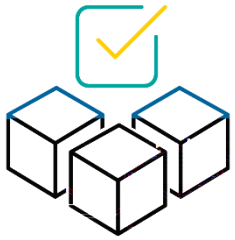
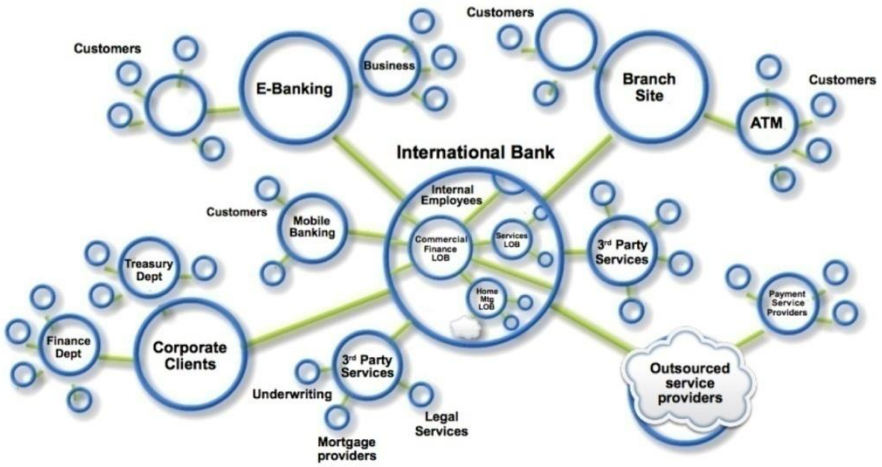


Business networks and transactions

Business networks, markets, and wealth

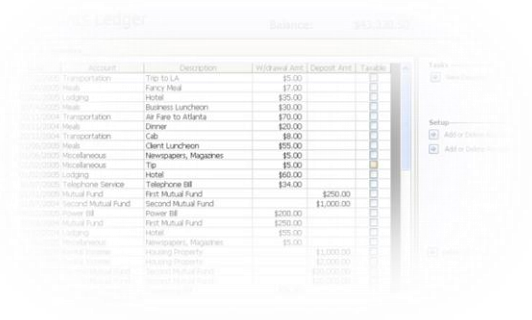
- Business networks benefit from connectivity
  - Participants are customers, suppliers, banks, partners
  - Cross-geography and regulatory boundaries
- Wealth is generated by the flow of goods and services across business networks
- Markets are central to this process
  - Public: fruit market, car auction
  - Private: supply chain financing, bonds



Transferring assets, building value

- Anything that is capable of being owned or controlled to produce value is an asset
- Two fundamental types of assets:
  - Tangible, such as a house
  - Intangible, such as a mortgage
- Intangible assets fall into several categories:
  - Financial, such as bonds
  - Intellectual, such as patents
  - Digital, such as music
- Cash is also an asset; it possesses the property of anonymity

