Fostering Next Generation Security

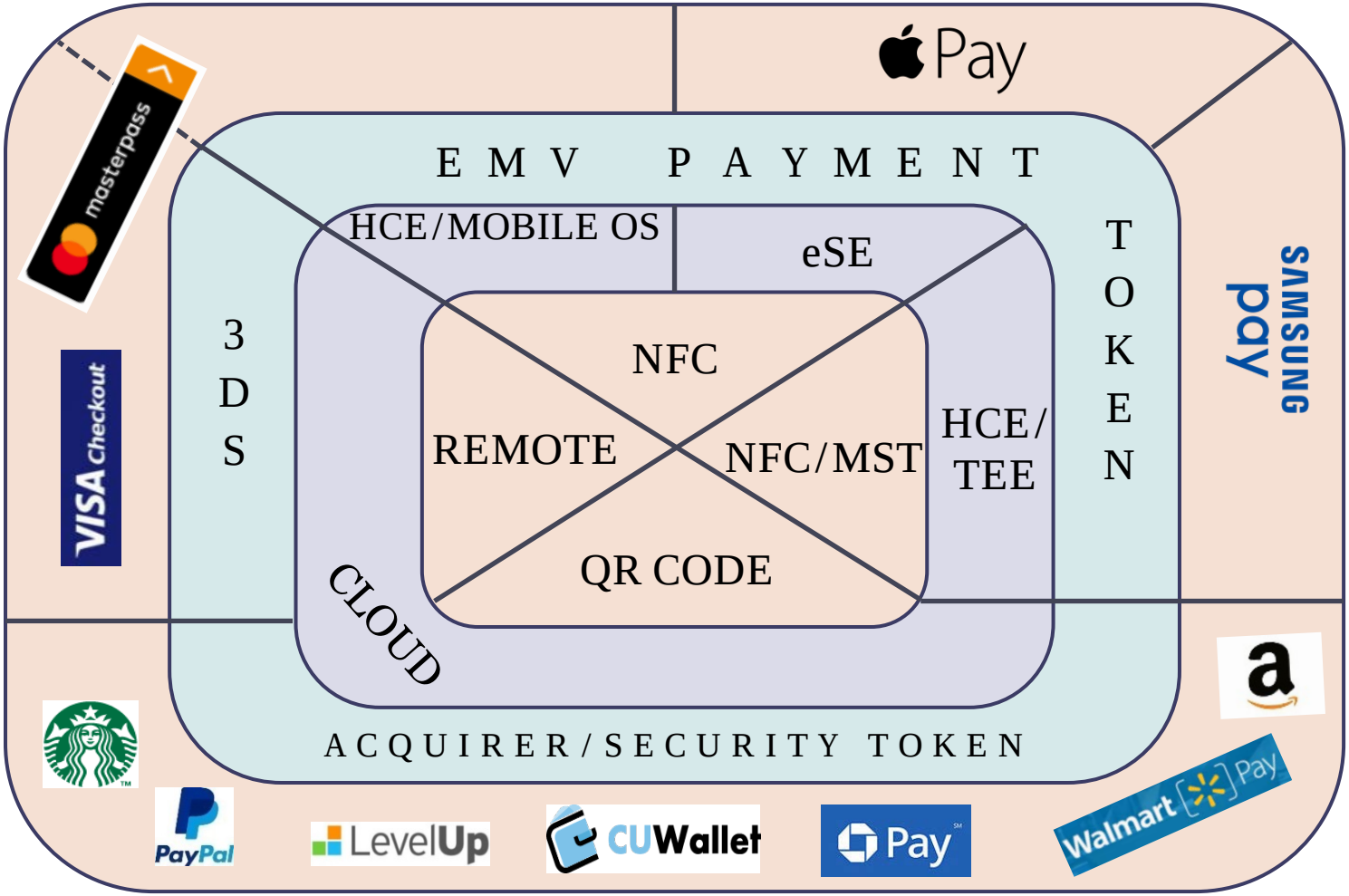
Chicago Payments Symposium 2016
October 12, 2016

