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| 2 June 2016 | ESMA/2016/773 RF |

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| Reply form for the  Discussion Paper on the Distributed Ledger Technology Applied to Securities Markets |
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| Date: 2 June 2016  ESMA/2016/773 RF |

Responding to this paper

The European Securities and Markets Authority (ESMA) invites responses to the specific questions listed in the ESMA Discussion Paper on the Distributed Ledger Technology (DLT) Applied to Securities Markets, published on the ESMA website.

*Instructions*

Please note that, in order to facilitate the analysis of the large number of responses expected, you are requested to use this file to send your response to ESMA so as to allow us to process it properly. Therefore, ESMA will only be able to consider responses which follow the instructions described below:

* use this form and send your responses in Word format (pdf documents will not be considered except for annexes);
* do not remove the tags of type <ESMA\_ QUESTION\_DLT\_1> - i.e. the response to one question has to be framed by the 2 tags corresponding to the question; and
* if you do not have a response to a question, do not delete it and leave the text “TYPE YOUR TEXT HERE” between the tags.

Responses are most helpful:

* if they respond to the question stated;
* contain a clear rationale, including on any related costs and benefits; and
* describe any alternatives that ESMA should consider

**Naming protocol**

In order to facilitate the handling of stakeholders responses please save your document using the following format:

ESMA\_DLT\_NAMEOFCOMPANY\_NAMEOFDOCUMENT.

E.g. if the respondent were XXXX, the name of the reply form would be:

ESMA\_DLT\_XXXX\_REPLYFORM or

ESMA\_DLT\_XXXX\_ANNEX1

***Deadline***

Responses must reach us by **2 September 2016.**

All contributions should be submitted online at [www.esma.europa.eu](http://www.esma.europa.eu) under the heading ‘Your input/Consultations’.

***Publication of responses***

All contributions received will be published following the end of the consultation period, unless otherwise requested. **Please clearly indicate by ticking the appropriate checkbox in the website submission form if you do not wish your contribution to be publicly disclosed. A standard confidentiality statement in an email message will not be treated as a request for non-disclosure.** Note also that a confidential response may be requested from us in accordance with ESMA’s rules on access to documents. We may consult you if we receive such a request. Any decision we make is reviewable by ESMA’s Board of Appeal and the European Ombudsman.

***Data protection***

Information on data protection can be found at [www.esma.europa.eu](http://www.esma.europa.eu) under the headings ‘Legal notice’ and ‘Data protection’.

# Introduction

Please make your introductory comments below, if any:

<ESMA\_COMMENT\_DLT\_1>

R3 CEV Ltd. (“R3”) appreciates the opportunity to respond to the Discussion Paper issued by the European Securities and Markets Authority (“ESMA”) on June 2, 2016, entitled “The Distributed Ledger Technology Applied to Securities Markets.”[[1]](#footnote-2) R3 is a Fintech company that is also a consortium of more than 60 financial institutions, which includes the full spectrum of the finance space, from banks and custodians to asset managers and insurers, all of whom are interested in the use of Distributed Ledger Technology (“DLT”) and all of whom are actively pursuing an application of DLT to financial services that will create cost savings, decrease transactional errors, and significantly increase settlement speed. As the target audience of the Discussion Paper, R3 submits these responses to the questions posed in the Paper, in hopes that they serve as a starting point for ongoing dialogue. We thank you for inviting responses to the Discussion Paper and welcome any questions or comments regarding our answers.

As additional background, R3 is leading an initiative with its members, which represent the world’s largest financial institutions, to develop ground-breaking commercial applications for the financial services industry that leverage the appropriate elements of distributed and shared ledger technology. Operating in New York, London and San Francisco, the R3 team is made up of financial industry veterans, technologists, and new tech entrepreneurs, bringing together expertise from electronic financial markets, cryptography, and digital currencies.

R3 believes that, although the primary applications in the initial waves of deployment are likely to be post-trade, in the long-term, the full promise of DLT will be realized by applications that address the entire asset lifecycle from issuance to trade to post-trade functionality. It is important to remember that this technology is still very much in the formation stage. The coming months and years will bring many new developments in the DLT space.

