RuPay One card
available for millions of mobile phones in India

Opportunities for India Smart Cities

A solution based on a contactless smart microSD Card

October 2020

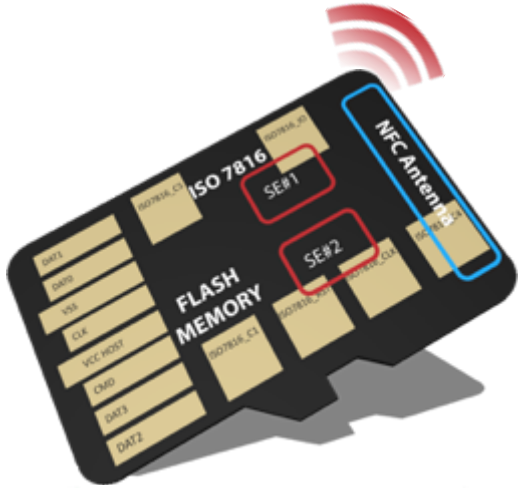
www.logomotion.eu

Content

Introduction

- Our product is a contactless smart microSD card (LGM Card) used while inserted in SD slot of a mobile phone
- LGM Card is **certified by NPCI as RuPay pre-paid One Card** and it supports all RuPay pre-paid use-cases **without any change of current stake-holders relations and infrastructures already deployed**
- With the LGM Card the customer can tap his phone to enter metro, to pay or to enter his employers' premises. He can also store more cards, identify himself on governmental servers, electronically sign documents and securely store and use his Aadhaar or Virtual ID number from his mobile phone
- LGM Card **addresses 900 millions of current mobile phones, including feature phones**
- LGM Card supports the idea of One Card for all Smart city payments as it enables to store RuPay One Card enabling contactless mobile services also on feature phones, non NFC and non connected smart phones. LGM Card contains two secure chips that can be divided into more secure domains **enabling many secure Tap&Pay&Go mobile use-cases**:
  - Pay on contactless POS with RuPay qSPARC contactless card
  - Enter metro with RuPay qSPARC contactless card or Stored Value Card issued by Metro SP
  - Enter and pay for parking, using parking card
  - Enter premises and pay using it as a student identification card
  - Smart city RuPay One Card enabling various discounts to support smart city businesses
  - A salary disbursement card, etc.

Product
LGM Card



- LGM Card is a standard microSD memory card. It contains:
  - 16GB flash memory for the user
  - one or two embedded secure chips (SE)
  - a micro NFC antenna
- It can be used in smartphones with OS Android and Windows, in Java devices and also in feature phones (LGM Card Gen 2)
- The micro NFC antenna works also under batteries and metal back covers. Customer is not limited in NFC use-cases by the phones' design
- Cards can be loaded in a contact way or Over-the-Internet (OTI). Additional cards and applications can be loaded OTI, on a dedicated validation devices (POS, AFC gates) or in physical premises

RuPay Dual Interface Card Type Approval LOA

NPCI

Logomotion, s.r.o.
Winterova 15,
Piestany-921 01,
Slovakia.

RuPay Letter of Approval - Dual Interface Card Functional

Approval number:	qSPARC.V2_LOG03052019_0149
Effective date:	18th July 2019
Valid till:	18th July 2022
Product registration number:	qSPARC.V2_LOG03052019_0149
Product vendor name:	Logomotion, s.r.o.
Product operating system / model:	JCOP 2.4.2 R1
Product name:	LGMRuPay 1.0-RuPay DI Applet
Product type:	Dual Interface(Contact & Contactless)

RuPay Compliance Program (CP) has found reasonable evidence, after assessing your Type Approval test summary report along with the Product Information Form (PIF) that the submitted samples of the above referenced product sufficiently conform to RuPay EMV Dual Interface Card Application Specification, version 2.0 Addendum to version 2.0. Along with the conditions of approval mentioned in Appendix A, if any, RuPay Compliance Program hereby grants approval to your Dual Interface (Contact & Contactless) Card type functional.

This approval does not extend to any other portion or component of a card application that is not defined in RuPay EMV Dual Interface Card Application Specification version 2.0 Addendum to version 2.0.
Please find conditions for approval in the appendix A.

Bharat Panchal
Chief-Risk Management

Version 2.0 Page 1 of 3 Confidential

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Smart City Areas
utilizing LGM Card

