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Implementation of Document Envelope Rest APIS for B2B Sterling Integrator

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Abstract: - a document envelope consists of control information that enables organizations to effectively exchange documents. The document envelope takes the original document, assigns a control number, and packages header and trailer information with it, prior to submitting it to a trading partner. Creating document envelopes is necessary if you wish to do edi with your trading partners.

Rest api's are used to perform crud (create, read, update and delete) operations for document envelope service which also include different services and features and these service contains all the transactions between the trading partners which include document exchange between them through document envelope.

I. INTRODUCTION

A document envelope is a kind of wrapping technique which consists of control information that enables organizations and trading partners to effectively exchange the required documents in more secure manner. The document envelope takes the input as original document, assigns a control number and packages header and trailer information with it, before submitting it to a trading partner in an organization. Creating document envelopes is much necessary if you wish to do Electronic data interchange (EDI) with your trading partners.

A. Sterling B2B Integrator

IBM® Sterling B2B Integrator enables the security-rich integration of complex Business to Business (B2B) processes with diverse partner communities. It provides a single, flexible B2B gateway that enables companies to meet a wide range of B2B integration needs. IBM Sterling B2B Integrator can improve business processes beyond enterprise boundaries and increase visibility into and across supply and demand chains.

Today's empowered customers expect more from the companies they do business with. This is leading to an increasingly competitive global marketplace and driving businesses to adapt their corporate strategies and tactics at an ever-faster pace. The systems and processes that drive the commerce lifecycle must better integrate with partners to anticipate and rapidly adjust to changing customer demands.

IBM Sterling B2B Integrator software helps companies execute a smarter commerce strategy by synchronizing virtually every part of the value chain. It addresses complex integration challenges, enabling you to connect your systems to those of your business partners. The approach enables you to automate business processes, providing visibility into actionable information that's needed to better collaborate with partners and rapidly respond to customer expectations and demands.

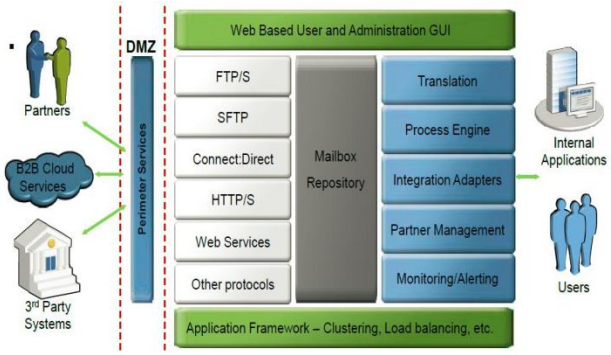

Figure 1.1: Sterling B2B Integration architecture

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Sterling B2B Integrator architecture consists of many business elements which are integrated together to enable and facilitate most of the business needs of customer. In the above figure1.1 the entire sterling integrator is divided into mainly three layers based on the high level view of the product by the business perspective of customer.

Partners are the users of the sterling integrator product for their business needs. A partner can be single individual user or a group of users like organization or community. Ideally we can consider partners as users, producers, consumers, customers, trading partners, organization, community etc… based on their activity and actions performed with sterling Integrator.

The second layer of the sterling b2b integrator is perimeter services which routes the information or message from the external web applications through external interfaces by providing security. Basically perimeter services are fit in demilitarized zone (DMZ) which is a physical sub network or logical sub network that contains organizational services for untrusted network. Perimeter service allows data traffic to travel from one end of a network to another by providing necessary security to it and it acts as a firewall in internet.

The third layer of sterling business to business integration architecture consists of elements which are used in end to end communication process. Web based user and administration graphical user interface (GUI) is used by the user to enter the input and take the response back. This is also used to manage and control all the business elements by an administrator user.

There should be some standard set of rules in both the ends of communication, these set of rules are called as protocols. Sterling B2B integration enables most of such protocols like, standard file transfer protocol (FTP) which enables user to transfer files in a network between client and server also enables secure file transfer using FTPS protocol by providing the authentication facility in file transfer process. SFTP (SSH/Secure File Transfer Protocol) which enable the secure way of transferring files by packing up the secure shell (SSH) which performs all operations like encryption , decryption etc.. And rest of the protocols does the same job in their own manner.

