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## Building the LVTS

### **The Magnitude of the Task**

The design and construction of a new national system for the transfer of large-value payments is a major endeavour, as is clearly suggested by the remarks made in the CPA Board and in its Senior Planning Committee. Don Marcotte of the Bank of Nova Scotia, the Board member who eventually became the “project owner” for the LVTS initiative, said that it looked like a “juggernaut.” (In ancient Hindu mythology, the juggernaut was a huge vehicle under which religious devotees would be thrown during an annual festival.) On another occasion, during an informal planning session in 1989, the CPA Deputy Chairman told the Board that “the scope of the project is at least as large as everything that the CPA has achieved since 1980.”

Behind these cautionary remarks was the fact that a contemporary electronic LVTS must include a number of complex and interlocking components. There must be a telecommunications network that allows participating financial institutions to send payment messages to each other securely and reliably. There must be an arrangement similar to the ACSS, in other words, a computer system that keeps track of the value flows embedded in the messages and continually calculates various cumulative positions for each participant. There must be a way of settling the obligations created by the payment activity of each day, together with a process to handle the situation in which a particular institution is unable to settle. The treatment of default will, in turn, influence the criteria under which an institution gains access to the LVTS and becomes a direct participant. In Canada, such essential elements must be described in a CPA by-law and must receive the approval of the appropriate federal authorities. Lastly, the computer systems must be designed, built, and successfully tested. Even under optimal circumstances (i.e., when the necessary understanding and consensus of the many relevant parties involved are already present), the creation of a national LVTS is likely to take four or five years.

## Convincing the Banks

The LVTS project posed a number of problems for the Canadian banking community and, hence, for the directors elected to represent the banks on the CPA Board. First, the various risks to direct clearers inherent in the default provisions of the existing clearing arrangements were esoteric matters understood only by specialists in the major institutions. The task of convincing more senior colleagues that the CPA should spend substantial sums on an LVTS to reduce these risks was not an easy one.

Second, some bankers considered that Canada already had a large-value transfer system; namely, the Interbank International Payments System (IIPS), which used procedures established by the Canadian Bankers Association. The IIPS had been operating since 1976, using the SWIFT<sup>1</sup> telecommunications network, but without central calculations of positions. Until 1991, each IIPS transfer was settled individually via the traditional clearing arrangements—and in a default situation each transfer could be reversed.

Third, it proved difficult for the banking community to accept the necessity of a collateralized risk-control structure. (In such a structure, each participant could, for example, be constrained such that no payment would pass the risk-control tests if that payment would cause the net amount owed by the institution to all the other participants to exceed a certain amount—an amount covered by collateral pre-pledged to the system and ready to be used in a default situation.) The increasing use of liquid securities that were owned by banks, but either lent to other institutions or sold under repurchase agreements, meant that the amount of the banks' liquid assets that could be pledged in the LVTS context had been noticeably reduced. Moreover, the opportunity costs that would be associated with increases in suitable liquid assets were perceived by several banks to be substantial.

Fourth, the banks were uneasy about the concept of a new system for which the access criteria would be quite broad. The IIPS had both a volume criterion and, for many years, a requirement that a participant had to be a domestic bank or the subsidiary of a foreign bank. In the opinion of the banks, any new system that took over the activity of the IIPS (primarily the large daily flow of interbank payments used to settle transactions involving the sale and purchase of foreign exchange) should maintain the membership relevant for that internationally oriented context.

The log-jam finally broke in 1992 at a CPA Board meeting in Regina, when agreement was reached in principle to pursue an LVTS that would involve the telecommunications arrangements of the IIPS, together with

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1. Society for Worldwide Interbank Financial Telecommunication.

three enhancements: a multilateral cap on exposure; a risk-sharing formula; and the integration of the IIPS under CPA by-laws and rules, including equitable access criteria. Several elements combined to attract the support of all the classes of members. For example, the Board had recently received a detailed business case for an LVTS that relied on existing facilities such as the ACSS and SWIFT, showing that an adequate system could be put in place for about \$7 million, and that the project could pay for itself in under three years.<sup>2</sup> The Board was also increasingly aware that the still-paper-based system for large-value payments in Canada was lagging behind the electronic mechanisms operating in the United States, the United Kingdom, and other trading partners, with a consequent negative effect on our international competitive position in both trade and finance. Lastly, senior officials, such as the Governor of the Bank of Canada, were saying in informal meetings and in public, “We need to get on with it.”<sup>3</sup>