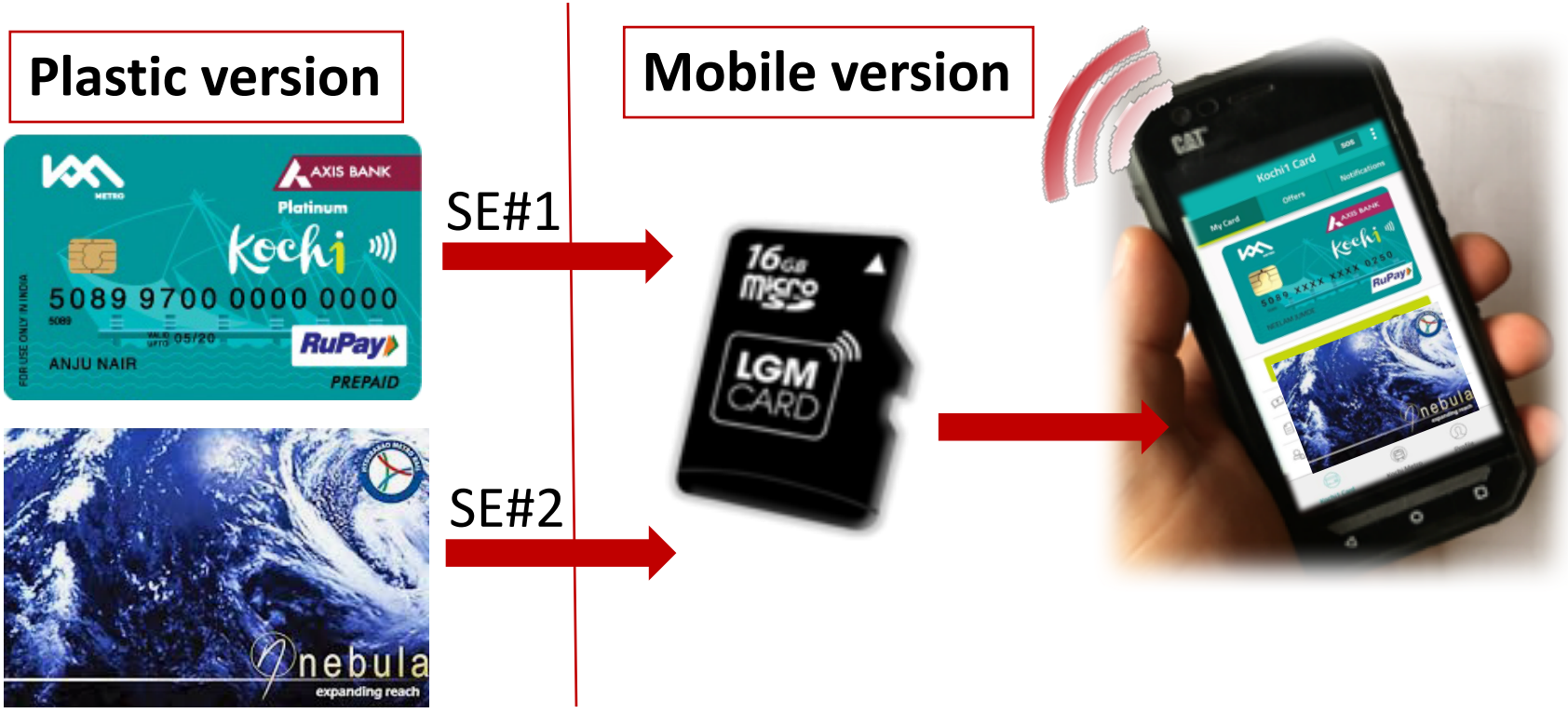
- Smart City can utilize the LGM Card mainly in the areas:
  - Urban Mobility - I
  - e-Governance - II
  - Smart Utilities - III

- Other PAN city areas that can be developed in co-operation with 3rd parties:
  - Smart parking based on big data
  - Financial inclusion platform and Wallet app
  - Intelligent traffic management

