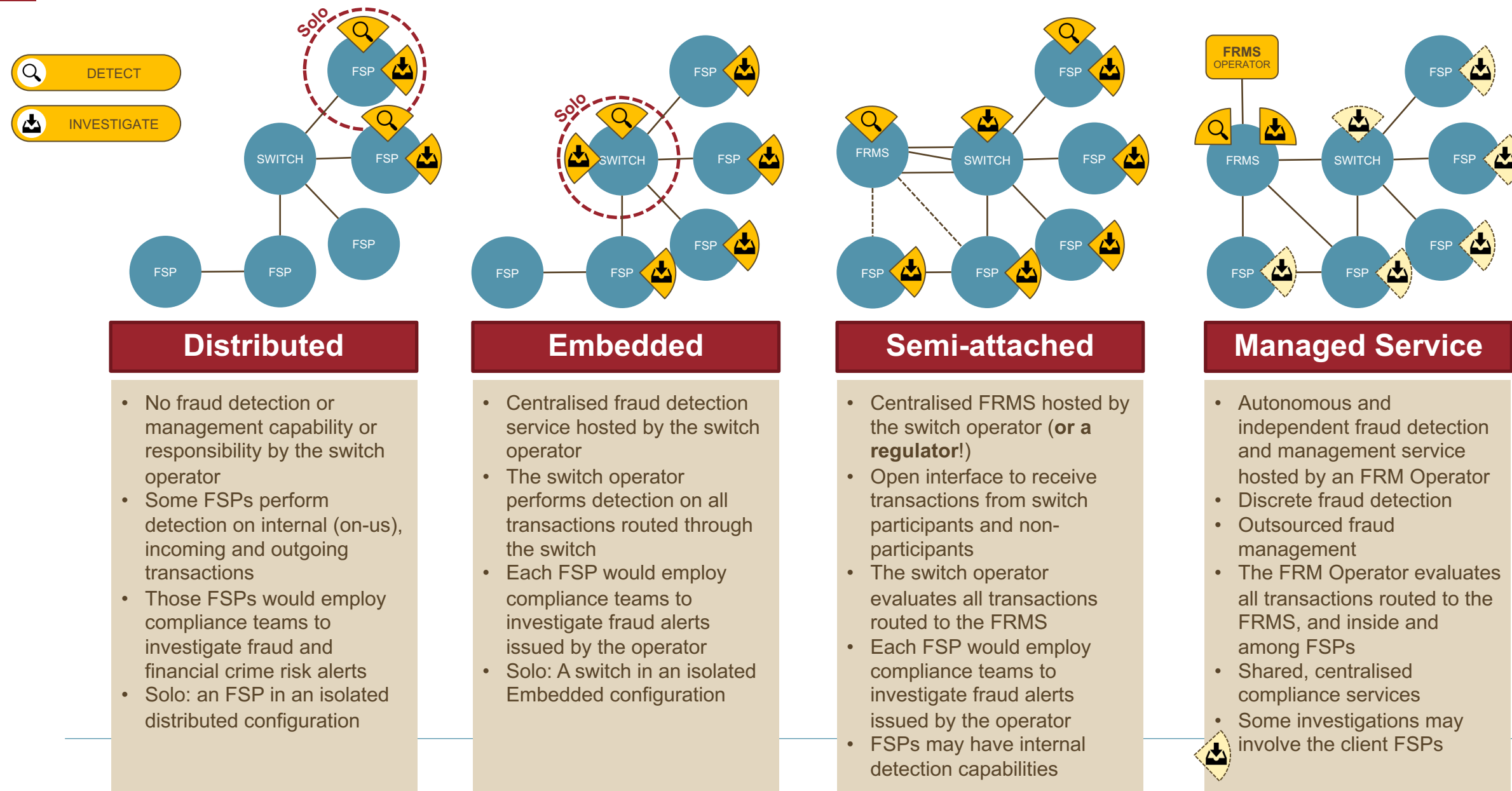
- AI/ML could greatly improve rules discovery by looking for as-yet undiscovered patterns in data
- AI/ML could be used to tweak the rule and typology configuration parameters to improve detection rates or minimize false positive detection rates

