



BULGARIAN
STOCK EXCHANGE

INTERNAL RULES

**Emergency Playbook – Incident Handling
Standards and best practices defined by Bulgarian Stock Exchange**

1. Introduction

This document provides to trading participants an overview of the processes applied in response to technical incidents affecting the T7 trading system of Bulgarian Stock Exchange AD (BSE), the supplier of which is Deutsche Börse, including guidance on the communications to the market and internal operational procedures triggered in case a technical incident occurs.

The trading system used by Deutsche Börse is robust and resilient and aims to minimize disruption and uncertainty to trading participants. Part of Deutsche Börse's mission is the continual improvement of the technologies used to ensure the provision of a robust infrastructure and, where needed, resolve any incidents in the best possible way. Trading participants have access to transparent and comprehensively defined processes for dealing with incidents that may affect the trading system. The framework requirements which obligate marketplaces to ensure system resilience and orderly trading are set out in MiFID II and in particular Article 47 and 48. BSE adheres to these requirements and therefore ensures high level of accessibility of the trading system. The platform provider strives on a continual basis to maintain a strongly resilient T7 trading system and improve business continuity so that users can have 100% access to the system and to keep chances of a technical incident rare. While such problems are unlikely, there are real-world circumstances which require readiness. There are clear standards for resolving potential technical incidents and incident response and communication mechanisms are continually reviewed and improved in order to promptly eliminate the problem and mitigate its impact. By making public the standards described in this document BSE aims to enhance the clarity and predictability for trading participants in respect of the operating procedures introduced in order to respond to incidents.

This manual describes the incident communication and operational procedures in place at BSE:

- BSE provides to the market prompt and transparent communication of any incidents by publishing, and updating on a regular basis, standardized and clear messages in Bulgarian and English through several communication channels. In addition to the communication with trading participants, BSE also ensures that any incidents are notified in a timely manner to the competent authority. Relevant information to the competent authority is provided on the basis of well-established procedures and in accordance with the legal obligations for notification set out in Article 54.2 of MiFID II.
 - BSE has introduced standardized operational procedures (SOPs) which are triggered upon the occurrence of a technical malfunction and aim to ensure orderly trading, which includes, where appropriate, decisions to suspend trading and/or cancel trades executed in improper trading conditions. BSE also establishes predefined procedures for reopening the market upon the resolution of a technical incident as well as procedures for determining a market closing price.
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2. Incident prevention: Resilience of the trading system

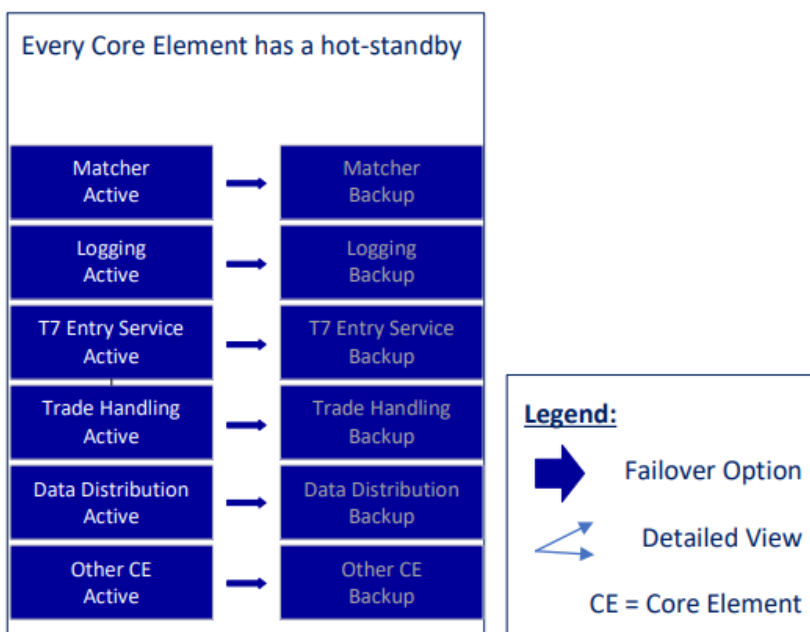
The design of the T7 trading system is based on state-of-art technology and on a robust and resilient architecture which is continually improved on the basis of lessons learned from previous incidents. This enables better response to system disruptions and, in the best-case scenario, avoids any adverse impacts on trading.

