

DGFI Orbit Determination and Geodetic Parameter Estimation Software - DOGS

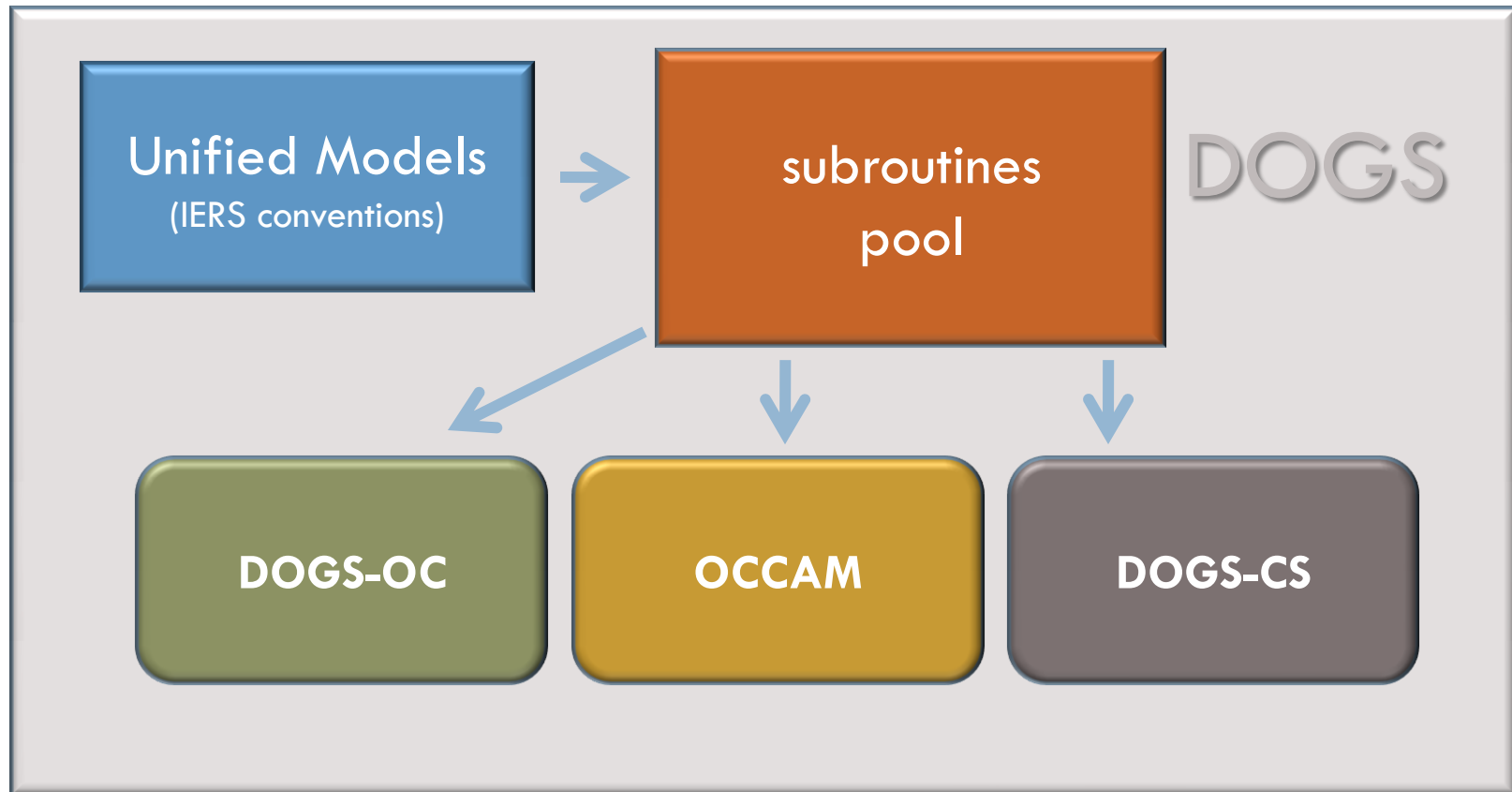
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Workshop on Combination on observation level,
21./22.10.09, Warsaw

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

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



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



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