<ESMA\_COMMENT\_DLT\_1>

##### Do you agree with the list of possible benefits of the DLT for securities markets? Please explain, e.g., are these benefits unique to the DLT, are some more important than others, are some irrelevant?

<ESMA\_QUESTION\_DLT\_1>

We agree with the list and envision an even broader set of benefits as the technology matures and new applications are developed. While there are existing technologies (such as distributed databases, public key infrastructure, hardware signing, and, as ESMA highlights in the Discussion Paper, standard identifiers) that can handle some tasks involved in realizing the benefits identified, DLT provides new types of utility and financial controls that did not previously exist and also, in some cases, improves the usefulness and speed of development, as with smart contracts. This is based on the technology’s ability to combine several key elements and deploy them across asset classes: immutability, value verification, uniqueness service, agent recognition, consensus, auditability, cryptographic security, speed, privacy balanced with transparency, legal-system compatibility, all while still maintaining scalability. Additionally, as R3 continues to build its platform, we maintain focus on facilitating compliance by improving the visibility of regulators through regulator nodes on the platform, which represents a huge leap in terms of quality of reporting and enablement of regulatory oversight.

<ESMA\_QUESTION\_DLT\_1>

##### Do you see any other potential benefits of the DLT for securities markets? If yes, please explain.

<ESMA\_QUESTION\_DLT\_2>

Yes. One key pre-trade benefit is the ability to enhance AML/KYC processes and systems, which would benefit both market participants and regulators in each ESMA jurisdiction and beyond.

<ESMA\_QUESTION\_DLT\_2>

##### How would the benefits of the technology be affected, in the case where the DLT is not applied across the entire lifecycle of securities (i.e., issuance, trading, clearing and settlement, safekeeping of assets and record of ownership) but rather to some activities only?

<ESMA\_QUESTION\_DLT\_3>

The financial services industry spends hundreds of billions of dollars each year on support for legacy IT systems and processes, and many firms face the need to maintain thousands of systems within their own firewalls alone. DLT offers the potential to address many of those inefficiencies in a targeted fashion, and many of our clients are already experimenting with such use cases. That said, the full potential of DLT would not be fully realized because many of the benefits accrue both as the result of deployment over the course of a transaction lifecycle and as a result of the network effect that is magnified as additional parties join the ecosystem. At R3, our mission is to both develop critical technology as well as drive its adoption through a broad-based consortium model that includes financial services firms, trade associations, standards bodies and regulators. Ultimately, we believe DLT will first gain adoption within targeted circumstances and, over time, expand to include more parties, more asset classes and more segments of a trade lifecycle.

<ESMA\_QUESTION\_DLT\_3>

##### Which activities (e.g., post-trading, other activities), market segments and types of assets in the securities markets are likely to be impacted the most by the DLT in your opinion? How is the DLT likely to modify the way securities markets operate? Please explain.

<ESMA\_QUESTION\_DLT\_4>

R3 believes that the greatest impact in the short and middle term will be felt in both pre-trade and post-trade activities, not the trade itself. To determine which market segments and asset classes present the greatest opportunity, we look to identity those parts of a transaction lifecycle that currently rely on the most inefficient, expensive and time-consuming processes: AML/KYC, post-trade reconciliations, collateral management, settlement and clearing. A key focus for us is the development of smart contract solutions that will address a host of these issues across both market segment and asset class. We have already launched various use cases and prototypes around both exchange-traded and OTC derivatives to support those efforts and identify potential commercial products. Specifically, for securities, we believe that the clearing and settlement process, collateral management, reporting, and regulatory oversight stand to improve dramatically with the deployment of DLT solutions. In turn, improved clearing, settlement and collateral management will reduce risk in the system.

<ESMA\_QUESTION\_DLT\_4>

##### According to which timeframe, is the DLT likely to be applied to securities markets in your view? Please distinguish by type of activities, market segments and assets if relevant.

