CLOUD AND SYSTEM INGERATION SOLUTIONS

FINAL REPORT

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1 Abstract

The purpose of this project was to take a variety of different data initiatives as part of Unum's digital transformation and provide integration solutions to these needs and release them into a live software environment. This will deliver real business value to Unum's employees and their clients. The applications created will provide accessibility to data that would be challenging or time consuming for an individual to gather manually and to streamline business process to reduce overhead costs to the company.

2 Introduction

The goal of this document is to give an overall insight into the development process of the different types of integration tasks for 3 different project initiatives as part of Unum's digital transformation. The software industry is an ever-evolving market and in recent years scalability, micro services and API's are the common buzz words you hear. With the addition of large-scale cloud providers such as AWS, AZURE and Google Cloud the need for scalable software integrations is vital. The cloud is something Unum has only explored in recent years and now seems to be where Unum first looks to if there is no tool or system already implemented to solve for the problem or business need.

The first section of this document will give the reader a brief overview of each individual project and discusses the technical and business reasons as to why the company went ahead with the directive.

The second section will compare the actual design from the functional specification with what has been completed, does the software align with what was specified and how was it tested.

The third section will look back retrospectively at the overall project to address the technical implementation of the project. Some of aspects that will be looked at are what worked throughout the development process, what hindered development and where improvements could be made in the future. Some key learning outcomes will be deduced along with some personal outcomes.

Lastly the fourth section of this document will review the findings from this project.

3 Project Overview

3.1 HRIS reporting

The goal of this feature was to supply a way for the onboarding specialist and their managers a way to see the state of where a client was in the onboarding process for HR Connect. HR connect was Unum's initiative on capturing business with large clients with commonly used 3rd party human resources software and integrating with said software. Due to swift development of the HR connect solutions, reporting has never been considered as a feature until Unum had pushed for growth in this area. Due to the demand of weekly status reports almost 10 working hours a week was spent for an onboarding specialist for gathering information from several different resources. It was then clear that a simpler method of reporting could be implemented in a dashboard.

Initially the Moonshot team in Unum Ireland had gathered the requirements for the user's stories and did some research on which business intelligence tools could be used. The tool which was chosen was QlikView which was an already existing tool that the company had been using. The tool had the ability to connect directly into data sources like databases along with connecting to REST API'S, cloud solutions like Salesforce the tool did everything that was required. With limited time and a high demand on the reports it seemed like QlikView was the quickest solution to the problem.

3.2 Salesforce as CRM

The purpose of this feature was to create a relationship between a customer in the Salesforce cloud system and IBM Master Data Management (MDM) when a new customer is enrolled by Unum that it is recorded and uniquely identifiable across many systems across the enterprise.

The tool chosen to complete this project was a combination of IBM WebSphere MQ and IBM Integration Bus (IIB). The reason for this direction as they were already existing tools that had been trialed and tested over many years at Unum. The tools had all the capabilities needed for the project.

3.3 Universal Life

The mission of this project was to integrate some mainframe batch cycles with an external cloud system with the goal of automating the generation of documents so that they could be printed and sent to a client. The push for this project was due to the automation of manual tasks completed by home office employees to create these documents for a client.

The tool chosen for this was again a combination of IBM MQ and IIB. Once again, these tools had been proven to work and communicate effectively with Cobol mainframe via MQ whilst creating message models XSD's from copybooks. Along with that this was proof for Unum to prove that mainframe could be integrated with AWS via a cloud vendor which was important scouting information as Unum in recent months has started to develop software in their own AWS environment.

4 Final Design

No signification change in the design has been changed any small changes have been added to the appendix page of this document.

4.1 Testing Metrics for Universal Life

Performance testing results showing all tasks and dates completed

Copy of Milestone
times for Pre-Stress te

Nightly job ran to test in user acceptance testing

Acceptance Async Status Report 04/15/2020

U

unum.support@calcfocus.com
To ○ unumproductsupport@CALCFOCUS.com; ⊞ **DL CalcFocus Production Counts**

AsyncStatusReport.csv ⌄   AsyncGroupReport.csv ⌄
.csv File   .csv File

CAUTION EXTERNAL EMAIL: This email originated from outside of the organization. Do not

Environment: Acceptance
Report Date: 04/15/2020

Annual Statements
Total Count: 13
Success Count: 13
Error Count: 0

Inforce Illustrations
Total Count: 0
Success Count: 0
Error Count: 0

This report was generated on 2020-04-16 06:02:55 AM.

