

Why does it still take days for money to move when messages travel in milliseconds?

The Technology Gap:

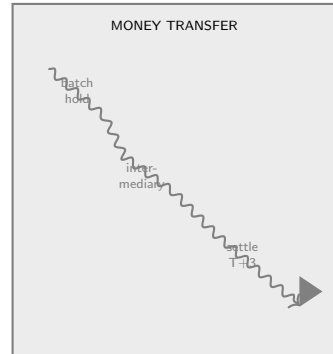
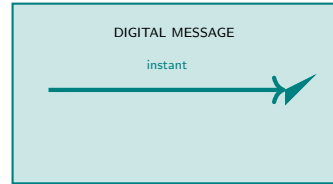
- Sending an email takes one second
- Streaming a movie takes seconds to start
- Yet a bank transfer can take three business days
- Technology exists to settle payments instantly

What Causes the Delay?

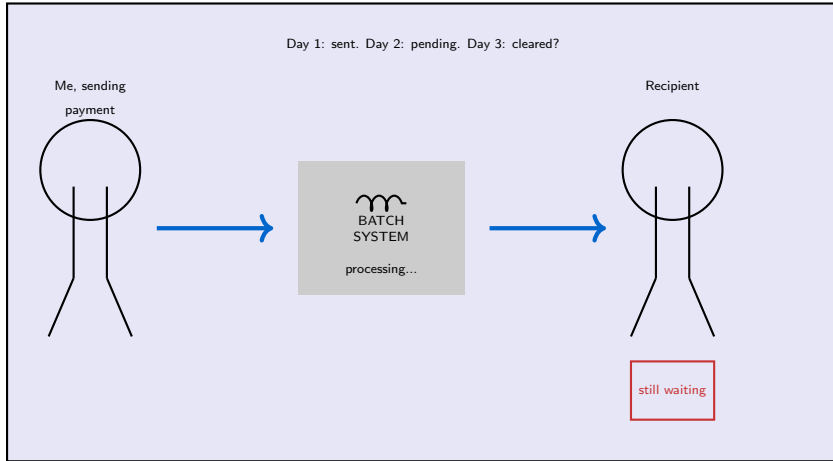
- Legacy batch systems built decades ago
- Settlement windows only during business hours
- Multiple intermediaries holding funds
- Regulatory requirements for fraud checks
- Incumbent banks earning interest on float

The Cost of Waiting:

- Merchants wait days for cash after a sale
- Working capital tied up during settlement
- Risk accumulates between authorization and finality
- Consumers anxious when critical payments delay



Have you ever waited anxiously for a payment to clear – and wondered why?



Why This Matters

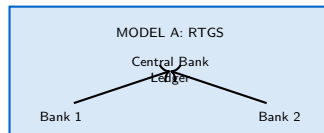
The anxiety of waiting for settlement is not just inconvenience – it reveals hidden costs in working capital and risk exposure during the delay.

Settlement lag creates real economic costs: merchants delay shipments, consumers worry about fraud, and capital sits idle.

What are the different models for moving money in real time?

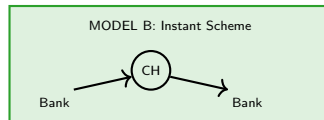
Model A: Centralized Real-Time Gross Settlement

- Each transaction settles individually on central bank ledger
- Settlement is immediate and final
- Participants hold liquidity buffers at the central bank
- High per-transaction cost but zero counterparty risk
- Used for high-value wholesale payments



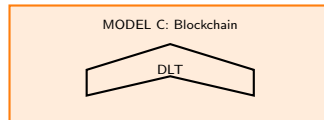
Model B: Instant Payment Schemes (Retail)

- Pre-funded accounts at a clearing house
- Settlement in batches every few minutes
- Optimized for low-value consumer payments
- Available around the clock, year-round
- Examples follow patterns like Europe and Asia



Model C: Blockchain Rails

- Distributed ledger with cryptographic settlement
- Settles in minutes, operates continuously
- No central clearing authority required
- On and off ramps introduce friction and cost



Trade-offs: Model A is most secure but expensive. Model B balances cost and speed. Model C eliminates intermediaries but adds technical complexity.

How does a real-time payment actually clear and settle in seconds?

