Open Science goes Geo

Part II: Scientific Software

European Geosciences Union
General Assembly 2015
Vienna | Austria | 12 – 17 April 2015

Conveners: Martin Hammitzsch and Sara Mynott

4-in-a-row

Short Course series: Open Science goes Geo

★ Part I: Research Data
Tuesday, 14 Apr, 17:30–19:00 / Room B1

★ Part II: Scientific Software
Wednesday, 15 Apr, 17:30–19:00 / Room B1

★ Part III: Beyond Data and Software
Thursday, 16 Apr, 17:30–19:00 / Room B5

★ Part IV: Winning Horizon 2020 with Open Science
Friday, 17 Apr, 08:30–10:00 / Room B4

Part II: Scientific Software

Speakers

- ★ Edzer Pebesma
- ★ Neil Chue Hong
- ★ Philip Wenig
- ★ Markus Neteler
- ★ Andrew Hufton
- ★ Xenia van Edig

Part II: Scientific Software

Today's menu

- ★ Best Practice in the R Community
- ★ Software Sustainability and Software Carpentry
- ★ Eclipse Foundation's Science and LocationTech WGs
- ★ OSGeo and Open Source Geospatial Software
- ★ Software Journals and Code Policies
- ★ Future Publication of Software

‘Mini’ Panel Discussion

Questions

- ★ save until the end
- ★ twitter hashtag #egu15sc24

Answers

- ★ at the end
- ★ follow-up later on

Citing R packages

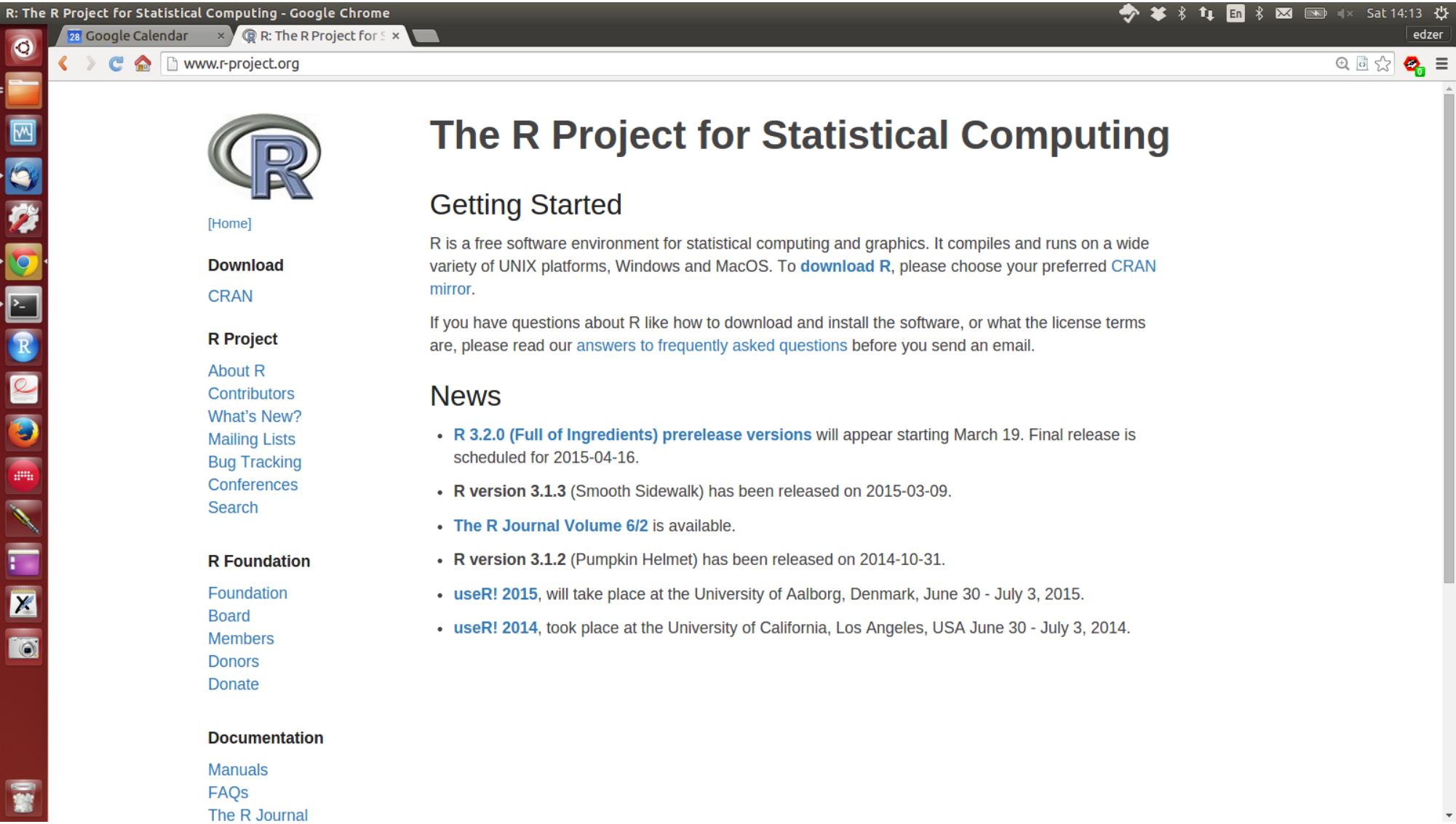
Edzer Pebesma

ifgi
Institute for Geoinformatics
University of Münster

52north
exploring horizons

EGU 2015 Short Course on
"Open Science goes Geo – Part II: Scientific Software"