Figure 1. Nightly Test Run

Annual Report end to end success

Figure 2. Annual Report Test

Annual report failure test

Figure 3. Annual Report Failure

Illustration end to end success

Figure 4. Illustration test

Illustration failure

Figure 5. Illustration Failure

Figure 6. Failure Log

4.2 Testing Metrics for HRIS Reporting

Successful

Script Execution Progress
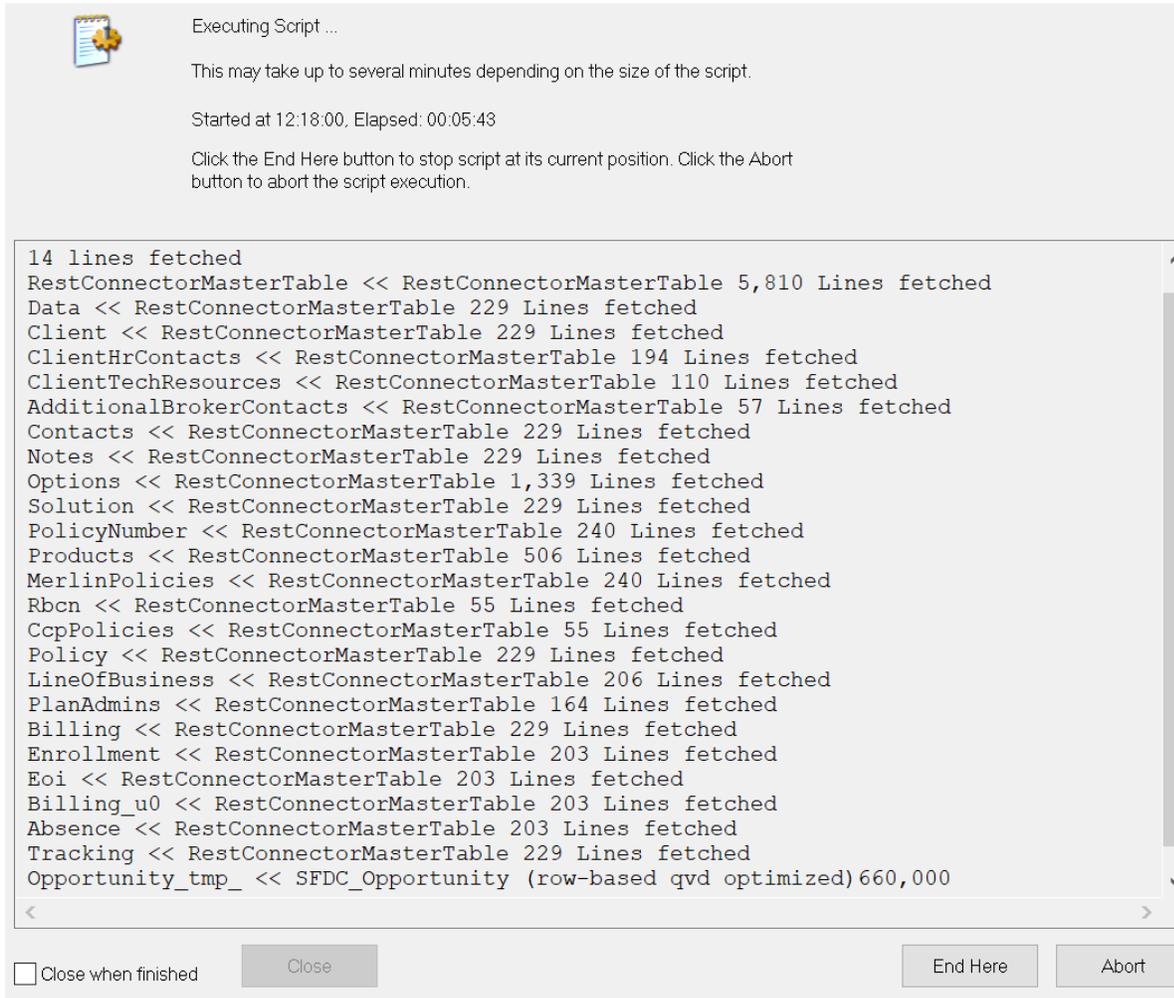
Executing Script ...

This may take up to several minutes depending on the size of the script.

