

Copyright on the Blockchain:
SPOOL Protocol
Specification and Reference Application

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About SPOOL

- SPOOL is
 - a protocol for documenting transactions relating to ownership of digital property, i.e. copyright rights
 - an overlay of the bitcoin blockchain
 - SPOOL = Secure Public Online Ownership Ledger
- SPOOL is not
 - The law. SPOOL must be used with a contract concerning transfer of copyright rights that participants have agreed to. E.g. the ascribe Terms of Service (TOS).
- SPOOL transactions include
 - Register ownership. Supports >1 *unique* editions, e.g. edition 1/10, 2/10, ..., 10/10.
 - Transfer ownership
 - Consign, for someone else to sell on your behalf
 - And more
- **SPOOL + TOS = copyright on the blockchain**

Context for SPOOL

ascribe tech stack as reference implementation

ascribe web app (www.ascribe.io)

ascribe REST API

ascribe servers

ascribe Terms
of Service
(incl. copyright
contract)

SPOOL bitcoin
overlay

bitcoin protocol

bitcoin blockchain

SPOOL

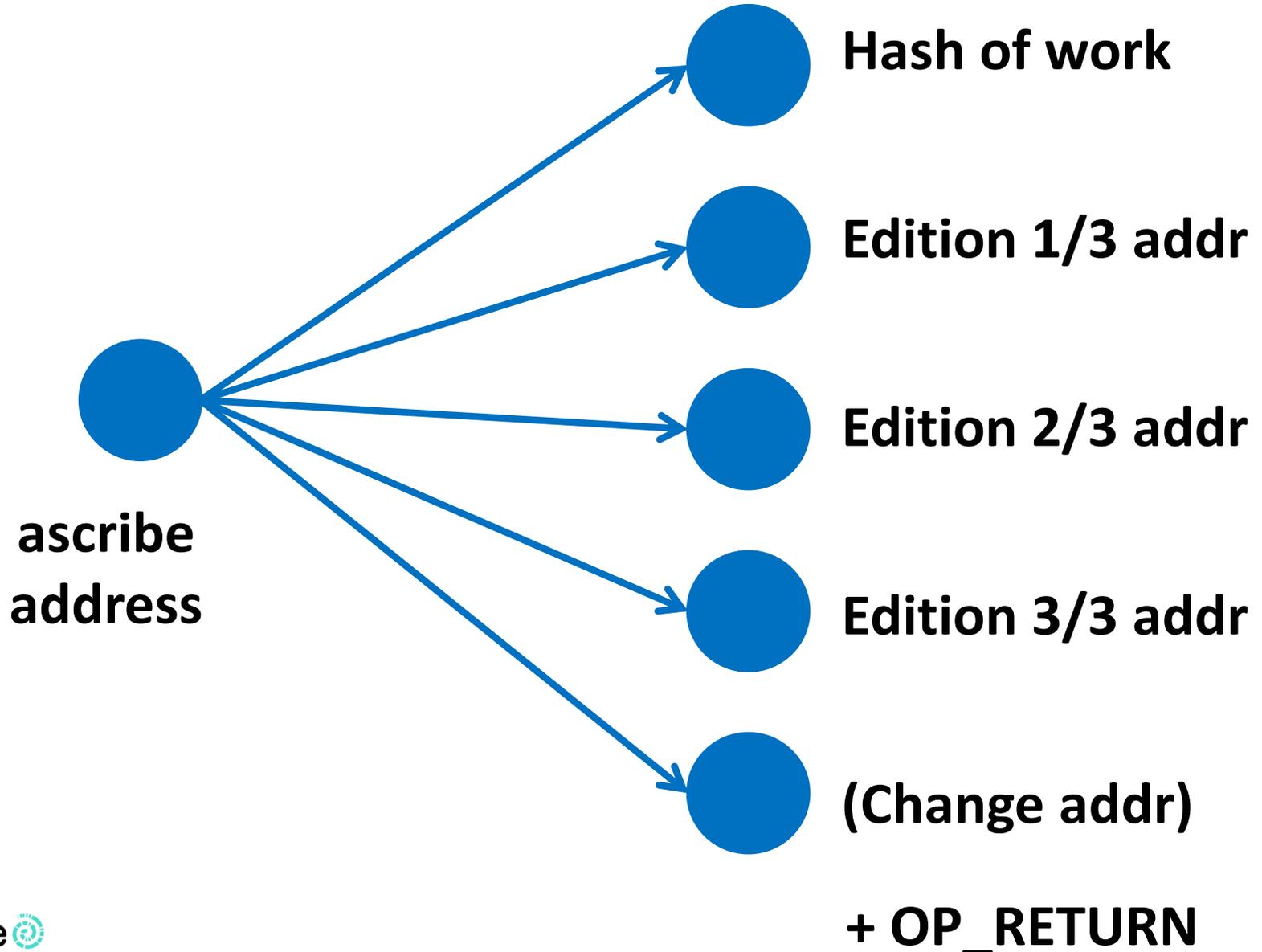
github.com/ascribe/spool

```
REGISTER:  
- MAPPING: 1-to-many  
- SPOOL: piece_hash -> edition(s)  
- BTC:  
TX = [[1jtt... : 20000+num_editions]] ->  
(OP_RETURN=SPOOLREGISTER:0),  
> balance of piece_hash = 10000 satoshis  
> balance of edition(s) = 1 satoshi  
  
TRANSFER:  
- MAPPING: 1-to-1  
- SPOOL: edition -> transfered_edition  
- BTC:  
* first transfer  
> balance of edition = 1 satoshi  
TX = [[1jtt...:29999]] -> [[edition_hash:1  
TX = [[edition_hash:20000]] -> transfered_edition
```

