**REST API and NoSQL**

Documentation

Created by

**UPTOWN IT**

For

**TAFE QLD Weather Studies**

**PROJECT REFERENCE:**

**DATE:**

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Remove all blue text once your report is completed. The blue text is intended to give you some pointers for completing the document content.

You may use diagrams, tables, graphics or screenshots to prove your knowledge, or explain your understanding, but each diagram, tables, graphic or screenshot MUST include captions.

# 

# PART ONE – NoSQL Solution

## NoSQL research and technology selection

* Review and analyse the scenario presented with the aim of identifying the business data needs and confirming that NoSQL is the best option for this project. (**100 to 150 words**)

Business Data Needs (Analysis of Scenario) (100 to 150 words)

Explain the scenario requirements and what functionality is required by the client.

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NoSQL Usage Justification(300 words )

Explain why a NoSQL database would be suitable for this scenario and provide 3 reasons for its suitability.

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Vertical vs Horizonal scaling (300 words)

Explain the differences between horizontal and vertical scaling and then provide 2 benefits of using horizontal scaling for this scenario.

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Relational vs Non-Relational comparison (50-100 words per cell)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TYPE of DATABASE | SUITABILITY by DATA VOLUME | SUITABILITY by DATA TYPE  Structured, Semi-Structured, Unstructured | QUERY COMPLEXITY | ACID COMPLIANCE |
| Relational: SQL |  |  |  |  |
| Non-relational: NoSQL |  |  |  |  |

NoSQL Vendor Comparison (50-100 words per cell)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NoSQL Interface | MAIN FEATURES | DATA FORMATS | EASE OF USE | BEST FOR  Types of Projects |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Add rows as necessary |  |  |  |  |

Justification for REST API (300 – 400 Words)

Explain why a REST API is suitable for this scenario, making sure to cover how it can provide the benefits of Flexibility and portability, Scalability and Cacheability for the project.

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RESTful Web API Framework Review (300 words)

Describe the Web API framework you will use for the project and explain why it is a good choice for the project.

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### Storage requirements and MongoDB creation

Data Storage Requirements (150 words)

Calculate the storage requirements needed to hold the current data set plus the required data growth needed to maintain the current rate of data input according to the scenario.

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Data Throughput Requirements (200 - 300 words)

Calculate the data input and output rates in kb/sec based upon the data provided in the scenario and any other assumptions/details provided by the client(or teacher) regarding the intended usage of the system. Show your calculations and detail the assumptions used for these calculations.

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Selected NoSQL Data Store Type (100 - 200 words)

Describe the NoSQL data store that will be used for the project (Document, wide column etc) and explain how it is suitable for the project and the benefits it provides.

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### Data Formats

Outline the data format of the collections you will need to develop for your project, including the field names and proposed data types. Make sure your field names reflect naming used in the sample data provided by the client.

|  |  |
| --- | --- |
| Collection name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| Field Name | Proposed Data type |
|  |  |
|  |  |
|  |  |
| Add rows as necessary |  |

|  |  |
| --- | --- |
| Collection name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| Field Name | Proposed Data type |
|  |  |
|  |  |
|  |  |
| Add rows as necessary |  |

Screenshot of imported data

|  |
| --- |
| Provide screenshot/s showing the sample data has been imported into your database and showing the number of records that have been uploaded. |

### Indexing

Justification for single field index

Explain a single field index you have created and what benefit that index will provide for the database and the associated API. Ensure your justification takes the usage of the system into account.

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Screenshot of single field index

|  |
| --- |
| Provide a screenshot showing that your index has been created. |

Justification for multi-key or compound index

Explain a compound index you have created and what benefit that index will provide for the database and the associated API. Ensure your justification takes the usage of the system into account.

