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PDL service for Paris-Durham MHD Shock Code

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PDL: A QUICK OVERVIEW

- Parameter Description Language (PDL) is intended to be a lingua franca of parameters:
  - Describes params in a sufficient detail to allow workflow tools to check if parameters can be “piped” between services
    - Physical Properties (Nature, Meaning, unit, precision,...)
    - Computing (Numerical Type, UCD, SKOS concept)
  - Also has capabilities do describe constraints on parameters
    - Physical constraints
    - Arbitrary (including mathematical) constraints
- **Not** a description of parameters “values” (cf. UWS).

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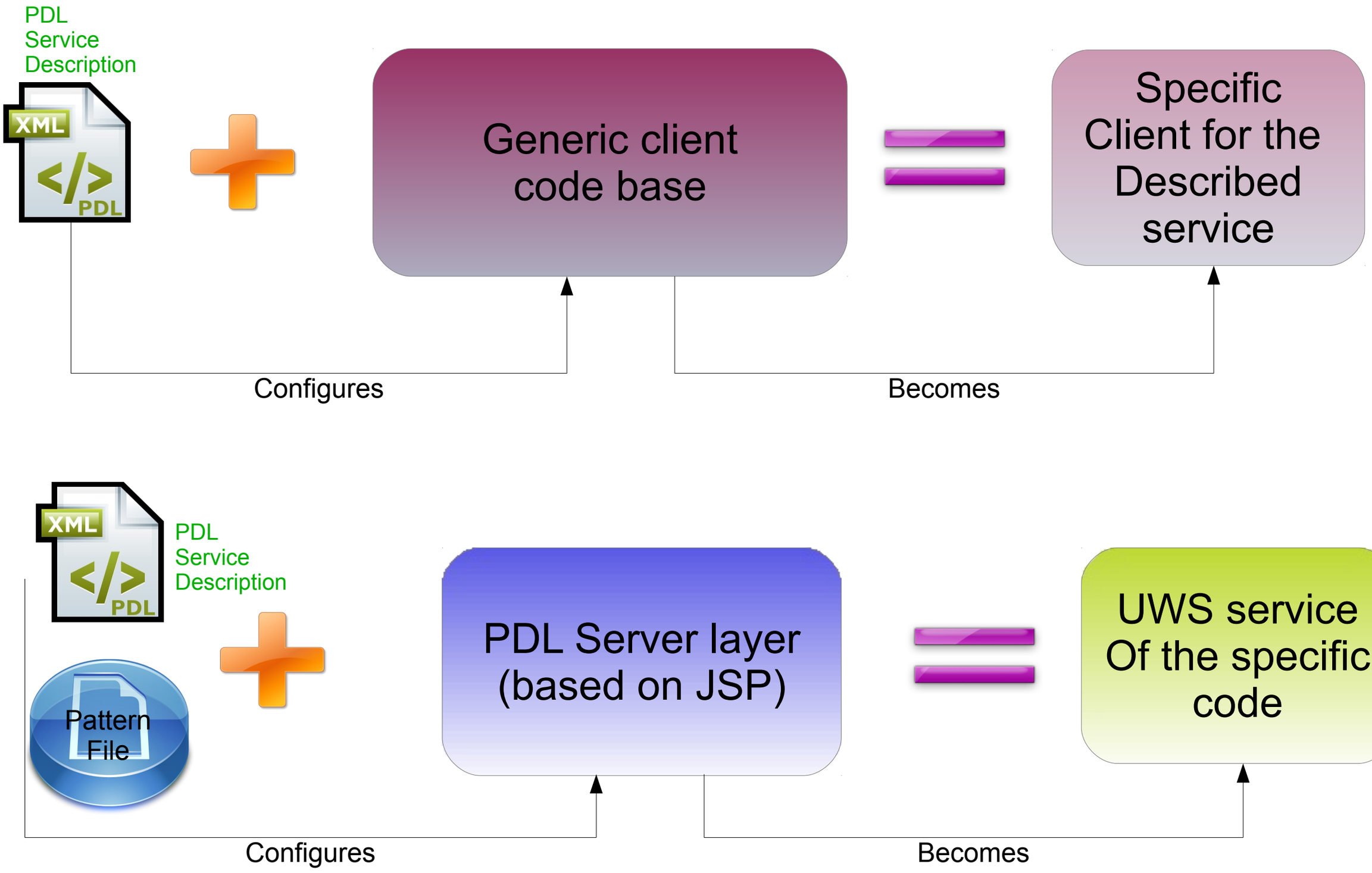
PDL based Framework				
Generic software components can be 'configured' by a PDL description for creating quickly fully interoperable new services				
Server exposing services as web services	User Interface (for interaction with PDL services)	Auto Generation of checking algorithms from description	Workflow plugin (for WF interaction with PDL services)	A priori computation of interoperability graphs

The PDL Client/Server : deploy a UWS compliant service in few clicks



The PDL Client/Server : deploy a UWS compliant service in few clicks using the PDL Framework

- The server
  - could run submitted jobs on
    - Server
    - Clusters
    - Grids
  - is based on JSP technology;
  - has a fully distributed architecture.
  - Interacts with the PDL client, but also with the PDL Workflows plugins.

