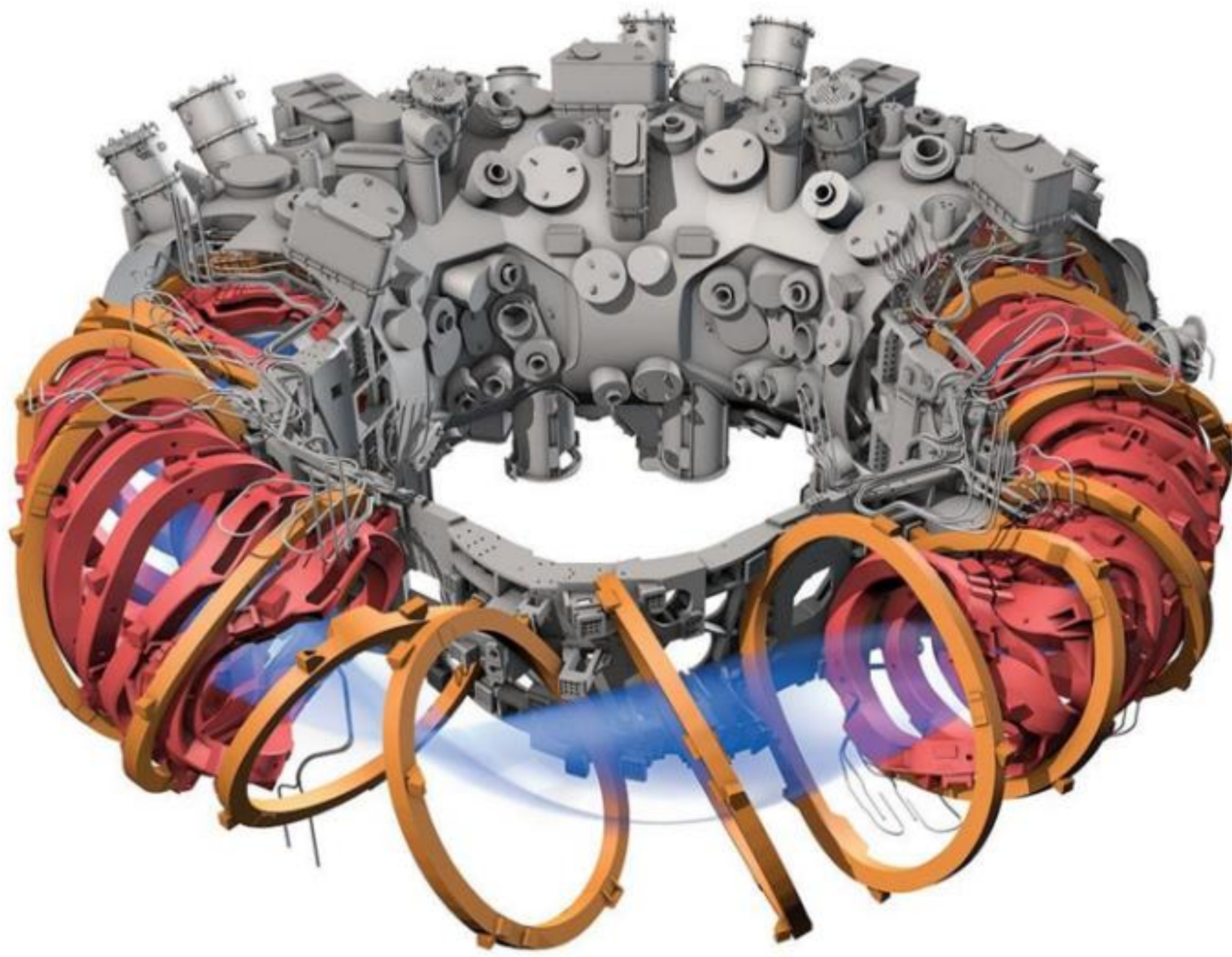Max-Planck-Institut für Plasmaphysik

W7-X Logbook REST API for processing metadata and experiment data enrichment at the Wendelstein 7-X stellarator

M. Grahl, A. Spring, T. Andreeva, T. Bluhm, S. Bozhenkov, S. Dumke, J. Geiger, O. Grulke, M. Grün, A. Holtz, U. Höfel, H. Laqua, M. Lewerentz, H. Riemann, J. Schilling, A. von Stechow, J. Svensson, A. Winter, The W7-X Team

