JDemetra+

an open framework for seasonal adjustment and time series methods for official statistics

ESTP training

Outline

- Objectives of JDemetra+ (JD+)
  - General
  - For seasonal adjustment (SA)
- What is really JD+ ?
- Architecture, design
- Seasonal adjustment framework
  - Overview, pre-processing, decomposition
- State space framework
  - Goals, overview
- Some examples
- Final remarks

General Objectives

- Providing algorithms for the production/analysis of [official] statistics
  - Regular time series (from monthly to yearly)
  - Algorithms for
    - Seasonal adjustment, business cycle analysis
    - Benchmarking, temporal disaggregation
    - Modelling (forecasting, estimation of missing values, outliers detection)
- Reusable modules, compatible with common IT infrastructure
  - Java, WEB services...
- Designed for the whole statistical process
  - From research to bulk production (flexible, high-performance)
- Maintainable
  - Open source solution

Objectives for SA

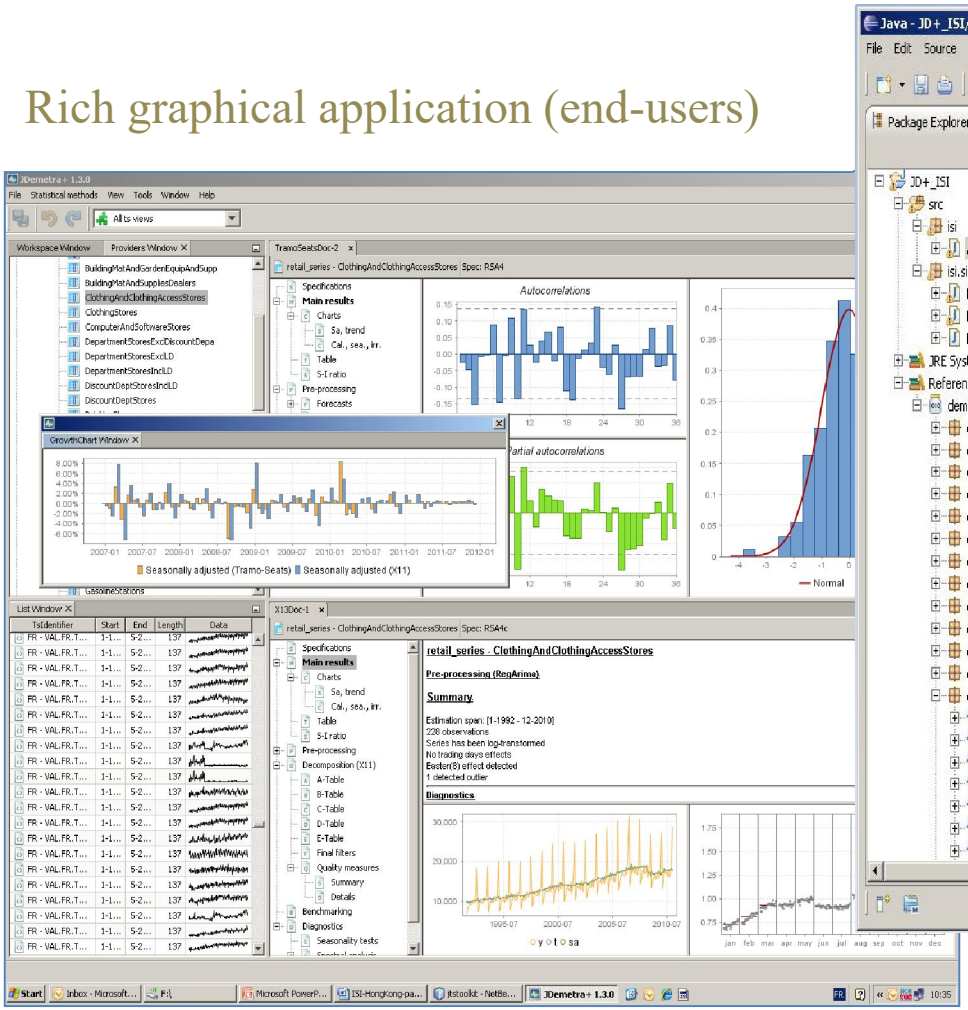
- Java implementation of the leading algorithms
  - Tramo-Seats, X12-ARIMA...
- Flexible design
  - Easier modifications of the core engines
  - Developments of additional tools/algorithms

