

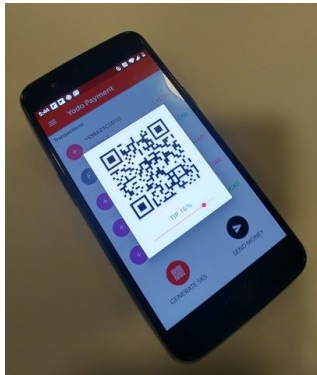
## MOJAUNO SYSTEM VISION

# Overview

MOJAUNO is an ***open source merchant-centric payment and money transfer system*** funded by fiat cash tendered by end-user-clients at registered merchant locations and/or electronically loaded (payroll & Government benefits) to client accounts via any number of third party electronic money transfer systems such as for example Canada's Interac e-Transfer, India's Unified Payments Interface (UPI) or Nigeria's Inter Bank Settlement System (NIBSS) and/or loaded by online, or in person Debit, Credit or PayPal charges made on any other such financial product accepted by the registered merchant. Uniquely client users will not be required to have an account or any other financial institutional affiliation.

### MOJA PAYMENT or ACCOUNT CREDENTIAL

The client account credential represented by an encrypted QR code, easily displayed on paper, card or on any payor's mobile device screen and captured contactlessly by any digital camera on any payee's mobile device. Said QR code accounts may be shared via MMS on any messaging app such as for example SIGNAL, WHATSAPP or any other secure messaging platform.



The MOJA account credential or MOJA QR Code (MQR) comes in two primary variants; closed payment and open payment types, represented by a leading A or B Hex character in their hexadecimal string representation. MQRs therefore consist of a Type, a Merchant Code, a Face-Type and an Account Number. All registered merchants are issued or assigned a fixed transaction currency, normally the fiat currency of the country in which their business is physically located.

## **Closed System (A-Type)**

For closed system applications, the minimal criteria for the creation of a MQR code need only be a merchant code and an unique client account number, wherein the face type defaults to zero until it may be appended to the MQR upon first in-person use by the client, that is to say when the client first transacts in the physically presence of a merchant in control of a Internet enabled device with a digital camera. It would be more common however upon creation for a pre-paid balance to be tendered and thus associated with A-Type MQRs; in effect creating a remit card, a gift card or a fare card valid at a particular accepting merchant. MojaUno will develop a web plugin to generate such A-Type MQRs (example hub here: [www.quecca.com](http://www.quecca.com)) for any participating merchant to deploy on their own website. For example a dry-goods store in Manila, could use the plugin on their own website, and a Pilipino migrant living in Winnipeg might visit and use her credit card to purchase a 10,000 Philippine Peso MQR redeemable only at said merchant, which would be sent to both her own mobile and to her mother's mobile. Alternately users might request a MQR at any merchant location, where the face-type of the client may be captured and included in the MQR upon creation which again may be routed to two mobiles; the intended recipient's and the intended donor's handsets. Such A-Type MQR are valuable in that they represent "Targeted Remittance" products meaning the funds may only be spent in the designated merchant location empowering a recipient woman or even child. Cash remittances can too easily find their way to a husband's wager on a cock-fight or a bottle of VuQo Premium Vodka. Note individual merchants may have a policy to provide clients a portion of needed cashback, but such policies would not greatly disrupt the normal procedure of funds to be spent at the designated merchant location. Merchants gain little from offering a cash out service, to be spent at another merchant location at the expense of their own greater sales revenue. Similarly to Open Loop type B MQRs (described below) the merchant agreement stipulates the maximum fee, if any, which may be charged for a cash out in the absence of a purchase.

Once created by a participating merchant ( the producer) the balance of any MQR is maintained in real time on a central cloud computer environment using an event driven product such as Apache Kafka, for all global consumers. When a face-type has been included, only the consumer with a matching face-type may spend from the MQR, whereas anyone (Employers, Government agencies, donors) with whom the Account number has been shared may load or reload the MQR.



Open source Nayuki QR generator.

<https://www.nayuki.io/page/qr-code-generator-library>

Open source JQuery-QR code

<https://github.com/jeromeetienne/jquery-qrcode>

### **MOJAPAY Client Applications (or the YoT Wallet)**

The Mojapay client application will be available on Android and KaiOS mobile handsets. The application needs only minimal function, able to receive, store and display the merchant and the balance of each MQR for transaction purposes. The Mojapay app would in effect become a MQR wallet, as each individual client may have multiple different MQRs stored on their app, able to pull up a particular merchant's MQR to pay for Groceries, to pay a public Transit fare or to pay a School cafeteria fee. Of course MQR, being open sourced, may also be utilized by any number of authorized third party apps. For example the extremely popular open sourced **MonTransit** scheduling app could easily be modified to allow a MQR code issued by a public transit operator to be stored in the app provided a menu driven method to pull up and display the MQR on demand were implemented.

