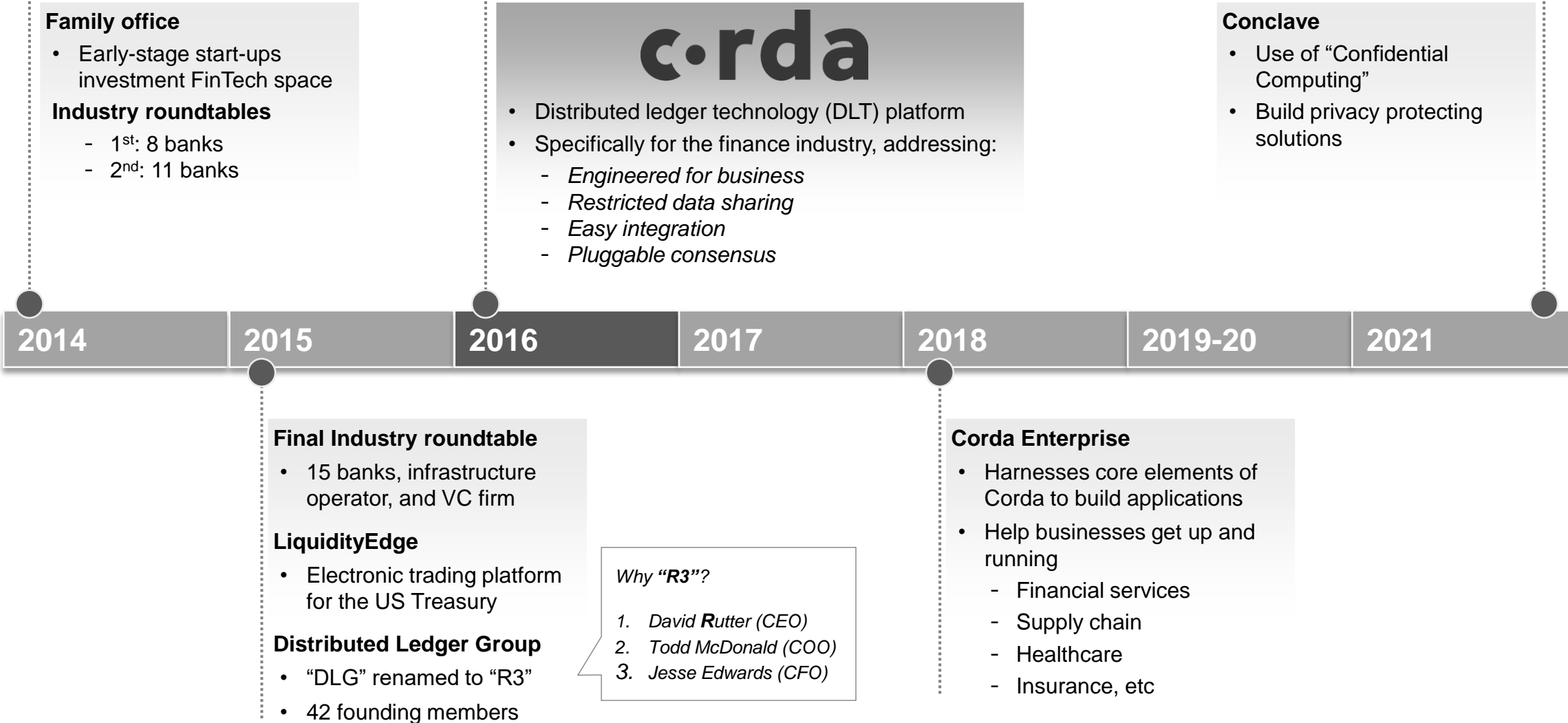


R3

Putting the 'Fin' Back in FinTech

Brief history of R3



The business problem in financial services

The industry is defined by agreements among financial institutions

Cash balance

“The following bank and I agree that they owe me \$1 million”

Security under custody

“The following custody bank and I agree that I own 1,000 shares of the following corporation”

Derivative agreement

“Bank A and B agree that they are parties to the following Interest Rate Swap...”