Started at 12:18:00, Elapsed: 00:05:43

Click the End Here button to stop script at its current position. Click the Abort
button to abort the script execution.

```
14 lines fetched
RestConnectorMasterTable << RestConnectorMasterTable 5,810 Lines fetched
Data << RestConnectorMasterTable 229 Lines fetched
Client << RestConnectorMasterTable 229 Lines fetched
ClientHrContacts << RestConnectorMasterTable 194 Lines fetched
ClientTechResources << RestConnectorMasterTable 110 Lines fetched
AdditionalBrokerContacts << RestConnectorMasterTable 57 Lines fetched
Contacts << RestConnectorMasterTable 229 Lines fetched
Notes << RestConnectorMasterTable 229 Lines fetched
Options << RestConnectorMasterTable 1,339 Lines fetched
Solution << RestConnectorMasterTable 229 Lines fetched
PolicyNumber << RestConnectorMasterTable 240 Lines fetched
Products << RestConnectorMasterTable 506 Lines fetched
MerlinPolicies << RestConnectorMasterTable 240 Lines fetched
Rbcn << RestConnectorMasterTable 55 Lines fetched
CcpPolicies << RestConnectorMasterTable 55 Lines fetched
Policy << RestConnectorMasterTable 229 Lines fetched
LineOfBusiness << RestConnectorMasterTable 206 Lines fetched
PlanAdmins << RestConnectorMasterTable 164 Lines fetched
Billing << RestConnectorMasterTable 229 Lines fetched
Enrollment << RestConnectorMasterTable 203 Lines fetched
Eoi << RestConnectorMasterTable 203 Lines fetched
Billing_u0 << RestConnectorMasterTable 203 Lines fetched
Absence << RestConnectorMasterTable 203 Lines fetched
Tracking << RestConnectorMasterTable 229 Lines fetched
Opportunity_tmp_ << SFDC_Opportunity (row-based qvd optimized)660,000
```

☐ Close when finished   Close   End Here   Abort

Figure 7. Hris Success

Error
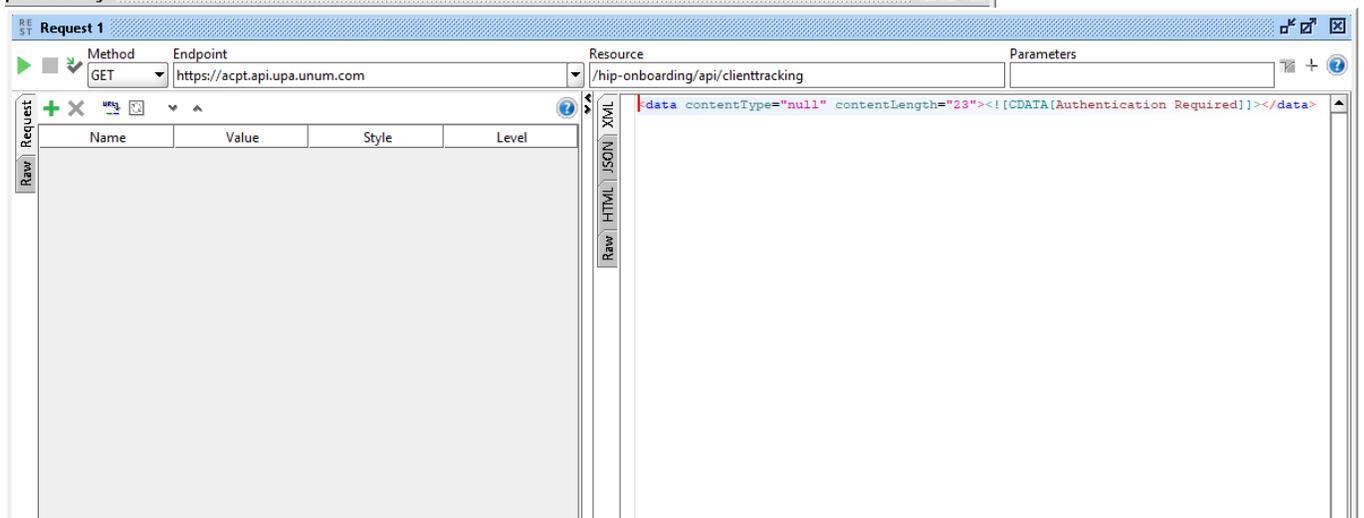
Figure 8. Hris Error

No Certificate error
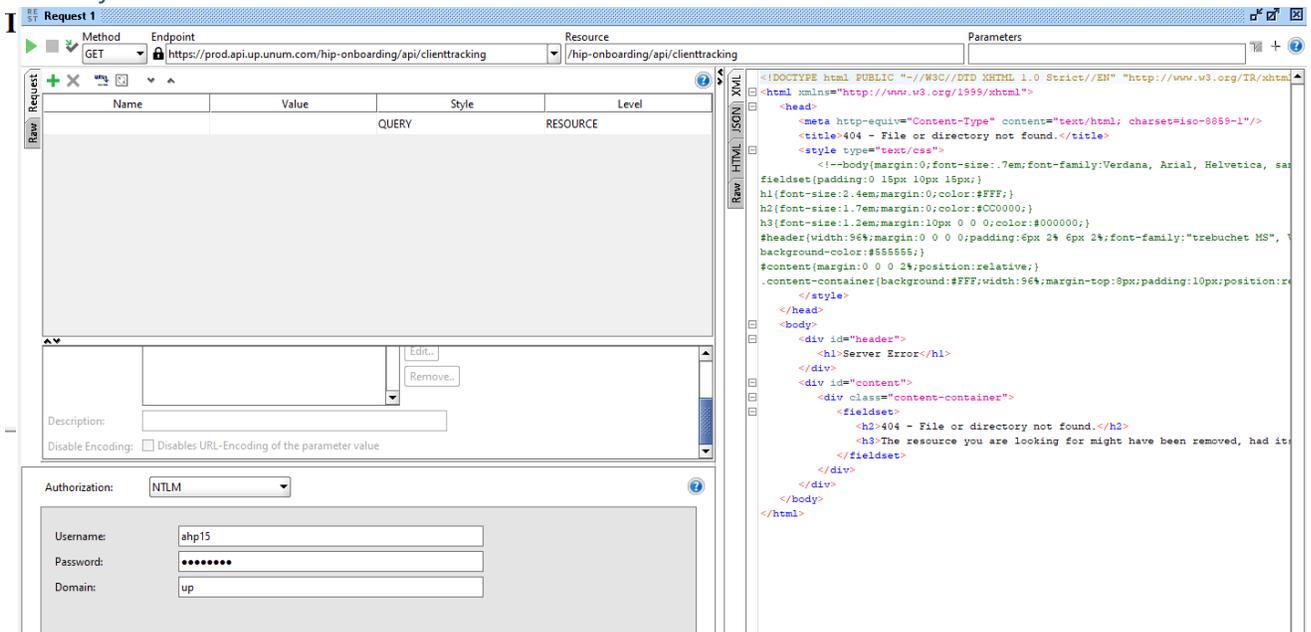
Figure 9. Invalid Certificate

