

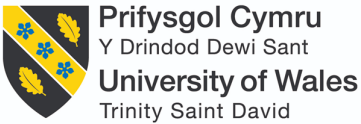
The Automation of Swansea Council Car Parks System

Introduction

Automation in business is a key topic providing time and cost savings to staff. The initial aim of the research is to ascertain whether web services can be implemented to automate a manual process delivered by staff at Swansea Council. The objectives are to interrogate the host systems data, convert the data to a suitable format for web services. The handling of images within a dataset and the interoperability of systems will form part of the research. Manual processes for the delivery of the documents by staff will also be scrutinised.

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Software Engineering



1. Case Study - Aims and Research Questions

Overall aim

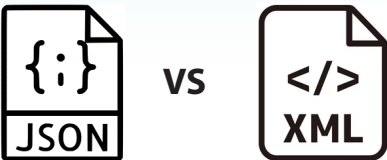
- Can Web Services be used to automate a manual business process

Research Questions

- Can the data be converted to a format suitable for web services
- How can interoperability be achieved across multiple systems
- Can images be transferred correctly across the network

2. Literature Review

Current literature regarding data format shows that JSON is the most widely used format and tests conducted by Breje, et al. [1] using common CRUD operations highlighted JSON superiority in terms of performance when compared to XML.



There are positive and negative points to be considered using either data format with JSON being more lightweight and suitable for CRUD operations with a simpler format leading to an increase in deserialization speed. XML is the more established with standards set for namespaces and schema, allowing agreement on format interchange between systems.

Data Amount	Time consume (ms)	
	Xml	JSON
100	23.16	16.07
200	24.45	16.65
500	40.14	27.55
800	44.36	33.08
1000	69.35	47.25
2000	120.15	78.45

XML and JSON transmission time [2]

3. Research Methodology and Philosophy

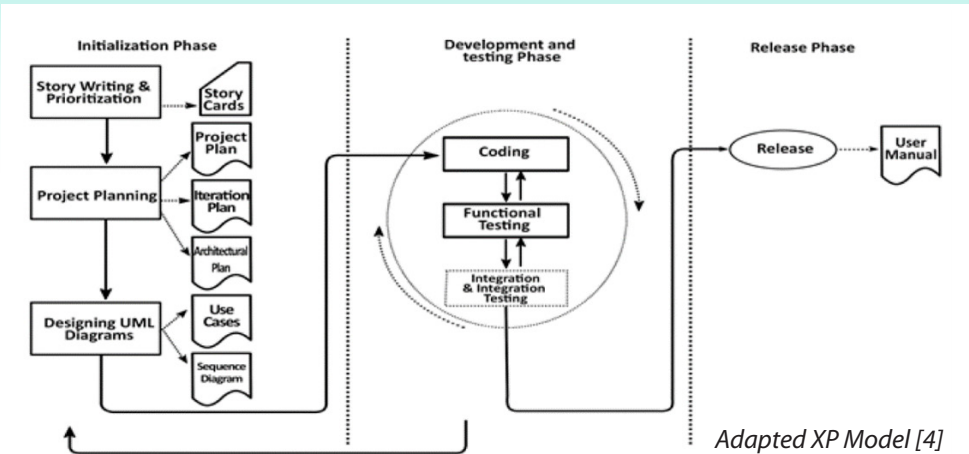
The case study methodology will be positivist and using a flexible design, which allows parameters to change over the duration of the study [3]. Researchers Runeson and Host [3] list three key main attributes that summarise a case study.

- The case study is flexible and able to manage the dynamism of real world occurrences.
- Data collected from multiple sources be it qualitative or quantitative is used to draw conclusions.
- If established theory previously exists it is to be built upon [3].