Apr 15, 2015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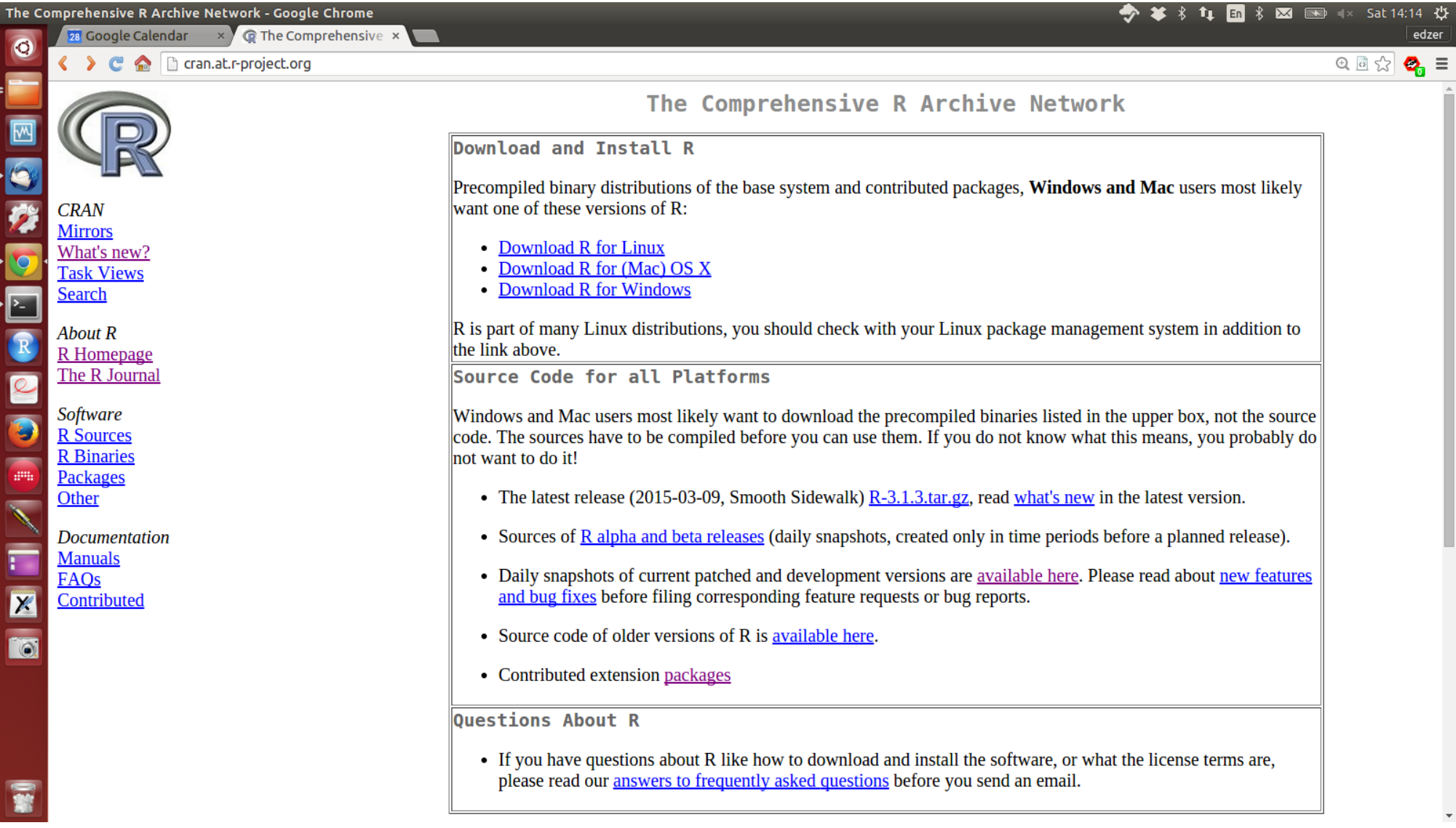
The R Project for Statistical Computing
Getting Started
R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. To download R, please choose your preferred CRAN mirror.
If you have questions about R like how to download and install the software, or what the license terms are, please read our answers to frequently asked questions before you send an email.
News
R 3.2.0 (Full of Ingredients) prerelease versions will appear starting March 19. Final release is scheduled for 2015-04-16.
R version 3.1.3 (Smooth Sidewalk) has been released on 2015-03-09.
The R Journal Volume 6/2 is available.
R version 3.1.2 (Pumpkin Helmet) has been released on 2014-10-31.
useR! 2015, will take place at the University of Aalborg, Denmark, June 30 - July 3, 2015.
useR! 2014, took place at the University of California, Los Angeles, USA June 30 - July 3, 2014.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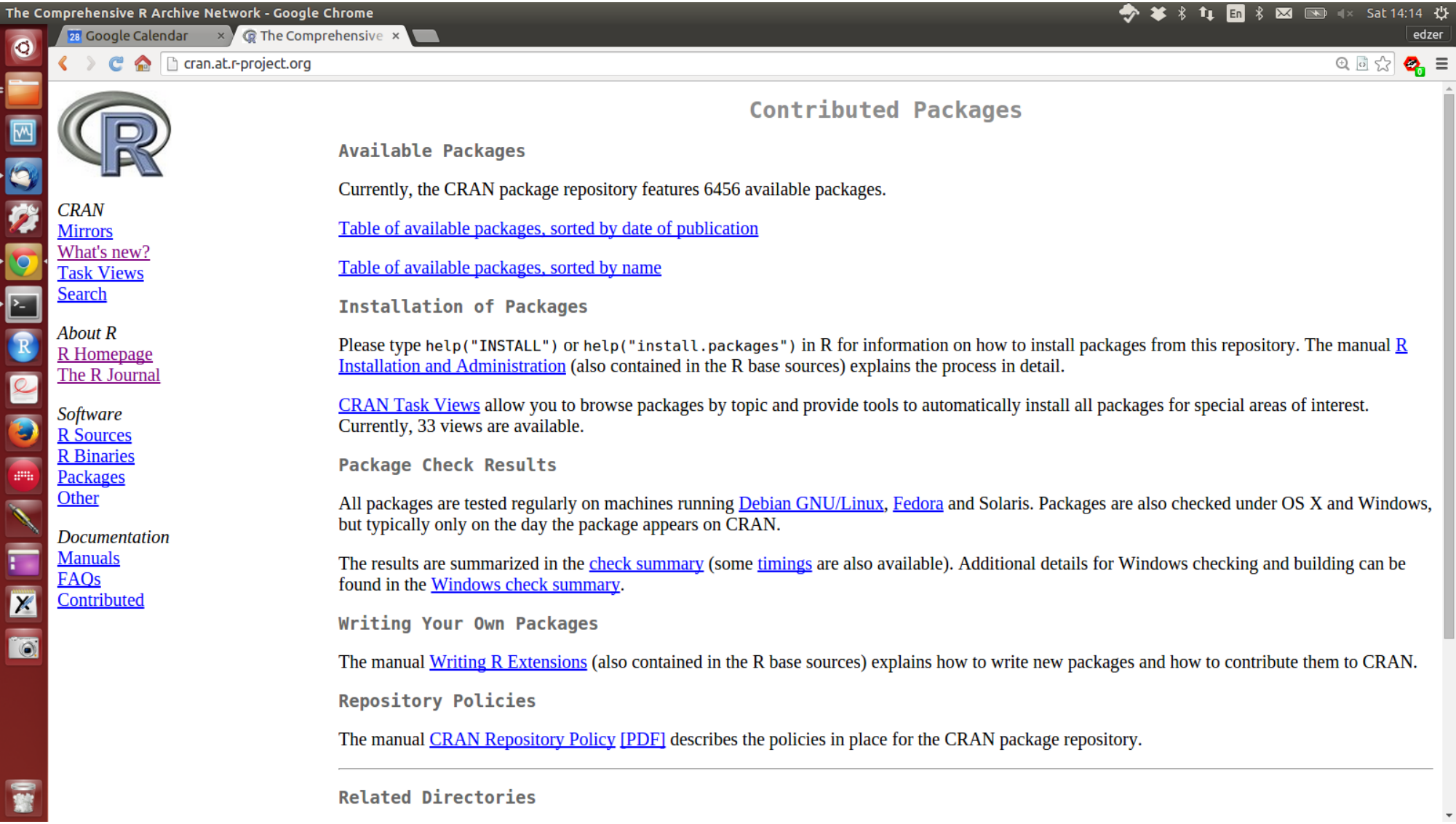
Download and Install R
Precompiled binary distributions of the base system and contributed packages, Windows and Mac users most likely want one of these versions of R:
Download R for Linux
Download R for (Mac) OS X
Download R for Windows
R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.
Source Code for all Platforms
Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!
The latest release (2015-03-09, Smooth Sidewalk) R-3.1.3.tar.gz, read what's new in the latest version.
Sources of R alpha and beta releases (daily snapshots, created only in time periods before a planned release).
Daily snapshots of current patched and development versions are available here. Please read about new features and bug fixes before filing corresponding feature requests or bug reports.
Source code of older versions of R is available here.
Contributed extension packages
Questions About R
If you have questions about R like how to download and install the software, or what the license terms are, please read our answers to frequently asked questions before you send an email.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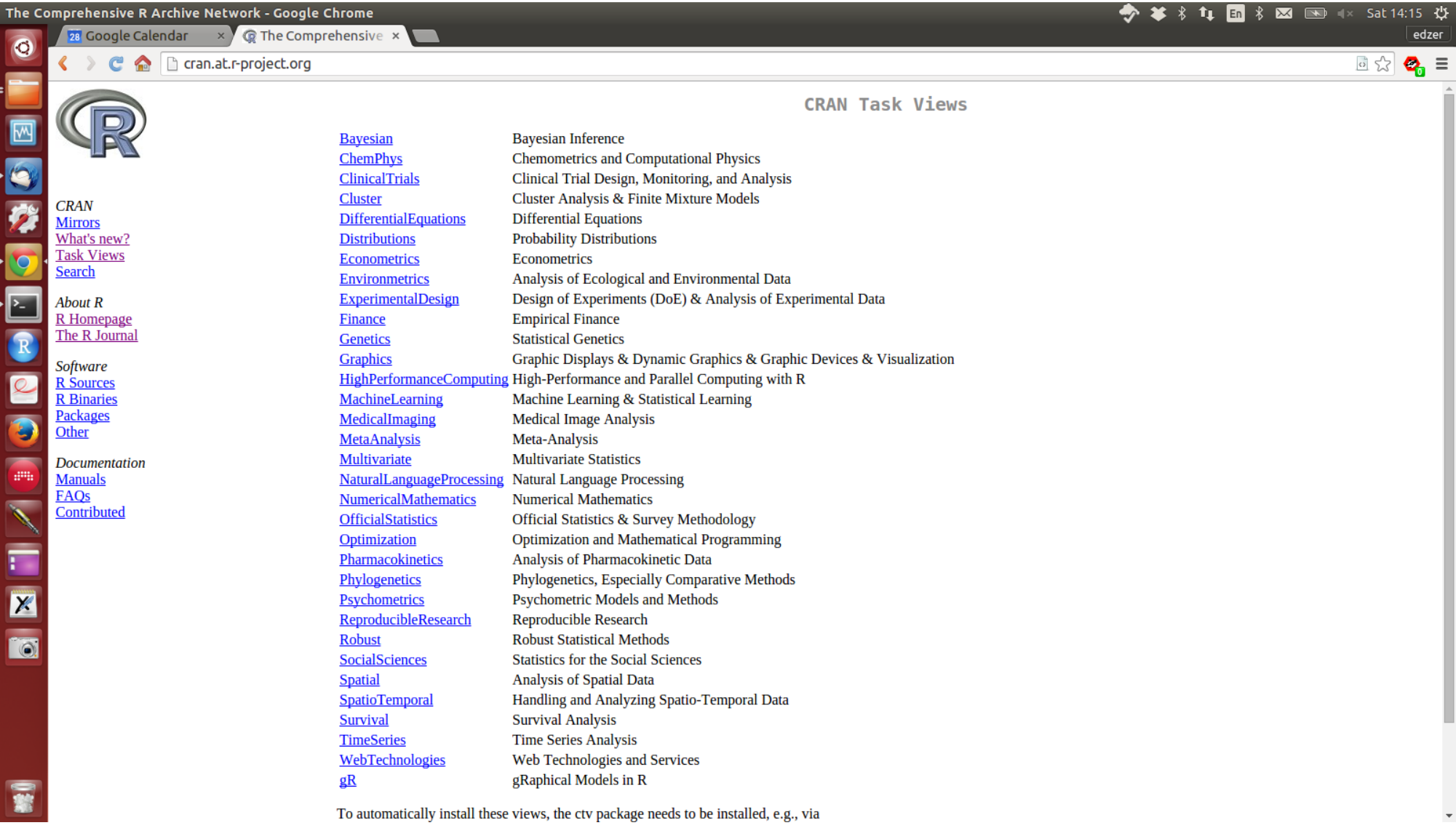
Available Packages
Currently, the CRAN package repository features 6456 available packages.
Table of available packages, sorted by date of publication
Table of available packages, sorted by name
Installation of Packages
