Descriptor Wallet: library and command-line

Dr Maxim Orlovsky,
Pandora Core AG

Call agenda

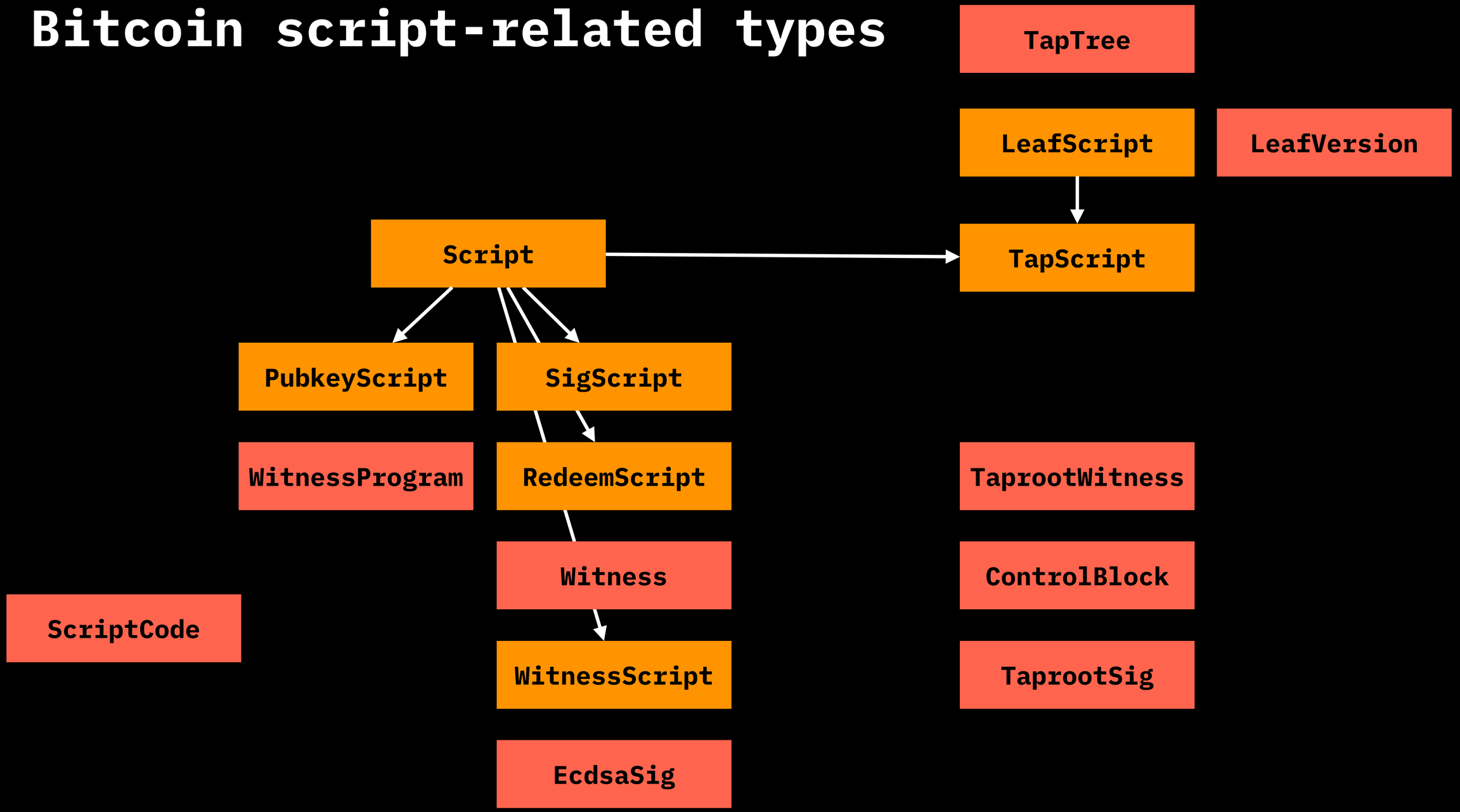
- Descriptor wallet intro
- Descriptor wallet demo
- Wallet challenges related to RGB & single-use-seals
- P2C & S2C commitment discussion

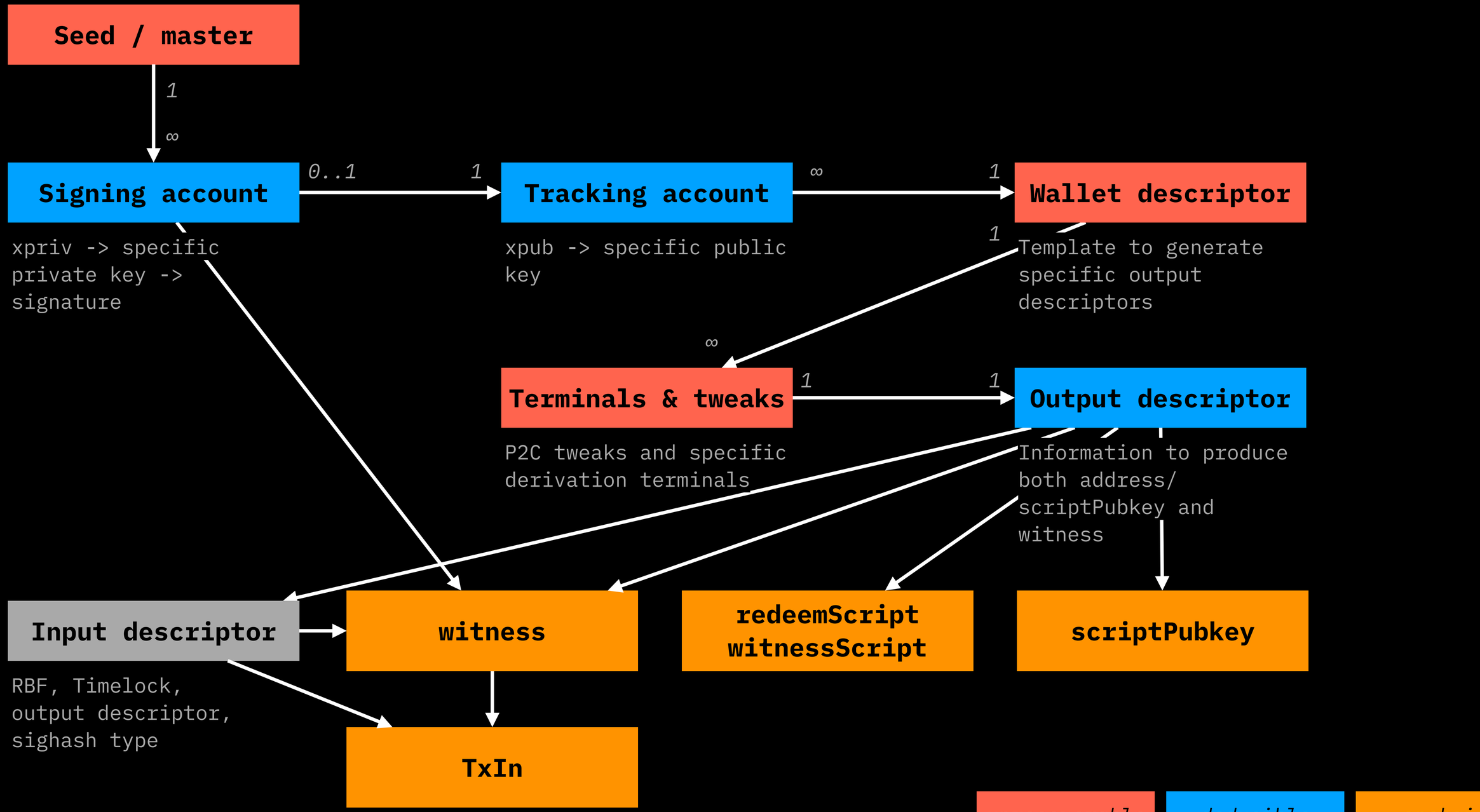
Descriptor wallet

- Separating cold and hot parts
- Allowing P2C / S2C commitments & single-use-seals
- Foundation for LNP Node, RGB Node, MyCitadel Wallet
- Pro command-line tool to do arbitrary-complex magic with bitcoin

	Descriptor Wallet	BitcoinDevKit	Green dev kit (GDK)	Libwally	All other wallet libraries
Full hot/cold wallet isolation	✅	🚫	🚫	🚫	🚫
Output descriptors	✅	✅	🚫	🚫	🚫
Input descriptors	✅	🚫	🚫	🚫	🚫
Miniscript	✅	✅	🚫	🚫	🚫
Taproot base	✅	✅	🚫	🚫	🚫
Taproot MuSig2	🚫	🚫	🚫	🚫	🚫
TapScript	✅	✅	🚫	🚫	🚫
P2C tweaks	✅	🚫	🚫	🚫	🚫
Custom sighashes	✅	🚫	🚫	🚫	🚫
Lightning compatibility	✅	🚫	🚫	🚫	🚫

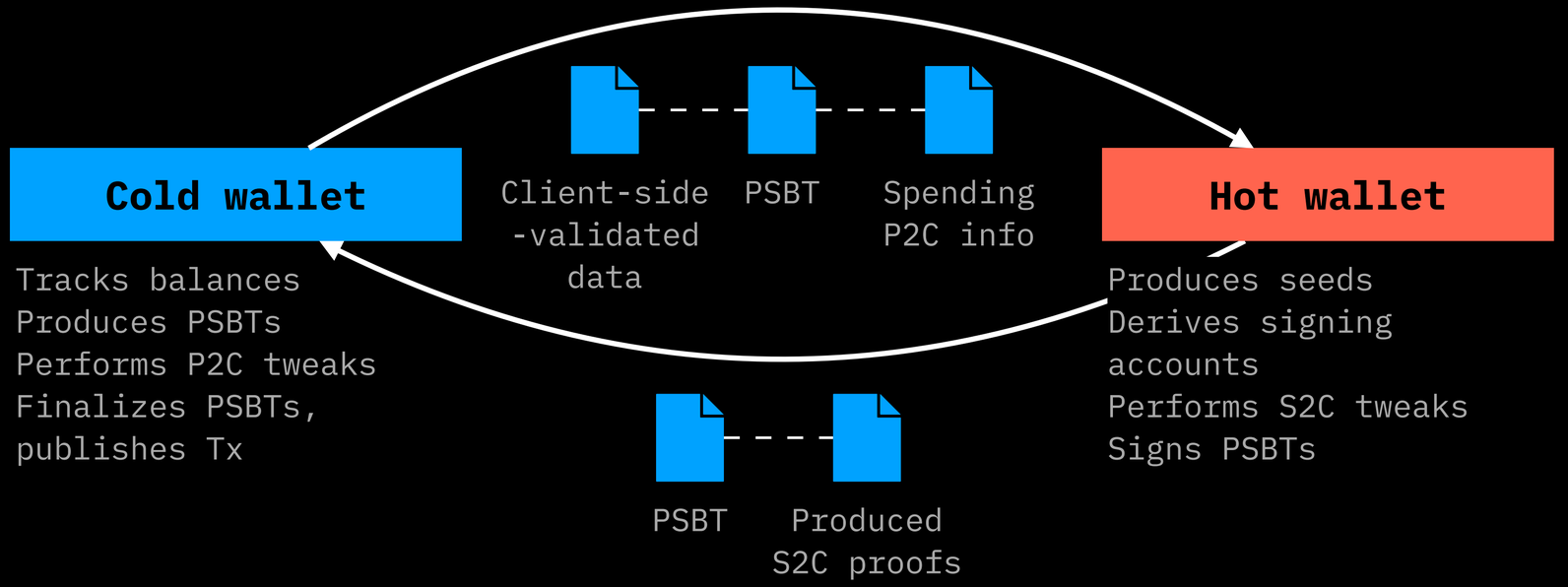
Bitcoin script-related types




Seed / master
1
∞
Signing account
0..1
1
Tracking account
∞
1
Wallet descriptor
xpriv -> specific private key -> signature
xpub -> specific public key
1
Template to generate specific output descriptors
∞
Terminals & tweaks
1
1
Output descriptor
P2C tweaks and specific derivation terminals
Information to produce both address/ scriptPubkey and witness
Input descriptor
witness
redeemScript witnessScript
scriptPubkey
RBF, Timelock, output descriptor, sighash type
TxIn
unrecoverable
deducible
onchain