Agreements are recorded by both parties in different systems



Bank A



A sends update to B hoping B reaches the same conclusion about the new state of agreement



Bank B

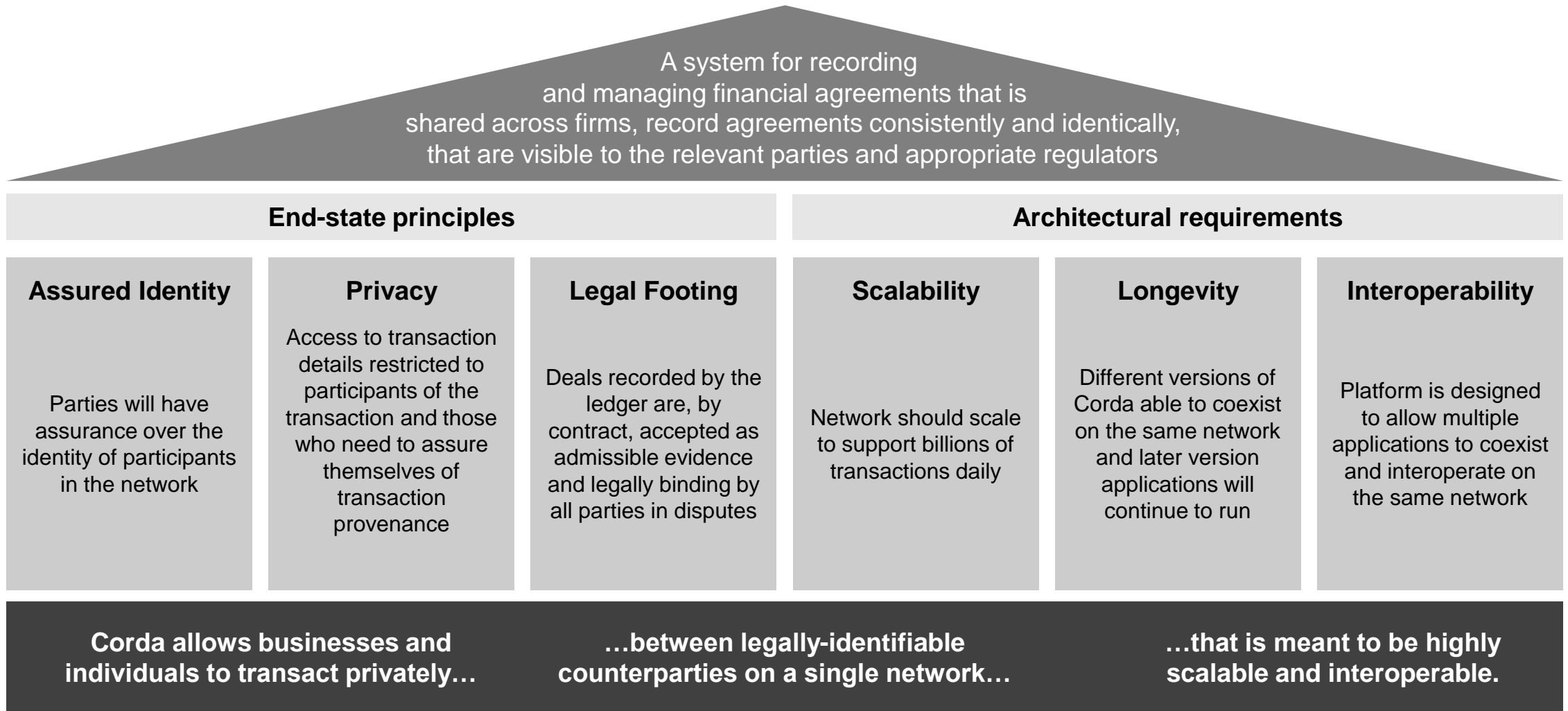
Industry pain points

- Reconciliation performed institutions separately
- Discrepancies exist when different systems end up believing different things
- Tens of billions of dollars spent each year ¹

