

# eMinuto

Concept for a decentral trust-based  
digital means of payment

Presented by Sebastian Galek

# Agenda

- Introduction (Minuto and Motivation for eMinuto)
- eMinuto - Functionality & Design
- Presentation of Prototype (Screenshots)
- Further Ideas / Outlook

# Introduction

## What is Minuto?

# What is Minuto?

- A performance-based means of payment (vouchers backed by working time), 60 Minuto = voucher for goods and services worth 60 minutes of quality performance
- The issuer creates vouchers that are backed by a male and a female guarantor.

## Features:

- Decentral, similar to cash, stable in value, based on trust and sense
- Can be created independently (no fiat money or electricity etc required),
- Unconspicuous, new money paradigm (People are the value)
- Ideal means of payment (no incentive for speculation)
- Less interested parties (no hypes by rising prices etc...)

**Question: How to digitalize it? (eMinuto - electronic Minuto)**



# Motivation – Why eMinuto?

- Ability to create own means of payment independently from institutions, has great charme – digital supplement would be ideal
- Digitalization is promoted and perceived as modern (an alternative for „cash deniers“)
- Usually companies / freelancers transfer invoices (barely cash)
- Trust-based online networks also emerge over greater distances (not applicable for paper vouchers)
- Can be used as means of payment only (crypto currencies often used for speculation → barely any creation of real value)

# eMinuto

# Functionality & Design

# Functionality of eMinuto

- Text files with transactions list (mini blockchain)
- Uses public user IDs instead of anonymous addresses
- Text files are digitally signed by user ID of issuer and guarantors
- eMinuto files sent to users (digital signatures in the transaction list confirm ownership)
- **No worldwide blockchain required (no server) → Fraud? (double spending)**
- Transactions are designed in such a way that frauds are detected and proven with a high probability (social control)
- Risk to exclude oneself from network of trust in case of fraud (high social penalty)

# User IDs

**MC**ePgzqLcs7BUej11JbDds3M1ffjhsmXdhyW6yy5SGQAaVtJPx1  
KefhjCawo8i8Y1uhW**UTmW**

- ID is a base58 coded **public key** generated from Seed (e.g. 12 keywords) + **prefix** and **checksum** as suffix
- Elliptic curves (ECC) used for cryptography
  - Signing allows for proof of identity
  - Short pubkey (can be used as user ID)
  - Elliptic-curve Diffie–Hellman (ECDH) - common key generation (transaction file can be decrypted by recipient – data privacy)



# Design of voucher file

```
{
  "region": "99947",
  "amount": "1000",
  "description": "Gutschein für Waren oder Dienstleistungen im Wert von 1000 Minuten qualitativer Leistung.",
  "valid_until": "2029-12-31T23:59:59.999999Z",
  "creator_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsmXdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
  "creator_organization": "",
  "creator_first_name": "max",
  "creator_last_name": "musermann",
  "creator_address": "Lindenstraße 5 Berlin ",
  "phone": "0123",
  "email": "mein@mail.de",
  "creator_gender": 1,
  "service_offer": "Haare schneiden",
  "creator_signature": null,
  "coordinates": "51.0 10.6",
  "guarantor_signatures": [],
  "needed_guarantors": 2,
  "transactions": [],
  "creation_date": "2024-02-10T12:18:58.272207Z",
  "voucher_id": "8dsmQrfAzoEkY6DGyoYBUXffh6jgXaZxcxxS7rKV5ZZP",
  "footnote": "Gutschein-Nutzung nur für Mitspieler/innen.",
  "is_test_voucher": false,
  "voucher_version": 1
}
```

- User data
- Voucher data

# Calculation of Hash

- Hash calculated as double sha256 like with Bitcoin
- Provides protection from potential attacks

