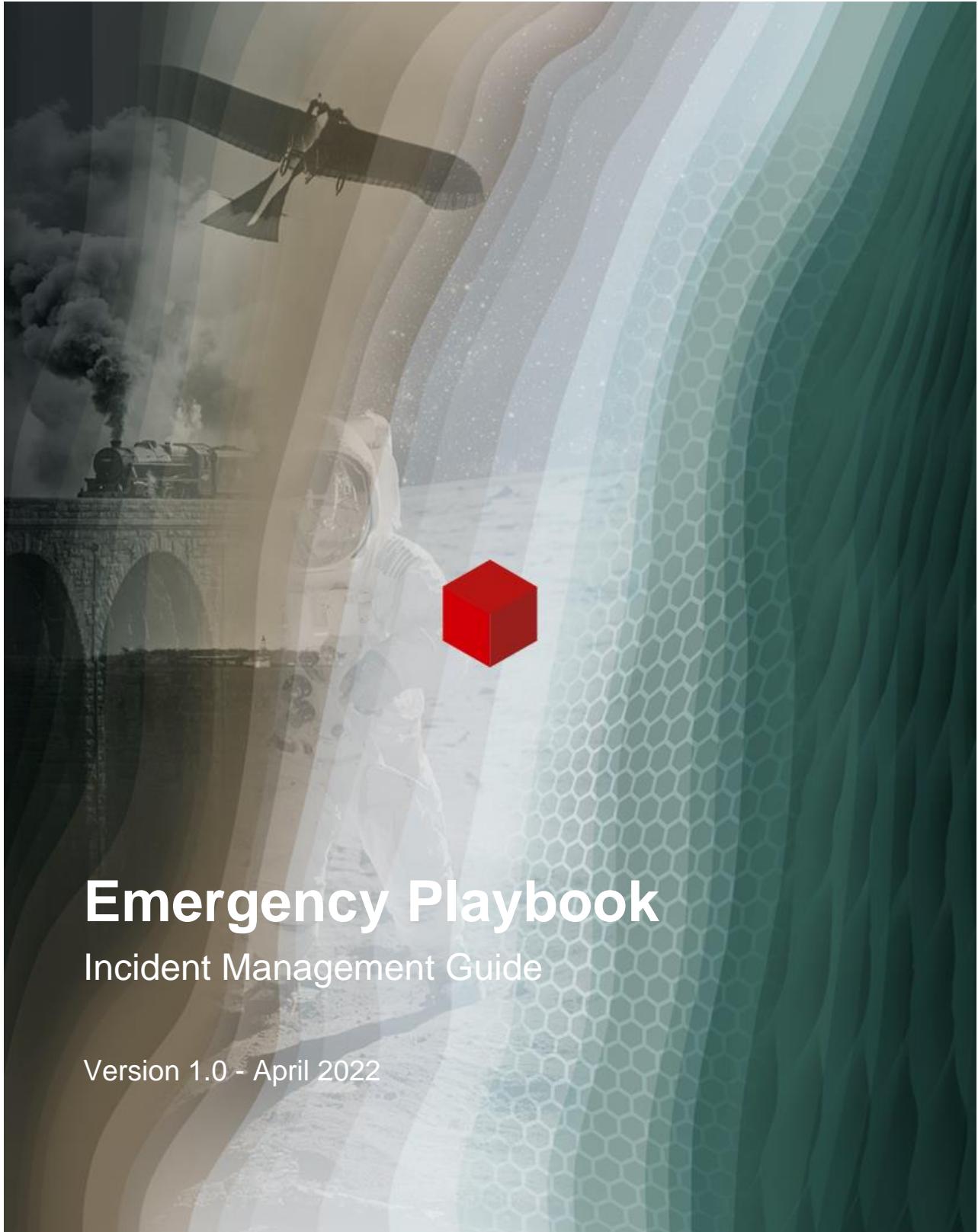250 years
wiener
boerse

Emergency Playbook

Incident Management Guide

Version 1.0 - April 2022

Delivering
the future
since 1771.

Table of Contents

Revision History

Version	Date	Reason
1.0	04.04.2022	Creation and publication of the document

1 List of Abbreviations

The table below shows the abbreviations and definitions used in this document.

