

# DTCC

## Interruptions in Processing Clearance and Settlement- Systems Outage



*The Depository Trust &  
Clearing Corporation*

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# Introduction

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DTCC is recognized as an industry leader in system reliability, contingency planning and disaster recovery. As part of its ongoing efforts to increase resiliency and reliability, DTCC has looked into several worst-case scenarios of systems outages that, however unlikely, are within the realm of possibility.

DTCC has prepared the following document to illustrate what a participant can expect in the event DTCC experiences an interruption in daily processing as the result of a protracted system software failure.

In such a case, DTCC will attempt to restore normal processing as quickly as possible and will resume processing from the point of failure once the affected systems are restored. DTCC will strive to run systems to normal completion and will create and distribute, perhaps later than scheduled, completed results of that day's processing before beginning the next logical business day.

The discussion in this paper, however, is focused on a scenario where DTCC experiences a severe system software failure and cannot recover within the same calendar day. This document describes the steps DTCC will put in place if settlement were to occur outside of normal business hours as the result of an extended systems outage. Specifically, it describes the settlement processing that DTCC will enact if it were to experience a systems outage severe enough to prevent completion of settlement within the calendar day resulting in the settlement process "failing over" to the following day in the early morning. In the event that settlement is delayed to this extent, DTCC would expect all parties involved to remain available until settlement has completed.

DTCC has addressed the ability to recover from a regional failure of a data center in a separate document. That document discusses the procedures that would be followed if and when DTCC has determined it must activate one of its out of region data processing centers. In the event of a failover to an out-of-region data center, DTCC will resume critical data processing operations within the required 2-hour timeframe. Additional information specific to the activation of the out-of-region data processing centers is available on line at <https://login.dtcc.com/dtcorg/members/page25205.html>.

Questions or comments regarding the topics in this paper may be directed to your Relationship Manager.

# Highlights

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## *Operational Considerations*

### **PARTICIPANT INPUT**

Any transactions received prior to the system outage will be processed once the system is recovered. DTCC will support a brief extended period for additional input, including a reclaim period, before DTC initiates the settlement process for the day of the outage.

### **PARTICIPANT OUTPUT**

Participants must analyze the ramifications of severe delays in receiving certain output from DTCC.

### **INVENTORY MANAGEMENT SYSTEM (IMS)**

The Inventory Management System will automatically resubmit any transactions not settled on an interrupted business date, providing relief to participants who already use the re-introduced drop service.

### **SETTLEMENT PERSONNEL**

To facilitate the resumption of processing as quickly as possible and to minimize delays to the start of the next business day, settlement personnel at participants and settling banks will be expected to remain available for as long as necessary and through the completion of settlement.

### **MONEY MARKET INSTRUMENTS (MMI)**

DTC's current MMI system automatically processes Maturity Presentments (MPs) at the start of the DTC day cycle (approximately 1 a.m.). MPs are presented against the Issuing and Paying Agent's (IPA's) DTC account, and represent credits to the MMI holders and debits to the IPAs. The MMI issuance transactions that generally offset the MPs occur throughout the processing day. If IPAs are required to pay the debits associated with MPs without realizing the credits associated with issuances, the result could be an increase in the number of MMI issuer failures. To mitigate this risk, DTC will provide a "processing window" for IPAs to process new issuance transactions after the system is recovered. (It is important to note that this processing window could be in the following calendar day.) At the end of the processing window, DTC will settle all participant balances. Again, this could occur on the following calendar day.\*

\* In the event of an outage affecting the Fedwire money transfer system, DTC might have to "roll over" MMI processing into the following day. In such an event, DTC would have to suspend all settlement balances, including those related to MMI activity, and roll the balances into the next business day. At the start of the next business day, DTC would automatically process the MPs scheduled to mature on that day. This will allow IPAs to process issuance transactions and net and/or aggregate the settlement proceeds with the settlement balances suspended from the prior day. At the end of the second day, DTC would perform a single settlement representing two days of activity.

## *Systems Considerations*

### **"WALL CLOCK" DEPENDENCY**

If system schedules are delayed past midnight, applications that use the system date instead of an application-based processing date can introduce business-logic errors (reclaims, fail-tracking, due-bill interest calculations, or even edit rejects). At DTCC, all systems have been reviewed and modified to ensure that no application problems will result if the schedule is delayed beyond the midnight hour. Participants will need to determine whether they have internal "wall clock" dependencies that could cause problems.

## SYSTEM DEPENDENCIES

Participants' systems may have dependencies on certain files from DTCC. Participants should assess such dependencies and determine the systemic impact of waiting on delayed files.