# Calculation – Voucher ID

```
{
  "region": "99947",
  "amount": "1000",
  "description": "Gutschein für Waren oder Dienstleistungen im Wert von 1000 Minuten qualitativer Leistung.",
  "valid_until": "2029-12-31T23:59:59.999999Z",
  "creator_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
  "creator_organization": "",
  "creator_first_name": "max",
  "creator_last_name": "musermann",
  "creator_address": "Lindenstraße 5 Berlin ",
  "phone": "0123",
  "email": "mein@mail.de",
  "creator_gender": 1,
  "service_offer": "Haare schneiden",
  "creator_signature": null,
  "coordinates": "51.0 10.6",
  "guarantor_signatures": [],
  "needed_guarantors": 2,
  "transactions": [],
  "creation_date": "2024-02-10T12:18:58.272207Z",
  "voucher_id": "8dsmQrfAzoEkY6DGyoYBUXffh6jgXaZxcxxS7rKV5ZZP",
  "footnote": "Gutschein-Nutzung nur für Mitspieler/innen.",
  "is_test_voucher": false,
  "voucher_version": 1
}
```

- All values except:
  - creator\_signature
  - guarantor\_signatures
  - transactions
- Keys sorted alphabetically in JSON format → string
- Hash from this string in base58 results in voucher\_id

# Guarantees

```
"guarantor_signatures": [  
  {  
    "voucher_id": "3UsCV8JG15LF2aN7fzbg1EwF5bHKs2VJk6nDQAbSpzZg",  
    "id": "MCLikeVCmfdvg1khTa2gWaTP9UEWuepPjig6Cb1oXduUmJE96UbwQvsWVL9tCY48zKACnuAV",  
    "first_name": "hans",  
    "last_name": "mustermann",  
    "organization": "",  
    "address": null,  
    "gender": 1,  
    "email": "meine@mail.de",  
    "phone": "0123-456789",  
    "coordinates": "",  
    "signature_time": "2024-02-04T23:37:36.367074Z"  
  },  
  "MGQCMCwlpWSOaqketD1oLfQZ0ivZCcvajHK3PHHaKxx45JVXEo/Nv..."  
],
```

- Voucher issuer sends voucher to guarantor
- Guarantor creates JSON string with voucher\_id, his own user ID and his data (see links)
- This string is signed
- String incl. **signature** returned to issuer

# eMinuto with Guarantees

```
...
"coordinates": "51.0 10.6",
"guarantor_signatures": [
  [
    {
      "voucher_id": "3UsCV8JG15LF2aN7fzbg1EwF5bHKs2VJk6nDQAbSpzZg",
      "id": "MCLikeVCmfdvg1khTa2gWaTP9UEWuepPjig6Cb1oXduUmJE96UbwQvsWV/L9tCY48zKACnuAV",
      "first_name": "hans",
      "last_name": "mustermann",
      "organization": "",
      "address": null,
      "gender": 1,
      "email": "meine@mail.de",
      "phone": "0123-456789",
      "coordinates": "",
      "signature_time": "2024-02-04T23:37:36.367074Z"
    },
    "MGQCMCwlpWSOaqketD1oLfQZ0ivZCcvajHK3PHHaKxx45JVXEo/Nv9oNo..."
  ],
  [
    {
      "voucher_id": "3UsCV8JG15LF2aN7fzbg1EwF5bHKs2VJk6nDQAbSpzZg",
      "id": "MCZwEJMWAReVUS61SevVP9huVW2iRCHs4TUzy6k1dH1aExoVPqD8AvzGasrohXsRfFihFgiB",
      "first_name": "gabi",
      "last_name": "",
      "organization": "",
      "address": null,
      "gender": 2,
      "email": "",
      "phone": "",
      "coordinates": "",
      "signature_time": "2024-02-04T23:43:09.319665Z"
    },
    "MGYCMQDFYkI3wkiUfQ8eJkisuTjgcBCZQPvnNij5aMCquSUzN+WWT/ZzuESRoH..."
  ]
],
"needed_guarantors": 2,
...
```