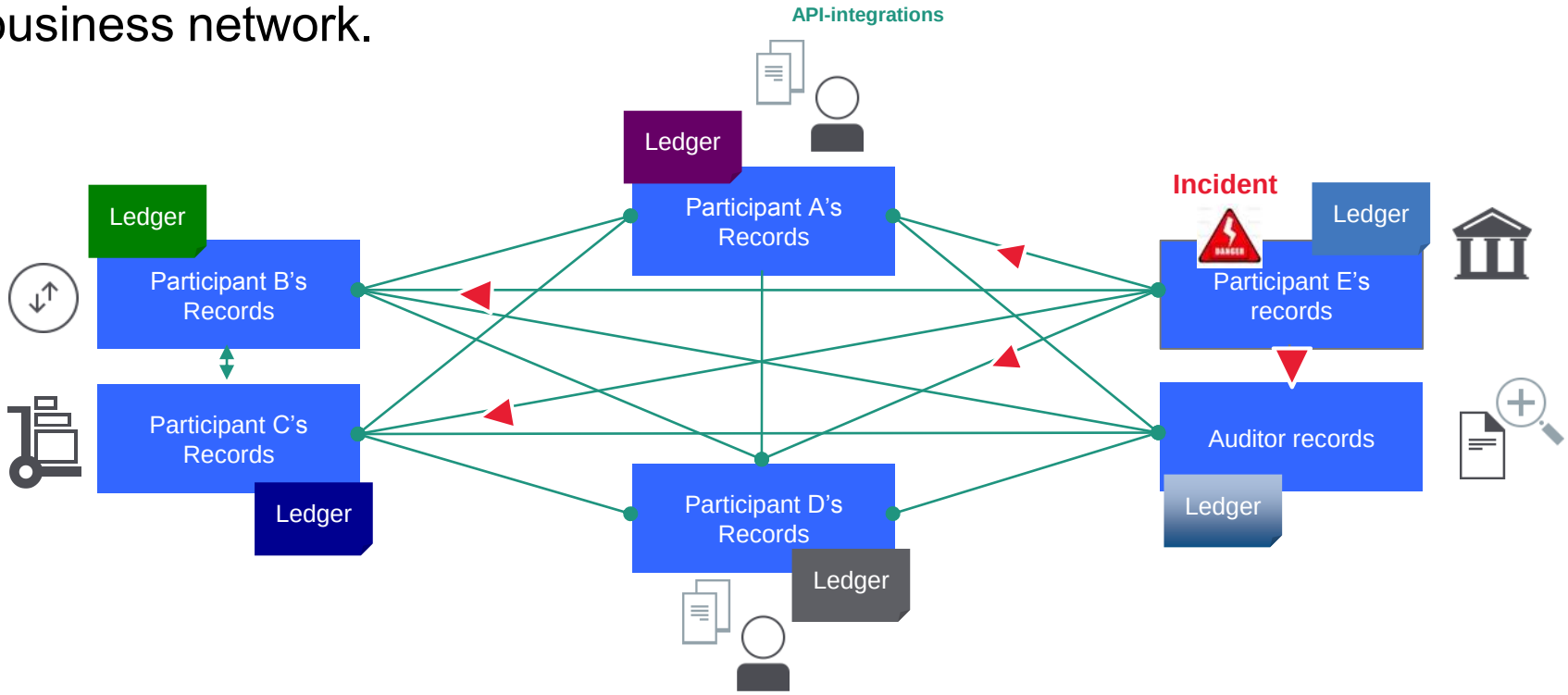
Ledgers are key



- The **ledger** is the system of record for a business.
- A business will have a ledger for each of the multiple business networks in which it participates.
- A **transaction** is an asset transfer on or off the ledger.
  - Jane gives a car to Anthony (simple)
- A **contract** defines the conditions for a transaction to occur.
  - If Anthony pays Jane money, then the car passes from Jane to Anthony (simple).
  - If the car won't start, funds do not pass to Jane as decided by a third-party arbitrator. (more complex)

