



Orekit Development Status

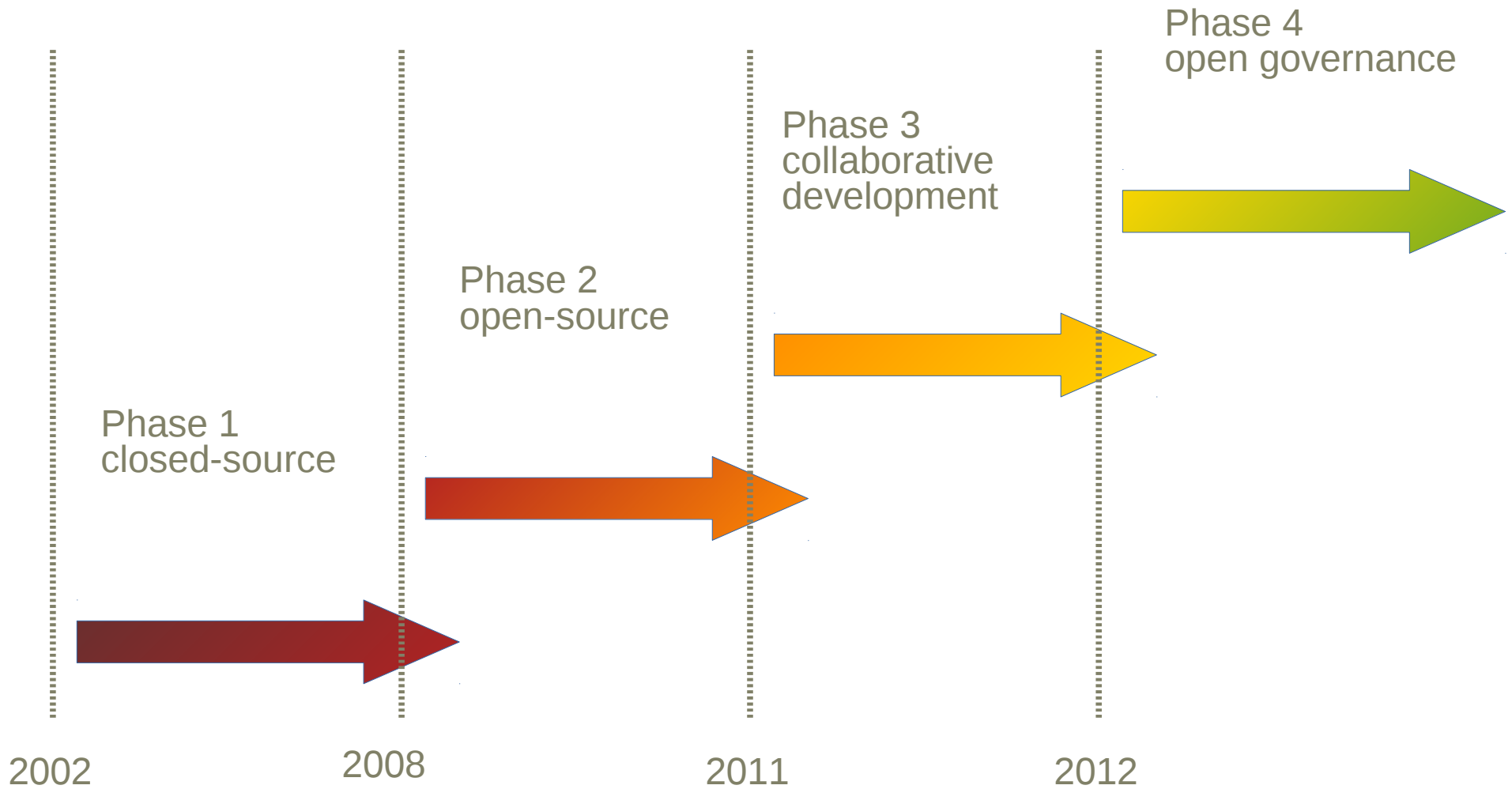
Orekit PMC: Paul Cefola (University Buffalo), Frank Dreger (ESOC), Nicolas Frouvelle (CS), Hank Grabowski (ADS), Sébastien Herbinière (TAS), Stéphanie Lizy-Destrez (ISAE), Luc Maisonobe (CS), Guillermo Ortega (ESTEC), Pascal Parraud (CS), Evan Ward (NRL)