# CORE EKUTA TRANSACTION MONITORING PROCESSES

*EKUTA processes transaction data through a series of linked task-specific processors*



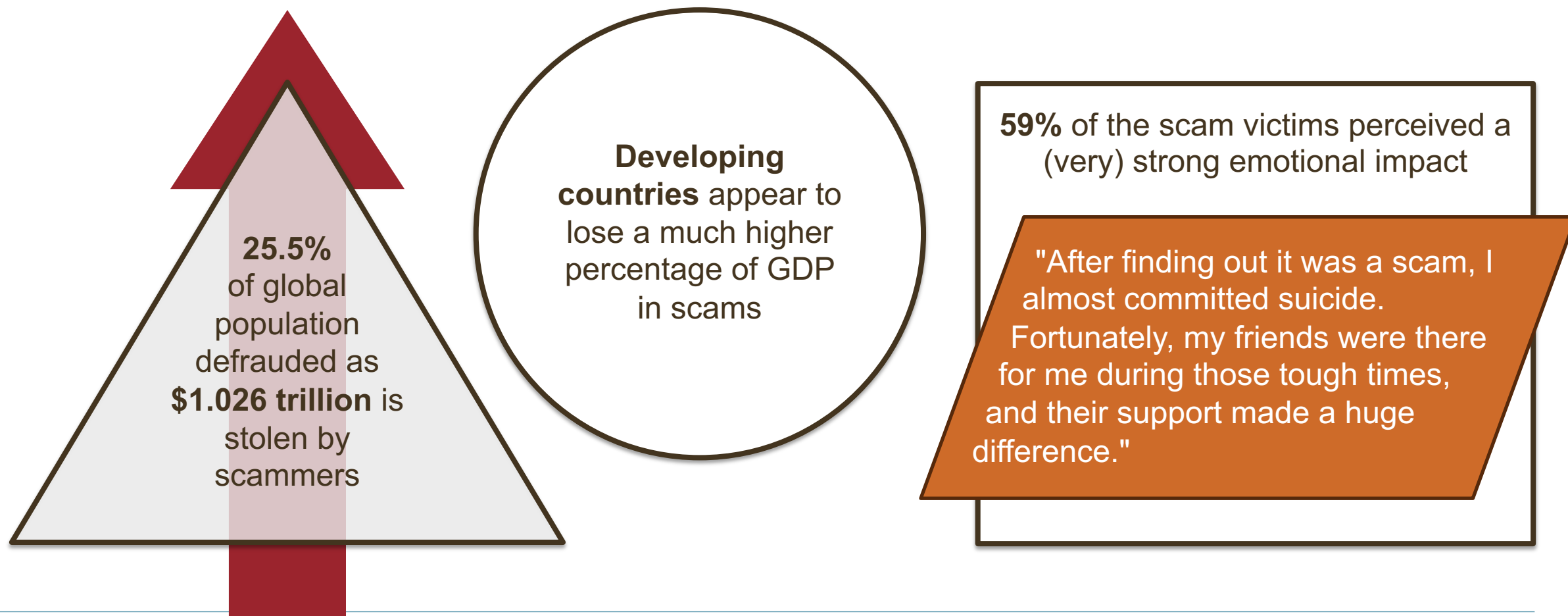
# OPERATING MODEL CONFIGURATION OPTIONS



# FRAUD AND AML TRENDS AND STATISTICS

# SCAMS – A HIGH LEVEL GLOBAL PERSPECTIVE

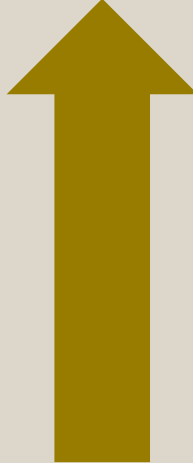
Global Anti Scams Alliance (GASA) 2023 Global state of scams report



## GASA REPORT CONTINUED....

- ✓ Worst hit by fraudsters, **Kenya lost nearly 4.5% of its GDP to scams**, followed by Vietnam (3.6%), Brazil & Thailand (3.2%).
- ✓ **Beyond financial loss, the worldwide emotional toll stands significant**, with 59% of scam victims reporting a substantial emotional impact, underscoring the global ramifications of scams against general wellbeing, transcending geographical boundaries.
- ✓ **A pattern of revictimization emerges**, indicating a global phenomenon of scammers returning to their prey to victimize them again. Most countries experience a revictimization rate of 1.5 per person. At the extreme end of the scale, Kenyans (3) and Nigerians (2) are retargeted the most.
- ✓ There is a **tendency (by 59% of respondents) towards not reporting** due to perceived complexity and uncertainty, highlighting a worldwide challenge in scam reporting and resolution.