The trust problem

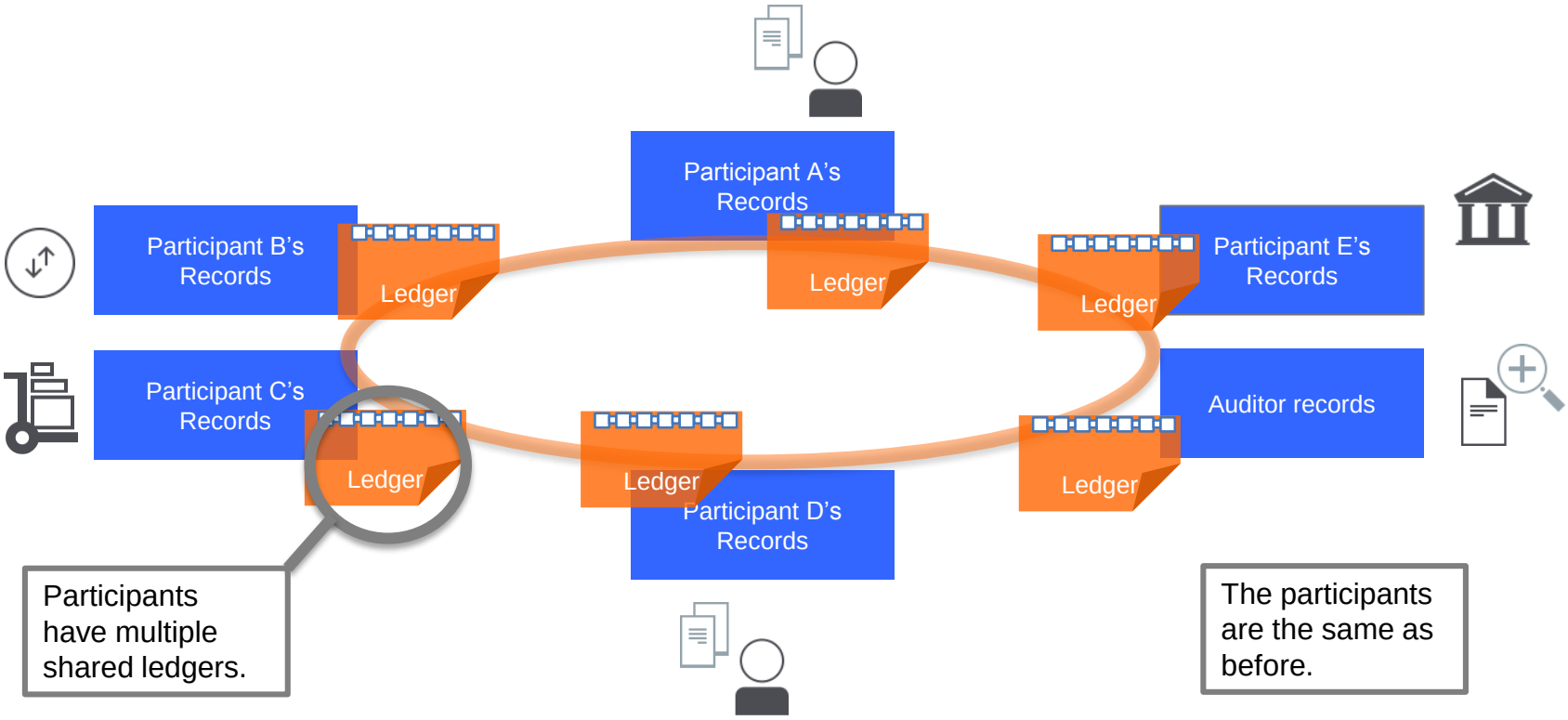
It is difficult to monitor asset ownership and transfers in a trusted business network.



