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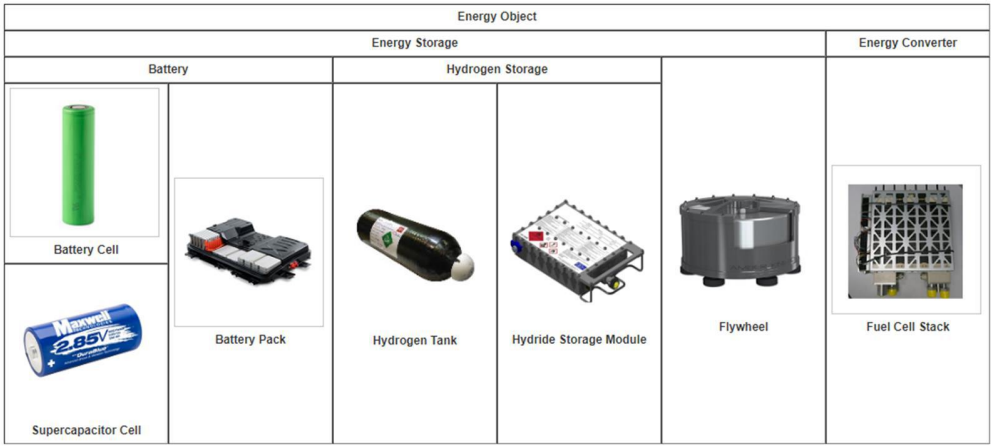
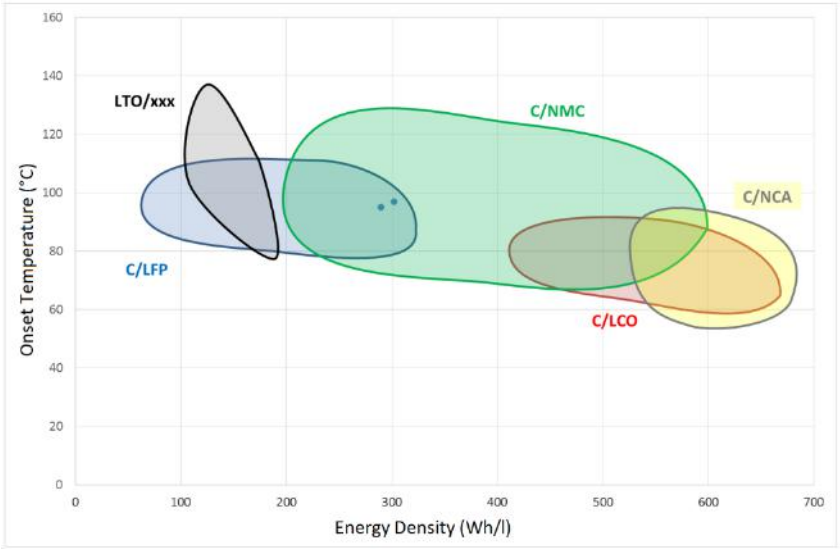




ESTOR : A DATABASE FOR ENERGY STORAGE AND CONVERSION

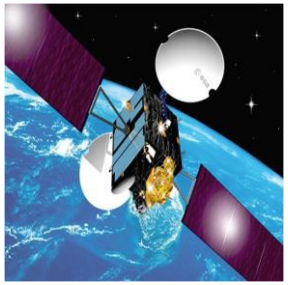
Fabien Perdu

22/05/2019

RATIONALE

Need for energy storage systems for various applications

- Transports
- Network services
- …



RATIONALE

- **Tradeoffs are to be found between various criteria**

  - Energy density
  - Power density
  - Energy efficiency
  - Lifetime

  …

  - Operating temperatures
  - Safety
  - Cost
  - Environmental impact

- **No existing database with detailed technical data on various technologies**

RATIONALE

- **CEA launched ESTOR database project to**

  - capitalize and validate existing information and test data
  - enhance communication between services
    testing, simulation, system integration,

