Towards an Abstract Style for True-Push-Communication Enabled Rich Web-based Applications

Conference Paper · December 2021

3 authors, including:

Nalaka Ruwan Dissanayake
Sri Lanka Institute of Information Technology
38 PUBLICATIONS **92** CITATIONS

SEE PROFILE

Shantha Jayalal
University of Kelaniya
36 PUBLICATIONS **31** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project   RiWAArch style: An abstract hybrid style for Rich Web-based Applications View project

Project   RiWA Design Methodology View project

Towards an Abstract Style for True-Push-Communication Enabled Rich Web-based Applications

Nalaka R. Dissanayake
Department of IT
Sri Lanka Institute of Information
Technology
Malabe, Sri Lanka
nalakadmnr@gmail.com

Dharshana Kasthurirathna
Department of SE
Sri Lanka Institute of Information
Technology
Malabe, Sri Lanka
dharshana.k@sliit.lk

Shantha Jayalal
Department of Industrial Management
University of Kelaniya
Kelaniya, Sri Lanka
shantha@kln.ac.lk

Abstract—The Rich Web-based Applications benefit from push-communication to improve the user experience via the features like notifications and real-time updates. Push-communication can be implemented as either push-simulation or true-push-communication. There is no abstract architectural style for Rich Web-based Applications to realize how the true-push-communication is integrated. If there is an abstract style for Rich Web-based Applications, which can realize the integration of true-push-communication, it will help reduce the complexity by improving the realization of the run-time configuration of the elements. This ongoing research aims to introduce an abstract hybrid architectural style for Rich Web-based Applications, which can realize the true-push-communication. The proposed approach is to extend the style named RiWAArch style to realize how the true-push-communication is integrated.

Keywords—Architectural Style, Push-Communication, Rich Web-based Applications

I. Introduction

This section first explains the fundamental background aspects in the focused domain: Rich Web-based Applications (RiWAs) [1]. Then the problem and the motivation of the ongoing research are discussed.

A. Background

1) Rich Web-based Applications

Rich Web-based Applications (RiWAs) [1] – like google apps or Facebook – are advanced web-based systems that provide rich graphical user interfaces with higher user experience than traditional web applications. The RiWAs allow their desktop applications like rich graphical user interfaces to communicate faster with the server using a unique communication model called Delta-Communication (DC) [2]. There are various technologies and techniques like AJAX [3] to implement DC. The rich graphical user interfaces demand implementing many related features on a single web page using DC, which upturns the complexity of the RiWAs.

2) Push-Communication

Push-Communication (PC) is used to further improve the user experience of the RiWAs through features like updates and notifications in real-time. The primary concept of the web is HTTP, which is built on the request-response model; hence, it is not supporting PC by core. Therefore, additional elements are required to enable PC in the web environment, developed using dedicated technologies/techniques such as polling, comet [4], or WebSocket [5]. Consequently, PC-enabled features further increase the complexity of the RiWAs.

There are two approaches to implement PC in RiWAs. DC techniques like comet [4] exploit the request-response model to simulate push-communication. Technologies like WebSocket [5] are capable of implementing *true-push-communication* (TPC) from the server to the client(s) with improved performance and scalability in the direction of enriching the user experience [6] [7] [8].

3) Software Architecture and Styles

Software architecture provides the basis for any software system. The support gained from the architecture is substantial throughout a software development project [9]. The architectural style provides a framework to design software architectures [10]. A style can be seen as an abstract description of good practices of the common forms of architecture [11]. Styles provide a way to capture the knowledge from successful software systems in the past, and we can think the styles will also be effective in systems alike [10].

B. Problem and Motivation

The research problem of this ongoing study is the unavailability of an abstract architectural style for RiWAs, which can realize the integration of the TPC. This condition is further elaborated below.

Even though the development aspects of the RiWAs have been improved, the RiWAs still lack abstract concepts like architectural styles, which can provide many benefits such as the abstraction of common characteristics and increased realization [12]. Available architectural solutions for RiWAs like SPIAR [13] and jAGA [14] are either based on a set of specific technologies/techniques or realize only push-simulation. Hence, they poorly address performance and scalability, and as a result, they are unable to improve the user experience.

Since styles provide an overall abstract picture of a system, a style can assist in understanding the system, which can help lower complexity [15] [16], which is also true for the PC-enabled RiWAs. If there is an abstract style for RiWAs to realize the integration of TPC, it will show the run-time configuration of the elements required to implement all the aspects of the RiWAs, including TPC-enabled features.

II. Research Process

This section states the aim of the research and discusses the selected approach.