- Verification of validity of data of guarantors
- Check if signature of respective guarantor data is correct
- Check if guarantor data belongs to the voucher (the **voucher\_id** of the guarantor data matches with the **voucher\_id** of the voucher)

# After Guarantors - Initialization

```
{
  "region": "",
  "amount": "888",
  "description": "Gutschein für Waren oder Dienstleistungen im Wert von 888 Minuten qualitativer Leistung.",
  "valid_until": "2029-12-31T23:59:59.999999Z",
  "creator_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
  ... Inhalte ausgeblendet ...
  "service_offer": "",
  "creator_signature": "MGUCMQDWGuzLa9s6fwVSw4dgSNxAVQ0vbVAdbUENrcbMcbcfivTJ41Mix...",
  "coordinates": "",
  "guarantor_signatures": [
    ... signaturen ausgeblendet ...
  ],
  "needed_guarantors": 2,
  "transactions": [
    {
      "previous_hash": "k11QxNwwSyqwUd1C95JGG2atixd8GUKX1kKGsNwxAeX",
      "recipient_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8...",
      "amount": "888",
      "sender_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y...",
      "t_time": "2024-02-04T23:48:20.263060Z",
      "t_type": "init",
      "t_id": "Dj3VejZrutVrCS47ZNy9bZr25ZVmZDvaJAGSBKtS9CLK",
      "sender_signature": "MGQCMCPtDJLa+Pv6v4W/lim7R5ymSN/fNOcJ4WtT0121k4q7bTW0dlsf..."
    }
  ],
  "creation_date": "2024-02-04T23:33:25.038959Z",
  "voucher_id": "3UsCV8JG15LF2aN7fzbg1EwF5bHKs2VJk6nDQAbSpzZg",
  "footnote": "Gutschein-Nutzung nur für Mitspieler/innen.",
  "is_test_voucher": false,
  "voucher_version": 1
}
```

- After the guarantors the voucher can be initialized by:
- **Signing** by the issuer (creator\_signature)
- Create the first initial transaction with the **total amount** of the voucher

(In general, initialization can be performed by the guarantors since guarantor data can be initialized independently and added later)