  ⇒ need for detailed technical data on a given type of specific objects

  - allow unbiaised comparison of technologies for a given application

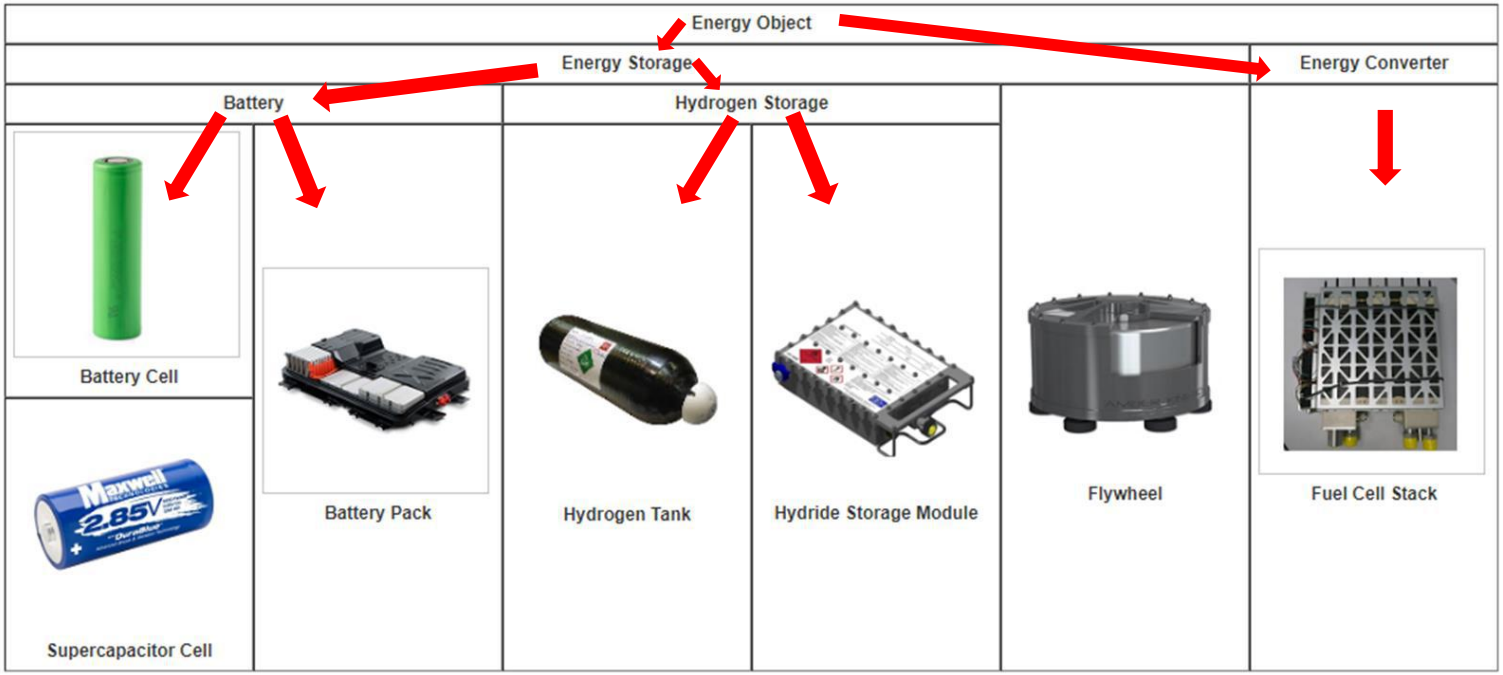
  ⇒ need for generic data on many types of objects

  - allow collaboration and sharing with partners of different domains
    towards a shared european database