1. According to Richard Brown, CTO of R3.

Corda envisions a single, global ledger

Connecting institutions and people



Putting the 'Fin' back in FinTech

Corda uses Blockchain/DLT to solve the financial services business problem

Characteristic	What it means	Corda's design
Consensus	<ul style="list-style-type: none"> • "I see what you see... and I know that what I see is what you see" 	<ul style="list-style-type: none"> • Visibility on a "need-to-know" basis • Parties within the same transaction should see details about a shared fact, but not a 3rd party
Validity	<ul style="list-style-type: none"> • Rules that define whether a given proposed update to the system is valid 	<ul style="list-style-type: none"> • Users write their own validation logic for each contract • Only the parties who are part of the transaction need to be in agreement about a fact
Uniqueness	<ul style="list-style-type: none"> • Anti-double-spend 	<ul style="list-style-type: none"> • Notary to ensure two valid, but conflicting transactions cannot both be simultaneously active in the system
Immutability	<ul style="list-style-type: none"> • Data once committed cannot be changed 	<ul style="list-style-type: none"> • Once committed, nobody else will accept a transaction if it tries to build on a modified version of some data that has already been accepted by other stakeholders
Authentication	<ul style="list-style-type: none"> • Actions in the system are associated with "private keys" 	<ul style="list-style-type: none"> • No concept of a "master key" or "administrator password" that gives God-like powers



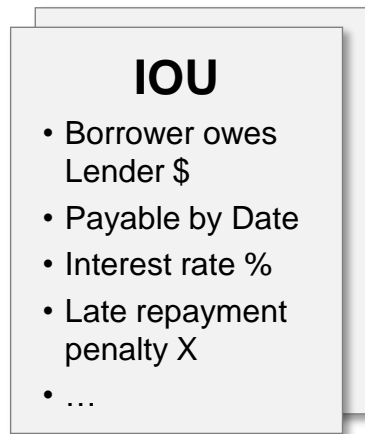
Corda's feature

- Maintains a permissioned, private, enterprise DLT platform, not "blockchain"
 - No unnecessary global sharing of data
 - Achieves consensus between firms at the level of individual deals
 - Allows transactions to be validated by parties to the transaction rather than a broader pool of unrelated validators
 - Enables regulatory and supervisory observer nodes
- Explicit link between human-language legal documents and smart contract code
- Builds on industry-standard tools and supports a variety of consensus mechanisms (pluggable consensus)
- Arranges and automates of workflow between firms without central controller

CorDapp: a distributed application running on Corda

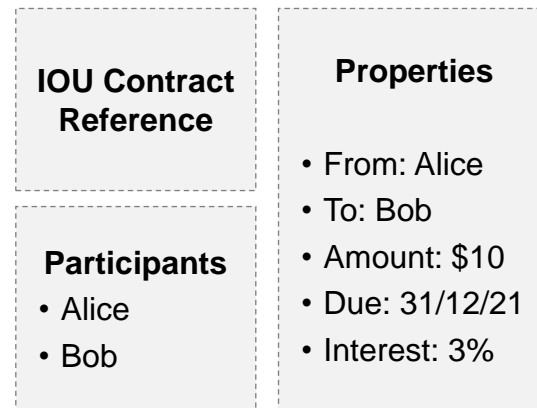
Encapsulation of business logic, replicating financial services between institutions

Contract



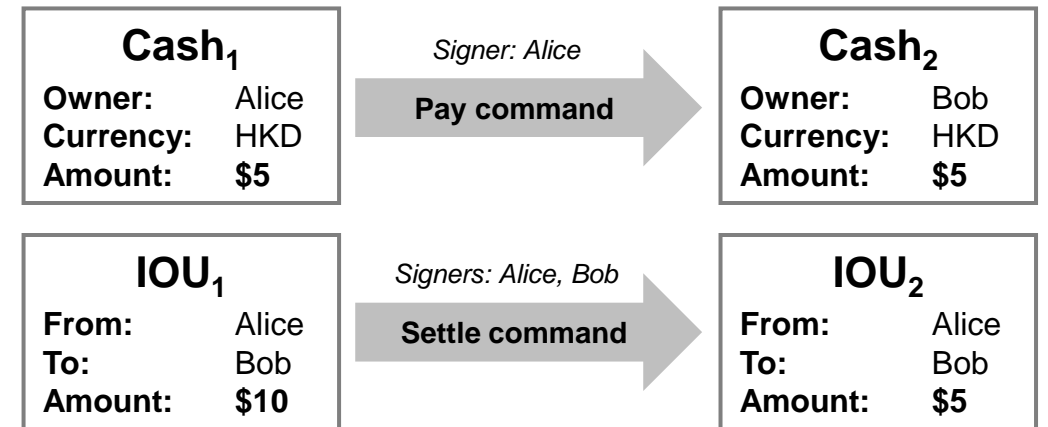
- Corresponds to the real world definition
- Mechanism used to impose constraints on how *states* can evolve
- Different to *smart contracts* of other DLT i.e. not stateful