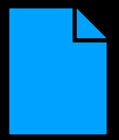
Demo

Cold-hot wallet distinction



Contact identities

Tracking accounts



Wallet descriptor

Tweak Information

Client-side-validation state commitments

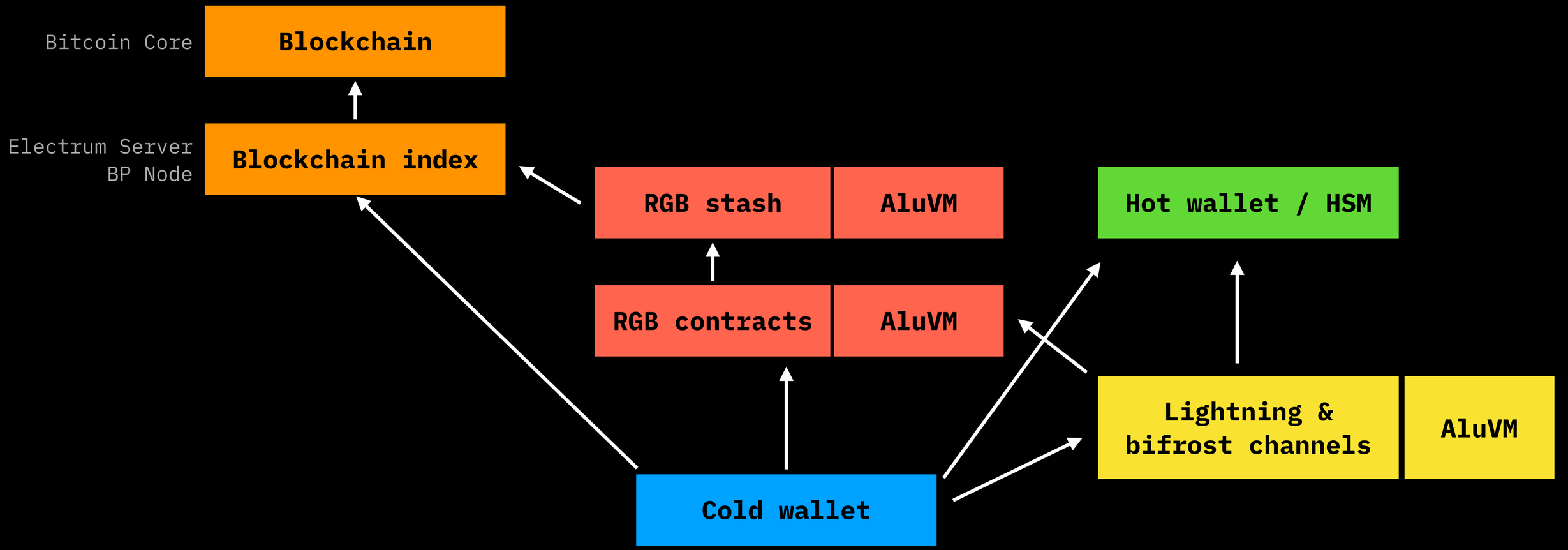
Signing accounts

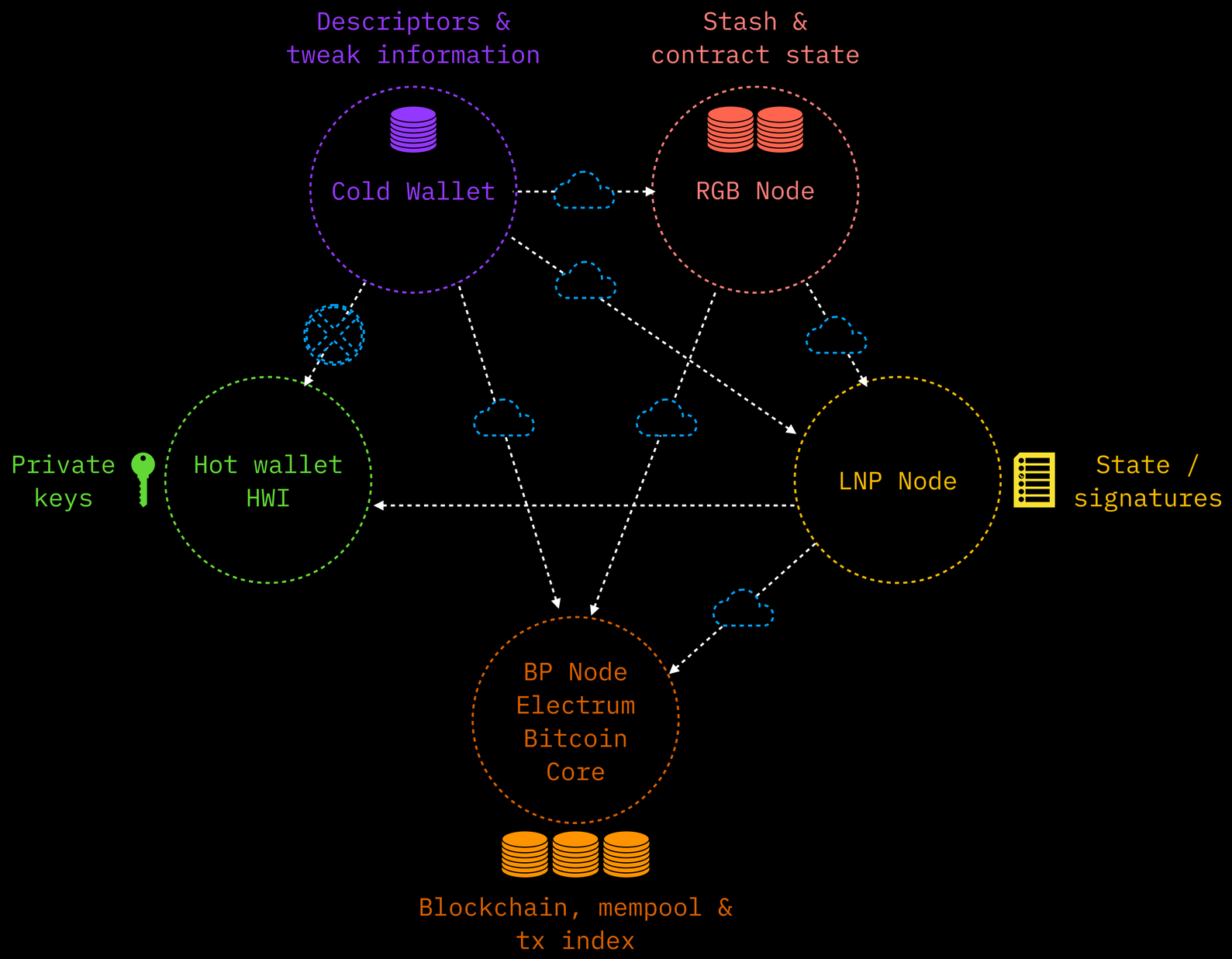
Wallet data structures

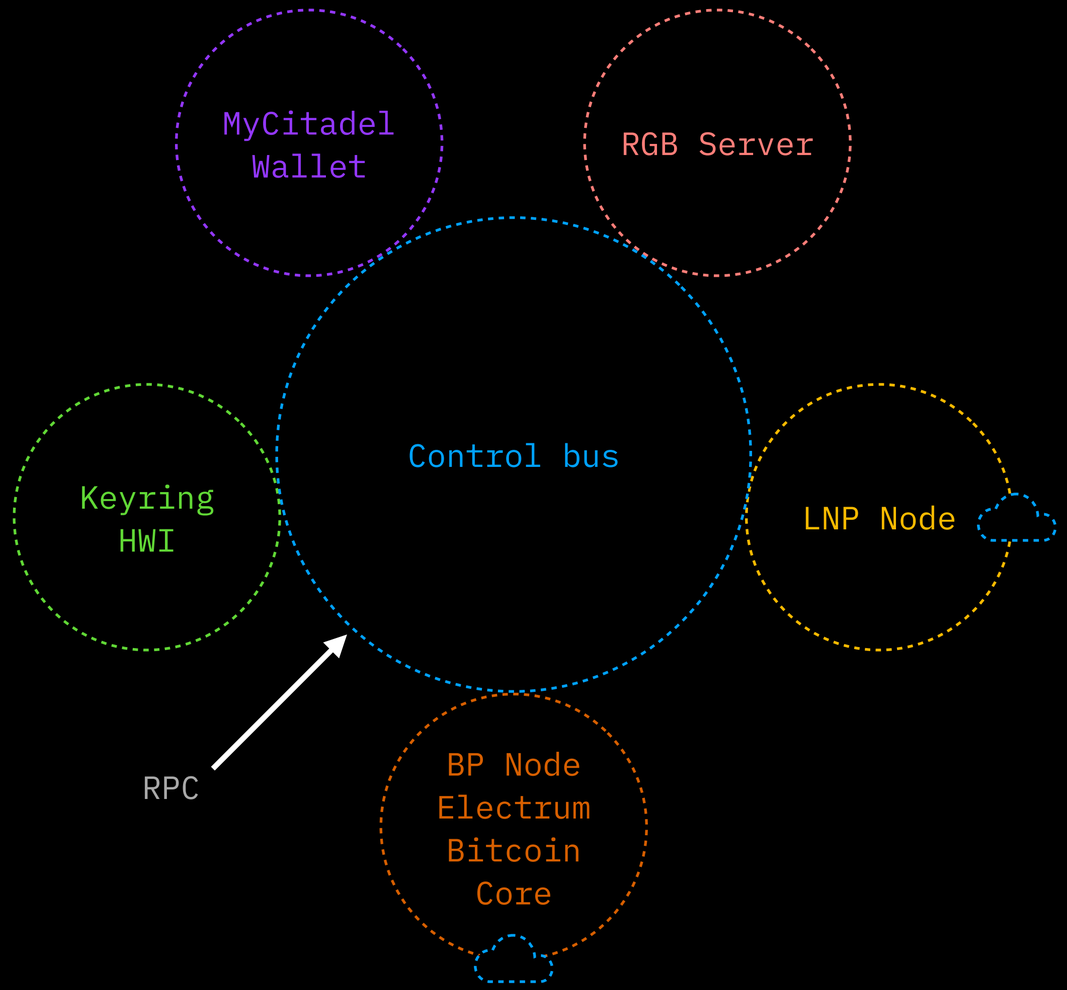
- Seed:
  mnemonic (12..24 words)
- Signing account:
  m=[f1493701]/44’/0’=[xpriv…]
- Tracking account (TA):
  m=[f1493701]/44’/0’=[xpub…]//**
- Wallet descriptor:
  tr(musig(TA1, TA2), {
  and_v(older(5),TA1),
  and_v(older(5),agg(TA1, TA1)
  })
- Terminals & tweaks:
  1/1665~[key_fingerprint]:tweak_hash
- Output descriptor:
  wsh(
  sortedmulti([fp1]~hash, [fp2])
)@1/1665
- Input descriptor:
  wsh(
  sortedmulti([fp1]~hash, [fp2])
)@1/1665@rbf#SINGLE

