

Conf Researchr

A Domain-Specific Content Management System for Managing Large Conference Websites

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DOI

[10.4230/OASlcs.EVCS.2023.12](https://doi.org/10.4230/OASlcs.EVCS.2023.12)

Publication date

2023

Document Version

Final published version

Published in

Eelco Visser Commemorative Symposium, EVCS 2023

Citation (APA)

Groenewegen, D. M., van Chastelet, E., de Krieger, M. M., Pelsmaeker, D. A. A., & Anslow, C. (2023). Conf Researchr: A Domain-Specific Content Management System for Managing Large Conference Websites. In R. Lammel, P. D. Mosses, & F. Steimann (Eds.), *Eelco Visser Commemorative Symposium, EVCS 2023* Article 12 (OpenAccess Series in Informatics; Vol. 109). Schloss Dagstuhl- Leibniz-Zentrum fur Informatik GmbH, Dagstuhl Publishing. <https://doi.org/10.4230/OASlcs.EVCS.2023.12>

Important note

To cite this publication, please use the final published version (if applicable). Please check the document version above.



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Conf Researchr: A Domain-Specific Content Management System for Managing Large Conference Websites

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Abstract

Conferences are great opportunities for sharing research, debating solutions, and networking. For the organizing committee there is a considerable deal of complexity and effort required to provide attendees and organizers with ways to find and manage programs, sessions, papers, tracks, talks, and authors. Eelco Visser found an opportunity to provide an integrated solution to these problems by designing the Conf Researchr conference management system in 2014 using our own domain-specific web programming language WebDSL. In this paper, we highlight the impact Eelco had on conference management, and how Conf Researchr evolved to become the platform of choice for hosting over 900 conference and workshop editions in SIGPLAN and SIGSOFT, among other areas of computer science research.

2012 ACM Subject Classification Information systems → Social networks

Keywords and phrases Conf Researchr, conferences, WebDSL, Eelco Visser

Digital Object Identifier 10.4230/OASIS.EVCS.2023.12

Acknowledgements We want to thank Eelco Visser for his guidance and vision.

1 Introduction

Federated conferences such as SPLASH and ICSE are complex organizations, consisting of many parts organized by volunteers. A main conference often has multiple tracks and co-located conferences and workshops. For example, the SPLASH conference consists of various tracks including OOPSLA, Onward!, invited speakers, tutorials, and panel discussions. Additionally, there are co-located conferences such as SLE, GPCE, and DLS, and workshops such as REBLS and LIVE, often scheduled in the days leading up to the main conference. Each of these parts has its own steering, organizing, and program committees that select and schedule the keynotes and presentations based on accepted papers or abstracts. These presentations should be put together into a program that the attendees of the conference can use to decide what to attend. While there has been considerable attention for organizing and automating the paper submission and review process (supported by tools such as EasyChair¹,

¹ <https://easychair.org/>



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Eelco Visser Commemorative Symposium (EVCS 2023).