<ESMA\_QUESTION\_DLT\_5>

Predicting timeframes for the deployment of technology in any field is difficult, especially so in the case of something as potentially powerful and broad-reaching as DLT. At R3, we are already actively developing our platform – Corda – and our product and use case teams are proceeding in parallel. The ultimate deployment of full-scale solutions is still 3-5 years away, and perhaps longer, but we believe the first wave of commercial applications will begin to emerge by the end of 2017. Note, however, that this first wave will serve as the introduction of applications into the marketplace, and we fully anticipate more mature products to follow-on subsequently.

<ESMA\_QUESTION\_DLT\_5>

##### How might your organisation benefit from the introduction of the DLT?

<ESMA\_QUESTION\_DLT\_6>

R3 is a Fintech firm that leads a global consortium of financial services institutions focused specifically on the development and deployment of DLT. The primary benefit to our members will be a dramatic reduction in costs as a result of the introduction of this technology.

<ESMA\_QUESTION\_DLT\_6>

##### If you are working on a concrete application of the DLT to securities markets please describe it (i.e., which activities, which market segments, which type of assets and for which expected benefits) and explain where you stand in terms of practical achievements in relation to your objectives.

<ESMA\_QUESTION\_DLT\_7>

The collaborative model has allowed us to make large steps towards market-ready pilots. First, we are focusing significant effort in the development of smart contracts and related solutions that can be used across various asset classes, including securities. By implementing smart contracts tolls atop a strong DLT foundation, financial services entities could address a host of post-trade challenges that exist in the current securities market. Second, our identity working group is focused on various possible solutions that would improve the AML/KYC requirements in securities markets. Removing significant cost and delays in these processes will free up additional capital that could then be reinvested in securities and other markets. Third, DLT solutions could be deployed in place of current legacy systems to satisfy regulatory reporting and market oversight demands because this technology naturally creates a cryptographically assured audit trail and by facilitating oversight through regulatory nodes as Corda does. Both regulators and market participants would benefit from these new applications.

<ESMA\_QUESTION\_DLT\_7>

##### Do you agree with the analysis of the potential challenges? Please explain, e.g., are some more important than others, are some irrelevant in your view.

<ESMA\_QUESTION\_DLT\_8>

* Scalability: While public blockchains have proven unable to scale, R3’s Corda – a permissioned shared ledger – is specifically designed with financial-grade scalability in mind. Scalability is determined by both robust technology and strong governance. Our internal team and their counterparts within our consortium members are addressing both in parallel.
* Interoperability with the Existing Systems and between Different Networks: In terms of interoperability, R3 has never envisioned one single blockchain solution to rule all, but rather a set of ledgers that will interoperate based on shared standards and protocols, just as the Internet is not one single network, but rather several networks that are designed to communicate and work together. We are working alongside our members and other stakeholders to develop those very standards.
* Need to Settle in Central Bank Money: Central bank-issued digital currency (CBDC) can provide on-chain settlement of many different types of instruments, including securities. For this reason, R3 is already working with several central banks – including the Bank of Canada – to experiment with and develop solutions that support CBDC.
* Recourse Mechanism: One of the great advantages of a distributed ledger is its immutability and the permanence of the audit trail. As the Discussion Paper, that raises the question of recourse. We believe the best approach to correcting errors is entering corrective transactions to resolve any errors that emerge after the relevant records are finalized. It is important to note that we do expect DLT to significantly reduce such errors due to the coordinated signing and consensus processes required in order to commit a transaction to the record.
* Position Netting: In our view, facilitating netting on ledger preserves an important efficiency. We can perform bilateral netting on ledger with flexible time-windows, but multilateral netting requires a third party. We are in the process of exploring various approaches using third-party services that sit over the ledger, which would be much more flexible in terms of netting windows and pools and exactly which trades need to participate in a multilateral net. An interesting alternative is - with cash on ledger, the ability to settle with finality in real-time, and ledger interoperability - to develop more holistic approaches to liquidity, collateral and settlement risk management.
* Margin Finance and Short Selling: We are proposing a collateral management ledger that will be delivered in phases. The first phase will involve sharing valuation logic via smart contracts. The second phase will be adding links to existing collateral management systems to control movement of collateral. The final phase will be holding and managing collateral on the ledger. Margin finance and short selling are key challenges, but we see two potential solutions. The first is to build a settlement cycle into the implementation of the settlement on the distributed ledger. The second is to automate the borrowing of cash (for margin finance) and securities (for short selling) within the selling or buying process.
* Governance and Privacy Issues: Governance and privacy issues, which are identified as potential challenges, we believe are easily addressed, and to the benefit of the market. With regard to governance, a permissioned system allows all the necessary checks to be performed on the front end by way of a user agreement signed during onboarding, although the platform could still facilitate anonymous matching to the extent that model is in regulatory compliance and desired by market participants. With regard to privacy issues, Corda is designed such that not all data is shared with every node, but rather is only shared to the extent that it needs to be. The Discussion Paper also cites as a possible concern the storage and sharing on ledger of private information of clients for KYC procedures, for example. The ledger solution that we envisage would allow the owner of the identity to fully control access to their data, which would limit sharing of customer information by banks to permissioned sharing.
* Regulatory and Legal: As we continue to develop Corda and use cases on Corda, it is foreseeable that we may encounter legal questions that sound in contract, privacy, and market regulation, among others. We have not yet developed use cases with sufficient detail that we can identify points of friction with any degree of certainty, but are mindful that as they develop it is critical that we continue devoting time and resources to ensuring that what we build is in compliance with regulations and, in fact, it is one of our key missions to ensure that what we build facilitates compliance.