Marianne Crowe
Federal Reserve Bank of Boston

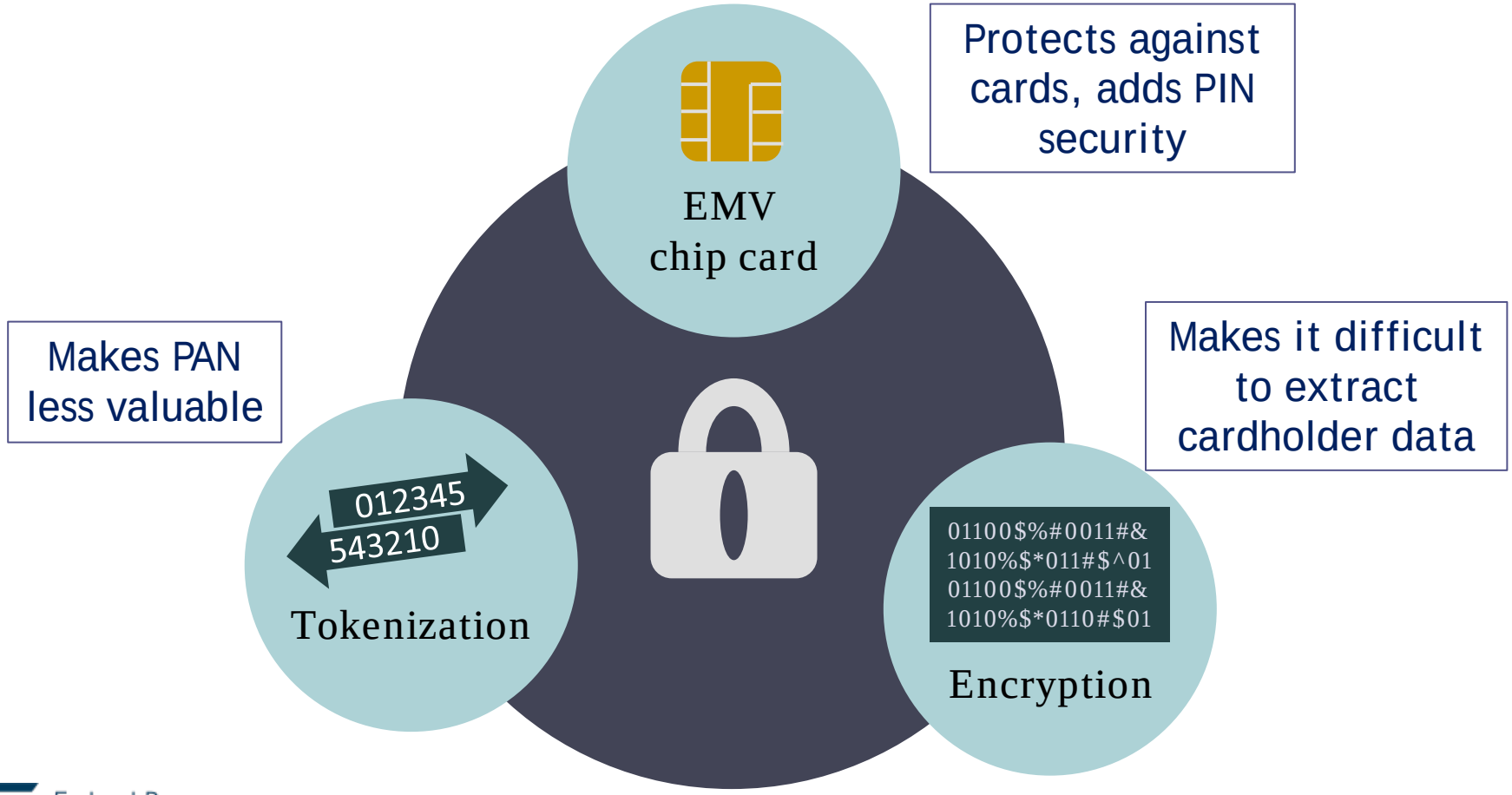
Channel convergence poses more complex payment security risks