Step 1: Initiation (Milliseconds)

- Payer authorizes the transaction through their bank
- Bank validates sufficient balance and fraud rules
- Payment instruction sent to clearing system

Step 2: Clearing (Seconds)

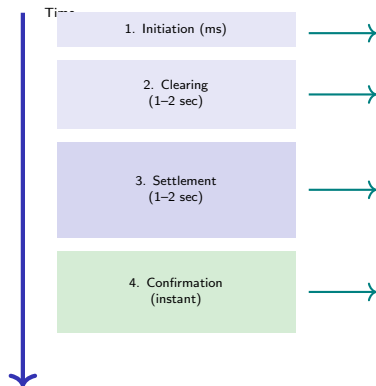
- Clearing house verifies both banks are participants
- Checks message format and completeness
- Routes instruction to beneficiary bank
- Beneficiary bank confirms account exists

Step 3: Settlement (Seconds)

- Funds debited from payer bank settlement account
- Funds credited to beneficiary bank settlement account
- Settlement is final and irrevocable
- Beneficiary sees funds immediately available

Step 4: Confirmation

- Both parties receive confirmation messages
- Transaction logged for reconciliation

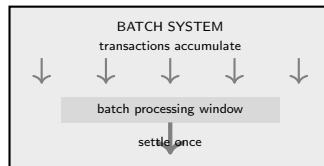


Total elapsed time: Typically three to ten seconds from authorization to final settlement and confirmation.

How do batch-based and real-time payment architectures differ?

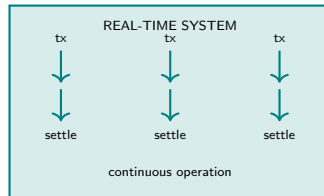
Batch Architecture (Legacy):

- Transactions collected throughout the day
- Processing happens at scheduled intervals
- Settlement occurs once per day or less
- Banks net their positions before settling
- Lower liquidity requirements due to netting
- Intraday exposure to counterparty risk



Real-Time Architecture (Modern):

- Each transaction processed immediately
- Settlement happens transaction by transaction
- Operates continuously, including nights and weekends
- No netting: gross settlement of each payment
- Higher liquidity buffers required
- No intraday credit risk once settled



Migration challenge: Moving from batch to real-time requires reengineering core systems and holding higher liquidity.

Operational Impact:

- Batch: predictable processing windows, manual reconciliation
- Real-time: continuous monitoring, automated exception handling

What breaks when a real-time system handles a sudden spike in volume?

Capacity Overload Scenarios:

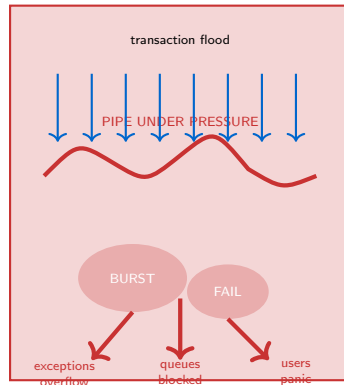
- Flash sales or viral payment events
- End-of-month payroll processing
- Emergency disbursements during crises
- Transaction volume exceeds design limits

What Fails First:

- Message queue backlogs exceed buffer capacity
- Settlement accounts drain faster than replenishment
- Validation systems timeout under load
- Database writes cannot keep pace
- Users see failures and retry, amplifying load

Cascading Effects:

- Failed transactions trigger exceptions
- Manual intervention needed at scale
- Participants lose confidence in system reliability
- Regulatory scrutiny increases
- Reputational damage persists long after recovery



Real-world example pattern: Systems designed for steady flow fail dramatically when volume spikes unexpectedly.

Where has real-time payment adoption grown fastest and why?