A. Aim of the Research

Our ongoing research aims to derive and introduce an abstract hybrid style to realize the integration of TPC into RiWAs.

The proposing style should be able to provide the following features. The style should be specific for the RiWA – in a broader environment, including mobile and IoT-based apps – which use PC-enabled functionalities, developed using true-push-DC. The style should realize the integration of true-push-DC with pull-DC and non-DC. The style needs to be a hybrid of the available styles; hence, it can realize the available styles for PC like broadcasting and publisher-subscriber style. Since the proposed style will be a hybrid of well-known available styles, it is expected to have a lesser learning curve, thus making it easy to adopt. The proposed style must be independent of development technologies and techniques, therefore, abstract, and gain the advantages of the abstract concepts [12].

B. Proposed Approach

This research has identified a potential style named Rich Web-based Applications Architectural style (RiWAArch style) [17], which can realize the pull-DC-based RiWAs. The RiWAArch style's primary limitation in the context of this research is that it does not realize TPC. This research will study the common characteristics of push-enabled RiWAs to extend the RiWAArch style to realize integrating TPC.

The resulting abstract style will provide a solution to the focused problem of this research. The ultimate style will assist in developing elements to perform true-push-DC using advanced technologies such as WebSocket to improve the scalability and performance of a system in the direction of increasing the user experience.

REFERENCES

[1] N. R. Dissanayake and K. Dias, "Rich Web-based Applications: An Umbrella Term with a Definition and Taxonomies for Development Techniques and Technologies," *International Journal of Future Computer and Communication,* vol. 7, no. 1, pp. 14-20, 2018.

[2] N. R. Dissanayake and G. Dias, "Delta Communication: The Power of the Rich Internet Applications," *International Journal of Future Computer and Communication,* vol. 6, no. 2, pp. 31-36, 2017.

[3] J. J. Garrett, "Ajax: A New Approach to Web Applications," adaptive path, 18 February 2005. [Online]. Available: http://www.adaptivepath.com/ideas/ajax-new-approach-web-applications.

[4] M. Carbou, "Reverse Ajax, Part 1: Introduction to Comet," IBM, 2011.

[5] I. Fette, i. Google, A. Melnikov and Isode Ltd., "The WebSocket Protocol," Internet Engineering Task Force, 2011.

[6] D. Esposito, "Cutting Edge - Understanding the Power of WebSockets," Microsoft, 2012.

[7] Q. Liu and X. Sun, "Research of Web Real-Time Communication Based on Web Socket," *International Journal of Communications, Network and System Sciences,* vol. 5, no. 12, pp. 797-801, 2012.

[8] K. E. Ogundeyi and C. Yinka-Banjo, "WEBSOCKET IN REAL TIME APPLICATION," *Nigerian Journal of Technology (NIJOTECH),* vol. 38, no. 4, p. 1010 – 1020, 2019.

[9] A. Solutions, *The Importance of Software Architecture,* Architech Solutions, 2014.

[10] D. M. Selfa, M. Carrillo and M. d. R. Boone, "A Database and Web Application Based on MVC Architecture," in *Electronics, Communications and Computers, 2006. CONIELECOMP 2006. 16th International Conference*, 2006.

[11] I. Sommerville, Software Engineering, India: Dorling Kindersley, 2011.

[12] N. R. Dissanayake and G. K. A. Dias, "Abstract concepts: A contemporary requirement for Rich Internet Applications engineering," in *9th International Research Conference of KDU (KDU-IRC 9)*, Colombo, Sri Lanka, 2016.

[13] A. Mesbah and A. v. Deursen, "A component- and push-based architectural style for AJAX applications," *The Journal of Systems and Software,* vol. 81, p. 2194–2209, 2008.

[14] J. Li and C. Peng, "jQuery-based Ajax General Interactive Architecture," in *Software Engineering and Service Science (ICSESS), 2012 IEEE 3rd International Conference*, Beijing, 2012.

[15] D. Hough, "Rapid Delivery: An eveolutionary approach for application development," *IBM SYSTEM JOURNAL,* vol. 32, no. 3, pp. 397-419, 1993.

[16] H. Zuse, Software Complexity Measures and Models, New York: de Gruyter & Co., 1992.

[17] N. R. Dissanayake and K. Dias, "RiWAArch Style: An Architectural style for Rich Web-based Applications," in *Arai K., Kapoor S., Bhatia R. (eds) Proceedings of the Future Technologies Conference (FTC) 2020, Volume 3. FTC 2020. Advances in Intelligent Systems and Computing, vol 1290. Springer*, Canada, 2020.