Input descriptor example

- txid:vout /1/167 [deadbeef]+hash rbf SIGHASH_ALL

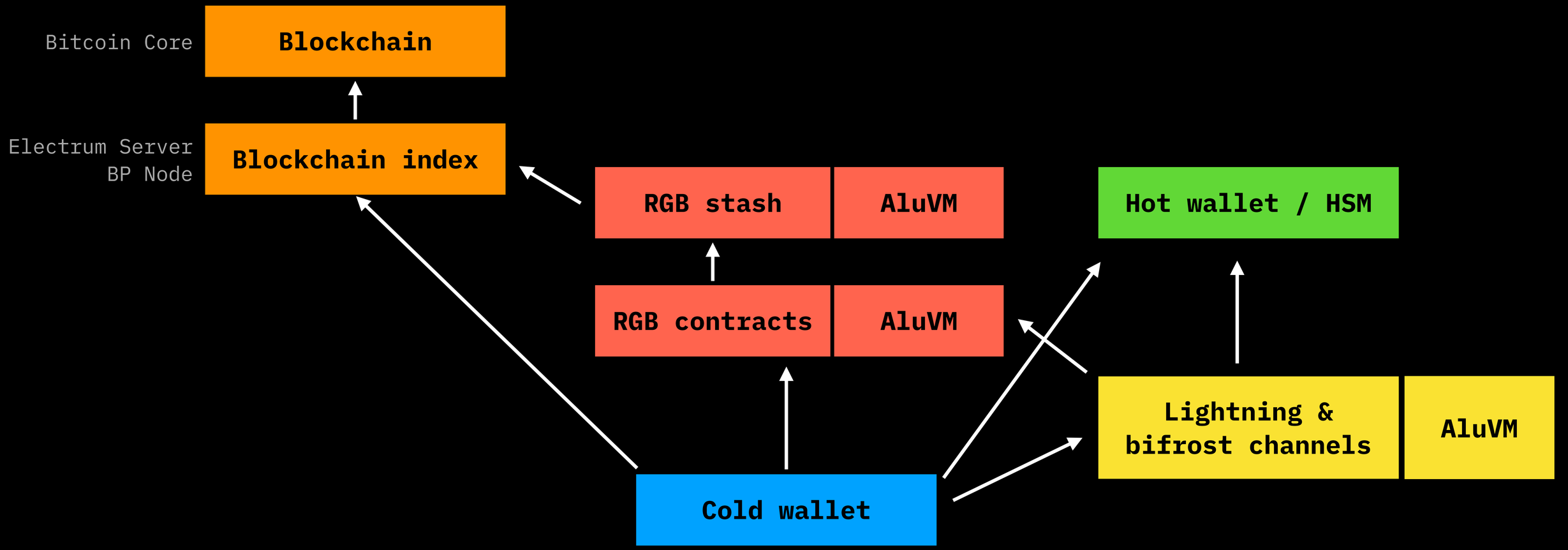

Bitcoin Core
Blockchain
Electrum Server
BP Node
Blockchain index
RGB stash
AluVM
RGB contracts
AluVM
Hot wallet / HSM
Lightning &
bifrost channels
AluVM
Cold wallet


Descriptors &
tweak information
Stash &
contract state
Cold Wallet
RGB Node
Private
keys
Hot wallet
HWI
LNP Node
State /
signatures
BP Node
Electrum
Bitcoin
Core
Blockchain, mempool &
tx index


MyCitadel
Wallet
RGB Server
Control bus
Keyring
HWI
LNP Node
RPC
BP Node
Electrum
Bitcoin
Core

LNP: Protocols and Node Demo

Dr Maxim Orlovsky,
Pandora Core AG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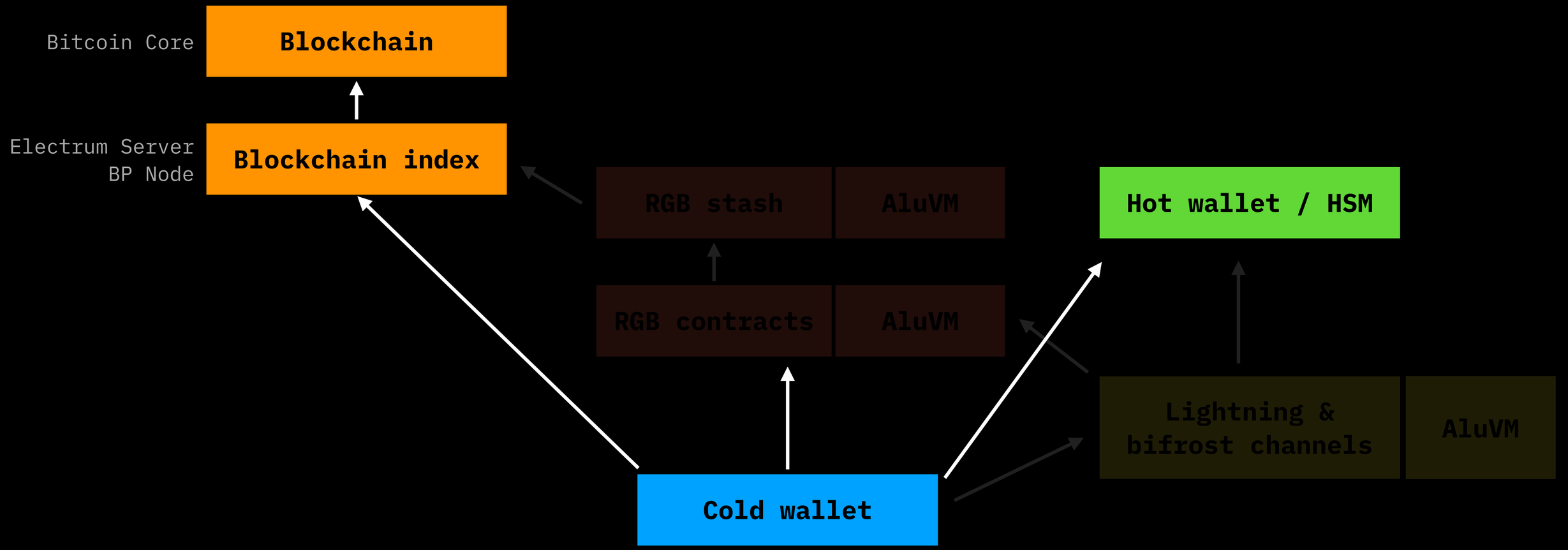
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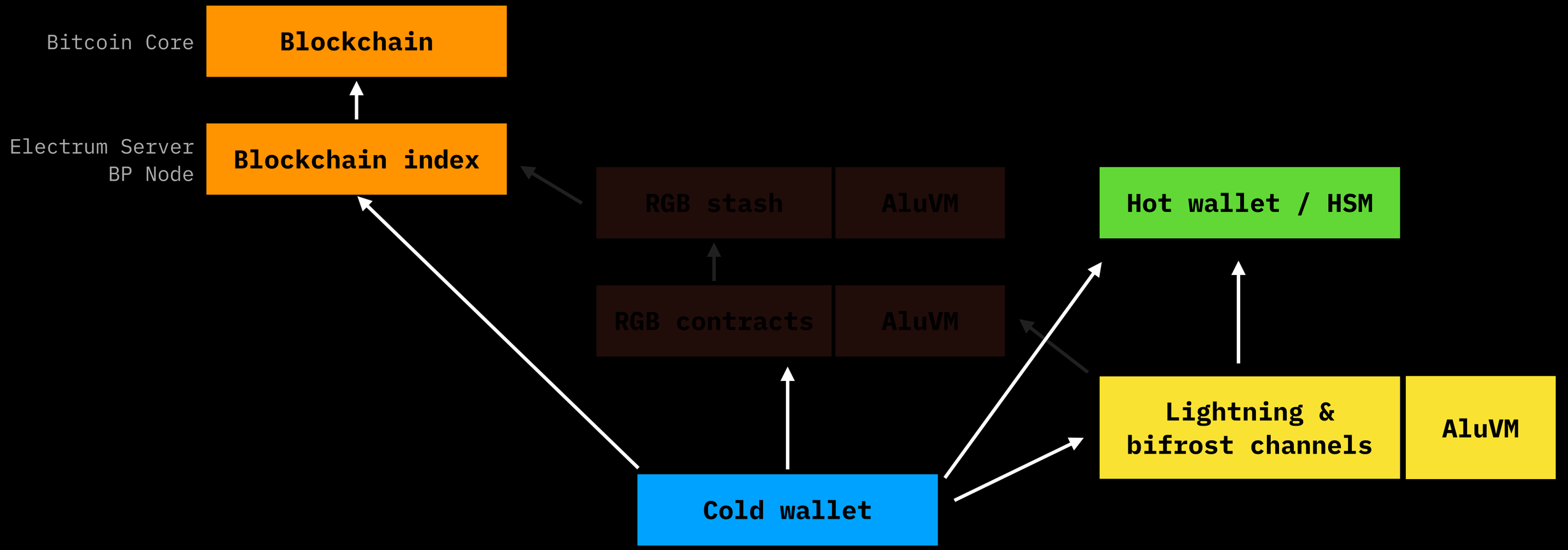
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AluVM
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bifrost channels
AluVM
Cold wallet