ADH	Alliance Data Highway
ASP	Application Service Provider
BSE	Budapest Stock Exchange
CE	Core Element
DBAG	Deutsche Börse Group
DORA	Digital Operational Resilience Act
EOBI	Enhanced Order Book Interface
EMDI	Enhanced Market Data Interface
ETI	Enhanced Transaction Interface
FMA	Austrian Financial Market Authority
FWB	Frankfurter Wertpapierbörse
GUI	Graphical User Interface
ISV	Independent Software Vendor
LAN	Local Area Network
LJSE	Ljubljana Stock Exchange
MDI	Market Data Interface
MiFID II	Markets in Financial Instruments Directive (2004/39/EC)
NCA	National Competent Authority
PEX	WBAGs Partner Exchanges → Budapest, Ljubljana, Prague and Zagreb Stock Exchange
PSE	Prague Stock Exchange
VLAN	Virtual Local Area Network
WBAG	Wiener Börse AG
ZSE	Zagreb Stock Exchange

2 Preamble

The document on hand provides an overview of how Wiener Börse (WBAG) deals with a technical malfunction of the Xetra® T7 trading system that potentially requires a "Market Halt" (Trading Stop). It also describes how Wiener Börse will communicate in such cases, what preventive measures have been taken and how trading is resumed.

The trading system Xetra® T7 of WBAG is operated by the system provider Deutsche Börse AG (DBAG), who relies on stable and resilient systems and aims to minimize disruptions and uncertainties for WBAG and its Partner Exchanges as well as their trading participants and connectivity customers.

MiFID II, and in particular Articles 47 and 48, set out the framework defining the requirements for trading venues to ensure the resilience of systems and orderly trading. WBAG complies with these requirements through the service levels contractually agreed with DBAG and thus ensures a high availability of its trading system Xetra® T7 for WBAG and its Partner Exchanges.

In the event of a technical incident, WBAG has implemented processes and communication guidelines with all parties involved to minimize the impact of an incident and to resolve the problem quickly. Transparent and timely communication towards the trading participants, Partner Exchanges and technical connectivity providers is a key point in this process.

With this document, Wiener Börse contributes to the industry-wide establishment of common standards. The services, processes, etc. are subject to a continuous improvement process and adapted to findings, new guidelines or technological progress.

3 Incident Prevention

The Xetra® T7 system is based on state-of-the-art technology and a robust and resilient architecture that is continuously improved based on experience gained. It is a main goal for Wiener Börse to avoid any system issues and to ensure the highest possible system availability.

3.1 System Provider DBAG

The Xetra® T7 trading system of WBAG and its Partner Exchanges (PEX) in Budapest (BSE), Ljubljana (LJSE), Prague (PSE) and Zagreb (ZSE) is operated by the system provider DBAG on the same platform as the T7® trading system for Eurex and FWB. The core features of the trading system resilience were designed to ensure data integrity as well as maximum availability and to reduce the likelihood of technical incidents considerably by

- Redundancy of Core Elements
- Physical Separation in two separated Data Center Rooms
- Separate Disaster Recovery System

3.2 Xetra® T7 system architecture

The central T7® systems are located in the "Equinix Data Center" in Frankfurt. DBAG also operates a "Disaster Recovery Data Center" which serves on the one hand as an access point to the T7® system and on the other hand as a Distaster Recovery (DR) data center for the T7® system.

The central Xetra® T7 production system architecture consists of so-called "partitions" that are designed redundantly in two physically separated rooms. WBAGs trading system is operated on one partition. On this partition the central data processing components - the order books, matchers, market data and trade generation as well as distribution functions - are deployed.

As an access point for trading participants to the trading system, a number of gateway systems are operated in a location that is designed redundantly (= two computer rooms with the same equipment).

The market data servers for Xetra® T7 - reference data as well as netted, unnetted and tick-by-tick market data - are also located in DBAG data centers. Among other things, they provide the market data for the WBAG index calculation, ADH Market Data Distribution to Data Vendors as well as for WBAGs own FIX interface and Trading GUI.

The second location – the Disaster Recovery Data Center - is used for simulation operations and is available as a fallback option ("cold standby") for production takeover if the first location fails completely.

A detailed description of the Trading System Resilience of the Xetra® T7 System can be found in the "Emergency Playbook for Incident Handling DBAG" of DBAG.