### *Financial Issues*

Participants may rely on their DTC credit to fund a third party. In the event that DTC is unable to process settlement, participants may need to find alternate sources of credit.

### *Communication during an Outage*

DTCC has implemented a plan for communicating with participants in the event of a significant systems outage. Features of this plan include:

- **Communication Vehicles**

In the event of an outage, DTCC will make hourly updates available via the Web that review progress on resolving the systems issues and its communications with all relevant industry organizations, regulators and the FRBNY.

- **Open Call – Command Team**

Based on the level of severity, DTCC may choose to establish an open conference call that allows participants immediate access to members of the command team. This would allow participants to raise issues, ask questions and offer suggestions as to the course of action.

## Illustration

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The following charts summarize DTCC's settlement processing both under normal circumstances and if DTCC were to experience a serious system software failure and was unable to recover on the same business day.

The scenario assumes that DTCC experiences a system outage at 10 a.m. It is also assumed that the system is not recovered until 12 midnight, 14 hours later. The column titled "Normal Processing" identifies the processes that occur at particular times under normal circumstances. The column titled "Extended Outage Processing" describes how processing will occur in the event of the assumed 14-hour delay from the systems outage. This scenario, of course, is hypothetical, and the actual sequence of events could be significantly different were such a severe systems failure actually to occur.

## Equities Illustration

### DAY 1

TIME	NORMAL PROCESSING FOR EQUITIES	EXTENDED OUTAGE FOR EQUITIES
8:00 p.m.	Night cycle for "Day 1" begins normally	Same
2:00 a.m.	Night cycle completes and participant output files (DTFDRQ and DTFPDQ) are made available. Day cycle processing begins.	Same
10:00 a.m.	Day cycle processing occurs. Files available: MMI issuance, reorg and dividends, day deliveries, CNS and intra-day activity	System goes down. All participant input and output is suspended.
3:00 to 5:30 p.m.	Cutoff and settlement through Fedwire. Files available: PARTPO (payment orders); CSHDAL (MMI interest); CSHRAL (MMI maturity and reorg payments); CSHSET (income, redemption and reorg payments); DTFMTA (daily activity)	System is still down. All participant input and output is suspended.
5:30 to 8:00 p.m.	Free processing period cutoff. End-of-day processing occurs: internal work, end-of-day work, pre-night cycle (pricing, master file updates).	System is still down. All participant input and output is suspended.
8:00 p.m.	Night cycle for Day 2 begins.	System is still down. All participant input and output is suspended.
9:00 p.m.	Night cycle for Day 2 begins.	DTC determines that it will not settle Day 1 activities on this calendar day and informs FRBNY that it intends to settle once it has recovered.

## Equities Illustration

### DAY 2

TIME	NORMAL PROCESSING FOR EQUITIES	EXTENDED OUTAGE FOR EQUITIES
12:00 Midnight	Day 1 APIBAL (position) and DTFPART (activity) files are available. Day 2 night cycle in process.	System recovers to point of outage. DTC processes all input received prior to point of failure and provides a short window for subsequent input.
1:00 a.m.	Normal processing occurs.	Input period ends. Reclaim period ends 15 minutes after input period ends. Settlement balances are calculated and settlement process begins.
2:00 to 3:00 a.m.	Night cycle completes for Day 2 activity. Participant output files (DTFDRQ and DTFPDQ) are made available. Day cycle processing begins.	Settlement with participants through Fedwire for Day 1 occurs. Settlement is completed within 1 hour.
3:00 a.m.	Normal processing occurs.	Day 1 files available: PARTPO (payment orders); CSHDAL (MMI interest); CSHRAL (MMI maturity and reorg payments); CSHSET (income, redemption and reorg payments); DTFMTA (daily activity).
4:00 a.m.	Normal processing occurs.	DTC is open for participant input for Day 2 night cycle. DTC begins processing internal Day 1 end-of-day work and Day 2 pre-night-cycle work.
5:00 a.m.	Normal processing occurs.	All end-of-day processing for Day 1 is completed. End-of-day processing occurs and the system is readied for the Day 2 night cycle.
6:00 a.m.	Normal processing occurs.	Night cycle for Day 2 begins. Day 2 files available: DTFMEM, memo seg balances; DTFMTE and daily activity.