Mailbox repository is the storage area which is allocated storage space separately to each and every trading partners or users who are actively involved in the activities of business. Mailboxes are used to store a data in achieved manner from end users mailbox. Mailbox repository provides different features like eliminating duplicate messages, attempting to store all the received messages of partner in mailbox, allows only specified authenticated users to perform operations like read, write, delete and transfer of messages.Sterling B2B integrator facilitates many features like translation which is used from information or message translation from one format to other format, Process engine which is a functional engine used to control and manage all the operations involved in business process and initiates the process communication between the systems, Integrator adapters are used to integrate different modules of business process into a single module.Partner management is one of the main functionality of sterling B2B integrator which enables to control and manage trading partners who are involved in all the activities of business process. With the help of partner management one can create a trading partner, and perform all the operations or facilities of the trading partners etc... Monitoring and alerting is a feature which enables the automatic management of business by finding the problems automatically and inform the same to the specific trading partner through the alert systems.Finally load balancing, clustering are places in sterling B2B integrator which is essential to maintain stability of product. If there are more partners involved in the activity of business by requesting for a request then these requests need to be process by activating load balancing in the server side which manages the load and provide the service to all clients and also avoid server to go down in this process. Basically if the number of requests reaches threshold value then next upcoming requests are assigned to another server. These entire processes are involved as internal individual applications of the business process which are used by the users.

B. 10x Architecture

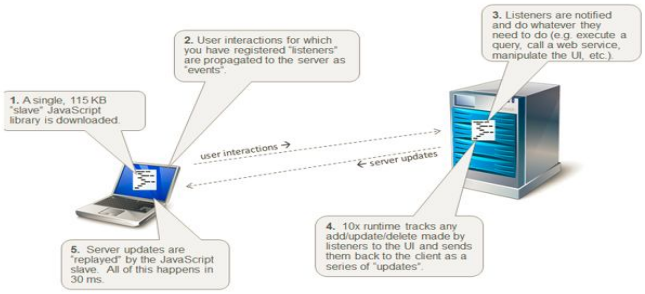

Figure 1.2: 10x Server centric architecture

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10x framework is an architecture which enables users to develop REST (Representational State Transfer) APIs. We make use of 10x framework to design and develop document envelope API. As shown in the figure 1.2 there are mainly five steps which details about how 10x architecture works.

1) In first step user needs to download a java script plugins into the client browser which enables to communicates with 10x libraries and get the response back to the user interface.
2) User now can able to interact with the server by sending the required request which can be in the form of events propagated to the server. The events which are triggered by client are the valid input request.
3) Server receives the requested event from the client with the help of listeners which are enabled in server side. And then server performs the required operations and functionalities like executing the queries through web services and manipulates the user interface with the response.
4) Meanwhile 10x runtime checks or tracks the user requests through listeners and performs the actions if it requires and updates the response by manipulating the user interface.
5) Finally the server updates or server responses are received by the client system through java slave. For each request requested by the client java slave all the above steps are run through to get the response dynamically. As 10x framework is very fast in nature to perform the operations, entire process in between client and the server is processed within 30ms.

C. Rest APIs

REST API Stands for Representational State Transfer Application programming Interfaces. REST architectural is used to communicate between client and server over HTTP protocol with statelessness as a key where stateless is nothing but handling the request is contained within the request itself. The key features of REST APIs are

