TITLE OF REPORT: Assignment 1

PROGRAMME: Post Graduate Diploma of Information Technology Level 8

COURSE CODE: IT8401 - Research in Information Technology -T2 June 2017

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DATE SUBMITTED: 25th June 2017

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In today’s world, websites or web applications have a crucial position in a business firm. By using websites businesses can connect with customers frequently, as well as expand to potential customers. Meanwhile, using web applications businesses can overcome the barriers of physical devices. Web applications are created with features to provide online services for customers and meet with organization demands with no need to rely on a specific platform or Operating system. Recent years, the world of web development witnesses a dominate of JavaScript libraries and frameworks such as jQuery, ReactJS, Angular and NodeJS, that boot the web application to a new level and reaching to the next generation of World Wide Web, Web 3.0. A modern web application using domain driven development pattern can provide to organization a multi-in-1 solution for branding and publicity. Businesses are rapidly adopting this aspect of development with the help of developers to meet their business demands. Following this trend of web development, teams and businesses also need to embrace new positions, methods and duties to fully implementing workflow of modern web development such as Front-end developers, DevOps and Scrum framework.

Modern web development is dependent on the innovation of technology. Cloud computing and browsers revolution is the main impact to the future of modern web apps. Although the technology goes with the “break-neck “speed, it provides a lot of very useful tools and concepts but also creates a maze of technologies for businesses and put puzzles on the hand of developers. For developers, it is a difficult to develop skillsets among JavaScript libraries and frameworks, as well as applications’ dependencies. For businesses, a challenging of investment in a new business domain, in which contains risks from technologies churn. To adopting modern web application development, businesses should aware of their tech firm partners which are provide, support, research and develop in a domain of technologies. Developers also need to stay closely to a technology companies to reduce learning curve and avoid technical debt development.

The purpose of this review is to provide an overview of modern web development, as well as point out the issues of modern web application and solutions for it. The steps are used as follows:

- Collecting relevant articles addressed modern web development.

- Summary and discuss on review content, research method, strengths and weaknesses obtained in collected articles

- Conclusion and further works

Summary of Articles

Article 1: The Tangled Web: A Guide to Securing Modern Web Applications by Michal Zalewski

In this book, the author providing an overview of basic protocols and standards that built up the web and how the web implement with major browsers, such as Chrome and Firefox, as well as the security risks come with it.

Deep drive into the book, in part two Michal describes security features in variety ways. Almost security features in this section are described by author in the browsers providers’ point of view. The Author also deep drive into each browser’s settings to provide an understanding of how all the addressed security features are implemented in those browsers. And how borrowers are handle those security risks in a user-friendly aspect.

Another key point of this book was mention by author in part three. Michal looks at web applications’ common vulnerabilities, and the author based on personal work and research experience provided some proposed solutions in development to assist web developers a flexible way in decision making when facing the same issues.

By using exploratory sequential mixed methods, the author who are experienced web developer and security engineer. First gathering data of web applications, how web application was made of, and web application vulnerabilities. After that, the author using statistics and vulnerable handle approaches of common browsers to explain and provide some solutions for web developers.

Michal write this book with a wide range of views on web application vulnerabilities. This book not only addressed how web applications are handled by browsers, but also proposed solutions in development process of modern web applications. However, this book contains a huge concepts of web security from both Front-end development and Back-end development. It is difficult for study one or two concepts. Although, the author in part one of this book provides all the information needed to get started with this book but it tills a “senior-book”.

Article 2: Docker: Lightweight Linux Containers for Consistent Development and Deployment

The modern web development nowadays contains a massive of technologies. It brings to developers’ fingertips a lot of choice for their project. On the other hand, it also the main cause of headache and conflicts inside a project team, as well as inside a developer’s mind. The disease owns its own name “dependency hell”, (Dirk Merkel, 2014).

In this paper, the author addressed the difficult of dependencies management in modern web applications. A modern web application during the process of development, test and live production consist of many dependencies base on each process due to the tools used in each environment.

According to Dirk Merkel modern web application are consist of existing components which are already rely on other technologies both old and new. So that when user intent to run multi-services and many applications in the same environment these will be some issues occurred due to the version confliction or resource confection.