## Equities Illustration

### DAY 2

TIME	NORMAL PROCESSING FOR EQUITIES	EXTENDED OUTAGE FOR EQUITIES
10:00 a.m.	Normal processing occurs.	Night cycle CNS processing is completed for Day 2. All Day 2 night cycle output is ready. Day 2 day-side process begins. Files available: MMI, RDP, DO, PO and CNS processing. DTFDRQ (night cycle output); DTFPDQ (night cycle output); APIBAL; and, Day 1 EOD position.
3:00 to 4:30 p.m.	Normal processing occurs.	Day-side processing continues. Intraday activity files are available.
5:00 to 6:30 p.m.	Normal processing occurs.	End-of-day processing and settlement with participants through Fedwire for Day 2 occurs.

## CORPORATE, MUNICIPAL, UIT (CMU) ILLUSTRATION

(NOTE: CMU TRADE SETTLEMENT BASICALLY FOLLOWS THE SAME CNS AND NON CNS PROCESSING AS EQUITIES.)

### DAY 1

TIME	NORMAL PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs	EXTENDED OUTAGE PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs
8:00 p.m.	Night cycle for "Day 1" begins normally	Same
2:00 a.m.	Night cycle completes and participant output files (DTFDRO and DTFPDQ) are made available. Day cycle processing begins	Same
10:00 a.m.	Day cycle processing occurs. Files available: MMI issuance, reorg and dividends, day deliveries, CNS and intra-day activity	System goes down. All participant input and output is suspended for both MQ and RTTM Web.  Trades matched between 9:31 a.m. & 10:00 a.m. are not sent to TRP at 10:30 a.m. (including trades matched between 9:31 a.m. & 10:00 a.m. that have a settlement date of today, i.e. Same Day Settlement trades).  10:15 a.m. - MSRB & NASD notified of CMU outage.  CMU trades will not be sent to TRP at 11:30 a.m.
3:00 to 5:30 p.m.	Cutoff and settlement through Fedwire. Files available: PARTPO (payment orders); CSHDAL (MMI interest); CSHRAL (MMI maturity and reorg payments); CSHSET (income, redemption and reorg payments); DTFMTA (daily activity).	System is still down. All participant input and output is suspended.

## CORPORATE, MUNICIPAL, UIT (CMU) ILLUSTRATION

(NOTE: CMU TRADE SETTLEMENT BASICALLY FOLLOWS THE SAME CNS AND NON CNS PROCESSING AS EQUITIES.)

### DAY 1

TIME	NORMAL PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs	EXTENDED OUTAGE PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs
5:30 to 8:00 p.m.	Free processing period cutoff. End of day processing occurs; internal work, end of day work, pre-night cycle (pricing, master file updates).	<p>System is still down. All participant input and output is suspended.</p> <p>CMU trades will not be sent to TRP at 5:30 p.m. or 8:15 p.m.</p> <p>(Most CMU trades have a T+3 settlement cycle. If they compared on T+1, they would still settle on the proper day. This would apply to T+2 settlement cycle trades as well.</p> <p>As Of trades that could have matched after 10:00 a.m. and before 11:30 a.m., if not for the outage, would have been eligible for Same Day Settlement. Instead they will settle the following day.</p> <p>CMU T+0 and T+1 settlement cycle trades are not eligible for settlement at NSCC. Their settlement is not directly impacted by the outage.)</p>
8:00 p.m.	Night cycle for Day 2 begins	<p>System is still down. All participant input and output is suspended.</p> <p>CMU trades are not sent to TRP as detailed above.</p>
9:00 p.m.	Night cycle processing continues	DTC determines that it will not settle Day 1 activities on this calendar day, and informs FRBNY that it intends to settle once it has recovered.

## CORPORATE, MUNICIPAL, UIT (CMU) ILLUSTRATION

(NOTE: CMU TRADE SETTLEMENT BASICALLY FOLLOWS THE SAME CNS AND NON CNS PROCESSING AS EQUITIES.)

### DAY 2

TIME	NORMAL PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs	EXTENDED OUTAGE PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs
12:00 Midnight	Day 1 APIBAL (position) and DTFPART (activity) files are made available. Day 2 night cycle in process.	System recovers to point of outage. DTC processes all input received prior to point of failure and provides a short window for subsequent input.
1:00 a.m.	Normal processing occurs.	End-of-day processing occurs. Reclaim period ends 15 minutes after that. Settlement balances are calculated and settlement process begins.  CMU begins its overnight processing.
2:00 to 3:00 a.m.	Night cycle completes for Day 2 activity. Participant output files (DTFDRO and DTFPDQ) are made available. Day cycle processing begins.	Settlement with participants through Fedwire for Day 1 occurs. Settlement is completed within 1 hour.
3:00 a.m.	Normal processing occurs.	Day 1 files available: PARTPO (payment orders); CSHDAL (MMI interest); CSHRAL (MMI maturity and reorg payments); CSHSET (income, redemption and reorg payments); DTFMTA (daily activity)
4:00 a.m.	Normal processing occurs.	Open for participant input for Day 2 night cycle. DTC begins processing internal Day 1 end-of-day work, and Day2 pre-night cycle work.
5:00 a.m.	Normal processing occurs.	All end-of-day processing for Day 1 is completed and the system is readied for Day 2 night cycle.

