Overview of proposed new format, its similarities and differences compared to ENDF-6

David Brown

NNDC, BNL

BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

U.S. DEPARTMENT OF ENERGY | Office of Science

This talk is in some ways premature

- **Requirements are due now**
  - Draft doc nearly complete
  - Core of this round of subgroup results
  - Hopefully can finalize it this week
- **Specifications are next step**
  - Low level containers mostly done
  - Properties Of Particles mostly done
  - Top Level in progress
- **Many more steps to follow:**
  - API,
  - processing, etc.,
  - documentation,
  - QA,
  - governance

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That said, we have a nearly complete prototype (GND) and expect final format to be very similar

These are the requirements that we've gathered from you, the nuclear data community

Requirements for a next generation nuclear data format

OECD/NEA/WPEC SubGroup 38*

(Dated: April 1, 2015)

This document attempts to compile the requirements for the top-levels of a hierarchical arrangement of nuclear data such as is found in the ENDF format. This set of requirements will be used to guide the development of a new set of formats to replace the legacy ENDF format.

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Main goals/requirements

1. The hierarchy should ***reflect our understanding of nuclear reactions and decays***, clearly and uniquely specifying all such data.
2. It should ***support storing multiple representations of these quantities simultaneously***, for example evaluated and derived data.
3. It should ***support both inclusive and exclusive reaction data***, that is discrete reaction channels as well as sums over multiple channels.
4. It should use ***general-purpose data containers*** suitable for reuse across several application spaces.
5. It should ***eliminate redundancy where possible***.
6. As a corollary to requirements 1 and 2, ***multiple representations of the same data should be stored as closely together*** in the hierarchy as feasible.

What data is stored?

- **All reaction data stored currently in ENDF**
  - nuclear (n, TSL, charged particle, gammas)
  - atomic (e, gamma)
- **Covariance data**
  - all that is in current ENDF
  - requested areas (FPY, decays)
  - framework more general so possible in many more data types
- **Particle properties**
  - Decay data from ENDF
  - Atomic relaxation data from ENDF
  - potential for common, unified mass table
  - potential for level information (most requested new feature) … right now take from RIPL

The need to support all legacy ENDF data is implicit

Notable features of new format(s)

- Hierarchy is physics guided
- Not just one format, any hierarchical meta-format can be used (XML, JSON, HDF5, BOF, Python)
- Use of hyperlinks
- Derived & original data may coexist in same file
- Covariance/uncertainties near data
- Unified covariance framework
- Unified resonance framework based on ENDF LRF=7
- Potential for centralized particle properties
- Use of generic low level structures (equivalent but modern versions of ENDF TAB1, TAB2, etc.)