Please type help("INSTALL") or help("install.packages") in R for information on how to install packages from this repository. The manual R Installation and Administration (also contained in the R base sources) explains the process in detail.
CRAN Task Views allow you to browse packages by topic and provide tools to automatically install all packages for special areas of interest. Currently, 33 views are available.
Package Check Results
All packages are tested regularly on machines running Debian GNU/Linux, Fedora and Solaris. Packages are also checked under OS X and Windows, but typically only on the day the package appears on CRAN.
The results are summarized in the check summary (some timings are also available). Additional details for Windows checking and building can be found in the Windows check summary.
Writing Your Own Packages
The manual Writing R Extensions (also contained in the R base sources) explains how to write new packages and how to contribute them to CRAN.
Repository Policies
The manual CRAN Repository Policy [PDF] describes the policies in place for the CRAN package repository.
Related Directories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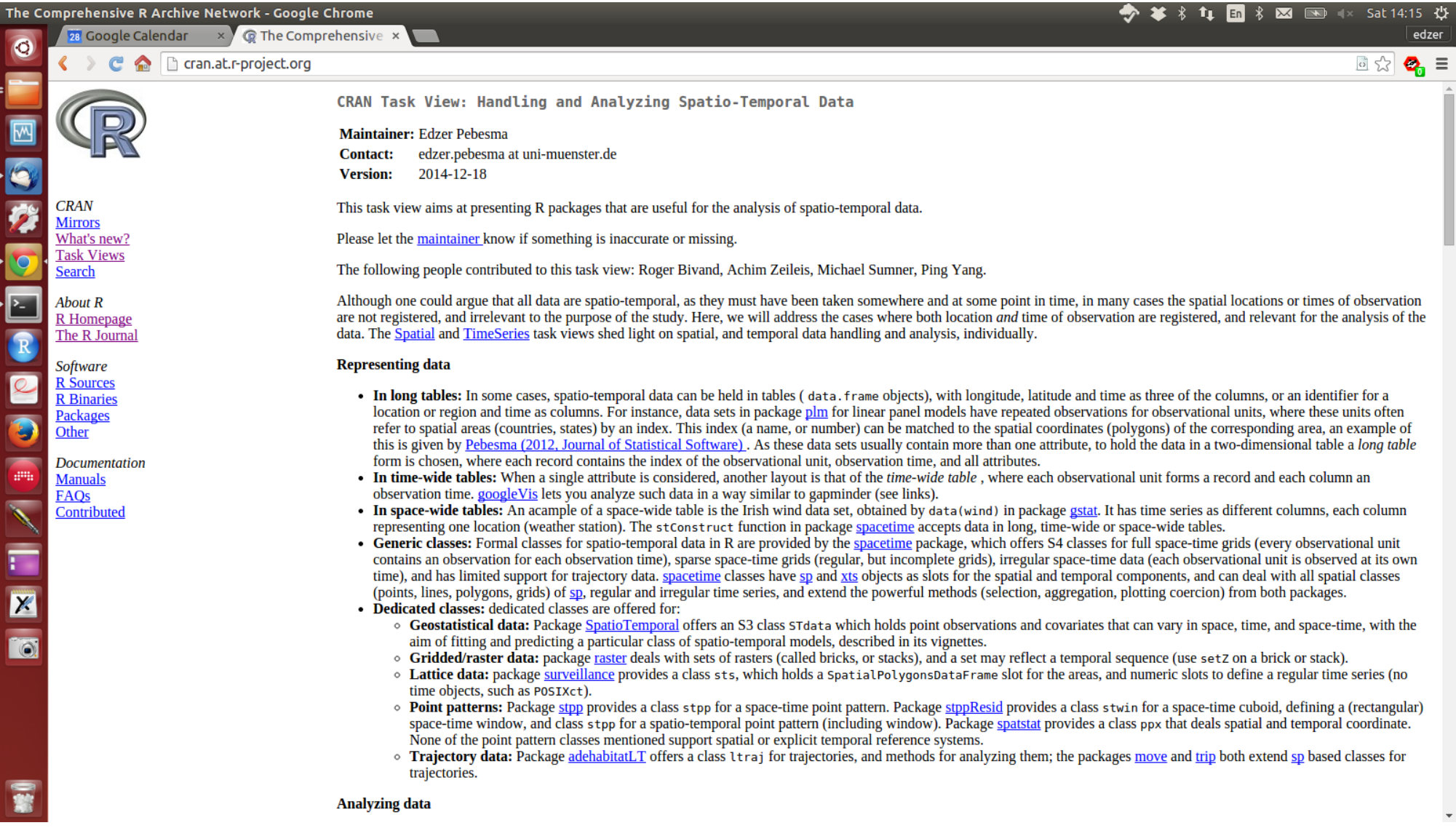
CRAN Task Views
Bayesian Bayesian Inference
ChemPhys Chemometrics and Computational Physics
ClinicalTrials Clinical Trial Design, Monitoring, and Analysis
Cluster Cluster Analysis & Finite Mixture Models
DifferentialEquations Differential Equations
Distributions Probability Distributions
Econometrics Econometrics
Environmetrics Analysis of Ecological and Environmental Data
ExperimentalDesign Design of Experiments (DoE) & Analysis of Experimental Data
Finance Empirical Finance
Genetics Statistical Genetics
Graphics Graphic Displays & Dynamic Graphics & Graphic Devices & Visualization
HighPerformanceComputing High-Performance and Parallel Computing with R
MachineLearning Machine Learning & Statistical Learning
MedicalImaging Medical Image Analysis
MetaAnalysis Meta-Analysis
Multivariate Multivariate Statistics
NaturalLanguageProcessing Natural Language Processing
NumericalMathematics Numerical Mathematics
OfficialStatistics Official Statistics & Survey Methodology
Optimization Optimization and Mathematical Programming
Pharmacokinetics Analysis of Pharmacokinetic Data
Phylogenetics Phylogenetics, Especially Comparative Methods
Psychometrics Psychometric Models and Methods
ReproducibleResearch Reproducible Research
Robust Robust Statistical Methods