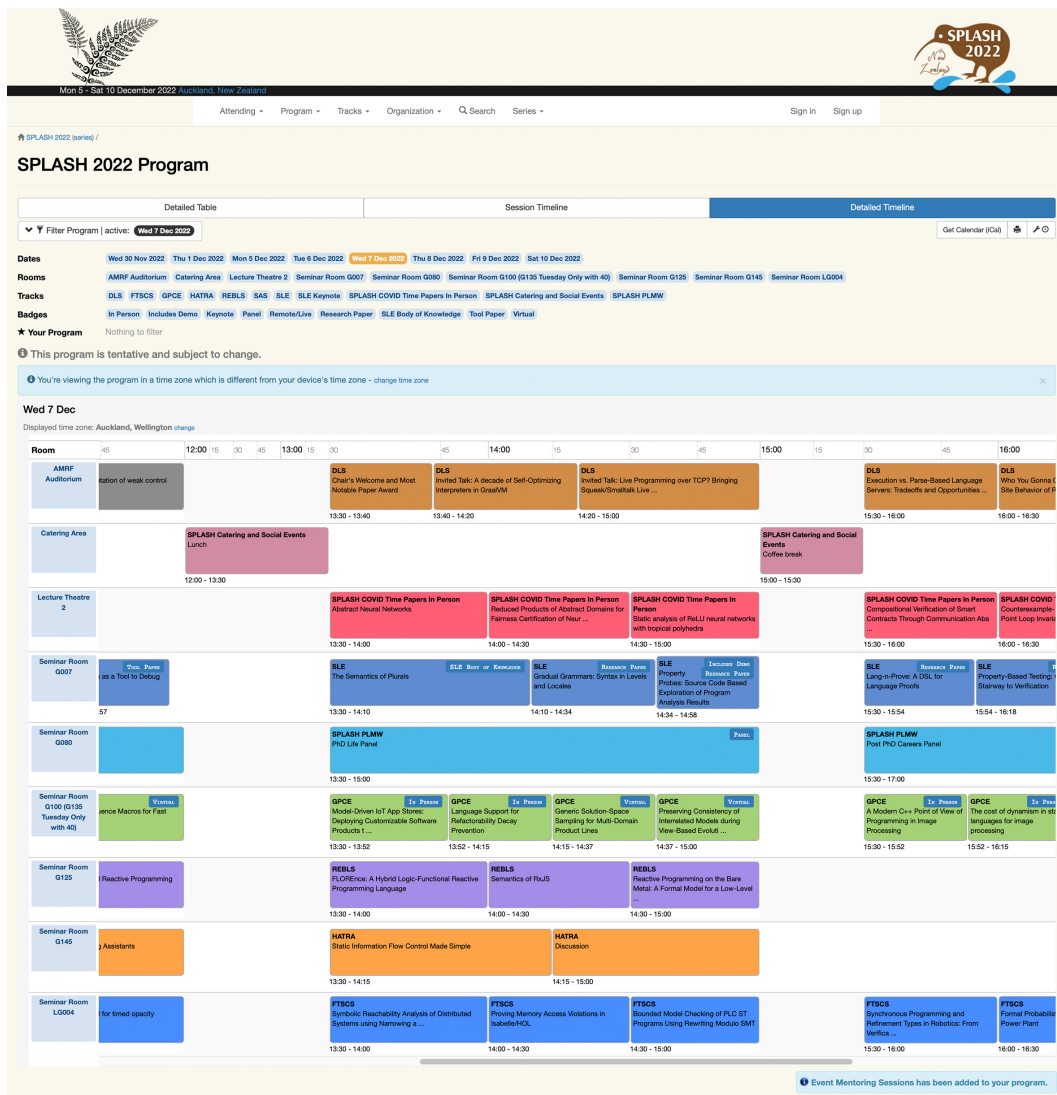
Editors: Ralf Lämmel, Peter D. Mosses, and Friedrich Steimann; Article No. 12; pp. 12:1–12:6



Open Access Series in Informatics

OASIS Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

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■ **Figure 1** A screenshot of the detailed timeline overview of the SPLASH'22 conference, the eighth edition of SPLASH that uses the Conf platform, with over 450 in-person and virtual attendees.

HotCRP², and Conference Publishing Consultancy³), developing the website for such a conference also requires considerable effort and input from many people over an extended period of time. This process is often reinvented for each yearly edition of a conference, by a fresh team of volunteers, using software that provides little to no support for the domain. As a result, information for many tracks is often not integrated in the main website, and each workshop maintains their own website from which the attendees have to harvest calls for papers and programs.

Eelco Visser came up with the idea for the Conf Researchr [2] conference management system to provide an integrated solution for such problems. He promoted the use of Conf Researchr actively in his network of conference organizers, always ready to provide a demo

² <https://hotcrp.com/>

³ <https://www.conference-publishing.com/>

on his laptop. His enthusiasm drove the continuous development and adoption of the system. Conf Researchr has been developed by the Academic Workflow Engineering team that Eelco formed at Delft University of Technology. It uses the WebDSL programming language, leveraging Eelco's earlier research into domain-specific languages for web programming. In this paper, we report on experiences of operating and evolving Conf Researchr.