The Author found that, Docker is not an innovative technology, it was developed on a concept that existed for several years. What make Dock deferent is it using unified API to managing kernel-level technologies, Linux Containers, this is the core of Docker. Docker also take advantage of Advanced Multi-Layered Unification Filesystem (AuFS) as a filesystem for containers, and it very useful for version container images. Although, Docker support all Linux distributions but it not friendly with Windows and iOS platform.

By using explanatory sequential mixed methods, the authors collection data from Google trends to point out the popularity Docker over time and use the same data source from Google trend to do comparison between Docker and Virtual Machines (VMs). After that Dirk Merkel explain Docker and compare Docker features with VMs in details. By using this approach author clearly explain the advances of Docker for modern web application based on virtualization point of view. Docker using manager resources more efficient and cheap than hypervisor-based virtualization which need to access hardware directly.

Ryan Boyd, in “Getting Started with OAuth 2.0” explains that before the first version of OAuth there are massive of claims-based identity authentication system, developed individually and supported by their own service provider. To build web applications which are consuming those technologies for authentication purpose is a huge challenge for developers. The author introducing the idea of OAuth’s first version. With OAuth 1.0 Ryan Boyd highlight that the technology can replace those existing authentication systems and converge them into one technology, as well as releasing developers from headaches of choosing the right technologies which are robust in future development. However, the author criticizes OAuth’s first version till have some security issue with cryptographic signatures and server side authentication and need more research, as well as future development. In the late research, Ryan Boyd suggests the next version of OAuth with many improvements and innovation in security and the ease of use for web development.

In “Getting Started with OAuth 2.0”, Ryan Boyd explains in details of OAuth and how it is developing with great ideas in minds. The author chronicles of OAuth’s development and analyses features of OAuth. Ryan Boyd never forget to emphasize the advantages of OAuth compare with traditional authentication systems. Author point out the necessary of apply OAuth 2.0 in modern web development in application flow, both server-side and client-side, as well as users’ flow for a good user experience. Ryan Boyd helps us understand OAuth 2.0 more by providing a comparator technology, a set of tools and libraries for developers. However, the author reminds that this is an overview to provide concepts of OAuth 2.0 workflow and features. An introduction this technology with security, user productivity and some consideration for developers to optimize user experience and performance of web applications when apply this technology.

Dongseok Jang, Ranjit Jhala, Sorin Lerner and Hovav Shacham in “An Empirical Study of Privacy-Violating Information Flows in JavaScript Web Applications” explain the risk of JavaScript language that is used to build in today web applications. A large-scale empirical study which is conducted based on 50,000 websites are extracted from Alexa web index database. This study proves that JavaScript not only a flexible programming language that is dominating the Front-end web development nowadays, but also a tool use to create many malicious scripts implicitly harm to users, as well as creates many security vulnerabilities for modern web applications. Authors carefully implement a JavaScript in Chrome browser engine to extract the information from websites which are contain malicious scripts. During the study, authors sometimes remind the dynamic and free style of JavaScript make difficult for using isolation mechanisms to isolate website elements and event handlers. A rewrite function solution based on C++ is created to do the job on Chrome engine.

Authors claim that the rewriting-base function is not effect to the performance of the browser while doing the experiment. By using qualitative research design this study presents the idea of many web applications are using malicious scripts that violate the user privacy. Authors politely address many pervious researches are done in different methods, from binary rewriting to using specialized hardware, and seriously compare the pros and cons of authors’ rewriting-base function method with them.

In “Crawling AJAX-Based Web Applications through Dynamic Analysis of User Interface State Changes”, A. Mesbah, A. van Deursen and S. Lenselink explain the difficulty of executing automation tasks in the modern web application which are using AJAX (Asynchronous JavaScript And XML). AJAX is a new development technique compare to webpages, AJAX allows developers to create a complex web application user interface. However, this breaking change brings many new challenges and difficulties due to the long run of webpage’ concepts in the past, said by authors.

Authors point out two top challenges that come along with AJAX are the ability of search by search engines and testability. Authors highlights traditional web applications are using URL (Uniform Resource Locator) to state the webpage but it AJAX web applications, JavaScript handles the requests from user interface lead to the URL cannot state the page. This study shows that common search engines ignore content produced by JavaScript codes.

Authors present the idea of an AJAX crawler can access dynamic content during the runtime of modern web applications, as well as a state change mechanism capture when data are exchange between client-side and server-side via event handlers. By using qualitative research design authors experiment the AJAX crawling algorithm for searching purpose and testing purpose. Although, authors claim that the crawling algorithm use in this experiment can be use in production environment by common search engines, but authors honestly address Google’s proposal on their crawler, as well as mention other studies in Web spiders and (ro)bots carried from 1997.