<https://developer.kaiostech.com/>

<https://play.kotlinlang.org/#eyJ2ZXJzaW9uLjoiMS4zLjYwIiwicGxhdGZvcn0iOiJqYXZhliwiYXJncyl6IiIsImVzI6IiIsIm5vbmVNYXJrZXJzLjlp0cnVILCJ0aGVtZSI6ImlkZWEiLCJjb2RlIjoilYyoqXG4gKiBZb3UgY2FuIGVkaXQsIHJ1biwgYW5kIHNoYXJlIHNoaXMgY29kZS4gXG4gKiBwbGF5LmtvdGxpbnxhbmcub3JnIFxulCovXG5cbmZ1biBtYWluKCKge1xulCAgIHByaW50bG4oXCJlZWxsbywgd29ybGQhISFclilcbn0ifQ==>

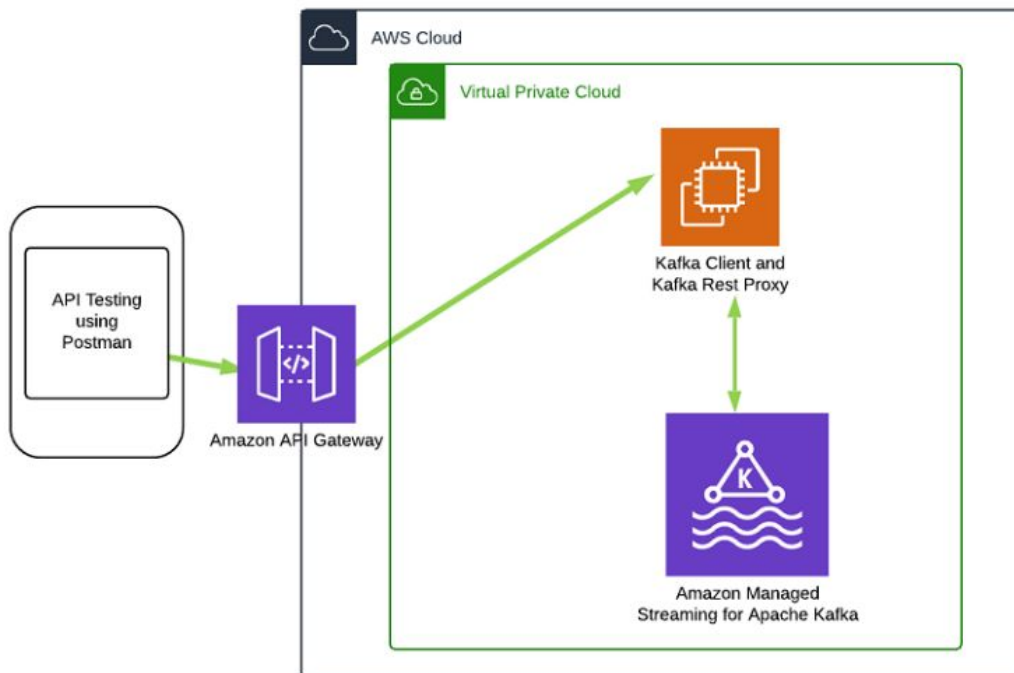
## MOJAPAY cloud backend / database

The Mojapay back end is a cloud computing platform anchored by Apache Kafka. Each and every registered Merchant along with their issued, or outstanding prepaid balance **plus** each and every account, represented visually by the unique MQR , with balance will be stored and updated in near-real-time on the Kafka database. An example deployed on Amazon cloud front would look similar to the following.

To implement the solution, complete the following steps:

1. Create an MSK cluster, Kafka client, and [Kafka REST Proxy](#)
2. Create a Kafka topic and configure the REST Proxy on a Kafka client machine
3. Create an API with REST Proxy integration via API Gateway
4. Test the end-to-end processes by producing and consuming messages to Amazon MSK

The following diagram illustrates the solution architecture.



Within this architecture, you create an MSK cluster and set up an [Amazon EC2](#) instance with the REST Proxy and Kafka client. You then expose the REST Proxy through Amazon API Gateway and also test the solution by producing messages to Amazon MSK using [Postman](#).

