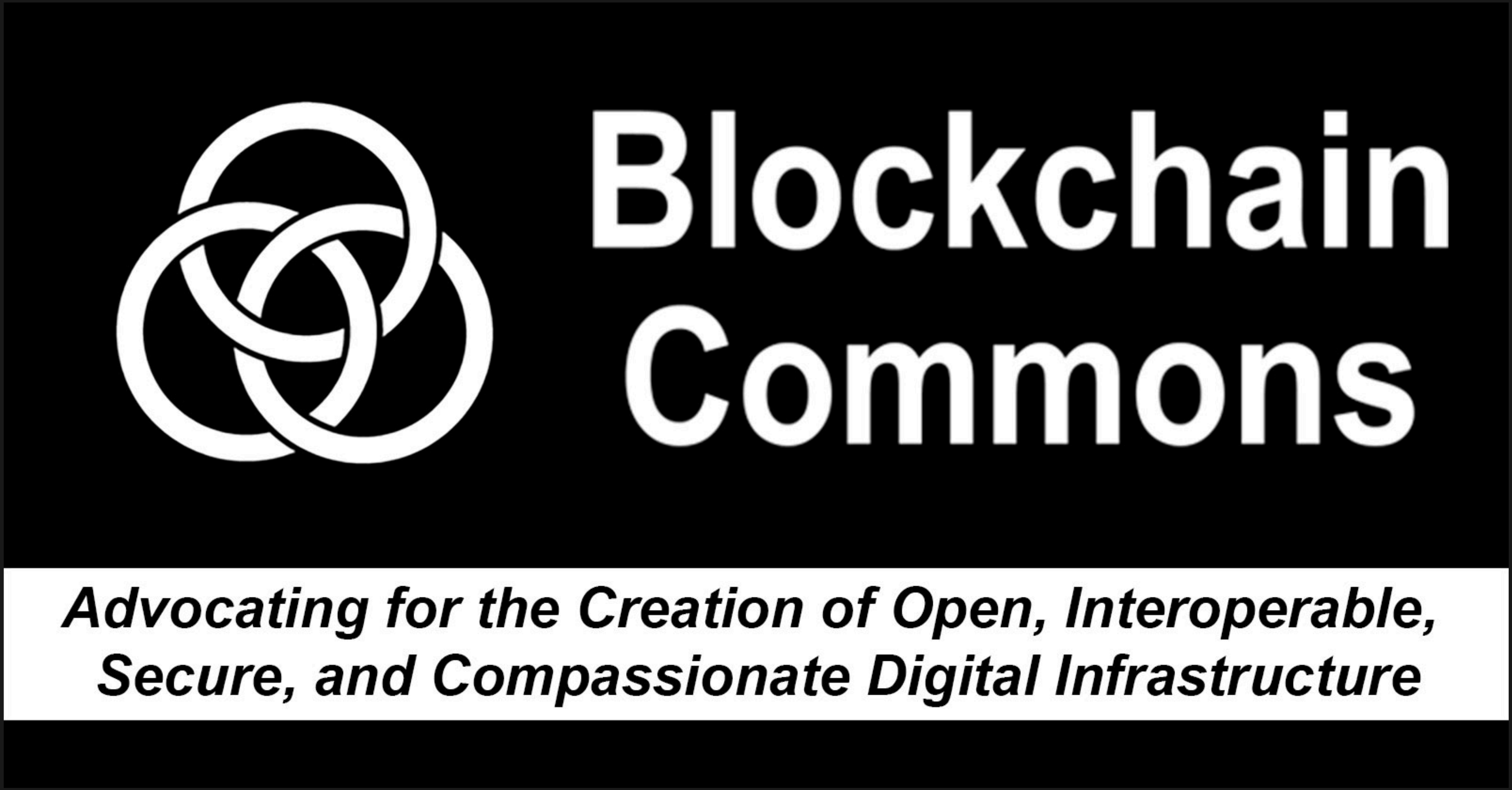


Blockchain Commons

Advocating for the Creation of Open, Interoperable, Secure, and Compassionate Digital Infrastructure

Blockchain Commons #Gordian Meeting 2024-08-07

What is Blockchain Commons?

