



# Regulatory Reporting for Financial Services

## Executive Summary

The financial services industry is under constant pressure from financial regulation bodies globally to ensure the integrity of the global financial system. They are subject to requirement, restrictions, and guidelines by regulators that may be government or non-government organizations. Examples of regulators and regulatory policies can include the Prudential Regulation Authority (PRA) and Financial Conduct Authority (FCA) in the U.K., which oversee the implementation of European reporting requirements such as FINREP and COREP, the Basel Accord, and the Sarbanes-Oxley Act of 2002 in the United States.

As part of these requirements the financial institutions are obliged to report periodically, whether it is daily, monthly, quarterly, or annually, to the various regulators. These Regulatory Reports may contain raw or summary data needed by the regulators to evaluate the safe and sound condition and operations of a bank or other financial institution or to determine compliance with any government act, or other law, rule, or regulation.

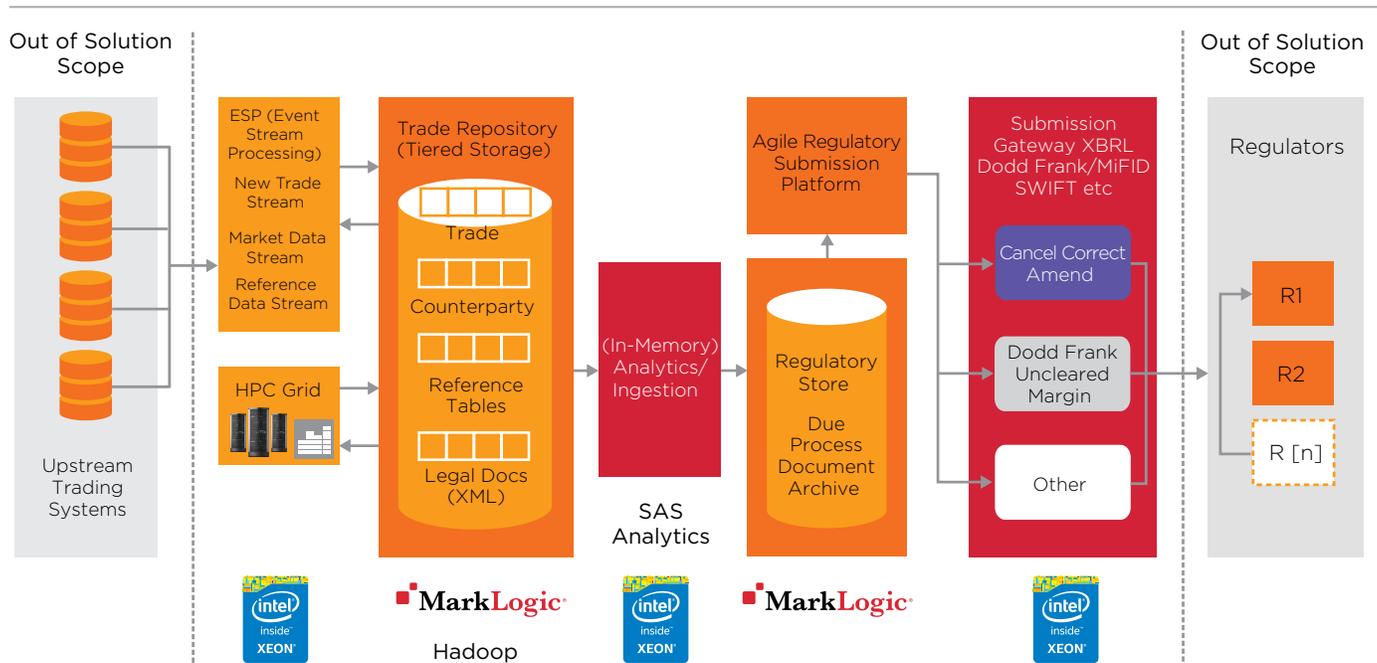
The volume and variety of data required as input for reporting purposes is vast, and includes data about trades executed, reference and counterparty data, sourced from trading and market data systems. The analysis of that data and the speed with which it needs to be manipulated requires considerable and complex processing resources.

Furthermore, the banks are obliged to ingest new data sources, and correlate them with existing data to provide even deeper levels of insight for the regulators. And if that were not enough, not only do the banks have to report periodically to the regulators, they can be subject to ad hoc reporting demands for stress and scenario testing. To support the regulatory framework, the regulators can set policies for firms' stress testing requirements, set stress scenarios, and monitor the test results.

## Business Drivers

All of these challenges can put enormous pressure on financial institutions, and consume considerable resources internally. It is therefore vital that they establish a sound application framework that will enable them to respond to regulators in an efficient, timely, and responsive manner. The volume and variety of data to be processed and analyzed, the complexity of the analytical processes, and the urgency of the reporting requirements all create technology challenges in the data center.

The volume and variety of data required as input for reporting purposes is vast, and includes data about trades executed, reference and counterparty data, sourced from trading and market data systems.



**Figure 1.** Regulatory reporting process

With these challenges in mind, Intel has a long history of working with an ecosystem of software solution providers to develop best-of-breed solutions for the financial services industry. These challenges are not addressed by either hardware or software in isolation, but by the harmonious cooperation between all technology components, including CPU/processors, data storage (including solid-state drives), networking components, and of course the database management system software and business logic/application code. Intel invests considerable resources in working with software providers to assist them in optimizing their applications for Intel® technology.