- Mobile payments environment changing rapidly - new technology platforms, solutions, channels and participants
- New payment models: card on file services, digital and QR code cloud-based mobile payments and POS NFC wallets
  - Payment card data breaches highlight risks of storing sensitive payment data at POS
  - Mobile creating more concerns about increase in payment card fraud as EMV chip migration shifts fraud from card-present to CNP
- Need to remove sensitive payment card data from transaction end-to-end and reduce payment risk
- No framework to secure payment credentials and associated end-to-end mobile payment transactions

Wallets developing around key platforms



Building Blocks for Payment Security & Authentication require Multi-layered approach



Fed role in driving payments security

- Mobile Payments Industry Workgroup (MPIW)
  - Collaboration of 40+ mobile payment industry experts
  - Share perspectives and assessments of mobile/digital topics of common concern, e.g. security, EMV migration, HCE, tokenization, wallets, CNP, regulation
- Tokenization Landscape Stakeholder Assessment (2014-15)
  - Benefits, challenges, opportunities of payment & security tokenization models
  - WP: "Is Payment Tokenization Ready for Primetime?" June 2015
- Mobile CNP Payments Fraud Risk Assessment (2015-16)
  - Compare different mobile CNP payment models, associated risks and security gaps
  - WP: November 2016

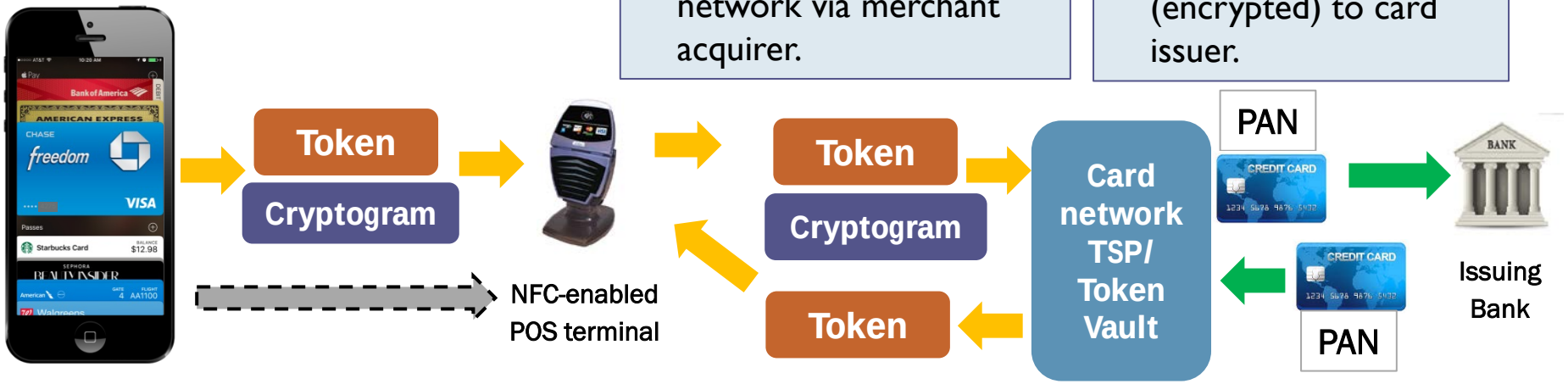
Conducted Tokenization Landscape Assessment

- Provisioning and processing of mobile and digital tokenized payment transactions under various schemes
- Payment tokenization removes original payment account credential (PAN) from transaction process
  - Replaces PAN with substitute value to use in mobile/digital financial transactions in lieu of PAN
  - Follows EMV token spec
  - Token renders payment card data meaningless to hackers
  - Not mathematically reversible - only Token Vault owner (token service provider) can de-tokenize
  - Format fits legacy payment account credentials (PAN)
- Security tokenization
  - Replaces underlying sensitive value (PAN) with a non-sensitive token value post-authorization for data-at-rest stored in merchant/acquirer database
  - Reduces risk of potential compromise and non-compliance with PCI.
  - Chargebacks and payment reconciliation can take place without handling payment data
  - Supported by PCI SSC, X9 (119-2), Proprietary merchant/acquirer model