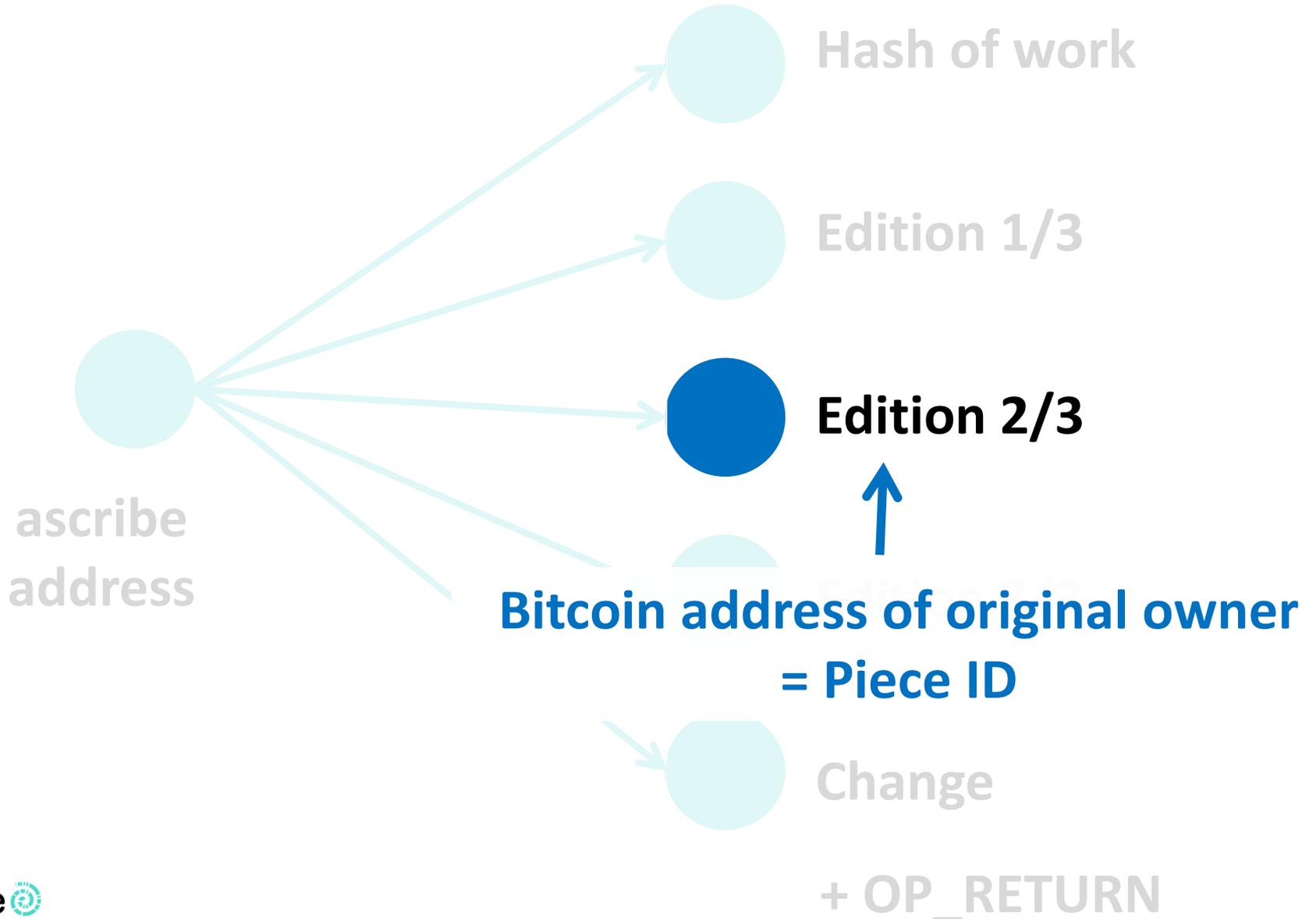
SPOOL specification

“Register” tx

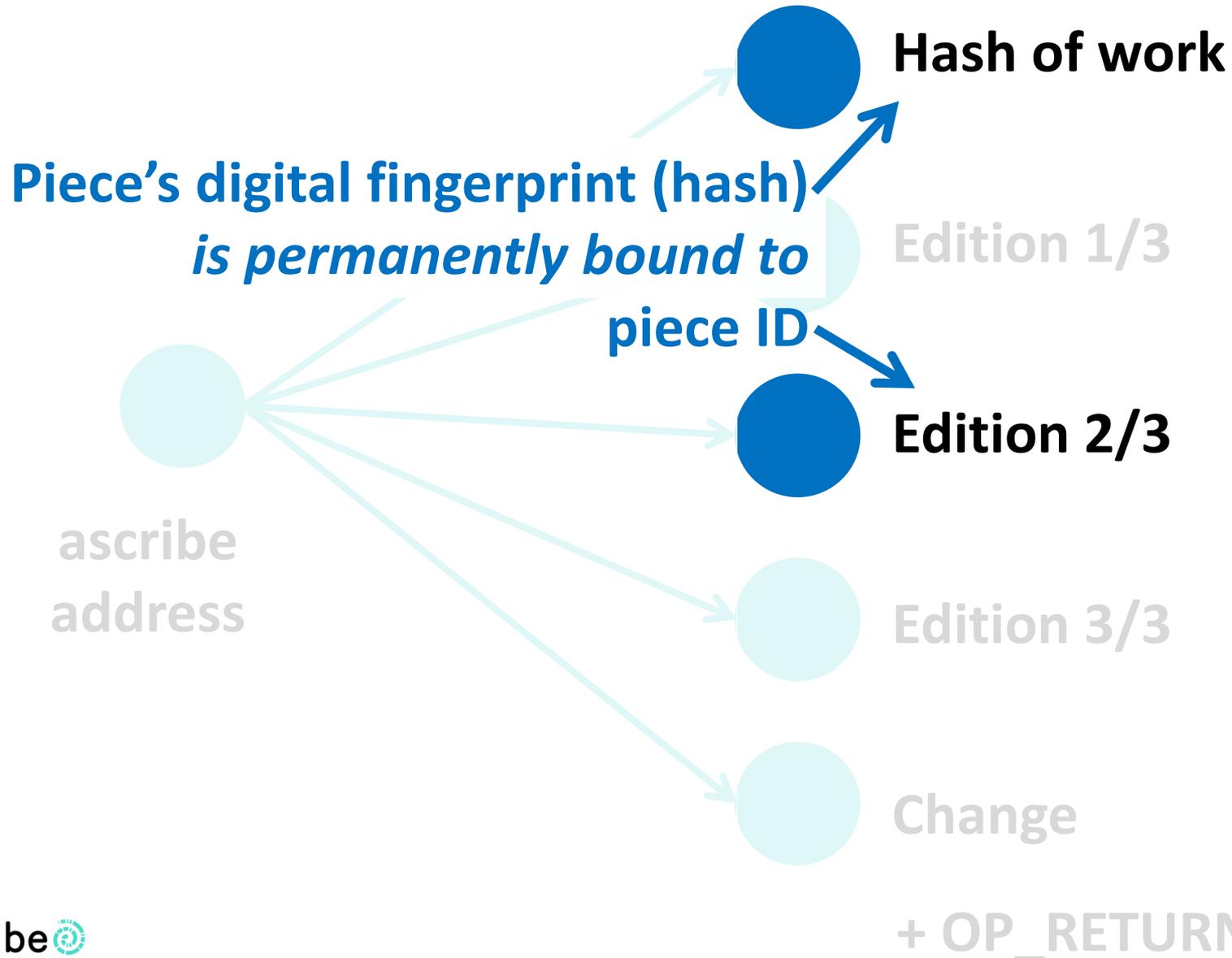