3.3 WBAG Trading System related infrastructure

The local Xetra® T7 networks at WBAG are provided on own virtual LANs (VLANs). Separate hardware is used for production, simulation and internal test operation. The hardware used is operated redundantly for all environments in two independent data centers (primary and backup).

3.4 Network Design

The physical network connection of Wiener Börse to the T7® trading system is provided via redundantly designed, dedicated network connections to the DBAG Access Point locations in Vienna.

The network connections between the DBAG data centers in Frankfurt and the DBAG Access Point locations in Vienna are operated by DBAG. They are part of the DBAG network and in DBAGs responsibility.

4 Incident Handling - Preparation

Wiener Börse is preparing comprehensively for handling an emergency situation. On the one hand, disaster recovery tests (DR tests) involving the Xetra® T7 Production Environment are carried out at least once per year, and on the other hand, focus days where different scenarios are tested are regularly executed in the Xetra® T7 Simulation Environment. The Xetra® T7 Simulation Enironment is available continuously and allows trading participants and WBAG to test their trading systems in normal and abnormal conditions.

4.1 Disaster Recovery Tests

WBAG takes part in the regular central "Disaster Recovery"-tests of the System Provider DBAG. In the course of these DR-tests, WBAG also participates with its downstream systems as well as its own Fix Interface and Trading GUI.

During a WBAG DR-test

- the native programmable Xetra® T7 Interfaces, WBAGs own FIX Interface
- the native Xetra® T7 Trading, Admin & Clearing GUIs, WBAGs own Trading GUI
- as well as connections and services of WBAG as System Provider for its Partner Exchanges and WBAG as Authorized Service Provider for Trading System Participants

are tested.

4.2 Focus Days

During ongoing Xetra® T7 Simulation several "Focus Days" (e.g. Market Data Failure, Processing Delays, Gateway and Matching Engine Failover, Market HALT) are offered by WBAG. Within the scope of the Focus Days, WBAG tests the reaction of the Trading System related downstream systems as well as behaviour of WBAGs FIX interface and related Trading GUI.

Details about timing and actions during Focus Days are communicated to Trading Members, ISVs and Technical Connectivity Customers via a "Focus Day Document" and via the "Xetra® T7 Simulation Calendar".

4.3 Xetra® T7 Simulation

In addition to Focus Days and DR tests, Wiener Börse also offers individual test options on request (e.g. Mass Quote/Order Deletions) which can be executed in the Xetra® T7 Simulation Environment.

5 Incident Management

When a technical incident is detected, predefined procedures are activated to enable problem resolution in a timely manner. An immediate communication process with DBAG is started triggering root cause analysis and further working steps to resolve the cause. As soon as the problem has been identified and resolved and the systems are available for trading again, all relevant parties are informed by Wiener Börse.

If a "Market Halt" has been initiated due to the technical incident, a timetable for the resumption of trading will also be published.

5.1 Incident Management Process

The following describes how Wiener Börse communicates in the event of an incident and what the re-opening procedure looks like.

5.1.1 Incident Notification (WBAG internal)

When a potential incident is identified either by WBAG or Trading System Service Provider DBAG, an internal Incident Notification is sent to a pre-defined receipient group including Incident Management, Market Operations and IT Operations. Assessment of incident severity based on a system impact analysis is started. Top severity is considered as default at first until more information is available.

5.1.2 Incident Analysis (WBAG internal)

The Incident Notification ensures that a thorough assessment takes place, including the following elements:

- Assessment of impacted products, services, markets, partners and clients
- Assessment of technical impact and the critical IT system(s) involved, with estimated time to repair

As soon as an overview on affected parts of the Xetra T7 system has been gained a respective "Emergency Situation" may be declared by WBAG depending on the severity of the incident (also based on information received from Trading System Service Provider DBAG).

5.1.3 Emergency Declaration and Status Update

When an "Emergency Situation" is declared, immediate communication processes are triggered by Incident Management to inform affected Partner Exchanges, WBAG Trading members and their ASPs, ISVs, Data Vendors, regulators and public investors via pre-defined communication channels.

Status updates are sent out periodically.

