

The GO FAIR Foundation's FAIR Capacity Building Programme

FAIR and GO FAIR

GO FAIR is an international, bottom-up movement to implement data and services according to the FAIR Guiding Principles with the aim to adhere as close as possible to the original intentions as they were formulated in the 2014 Lorentz Center workshop and in the seminal article published in 2016¹. Meanwhile, many pioneering implementations of, and publications about FAIR have emerged. This signifies worldwide adoption of the FAIR Guiding Principles across all disciplines of science and innovation. However, this rapid uptake also makes the FAIR Guiding Principles vulnerable to misinterpretation² and inflation³.

The GO FAIR community responded with a more explicit and precise set of interpretations of the original FAIR Guiding Principles⁴. This documented interpretation of the FAIR Guiding Principles, as well as additional GO FAIR Foundation criteria promoting the use of open minimal standards can be found on the GO FAIR Foundation website⁵.

Working with a broad spectrum of stakeholders since 2018, the GO FAIR initiative has gained extensive experience in training and education around FAIR, but also in real-world FAIRification projects. This experience has been subsequently consolidated into the Three Point FAIRification Framework (3PFF) that helps communities to roadmap their FAIR ambitions⁶. The 3PFF is a communication tool (explaining practical aspects of FAIRification), a guide to FAIR deployment, and is the basis for a localized capacity building programme aiming to upscale FAIR know-how and skills.

¹ Wilkinson, M., Dumontier, M., et al. [The FAIR Guiding Principles for scientific data management and stewardship](#). *Sci Data* 3, 160018 (2016)

² Mons, Barend et al. ['Cloudy, Increasingly FAIR; Revisiting the FAIR Data Guiding Principles for the European Open Science Cloud'](#). 1 Jan. 2017 : 49 – 56

³ Recognizing Fake FAIR. Andreas Thalhammer, Principal Data Engineer at Roche Diagnostics. April 9 2022 <https://www.linkedin.com/pulse/recognizing-fake-fair-andreas-thalhammer/>

⁴ Annika Jacobsen et al. [FAIR Principles: Interpretations and Implementation Considerations](#). *Data Intelligence* 2020; 2 (1-2): 10–29. doi: https://doi.org/10.1162/dint_r_00024

⁵ Criteria for GO FAIR Foundation Qualification <https://www.gofair.foundation/criteria>

⁶ How to GO FAIR <https://www.go-fair.org/how-to-go-fair/>



The 3PFF

The 3PFF provides practical “how to” guidance to stakeholders seeking to go FAIR. It does not represent the “only” or the “best” route to FAIRification, but rather, provides via light-weight hackathon style workshops and tools, a supportive environment in which key implementation decisions can be confidently made. The 3PFF provides tooling and knowledge (i.e., the growing repository of qualified FAIR Enabling Resources) that ensure current and well-informed decisions. The principle goal of the 3PFF is to maximize reuse of existing resources, optimize interoperability, and accelerate convergence on standards and technologies supporting FAIR data and services.

As the name suggests, the 3PFF events (*Figure 1*) focus attention on three key decision points of FAIRification:

1. Machine Actionable Metadata



Typically, the FAIRification process begins when a community of practice considers its domain-relevant data requirements and other data policy considerations, and formulates these as machine-actionable metadata components. These considerations, and routes to their FAIR implementation, are supported in **Metadata for Machines (M4M) workshops**.