Urban Mobility - I

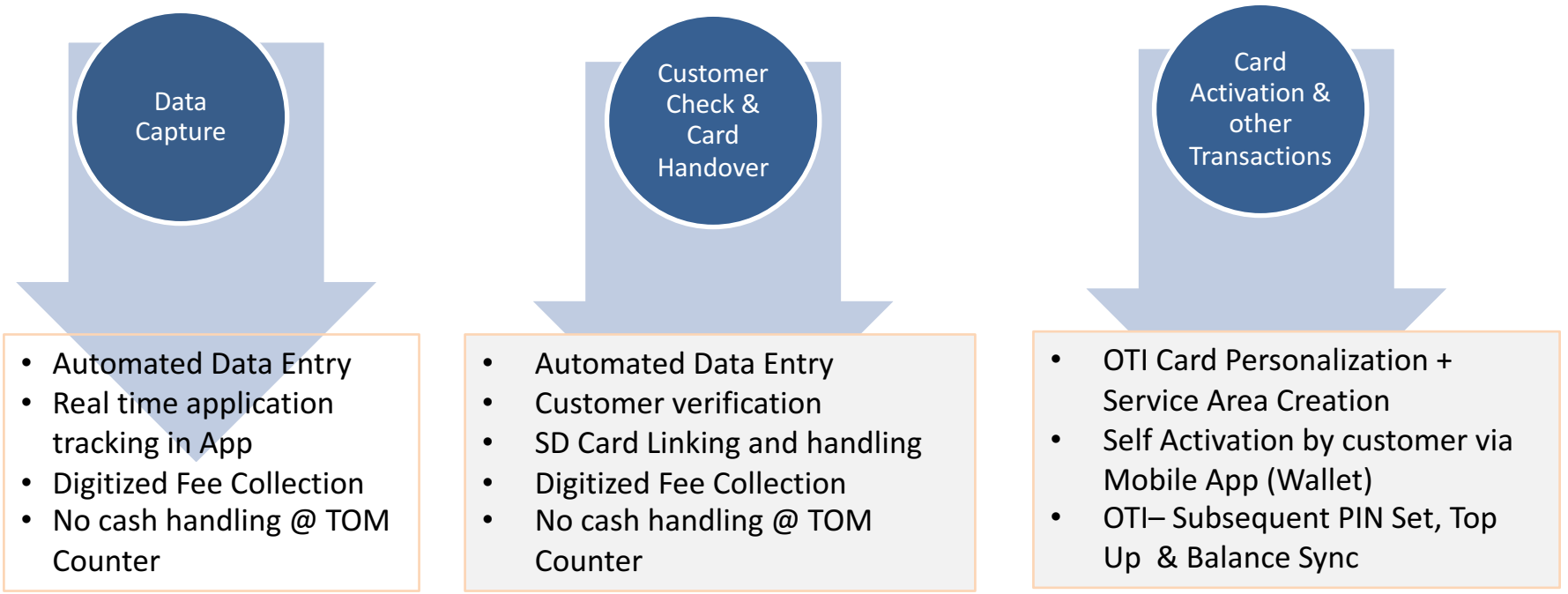
Transit Card(s) stored on LGM Card

- LGM Card Gen1 has embedded two NXP secure chips, independent on each other
  - SE#1: NXP J5C145, JCOP 2.4.2 R1, 145 KB EEPROM memory, **MIFARE FleX® (4K).** This Secure chip can **store EMVCo open loop transit card** (e.g. **qSPARC RuPay One Card**, India)
  - SE#2: NXP J5D081, JCOP 2.4.2 R2, 80 KB EEPROM memory, **MIFARE® DESFire® EV1 8K**. This Secure chip can **store Close loop transit card** (**SVC, stored value card**)
- Access to the transit cards will be from the Wallet app. All features for current plastic transit cards are supported also on transit cards stored on SE of the LGM Card



Urban Mobility - I

Enhancing Customer Journey



- Currently the time taken at counter is approximately 7 - 10 minutes with lots of manual activities and with not so good customer experience
- With Transit card stored on Secure chip of the LGM Card and used from a mobile phone the time taken at counter will be around 1-2 minutes with automated and authentic data entry and digitized customer experience
- Main enhancements - less time spent on the counter, no compulsion on customer to stay back at TOM counter, simplified authentication of card against linked customer, customer can act as per his convenience and needs

VAS for Transit

- Bank and Transit SP will issue RuPay One Card (or Transit SP will issue SVC) and that will be personalized and stored on the secure chip of the LGM Card
- Customer will withhold the LGM Card at transit provider's premises and link it with his mobile number validated during activation through app
- Ensure single device only usage is possible with binding of (mobile) device id / IMEI number with Secure chip Unique Number
- Control card behavior - limits, offline balance threshold check, status etc. is possbile
- Real time-card block option on the Secure chip – over and above the blacklist management@ device
- No queue for top-up. Perform Money Add to host and Secure chip directly - Over the Internet

LGM Card
used in Feature phones

Power Management

- On smartphones the SD slot powering is managed by phone OS and NFC antenna is switched off when the application stops. This leads to convenient usage and optimal battery spending while using the LGM Card
- Most of feature phones have microSD slot under the power all the time. Because the LGM Card Gen1 has not its own power management this can cause discharging the battery in few hours. LGM Card Gen2 will solve this as it will use NFC controller with its own power management

Wallet Application

- On smartphones Wallet application manages the LGM Card including NFC antenna in the phone
- Most of feature phones cannot download apps so the NFC antenna is always switched on (similar use-case as a plastic contactless card). The advantage can be better comfort for the user: he need not start the application before going to the gate

LGM Card
for not connected customers

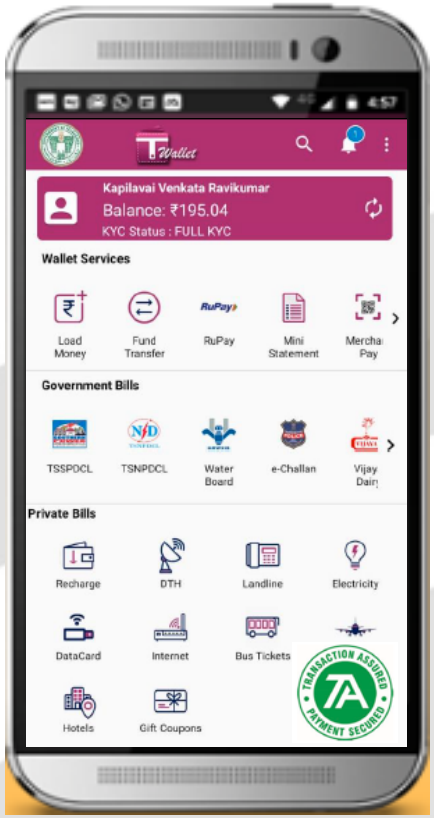
- Not connected customers usually do not use smartphones. Usually banks provide mobile services to these customers using SMS banking - yet with a limited number of services
- LGM Card will add NFC capability also to basic and feature phones. Secure chip of the LGM Card can store bank card, transit card, access card and customer can use these to tap&pay and tap&go use-cases also without data connectivity of this phone