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Screenshot of multi-key or compound index

|  |
| --- |
| Provide a screenshot showing that your index has been created. |

|  |  |
| --- | --- |
| **Part 1 – Planning and Database SIGNOFF**  Signing off on this document signifies that the **MongoDB database setup and planning documentation** presented **complies** with the Client’s Business **requirements.** | |
| **Project Manager or relevant stakeholder**  Signature:  Date: | **Web Developer**  Signature:  Date: |
| **Initial Review**  *(Feedback provided by Teacher)* | |
| **APPROVAL**  Granted  Not Granted | |
| **Secondary Review** *(If adjustments are required in the Initial Review)*  *(Feedback provided by Teacher)* | |
| **APPROVAL**  Granted  Not Granted | |

# PART TWO – REST API

## Build and document REST API Project

Screenshot of the created Project, via a solution or file explorer

|  |
| --- |
| Provide a screenshot of your project from the solution explorer of your IDE. |

Screenshots of the connection to the Database from the API

|  |
| --- |
| Provide screenshots of the configuration files and classes used to establish a connection to the database. |

Description of the mechanism used to allow for connection between the API and the Database: **(100 – 200 words)**

Explain how the components and classes in the images above are used to connect to the database.

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### Build the REST API: Endpoints and methods

Check off the following list to confirm that each of the following endpoint types have been created in your API. Each point should align with one of the endpoints required by the scenario.

Functionality Checklist

|  |  |
| --- | --- |
| **Functionality** | **Created Y/N** |
| Retrieve a single record. |  |
| Retrieve multiple records. |  |
| Insert a single record. |  |
| Insert multiple records. |  |
| Update or replace a single record. |  |
| Update or replace multiple records. |  |
| Delete a single record. |  |
| Delete multiple records. |  |
| Utilise projection on at least one occasion. |  |
| Extra methods required in the scenario (as required) |  |
| Extra methods required in the scenario (as required) |  |
| Extra methods required in the scenario (as required) |  |
| Extra methods required in the scenario (as required) |  |

### Endpoint Screenshots

Provide images of the controller endpoints associated with the items in the checklist. At this stage the endpoints do not need to be interacting with the database, they only need to be created and provide responses to the user.

1. Return a single record, using the GET method

|  |
| --- |
|  |

1. Return a collection of records, using the GET method

|  |
| --- |
|  |

1. Add a single record to a collection, using the POST method

|  |
| --- |
|  |

1. Add multiple records to a collection, using the POST method

|  |
| --- |
|  |

1. Update or Replace an existing record, using the PUT method

|  |
| --- |
|  |

1. Update or Replace multiple existing records, using the PUT method

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|  |

1. Remove a specified record from a collection using the DELETE method

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| --- |
|  |

1. Remove multiple records from a collection, using the DELETE method

|  |
| --- |
|  |

methods required in the scenario (as required)

### Test methods

Test your endpoints using a suitable tool to ensure endpoints are returning the appropriate response codes when used. Each endpoint must be tested to show responses for both correct and incorrect data provided and outline the data provided for the response and the response output.

|  |  |  |  |
| --- | --- | --- | --- |
| Endpoint (and parameters) | Method | Result of correct data / parameters provided | Result of incorrect data / parameters provided |
| /api/note?id=1 | GET | Id of 2 provided, 200 – data returned | ID of 0 provided, 404 not found returned |
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Testing Result Summary: (200 – 300 words)

Explain the outcomes of your testing, including how you determined the correct and incorrect data that should be used to preform each test. Explain any unexpected results and how you needed to adjust your endpoints to fix any incorrect responses.

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# PART THREE – API configuration

## Configure Cross-origin Resource Sharing (CORS)

Screenshots of CORS configuration, including the allowed origins, headers and methods.

|  |
| --- |
| Add a screenshot of your CORS configuration from your program.cs class. |

Screenshots of CORS requests and responses to at least one endpoint for each of the methods described below:

**GET**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a GET fetch request. |

**PUT**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a PUT fetch request. |

**POST**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a POST fetch request. |

**DELETE**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a DELETE fetch request. |

**PATCH**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a PATCH fetch request. |

Complete the table below

Use the table to outline the details of each of the previous requests, explaining the endpoint used, the origin address you sent the request from and the details of the response, including the response code.

|  |  |  |  |
| --- | --- | --- | --- |
| **METHOD and ENDPOINT** | **ORIGIN OF REQUEST** | **CORS ERROR?** | **COMMENTS** |
| GET api/notes/1 | https://www.test-cors.org/ | NO | Request was of type ‘cors’ and returned a 200 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Add rows as necessary |  |  |  |

Screenshots of configuration required to allow Pre-Flight requests, N/A is acceptable if no further configuration was required

|  |
| --- |
| Provide screenshots of any configuration needed to configure pre-flight requests. If none were needed write N/A in this box. |

Screenshots of the request to endpoints using the following methods (at least one for each) clearly demonstrating the OPTIONS request and the CORS request sent sequentially.