  ⇒ need for fine access control management

IMPLEMENTATION

- **Hierarchy of object classes inside the Technologies table.**



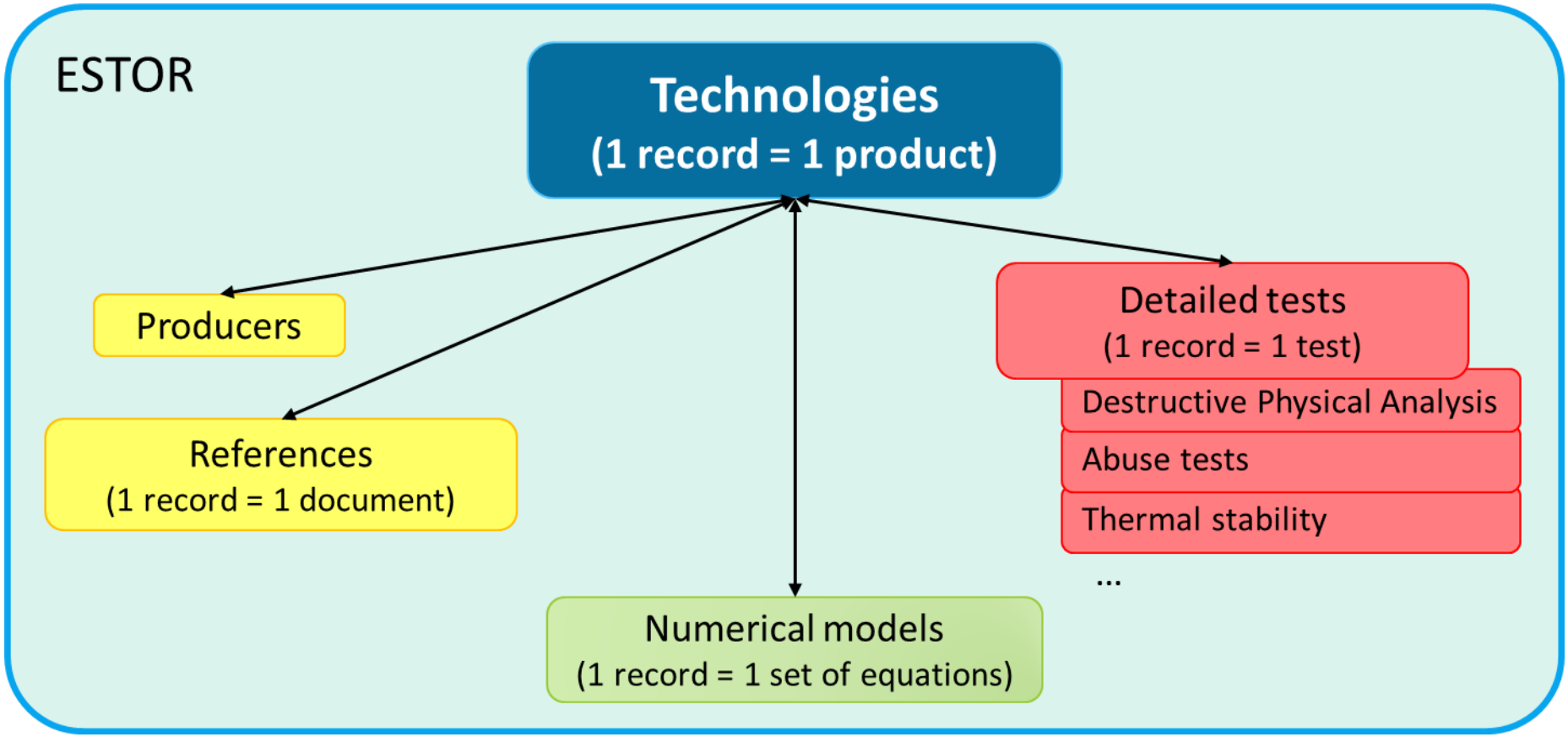
Generic
(e.g. mass, power)

Specific
(e.g. capacity, flowrate)

Selecting a class selects

- a subset of objects of the relevant type
- the relevant attributes for these objects to display