<ESMA\_QUESTION\_DLT\_8>

##### Do you see any other potential challenges? If yes, please explain.

<ESMA\_QUESTION\_DLT\_9>

Any DLT system adopted by regulated financial institutions must provide definitive, not probabilistic, legal settlement finality. R3 is collaborating with our clients and outside institutions to work through this issue and offer solutions to market participants and regulators. Earlier this year, we hosted the first of several symposia on the issue and intend to publicize a white paper that will help inform the debate and reach consensus between key stakeholders. Several of our lab experiments around payments and CBDC are designed with relevant solutions in mind. It is also a key topic for resolution and discussion in our regulatory outreach efforts. We look forward to sharing more on the topic in the coming months.

<ESMA\_QUESTION\_DLT\_9>

##### Which solutions do you envisage for these challenges and where do the current initiatives stand in terms of practical achievements to overcome them?

<ESMA\_QUESTION\_DLT\_10>

Many challenges require both technological and legal/policy solutions. Taking settlement finality as a key example, smart contracts can be designed to alleviate many of the issues (trade breaks, reconciliation errors, collateral movement) that impact final settlement. However, additional legal hurdles (the demand for a physical signature in certain jurisdictions) may require resolution that can only be reached when the private and public sectors work together to reach a consensus that works for all key stakeholders.

<ESMA\_QUESTION\_DLT\_10>

##### Do you agree with the analysis of the key risks? Please explain, e.g., are some risks more important than others, are some irrelevant in your view.

<ESMA\_QUESTION\_DLT\_11>

Interestingly, we believe that some of the risks cited above are precisely the areas of concern that DLT is designed to mitigate:

1. Cyber risk, fraud and money laundering – DLT offers a far more robust and secure technology infrastructure than anything currently used in the financial services marketplace. The technology’s cryptographic protections are stronger in the face of potential cyber-attacks. The immutability of data held on ledger creates a clear audit trail that helps guard against fraud. While Bitcoin and other virtual (non-central bank-issued) currencies have proven vulnerable to money-laundering concerns, with appropriate controls built in to DLT, central bank-issued digital currencies would prove more difficult to launder than standard physical currency. Moreover, to the point about an attack giving access to the full breadth of information recorded on ledger, Corda, by its design which does not distribute a full copy of the ledger to each node, does not pose that same risk. Finally, permissioned ledgers by definition do not allow individuals to conceal identities and hide the history of transactions such that money laundering and terrorist financing are enabled.
2. Operational risks – The power of DLT in part rests upon its ability to replace multiple legacy systems and processes, thereby lowering operations risk concerns. The possibility for an error in coding is no higher than the possibility of an error today. The Discussion Paper identifies as a concern the possibility that an error would have greater impact in the context of smart contracts and automation generally in DLT. We believe that such risks can be controlled in operation through the rigid enforcement of coding standards and methods in the way smart contracts are constructed and allowed to operate, which Corda incorporates. For example, we are strictly limiting the types of activities that smart contracts can engage in on the ledger by using a “sandbox” approach, which requires smart contracts to operate inside a very controlled environment, limits the activities, and subject to group control (and such group may include regulators). Over time, the restrictions may be loosened in response to increase testing and confidence that risks are known and controlled.
3. Market volatility, interconnectedness, new pockets of risks – The deployment of DLT would have no impact either way on market volatility. The terms “interconnectedness” and “new pockets of risk” could be defined in various ways, so without clarification, both are difficult to address.

