R3 Putting the 'Fin' Back in FinTech

Brief history of R3

Family office

 Early-stage start-ups investment FinTech space

Industry roundtables

- 1st: 8 banks
- 2nd: 11 banks

c·rda

- Distributed ledger technology (DLT) platform
- Specifically for the finance industry, addressing:
 - Engineered for business
 - Restricted data sharing
 - Easy integration
 - Pluggable consensus

Conclave

- Use of "Confidential Computing"
- Build privacy protecting solutions

2014 | 2015

2016

2017

2018

2019-20

2021

Final Industry roundtable

15 banks, infrastructure operator, and VC firm

LiquidityEdge

 Electronic trading platform for the US Treasury

Distributed Ledger Group

- "DLG" renamed to "R3"
- 42 founding members

Why "R3"?

- 1. David Rutter (CEO)
- 2. Todd McDonald (COO)
- 3. Jesse Edwards (CFO)

Corda Enterprise

- Harnesses core elements of Corda to build applications
- Help businesses get up and running
 - Financial services
 - Supply chain
 - Healthcare
 - Insurance, etc

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"

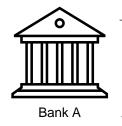
Security under custody

"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



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



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

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Corda envisions a single, global ledger

Connecting institutions and people

A system for recording and managing financial agreements that is shared across firms, record agreements consistently and identically, that are visible to the relevant parties and appropriate regulators

End-state principles

Assured Identity

Parties will have assurance over the identity of participants in the network

Privacy

Access to transaction details restricted to participants of the transaction and those who need to assure themselves of transaction provenance

Legal Footing

Deals recorded by the ledger are, by contract, accepted as admissible evidence and legally binding by all parties in disputes

Scalability

Network should scale to support billions of transactions daily

Architectural requirements

Longevity

Different versions of Corda able to coexist on the same network and later version applications will continue to run

Interoperability

Platform is designed to allow multiple applications to coexist and interoperate on the same network

Corda allows businesses and individuals to transact privately... ...between legally-identifiable

...that is meant to be highly scalable and interoperable.

counterparties on a single network...

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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	 "I see what you see and I know that what I see is what you see" 	 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	Rules that define whether a given proposed update to the system is valid	 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	Anti-double-spend	Notary to ensure two valid, but conflicting transactions cannot both be simultaneously active in the system	
Immutability	Data once committed cannot be changed	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	 Actions in the system are associated with "private keys" 	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

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CorDapp: a distributed application running on Corda

Encapsulation of business logic, replicating financial services between institutions

• Bob

IOU

Contract

- Borrower owes Lender \$
- Payable by Date
- Interest rate %
- Late repayment penalty X
- ...
- 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

• Interest: 3%

 Can be arbitrary data for facts of any kind e.g. stocks, bonds, loans, KYC data, identity, etc