For the production implementation, make sure to set up the REST Proxy behind load balancer with an Auto Scaling

<https://kafka.apache.org/>

<https://medium.com/@megachucky/is-apache-kafka-a-database-ddc310898f5c>

<https://aiven.io/>

<https://aws.amazon.com/blogs/big-data/govern-how-your-clients-interact-with-apache-kafka-using-api-gateway/>



<https://www.linkedin.com/in/prasadalle/>

## **MOJAPAY Transaction processor code**

Mojapay Transaction Processor code (MTP) will be open source and released under the MIT Open Source license. This will encourage as many different Point of Sale (POS) application providers as possible to include Mojapay support or payment acceptance in their own proprietary software. Similarly to Yodopay but with OPEN and deeper integration. When the customer requests payment via Mojapay , the MTP will open a digital camera or 2D barcode scanner to capture the MQR being presented by the customer. The captured code will route the payment credential to the Mojapay cloud service (Kafka cluster) for acceptance and approval. Once approved and accepted by the merchant, the balance of the MQR account is updated on the server.

As mentioned earlier, Individual e-Commerce merchants can deploy a version of the MTP code on their own websites to allow customers to make purchases by presenting MQR codes to a device camera while visiting the site on any Browser ,and even sell and reload MQR online by using an iFrame developed by MojaUno which would be an open source Web plug-in using CORS to issue (sell) MQR and route to customers' mobile phones.

<https://developer.mozilla.org/en-US/docs/Web/HTTP/CORS>

## **Open Loop MQR (B-Type)**

The main difference between Open and Closed loop MQR types is obviously that a merchant settlement process must be implemented for open payments and each client must now also choose a fixed currency for their own MQR account. This is exactly the process deployed by YodoPay which performs real time FX across the entire platform. The fixed currency of client MQRs could in fact be stored in the encrypted QR code as all global merchants, most with different default currencies, would all be accepting this open loop payment product.



AA24C8907DEF309B876CA8B2A

In terms of merchant settlement between and among the registered merchants themselves, some form of private side-chain, with stable coin may be prescribed. An example would be Stellar Network's Centarus

<https://stellar.expert/blog/centaurus-second-layer-payment-network-exchange-and-scaling-solution>  
<https://galactictalk.org/d/2168-centaurus-second-layer-payment-network-exchange-and-scaling-solution>

Each merchant would themselves be required to subscribe to, and maintain a prescribed minimum settlement balance with, the mandated provider. Event driven merchant settlement would occur automatically when each registered merchant reached a negotiated threshold of prepaid cash. YodoPay found this to be an efficient method as merchants, who typically attract a limited but loyal customer base, often exhibited a **stable pool of prepaid cash**. That is over time customers would be tendering cash at approximately the same rate as they were purchasing goods or services and/or cashing out. Ideally this side-chain could also run from a standard such as Mojaloop's central ledger but could be a collaboration with existing private enterprises, for example a service such as PayPal's own crypto service, as referenced in the second diagram below. Each registered merchant would be required to have a PayPal account, with sufficient crypto-currency to cover Mojapay's open payment merchant settlement process. Of course any merchant may then choose to also accept PayPal from their own customers, but this would be an isolated separate function and entirely the decision of the merchant themselves. Note the closed loop pool of pre-paid cash is an entirely separate pool, since it has been tendered to and will be spent or redeemed only at a single merchant.