1) *Uniform Interface:* Each REST calls are simplified and decoupled by calling the API independently.
2) *Resource Based:* Each individual resource is identified and uses different URIs as a resource identifies. Depending on the request the resources are provide say, if the request is in XML/JSON then the resources are processed and response will be in the same format as requested by the client.
3) *Statelessness:* As the REST states it works as statelessness as a key. Which means the way of handling requests are stated in request itself that doesn't require any of the external way of handling request?
4) Cacheable: This is one of the key features of REST APIs where the response can be cached in the client side which increases the performance of the application and response time of an application.
5) *Layered System:* REST APIs not only work as peer to peer communication, the request can be process through intermediate servers which increases the stability of the server. This also increases the security of the application by enforcing security policies between client and server.REST APIs are mainly works on XML and JSON representation of data where JSON (JavaScript Object Notation) is widely used in rest apis as it is very easy to access and manipulate the data which is in json format. The data will be represented in the form of key value pairs. REST API incorporates and supports all CRUD (Create, Read, Update and Delete) operations which are required to process the business needs and it supports these operations with the help of below mentioned methods.
6) *GET*: HTTP Get method is used to perform read operation of application. This method represents the resources with all the information and if there are no errors then it returns the response code of 200 (OK) else it returns the error message along with response code as 400 (Bad request) or 404 (Not Found).
7) *PUT*: HTTP Put method is used for updating the resources of an application. This method takes an input as the resource which needs to be updated and returns status code or response code as 200 (OK) if the resources are updated successfully else in case of error then it returns status code as 404 (Bad request)
8) *POST:* HTTP Post method is used for creating the resources of an application. This method takes an input as the resource which needs to be created and returns status code or response code as 200 (OK) if the resources are created successfully else in case of error then it returns status code as 404 (Bad request)
9) *DELETE:* HTTP Delete method is used to delete the selected resources of an application. This method takes an input as the resource which needs to be deleted and returns status code or response code as 200 (OK) if the resources are deleted successfully else in case of error then it returns status code as 404 (Bad request).

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II. BACKGROUND WORK

"Construction of decision support system in business design based on integration of information technology" talks about automating the business processes which are used, which is not a good way of integrating the applications on instances. "On Event-Driven Business Integration" which specifies the inclusion of business process automation, business activity monitoring, service mediation, and others which is more helpful to run the system automatically in the instances."Using semantic Web technology to enhance current business-to-business integration approaches" Technology used is Rosetta Net, which uses XML and XML Schema technologies to define standardized syntax messages used in interactions. These schemas are not that much flexible to process the data in the required manner and it's hard to analyze the data and perform the desired functionalities which can be performed in JSON notation of data. A paper by Tobias Fertig called Model driven testing of RESTfull APIs[4. Rest apis] talks about how we can easily test Restfull web services using an approach called module driven testing. Soon after designing any of the applications we use different testing methods to ensure whether the applications are working fine. It is very difficult to cover all the test cases as test cases are written manually by the testing team. In order to overcome these problems, it is good to design applications using restful web services because as restful web service framework provides state-of-the-art tool which helps to understand the structure of application by testing tools and easily generates all the functional and security test cases automatically.

A. Motivation

As Sterling Business to Business integrator is a complex product which includes many more complex business elements in it, it is not a good approach to deliver entire product as a service to all the customers. So the best approach for this is to create a separate application programming interface for each and every business models in sterling integrator and provide these as a service for customers. We can create these APIs using many approaches but features of RESTful web services like security, performance driven, cacheable, statelessness etc... This motivates to design the application programming interfaces for document envelope module of sterling integrator as REST APIs.

B. Existing approach of Document Envelope in Sterling Integrator

Currently, to create any of the documet we were using the sterling integrator which is more complex in nature. The Sterling integrator itself is a huge complex product which containd so many complex sub modules and one of complex sub module is document envelope. The Document envelopes in the sterling integrator is as shown in the fig 2.1:Document envelope in Sterling Integrator.

