

Configured Report Generator using REST API

Meghana.C.Shekar¹, Dr.Siddaraju²

¹ M. Tech Student , Department of Computer Science & Engineering, Dr. Ambedkar institute of Technology,Bangalore-560056,meghanamonvirgo@gmail.com

² Professor and Head, Department of Computer Science & Engineering, Dr. Ambedkar institute of Technology,Bangalore-560056

Abstract - Reports are used to extract and print information from a database in structured way. They can be useful for generating, scheduling, sharing and emailing. Reports are generated HTML-based documents and associated files, which can be private and shared across the users. When reports are generated, they are in the formats such as PDF, MS-Word, Excel, etc. They display charts, texts, tables, etc and statistics to visualize the data. In this paper, generated reports are configured by the templates using the drag and drop feature. The templates can be later edited, saved or restored in the system. Therefore, code re-usability can be achieved at functionality level.

Key Words: Report Generator, Template creation, Authentication, Automation

1. INTRODUCTION

Generating reports from the available data is a task in most of the applications, data analytics, medical fields, e-commerce applications, etc. Many organizations are needed to create formatted reports using the tools or some reporting software. The reports generated can be viewed in formats such as PDF, MS-Word, Excel etc from the target system. The reports can be used either as reference in organizations for future analysis or the data formatted from reports can be delivered to users, third party vendors, etc. The templates are configured once the elements are dragged to specific positions and unique URL is generated for this template. The elements are images, tables, graphs, texts, etc are stored in the database systems which can be retrieved within the web page. The templates to be configured are been created and saved. With the help of unique URL's generated in the tool we can even generate batch reports by passing the dynamic data.

In web applications, dynamic web pages consists of the database reports which are useful for transactions and it has specific approach for report generation. In medical fields, they use a specific tool such as OLAP (On-Line Analytical Processing) for reports as they have no knowledge in database systems. This can be used in hospitals where it includes operations such as creating medical data models, filtering and formatting data from medical information systems and generate reports. Data analytics is widely used in industries to enable organizations for business decisions. They use tools which can generate various kinds of report such as Data report, Chart report,etc. There are many approaches for

consideration of report generation such as document-driven, report structuring of data models. The document-driven approach where reports are generated using query languages and it provides more flexibility.

The paper also focuses on automation of reports where the reports are made easily accessible for users, third-party vendors, etc. The users will authenticated based on OAuth2 protocol and the required parameters are passed to the URL generated and when triggered from the machine reports are generated. The next section describes about the Literature survey of the standard reports in the market and their comparison.

2. Literature Review

Generation of reports from databases and other data sources has been task for software developers ever since it has been introduced.

One of the most powerful database platforms is the Oracle Reports. The layout models allowed the creation of reports for both paginated output and web-oriented output. Various data sources can be used- relational databases, text files, XML(Extended Markup Language), etc. The tool contains a WYSIWYG reports editor and templates to design the report. The server is JEE 5 with multi-tier architecture to generate reports in any format for web and distribute it to any destination. It provides flexibility by placing the fields anywhere in page.

Microsoft also includes a less versatile reporting tools in their database platform- MS SQL Server. Administered via a Web interface, it can be used to prepare and deliver a variety of interactive and printed reports. It includes features like support for multiple data sources, dynamic end-user sorting, cascading, etc. There is also tool named Report builder, that allows business users to create their own reports and explore corporate data.

An additional powerful tool provided by SAP is Crystal Reports. Crystal reports is a business intelligence application which is used to design and generate reports from many data sources. The data sources are databases such as PostgreSQL, Sybase, Spreadsheets such as Microsoft Excel. Its version is integrated in software development tools from Microsoft. This is the standard reporting tool for Visual Studio .NET. It brings

the ability to create interactive, presentation-quality content to the .NET platform. In the case of a web application that hosts a local report, the processing is based on a two-tier relationship where any events raised on the client are handled on the Web server. The drawbacks of the crystal report is this is not freely available and the end user must have crystal report viewer to review the output.

The next section describes the overview of the system architecture.