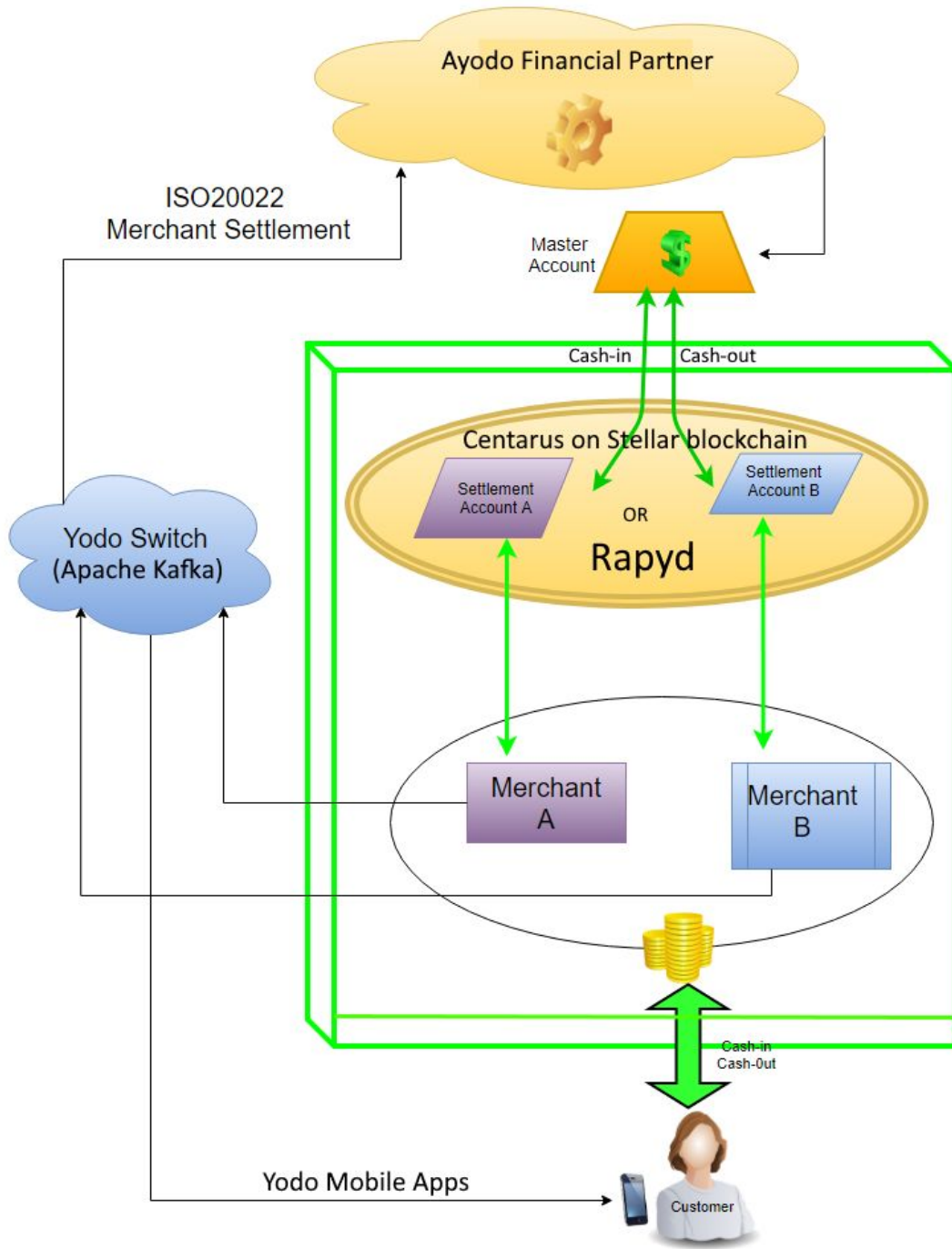
Additionally with defined types, each national QR encoding can adopt the Mojaloop standard by applying their own account numbers as the client number. For example Indians could use the Aadhaar as the client account number encrypted inside the MQR thus benefiting from the well

developed and existing UPI infrastructure while extending authentication or reach for individuals outside of India by compiling with Mojaloops MQR standard.

<https://www.mygov.in/digidhan/pages/pdf/sbi/NPCI%20Unified%20Payment%20Interface.pdf>