SocialSciences Statistics for the Social Sciences
Spatial Analysis of Spatial Data
SpatioTemporal Handling and Analyzing Spatio-Temporal Data
Survival Survival Analysis
TimeSeries Time Series Analysis
WebTechnologies Web Technologies and Services
gR gRaphical Models in R
To automatically install these views, the ctv package needs to be installed, e.g., via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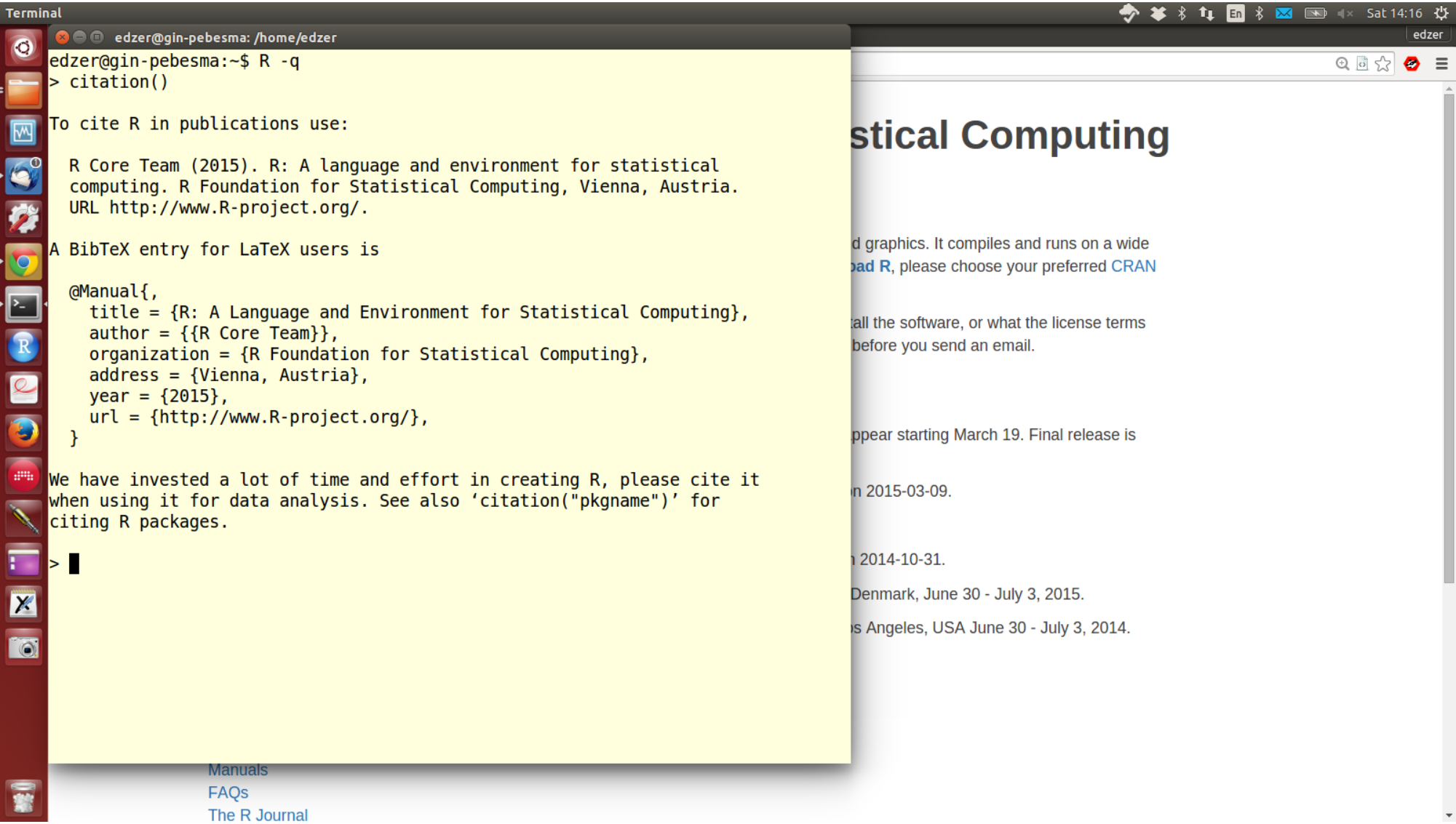
CRAN Task View: Handling and Analyzing Spatio-Temporal Data
Maintainer: Edzer Pebesma
Contact: edzer.pebesma at uni-muenster.de
Version: 2014-12-18
This task view aims at presenting R packages that are useful for the analysis of spatio-temporal data.
Please let the maintainer know if something is inaccurate or missing.
The following people contributed to this task view: Roger Bivand, Achim Zeileis, Michael Sumner, Ping Yang.
Although one could argue that all data are spatio-temporal, as they must have been taken somewhere and at some point in time, in many cases the spatial locations or times of observation are not registered, and irrelevant to the purpose of the study. Here, we will address the cases where both location and time of observation are registered, and relevant for the analysis of the data. The Spatial and TimeSeries task views shed light on spatial, and temporal data handling and analysis, individually.
Representing data
In long tables: In some cases, spatio-temporal data can be held in tables (data.frame objects), with longitude, latitude and time as three of the columns, or an identifier for a location or region and time as columns. For instance, data sets in package plm for linear panel models have repeated observations for observational units, where these units often refer to spatial areas (countries, states) by an index. This index (a name, or number) can be matched to the spatial coordinates (polygons) of the corresponding area, an example of this is given by Pebesma (2012, Journal of Statistical Software) . As these data sets usually contain more than one attribute, to hold the data in a two-dimensional table a long table form is chosen, where each record contains the index of the observational unit, observation time, and all attributes.
In time-wide tables: When a single attribute is considered, another layout is that of the time-wide table , where each observational unit forms a record and each column an observation time. googleVis lets you analyze such data in a way similar to gapminder (see links).