- We are a community supporting the self-sovereign control of digital assets.
- We bring together stakeholders to collaboratively develop interoperable infrastructure.
- We design decentralized solutions where everyone wins.
- We are a neutral "not-for-profit" that enables people to control their own digital destiny.

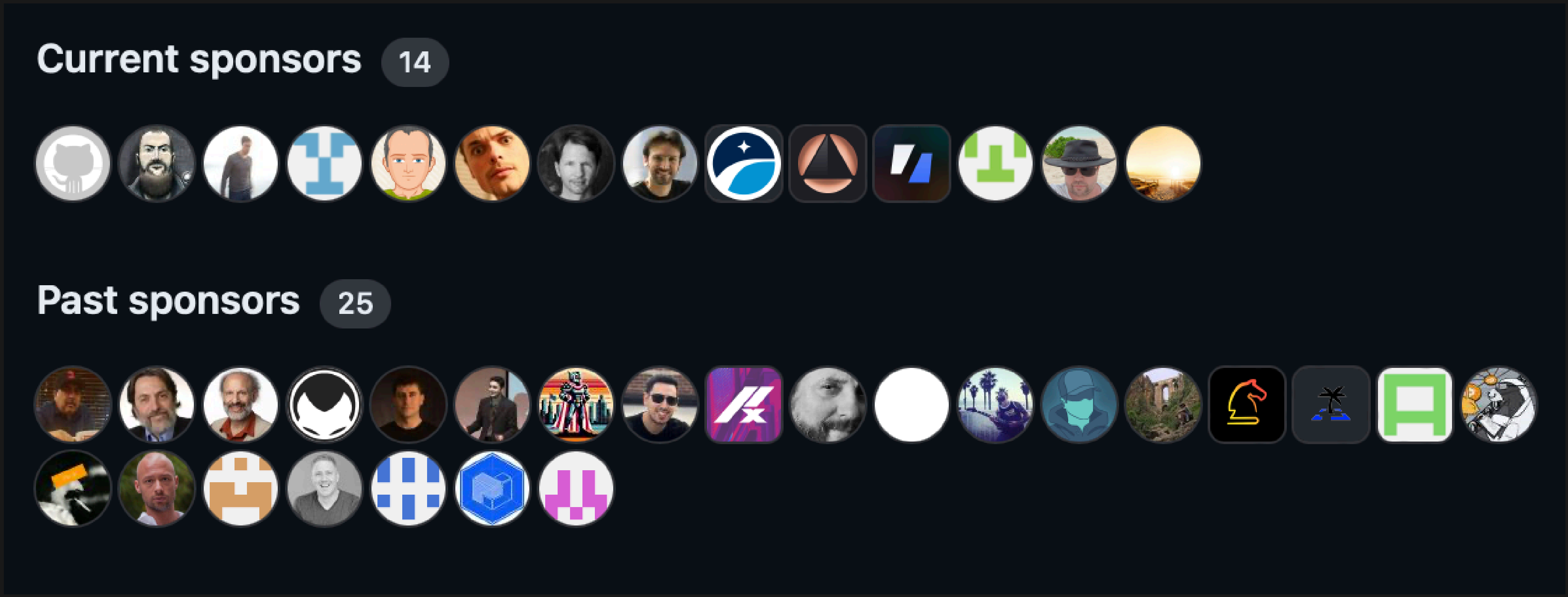
Thank you to our Sponsors!

Become a sponsor! Mail us at team@blockchaincommons.com

Sponsorships

- It's been a tough year! We've lost a number of sponsors!
    - They remain interested in supporting our technology.
    - But they're having problems with funding.
- Become a sponsor, mail us at team@blockchaincommons.com
- We can also support your company on specific projects
    - Open source & related to our specifications
    - Talk to us!
- Thanks to:
    - HRF for a Recent FROST Grant!
    - Foundation Devices for recent GSTP Research Funding!

Thanks also to individual sponsors!



