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Statement of

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Chairman Johnson, Ranking Member Shelby, and members of the Committee, thank you for inviting me to appear before you today to talk about consumers' use of mobile financial services.

My testimony today will discuss development of the mobile payments system in the United States, and activities and progress of a mobile payments industry workgroup (MPIW) first convened by the Federal Reserve Banks of Boston (FRB Boston) and Atlanta in January 2010 to facilitate a discussion among key mobile industry stakeholders as to how a successful retail mobile payments ecosystem could evolve in the U.S. This group includes representatives of several large banks, credit card and automated clearing house (ACH) networks, the two largest mobile carriers, intermediaries/third-party payment processors, Internet payment service providers, mobile technology and security providers, handset and chip manufacturers, mobile and payment trade organizations, and a merchant trade group. Representatives from the Board of Governors of the Federal Reserve and United States Treasury also participate. This workgroup has continued to meet three to four times each year since the initial 2010 meeting.

Evolution of Mobile Payments and Banking in the U.S.

Before turning to mobile payments and banking, it may be helpful to provide brief context about the post-World War II history of the U.S. payments system. Looking back, banks and policymakers in the 1950s and 1960s were grappling with significant problems created by the growth of economic and financial activity relative to our ability to process paper payments and other financial instruments. At that time, retail payments were largely made by cash and checks. The use of computers to automate banking processes was just beginning. Since then, the U.S. payments landscape has changed dramatically. Electronic payments made through

payment card networks and the automated clearing house system have become increasingly prevalent, and now represent about four out of every five noncash payments in this country. Virtually all check payments, which have been declining in number since the mid-1990s, are now cleared electronically, rather than in paper form. The cumulative effects of automation and innovation have driven several waves of new banking and payment services that continue to improve the efficiency and effectiveness of our payment systems.

The evolution of mobile banking and payments encompasses a combination of continued advances in hardware, software, and payment systems, including contactless payments, online banking, mobile phones (particularly smartphones), applications, and the convergence of Internet or e-commerce and mobile-commerce.

Since the late 1980s, companies and industries around the globe have experimented with different payment mechanisms aimed at improving access to banking services and the efficiency and ease of use for retail point-of-sale payments. For example, a contactless technology was developed in Japan, which a major commuter railroad in Tokyo implemented in a proprietary reloadable prepaid card. In addition to transit fare, consumers could use the contactless card to pay for purchases at merchants equipped with contactless readers near train stations. A similar product, also based on this contactless technology, was launched in Hong Kong's transit system in 1997. In the same year, a RFID[1] contactless payment system that allowed customers to wave/tap a fob to pay at the pump, was launched, the first of its kind in the U.S.

In the late 1990s, Finland launched a number of mobile commerce and banking initiatives. The first two mobile phone-enabled vending machines, which accepted payment via

[1] RFID or Radio Frequency Identification Device is a tag or transponder used to identify and transmit data short distances in one direction via radio waves.

mobile phone text messaging, were installed in Helsinki. A bank in Finland launched the first mobile banking service to monitor account activity using this technology.

In the early 2000s, an online payment platform emerged that allowed consumers to email payments to each other. In 2002, online auctions were enabled to receive electronic payments from participants, replacing paper checks. Eventually, the online payment platform was expanded to online merchants.

U.S. consumers began to embrace online banking in the early 2000s. By October 2002, 34 million consumers, (representing 30 percent of U.S. Internet users) used online banking, an increase of 19 million consumers performing online banking since March 2000.

Initiatives that would allow consumers to use their mobile phones to perform new functions surged in 2000, driven by the development of mobile Internet access, the popularity of the Internet and e-commerce, and the increased awareness of mobile phones as more than voice communication tools. However, these service offerings did not meet consumer expectations and neither the phones nor the mobile networks handled data well, which led to very low adoption rates. The arrival of 3G[2] services in the mid-2000s addressed earlier technology problems and had a revolutionary impact on mobile technology in the U.S. Mobile phone manufacturers introduced smartphones that were enabled with more effective web browsing and data capabilities.