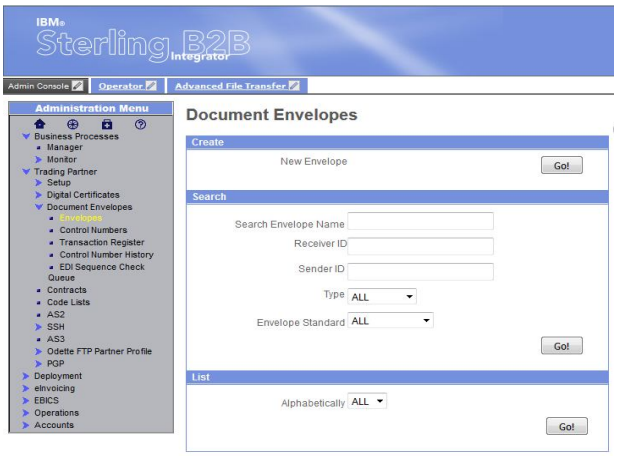

Fig 2.1: Document Envelope in Sterling Integrator

The existing approach consists of lot more elemts which intern turned into drawback as customers expect the module to be simpler and easy to understand. In the figure we can notice that there are there are different complex modules which is in left side of sterling integrator figure. The Busineess process, Trading partner, deployment, eInvoicing, EBICS, Operations and accounts some of the very important modules which are visible. In that to get the document envelope we need to look into trading partner module and document envelope sub module. There are some disadvantages in the existing approach they are mentioned below.

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C. Disadvantages of existing approach

1) As the sterling integrator contains complex modules in it, It is very difficult to understand the concepts of simple sub modules like document envelope.
2) Company cannot provide entire product as a service to all the customers.
3) Most of the customers may not requires all the services avilable in sterling integrator and they cannot buy entire product as it affects them with respect to cost afford on the service or the product.
4) To create a single document envelope, the customer need to spend more time while navigating to next options.
5) Customer expects the creating, updation, deletion and reading of the document envelope to be automized.
6) We cannot divide the services of sterling integrator which can be act as back end services.
7) Its difficult to integrate the only required services in blumix cloud.

III. SYSTEM DESCRIPTION

A document envelope is a technique used to provide high level of security in transferring confidential documents from one instance to another instance. Here the document is wrapped up using the envelope which is created and transferred over the network and if the document is attacked by any of the middle man then also they cannot able to view the document as it wrapped up with different algorithms for encryption and also uses different signing techniques.

A. Structure of Document Envelope

The Document envelope is designed in more structured manner which consists of three levels of envelops. Each level is used to keep the data of document in more secure manner. The below shown figure explain three levels of envelope namely Interchange Envelope, Functional Group envelope and Transactional set envelope

1) *Interchange Envelope*: The outermost enveloping design for documents is called as interchange envelope which contains the headder information, trailer information and all the data or information which needs to be transferred over the network in same transmission.
2) *Functional Group Envelope*: This is the middle level of enveloping document which contains the detail information about the group headder and trailer of the documents which are transmitted in the group transmission . Here there can be many documents transfeed at a same time using this functional group envelope technique.
3) *Transactional Set Envelope*: This is the inner most enveloping technique which works for transactional set of information to be carried over the network. The transactional set envelope consists o transactional header and transactional trailer information.

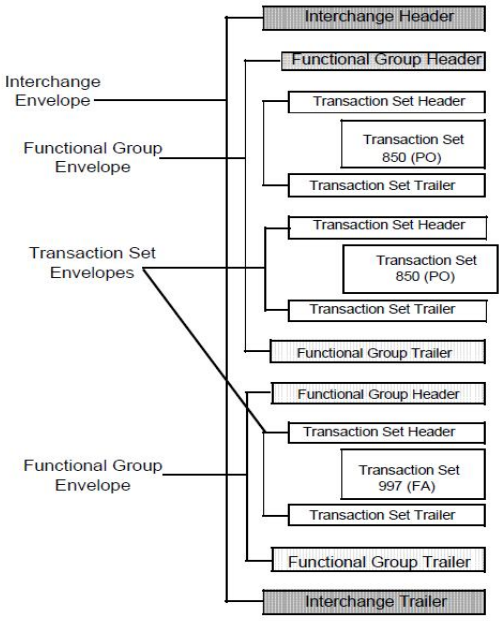

Fig 3.1: Structure of Document Envelope

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In the above figure 3.1 we can see the structure of document envelope which contains three level of enveloping. The inner most level of envelopin is called as transactional set envelope which contails transactional set header and transactional set trailer information surrounded by transactional set data. The middle level of envelope in the above figure is functional group envelope which contains functional group header information and functional group trailer information for the documents which are transmitted over the network in group transmission. The last and final level of enveloping or the outer most enveloping technique is called as interchange envelope that contains the header and trailer information of documents which are transmitted over the network in same transmission.