IMPLEMENTATION



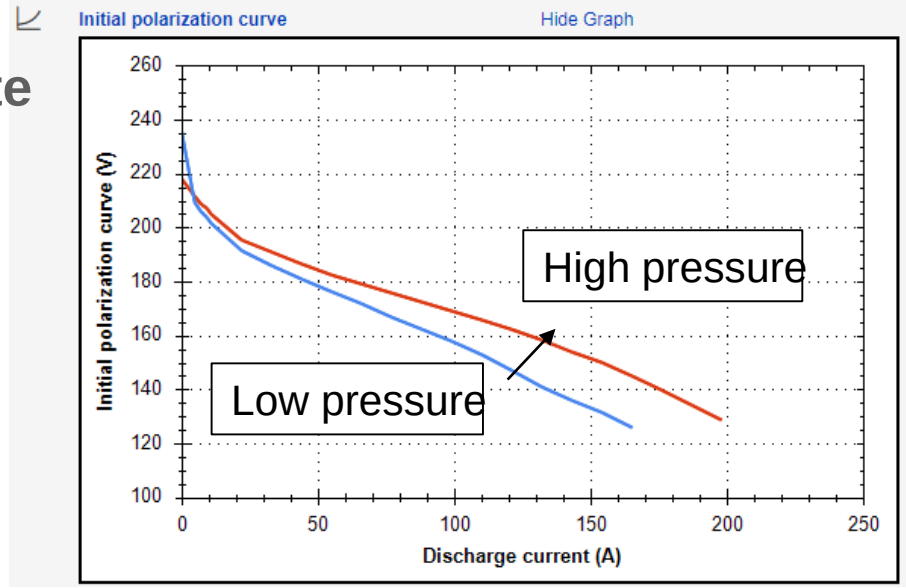
Hundreds of attributes are defined
and hundreds of records are filled

IMPLEMENTATION

- **Each technology record bears**
  - Traceability attributes (date, source of data,…)
  - Nominal performance
  - Performance in specific conditions
  - Ageing
  - Cost and environmental impact

- **Example of performance attribute**

  polarization curve of a PEM fuel cell



IMPLEMENTATION

- **Example of specific test data**

POSITIVE ELECTRODE

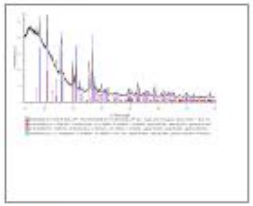
(+) Double-side electrode thickness	137	µm
(+) Electrode length	1700	mm
(+) Electrode width	55	mm
(+) Electrode loading	26.7	mg/cm^2

Pictures of core (+) electrode — Hide table

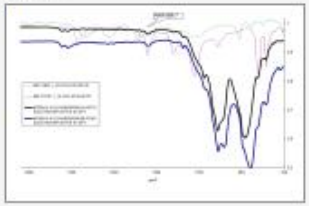
(+) Optical microscopy pictures — Hide table

