

Payment Rails and SWIFT

Module 4: Traditional Digital Finance — Lesson 39

Digital Finance

December 13, 2025

Learning Objectives

- Understand global payment infrastructure: SWIFT, SEPA, ACH, real-time systems
- Analyze SWIFT messaging protocols and correspondent banking networks
- Evaluate alternatives to SWIFT: instant payment systems, blockchain
- Comprehend cross-border payment challenges and emerging solutions

Domestic Systems

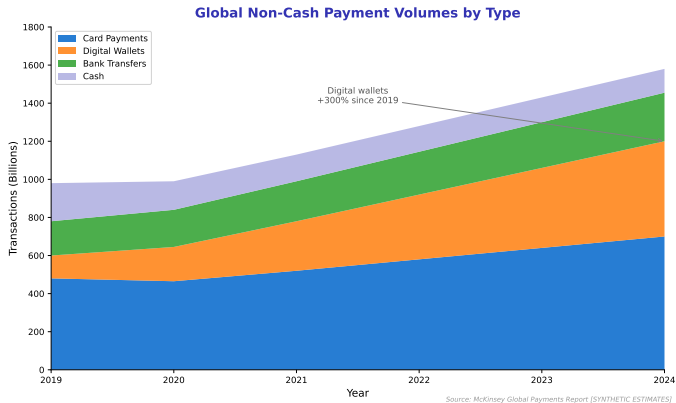
- ACH (US)
- SEPA (Europe)
- BACS/Faster Payments (UK)
- CHIPS (US large value)
- Fedwire (US real-time)

International Systems

- SWIFT
- Correspondent banking
- TARGET2 (EU)
- CIPS (China)
- CLS (FX settlement)

Global Volume: 700B+ non-cash transactions annually, \$2 quadrillion value

AI and ML are transforming financial services through automation and prediction.



Payment volumes reflect the critical role of different rails in the global economy.

Real-Time Gross Settlement (RTGS)

- Immediate finality
- High value payments
- Central bank operated
- Fedwire, TARGET2, CHAPS

Deferred Net Settlement (DNS)

- Batch processing
- Netting efficiency
- Lower cost
- ACH, BACS, SEPA (some)

Instant Payments: Real-time retail, 24/7/365 availability, irrevocable

Payment systems are critical infrastructure for economic activity.

Coverage: 36 countries, 500M+ citizens, euro-denominated payments

SEPA Instruments

- SEPA Credit Transfer (SCT)
- SEPA Instant Credit Transfer (SCT Inst)
- SEPA Direct Debit (SDD)
- SEPA Card Framework

Key Features

- Uniform pricing (domestic = cross-border)
- IBAN/BIC identifiers
- ISO 20022 messaging
- T+1 settlement (SCT)
- 10 seconds (SCT Inst)

Volume: 46B SEPA transactions (2023), 80% SCT, 20% SDD

Key concepts from this slide inform practical applications in finance.

Use Cases: Salaries, invoices, person-to-person, e-commerce

Process Flow

- ① Originator submits to bank
- ② Bank validates IBAN
- ③ Routing via clearing house
- ④ Settlement in T+1
- ⑤ Beneficiary notification

Technical Details

- Maximum 999,999,999.99 EUR
- pain.001 XML message
- EPC Rulebook compliance
- IBAN validation (checksum)
- BIC optional (since 2016)

Infrastructure: EBA Clearing (RT1, STEP2), TARGET2, local CSMs

Key concepts from this slide inform practical applications in finance.

SEPA Instant Credit Transfer (SCT Inst)

Launch: November 2017, adoption accelerating (2024: 80% coverage)

Specifications

- 10-second processing
- 24/7/365 availability
- 100,000 EUR limit
- Irrevocable settlement
- ISO 20022 pacs.008

Use Cases

- P2P transfers
- E-commerce checkout
- Bill payments
- Request-to-pay
- Digital wallets

Adoption: 11B SCT Inst (2023), growing 70% YoY, mandatory for EU banks (2025)

Key concepts from this slide inform practical applications in finance.