The key resilience features of the system are designed to ensure data integrity and maximum accessibility on the basis of four lines of defense which have been deployed in order to significantly reduce the likelihood of technical malfunctions. The four lines of defense aim to provide a robust framework which anticipates potential failures and proactively deals with them through the system design.

2.1. Defense Line 1: Redundancy of Core Elements

The Core Elements (CE) of the T7 trading system (such as Matching Engine, Logging, T7 Entry Service) are backed up so that a system failover can be processed automatically. This means that when an active CE fails, the backup CE will take over without any delay as it knows the current work status. Trading participants are not required to take any action. Information about the resolution of a the failover will be published immediately. This is depicted in Figure 1 below which includes some of the most important components of the T7 trading system.

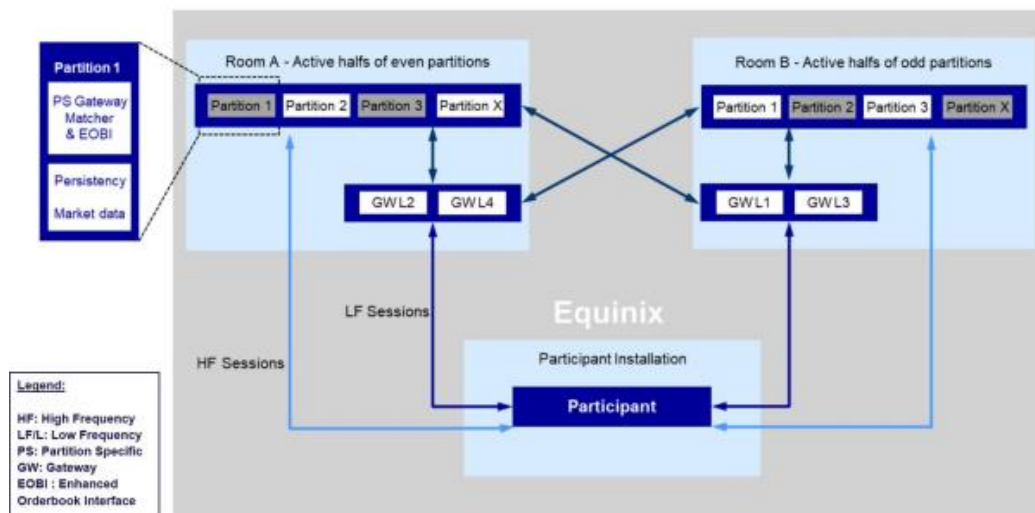
Figure 1:



2.2. Defense Line 2: Physical Separation

The above-mentioned Core Elements are set up on two different hardware configurations. These are located in different rooms of the data center in order to prevent a scenario where physical damages or malfunctions affect both the leading Core Elements and their backups at the same time. This is shown in Figure 2, which also outlines the connectivity between the two locations. The cells with white background indicate the active Core Elements, while the redundant CEs are displayed in cells with grey background. The active element of Partition 2 is in Room A and the backup element of Partition 2 is in Room B. In case Room A becomes inaccessible due to some physical damage (e.g. power outage or fire), the Core Element in Room B can take over its functions because it will remain unaffected by the physical damage that affected Room A. The participants have an established connection with both rooms so that in such a scenario they will be able to continue trading and will have access to the backup partition in the opposite Room.