Apple Pay use case: How payment token secures mobile credentials

2. Tokenized PAN & cryptogram sent to network via merchant acquirer.

3. TSP de-tokenizes token. Sends real PAN (encrypted) to card issuer.



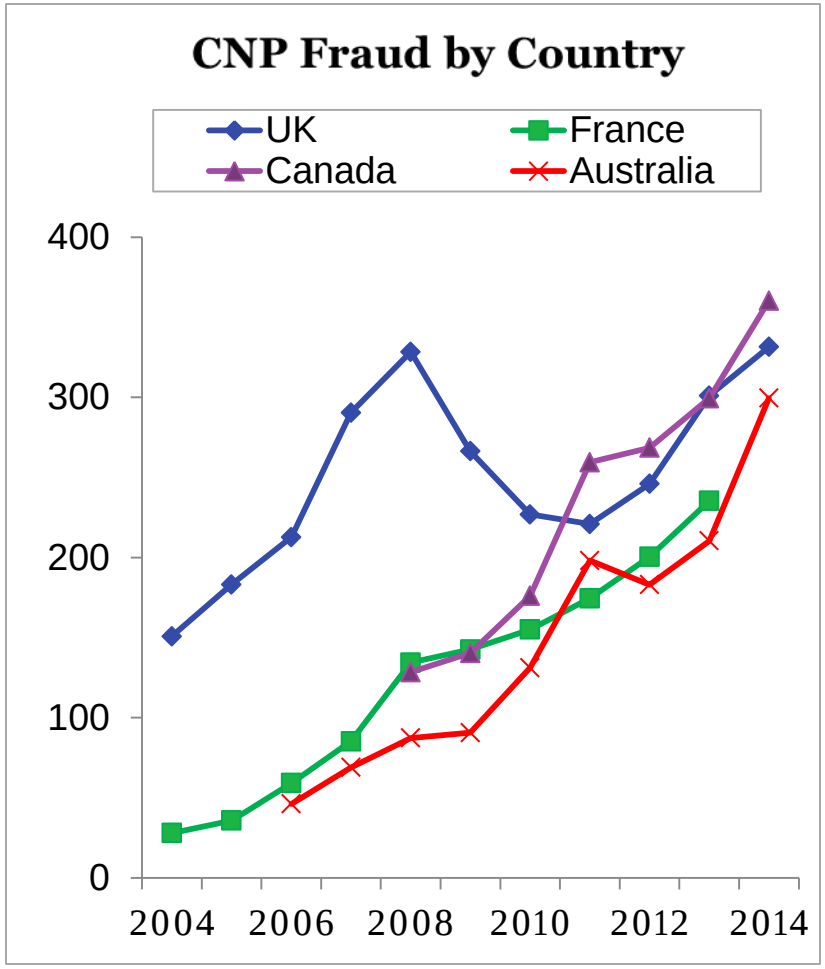
1. Tap iPhone on NFC-enabled terminal. Authenticate with fingerprint or passcode. Transmit token & dynamic cryptogram to POS terminal.