Purpose: Recurring payments (subscriptions, utilities, insurance)

SDD Core (B2C)

- Consumer protection
- 8-week refund right
- Pre-notification required
- D-1 submission

SDD B2B (Business)

- No refund right
- Bank verification
- D-1 submission
- Mandate management

Mandate: Signed authorization, unique mandate reference (UMR), IBAN, creditor ID

Key concepts from this slide inform practical applications in finance.

ACH Network (United States)

Operator: Nacha (National Automated Clearing House Association)

ACH Transaction Types

- ACH Credit (push)
- ACH Debit (pull)
- Same-Day ACH
- International ACH (IAT)

Use Cases

- Direct deposit payroll
- Bill payments
- Business-to-business
- Tax refunds
- Government benefits

Volume: 31B transactions (2023), \$76 trillion value

Network metrics provide objective measures of adoption and ecosystem health.

Standard ACH

- T+1 settlement (Next Day)
- Batch processing (4x daily)
- Cut-off times
- Lower cost (\$0.20-0.50)

Same-Day ACH

- Same-day settlement
- Two windows (10:30, 15:00 ET)
- \$1M limit per transaction
- Higher fee (\$0.50-1.00)

2024 Enhancements: Same-Day ACH \$1M limit (up from \$100k), third window added

Understanding the process flow is key to identifying optimization opportunities.

SWIFT: Society for Worldwide Interbank Financial Telecommunication

Founded: 1973 (Brussels), 11,500+ institutions, 200+ countries

Functions

- Secure messaging network
- Standardized formats
- No funds transfer (messaging only)
- Member-owned cooperative

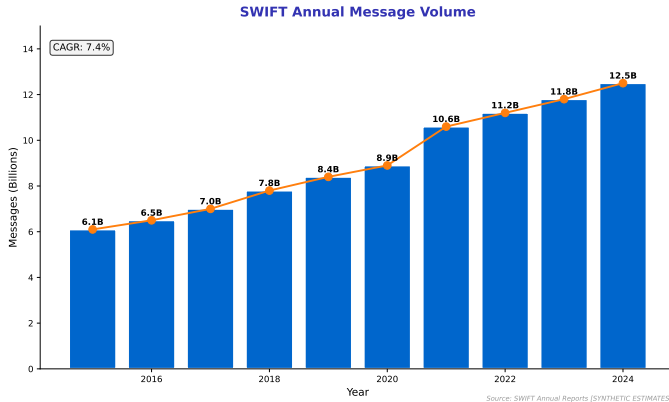
Message Types

- Payments (MT103, MT202)
- Securities (MT54x)
- Treasury (MT300, MT320)
- Trade finance (MT700)

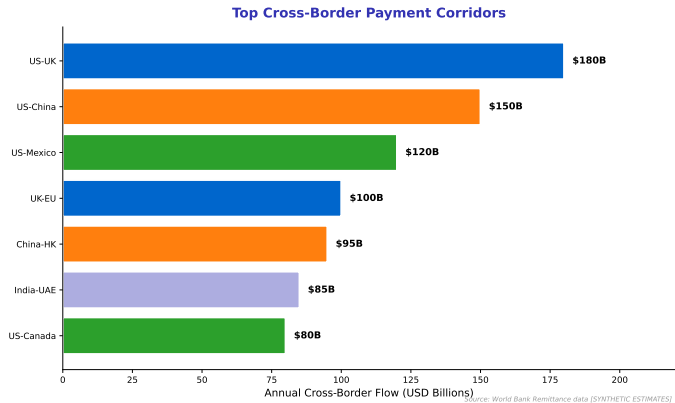
Volume: 45M messages/day (2024), 11B annually

Banks play a central role in the financial system as intermediaries.

SWIFT Message Traffic Growth



SWIFT message growth reflects increasing global financial integration.



