WORLD BANK GROUP
Finance, Competitiveness & Innovation
Financial Sector Advisory Center (FinSAC)

Session 6:
Crypto-Assets and Blockchain

Speakers:

Dan Morgan, Ripple

Shermin Voshmgir, Blockchain Hub, Vienna University of Economics

Marc Farag, Basel Committee on Banking Supervision

Moderator:

Aquiles Almansi, The World Bank Group

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Image Source: Tyler Wetzel
www.tylerwetzel.com

Things we hear …

- *"…an alternative payment system with no government involvement, it has become a combination of a bubble, a Ponzi scheme and an environmental disaster*." Agustín Carstens (BIS)

- *"I probably shouldn't say any more about cryptocurrency. But it's not the same as gold or fiat currencies. Those are supported by law, police, courts. … Blockchain, on the other hand, is real. We're testing it and will use it for a whole lot of things*." Jamie Dimon (JP Morgan)

Digital records

	A	B	C	D
1		**Anna**	**Peter**	**Lucy**
2	**Balances Day 0**	70	45	37
3	**Operations Day 0**	-20	30	20
4	**Balances Day 1**	50	75	57
5				

Cryptography: hash functions

```
In [1]: import hashlib

In [2]: def hashFunction(string):
            return hashlib.md5(string.encode()).hexdigest()

In [3]: hashFunction('World Bank')

Out[3]: 'b7b1392937b89054ef8d8bf494c8dae0'

In [4]: hashFunction('World Bank!')

Out[4]: 'd13edd5cfe4bd51de7ec7a25723f6baf'
```

Hashed Records

	A	B	C	D	E
1		**Anna**	**Peter**	**Lucy**	**Hash**
2	**Balances Day 0**	70	45	37	'0bb9847ac20152473fd0b0dd55b970b8'
3	**Operations Day 0**	-20	30	20	
4	**Balances Day 1**	50	75	57	'bee770c8485eeeeaf7b522555ba6f4ac'
5					

Tamper-Evident Records

Hash of Balances Day 0

```
hashFunction('70,45,37')
```

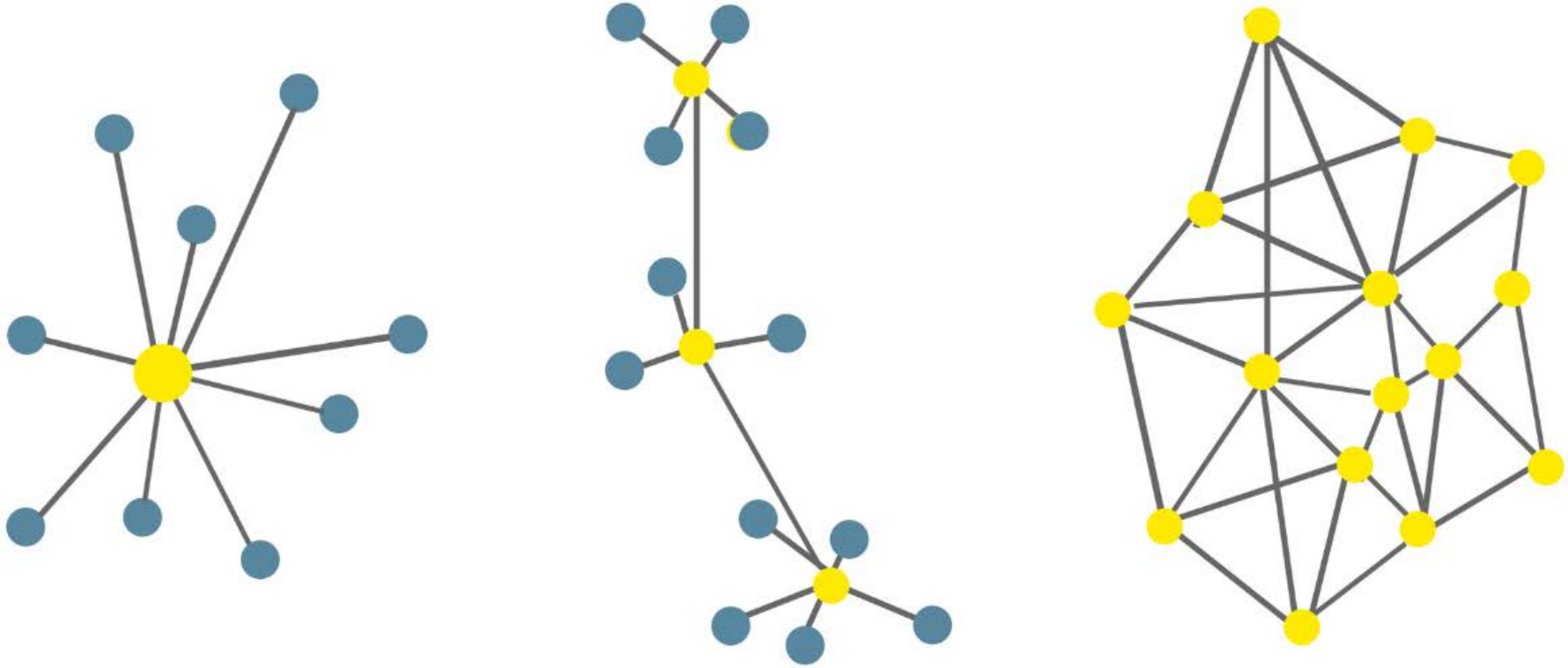
```
'0bb9847ac20152473fd0b0dd55b970b8'
```

Hash of Balances Day 1 = Hash of (Hash of Balances Day 0 + Operations Day 0)

```
hashFunction('0bb9847ac20152473fd0b0dd55b970b8'+'-20,30,20')
```

```
'bee770c8485eeeeaf7b522555ba6f4ac'
```

Computer-Network Architectures



Network nodes (yellow) and clients (blue)

Private or Public?

- Private (“permissioned”): all nodes (servers) belong to (are controlled by) the same organization; hence, there is no lack of trust among them.
- Public: anybody can set up a node and join the network; hence, there is zero trust among nodes and it needs a cheating-proof consensus mechanism.

Crypto assets or just records?

	A	B	C	D	E
1		**Anna**	**Peter**	**Lucy**	**Hash**
2	**Balances Day 0**	70	45	37	'0bb9847ac20152473fd0b0dd55b970b8'
3	**Operations Day 0**	-20	30	20	
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5					

Inside or Outside the Network?

- **Digital assets:** like Bitcoin and other "crypto currencies," plus assets (and liabilities) created with "smart contracts," which exist only within (usually public) computer networks.

- **Digital representation of standard assets and contracts:** property registries, contracts such as bonds, bank accounts, derivatives, etc., which exist within a known national jurisdiction.

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Our speakers today:

-> Dan Morgan

-> Shermin Voshmgir

-> Marc Farag