

# REPORT ON SHARES AND EXCHANGE-TRADED FUNDS

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*Expert stakeholder group on equity and non-equity  
market data quality and transmission protocols*

*October 2024*

## ***Report on shares and exchange-traded funds***

*October 2024*

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## Purpose

As per the Creating Act and mandate<sup>1</sup>: Pursuant to Articles 11 and 22b of Regulation (EU) No 600/2014 as amended by the MiFIR reform, the European Securities and Markets Authority (ESMA) is required to submit draft regulatory technical standards to the Commission by 9 months from the date of entry into force of the MiFIR reform. Before submitting its draft proposals to the Commission, ESMA is to consult the expert stakeholder group as referred to in Article 22b(2) of Regulation (EU) No 600/2014 as amended by the MiFIR reform, in coordination with the Directorate-General for Financial Stability, Financial Services and Capital Markets Union (DG FISMA).

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<sup>1</sup> See Creating Act <https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3938>

## Scope

The scope of our mandate is to provide advice to the Commission and to ESMA on:

1. The quality of the transmission protocols;
2. Measures to address erroneous trade reporting and enforcement standards in relation to data quality, including arrangements regarding cooperation between data contributors and the consolidated tape provider;
3. The quality and the substance of the data for the operation of the consolidated tapes and the data needed to be transmitted to the consolidated tape for it to be operational;
4. Advice as to what constitutes the transmission of data as close to real-time as technically possible;
5. Advice on activities and good practices in the field of market data transparency, taking into consideration the Commission's objectives to reduce the administrative burden on companies and rationalise reporting requirements;
6. Advice to the Commission on the possible adaptations to the transparency rules.

## Conduct

While the DEG's mandate is reasonably broad, the time afforded to provide this initial advice was insufficient. The DEG met on 12 occasions over six weeks and deliberated for more than 17 hours, as well as, several breakout discussions alongside these meetings. These collective discussions and feedback provided by DEG members, observers and ad hoc experts form the basis for the advice provided herein. The intent of this report is to provide advice on the fundamental principles in support the success of the transparency regime. The DEG is committed to providing continued support and advice to the Commission and to ESMA during the drafting and and refinement of the regulatory technical standards (RTS).

## Introduction

A competitive market structure requires a well-functioning microstructure for supporting the data quality necessary for sufficient market transparency. The Consolidated Tape (CT) will play a pivotal role by providing a single point of data access for the entirety of the European market. However, the transparency challenges in the European equities market relate not only to fragmented data but also to the fragmented responsibilities for data quality, which are critical to the success of the CT. These challenges require a framework of robust standards, clear rules, and effective oversight to ensure the coordination and accountability for data quality at the ultimate source of each data contribution.

While the adopted legislative proposals broadly cover these responsibilities, ESMA's supporting Regulatory Technical Standards (RTS) must apply this framework for ensuring the quality of data contributed by Trading Venues (TVs), Approved Publication Arrangements (APAs), Designated Publishing Entities (DPEs) and Investment Firms (IFs).

The collective expertise and experience of the Data Expert Group.

## I. Data Quality Control Framework

In the context of the adopted legislative proposals and transparency rules, data quality is critical to the intended outcomes and driven by underlying key principles of data integrity, information quality and accountability. As the single source of truth, the integrity of the data regarding accuracy, completeness, and timeliness are foundational and a required dependency for the information quality and success of the CT.

### A. Principles of Data Integrity

Ensuring data integrity requires accurately capturing the entirety of events for completeness and reliability of the data. Accurate data semantics enable effective filtering without corruptive techniques such as exclusions or roll-ups. Balancing timeliness is crucial for maintaining the relevance of the data in decision-making, but it must not be at the expense of accuracy and completeness. Together, these principles engender trust by ensuring that data is comprehensive, accurate, and actionable.

- 1) **Accuracy:** Data must accurately and precisely reflect market events. Market events, whether from trading venues, APAs, DPEs, or investment firms, must capture the correct price, volume, time, sequence, and event characteristics. Even a small number of inaccurate events can distort transparency.
- 2) **Comprehensive Representation:** All events must be captured must be captured in entirety. Omissions of events or incomplete data records can lead to misinterpretation and a loss of investor confidence.
- 3) **Timeliness:** Timeliness is critical for decision-making but should also be assessed taking into account accuracy objectives to ensure the CT's success. The wrong data delivered quickly can mislead users, reducing transparency and undermining the CT's success. Effective techniques are required to support the performance required to ensure this balance.
- 4) **Consistency:** Data must be consistently represented across all sources. By applying data standards at each source of data (trading venues for on-exchange data, Investment firms for off-exchange), rules and controls can be effectively applied to control quality and unlock insights.

### B. Principles of Information Quality

As a distinction from data integrity, information quality supports the meaningful interpretation of data by applying data standards and semantics for context. Information quality is often overlooked, yet it is the key to transparency and the success of the CT. As the single source of truth for the comprehensive European equity market, the quality and usefulness of the information provided to investors is critical. The goal of informing the broadest population of users addresses information asymmetries and is consist with the

objectives of the Savings and Investments Union (f.k.a. Capital Markets Union or 'CMU'). Information quality relies on the following key principles:

- 1) **Standardisation:** Standardised data taxonomies provide compatible data structure across disparate sources and formats, supporting fungibility and allowing data to be effectively consolidated into useful information.
- 2) **Coherence:** Standardised data semantics for event type classifications, such as trade flags, allow data users to assess liquidity, market events, and price formation across the market.
- 3) **Relevance:** Event-type filtering criteria enable the useability of data, allowing users to focus on the relevant events for their specific needs. Examples include market events which represent accessible liquidity or price formation.

### C. Principles of Accountability and Oversight

Effective oversight is essential to ensure data quality and that all market participants are held accountable for their data integrity responsibilities and for properly applying data standards to unlock insights for the benefit of investors. In the context of European Equity markets, there has been insufficient accountability and oversight of the market microstructure contributors, particularly for the sources of data contributed through the APA regime. This requires the coordination of ESMA and NCAs to extend oversight and guidance to DPEs and IFs, emphasizing the responsibilities for the principles of data integrity and contributions to information quality. The DEG does not believe that the proposed revenue distribution exclusions will be a sufficiently effective data quality control - requiring enhanced, direct NCA enforcement at each source of data. Enforcement must include regular audits and be supported by oversight consisting of clear rules and timely interpretative guidance. Specifically, the DEG advises:

- 1) **Direct Accountability and Enforcement:** Effective oversight must involve direct enforcement of transparency rules on the each source of data, including TVs, APAs, and IFs. These entities are responsible for the accuracy and reliability of the market data they provide, and it is critical that they are held directly accountable for their contributions. The Consolidated Tape Provider (CTP) will play an important role and central function but will be dependent on the sources of data requiring accountability through direct NCA or ESMA supervision. There is no shortcut for transparency; accountability is required throughout the data chain. By ensuring consistent oversight and enforcement across jurisdictions, clearly defined rules, and consistent enforcement, regulators can create a reliable data quality control framework.
- 2) **Transparent Reporting and Auditability:** Each participant must be required to provide transparent and verifiable record of their data management activities. These reports must provide complete visibility into how data integrity was controlled and applied, supporting the provenance and lineage that allows regulators to trace events back to their origin and verify compliance with transparency rules. This level of

auditability is essential for detecting errors, manipulations, or other violations of transparency requirements. Transparent reporting builds trust in the market and supports the overarching goals of fairness and market integrity.