Current sponsors 14

Past sponsors 25

- You help us to go to people like HRF & say we have developer support!
- Even $20/month makes a difference!

Subscribe to Our Announcements

- https://www.blockchaincommons.com/subscribe/
    - Announcements for Gordian Developers, FROST
        - Announcements-only Mailing List
        - Signal Discussion Channel
- For Google Calendar invite to regular Gordian meetings:
    - Request from Christopher
        - ChristopherA@LifeWithAlacrity.com

Last Meeting

- Seedtool in Rust
- Why SSH?
    - SSH Envelope-CLI Updates
- Gordian Sealed Transaction Protocol (GSTP)

Today's Topics

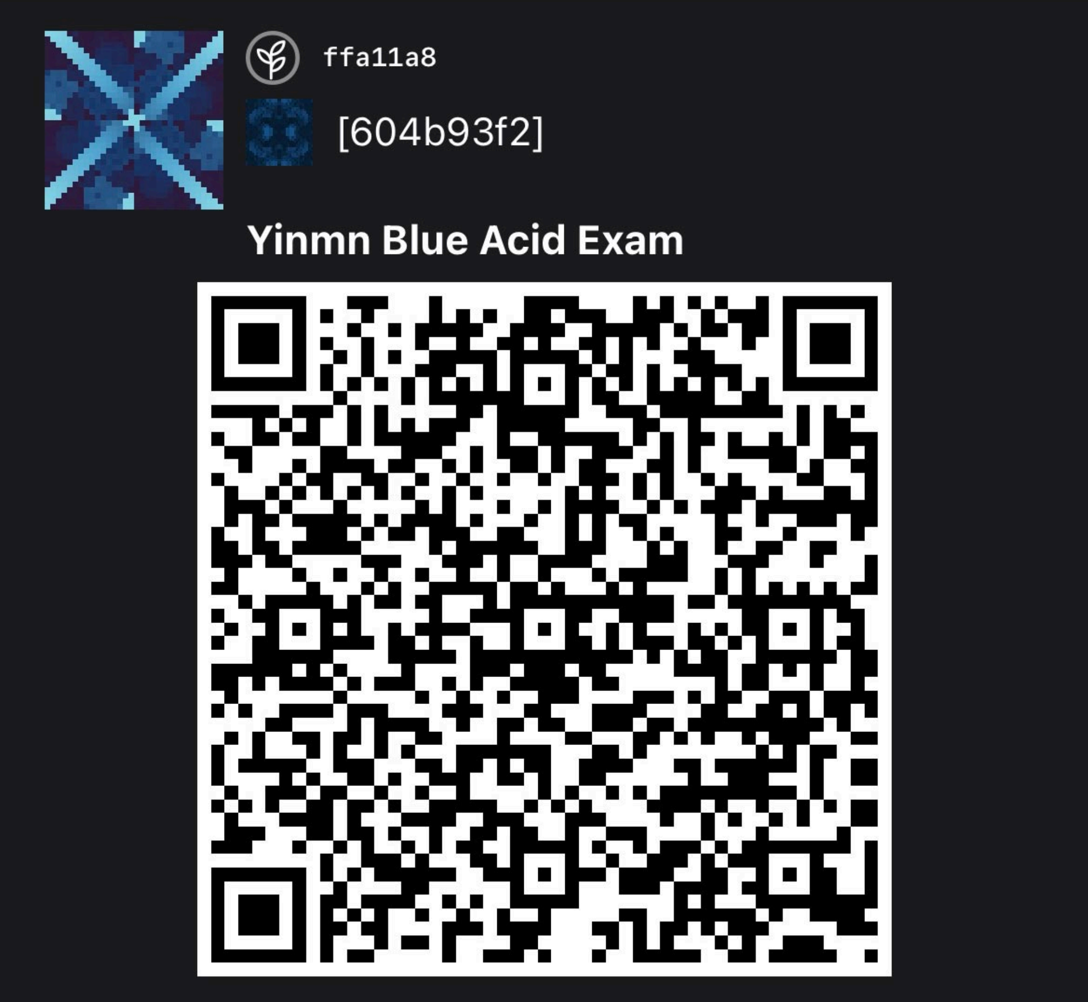
- Seed Resilience
- Seeds in Blockchain Commons Tools
- BIP-85
- Ledger Seed Tool
- What's Next?