5.1.4 Incident Resolution (WBAG internal)

The Incident Resolution process ensures that after thorough assessment of the incident, careful measures are taken to re-establish orderly trading in the shortest of possible time taking into account incident severity. Following tasks are performed:

- Identification, validation and implementation of workarounds
- Identification and implementation of technical recovery solution(s)
- Identification of root cause and application of permanent fixes
- Recommendation regarding alteration of the usual trading schedule including regular reassessment of the recommended schedule based on incident resolution progress
- Internal declaration of Incident Resolution

5.1.5 Incident Resolution Confirmation

The Incident Resolution Confirmation process ensures that after internally declared Incident Resolution, validation of affected processes / services takes place and external communcation is triggered accordingly, including information about the trading re-start procedure and its timing.

5.2 Incident Communication

WBAG is prepared to respond quickly and efficiently in the event of a technical emergency. Procedures regarding activities and communication are predefined and documented.

As soon as a technical emergency is identified, the following communication streams are opened (according to the extent of the emergency):

- WBAG internal communication involving the Management Board, Market Operations, IT Operations incl 2nd Level Experts and WBAGs Spokesperson
- Communication process with Trading System Provider DBAG
- Communication process with affected Partner Exchanges
- Communication to Trading System related Customers (Trading & Clearing Members, ASPs and ISVs)
- Communication to the NCA (FMA)
- Communication to public

The Incident Communication stipulates

- the decision making for incident communication
- the initial incident communication pointing out possible issues with the trading system
- the intervals for ongoing updates on the incident until resolution
- the communication of the resumption of the incident as well as,
- the communication of the root causes for the incident after completion of the analyzes

5.2.1 WBAG Internal Communication

WBAG has implemented an internal communication process that also takes into account the failure of individual communication channels. This communication process is

- regularly reviewed,
- updated if necessary and
- brought to the attention of all employees of WBAG.

Based on the internal communication, a communication plan was developed, which shows exactly which unit has to inform which stakeholders and the relevant public bodies.

5.2.2 Communication with Trading System Provider DBAG

WBAG and its Trading System Provider DBAG agreed on an Emergency Communication Process. The process is well documented and tested twice a year. It contains a detailed description regarding the communication actions to be taken by DBAG and WBAG in case of technical outages of Xetra® T7 for WBAG or its Partner Exchanges related to T7® technical issues.

5.2.3 Communication process with Partner Exchanges

The incident communication with the affected Partner Exchanges is aligned with WBAG internal communication and takes into account the failure of individual communication channels.

5.2.4 Communication to Trading System related Customers

Customer communication takes place via the Newsboard, which is implemented in the Trading system. News Board messages are also published on WBAGs website. In addition communication takes place by email via an external cloud-based newsletter tool, independent of the WBAG infrastructure.

5.2.5 Communication to the NCA

The NCA (FMA) is informed according to the pre-defined incident handling process.

5.2.6 Communication to public

Information about an emergency situation are published on WBAGs Website including information on resolution status and timing for Market Re-Opening.

Individual public information requests are directed and handled by WBAGs spokes person in charge.

In addition, monitoring of Social Media activites takes place with focus on WBAGs offical accounts (Twitter, LinkedIn). According reaction to related posts is carried out by WBAGs Social Media Team in close cooperation with WBAGs spokes person.

5.3 Market Re-Opening Procedure

Once the issues have been solved, Wiener Börse aims to make the Xetra® T7 trading system available again as soon as possible after carrying out specified system checks. The market re-opens with standardized pre-trading and auction phases. Please note, that non-persistent orders and quotes will be deleted automatically in the course of a Market Halt procedure.

5.3.1 Re-Opening Schedule

Wiener Börse will inform trading participants in good time about the resumption of trading and the planned re-opening schedule incl. the respective times for the various instrument states. In more or less all cases, the products will be switched to pre-trading first.

The communication will take place via our communications channels (see 5.2 Incident Communication).

5.3.2 Pre-trading

The resumption of trading in Xetra® T7 takes place in the first step by switching the products into pre-trading. During pre-trading, trading participants can reconnect their systems, reconcile orders and trades (order book restatement) and enter, modify or delete orders or quotes, etc. No trading takes place during pre-trading. Pre-trading normally lasts at least 30 minutes.

5.3.3 Trading

At the end of the pre-trading phase, the product state switches to the trading and commences with an initial auction.

5.3.3.1 Continuous Trading with Auctions

When trading is resumed, an auction usually lasts five minutes. As soon as the auction is over, the products are switched to continuous trading. Unless it is the closing auction, in which case there will be no continuous trading afterwards.