In space-wide tables: An acample of a space-wide table is the Irish wind data set, obtained by data(wind) in package gstat. It has time series as different columns, each column representing one location (weather station). The stConstruct function in package spacetime accepts data in long, time-wide or space-wide tables.
Generic classes: Formal classes for spatio-temporal data in R are provided by the spacetime package, which offers S4 classes for full space-time grids (every observational unit contains an observation for each observation time), sparse space-time grids (regular, but incomplete grids), irregular space-time data (each observational unit is observed at its own time), and has limited support for trajectory data. spacetime classes have sp and xts objects as slots for the spatial and temporal components, and can deal with all spatial classes (points, lines, polygons, grids) of sp, regular and irregular time series, and extend the powerful methods (selection, aggregation, plotting coercion) from both packages.
Dedicated classes: dedicated classes are offered for:
Geostatistical data: Package SpatioTemporal offers an S3 class STdata which holds point observations and covariates that can vary in space, time, and space-time, with the aim of fitting and predicting a particular class of spatio-temporal models, described in its vignettes.
Gridded/raster data: package raster deals with sets of rasters (called bricks, or stacks), and a set may reflect a temporal sequence (use setZ on a brick or stack).
Lattice data: package surveillance provides a class sts, which holds a SpatialPolygonsDataFrame slot for the areas, and numeric slots to define a regular time series (no time objects, such as POSIXct).
Point patterns: Package stpp provides a class stpp for a space-time point pattern. Package stppResid provides a class stwin for a space-time cuboid, defining a (rectangular) space-time window, and class stpp for a spatio-temporal point pattern (including window). Package spatstat provides a class ppx that deals spatial and temporal coordinate. None of the point pattern classes mentioned support spatial or explicit temporal reference systems.
Trajectory data: Package adehabitatLT offers a class ltraj for trajectories, and methods for analyzing them; the packages move and trip both extend sp based classes for trajectories.
Analyzing data