B. Overview of End to End Envelope Service

In the end to end communication of client organization and sterling integrator there will be huge flow of confidential documents like invoice, licenses, policy files etc… So these documents need to be enveloped in both the ends of communication.

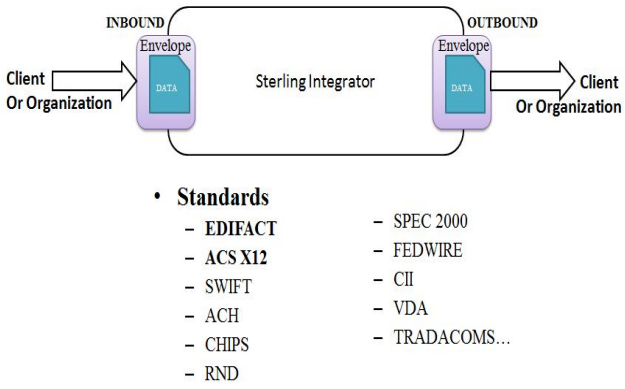

Fig 3.2: End to End envelope service

In the above figure 3.2 it shows an end to end structure of envelope service. Here the client organization sends the enveloped document to sterling integrator and the received document of sterling integrator needs to be unwrapped and this process of removing the headers and trailers of document is called as developing When sterling integrator needs to send any confidential information to its client organization then the document is wrapped up or added the required headers and trailers into the document and this process is called as enveloping the document. The envelope which is used in this process contains many more information like control information which helps in exchanging the documents effectively between the organizations. Most of the document in a network are transsmited using EDI (Electronic Data Interchange) technique which makes use of different kinds of envelope. There are many envelope standards which are supported by sterling integrator is as listed below;

1.	ACH	2.	CHIPS
3.	CII	4.	EDIFACT
5	FEDWIRE	6.	RND
7	SPEC2000	8.	SWIFT
9	TRADACOMS	10.	VDA
11	ASC X12		

From the above list of envelope standards we are going to implement EDIFACT (Electronic Data Interchange for Administration Commerce and Transport) envelope standard and ASC (Accredited Standards committee) X12 envelope standards only as an rest api in document envelope because most of the edi transactions are done with the help of EDIFACT and X12 standards. In later section will see detail information about these two envelope standards.

1) *EDIFACT Envelope standard :* EDIFACT stands for electronic data interchange for administration commerce and transport which is an standard of envelope that can be used while transfering the confidential documents from one instance to another instance in more secure manner. The EDIFACT envelop incorporates three different syntaxes in it for performing outbound

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envelope functionalities in three different envelopes. The three syntaxes of EDIFACT outbount envelope is as follows

a) UNB UNZ Syntax 4: This is the syntax used in EDIFACT envelope to perform outer most enveloping for the seleted documents which is called as Interchange level of outbound document envelope .

b) UNG UNE Syntax 4: With the help of UNG UNE syntax 4 EDIFACT envelope standard we can wrap or envelope the documents at group level which is called as middle level of enveloping the documents.

c) UNH UNT Syntax 4: UNH UNT Syntax 4 envelope standard is used to envelope the confidential documents at transactional set level which is called as inner most level of enveloping the documents.

2) ASC X12 Envelope standard ASX X12 stands for Accredited Standards committee X12 envelope which is used in transfering the documents from one instance to another instance in the standards of acreedited committee which has high quality of standards in document excahnge between the organisations. Based on the functionality levels of ASC X12 envelope there are mainly three syntaxes which are listeed below.

a) ISA IEA: This is the syntax used in ASC X12 document envelope to perform outer most enveloping for the seleted documents which is called as Interchange level of outbound document envelope .

b) GS GE : With the help of GS GE ASC X12 envelope standard we can wrap or envelope the documents at group level which is called as middle level of enveloping the documents.

c) ST SE: ST SE envelope standard is used to envelope the confidential documents at transactional set level which is called as inner most level of enveloping the documents.