4. Software Methodology

Adapted XP Model



Adapted XP Model [4]

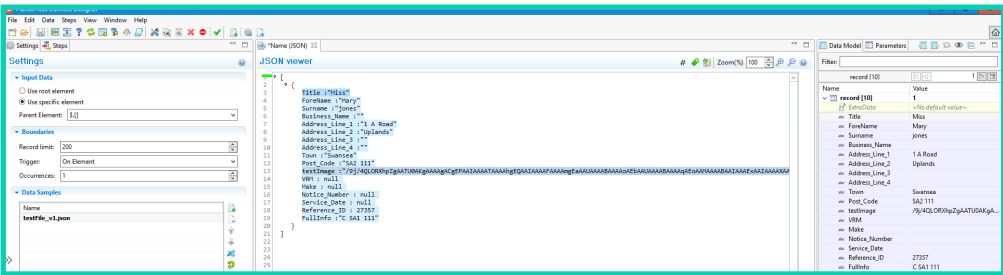
5. Research question findings

The conversion of data to JSON was successful and read by the middleware.

Once the data was in place in the correct format some further authentication privileges would allow the systems to communicate achieving interoperability.

The images can be transferred across the network successfully using Base64 file conversion.

```
private string loadImageByteArrayFromFileToString(string filepath)
{
    byte[] imageFileByteArray = System.IO.File.ReadAllBytes(filepath);
    string imageString = Convert.ToBase64String(imageFileByteArray);
    return imageString;
}
```

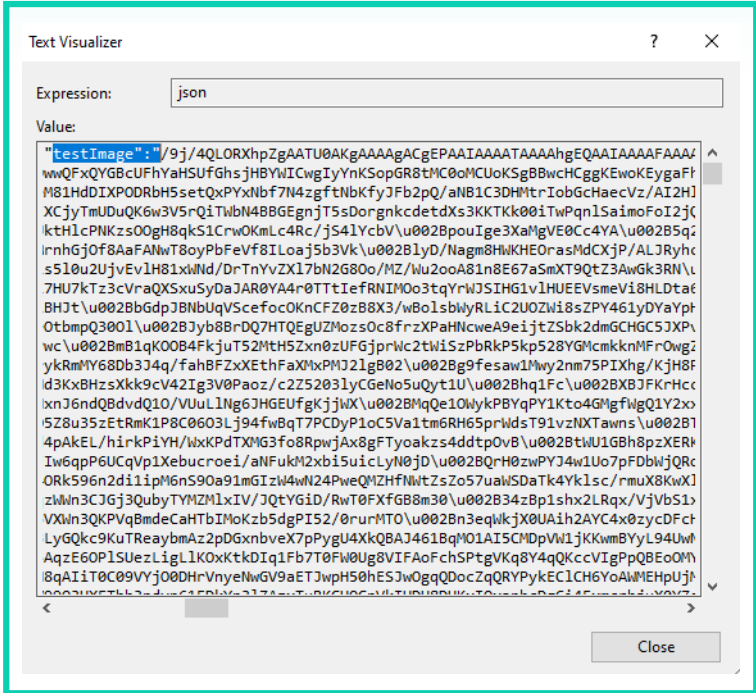


6. Conclusion

Based on the research conducted in the literature review and the application, JSON is the de facto file format for web services with XML still retaining its place where security is a deciding factor.

The work carried out in extracting and converting data from the host system was essential in meeting the objective format for web services data.

Using the Base64 conversion method to ensure images could be sent across systems successfully.



7. References

[1] R. G. C. G. D. Z. a. G. P. Anca-Raluca Breje, "Comparative Study of Data Sending Methods for XML and JSON Models," International journal of advanced computer science & applications, vol. 9, no. 12, 2018.

[2] Y. C. X. C. a. Y. Y. Boci Lin, "COMPARISON BETWEEN JSON AND XML IN APPLICATIONS ON AJAX," in International Conference on Computer Science and Service System, 2012.

[3] P. R. a. M. Höst, "Guidelines for conducting and reporting case study research in software engineering," Empirical software engineering : an international journal, vol. 14, no. 2, pp. 131-164, 2008.

[4] F. A. S. Anwer, "Proposal of Tailored Extreme Programming Model for Small Projects," International Journal of Computer Applications, vol. 171, no. 7, 2017.