- 3) **Monitoring and Surveillance:** Oversight must include monitoring and surveillance of market activity. This helps regulators identify discrepancies, detect breaches of transparency rules, and address issues in data quality as they arise. Regular monitoring is crucial for ensuring market participants consistently adhere to transparency rules.
- 4) **Clear and Enforceable Sanctions:** To ensure compliance, NCAs must establish clear and enforceable sanctions for breaches of transparency rules.
- 5) **Regulatory Oversight and Regular Audits:** Regulators should perform regular audits of IFs, DPEs, APAs and TVs, focusing on their adherence to transparency and data integrity requirements. These audits should ensure that data is accurate, timely, and consistently reported. By conducting these audits, regulators help maintain a high level of accountability across all entities, ensuring that transparency is upheld over time. Audits also provide valuable feedback on the effectiveness of transparency rules and may highlight areas where additional regulatory guidance or oversight is needed.
- 6) **Agile Oversight:** As markets evolve and new technologies and trading practices emerge, regulators must retain flexibility in their oversight frameworks. Transparency rules should adapt to changing market conditions, ensuring that oversight remains effective despite innovation or market complexity. Regulators must regularly reassess transparency rules to ensure they strike the right balance of supporting data quality without stifling liquidity or innovation. The use of pilot programs has been suggested as a means of adopting a more agile approach to RTS changes as appropriate. These programs have proven successful in other jurisdictions and are worth consideration.
- 7) **Continuous Improvement:** A key principle of evolution is the commitment to continuous improvement through Feedback and Review. Regulators should periodically review participant transparency rules' effectiveness, gathering market participant feedback, and using transparency metrics to scrutinize and measure compliance and market outcomes. This ongoing review process allows for timely adjustments when existing rules no longer serve their purpose or when new risks emerge. Continuous improvement fosters a regulatory environment that is dynamic, responsive, and aligned with the goals of maintaining transparency and market integrity.



## II. Advice

The following areas of advice are considered to be the highest priority from the DEG's perspective.

### A. Trade Reporting

Due to the decentralized nature of trade reporting, the integrity of trade reporting data relies on the consistent interpretation of guidelines by IFs, the cooperation of DPEs and coordination with the APAs, NCAs and ESMA. Despite recent efforts by ESMA and the promise of the planned DPE regime, further measures are required to mitigate the risks of duplicate reporting, non-reporting, ambiguities in trade identification and inconsistent application of trade flagging standards which are critical to transparency. The DEG urges ESMA to adopt the following measures:

#### 1) Comprehensive Handbook

Supplemental to the highly appreciated but very comprehensive ESMA Manual on post-trade transparency under MiFID/MiFIR, a detailed handbook should be drafted and published by ESMA (with the support of the DEG), with each specific trade reporting scenario, including their correct flagging requirements. The handbook should be made widely available and considered as the key reference document for the interpretations of procedures and rules by each of the DPEs, APAs, and NCAs. The handbook should be updated regularly and available at least 6 months before the launch of the equity CT.

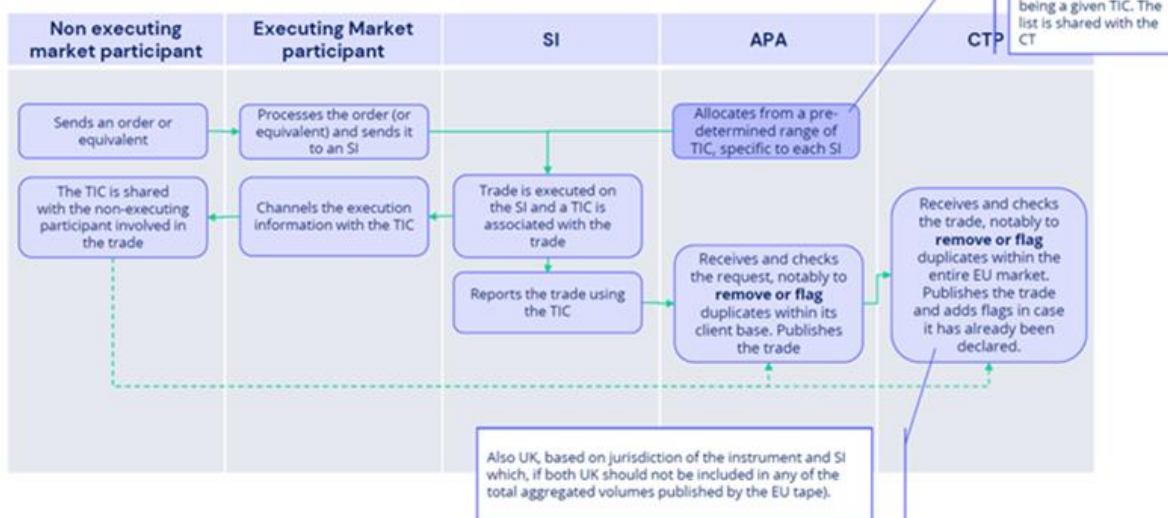
#### 2) Timely NCA Intervention

National Competent Authorities (NCAs) must play an active role in arbitrating and interpreting trade reporting procedures between Investment Firms, DPEs and APAs. Timely intervention in trade reporting discrepancies and supporting timely handbook interpretations must be provided, and resolutions of any discrepancies should be concluded within a period of no longer than one month. ESMA must ensure the consistency of handbook interpretation among NCAs.

#### 3) APA Transaction Identifier Code (APATIC)

While the DPE regime is designed to reduce duplicate trade reporting, it will not eliminate duplications. The DEG advises ESMA to mandate the implementation of a Unique Transaction Identifiers for trades reported to APAs. A unique identifier provides a reliable means of ensuring data integrity by detecting duplicated trades, non-reporting and ambiguities in trade reports. The diagram below and the attached *Exhibit 2* provide a high-level explanation for the design of the APATIC but further analysis and consultation is strongly advised.

Diagram 1



#### 4) Trade Reporting Data Quality

The DEG makes note of the recent modification by the FCA to remove give-ups from the scope of trade reporting, leading to a reduction in the OTC trade reported volume in the UK by 57%. The DEG urges ESMA to maintain a comprehensive scope for trade reporting with careful consideration for reporting waivers, particularly given the complexity and challenges observed in the consistent interpretation of trade reporting rules. In cases where reported trades duplicate reported volumes or are otherwise irrelevant, the DEG advises that trades be reported but filtered at the CTP level. This requires, however, that trades are appropriately flagged at source and sufficient granularity of trade flags applies or that the APATIC is implemented throughout the chain. In the case of give-ups, these trades are currently reportable under the “BENC” flag and, as such, are indistinguishable from other types of benchmark trades through the use of available regulatory flags.