In “A Grounded Theory Analysis of Modern Web Applications - Knowledge, Skills, and Abilities for DevOps”, Soon K. Bang, Sam Chung, Young Choh, Marc Dupuis explain the key skills requirement for a Software Development and IT Operator (DevOps), a very importance role in nowadays modern development. By collecting data from 3 different wed application projects and using qualitative analysis approach authors suggest four importance properties of a DevOps in a project team. Authors note that cloud computing bring a momentous change for the modern web development with ability of merge together software development, deployment, and operation in one role compare to traditional web development.

Authors analyse data of 3 web development projects from Aerospace Manufacturer to Research Group and Teriyaki Restaurant to identify knowledge, skills and tools are related to the four properties of DevOps. Authors propose a theory that DevOps roles are important in modern web development projects, and suggest the need for conduct more studies to train a DevOps.

According to “Invariant-Based Automatic Testing of Modern Web Applications” by Ali Mesbah, Arie van Deursen and Danny Roest, Modern Web Applications or Web 2.0 are AJAX-based applications, it different from traditional web applications and difficult to test. In this research authors using Automatically Testing UI States of AJAX (ATUSA) a Java application base on crawler CRAWLJAX, an open-source project. Authors present the trend of wed application development due to many advantage features of Web 2.0 include AJAX. Although AJAX make the web applications more user friendly, but it also brings some challenges. The more dynamic content AJAX brings to the web, the more difficult it is to test, and all the automation testing techniques are being use for traditional web development are seemed to be useless.

By using qualitative research design, Authors survey experiments from automation testing techniques and Graphic User Interface (GUI) application testing, to prove that AJAX-base applications need a new automation testing approaches. Authors although mention few current AJAX testing approaches, but they are partial automation techniques, that means testers are required doing manual testing as well.

Authors highlight ATUSA approach, a simulation of real user events on the application interface. This approach focusses on finding and tracking the behaviour of invariant elements on the web at runtime. Authors conduct number of empirical cases to find invariants in AJAX applications and track it by ATUSA framework, as well as the performance, effectiveness and productiveness of ATUSA framework. Authors conclude that, although ATUSA can automatically find programming faults by track invariant elements of the Document Object Model (DOM), but manual effort is needed to complete the approach. However, authors admit that finding and tracking the behaviour of invariant elements approach create more challenges for web developers in practical environment, which mean web developers need to define invariants in the DOM.

Keqiang He, Alexis Fisher, Liang Wang, Aaron Gember, Aditya Akella, Thomas Ristenpart in “Next Stop, the Cloud: Understanding Modern Web Service Deployment in EC2 and Azure”, explain that cloud computing bring a momentous changes to the way of web deployment, especially in modern web services, as well as cloud services and cloud infrastructure improve these deployments. By using concurrent triangulation research design, authors collect data of web services are using EC2/Azure from over 34 million DNS records from Alexa datasets and a large data captured from university network. After that the data are visualized and analysed to prove more understanding of web services are using on the clouds. The data collected also analysed separately to presents the idea of cloud services are using commonly.

Authors show that cloud services of both AWS (Amazon Web Services) and Azure are quite similar, there is only one thing different in the regions infrastructure. AWS provides different zones in one region, Azure stop at region level. The deployment patterns of both Cloud services are similar. Authors also explain use case of each services, meanwhile AWS zones are more robust from failure due to mode zones-specific, Azure provide backup method by multi regions mode. Both cloud services are complex ecosystem provide a wide range of choice for deployment patterns.

Deep dive in to the research, authors find most web services are using many cloud services at a time to transfer static data, and suggest a compression method should be applying for saving bandwidth and reduce latency. Another importance key finding is web services are appearing to use a single region. Authors discuses that web services are deployed on multiple regions can reduce latency, improve performance and cloud failures proof. However, this approach need to consider on challenges of management regions and share data across regions. Authors identify a future work on a solution of regions management and deployment, as well as address prior studies and researches from cloud for data centres to cloud backend workload compare with authors’ study on cloud-using web services.

Discussion

The research question is What is the issue of Modern Web applications?

Sub-objectives question is What is the solution for the issue of Modern Web Applications

First, Michal Zalewski addressed an overview and common security issue in modern web application