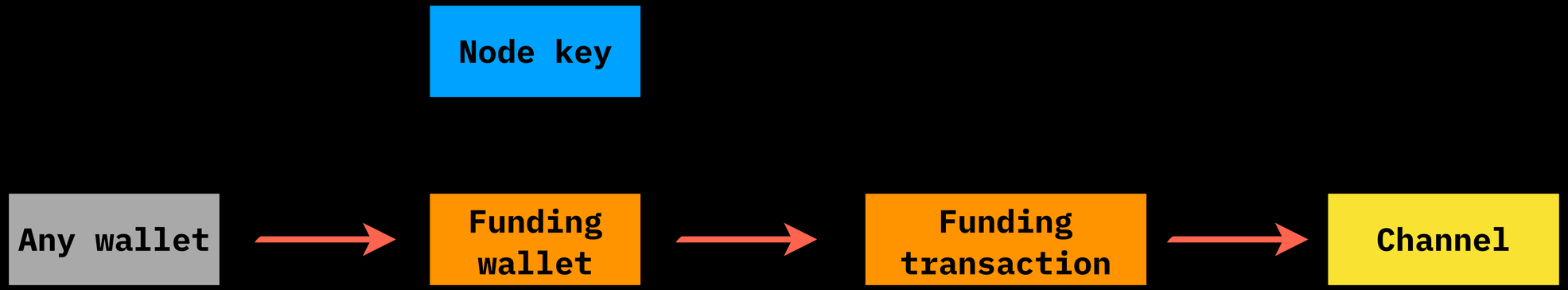
LNP, Bifrost & LNP Node roadmap

- **By the end 2021:** get LNP Node full operational with the **legacy Lightning network**
  (BOLT-standard compliant)

- **Jan-Feb 2022: Bifrost** implementation in LNP Node
  (completion of LNPBP standards)

Demo of lightning node initialization

Lightning funding wallet



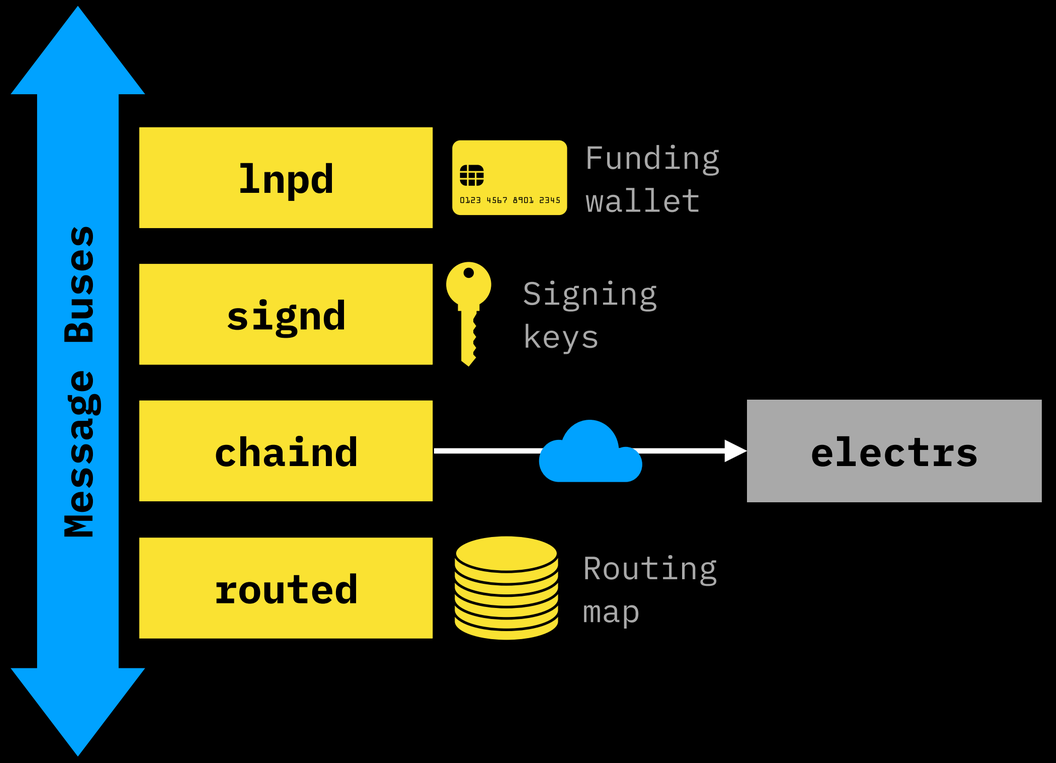
LNPBP-46: HD wallets for lightning

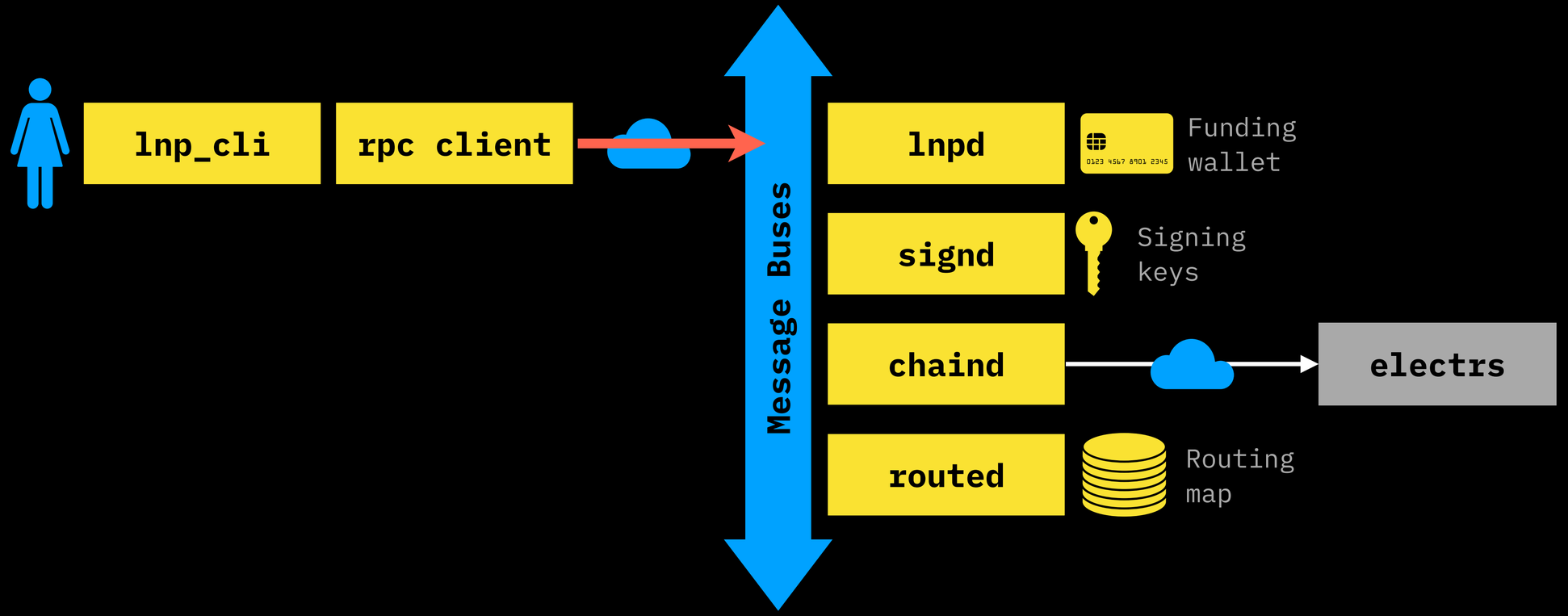
https://github.com/LNP-BP/LNPBPs/pull/120

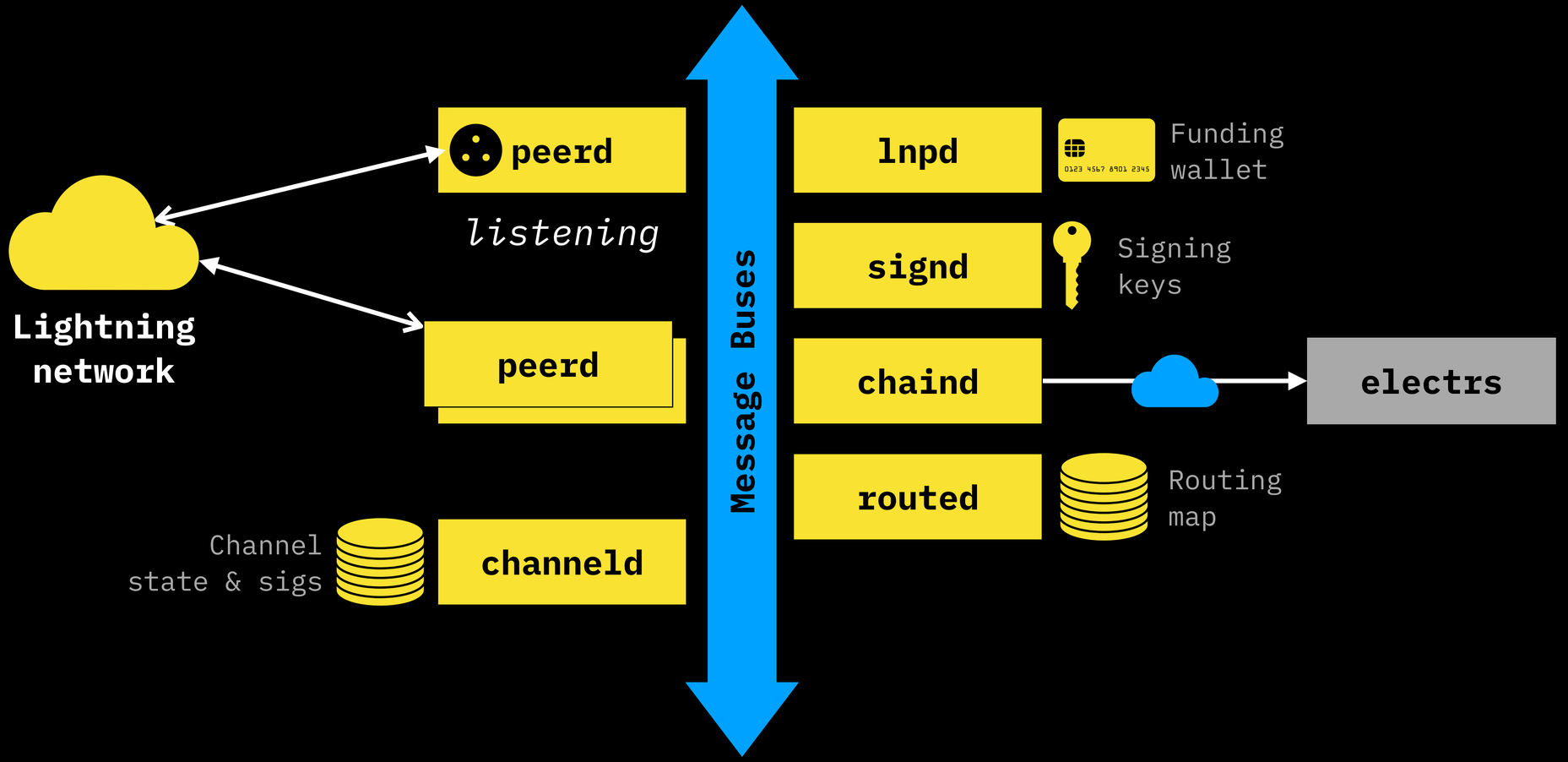
Concept: restore most of node from a single seed

