

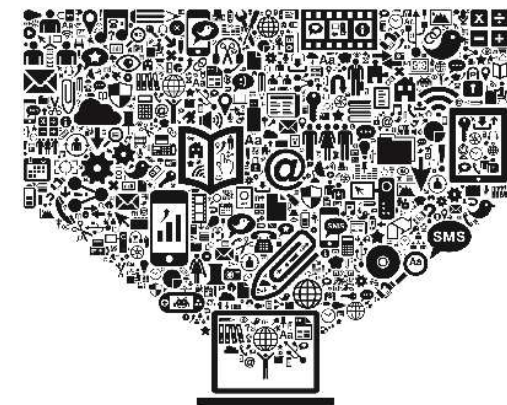


Testing the Test

Outline

1. Experiment 3

2. Database

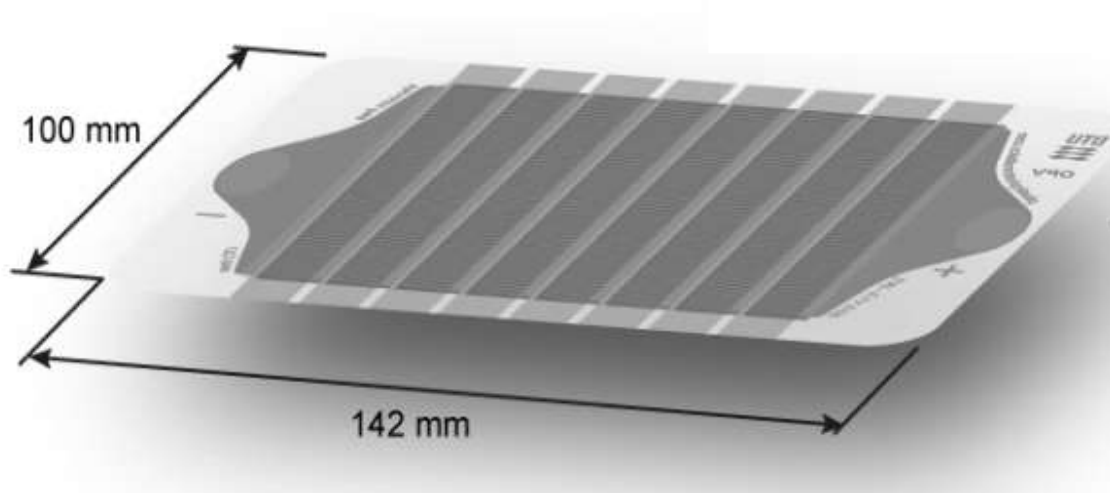




Experiment 3: aim & approach

- Compare setups to execute stability studies according to ISOS protocols/guidelines by COST Action members (WG3)
- Compare different levels of protocols/guidelines
- Use highly reproducible samples with narrow standard deviation in performance as well as variation in processing conditions

Experiment 3: Sample - DTU module



Experiment 3: Aging conditions

ISOS protocols, levels & conditions

ISOS protocol	level		
	1	2	3
Dark ISOS-D	'shelf'	T:65/85 °C	RH: 85%
Outdoor ISOS-O	Sunlight, ambient Solar sim MPP/V _{oc}	Sunlight (in-situ)	Sunlight & solar sim. MPP
Lab. Weathering ISOS-L	Light soak, ambient	T:65/85 °C	RH: ~50%
Thermal cycling ISOS-T (dark)	T range: RT-65°C Hot plate / Oven	Oven / Env. Chamber	T range: -40 - 85 °C RH: ~55% Env. chamber
Solar-therm.-hum. ISOS-LT	Solar/thermal cycling Light soak T range: RT-65°C Weathering chamber	S/T/Humidity T range: 5-65 °C RH: ~50% Env. cham+solar sim.	S/T/H/Freeze T range: -25 - 85 °C

Experiment 3: Aging conditions

ISOS protocols, levels & WG3 members

ISOS protocol	1	level 2	3
Dark ISOS-D	Rudjer B Institute ICCF	TU Ilmenau Tech. Uni. Cartagena	TÜBITAK NPL
Outdoor ISOS-O	UNAM Wroclaw Research Centre EIT+	ICN2 U. Ilmenau	IADP ev
Lab. Weathering ISOS-L	Mcast Vilnius University		
Thermal cycling ISOS-T (dark)	Uni Rovira I Virgili Uni. Oxford		
Solar-therm.-hum. ISOS-LT	ICL, KAU		DTU Bangor Uni.