2. FAIR Implementation Profile



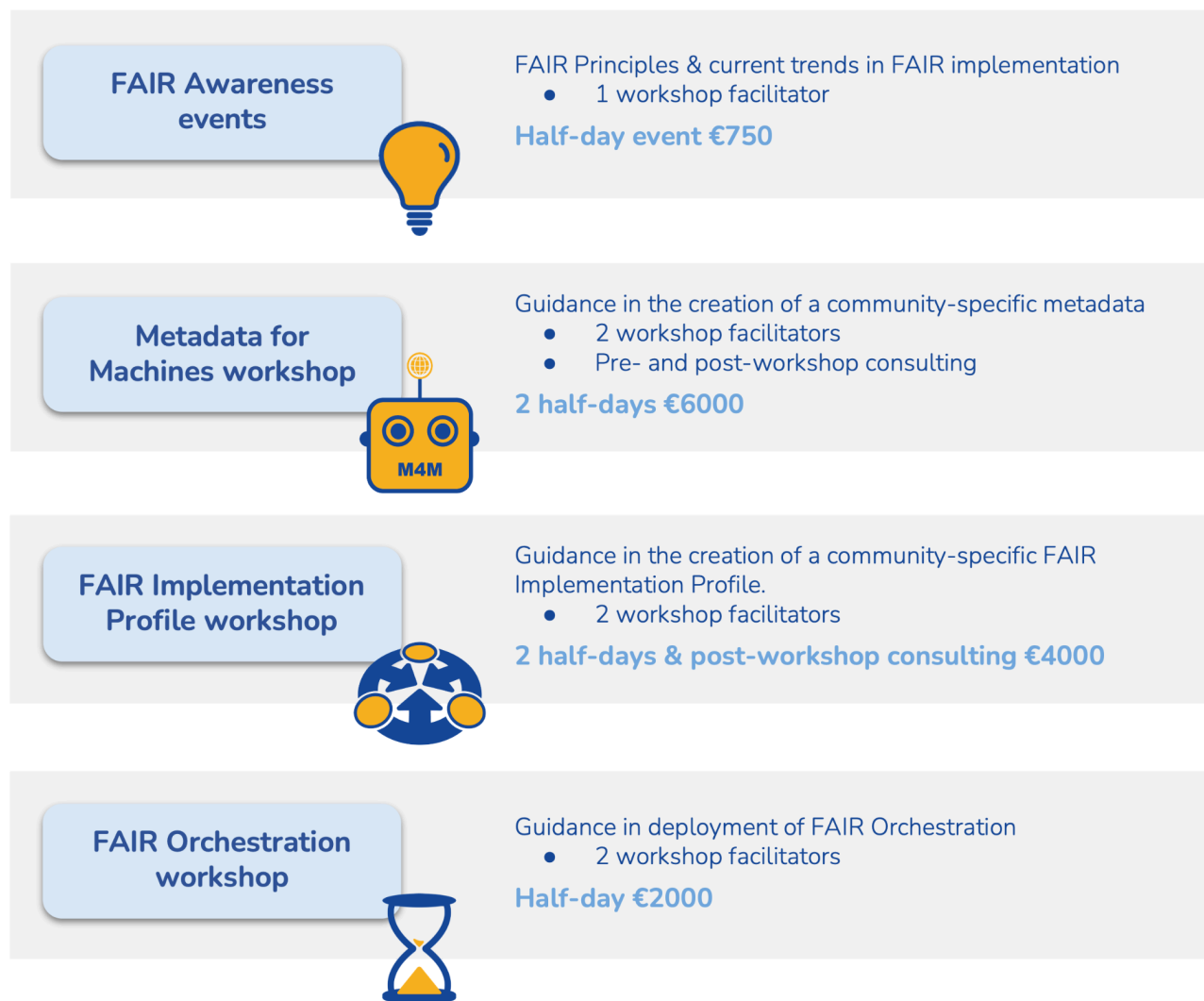
The re-usable FAIR vocabularies and metadata schemata produced in the M4M workshops compose part of the overall FAIR Implementation Profile (FIP). The FIP is a published record of domain-relevant community standards regarding FAIR. **FIP workshops** guide participants in the creation and maintenance of their community-specific FIPs.

3. FAIR Orchestration



The FIP in turn guides the choice and configuration of FAIR infrastructure, for example the use of FAIR repositories such as FAIR Data Points or the application of FAIR Digital Objects which contribute to a global Internet of FAIR Data and Services. **FAIR Orchestration (FO) workshop** formats have been developed to introduce approaches and thus support well-informed FO choices fit to community-specific purposes.

GO FAIR Foundation's 3PFF Workshops



Shown are typical workshop formats and pricing. However, all workshop formats are flexible and can be customized to fit specific purposes. All pricing is excluding VAT.