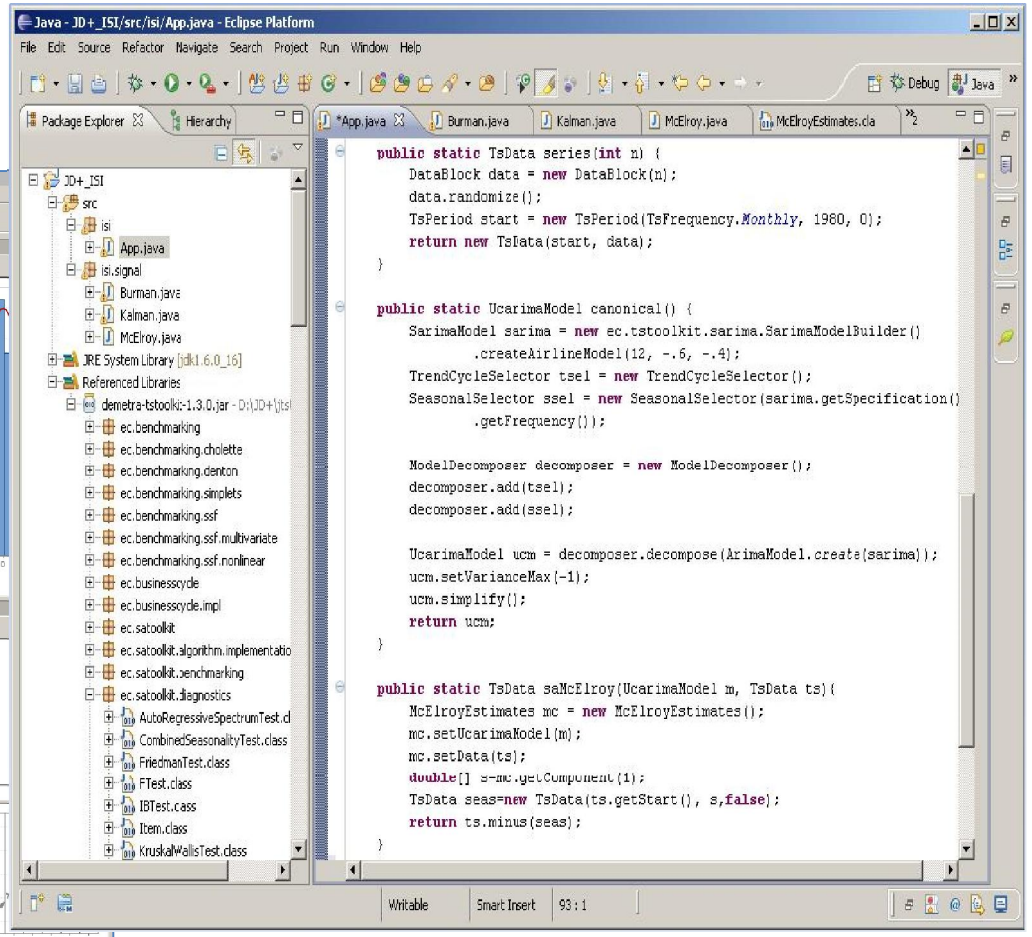
- Challenge
  - Keeping
    - similar results
    - high performances
  - with
    - flexible (more general) design and algorithms
    - slower technical solution

What is JD+ (I) ?