## Gaining Regulatory Approval

In late 1992 and early 1993, three working groups of Board members articulated the risk-control characteristics, the access criteria, and the systems-development plans for the LVTS. With respect to risk control, the thought within the CPA was strongly influenced by the mechanisms that had been built into the large-value transfer system in New York called the Clearing House Interbank Payment System (CHIPS), in which participants’ contributions in the event of a default were calculated as a function of their regularly declared credit assessments of each other. In addition, CHIPS was a net settlement system, one that used early evening transactions with the central bank to extinguish the settlement obligations of those participants in a net debit (i.e., disbursement) position for the day as a whole. The Canadian extension of these ideas involved the use of two categories of LVTS transfers: those in Tranche 1 and those in Tranche 2. Any transfer in Tranche 1 had to be fully covered by collateral pre-pledged by the sending institution to the Bank of Canada. For transfers in Tranche 2, each participant’s maximum permitted net debit position was covered by a collateral pool. Before daily operations commenced, each institution had to pledge securities to the central bank equal to a certain percentage (about 25 per cent) of the largest bilateral line of credit it had extended to any other LVTS participant. As the day proceeded, an institution could not send a Tranche 2

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2. B. Kelman, J. Tullett, and J. Dingle, *The LVTS Using Existing Structures*. Unpublished document prepared for the Banff meeting of the CPA Board of Directors (September 1991).

3. J.W. Crow, “What Makes a Good Payments System?” Remarks to the Third Annual Conference of the Canadian Bankers Association, 18 June, 1992. Montréal, Quebec. Reprinted in *Bank of Canada Review* (June 1992): 11–16.

transfer that would result in its multilateral net debit position becoming greater than the same percentage applied to the sum of the bilateral lines it had received from other participants that morning. The collateral pool was thus always sufficient to cover the negative position of the participant with the largest permitted net debit.<sup>4</sup>

With respect to access criteria, the CPA took advantage of the two-tranche arrangement in the LVTS to allow a relatively broad set of participants. Since a participant experiencing financial difficulties could continue, if necessary, to function on a self-collateralized basis by sending only Tranche 1 transfers, there was no need to restrict access to the LVTS to those CPA member institutions that satisfied some sort of financial-strength criterion. Only technical criteria such as the capacity to use SWIFT were necessary.

On 25 March 1993, the basic characteristics of the LVTS were put before senior representatives of the four relevant Ottawa agencies (Department of Finance, Bank of Canada, Canada Deposit Insurance Corporation, and Office of the Superintendent of Financial Institutions) at a special meeting of the CPA Board in Toronto. The proposed characteristics were summarized as follows: (i) The SWIFT telecommunications network will be used to send electronic credit-transfer messages. (ii) Risk-control mechanisms will be applied to each and every payment throughout the day. (iii) The risk-control mechanisms will be such that any loss caused by a defaulting institution will be fully covered by collateral put up by the defaulting institution and the surviving institutions. (iv) Certainty of settlement will be provided for each payment immediately on passing the risk-control tests, and same-day settlement with finality will take place in the early evening at the Bank of Canada. (Subsequently, while the LVTS was under construction, the Bank of Canada agreed to guarantee completion of the daily settlement process in the rare circumstance of a multiple default on the same day.)<sup>5</sup> These characteristics would make it possible for CPA member institutions to offer finality of payment to their customers.

Three months later, in July 1993, a letter signed by executives of the four agencies was delivered to the Chairman of the CPA, stating, "We are in agreement with the broad characteristics proposed for the LVTS." The letter noted that the use of net sender limits, prespecified loss-allocation procedures, and the pledging of collateral would mean that the LVTS would meet the relevant international "Lamfalussy" standards published by the

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4. See J. Dingle, "The LVTS—Canada's Large-Value Transfer System." *Bank of Canada Review* (Autumn 1998): 47.

5. Bank of Canada, *Annual Report of the Governor to the Minister of Finance* (Ottawa: Bank of Canada 1996), 20–22.

Bank for International Settlements.<sup>6</sup> The proposed access criteria were judged acceptable because the full range of financial institutions involved in the payments system found them workable. It was anticipated that the access criteria, together with the details of the netting mechanism, would be contained in a CPA by-law to be approved by Governor-in-Council; i.e., by the Cabinet of the federal government. (This legally significant event occurred almost five years later.)

## **The Construction Phase**

Since the basic characteristics of the LVTS involved the application of risk-control tests with respect to each and every payment message, it would be necessary to establish (or hire) a central computer facility for the CPA. The chosen telecommunications network and the central facility would also have to be linked. (At that time, SWIFT was offering a service to national systems by which an automated copy of each payment message could be forwarded to such a facility; this was found to be workable for the LVTS.) The particular user specifications for the system—for example, those of each major deposit-taking institution, those of the CPA as the LVTS operator, and those of the Bank of Canada as the national monetary authority—had to be assembled. This process alone was viewed as likely to take as long as 18 months. Fortunately, the CPA succeeded in obtaining the assistance of Fredda Cole, a person of remarkable energy and intellect, to marshal the distinctly heterogeneous user needs and mould them into a workable whole. Her documentation of user needs and the system specifications that addressed them ran to several hundred pages.

