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Annual progress report FIRE21 (2022)

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2022

Document Version:

Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):

Mcnamee, M., Gjørund , G., Markert, F., Uhr, C., Frykmer, T., & Vylund, L. (2022). *Annual progress report FIRE21 (2022)*. (TVBB; No. 3245). Lund University.

Total number of authors:

6

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Annual progress report FIRE21 (2022)

Margaret McNamee (editor)

FIRE SAFETY ENGINEERING | LUND UNIVERSITY



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Lund 2022

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Report 3245

ISRN: LUTVDG/TVBB--3245--SE

Antal sidor/Number of pages: 15 (inklusive bilagor)

Illustrationer/Illustrations: 3

Sökord/Keywords

Fire and Rescue Services, FRS, Problem-solving networks, incident management, capabilities, case studies

Abstract

This report provides a status update for the project FIRE21 – Nordic Fire and Rescue Services in the Twenty First Century after work completed the first year.

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Avdelningen för Brandteknik, Lunds tekniska högskola, Lunds universitet, Lund 2020

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Preface

This report is an annual report of the FIRE21 project – Nordic Fire and Rescue Services in the Twenty First Century. The project is a collaboration between Norway, Sweden and Denmark, funded by NORDFORSK.

The project is comprised of five work packages (WP): WP1 – Project management; WP2 Benchmarking network-based decision making in the FRS; WP3 Description of risk landscape – today and in the future; WP4 Problem solving networks of tomorrow; WP5 Dissemination.

The summary of results for each WP has been written by the WP leader as given below:

- Chapter 1 and 2: WP1-leader Professor Margaret McNamee (LU, Project leader)
- Chapter 3: WP2-leader Dr Gudveig Gjørund (NTNU Social Research)
- Chapter 4: WP3-leader Dr Frank Markert (DTU) and WP1-leader
- Chapter 5: WP4-leader Dr Christian Uhr (LU) and Deputy Project Leader Dr Tove Frykmer
- Chapter 6: WP5-leader Lotta Vylund (RISE)
- Chapter 7: WP1-leader Professor Margaret McNamee and Deputy PL Dr Tove Frykmer

List of Tables

[no tables]

List of Figures

Figure 1: Management structure for FIRE21..... 6

Figure 2: Example of NVivo mapping for Norway. 9

Figure 3: General process for assessments and reporting on national risks as developed in Sweden, redrawn from MSB (2011)..... 10

Contents

- Preface..... 2
- List of Tables..... 4
- List of Figures..... 4
- 1 Introduction..... 6
- 2 Work package 1 Project management 6
 - 2.1 Management 6
 - 2.2 Meetings..... 7
 - 2.3 Funding 7
- 3 Work package 2 Benchmarking Network Based Decision Making in the FRS..... 8
 - 3.1 Document study/collection 8
 - 3.2 Seminar with Norwegian, Swedish and Danish authorities 8
 - 3.3 NVivo-mapping..... 9
 - 3.4 Case study – Initial steps 10
- 4 Work package 3 Description of Risk Landscape Today and in the Future 10
- 5 Work package 4 Problem Solving Networks of Tomorrow 11
- 6 Work packages 5 Dissemination..... 11
- 7 Other activities 12
 - 7.1 Terminology activity 12
 - 7.2 Problem-solving networks..... 13
 - 7.3 Masters theses and other activities 13
- 8 References..... 14

1 Introduction

This is the first annual progress report in the project “FIRE21 – Nordic Fire and Rescue Services in the 21st Century” financed by NORDFORSK.

FIRE21 is a research project that investigates problem solving in the Fire and Rescue Services in Sweden, Norway and Denmark. The project examines the importance of formal and informal networks before, during and after a rescue operation. A central part of the research in FIRE21 is to map out what capabilities need to be developed and what resources are essential to achieve a well-functioning rescue service. By identifying these parameters, the research will contribute to an effective Fire and Rescue Service in the future.

FIRE21 runs nominally for four years (cover five calendar years) and is a collaboration between Lund University, DTU Technical University of Denmark, NTNU Norwegian University of Science and Technology, NTNU Social Research, RISE Fire research AS and RISE.