Tap & pay on contactless POS
Tap & go on metro
Store Aadhaar on SE

- Secure chip of the LGM Card can also store Aadhaar number and that can be displayed on the phone's screen during Aadhaar based purchases or read by NFC Reader
- Tap & pay function can be integrated into Bank's / Transit / Smart city mobile Wallet application - or it can be enabled from the phone's menu
- Connected customers using Wallet application can benefit in more areas – see next slides

e-Government II

Smart City Wallet



- **LGM Card can be integrated with any Wallet**
- LGM Card is currently integrated in TA Wallet [1)] while this platform enables various transactions online:
  - **State Transactions**
    - Payments from citizens to Government, e.g. tax pays, utility bills
    - Payments from Government to citizens
  - **Co-operating Partners Transactions**
    - Banks - securing digital transactions, money transfers, loan requests etc.
  - **Other Transactions**
    - private bill payments
    - merchant loyalty programs, meal tickets, fuel cards etc.

- **With integrated LGM Card into Smart City Wallet - services can be extended in NFC use-cases using RuPay One Card in transit and by retail merchants** (addressing also feature phones). At the same time the Wallet security and convenience for the users will be enhanced

1) Solution of **Transaction Analysts (India) Pvt. Ltd. Reference:** Telangana T wallet - https://twallet.telangana.gov.in

e-Government II

RuPay One Card stored the LGM Card

RuPay Prepaid Use cases

RuPay Prepaid card offers the unique proposition of One Card for all Payments.

Move all RuPay prepaid use-cases into millions of mobile phones

RuPay

A secure NFC microSD card

Business Use Case

- Transit Program
- Corporate Allowance
- Salary Disbursement
- Instant Loan Disbursements
- Student / University programs
- Smart City
- Toll & Parking

Transaction Use Case

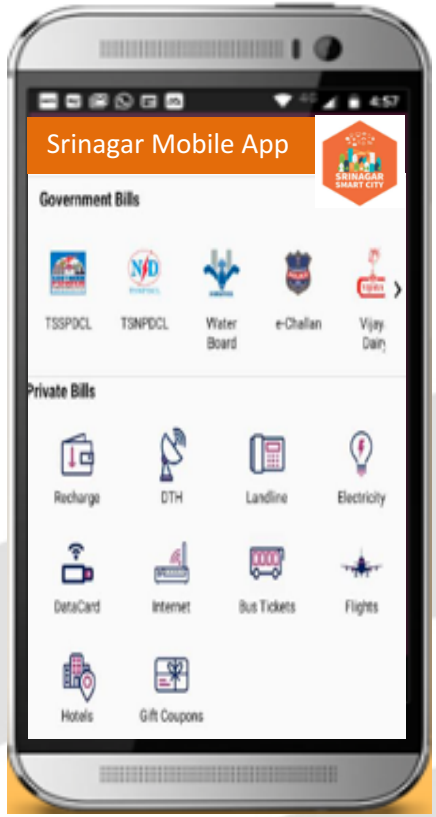
- Shopping
- Travel
- Entertainment
- Fuel
- ATM's
- Utility Bill payments

and many more.

Without any changes of current stake-holders relations and infrastructures already deployed

e-Government - II

Secure Authentication



- Smart City can use secure chip (SE) of the LGM Card to
  - Store digital certificates (client certificate, ID, token)
  - Store secure keys and PKI certificates
  - Encrypt data
- LGM Card enables both-side authentication with the Government servers during which the Mobile application will read data from the SE of the LGM Card via a dedicated API and send it to the Government server to confirm that LGM Card was issued to the particular customer
- A citizen will download and store a Mobile application onto his mobile phone while the authentication of the LGM Card will be seamless against linked customer

- **This will enable citizens highly secure and convenient remote access from mobile phones -** a simple registration and login, seamless secure authentication, OTP reduction, a convenient electronic signature and no need for central databases collecting sensitive data
- The LGM Card can be distributed at Civil Centers. It can be distributed with already loaded Aadhaar number ID applet **enabling citizen to manually store his Aadhaar** - see next
- **The secure chip of the LGM Card can store more unique IDs - e.g. taxID , socialID** and that will enable similar - secure and convenient connectivity with other governmental entities

e-Government II

Aadhaar Seeding Offline

- The Secure chip (SE) of the LGM Card can support Aadhaar number ID applet support Aadhaar number ID applet
- This will enable citizen to manually insert his Aadhaar number on his mobile phone; while it will be stored on SE of the LGM Card
- Usage example
  - The employee will handover the LGM Card to the citizen
  - The citizen will insert the LGM Card into his mobile phone, download and store Mobile App into his phone
  - He will enter and confirm his Aadhaar on the phone
  - Aadhaar number is securely stored on the SE