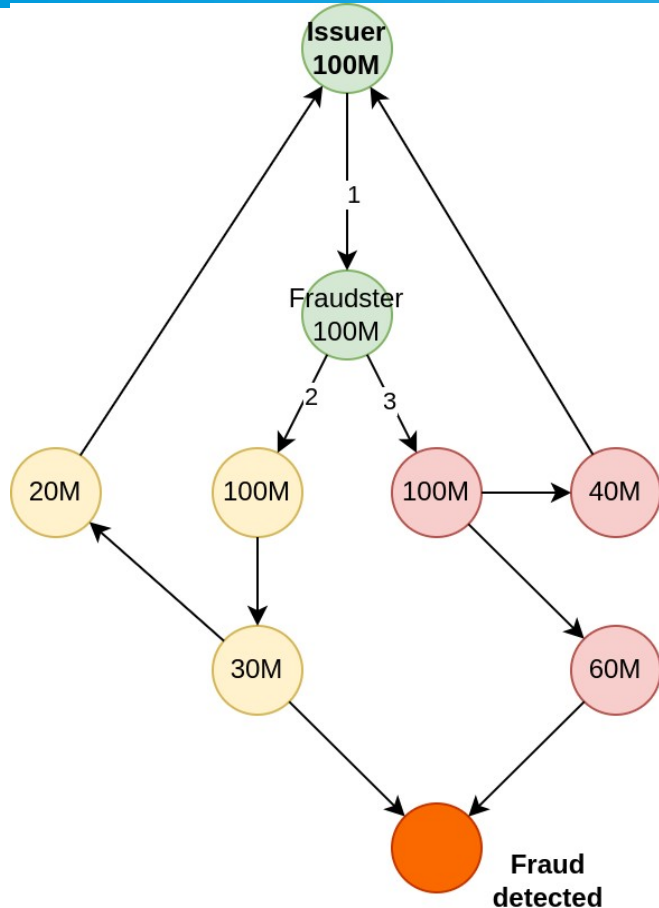
```

"transactions": [
  {
    "previous_hash": "k11QxNwwSyqwUd1C95JGG2atixd8GUkX1kKGsNwxAeX",
    "recipient_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
    "amount": "888",
    "sender_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
    "t_time": "2024-02-04T23:48:20.263060Z",
    "t_type": "init",
    "t_id": "Dj3VejZrutVrCS47ZNy9bZr25ZVmZDvaJAgSBKtS9CLK",
    "sender_signature": "MGQCMCpTDJLa+Pv6v4W/Iim7R5ymSN/fNOcJ4WtT0121k4q7bTW0dl4/3OB4Yofsf/b..."
  },
  {
    "previous_hash": "2DCmLsESvawYz6hJVpwQ8ccE9X5m6HgpVQFVyRKD4UUUV",
    "recipient_id": "MCLikeVCmfdvg1khTa2gWaTP9UEWuepPjig6Cb1oXduUmJE96UbwQvsWVL9tCY48zKACnuAV",
    "amount": "111",
    "sender_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
    "t_time": "2024-02-04T23:50:25.825178Z",
    "t_type": "split",
    "sender_remaining_amount": "777",
    "t_id": "7UXnhQ8GfjSCcEetZmaxSCDdEc2jhQnDNcdjZzCwsAG",
    "sender_signature": "MGYCMQDU74VCPKJUBspCIY8e4+LBNkSBt1mC7/yt3S8ynFdZ3EpiRjc9bzGvKTRaQXf5jg="
  },
  {
    "previous_hash": "FqJQ6utaftZsSQpdEnhM1W7EUDn7F5RaZLJwAQE3Fxn",
    "recipient_id": "MCePgZqLcs7BUej11JbDds3M1ffjhsMxdhyW6yy5SGQAaVtJPx1KefhjCawo8i8Y1uhWUTmW",
    "amount": "111",
    "sender_id": "MCLikeVCmfdvg1khTa2gWaTP9UEWuepPjig6Cb1oXduUmJE96UbwQvsWVL9tCY48zKACnuAV",
    "t_time": "2024-02-05T12:54:59.755583Z",
    "t_id": "5Z54abV76DMCXqebS4FXhV4cRGmkzf1Jrt9oANZXbrEg",
    "sender_signature": "MGUCMFyKG5VS8sEC4dAVs7S8wv8Dy63F/c1HdATsDcYz2y77IWJ8jy30UCroTpWNon..."
  }
]

```

- `previous_hash` is hash of the previous transaction (except for first transaction (hash of voucher\_id))
- `t_id` (transaction ID) is hash of all transactions data without signature
- Double spending detection (fraud) if 2 transactions found (of all available vouchers) that have the same **previous\_hash** with the same **sender\_id**