3. System architecture

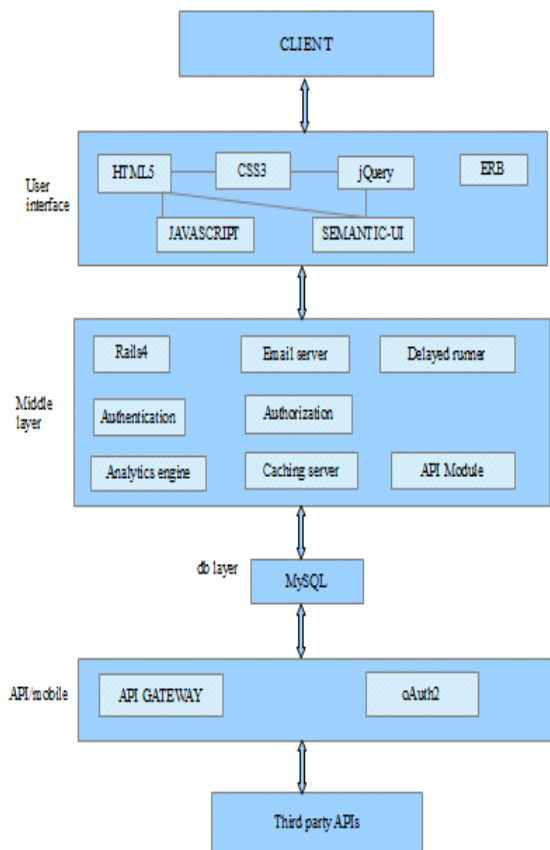


Figure 1: Architecture

The Figure 1 represents the proposed architecture of the system. The client consumes data and provides interfaces to end-users. The first layer is the user interface layer which involves front-end technologies such as HTML5, CSS3, Javascript, jQuery, etc. The user interface in the industrial design of human machine interface (HMI) is defined as the space where interactions occur between humans and machines. The bidirectional arrow indicates that the process is engaged between both the layers. The interface is kept simple, consistent and mainly the appearance which uses text, color, texture, etc. The next layer comprises of the implementation or middle layer which involves templates

creation, security, etc. This layer is mainly responsible for business logic that encodes real world business which can be created, displayed and stored. It is contrasted with the reminder of software which is concerned with lower-level details of managing database or displaying user-interface or system architecture. This also collects analytics data, provides caching and other functionalities.

The database layer provides an object view of database information by applying schema to database records. This layer is an internal interface that is not exposed to users. All database access is routed through this layer and is responsible for creation, deletion and retrieval of individual records. The database used here is MySQL. API Gateway servers that act as front-end, receive API requests, pass the calls to the back-end service and then pass the response back to invoker(Third-party API's). There would be separate API for each kind of client. API layer also consists of OAuth2 protocol for authorization. The OAuth2 protocol shares the information with the third-party users. Cost of the system is very less as we are using open source libraries.

The next section describes about the report generation and its functionalities.

4. Configurable Report Generation

Report Generation is a computer program whose purpose is to take data from a source such as database, and produce a document in format like PDF, MS-Word. Generating reports from the available data is a task in most of the applications, data analytics, medical fields, e-commerce applications, etc. Configurable reports allows us to create custom reports in which the specifications are defined and reports can be kept for emailing, printing, etc. Report Generators are in many forms such as Standalone report generators, batch reports, etc.

Standalone report generators are the ones which work with multiple data sources and export reports to different document formats. This standalone report helps in creating and analyzing interactive reports on the machine. Reports can be saved as files, shared via email, exported to any format and printed. Reports are configured and hence are made accessible to the users. The third party can get the reports easily and proposed method is explained in next section.

5. Proposed Configurable Report Generation module

Reports in the form of MS-Word, PDF are generated from the target system. Web API is an application programming interface for a web server. The server side consists of end points defined to a request-response system which is expressed in JSON or XML via the web. Templates are created only once by dragging the elements and Unique URL is generated from this template. The elements are grouped under the category and they are placed at specific positions in

the droppable area. The data is selected for placed components and Unique URL is generated for the user. Unique access token is generated for the users, which is shared along with the URL. Authentication is done based on OAuth2 protocol among the users and they send the required parameters to get the report. OAuth2 is open standard for authorization commonly used for internet users to authorize websites or applications to access information on other websites without giving their passwords. Emails can be sent to users to share the URL. User need not have any technical knowledge about the system as the system is drag and drop based system. As the system also supports API integration with very tight OAuth2 integration, this can be integrated by virtually any system.

5.1 Flowchart

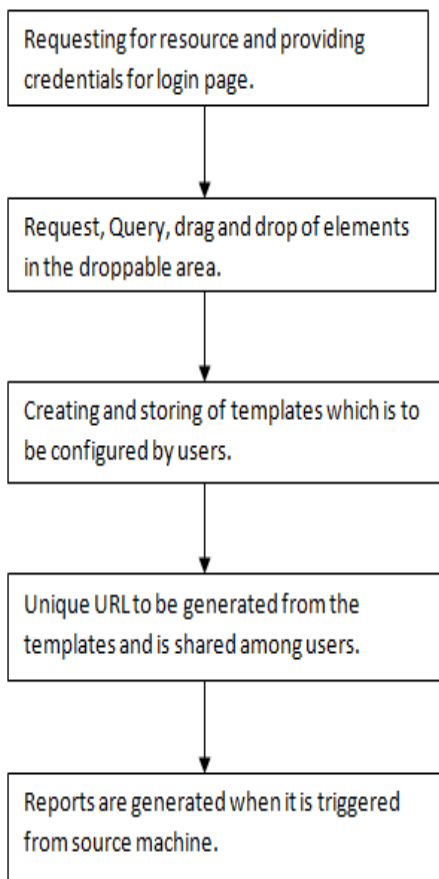


Figure 2: Flowchart

The Figure 2 describes the flowchart regarding report generation. The login page providing credentials which validates and checks for the correct login and password. The elements are requested, listed and grouped under the category to which it belongs. Then, the elements are placed