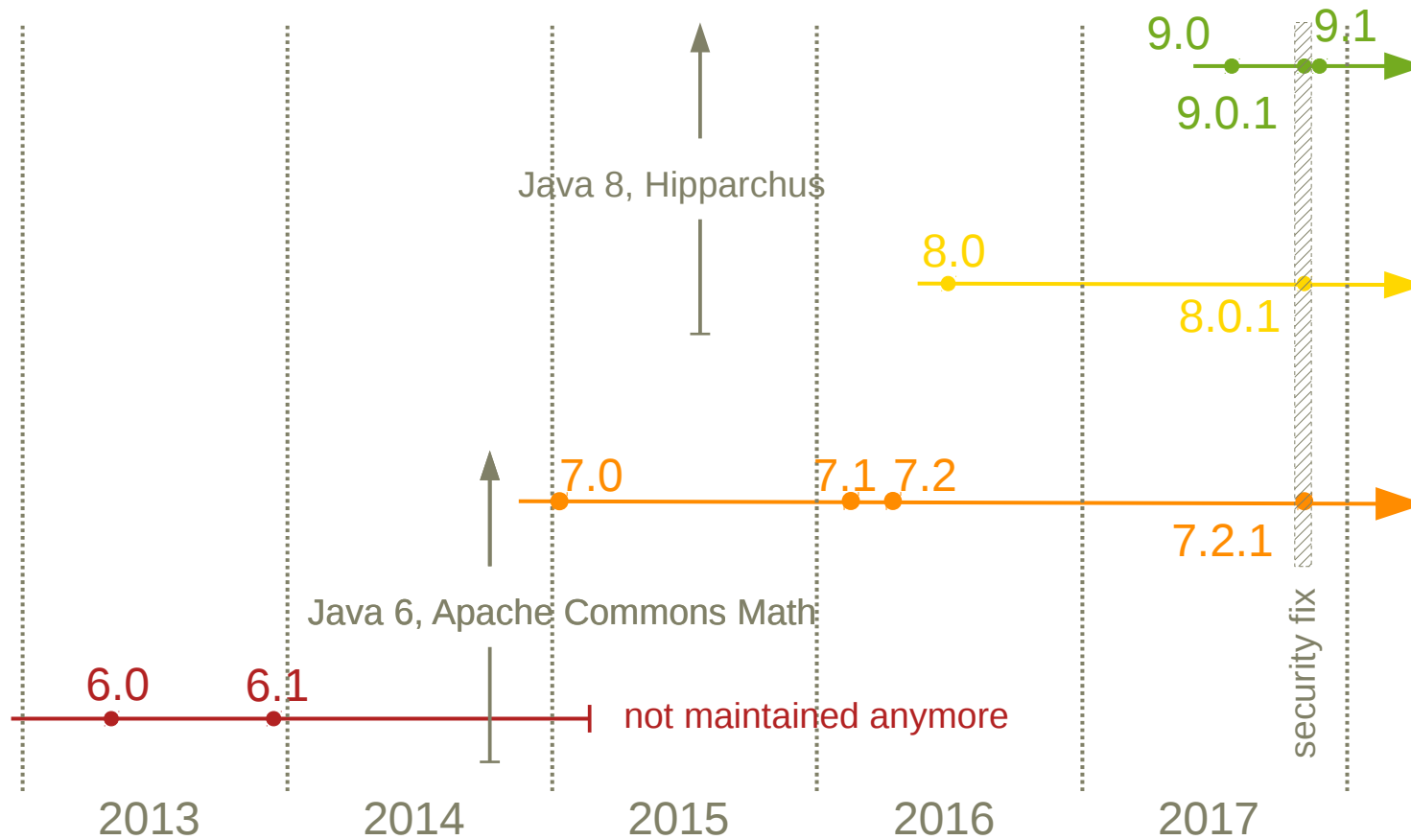
Agenda

- History
- Recent releases
- Major features
- Project organisation
- Trends

History



Recent releases



Major features

- 6.X series
 - DSST propagator with mean elements
 - Jacobians
- 7.X series
 - DSST with short periodic terms
 - Second order derivatives for many models
- 8.X series
 - Switch to Hipparchus and Java 8
 - Orbit determination
- 9.X series
 - Field propagators
 - GNSS/very high precision