Seed Resilience

- Seeds are the heart of Digital Asset Security
- The “Layer 0” of Cryptographic Security
- Just 12 or 24 Bytes, But Crucial
- How do We Keep them Safe? (Security)
- How do We Avoid Losing them? (Resilience)
- We'll Explore that Today!

Blockchain Commons Specs & Tools

- What's working so far?
  - UR/Envelope for Seed Storage
  - SSKR Sharding for Seed Resilience
  - Request/Response for Seed Transfer & Key Derivation
- Reference Apps
  - Seedtool-CLI-Rust
    - Create & manage seeds on the command line
    - Integrate with Envelope-CLI & Other Apps
  - iOS Seedtool
    - Best Practices app on your iPhone
  - For helping developers implement & test standards!



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[604b93f2]

Yinmn Blue Acid Exam

Seed as Gordian Envelope

```
ur:envelope/lftpsogdhkwzdtfthptokigtvwnnjsqzcxknsktdoyadcsspgmgreefy
```

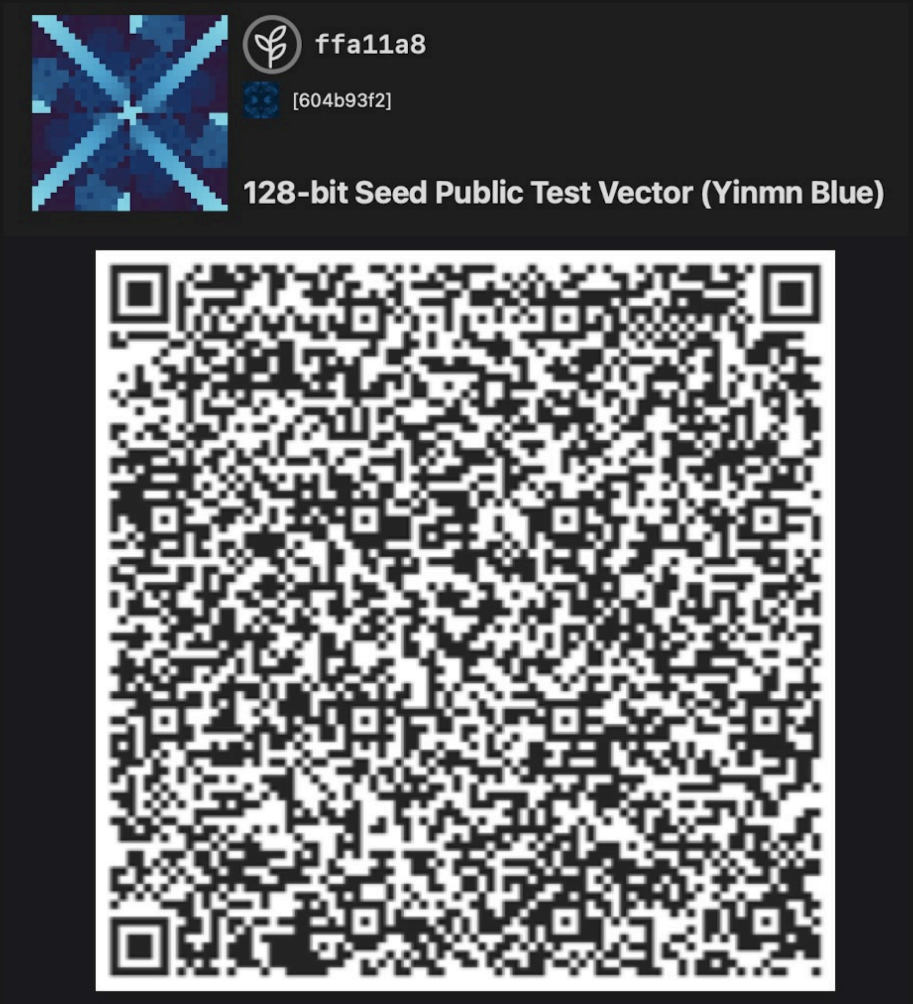
Minimal Bytewords convert to dCBOR:

```
82d8c95059f2293a5bce7d4de59e71b4207ac5d2a10118c8


82                                      # array(2)
   D8 C9                                # tag(201)
      50                                # bytes(16)
         59F2293A5BCE7D4DE59E71B4207AC5D2 # "Y\xF2):[\xCE}M\xE5\x9Eq\xB4 z\xC5\
   A1                                   # map(1)
      01                                # unsigned(1)
      18 C8                             # unsigned(200)
```