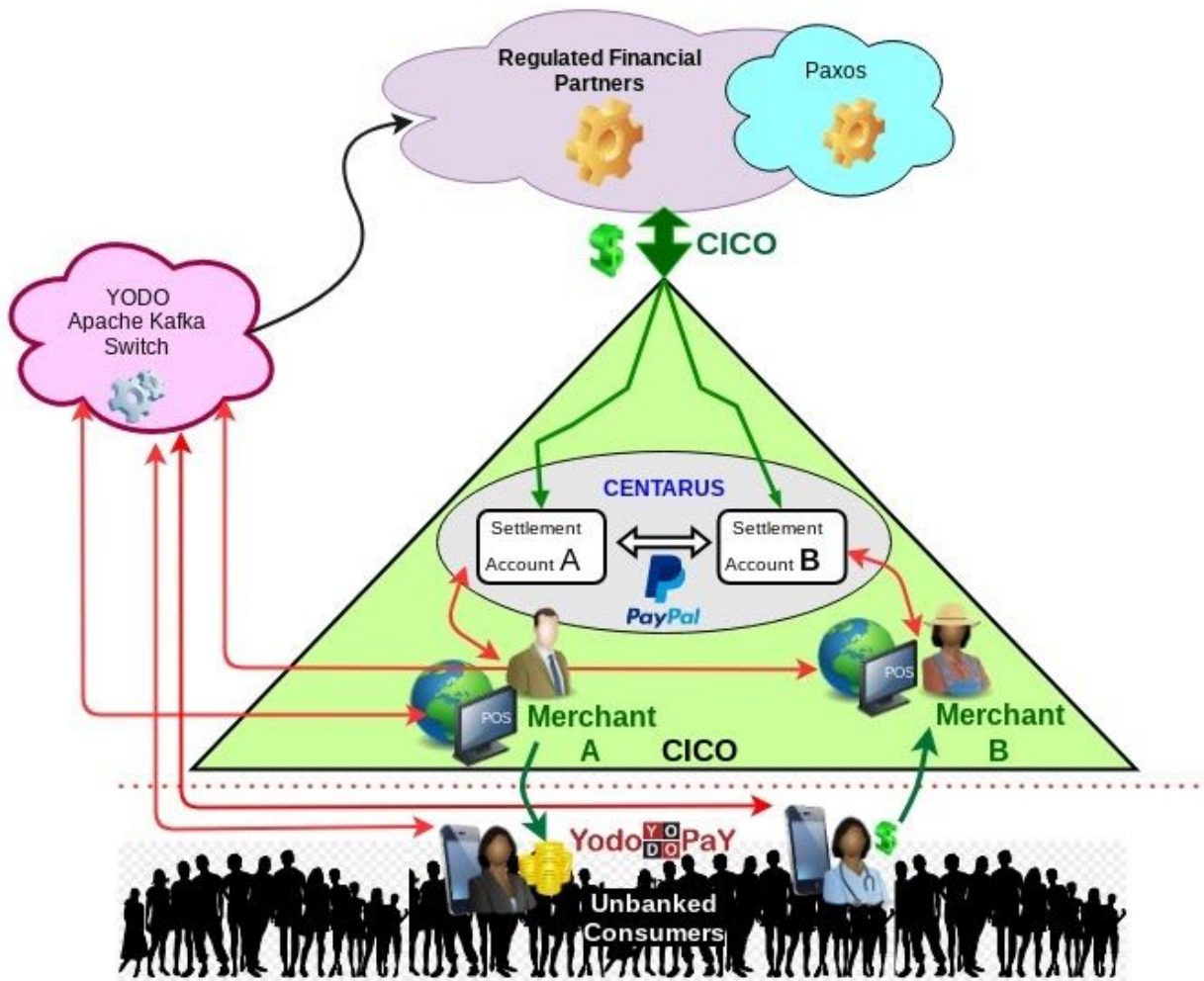


# Moja Settlement



## REGULATORY CONSIDERATIONS

The MojaPay payment and money transfer system must be adherent and compliant with global Money Service Businesses (MSB) regulations. Given the diversity and number of regulatory frameworks most of which have been legislated on a national basis by each country this is not always an easy task. YodoPay has been commercially deployed in Canada for more than 5 years and has adhered to the awkwardly named “Proceeds of Crime Money Laundering and Terrorist Financing Act (PCMLTFA). FINTRAC enforces the PCMLTFA and like many regulatory agencies a “carve-out” or an exemption has been created for prepaid products. Generally prepaid products are exempt under MSB regulations. This is true in both Canada and the USA (FINCEN) are the primary money service regulatory agencies. If it were not the case regulators would need to be scrutinizing every public transit agency having sold a fare card, every store having issued a gift card or prepaid credit card and every Yoga club having sold a ten lesson punch card. PCMLTFA has two thresholds for prepaid exemption; 1) the balance must never exceed \$1,000 and 2) the velocity of money must be controlled to never allow transactions to aggregate to 1,000 in a 24 hour period. It would obviously be ideal if all countries would legislate similar prepaid product regulations, however, it should be possible to canvas each country MojaPay is slated for release, to ascertain the correct balance and velocity limits for prepaid products. YodoPay for example set the thresholds to USD 500 and monitored Yodo’s transaction switch for any attempt to exceed these limits, which caused the account to be flagged and transactions to be blocked. We refer to this paradigm as **Know Your Merchant** KYM as opposed to the bank paradigm of KYC and believe remittances and Financial Inclusion will be enhanced if those individuals below the red-line in the following diagram are exempt from all KYC regulatory requirements. You will note that any significant value of cash movement occurs only at the top of the pyramid via fully regulated channels. Poor unbanked individuals normally do not transact in sums greater than a few hundred dollars.



