



CATS

**Coherent set of
Astrophysical
Tools for
Spectroscopy**

Peter Schilke

Goal

Provide data and tools to facilitate usage of (pre-existing) models and allow meaningful comparison with (ALMA) data

Motivation

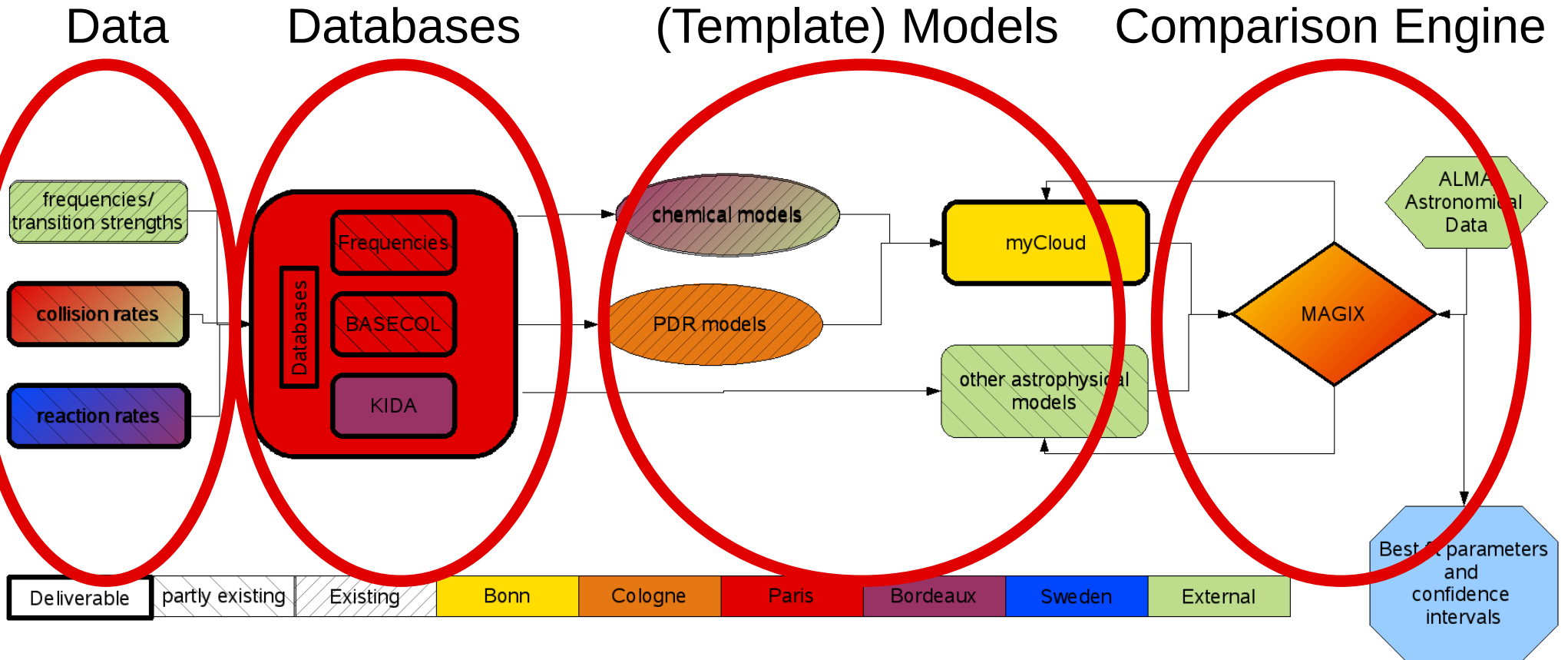
- New instruments will produce data in large quantities, and with high quality
- Physical and chemical models do exist, but are
 - Not easily accessible to everybody
 - Not adapted to the quality and quantity of data
 - Not make for easy comparison with data
 - Often fit to data is made “by eye”
 - No estimates of parameter confidence intervals

⇒ **Between data taking and interpretation there is a bottleneck**

TEAM

- Peter Schilke (U Cologne/MPIfR)
 - Thomas Möller
 - Irina Bernst
 - Despina Panoglou (from Oct 15 on)
- Marie-Lise Dubernet (Obs Paris)
- Gunnar Nyman (U Gothenburg)

Structure



Data

- Molecular collision rates (France)
 - HCN+vib
 - CH₃CN
- Molecular reaction rates (Sweden)
 - SO+O
 - CS+O
- Molecular frequencies (Cologne) – not part of CATS, but will happen anyway