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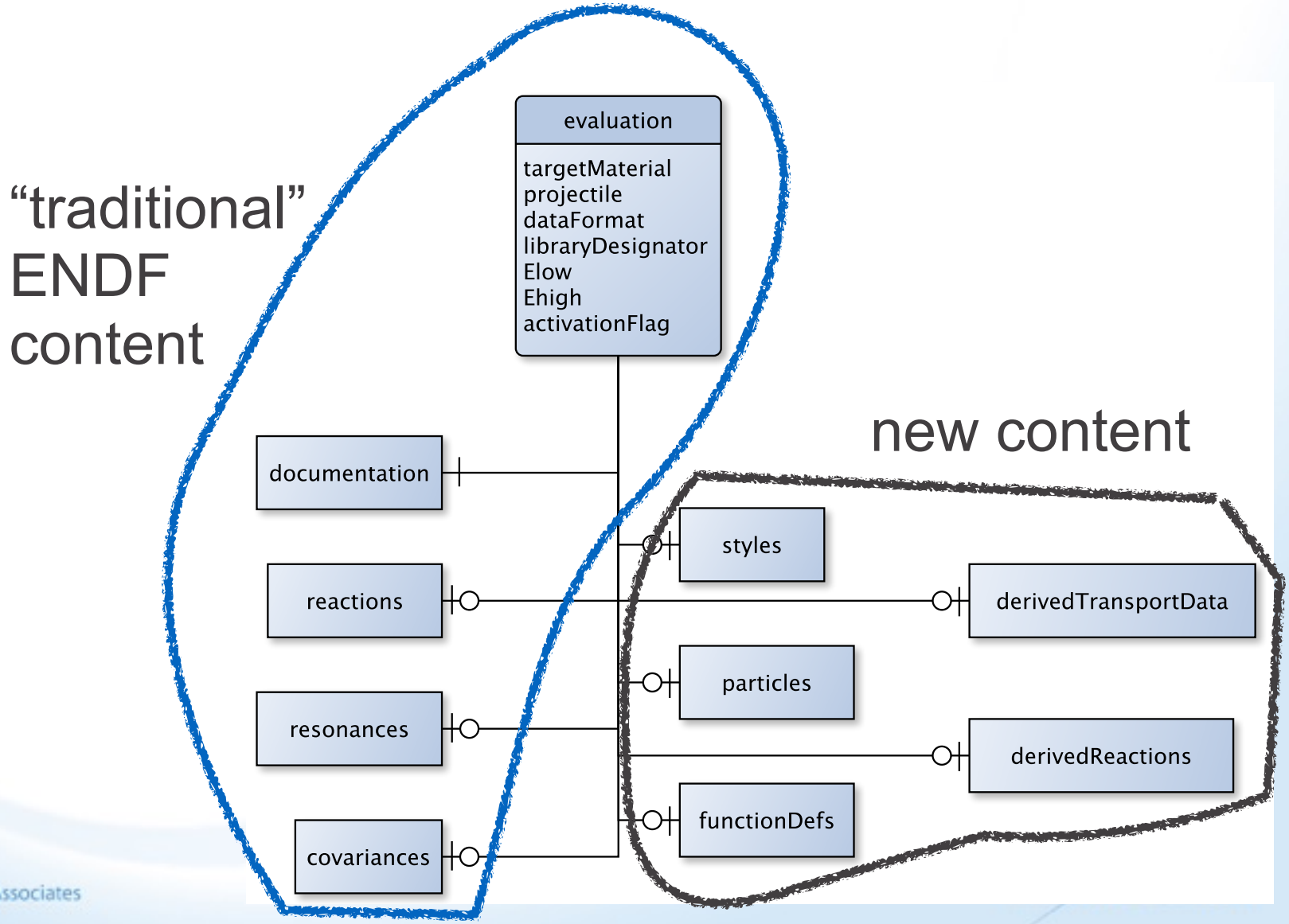
Organization of *reaction data*