# SOUTH AFRICA – SOUTH AFRICAN FRAUD PREVENTION SERVICE (SAFPS)

FRAUD STATISTICS		ECONOMIC STATISTICS
SCAMS INCREASED 150%		POVERTY LINE 4.6% INCREASE YEARLY
EMPLOYMENT FRAUD INCREASED 57%		UNEMPLOYMENT 31.5% INCREASE YEARLY
IMPERSONATION INCREASED 53%		INFLATION 5% INCREASE YEARLY
MONEY MULES INCREASED 44%		PEOPLES DESPERATION ???%

37% YOY Growth in number of fraud incidents reported & 15% increase in losses incurred in first 3 quarters of 2023

## REPORTED LOSSES

JAN-DEC 2022: > R680M  
JAN-AUG 2023: > R1 BILLION

sSAFPS – SOUTH AFRICAN FRAUD PREVENTION SERVICE; SOCIOECONOMIC STATS AS PER STATS SA



# PROMINENT FRAUD TYPOLOGIES – A GLOBAL VIEW

Application Fraud	Impersonation Fraud	Scam Fraud
<p>Application fraud takes place at account opening using fake or stolen documents, using the account to withdraw cash, obtain credit, or defraud legitimate entities – MULE ACCOUNT FRAUD is included.</p>	<p>Impersonation Fraud is a type of identity theft where the fraudster leverages stolen information to gain unauthorised access to an account belonging to someone else. Here the payer is not aware of the payment.</p>	<p>Scams are methods of deceitfully obtaining information while looking like they come from trusted sources such as banks or legitimate entities – this is voluntary push payment fraud OR Authorised Push Payment (APP) fraud.</p>
<ul style="list-style-type: none"><li>✓ Fake ID</li><li>✓ Identity Theft</li><li>✓ First Party Fraud</li></ul>	<ul style="list-style-type: none"><li>✓ Remote Account Take Over</li><li>✓ Phishing</li><li>✓ Smishing</li><li>✓ Vishing</li><li>✓ Sim Swap</li><li>✓ Identity Theft</li><li>✓ Stolen Device</li></ul>	<ul style="list-style-type: none"><li>✓ Advance Fee scam</li><li>✓ BEC (Business Email Compromise)</li><li>✓ Purchase scams</li><li>✓ Deposit Refund scams</li><li>✓ Holiday scams</li><li>✓ Romance scams</li><li>✓ Investment scams</li><li>✓ Commodity scams</li><li>✓ Ancestry scams</li><li>✓ Loan scams</li></ul>

Source – Southern African Fraud Prevention Service (SAFPS), Bankserve Africa

# FRAUD RELATED – GLOBAL REGULATORY DEVELOPMENTS

Let's start with FATF (Financial Action Task Force) - not a Regulator but a GLOBAL STANDARD SETTING BODY.

FATF Plenary – held 25th –27th Oct 2023

- ✓ Major amendments to the FATF Recommendations, to provide countries with enhanced tools to more effectively freeze, seize, and confiscate criminal property, both domestically and through international cooperation.
- ✓ The revised Recommendations **require countries to have policies and operational frameworks that prioritise asset recovery and establish non-conviction-based confiscation regimes in their legal systems.**
- ✓ They also provide new features, such as the **power to suspend transactions related to money laundering, terrorist financing and serious crime.** This will allow relevant national authorities to secure criminal assets more swiftly, increasing the chances of successful confiscation and potential recovery for victims.



This could have significant impact in the payment ecosystem including banks, FI's and Regulators depending on how the member countries interpret and implement!