IV. DESIGN & IMPLEMENTATION

System architecture of document envelope represents the different modules which are divided as a sub module to reduce the complexity of an application to understand easily by and of the users. In the below figure it shows the high level system architecture of document envelope rest API. This architecture is designed to understand the functionality of every sub module in the system by mentioning the kind of input it can take and which kind of output to be expected by the previous module.

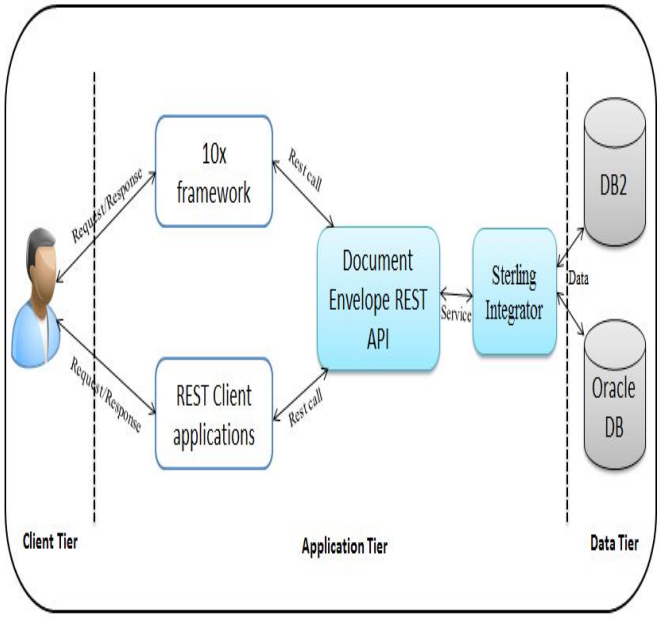

Figure 4.1 System Architecture of Document Envelope Rest API

In figure 4.1system architecture of document envelope shows the system architecture used to design the document envelope REST API. In the below mentioned system architecture we can identify different modules which are described briefly below with their functionalities. Client tier is the user level where one can provide a request and expect for the response from application tier. The application tier receives the request from client tier and process accordingly using proposed methodology called document envelope rest API with the underlying database used by sterling integrator.

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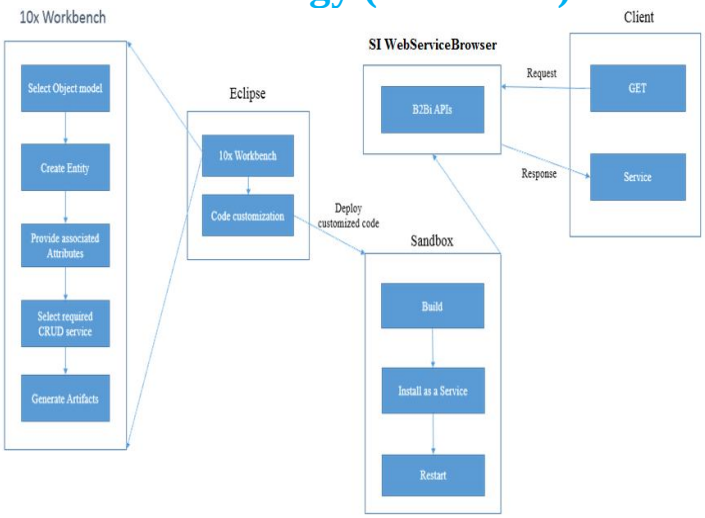

Fig 4.2: Design and implementation of REST APIs

The above shown figure 4.2 we can see the design and implementation of Document Envelope REST API. In which first we need to identify all the attributes which are required by Document Envelope and need to identify the same in the database. Mapping should be done between Document Envelope UI attributes and the Document Envelope attributes in the database.