Inefficient, expensive, vulnerable

The solution to the trust problem

A shared, replicated permissioned ledger



Consensus, provenance, immutability, finality

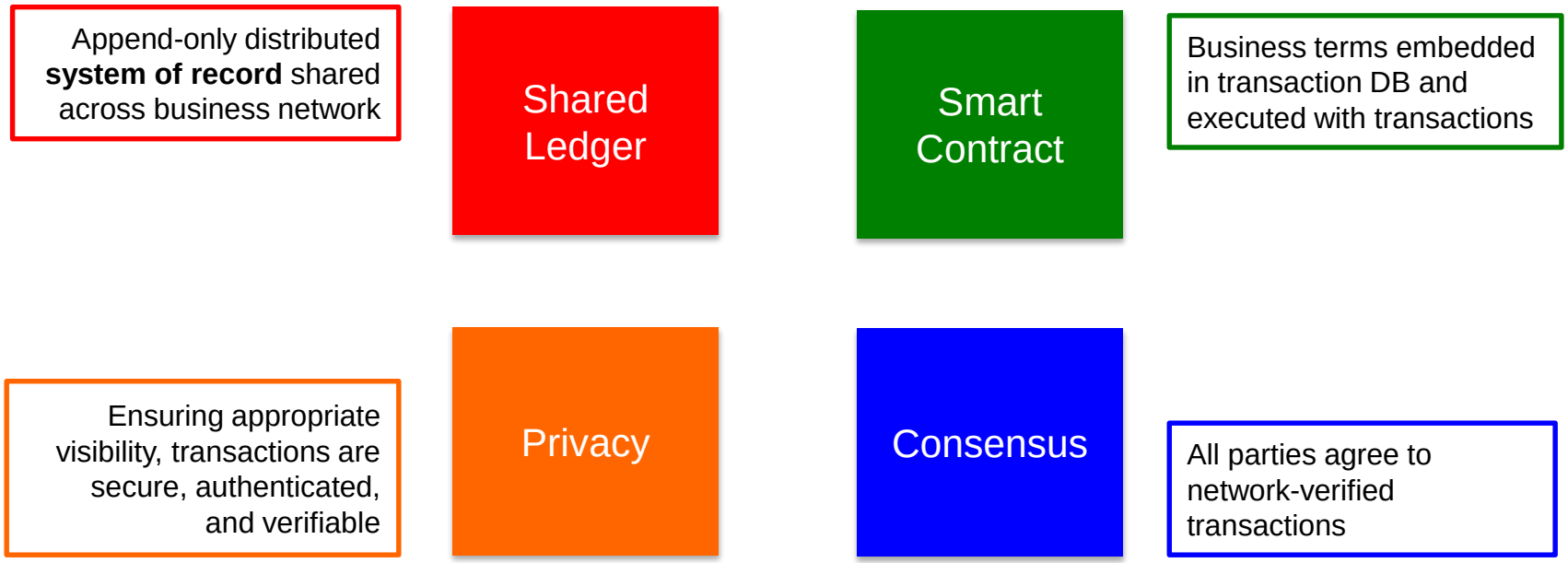
Introducing blockchain

What is blockchain?

Blockchain is a shared ledger technology allowing any participant in the business network to see *the* system of record, specifically, the ledger:

- Supports business networks
  - Provides a decentralized peer-to-peer architecture with nodes consisting of market participants (for example, banks and securities firms)
  - Uses a protocol that peers validate and commit transactions in order to reach consensus
- Supports shared ledgers
  - Records all transactions across the business network
  - Shares the ledger among participants
  - Replicates the ledger so that each participant has his or her own copy
  - Makes the shared ledger permissioned, so all of the participants can see only their appropriate transactions

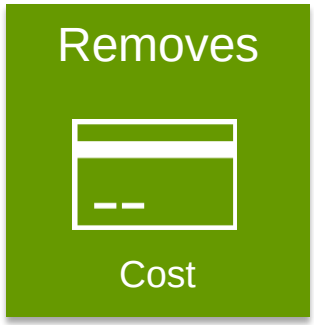
Blockchain for business



Broader participation, lower cost, increased efficiency

Blockchain benefits

Transaction time from days to near instantaneous



Overheads and cost intermediaries

Tampering, fraud, and cyber crime

Example use cases

Consensus use case: shared routing codes

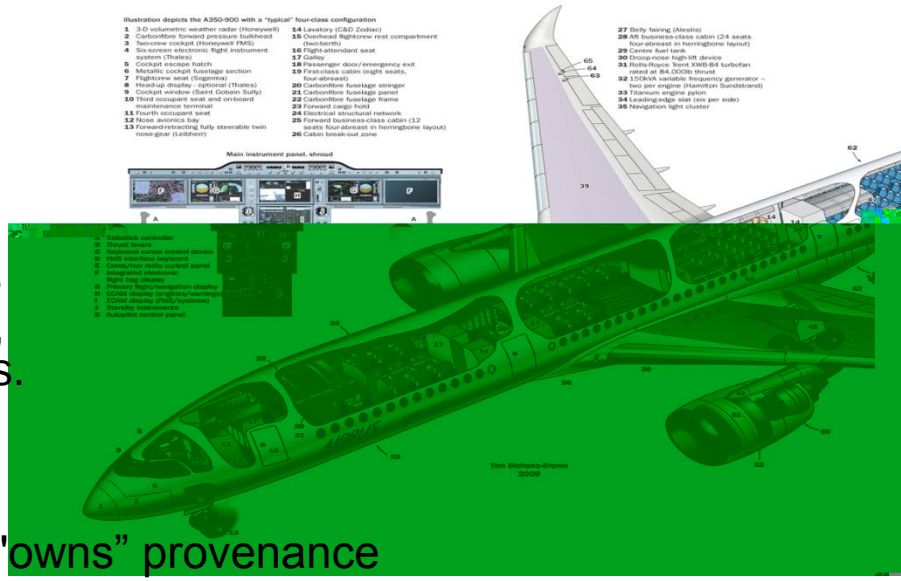
- What?
  - Competitors and collaborators in a business network need to share reference data, such as bank routing codes.
  - Currently, each member maintains his or her own codes and forwards changes to a central authority for collection and distribution.

- How?
  - Each participant maintains his or her own codes in a blockchain network.
  - Blockchain creates single view of the entire data set.