Terminal
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edzer
edzer@gin-pebesma: /home/edzer
edzer@gin-pebesma:~$ R -q
> citation()
To cite R in publications use:
R Core Team (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.
A BibTeX entry for LaTeX users is
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organization = {R Foundation for Statistical Computing},
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year = {2015},
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}
We have invested a lot of time and effort in creating R, please cite it when using it for data analysis. See also 'citation("pkgname")' for citing R packages.
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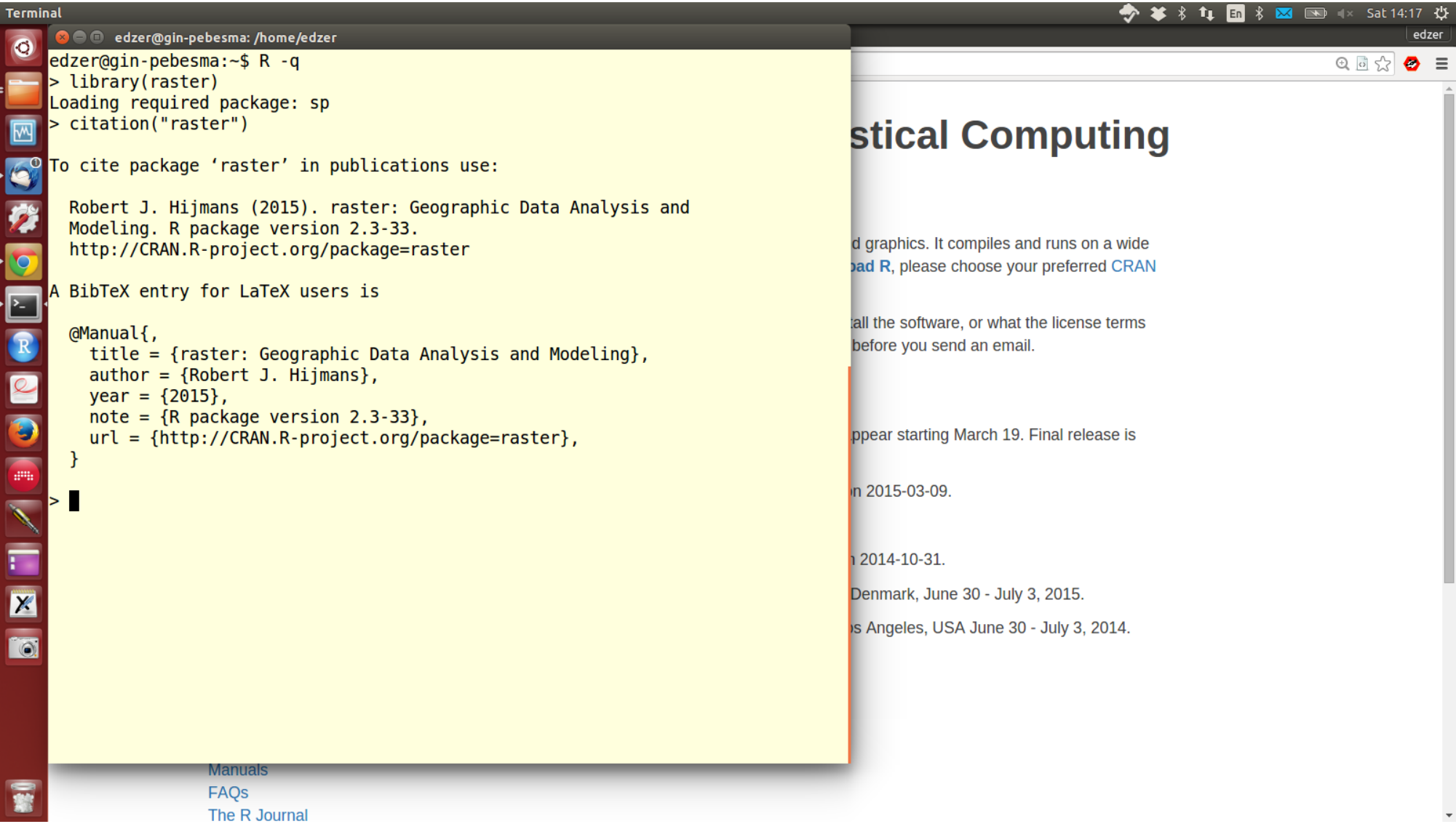
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edzer
edzer@gin-pebesma: /home/edzer
edzer@gin-pebesma:~$ R -q
> library(raster)
