

E-Payment Systems and Cryptocurrency Technologies

<https://course.ie.cuhk.edu.hk/~ierg4004>

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Acknowledgements

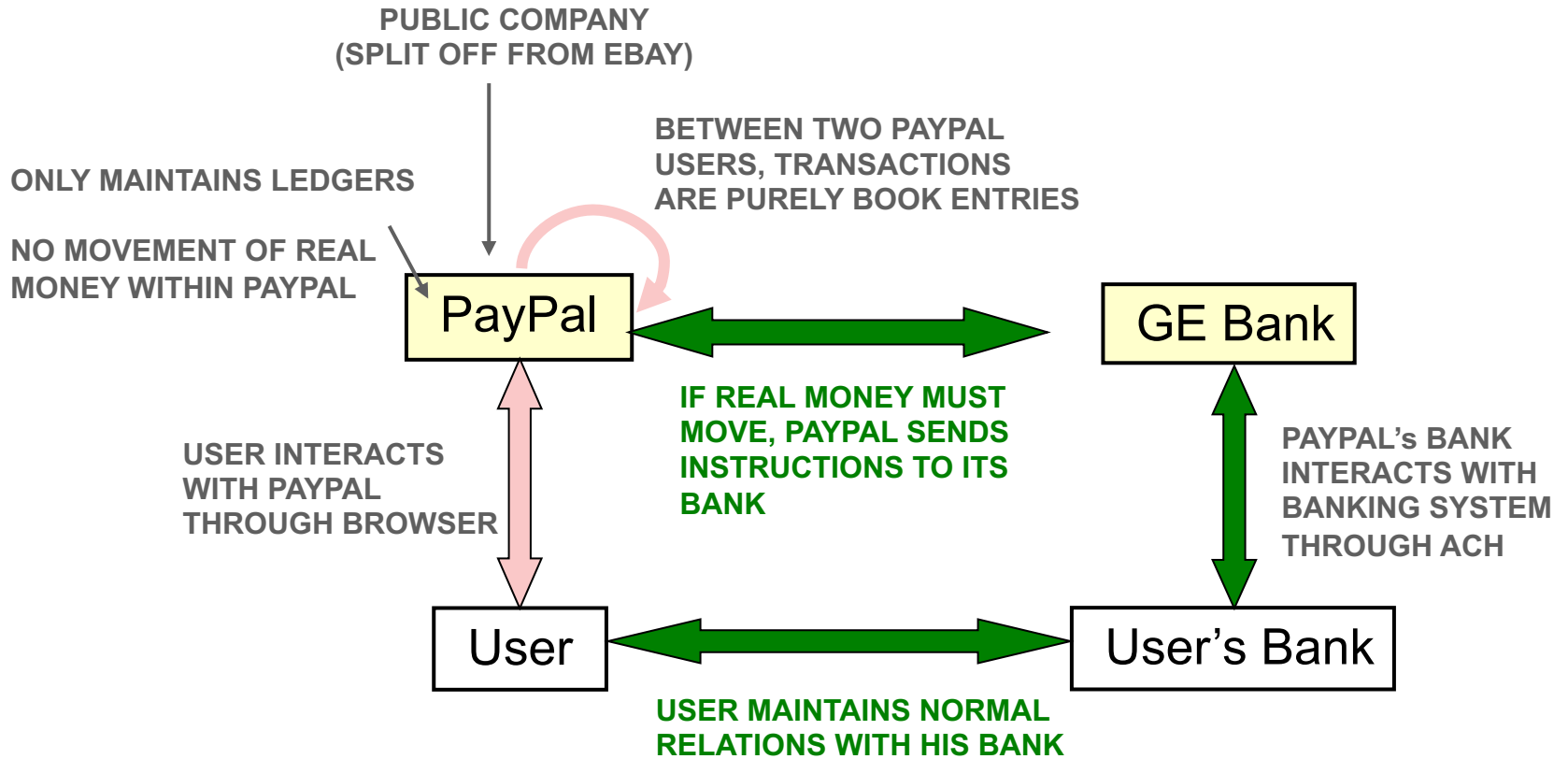
■ The slides used in this lecture are mostly adapted from the following sources. The copyrights and contribution of the original authors are hereby acknowledged and recognized:

- ◆ **The Electronic Payment Systems course by Prof. Michael Shamos, CMU**
- ◆ Chapter 12 of “Protocols for Secure Electronic Commerce”, 3rd Edition, Sherif Mostafa.
- ◆ “Technical Overview of PayPal as an Additional Payment Option,” PayPal Inc.
- ◆ “Introduction to PayPal Payment Solutions,” PayPal Inc.
- ◆ “PayPal Officially Enters China: Challenges vs. Opportunities,” Forbes, Jan 2020.
- ◆ <https://spendmenot.com/paypal-statistics/>

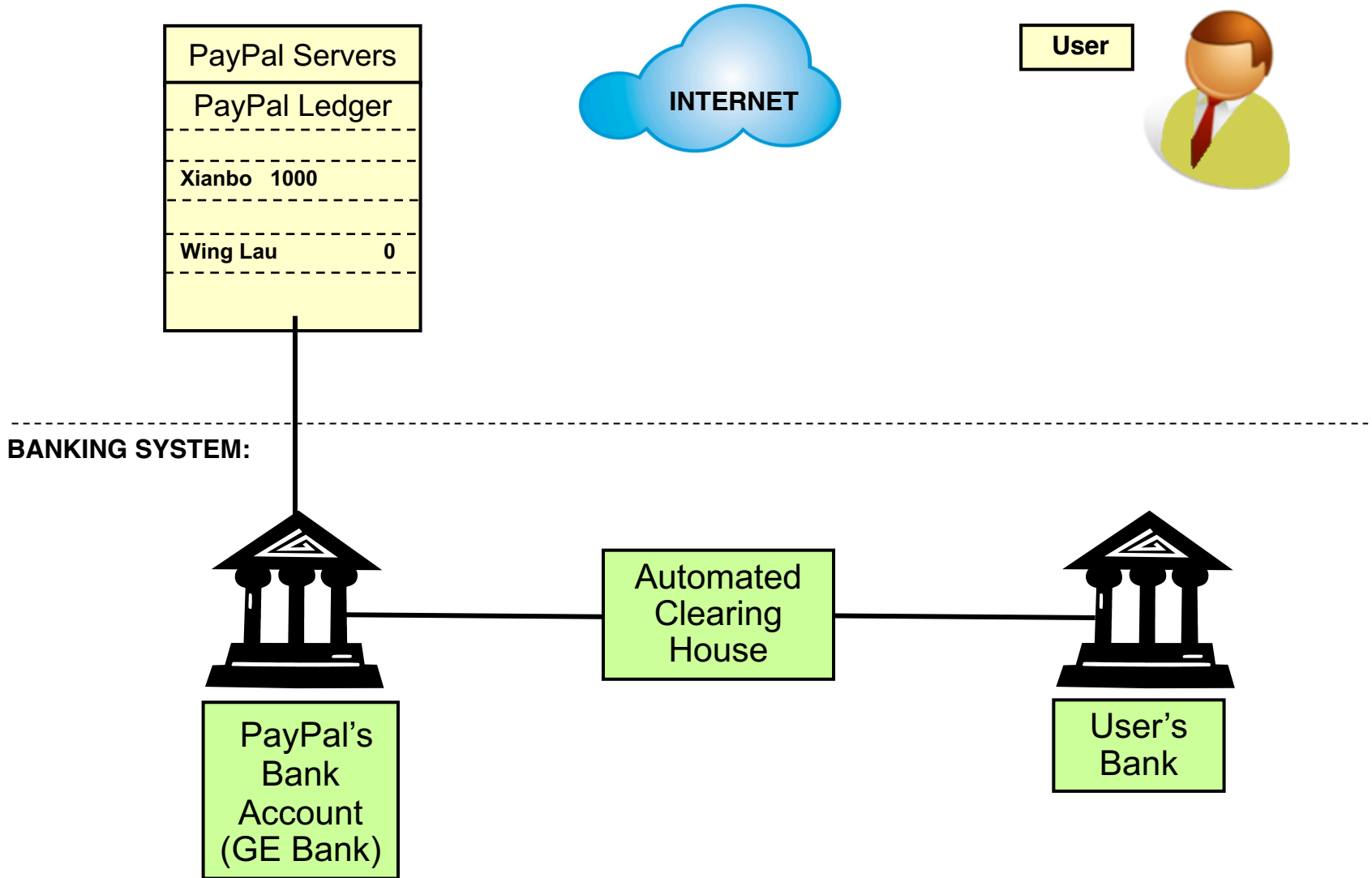
PayPal Concepts

- Initial Mission/ Vision was to “create a global currency that was independent of interference of banks and government !!
The mission has failed and mission has changed
- Pay anyone, anywhere via email address
- Withdraw funds anytime, or send to someone else
- Mass (bulk) payments possible
- Merchants pay low fees; individuals pay nothing
- Initially, Paypal mainly draw funds from **user's bank account (e.g. via Automated Clearing House in US)** while placing credit hold on credit card for guarantee ; Interest paid on deposits ;
- Subsequently, Paypal (consumer) accounts can be funded directly via Credit cards, i.e. no need to bind with the user (buyer) account,
 - ◆ Merchants still prefer to use ACH to receive money from Paypal to lower overhead charges