The CPA selected a suitable systems-development company by the usual request-for-proposal process, and in April 1996, the General Manager signed a contract worth over \$10 million with DMR Group Inc. to both build the LVTS software and join with CDSL Limited in providing the operating platform. As is so often the case in large-scale systems-development projects involving many parties, the fixed-price contract took longer to complete than either side anticipated, and required significantly more resources. But, in the end, the development of the LVTS was completed in a satisfactory manner. Moreover, it was subsequently nominated for a Computerworld Smithsonian Award for the use of technology to produce educational, social, or economic benefits.

The development costs of the LVTS, which were initially paid by the CPA members at large as part of their annual dues, were recorded for later

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6. Bank for International Settlements, *Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries* (Basel: BIS, 1990).

reallocation over a five-year period to particular members on the basis of the recorded volumes of LVTS messages received and sent by each institution. The total costs so accumulated were \$14.9 million. Of this amount, the portion relating to software development was about \$7 million.

The LVTS commenced full-scale operations on Thursday, 4 February 1999. On that first day, the value of payments moving through the system exceeded \$90 billion, in some 11,400 transactions. Within a year, the value of paper cheques and other traditional payment items cleared through the ACSS had declined by two-thirds, to about \$20 billion per day.

### **Adjusting the Daily Implementation of Monetary Policy**

The procedures used by any central bank to transmit the thrust of monetary policy into the short-term financial markets are closely linked to the national system (or systems) through which payments clear and settle. This reflects the fact that the very-short-term decisions of major banking institutions regarding the management of assets and liabilities are largely driven by their expected—and unexpected—clearing gains and losses. As early as 1995, the Bank of Canada had begun the public process by which a new way of implementing monetary policy in the LVTS context could be determined, issuing the first of two discussion papers on the subject.<sup>7</sup> The Bank of Canada refined the procedures in the light of comments received, and the revised documents were published in time for the procedures to go into effect on the first day of LVTS operations in February 1999.

The central features of the new approach as initially implemented can be described as follows: From time to time, the Bank of Canada would announce changes in its 50-basis-point operating band for the overnight (i.e., one-day maturity) interest rate; this occurred at 9 a.m. via a press release.<sup>8</sup> The upper limit of the band was the Bank Rate—the rate charged for overdraft loans to LVTS participants still in a negative position during the early evening settlement process. The lower limit of the band was the rate paid by the Bank of Canada on positive LVTS balances left by participants at the central bank overnight. In the broader money market, overnight interest rates would typically stay within the same 50-basis-point band because of the arbitrage opportunities available to LVTS participants whenever an extraordinarily high or low rate was spotted.

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7. Bank of Canada, “A proposed framework for the implementation of monetary policy in the Large Value Transfer System environment. Discussion paper 1,” *Bank of Canada Review* (Winter 1995–96): 73–84.

8. The practice of using previously announced fixed dates for such actions began in December 2000.

As a general rule, the Bank of Canada planned to conduct daily transactions involving the LVTS to set the total level of LVTS settlement balances at essentially zero. These transactions would, for example, offset the net amount of federal government revenues and expenditures flowing over the LVTS. The various LVTS participants, being aware of this procedure, could confidently enter into transactions with each other so as to even out long and short LVTS positions during the half hour following the general closing time but still before the final settlement process.<sup>9</sup>

Although the ACSS continued to operate in the LVTS era, the great majority of the value of federal government receipts and disbursements, as well as most transactions related to the financial markets, were rerouted through the LVTS. As a result, the LVTS became the sole focus of monetary policy operations. Nevertheless, a significant flow of cheques and other traditional payment items was still cleared via the ACSS and still settled on the books of the Bank of Canada about noon on the business day following the physical exchanges of such items. The relevant settlement entries in the accounts of the direct clearers held at the central bank continued to be made on a “retroactive” basis; i.e., back-dated to the preceding business day when the exchanges of payment items had occurred. For any one direct clearer, the retroactive clearing result could—despite good forecasting techniques and special transactions to locate settlement balances appropriately—involve occasionally large adverse surprises and the need to take correspondingly large overdraft advances from the central bank. For several years, the rate charged on ACSS overdrafts was substantial, being 150 basis points over the Bank Rate. This pricing policy of the Bank of Canada encouraged CPA members and their customers to use the LVTS rather than cheques wherever possible. The more that Canada’s payment flows were cleared and settled with finality over the LVTS, rather than via the ACSS, the lower would be the residual risk in the Canadian payments system.<sup>10</sup>