Seedtool iOS & macOS Features

- Create Seeds
- Identify Seeds
    - Name, LifeHash, Object Identity Block
- Backup Seeds
    - BIP-39, ByteWords, Hex
    - Envelope
        - Metadata, Name, Date, Note, Output Descriptors
    - QRs
- Shard Seeds
    - SSKR, SSKR-Envelope (CSR/Gordian Depository)
- Derive Keys
    - Bitcoin, Ethereum, Tezos
- Sign Bitcoin PSBT requests



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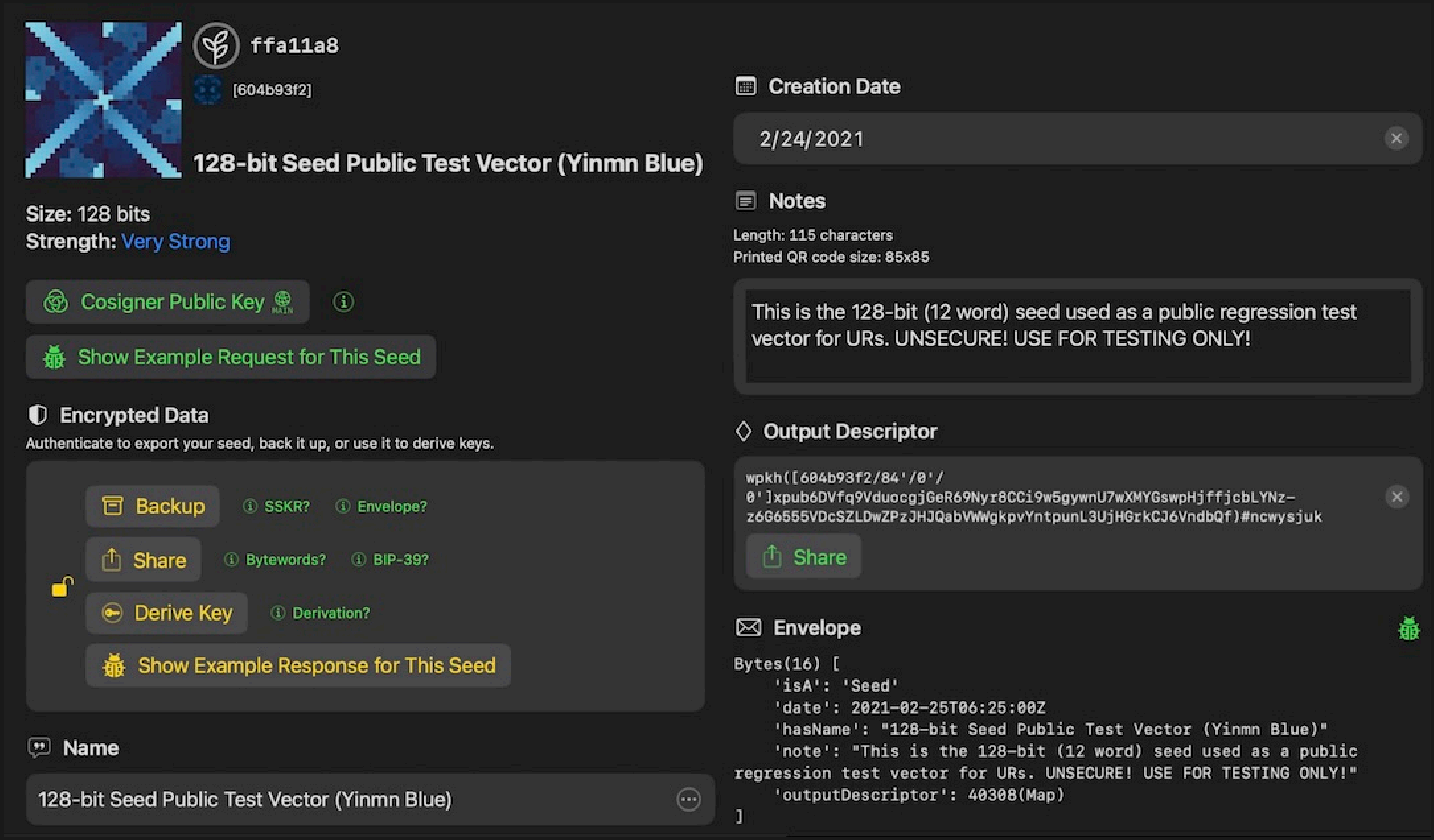
[604b93f2]