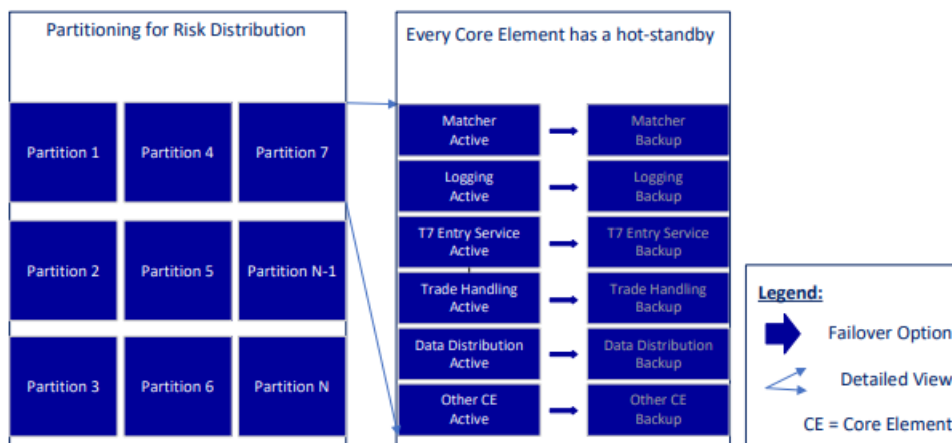
Figure 2:



2.3. Defense Line 3: Localization of Issues

The trading system is divided in partitions, each holding a set of products. These partitions operate independently from one another and on their own hardware, which prevents spillover effects. Each partition hosts its own instances of the Core Elements. Restorations, failovers and restarts can be run without impacting the products or instruments on other partitions. This is shown in Figure 3.

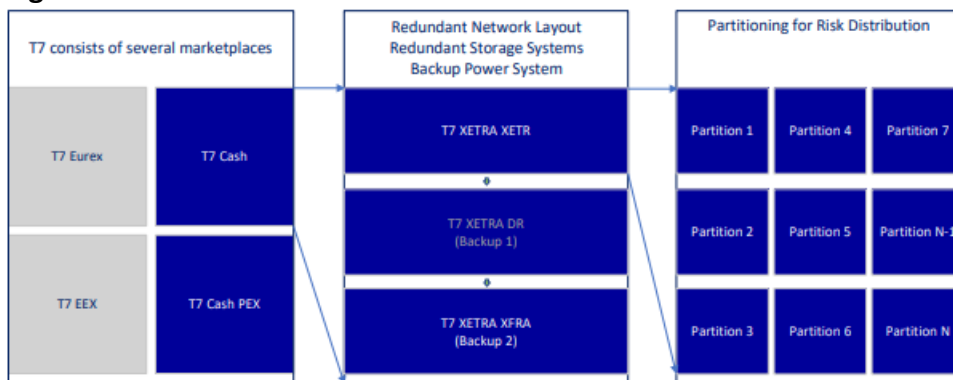
Figure 3:



2.4. Defense Line 4: A separate emergency recovery system

Furthermore, the mechanisms described in Defense Lines 1 and 3, and the advantages of these mechanisms, are also present in a second T7 disaster recovery system. The emergency recovery environment is duplicated on separate hardware in different data center and would be used if the recovery of the standard environment is unlikely or if the data center containing Room A and B would not be available at all. Essentially, the emergency recovery environment provides a third and fourth Matcher per partition that can be activated to offer continuous matching.

Figure 4:



3. Incident Handling

Although the likelihood of technical incidents is reduced by the resilient architecture of the trading system, Deutsche Börse are ready to respond promptly and efficiently to any technical outage. The internal discovery of a technical emergency triggers predefined procedures designed to facilitate the timely resolution of the problem. The departments in charge maintain communication to ensure that the current status of the system is back to normal. The incident triggers immediately a root cause investigation and problem resolution process. At the same time, an initial notification is dispatched to BSE through multiple communication channels (email, SMS, phone call) to flag that the system is experiencing problems.

Upon receiving the notification from Deutsche Börse, BSE disseminates messages to all trading participants via the electronic document management system E-corr as well as to all trading parties by posting a message on the BSE website.

In order to keep the participants informed, regular updates are published during the root cause investigation and problem resolution process. Then, the participants are informed as soon as the problem is resolved and access to the trading system is reopened. Where the technical incident has caused suspension of trading, a reopening schedule is prepared and published as notification to the trading participants.

3.1. Communication in case of incidents

A key enabler for the prompt resolution of technical emergencies is the clear, swift and reliable communication with trading participants. If the T7 trading system becomes (partially) unavailable (e.g. due to a technical issue), BSE aims to provide to trading participants an initial notification in a quick and accurate manner as well as regular status updates until the issue is fully resolved. The different emergency communication types are:

- Emergency messages automatically generated by the T7 trading system;
- Initial incident notification;
- Regular updates until the resolution of the incident;
- Resumption of trading/final resolution message.