5 Challenges and Learning Outcomes

5.1 Technical issues and challenges

5.1.1 HRIS reporting challenges

Upon commencing the feature, the goal was to utilize two REST API's and two SOAP messages. This project had started with a strict delivery date. The moonshot team initially had gathered the requirements and looked at how the reporting was going to work. No engineers on the team had used the QlikView tool before and some estimates were made about the tool's capabilities because of this strict deadline.

One of the assumptions made was that QlikView could refresh on demand however this was not the case. QlikView is refreshed on a set schedule which meant the data for the report was only updated on the server when a task was executed. This additional research had to be done which meant less time to implement the solution with a strict released date, this was very challenging. The Report was scheduled for 9am – 5pm EST. This was due to the frequency of how often the data was going to be accessed or updated along with the volume of data being requested.

Another assumption which was made about the API support was that the application was able to make parameterized API service calls from the data from a previous call. This was especially challenging for calling the two existing SOAP services to get the Merlin Policy Numbers or CCP RBCN's as they were reliant on an identifier being passed from the HRIS Rest call. This also meant that the call to the Salesforce service was not possible. This was not an issue for the REST call to HRIS as it just done a full data dump on all its client information and did not require any parameters.

The final assumption made was the report would be able to send email alerts and attach excel files of the report data. This was possible but required a lot of effort and research and with a tight deadline the argument was made that there was no need for emails as the user could just navigate to the report in browsers and export the report. Once the onboarding team was aware of this, they were happy with the terms of what was going to be delivered.

One of the main challenges was learning the tool itself and the development experience. QlikView was a complete unused technology and is its own application. There was no built-in error logging console which meant you needed to search through log files to find out what went wrong. There was no source control which meant all files were stored locally or on the server which meant versions needed to be saved by the developer locally.

5.1.2 Salesforce as CRM challenges

When this directive started the goal of this feature was to update the enterprise ID in Salesforce after Salesforce had sent the rest to IIB. Initially a direct connection between IIB and Salesforce had been coded and implemented and working as far as the acceptance environment. The design of this feature then changed mid sprint. The implementation was reviewed at a design review meeting to which a suggestion was made to change to use the newly created platform events feature in Salesforce. This supplied a publish and subscribe pattern for message passing which would allow multiple subscribers to listen for that event in Salesforce. This was a better long-term solution and matched the service oriented architecture discussed in the research document.

This change on the Salesforce side which meant the code needed altering to match the new design after the development had been completed. It was also suggested that Salesforce use the

PublishBusinessEvents IIB service for routing the message to an MQ queue pub/sub configuration this was to follow company architectural direction. This meant that new queues were needed which was the publish/subscribe queue in MQ. Along with that the input for the initial service had to switch from a REST input to be a MQ queue input. Changes to this design meant additional work needed to be done and new documents need to be created/updated.

5.1.1 Universal Life challenges

One of the main challenges of this feature was the complexity of the data and how it needed to be mapped. The first issue having no previous experience with Cobol copybooks. The data was passed to IIB via an MQ queue. The message format was in binary large object. If the data was not formatted correctly it would cause a parsing error this meant if an incorrect data type was passed or an empty value was passed to a non-nullable element on the XSD the transaction would fail.

The logs would need to be checked to identify if a parsing error occurred. In ordered to replicate the error you need to take the request message and create a CPY file (Cobol file) and either pass it through IIB with a debug activated and see how far the message had parsed to count the characters then search for that character position in the input message to change it. This was very time consuming until the discovery of rfhutilc.exe which allowed the message to be easily parsed and to identify the issue a lot quicker.