The 10x workbench is used to generate the required entity say Document Envelope, it ensures that required attributes of that particular resource is defined. The contents of attributes are obtained from corresponding columns from the tables present in database which are mapped with the attributes of the same resource in UI. 10 x workbenches also facilitates us to define all the CRUD (Create, Read, Update & Delete) for the created entity and also some of the operations can also define if the entity requires to perfume some action, After creation the required entity, associated attributes, CRUD services, Actions etc.Once the generation of code is done we can write the code into it which performs specified operation. This can be done using some of the existing services rather than directly querying on database. Then edit the 10-x entities files as required. Deploy the code which is developed and generated into the sandbox; build the code in sandbox which generates the class files of our files which contains code. Install the same which created the war file of entire project which can be taken up by any of B2BI APIs and provides as a service to the clients/customers. Code customization is done on generated classes to fetch the resource details then these classes are deployed in sandbox. The corresponding results will be displayed in a browser in JSON/XML format. The third party clients can make use of these services by making a REST API call for that particular resource. The implemented code is deployed in sandbox and in case or errors/exceptions, message logs and console logs need to be analyzed and corresponding errors needs to be resolved and redeploy the modified code.

V. ADVANTAGES OF DOCUMENT ENVELOPE REST API

A. We can divide the complex module into sub modules and provide it as a service.
B. The API is able to perform all the required CRUD operations on document envelope api easily.
C. Can able to import and export the created resources from one instance to another instances easily.
D. As api designed using 10x-architectute, that helps to provide a rich GUI for end users.
E. The designed application can act as back end service of b2b end users.
F. Customer expects are fullfilled by providing rest apis which can be deployed in ibm blumix cloud environment.

VI. TESTING

System testing is performed once the entire unit test cases are successful tested manually by the developers and commit the application into the specified branch which can be pick up by the testing team. When the developer is confident about the application in terms of its performance and functionalities, testing team takes the testing into next higher level of testing with the help of automatic testing tool called AAA testing.

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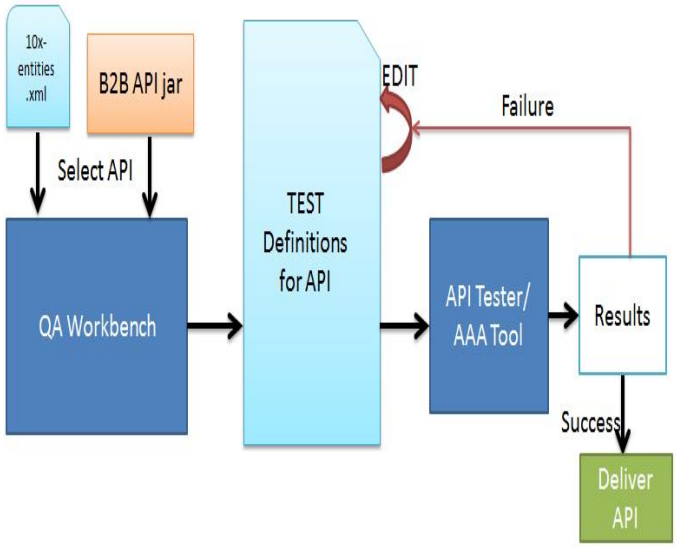

Fig 5.1: AAA Testing

The above figure called AAA (Automatic Testing tool) structure make sure that the designed document envelope REST API is good enough to release to the outside world. The QA workbench takes the input as 1x-entities and b2b api jar and generates the test definations automatically. These test definations needs to be modified as per user requirements and the modified test cases are been provided as input to AAA testing tool which will test each and every test definations as a rest call to the proposed methodology. Is all the test cases are passed successfully then the resigned api can be delivered to the customers who needs it.otherwise either test definations ot the underlaying application needs to be corrected and test again till all the test cases passed successfully.

VII. CONCLUSION

Using Document Envelope REST API we can perform all the services offered by Dcoument Envelope of sterling integrator. The Designed REST APIs can be used by end user or customer as an individual service and can also able to perform all the CRUD operations & actions of Document Envelope through API itself. The developed API is platform independent as it is developed using java and also database independent as we used geniric queries which will run in any databases. This API can also used as an back end application by the consumer which is more secure.