Figure 1. GO FAIR Foundation's FAIR Awareness events and its 3PFF Workshops provide participants with rigorous, time-efficient, and cost-effective introductions to the FAIR Principles, and practical hands-on FAIRification experience. Flexible workshop formats can be configured to fit local needs.

The 3PFF and its associated training events provide an efficient approach to embedding FAIR knowledge and implementing FAIRification in a local setting. The 3PFF has helped a diverse spectrum of stakeholders to see what “going FAIR” means in practice to them and to insert themselves into the emerging FAIR technology landscape. Not only does the 3PFF keep the priority

set on the practical elements of FAIRification, but it allows a distributed approach to community coordination that is necessary for rapid scaling and convergence of FAIR data.

Since their original formulation in the spring of 2020, more than 60 3PFF workshops and associated events have been delivered by the GO FAIR Foundation to the international community, representing a broad array of knowledge domains. The current list of workshops is actively maintained at the GFF website: <https://www.gofair.foundation/3pffevents>.

As the demand for FAIR data increases, there is a clear need for training FAIR implementers and additional qualified workshop facilitators, especially those who can embed FAIR skills in their local organizations.

FAIR Capacity Building

With instruction, the road-tested skill sets and the accumulated experience gained in delivering 3PFF workshops can be transferred and locally embedded within organizations. This guarantees that researchers, data stewards and other data creators have routine and cost-effective access to efficient institutional-based FAIRification options.

The GFF has therefore developed a **FAIR Capacity Building Programme**, to provide extended, professional and qualified training for data stewards who aspire to use 3PFF methods in their daily work and to conduct qualified 3PFF workshops as they see fit. The FAIR Capacity Building Programme is designed to save costs and increase independence by locally embedding know-how in the organization. The Programme distinguishes between 3PFF **Implementers**, workshop **Facilitators** and 3PFF **Trainers** (*Figure 2*). These three roles have their own learning objectives, evaluation criteria, and qualifications each with their own training module.

The FAIR Capacity Building Programme is based on lectures, discussions, and exercises, using open source tools and proven methods. It begins with the FAIR Awareness unit (20 hours) that covers the theoretical and historical background of FAIR and provides up-to-date information on current trends in FAIR technology. The FAIR Awareness unit provides a solid foundation for the 3 training modules of the GFF Capacity Building Programme:

1. Implementer module

After completing the FAIR Awareness unit, the trainee can choose paths leading to FIP and/or M4M **Implementer** Qualification. As Implementer, the trainee will have gained the

competencies to build and maintain domain-relevant community-specific FIPs and/or metadata resources. The trainee can put these skills to use as part of a cost-effective and professional approach to FAIR data stewardship within their organization. The FIP Implementer Qualification consists of a single training unit (40 hours) while the M4M Implementer Qualification consists of three mandatory units including training on schema and vocabulary development as well as FAIR orchestration (60 hours). Optional units covering advanced and trending metadata topics will also be offered (for additional costs) depending on demand. Taken together, these two Implementer Qualifications will ensure that trainees have a complete FAIR skill set and are competent to perform rigorous FAIR implementation.

2. Facilitator module

Within any organization, there may be ongoing need to conduct 3PFF events. The Qualified FIP/M4M Implementer can be taught how to professionally facilitate 3PFF workshops by assisting in real-world, 3PFF workshops. The Facilitator module consists of two assistance units where the trainee learns how to run workshops by apprenticing with qualified and experienced 3PFF workshop Trainers. After dedicating 20 hours of successful apprenticeship assisting FIP and/or M4M workshops, the FIP/M4M Implementer becomes a Qualified FIP/M4M **Facilitator** and can now run Qualified 3PFF workshops independently. Qualified FIP/M4M Implementers are welcomed to voluntarily enter into the assistance units in ongoing 3PFF workshops without additional costs.