(+) Active material composition	LFP

(+) XRD — Hide table



(+) IR — Hide table



IMPLEMENTATION

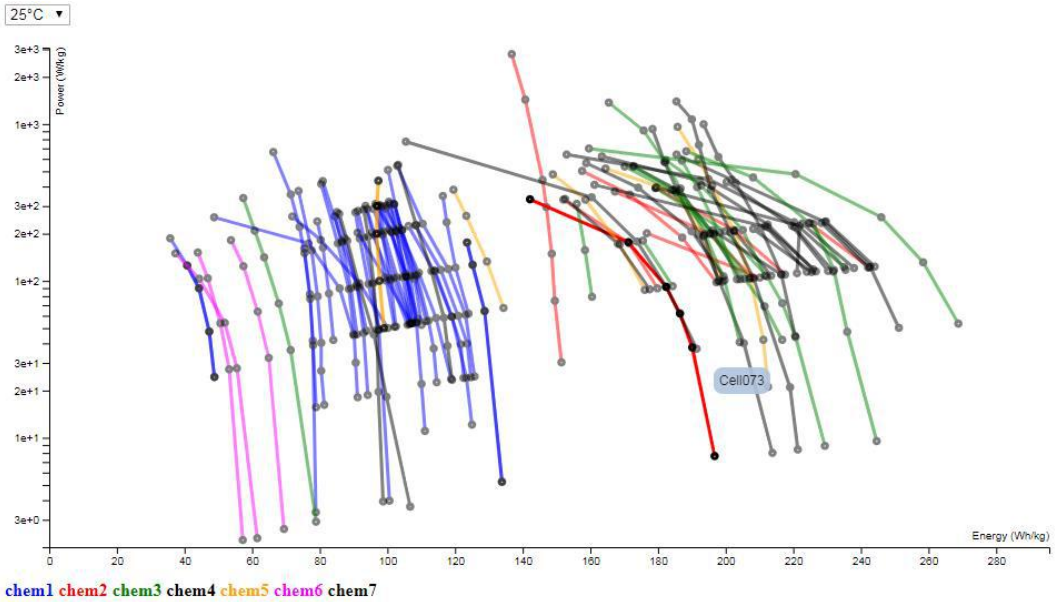
- **Example of scripting :**

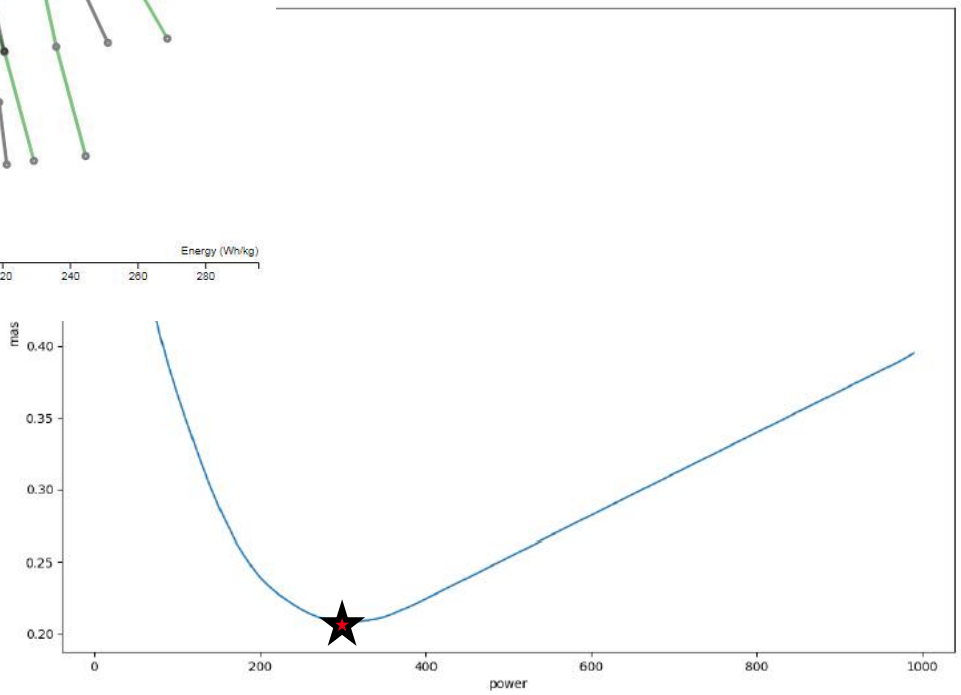
  automatic checks and completion

Length	227	mm
Width	160	mm
Height	7.25	mm
Volume	0.263	l
Script status	Checked by script : OK	

IMPLEMENTATION

- Allows new exploration tools





and coupling with simulation software

IMPLEMENTATION

- **Uses Granta MI software**
  - Very versatile structure
  - Fine tuning of access rights
  - Easy access trhough web application
  - Advanced usage through Python API

FUTURE WORK

- **European project great opportunity to build upon ESTOR**

  - Shared access to various European partners

  - Large number of characterization techniques for batteries

  => need to extend the existing structure

FUTURE WORK

- Objects (1 table = Technologies):
  Cell INR18650VTC6 from Sony
  NMC MX6 from Umicore,…

  Store description and aggregated results of various tests on various samples
  Allows for ‘material datasheets’

- Sample (1 table):
  An individual cell or material or…
  (instance of object)

  Store sample history :
  Which tests, when, in which order
  Allow splitting a sample into several or creating a sample from several

- Technique:
  Method for preprocessing, testing, post processing

  Store the description of the technique (characterization or model)

- Test:
  Application of a technique to a sample

  Store test conditions
  + post-processed test results
  + pointer to raw test results (which remain at SP)