To quote the January 2015 BIS BCBS239 Adoption progress report, “A bank should design, build, and maintain data architecture and IT infrastructure which fully supports its risk data aggregation capabilities and risk reporting practices not only in normal times but also during times of stress or crisis, while still meeting the other Principles.”<sup>1</sup>

### Solution Architecture for Regulatory Reporting

Figure 1 depicts the solution architecture for a complete Regulatory Reporting solution, based on the MarkLogic\* Enterprise NoSQL database platform. Data from upstream trading systems is collected and ingested, via

an Event Stream Processing component, into a trade repository, which contains not only trade data, but also data about trading counterparties and reference data. Legal documentation in XML format may also be stored to satisfy regulatory demands to correlate contractual agreements with trades executed under such contracts. This creates a data storage requirement, which for some large banks will exceed a petabyte of data.

Data from the trade repository is then processed and analyzed for downstream reporting to the various regulatory bodies. Two key features of the downstream reporting are:

- **Regulatory Store:** Historically, banks have created reports for the regulators but have not stored them for future reference or back-processing. A key feature of this architecture is that all reports generated are stored in a Report Repository so they can be back-referenced.
- **XBRL (Extensible Business Reporting Language)** has now been adopted by many of the regulatory bodies for reporting purposes. A key feature of the solution architecture is the ability to generate the reports in the standardized form of XBRL for flexibility and extensibility.

An agile Regulatory Submission Platform facilitates the production of reports from the Regulatory Store while the submission gateway facilitates the transmission of those reports, in XBRL and other formats, to the relevant regulators.

Analytics capabilities may be provided by SAS, as illustrated in Figure 1, or by R from Revolution Analytics, while Qlik\* and Tableau\* may be used for business intelligence reporting (not shown in Figure 1) for more basic regulatory reporting requirements.

### Key Benefits of the MarkLogic\* Enterprise NoSQL Database

#### Lightning-Fast Search

Not another add-on, our built-in search provides sub-second results<sup>2</sup>

#### Flexible and Scalable

Scales out on any hardware environment, such as Intel® Xeon® processor-based servers, adapts as data changes and new data is added

#### Any Format

Load your transactions, customer and reference data, filings, reports, and so on without the pain of upfront data modeling

#### Reliable Performance

Transactional consistency (ACID), high availability, and government-grade security

#### Unified Platform

Avoids the complexity and brittleness that multiple applications carry

#### Lower Costs

Reduces time to market, management time, and overall costs

Two key features of the MarkLogic Enterprise NoSQL database platform are also worth emphasizing:

MarkLogic Semantics provides a new approach to modeling data that focuses on relationships and context. This is particularly relevant for the correlation of data, such as legal documentation and trade data. It also extends MarkLogic's built-in search capability, providing the ability to expand searches to include related terms or to show users the connection between related entities.

The MarkLogic Bitemporal feature allows the querying of data across system and valid time axes. This is of particular importance for regulatory requirements, to avoid the increasingly harsh downside consequences from not adhering to government and industry regulations, particularly in financial services and insurance, and for audits—to preserve the history of all data, including the changes made to it, so that clear audits can be conducted without having to worry about lost data, data integrity, or cumbersome extract, transform, and load (ETL) processes with archived data.

### About MarkLogic

Today, more data is collected than ever before and organizations have great ideas for bigger, smarter applications they can roll out to millions of users. Unfortunately, in today's world of big data, the relational databases that have been relied on for the past few decades are too limiting and inflexible. Organizations are facing a growing inability to handle their current structured data, let alone the new data sources that go unaccounted for.

Since our inception in 2001, MarkLogic Corporation has focused on offering organizations a new-generation database platform designed to integrate, store, manage, and search more data than ever before. Global enterprises and governments rely on MarkLogic to power intelligent, high-performance applications aimed at analyzing data for better insights and also running crucial day-to-day business operations.

With MarkLogic, organizations achieve faster time-to-value than was possible with legacy relational databases, while minimizing risk and improving data quality.

For more information about MarkLogic, visit:

[www.marklogic.com](http://www.marklogic.com)

### About Intel

Intel (NASDAQ: INTC) is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world's computing devices. Additional information about Intel is available at [www.intel.com](http://www.intel.com).



<sup>1</sup> Reference: <http://www.bis.org/publ/bcbs239.pdf>

<sup>2</sup> Reference <http://www.marklogic.com/what-is-marklogic/features/>

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer, or learn more at [www.intel.com](http://www.intel.com).

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to [www.intel.com/performance](http://www.intel.com/performance)

Intel does not control or audit the design or implementation of third party benchmark data or Web sites referenced in this document. Intel encourages all of its customers to visit the referenced Web sites or others where similar performance benchmark data are reported and confirm whether the referenced benchmark data are accurate and reflect performance of systems available for purchase.

This document and the information given are for the convenience of Intel's customer base and are provided "AS IS" WITH NO WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. Receipt or possession of this document does not grant any license to any of the intellectual property described, displayed, or contained herein. Intel® products are not intended for use in medical, lifesaving, life-sustaining, critical control, or safety systems, or in nuclear facility applications.

\*Other names and brands may be claimed as the property of others. Intel, the Intel logo, Intel Inside, the Intel Inside logo, and Xeon are trademarks of Intel Corporation in the U.S. and other countries.

All claims are the responsibility of the company making the claim.