Orbit Determination

- Weighted Batch least square in 8.0
 - measurements: range, range-rate, az/el, PV
 - parameters: orbit (even partial elts), drag, SRP, station position, biases
- New models in 9.x
 - measurements: turn-around, α/δ , intersat range
 - parameters: EOP, parametric acceleration
 - multi-sat orbit determination (see later)
 - fast handling of tens of thousands of measurements
 - ground points displacements
- Upcoming
 - Kalman (probably 9.2 very soon)

Field propagators (1/3)

```
double f(double x, double y) {  
    if (x > 0) {  
        return x + g(y);  
    } else {  
        return x - g(y);  
    }  
}
```

double based computation



```
T f(T x, T y) {  
    if (x.getReal() > 0) {  
        return x.add(g(y));  
    } else {  
        return x.subtract(g(y));  
    }  
}
```

field based computation

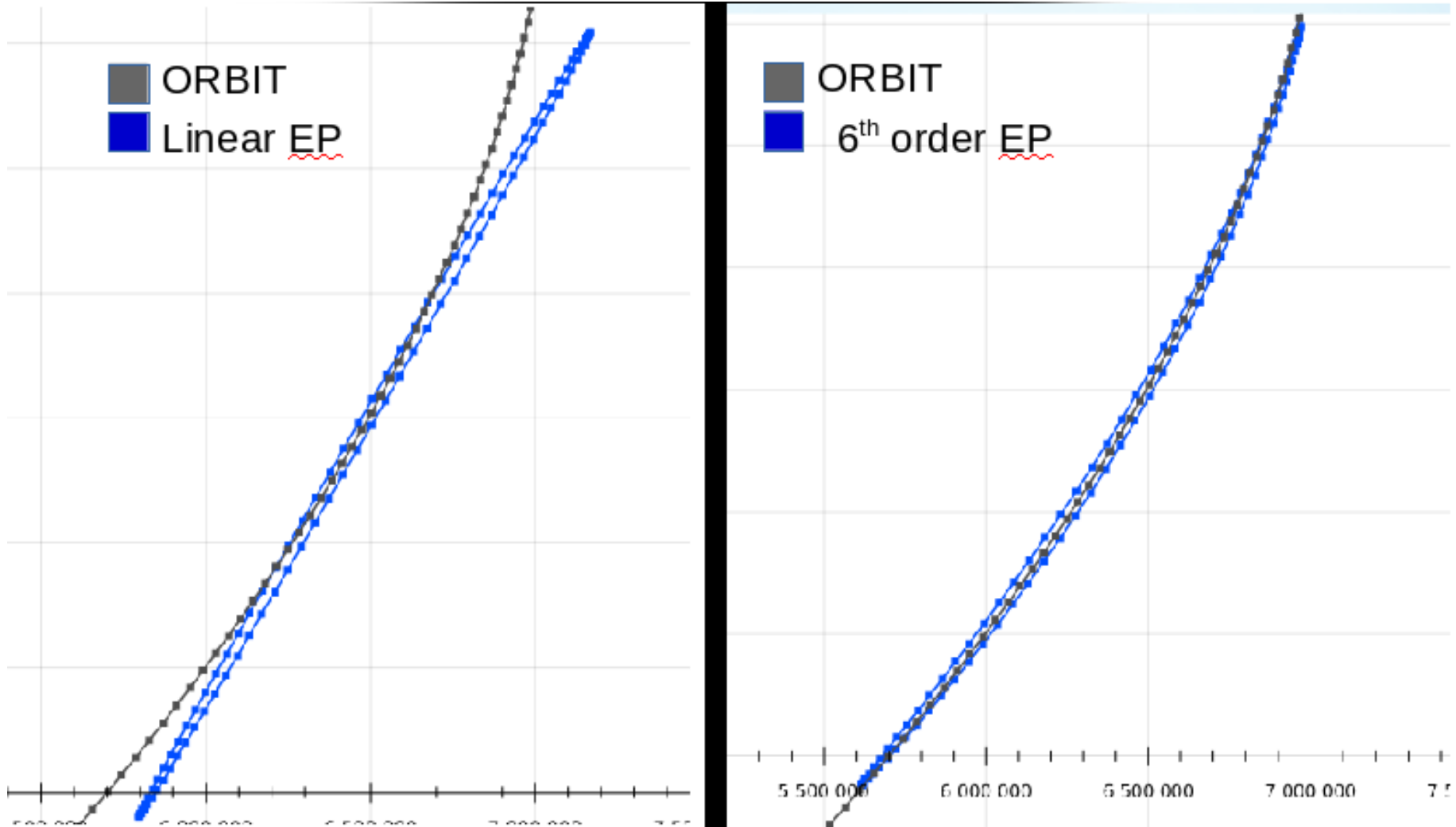
Field propagators (2/3)