128-bit Seed Public Test Vector (Yinmn Blue)

Yinmn Blue in SeedTool for iOS/macOS



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[604b93f2]

128-bit Seed Public Test Vector (Yinmn Blue)

Size: 128 bits
Strength: Very Strong

Encrypted Data

Authenticate to export your seed, back it up, or use it to derive keys.

Name

128-bit Seed Public Test Vector (Yinmn Blue)

Creation Date

2/24/2021

Notes

Length: 115 characters
Printed QR code size: 85x85

This is the 128-bit (12 word) seed used as a public regression test vector for URs. UNSECURE! USE FOR TESTING ONLY!

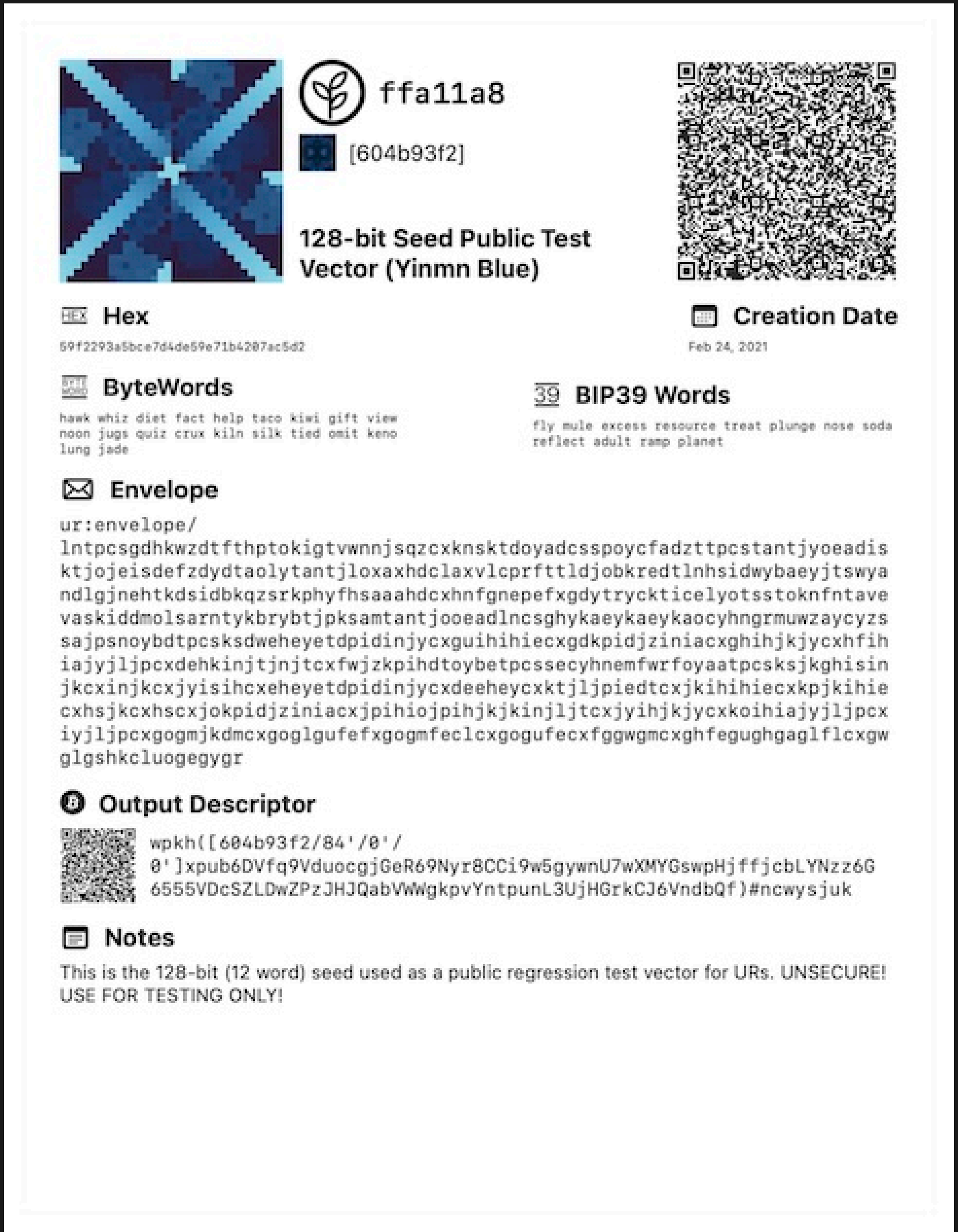
Output Descriptor

```
wpkh([604b93f2/84'/0'/
0']xpub6DVfq9VduocgjGeR69Nyr8CCi9w5gywnU7wXMYGswpHjffjcbLYNz-
z6G6555VDcSZLDwZPzJHJQabVWWgkpvYntpunL3UjHGrkCJ6VndbQf)#ncwysjuk
```