Cross-border flows show regional payment patterns and economic links.

Use: Customer credit transfer (cross-border wire)

Key Fields

- Sender/Receiver BIC
- Transaction reference
- Value date
- Currency and amount
- Ordering customer
- Beneficiary

Optional Fields

- Intermediary banks
- Charges (OUR/SHA/BEN)
- Purpose of payment
- Regulatory reporting
- Remittance information

Example: :20:TRN12345 :32A:241207USD10000,00 :50K:Sender Name :59:Beneficiary

Key concepts from this slide inform practical applications in finance.

Launch: 2017, modernization initiative, 4,000+ banks

Features

- End-to-end tracking
- Same-day use of funds
- Transparent fees
- Rich remittance data
- Status updates

Performance

- 50% complete <30 min
- 90% complete <24 hours
- 100% tracking coverage
- Reduced inquiries 60%

Technology: SWIFT gpi Tracker database, Unique End-to-End Transaction Reference (UETR)

Payment systems are critical infrastructure for economic activity.

Timeline: March 2023 coexistence, November 2025 full migration

MT (Legacy)

- Fixed field format
- Limited data capacity
- 78 characters/line
- Cryptic structure
- Established since 1970s

ISO 20022 (XML)

- Rich structured data
- pacs.008, pain.001 messages
- Extended remittance
- Regulatory data
- Future-proof

Benefits: Better STP (80% to 95%+), compliance automation, fraud detection

Key concepts from this slide inform practical applications in finance.

Purpose: Enable cross-border payments without direct relationships

Nostro/Vostro Accounts

- Nostro: Our account with you
- Vostro: Your account with us
- Pre-funded balances
- Currency settlement

Payment Flow

- 1 Customer instructs Bank A
- 2 Bank A debits customer
- 3 Bank A sends MT103 via SWIFT
- 4 Intermediary banks relay
- 5 Bank Z credits beneficiary

Challenges: 3-5 days settlement, opaque fees, multiple intermediaries

Banks play a central role in the financial system as intermediaries.

Trend: Banks exiting correspondent relationships (30% reduction 2011-2021)

Drivers

- AML/CFT compliance costs
- Sanctions screening
- Regulatory penalties risk
- Low profitability corridors
- KYC burden

Impact

- Reduced access (developing markets)
- Higher costs for SMEs
- Longer processing times
- Financial exclusion risk

Solutions: Utility models (SWIFT KYC Registry), shared infrastructure, fintechs

Risk management is essential for financial stability and profitability.

Global Systems

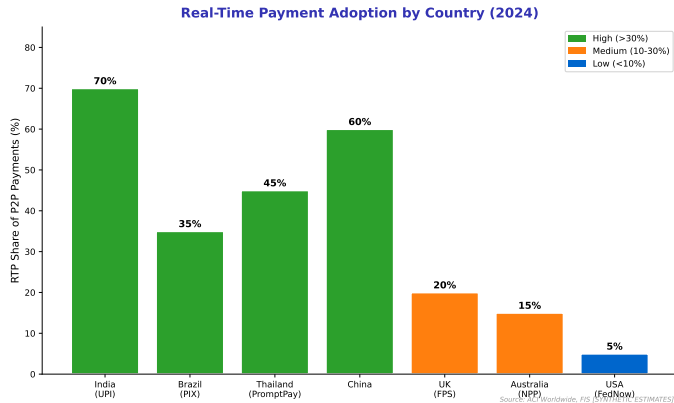
- UK Faster Payments (2008)
- SEPA SCT Inst (2017)
- US FedNow (2023)
- US RTP (TCH, 2017)
- India UPI (2016)
- Brazil PIX (2020)

Characteristics

- 10-second settlement
- 24/7/365 availability
- Irrevocable
- Low/zero cost
- Mobile-first UX