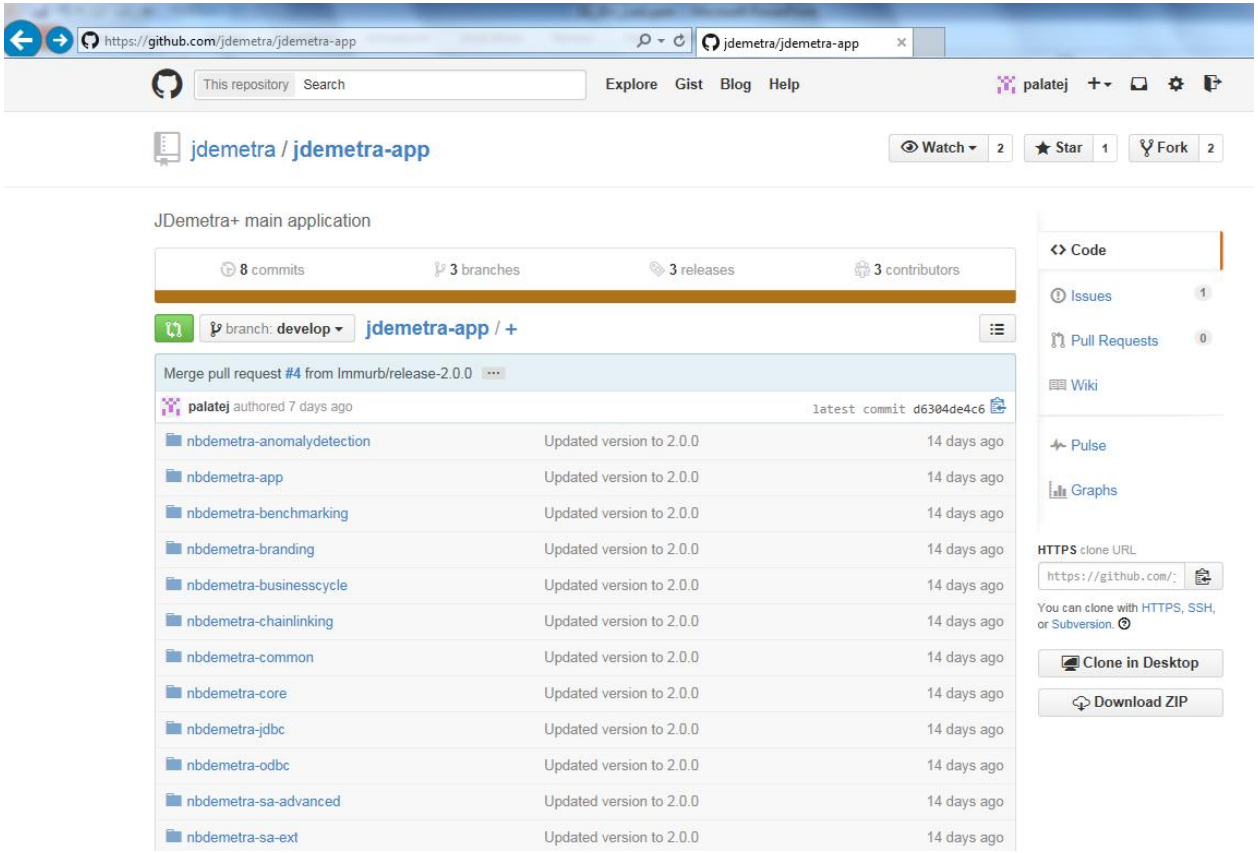
Advanced Java toolkit for time series (SA) processing (IT-teams, researchers)

Rich graphical application (end-users)





What is JD+ ?
(II)