Envelope

```
Bytes(16) [
    'isA': 'Seed'
    'date': 2021-02-25T06:25:00Z
    'hasName': "128-bit Seed Public Test Vector (Yinmn Blue)"
    'note': "This is the 128-bit (12 word) seed used as a public
regression test vector for URs. UNSECURE! USE FOR TESTING ONLY!"
    'outputDescriptor': 40308(Map)
]
```

Yinmn Blue for offline PDF



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[604b93f2]

128-bit Seed Public Test Vector (Yinmn Blue)

Hex

59f2293a5bce7d4de59e71b4207ac5d2

Creation Date

Feb 24, 2021

ByteWords

```
hawk whiz diet fact help taco kiwi gift view
noon jugs quiz crux kiln silk tied omit keno
lung jade
```

BIP39 Words

```
fly mule excess resource treat plunge nose soda
reflect adult ramp planet
```

Envelope

```
ur:envelope/
lntpcsgdhkwzdtfthptokigtvwnnjsqzcxknsktdoyadcsspoycfadzttpcstantjyoeadis
ktjojeisdefzdydtaolytantjloxaxhdclaxvlcprfttldjobkredtlnhsidwybaeyjtswya
ndlgjnehtkdsidbkqzsrkphyfhsaaahdcxhnfgnepefxgdytrycktice lyotsstoknfntave
vaskiddmolsarntykbrybtjpksamtantjooeadlncsghykaeykaeykaocyhngrmuwzaycyzs
sajpsnoybdtpcsksdweheyetdpidinjycxguihihiecxgdkpidjziniacxghihjkjycxhfih
iajyjljpcxdehkinjtjnjtcxfwjzkpihdtoybetpcssecyhnemfwrfoyaatpcsksjkghisin
jkcxinjkcxjyisihcxeheyetdpidinjycxdeeheycxktjljpiedtcxjkihihiecxkpjkihie
cxhsjkcxhscxjokpidjziniacxjpihiojpihjkjkinjljtcxjyihjkjycxkoihiajyjljpcx
iyjljpcxgogmjkdmcxgoglgufefxgogmfeclcxgogufecxfggwgmcxghfegughgaglflcxgw
glgshkcluogegygr
```

Output Descriptor

```
wpkh([604b93f2/84'/0'/
0']xpub6DVfq9VduocgjGeR69Nyr8CCi9w5gywnU7wXMYGswpHjffjcbLYNzz6G
6555VDcSZLDwZPzJHJQabVWWgkpvYntpunL3UjHGrkCJ6VndbQf)#ncwysjuk
```

Notes

This is the 128-bit (12 word) seed used as a public regression test vector for URs. UNSECURE! USE FOR TESTING ONLY!