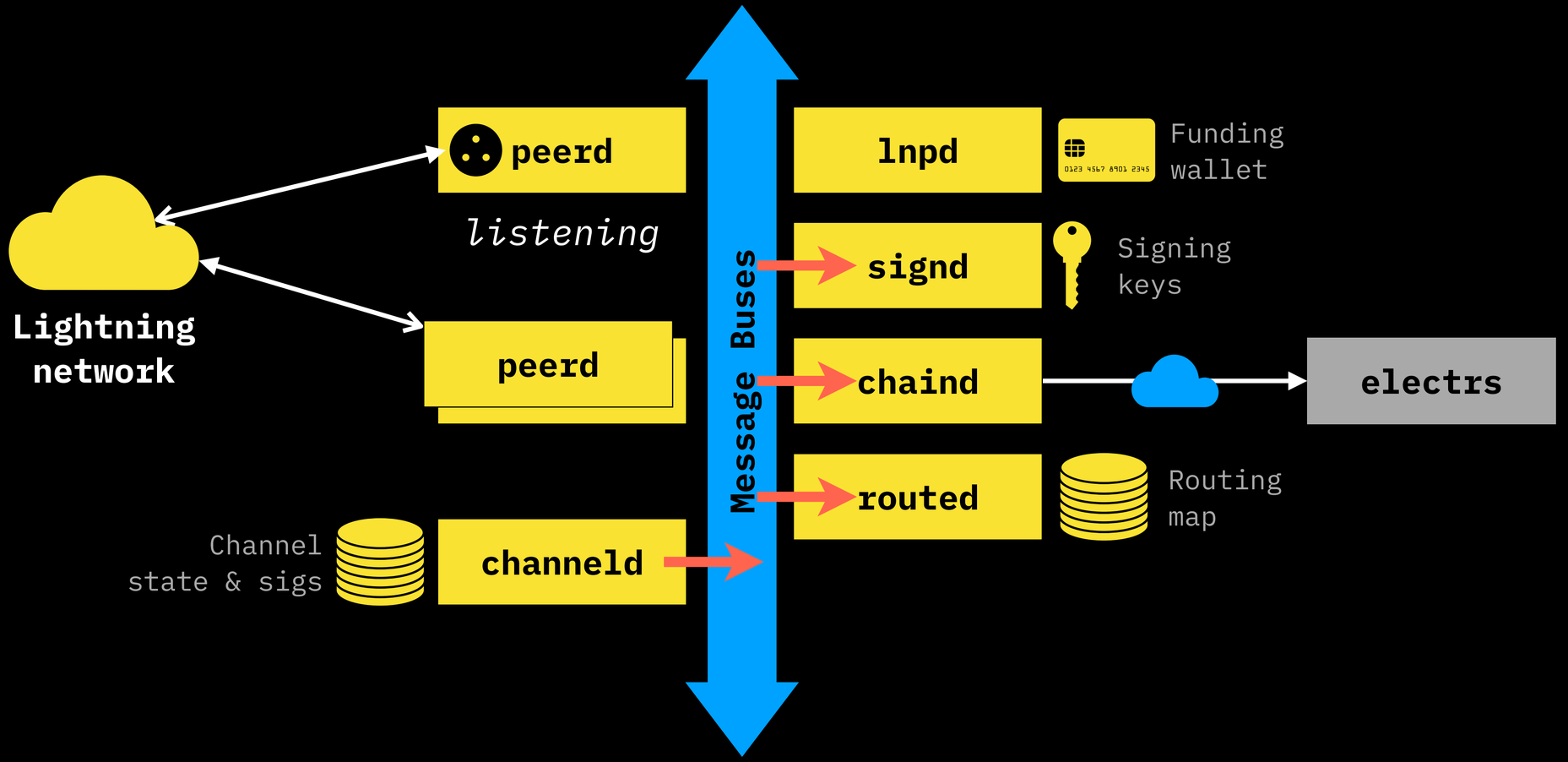
- Funding wallet
- Node key
- Per-channel set of basepoints

Demo of lightning basics

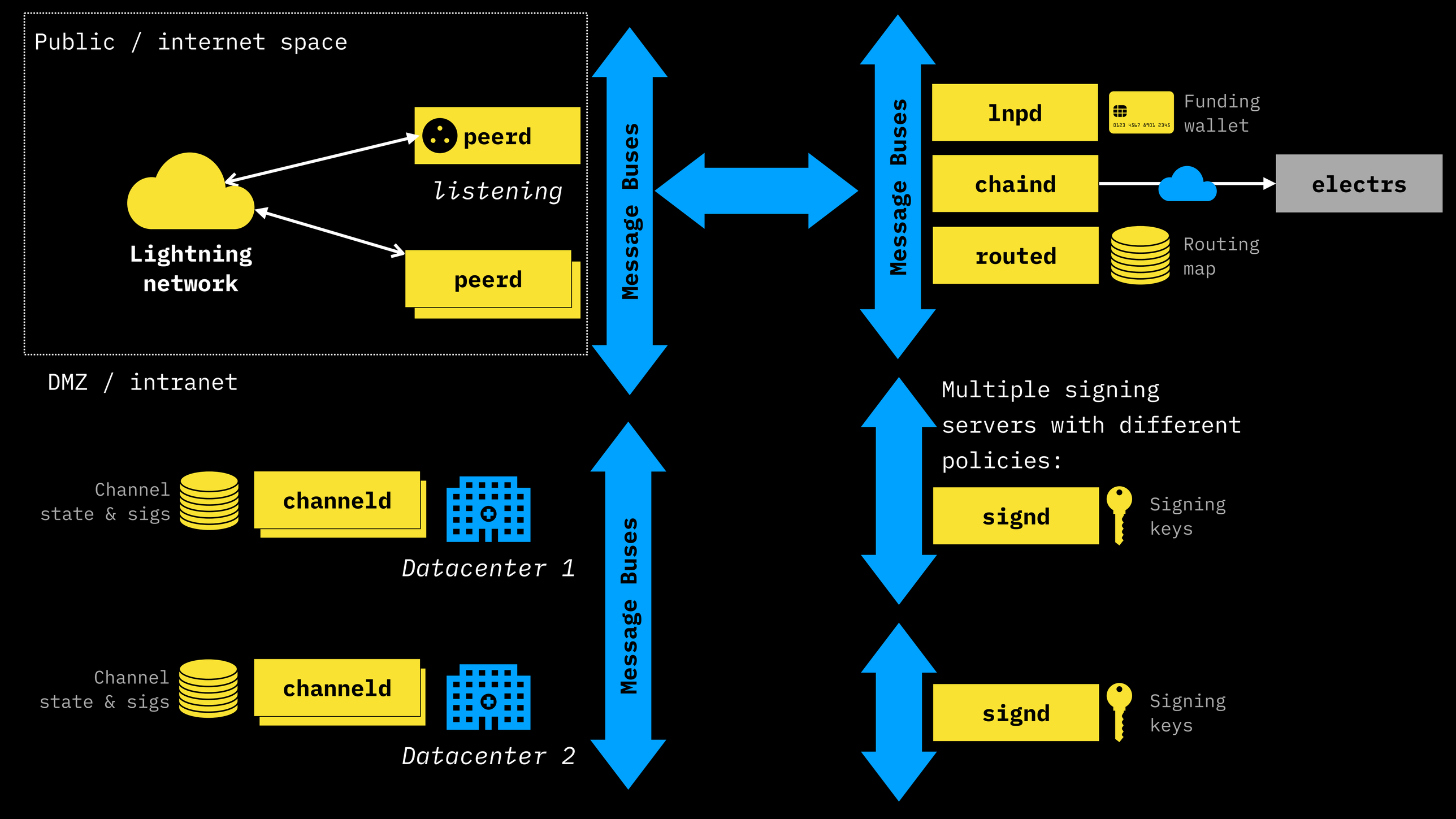

Message Buses
lnpd
signd
chaind
routed
0123 4567 8901 2345
Funding wallet
Signing keys
electrs
Routing map