## CORPORATE, MUNICIPAL, UIT (CMU) ILLUSTRATION

(NOTE: CMU TRADE SETTLEMENT BASICALLY FOLLOWS THE SAME CNS AND NON CNS PROCESSING AS EQUITIES.)

### DAY 2

TIME	NORMAL PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs	EXTENDED OUTAGE PROCESSING FOR CORPORATE AND MUNICIPAL BONDS AND UITs
6:00 a.m.	Normal processing occurs.	Night cycle for Day 2 begins. Files available: DTFMEM, memo seg balances, DTFMTE and daily activity.
7:00 a.m.	Normal processing occurs.	CMU Start of Day runs at 7:00 a.m. and CMU opens for normal processing.
10:00 a.m.	Normal processing occurs.	Night cycle CNS processing is completed for Day 2. All Day 2 night cycle output is ready. Day 2 day-side process begins. Files available: MMI, RDP, DO, PO and CNS processing. DTFDRQ (night cycle output); DTFPDQ (night cycle output); APIBAL and Day 1 EOD position.  CMU matched trades sent to TRP at 9:30 a.m.
3:00 to 4:30 p.m.	Normal processing occurs.	Day-side processing continues, intraday activity files available.
5:00 to 6:30 p.m.	Normal processing occurs.	Cutoff and settlement with participants through Fedwire for Day 2 occurs.

## GOVERNMENT SECURITIES DIVISION SECURITIES DVP SETTLEMENT CYCLE—ILLUSTRATION

<b>DAY 1</b>		
<b>TIME</b>	<b>NORMAL PROCESSING FOR DVP GOVERNMENT SECURITIES DIVISION'S SECURITIES DVP CYCLE</b>	<b>EXTENDED OUTAGE PROCESSING FOR GOVERNMENT SECURITIES DIVISION'S SECURITIES DVP SETTLEMENT CYCLE</b>
11:00 p.m.	Night cycle for Day 1 completes normally.	Same
11:30 p.m.	Participant output files are made available including next day's settlement obligations. GSD clearance instructions for the next business day are forwarded to clearing banks.	Same
7:30 a.m.	The GSD DVP application becomes available. Communications with clearing banks is established. Settlement of obligations starts. New clearance instructions to expedite repo substitutions are submitted to the clearing banks.	Same
10:00 a.m.	Normal processing continues at the clearing banks – settlement status updates are communicated interactively to FICC from the clearing banks. Cleared Obligations are marked settled. Updated status are available to participants	GSD DVP application fails. Communication with participants and clearing banks is suspended. The outage does not affect clearing banks' settlement of DVP netted obligations – FICC Operations staff continues to perform settlement functions directly via bank applications. Status updates will remain in queue at the clearing banks or in DTCC's mainframe for eventual communication to FICC DVP application. GSD is unable to capture repo substitution instructions.
10:01 a.m. to 3:00 p.m.	Normal settlement processing continues. At 3 p.m. the Fedwire Securities System (FSS) closes for delivery process.	System is still down. All participant input and output is suspended. Operations staff continues to perform settlement functions directly via bank applications.

## GOVERNMENT SECURITIES DIVISION SECURITIES DVP SETTLEMENT CYCLE—ILLUSTRATION

<b>DAY 1</b>		
<b>TIME</b>	<b>NORMAL PROCESSING FOR DVP GOVERNMENT SECURITIES DIVISION'S SECURITIES DVP CYCLE</b>	<b>EXTENDED OUTAGE PROCESSING FOR GOVERNMENT SECURITIES DIVISION'S SECURITIES DVP SETTLEMENT CYCLE</b>
3:02 to 3:30 p.m.	Normal settlement processing continues. FSS remains available for DK processing only.	DK process is managed exclusively in the clearing banks' systems. Updates to GSD applications remain in queue.
3:31 p.m. to 6:30 p.m.	FSS system is closed for all receive and deliver processing at 3:31 p.m.  Bank settlement is completed for DVP and GCF.  Lock up of collateral for net GCF obligations occurs.  End of federal funds settlement between banks.	FSS system is closed for all receive and deliver processing at 3:31 p.m.  DVP bank settlements are completed via remote access directly to clearing bank application.  In queue awaiting system recovery: 1. All cleared obligation updates received after 10 a.m.  2. All repo substitutions position returns and replacements not yet entered into DVP application  3. Any miscellaneous unsolicited transactions.
6:31 p.m. to 8:00 p.m.	Any remaining trade input from participants is accepted until 8 p.m. cutoff.	System is still down. All participant input and output is suspended.
8:00 p.m.	Night cycle for Day 2 begins	System is still down. All participant input and output is suspended.
9:00 p.m. to 9:59 p.m.	Night cycle processing continues.	System is still down. All participant input and output is suspended.

