

# Creating an Integrated Payment System: The Evolution of Fedwire

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On January 1, 1999, the countries participating in the European Union are expected to adopt a single currency and monetary policy. To support the creation of an integrated money market and the conduct of a unified monetary policy, the European Monetary Institute (EMI) and the national central banks in the European Union are developing a new payment system, the Trans-European Automated Real-Time Gross Settlement Express Transfer (TARGET) system. TARGET will interlink the advanced payment systems that the central banks of the European Union have agreed to implement in their own countries. This linkage will enable the banking sector to process cross-border payments in the new currency, the euro.

As the European Union moves forward with TARGET, it is an appropriate time to reconsider the U.S. experience with Fedwire, the large-dollar funds and securities transfer system linking the twelve district Banks of the Federal Reserve System. (See the box for a brief overview of Fedwire.) Just as TARGET is designed to ease the flow of funds among financial institutions throughout Europe, Fedwire allows U.S. financial institutions

to send and receive funds anywhere in the country through accounts at their local Reserve Banks.

This paper traces the evolution of Fedwire from twelve separate payment operations, linked only by an interdistrict communications arrangement, to a more unified and efficient system. Our account highlights both the difficulties the Federal Reserve encountered as it sought to standardize and consolidate payment services and the lessons it drew from its experience. These lessons may prove useful to the European Union and to other nations undertaking a similar integration of payment systems.

## ORIGINS OF THE FEDWIRE SYSTEM

The motives for linking the payment systems of the twelve Reserve Banks in the early part of this century were not unlike the current goals of TARGET. Prior to and immediately following the creation of the Federal Reserve System in 1913, exchange rates governed payments across regions in the United States. Like foreign exchange rates under a gold standard, the regional exchange rates for the U.S. dollar moved in a narrow band established by the costs of shipping gold or currency—costs that included freight charges and the interest lost during the time it took for payments to be received (Garbade and Silber 1979, pp. 1-10).

## FEDWIRE: THE FEDERAL RESERVE WIRE TRANSFER SERVICE

The Federal Reserve Fedwire system is an electronic funds and securities transfer system. Depository institutions that maintain a reserve or clearing account with the Federal Reserve may use the system.

Fedwire provides real-time gross settlement for funds transfers. Each transaction is processed as it is initiated and settles individually. Settlement for most U.S. government securities occurs over the Fedwire book-entry securities system, a real-time delivery-versus-payment gross settlement system that allows the immediate and simultaneous transfer of securities against payments.

Operationally, Fedwire has three components: data processing centers that process and record funds and securities transfers as they occur, software applications that operate on the computer systems, and a communication network that electronically links the Federal Reserve district Banks with depository institutions.

To address the regional differences in the value of the U.S. dollar and their perceived negative effect on business, the Federal Reserve took two steps shortly after its establishment. First, to eliminate the transit costs in payments, the Federal Reserve created the Gold Settlement Fund. Thereafter, commercial banks could settle both intradistrict and interdistrict transfers through their local Reserve Bank, which in turn would settle with other Reserve Banks through the Gold Settlement Fund. The arrangement permitted interdistrict balances to settle through book-entry transfers—a method of effecting settlements whereby debits and credits are posted to accounts—and made the physical shipment of gold or currency unnecessary. Second, the Federal Reserve inaugurated leased-wire communications among the Reserve Banks and transferred funds daily over the wire at no cost to member banks. This practice eliminated the interest losses that occurred during the time it took to transfer funds. By 1918, these two services helped abolish regional exchange rates and formed the basic structure of the modern Fedwire system (Garbade and Silber 1979, p. 10).

## NEW CHALLENGES: FEDWIRE IN RECENT DECADES

Over the years, Fedwire grew more sophisticated as advances in technology were applied, but it remained structured as a system that linked twelve operationally unique units. The widely held view that each Reserve Bank could best serve the specific needs of institutions in its district helped to perpetuate a decentralized approach. In addition, because statutory prohibitions on interstate banking kept banks from crossing Federal Reserve districts, the lack of consistency in payment services was not regarded as a problem by many Fedwire participants.

Despite these considerations, by the 1960s the need to standardize services had become increasingly apparent to the Federal Reserve. The existing system for the interdistrict and intradistrict transfer of funds was inefficient. Although the payment units at the various Reserve Banks were required to originate and receive transfer messages using a common format, each unit maintained its own funds software, data processing center, and computer programmers. As a consequence, enhancements to Fedwire were time-consuming to execute; before a change could be implemented, the twelve individual systems and the electronic interlinks among them had to be tested. In addition, enhancements had to be introduced on a staggered basis, or a single cutoff date had to be worked out

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among all the Reserve Banks. Coordinating these efforts proved difficult. Along with creating inefficiencies, this multisystem environment introduced greater operational risk to the task of revising and upgrading services.

