The Impact of Participant Outages on Canada's Large Value Transfer System

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Each business day, about 15,000 payment messages, with a total value averaging $114 billion, flow through Canada's Large Value Transfer System (LVTS). The Bank of Canada and 13 deposit-taking financial institutions participate directly in the LVTS.[1] It is owned and operated by the Canadian Payments Association (CPA).

The LVTS functions smoothly because, on most days and for most participants, inflows and outflows tend to be roughly offsetting. This, together with the legally enforceable netting of payments, as well as intraday borrowing backed by collateral held at the Bank of Canada, reduces participants' intraday liquidity requirements. If an LVTS participant was unable to send payments to other participants because of an outage of its own internal systems, the payment flows of other participants and of the LVTS as a whole might be disrupted and could be made only at greater expense (because of increased collateral requirements).

Lengthy outages in the computer systems or telecommunications systems of LVTS participants are infrequent. Between June and August 2002, seven outages occurred. Four were resolved fairly quickly. However, one lasted one and a half hours, and two lasted for just over two hours. The potential effects of disruptions to the flow of payments in the LVTS increase with the length of an outage. It is therefore important that participants have reliable backup systems that they can switch to quickly if primary systems fail. It is also important that procedures are in place to deal with participant outages in order to limit their impact on the payments system as a whole.

In this article, a simple illustrative model is used to describe how a participant outage affects the payment flows of other participants and of the LVTS as a whole. The model is then used to provide an indication of the effect of an actual participant outage on the LVTS. The procedures that are currently in place to deal with the potential problems raised by participant outages are also described. When an outage occurs, it is important that these procedures be implemented quickly.

How Does a Liquidity Drain Occur?

Consider an outage that prevents a participant from sending payment instructions to the LVTS. Payments sent to that participant by other participants will continue to pass through the LVTS until those participants take specific action to delay payments or until sending additional payments would violate the LVTS's risk controls. These payments will be recorded as a "credit" to the position of the problem participant. If this position becomes sufficiently large, substantial liquidity could be drained from the system.

The LVTS has two separate payments streams. In the first stream (called Tranche 1 or T1), the sender, in effect, fully collateralizes each payment sent through the system. In this article, we focus on the second stream (Tranche 2 or T2), because it accounts for about 90 per cent of the value of payments sent through the LVTS and because it is the stream for which the issue of liquidity drains is most relevant. To support payment flows, T2 relies on intraday credit extended between participants, a collateral pool, and robust risk controls rather than on

1. For more information on Canadian payments systems and the structure of the LVTS, see the Bank of Canada's Web site at http://www.bankofcanada.ca/en/payments/mainpage. The LVTS is a multilateral netting system. Payments made during the day through the LVTS are final and irrevocable. The risk-control mechanisms in the LVTS ensure that it will be able to complete settlement in all circumstances at the end of each day.

full collateralization by the sender of a payment. Payments sent via T2 are as protected from risk as those sent by T1. When sufficient credit is available to them, LVTS participants generally choose to send payments via T2 because the collateral requirements are lower.

To contain the risk in the T2 stream, each payment sent via T2 during the day must pass certain risk controls. A hypothetical example, outlined in Table 1, uses five financial institutions to demonstrate how the risk controls and multilateral netting mechanism in T2 function. Two types of risk controls (explained below) are applied to each payment sent through T2: bilateral credit limits (BCL) and T2 multilateral net debit caps (T2NDC).

Each participant can grant each other participant a BCL. The BCL granted by one participant to a second participant represents the maximum net debit (or negative) position that the second participant is allowed to incur with respect to the first. This BCL can also be viewed as the maximum positive balance that the first participant will allow with respect to the second. For example, in Table 1, A has granted a BCL of 30 to B and a BCL of 50 to C. Thus, B's bilateral net debit position with respect to A cannot exceed 30 and C's negative balance with respect to A cannot exceed 50.

The first step in calculating a participant's T2NDC is to add the BCLs granted to that participant by all other participants (e.g., for A, this is equal to 25 + 45 + 60 + 65 = 195). This sum is then multiplied by a "system parameter" to calculate each participant's T2NDC. (In Table 1, this is 0.24, the system parameter currently used in the LVTS.) The T2NDC represents the maximum allowable T2 negative position that results from one participant's flow of payments to and from all other participants. In the case of A, for example, the T2NDC is 47.