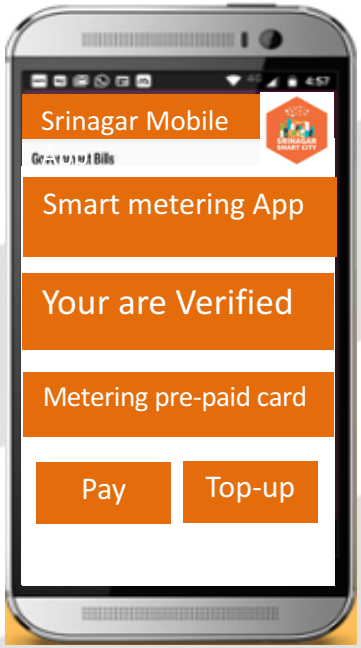
- A standard Aadhaar seeding process with banks is also supported - from the phone
- Full KYC and Aadhaar stored on the mobile phone can enable to offer extended range of digital transactions

Smart Utilities III

LGM Card used in Smart Metering

- Smart metering is automated meter reading system for automated billing and remote control and management of the meters. It can be a two-way wireless system enabling the utility company to remotely connect and disconnect services; enabling load balancing and increased cost control

- The **prepaid metering extension with the LGM Card** can be a solution with **the easiest way to add credit of any compatible systems without need of installing keypads in the metering room or in every individual house to enter the information**

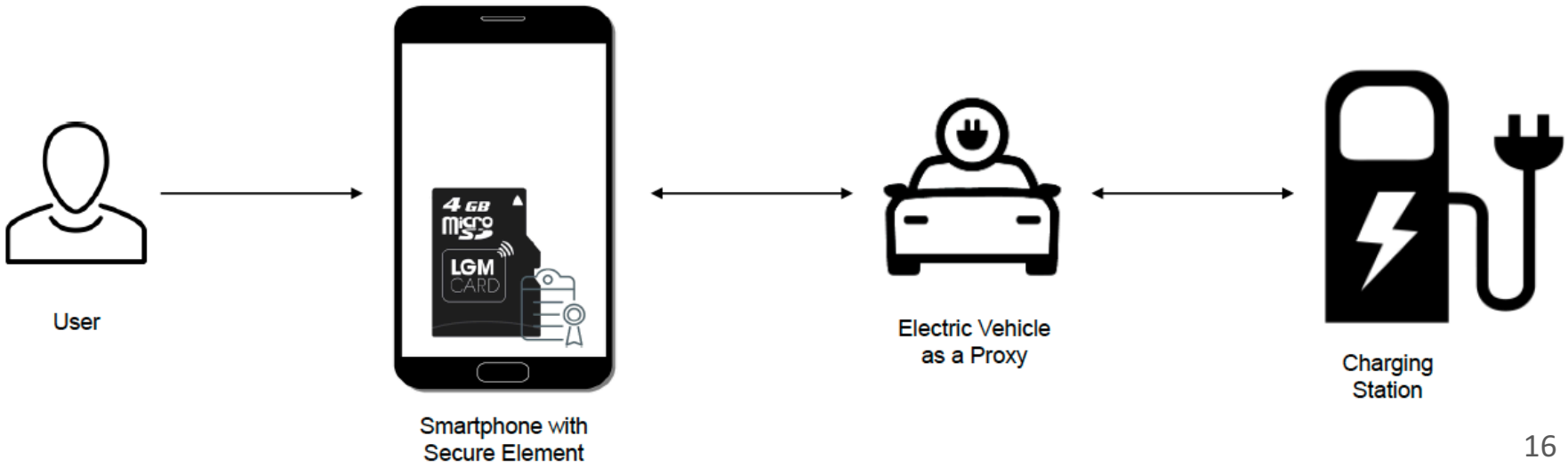


- **Metering Service provider (MSP) will store on SE of the LGM Card - Customer ID, secure keys or CA certificate PKI and a pre-paid card**. MSP will benefit from:
  - immediate online & offline payment (credentials deduction) for MSP services
  - secure and convenient verification of customers accessing MSP's servers
  - secured line of communication using cryptography token of the SE

Smart Utilities III

LGM Card used during EV charging

- Smartphones with the LGM Card can be used for a secure, private (user/vehicle anonymity) charging of electric vehicles (EV)
- SE of the LGM Card will secure - authentication with the networks, secure storage of Certificate and crypto algorithms
- In this way each smartphone will hold contract certificate, secure chip for contract certificate and anonymous authentication - charging station cannot identify the vehicle
- At the same time LGM Card which stores a bank card can enable the user to tap his phone to pay for the charging at contactless merchant POS