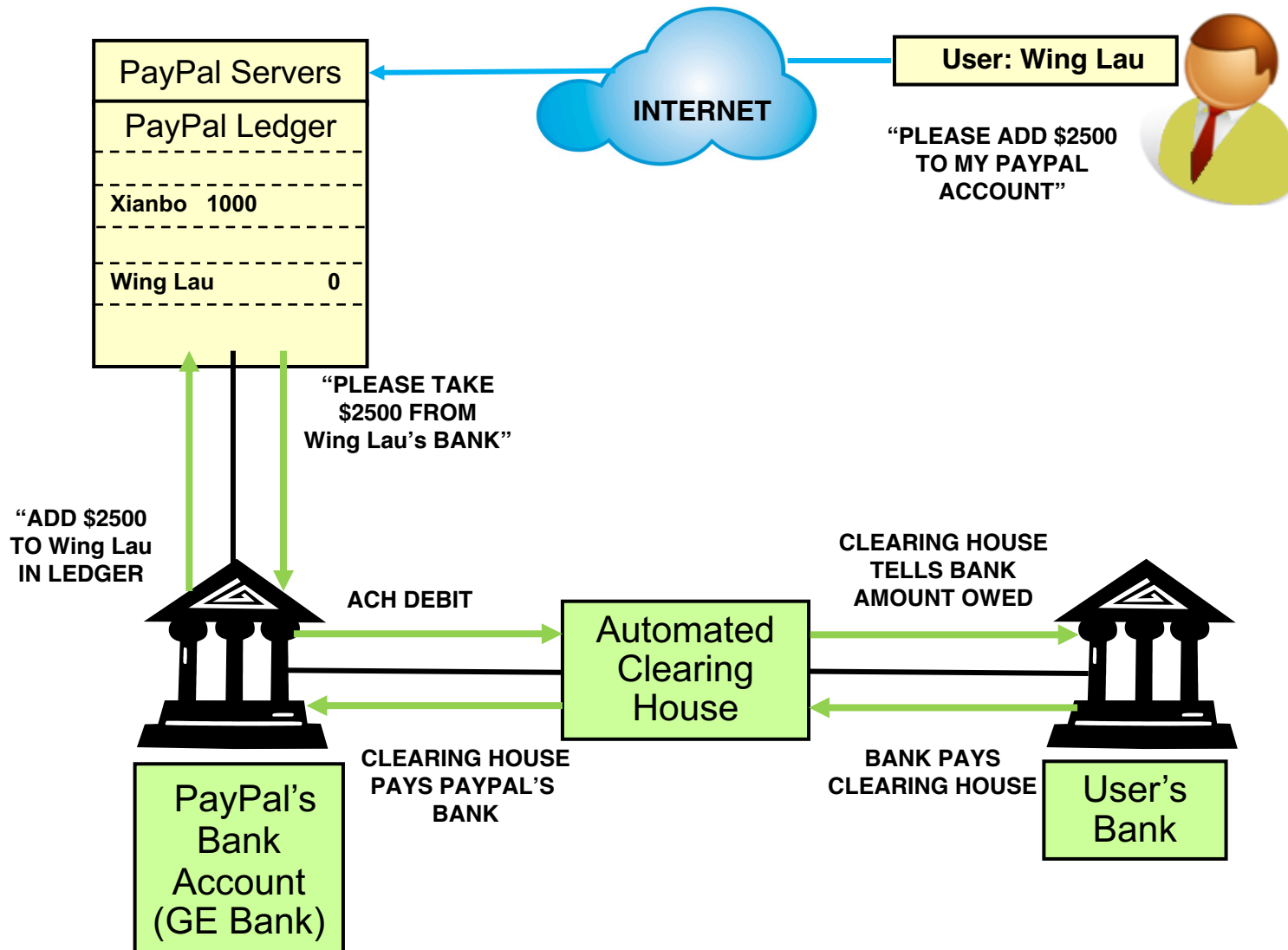
PayPal Structure



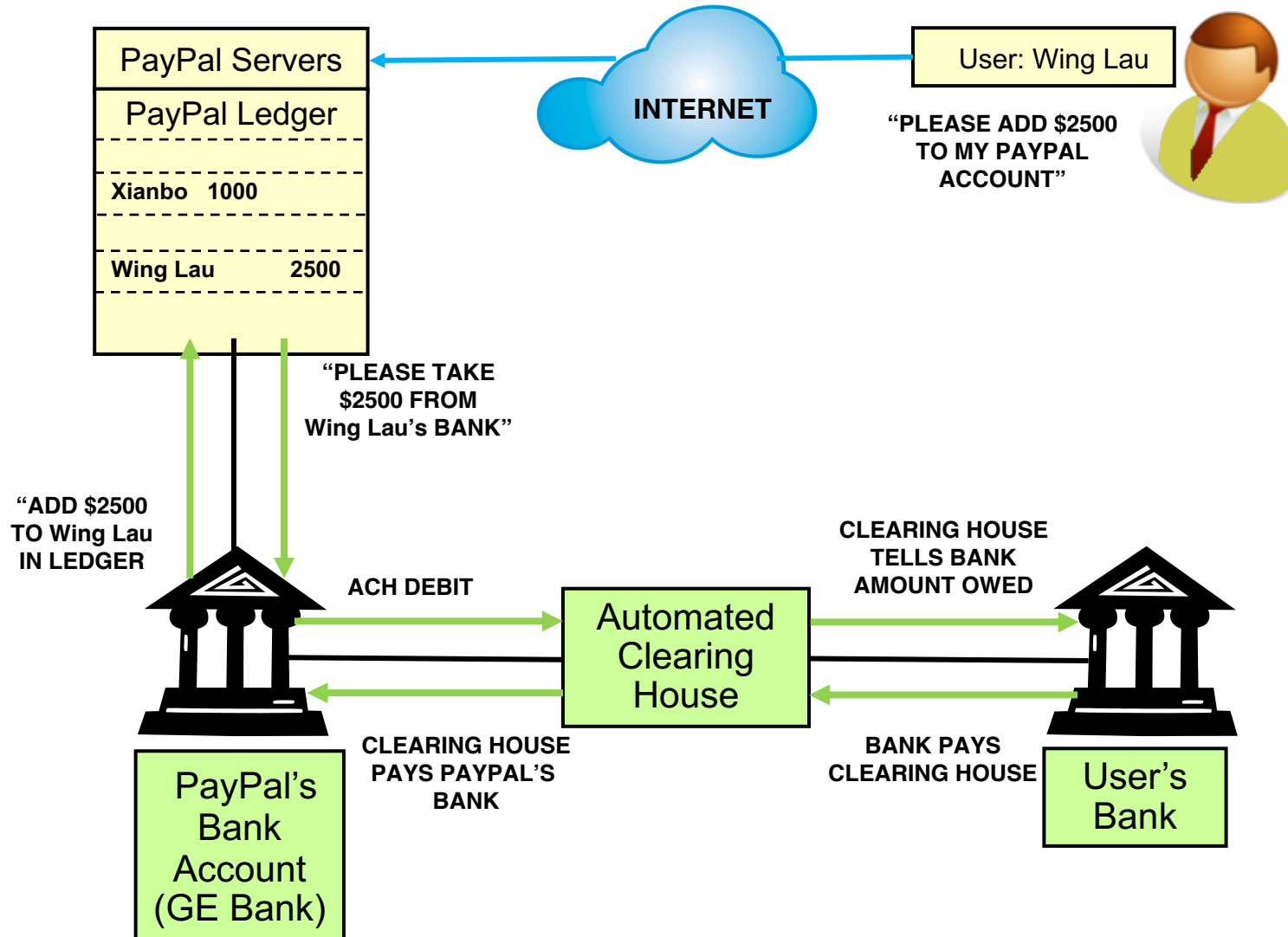
PayPal Structure



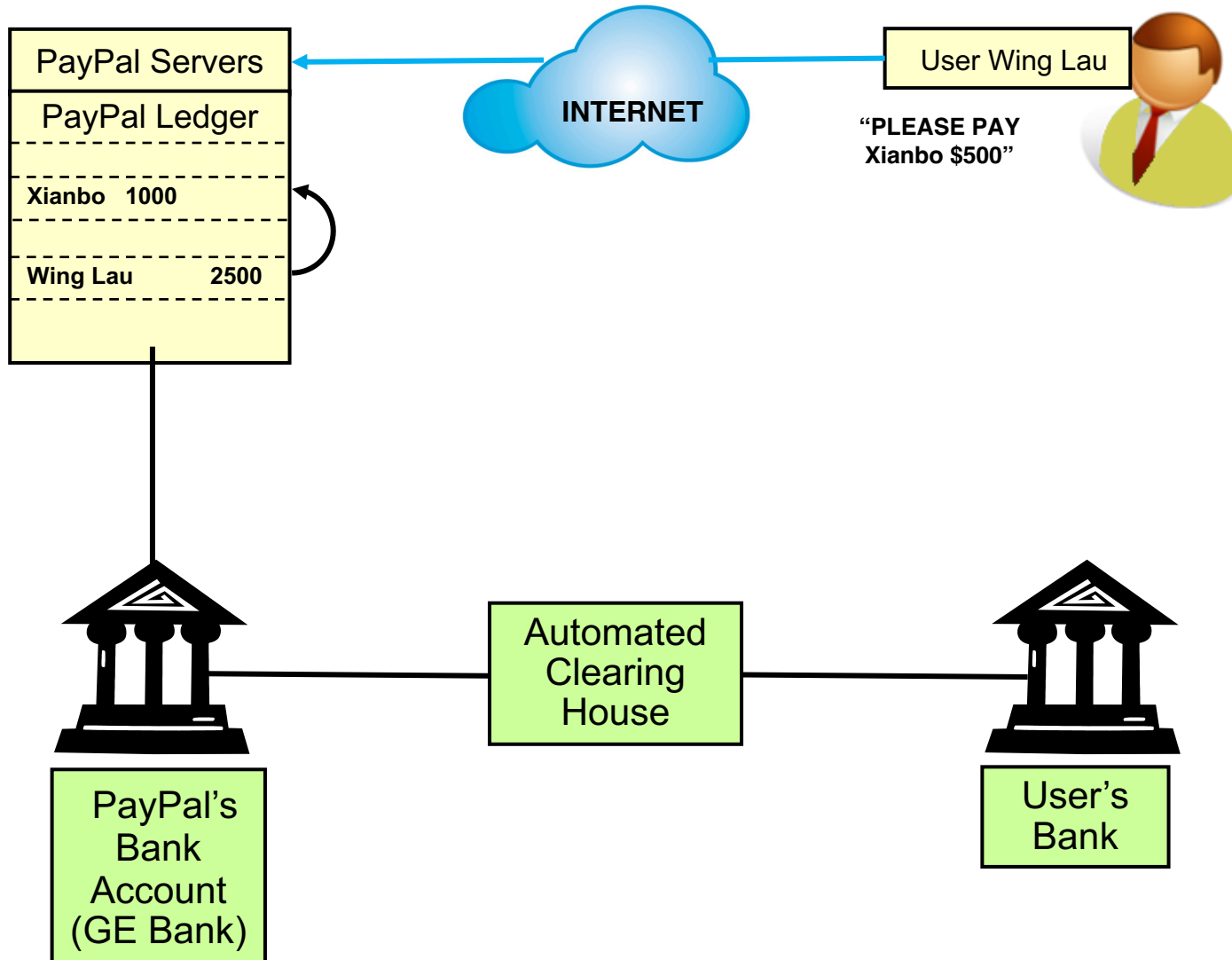
Putting Money Into PayPal



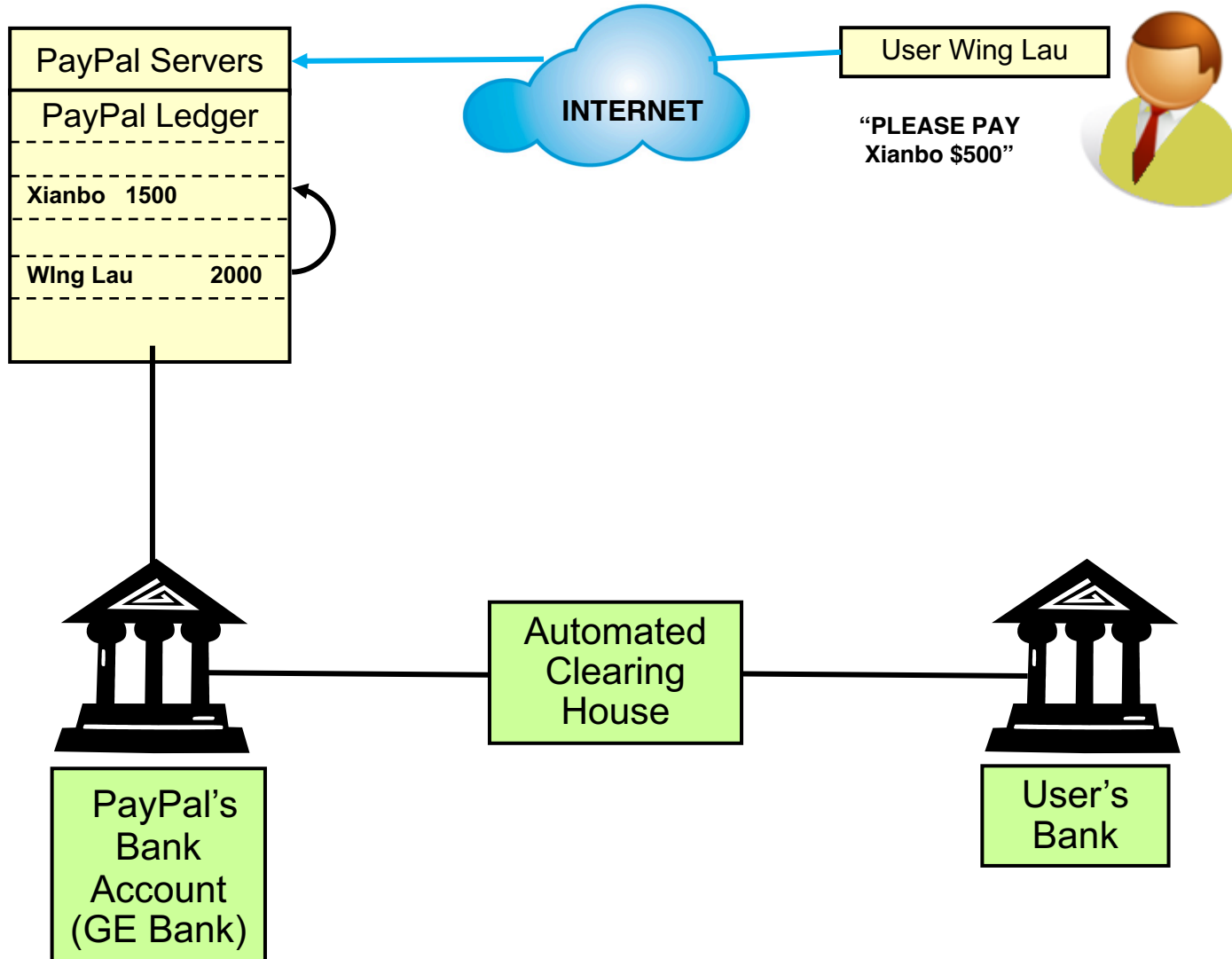
Putting Money Into PayPal



Paying A PayPal User

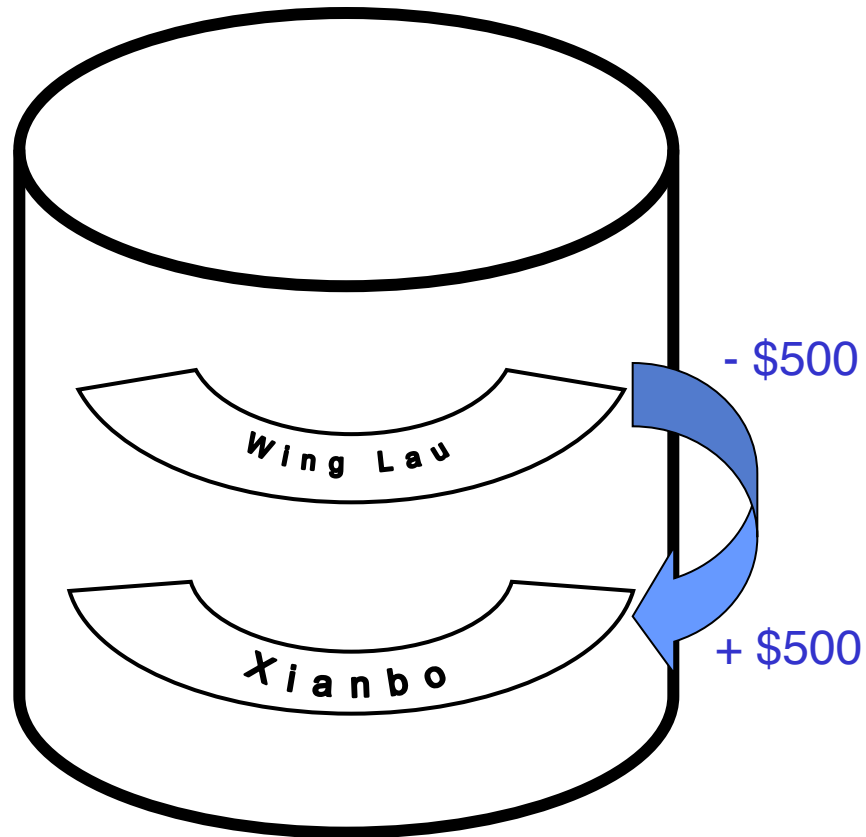


Paying A PayPal User



PayPal

- It's just a big disk drive!



PayPal Fees

	Personal Account	Premier/Business Account
Open an Account	Free	Free
Send Money	Free	Free
Withdraw Funds	Free for US bank accounts Fees for other banks	Free for US bank accounts Fees for other banks
Add Funds	Free	Free
Receive Funds	Free	2.2% + \$0.30 USD to 2.9% + \$0.30 USD [†]
Multiple Currency Transactions	Exchange rate includes a 2.5% fee*	Exchange rate includes a 2.5% fee*

SOURCE: [PAYPAL](#)

Business Model(s) of PayPal

- **Initial** Business model :
 - ◆ Enabled online P2P payments ;
 - ◆ Revenues: Fees + Float by building large user base
- **Current** Business model:
 - ◆ Payment Processing/ Management for online & offline Merchants, e.g., Fraud Management
 - ◆ Enable Global, Cross-border online purchases (e.g. acquired banking license in different countries)
 - ✦ Paypal mobile App/ web-based payments supported for “remote (Internet) shopping”
 - ~300K websites in US uses PayPal for payments
 - UK: 63.5K websites ; Germany: 54.5K ; France 38.9K ; Italy 35.4K
 - ◆ Big Data Analytics, Know-Your-Customers (KYC) :
 - ✦ Paypal shares its data with 600+ other companies