To be completed with you!

Experiment 3: Structure

Fabrication (WG2): DTU

Degradation:
Aging according to
ISOS D, O, L, T, LT

@ all groups WG3
groups

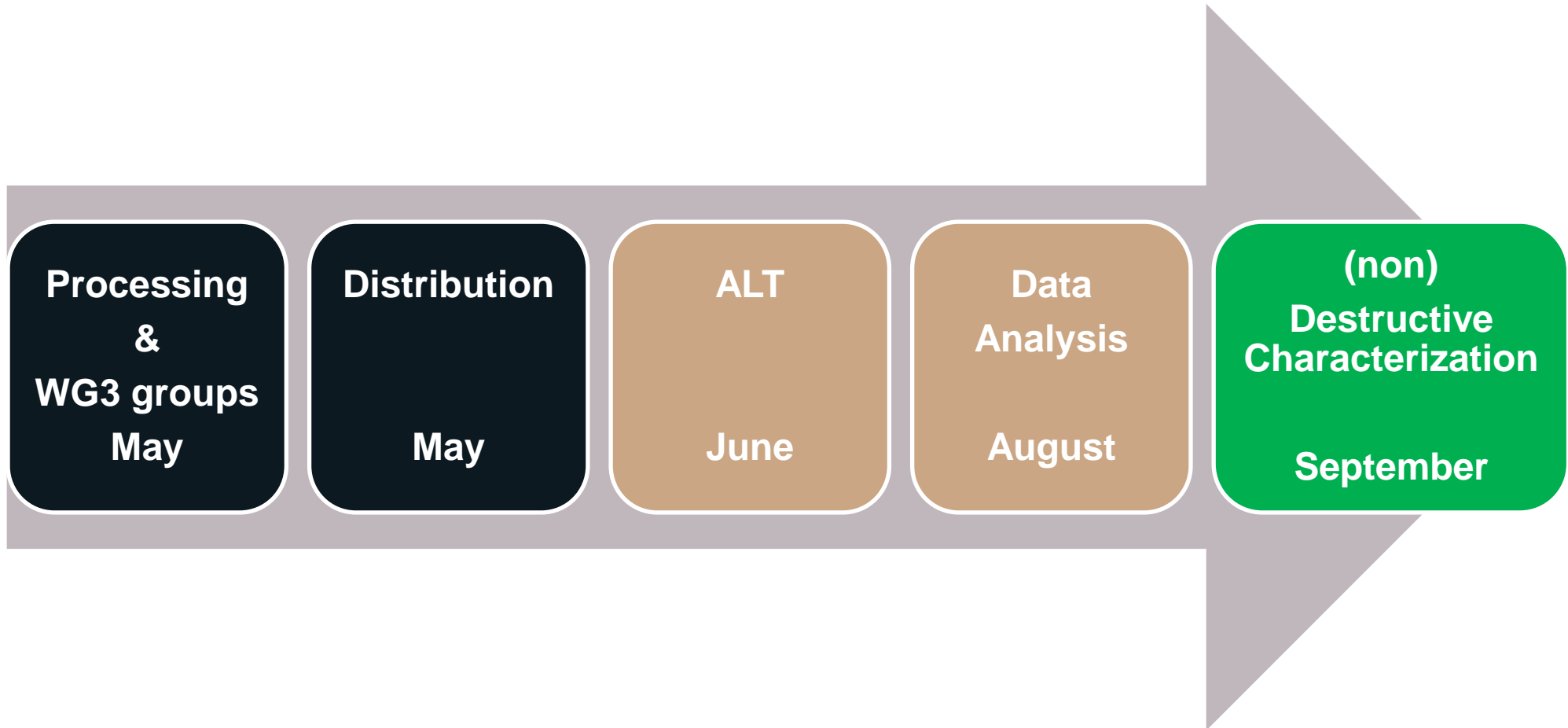
**Data
analysis**

**Joint
decision**

**Non-destr.
Char. (WG4)**

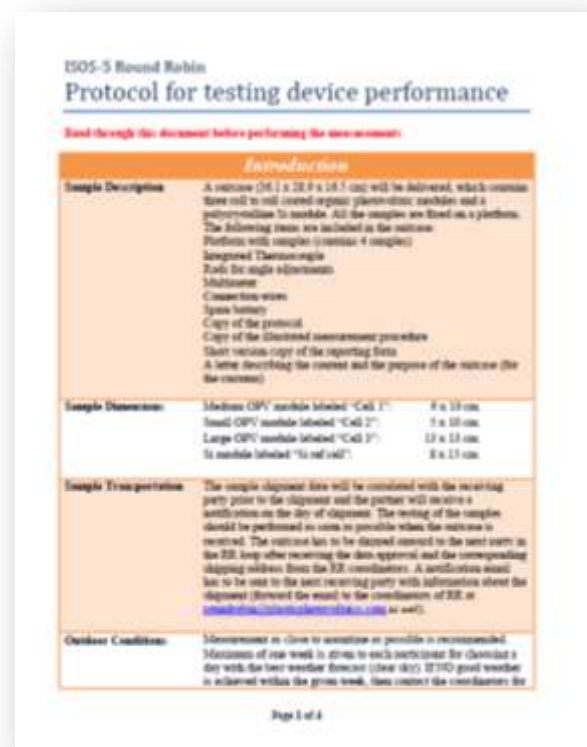