In response to these problems, a decision was made in the 1970s to develop standard software for each key

payment service. By the early 1980s, a standard software application had been developed for the Fedwire funds transfer service. The individual Reserve Banks then implemented copies of this application on their local mainframes. The single common application was more efficient to develop, maintain, and modify.

Unfortunately, during the 1980s, the standard software applications became increasingly less standard. To meet the perceived desires of local customers, the Reserve Banks made modification upon modification to the common applications. In addition to trying to satisfy customers, the Reserve Banks made changes to meet internal reporting and system interfacing requirements. The components altered at the local level ranged from peripheral aspects of Fedwire, such as the type of reports generated, to core elements of the system, such as communication links. The end result was an erosion of the standard applications and the introduction of the same problems experienced earlier. The system became difficult to update, and the risk of operational problems grew.

By the late 1980s, the Federal Reserve was aware of the limitations and potential problems created by the locally modified applications. At the same time the operations at the Reserve Banks were becoming more individualized, the need for standard services was becoming more pronounced. This need was particularly apparent from the perspective of Federal Reserve customers as the boundaries and distinctions between districts blurred. One reason for this blurring was that bank holding companies increasingly operated separate subsidiary banks in multiple Federal Reserve districts. In addition, as differences in business practices and financial markets in regions throughout the United States diminished, the demands of Fedwire customers became more homogeneous. Customers also became increasingly concerned about inequalities in the service provided to institutions in different districts.

It is important to note that the Reserve Banks never deliberately made Fedwire less customer friendly. In fact, the Reserve Banks modified their systems with precisely the opposite intention—to improve the services for

customers. Nevertheless, with twelve organizations working independently to improve their local service, a system arose that as a whole did not fully meet the needs of emerging regional and national banks. Business managers tried to address these problems by eliminating district modifications, but their efforts met with limited success.

Turning from Fedwire's electronic funds transfers to its securities transfers, we find even more striking inconsistencies in the services provided by different Reserve Banks. In fact, despite an effort to develop standard soft-

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ware, two completely distinct applications came into operation. The New York and Philadelphia Reserve Banks used software called BESS, designed as a high-speed application that could handle large volumes, while the other ten Federal Reserve districts used software called SHARE. Because local modifications were made to these two unique applications, the difficulties experienced for funds transfers were exacerbated for Fedwire securities services. In addition, during the 1980s, new types of securities, such as mortgage-backed obligations, were added to Fedwire at a rapid pace, creating the need to update and modify the system constantly.

The communication network linking the computer systems of the Federal Reserve Banks and depository institutions also presented problems. The network technology available in the 1960s was relatively inefficient. As a result, all Fedwire interdistrict messages had to pass through a single hub, in Culpeper, Virginia. In addition, if a district temporarily lost its connection to Culpeper, it could not communicate with the entire system.

In the 1980s, the Federal Reserve incorporated advances in network technology to address these shortcomings. A new network consisting of a common backbone with unique local networks was implemented. Each of the twelve Federal Reserve Banks maintained an independent local network; switch-routing software linked the networks for interdistrict messages. Although an improvement over the central hub model, this network configuration had its own weaknesses. In particular, the existence of twelve unique local networks greatly complicated the diagnosis and resolution of technical problems.

#### CURRENT STRATEGIES FOR CONSOLIDATING SYSTEMS

Recognizing the need for further refinements of Fedwire, the Federal Reserve is now standardizing and consolidating software, data processing centers, and communications networks for both funds and securities throughout the System. The software applications that were modified by the Reserve Banks to meet the needs of local customers are being replaced by a single application for funds transfers

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and a single application for book-entry securities transfers. In addition, the twelve district data processing centers and their four backup locations have been consolidated into three sites: one primary processing center for Fedwire and other critical national electronic payment and accounting systems, and two backup sites. The individual Reserve Banks will continue to maintain their own balance sheets, and customer relations will be handled locally. Although the conversion to a

more centralized system has gone very smoothly to date, the relationship of Fedwire customers to the Reserve Banks and consolidated processing sites is still in transition. Over time, it will become more difficult for Reserve Banks to maintain their technical expertise as responsibility for automated operations is ceded to centralized offices.

In addition to making these changes in software and data processing, the Federal Reserve recently converted the network linking computer systems at the Reserve Banks and depository institutions to a unified communications network with common standards and equipment. The new network, known as FEDNET, is linked with the main processing center in New Jersey and the two contingency centers and is used to process both transactions within a single district and those between districts. Because FEDNET has standard connection equipment at depository institutions, it simplifies diagnostic testing and provides improved service and enhanced disaster recovery capabilities.