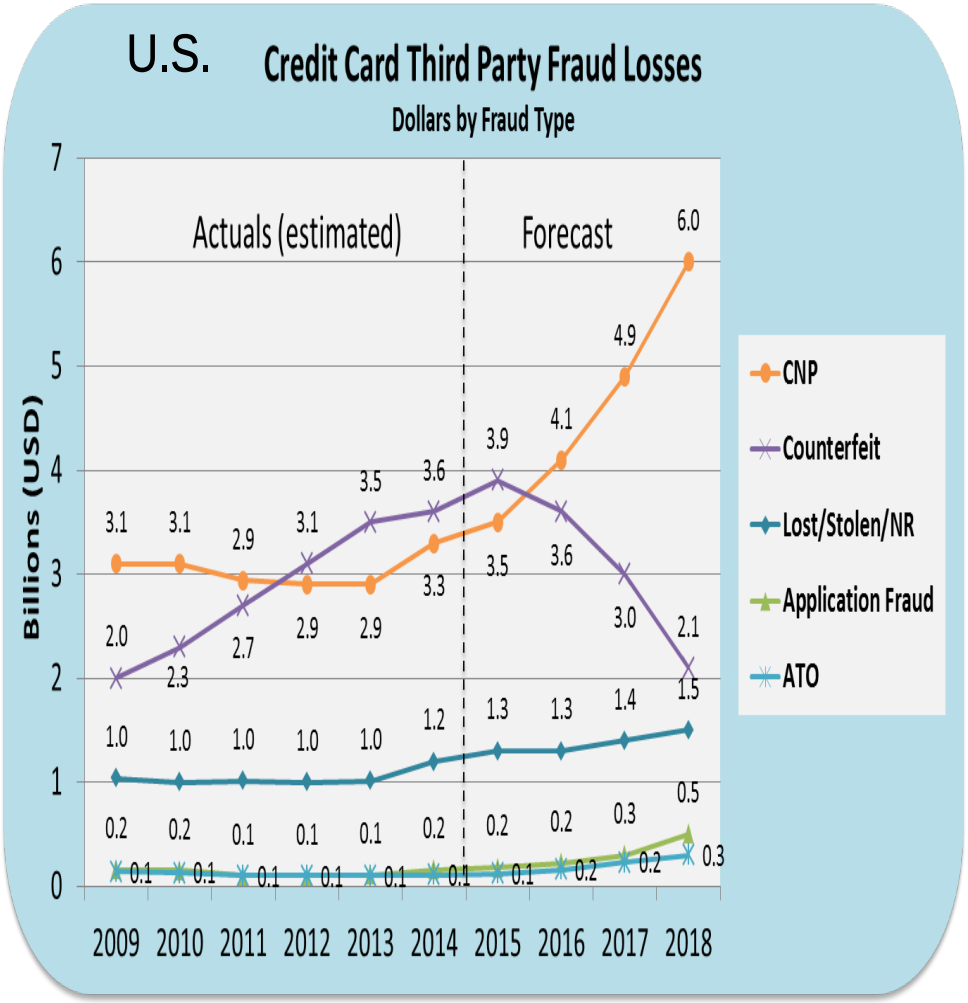
4. TSP re-tokenizes PAN. Sends token back to merchant terminal (via acquirer) to complete transaction.

Mobile/digital wallets expand to e-commerce channel with new security challenges

Mobile/Digital Wallets	Technologies	Examples
'PAY' Wallets	NFC + eSE	Apple Pay
	NFC + HCE	pay
	NFC + TEE / MST	SAMSUNG pay
Merchant-centric	Cloud + QR Code	Walmart Pay, CURRENTC
Payment Service Providers	Cloud	amazon payments, PayPal
Banks	Cloud	Pay, WF, Capital One
Card Networks	NFC + HCE	masterpass
	Cloud	VISA Checkout