As a matter of principle, this issue provides an example of the interdependencies between information quality and data integrity due to the insufficiency of trade flag granularity and rules to support these trades from being distinguished from other benchmark trades. As a practical matter, we note that the characteristics of these types of transactions are:

- they are typically linked to separate transactions (previously reported trade on an execution venue);
- they are non-price forming; and
- they are non-addressable.

The DEG did not reach consensus on the advice to ESMA as to whether to exclude these transactions from the scope of reportable trades. Although such an approach would violate the principles of data quality as stated above, as a practical matter, the majority of the DEG participants advised that these trades should be omitted until such time that a reliable means of flagging and filtering can be achieved. The DEG welcomes further collaboration with ESMA and advises ESMA to also review trade flagging standards that can be leveraged for these purposes.

## **5) Role of APA**

The role of the APA and its responsibilities were discussed extensively within the DEG. Whilst it necessary that regulated Investment Firms are responsible for the quality of its trade reporting, the APA also share in the responsibility and should be held accountable for data quality monitoring and controls. These responsibilities are fundamental to the objectives of the APA regime and must be enforced with a clear understanding of the limitations that APA's have in terms of visibility. The APA control functions require the support of a comprehensive handbook and timely interventions by NCAs. APA oversight is also made easier by the fact that, according to ESMA's most recent report on the quality and use of data in equities, three APAs now publish 98% of all APA transactions, reducing the oversight effort. APAs must take responsibility for monitoring the trade reports of their clients and conforming with the handbook (this obligation should be added to the draft RTS on APAs & ARMs). The DEG urges greater clarification and detail of the APAs responsibilities as outlined in Article 10 of the draft RTS. The guidance given by ESMA should be unambiguous as to the specific data quality controls that the APA must implement. The DEG suggests the following areas of clarification:

- i. The list of European controls must be appropriately coded (such as the controls required by ESMA with investment firms subject to EMIR/MIFIR/SFTR). Further explanation of these responsibilities can be found in Exhibit 5 below.
- ii. The codification of the controls carried out by all European APAs will allow the DPE (from Feb 2025) to implement these same codified controls, allowing a simpler exchange between them and their APA and significantly improving the quality of the data transmitted.
- iii. The codification of controls will allow a classification of the most important errors identified by the APA. It will allow ESMA to communicate more easily with the industry during data quality exercises with the APA.
- iv. Identical requirements should also apply to DPEs.

## B. Application of Data Standards

ESMA must ensure both the adoption and oversight of the consistent application of data standards by all APAs, trading venues and the CTP to support the information value that the CT provides as a critical success factor. Data standards include both taxonomies, which ensure the consistent representation of data even across nonstandard formats, and semantics, which ensure consistent classifications and values are provided throughout each data contribution. The key data standards include:

### 1) Uniform Instrument Identification:

As contemplated by the RTS proposals, The DEG agrees with the use of the International Securities Identification Number (ISIN) but recommends a unique symbology combination comprised of the ISIN, Market Identifier Code (MIC), and the ISO currency code for the currency in which the transaction occurred. As specified in Article 22 of MIFIR, the segment MIC is expected to be reported or the operator MIC if the segment MIC does not exist. Given the likelihood that the CT will be used internationally and combined with data from other jurisdictions outside the EU, the DEG advises using these international standards and the inclusion of currency.

- i. **ISIN:** Ensures the unique identification of the financial instrument across markets.
- ii. **Segment MIC Code (or Operator MIC doe if Segment MIC is not available):** Identifies the specific market or trading venue where the transaction occurred.
- iii. **Currency:** Adds granularity, ensuring clarity when multiple currencies are traded for the same instrument across different venues.

### 2) Trade Flags:

- i. **Adoption and Consistent Application of Trade Flags:** The DEG recommends that ESMA leverage trade flagging standards for unambiguous trade type classifications to maximize the CT's information quality. Widely adopted standards such as the Market Model Typology provide a granular, multi-level classification of trading phases and mechanisms to support complex trading scenarios and consistent trade classification across TVs and APAs.
- ii. **Application of Trade Flags in Post-Trade Reporting:** APAs and IFs must both consistently apply trade flag standards to ensure the coherence and relevance of CT data. This requires clear rules supported by a detailed handbook and timely interpretive guidance by NCAs.

## C. Role of the CTP

The role of the CTP is to ensure the availability and quality of the CT, providing a single source of truth and accurate representation of market events in aggregate across the EU market for every Equity and ETF product traded in Europe. The CTP shares in the responsibility of ensuring data quality but is primarily dependent on the contributing TVs, APAs, DPEs and IFs for this purpose. These shared responsibilities must be clearly specified and delineated to avoid any misunderstandings or accountability failures. Exhibit 4 lays out a clear comparison of responsibilities to support this clarity.

### 1) CTP Responsibilities:

- i. Perform an accurate and reliable consolidation of the received data according to clearly defined rules. Secures that it has received and processed all information
- ii. Ensure mutual and clear understanding around expected data quality to data producers delivering to the CT with consideration given to trading models used
- iii. Identify technical issues and coordinate with the data contributors to solve the issues: content and connectivity. Implement proper mechanisms to retrieve the correct data
- iv. Detect delays vs the expected time of submission: alerts, potentially with a flag
- v. Identifying obvious errors (fat fingers)
- vi. Consistency of the referential data, notably vs. FIRDS

## **2) CTP Dependencies & Constraints:**

- i. Price & volume validations must be applied at the source of each contribution.
- ii. Consistency with direct feeds from each TV if different from contribution.
- iii. Interpretive guidance for SI/IFs, i.e., trade reporting scenarios
- iv. Proper application of trade flags by the APA/SI/IF and APA control procedures.
- v. Use of pre-trade transparency waivers, LIS validation vs trade quantities, and reference prices versus the BBO

## **3) CTP Contributions**

### **Standardized Input Protocols**

The DEG did not reach a consensus on the near-term adoption of standardized CTP contributions due to practical concerns regarding the cost and time implementation. While the CTP could more easily apply data quality validations if input contributions are standardized, the accountability for data quality remains with contributors. The DEG advises the adoption of standardized inputs over time to:

- i. Reduce operation burden on the CTP for data translation and ongoing changes
- ii. Reduce risks of inconsistencies with direct feeds in terms of content, synchronization and availability
- iii. Evolution of input contributions; avoids being hard-coded into regulation and allows for easier change

This will likely involve adopting TCP protocols for the transport layer of contributions as an alternative to multicast protocols primarily used in each direct feed available for each TV and APA. The DEG advises ESMA to adopt a harmonized approach led by the CTP to prescribe minimum requirements for contribution protocols at different levels of the OSI model<sup>2</sup> to ensure:

- Accessibility
- Performance: latency, throughput, scalability, connection uptime
- Reliability: error detection, error correction, recovery mechanism

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<sup>2</sup> See [https://en.wikipedia.org/wiki/OSI\\_model](https://en.wikipedia.org/wiki/OSI_model)

- Security data confidentiality, authentication, non-repudiation
- Compatibility: open solution, interoperability (need to clarify what it must cover)
- Stability: backward and forward compatibility

For the input contributions, the speed and bandwidth efficiency are critical. To minimize the impact and reduce operational risks, it is also important that the protocols allow to perform upgrades ahead of the upcoming changes and allows the CT to not be systematically impacted by a change that is irrelevant for the CT (forward and backward compatibility). For these purposes, session level protocols such as FIX or ITCH are appropriate and SBE, ITCH and potentially FAST, FIXML for the presentation layers.