MojaPay recognizes the importance of and will abide by all regulations controlling services which permit money to flow between individuals and in particular to flow across borders. Money Laundering and Terrorist Financing are activities we should all be concerned with, and any system designed to enhance Financial Inclusion should not only be legally compliant with respective regulations, but needs to strive to prevent any such activities.

## MQR BIOMETRIC

Before considering the MQR requirement for a FACE TYPE it is important to understand the requirement is **NOT** for Facial Recognition. Most cellular handsets already deploy facial recognition apps for authentication to either open the phone and/or access particular applications. Yodo itself has deployed facial recognition, licensed from Finland's Visidon, for more than 6 years for our Password Reset function. Yodo's hardware partner Sunmi from China has been using facial recognition for their FACE PAY products for several years now, and has thus developed very efficient FACE PAY products which allow customers to literally pay for a product or service by presenting nothing more than their face to a POS device.

<https://www.sunmi.com/en/fs/>

<https://www.sunmi.com/en/K2mini/>

## HARDWARE CONSIDERATIONS

Any mobile device with a digital camera becomes a MQR processing device. Obviously this would include any number of non-proprietary cell phones, tablets or computers with webcams, but pragmatically speaking it would be preferred and would lead to wider market recognition and thus acceptance and penetration, if a peripheral similar to the Sunmi Blink (pictured below) were supplied to each registered merchant.



This Sunmi product has been being used by Yodo and has an acceptable cost price of \$9. View it in commercial operations at the bottom of the page here:

<https://www.yodopay.com/videos.html>

In the case of desirable enhanced security, dedicated standalone hardware on a low cost 4G SOC such as UNISOC with both a 3D camera and a Physically Unclonable Feature (PUF) which is like a digital fingerprint in a small chip, may be manufactured and sold for about \$20, (or about the same cost of a KaiOS handset). Any number of POS applications would still communicate the sales price or cash-out amount via secure Bluetooth to such a new MQR processor, but the dedicated hardware would be the sole device able to access the payment switch and would be indisputably operated by a registered merchant due to the unique nature of the PUF.

<https://www.youtube.com/watch?v=2SoEmjtMU1k>

Yodo/Ayodo has developed prototypes of such a device fashioned on the Sunmi Blink, with 3D camera plus a third party Credit card reader ( Square or Sumup ) and feels comfortable that the device could be manufactured for a cost point which would allow massive distribution and scale given Ayodo would release the hardware on a not-for-profit basis to enhance Financial Inclusion.

## FACE TYPE (FT) ALGORITHMS

There are literally hundreds of open source Facial Recognition projects.

<https://awesomeopensource.com/projects/face-recognition>

As their project names indicate, these algorithms are attempts to uniquely and reliably RECOGNIZE an individual by his or her face. As mentioned previously, for the protection of an individual's privacy, MQR specifically does **NOT** wish the incorporated biometric to be powerful enough to conclusively and uniquely identify an individual from their face template alone. In contrast, MQR requires software to quickly extract, by similar mathematical biometric methods used in traditional facial recognition, a subset representation of a Face Type (FT) only, which can be incorporated into a standard QR code to become one-factor in a multi-factor scheme for a highly effective digital ID. Individuals will remain in complete control of their Digital ID simply by concealing the MQR from present digital cameras (scanning software) yet be able to swiftly verify themselves as the owner of the Digital ID by allowing both their face and the MQR to be scanned simultaneously. We envision a process more similar to Visidon's Gender and Age face recognition which makes no attempt to fully recognize an individual thus protecting their identity. Yodo already licenses Visidon's recognition software for YodoPay password resets.

[https://www.visidon.fi/technology\\_post/age-gender-recognition/](https://www.visidon.fi/technology_post/age-gender-recognition/)

DLIB suggests another method which may be used to determine a Face Type by focusing broadly on FACE Differences. By categorizing faces into a finite set of Face Types, perhaps as few as 64 different face types (?) thousands of individuals would continue to have the same Face Type, to ensure the technology could never be used to infringe upon personal privacy. In simplest form a 99%+ effective digital determinant, say male or female, when used in a multi-factor authentication scheme would block approximately half the imposters. Extend this to give any imposter only a one in sixty-four(1/64) chance of successfully authenticating themselves with another person's Digital ID (MQR) and it could be a very sufficient method to authenticate while preserving individual privacy.

<https://github.com/davisking/dlib>