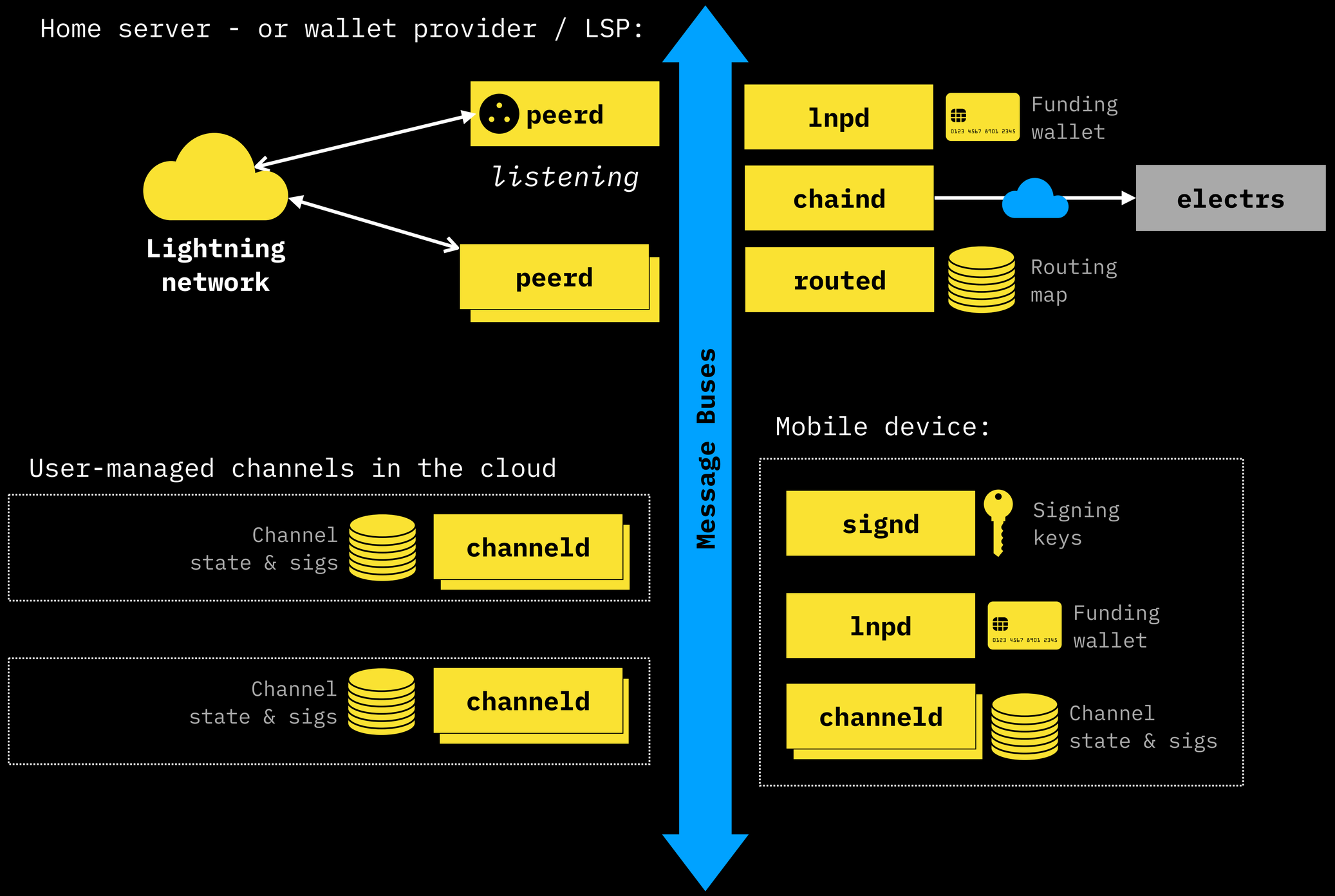

lnp_cli
rpc client
Message Buses
lnpd
signd
chaind
routed
0123 4567 8901 2345
Funding wallet
Signing keys
electrs
Routing map


peerd
listening
Lightning network
peerd
Channel state & sigs
channeld
Message Buses
lnpd
Funding wallet
signd
Signing keys
chaind
electrs
routed
Routing map

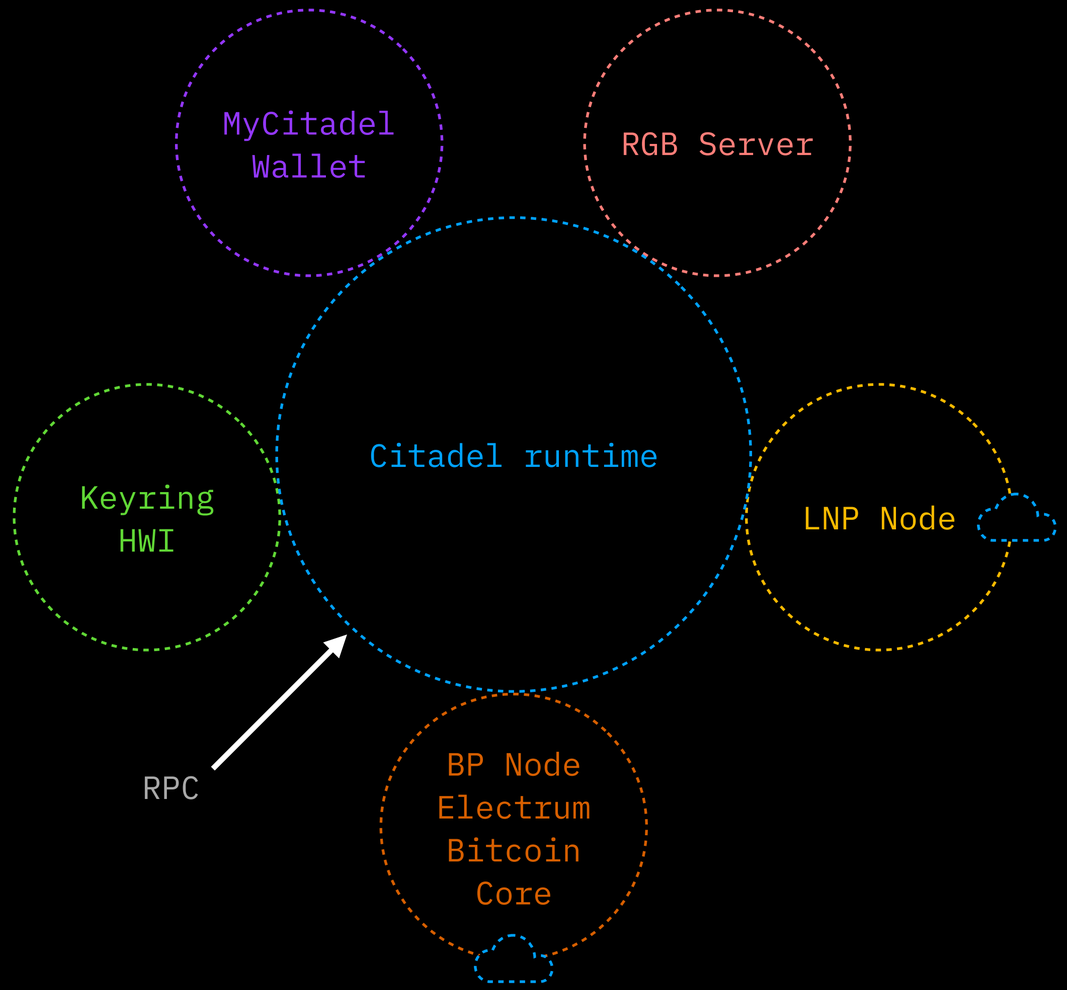

peerd
listening
peerd
Lightning network
Channel state & sigs
channeld
Message Buses
lnpd
Funding wallet
signd
Signing keys
chaind
electrs
routed
Routing map

LNP Node and infrastructure / service providers (LSP)

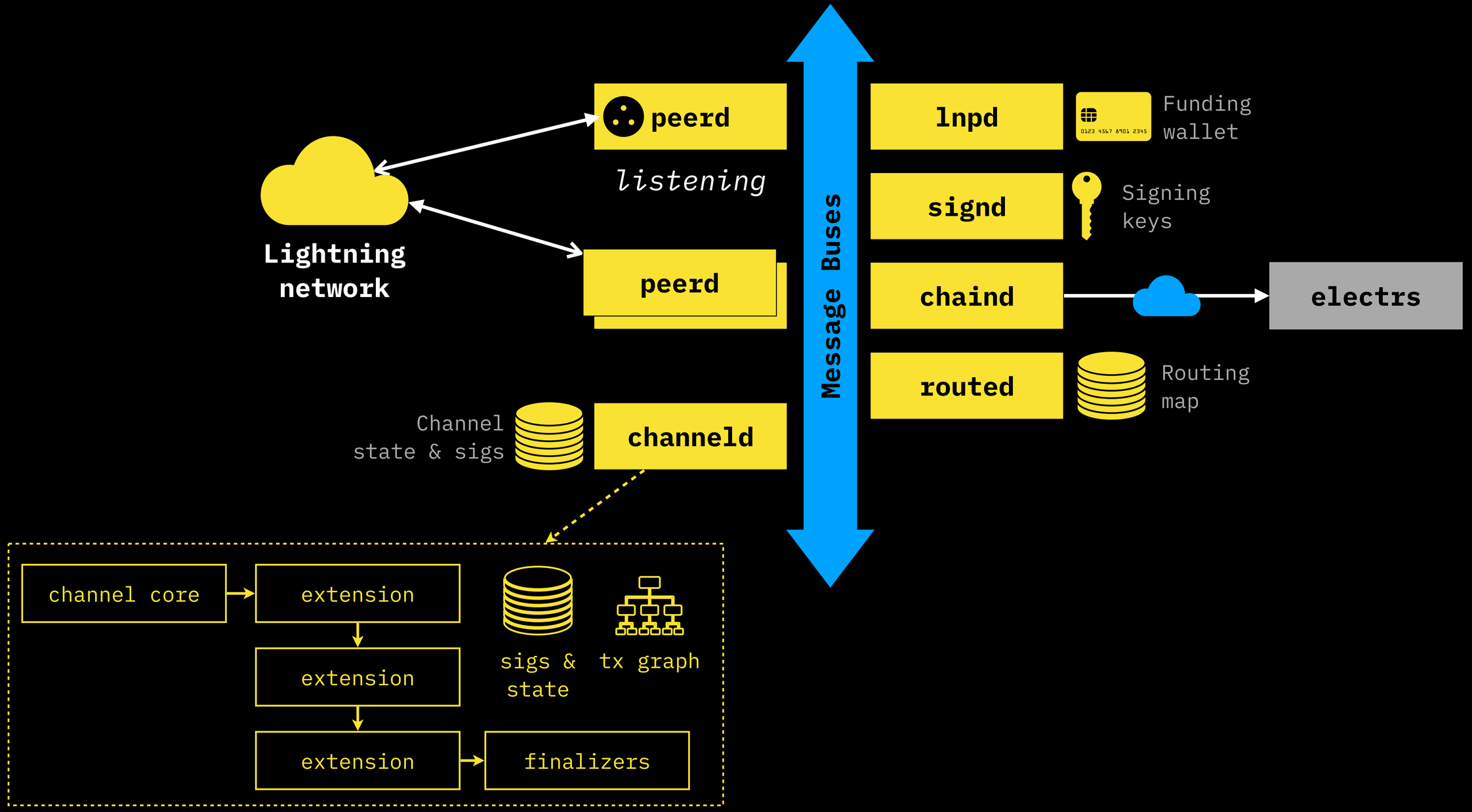

Public / internet space
peerd
listening
Lightning network
peerd
DMZ / intranet
Message Buses
Message Buses
lnpd
Funding wallet
chaind
electrs
routed
Routing map
Multiple signing servers with different policies:
signd
Signing keys
Channel state & sigs
channeld
Datacenter 1
Message Buses
Channel state & sigs
channeld
Datacenter 2
signd
Signing keys