EMV card migration does not address CNP fraud



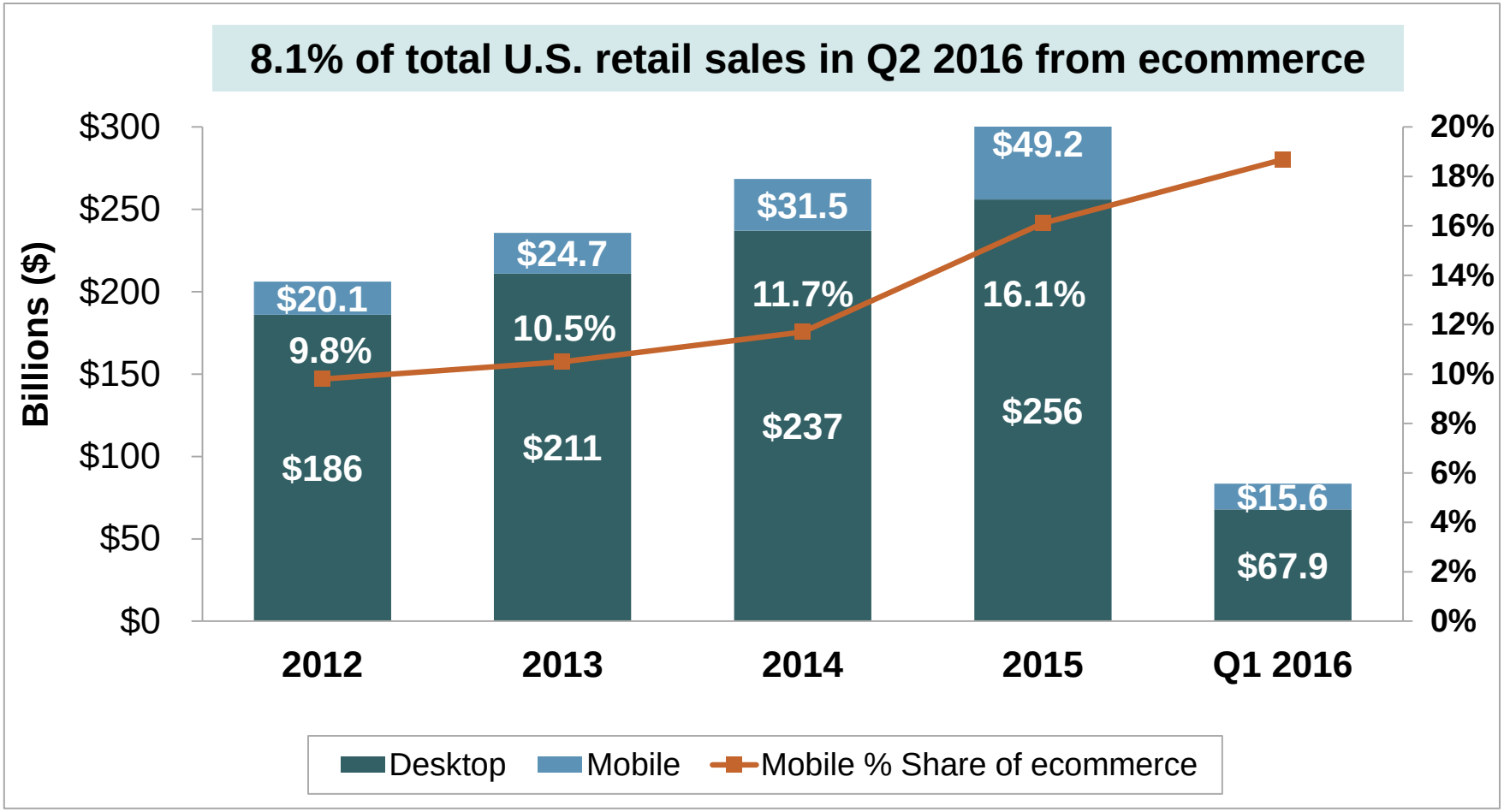


Federal Reserve Bank of Boston™

Source: Retail Payments Risk Forum, FRB Atlanta, 2015

Source: Early Warning Analyst Estimates, 2015

Mobile payments is driving up CNP/ e-commerce volume



Federal Reserve Bank of Boston™

Source: U.S. Census Bureau; comScore mcommerce Measurement, 2016

Conducted assessment of m-c0mmerce models in CNP environment

- Goal to understand and compare risks and security controls of m-commerce wallet models
- Analyzed four mobile CNP use cases
  - Guest checkout via mobile browser and app (no CoF)
  - Mobile in-app with EMV ID&V (Apple Pay, Android Pay, Samsung Pay)
  - Cloud-based wallets using other authentication approaches (PayPal, Amazon)
  - Card network digital wallet (Visa Checkout, Masterpass, AmEx Express Checkout)

Mobile CNP Assessment

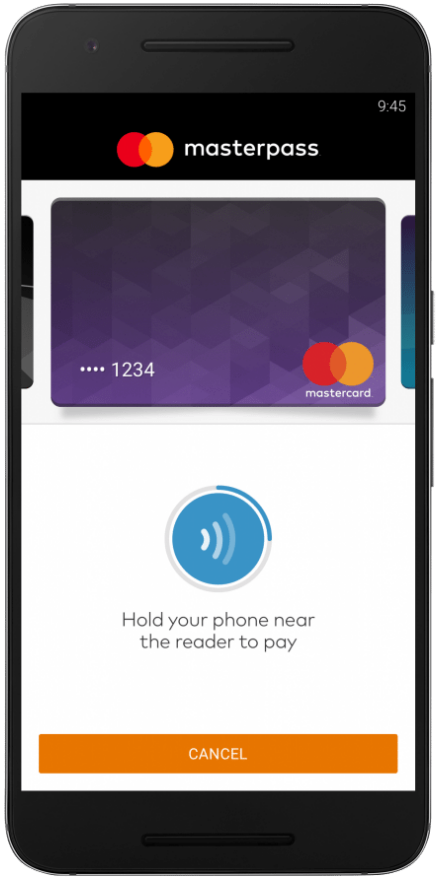
- Looked at critical points of vulnerability across use cases
  - Account creation
  - EMV ID&V*
  - Authentication*
  - Mobile device and operating system integration
  - Use of third-party service providers
- Identified possible mitigation solutions and tools across use cases
  - Authentication
  - Use of dynamic cryptograms
  - Encryption
  - Security and payment tokenization
  - 3D–Secure 2.0