3.1.1. Emergency messages automatically generated by the T7 trading system

The trading system is designed to identify certain specific problems (such as Gateway failure or a Matching Engine failover). The automated response functionality of the T7 trading system provides immediate notification of a potential technical issue. The automated messages are published on T7 GUI News Board as well as through the Enhance Trading Interface (ETI) or through the market data interfaces.

3.1.2. Initial emergency message

The Exchange alerts trading participants to the problem using the T7 GUI News Board (if T7 is available), the electronic document management system E-corr and the news section of its website. The emergency messages disseminated through these channels are based on predefined templates for various emergency scenarios. All messages contain identical information and those on the website are also published in English. Although BSE strives to inform all stakeholders in a timely manner, simultaneous (timely) delivery of the messages in each case and across all channels cannot be guaranteed.

3.1.3. Regular updates until the resolution of the incident

Trading participants receive updates by messages from the BSE to ensure they have full visibility to the status of the incident. Thus, after the initial notification participants can expect regular updates until the final resolution of the problem (through the same channels as those detailed in section 3.1.2). The maximum interval between two updates is 30 minutes. These messages may include information that the problem is still under investigation or some additional information if relevant effects have been identified in the meantime. If any appropriate information becomes available at an earlier time, such new information is communicated immediately.

3.1.4. Resumption of trading/final resolution message

In case the technical problem is resolved, the Exchange sends a message containing details concerning the resumption of trading (where applicable) or an incident resolution message. Again, the same channels as those described in section 3.1.2 are used.

3.2. Market reopening procedures

Once the problems have been resolved, BSE aims to ensure that the trading system is available again to the trading participants as soon as possible. This includes, among other things, certain preparations for reopening the market.

There are pre-defined re-opening schedules depending on the magnitude/length of the technical incident. The market re-opens with standardized pre-trading and auction phases. This is communicated before the market is opened and follows a strict and predictable procedure.

Predefined market reopening schedule

BSE informs all trading participants as soon as the trading systems are recovered and restarted. In nearly all cases, the instruments are initially transferred to a Pre-trading phase. BSE publishes a specific trading schedule which includes details of the various timings and phases of the instruments.

The following is an example of a message by which a market reopening schedule is communicated:

(MIC:XBUL) System T7 is now available again/opening schedule

Trading will start in accordance with the following schedule:

11.00 a.m. Pre-trading

11.25 a.m. Opening auction with a minimum duration of 5 minutes

11.30 a.m. Continuous trading

The trading session is closed in accordance with the standard schedule.

All Non-Persistent orders and quotes entered through the ETI interface have been deleted. Please check/reconcile the state of your Persistent orders with T7. Please note that your trades have been executed only if you have received trade confirmation. You can check all your trades in T7 GUI – Own Trades Overview.

Should you need any additional information, please call our Trading, Listing and Membership Directorate at 02/937 09 30, 31,32, 33, 42 or Information Technology Directorate at 02/400 14 49, 52.

Definition and typical duration of the Pre-trading and Continuous trading phases

The Pre-trading and Opening auction phases are typically 30 minutes long. Depending on the circumstances of the incident, this period can be shorter or longer. The duration of these phases is established so as to allow sufficient time for reconciliation and review of orders and trades, which is possible for all trading participants as soon as the trading system is technically accessible again.

In the end of the Pre-trading phase the instruments move to the Continuous trading phase which starts with an Opening auction. The minimum duration of the Opening auction is 5 minutes. The minimum duration of the Opening auction will always be announced in the publication of the opening schedule.

3.3. Monitoring of the conditions for equal access to the trading system

BSE's mission is to provide conditions for fair and orderly trading in accordance with the established rules. The market status and activity is monitored before the Opening auction is concluded and the instruments are switched to the Continuous trading phase. Such monitoring includes the number of participants connected to the market and their respective market share, the general status and the type of connectivity used by trading participants (GUI, ETI, FIX), and the number and quality of the incoming calls from these participants. On the basis of these factors, an assessment is made as to whether there are conditions for fair and orderly trading in accordance with the established rules.