- Field T is an enhanced double
 - supports all double operations (+, -, *, /)
 - supports all mathematical functions (sin, ..., atanh)
 - supports all ieee functions (scalb, copysign...)
 - supports mixed operations
- Predefined fields
 - Dfp, Decimal64, DerivativeStructure, FieldDerivativeStructure, SparseGradient, Tuple, FieldTuple

Field propagators (3/3)

- DerivativeStructure
 - Taylor algebra
 - typically 6 parameters, order 3
 - uncertainties propagation
 - very fast Monte-Carlo analysis
 - Orbit determination?
 - to be discussed in roundtable
- Tuple
 - Parallel propagation
 - domain exploration
 - co-positioning

Taylor Algebra example



Multiple orbit propagation

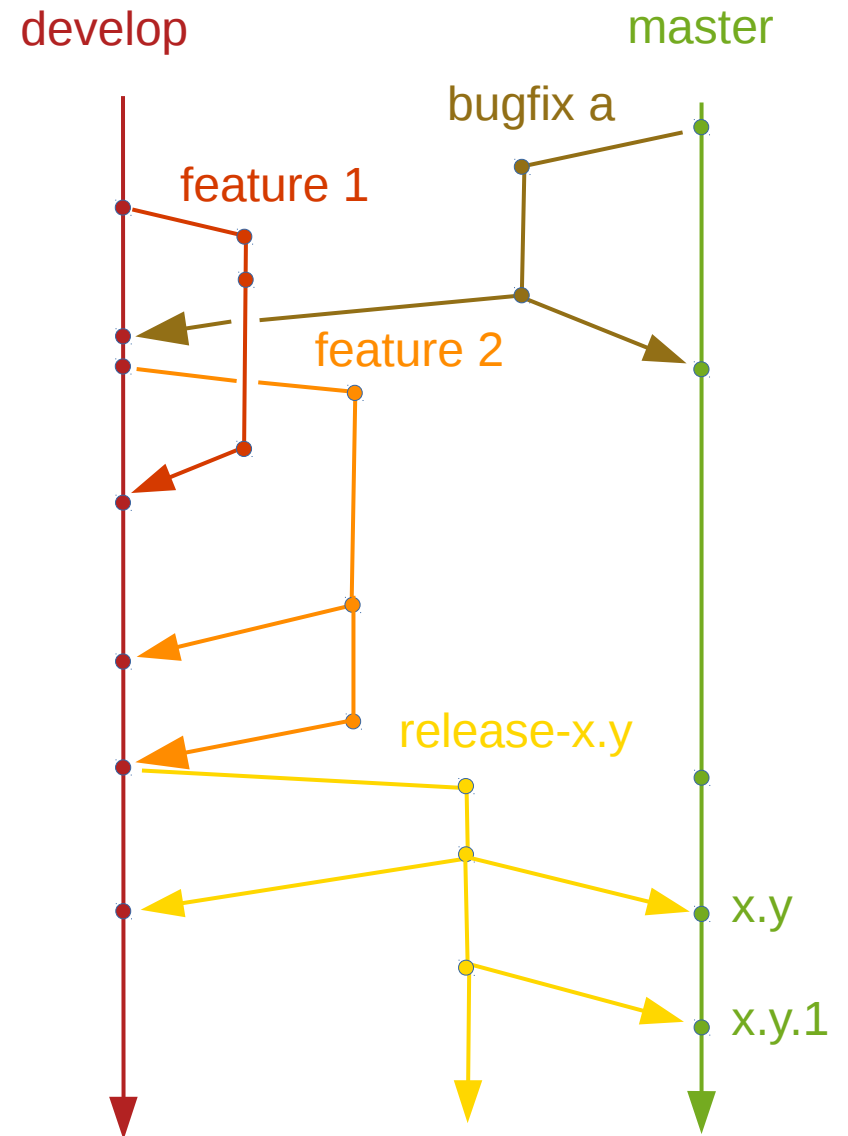
- multi-threading and controller
 - used for multisat orbit determination
 - can mix propagators types
 - rendezvous on step ends
 - events only at propagator level
- field propagator and Tuple
 - co-positionning
 - multi-sat events
 - should **not** be used if satellites are too far away