**GET**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a GET pre-flight request.  The console image can be the same as the one used in the previous section and the responses should be from the network tab in the browser tools to show the request triggered a pre-flight or OPTIONS type request before the main request. |

**PUT**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a PUT pre-flight request.  The console image can be the same as the one used in the previous section and the responses should be from the network tab in the browser tools to show the request triggered a pre-flight or OPTIONS type request before the main request. |

**POST**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a POST pre-flight request.  The console image can be the same as the one used in the previous section and the responses should be from the network tab in the browser tools to show the request triggered a pre-flight or OPTIONS type request before the main request. |

**DELETE**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a DELETE pre-flight request.  The console image can be the same as the one used in the previous section and the responses should be from the network tab in the browser tools to show the request triggered a pre-flight or OPTIONS type request before the main request. |

**PATCH**

|  |
| --- |
| Provide a screenshot of the console command used and the response supplied in your browser console to test a PATCH pre-flight request.  The console image can be the same as the one used in the previous section and the responses should be from the network tab in the browser tools to show the request triggered a pre-flight or OPTIONS type request before the main request. |

Complete the table below

Use the table to outline the details of each of the previous requests, explaining the endpoint used, the origin address you sent the request from and the details of the response, including the response codes returned for both the pre-flight and follow up requests.

|  |  |  |  |
| --- | --- | --- | --- |
| **Method and Endpoint** | **ORIGIN OF REQUEST** | **STATUS CODE** | COMMENTS |
| GET api/notes/1 | https://www.test-cors.org/ | 204 | No headers needed to be added to the request to trigger the pre-flight |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Add rows as necessary |  |  |  |

## Evaluate and secure REST API

Description of the method chosen to secure the application. (200 – 300 words)

Explain the process you will use to control user access to the API and the basics of how the system will work. Include details of how the required credentials will be provided and how they will be enforced/checked.

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Secured Endpoints

List the API’s endpoints and their HTTP method types then provide the details for each endpoint to outline if authentication is required to use the endpoint, and the required roles/access levels needed to access each one.

|  |  |  |  |
| --- | --- | --- | --- |
| ENDPOINT Name | HTTP Method | Authentication Required? | Authorisation required (Role or access level) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Add rows as necessary |  |  |  |

Screenshot/s of successful Authentication

|  |
| --- |
| Provide at least 1 screenshot to show your authentication system working. This should be a shot where the user’s credentials(API key) have been provided and they are allowed to access the required endpoint. |

Screenshot/s of unsuccessful Authentication

|  |
| --- |
| Provide at least 1 screenshot to show your authentication system working. This should be a shot where the user’s credentials(API key) HAVE NOT been provided and they are being denied access to the required endpoint. |

Screenshot/s of successful Authorisation

|  |
| --- |
| Provide at least 1 screenshot to show your authentication system working. This should be a shot where the user’s credentials(API key) have been provided and they are allowed to access the required endpoint based upon their user role. |

Screenshot/s of unsuccessful Authorisation

|  |
| --- |
| Provide at least 1 screenshot to show your authentication system working. This should be a shot where the user’s credentials(API key) have been provided but they are still NOT allowed to access the required endpoint due to an insufficient role level. |

## Documenting REST API endpoints

Evaluation of at least 3 different API Documentation tools including Features, Cost, Ease of Use and Project type suitability

Tool 1 (100-150 words)

Postman\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Tool 2 (100-150 words)

Swagger\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Tool 3 (100-150 words)

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Screenshots of each endpoint demonstrating the Purpose, Parameters and Expected Response Codes.