***Considered most vulnerable even though they are risk controls**

Payment tokenization moving to online and in-app CNP payments

MasterCard to integrate fully tokenized checkout experience within MasterPass-enabled bank issued wallets using MDES

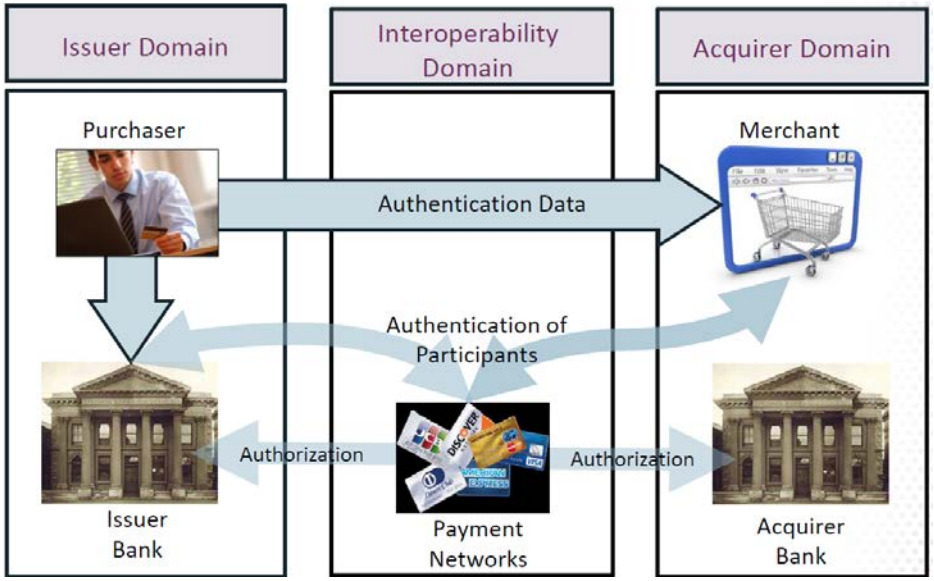
- Replaces PAN with a payment token for consumer credit & debit, commercial and prepaid cards stored in MasterPass
- Tokens are unique to each bank-connected MasterPass wallet,
- Similar to tokens used at POS, following the EMV token spec.



Risk-based authentication improves ecommerce security

EMVCo 3DS

- Secure communication protocol
- Enables real-time cardholder authentication directly between merchant and issuer
- Liability for fraudulent transactions shifts to issuer



Source: EMV Migration Forum, 2015

3DS 1.0

- Never broadly adopted in U.S.
- All transactions authenticated
- Cardholder must enroll

Will U.S. merchants and issuers implement 3DS 2.0?

- Authenticates ONLY when risk exceeds predetermined level
- Reduces customer abandonment, improves check-out speed and convenience

Recommendations

- Extend payment tokenization model to CNP e-commerce and cloud-based wallets to remove PAN from clear
- Simplify integration of payment and security tokens on merchant back-end
- Implement end-to-end encryption with tokenization at POS and CNP
- Monitor potential social engineering fraud during enrollment with ID&V
- Use multi-layered and other authentication tools, including MFA, biometrics (fingerprint), enhanced risk based methods (3DS V2.0)
- Large merchants, FIs & providers should share expertise/best practices in CNP risk management with less sophisticated, smaller e-commerce merchants
- Manage m-commerce as a separate channel from e-commerce
- Collaborate on standards and best practices for mobile payments in CNP environment