LGM Card

Use Cases for Digital India

DigitalSeva

GOVERNMENT SERVICES Election Aadhaar Passport PAN Card	**Store Aadhaar stored on secure chip** **Aadhaar based authentication for Bharat Bill Pay** from a mobile phone with simplified registration and secure usage
B2C SERVICES Electricity and Water Bill Payment VLE Bazaar Health Agriculture	**Seamless access to Digital*Seva* portal based on Aadhaar and CSC id from a mobile phone** **Store CSC id, GST Tax number, PAN, PRAN for pension services, electronic signature etc. on the secure chip of the LGM Card**
BANKING Digi Pay Pradhan Mantri Jan Dhan Yojna Financial Literacy	**Aadhaar based authentication for Aadhaar payments (AePS)** **Enable feature phones to make contactless payments and transit access using RuPay One Card** **Enable to top-up any pre-paid card or Wallet from a mobile phone**
TRAVEL Railway Airline Bus Hotels	**Store a Close-loop transit card and use it to access the transit gates with a mobile phone** **Enable tap by phone payments for parking, bicycle sharing** and other travel services from a mobile phone
INSURANCE Life Insurance Premium Payment Insurance Sales RAP Registration VLE-Insurance Registration	**Enable CSC employees and Rural Authorized Person (RAP)** ID based authentication during **access to Digital*Seva* network and CSC systems**

Summary

- LGM Card is NFC secure microSD card. It contains a standard 16GB memory for the user, NFC antenna and two secure chips. It is used while inserted in SD slot of a mobile phone
- **Currently a unique solution how to enable RuPay One Card to be used by millions of existing mobile phones, including feature phones - for contactless payments on POS, in Transit and many more**
- The 2nd Secure chip of the LGM Card can store MIFARE DESFire close-loop SVC used in Transit.

Benefits for Smart City / Transit SP / Bank

- 900 million immediate addressable base (incl.feature phone users) using RuPay One Card from their mobile phones
- Re-using current infrastructures of Cĺess POS and AFC gates, NFC readers
- Tamper resistant hardware security. Based on Global Platform, Common Criteria and EMVCo standards
- Independence on phone vendors
- Multi-functional use-cases for customers

Benefits for Customers:

- Contactless mobile payments and transit on my existing phone
- Enhancing convenience during transport - less time spent on the counter, no queue for top-up
- Easy to tap my phone to pay on POS
- Adding new use-cases on my mobile phone - access card, parking card etc.

Back up Slides

Card Issuance

Card Validation

Card Top-up

Mobile Aadhaar Use-cases examples

Focus on Security

About Logomotion

RuPay One Card on LGM Card

Issuance

- Customer can **withhold the LGM Card at Smart City Civic premises or at Metro premises and personalize the RuPay One Card in any of below:**
  - **On NFC readers** connected to PC - personalization is made after dispatch of the LGM Card to the customer at the branch or kiosk, after inserting it into his phone and tapping it on NFC enabled reader connected with transit card issuing system (for both feature and smartphones)
  - **In a contact way.** LGM Card is inserted in a plastic ID-1 carrier. Pre-personalisation, service area creation and personalization on standard perso machines is possible while the LGM Card is placed on ID-1 size plastic carrier (for both feature and smartphones). Customer will activate the transit card from the Wallet app (smartphones)
  - **Over the Internet (OTI).** Consumer will dispatch LGM Card, insert it into his phone and download Wallet application. The transit card can be activated and personalized OTI in accordance with Key Management system set processes (smartphones)

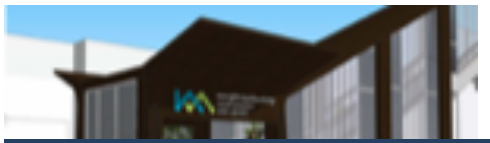
OTI perso

- Developed for Dubai Wallet emPay

Contact perso

- Tested on Datacard Machines, video: https://www.youtube.com/watch?v=U3VneM1Hm-Y

Contactless perso



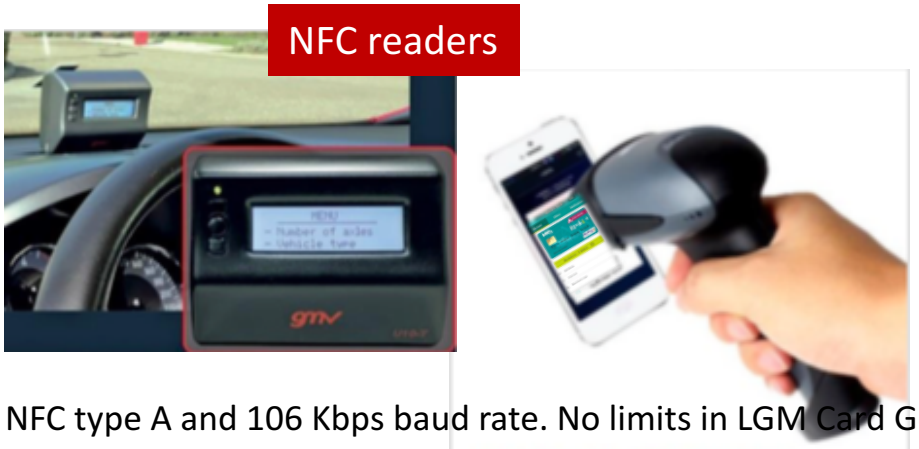
- RTA Dubai Metro (NOL Card) - internal lab
- CMRL Chennai Metro - internal lab
- LTA Singapore - internal lab