https://github.com/jdemetra

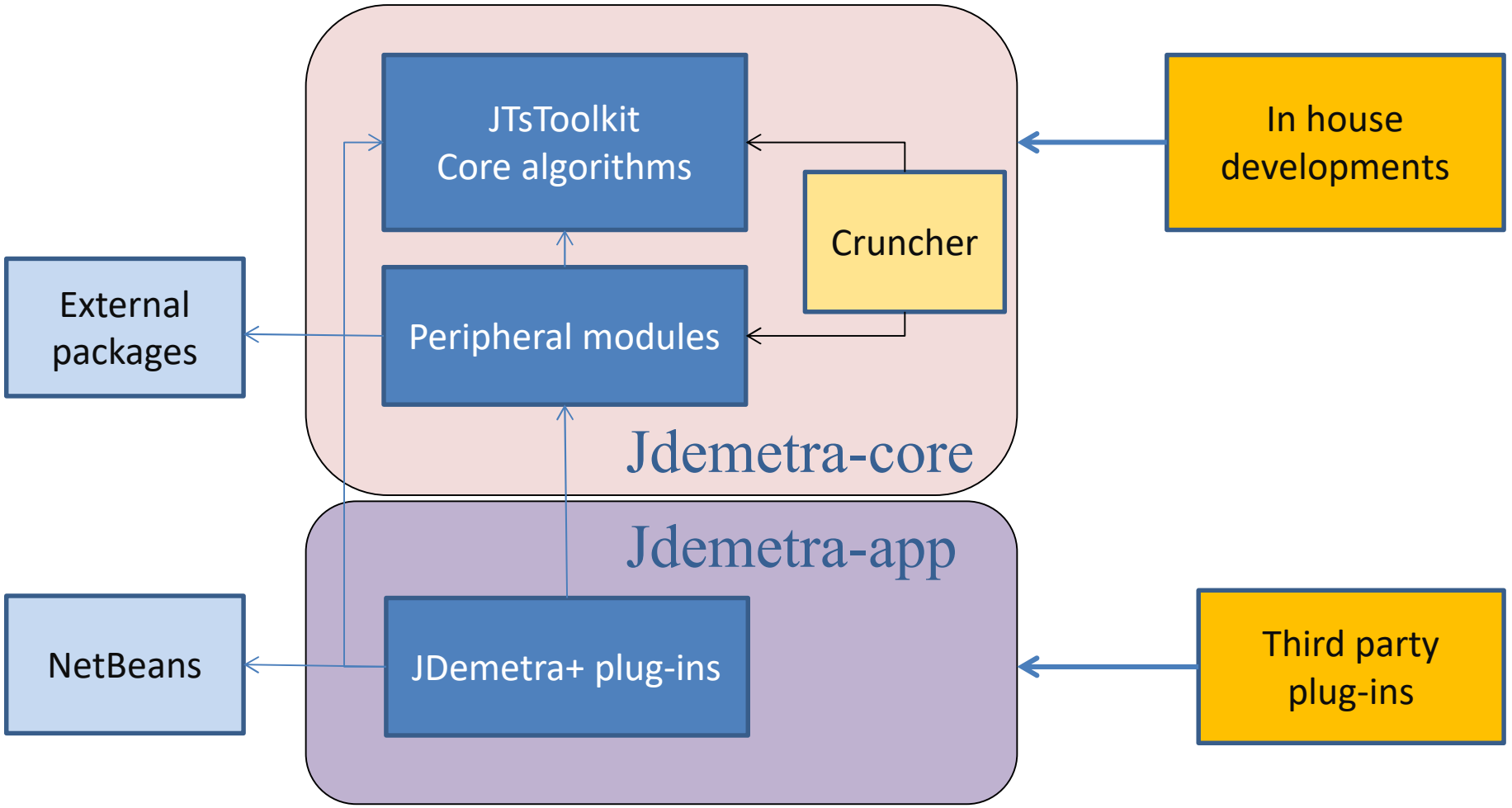
Open Source project (EUPL license)