under the respective positions using drag and drop feature. Templates are created, saved in database, stored and displayed. Reports are generated when triggered from source machine and later it can be sent to users via email. The next section describes about the process regarding report generation.

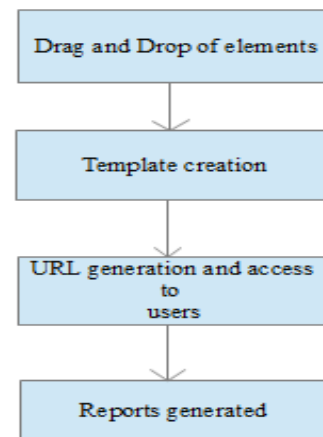


Figure 3: Manual generation of reports

6. Overview of the proposed method

Stage 1: Manual method

Generation of reports such as PDF, MS-Word when it is triggered from source machine. The elements are requested which should be listed and group them under their category to which it belongs. The elements are then placed at respective positions using drag and drop feature. Templates are created, stored and displayed and URL generated is authenticated which is later shared among the users.

Stage 2: Automation method

Report automation eliminates the need to manually generate reports, reduce the possibility of errors and analyze the data. It automatically gathers all the data from any application, web services or internal database in one report. It allows the users to get the status of processes, systems and activities and respond quickly. Drag and Drop of elements in the droppable area and unique API URL's are generated for the template. Authentication is created for the system to extract the API and generate the report. In this paper, automation of reports is done through postman application where API development is easier and faster from building API requests through testing, documentation and sharing. Postman apps lets the user to use any kind of request and here the POST request is being used to send the request. Requests and responses can be saved. Using the app, reports can be generated where the data can be sent directly through POST request via API calls. Authentication is being provided for the user who wants to

extract the API and reports are generated. The final results and further discussions are discussed in the next section.

7. Results and Discussions

Using configurable API report generator, it is easy to generate reports irrespective of its size, complexity and format. With this approach, data can be stored, retrieved from the database and recreated. Dynamic data has been used with the URL's generated and this will reduce the time taken to spend on configuring the system. With this method, it speeds up the process of report generation. The third party users can consume the API's and get the reports easily. Reports are then sent to users via email and printout of the reports are also available. Furthermore, this application is deployed in IBM Bluemix. IBM Bluemix is a cloud platform as a service (PaaS) developed by IBM. Platform as a service Bluemix supports various programming languages including Java, Python, Ruby on Rails, etc. The framework used is Ruby on rails framework is a server-side web development framework used in server environments. Rails is a framework where Ruby is built-in languages. The deployment method in Bluemix helps in code compilation which puts the result into production providing services as needed or made available for use.

using Hybrid approach where the customers deploy the software as a service to switch the service from one end to other when needed.

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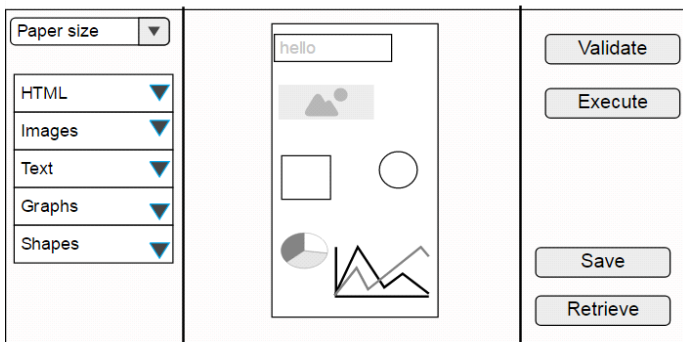


Figure 4: User Interface page

8. Conclusion

Using the configurable API report generator, it's easy to generate reports irrespective of its size, complexity and format. With the help of unique URL's generated in the tool, we can even generate batch reports by passing dynamic data on the go. Dynamic data denotes information that is updated timely fashion as and when further the information becomes available. This will reduce the time which we need to spend for configuring the system and will speed up the process of report generation. Also the system has no dependent components and hence easy for integration. The third party system can consume the REST API's for sending the data and can get report momentarily. Connecting between private and public clouds using hybrid cloud can be implemented. Using a hybrid model is a valuable approach to an architecture where we can match the resources between local infrastructure which is scalable and provisioned on demand. SaaS model