## FRAUD RELATED GLOBAL REGULATORY DEVELOPMENTS - UK

**ECONOMIC CRIME AND CORPORATE TRANSPARENCY ACT** received royal assent 26th October 2023!

The creation of a criminal offence, called ‘failure to prevent fraud’

UK Home Secretary said:

“

It will have a big impact on our ability to fight organised crime, including terrorist funding, **fraud** and money laundering, and that will ultimately help keep us all safe.

”

## REGULATORY DEVELOPMENTS – STAYING IN THE UK....

- ✓ In June 2023, the UK Payment Systems Regulator (PSR) made it mandatory for banks and payment firms to **reimburse victims of online bank fraud within five days**, in cases where users at a business send money to a bank account controlled by fraudsters.
- ✓ New rules will be imposed on the Faster Payments system, where the vast majority of APP fraud has occurred so far, with the **reimbursement requirements coming into force 2024**
- ✓ Both **sending and receiving firms equally splitting the reimbursement costs**.
- ✓ Rules and details – tbd once Parliament expands the powers of the PSR

# AML AND FRAUD... FOCUS NOW IS TO BRING FRAUD CONTROL FIRMLY IN VIEW

*Mitigating Risk in the Payments Ecosystem*

## Traditional Risk Focus Areas

AML

Regulatory  
Compliance

Counter  
Financing of  
Terrorism

Sanctions  
Compliance

FRAUD Risk

Cybercrime

ESG

Crypto

## FRAUD DETECTION IN EKUTA

- The project has identified **266** typologies for instant payments (so far)
  - **92 fraud** and **174 money-laundering** and supporting typologies
- **31** typologies have been configured in the platform, making use of **33** rules
  - **8 fraud** and **23 money-laundering** and supporting typologies
- Rules focus on fraud *and* money laundering behaviours

“ Not all money-launderers are fraudsters, but all fraudsters are (eventually) money-launderers. ”

- New rules take about a week to develop and implement
- Typology composition is a configuration process that can take mere minutes

# BECOMING A LINUX PROJECT

### LF CHARITIES

- We will be joining The Linux Foundation
- EKUTA will be an official project  
The typologies will be in a separate JDF for standards
- The Center of Excellence will still advocate for the product and its use, produce guides, training, and skills



## MAJOR NEWS (CONT'D)

# LF CHARITIES

- Why The Linux Foundation?  
Why not Mojaloop or our own foundation?
- Differing use case from Mojaloop / switching  
We support any switch or LOB application  
We are designed to be deployed at the DFSP or centrally  
Many more users of our software
- The name recognition and distribution will help us reach more users
- Governance! Ready to go. It's what they do - OSS experts

## MAJOR NEWS (CONT'D)

### LF CHARITIES

- Linux neutrality, scale access to expertise
- The membership-based standards organization
  - Will help keep away from bad guys' URLs
  - Can have secured access and repositories
- What does this mean for you?
- On one hand nothing – it's still us. We are not going away.
- On the other, everything. Deeper access to other OSS products. Hopefully, we will build this community faster, better

## ■ MAJOR NEWS (CONT'D)

### □ LF CHARITIES

- Launch Event?!
- Ready to officially launch.

# EKUTA

## PRODUCT UPDATE

## PRODUCT HIGHLIGHTS

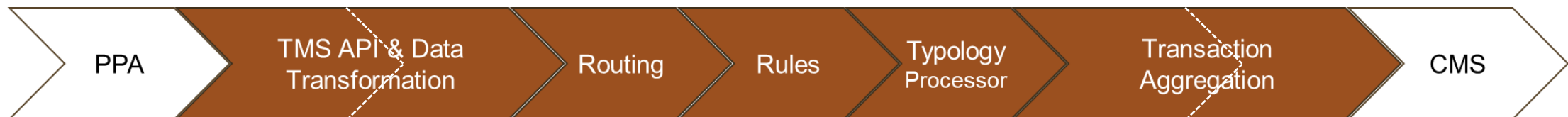
Version 1.2.0 released

A Docker only version released  
(Docker compose)