**Destr. Char.
(WG5)**

Experiment 3: Timeline



Experiment 3 - (detailed) protocol

Experiment document

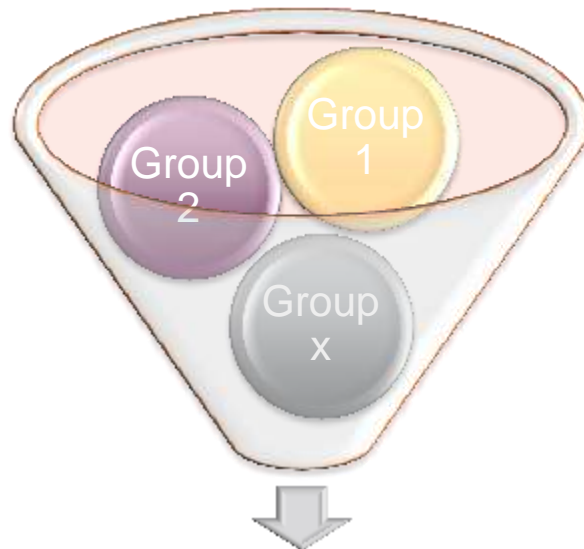


Aim,
Approach,
Sample,
Contacting,
Measurement details,
Reporting format,
Equipment, settings,
Timeline,
Data analysis