2 Work package 1 Project management

The project began 1st November 2020. Work package 1 has been on-going for the whole of the project thus far and is expected to continue until the end of the project.

2.1 Management

In the project application, the project management was proposed to consist of an operational level, a strategic level and an administrative level, see Figure 1.

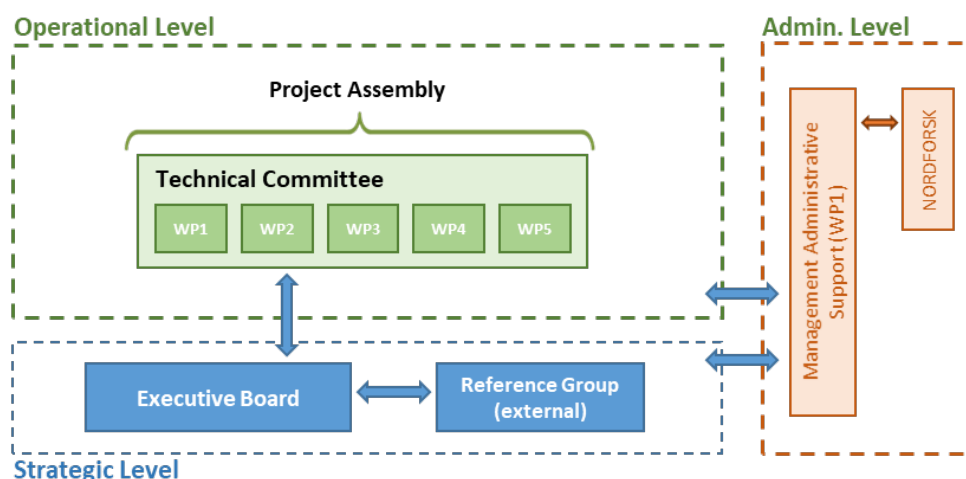


Figure 1: Management structure for FIRE21.

At the outset of the project the various committees were constituted as follows:

- **Project Assembly (PA):** comprised of all partners in the project, including all active members rather than one representative per organisation.
- **Technical Committee (TC):** comprised of the WP-leaders with the Project Leader as Chair (see list in introduction). In addition, the Project Communicator (Susanne von Hebel) and the Deputy Project Leader (Tove Frykmer) have been co-opted to participate in the TC meetings.
- **Executive Board (EB):** comprised of the Project Leader and Deputy Project Leader.
- **Management Administrative Support (MAS):** Loella Ainetoft was assigned MAS.
- **Reference Group (external):** has not been constituted at this time due to the difficulty of convening the group in person due to the COVID-pandemic.

As part of the project contract development with NORDFORSK a Consortium Agreement was signed between all partners to ensure clear definition of project expectations.

A project Teams space was established with the following folders for sharing project documents with all participants:

- Approved Application
- Terminology
- WP1 Project Management
- WP2 Benchmarking Network Based Decision Making in the FRS
- WP3 Description of Risk Landscape Today and in the Future
- WP4 Problem Solving Networks of Tomorrow
- WP5 Dissemination

2.2 Meetings

The project has been divided into a number of different meeting formats to assist development of the research:

- Monthly TC meetings (minuted)
- Quarterly PA meetings (minuted)
- At need EB meetings in preparation for the TC and PA meetings
- Quarterly meetings between the Project Leader and MAS
- WP-meetings defined on an ad hoc basis by the WP-leader based on WP needs (minuted)

The project established a Teams space for shared documents. All meeting minutes are stored there for easy access by all project participants.

2.3 Funding

Funding sent to Lund University from Nordforsk has been distributed based on the distribution in the application.

3 Work package 2 Benchmarking Network Based Decision Making in the FRS

Work package 2 was kicked off in Spring, 2021. As mentioned in chapter 2.2 there has been several WP meetings, and some of the quarterly PA meetings have also contained themes connected to the activities in WP2. All countries and institutions have contributed with concrete work and/or participation on the activities described below.