Card Validation

- LGM Card can be inserted in SD slot of 900 million of existing phones in India. Customer will tap his mobile phone to any standard contactless POS, AFC gate or NFC enabled reader, kiosk or ATM
- **No changes on AFC gates [1], validation devices or readers using NFC.** The same transaction processing like with a plastic version of the metro /bank card

Value added services

- Re-use current infrastructures
- Control card behavior - limits, offline balance threshold check, status etc.
- Real time-card block option on the SE – over and above the blacklist management at the phone device
- No queue for top-up. Perform Money Add to host and chip directly - OTI



1) The antenna system of LGM Card Gen1 is limited to NFC type A and 106 Kbps baud rate. No limits in LGM Card Gen2 in NFC Types A/B/F and and communication speeds 106, 212, 424 and 848 kbps.

Top-up Options

- LGM Card physically stores the transit card on the secure chip and provides NFC capability to the phone using the transit card. This enables all existing offline and online top-ups and adds new options:
  - Top up from the phone - no queues, adding money to host and SE directly OTI
  - Top up at the NFC enabled kiosks - by taping the phone to the NFC enabled Kiosk

Standard, from PC

www.passengerwebsite.com

Standard @ticket office
tap the phone to NFC reader

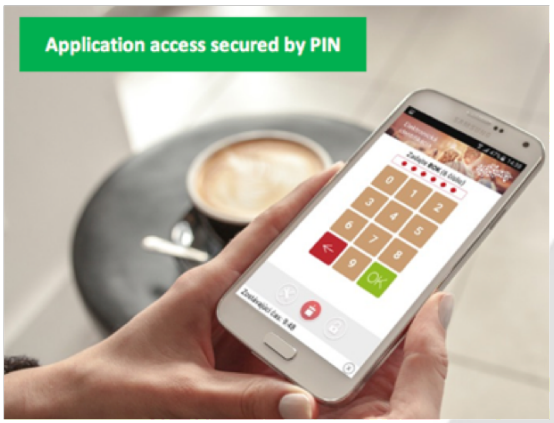
From a mobile phone

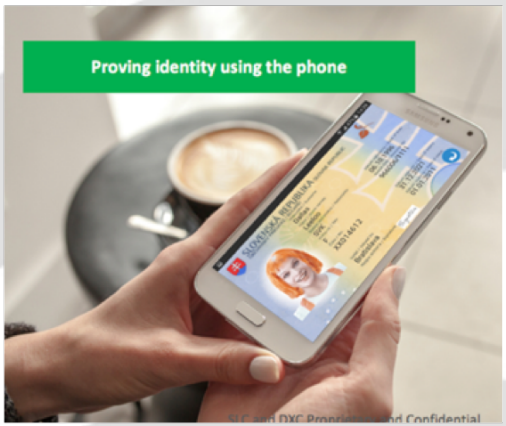
On NFC enabled Kiosks

Mobile Aadhaar

Use-cases Examples

- Secure chip of LGM Card can Generate and store digital certificates (key, client certificate, ID, token, PKI certificate) and store ID card or Aadhaar/Virtual number including biometrics data at client's side
- This will enable citizen to use his mobile phone as a unique identification during remote access to Smart city cloud or server – securely and under full control of Government
- **Verification services using Aadhaar can**
  - Enable to verify (on-spot and remotely) any citizen (control of Aadhaar data stored on secure chip)
  - Identify each citizen who is accessing governmental servers. Adding security to cloud-based services
  - Store and use electronic signature from a mobile device
  - Offer Governmental verification services to commercial entities
- **Payments for governmental services** - with a co-branded Government/bank card stored on SE





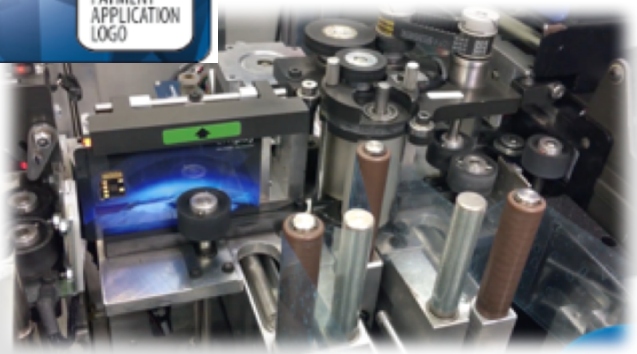
Pictures of a prototype solution using LGM Card - developed for Ministry of Interior of Slovak Republic