In any case, TV's input contributions must, at minimum, include the mandatory RTS1 data to the CTP. The DEG urges ESMA to expand the mandate and interpretive guidance by leveraging the Market Model Typology (MMT), which is critical to the CT's information value. MMT has already been adopted by the majority of the industry but must be mandated and consistently applied to achieve these objectives.

As indicated by ESMA in its consultations, the CTP should also receive regulatory information such as the security status information with each contribution in order to fulfil its objectives.

#### **4) Contribution Timestamps**

- i. Post-trade - The CT must receive the execution time stamp by TV, APA, DPE or IF and the trade publication time stamp: by each TV and APA
- ii. Pre-trade - Time stamps to be delivered to CTP for pre-trade data should include both the trading system (matching engine) time stamp and each TV's pre-trade publication time stamp.
- iii. Timestamp Resolution Uniformity - The timestamp resolution is critical for the CT to manage the sequence of information. If two messages are contributed simultaneously by a TV with a microsecond granularity (e.g.: 12:00:00001010 and 12:00:00001900) and from an APA with a millisecond granularity (e.g.: 12:00:00001), it is not possible to know if the APA trade occurred before or after the message 1 and 2 from the TV. It is critical that TVs, APAs and IFs adopt uniform timestamp resolution.
- iv. Synchronisation - Depending on the level of precision, different time transfer techniques exist to synchronize clocks across regions. The more precise and fault-redundant, the more costly it is. Precision Time Protocol (PTP) is widely used but does not guarantee synchronization between data centers. A balance must be achieved, considering the predominant use of CT data is not intended for trading. If timestamp precision is in order of magnitude of the millisecond across Europe, it would be feasible to build a reliable solution (with an acceptable standard deviation level versus an official source of time like UTC(OP) for instance) and traceability would be guaranteed. This solution needs to be aligned with the precision required for the

different timestamps, and the data needs to be recorded somewhere in case an end user of the CT has contradictory information regarding the data received. The CT might consider providing its own source of time to guarantee that the timestamps are all synchronized, as in the case of the US consolidated tapes.

## 5) Enhanced CTP Metrics

The metrics that ESMA requires the Consolidated Tape Provider (CTP) to publish under its Regulatory Technical Standards (RTS) proposals align with the data quality principles but require enhancements for relevance see Exhibit 7 for DEG proposed enhancements. In addition to the data quality and operational metrics, the DEG proposed to add the following metrics to better manage the CT information value and enhance the data quality measures:

### i. **Information Value Metrics:**

- By Security/Trade Flag: Number of Trades, Total Percentage, Avg Size, Median Size
- Reference Price Waivers: Large in Scale, Negotiated Trades and Order Management Facility: Number of trades, Notional, Percentage, Avg size, median size, Number/pct reported real-time vs deferred
- EBBO average size/spread by security, average presence time<sup>3</sup>

### ii. **Additional Data Integrity Metrics:**

- Amended trade reports number of trades reported/amended or ratio

### iii. **Capacity and Performance Metrics by Contributor**

- Peak Messages Per Second
- Peak Transactions Per Day
- Average Latency ( $\mu$ s)/Median Latency ( $\mu$ s)
- 10<sup>th</sup>/90<sup>th</sup>/99<sup>th</sup> Percentile Latency ( $\mu$ s)

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<sup>3</sup> Two observers expressed disagreement with the inclusion of the average presence time among the information value metrics.



## 6) CTP Publication

The CTP is best positioned to lead the adoption of standardized messaging protocols, evolve over time, and ensure the broad use of the CT. The DEG advises against the use of JSON for market data due to its verbosity and performance issues. SBE, ITCH, and FAST are preferred alternatives.

At a minimum, the CT should publish:

- i. All functional data required by the proposed RTS
- ii. Time stamps published by the CTP for post-trade data:
  - Trade execution time stamp by each TV, SI/DPE or IF (via APA)
  - Trade publication time stamp by each TV and APA
  - Trade reception timestamp by the CT for each message
  - Trade publication time stamp by the CT
- iii. Time stamps published by the CTP for pre-trade data:
  - Pre-trade event (matching engine) timestamp for TV.
  - Pre-trade publication time stamp for each TV
  - EBBO calculation timestamp by the CT for each EBBO message
  - EBBO publication time stamp by the CT

The timestamp of execution at the data contributor is required to understand the global sequence of events. The timestamp of dissemination by the data contributor is required to measure the time to process and disseminate that data. The CT should add the timestamp of reception of each post-trade and pre-trade message contributed. The timestamp of dissemination of the data by CT allows the quality of the CT processing time to be measured and included in the Enhanced CTP Metrics.

- i. Primary Listing Venue
- ii. Dual Listing Flag/Venue
- iii. Market Events: Opening and closing trades (where available)
- iv. Price events: High price and low price (day and 52 week)
- v. Security status: Halts, trading phases, etc.

## 7) Conflation & Usability

A common method used to ensure usability is conflation, which reduces the burden of consuming each event and provides a cumulative state even across microbursts within a millisecond, which can be common in fast markets. Here again, the DEG recommends that the CTP be provided the flexibility to determine the needs and demands of its users and **offer conflated alternatives as appropriate.**

## 8) Operational Considerations

Services hours of the CT must be aligned at least with the opening hours of EU trading venues and APAs. Annual trading schedules including overview of EU bank holidays in different member states and clear operating times should be provided to the CTP on issuance of the respective trading schedule by the TVs and APAs.

## 9) Latency Performance

It is complex and expensive to control the maximal transmission delay of a market data component. The DEG advises ESMA to replace the obligation from absolute latency to a percentile. This is already tracked by most trading venues and would allow the CT to get the data faster in 99% of the cases by setting a lower limit. The current RTS proposals imposing absolute latency performance requirements with hardcoded thresholds will likely prove impossible to achieve due to complexities in each network environment.

## D. Error Handling

In case of inaccurate information detected in an upstream layer, the CT should inform the entity which provided the input and ask for the correction of the data; The DEG advises the use of "Suspicious Data" flags where possible however, direct modifications to the incoming data should only be done by the entity originating the data. In case of repetitive issues impact each layer, the entity detecting the issue (APA, CTP) should have strong mechanisms to secure that the quality of incoming data improves. The incentives could take the form of certifications (and removal of the certification), financial sanctions, remediation plans. They have to be done in coordination with the NCA supervising the entity facing data quality issues. If the issue is a loss of information between the data contributor and the CT, a mechanism should be implemented to allow the user to retrieve the information. Usually sequence numbers are used to detect missing packets.