Loading required package: sp
> citation("raster")
To cite package 'raster' in publications use:
Robert J. Hijmans (2015). raster: Geographic Data Analysis and
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http://CRAN.R-project.org/package=raster
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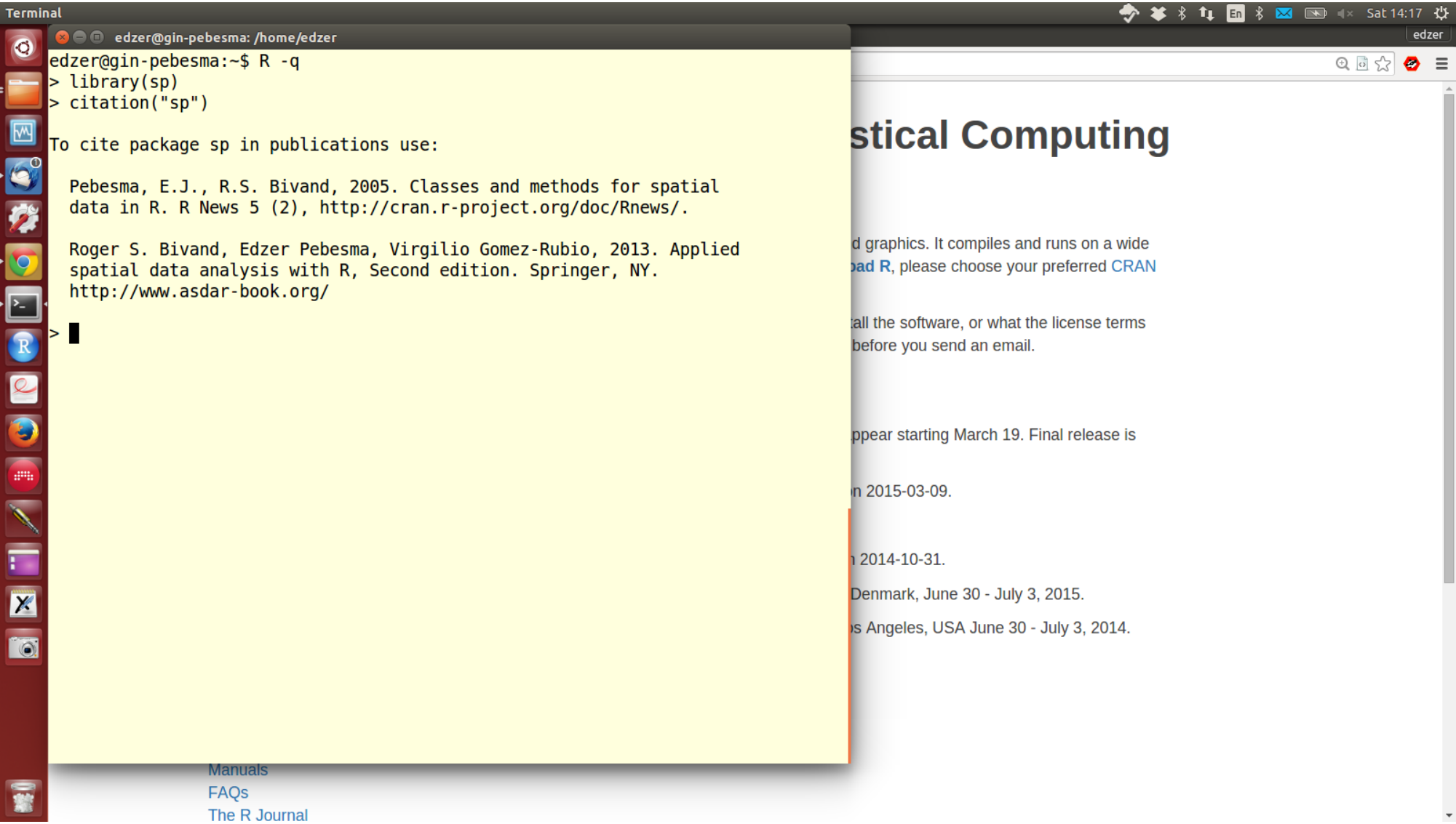
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edzer@gin-pebesma: /home/edzer
edzer@gin-pebesma:~$ R -q
> library(sp)
> citation("sp")
To cite package sp in publications use:
Pebesma, E.J., R.S. Bivand, 2005. Classes and methods for spatial data in R. R News 5 (2), http://cran.r-project.org/doc/Rnews/.
Roger S. Bivand, Edzer Pebesma, Virgilio Gomez-Rubio, 2013. Applied spatial data analysis with R, Second edition. Springer, NY. http://www.asdar-book.org/
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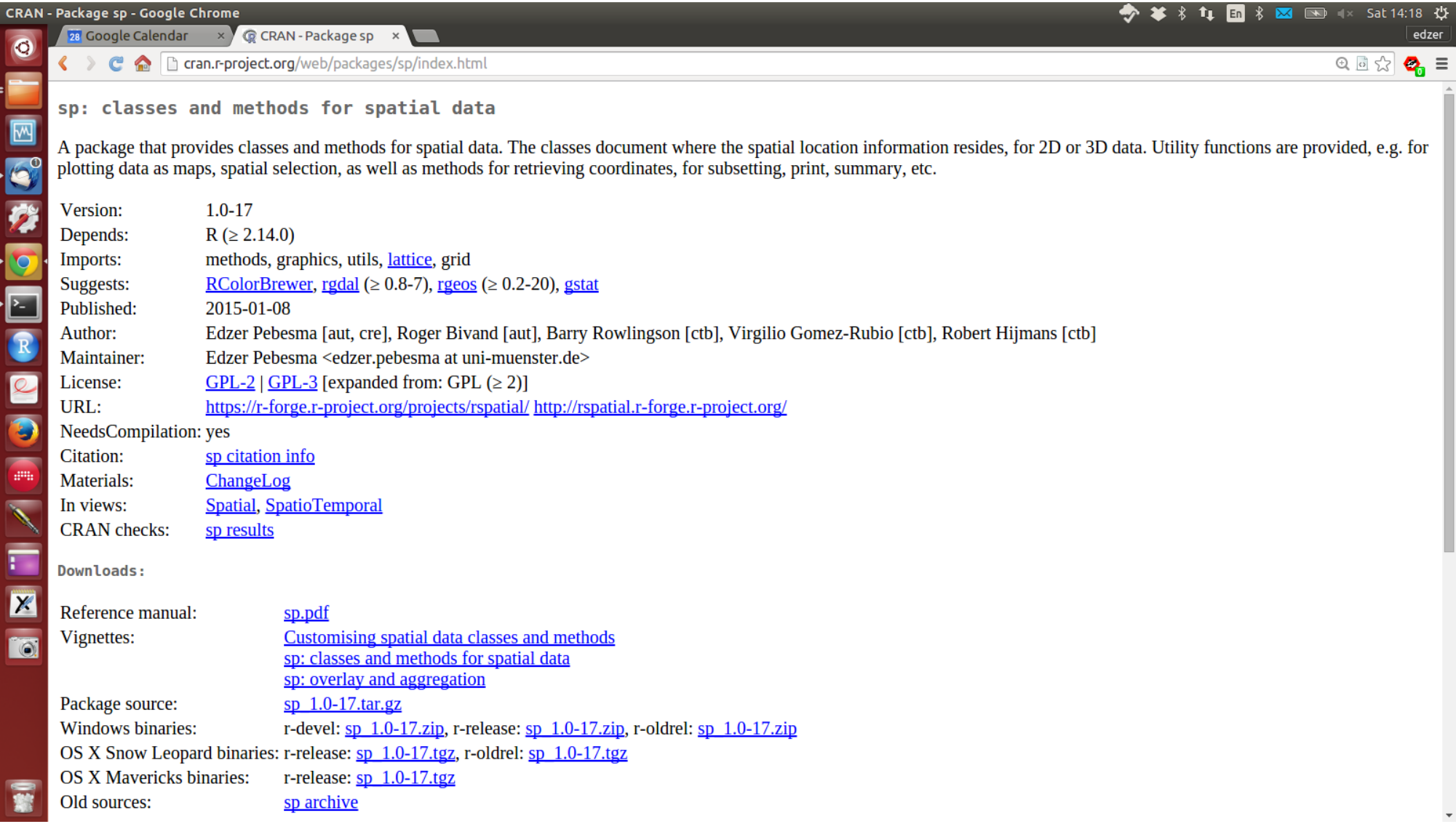