Mapping this complex data to the Accord 191 XSD caused a lot of minor issues as the data had been mapped in one go instead of implementing small, then testing. This created a lot of back and forward between the business testers and development with incorrectly mapped fields or values.

Debugging was essential in this project as there were many different requests between multiple systems this meant a lot of time was spent tracing where messages had failed and for what reason. As there were 4 different teams that meant there was a lot of communication between different data sources. When something had failed the person in middleware was responsible for finding the issue and figuring out who needed to change what.

In general, due to how big this integration was getting all the components of the design to work correctly was quite challenging and required a lot of patience. Without good diagrams, accurate documentation, clear communication and a good logging process it may have taken a lot more time to do.

5.2 Achievements

5.2.1 HRIS reporting achievements

All items of work had been delivered to the users in production and all requirements were met with the addition of additional enhancements. What was included in that was 9 different reports, the security features that insured only the right people got to see the information, the data filtering and searching and the export to excel features. Although the report did not do everything that was expected initially the users got exactly what they needed and not what they thought they wanted.

5.2.2 Salesforce as CRM achievements

As part of this initiative all the entities have been created and ready to use. This would consist of the Salesforce platform event, MQ queue's, the publishBusinessEvents IIB flow, the getEIDForSFOrg IIB flow, assignClientEnterpriseIdentifer IIB flow, getEnterpriseID REST service, the calls to MDM addContractMDM and getMasterAgreementByNK. The code itself is receiving the message from Salesforce transforming that message into a different message structure to suit a reusable service then generating the enterprise ID

and updating Salesforce. As for the update to MDM the services are in place to call but was receiving error responses from the last service addContractMDM. Unfortunately, before this work could be completed the project was halted and all development was stopped due to lack of business involvement and buy in.

5.2.3 Universal Life achievements

All planned items of this feature tasks within the time frame have been completed and released to production and been verified by the business. Stress testing has been conducted with over 10 thousand records at once and ran successfully with no message loss. Lastly the CIA changes are pending in dev now and waiting for the April release to be completed before promotion to acceptance testing. Finally, additional work was added to the project as per request of the business due to the abrupt ending to the Salesforce as CRM project. With the skills gained from the HRIS work it was suggested that maybe creating a dashboard of this information and there was immediate interest from the business. As far as implementation goes the database table have been created to store the information and the SQL store procedures have been coded and sent to the database admins to implement.

Some stats were also recently received also on the implementation in production.

- Total in-force Universal Life block as of 3/31/20 = 505,471
- New annual reports mailed as of 4/3/20 = 265,290
    - Note: 16% of this volume (41,124) was mailed on our single largest anniversary date, all messages processed
- 52% of our in-force customers have received a new annual report

5.3 Learning outcomes

5.3.1 HRIS reporting learning outcomes

As far as learning for this project being exposed to an analytics tool was a very useful experience. This helped to understand what a tool like this is capable of and will provide insight into solving similar problems in the future. Along with that a lot was learned about security and what are all the necessary pieces of how a user is verified. Also, learnings about when to push back and not agree to terms without fully understanding something and its capabilities. This project would not be something developers from data integration usually would take on so having no experience with the tool meant that a lot of research was necessary. What was also learned that sometimes you must swallow your pride in order to progress this was evident at the start of the development and some guidance was needed from existing QlikView developers in the company.

5.3.2 Salesforce as CRM learning outcomes

A great deal was learned from this project particularly around business direction and involvement. This project only involved IT resources in the exception of one project manager. The recommendation of carrying out this work was directed by IT for IT. In early January the project manager had switched employer leaving the team with 2 senior software engineers, 1 software engineer and a data analyst. This then caused a breakdown in communication with architecture groups and other teams. Whilst developing, in early January the company had decided that MDM 11 was not going to be used as their master data store and MDM 2.0 in the cloud was being looked at in February. This grinded the project to a halt without any warning. It showed the importance of communications through the project manager and that even if a project is close to being finished it does not mean it will be accepted.

5.3.2 Universal Life learnings

From this project the main challenge was overcoming the Cobol messages. Once the basics of the language were understood what certain statements did and what values had to be in what column's that was the main learning outcome.

With some experience with IIB and ESQL some additional information about certain features and how things work within the application we're discovered also. A big part of this integration was focused on scalability what was learned was how to create multiple instances of the applications also and increasing the thread pool. Lastly due to the size and the amount of message passing in this application a lot of time was spent debugging minor issues and deducing where problems were located which was also very useful. Overall for this project what was learnt that with the right mindset, attitude and perseverance with your effort's, small steps over a long time can make a huge difference.

5.3 After thoughts

5.1.1 HRIS reporting after thoughts

After completion of all the tasks of work and releasing the reports into production it was noticed that a better solution could be delivered. Unfortunately, due to the strict deadline of this feature the decision was made that there wasn't enough time to refactor everything and go back into discussion with the stakeholders on a better solution.