By 2006, helped by increased Internet and online banking adoption, and availability of smartphones, banks began to reexamine the development of mobile banking capabilities. Six of the largest ten U.S. banks offered mobile banking services by the end of 2007. Initially most

[2] 3G (generation) mobile services provided more bandwidth for faster Internet access from a mobile phone, as well as advanced media features.

banks offered browser and Short Message Service (SMS) based services, but in 2007, the mobile banking/payments market underwent a major transformation with the introduction of a new generation of smartphone. Now customers were able to download banking applications and other more advanced applications used for mobile-commerce that were not SMS-based, providing customization and improved security. The success and rapid growth of these and other smartphones led to increasing use of downloadable mobile applications for mobile banking and payments. By 2008, core deposit processors and mobile solution vendors began to develop software solutions tailored to financial institutions, enabling smaller U.S. banks to also offer mobile banking services.

Beginning in 2005, two payment networks launched several U.S. card and mobile contactless trials, which typically took place in metropolitan areas and ran for four to six months. The trials involved using a mobile phone to pay for in-store purchases at selected convenience stores and fast food restaurants, purchase transit tickets, or purchase concession items at sports venues. Although some trials proved the viability of Near Field Communication[3] (NFC) contactless technology, no full-scale deployments followed. In 2009-2010, several NFC initiatives were taking place in Turkey, Singapore, and the U.K., and NFC-enabled phones were introduced in Canada.

Several new mobile payment services were introduced within the last three years that could have a major impact on mobile payments in this country. In 2009, a new attachable card reader that plugs in to a smartphone was introduced, enabling small merchants to accept credit

[3] Near Field Communication or NFC is a short-range wireless proximity technology that uses radio frequency to enable two-way communication between devices. NFC chips are embedded in mobile phones to enable contactless 'tap and go' payments.

and debit cards. In 2011, a number of companies and industry partnerships announced mobile/digital wallet solutions utilizing NFC or cloud technology.

Mobile payments have been referred to as the "next payments revolution" by some industry participants. As mobile wallet technology, built upon the NFC contactless chip and secure element[4] for improved security and convenience, appeals to a broader array of consumers, and as merchants, banks, payments systems participants, and technology and telecommunications providers derive increased revenue or lower costs as a result of broad adoption, mobile payments should significantly change domestic and global payments practices.

Why the Federal Reserve System Convened the MPIW

The Federal Reserve strives to foster the safety and efficiency of the nation's payment systems. We monitor the evolution of retail payments through a variety of means, including a triennial Retail Payments Study[5] and an annual Survey of Consumer Payment Choice.[6] Of particular interest has been the migration of retail payments from traditional to emerging platforms, including the evolution of mobile banking and payments.

When FRB Boston began to research mobile banking and payments, our goal was to better understand how the industry was evolving, the factors that would motivate interaction and cooperation between mobile carriers and U.S. banks, the major barriers to adoption, and the impact of mobile payments on consumers in the U.S. payment system. We had seen mobile payments evolving more quickly in other parts of the world and wanted to understand why progress in the U.S. was slower. In late 2009, the large U.S. banks were developing mobile

[4] Combination of hardware, software, interfaces and protocols that enable secure storage and use of credentials for payment, authentication and other services
[5] http://www.frbservices.org/communications/payment_system_research.html
[6] http://www.bos.frb.org/economic/ppdp/2011/ppdp1101.htm

banking solutions, and regional and small banks were beginning to assess their business cases for mobile banking, but the concept of using a mobile phone to make a purchase was just surfacing.[7]

In conversations FRB Boston had with bankers and payments experts in 2009, we heard that they were concerned with fragmentation and lack of communication among key stakeholders, particularly mobile carriers, about the direction of mobile payments in the U.S. Industry participants suggested that the Federal Reserve facilitate a conversation among a diverse group of mobile payment stakeholders. Realizing that mobile payments would impact consumers in new ways, we wanted to ensure that all stakeholders adequately addressed issues related to consumer protection and security. Additionally, mobile carriers, which had limited understanding of banking and payment systems, would have an important role in the evolution of mobile payments, which introduced new coordination issues. Lastly, we believed that mobile payments, correctly implemented, could create new efficiencies in payments and possibly create new, cost effective, alternatives for the unbanked and the underbanked. As a result, the Federal Reserve hosted the first meeting of the MPIW in January 2010, to facilitate discussion on the evolution of mobile retail payments in the U.S.

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[7] Banks had shown significant interest in the previous three years, but many preferred to be fast followers, not leaders. Most banks, except the very large, were moving slowly, waiting for others to demonstrate the viability of mobile payments. Only 1,000 of the approximately 17,000 banks offered mobile banking in the U.S. at the end of 2009. However, 40 percent of U.S. consumers used online banking. Many stakeholders believed that in 2010 and 2011 there would be significant momentum leading the financial services industry to become more involved in mobile (banking and payment) services. They noted, however, that many smaller U.S. banks and credit unions look to their existing third-party core deposit processors to deliver solutions without significant upfront cost.