Fair competition and orderly markets – The deployment of DLT would have no impact either way on fair competition and orderly markets.

<ESMA\_QUESTION\_DLT\_11>

##### Do you see any other potential risks? Please explain.

<ESMA\_QUESTION\_DLT\_12>

One important risk to address is that of implementing and controlling the controls for key recovery and key management. Protecting the security of these keys is of crucial importance to the maintenance of a secure ledger. Secure contract construction is also imperative; if the program used is no more consistent in execution than the manual or existing IT solutions, what’s the point?

<ESMA\_QUESTION\_DLT\_12>

##### How could these risks be addressed? Please explain by providing concrete examples, especially for the risks potentially affecting your organisation.

<ESMA\_QUESTION\_DLT\_13>

Risks around key management and recovery are best addressed within the context of architectural designs at the platform level. Private Keys are of fundamental importance and, as such, will be subject to the highest level of security best practice. R3 has framed its solution to comport with the needs of regulated financial institutions that maintain and store confidential client and firm data. We will utilize making extensive use of one-time keys derived from a root key for specific transactions and are exploring various options for hardware-based key security.

<ESMA\_QUESTION\_DLT\_13>

##### Do you think that the DLT will be used for one of the scenarios above? If yes, which one(s)? If no, please explain?

<ESMA\_QUESTION\_DLT\_14>

Yes, we have seen proposals for both OTC and exchange-traded derivatives from Fintechs using DLT. R3 itself is already working on a set of use cases and prototypes that use DLT to make CCPs and exchange-traded derivative products handled by those CCPs more efficient and less prone to settlement risk. These solutions will benefit market participants and regulators alike.

<ESMA\_QUESTION\_DLT\_14>

##### If the DLT is used for one of these scenarios, how compliance with the regulatory requirements attached to each scenario could be ensured?

<ESMA\_QUESTION\_DLT\_15>

By codifying law into the technology with smart contracts, market participants would ensure that the technology executes and settles derivatives trades based on the terms of the law and fulfills the regulatory compliance in the software code itself. In effect, DLT could actually enable ‘regtech’ – by digitizing and encoding regulations with which financial institutions are required to comply.

<ESMA\_QUESTION\_DLT\_15>

##### Do you think that the DLT will be used for one of the scenarios above? If yes, which one(s)? If no, please explain?

<ESMA\_QUESTION\_DLT\_16>

DLT, if properly designed and deployed, is robust enough to provide solutions for both environments. When R3 began its work on our Corda shared ledger platform, we started by asking ourselves what problems financial institutions were looking to solve with DLT that other offerings in the market failed to address. Key questions about settlement, risk and payments – like those addressed by CSDR and SFD – figure prominently in our design decisions.

<ESMA\_QUESTION\_DLT\_16>

##### If the DLT is used for one of these scenarios, how could compliance with the regulatory requirements attached to each scenario be ensured?

<ESMA\_QUESTION\_DLT\_17>

The most effective way to ensure compliance is to design solutions in collaboration with a broad array of compliance professionals and regulators, thereby taking those critical concerns into account from the very start of the development process. R3 believes the consortium model is the best path to achieving this type of collaboration, and one of the key reasons we structured our effort as we have.

<ESMA\_QUESTION\_DLT\_17>

##### Do you think that the DLT will be used for safekeeping and record-keeping purposes? Please explain, with concrete examples where appropriate.