Initially some minor bugs in the reports such as changes to the size of the fields or spelling mistakes were found and were quickly fixed and deployed. Until it was noticed that some data was not showing correctly. After a bit of investigation, it was noticed that there was a flaw with a piece of logic between existing and a prospect customer which removed any of the fields that didn't have a status of "Go Live". Once this was noticed and with some extra time due to the stoppage of the Salesforce as CRM project. The 9 reports were combined into 1 report utilizing the in-built filtering in QlikView to filter the data on the presentation layer opposed to the script. Along with a small update to the HRIS REST API to include an identifier this solved all the user's issues and created a better sustainable solution.

If perhaps more time and research was spent on using the QlikView tool at the start, the development might have been better, and a more combined approach might have been delivered initially.

5.1.1 Salesforce as CRM after thoughts

if more investigation and research was done at the start of this project along with getting some direct involvement with business stakeholders this project could have been completed.

5.1.1 Universal Life after thoughts

Some of the after thoughts on this project was that the queue depths for the annual report flow in production (5000) had all smaller queue depth than the sub production regions (50000). This was noticed after the first large batch of customers was executed in production and the queue depth was exceeded and about 9 messages were sent to the backout queue. The change to fix this was simple and the messages that failed were simply reprocessed. I think if an additional check to the production check list was added this error could have been caught. Luckily this process ran nightly and due to the 5-hour time different between the USA and Ireland the error had no impact on operations and the queue capacity was increase to 50000 in the same day.

6 Conclusion

After all implementation and tools were explored some conclusions can be made about cloud and system integration. From the HRIS reporting what can be concluded that using business intelligence allows for speed to market and quick aggregation of multiple different data resources. The ODBC connectors in the tool make it simple to make direct connection to an entity, although this data connection is only reusable by another QlikView service. What the tool does not provide is the ability to integrate multiple different web services and make them communicate with one another.

Another conclusion can be made is that it's possible for integration between mainframe and cloud computing platforms is possible and is able to execute effectively with large message batches. This was largely due to good research and testing. AWS's ability to scale with a serverless implementation and MQ enablement of allowing for asynchronous messaging from mainframe worked together seamlessly. This was evident as the implementation was able to process 16% of all Unum's customers using universal life in one night.

Finally, from the Salesforce as CRM project and with the use of the publish and subscribe pattern it is a good architectural decision if the goal is to implement a service-oriented architecture (SOA). This means the enterprise can define a set of published events to define when a customer has made an important milestone in a process which means several subscribed services can then carry out tasks in order to prepare them for the next stage of the process.

7 Acknowledgements

I would like to express my sincerest gratitude to the follow people for all their help and guidance through this project without these people this project would not have been possible.

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- Hernan Maschwitz
- Evan McDonald
- Luis Landi
- Mohammad Alvi
- Peter McCluskey

8 Plagiarism Declaration

Declaration

• I declare that all material in this submission e.g. thesis/essay/project/assignment is entirely my/our own work except where duly acknowledged.

• I have cited the sources of all quotations, paraphrases, summaries of information, tables, diagrams or other material; including software and other electronic media in which intellectual property rights may reside.

• I have provided a complete bibliography of all works and sources used in the preparation of this submission.

• I understand that failure to comply with the Institute's regulations governing plagiarism constitutes a serious offense.