- Supported by Eurostat

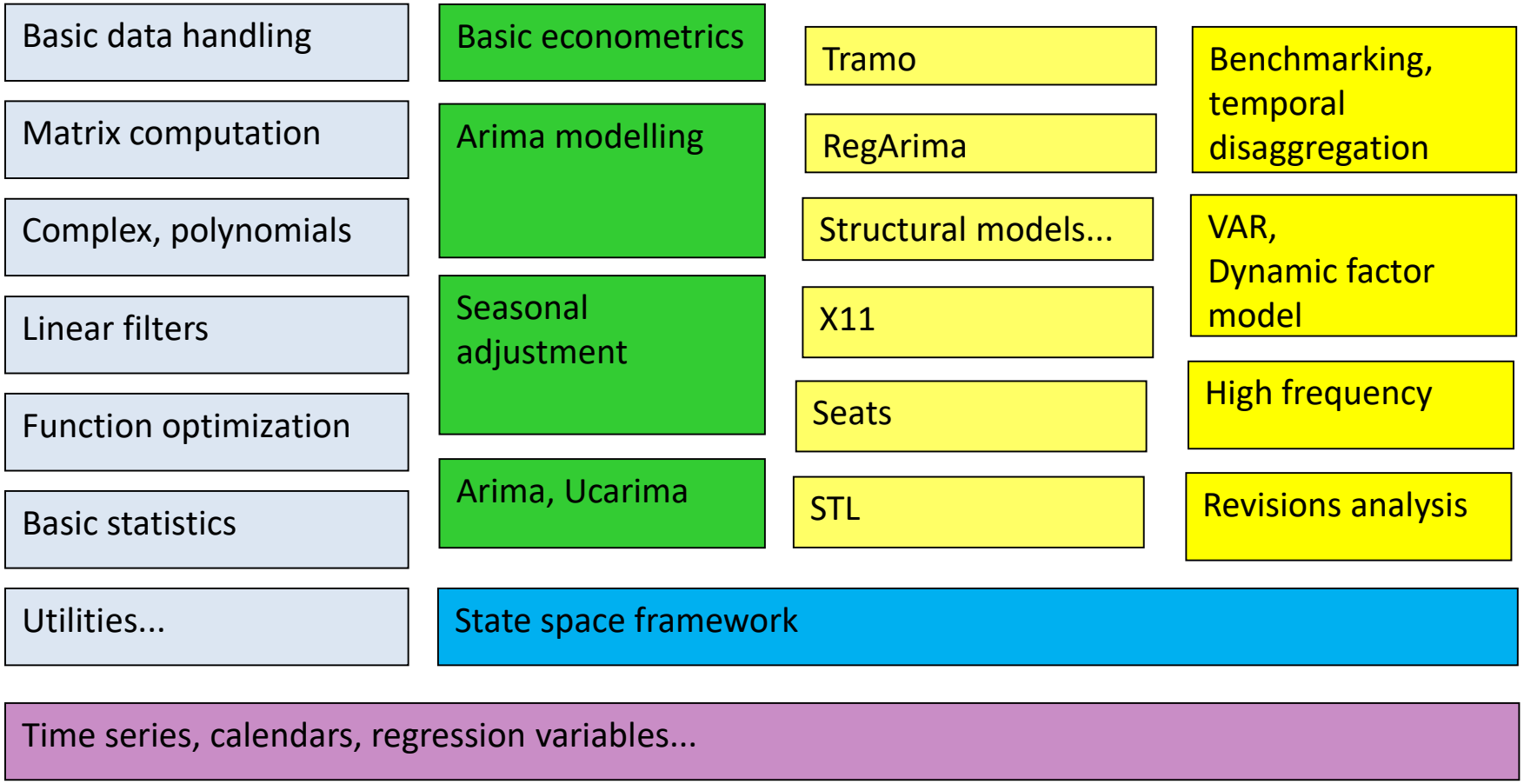
- Developers:
  - NBB
  - Bundesbank
  - ...

- Originally based on:
  - Tramo-Seats (BDE)
  - X12-Arima (USCB)

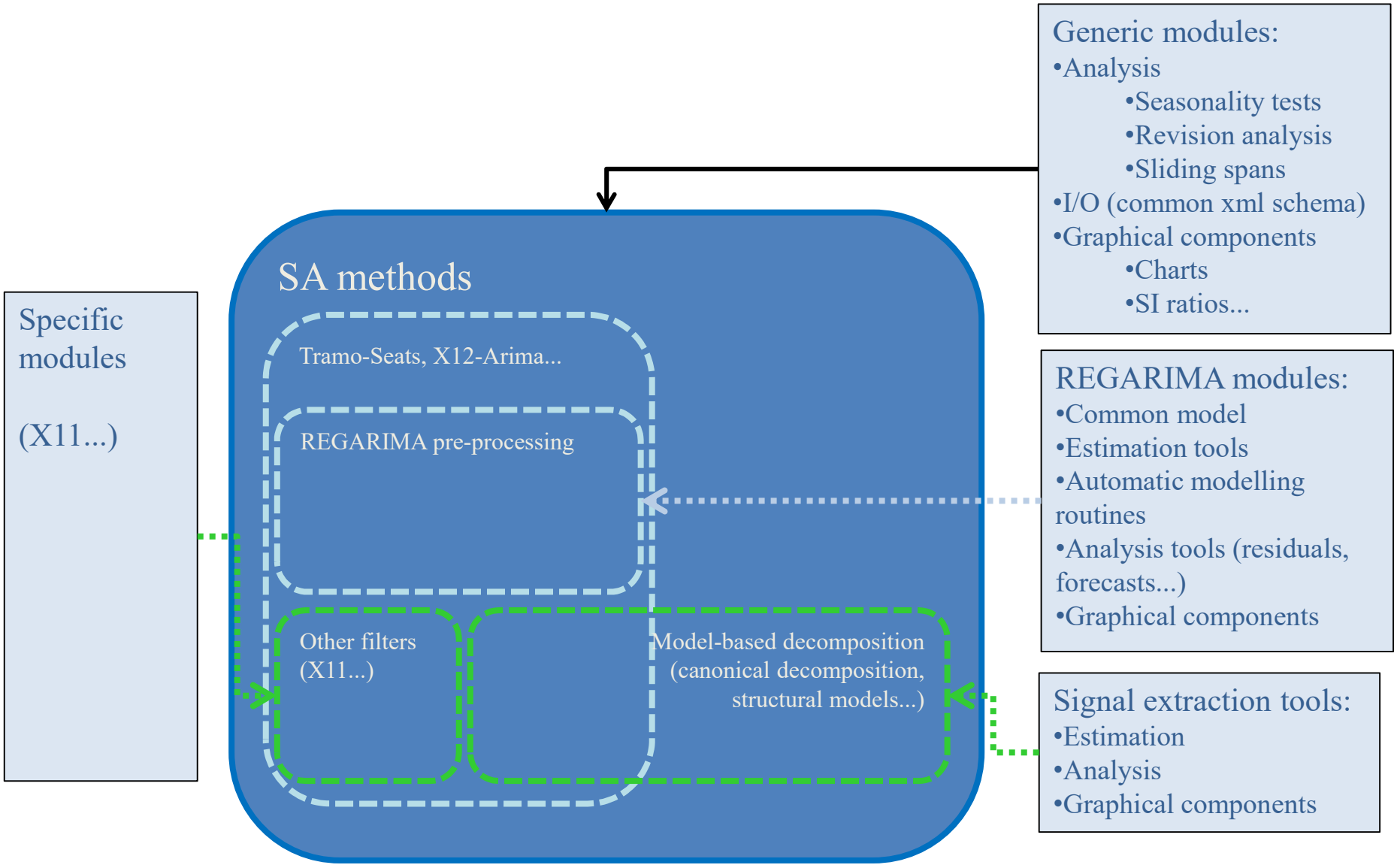
Architecture (I)