Documentation Screenshots or export

|  |
| --- |
| *These screenshots should be from the swagger (or equivalent) interface, and can be of individual endpoints, or an export of the swagger interface included in this document.*  *The endpoints must be documented to cover its’s purpose all the endpoint* *Parameters and Expected Response Codes.* |

|  |  |
| --- | --- |
| **Part 2 and 3 – REST API Development SIGNOFF**  Signing off on this document signifies that the **RESTful API and Documentation** presented **complies** with the Client’s Business **requirements.** | |
| **Project Manager or relevant stakeholder**  Signature:  Date: | **Web Developer**  Signature:  Date: |
| **Initial Review**  *(Feedback provided by Teacher)* | |
| **APPROVAL**  Granted  Not Granted | |
| **Secondary Review** *(If adjustments are required in the Initial Review)*  *(Feedback provided by Teacher)* | |
| **APPROVAL**  Granted  Not Granted | |

# PART FOUR Database Tasks

## Configuration

Screenshot of the configuration of a TTL Index

|  |
| --- |
| Provide a screenshot of a TTL (Time-To-Live) index that you have setup in your database. It must be a TTL that is suitable for the provided scenario. |

Screenshots of Configuration File and Testing to demonstrating Persistence

|  |
| --- |
| Provide screenshots of your database configurations to show persistence is activated as well as screenshots to demonstrate that your data persistence is being maintained. |

Trigger Details

Based upon the scenario, explain 2 triggers you intend to setup and the details of these triggers.

|  |  |  |
| --- | --- | --- |
| Trigger | Event | Actions to be performed |
|  |  |  |
|  |  |  |

Trigger Email

|  |
| --- |
| Provide a mock email to your manager to explain your 2 intended triggers and how they will be setup to work for the scenario. |

Trigger 1 code

|  |
| --- |
| Provide a screenshot of the code used to setup your first trigger in your database. |

Trigger 1 Data Before Screenshot

|  |
| --- |
| Provide a screenshot of an entry you are modifying/interacting with to active your first trigger. Make sure the shot shows and explains the action being performed to cause the trigger to run. If the trigger is designed to delete and entry, make sure the records before and after it are shown in the image. |

Trigger 1 Data After Screenshot

|  |
| --- |
| Provide a screenshot of the database to show the result of the trigger running. This could be an image of the record with its values updated/changed or an image of the collection showing the record is no longer there. |

Trigger 2 Code

|  |
| --- |
| Provide a screenshot of the code used to setup your second trigger in your database. |

Trigger 2 Before Screenshot

|  |
| --- |
| Provide a screenshot of an entry you are modifying/interacting with to active your second trigger. Make sure the shot shows and explains the action being performed to cause the trigger to run. If the trigger is designed to delete and entry, make sure the records before and after it are shown in the image. |

Trigger 2 After Screenshot

|  |
| --- |
| Provide a screenshot of the database to show the result of the trigger running. This could be an image of the record with its values updated/changed or an image of the collection showing the record is no longer there. |

Description of Database Authentication (50 – 100 words)

Explain the system used to manage authentication between your API and the database. This will not be talking about the users of the API itself and should only be about the connection form the API to your database server.

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Screenshot of Configuring Database Authentication

|  |
| --- |
| Provide labelled screenshots to demonstrate setting up login credentials for your API/Compass. |

Screenshot of Successful Database Authentication

|  |
| --- |
| Provide labelled screenshots to demonstrate using the previously setup credentials to successfully connect to your database server. |

Screenshot of Unsuccessful Database Authentication

|  |
| --- |
| Provide labelled screenshots to demonstrate attempting to connect top your database server from your API/Compass without providing valid login credentials. |

Description of Database Authorisation

Explain the system used to manage authorization between your API and the database to control access permissions for logins. This will not be talking about the users/roles of the API itself and should only be about the connection form the API to your database server.

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Screenshot of Configuring Database Authorisation

|  |
| --- |
| Provide labelled screenshots to demonstrate setting up access control roles for your previously setup database login in accordance with the scenario.  Also show images of a secondary login being setup with a lower access levels to your main login. |

Screenshot of Successful Database Authorisation

|  |
| --- |
| Provide labelled screenshots to demonstrate your login with the role that has higher access performing actions that this user is allowed to do but the lower-level role should not be able to do. Include images of logging in/connecting to the server using this login. |

Screenshot of Unsuccessful Database Authorisation

|  |
| --- |
| Provide labelled screenshots to demonstrate your login with the role that has lower access performing the same actions as in the previous section. They should show that this user should not be able to perform the desired actions. Include images of logging in/connecting to the server using this login. |

Description of Data Encryption in place to meet project requirements (100 – 150 words)

Describe/explain how your database system manages encryption in transit and encryption at rest for the data in the system. Also explain any other encryption options the system offers.