Focus on Security

Technical Characteristics

Form Factor	SDHC microSD card, Speed Class 10, Bus interface UHS50 (UHS-I)
Flash Controller	32-bit RISC microprocessor, PS8033/ PS8036
Flash Memory	Toshiba NAND 19nm / Toshiba NAND 15nm
Type MSD-101BA	SE#1: NXP J5C145, JCOP 2.4.2 R1, 145 KB EEPROM memory, MIFARE FleX® (4K) SE#2: NXP J5D081, JCOP 2.4.2 R2, 80 KB EEPROM memory, MIFARE® DESFire® EV1 8K
NFC Antenna	ISO 14443A, ISO 18092, Compliant with MIFARE®
Interfaces Standards Applets	Standard microSD interface, ISO 14443A, ISO 7816 Global Platform Card Specification v.2.1.1, Security certification: CC EAL5+ LGM RuPay 1.0, MasterCard (MMPP), VISA (VMPA), Mifare4Mobile (M4M)

Optional plastic carrier enabling contact personalization (used only during personalization)



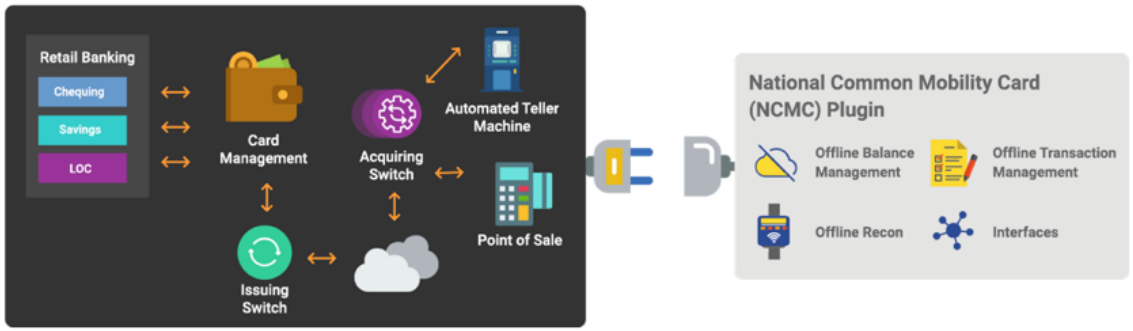
- LGM Card is NPCI certified
- Secure chips of the LGM Card meet Global Platform (GP) specifications and enables the strongest HW authentication[1] for
  - Physical storage of full card data on Secure element
  - Storage of Clients certificates enabling more secure access to Governmental Cloud, HCE or wallet servers, to store tokens etc
- LGM Card is inline with Government of India – Use of Aadhaar e-KYC service of UIDAI[2]

- qSPARC payment application is pre-personalized in a contact way according to EMVCo specification
- More ways of personalization
- Unique number of the microSD card printed on the plastic carrier (that can be used as a Reference number linked to PAN number)

1) *PCI DSS Requirement 8.3, February 2017 and Gov. of India, Ministry of Electronics & Information Technology, ORDER No 2(94)/2017 – Cert-In-Pt.I, date:12.08.2017*
2) *Government of India Ministry of Communications Department of Telecommunications, File No.:800-29/2010-VAS (Vol.1), dated 12th June, 2018*

Integration

- We sell the LGM Card hardware and the LGM Card API. This will enable LGM Card integration by any Service provider
- Chip cards can be loaded on the SE in a contact way, contactless way or Over-the-Internet
- Additional cards and applications can be loaded:
  - Online: OTI or directly on the phone - via supporting applet
  - Offline: on the phone - via supporting applet, by a tap on dedicated validation devices e.g. on POS, on AFC gates and by a tap in physical premises
- We can recommend India partners for integration of LGM Card into the Wallet app, integration into bank CMS and Transit SP systems



http://paycraftsol.com

http://transactionanalysts.com

About Logomotion

Name	**LOGOMOTION, s.r.o.**
Owner	Mr. Emil Hubinak, Chairman of the Board
Date of establishment	1994
Headquarter	Piestany, Slovak Republic
Offices and Lab	Bratislava and Piestany, Slovak Republic
URL	http://www.logomotion.eu
Main activities	R&D and commercialization of technologies

- From 2007 Logomotion's business is in the area of NFC antenna systems
- Between May 2015 - September 2020 Logomotion was in a join-venture company with SMK Corp., Japan. In the company SMK-Logomotion Corp. Logomotion team was responsible for R&D and production support
- Since September 2018 Logomotion R&D team has been independently promoting the technologies
- Logomotion has developed contactless smart microSD card (LGM Card), secure microSD card for cash-registers in Germany and micro NFC coil antennas used in glass tube under skin implates. Logomotion had filed and was granted more patents
- Logomotion current products portfolio: LGM Card, micro coil antennas and NFC secure dongle [1] - EMVCo card reader attached to smartphones enabling merchants to accept contactless bank cards

1) Under testing