Gevorgyan, DTU,
ISOS 6, Chambery, 2013

Experiment 3 - Reporting

Reporting data									
*Measurement place	ECN, Netherlands								
*Measurement conducted by	Wiljan Verhees (verhees@ecn.nl)								
*Measurement date	08.03.2012								
Specimen producer and number	ISE SI PD007 2010								
Specimen description	Si photodiode encapsulated in a special holder with an integrated RTD sensor. Both PV and RTD require LEMO connectors for measurement. LEMO connector is supplied with specimen for PV (4-point) measurement, but not for RTD.								
Mismatch factor	0.995								
PV parameters	<table border="1"> <thead> <tr> <th>Isc (mA)</th> <th>Voc (V)</th> <th>FF (%)</th> <th>Pmax (mW)</th> </tr> </thead> <tbody> <tr> <td>13.28</td> <td>0.621</td> <td>80.2</td> <td>6.62</td> </tr> </tbody> </table>	Isc (mA)	Voc (V)	FF (%)	Pmax (mW)	13.28	0.621	80.2	6.62
Isc (mA)	Voc (V)	FF (%)	Pmax (mW)						
13.28	0.621	80.2	6.62						
Active Area	1 cm ² (provided by producer)								
Masking	No masking applied								
Additional PV parameters	<table border="1"> <thead> <tr> <th>Jsc (mA/cm²)</th> <th>PCE (%)</th> </tr> </thead> <tbody> <tr> <td>13.28</td> <td>6.62</td> </tr> </tbody> </table>	Jsc (mA/cm ²)	PCE (%)	13.28	6.62				
Jsc (mA/cm ²)	PCE (%)								
13.28	6.62								
Device Temperature during meas.	26.8 ± 0.2 °C								
Connection type	4-point measurement								
Reporting additional data									
Light source spectrum	Class AAA (Wacom)								
Reference device type	RSID2 solar cell with KG3 filter								
IV scan range	-1 V to +1 V (101 points)								
Spectral response measurement	No bias light, Chopper frequency 73 Hz								
Temperature measurement	RTD sensor integrated inside specimen								
Deviations from protocol	XXX								
Comments	XXX								



Database

Computer Physics Communications

On the communication of scientific data: The Full-Metadata Format

Martiz Riede^a, Riza N. Baeppe^a, Kristian O. Sylvester-Hvid^b, Martin Käber^c, Michael C. Kötter^d, Klaus Zimmermann^a, Andrew W. Leth^{e,f}

ARTICLE INFO

ABSTRACT

1. Introduction

In the last few years an increasingly sophisticated experimental infrastructure has enabled students to share not only knowledge but also primary data with scientific publications [1, 2]. With this increase in sharing primary or generated scientific data the lack of reliable and well defined data formats for simple tabular data has become increasingly obvious. For complex data sets the data must still be in the public domain, adequate binary formats like the NetCDF Common Data Form (CDF) [3] or the Hierarchical Data Format (HDF) [4] are well established [5, 6], and the publication of observational geophysical data in World Data Center has developed into an effective mechanism for data exchange [7]. Another example is the collaborative technology infrastructure for handling the data of the ATLAS experiment [8] where the event data is mainly stored in the ROOT file format [9]. For less complex data structures, like tables which are typically encountered in many parts of natural and technical sciences, no single standard format has evolved.

The success of the HDF and netCDF relies on the fact that these formats are well defined and integrate smoothly into the workflow of scientists in different laboratories. Although these formats are capable of storing and documenting simple tabular data, the

need for a well defined and compact binary file generally poses a barrier to the use of these formats in fields where complex data structures are inherently found.

A natural requirement of a standardized file format for tabular data is that it allows scientists to add observations, sensor parameter specifications and analysis results by adding a clear text using any given row editor. This requirement, when met, is the data format used by laboratories around the world for its various domains, as can be seen in the field of biology, where laboratories working together or even across but on individual format of documenting scientific results with relational databases. While this is completely sufficient in a short term perspective, it becomes incompatible with the tendency of research groups to rely on the integration of international consortiums involving many different laboratories. Furthermore, in publishing scientific results, there is an increasing demand to also provide processed data as supplementary data or even to publish primary data in OpenData repositories [2]. Thus, there is a need for a common data format for tabular data which is:

Available and self-documented: The data should be written in the same way the scientist is accustomed to reading it, e.g. in a laboratory notebook. It should be clear, well based and parsimonious with any word processing tool. The format should include sections which allow the scientist to document the data and its origin, and this to such an extent that no other source be in-

From: Rera systems
Maritz Riede
Verhees, ECN

Outline

1. Experiment 3

2. Database

RERA SOLUTIONS
PV MEASUREMENT SYSTEMS

ReRa Solutions

PV-DB Experiment storage system

Company

- ReRa Solutions BV
- Established in April 2008 in The Netherlands
- Spin off company Radboud University Nijmegen
- Many years of experience in the development of PV measurement systems, software and monitoring
- Broad reference list of various customers inside and outside Europe

Situation

Each member generates measurements on samples/modules

This can be all sort of measurements: EQE, IV, EL, HALL, and many more

It is very complicated to define one format to be used by everybody for all measurement setups using fixed fields and records