# Fraud detection (double spending)



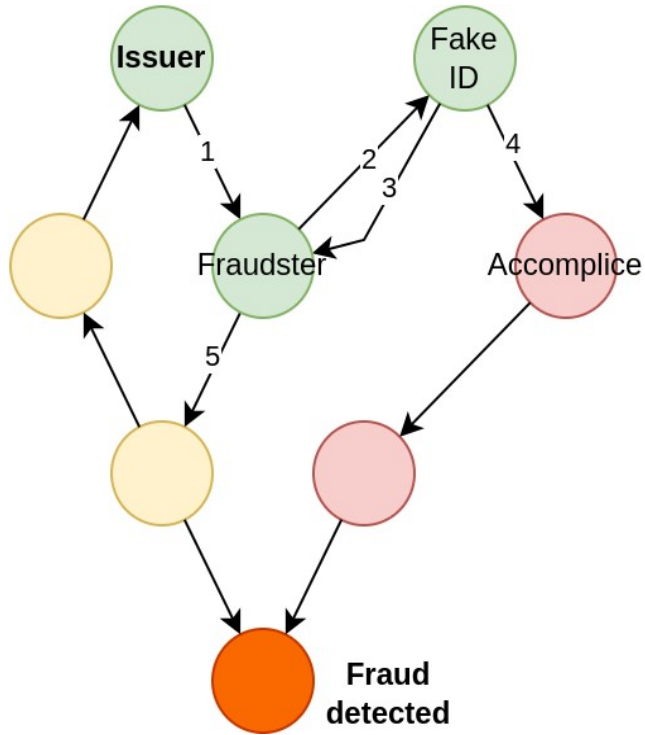
- Issuer creates 100 Minuto
- Fraudster spends 100M twice
- If some valid and double spent Minuto come together at a user → fraud is detected by the transaction list
- Fraud is unambiguous by signatures and is not deniable (could only have happened „by mistake“)



# Fraud detection (double spending)

Fraudster creates fake IDs

- Apparently, FakeID is only known to fraudster by which he attracts attention
- FakeIDs are evidence for deliberate fraud - greater social penalty



# Prototype

# Prototype

- Desktop version
- Python + Pyside6
- <https://github.com/minutogit/MinutoCashDigitalPrototype/>

# Launch / Dashboard

## Initial launch – Profile generation

Profil generieren

Profilname (beliebig wählbar)

Organisation / Firma:  Rufname:  Familienname:

Passwort:  Passwort wiederholen:

Schlüsselwörter

Schlüsselwörter zur Bestätigung nochmal eingeben

Diese Wörter erzeugen eine digitale Identität. Aufschreiben und geheim halten. Die Worte dienen auch zur Profil- und Passwortwiederherstellung.

## Dashboard

eMinuto - Profil: max - ID: MCEPgzqL

Start Minuto Profil

**max** ID:

**Kontostand**

eigene Minuto	<input type="text" value="91,00"/>
andere Minuto	<input type="text" value="0,00"/>

# Voucher

## Voucher issuance

eMinuto erstellen - Profil: max

### Gutschein Daten

Wie viel Minuto sollen geschöpft werden?

Minuto Region: 10115    Koordinaten: 52.5, 13.40

Wert: 1000    Gültigkeit: 5 Jahre

Gutschein für Waren oder Dienstleistungen im Wert von 1000 Minuten qualitativer Leistung.

### Eigene Daten

Organisation / Firma:

Rufname: max

Familienname:

Geschlecht: männlich

Adresse:

eMail Adresse:

Telefon:

Angebote / Fähigkeiten:

Gutschein-Nutzung nur für Mitspieler/innen.

Als Testgutschein nutzen (ohne Wert)

## Voucher details

eMinuto Details - Profil: max

**Eigener Gutschein (Bürgen fehlen)**      Verfügbarer Betrag: 0 Minuto

Inhalt	Wert
Region	
Betrag	1000
Beschreibung	Gutschein für Waren oder Dienstleistungen im Wert von 1000 Minuten qualitativer Leistung.
Gültig bis	2029-12-31T23:59:59.999999Z
Ersteller-ID	MCePgqzLcs7BUej11JbDds3M1ffjhsMxddyW6yy5SQQAaVtJPx1KefhjCawo8i8Y1uhWUTmW
Organisation	
Vorname	max
Nachname	
Adresse	
Telefon	
E-Mail	
Geschlecht	Unbekannt
Serviceangebot	
Unterschrift des Erstellers	Nicht unterschrieben
Koordinaten	
Anzahl Bürgen	0
benötigte Bürgenanzahl	2
Transaktionen	0
Erstellungsdatum	2024-02-10T12:18:58.272207Z
Gutschein-ID	8dsmQrfAzoEkY6DCyoYBUXffh6jgXaZcxcxS7rKV5ZZP
Fußnote	Gutschein-Nutzung nur für Mitspieler/innen.