Contactless cards, introduced several years ago in the U.S., were not successful and did little to generate demand for mobile payments. Poor marketing and education may have contributed. Many cardholders received contactless cards but were unaware that they had them or how to use them and did not know whether merchants they frequented accepted contactless payments.

Objectives of the MPIW

The overarching goal of the Federal Reserve in convening the MPIW was to encourage growth and innovation in the mobile payments market while minimizing risk to consumers and the payment system. The Federal Reserve believed it was important to gain an industry perspective to determine what barriers existed to the proper evolution of this market and whether we could help eliminate these barriers. We also wanted to explore how we might collaborate on issues of mutual interest. Thus, the objective for the first meeting was to have the experts inform and educate us, and to engage in an open cross-industry dialogue.

Many of the organizations represented at the meeting were already involved in mobile payment initiatives in Asia, Africa, and Europe. In the U.S., a variety of very limited NFC contactless pilots were underway that enabled contactless payments initially on credit and debit cards and then mobile phones, but none with any lasting commercial availability. The industry was struggling to define a direction for mobile payments because of conflicting business models and strategies, and a lack of demonstrated consumer demand.

The main objectives for the group were to (1) gain a mutual understanding of the evolution of mobile retail payments in the U.S.; (2) provide a forum for participants to assess challenges, find points of mutual value, share ideas, and build consensus in a non-binding, free market manner; and (3) identify possible opportunities for future collaboration to help build critical mass for the success of mobile payments in the U.S.

What the MPIW Has Completed To Date

Recognizing the diversity of industries in the MPIW, subsequent meetings attempted to level set the group by covering each organization's initiatives relative to mobile payment plans,

and perspectives on the benefits and barriers to implementation. Participants identified as benefits of mobile payments:

- The ability to reduce fraud using an encrypted contactless mobile platform.

- Potential merchant cost efficiencies gained by processing mobile payment transactions considered more secure than card transactions because of the use of dynamic data versus static magnetic card data, and reducing potential costs associated with PCI (Payment Card Industry) security standards compliance.

- Consumer convenience and value using a mobile wallet containing multiple payment methods stored securely in the mobile device, along with loyalty cards, virtual coupons, and discounts customized to reach different demographic cohorts determined by location-based, real-time capabilities of mobile technology.

- The ability to use a mobile phone to provide financial services to the unbanked and underbanked consumer segments.

Despite the benefits, participants identified a number of barriers that have impeded the growth of mobile payments, including:

- Lack of consumer demand, driven by the availability of many safe alternative payment choices in the U.S. and few differentiating factors or substantial benefits that consumers can see yet from mobile payments.

- Lack of NFC-enabled smart phones. This obstacle may be partially addressed as several handset manufacturers have committed to making more NFC-enabled phones in 2012.

- Lack of a standard business model (bank-centric, carrier-centric, partner or nonbank-centric), creating market fragmentation and limits mass adoption.

- Small percentage of merchant terminals that accept contactless NFC payments today. The capital investment in point-of-sale equipment for contactless technology is expensive, so merchants have been reluctant to make investments until they are certain of the direction in which the market is headed. They must now also factor in the implementation of EMV technology in the U.S., given the recent Visa/MasterCard mandate of compliance beginning in 2013.[8] However, this mandate may encourage faster

[8] EMV is a global standard for credit and debit payment cards based on chip card technology, taking its name from the card schemes Europay, MasterCard, and Visa, which developed it. The standard covers the processing of credit

implementation of NFC as part of the EMV implementation, or at least provide a deadline for compliance.

- Uncertain revenue models and lack of collaboration. Two NFC mobile wallet providers are aggressively seeking merchants to participate in their programs, and offering incentives for eligible consumers to use their mobile phones to pay for purchases. These commercial trials test new revenue models and partnerships to determine whether collaboration among stakeholders is successful.

- Participants also identified other barriers, such as the uncertainty regarding who owns the customer relationship (banks or mobile carriers), lack of global standards, and unclear regulatory direction as hindering the growth of the market.