5.3.3.2 Auction

If trading can be resumed in time before the scheduled times of the auction, then trading will take place according to the normal schedule. In all other cases, Wiener Börse will announce the exact time schedules. In special cases, Wiener Börse may also decide to cancel trading (the resumption of trading) on the day of the technical problem.

5.3.3.3 Continuous Auction

Trading is usually resumed shortly after the start of Continuous Trading. In special cases, Wiener Börse may also decide to cancel trading (the resumption of trading) on the day of the technical problem.

5.3.4 Closing Auction and End-of-Day processing

In the occurrence of an incident affecting the closing auction, Wiener Börse may postpone the closing auction. Wiener Börse will make its best efforts to determine the offical closing prices, taking into account the circumstances surrounding the incident and its resolution.

If, despite all efforts, WBAG is unable to establish a closing price, the Last Price (last traded price) will be used as the official closing price. The closing auction cannot take place later than 17:30 hrs (local time).

5.4 Monitoring of Fair and Orderly Trading Conditions

It is the task of a trading venue to ensure fair and orderly trading conditions. Wiener Börse carefully monitors the market status and activities in the market. This means that Wiener Börse regularly monitors the number of connected trading participants and their respective market share, the general status and type of connections of the trading participants (GUI, ETI, FIX) as well as incoming calls of the trading participants (e.g. reporting of anomalies). These are all factors for assessing market quality and proper trading conditions.

If Wiener Börse identifies adverse situations (e.g. incorrect market data distribution during ongoing trading) that could lead to unfair and improper trading conditions, Wiener Börse will interrupt trading (Market Halt). Trading will only be resumed when fair and orderly trading conditions have been restored.

As a rule, trades are deemed to have been concluded when the legally binding trade confirmation has been sent by the Xetra® T7 system and is available there after the technical problems have been resolved and pre-trading has been achieved.

In case extraordinary, emergency-related circumstances have led to improper trading conditions in the execution of orders, WBAG will announce and execute the reversal of the resulting trades (only in accordance with §10 (9) Trading Rules for the Trading System Xetra® (Exchange Electronic Trading)). If WBAG becomes aware of such a scenario during a disruption, WBAG will endeavour to communicate the reversal of these trades before the market re-opens.

5.5 Post Incident Analysis and Communication

After the Incident is resolved, the root cause and the impact of the incident is analyzed. The involved system suppliers are asked for statements with the results of their own incident analyzes.

Based on this, WBAG prepares a detailed incident report, which is forwarded to the NCA (FMA) and, if affected, its Partner Exchanges.

Moreover the incident report is subsequently the basis for

■   improvements in the affected systems,

■   improvements in the monitoring and

■   improvements the incident handling process itself.

6 Contacts

Technical Service Desk

Phone: +43 1 53165 170

Email: it_helpdesk@wienerboerse.at

Trading Service Desk Xetra® T7 & Market Operations

Phone: +43 1 53165 500

Email: trading@wienerboerse.at

Xetra® T7 Vienna Trading System Key Account and Incident Management

Phone: +43 1 53165 253

        +43 1 53165 218

Email: xetra@wienerboerse.at

7 Related Documents

All mentioned documents can be downloaded on the Webpage of WBAG.

Public area:

- Xetra® T7 Detailed specifications to the market models
- Trading Rules for the Trading System Xetra® (Exchange Electronic Trading)
- Rules for the Technical Installations of the Trading Systems

Closed User Group for Members & 3rd Parties (accessable only for registered users):

- Xetra® T7 Incident Handling Guide
- Xetra® T7 Disaster Recovery Test Concept
- Xetra® T7 Focus Days in Simulation
- Xetra® T7 Simulation Calendar

Disclaimer

The information in this document is provided exclusively for information purposes. It does not constitute any legal or investment advice. Any legal basis for decisions by Wiener Börse AG related to the handling and management of incidents, such as the Austrian Stock Exchange or Wiener Börse AG's Terms and Conditions, shall remain unaffected by this document. Wiener Börse AG does not assume any liability for the completeness or correctness of the information in this document. Therefore, no one should rely exclusively on the information contained herein. Wiener Börse AG does not assume liability for any damages that may arise due to actions taken on account of the use of this document.

Should parts or individual phrases in this disclaimer fail to comply with applicable law or no longer comply or fail to be fully in line with the law, the contents and the validity of the remaining parts of the document shall remain unaffected.