Project organization

- Git-flow like branching model
 - Users with different needs have a choice
 - Better traceability of features development
- Faster process to release critical bug fixes
 - No more PMC vote delay
 - Should never be use...
 - ... was used 2 days after having been adopted

git-flow like branching model

- Need stability?
 - select master branch
 - it points to latest release
- Maintain a product?
 - stick to release-x.y
 - it includes patches for x.y
- Want latest features?
 - follow develop branch
 - it is bleeding edge



Security fix released

Problems @ Javadoc Declaration Search Console LogCat History Call Hierarchy

Project: orekit [orekit]

Id	Message	Author
85dd338	9.0.1 release-9.0 origin/release-9.0 Releasing Orekit 9.0.1.	Luc Maisonobe
b938552	8.0.1 release-8.0 origin/release-8.0 Releasing Orekit 8.0.1.	Luc Maisonobe
8cbb7d2	7.2.1 release-7.2 origin/release-7.2 Releasing Orekit 7.2.0.	Luc Maisonobe
16f51ef	Disable external XML resources for TDM files	Evan Ward
75547b6	Disable external XML resources for rapid EOP data	Evan Ward
7b32841	Disable external XML resources for rapid EOP data	Evan Ward
e46684b	Disable external XML resources for rapid EOP data	Evan Ward
63a4d76	develop origin/develop HEAD Merge branch 'xml' into develop Merge branch 'fix-npe' into develop	Evan Ward
5184f01	Disable external XML resources for TDM files	Evan Ward
f803def	Disable external XML resources for rapid EOP data	Evan Ward
6444376	Merge branch 'fix-npe' into develop	Evan Ward

Trends (1/3)

- GNSS / very high precision
 - Multi-satellite propagation
 - Multi-satellite orbit determination
 - Parametric accelerations
 - Ground points displacements
 - Tides
 - Ocean loading
 - ANTEX files loading
 - GNSS specific eclipse/noon turns in attitude

Trends (2/3)

- Persistently adding standard data interface
 - IERS (since the beginning)
 - JPL/Inpop (4.1)
 - SP3 (6.0)
 - CCSDS ODM (6.1 for read, 9.0 for writing OEM)
 - WMM (7.1)
 - SEM – Yuma (8.0)
 - CGIM (9.0)
 - CCSDS TDM (9.0)
 - ANTEX (9.1)
 - Upcoming: RINEX, STK .e, OLES, CCSDS ADM...
 - to be discussed during roundtable

Trends (3/3)

- Closed source
- Closed development
- Open development (forge)
- Continuous Integration
- Git flow
- Nightly builds, continuous delivery?