2 Feature Evolution

Conf Researchr is implemented as a *multi-tenant* web application, hosting the web sites for multiple conference series and editions in a single application. Multi-tenancy is realized by using the domain name or URL path to denote the viewing context for each page, which is typically the conference or workshop itself, but may also be the hosting conference in case of a co-located event. The viewing context is used at various places in the implementation that are responsible for rendering the pages, and is designed to create a unique look-and-feel for each tenant while enjoying the recognizable structure of Conf Researchr. It determines how navigation menus are constructed, whether or not a custom style sheet should be included and which, possibly role-dependent, links a visitor has access to. As these tenants often operate under distinct domain names specific to each conference, requesting and renewing SSL certificates for each edition's domain name has been automated on the server using Let's Encrypt⁴.

A central feature of Conf Researchr is managing and viewing a conference program. Conference attendees can discover the conference program through extensive filtering options, and add events to their individual program to compose a personal schedule to use during the conference. Figure 1 shows an example of the timeline program view for SPLASH 2022.

Conf Researchr is a major timesaver for conference organizers, who, instead of painfully putting together a program in a spreadsheet and converting it to HTML, are provided with a system specifically geared toward this purpose. The first step in configuring a program is to create session slots that indicate the time slots available for presentations and other sessions. Then, conference tracks are assigned to session slots to indicate the days and times in which the track is running. Events that fit into the track sessions are selected from the imported list of accepted papers and other submissions. These events are evenly spread across the session time by default, and the times can be adjusted if necessary. Author profiles are automatically matched and linked based on their email address, and otherwise are easy to look up and configure by the organizers.

Since the initial implementation that was first used by SPLASH 2014, Conf Researchr evolved through requested quality of life improvements and additional features from conference organisers to streamline the processes. Examples of these additions include: importing events and authors from additional paper submission systems, copying content from previous editions, conflict detection while scheduling sessions, providing a data API for mobile applications, shared schedules between tracks, and a workshop proposal system.

Conference contributors have a customizable profile page that features their current affiliation, a small biography, and the contributions and roles within a conference. At the time of the conference, a snapshot is created of this conference-specific profile page, to give an insight into the activities and interests of the contributor at that point in time. The general profile of a user gives an overview of all their past contributions and roles, and becomes more accurate as an academic portfolio when more conferences in a field use the system.

⁴ <https://letsencrypt.org/>

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Next to profile pages, Conf Researchr automatically creates a *people index* of everyone that is involved on the conference level, or within a track. With filtering and advanced search in place, the people index gives an opportunity to interactively discover the contributors, committee members and session chairs.

For providing a historical perspective and easy retrieval of passed events, it is essential to keep a conference website online after it is finished. Thanks to the multi-tenant setup of our system, we can conveniently keep hosting previous editions of conferences. Some conference organizers even retroactively set up editions in Conf Researchr for past conferences that no longer had a working website. Conf Researchr also provides a download of a static backup of the conference website, mainly for continuity purposes but also to serve as emergency backup in case the Conf Researchr services would ever be down during a conference.

The COVID-19 pandemic greatly impacted the organization of conferences. We adapted Conf Researchr to tackle the challenges of arranging remote and hybrid conferences. Features created for online conferences include mirrored sessions for different time zones, remote meeting links for participants, and embedding pre-recorded presentations in conference events.