Some Recent Developments

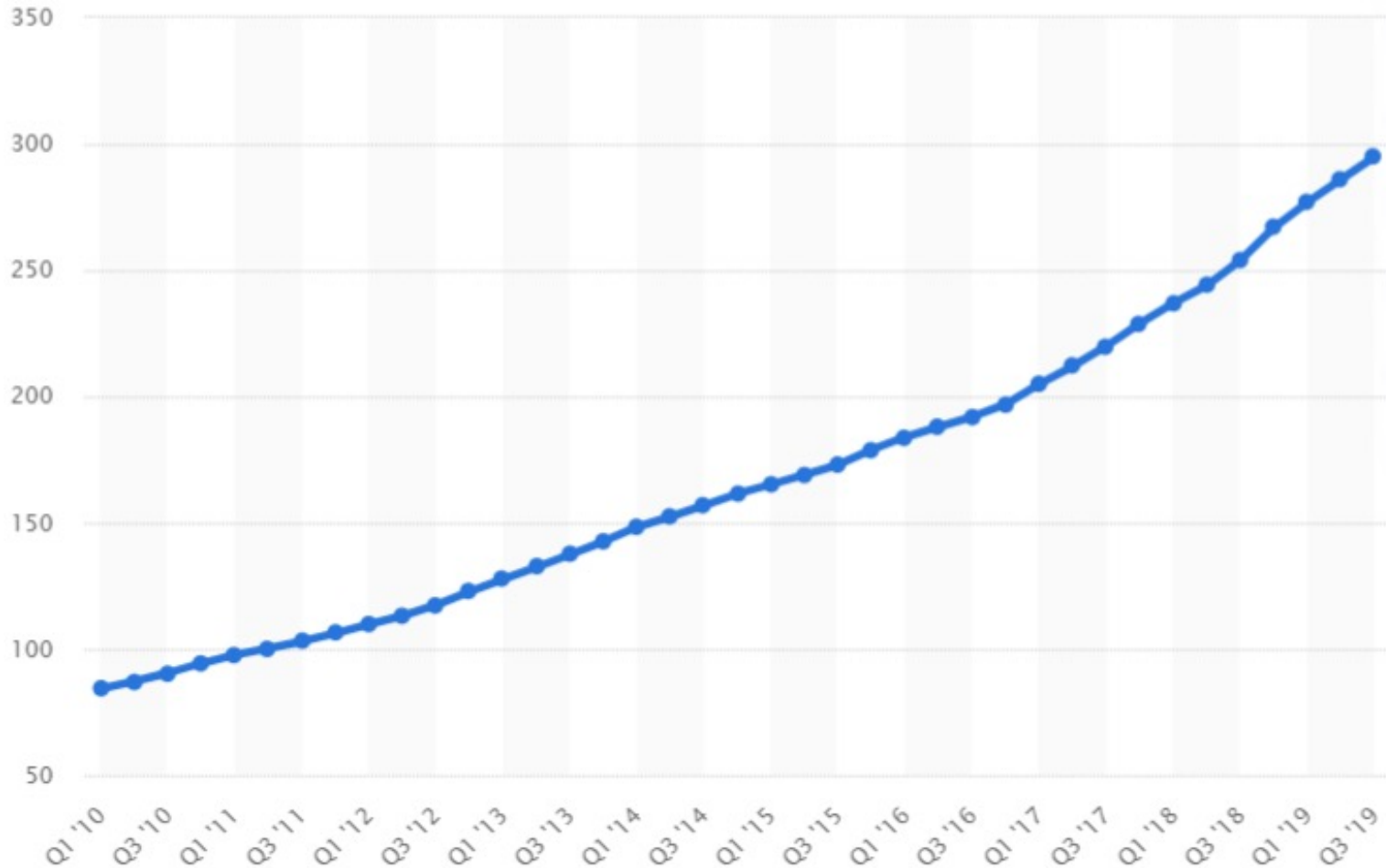
- In 2013, Paypal acquired Venmo, a mobile/social P2P payment startup, via its purchase of BrainTree
 - ◆ Since then, has integrated Venmo as a money transfer service under Paypal (for U.S. based customers so far)
 - ◆ Venmo accounts are funded via ACH
 - => avoid/ circumvent the costs of funding Paypal account by Credit-card".
 - ✦ In 2020, Venmo has 40 million users in total with ~10 million monthly active users in US ;
 - ✦ Handled US\$ 12 billion of transactions in 2018Q1 ;
 - ✦ US\$300 million in revenue in 2019
- US-based Paypal customer can enroll (Beta) features of FDIC pass-through insurance
 - ◆ Against bankruptcy of PayPal ; Accounts insured up to \$250K
 - ◆ Different protection for fraud

Some statistics of Paypal

- As of Jan 2020, Paypal had 286 million active users plus 20+ million merchant accounts ; \approx 21st largest bank in US
 - ◆ Ave. Paypal user conducts 36.9 transactions per year
 - ◆ 87.5% online buyers use Paypal
 - ◆ 3.1 billion payment transactions in 2019Q3
 - ◆ Mobile payment volume grew by 52% in 2019Q1
 - ◆ 2019 revenue expected to exceed US\$17.70 Billion
 - ◆ % of Paypal users from different countries:
 - ✦ U.S.: 43.86% ; Germany: 17.61% ; UK: 14.39%
 - ◆ Supports 200 countries/regions ; 25 currencies
 - ◆ **Officially entered the China market in Dec 2019**
- Most Popular Digital Wallet among users in the US in 2016:
 - ◆ Paypal 76% ; Amazon Payment 24% ; Visa Checkout 15% ; Google Wallet/ Android Pay (23%) ; Apple Pay 12%

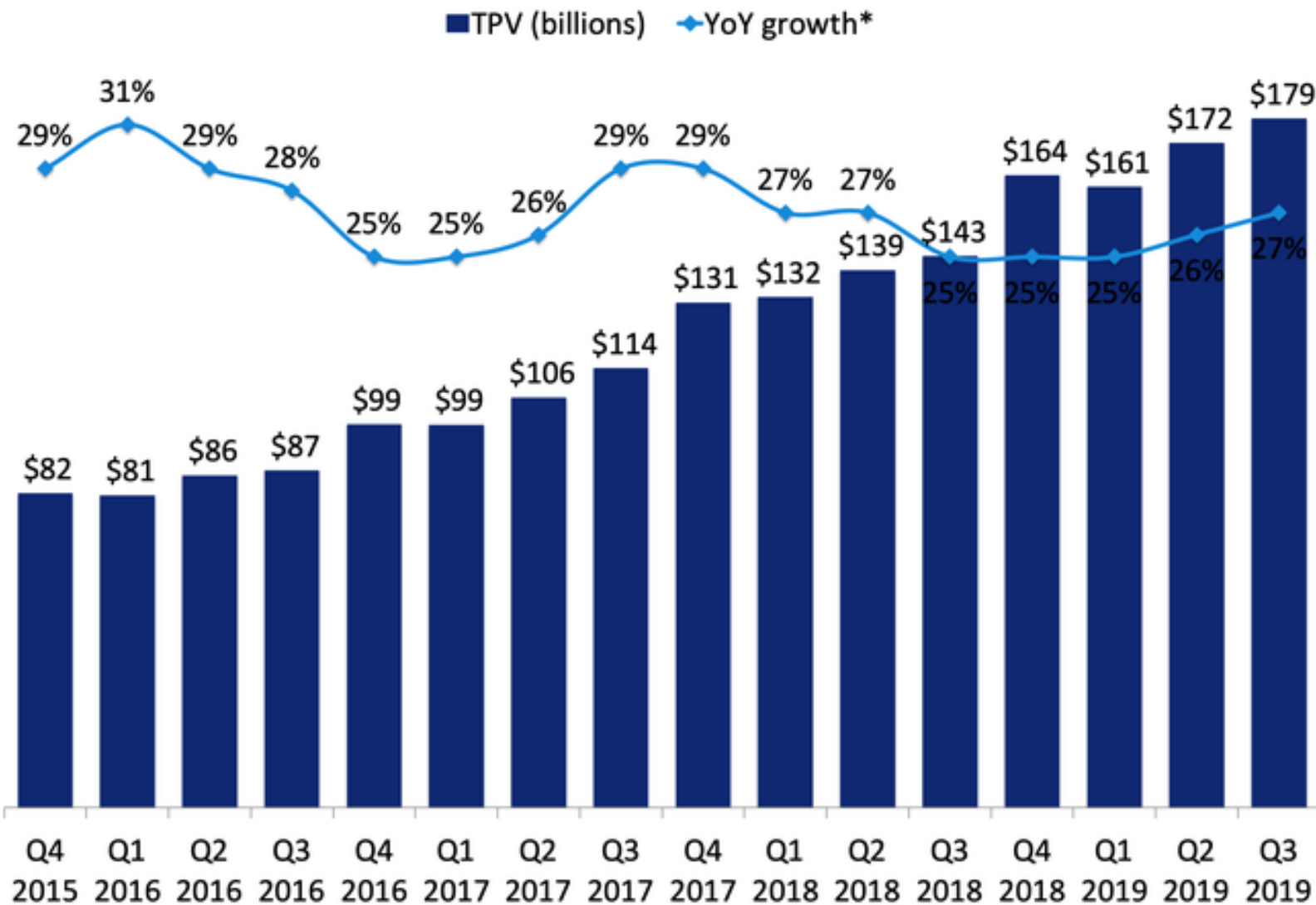
Growth of Number of Active Paypal Users

(in Millions)



PayPal Total Payment Volume (TPV)