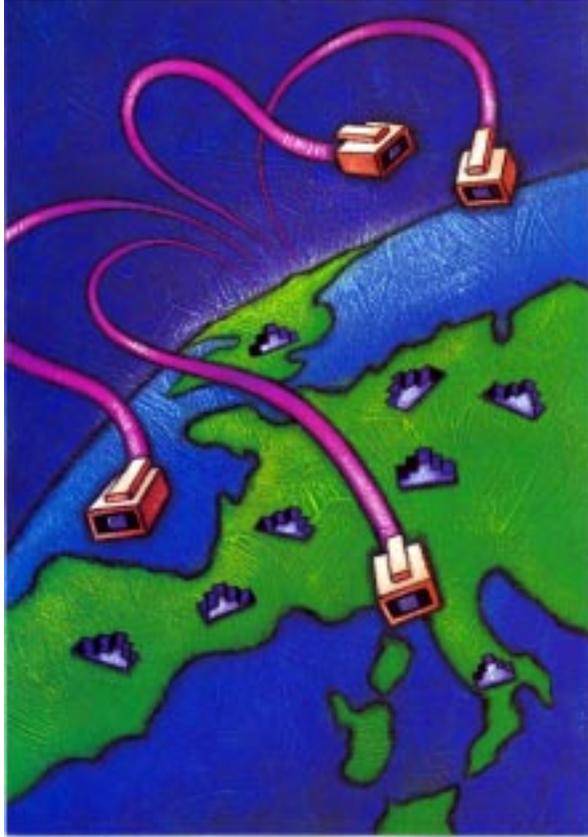
## **The LVTS in the Domestic Context**

The LVTS contributed significantly to the soundness of other parts of the Canadian financial system. For example, the LVTS was used by the participants of the Debt Clearing Service (DCS) operated by the Canadian Depository for Securities Limited. At the close of business each day, those DCS participants that were required to make payments to the depository sent

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9. D. Howard, “A primer on the implementation of monetary policy in the LVTS environment.” *Bank of Canada Review* (Autumn 1998): 57–66.

10. In 2003, the CPA accelerated this migration by instituting a maximum of \$25 million for individual cheques passing through the ACSS clearings.



the payments via the LVTS to the Bank of Canada, which served as the settlement agent or “banker” for the DCS. Conversely, all participants that were entitled to receive payments received them from the Bank of Canada (on behalf of the depository) via the LVTS. The ability of DCS participants to receive and send final payments promptly and efficiently, with no overnight risk (as existed with cheques), implied a major strengthening of the risk-containment mechanisms in the securities markets. The relationship between the LVTS and the DCS was complementary, because the DCS provided the securities-pledging facilities required for the risk-control features of the payments mechanism.

### **The LVTS in the Global Context**

The strong orientation of the LVTS to the settlement of foreign exchange transactions and to cross-border payments was regularly observed whenever the major payments systems in the United States were closed for a holiday that was not observed in Canada. On such days, the value of LVTS transactions generally dropped by over half. Accordingly, the LVTS was viewed by both Canadians and foreigners as an important component of the global payments infrastructure, handling the large-value transactions denominated in one of the world’s major trading currencies. It was therefore of some significance that the LVTS differed noticeably from most of the other national systems for large-value transfers that were established in the 1990s. The LVTS was a deferred net settlement system (with one entry per participant per evening on the books of the central bank), as opposed to a gross-settlement system (in which every transaction led simultaneously to adjustments in two settlement accounts at the central bank). Canadian central bankers expended considerable effort in convincing the international community of financial authorities that the LVTS did, in fact, provide the highly desirable properties of well-designed large-value payments systems; namely, certainty of settlement and intraday finality. This positive perception of the LVTS was subsequently confirmed in 1999 in the Financial Sector Stability Assessment of Canada conducted by the International Monetary Fund. The IMF judged that the LVTS was in “full compliance” with the Core Principles for Systemically Important Payment Systems.<sup>11</sup>

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11. International Monetary Fund, *Report on the Observance of Standards and Codes - Canada* (Washington: IMF, 2000).

In 2002, the LVTS came to be used for Canadian-dollar transfers within the new global arrangements for the settlement of foreign exchange transactions, a process called Continuous Linked Settlement.<sup>12</sup> This innovation required a significant extension of the operating hours of the LVTS in order to support some 100 time-critical transfers among several scores of large institutions taking place between the early hours of 1 a.m. and 6 a.m., Monday through Friday. The staff of the CPA responsible for the smooth operation of the LVTS was necessarily reorganized to function on what was virtually a 24-hour-a-day basis. There could hardly be a more concrete indication of the globalization of the national payments system.

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12. See J. Dingle, *The Elements of the Global Network for Large-Value Funds Transfers*. Bank of Canada Working Paper No. 2001-1. (2001), 14–15.