Date: 20.05.2022
Number: 22-87a

RISK CONTROL

Note

RC-Dashboard and Data Mart

RC-Dashboard and Data Mart are new systems employed as part of an enhanced set of risk reporting processes and routines.The Dashboard enhances Risk Reporting activities. The Data Mart provides a central repository for input and output data from the client's risk applications and supply information for the Risk Dashboard.
To combine existing software and database components to construct a flexible bespoke Risk Dashboard linked to a Data Mart based on a powerful, distributed database.
The Data Mart component will store copies of inputs and outputs from risk applications.
These data which include both aggregate and granular exposure/counterparty level data will be indexed and made available for drill-down style search by the Risk Dashboard and possibly other systems.

- The Risk Dashboard component will provide:
  1. Interactive user-friendly dashboards allowing users to analyse Key Risk Indicators (KRIs) through a deep dive into the underlying data.
  2. Presentation of key KRIs and tracking of their performance against predetermined criteria such as risk appetite.
- The integrated Data Mart and Dashboard system will be made up of three software components:
  1. Data Connector: This module collects data from other systems and copies them into the Data Mart. The Connector supports multiple protocols for the receipt of data and allows for a variety of automated checks to be applied to the data before it is passed onto the Data Mart.
  2. Data Mart: This consists of a clustered, distributed relational database permitting searching and analysis of data in real time. This module collects and indexes the data which may then be accessed by the Dashboard itself.
  3. Risk Dashboard: This component executes performant queries on the indexed data contained in the Data Mart and presents output.

Figure 1: Architecture of the whole system

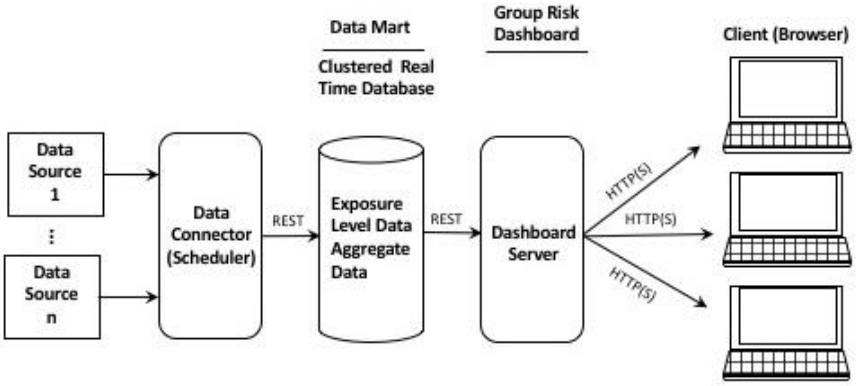

Figure 1 provides a summary of the data architecture of the system. The Data Connector will receive data from ICIEC's other systems (for example, capital model, underwriting system, scoring models), organise them and possibly check for consistency in a variety of ways (this functionality is already built into our components). It will then write the data to the Dart Mart which will index the data to permit highly performant searches. The Dashboard server will then access the data from the Data Mart and present it to users based on the choices and options that they have interactively supplied

Technical Information
The RC-Dashboard and Data Mart comprises three primary components:

1. **RC-Data Connector**
2. **RC-Data Mart**
3. **RC-Dashboard**

Data Connector
The Data Connector collects data from data sources provided by backend systems and pushes it into the Data Mart. The data connector component we will employ is designed to be highly configurable so that will be able to connect to all systems that provide data for access by the Dashboard. The Data Connector will also execute scheduled tasks to update the contents of the Data Mart on a periodic basis (for example, daily).

The Data Mart's data storage is accessed by a RESTful API so the Data Connector instance will read data from the backend systems, convert it into JSON format and transfer this data subsequently to the data storage. We will design and configure the Data Connector to meet the precise needs of ICIEC, ensuring full compatibility with its existing IT systems.

Data Mart
The Data Mart stores and indexes all incoming data to make it available for querying by the Dashboard component. Technically, the Data Mart stores data in the form of traditional tables in a clustered relational database and indexes this data to make it performantly searchable. The Data Mart will make use of distributed database technologies so that it is easy to scale as the volume of data accumulates.

Dashboard
The Dashboard is built on an open source analytics and visualization platform. It displays the data based on the Data Mart contents. This Dashboard can perform advanced data analysis and offer visualizations of the data using a variety of charts, tables, and maps.

The frontend of the Dashboard is proposed to use the technology of React combined with Plotly. React is a JavaScript library for building web user interfaces, maintained by Facebook together with a community of developers. First released in 2013, this component-based library has consistently gaining popularity. The large number of open source components contributed from developers makes creating highly interactive and dynamic user interface possible.

Though React is responsible for rendering the pages, the charts are managed by Plotly, a graphing library based on D3.js. Plotly provides three bindings to JavaScript, Python and R, and this allows flexibility for its user to choose the backend. Additionally, Plotly has an abundant collection of ready-to-use chart types, reducing the time for development.

Depending on the specific needs and data from ICIEC, additional libraries can be incorporated easily such as 3D map manipulation with deck.gl, fast particle rendering with Three.js and WebGL, or heavy client-side computation with web-assembly.

The backend of the Dashboard can be implemented with a variety of language choices, such as JavaScript, Java, Python, Go, etc.

Figure 2: Example architecture of the Dashboard using Flask as backend

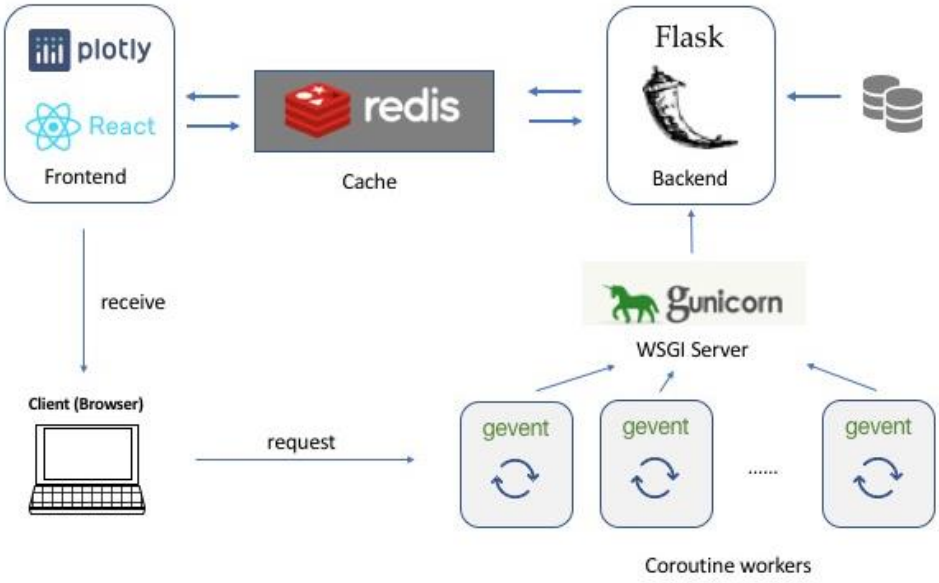

Figure 2 shows an example architecture of the Dashboard application, using Flask as its backend. The WSGI Python server is provided by gunicorn, which has multiple parallel processes (each of which is a gevent coroutine worker responsible for handling the browsers' requests). Redis is used as an in-memory database for caching the retrieved data. User management is provided by a separate Java application that provides a wrapper for the Python dashboard. Using the above technologies, ICIEC has created a prototype dashboard using ICIEC risk data (see Figure 3).

Figure 3: Example ICIEC Risk Dashboard

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