Drivers of Fast Adoption:

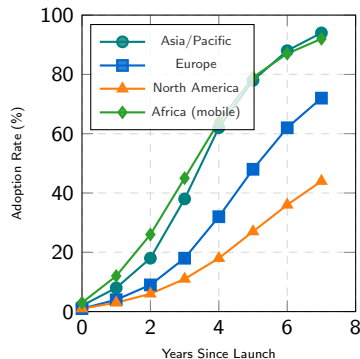
- **Regulatory mandate:** Government requires participation by all banks
- **Public infrastructure:** Central bank builds and operates the system
- **Mobile-first design:** QR codes and app integration for easy merchant acceptance
- **Low or zero fees:** Subsidized by government or funded by data monetization

Regional Patterns:

- **Asia:** Fastest adoption due to mobile-first culture and government backing
- **Europe:** Moderate growth driven by regulatory pressure
- **North America:** Slower uptake due to entrenched card networks
- **Africa:** Mobile money ecosystems enabling leapfrog adoption

Barriers to Adoption:

- Incumbent resistance from card networks earning interchange
- High switching costs for merchants already integrated
- Consumer habit and trust in existing payment methods



Regions with regulatory mandates and mobile-first infrastructure see adoption curves steeper by a factor of two to three.

Who gains and who loses when settlement goes from days to seconds?

Winners:

- **Merchants:** Receive funds immediately, improving cash flow and reducing working capital needs
- **Consumers:** Faster refunds, instant person-to-person transfers, reduced anxiety
- **Small businesses:** Compete on equal footing with large firms that previously leveraged float
- **Fintech platforms:** Build new services on real-time rails without legacy constraints
- **Regulators:** Reduced systemic risk from intraday credit exposure

Losers:

- **Incumbent banks:** Lose interest earned on float during settlement delays
- **Card networks:** Face competition from lower-cost account-to-account transfers
- **Correspondent banks:** Disintermediated as settlement chains compress
- **Treasury departments:** Must manage liquidity in real time rather than optimizing overnight

The Transition Challenge:



Net effect: Real-time settlement redistributes value from intermediaries to end users and platforms.

Three criteria for assessing a real-time payment system's readiness

Criterion 1: Is settlement truly final, or provisional?

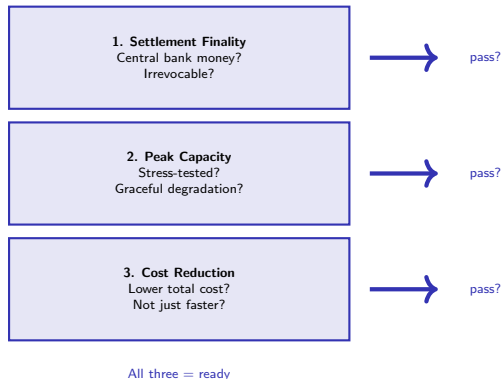
- **Final settlement:** Funds are irrevocable once confirmed; no chargebacks or reversals
- **Provisional settlement:** Recipient sees funds but they can be clawed back
- **Why it matters:** Provisional settlement leaves merchants exposed to fraud and disputes
- **Test:** Check whether the system settles in central bank money or commercial bank money

Criterion 2: Can the system handle peak volumes?

- **Design capacity:** Transactions per second under normal load
- **Peak capacity:** Maximum throughput during spikes
- **Failure mode:** Does the system degrade gracefully or crash?
- **Test:** Review stress-test results and historical uptime during high-volume events

Criterion 3: Does it reduce cost or just speed?

- **Speed without savings:** Faster settlement but same or higher fees
- **True cost compression:** Lower total cost of ownership
- **Test:** Compare end-to-end cost including liquidity, operations, and



How to use: Evaluate any real-time payment system against these three criteria before committing integration effort.

Your Challenge

Task: Compare the settlement process for three payment methods you used this week. Which one came closest to real-time? What prevented the others?

Step 1: Document Three Payments

- Payment A: (example: card purchase at a store)
- Payment B: (example: bank transfer to a friend)
- Payment C: (example: online checkout)

Step 2: For Each Payment, Answer:

- ① How long did it take for the recipient to have access to the funds?
- ② Was settlement final immediately, or could it be reversed?
- ③ What intermediaries were involved (acquirer, card network, correspondent bank)?
- ④ What prevented instant settlement (batch windows, fraud checks, multiple hops)?

Step 3: Rank by Real-Time Readiness

- Which payment came closest to true real-time settlement?
- Apply the three-criterion test from the previous slide
- Identify one bottleneck that could be removed with existing technology

What You Will Learn

This exercise reveals that most payments still operate on legacy rails, even when real-time alternatives exist.