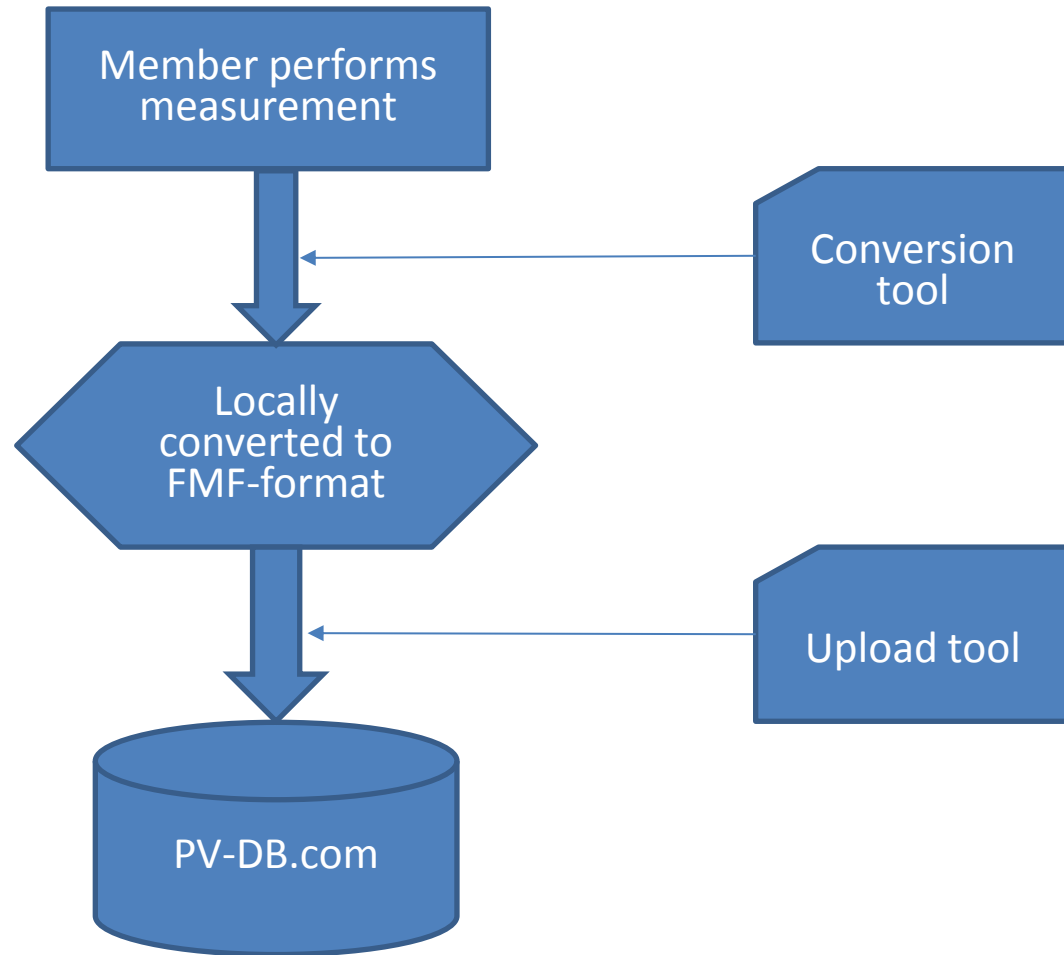
Solution: Full-Metadata Format (FMF) by Moritz Riede et al. This is a self documenting, flexible format to store tabular data