# Transactions

## Transactions (transfer)

Minuto versenden - Profil: max

**Minuto versenden**

Empfänger ID (Adresse):

Zweck:

Betrag:  Minuto

**Hinweis:** Es wird eine Datei erstellt die dann dem Empfänger gesendet werden muss. (per E-Mail, Messenger, Datenträger, ..)

Transaktionen - Profile: max

Liste aller Transaktionen

Alle Transaktionen Filter:

Transaktions-ID	Sender	Empfänger	Betrag	Zweck	Zeit	
1	GE8M14aKws...	MCePgqzLcs...	MCZwEJMW...	-60.00	beratung	2024-05-04 ...
2	2v3tfZ7XeCB...	MCePgqzLcs...	MCZwEJMW...	-10.00	123	2024-05-04 ...
3	42dXSKW1zE...	MCePgqzLcs...	MCUVQJxgL...	-11.00	test heute	2024-04-10 ...
4	DLiSjao7Rdf...	MCePgqzLcs...	MCUVQJxgL...	-600.00	test hans	2024-02-18 ...
5	6JfWnJF74A...	MCePgqzLcs...	MCUVQJxgL...	-120.00	test hans	2024-02-18 ...
6	EErHsHM9Dk...	MCUVQJxgL...	MCePgqzLcs...	33.00		2024-02-18 ...
7	2vzDuu4y4k2...	MCUVQJxgL...	MCePgqzLcs...	22.00		2024-02-18 ...
8	4fYyGk4oQE...	MCUVQJxgL...	MCePgqzLcs...	17.00		2024-02-12 ...

Transactions overview

eMinuto-Liste - Profil: max

Gutscheinliste

Eigene Filter:

Gutschein-ID	Betrag	etrag (verfügbar)	Gültigkeit bis	Ersteller	Organisation	Adresse	Geschlecht
13 BurphEs7Hm...	1000.00	0	2030-01-01 ...	max Muster	Musterfirma		Männlich
11 8dsmQrfAzo...	1000.00	0	2030-01-01 ...	max			Unbekannt
10 6JRxPGnx4b...	666.00	0	2030-01-01 ...	hans			Männlich
12 62atUTQB2Pi...	1000.00	0	2030-01-01 ...	max test			Unbekannt
9 5tfMHRnMb...	1000.00	0	2030-01-01 ...	max			Männlich
1 3UsCV8JG15...	888.00	0	2030-01-01 ...	max			Männlich
2 3UsCV8JG15...	888.00	0	2030-01-01 ...	max			Männlich
3 3UsCV8JG15...	888.00	6.00	2030-01-01 ...	max			Männlich
4 3UsCV8JG15...	888.00	0	2030-01-01 ...	max			Männlich
5 3UsCV8JG15...	888.00	0	2030-01-01 ...	max			Männlich
6 3UsCV8JG15...	888.00	0	2030-01-01 ...	max			Männlich
7 3UsCV8JG15...	888.00	85.00	2030-01-01 ...	max			Männlich
8 3UsCV8JG15...	888.00	0	2030-01-01 ...	max			Männlich