Global

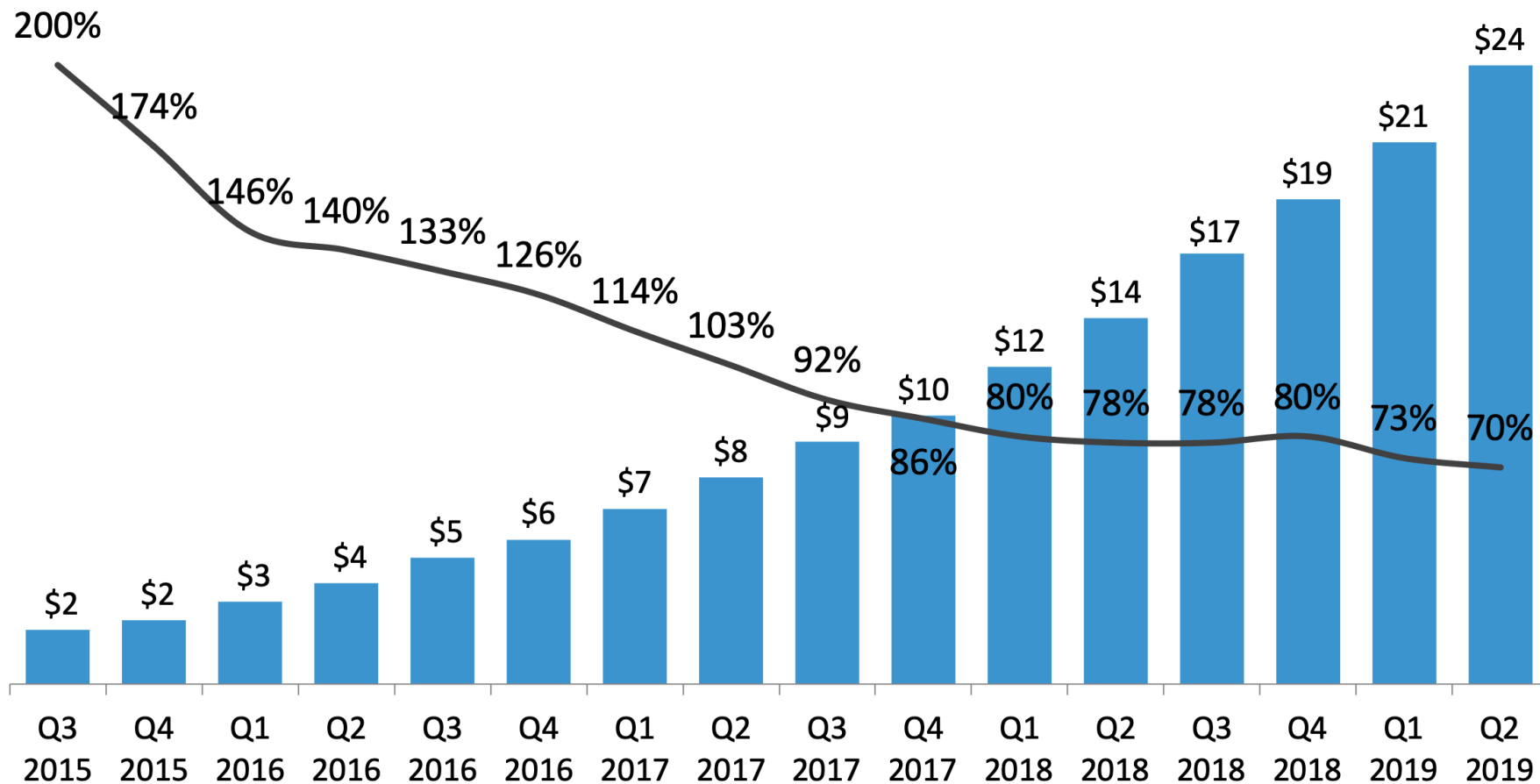


*On a constant currency (FX-neutral) basis
Source: Company filings

Venmo Total Payments Volume



■ Total payments volume (billions) — YoY growth

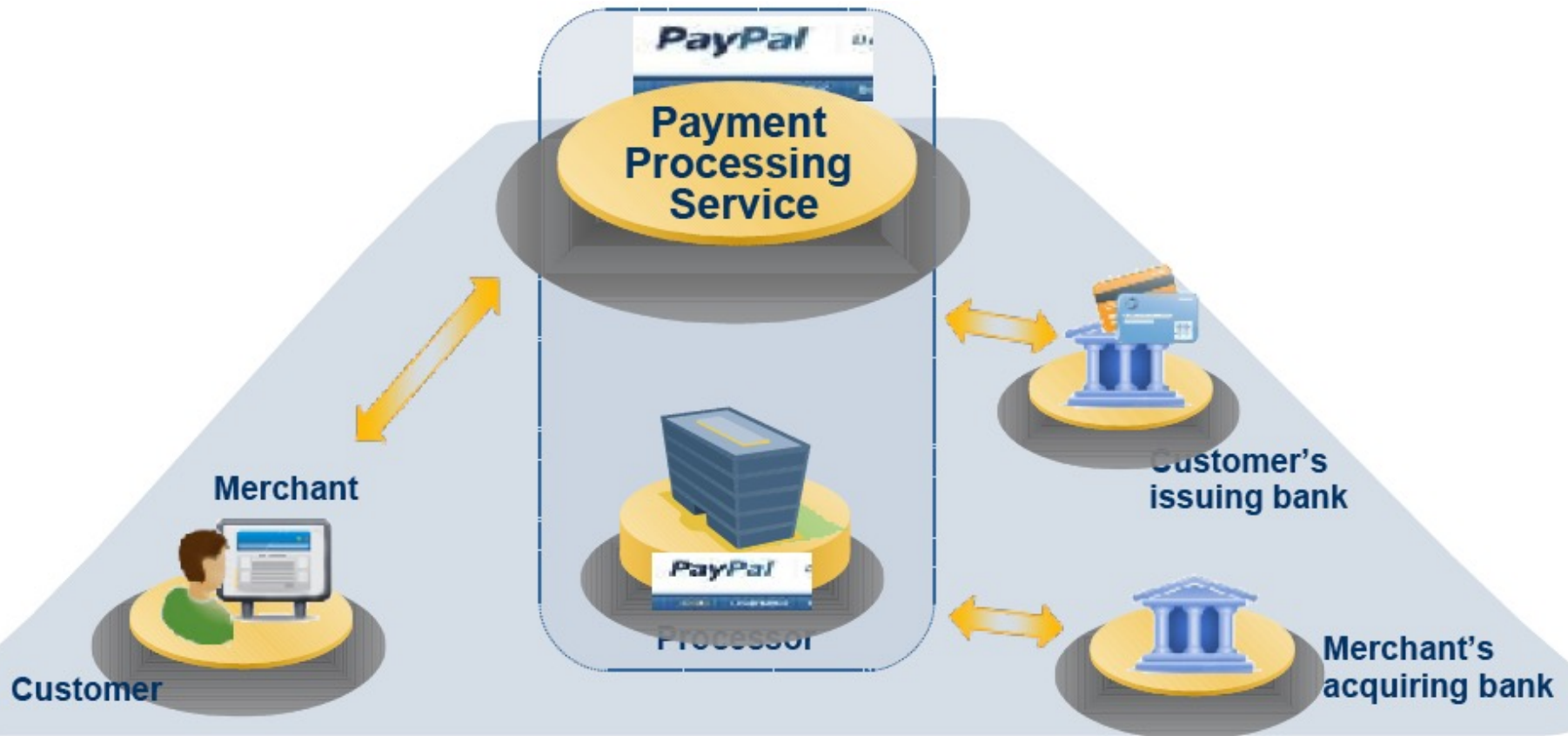


BUSINESS
INSIDER
INTELLIGENCE

Business Evolution of PayPal

- Phase 1 (1998-2003):
 - ◆ Enabled P2P online, (micro) payments for its users ;
 - ◆ Closely tied to Online-Auction support (eBay)
 - ◆ Target small home-business/ online merchants which are not qualified for credit-card payment processing services.
- Phase 2 (2004-2007):
 - ◆ Expanded beyond eBay auctions to offer Payment solutions to online merchants, e.g. Payment gateways, processing, security/fraud prevention, seller-protection, financial reporting
- Phase 3 (2008–July 2015)
 - ◆ Started operating in European Union and other currencies ;
 - ◆ Expanded its focus on large businesses and mobile networks
- Phase 4 (since July 2015 after divested from eBay)
 - ◆ Cross-border money transfer remittances from/to US
 - ◆ Cloud-based mobile commerce
 - ◆ Integrate Venmo's mobile/social payment service into Paypal's ecosystem
 - ◆ Became the 1st foreign payment platform in China by acquiring 70% equity stake in GoPay (Guofubao Information Tech. Co.) in Dec 2019.