State



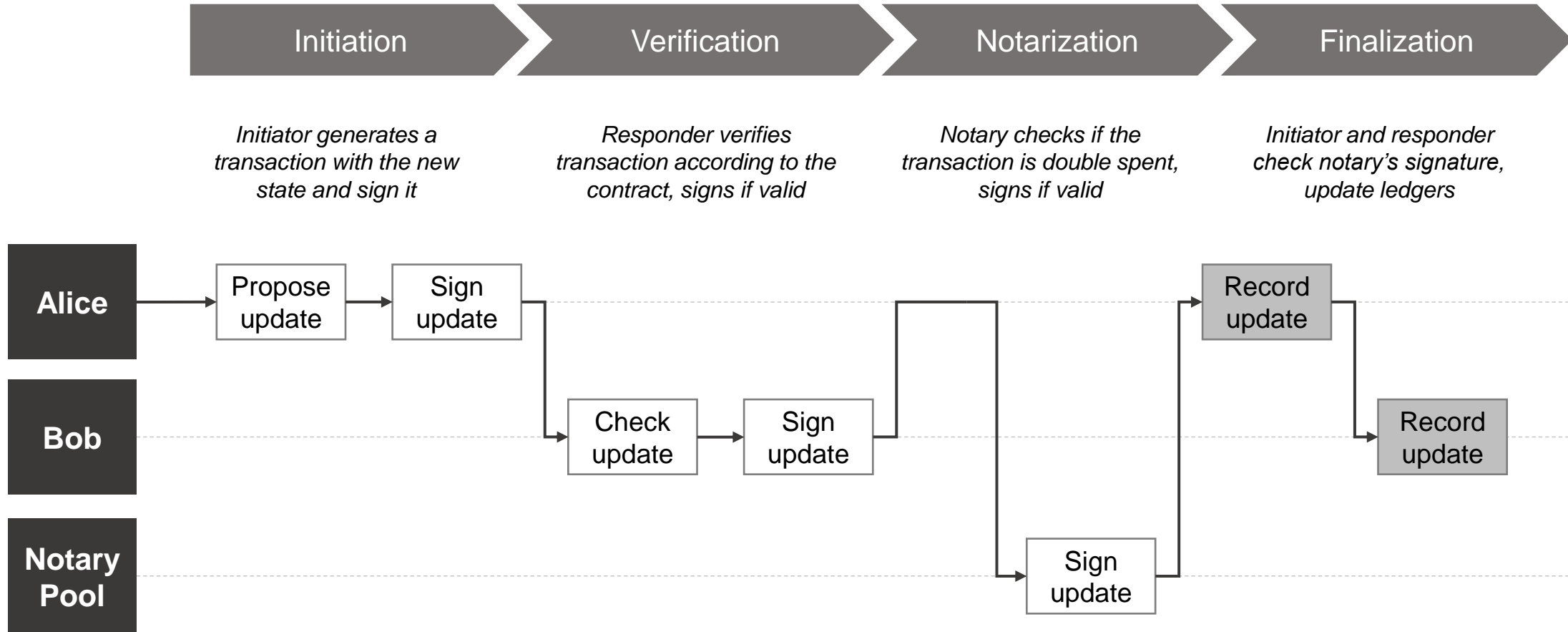
- Immutable object representing facts known by one or more Corda nodes at a specific point in time
- Can be arbitrary data for facts of any kind e.g. stocks, bonds, loans, KYC data, identity, etc

Transaction



- Transaction triggers update of shared fact i.e. state
- State updated by creating a new version of the state and marking the existing state as historic / consumed
- Sequence of state replacements gives a full view of evolution of the shared fact over time

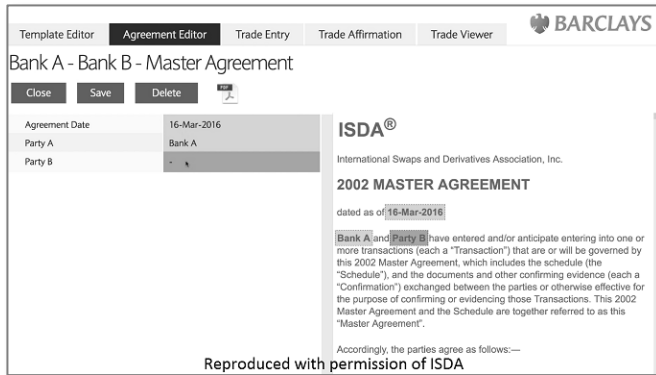
The business problem in financial services