Voucher list

Gutschein oder Bürgerunterschrift aus Datei öffnen

## Source code of a voucher

eMinuto-Rohdaten - Profil: max

Rohdaten

```

{
  "region": "",
  "amount": "888",
  "description": "Gutschein für Waren oder Dienstleistungen im Wert von 888 Minuten qualitativer Leistung.",
  "valid_until": "2029-12-31T23:59:59.999999Z",
  "creator_id": "MCePgqLcs7BUej11JbDds3M1ffjhsMxhdhyW6yy55GQAaVLPx1KeFhjCawo8i8Y1uhWUTmW",
  "creator_organization": "",
  "creator_first_name": "max",
  "creator_last_name": "",
  "creator_address": " ",
  "phone": "",
  "email": "",
  "creator_gender": 1,
  "service_offer": "",
  "creator_signature":
  "MGUCMQDWGuzLa9s6fwVSw4dgSNxAVQ0vbVAdbUENrcbMcbcfivTJBtlrQ41MixxET+QKNXcCMFw98Vv13FCRgaNEdrzCKM/
  V8H1zO72EkClrsq8RHZtxRfzBHfYwTLvXrG4kSuqhc7w==",
  "coordinates": "",
  "guarantor_signatures": [
    {
      "voucher_id": "3UsCV8JG15LF2aN7fzbg1EwF5bHKs2VJk6nDQAbSpzZg",
      "id": "MCLikeVCmfdvg1khTa2gWaTP9UEWuepPjig6Cb1oXduUmJ96UbwQysWVL9tCY48zKACnuAV",
      "first_name": "hans",
      "last_name": "",
      "organization": "",
      "address": null,
      "gender": 1,
      "email": "",
      "phone": "",
      "coordinates": "",
      "signature_time": "2024-02-04T23:37:36.367074Z"
    },
    {
      "voucher_id": "3UsCV8JG15LF2aN7fzbg1EwF5bHKs2VJk6nDQAbSpzZg",
      "id": "MGUCMQDWGuzLa9s6fwVSw4dgSNxAVQ0vbVAdbUENrcbMcbcfivTJBtlrQ41MixxET+QKNXcCMFw98Vv13FCRgaNEdrzCKM/
      YK451+1GovTnZ+H6bi7d8xSPOFJhFfx7T5V58wjKqJavMwi"
    }
  ]
}

```

Schließen

# Further Ideas / Outlook



# eMinuto Disadvantages

- Insecurity factor (fraud, do people trust each other?, ...)
- Mistrust among each other – used rarely
- Backup of the voucher files necessary
- Complex development of an app (wallet), thus can be used by normal users

# eMinuto Advantages

- eMinuto is basically a simple algorithm
- Mutual control (not only „top down“ like with digital Euro)
- Transparency (digital ID) promotes trust (anonymity needed if illegal (repressions) or social taboo)
- Data privacy (every user sees (controls) only a small part of the transactions)
- No illegal transactions possible (since traceable who traded with criminals)
- Social educational function, can only be used by trusted people (one has to „behave“)
- Cannot be stolen (hacking is pointless)
- Serverless (resource-saving), scalable to any size („billions“ of transactions per second)
- Transactions by transferring files (messenger, email („Paypal“), offline (Bluetooth, USB stick, ...))
- All advantages of Minuto (stable in value, can be issued, meaningful, no speculation – only value creation, regional resp. in networks of trust, ...)
- Insecurity factor → Trust among each other → great potential

# App Challenges

- Backups (avoid accidental „double spending“)
- Identity management (Web of Trust)
  - Mutual key signatures (signing)
  - Key distribution

# State of Development / Ideas

- Prototype for desktop exists
- For success, it probably needs an app
- For end users, a backup (sync) should work
  - Option of linking the app with email (backup function + comfort like Paypal)
  - App as website „online banking“ - (backups (data security) by hosting provider)

# Outlook

- Prototype exists. What next?
- External security audits needed (to avoid simple errors)
- A mobile app probably promises the largest user base
  - Mobile devices are standard in poor countries, too (PCs are less common there)
- Developers wanted who take pleasure in it
- Funding?
- What does it take to realize such a project?

Thank you for your attention.

- **Contact:** Sebastian Galek
- **GitHub:** <https://github.com/minutogit/MinutoCashDigitalPrototype>
- **Email:** [hello@eminuto.org](mailto:hello@eminuto.org)
- **Website:** <https://eminuto.org>
- **Telegram:** <https://t.me/+AntAAQ8uvGllOWMy>