## E. European Best Bid and Offer (EBBO)

### 1) Contributions

- i. Each TV contributor will be required to submit, at a minimum, the best bid and offer as a quotation from each market. As the DEG has advised no standardization of protocol, it would advise the CTP to determine the standardization of contribution formats to ensure the appropriate data is available for the construction of the European Best Bid and Offer (EBBO).
- ii. It is critical that there be a common methodology defined by the CTP for the frequency that quotations are published by each TV as the underlying orderbook changes.
- iii. It is critical that the CTP defines a minimum quote size for EBBO updates. The DEG discussed the use of Standard Market Size as the potential minimum but did not conclude its deliberations requiring further consultation.

### 2) Calculation Timing

Consideration should be given to the time required to consolidate and publish the EBBO upon each change. The timestamp precision and transparency is especially important for pre-trade contributions. The geographical diversity of pre-trade contributions will inevitably create situations that distort the true liquidity at the EBBO. As the CT is expected to serve as a reference and not to be used for trading, EBBO aggregation logic should support this objective by providing as accurate a view of the EBBO as possible. **The DEG advises ESMA to give the CTP latitude in determining the optimized methods that align with the needs of the market<sup>4</sup>.**

### 3) Publication

- i. The publication should be as close to real-time as possible from the calculation.
- ii. An EBBO should be published as long as one TV is trading in a continuous trading phase.

#### *a) Multicurrency EBBO*

The DEG advises that the EBBO be constructed at the level of ISIN/MIC (of primary market)/Currency as suggested in symbology. The adjunction of order books in different currencies creates complexity for limited value and might be better supported by data

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<sup>4</sup> Two observers expressed disagreement with the proposal that the CTP should set the standards on how to calculate the EBBO.

vendors who enhance data for human consumption. Again, the **DEG urges ESMA to provide the CTP with latitude here to enable vendors to apply additional aggregation logic.**

## F. Accountability and Oversight

Effective oversight requires enforcement and sanctions to drive accountability for data integrity as a key microstructure responsibility. The Data Expert Group (DEG) proposes a comprehensive regulatory oversight framework for trade reporting, APA contributions, trading venue contributions, and CTP consolidation, which is centred on ensuring consistency, accountability, and transparency across the transparency regime. This framework should also ensure the consistent application of reference data and trade flagging standards, which support the use and interpretation of transparency data. The recommendations address key areas of compliance, auditing, harmonization, and enforcement. The foundation of a reliable Consolidated Tape (CT) is the proper application of uniform standards for trade reporting, symbology, timestamping, and trade flagging. The DEG emphasizes the need for ESMA to ensure that all market participants—including Investment Firms (IFs) and Systematic Internalizers (SIs, submitting off-exchange trade reports to either a Designated Publishing Entity (DPE) or Approved Publication Arrangement (APA)—adhere to these standards, particularly the reference data<sup>5</sup> and trade flagging conventions which support the filtering criteria at the CTP level.

### 1) Timestamping Precision:

- i. **High-Precision, Synchronized Timestamping:** ESMA should enforce the use of high-precision timestamping protocols, ensuring consistency across trading venues, APAs, DPEs and IFs. This includes mandating the use of synchronized clocks to ensure uniformity in trade reporting and the detection of discrepancies in trade timing.
- ii. **Cross-Venue Timestamping Accuracy:** ESMA should monitor timestamp synchronization across jurisdictions, venues, APAs and IFs ensuring that timestamp granularity matches regulatory requirements (e.g., microsecond precision) to improve the traceability of trades.

### 2) Monitoring and Verification:

Regular reviews and audits should be conducted to ensure that APAs, IFs and trading venues adhere to these data standards, particularly focusing on proper instrument identification, trade flag application, and accurate timestamping.

- i. **Regular Audits:** ESMA should conduct scheduled audits to assess compliance with data standards, focusing on the application of standards, and timestamp accuracy.

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<sup>5</sup> One observer expressed disagreement with the inclusion of reference data among the areas for which market participants should adhere to uniform standards.

- ii. **Random Audits:** Randomized audits should be conducted periodically to ensure that participants are consistently compliant, even outside of expected audit periods. This creates a deterrent against potential non-compliance and ensures ongoing accountability.

### 3) Clear Rules and Timely Interpretative Guidance

Clear conduct rules in the form of a handbook and interpretative guidance are critical to ensuring that APAs, trading venues, and the CTP properly apply trade reporting standards. These rules should be accompanied by accessible guidance to assist market participants in their compliance efforts.

#### i. **Comprehensive Handbook:**

- ESMA should establish detailed conduct rules that clearly define the responsibilities of APAs, IFs, trading venues, and the CTP. These rules should address:
  - Proper classification of trades according to taxonomy.
  - Consistent use of symbology and timestamping.
  - Obligations for correcting inaccurate trade data.

#### ii. **Timely Intervention & Discrepancy Guidance:**

- To support compliance, ESMA should publish interpretative guidance on when and how to report, apply trade flags and other trade reporting standards. This guidance should be regularly updated to reflect technological advancements and changes in market practices.
- NCAs must provide timely intervention and guidance upon request. Ultimately, ESMA and NCAs should implement systems that allow for the real-time<sup>6</sup> detection and correction of discrepancies in trade flagging, symbology, and timestamps. This ensures that data integrity issues are resolved as soon as they arise, minimizing potential market impact.

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<sup>6</sup> One observer expressed disagreement with the inclusion of a reference to “real time” detection.

#### 4) Consistent Oversight and Enforcement

For effective oversight, ESMA must establish a consistent and transparent enforcement framework that holds all market participants accountable to the same standards, regardless of jurisdiction.

i. **Oversight Consistency:**

ESMA should develop standardized oversight NCA procedures that ensure all APAs, DPEs, IFs, trading venues, and the CTP are subject to the same level of scrutiny. This includes consistent application of trade flagging, symbology standards, and timestamping across all reporting entities.

ii. **Uniform Enforcement:**

Enforcement actions should be applied uniformly across all NCA jurisdictions, ensuring that compliance with data standards is upheld across the board. ESMA should clearly define the circumstances that trigger enforcement actions, such as fines or restrictions for non-compliance.

iii. **Corrective Action Plans:**

For minor breaches, ESMA should allow market participants to submit corrective action plans. These plans must detail how the participant will rectify the issue and ensure future compliance. ESMA should closely monitor the implementation of these plans.