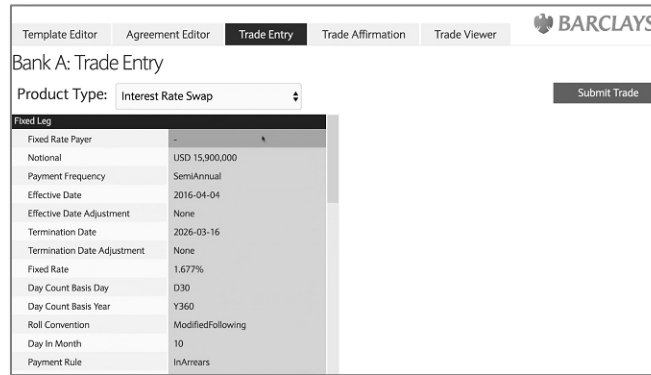
Barclays' Smart Contract Templates

The first public demo of R3's Corda (2016, O2 in London)

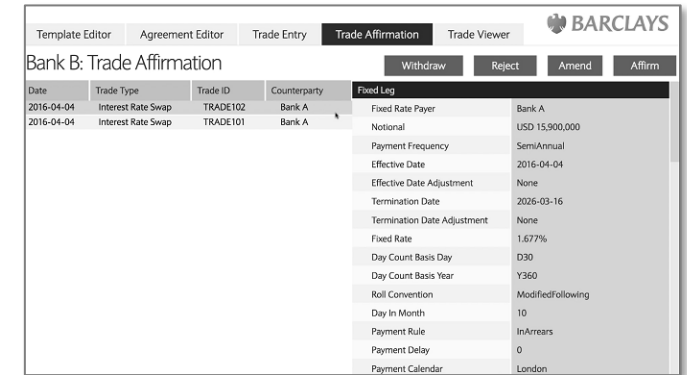
Generation of agreement



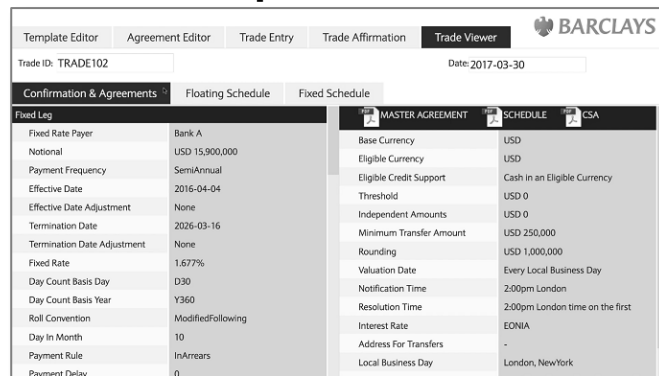
Interest rate swap created by Bank A



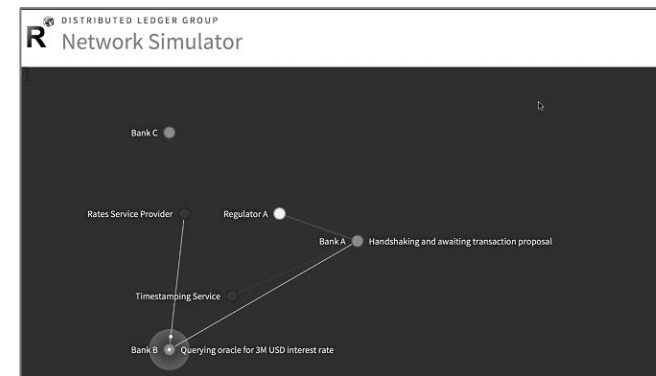
Trade affirmation by Bank B



Trade running on Corda platform

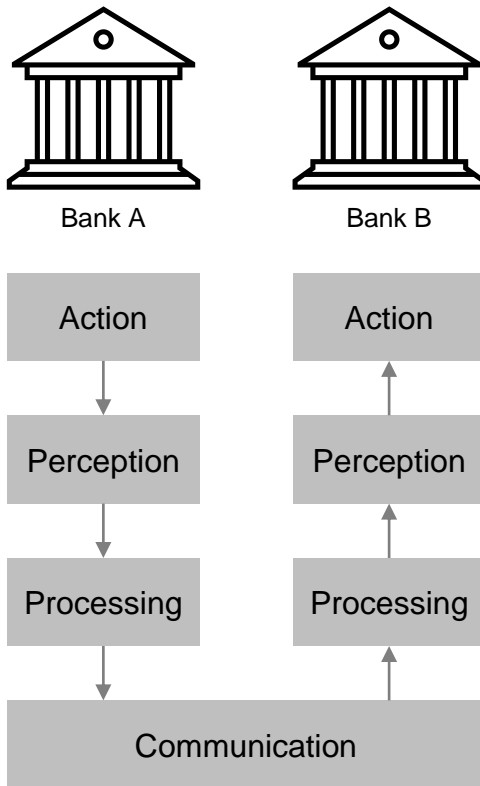


Visualization of network

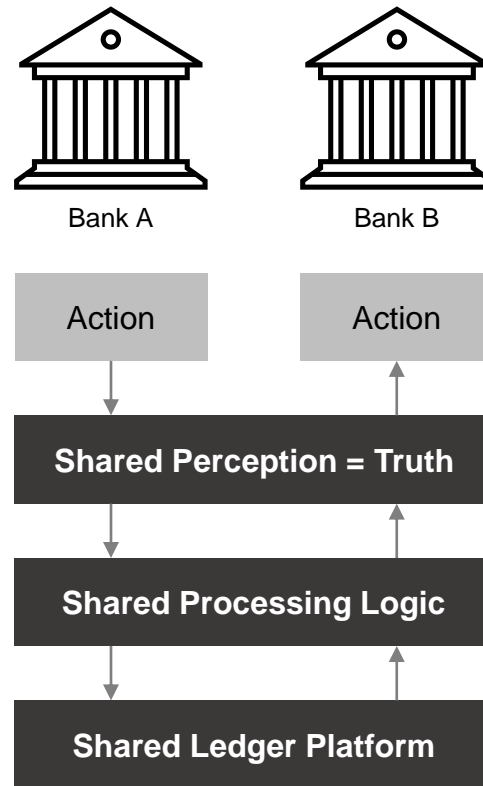


Corda's platform offers several advantages

Current status



With shared ledgers



Solving pain points for the financial services industry

- Operational simplification
- Regulatory efficiency
- Risk reduction
- Reduction in clearing/settlement time
- Improvement in liquidity capital
- Minimization of fraud

Comparing Corda with other DLT Enterprise platforms



	R3 Corda	Hyperledger Fabric	Ethereum
Operation mode	<ul style="list-style-type: none"> Private – permission needed 	<ul style="list-style-type: none"> Private – permission needed 	<ul style="list-style-type: none"> Public – no permission needed
Consensus	<ul style="list-style-type: none"> Validity – only parties in the same transaction take part Uniqueness – notary node can run several consensus algorithms 	<ul style="list-style-type: none"> Practical Byzantine Fault Tolerance (PBFT) consensus protocol 	<ul style="list-style-type: none"> Proof-of-Work (PoW) / Proof-of-Stake (PoS)
Governance	<ul style="list-style-type: none"> R3 	<ul style="list-style-type: none"> Linux Foundation 	<ul style="list-style-type: none"> Distributed among participants
Smart contract	<ul style="list-style-type: none"> Kotlin Legally bound 	<ul style="list-style-type: none"> Golang Not legally bound 	<ul style="list-style-type: none"> Solidity Not legally bound
Revertability of transaction	<ul style="list-style-type: none"> Roll back function available in case of accidental error 	<ul style="list-style-type: none"> Unclear as to how conflicts are resolved 	<ul style="list-style-type: none"> All executions are final and cannot be reverted
Currency	<ul style="list-style-type: none"> Nil 	<ul style="list-style-type: none"> Nil 	<ul style="list-style-type: none"> Ether
Use case	<ul style="list-style-type: none"> Specialized DLT, customized to the needs of financial service industry 	<ul style="list-style-type: none"> Preferred platform for B2B operations, mainly enterprises 	<ul style="list-style-type: none"> Generalized applications, mostly P2P and B2C operations



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