PayPal's Payment Service Model for Online Merchants



Different types of PayPal Payment Solutions

PayPal Products



**Website
Payments
Standard**

Scenario #1

Accept online credit card payments with minimal effort



**Website
Payments
Pro****

Scenario #2

Build an all-in-one solution for accepting web, phone, fax and mail payments



**Express
Checkout****



Scenario #3

Accept PayPal, keep current payment processor



**Payflow
Gateway**

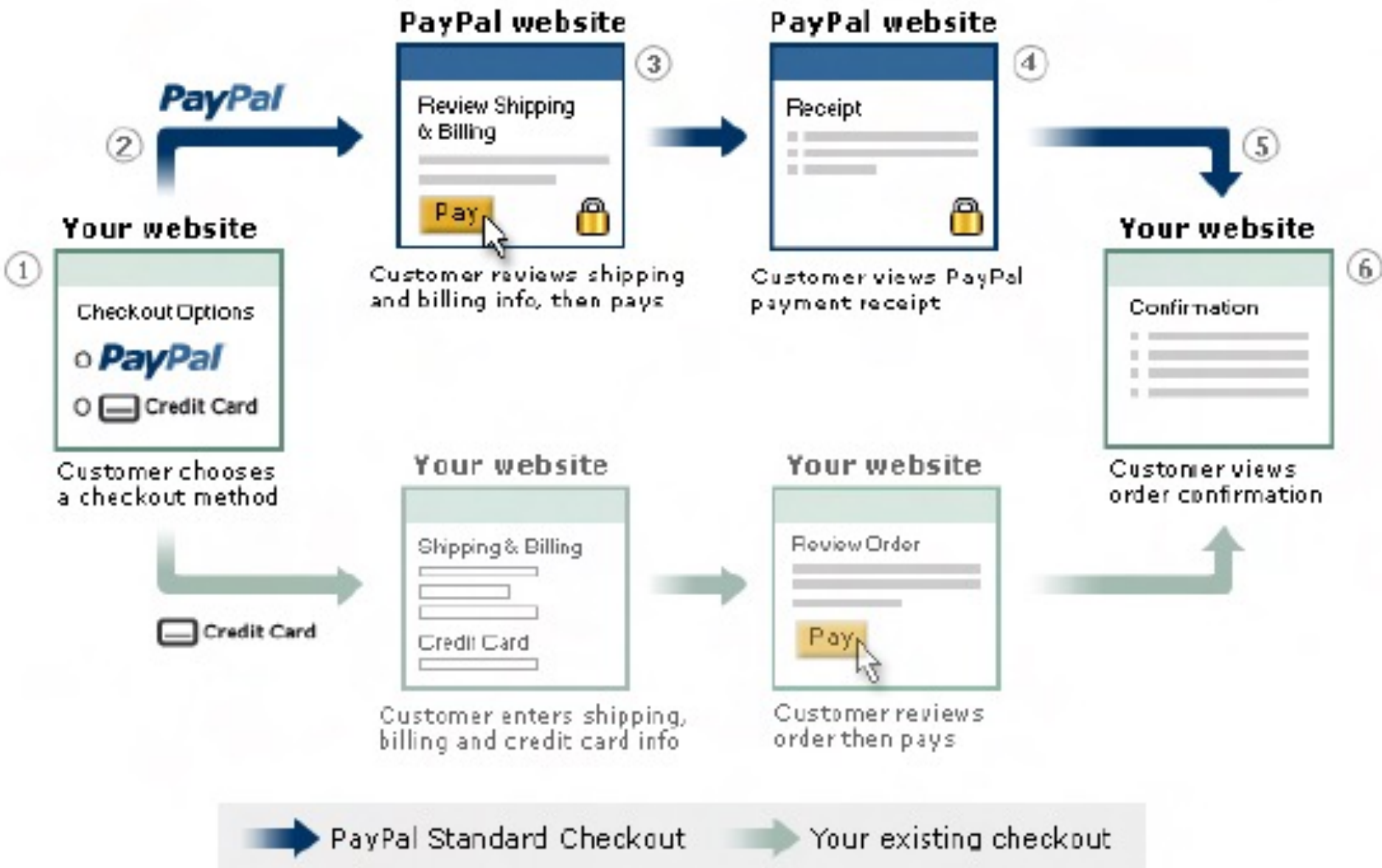
Scenario #4

Provide a secure connection from your online store to your merchant account

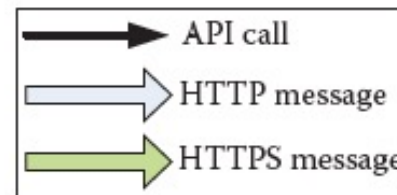
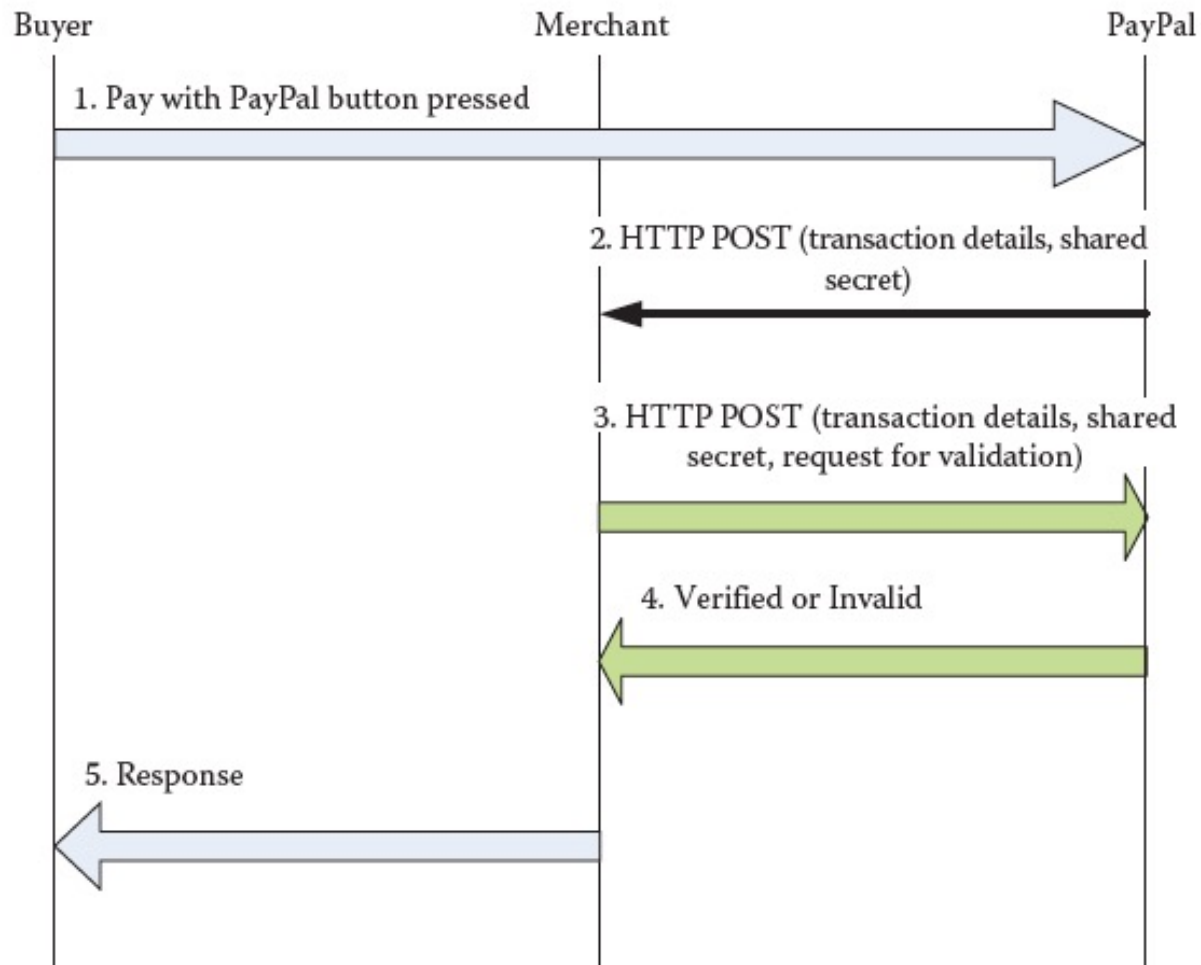
Different types of PayPal Payment Solutions

Product	Website Payments Standard	Website Payments Pro	Express Checkout	Payflow Gateway
Scenario	Accept online credit card payments with minimal effort	Build an all-in-one solution for accepting web, phone, fax and mail payments	Accept PayPal, keep current merchant account	Establish a secure connection between online store and merchant account, and keep merchant account
Internet merchant account needed?	X	X	✓	✓
Where customers checkout	PayPal	PayPal or merchant's website	PayPal	PayPal or merchant's website
Virtual Terminal included?	X	✓	X	✓
Business credit approval needed?	X	✓	X	X