Example on 3 editions



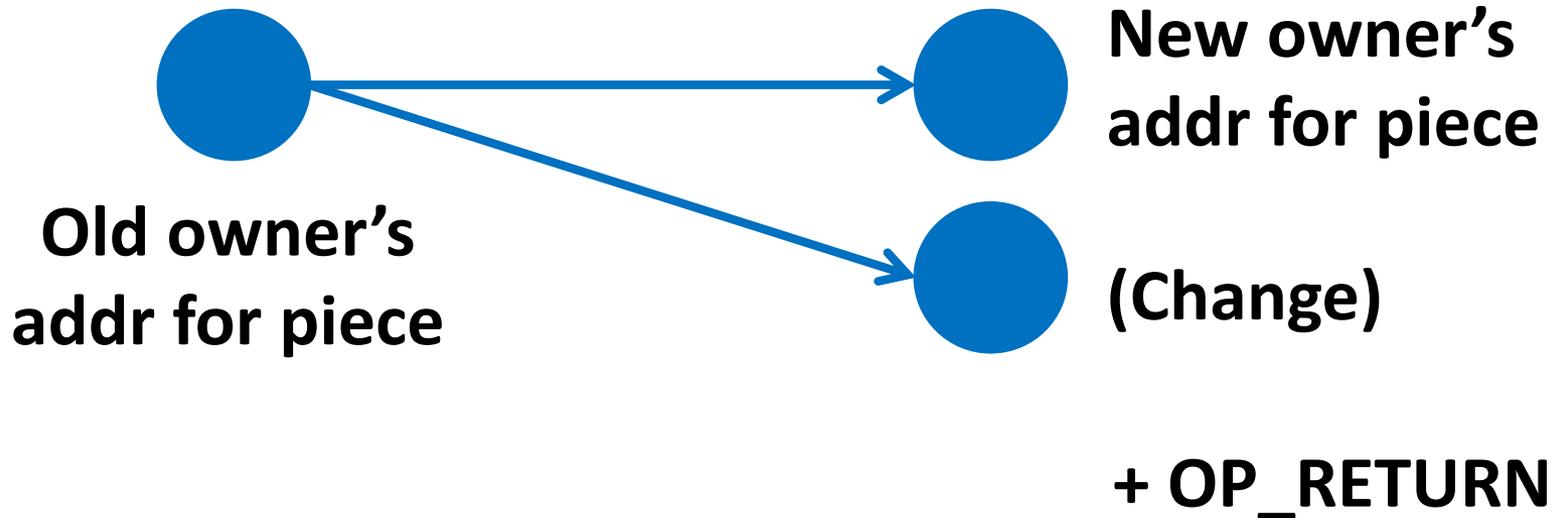
“Register” tx



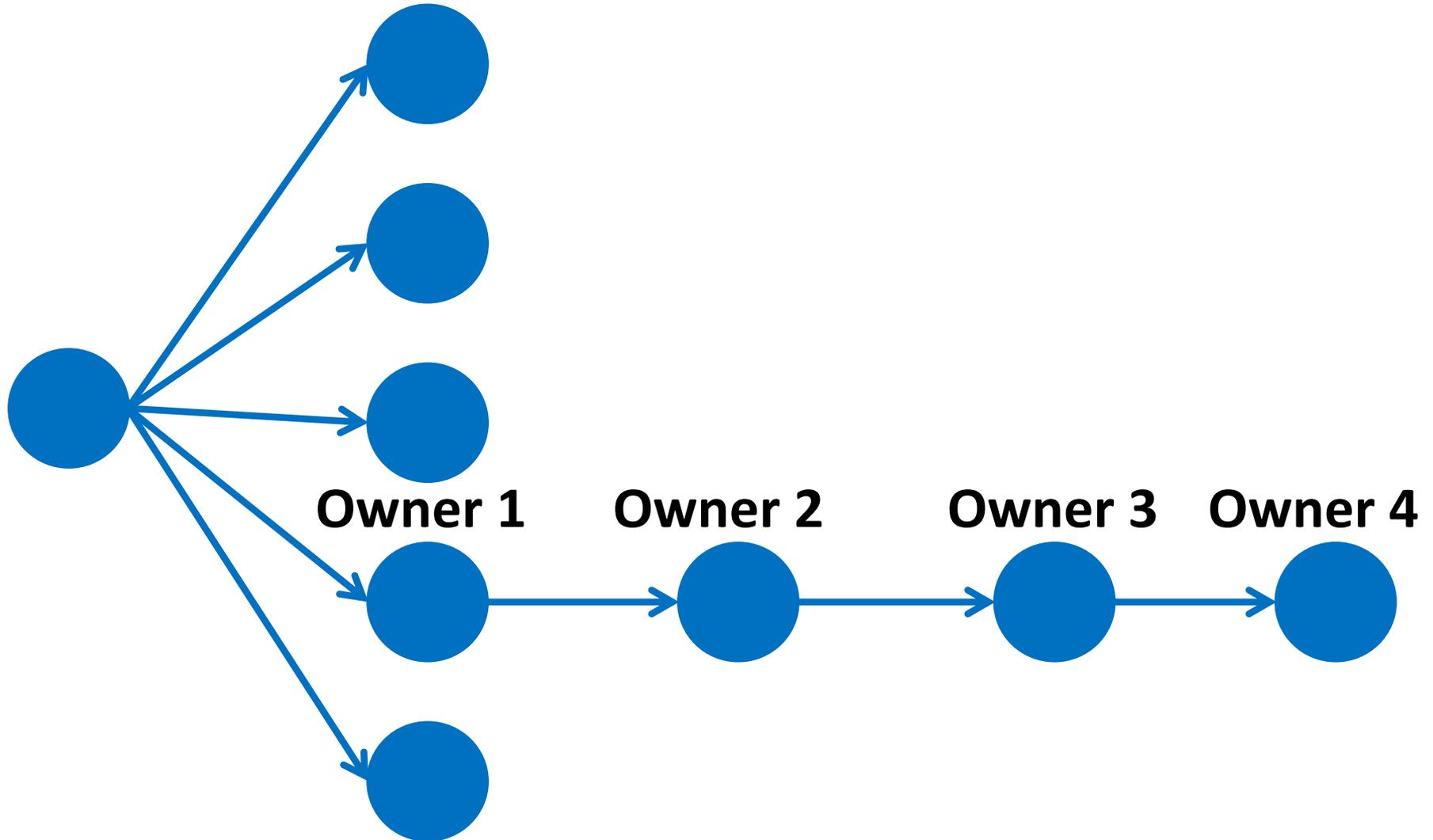
“Register” tx



“Transfer ownership” tx



Provenance (ownership history) emerges naturally



SPOOL spec

Full spec at github.com/ascribe/spool

REGISTER:

- MAPPING: 1-to-many

- SPOOL: piece_hash -> edition(s)

- BTC:

TX = [(1jtt... : 20000+num_editions)] -> [(piece_hash:10000), (edition1_hash:1), ..., (editionx_hash:1), (OP_RETURN=SPOOLREGISTER:0), (fee:10000)]

> *balance of piece_hash = 10000 satoshi*

> *balance of edition(s) = 1 satoshi*

TRANSFER:

- MAPPING: 1-to-1

- SPOOL: edition -> transfered_edition [transfered_edition is on a HD wallet owned by the transferee]

- BTC:

* first transfer

> *balance of edition = 1 satoshi*

TX = [(1jtt...:29999)] -> [(edition_hash:19999), (OP_RETURN=SPOOLREPLENISH:0), (fee:10000)]

TX = [(edition_hash:20000)] -> transfered_edition_hash [(transfered_edition_hash:10000), (OP_RETURN=SPOOLTRANSFER:0), (fee:1000)]

> *balance of edition = 0 satoshi*

> *balance of transfered_edition = 10000 satoshi*

* next transfers

> *balance of transfered_edition = 10000 satoshi*

TX = [(1jtt...:20000)] -> [(10000), (OP_RETURN=SPOOLREPLENISH:0), (fee:10000)]

TX = [(transfered_edition_hash:20000)] -> [(transfered_edition_next_hash:10000), (OP_RETURN=SPOOLTRANSFER:0), (fee:1000)]

> *balance of transfered_edition = 0 satoshi*

> *balance of transfered_edition_next = 10000 satoshi*

CONSIGN:

- MAPPING: 1-to many

- SPOOL: edition -> consigned_edition(s) [consigned_editionx is on a HD wallet owned by consignee x]

Reference application: **ascribe web app**

A service for creators to register, archive, and transfer ownership of their works

<http://www.ascribe.io>

ascribe web app in tech stack

ascribe web app (www.ascribe.io)

ascribe REST API

ascribe servers

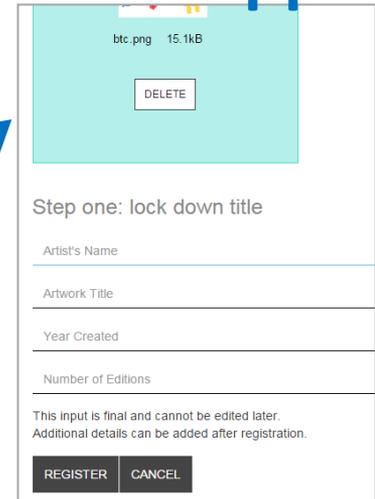
ascribe Terms
of Service
(incl. copyright
contract)

SPOOL bitcoin
overlay

bitcoin protocol

bitcoin blockchain

Web app



btc.png 15.1kB

DELETE

Step one: lock down title

Artist's Name

Artwork Title

Year Created

Number of Editions

This input is final and cannot be edited later.
Additional details can be added after registration.

REGISTER CANCEL

Welcome to ascribe!

Click or drop artwork

Step one: lock down title

Artist's Name

Artwork Title

Year Created



Number of Editions

[About / Impressum](#)

Welcome to ascribe!



btc.png 15.1kB

DELETE

Step one: lock down title

Trent McConaghy|

Bitcoin Love

2015 

3

This input is final and cannot be edited later.
 Additional details can be added after registration.

REGISTER CANCEL

Welcome to ascribe!



btc.png 15.1kB

DELETE

Step one: look down title

Trent McConaghy

Bitcoin Love

2015

3

This input is final and cannot be edited later.
Additional details can be added after registration.