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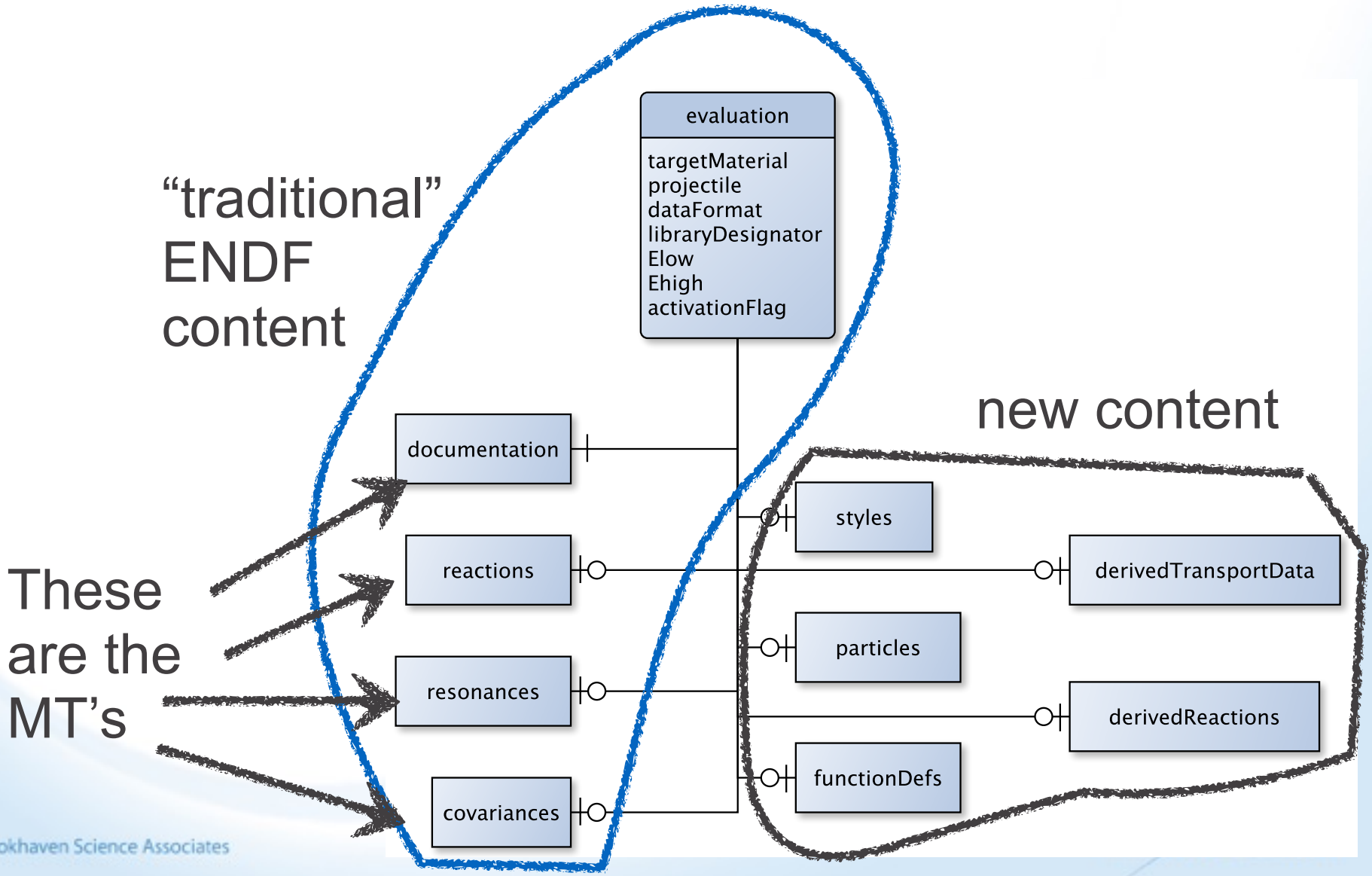
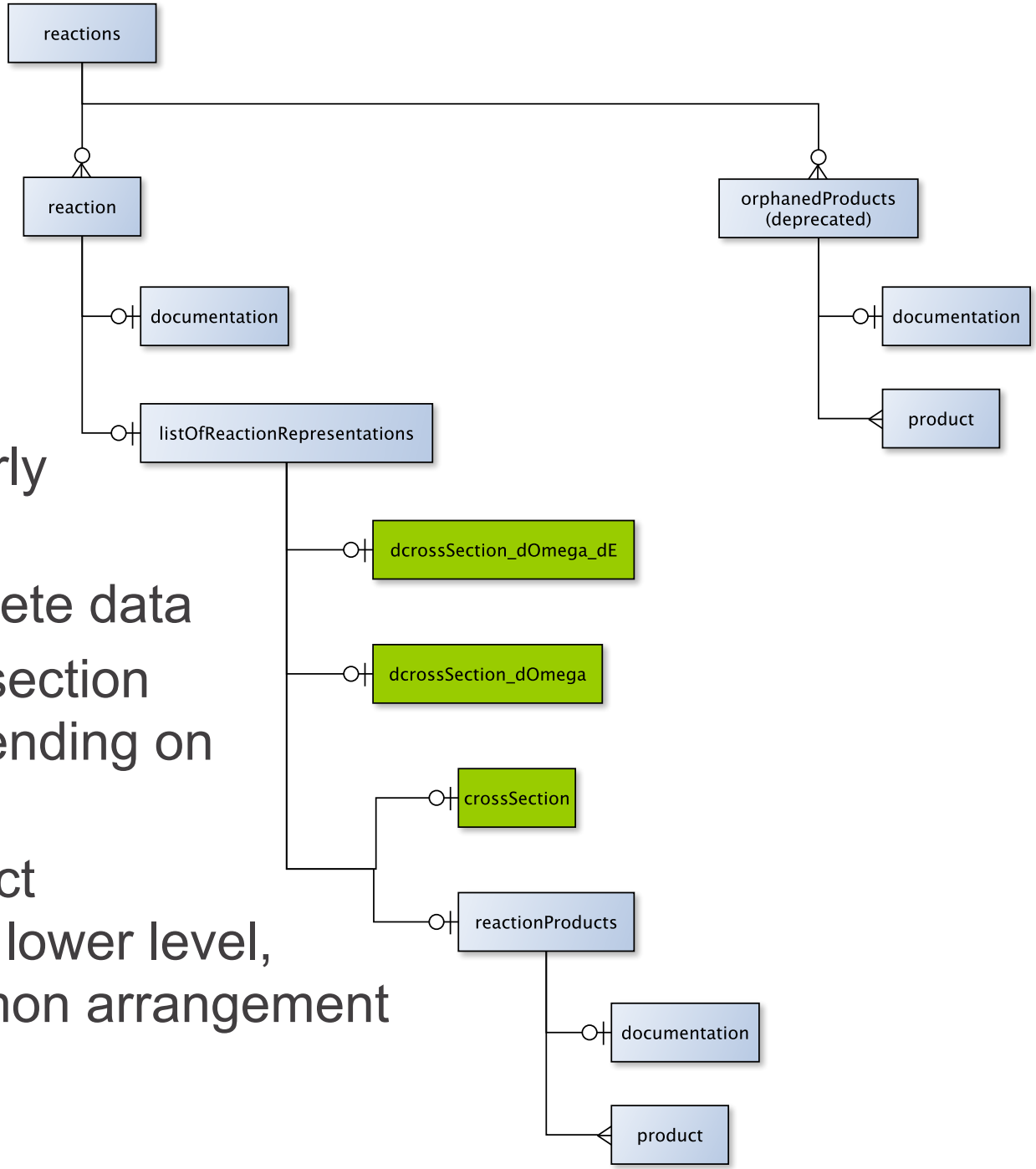