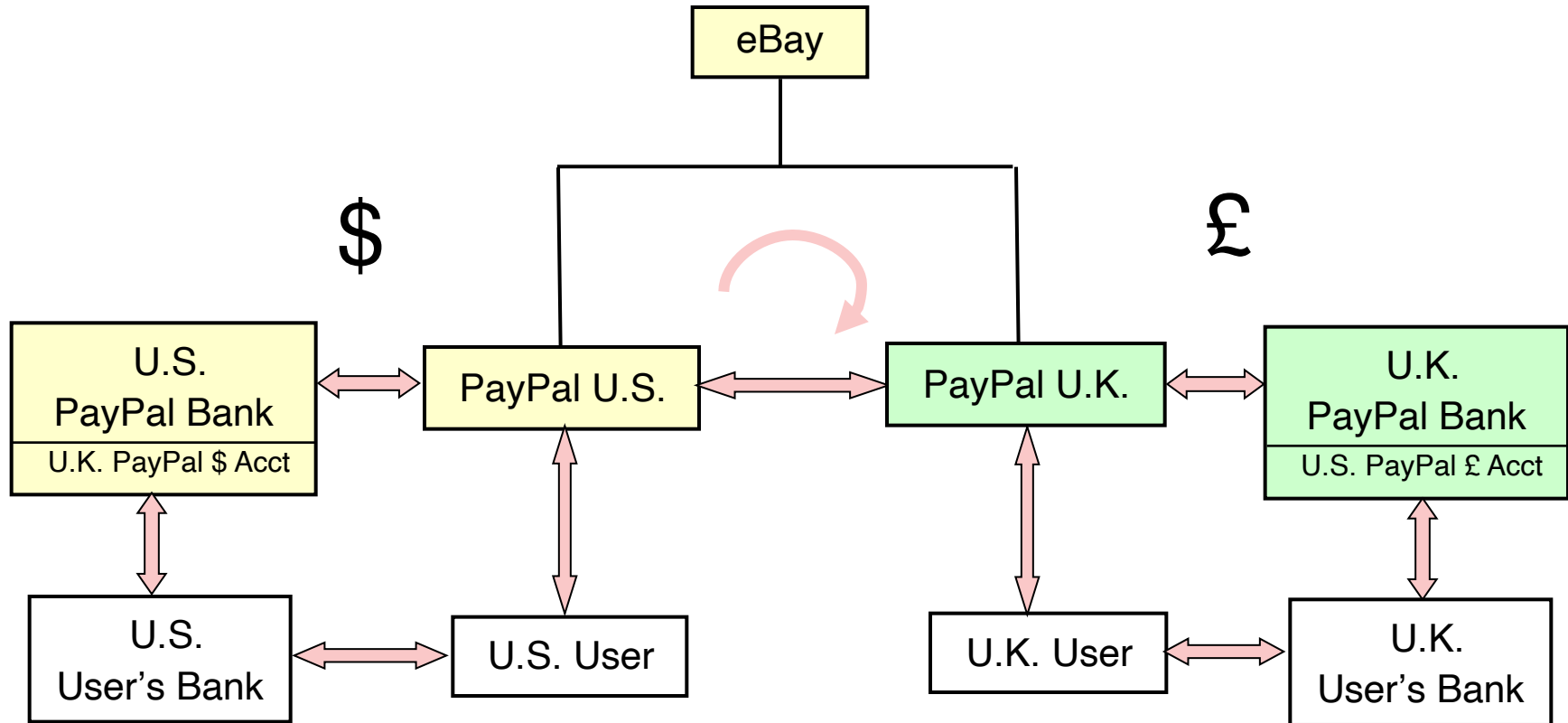
Standard Checkout Process with PayPal



Protocol Flow of Basic Hosted Service of PayPal for e-shopping websites

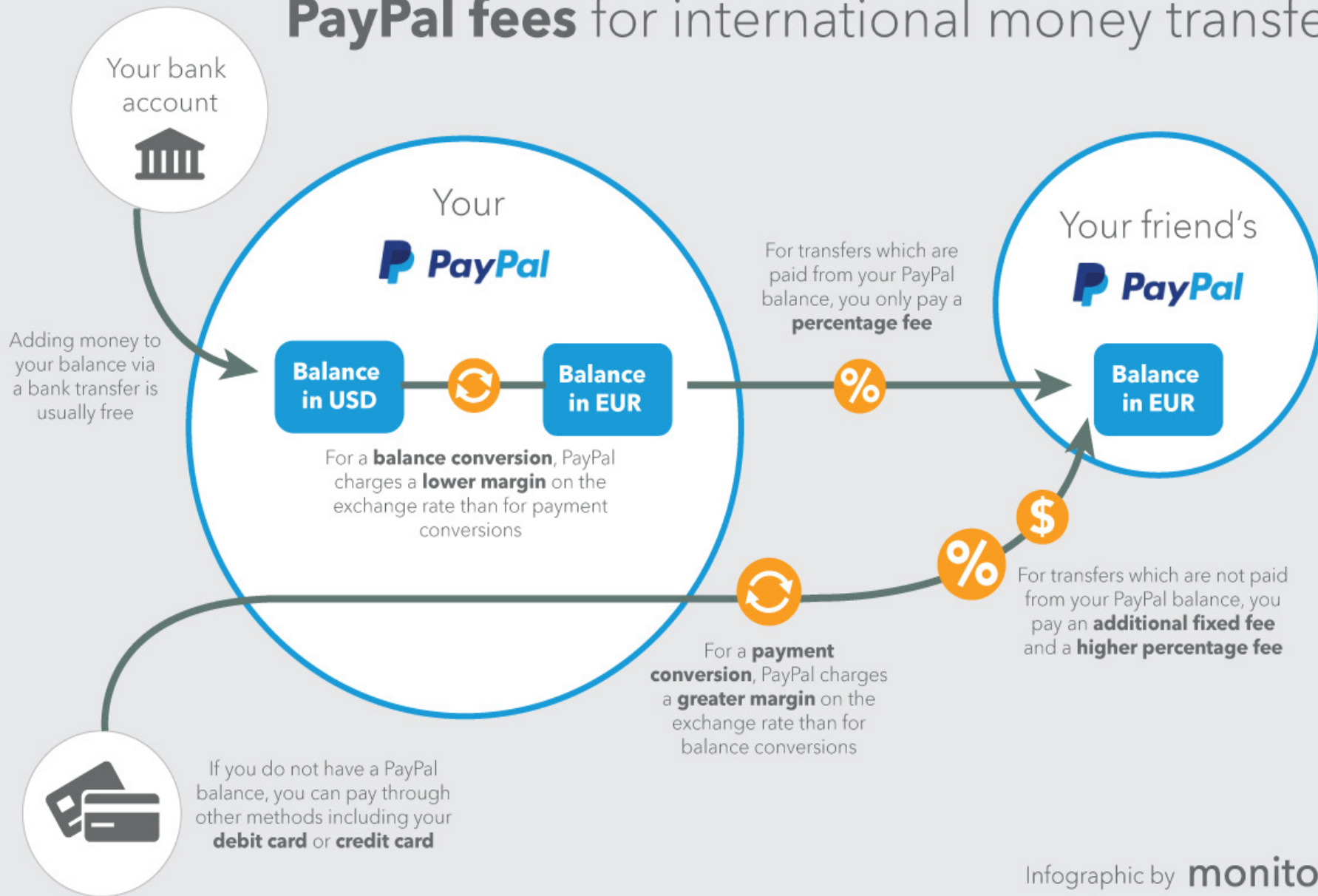



Multi-currency support with PayPal



- While the initial Mission/ Vision of Paypal was to “**create a global currency** that was independent of interference of banks and government”, this mission **has failed and never materialized !** (mainly due to Government Regulations, e.g. Anti-Money Laundry requirements/ concerns ; see problems of Facebook’s Libra project !)
- Instead, Paypal supports cross-border/currencies transactions like how conventional Banks handle foreign exchange transactions ;
- Paypal also supports a customer to keep balance in different currency accounts