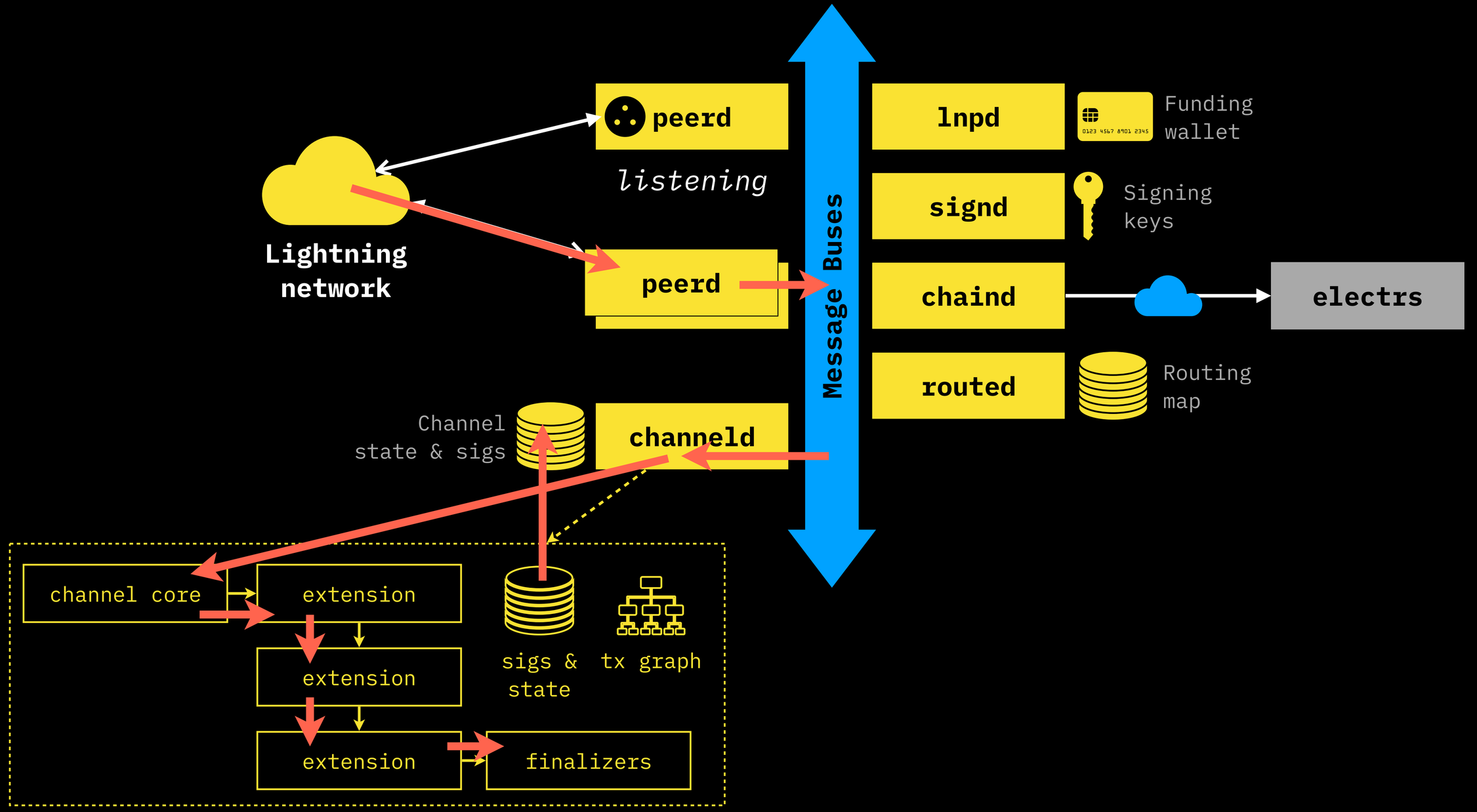

Home server - or wallet provider / LSP:
peerd
listening
Lightning network
peerd
Message Buses
lnpd
Funding wallet
chaind
electrs
routed
Routing map
Mobile device:
signd
Signing keys
lnpd
Funding wallet
channeld
Channel state & sigs
User-managed channels in the cloud
Channel state & sigs
channeld
Channel state & sigs
channeld

Citadel runtime for wallet devs



Extensions, extensions, extensions!


peerd
listening
Lightning network
peerd
Message Buses
lnpd
Funding wallet
signd
Signing keys
chaind
electrs
routed
Routing map
Channel state & sigs
channeld
channel core
extension
extension
extension
finalizers
sigs & state
tx graph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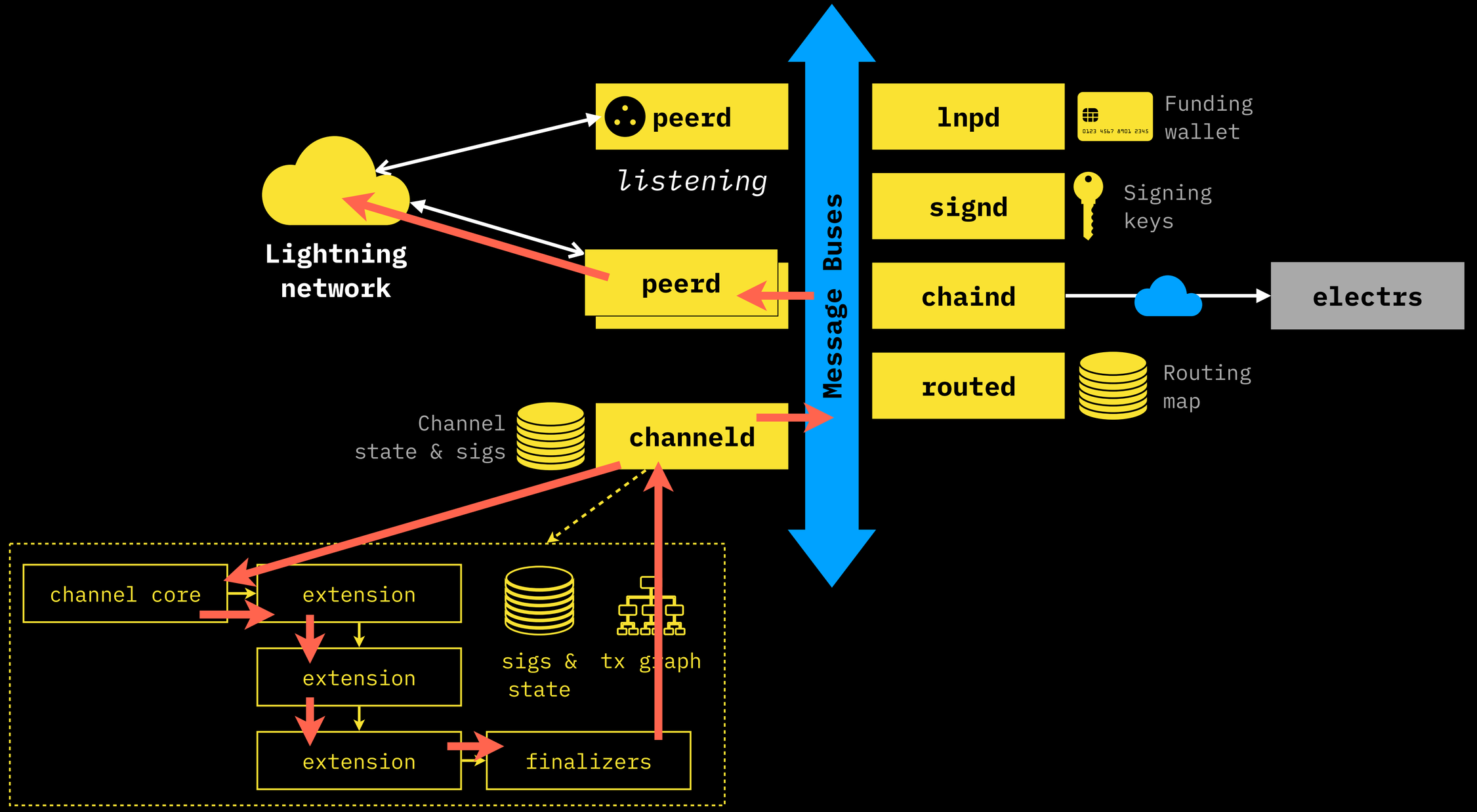
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tx graph

Everything in channel is an plugin!

- HTLC
- Anchor outputs
- Lexicographic output ordering

Extensions

- Read state from incoming peer messages
- Can contribute to composing messages to other peers
- Add / remove transactions to the graph
- Add / remove transaction outputs
- Manage their state
  channeld orchestrates state saving, restoration & backups across all extensions

Constructing channels like that not only allow us to quickly adopt new BOLT changes –

but also start with the Bifrost concept of generalized channels with no additional work required

Everything in channel is an plugin!

- HTLC or PTLC (or both!)
- RGB
- DLCs
- Storm
- Prometheus
- Lexicographic output ordering

Extensions unlock channel composability

Not only channels: extensions work for

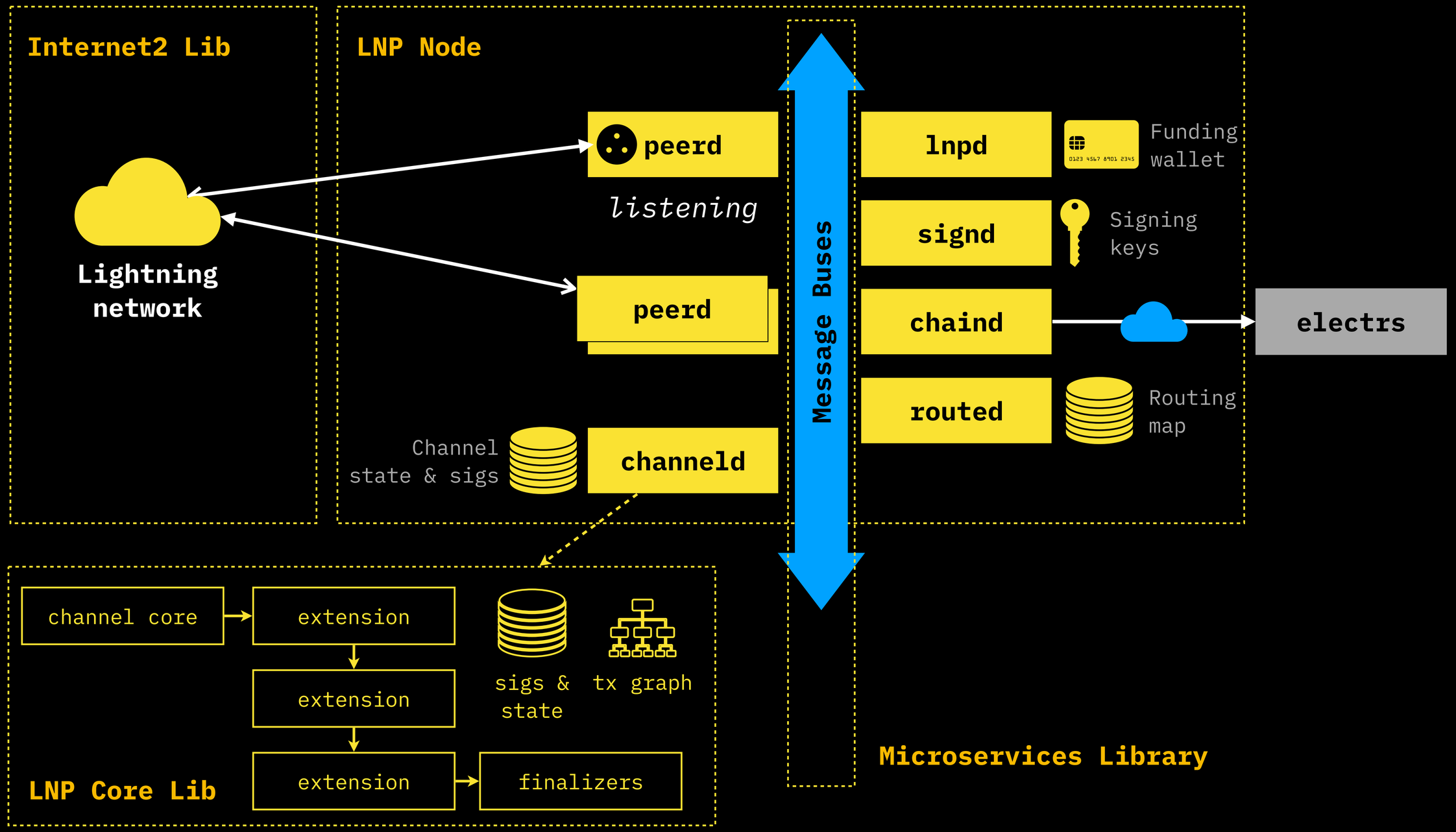
- Gossip protocol: currently BOLT-7
- Routing:
  - trampoline
  - ant routing
  - … more to come?