Building on the identified benefits and challenges, the MPIW discussed the need for a roadmap to develop a high-level framework for the U.S. mobile ecosystem. This roadmap would include best practices and industry standards to manage the technology, security, settlement risk, and customer requirements at different points in the value chain. The MPIW also wanted to understand the roles of regulators for mobile payments and the applicable regulations. The MPIW then worked to define the principles essential to addressing the barriers and ensuring a successful mobile payment ecosystem in the U.S. Participants agreed in general with the principles related to mobile security, interoperability, and consumer protection, although there was not unanimous support on all details. These principles formed the basis of a white paper on the future of point-of-sale mobile payments in the U.S., *Mobile Payments in the United States Mapping out the Road Ahead,* published in March 2011.[9] Although written by the Federal

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and debit card payments using a card that contains a microprocessor chip at a merchant payment terminal. The transactions are referred to as "chip and PIN" because PIN entry is usually required to verify the customer is the genuine cardholder. The EMV standard has been implemented in most developed countries, other than the U.S. In August 2011, Visa announced a phased EMV migration plan for the U.S. In January 2012, MasterCard announced its own EMV adoption program. Both programs incorporate similar incentives and timelines designed to encourage migration by processors and acquirers by April 2013, and retailers by mid-2015 (2017 for automated fuel dispensers).

[9] http://www.bos.frb.org/bankinfo/firo/publications/bankingpaypers/2011/mobile-payments-mapping.htm

Reserve, it reflected the general thoughts of the MPIW. These foundation principles are summarized below:

- Creation of an "open mobile wallet" that supports multiple payment options (credit, debit, bank account, prepaid/stored value, etc.) stored in a secure element in the phone, with broad payment and merchant marketing value options, such as rewards, coupons, and loyalty programs, enabling consumer choice.

- Use of NFC technology for contactless mobile payments at point-of-sale, along with enabling secure mobile applications. NFC must be based on industry standards, capable of supporting all payment methods and networks, and operable globally and in multiple venues (e.g. retail, transportation, ATM).

- Clearing and settling payments through existing channels (credit, debit, prepaid, ACH, mobile), but open to new channels**.** Existing payment mechanisms are the necessary foundation for the mobile payments platform to allow for mass adoption and consumer choice. New payment channels should be permitted but must be interoperable with the existing clearing/settlement system.

- Deployment of dynamic data authentication (DDA) as part of the security and fraud mitigation program for card-based mobile payment transactions. DDA generates a unique one-time cryptogram for each transaction, which is verified by interaction between the encrypted information on the chip and the network server when the transaction is authorized. Using contactless chip technology for mobile payments can reduce fraud because even if payment card information is stolen it cannot be used to make counterfeit cards or fraudulent online transactions.

- Development of mobile payment standards for the U.S. based on international standards and an industry-supported certification process to ensure domestic and global interoperability. The MPIW discussed potential gaps in standards for rules and best practices, and possible existing banking standards or rules that could be applicable to mobile phones with some modification. The payments business has well-defined groups that set standards, such as the American National Standards Institute and NACHA. Who would promote the adoption of the standards by the mobile payments industry is an open issue. Participants suggested that the U.S. consider working with existing mobile standards bodies, such as GSMA, GlobalPlatform, and NFC Forum, as appropriate, to identify gaps in coverage, and develop globally interoperable standards.

- Clarity of regulatory responsibilities among bank and nonbank regulators needs to be established early on, with input from the mobile stakeholders. While current regulations and rules may cover underlying payment methods, there is confusion because multiple regulatory agencies have responsibility for different aspects of payments and wireless transactions. Industry participants urged bank and nonbank regulators, such as the

Federal Communications Commission, the Federal Trade Commission and the Consumer Financial Protection Bureau, to collaborate to define the regulatory environment for all the participants.

For example, data privacy was a major concern. Complexities arise when different parties begin to share data. The potential marketing value of customer data when tied to mobile payments is significant. Data must be managed carefully to avoid potential abuse and unauthorized access to mobile payments data (e.g. transaction data, location-based data, etc.).

- Trusted Service Managers (TSMs) should manage and control the provision of secure elements in the mobile phone to control risk and ensure interoperability between mobile platforms. Although a broader role for the TSM was mentioned, the MPIW believed it was too early in the mobile payments evolution to consider this option.

Several major initiatives occurred after the paper was published in March 2011. First, the Federal Reserve and MPIW members began discussing the basic principles at payment industry conferences, and with payment trade groups, individual organizations, and regulators to collect feedback and escalate issues.