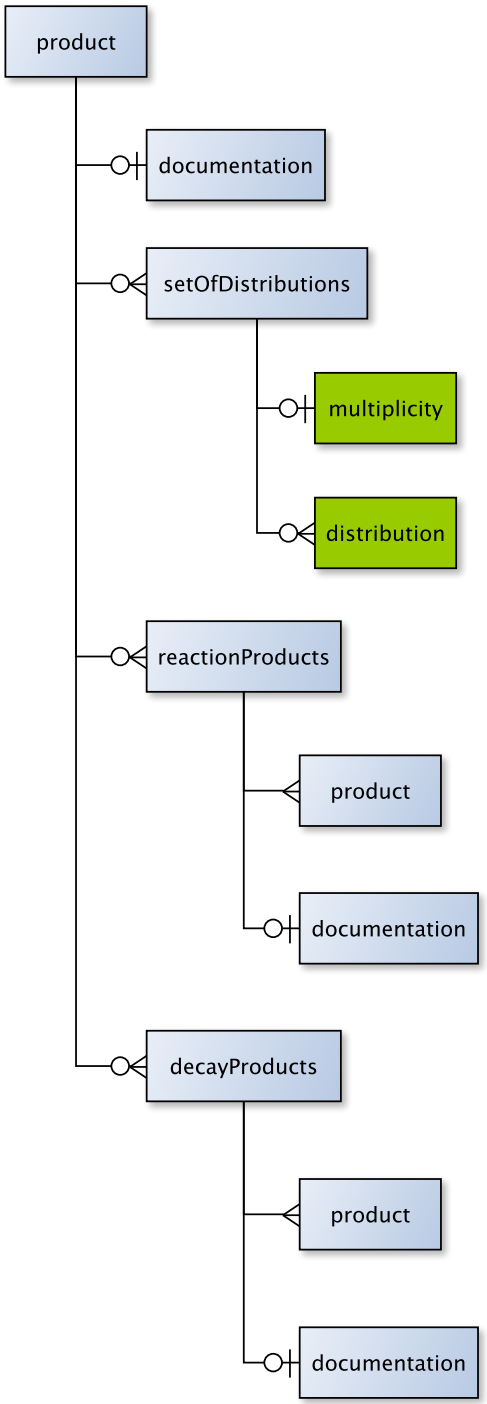
Drill into reactions

- Note: documentation allowed at nearly any level
- Place for obsolete data
- Various cross section schemes, depending on need
- Detailed product distributions at lower level, but have common arrangement



Drill further into product tree

- Products have
  - multiplicities (they may be constant)
  - all distributions P(E',m|E) (MF=6, LANGS; MF=4,5, MF=12,13,14,15)
- Reaction products can have reactionProducts or decayProducts underneath
  - This enables breakup reactions
  - Common scheme for decay data in particle properties and in reaction data