## GOVERNMENT SECURITIES DIVISION SECURITIES DVP SETTLEMENT CYCLE—ILLUSTRATION

### DAY 1

TIME	NORMAL PROCESSING FOR DVP GOVERNMENT SECURITIES DIVISION'S SECURITIES DVP CYCLE	EXTENDED OUTAGE PROCESSING FOR GOVERNMENT SECURITIES DIVISION'S SECURITIES DVP SETTLEMENT CYCLE
10:00 p.m. to 12:00 a.m.	Night cycle is complete and the system is ready to start the next submission day.	System recovery is complete. All links to participants and clearing banks are recovered. All inputs and outputs are captured and processed
12:00 a.m. to 3:00 a.m.	Normal processing occurs.	Night cycle completes. The system is ready for next-business day.

## MORTGAGE BACKED SECURITIES DIVISION SECURITIES PROCESSING CYCLE—ILLUSTRATION

### DAY 1

TIME	NORMAL PROCESSING FOR MORTGAGE BACKED SECURITIES	EXTENDED OUTAGE PROCESSING FOR MORTGAGE BACKED SECURITIES
11:00 p.m.	Night cycle (including Clearing application “PM Pass”) for Day 1 completes normally.	Same
11:30 p.m.	Participant output files are made available (including next-day’s preliminary margin computations).	Same
7:30 a.m.	The MBSD RTTM, Clearing and EPN applications become available.	Same
10:00 a.m.	Normal processing occurs.	<p>MBSD RTTM application fails. Communication with participants is suspended. The outage does not affect the MBSD Clearing application or EPN application.</p> <p>FICC Operations staff continues to perform EPN and funds settlement functions.</p>
3:01 to 3:30 p.m.	Normal processing occurs.	<p>FICC Operations staff continues to perform EPN and funds settlement functions.</p> <p>Participant Interactive Messaging submissions are accepted and held pending availability of MBSD RTTM application.</p>
3:31 p.m. to 8:00 p.m.	Normal processing occurs.	<p>EPN end of day</p> <p>Clearing application updated with current day closing prices</p> <p>Participant Interactive Messaging submissions are accepted and held pending availability of MBSD RTTM application</p>

## MORTGAGE BACKED SECURITIES DIVISION SECURITIES PROCESSING CYCLE—ILLUSTRATION

### DAY 1

TIME	NORMAL PROCESSING FOR MORTGAGE BACKED SECURITIES	EXTENDED OUTAGE PROCESSING FOR MORTGAGE BACKED SECURITIES
8:00 p.m. to 9:00 p.m.	Normal processing occurs.	System is still down. All input via Interactive Messaging is safe stored and output is suspended.  Participant Interactive Messaging submissions are accepted and held pending availability of MBSD RTTM application.
9:01 p.m. to 9:59 p.m.	Normal processing occurs.	System is still down. All input via Interactive Messaging is safe stored and output is suspended.  Participant Interactive Messaging submissions are accepted and held pending availability of MBSD RTTM application.
10:00 p.m. to 12:00 a.m.	Normal processing occurs.	System recovery is complete. All links to participants are recovered and participant input submitted via Interactive Messaging is captured and processed.  At the point the MBSD RTTM application becomes available, MBSD Management will determine the benefits of providing a small window for additional member input before executing the AM pass (originally scheduled for earlier that day) which, when applicable, will include the TBA netting cycle followed by all regularly scheduled "AM Pass" output.
12:01 a.m. to 3:00 a.m.	Normal processing occurs.	Following completion of the AM Pass, MBSD Management will determine the benefits of providing a small window for additional member input before executing the subsequent "PM Pass" followed by all regularly scheduled "PM Pass" output.
12:00 a.m. to 3:00 a.m.	Normal processing occurs.	Night cycle completes and the system is ready for next-business day.