The ultimate goal* is to have all extensions to run on **AluVM** – such that external devs can create new channel types, routing algos etc, distribute to users, who can plug them in hot into wallets

** probably not that soon*

Dealing with the codebase

Abstraction is crucial for extensibility


Internet2 Lib
LNP Node
peerd
listening
peerd
Lightning network
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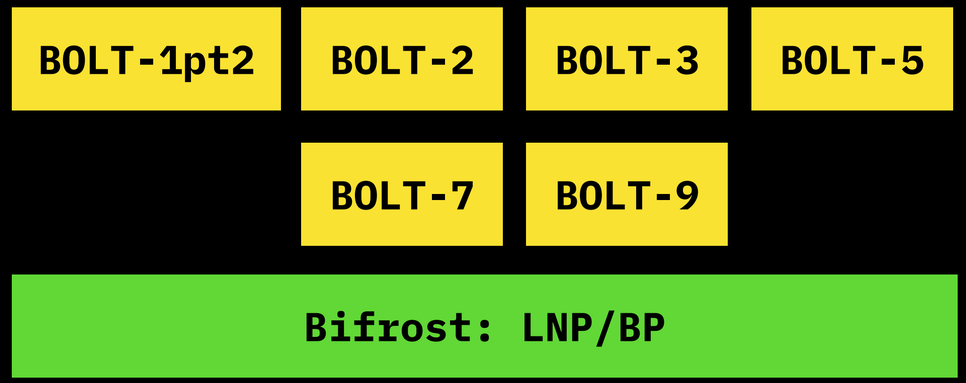
Routing map
Channel state & sigs
channeld
channel core
extension
extension
extension
finalizers
sigs & state
tx graph
LNP Core Lib
Microservices Library

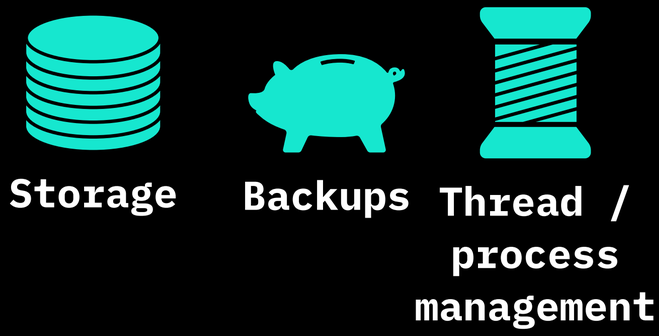
LNP Core

- Everything related to BOLT - or LNPBP standards



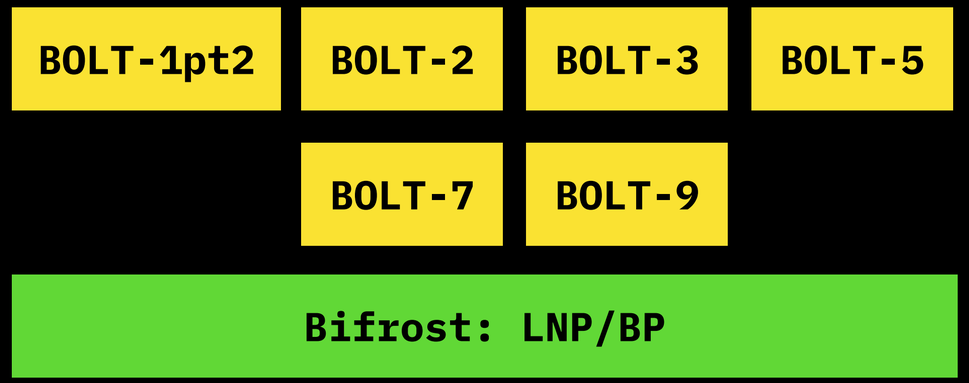
LNP Node

- Everything aside from BOLT/LNPBP standards



LNP Core

- Everything related to BOLT - or LNPBP standards



LNP Node

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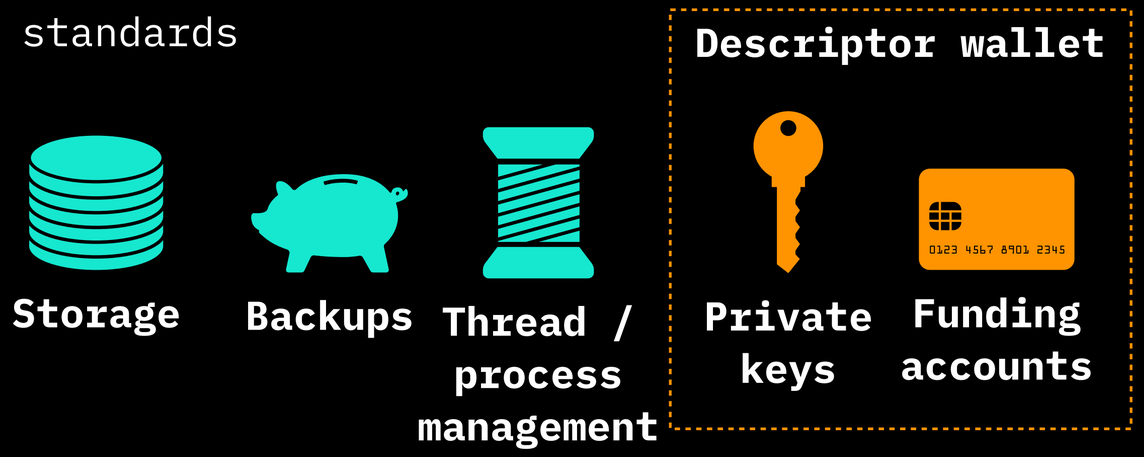

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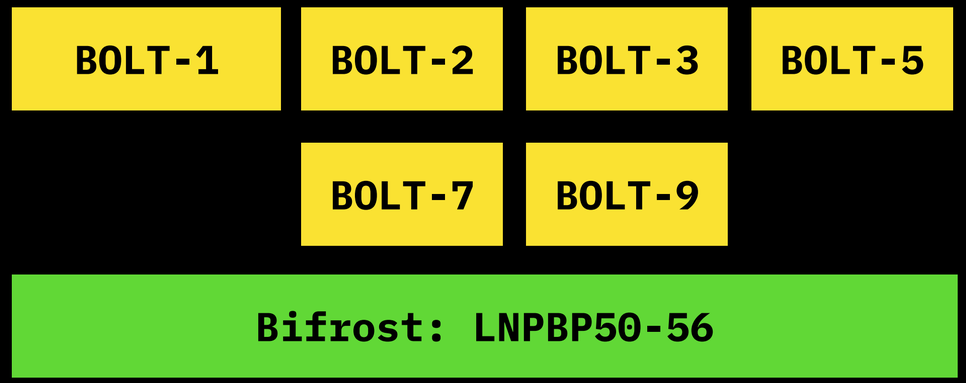

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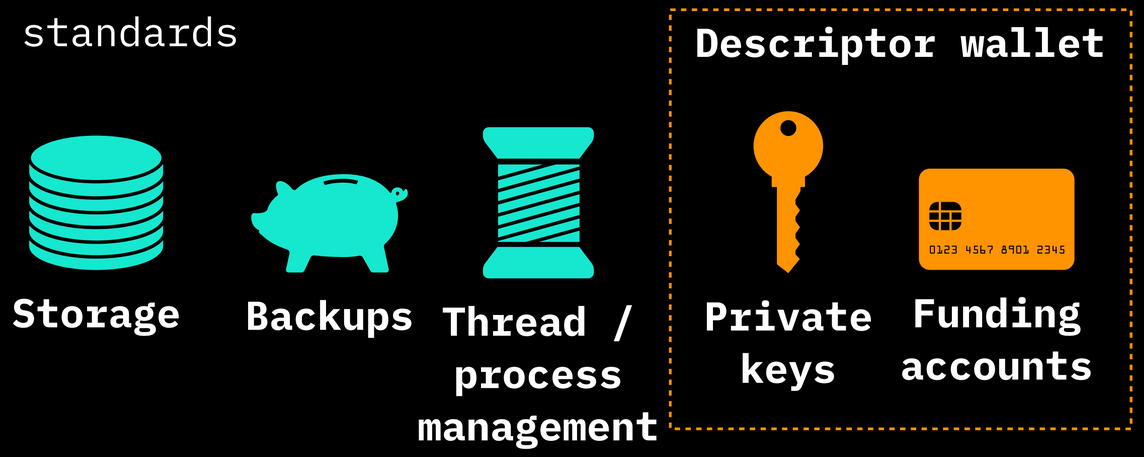

Internet2

Microservices

Libraries

- github.com/LNP-BP/LNP-Core — **BOLTs & Bifrost**
- github.com/LNP-BP/LNP-Node — **Node, RPC, client**
- github.com/LNP-BP/descriptor-wallet — **Wallet lib**
- github.com/internet2-org/rust-internet2 — **Networking**
- github.com/internet2-org/rust-microservices — **Infrastructure**
- github.com/LNP-BP/LNPBPs — **Standards**

Channel operations

Demo of lightning channel operations