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## Partitioning

Description of the selected Partition key and justification for this choice (150 – 200 words)

Explain the partition key you used for your sharded cluster and outline how you decided this was a suitable key for the cluster.

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Screenshot/s demonstrating a collection partitioned using the selected key, including the collection name, number of chunks, shards and distribution spread

|  |
| --- |
| Provide labelled images to show the command to setup your partition key followed by images to show the successful partitioning of your collection and the outcomes of the shard distribution. |

Review of Partitioning and description of process to maintain distribution or optimise data (150-200 words)

Review the outcome of your partition key selection including details on the success/failure of the distribution and how well it balanced the data.

Add additional details to then explain how you might improve the distribution nd how you could maintain the system as the data grows to keep the distribution efficient and balanced.

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| --- | --- |
| **Part 4 – Database Tasks SIGNOFF**  Signing off on this document signifies that the **Final Database Task Documentation and Procedures** presented **comply** with the Client’s Business **requirements.** | |
| **Project Manager or relevant stakeholder**  Signature:  Date: | **Web Developer**  Signature:  Date: |
| **Initial Review**  *(Feedback provided by Teacher)* | |
| **APPROVAL**  Granted  Not Granted | |
| **Secondary Review** *(If adjustments are required in the Initial Review)*  *(Feedback provided by Teacher)* | |
| **APPROVAL**  Granted  Not Granted | |

# PART FIVE – KNOWLEDGE RESEARCH

## Contingency task and knowledge concepts

**REFERENCING YOUR WORK**

*Part 5 requires you to carry out research and provide answers to a number of questions. Provide the answers in your own words. Plagiarism is a form of academic misconduct and will not be tolerated. Include references for all your sources using a formal referencing style such as APA or Harvard.*

Q1 **Contingency task:** Assume that you are notified that some MongoDB documents are sometimes removed without any apparent operation being performed on that particular data store. Where would you start looking for the source of the problem? (**100 to 150 words**)

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Q2 In relation to the project completed in this portfolio, identify the **programming language** used to interact with the NoSQL and the **data interchange format language** or notation. Assess the performance and suitability of the language selected for the task. (**250 to 300 words**)

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Q3 In relation to the project completed in this portfolio:

1. Outline the criteria that you used to **partition** a specific data store and the benefits achieved. (**300 words**)

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1. What scalability method makes possible the **distribution of data across partitions** in NoSQL databases? Describe how the distribution process works. (**300 words**)

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1. Explain how **sort keys** can be used in a partition to increase performance and outline their **functions and features** in a NoSQL implementation**.** (**150 words**)

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Q4 In relation to the project completed in this portfolio, review the requirements that needed to be reviewed before the implementation of a TTL index on a field, and the functionality provided by this TTL. (**300 words**)

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Q5 In relation to the project completed in this portfolio:

1. Examine how you implemented **transport encryptions**, **authentication**, and **authorisation** in the REST API. Clarify how the methods and **features** you used contributed to securing the application. **(200 – 300 words)**

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Q6 In relation to the project completed in this portfolio, identify the debugging and testing methodology used and delineate four (4) **techniques** used to **debug** and **test** the API. For each technique evaluate its effectiveness in this specific project. (**300 words**)

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Q7 Identify and appraise the **datastore format** used for this portfolio project. Provide a brief description of each datastore format presented in the table below.

**Datastore Format Details**

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| DATA FORMAT | FEATURES | WHEN TO USE | EXAMPLE |
| **Key-value** |  |  |  |
| **Document-based** |  |  |  |
| **Column-based** |  |  |  |
| **Graph-based** |  |  |  |

Q8 For each data format listed below, explain the range of values allowed and provide an example of the NoSQL code/notation used to declare them. For the purpose of this exercise, provide a screenshot of a single document created in a NoSQL technology of your choice that demonstrates each of the data types below

1. Numeric

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1. String

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1. Boolean

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1. complex (nested object/array)

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1. date time

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Document screenshot

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| --- |
| Provide a screen shot of a NoSQL document demonstrating the use of all 5 data types. This DOES NOT need to be a document used in your project. |

# Appendix

You can add copies of coding to the appendix

# References

All references for Part 5 should be included here