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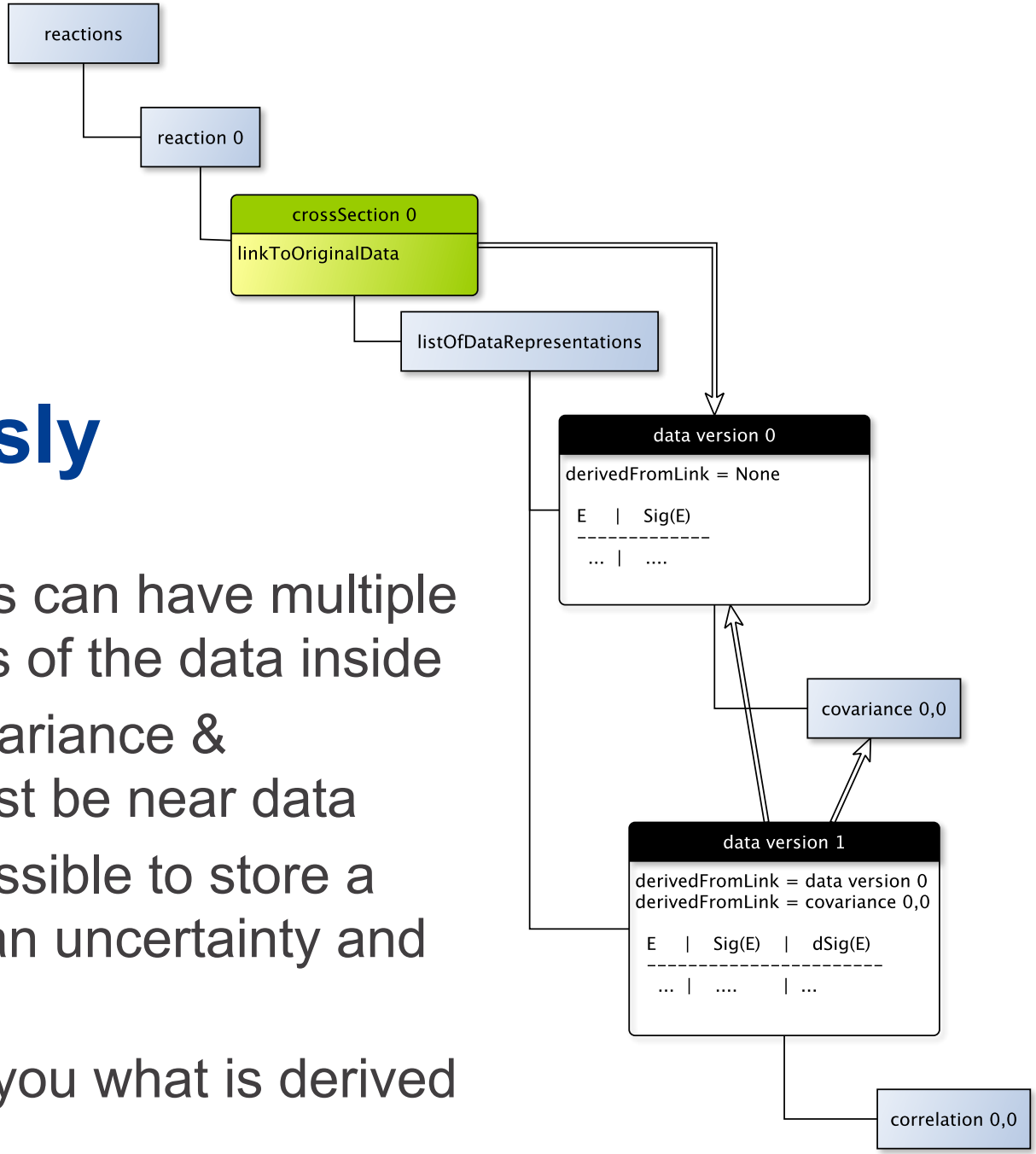
Sketch how to store different versions simultaneously



- Data containers can have multiple representations of the data inside
- If possible, covariance & uncertainty must be near data
- It should be possible to store a covariance or an uncertainty and correlation
- Hyperlinks tell you what is derived