3.1 Document study/collection

In order to establish an understanding of the FRSs problem solving networks we need to learn how they are formally organized. A mapping of the legal framework and regulatory documents for the FRSs in each country was considered as an important preparation work for the case studies (which can be considered as the main activity in this WP). In WP meetings with the project group, we came together to decide what type of documents that was needed. The documents were collected and systematized/sorted in categories and will be important input for the NVivo mapping (see chap. 3.3) and useful framework when analysing data from the case studies (see chap 3.4). This work has been completed in two out of three countries.

3.2 Seminar with Norwegian, Swedish and Danish authorities

When collecting the documents, we saw a need to get the national authorities to comment and explain the background for the documents, how they are used and translated, and also to help us make some direct comparisons between the three countries.

In August 2021 we arranged a webinar where we invited representatives from each country's directorate; Swedish Civil Contingencies Agency (MSB), Danish Emergency Management Agency (DEMA/Beredskabsstyrelsen) and The Norwegian Directorate for Civil Protection (DSB). Participants were from the research group in FIRE21. The program contained presentations from the three directorate representatives, a section where the representatives reflected upon each other's presentations and discussed similarities and differences between the countries, before the research group got answers on both planned and spontaneous questions related to their research interests in the project.

The themes that were presented and discussed were:

- The most important **tasks and roles** DSB/MSB/DEMA has when it comes to FRSs in their country (e.g. supervision, coordination, exercises, guidance, education etc.)
- The **formal organization** of Fire and Rescue in their country – from bottom to top (laws/regulation/legislation)
- The **actors** that are important for DSB/MSB/BS (formal and informal, as premise providers, collaborators, recipient)
- How their directorate **collaborate** with the two other countries directorates (DSB/MSB/DEMA)
- **Future challenges** and future development (technology, dimensioning, emerging risks)

Several interesting topics which will be addressed in the project were discussed, and the contact that has been established between the directorates and the research group will be of great value for the continuation of the FIRE21 project.

3.3 NVivo-mapping

We have been mapping the formal relationships between organizations as these are supposed to unfold in incidents. We used NVivo, a qualitative data analysis software that allows to create network maps based on the qualitative coding of documents. As a basis for the mapping, we used the official documents collected (described in 3.1) that prescribe which relations are supposed to exist and be activated in case of emergencies and other incidents. For the Norwegian map, documents about the fire and rescue services and future risks from DSB (Norwegian Directorate for Civil Protection), HRS (Joint Rescue Coordination Centre) and NOU (Official Norwegian Reports) were the first documents we used. More documents were included to fill “holes” in the so created map – for example, documents by The Norwegian Directorate of Health about emergency medical services, and documents regarding the “County Governor”, who is mentioned many times in many documents but often with a lack of description of network connections.

The so created map depicts the formal relations that the organizations are supposed to have with each other in emergency response operations according to formal documents from public authorities. This map of formal relations gives us, firstly, a picture of the existing network that already provides interesting connections and complexities. Secondly, the coding of relationships allows us to trace network relations back to the documents and use these in other forms of qualitative data analysis. Thirdly, we can export the results from NVivo to quantitative data analysis software for statistical analyses, see Figure 2. Fourthly, the map of formal relations can be used to compare these formal prescriptions with how relations unfold empirically in actual operations. This allows us to compare formal structure with practice.