Student Name: Conleth Kennedy

Student Number: C00172853

Signature: Conleth Kennedy

Date: 20/04/2020

9 Appendix

Entity Relationship Diagrams

HRIS data model

Input data

Client_Tracking.json

Reflected Model
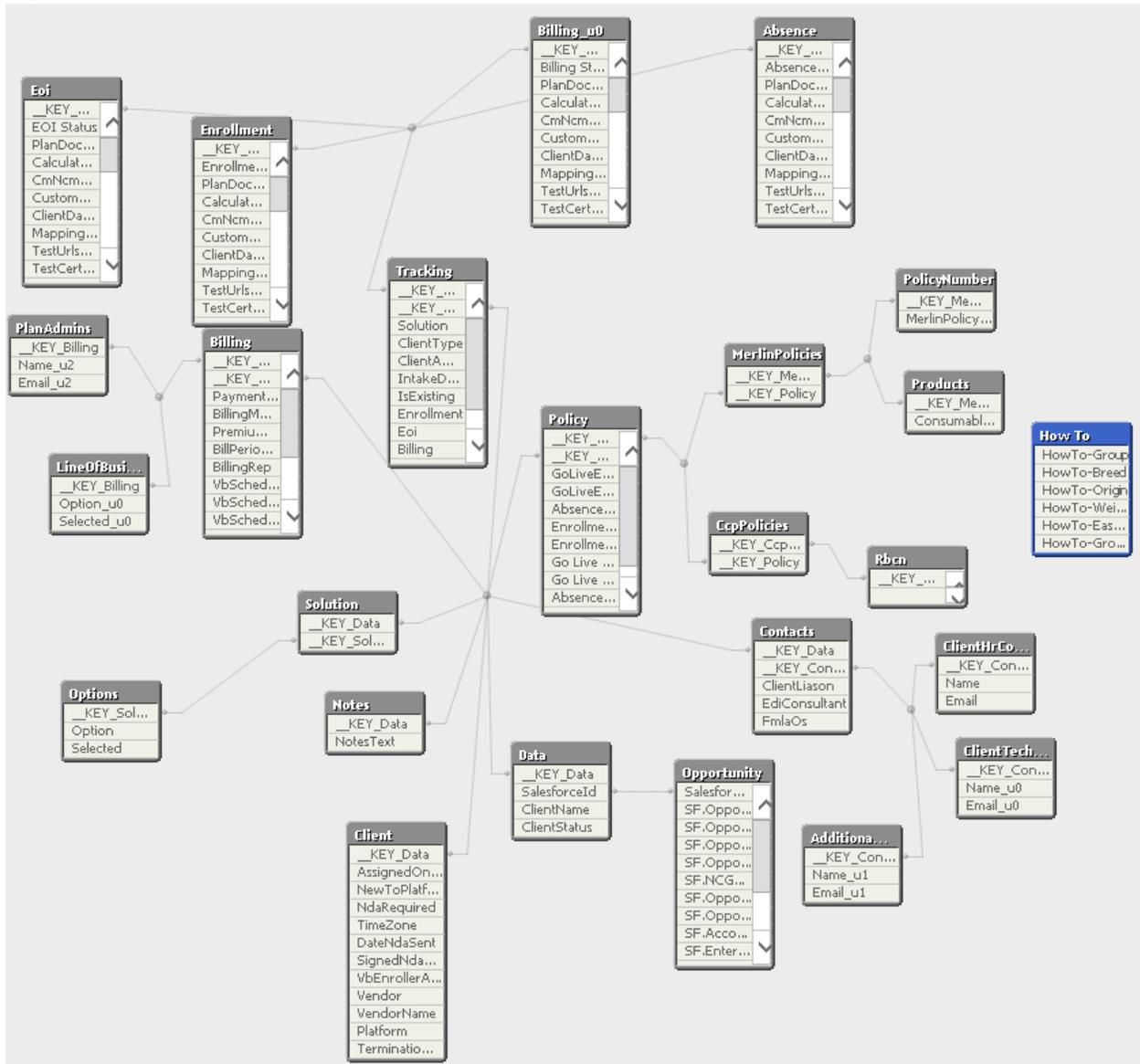
Figure 10. QlikView Data Model

Qlikview ER Diagram.png

UI UX

HR Connect Onboadring Report

My Command   My Toggle   ▼ Filters   **0** Selections ◀ Clea

No current selections   Updated 2020-

| Intro | How To | Dashboard | | Def |

Onboarding Customers

ClientName	SF.NCG_...	EOI Status	Absence St...	Billing S...	Enrollment Status	AssignedOnboarder	Intake Date	Go Live Enrollment Date	Go Live Eoi Date	Absence Go Live ...	Bill Period Begin Date	E
	-	Ideation	Ideation	Cancelled	-	Frost, Dorothy	2020-03-23	-	2020-07-01	2020-07-01	2020-07-01	-
	-	GoLive	GoLive	Cancelled	Cancelled	Frost, Dorothy	2019-08-02	2019-10-21	-	2020-01-01	2020-01-01	2
	-		GoLive	Cancelled	-	Higgins, Kristy	2019-04-08			2020-01-01	-	
	-		GoLive	Cancelled	Cancelled	English, Matthew	-	-	-	2020-01-01	2020-06-01	-
	-	Discovery	Discovery	Cancelled	-	English, Matthew	2020-01-29	2020-05-01	-	2020-05-01	2020-05-01	-
	-	Cancelled	Cancelled	Cancelled	Cancelled	Ross, John	2019-04-05	2020-07-01	-	-	2020-07-01	-
	Core Mid	-	Cancelled	Cancelled	-	English, Matthew	2020-01-18	-	-	2020-07-01	2020-07-01	-
	-		Cancelled	Cancelled	Cancelled	English, Matthew	-	-	-	2020-01-01	2020-05-01	-
	-	GoLive	-	Cancelled	-	Ross, John	2019-03-19	2019-10-09	-	-	2020-03-01	-
	Core Mid	Cancelled	-	Cancelled	-	Higgins, Kristy	2019-04-19	2020-01-01	-	-	-	-
	-	Cancelled	-	Cancelled	Cancelled	Higgins, Kristy	2020-02-27	2020-10-01	2020-10-01	-	2020-10-01	-
	-	-	-	Cancelled	GoLive	Ross, John	2019-01-07	2019-08-08	-	-	-	-
	-	GoLive	GoLive	Discovery	-	Clemons, Ary (Clemon...	2020-01-17	2020-01-27	-	2020-01-17	2020-03-01	-
	-	Testing	GoLive	GoLive	-	Frost, Dorothy	2019-10-09	2020-03-01	-	2020-02-01	2020-01-01	-
		Testing	GoLive	GoLive	Cancelled	English, Matthew	2019-10-10	2020-03-01		2020-03-01	2020-04-01	