1. Introduction

- The Wendelstein 7-X stellarator successfully completed its first 3 operational phases, with over 4000 experiment programs (XPs)
- W7-X operation is supported by CoDaC tool chain, which is designed for the steady-state requirements of W7-X (e.g. 30 min. discharges)

›› **W7-X logbook is an electronic lab notebook for the W7-X team**

First operational phases

40 diagnostics
50 XPs per day
100 sec. pulses max.
500 TB exper. data

2. REST API

Logbook access with any software

- RESTful interface via HTTP/JSON & website (HTML/JavaScript)
- Users can read logbook content & add (rich-text) comments & logs
- Easy and flexible integration into other software & web services (e.g. in CoDaC, physics modeling, and data analysis software)

›› **Supports automatic metadata creation & data analysis**

Operations

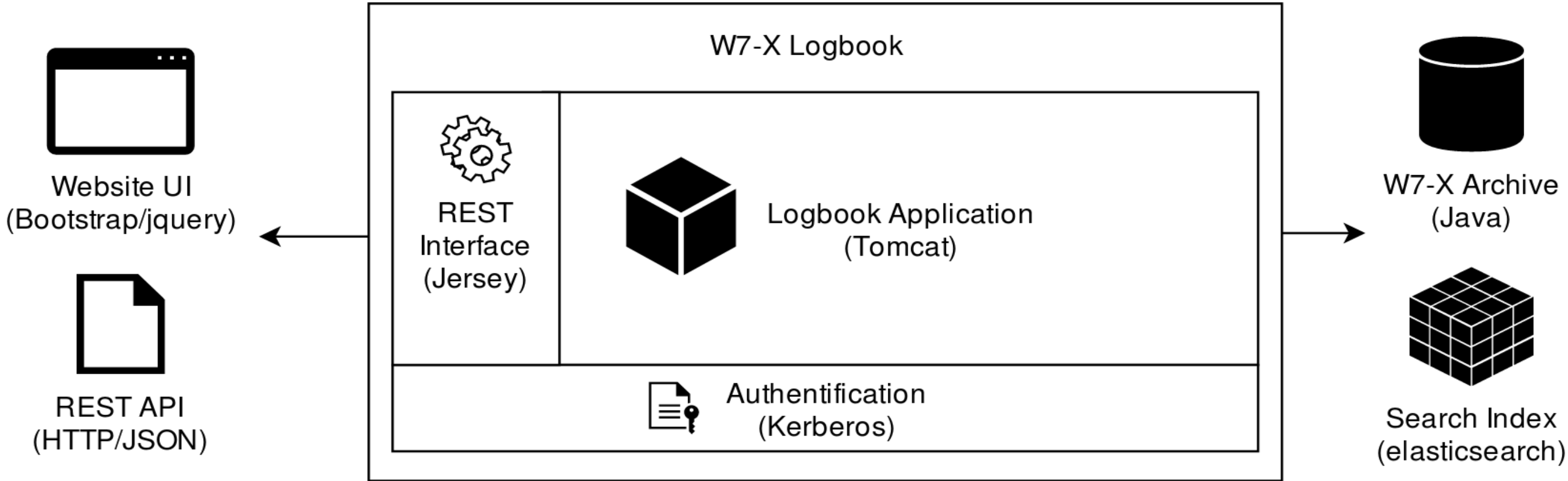| Operation	Path	Action
GET	/log/**{id}** /_search?q=**{string}**	Read a resource as JSON Search request
POST	/comment /comment/**{id}**	Create a new resource Update a resource
DELETE	/comment/**{id}**	Delete a resource

REST API call in Python

```python
import requests
url = 'https://w7x-logbook.ipp-hgw.mpg.de/api/_search'
my_query = {'q' : 'tags.ECRH\ duration:[25 TO 60]'}
h = {'Accept':'application/json'}
r = requests.get(url, headers=h, params=my_query).json()

program_id = r['hits']['hits'][0]['_source']['id']
```

Logbook architecture

3. Experiment metadata

Tags for standardized input

- Contextual data for experiment description and classification at different levels (high-level vs. diagnostic details) by tags from a catalogue
- Logs automatically extracted from planned programs by control software and completed by W7-X team