## Exhibit 1 – Unique Transaction Identifier (UTI)/APA Transaction Identification Code diagram

The unique trade identifier (UTI) is a unique alphanumeric code assigned to each individual trade. This identifier is generated at the point of execution, and allows both trading venues and APAs to distinguish between different trades and avoid reporting the same trade multiple times. The UTI ensures the accuracy and transparency of post-trade data, especially under regulatory frameworks like MiFID II in Europe, which requires comprehensive trade reporting to both the public and regulatory bodies. Here's how a UTI works and helps in avoiding duplicate trade reporting:

Diagram 1  
UTI for Trading Venues

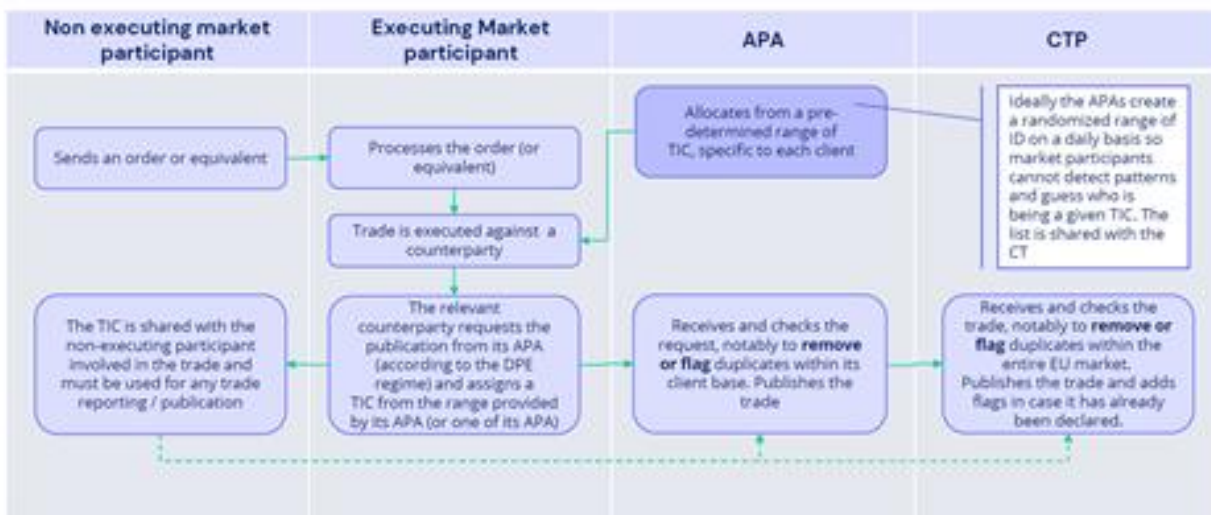


When data is published to the CTP or for regulatory reporting, the UTI ensures that the trade is only counted once, even if it has been reported by multiple entities. This avoids overreporting and provides a more accurate view of the market.

An APA Transaction ID Code (APATIC) works similarly to the TVTIC used by trading venues but is specifically tied to the reporting of trades through an Approved Publication Arrangement (APA). This concept of UTI/ APATIC on bilateral transactions would be valid across all classes of instruments, and would be of particular value for bilateral transactions that have to reported in 2 different jurisdictions due to nature of counterparties, typically vehiculating the same Unique Transaction identifier would help aggregating data for the CTP by making it possible to deal with dual reporting (such as in UK / EU) while avoiding duplicates in the aggregation for the CTP. An APA's role is to ensure that trade details are published in a way that meets post-trade transparency requirements under regulations like MiFID II. Here's how the APA UTI functions, its purpose, and how it supports the overall integrity and transparency of financial markets:

Diagram 2

### APATIC for Bilateral Trading

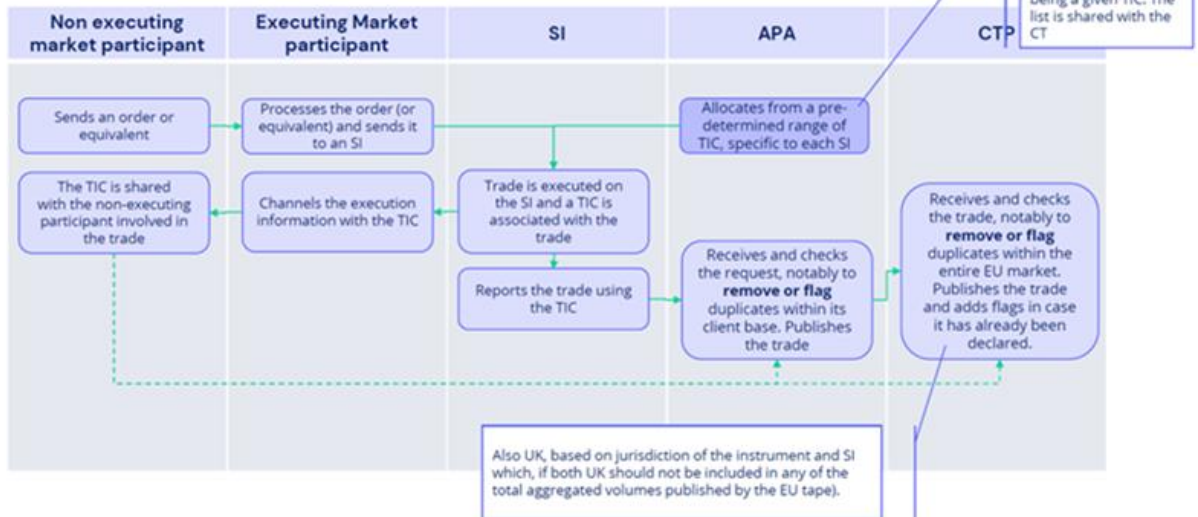




When a trade is executed off-exchange by an investment firm, it needs to be reported through an APA for post-trade transparency. The trade details are submitted to the APA along with or through the creation of a Unique Transaction ID.

### APATIC for SI and DPE

Diagram 3



**Exhibit 2** Responsibility Matrix – Data Quality Control Framework

	<b>Responsible</b>	<b>Dependent</b>	<b>Rationale</b>
<b>CTP</b>			
Perform consolidation according to clearly defined rules	X		
Specify guidelines and acceptance criteria for contributions	X		
Identify technical issues and coordinate with the data contributors for resolution.	X		
Detect and identify/flag delays	X		
Identify obvious errors (fat finger)	X		
Maintain referential data consistency with FIRDS	X		
Price validations		X	Out of scope of controls
<b>TVs</b>			
Contribute data as per CTP-defined rules	X		
Accurate and timely contributions to CTP	X		
Detect Duplicates		X	Out of scope of controls

Detect Missing Reports		X	Out of scope of controls
Detect Trade Flag Errors		X	Out of scope of controls
Execution type according to the market model	X		
<b>APAs</b>			
Contribute data as per defined rules	X		
Accurate reporting of trades to CTP	X		
Detect Duplicates		X	Out of scope of controls
Detect Missing Reports		X	Out of scope of controls
Detect Trade Flag Errors		X	Out of scope of controls
Defines the waivers, execution type according to the market model		X	Out of scope of controls
<b>DPEs</b>			
Compliance with trade reporting rules	X		
Defines the waivers, execution type according to the market model	X		

Accurate reporting of trades to APA	X		
Timely reporting of trades to APA	X		
<b>Investment Firms</b>			
Compliance with trade reporting rules	X		
Defines the waivers, execution type according to the market model	X		
Proper use of waivers	X		
Accurate reporting of trades	X		
Timely reporting of trades to DPE or APA	X		