On the exposed code

The interstellar medium (ISM)

- The Interstellar medium is constantly out of equilibrium, as it is permanently subject to energy injections in different forms :
  - **Mechanical**, with for instance the propagation of shock waves that accompany the formation and death of certain types of stars
  - UV radiation, emitted by the massive stars of the Galaxy
  - More energetic radiations : X-rays, and cosmic “rays”

- We provide a model to study the propagation of shocks in a relatively dense and molecular medium, best-suited to yield constraints on physical and chemical conditions around young stars of any kind, and old supernova remnants.

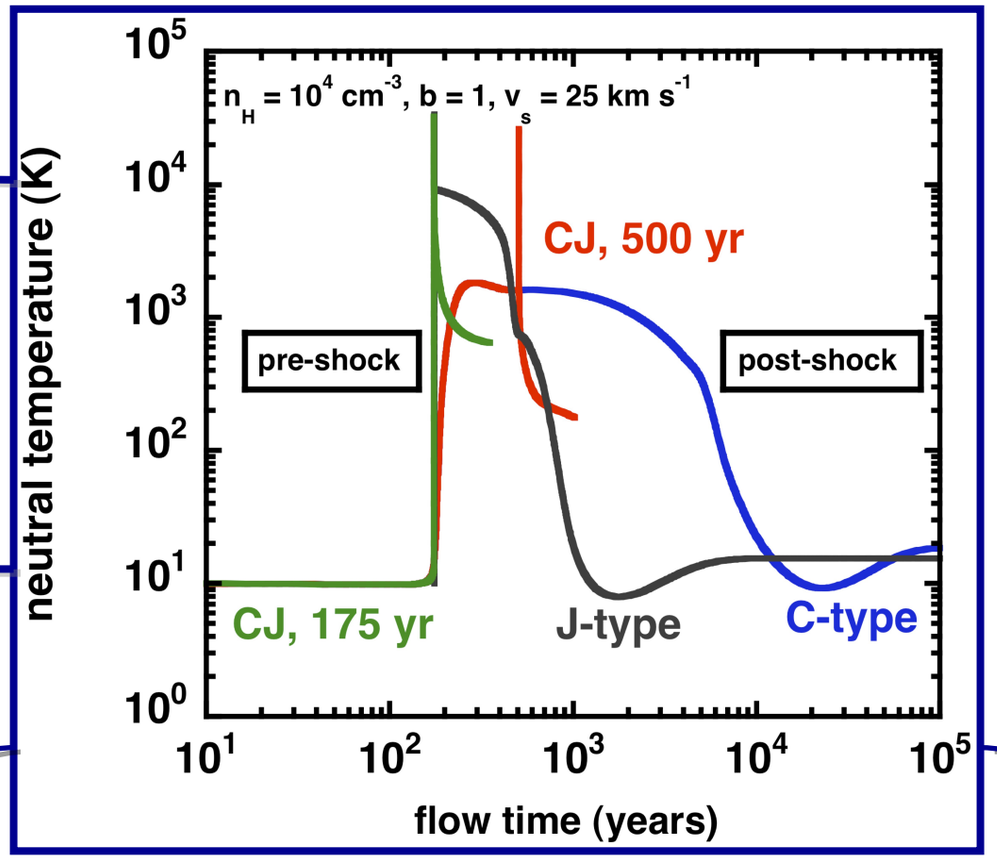
- In turn, such constraints:
  - Help us to understand the physics and chemistry at work in the ISM
  - Provide better insights on star formation scenarios
  - Provide an accurate knowledge on the ISM composition near supernova remnants, supporting cosmic rays-related questions
  - Allow to assess the contribution of shocks to the energetic balance of the Milky Way and of other galaxies

Comparing observations with models: our method

MHD shock code
- 1D stationary (C,J)
- 1D approximated non stationary (CJ)

Inputs: type, b, n_H, v_s, (age if CJ)

Constraints on the inputs



macro physics:
Conservation equations
Source terms, ρ, v, T

micro physics:
H_2, chemistry,
grains (physics & chemistry)

Outputs: physical and chemical structure

Radiation transfer
LVG: emissivities, level population at each point of the shock

Consistent comparisons with the observations

- **H_2 excitation diagrams**
- **CO integrated intensity diagrams**