3. Trainer module

In some cases the long-term demand for FAIRification may begin to exceed the in-house capacity to deliver. Furthermore, over time qualified personnel will likely move on to other appointments. In these cases, it may be cost-effective to train additional FIP/M4M Implementers and Facilitators within the organization in a “train-the-trainer” capacity. In the Training module, Qualified FIP/M4M Facilitators who have accumulated sufficient experience delivering FAIR Awareness events and FIP and M4M workshops can debrief and receive assessment on the quality of their documented workshop facilitation. Trainees will also receive personalized coaching to help spot, and resolve any knowledge gaps and to gain deeper insights into workshop pedagogy. This personalized, one-on-one evaluation and coaching is estimated to take 10 to 20 hours depending on the trainee’s acquired skills and experience. The result is Qualification as a 3PFF **Trainer**, who is then competent to provide instruction to and assessment of trainees in the Implementer module and to take on apprentices of their own in the Facilitator module. As with the Facilitator module, entering into the Trainer module is voluntary.

The GFF runs 3PFF training courses multiple times per year for 12-25 trainees, leading to Implementer, Facilitator and Trainer Qualifications. After completing the FAIR Awareness unit (20 hours), the Implementer module (100 total hours), Facilitator module (40 total hours) and Trainer module (10-20 hours as needed at current GFF consulting rates) are to be consecutively taken and together would amount to a maximum 180 hours of trainee time. Costs for FIP and M4M Implementer Qualifications are calculated per student and together amount to €8000 per student. Assessment and one-on-one coaching in the Trainer module will have variable costs typically ranging from €1000-2000. Typically, a single organization (e.g. institution, consortium, project) will choose to train 2 or more data stewards to build collective in-house FAIRification knowledge. GFF recommends Qualification updates every two years, and so also runs bi-annual Qualification Update Events providing overview of emerging FAIR technology and other developments (these are half-day events, with documentation and Qualification upgrades covered by a fee of €250).

The GO FAIR Foundation's FAIR Capacity Building Programme is pictured below in **Figure 2**. Learning outcomes and assessment criteria are described in the [Appendix: Training modules details](#).