ReRa operates an online storage system for these files: www.pv-db.com

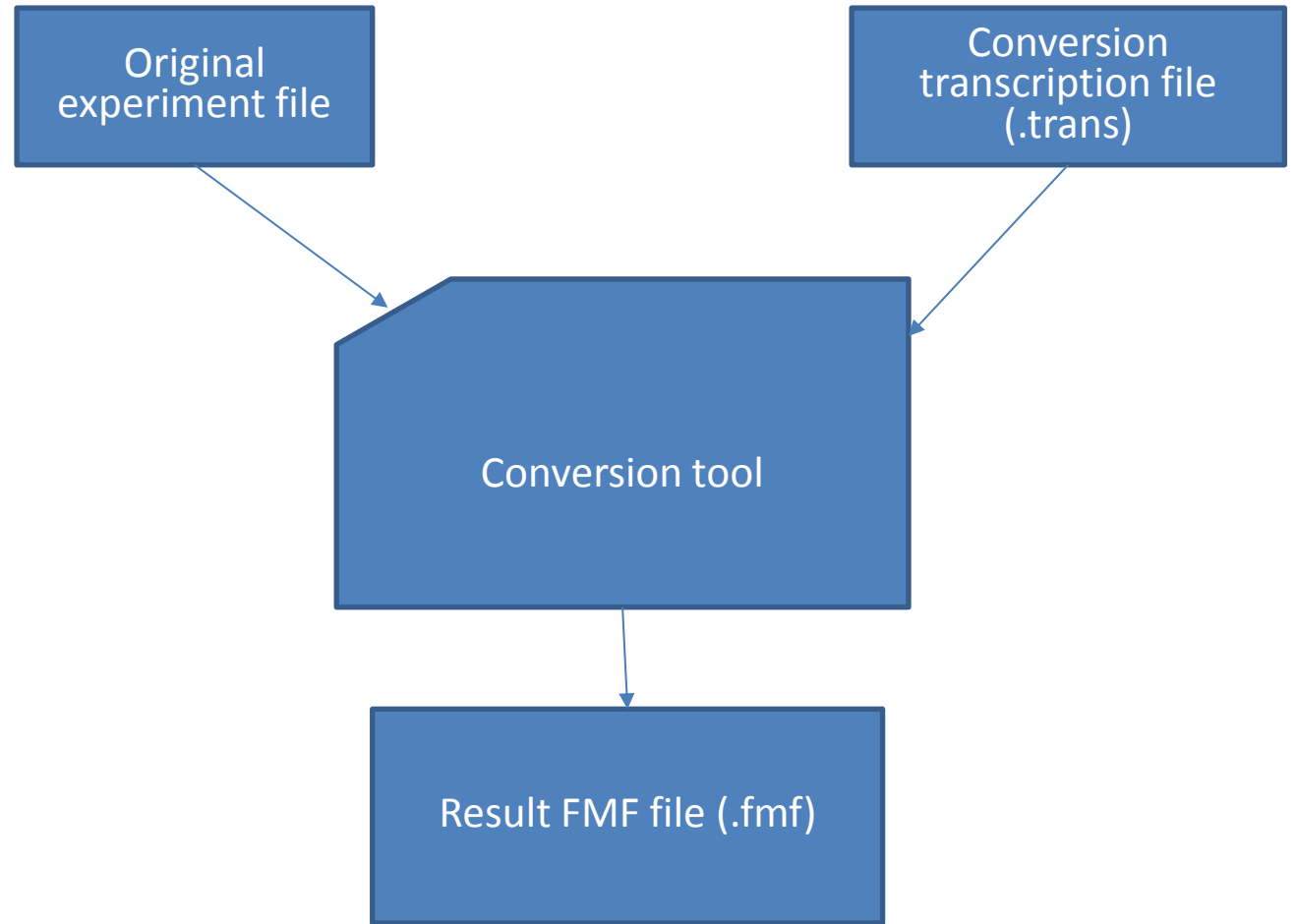
First focus: **Get the data in there!**

Second: Analyze and visualize the data

Dataflow



Conversion tool



Experiment types

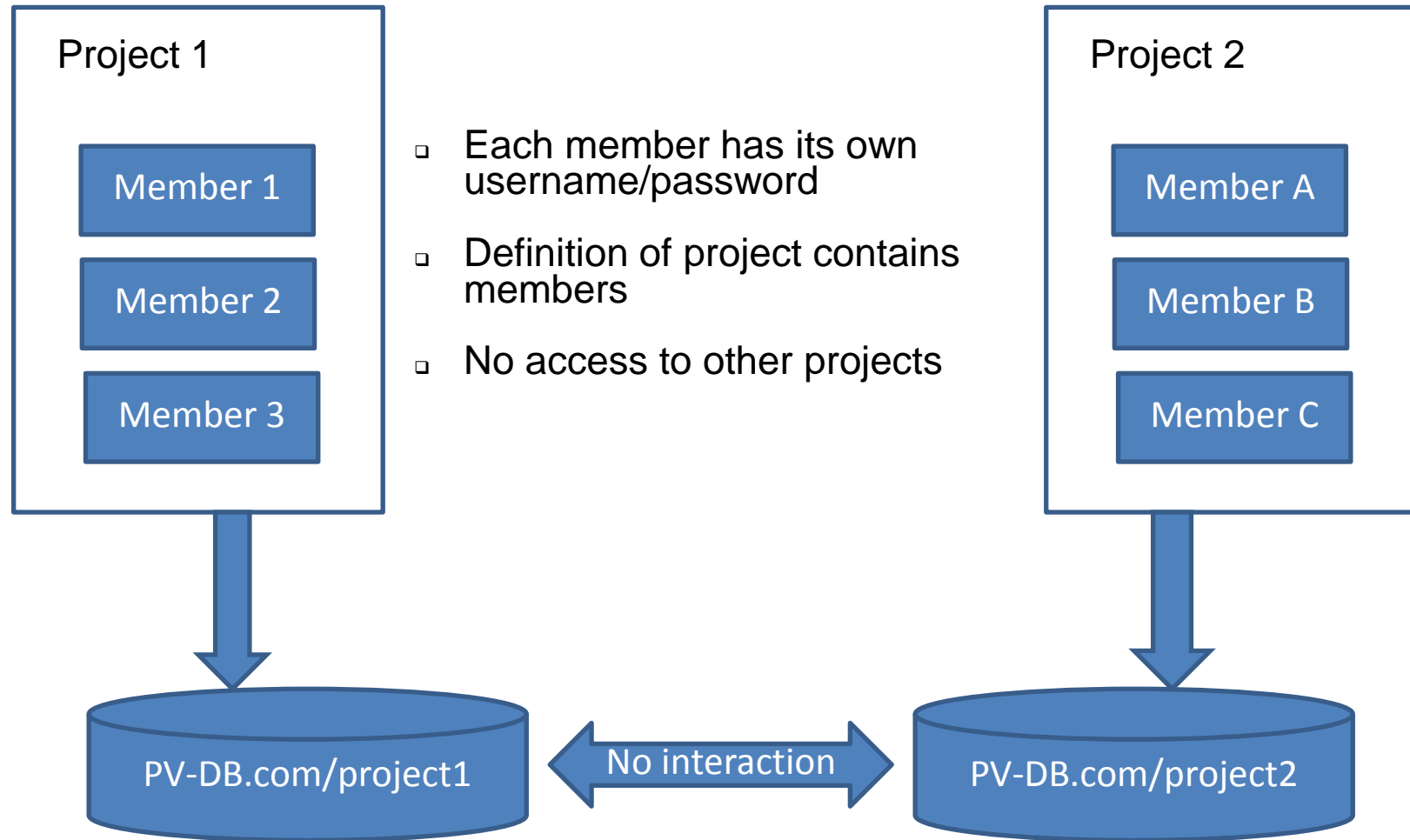
- We need to define some common experiments and their fmf representation (EQE, IV, EL, HALL??)
- In principle any fmf file can be stored, but if the structure is unknown it is difficult to represent the contents

Agreements

Flexible format is nice, but some agreements should be made in order to search and analyze the data

- Sample name
- Measurement types
- Header format
- Fixed fields
- This needs to be defined in a document

Authentication



Access rights

- Each project has 1 Experiment Coordinator (EC), which is one of the members.
- The EC has read/write access to all files in the project
- The EC can add/remove other members and apply read/write access rights.
- A member always has read/write access rights on its own files
- A member only has read access on the other members' files when this is allowed for by the EC

Current Status

Operational:

- Online FMF storage (www.pv-db.com)
- User management and project control

Current priority:

- Upload tool (Linux, Windows and Apple)
- Definitions of fixed fields
- Simple viewer

Future:

- Local conversion tool (Linux, Windows and Apple)
- Extended viewer