In case that adverse situations are identified, such as for example incorrect data dissemination during continuous trading, that could lead to unfair and not orderly trading conditions, the trading will be suspended. The trading session will be resumed in accordance with the best practices described above as soon as the conditions for fair and orderly trading in accordance with the established rules are in place again.

In the general case, trades are valid if a legally binding trade confirmation is disseminated and available in the T7 system after the technical issues have been resolved and the Pre-trading phase is reached.

If some extraordinary circumstances have led to non-orderly trading and thereby to the execution of orders, BSE cancels these trades in accordance with Part IV (Trading Rules) of the BSE Rulebook. If such a scenario occurs during an incident, BSE strives to communicate the cancellation of these trades before the reopening of the market.

3.4. Best practice for the reconciliation of trading participants' orders and trades

Market Reset

A Market Reset situation is triggered if the secondary/backup Matching Engine takes over the leading role from the primary engine (see also Figure 1 which describes the redundancy of the Core Elements). This may be caused by failure of the primary Matching Engine or key components of the T7 system.

During a Market Reset, all Non-Persistent orders and quotes in the affected partition are deleted automatically. The backup component will take over the functions by loading Persistent orders. Individual notifications for the deletion of Non-Persistent orders and quotes will not be issued.

Order and trade confirmations

In addition to the loss of Non-Persistent orders and quotes, the initial replies regarding order handling operations sent to a trading participant (such as execution, addition, modification or deletion) may not have reached the Persistency Layer and in this case they will not be taken into account after a Market Reset. Due to the preliminary nature of all responses (including preliminary execution reports) sent by the matching engine, it is crucial to synchronize the status of all persistent orders with the order book restatement. All Order Book Restatement messages are recoverable.

Furthermore, if a legally binding Trade Notification (ETI)/trade capture report (FIX) for a given Execution Report is missing after the trading system is available again, that Execution Report must be considered invalid and needs to be discarded.

The expected sequence of events in this context will unfold as follows:

- A Market Reset event is signaled to the trading participants via the ETI interface at partition level using an Event Message through the individual ETI trading session;
 - Non-Persistent orders and quotes have been automatically deleted;
 - Trading is resumed through the Market Reset event. The individual instruments in the affected partition may move to a Halt phase;
 - After transition to the Pre-trading phase, all active Persistent orders can be accessed by the trading participant through the corresponding session;
 - Finally, a Trading Session Event Message is dispatched to indicate the end of Order Book Restatement for each instrument.
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For more details about Order Book Restatement please consult the Enhanced Trading Interface (ETI) Manual, Section 4.7.10 (Order Book Restatement) and the T7 FIX Gateway Manual, section 3.9.11 (Order Book Restatement).

3.5. Closing auction

BSE strives to ensure that in future the closing price will be set according to the rules and in the framework of the Closing auction. The T7 trading system allows a Closing auction for the corresponding trading session to take place until 6.00 pm. Since the introduction of the XETRA trading system in 1997, a Closing auction takes place in each trading session. In case the standard environment does not recover fast enough, the emergency recovery environment is used and started in due time to enable the processing of the Closing auction. Through dedicated communication channels, trading participants are informed about the problem and receive regular updates about the progress towards resolution. The published schedule of the Closing auction includes time for verification and processing of the orders in the framework of a Pre-trading phase, followed by a Closing auction phase. The duration of the two phases is at least 30 minutes.

However, if a Closing auction cannot take place, then the last available reference price is taken as the official closing price of the affected instruments.

As regards any trades made during the Closing auction which however are considered as trades made in improper trading conditions, BSE will cancel all these trades and the last available reference price will be taken as the official closing price of the affected instruments.

3.6. Post-incident analysis and communication

The practice of Deutsche Börse is to undertake post-incident analysis in respect of each technical incident with the T7 trading system. BSE receives an incident report explaining the sequence of the events, the conclusions, the measures taken to resolve the incident and the measures that will be taken in order to prevent similar incidents from occurring in future.

BSE can provide that report to its members and to the regulator so that trading participants can properly understand what happened.