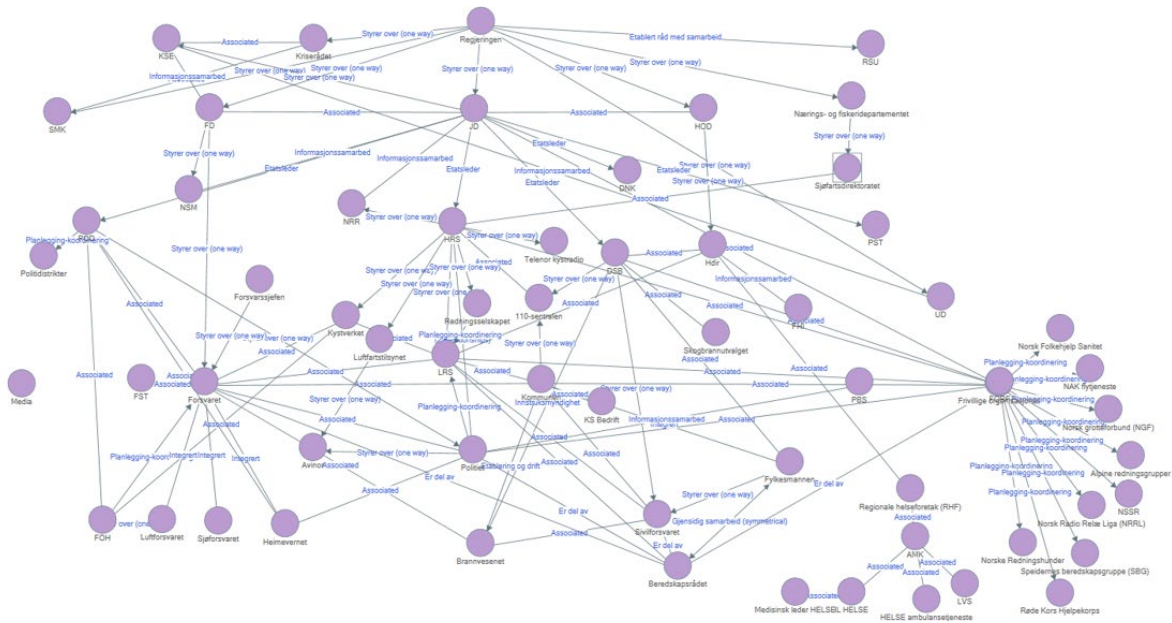


Figure 2: Example of NVivo mapping for Norway.

The picture presents one of the maps made from the Norwegian documents. Due to the reduction of the size it is difficult to read it, but it gives an illustration of how this kind of NVivo mapping can appear. This NVivo mapping is soon to be completed in Norway, in progress in Sweden, and planned to be conducted in Denmark.

3.4 Case study – Initial steps

In October 2021 the work with choosing cases started, and some criteria were developed; 1) 3 case studies in each country, 2) each country will cover at least 2 different incidents (within the 3 case studies), and 3) pick cases that represents different types of FRSs. A PA-meeting with all project members were arranged with the purpose to come up with all types of cases that could be relevant for the project. These cases were afterwards sorted in 1) types of FRS, and 2) type of incident (linked to climate change, new energy carriers and materials, malicious acts/terrorism, known disaster scenarios). The project members also discussed what themes the case interviews had to cover in order to give needed input to all the work packages in FIRE21. This preparation work has made it possible to start the data collecting work in early 2022.

4 Work package 3 Description of Risk Landscape Today and in the Future

Work package 3 was also kicked off in Spring, 2021. As mentioned in chapter 2.2, there have been several WP meetings, and one of the quarterly PA meetings focussed on benchmarking the risk landscape today in the Nordic countries. The PA meeting provided input from the whole project concerning risks which are relevant in the present day for the Fire and Rescue Services (FRS). Further, a benchmark of common incidents was presented by RISE Fire Research for Norway, LTH for Sweden and DTU for Denmark. The material is presently being summarised in a report from this WP, expected to be completed before the summer 2022.

For the Nordic countries procedures are established to work out and update the national risk pictures at certain time intervals. The national approaches being similar to the EU guidelines in this field. These guidelines are to be seen as an overall input to facilitate the continuous process to achieve national risk assessments as a basis to establish the national risk pictures. The process of risk assessment follows the following steps (see Figure 3):

1. The process starts with a description of the basic values to protect.
2. Followed by a process of risk identification
3. Selection of risks for analysis
4. Scenario development
5. After that, an analysis and risk evaluation are conducted, using scenarios.
6. Finally, a synthesis of the individual scenarios is made. The work is then compiled into a national risk assessment.



Figure 3: General process for assessments and reporting on national risks as developed in Sweden, redrawn from MSB (2011).

The existing system for the government agencies' risk and vulnerability analyses will be an important reference point for further work in WP3; but it will also consider other relevant processes and activities, e.g.:

- national reporting on existing EU directives (e.g. the Floods Directive, EPCIP and Seveso),
- the process of developing reference scenarios and national disaster management plans at the EU level,
- the work on risk and vulnerability analyses,
- the process of capability assessments, existing national and cross-sectoral risk analyses and compilations,

- the national strategy and response plan for the protection of vital societal functions,
- the work on developing basic safety levels and targets, and
- research within the field of civil protection and emergency preparedness.