›› **Collaborative creation of experiment overviews**

- Fast search index allows near real-time full-text searches and range queries for numeric values

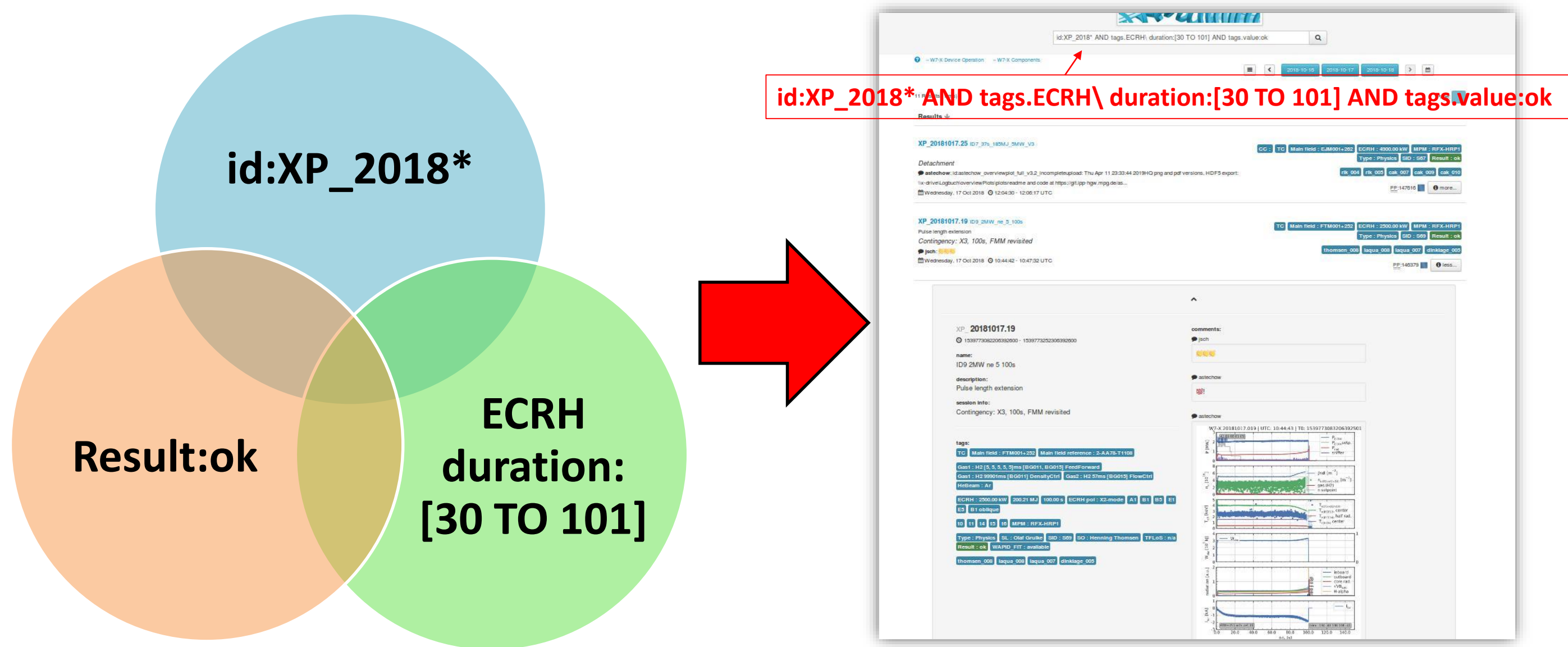›› **Searchable experiment journal**

Logbook web browser UI

Listing of XPs (incl. tags) on search page

XP page with interactive plots from archived data (JavaScript)

Component tab on XP page for diagnostic logs & comments

Powerful search syntax

id:XP_2018*

Result:ok

ECRH duration: [30 TO 101]

id:XP_2018* AND tags.ECRH\ duration:[30 TO 101] AND tags.value:ok

4. Conclusion

- Central logbook for W7-X team (incl. diagnostics & subsystems)
- Experiment metadata via standardized input (tag catalogue)
- REST API for programmatic access and content creation
- Automatically generated logs by W7-X control software & users
- Search index for near real-time full-text search and range queries
- Became a crucial tool for W7-X operation & data exploration
- 1st OPs: 37000 logs (+ 21000 comments) created by W7-X Team