### Exhibit 3

#### MMT Level 1 Comparison to Mandated Trade Flags

Level	Full Name	v4.2	v5.0	ESMA			
		Existing Display Code	Display Code (ESMA recommendation)	RTS 1 (equity)	RTS 2 (non-equity)	RTS 1 SI Use Only	
		<b>1</b>	<b>MARKET MECHANISM</b>				
	Central Limit Order Book	"LB"	"CLOB"	✓	✓		
	Quote Driven Market	"QB"	"QDTS"	✓	✓		
	Dark Order Book	"DB"	???	???	???		Annex I, Table 1: No suitable definition supporting proper categorisation of Dark Trading
	Off Book (including Voice or Messaging Trading)	"QB"	"VOIC"	✓	✓		When the field 'Venue of execution' is populated with "SINT" or "XOFF", this field shall not be populated. --> Off Exchange off book trades should convey an empty field
	Periodic Auction	"PA"	"PATS"	✓	✓		
	Request for Quotes	"RQ"	"RFQT"	✓	✓		
	Any Other, Including Hybrid (original ESMA definition in RTSS 1 & 2)	"AH"	???	???	???		
	Hybrid System (revised ESMA definition, replacing 'Any Other, Including Hybrid')	"HS"	"HYBR"	✓	✓		
	Any Other, Excluding Hybrid (revised ESMA definition, replacing 'Any Other, Including Hybrid')	"AO"	"OTRH"	✓	✓		

## Exhibit 4 – Trade Reporting by Type

### Comparison between EU and UK

#### Equities and Equity-Like Securities

ID/Trade Scenario	Frequency	AL?	Traded on TV		Brought on TV		Traded on SI (SINT)			Traded OTC (XOFF)		
			EU+UK, all times	EU to end 2023, UK to 28/4/24	EU from 1/1/24	UK from 29/4/24	EU to end 2023, UK to 28/4/24	EU from 1/1/24	UK from 29/4/24	EU to end 2023, UK to 28/4/24	EU from 1/1/24	UK from 29/4/24
<b>Vanilla risk fill scenarios</b>												
1 Price-forming risk fill in liquid instrument above LIS	High	Y	n/a	NTLS (3.10), or NLIQ (3.2), or both**	NTLS (3.10), or NLIQ (3.2), or NETW	SIZE (3.10)	SIZE (3.10)	no flags	no flags	no flags	no flags	no flags
2 Price-forming risk fill in liquid instrument between SMS and LIS	High	Y	n/a	NLIQ (3.2)	NLIQ (3.2)	NETW (3.2)	SIZE (3.10)	no flags	no flags	no flags	no flags	no flags
3 Price-forming risk fill in liquid instrument below SMS at SI quote	High	Y	n/a	NLIQ (3.2)	NLIQ (3.2)	NETW (3.2)	no flags	no flags	no flags	no flags	no flags	no flags
4 Price-forming risk fill in liquid instrument below SMS with px improvement	Low	Y	n/a	NLIQ (3.2)	NLIQ (3.2)	NETW (3.2)	RPRI (3.1)	RPRI (3.1)	no flags	no flags	no flags	no flags
5 Price-forming risk fill in illiquid instrument above LIS	Medium	Y	n/a	NTLS (3.10), or OILQ (3.2), or both**	NTLS (3.10), or OILQ (3.2), or NETW	ILQD (3.2)	ILQD (3.2)	no flags	no flags	no flags	no flags	no flags
6 Price-forming risk fill in illiquid instrument below LIS	Medium	Y	n/a	OILQ (3.2)	NETW (3.2)	ILQD (3.2)	ILQD (3.2)	no flags	no flags	no flags	no flags	no flags
<b>Other trading scenarios</b>												
7 Non-reportable as per RTS 1.13 (e.g. cash give-up)	Low	N	NPFT (3.8)	NPFT (3.8)	NPFT (3.8)	NPFT (3.8)	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
8 RFMD give-up	High	N	n/a	NPFT (3.8), GIVE (3.13)	NPFT (3.8), GIVE (3.13)	NPFT (3.8), GIVE (3.13)	n/a*	Not reported	TNCP (3.8), BENC (3.5), GIVE (3.13)	BENC (3.5), GIVE (3.13)	Not reported	Not reported
9 Non-portfolio guaranteed VWAP	Medium	Y	n/a	PRIC (3.2), BENC (3.5)	PRIC (3.2), BENC (3.5)	NETW (3.2), BENC (3.1), TNCP (3.8), BENC (3.5)	BENC (3.5)	BENC (3.5)	TNCP (3.8), BENC (3.5)	BENC (3.5)	BENC (3.5)	BENC (3.5)
10 Portfolio guaranteed VWAP	Medium	Y	n/a	PRIC (3.2), BENC (3.5)	PRIC (3.2), BENC (3.5)	INETW (3.2), BENC (3.1), TNCP (3.8), BENC (3.5)	BENC (3.5), PORT (3.1)	BENC (3.5), PORT (3.1)	TNCP (3.8), BENC (3.5)	BENC (3.5), PORT (3.1)	BENC (3.5), PORT (3.1)	BENC (3.5), PORT (3.1)
11 Portfolio risk basket (not guaranteed VWAP)	High	Y	n/a	PRIC (3.2)	PRIC (3.2)	NETW (3.2), PORT (3.1), TNCP (3.8)	PORT (3.1)	PORT (3.1)	TNCP (3.8)	PORT (3.1)	PORT (3.1)	PORT (3.1)
12 Non-portfolio guaranteed close	Medium	Y	n/a	PRIC (3.2)	PRIC (3.2)	NETW (3.2), BENC (3.1), TNCP (3.8)	BENC (3.5), CLSE (3.5)	BENC (3.5), CLSE (3.5)	TNCP (3.8)	BENC (3.5), CLSE (3.5)	BENC (3.5), CLSE (3.5)	BENC (3.5), CLSE (3.5)
13 Portfolio guaranteed close	High	Y	n/a	PRIC (3.2)	PRIC (3.2)	NETW (3.2), CLSE (3.5), TNCP (3.8)	BENC (3.5), PORT (3.1), CLSE (3.5), PORT (3.1)	TNCP (3.8)	TNCP (3.8)	BENC (3.5), PORT (3.1), CLSE (3.5), PORT (3.1)	TNCP (3.8)	BENC (3.5), PORT (3.1), CLSE (3.5), PORT (3.1)
14 Exchange for physical (vanilla)	Medium	Y	n/a	PRIC (3.2)	PRIC (3.2)	NETW (3.2), PORT (3.1), TNCP (3.8)	CONT (3.12), PORT (3.1)	CONT (3.12)	TNCP (3.8)	CONT (3.12), PORT (3.1)	CONT (3.12)	CONT (3.12)
15 Exchange for physical (VWAP-priced)	Low	Y	n/a	PRIC (3.2), BENC (3.5)	PRIC (3.2), BENC (3.5)	NETW (3.2), BENC (3.1), TNCP (3.8), BENC (3.5)	CONT (3.12), PORT (3.1)	CONT (3.12), PORT (3.1)	TNCP (3.8), BENC (3.5)	CONT (3.12), PORT (3.1)	CONT (3.12), PORT (3.1)	CONT (3.12), PORT (3.1)
16 Exchange for physical (close-priced)	Low	Y	n/a	PRIC (3.2)	PRIC (3.2)	NETW (3.2), CLSE (3.5), TNCP (3.8)	CONT (3.12), PORT (3.1)	CONT (3.12), PORT (3.1)	TNCP (3.8)	CONT (3.12), PORT (3.1)	CONT (3.12), PORT (3.1)	CONT (3.12), PORT (3.1)
17 Other (non-portfolio, non-benchmark) contingent trade	Low	Y	n/a	PRIC (3.2)	PRIC (3.2)	NETW (3.2)	TNCP (3.8)	CONT (3.12)	TNCP (3.8)	CONT (3.12)	TNCP (3.8)	CONT (3.12)
18 Trades brought on venue purely for clearing/settlement	Medium	N	n/a	NPFT (3.8)	NPFT (3.8)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
19a ETF NAV trades - first report (with price to follow)	Medium	N	n/a	PNDG (3.8)	NPFT (3.8)	PNDG (3.8)	PNDG (3.8)	Not reported	PNDG (3.8)	PNDG (3.8)	Not reported	Not reported
19b ETF NAV trades - second report (price available, cancel/replacing first report)	Medium	Y	n/a	PRIC (3.2), BENC (3.5)	PRIC (3.2), BENC (3.5)	NETW (3.2), BENC (3.1), TNCP (3.8), BENC (3.5)	BENC (3.5)	BENC (3.5)	TNCP (3.8), BENC (3.5)	BENC (3.5)	BENC (3.5)	BENC (3.5)
20 Trade-at-last (non pre-trade transparent), using close price	Low	Y	RPFT (3.5), CLSE (3.5)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