Second, to get input from a broader group of stakeholders, we invited several merchants, a prepaid card provider, debit card networks, a global mobile standards body, and consumer-focused organizations to the July 2011 MPIW meeting. The merchants raised several issues. They remain concerned about their business case – processing costs, investment in terminal upgrades, and cost of PCI compliance. Merchants would like to collect marketing data that will enable them to offer loyalty programs, customized coupons, and merchant rewards that provide consumers with a better shopping experience and increase sales. Because of the large capital investment, they would like to see a roadmap that clearly illustrates the industry direction for mobile payments, including mobile wallets.

Third, we created a sub-group to identify security pros and cons related to retail mobile payments that use contactless NFC (SIM, micro SD and embedded chip) or cloud technology. FRB Boston plans to publish a report of the findings later this year.

Current Status of the U.S. Mobile Payments Landscape

The volume of mobile Internet and remote purchases (m-commerce) is still small, but growing as the number of mobile applications increases, and more consumers own smart phones (about 45 percent adoption in the U.S. currently). As consumers have more opportunities to receive mobile coupons, discounts, rewards and location-based offers, the incentives to use mobile payments will further increase.

NFC contactless technology is being implemented in conjunction with several mobile wallet solutions at retail point-of-sale locations; however, alternatives to NFC do exist. QR codes[10] are in use at a few retailers for prepaid mobile purchases. Cloud technology, where payment credentials are stored on a secure file server that communicates with the merchant terminal for payment, rather than in a secure element on the physical mobile phone, is another emerging alternative. In the current mobile market, some of the large players continue to invest in NFC, others are developing wallets in the cloud, and still others are covering all bases by providing mobile services for both NFC and cloud. It is feasible that these technologies will co-exist in the mobile payment ecosystem.

Nonbanks are substantially influencing the evolution to mobile payments. In 2011, several commercial partnerships and joint ventures were announced for retail mobile wallet payments. Additionally, an online payment platform announced plans to enable brick-and-

[10] For mobile payments, QR codes are two-dimensional barcodes that can be read by smartphones with a mobile application to pay for purchases or receive mobile coupons.

mortar merchants to accept payments from its wallet accounts. The initial offering uses a mobile phone number, not a mobile phone. Several new entrants to the payment system are enabling small merchants to accept card payments using their mobile phones with a plug-in device and a mobile application, while others serve as intermediaries to handle payments for digital content billed directly to mobile carriers.

Some smartphones are being used for functions previously performed on personal computers. These devices became a game changer because they provided consumers with an interface to the web and many new applications. Consumers demonstrated their desire to use their smartphones for multiple functions, which led to even more new applications. The smartphone helped to build consumer experience and prepare the environment for mobile payments.

Next Steps

The Federal Reserve will continue to facilitate the dialogue among MPIW participants and other stakeholders and monitor progress in the evolution of mobile payments. The next MPIW meeting is scheduled for April 2012. This meeting, which will include bank and nonbank regulatory agencies, will focus on issues related to security, privacy, and consumer protection, and respective oversight responsibilities. Future MPIW efforts will focus on education that is needed to help consumers understand steps they can take to protect their mobile financial data, including using passwords to lock their devices to prevent access to sensitive data, mitigation tools that allow for remote device deactivation and wiping of data, and alerts of suspicious activity.

The Federal Reserve will continue to conduct research to better understand consumer needs, behaviors, and adoption plans related to mobile payments. In addition, the Federal Reserve plans to work with industry participants to identify potential gaps in security and fraud prevention, and potential mitigation strategies for the different mobile payment technologies (NFC versions and cloud). We plan to encourage the mobile stakeholders to work together to define the respective responsibilities of the various parties (e.g., the phone, mobile carriers, processors, banks, and settlement systems) to ensure robust end-to-end security, and to develop security rules and standards for eliminating or appropriately mitigating risks for mobile payments.

Conclusion

Collaboration among mobile industry stakeholders, the Federal Reserve, and interested government agencies through the MPIW has helped to educate diverse participants on different views and concerns around mobile payments, and awareness of the need for collaboration in certain areas, such as security and standards. Going forward, the MPIW will continue to provide a forum to discuss issues and barriers as they arise with an objective of more timely resolution. The MPIW enables proprietary innovation to occur, while promoting a shared framework for interoperability. Finally, working with mobile carriers, banking and payments industry participants, and government regulators, the Federal Reserve hopes to help mobile payments in the United States evolve in an efficient and safe manner and provide a convenient payment option to all consumer segments.

Thank you again for inviting me to appear today. I am happy to answer any of the committee's questions.