Policy Number and Client					RBCN and Client				Onboarder Breakdown						

MerlinPolicyNumber	ClientName
'09	
'40	
327	
327	
328	
328	
010	

CCP_RBCN	ClientName
R003	
R007	
R008	
R009	
R013	
R018	
R021	

AssignedOnbo...	Status Testing	Status Oboarding	Status Ideaion	Status GoLive	Status Discover
	57	31	32	249	
-	0	0	0	16	
Clemons, Ary (Cl...	6	11	6	4	
Ross, John	7	6	6	54	
English, Matthew	8	6	3	12	
Frost, Dorothy	10	3	7	28	
Leahy, Jordan Elle	12	3	7	59	
Higgins, Kristy	14	2	3	76	

Enrollment Status		Billing Status		EOI Status		Absence Status		SF.Client Manager		SF.Primary Sales Rep		SF.NCG_Core		SF.Implementa
Cancelled	15	Cancelled	12	Cancelled	5	Cancelled	9	Caitlin Donnelly	1	Brad Velin	2	Core Mid	12	
Discovery	1	Discovery	1	Discovery	2	Discovery	5	Cassandra Fox	1	Brett Heltne	1	NCG	2	
GoLive	40	GoLive	69	GoLive	74	GoLive	66	Courtney Yurczyk	1	Bryan Herman	1	NCG Regional Non-Heal...	1	
Ideation	3	Ideation	9	Ideation	11	Ideation	9	Greg Tamburino	1	Chris Sawyer	1			

Figure 11. UI QlikView

## Sequence Diagram
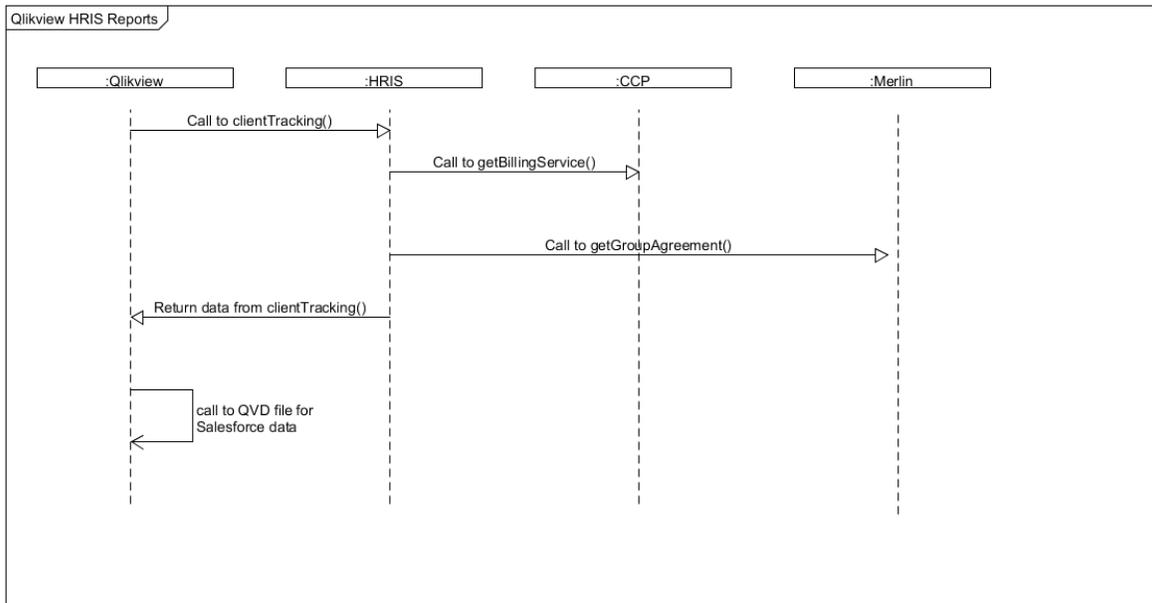
Figure 12. Final HRIS Sequence Diagram

Universal Life data model

Input data

APMYL350.cpy

ULXYARPT.cpy

Mapping of data

UUS Annual Report
191 elements 112719

UUS UL Illustration
191 elements 092319

Reflected Model / Output

UL Annual Report
Analytics Physical Dat

UL Dev Report.pdf