Seedtool-CLI Features

- Create Seeds
- Backup Seeds
  - BIP-39, ByteWords, Hex
  - Envelope
    - Metadata, Name, Date, Note
  - Multipart URs
- Shard Seeds
  - SSKR, SSKR-Envelope (CSR/Gordian Depository)
- Translate Seeds
- Integrate with Envelope-CLI
  - Signing
  - Eliding
  - Encryption

Using Seedtool-CLI

```
$ seedtool
89290acafd0aafb21bd53904de47ed80
$ seedtool -i hex 89290acafd0aafb21bd53904de47ed80 -o bip39
matrix embark razor wheel priority suit hungry poet age vendor window abandon
$ seedtool -i hex 89290acafd0aafb21bd53904de47ed80 -o sskr -g 2-of-3
ur:envelope/lftansfwlrhdcetbsorflpmelgyaguurjzbdiyguetbzcyyacmldcwjennhnaysklgm
ur:envelope/lftansfwlrhdcetbsorflpmelgyaguurjzbdiyguetbzcyyacmldcwjennhnaysklgm
ur:envelope/lftansfwlrhdcetbsorflpmelgyaguurjzbdiyguetbzcyyacmldcwjennhnaysklgm
$ seedtool -i hex 89290acafd0aafb21bd53904de47ed80 -o envelope | envelope forma
Bytes(16) [
    'isA': 'Seed'
]
```

What's Next?

- Our main topic for the day!
- What's upcoming & just becoming available?
- How do we support it?
- How do we improve SECURITY & RESILIENCE for seeds?

BIP-85

- BIP-85 Uses a Single Seed for Multiple Wallets
- Children Seed Derived from Parent Seed
    - with a Simple Index
- *One Seed to rule them all, One Key to find them, One Path to bring them all, And in cryptography bind them.*

Ledger Seed Tool Application

- A New Tool for Seed Resilience!
- Shamir's Secret Sharing on Ledger
    - with Blockchain Commons' SSKR
    - And Lots More Assistants!
- https://www.ledger.com/blog/seed-tool-app
- 7 million hardware wallets can now use SSKR!

Key Exfiltration

- We need to stay up to date with modern threats
  - We've known about key exfiltration since 2018!
- It's about how keys could be compromized
  - Through untrustworthy signatures
    - Specifically, non-random nonces
  - But randomness is important to seeds too!
  - GSTP and FROST can help with both.

What's Next?

- There are lots of other ways to protect seeds
    - BIP-85 for hot wallets is an example
- There are lots of adversaries to be concerned about
    - Key Exfiltration is getting attention today
- What else?
- What features do we want for
    - iOS Seedtool & Seedtool-CLI?
    - Ledger Seed Tool?

Possible Additions

- Child Seed Derivation
    - BIP-85
- More Key Derivations
    - ZCash, Monero?
- Backup Mechanisms
    - GSTP and Gordian Depository Deployment
    - NFCs on NREF or smart JavaCards
- Key Generation and Multi-Party Computation
    - Trusted Dealer & Distributed; MUSIG2 & FROST
- What Else?

Get Involved!

- Use Our Existing Specs
    - UR for interoperable connections & animated QRs
    - SSKR bytewords for simple sharding
    - Envelope for Smart Storage
- Get In On the Next Thing: Collaborative Seed Recovery
    - Shard your seeds & metadata with SSKR-Envelope
    - Support GSTP, Host a Gordian Depository

www.BlockchainCommons.com

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