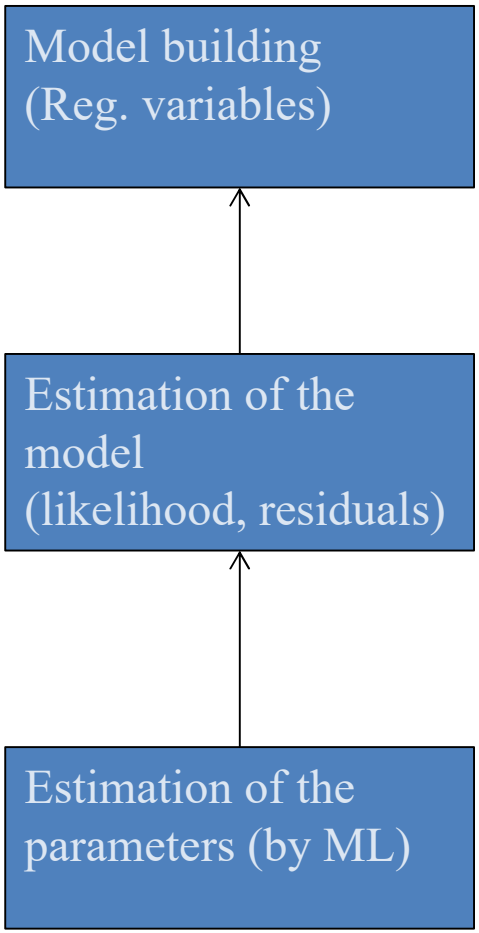
Architecture (II). Algorithmic libraries



Seasonal adjustment framework



REGARIMA modelling



- Common definitions for Calendar variables, outliers, intervention variables, user variables...

- Algorithms for likelihood estimation
  - Kalman filter (Tramo-like),
  - Ansley algorithm (Cholesky on banded matrix)
  - (modified) Ljung-Box algorithm (X12-like)
- Equivalent results, different performances
- JD+ uses Kalman filter
  - Up to 4 x faster than Ljung-Box
  - Ansley in specific cases (outliers detection)

- Optimization procedure
  - Levenberg-Marquardt. Tramo-Seats, X12 and JD+ use slightly different variants.

Final remarks

- JD+ is a complete re-factoring of Tramo-Seats an of X12-Arima in an open OO framework. In some cases, the new algorithms may lead to (usually slightly) different results .

- JD+ is also designed for the handling of related time series problems, especially through a rich state space library.

- By developing it as an open source solution, we have tried to create an environment appropriate to external collaborations.