DGFI Orbit Determination and Geodetic Parameter Estimation Software - DOGS

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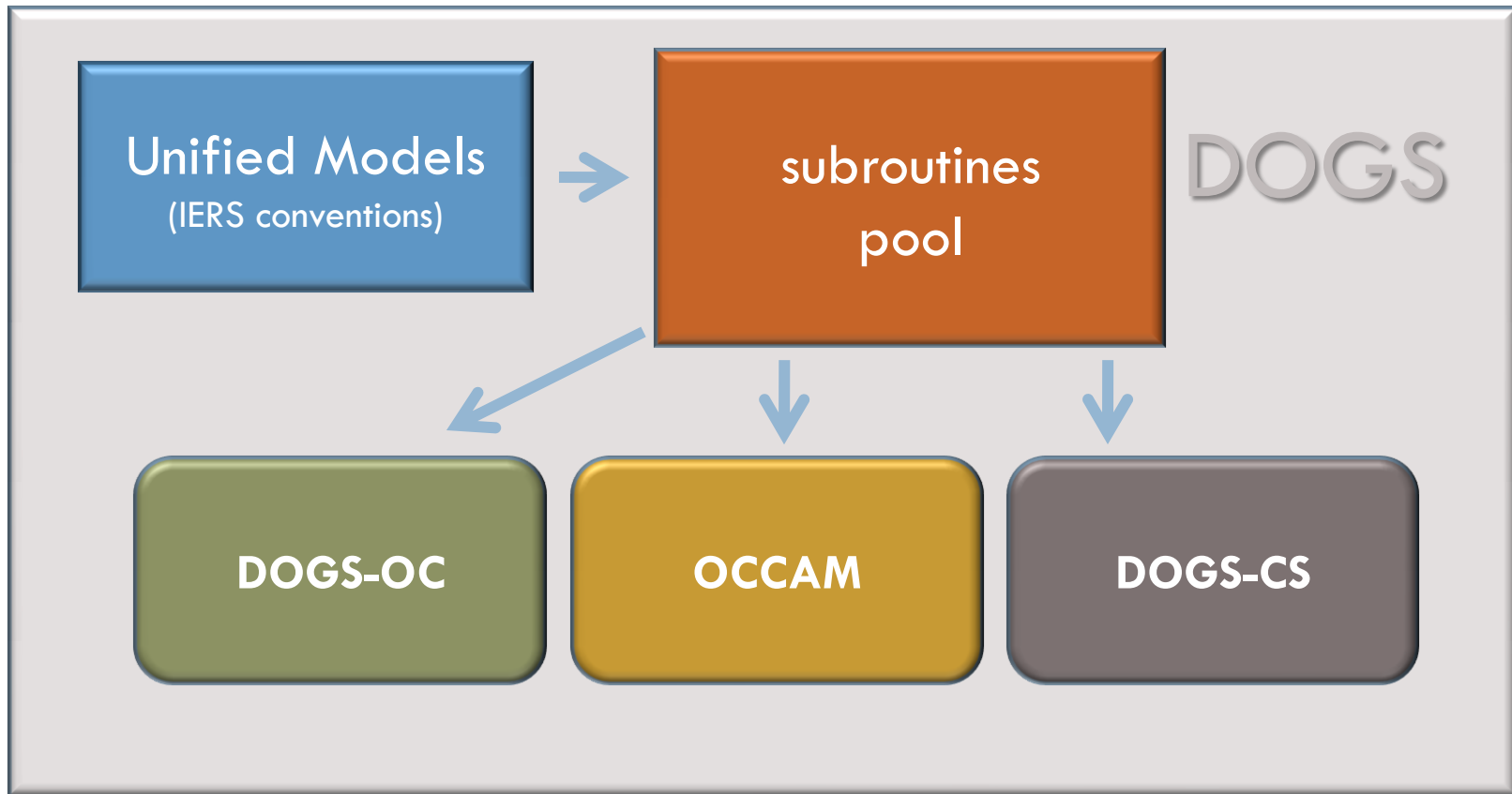
Software packages

- **DOGS-OC:** SLR observation analysis software

- **DOGS-CS:** combination software

- **OCCAM:** OCCAM VLBI software transformed to Fortran2003 and adopted to the DOGS standards

- Different small programs for format transformations

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Software packages

DOGS-OC

- Software for the solution of differential equations of satellite orbits and perturbation equations of model parameters

  - allows for the analysis of different observation types, but
  - only SLR observation analysis is state-of-the-art
    - Lageos 1/2, Ajisai, Starlette, Stella, Etalon, …
  - program iterates the two steps:
    - 1 - numerical integration of Kepler and variational equations
    - 2 - least-squares adjustment in order to improve orbit and model parameters

OCCAM

- FORTRAN-coded VLBI analysis software

  - computes theoretical delays and corrections on the observed delays according to IERS Conventions
  - theoretical and observed delays are adjusted by robust parameter estimation, Kalman Filtering or Least Squares Collocation
  - possible parameters:
    - baseline lengths and station coordinates (with terrestrial datum),
    - source positions (with celestial datum),
    - EOP (Celestial Pole Offsets, Polar Motion, dUT1)
    - tropospheric parameters
    - Love numbers and the γ-parameter of the parameterized post-Newtonian (PPN) formalism can be estimated by some versions
  - developed by various authors or groups, independent versions used by various IVS ACs (AISP, AUS, DGFI, IGG, IAA, PUL)

DOGS-CS

□ Combination Software

    □ philosophy: combination of constraint free normal equations

    □ software options:

- handling of **systems of equations** : observation equations, normal equations, elimination equations, reduction and back-substitution equations

- handling of **parameters** (variables, apriori values)

- handling of **parameter functions**: time series, linear and trigonometric functions

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DOGS-CS

- Combination Software
  - Options:
    - transformation from SINEX to DOGS-CS format and vice versa
    - Operations on systems of equations:
      - Addition
      - Elimination
      - Reduction and back-substitution
      - Inversion and eigendecomposition
    - Diverse condition equations
    - Introduction of parameters and change of the mathematical model of parameter functions
      - rates
      - similarity transformation parameters
      - sine/cosine amplitudes
    - Independent from parameter types
    - meta data information is stored directly in the binary file of the equations

Independent Fortran2003 programs that can be combined individually (in scripts/programs)

→ High flexibility

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Where DOGS is used?

- **DOGS – OC:** ILRS AC @ DGFI

- **OCCAM:** IVS AC @ DGFI

- **DOGS – CS:** ITRS CC @ DGFI

        IVS CC @ IGG, Bonn

        now IVS CC @ BKG/DGFI

        IVS AC @ DGFI

        IVS AC @ IGG, Vienna