GO FAIR Foundation's FAIR Capacity Building Programme

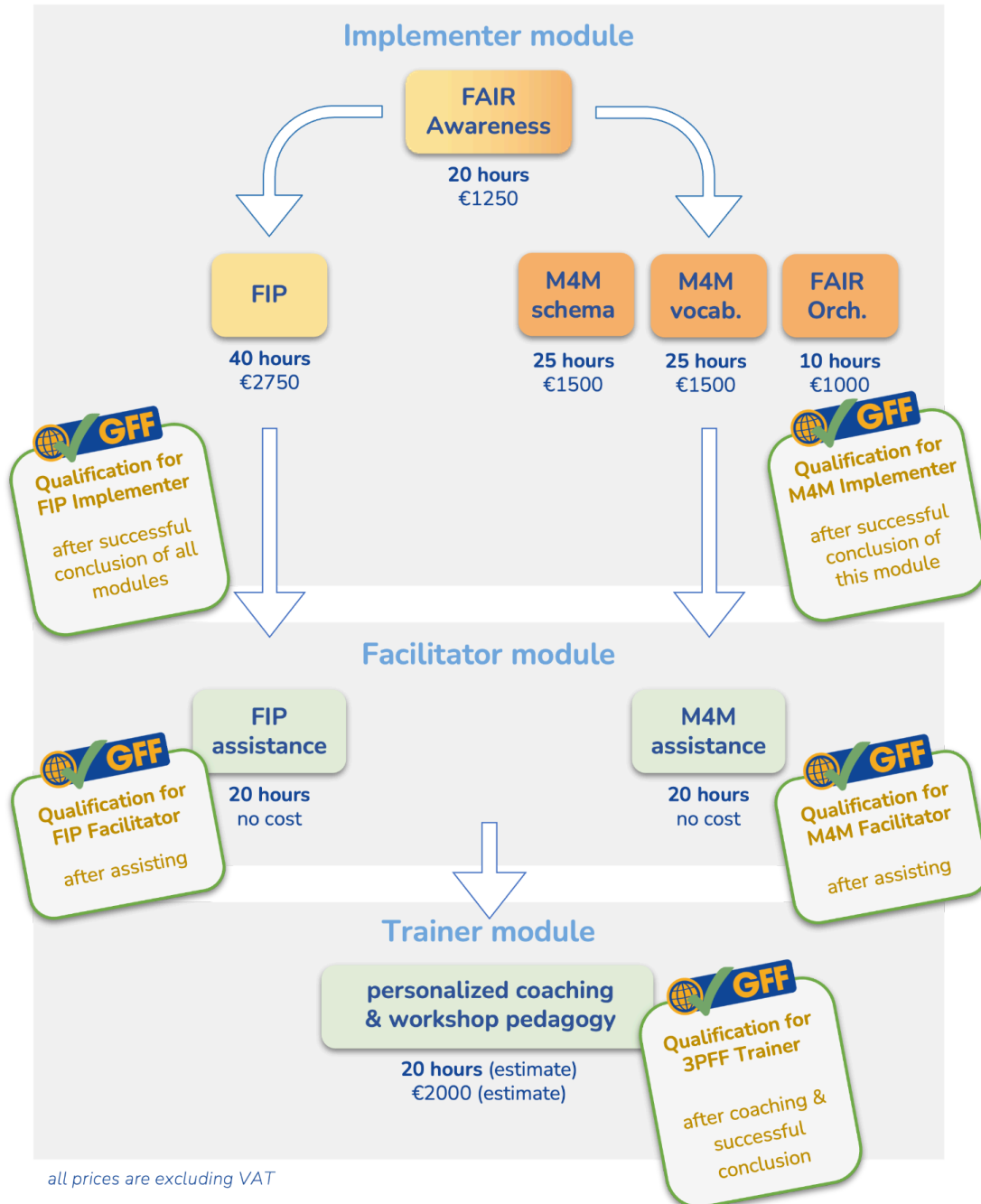


Figure 2. The GO FAIR Foundation's FAIR Capacity Building Programme is based on the 3PFF. Trainees who aspire to implement FAIR data, to facilitate 3PFF events or to train others can follow the desired modules. At each stage, trainees receive the GFF Qualifications which are issued in the form of machine-readable nanograph-based FAIR Digital Objects.

Appendix: Training module details

FAIR Awareness

Time Investment

To be well prepared for the Implementer module, the trainee must participate in the following training event (a total of 20 hours):

- Participate in a FAIR Awareness (FA) workshop (2 hours)
- Receive FA training (18 hours)

Student learning outcomes

- Be able to explain the FAIR Principles → GFF Interpretations → Implementation considerations
- Be knowledgeable about history and purpose of the FAIR Principles (and the GFF)
- Be knowledgeable about the Three-Point FAIRification Framework (3PFF) and the FAIR Hourglass
- Be knowledgeable about costs/benefits & barriers/incentives of implementing FAIR
- Be aware of automated FAIR assessment tools and FAIR Implementation Profiles
- Be aware of how FAIR fits into Data Management and Data Stewardship
- Be aware of good implementation examples including repositories (as well as examples of “Fake FAIR”)
- Understand how to prioritize FAIR implementations in project proposals, roadmapping
- Be knowledgeable about the Metadata for Machines (M4M) concept:
 - Theory:
 - Be able to explain metadata vs. FAIR metadata
 - Be knowledgeable about domain-relevant community standards as it relates to metadata
 - Practice:
 - Be able to explain the concept of FAIR vocabulary
 - Be able to explain what a machine-actionable metadata schema is
 - Be able to list different M4M tools to create FAIR metadata

Implementer module - FAIR Implementation Profile (FIP)

Time investment

To become a **FIP Implementer**, the trainee must participate in the following training events (a total of 40 hours):

- Participate in a FIP workshop (5 hours)
- Receive FIP training (35 hours)

Student learning outcomes

- Theory:
 - Be able to give a concise definition of the FIP
 - Be able to explain the multiple purposes of the FIP:
 - Education
 - Guidance during FAIR implementation
 - Accelerating convergence
- Practice:
 - Be able to explain the FIP Ontology
 - Be able to explain nanopublications
 - Be able to use nanopublications in FIP Wizard/Nanodash
 - Be able to explain FAIR Enabling Resources (FERs) and FAIR Supporting Resources (FSRs)
 - Be able to qualify FSRs
 - Be able to guide through the FIP Wizard
 - Be able to answer FAIR principles related questions
 - Understand the different levels of convergence
 - Be able to build and explain the FAIR Convergence Matrix
 - Do analysis on the results of the Matrix