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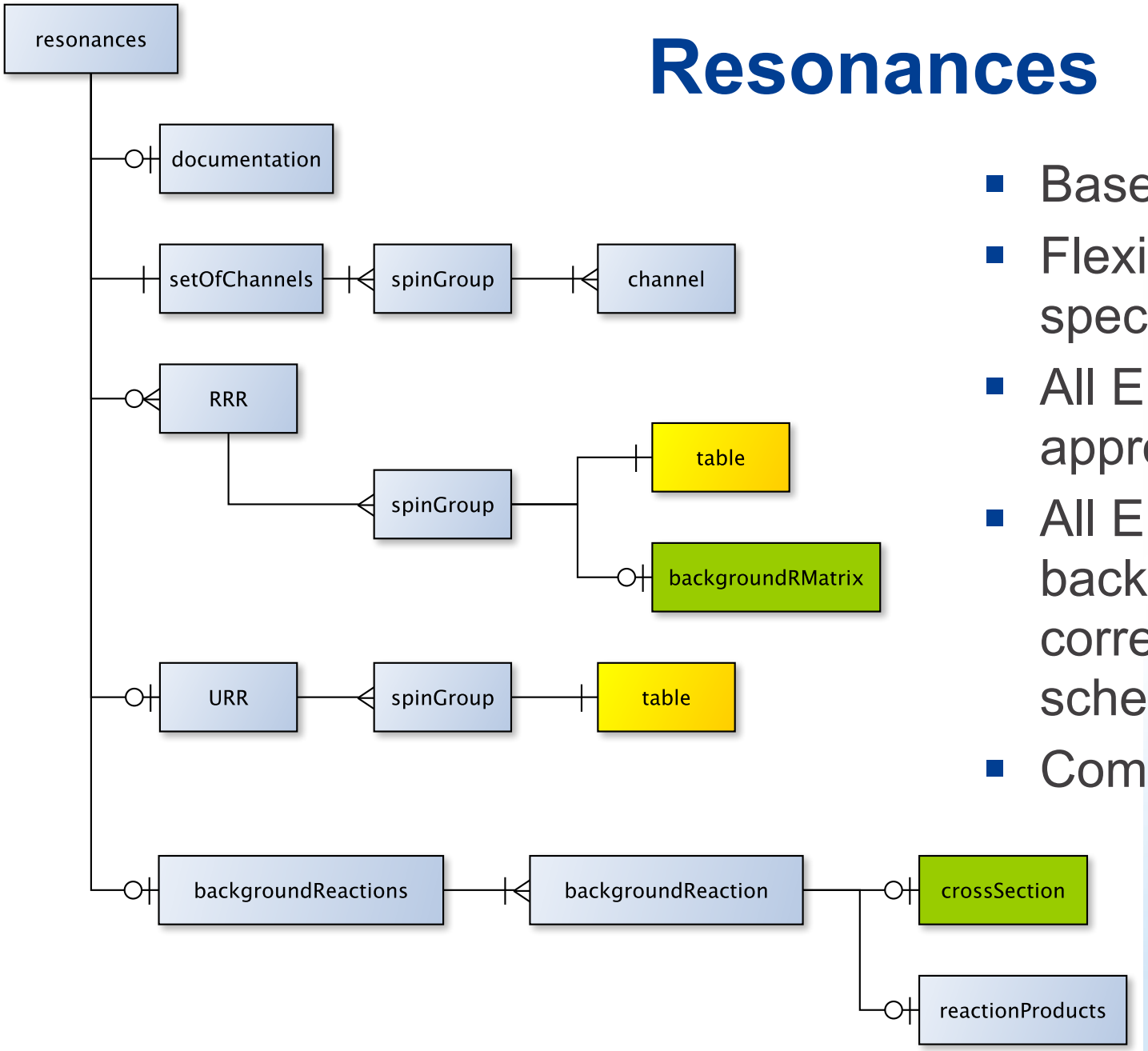
Resonances



- Based on LRF=7
- Flexible channel specification
- All ENDF approximations
- All ENDF background correction schemes
- Common format

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Specifications for *particle properties*

Requirements and specifications for a particle database

WPEC Subgroup 38

May 13, 2015

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Specification of *low level data containers*

General-Purpose Data Containers for Science and Engineering*

OECD/NEA/WPEC Subgroup 38

April 27, 2015

DRAFT

Hopefully we've captured your input see https://www.oecd-nea.org/science/wpec/sg38/top_level_hierarchy.pdf

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