- Benefits
  1. Consolidated, consistent data set reduces errors
  2. Near-real-time of reference data
  3. Naturally supports code editing and routing code transfers between participants

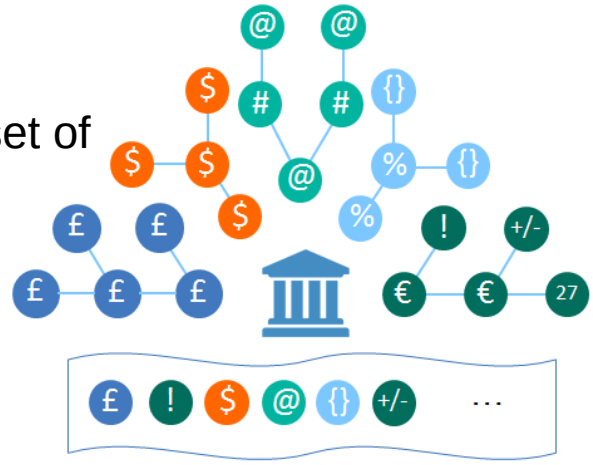
Provenance use case: vehicle maintenance

- What?
  - Provenance of each component part in complex system is hard to track.
  - Manufacturer, production date, batch, and even the manufacturing machine program.
- How?
  - Blockchain holds complete provenance details of each component part.
  - Accessible by each manufacturer in the production process, the aircraft owners, maintainers, and government regulators.
- Benefits
  1. Trust increased because no authority "owns" provenance
  2. Improvement in system utilization
  3. Recalls are "specific" rather than cross-fleet



Immutability use case: financial ledger

- What?
  - Financial data in a large organization is dispersed throughout many divisions and geographies.
  - Audit and compliance needs indelible record of all key transactions over reporting period
- How?
  - Blockchain collects transaction records from diverse set of financial systems.
  - Append-only and tamper-proof qualities create high confidence in the financial audit trail.
  - Privacy features ensure authorized user access.
- Benefits
  1. Lowers cost of audit and regulatory compliance
  2. Provides “seek and find” access to auditors and regulators
  3. Changes nature of compliance from passive to active

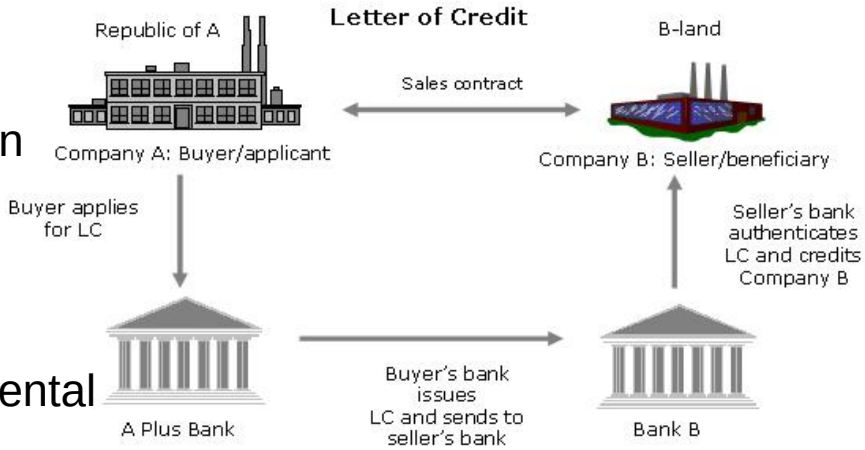


Finality use case: letter of credit

- What?
  - Banks provide letters of credit (LOC) want to offer them to a wider range of clients, including startups.
  - Currently, they're constrained by costs and the time to execute.

- How?
  - Blockchain provides common ledger for letters of credit.
  - This allows all counter-parties to have the same validated record of transaction and fulfillment.

- Benefits
  1. Increase speed of execution (less than one day)
  2. Vastly reduced cost
  3. Reduced risk, for example, from currency fluctuations
  4. Value-added services such as incremental payment



Other potential use cases

- Securities
  - Post-trade settlement
  - Derivative contracts
- Trade finance
  - Bill of Lading
  - Cross-currency payment
- Syndicated loans
- Supply chain
- Retail banking
  - Cross-border remittances
  - Mortgage verification and contracts
- Public records
  - Real estate records
  - Vehicle registrations
  - Citizen identity
- Digital property management

Not for all . . .

Blockchain is NOT

- ✗ Suited to high performance (millisecond) transactions
- ✗ For just one participant (no business network)
- ✗ A replicated database replacement
- ✗ A messaging solution
- ✗ A transaction processing replacement
- ✗ Suited for low-value, high-volume transactions