Assessment criteria for FIP Implementer Qualification

Qualification can be achieved with a minimum of 75 out of 100 points:

- 100% attendance in events and training (20 pts) (recording is available, but online presence is preferable)
- Published a complete FIP (10 pts) or participate in the creation of a FIP (5 pts)
- Published 3 FSRs/community nanopubs (10 pts)
- Qualifications of 5 FSRs nanopubs (10 pts)
- FIP analysis for convergence (10 pts)

- Assess the FAIRness of a metadata schema (10 pts)
- Pass exam (30 pts)

Implementer module - Metadata for Machines (M4M)

Time Investment

To become an **M4M Implementer**, the trainee must participate in the following training events (a total of 60 hours):

- Participate in a M4M workshop (5 hours)
- M4M schema training (20 hours)
- M4M vocabulary training (25 hours)
- FAIR Orchestration training (10 hours)

Student learning outcomes

M4M - schema

- Be aware of existing semantic artifacts for the objects in the metadata schema
- Be aware of existing semantic artifacts for the predicates in the metadata schema
- Be able to build a metadata schema in CEDAR
- Be able to build a metadata schema as nanopublication template
- Be able to build a metadata schema in DSW
- Be able to facilitate a collaborative development of metadata schemas for a community

M4M - vocabulary

- Be able to explain semantic artifacts and the semantic ladder
- Be knowledgeable about domain-relevant community standards as it relates to semantic artifacts
- Be able to identify FAIR vocabulary and to use FAIR assessment tools for vocabularies
- Be knowledgeable about the Sheet2RDF pipeline
- Be aware about other vocabulary editors
- Be aware about the semantic mapping techniques
- Be aware about the crosswalk techniques
- Be able to create a vocabulary about a specific topic
- Be able to facilitate collaborative development of a common vocabulary
- Be knowledgeable about vocabulary governance models

FAIR Orchestration

- Be able to introduce the concept FAIR Orchestration and give an overview of emerging tools
- Be knowledgeable about FAIR Data Points and FAIR Data Stations
- Be knowledgeable about emerging technologies in FAIR Digital Objects
- Be able to guide trainees in setting up a FAIR Data Point or similar FAIR orchestration service

Assessment criteria for M4M Implementer Qualification

Qualification can be achieved with a minimum of 75 of 100 points:

- 100% attendance in events and training (20 pts) (recording is available, but online presence is preferable)
- Co-create one or more FAIR Supporting Resource (30-60 pts):
 - Create FAIR Metadata Specifications (choose at least one of the following):
 - Nanopublication template (10 pts)
 - DSW Knowledge Model (10 pts)
 - RO-Crate (10 pts)
 - FAIR SKOS/OWL vocabulary (5-10 pts)
 - FAIR metadata in CEDAR (5-10 pts)
 - FO service (10 pts)
- Pass exam (30 pts)

Facilitator module - FIP and/or M4M

Time Investment FIP

To become a **FIP Facilitator**, the qualified FIP Implementer must assist in real-world FIP workshops (a total of 20 hours):

- Have received qualification as a FIP Implementer
- Assist in FIP workshops (20 hours)

Time Investment M4M

To become an **M4M Facilitator**, the qualified M4M Implementer must assist in real-world M4M workshops (a total of 20 hours):

- Have received qualification as an M4M Implementer
- Assist in M4M workshop (20 hours)

Assessment criteria for Facilitator Qualification

- Assisted in the delivery of successful FIP/M4M events having official event evaluations

Trainer module

Time investment

- To become a **3PFF Trainer**, the qualified FIP-M4M Facilitator must receive 10 to 20 hours of one-on-one assessment and coaching. Additional consulting hours are available when needed at current GFF rates.

Assessment criteria for 3PFF Trainer Qualification

- Agreement between trainer and trainee that the trainee has mastered the complete overview of 3PFF methods, tooling, event formats and can confidently implement FAIR data and services.

Document information and version history

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