Transaction

Cash₁

Owner: Alice
Currency: HKD
Amount: \$5

Signer: Alice
Pay command

From: Alice To: Bob Amount: \$10

Cash₂
Owner: Bob
Currency: HKD
Amount: \$5

Amount: \$5

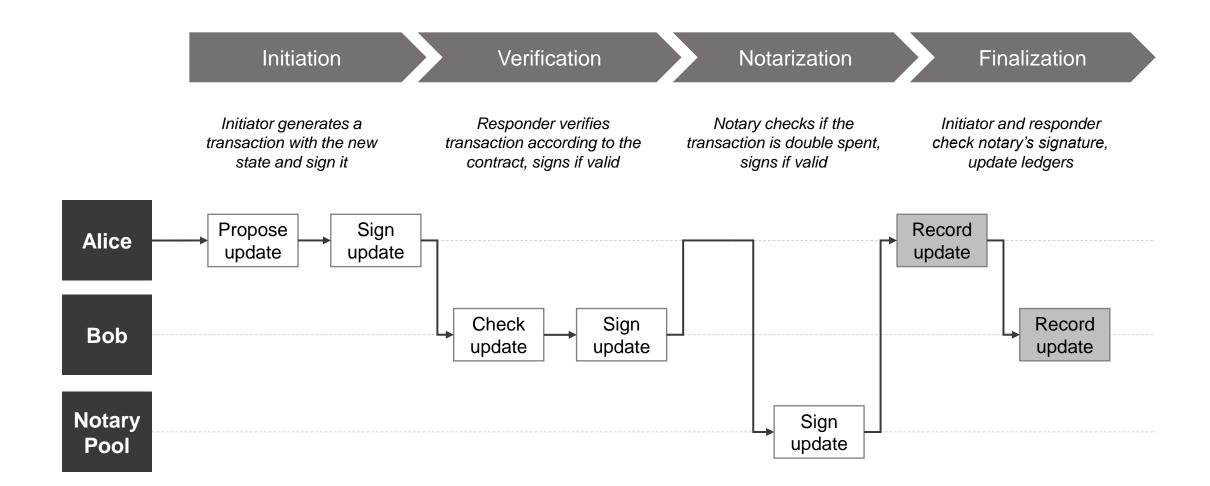
Bob

To:

- 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

Source: Literature research

The business problem in financial services



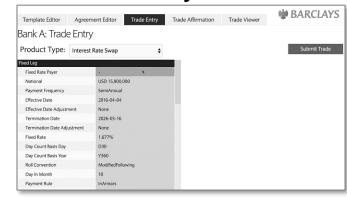
Barclays' Smart Contract Templates

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

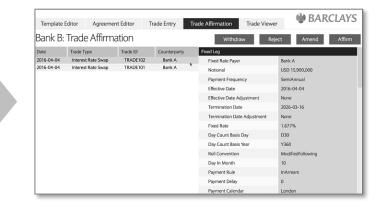
Generation of agreement



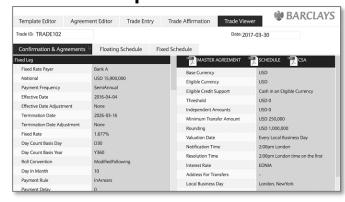
Interest rate swap created by Bank A



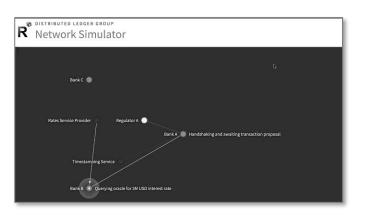
Trade affirmation by Bank B



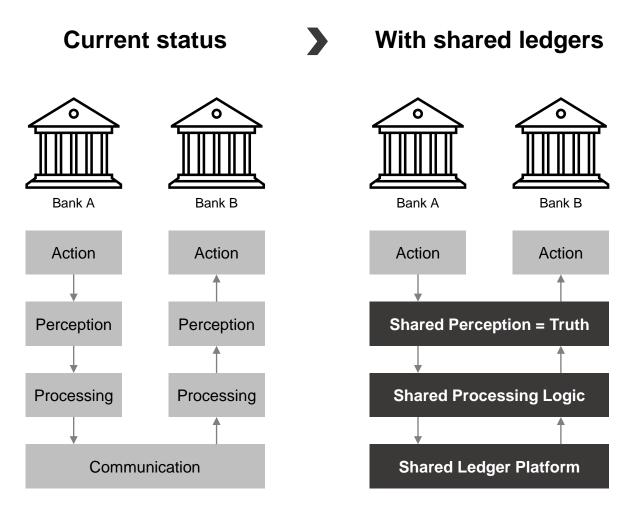
Trade running on Corda platform



Visualization of network



Corda's platform offers several advantages



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







Operation mode	Private – permission needed	Private – permission needed	Public – no permission needed
Consensus	 Validity – only parties in the same transaction take part Uniqueness – notary node can run several consensus algorithms 	Practical Byzantine Fault Tolerance (PBFT) consensus protocol	 Proof-of-Work (PoW) / Proof-of-Stake (PoS)
Governance	• R3	Linux Foundation	Distributed among participants
Smart contract	KotlinLegally bound	GolangNot legally bound	SolidityNot legally bound
Revertability of transaction	Roll back function available in case of accidental error	Unclear as to how conflicts are resolved	All executions are final and cannot be reverted
Currency	• Nil	• Nil	• Ether
Use case	 Specialized DLT, customized to the needs of financial service industry 	 Preferred platform for B2B operations, mainly enterprises 	 Generalized applications, mostly P2P and B2C operations

Source: Literature research