REGISTER CANCEL

CONSIGN

TRANSFER



Piece detail



Trent McConaghy

BITCOIN LOVE

2015, edition: 1/3

ID: 16XcLp6mEuujWng6w6LqPNprRYbj9eUcT4

Status: Can Transfer/Consign

Owner: iheartbtc@mailinator.com

Certificate of Authenticity

CREATE

Personal Note Show/Hide

Provenance/Ownership History Show/Hide

Consignment Show/Hide

Further Details Show/Hide

+ Add Display instructions

+ Add Technology details

+ Add Artist contact info

+ Add Optional data files

SPOOL Details Show/Hide

Delete Actions Show/Hide

All works =archive =wallet

ascribe 

iheartbtc@mailinator.com 

+ ARTWORK



	Artist	▼ Title	Edition	Action
	Trent McConaghy	Bitcoin Love <i>ID: 16XcLp6mEuujWng6w6LqPNprRYbj9eU...</i>	2015, 1/3	Can Transfer/Consign
	Trent McConaghy	Bitcoin Love <i>ID: 16fv1VhXK2gVE1hpgxpBfzdDxEEnCa7M...</i>	2015, 2/3	Can Transfer/Consign
	Trent McConaghy	Bitcoin Love <i>ID: 1LPjuoXom5B5E6DQkj7Pux4QLBiWZXi...</i>	2015, 3/3	Can Transfer/Consign

[About / Impressum](#)

CONSIGN

TRANSFER



Transfer ownership

Transfer artwork ✕

Transferee email

Hi,

I transfer ownership of "Bitcoin Love" to you.

Truly yours,
iheartbtc@mailinator.com

Make sure that display instructions and technology details are correct.
They cannot be edited after the transfer.

Password

TRANSFER **CLOSE**

CREATE

Show/Hide

+ Add Technology details

+ Add Artist contact info

+ Add Optional data files

SPOOL Details Show/Hide

Artwork ID: 16XcLp6mEuujWng6w6LqPNprRYbj9eUcT4 [Blockchain] [Raw]

Hash of artwork, title, etc: 13ewcT3FxfmiNAaNcpMyiRqkr3TK9nYq61 [Blockchain] [Raw]

Owned by SPOOL address: 16XcLp6mEuujWng6w6LqPNprRYbj9eUcT4 [Blockchain] [Raw]



Interesting aside:

While this is a *bitcoin* app,
you don't have to know bitcoin at all.
Though if you do, you can cross-check...

Further Details [Show/Hide](#)

+ Add Display instructions

+ Add Technology details

+ Add Artist contact info

+ Add Optional data files

SPOOL Details [Show/Hide](#)

Artwork ID: 16XcLp6mEuujWng6w6LqPNprRYbj9eUcT4 [\[Blockchain\]](#) [\[Raw\]](#)

Hash of artwork, title, etc: 13ewcT3FxfmiNAaNcpMyiRqkr3TK9nYq61 [\[Blockchain\]](#) [\[Raw\]](#)

Owned by SPOOL address: 16XcLp6mEuujWng6w6LqPNprRYbj9eUcT4 [\[Blockchain\]](#) [\[Raw\]](#)

Easily cross-ref
blockchain 1/3

Easily cross-ref blockchain 2/3

https://blockchain.info/tx/c451dd9f6984c9870d925ca88067114dbc0bc4d8c843f96503b94eafd4a5fad4



Home Charts Stats Markets API Wallet



Transaction View information about a bitcoin transaction

c451dd9f6984c9870d925ca88067114dbc0bc4d8c843f96503b94eafd4a5fad4

1JttRRdtAi6cDNM23Uq4BEU61R8kJeANJs



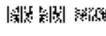
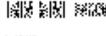
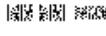
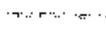
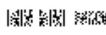
13ewcT3FxfmiNAaNcpMyiRqkr3TK9nYq61 0.0001 BTC
16XcLp6mEuujWng6w6LqPNprRYbj9eUcT4 0.000006 BTC
16fv1VhXK2gVE1hpgxpBfzdDxEncA7MpYn 0.000006 BTC
1LPjuoXom5B5E6DQkj7Pux4QLBiWZXiC7N 0.000006 BTC
1JttRRdtAi6cDNM23Uq4BEU61R8kJeANJs 0.000182 BTC
0 BTC

7 Confirmations 0.0003 BTC

Summary	
Size	359 (bytes)
Received Time	2015-03-22 13:50:30
Included In Blocks	348695 (2015-03-22 13:50:30 + 0 minutes)
Confirmations	7 Confirmations
Relayed by IP	144.76.13.207 (whois)
Visualize	View Tree Chart

Inputs and Outputs	
Total Input	0.0004 BTC
Total Output	0.0003 BTC
Fees	0.0001 BTC
Estimated BTC Transacted	0 BTC
Scripts	Show scripts & coinbase