#### Modifiers (apply on top of the above scenarios except where n/a)

A Deferral (LRGS)	High	-	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)	LRGS (4.1)
B Ex/cum div (SDIV)	Low	-	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)	SDIV (3.6)
C Intra-group trade (IGRP)	Medium	N**	n/a	IGRP (5.3)	IGRP (5.3)	IGRP (5.3)	IGRP (5.3)	Not reported	IGRP (5.3)	IGRP (5.3)	Not reported	Not reported
D Agency cross (ACTX)	Low	-	n/a	ACTX (3.3)	n/a	ACTX (3.3)	ACTX (3.3)	n/a	ACTX (3.3)	ACTX (3.3)	n/a	n/a
E Cross-border duplicate trade (XBDT)	Low	N**	n/a	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)	XBDT (5.2)
F APA duplicate trades (DUPL)	None	N**	n/a	n/a	n/a	DUPL (5.1)	DUPL (5.1)	n/a	DUPL (5.1)	DUPL (5.1)	n/a	n/a
G Inter-fund transfers on behalf of clients	Low	N**	IFND	IFND	IFND	IFND	IFND	IFND	IFND	IFND	IFND	IFND

#### Notes

In the above 'portfolio' should be interpreted as meeting the definition under RTS 1 article 1 (both EU and UK)

In the yellow area, flags SIZE (3.10), RPRI (3.1) and ILQD (3.2) can also apply where appropriate

Flags shown in blue denote voluntary usage (IOS-recommended flags where not mandated through regulation)

\* Flagging RFMD give-ups as XOFF-BENC is as per ESMA Q&A; the voluntary addition of GIVE is to cover the non-uniqueness of this flag combination

\*\* The presence of any of these flags on any trade will result in it being considered non-addressable

\*\*\* MMT supports these permutations but FIX does not make any recommendations as to which to use

- In the Modifiers section indicates that the presence of one of these flags does not alter the addressable liquidity status of a trade

Scenarios 12 and 13 use combinations of BENC and CLSE which requires a new version of MMT

Scenario 20 uses a combinations of RPFT and CLSE which requires a new version of MMT

Scenarios 13 and 16 use more than three of BENC, PORT, CONT or CLSE which requires a change to the FIX Protocol

IFND flag is pending addition to MMT and FIX Protocol standards

Scenario 19b (the second report for ETF NAV trades) is under discussion in the working group

Source: FIX Protocol

## Exhibit 7– Enhanced CT Metrics

The DEG advises the following enhancements to the RTS proposals concerning CTP metrics.

<b>RTS Metrics: Data Completeness</b>	<b>DEG Proposed Enhancements</b>
1. Coverage of Venues - Percentage of trading venues included in the consolidated tape.	<ul style="list-style-type: none"> <li>• % of notional traded covered by the CT</li> <li>• European market capitalization covered by CT</li> </ul>
2. Instrument Coverage - Range of financial instruments included.	<ul style="list-style-type: none"> <li>• % by category (i.e. equity, DR, ETF, equity-like)</li> </ul>
3. Transaction Coverage - Proportion of trades from venues included in the consolidated tape.	<ul style="list-style-type: none"> <li>• Identify the absolute number of missing trades, notional value</li> </ul>
4. Data Completeness Ratio - Ratio of complete vs. expected trades in the data.	<ul style="list-style-type: none"> <li>• Trend comparison change month over month/year over year</li> </ul>
<b>RTS Metrics: Data Accuracy</b>	<b>DEG Proposed Enhancements</b>
1. Error Rates - Percentage of errors in the data (prices, volumes, timestamps).	<ul style="list-style-type: none"> <li>• Trend comparison change month over month/year over year</li> </ul>
2. Data Integrity - Measures consistency and integrity of data.	<ul style="list-style-type: none"> <li>• Trend comparison change month over month/year over year</li> </ul>
3. Number of Retransmissions - Number of times data needs to be corrected.	<ul style="list-style-type: none"> <li>• Trend comparison change month over month/year over year</li> </ul>

**RTS Metrics: Latency and Data Timeliness****DEG Proposed Enhancements**

- 
- |  |                                  |
|--|----------------------------------|
| 4. Time to Consolidate Data - Time taken to aggregate data from venues and publish.          | • Percentile 10/90/99 ( $\mu$ s) |
| 5. Time to Publish Post-Trade Data - Speed of publishing post-trade data after trade occurs. | • Percentile 10/90/99 ( $\mu$ s) |
| 6. Data Staleness - Extent of data delay compared to real-time.                              | • Average Standard deviation     |
| 7. Latency Distribution - Statistical distribution of data latency across venues.            | • Percentile 10/90/99 ( $\mu$ s) |
- 

**RTS Metrics: Individual Venue Latency****DEG Proposed Enhancements**

- 
- |  |                                  |
|--|----------------------------------|
| 8. Individual Venue Latency- Latency for specific venues, allowing comparison between markets. | • Percentile 10/90/99 ( $\mu$ s) |
| 9. Venue Contribution - Contribution of each venue in terms of volume/liquidity.               |                                  |
-



**RTS Metrics: Operational Performance****DEG Proposed Enhancements**

- 
- |   |                  |
|---|------------------|
| 1. System Uptime/Downtime - Tracks operational availability of CTP systems. | • Time intervals |
| 2. Service Disruptions - Number and duration of service interruptions.      | • Time intervals |
-