#### BENEFITS OF CONSOLIDATION

Several important benefits should arise from the initiatives undertaken in recent years:

- The Federal Reserve will be able to provide uniform payment services throughout the country. Customers have repeatedly asked for standard services to eliminate unnecessary inconvenience and expense and to ensure that institutions are treated equitably regardless of their location.
- Redundant resources will be eliminated, and costs will be reduced. At the start of the year, with consolidation almost complete, the Federal Reserve was able to reduce the fee for Fedwire funds transfers by 10 percent. Given the competitive environment facing both the Federal Reserve and its customers, the ability to reduce costs without compromising the integrity of the system is of utmost importance.
- In the future, it will be possible to modify payment systems more quickly and with less risk.
- The designation of multiple backup facilities for critical payment systems will enhance contingency processing capabilities, while the move from twelve sites to one will improve security.

As noted, standardizing Fedwire should make it easier to modify the system quickly. In this regard, a number of changes are currently being implemented or considered. The message format for Fedwire funds transfers is being modified to make it similar to both the CHIPS and the S.W.I.F.T. message formats.<sup>1</sup> This change should provide significant efficiencies for customers by reducing the need for manual intervention when transactions are processed and by eliminating the truncation of payment-related information when payment orders received via CHIPS and S.W.I.F.T. are forwarded to Fedwire. Another change, scheduled to occur in December 1997, will expand the Fedwire funds processing day to eighteen hours. The extended hours will give customers additional flexibility and should create an improved environment for reducing foreign exchange settlement risk. The Federal Reserve is also studying extending the hours of the book-entry system. Most important, whatever changes the Federal Reserve elects to make, they will be easier to implement in a standardized and consolidated environment.

Introducing changes such as these should also be easier because the management of Fedwire services has been centralized along with the automated operations themselves. Payment personnel started out with a diffuse management approach that relied on a series of committees with representation from each Reserve Bank. They have now structured management responsibilities by establishing systemwide product offices for wholesale payments, retail payments, cash, and fiscal services. These offices report to a six-member policy committee made up of presidents and first vice presidents from the Reserve Banks. The product offices also consult with Reserve Bank staff and staff of the Board of Governors of the Federal Reserve System, as well as other interested parties.

The Federal Reserve has coordinated its consolidation of the payment system with changes in Reserve Bank risk management designed to meet the challenges of a rapidly evolving financial landscape. For example, with the elimination of barriers to interstate banking in June of this year, each interstate bank will be given a single account at the Federal Reserve. Thus, even though a bank based in San Francisco might have a branch in New York City making payments and transferring

securities over Fedwire, those transfers will be posted to the books of the San Francisco Reserve Bank. This arrangement allows a single risk manager at the Reserve Bank with the primary account relationship to monitor the Reserve Bank's credit exposure to a particular customer. In connection with this change, efforts are also under way to improve the Reserve Banks' risk management by developing standard operating procedures for lending at the discount window and by setting uniform standards on the acceptability and valuation of collateral for securing credit from the Reserve Banks.

#### LESSONS FROM THE U.S. EXPERIENCE

Three major lessons have emerged from the Federal Reserve's experience with Fedwire. First, an effective payment system must be able to respond to changes in financial markets and technology. It must be flexible enough to adapt in many areas, including software applications, data processing, networking, account relationships, risk management, and management structure. Moreover, any modifications must be handled effectively from the

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perspective of both the central bank and its customers. The central bank's responsiveness to change is especially important when the bank operates in conjunction with private-sector payment and settlement mechanisms. If the central bank is unable to adapt its services, it may perpetuate risks and inefficiencies in the market.

Second, central banks are likely to feel pressure to meet the evolving demands of customers and internal constituents. Unless these pressures are managed, central banks may respond by modifying systems locally. The resulting differences may compromise the effectiveness and adaptability of the system as a whole. The local differences may also influence where a banking organization chooses to locate or how it elects to structure its operations.

Finally, a central bank must consider how customers will evaluate its payment services and policies relative to alternative payment mechanisms. Payment services are, of course, a banking business. If the potential response of customers is not given adequate consideration, a market reaction could occur that is inconsistent with the central bank's business or policy objectives. If a central bank makes its systems too expensive or difficult to use, or does not provide the services market participants demand, customers may well go elsewhere. The implications of such a

development must be carefully considered.

This paper has outlined some of the challenges the Federal Reserve has faced in establishing a payment system and the ways in which it has responded. To be sure, this response is still evolving. As the countries participating in the European Union develop their own integrated payment system, they will undoubtedly find unique solutions to the problems they confront. Nevertheless, the Federal Reserve's experience with Fedwire may serve as a helpful reference in the European effort.

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## ENDNOTES

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1. CHIPS (Clearing House Interbank Payments System) is a private funds transfer system that settles on a net basis through the Federal Reserve Bank of New York. S.W.I.F.T. (Society for Worldwide Interbank Financial Telecommunication) is a private network for transferring payment messages; the exchange of funds (settlement) subsequently takes place over a payment system or through correspondent banking relationships.

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## REFERENCES

*Garbade, Kenneth D., and William L. Silber, 1979. "The Payment System and Domestic Exchange Rates: Technology Versus Institutional Change." JOURNAL OF MONETARY ECONOMICS 5: 1-22.*