PayPal fees for international money transfers





 Conversion fees

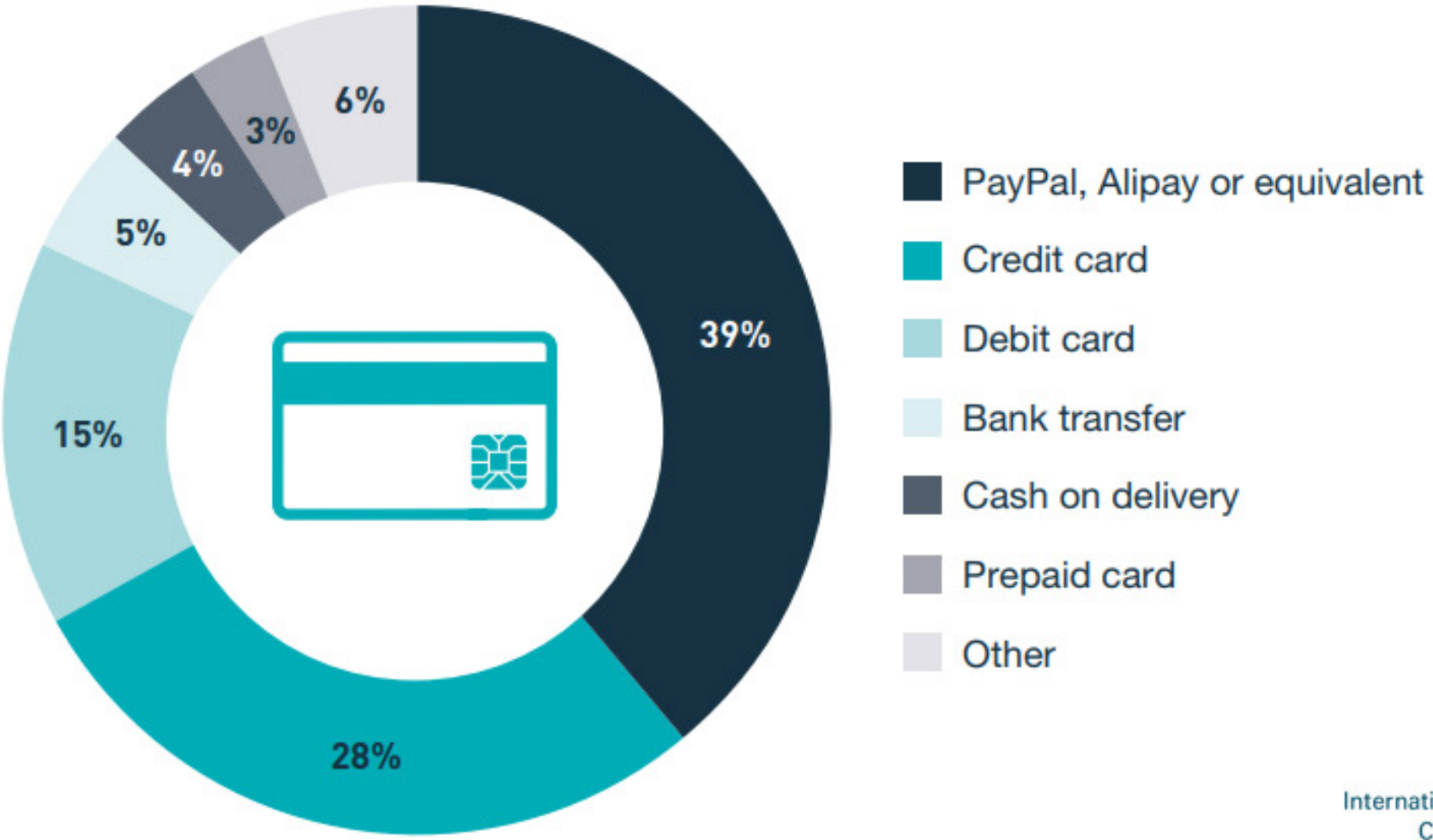
 Percentage fees

 Fixed fees

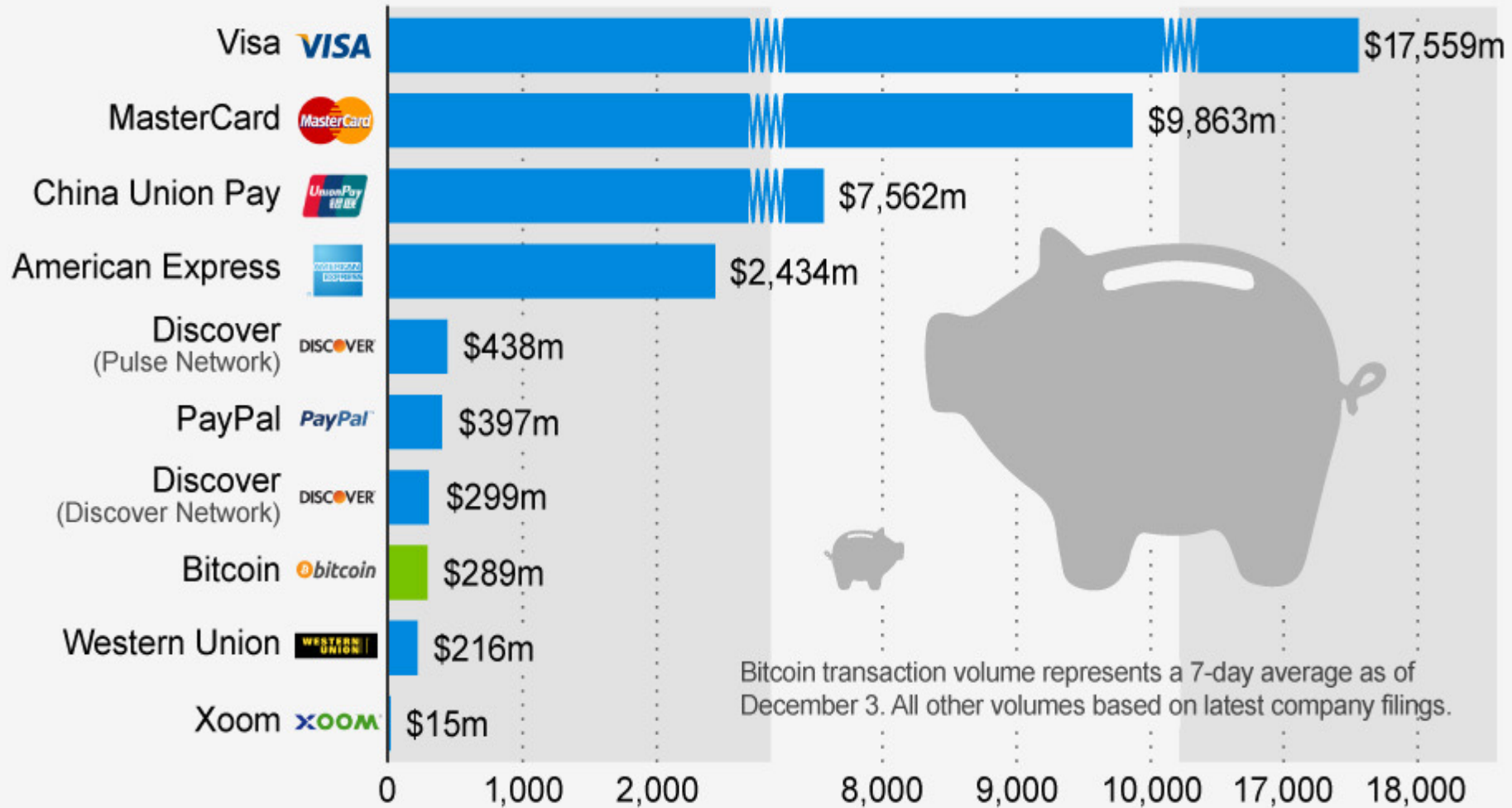
Infographic by **monito** 

Please share this illustration, but make sure to link it back to [Monito.com](https://monito.com)  

Cross-Border Online Shopping Payment Methods



How Paypal Activities Stacks up against other Payment Networks (Ave. daily transaction volume (in million US\$) (circa Dec 2013))

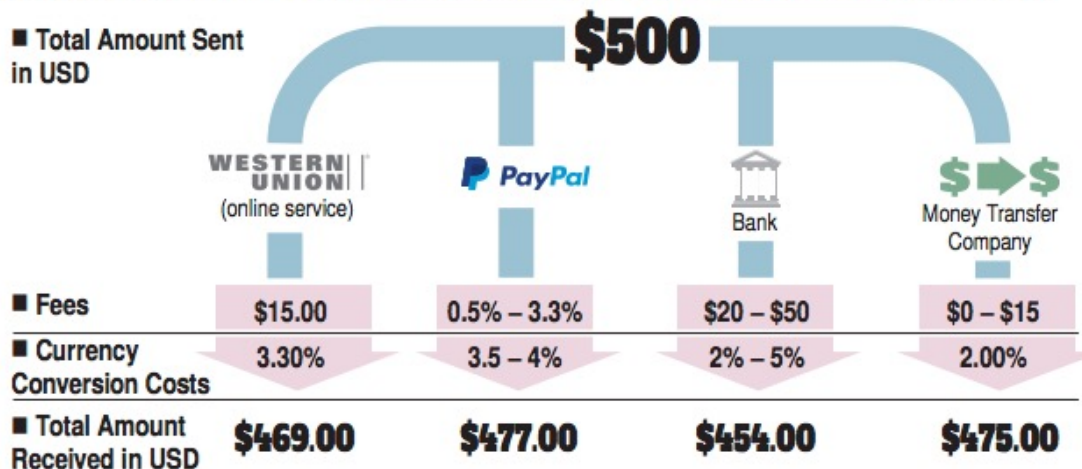


INTERNATIONAL MONEY TRANSFERS

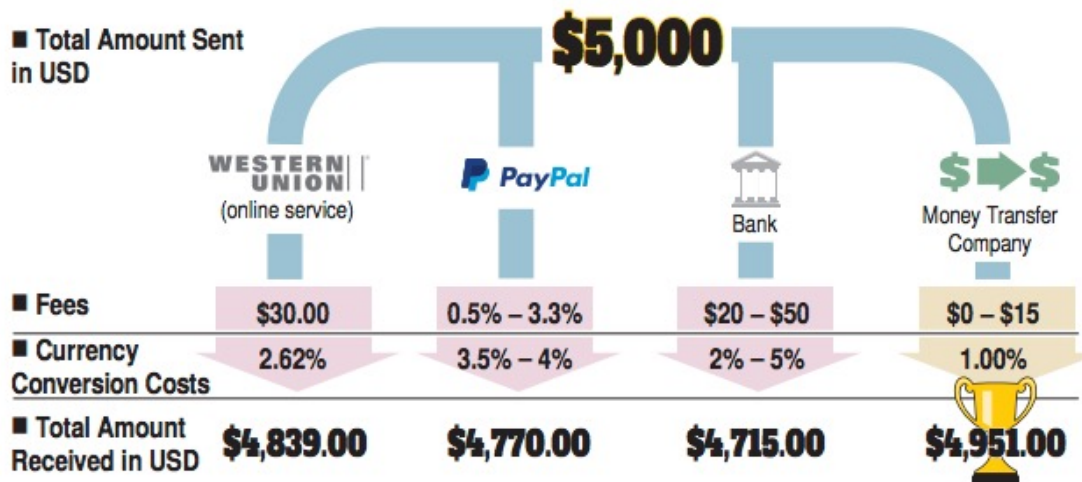
How much actually arrives?

Banks and international money transfer companies make money from fees and converting currencies.

■ Total Amount Sent in USD



■ Total Amount Sent in USD



Notes:

The Western Union results are based on using their online service using a credit card with cash pickup
 PayPal results are based on PayPal balance or linked bank account. Credit Card or Debit Card currency conversion costs are 3.9% - 7.4% plus the Fee, depending on the country
 Bank Total Amount Received does not include fees often charged by the receiving bank
 PayPal, Bitcoin and Western Union are registered trade marks of those respective companies
 Currencies and Countries change the costs
 While every care was taken at time of publishing, different results may occur due to different services, fees and currency conversion costs based on countries and changes to fee structures

Source: Transumo.com based on an USD to CAD exchange and converted back to USD using the mid-market rate.

Major Ideas

- The Business Model and Key Revenue streams for PayPal keep evolving.
- To better align with Government Regulations on foreign exchange, anti-money-laundry requirements etc, PayPal **chose NOT to position** itself as a new online currency (i.e. unlike Bitcoin, or Libra -- Facebook's cryptocurrency project which failed recently) ; instead it supports multi-currency/ cross-border payment transactions like how conventional banks conduct FX transactions.