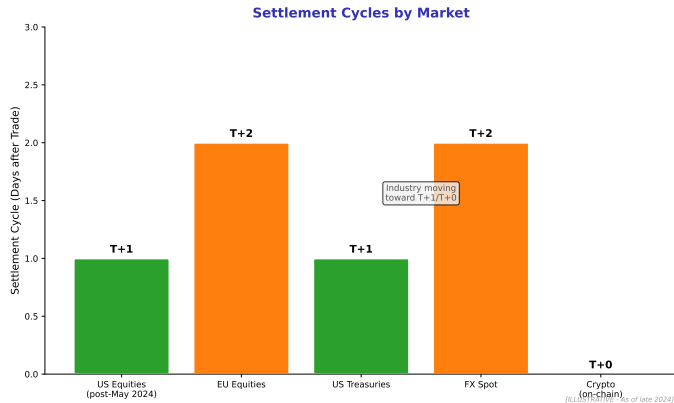
Adoption: 118B instant payments globally (2023), 64% in Asia-Pacific

AI and ML are transforming financial services through automation and prediction.



Instant payment adoption varies significantly across regions and markets.

Settlement Systems Comparison



Different settlement mechanisms balance speed, cost, and finality.

India UPI: Unified Payments Interface

Launch: 2016, operated by NPCI (National Payments Corporation of India)

Features

- Virtual Payment Address (VPA)
- QR code payments
- Request-to-pay
- Interoperable apps
- Free for consumers

Scale

- 12B transactions/month
- 500M+ users
- 300+ banks
- 50M+ merchants
- \$200B+ monthly value

Success Factors: Government push, mobile penetration, zero MDR, interoperability

Payment systems are critical infrastructure for economic activity.

Launch: July 2023, operated by Federal Reserve

Capabilities

- Instant payments 24/7
- \$500k transaction limit
- ISO 20022 messaging
- Request for payment
- Fraud monitoring tools

Adoption Status

- 700+ institutions (2024)
- Competing with RTP (TCH)
- Slow initial uptake
- Focus on billers, payroll

Challenge: Dual infrastructure (FedNow + RTP), consumer awareness, use case development

Key concepts from this slide inform practical applications in finance.

CIPS (China)

- Cross-Border Interbank Payment System
- RMB internationalization
- 1,400+ participants
- 80 trillion RMB (2023)

SPFS (Russia)

- System for Transfer of Financial Messages
- Sanctions mitigation
- 500+ Russian banks
- Limited international use

Geopolitical Context: Russia excluded from SWIFT (2022), Iran, North Korea restrictions

Key concepts from this slide inform practical applications in finance.

Ripple (XRP)

- On-Demand Liquidity (ODL)
- 3-5 second settlement
- Low cost (\$0.0002)
- 70+ corridors
- Regulatory challenges (US)

Stablecoins

- USDC, USDT cross-border
- 24/7 settlement
- Blockchain rails (Ethereum, Solana)
- Programmability
- Regulatory uncertainty

Pilot Projects: JPM Coin (JPMorgan), Utility Settlement Coin (Fidelity), mBridge (BIS)

AI and ML are transforming financial services through automation and prediction.

- Payment rails enable domestic and cross-border value transfer
- SEPA unifies euro payments across 36 countries with instant settlement (SCT Inst)
- ACH processes 31B US transactions annually with same-day options
- SWIFT provides secure messaging for 11,500+ institutions, 45M messages/day
- Correspondent banking enables cross-border payments via nostro/vostro accounts
- Instant payment systems (UPI, FedNow, PIX) offer real-time, low-cost transfers
- Alternatives emerging: CIPS, blockchain, stablecoins challenge SWIFT dominance

Further Reading

- Bank for International Settlements (2024). *CPMI Statistics on Payment Systems*. BIS.
- European Payments Council (2023). *SEPA Credit Transfer Scheme Rulebook*. EPC.
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- SWIFT (2023). *SWIFT gpi: The New Standard in Cross-Border Payments*. SWIFT.
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