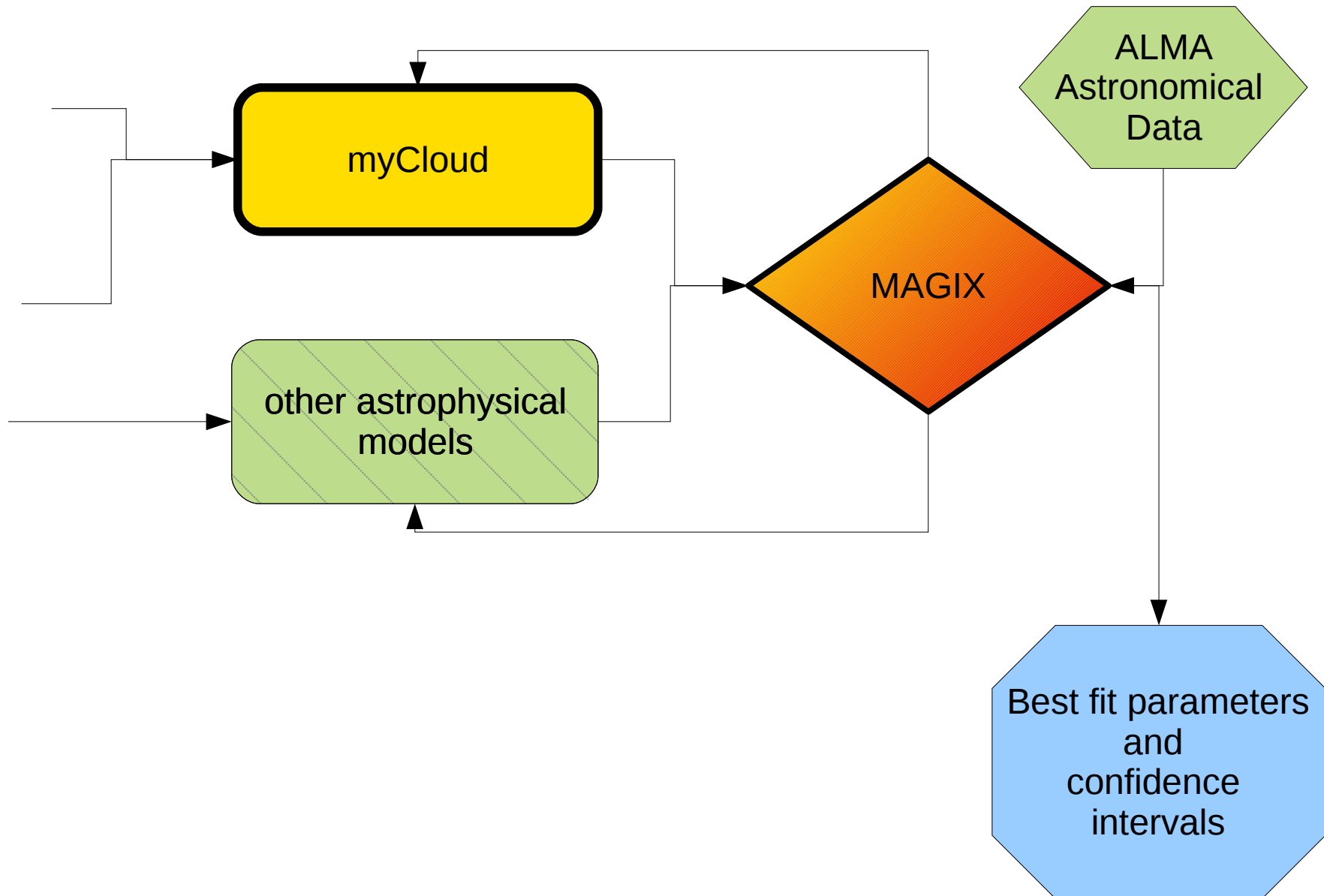
Databases

- VO compatibility + tools
- BASECOL (Paris)
 - Collision rates
 - [Molecular Frequencies]
- KIDA (Bordeaux)
 - Chemical reaction data base

(Template) Models

- Interfacing existing models to RT models
 - Nahoon (chemical model, Bordeaux)
 - KOSMA- τ (PDR model, Cologne)
- Template models
 - myXCLASS: multi-molecule, 1-d
 - myCloud: multi-molecule, 3-d
 - ARTIST and STAR FORMAT models and data bases
 - (RATRAN)
 - <insert your favorite model here>

Comparison Engine



MAGIX

- Application 1: synthetic datacubes
 - Will take (parametrized) model
 - Will create “observed” synthetic data cube
 - Will compare with observed data cube
 - Will modify model parameters
 - etc.
 - Will produce best fit model and confidence intervals

MAGIX

- Application 2: model data bases
 - Will compute figure of merit for models in the data base with observations
 - Will output best model, with some kind of quality assessment

MAGIX issues

- How to extract observables from models
 - Not obvious for e.g. Hydrodynamic calculations
- How to determine figure of merit
 - χ^2 for data cubes
 - Power spectrum
 - ...
- Robust algorithms for finding best fit and confidence levels
- Versatile interfaces for external models
 - Prototype DALIA (Frédéric Boone)

Status

- Prototype with Levenberg-Marquardt and simulated annealing algorithms exists
- Can be embedded in CASA
- Based on XML description of models and data
- Under development
 - More algorithms
 - More templates
 - Mechanism for determining confidence intervals
 - Parallelization
- Will be made publicly available

Conclusion

- CATS is an interface
- Depends on plug-ins (Models, Model databases)
- We're wide open to collaborations