3 Implementation Evolution

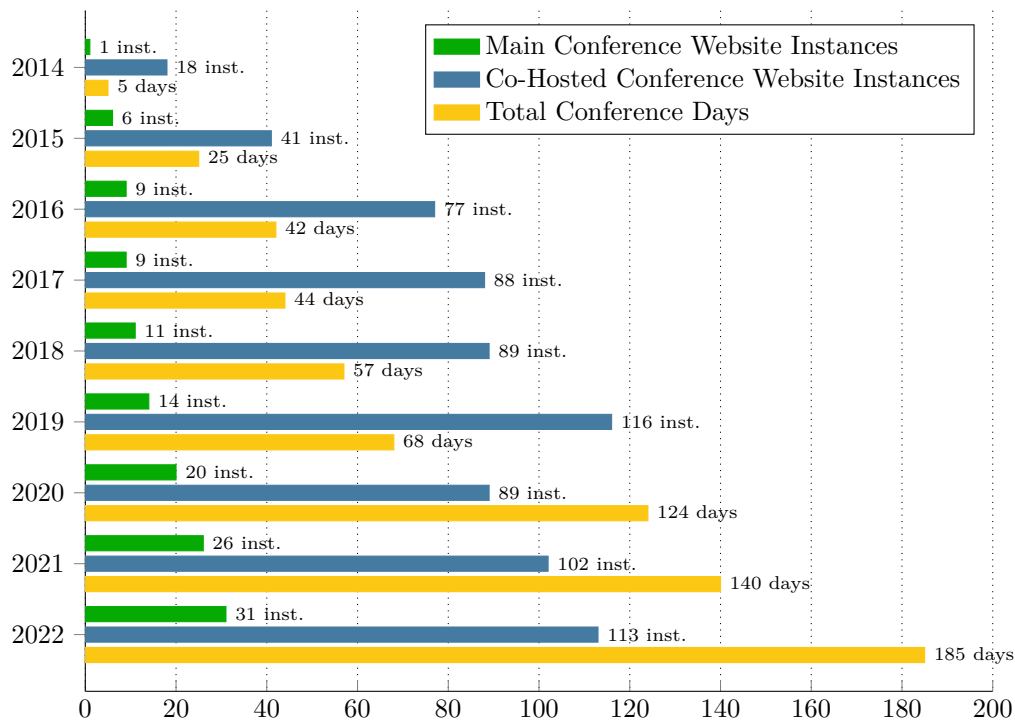
Conf Researchr is developed using WebDSL [3, 1], a domain-specific programming language for the development of full-stack web applications that integrates sub-languages for data persistence, user interfaces, access control, data validation, and full text search. WebDSL enables rapid prototyping of web applications and allows for customization to further improve the performance and user experience.

While the WebDSL language has been gradually extended and improved over time, some features were added to WebDSL primarily to support Conf Researchr. This includes the ability to customize URL routing instead of depending on an automatic URL scheme, to support multi-tenancy on different domain names. While the standard pattern for WebDSL page URLs consisted of a page name followed by slash-separated URL representations of page arguments, for Conf Researchr the domain name is also used to determine one of these arguments, namely the conference viewing context.

Another added feature was an automatic page cache in WebDSL, to optimize applications with relatively stable content including Conf Researchr. Furthermore, features were added to WebDSL to shorten several code fragments, such as static code templates to create a library of input components with consistent HTML element wrappers and styling.

The first deployed version of Conf Researchr in October 2014 was around 8,500 lines of WebDSL code. The current implementation consists of roughly 30,000 lines of WebDSL code. Of this codebase, approximately 60% is user interface code in the form of WebDSL pages and templates (displaying HTML with entity data and handling user interface actions), 30% is used for persisted entities and their functions (data objects with methods), and the remaining 10% are other definitions such as access control rules, static code templates, web services for the data API, and search configurations.

Database migrations have been automatic, as these have only consisted of adding elements to the data model. After adding new entities and entity properties to existing WebDSL applications, new tables and columns are created automatically when a new application version is deployed. For large tables, adding a column can take a while, in these cases we sometimes performed the schema change manually before deploying the new version to avoid downtime.



■ **Figure 2** A breakdown showing the number of Conf Researchr website instances for main conferences and co-hosted conferences, and the total number of conference days for each year since the application's inception.

4 Usage

Conf Researchr was first used for SPLASH 2014. Eelco managed to secure contracts that expanded the usage of the application to include all other SIGPLAN conferences, and later SIGSOFT. In addition, many new conference organizers found the Conf Researchr platform through attending other conferences or based on positive experiences from other organizers. At the time of writing, the system has over 24,000 user accounts, and hosts over 900 conference and workshop editions. Figure 2 shows the progression of Conf Researchr usage since its inception.

5 Conclusion

Eelco Visser saw opportunities to improve the status quo with respect to conference websites, that were often created manually for each conference edition. The result of this is the Conf Researchr application, which was first deployed as part of SPLASH 2014. Since then it has been used by hundreds of conference editions and visited by tens of thousands of attendees. The design of the application was directed by Eelco based on his experience as both a recurring conference attendee and committee member. Conf Researchr is still actively being developed at the Delft University of Technology by Eelco's Academic Workflow Engineering team.

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