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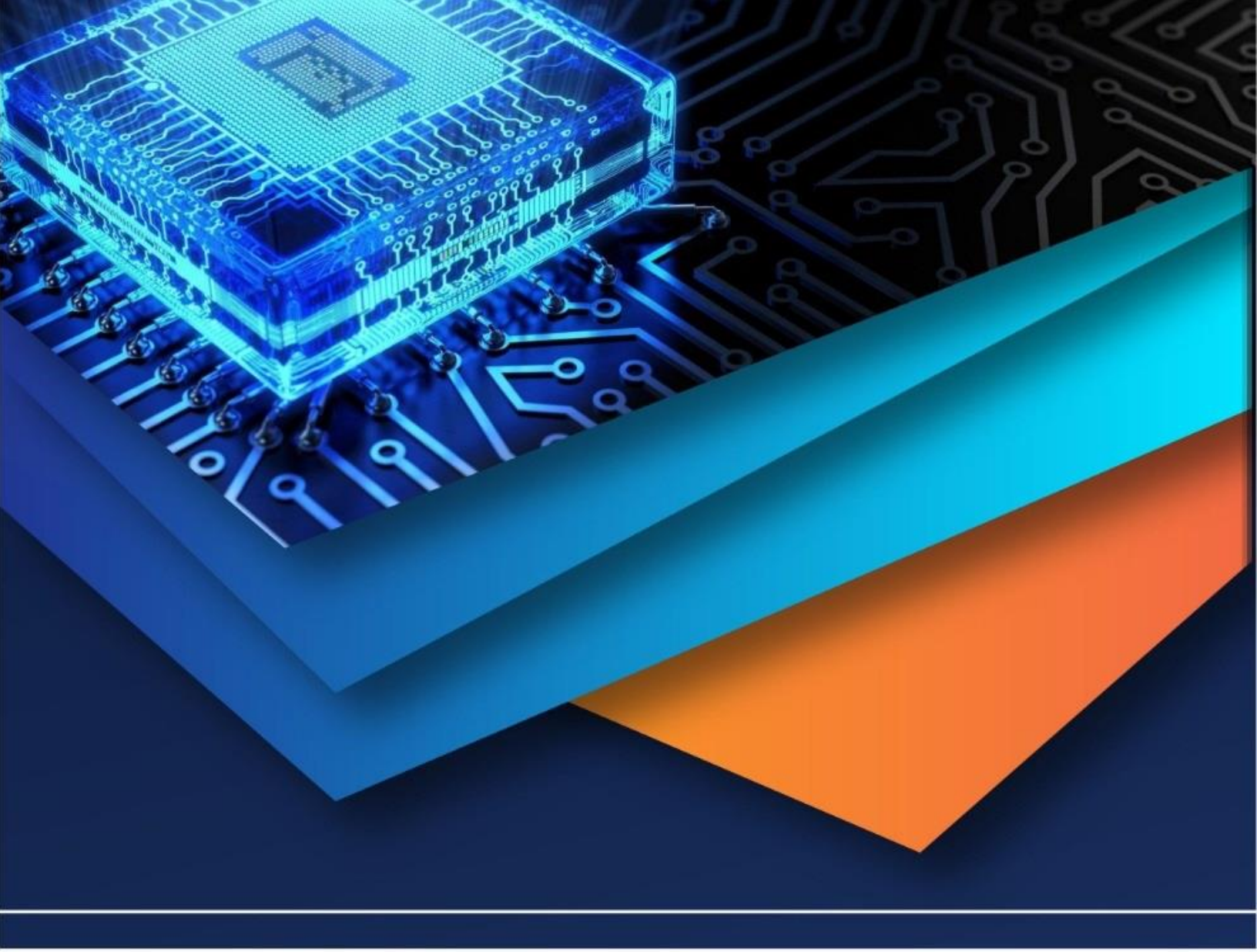

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