As a joint initiative, WP2 and WP3 have conducted a discussion of relevant scenarios for case studies as part of the next step in WP2. Presently in Norway interviews are underway with a small FRS about their PSN, in Sweden interviews are underway in Goteborg concerning a recent bombing incident. The case studies in Denmark will begin in the second quarter 2022.

5 Work package 4 Problem Solving Networks of Tomorrow

The fourth work package in FIRE21 has two objectives; (1) to transfer and translate research results into recommendations accessible to professional first responders, and (2) to identify which individual problem-solving capabilities that are needed to operate in tomorrow's problem-solving networks. Working with the first objective must, by logical reasons, be put on hold until more definite results from the other WPs can be compiled.

Therefore, WP4 is currently focusing on the area of individual capabilities for problem-solving in a fire and rescue response context. The overall research process is designed around the following:

Through an in-depth literature study and interviews with experienced professionals in the fire and rescue services, desirable individual qualities will be identified. Thereafter, the qualities will be tested and validated using the conditions from the risk scenarios identified in WP3. The tests will be performed in a microworld experiment (a game with a limited set of controlled variables) designed to represent relevant conditions from a fire and rescue service perspective. Deriving from the microworld experiments will be a set of individual qualities for collective problem-solving under tomorrow's conditions, qualities that are predicted to improve the handling of future risk scenarios faced by the fire and rescue services. Using controlled experiments means that the evidence base for providing recommendations on which individual qualities to develop is stronger than e.g. expert opinion.

At the time of writing the first part of an in-depth literature study is taking place. The area of problem-solving networks is represented by several disciplines and scholars using somewhat diverging conceptual frameworks. In order to stimulate a broad literature search interviews with scholars from various disciplines are carried out. Examples of disciplines engaged in relevant research are psychology, cognitive science, pedagogy, innovations science, and management research. When several starting points for the literature review are identified, the detailed process of finding and merging relevant literature will be designed.

A key ambition is to move beyond explanatory research literature trying to find prescriptive results based on various levels of evidence. Based on earlier research conducted by members in the current research group a conceptual development is continuously carried out. It becomes clear that the academic process benefits from clear analytical tools when discussing problem-solving networks in the particular context.

6 Work packages 5 Dissemination

WP5, Dissemination, works with the communication for FIRE21. During 2021, a project communicator was introduced to the project and the work package. The first task was to establish a communication plan for the project.

In the communication plan, two specific purposes of the communication activities in FIRE21 were identified. These two purposes are: 1) to inform about the research, and by informing about the research, 2) to contribute to the research progress. Further, four approaches were pointed out. These are enlightenment, engagement, publication, and implementation. Naturally, the implementation will

take place towards the end of the project time. Finally, the target groups of the communication in FIRE21 were stated. The target groups are practitioners, directorates, municipalities, county administrative boards and governmental organizations as well as universities, the scientific community and Fire and Rescue education.

In addition to the communication plan, an activity plan has been established. This activity plan specifies activities per year and clarifies objective, target group and the person responsible for the individual activity. Furthermore, there is also a channel plan connected to the communication plan and activity plan. The purpose of the channel plan is to inspire to and support the communication activities on a practical level. In other words, the channel plan suggests what conferences, webinars, and workshops to attend. It also gives ideas to publications, reports, and articles to write. The channel plan helps to better reach out with information about the research in FIRE21. These three parallel plans are changeable documents, to be revised annually and to be checked quarterly on the WP-leader project meetings.

To present FIRE21, a project web page has been published: www.ri.se/en/what-we-do/projects/fire21-problem-solving-in-the-21st-century, as well as a more detailed and lengthier web site: www.ri.se/en/fire21 The web site presents the project, the five work packages, publications and other activities. There is also a contact form to encourage stakeholders to get in touch.

In August, a webinar was arranged. The directorates in Sweden, Norway and Denmark participated along with the project group. The aim of the webinar was to examine differences and similarities between the three countries. A summary of the webinar was written for a Fire industry magazine. Since the magazine is postponed, the article will soon be published on the web page.