Easily cross-ref blockchain 3/3

2015 12:57 GMT	0e00e07d0e	6a2606ed3162cb03e55ca0ed5e93ab88de53a70a4da37464d7179e386d706	9256c1318ebbc (raw)	
23 Mar 2015 12:57 GMT	348843 590db4315882e4c870387b8be37 07d7318383123d98e045f0489fd ca04199718	??_???M???7^?y?>?UN???az?R\$5????m???????	ouhf3LT9TcsAITdeFXnDPgpVTvuhn2F67llkNcfl0lJtAAAA1hAAA== (base64) 6a28a2e85fdc b4fd4dc b0095375e1579c 33e0a554efba19f617aee522435c 7c 8d082 6d00000d6100000 (raw)	
23 Mar 2015 12:29 GMT	348838 c1ccc898d3eaf42df3a135ed12 1a1fff80832528791e8897eb257b 8a488c1cc	ASCRIBESPOOLREGISTER	QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c 5245474953544552 (raw)	
23 Mar 2015 12:19 GMT	348837 7b99e0d3fa9d4d24d2f02871533f d4a2bf8d4d512ee5407d7d898b2 9c709d4e3	BITPROOF?kf?^U????:????Bx?~::????k(???r (Bitproof)	QkIUUFJPT0YCa2b+XIXp2uTgOoPE4dNCeN5+Ojrv0P7Y7Gso7lgYcg== (base64) 6a2842495450524f4f46026b66fe5e55e9dae4e03a83c 4e1d34278de7e3a3aefd0fed 8ec6b28ec 881872 (raw)	
23 Mar 2015 11:03 GMT	348828 649e8ebf8007ae55f4a8be5c571 887c2eab61828b5b0917d098a8b fcb2d15f6b	ASCRIBESPOOLREGISTER	QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c 5245474953544552 (raw)	
23 Mar 2015 11:03 GMT	348828 ea38fb870979b5121bc815043f2 2bd455fcc4c07e88cc30e8fe5f3c 830df98a9	ASCRIBESPOOLREGISTER	QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c 5245474953544552 (raw)	
23 Mar 2015 11:03 GMT	348828 25292c3e7a6b90ba6116f5a08af 51d08b027e2c8d58b033da94abf 127b2fd11e	ASCRIBESPOOLREGISTER	QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c 5245474953544552 (raw)	
23 Mar 2015 11:03 GMT	348828 078e3f6b7a5371c8b84c432746c 89fc54f5e72890f7502f4e58b0f2e 634722c8	OA????? (Open Assets)	TOEBAAEKAA== (base64) 6a074f410100010a00 (raw)	
23 Mar 2015 11:03 GMT	348828 3bded75f4cbf35ea30b8857c817	ASCRIBESPOOLREGISTER		

Webapp & SPOOL history

- Prototype – Nov 2013
 - E.g. <https://blockchain.info/tx/13b5828c281bb2c8a9448bd3cbebd9a592ba4a6b55ec4aad79b4625cb85e4c>
- alpha – Mar 2014
- beta – Sep 2014
- production v1 – Mar 2015
 - E.g. at coinsecrets.org

348828	649e9ebf8007ae55f4a0be5c571887c2eab6182b5b0917d099a9bfc2d1f5fb	ASCRIBESPOOLREGISTER QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c5245474953544552 (raw)	 
348828	ea38fb870979b5121bc815043f22bd455fcc4c07e88cc30e8fe5f3c830df98a9	ASCRIBESPOOLREGISTER QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c5245474953544552 (raw)	 
348828	25292c3e7a8b90ba8116f5a08af51d08b027e2c0d58b033da94abf127b2fd11e	ASCRIBESPOOLREGISTER QVNDUKICRVNQT09MUKVHSVNUrVI= (base64) 6a144153435249424553504f4f4c5245474953544552 (raw)	 

Conclusion

- SPOOL + TOS is **copyright on the blockchain**
- SPOOL spec at github.com/ascribe/spool
- Webapp implementation at www.ascribe.io
- In production use now