Because of the offsetting nature of payments in a multilateral netting system, a relatively small T2NDC (i.e., much smaller than the sum of the BCLs) can support a large number of payments. The greater the power of multilateral netting is, the more the sum of the BCLs can be scaled down by the system parameter without impairing the smooth flow of payments through the LVTS. The CPA has chosen a small system parameter (which results in smaller T2NDCs) that still allows payments to flow smoothly, because

Table 1

Risk Controls and the Multilateral Netting Mechanism in T2 of the LVTS: An Example

		BCL granted to:					Sum
		A	B	C	D	E	
BCL granted by:	A	x	30	50	60	70	210
	B	25	x	60	50	70	205
	C	45	60	x	300	300	705
	D	60	75	250	x	500	885
	E	65	60	250	500	x	875
Sum of BCLs		195	225	610	910	940	
X							
System parameter		0.24	0.24	0.24	0.24	0.24	
=							
T2NDC		47	54	146	218	226	

this reduces the collateral requirements of LVTS participants.

Suppose that, at the beginning of the day, participant A (a small financial institution that grants and receives relatively small BCLs) is unable to send payment messages because of a technical outage, but continues to receive payments from other participants. In this example, B can send a maximum of 30 (the BCL) to A, C can send a maximum of 50, and so on. Thus, participant A can drain 210 in liquidity from other participants—i.e., the sum of BCLs granted by A. Participants B, C, D, and E, however, each retain the ability to send payments to each other (e.g., given that B has sent 30 to A and since B's T2NDC is 54, B can still send up to 24 to C, D, and E). The outage at participant A drains liquidity from other participants, but they retain the ability to send and receive T2 funds.

Now, suppose participant E (a large financial institution that grants and receives relatively large BCLs) has an outage. The BCL that E has granted to A is 65; however, A's ability to send 65 to E is constrained because its T2NDC is smaller than the BCL. Participant A can send a maximum of 47, its T2NDC, to E. The same situation applies for B, C, and D. In this worst-case scenario, E has drained all T2 liquidity from other participants because their T2NDC prevents them from making any payment to any other participant.

The Potential Impact on the LVTS of Participant Outages

Both large and small financial institutions participate in the LVTS. If a small LVTS participant experiences an outage, and other participants continue to send payments to the problem participant until their BCL or T2NDC is reached (i.e., a worst-case scenario), that participant could drain about 15 per cent of the T2 liquidity of other participants. An outage at one of the large participants in the LVTS, however, could theoretically drain about 85 per cent of T2 liquidity from the system.

In practice, this worst-case scenario is unlikely to ever occur because other participants would eventually stop sending payments to the problem participant. Nevertheless, if there was an outage when a large participant had already built up a large positive balance in the LVTS, a substantial liquidity problem would result, because that participant would be unable to recycle liquidity back to other participants. If that participant continued to receive LVTS funds without being able to send LVTS payments for a considerable length of time, it would continue to drain liquidity. In actual practice, an outage lasting several hours at a large LVTS participant might quickly drain on the order of 30 to 40 per cent of the total T2 liquidity that exists in the LVTS. Other participants would still be able to divert payments from the T2 stream to T1, but this is much more expensive because it requires more collateral.

How Does the CPA Limit the Consequences of Participant Outages?

The LVTS has several mechanisms in place to address this issue. They are designed to make the consequences of a participant outage much less severe than the worst-case scenarios described above.

First of all, there is an expectation among LVTS participants that participants should be able to resume payment operations within two hours of a technical failure, although this is not currently incorporated into the LVTS rules. This should limit the length of time during which a participant with a problem could drain funds from other participants. The Bank of Canada has noticed a tendency among LVTS participants with outages to prefer to try to restore their primary systems, rather than switching to backup systems, since they hope that the primary-system outage can be resolved within two hours. However, if primary systems cannot be restored fairly quickly, an outage could persist for several hours before a decision is taken to transfer operations to backup systems. Additionally, once this decision is made, it can take up to two hours to begin operations at backup facilities. Thus, a stronger incentive for participants to resume processing within two hours, perhaps by incorporating this requirement within LVTS rules, might be beneficial.

Equally important, under the CPA rules, an LVTS participant with a technical outage is required to notify the system operator immediately. The system operator then notifies other participants, so that they can choose to temporarily stop sending payments to the affected participant until the problem is resolved. By doing this, other participants can monitor and preserve their liquidity.

As noted above, lengthy participant outages are infrequent, but they do sometimes occur and, on rare occasions, it may be difficult to resolve the problem in a reasonable length of time. Use of reliable backup processing capabilities that can restore payments processing within a maximum of two hours is important. Moreover, tighter domestic and international requirements regarding time-sensitive payments are shortening the acceptable duration of participant outages.[2] When a participant outage does occur, it is important that the participant follow the CPA rules and notify the CPA promptly in order to prevent the buildup of liquidity at the failed participant and a corresponding drain of liquidity from other participants. This will minimize the impact of such outages on the payments system as a whole.

2. See “The CLS Bank: Managing Risk in Foreign Exchange Settlements,” on page 41.