<ESMA\_QUESTION\_DLT\_18>

Yes, we do. This is the essence of DLT in that reaching consensus over a shared set of facts creates a record that can be relied upon without fear of change, manipulation or loss, and without needing cumbersome, error prone and expensive reconciliation processes.  As this ability to reach consensus on that secure record becomes apparent, there will be pressure to move more records and more flow onto DLT to gain the benefit of that secure, transparent foundation. We have seen potential use cases related to safekeeping and record-keeping, however it is unclear at this time whether storing that type of information directly onto a distributed ledger is the most optimal, or whether taking a hash of that information and storing it off the ledger would be better. DLT offers the ability to structure a ledger that would serve as a “golden copy” of crucial data. That golden copy – a prototype of which R3 is in the process of creating – would not only protect key pieces of data by cryptographic means, but also serve as the shared location for the storing of records – all in a cloud-based environment.

<ESMA\_QUESTION\_DLT\_18>

##### If the DLT is used for the safekeeping and record-keeping of ownership, how could compliance with the regulatory requirements be ensured?

<ESMA\_QUESTION\_DLT\_19>

We envision a shared ledger that includes nodes operated by and for all relevant regulators, which would give them oversight, where appropriate, of critical data related to their regulatees and the transactions of those regulates.

<ESMA\_QUESTION\_DLT\_19>

##### Do you think that the DLT will be used for regulatory reporting purposes? Please explain, with concrete examples where appropriate.

<ESMA\_QUESTION\_DLT\_20>

Yes, we do. Because the data on a shared ledger would contain all data relevant to meet reporting requirements, and because regulators could be given nodes on the ledger, the ledger itself could be structured to meet the very specific reporting requirements, and be tailored to the unique demands that exist across jurisdictions.

<ESMA\_QUESTION\_DLT\_20>

##### If the DLT is used for regulatory reporting purposes, how could compliance with the applicable regulatory requirements be ensured?

<ESMA\_QUESTION\_DLT\_21>

We are building a ledger that includes nodes, which we envision being operated by and for all relevant regulators. Those nodes would give regulators oversight, where appropriate, of critical data related to their regulatees and the transactions of those regulatees.

<ESMA\_QUESTION\_DLT\_21>

##### Do you think that the DLT could be used for other securities-related services than those already discussed, in particular trading and issuance?

<ESMA\_QUESTION\_DLT\_22>

Yes, we do. As stated earlier, R3 believes the greatest area of impact will be felt in the pre- and post-trade space, yet trading and issuance systems and processes would also stand to gain from the deployment of this technology. R3 has already run experiments during a commercial paper use case that included issuance in particular. That methodology could be deployed directly to the securities market as well.

<ESMA\_QUESTION\_DLT\_22>

##### Do you see potential regulatory impediments to the deployment of the DLT in securities markets?

<ESMA\_QUESTION\_DLT\_23>

One potential impediment springs from the differences in regulations across different jurisdictions. Capital markets are incredibly interconnected, and an effort at cross-border harmonization between the different jurisdictional requirements should focus on ensuring those differences do not stifle the development of these innovative technologies. Even within a single jurisdiction, differences exist between multiple rules promulgated by various regulators – the same focus on harmonization should be made within each jurisdiction.

<ESMA\_QUESTION\_DLT\_23>

##### Should regulators react to the deployment of the DLT in securities markets and if yes how? If you think they should not do so please justify your answer.

<ESMA\_QUESTION\_DLT\_24>

R3 believes that regulators should take a “wait-and-encourage” approach to financial infrastructure uses of these technologies similar to the approach taken to the Internet. Shared ledger technology itself should not be the subject of regulation. Rather, the question should be whether and how existing regulation of various entities, transactions, and venues needs to be changed (if at all) to accommodate shared ledger-based financial transactions. DLT can improve regulators’ ability to regulate and market participants’ ability to comply – dramatically improve and automate reporting; market surveillance; post-infraction enforcement; AML/KYC. Innovation should be encouraged within regulated entities, rather than market disruptors with little understanding of, or care for, the importance of regulation.

<ESMA\_QUESTION\_DLT\_24>

1. ESMA, June 2, 2016 (“Discussion Paper”). [↑](#footnote-ref-2)