Benchmarked a range of  
performance specifications

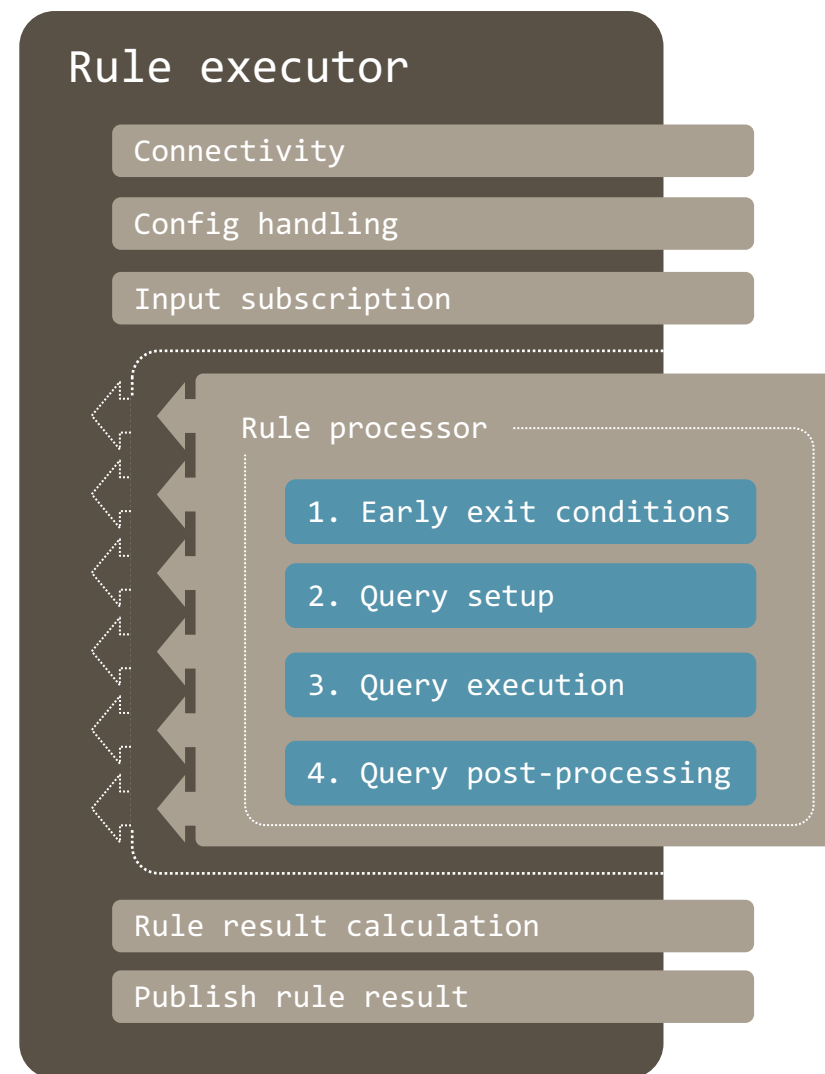
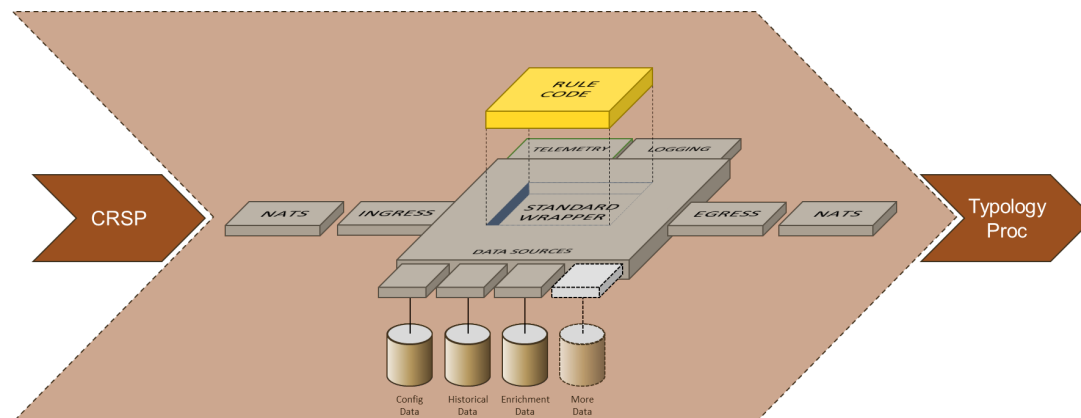
## EKUTA PRODUCT UPDATE – PLATFORM OPTIMIZATION HIGHLIGHTS