FIRE21 has participated in another two seminars during the autumn: the Extreme index reference group and the Nordforsk seminar. We have also participants in national workshop connected to fire and rescue emergency management development.

During the autumn of 2021, a newsletter template was developed. This template will be used for coming newsletters from the project. Also, the first newsletter was produced and distributed. In addition to a send list, the newsletter was published on the project member's LinkedIn profiles.

Another activity in WP5 was to produce and publish a two pager which briefly presents the project. This two-pager can be used when describing the project to various stakeholders or interviewees. On that subject, interviews with both stakeholders and practitioners have started in 2021.

By the end of 2021, the activity plan was run through to ensure that WP keeps pace with the planned communication activities for FIRE21.

7 Other activities

7.1 Terminology activity

In a multi-disciplinary, multi-organizational project like FIRE21, there is a need for creating a common understanding of the terminology to be used throughout the activities of the project members. This minimizes the risk of misunderstandings when collaborating on a common subject and coming from different disciplines and academic/professional backgrounds. The terminology in question concern both more general aspects such as how the various definitions of adverse events, such as accidents, disasters, crises or catastrophes, relate to each other, and the more project-specific aspects of how problems and problem solving can be interpreted and defined in the context of the fire and rescue services.

Therefore, a terminology discussion was initiated already at the kick-off meeting in November 2020, and followed up at a second meeting in 2021. The purpose of the meetings was to understand how

each project partner viewed the central project terms, so as to establish a common ground. The outcome of the meetings was documented in minutes and Powerpoint presentations and supplemented with specific writings from project members. This work is not specific to any particular WP and has been run as a cross-cutting activity. It should be noted that discussions on terminology will be a continuous activity in the project and thus will continue throughout the remaining period.

7.2 Problem-solving networks

The concept of problem solving networks (PSN) is central to the FIRE21 project. Therefore, a document presenting a theoretical foundation on problems and problem solving was created to be used in the project (attached in Researchfish). A short summary of the document is found here.

Solving problems is as obvious as it is challenging during an emergency or disaster. Some of the problems are easy to understand and solve, others are more difficult or cannot even be understood or solved. Some problems occur immediately, while others appear along the way. As a theoretical concept, problem-solving is part of many fields and studied in many different ways. The purpose of the document is to describe literature and ideas concerning problems, problem-solving and problem-solving networks that can be relevant to FIRE21. It also serves to contribute to a common understanding of these concepts for FIRE21 project members, an understanding that can be used in common deliverables in the project.

In the literature, there is reasonable agreement that a problem means that: *“there is some form of undesirable current state, it is desired to be in another state and there is no direct, obvious way to move from the given to the goal state”*. This represents the view on problems in FIRE21. In short, the definition suggests that problems are subjective and shaped by individuals’ beliefs, preferences and goals. In a multi-organizational setting like in emergencies and disasters, this means that a problem may be perceived as so by an individual or an organization but not by others. Therefore, defining, or representing, the problem before attempting to solve it can be important in order to not solve the wrong problem right. Problem solving can be conceptualized through *phase models*, which show a logical sequence of steps to be taken in the problem-solving process and argue that the outcome will be more successful if the steps are followed. There are many varieties of problem-solving models in the literature, but the steps can generically be summarised as: representing the problem, generating a course of action, evaluating the course of action and carrying out the course of action. The document presents a phase model that can be used to analyse problem-solving in emergency and disaster response management.

In FIRE21, the fire and rescue services’ problem-solving networks will be investigated. In the theoretical document, such networks are described to consist of humans and/or artefacts and can be found at various organizational levels, between or within organizations. This means that when investigating problem-solving networks, it depends on which perspective is relevant for the question at hand. For example, the entire response management system can be seen as a problem-solving network, or one particular part of the fire and rescue service command can be seen as one. The problem-solving capability of a problem-solving network, or the entire responding system, can be said to rely on the composition of individuals, organizations and artefacts, and the relationships between, which can be used as an analytical lens when analyzing the effectiveness of problem-solving in emergency and disaster response management.

7.3 Masters theses and other activities

The university partners have the opportunity to engage students in the research as part of their education. Several thesis topics have been advertised but at the time of this first annual report no such project has been launched.

8 References

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