- Removed OpenFaaS
- Implemented NATS for end-to-end inter-services pub/sub functionality
- Implemented Protocol Buffers for faster inter-service and Redis serialization
- Node.js (v8) optimizations
- Collapse data transformation into the API
- Collapse channel aggregation into the TADProc



# EKUTA PRODUCT UPDATE – PLATFORM OPTIMIZATION HIGHLIGHTS

- Overhauled the rule processor design
  - We abstracted and wrapped common rule processor code inside an executor
  - All rule queries were consolidated and optimized
    - Previously up to five DB reads; now only one
  - Forward-casted caching



## EKUTA PRODUCT UPDATE – OTHER FEATURES

*What else did we do?*

- Abstracted common code into a centralised code library
  - Improved rule processor error and exception handling
  - Two new rules to detect transaction mirroring by the debtor
    - Basic Rules development turnaround time is now a couple of days to aa week
  - Implemented a containerized Jupyter Notebook
    - + standard reporting to support benchmarking
  - Pin-point transaction ingestion
  - Implemented a NATS REST proxy for testing via Postman
  - Composed the platform into a Docker container
-



# EKUTA OPEN-SOURCE TECHNOLOGY STACK

## Control & Orchestration

- Via Kubernetes Config
- Via YAML
- Kubernetes API
- EKUTA services connected via NATS pub/sub

## Scaling

- Via Kubernetes

## Security

- Keycloak
- TLS and/or mTLS

Primary orchestration in Kubernetes

API Gateway

**BASSADOR**

 **kubernetes**

EKUTA services

**NATS**  
Protocol Buffers



TMS API & Data Transformation

Routing

Rules

Typology Processor

Transaction Aggregation

REST API

**TS** TypeScript

**node** JS

Admin & Config

Security

 **Vault**

 **KEYCLOAK**

Containerisation

 **docker**

CI/CD

 **HELM**

Automated Deployment

 **Jenkins**

Service Testing

 **POSTMAN**

Unit Testing

 **NEWMAN**

**Data-only processes**

External Data Sources

Data preparation

Pseudonymisation

Entity Resolution

Data transformation

Data persistence

**TS** TypeScript

Cache

Performance

Result collation

Configs

 **redis**

Persistent Data Store

 **ArangoDB**

Config DB

Admin

Rule

Ops

Typology

Version control/archive

Message history

Historical Graph

Evaluation results

Analytics / Telemetry / Logging

APM

Dashboards

Reports

 **Stack**

 **jupyter**

# EKUTA PRODUCT ROADMAP

## *What are we planning?*

- Complete optimization at 3000 evaluations per second
- Transaction blocking and short-term overrides
- Batch processing (data catch-up and evaluations)
- Platform Configuration User Interface
- Improved and centralized logging and monitoring (Linux Kernel eBPF?)
- Dynamic on-demand scaling
  - Focus on scaling the infrastructure instead of the software
- (starting) Artificial Intelligence and Machine Learning for calibration and rules discovery
- Review of ArangoDB's move to BSL 1.1 – Matt negotiated a full license

## PERFORMANCE

- We achieved 2,000 TPS in the lab before we stopped
- Market based assessment:  
M-Pesa 2,600 TPS, 21.03 billion transactions worth  
\$24 Billion USD  
<https://www.the-star.co.ke/business/kenya/2023-07-10-m-pesa-transacted-sh36-trillion-three-times-kenyas-gdp-report/>
- \$385 per month 1 TPS to 2 TPS peak

\$1,000 USD	\$5,000 USD	\$10,000	\$16,712
45 TPS	407 TPS	1,127 TPS	1,925

## PIPELINE OF INTEREST

12  
National  
Switches

5  
Special Purpose  
Switches

58  
Countries

Interested in POCs and implementations.