sp: classes and methods for spatial data

A package that provides classes and methods for spatial data. The classes document where the spatial location information resides, for 2D or 3D data. Utility functions are provided, e.g. for plotting data as maps, spatial selection, as well as methods for retrieving coordinates, for subsetting, print, summary, etc.

Version:	1.0-17
Depends:	R (≥ 2.14.0)
Imports:	methods, graphics, utils, lattice, grid
Suggests:	RColorBrewer, rgdal (≥ 0.8-7), rgeos (≥ 0.2-20), gstat
Published:	2015-01-08
Author:	Edzer Pebesma [aut, cre], Roger Bivand [aut], Barry Rowlingson [ctb], Virgilio Gomez-Rubio [ctb], Robert Hijmans [ctb]
Maintainer:	Edzer Pebesma <edzer.pebesma at uni-muenster.de>
License:	GPL-2 | GPL-3 [expanded from: GPL (≥ 2)]
URL:	https://r-forge.r-project.org/projects/rspatial/ http://rspatial.r-forge.r-project.org/
NeedsCompilation:	yes
Citation:	sp citation info
Materials:	ChangeLog
In views:	Spatial, SpatioTemporal
CRAN checks:	sp results

Downloads:

Reference manual:	sp.pdf
Vignettes:	Customising spatial data classes and methods sp: classes and methods for spatial data sp: overlay and aggregation
Package source:	sp_1.0-17.tar.gz
Windows binaries:	r-devel: sp_1.0-17.zip, r-release: sp_1.0-17.zip, r-oldrel: sp_1.0-17.zip
OS X Snow Leopard binaries:	r-release: sp_1.0-17.tgz, r-oldrel: sp_1.0-17.tgz
OS X Mavericks binaries:	r-release: sp_1.0-17.tgz
Old sources:	sp archive

To cite package sp in publications use:

Pebesma, E.J., R.S. Bivand, 2005. Classes and methods for spatial data in R. R News 5 (2), http://cran.r-project.org/doc/Rnews/.

Roger S. Bivand, Edzer Pebesma, Virgilio Gomez-Rubio, 2013. Applied spatial data analysis with R, Second edition. Springer, NY. http://www.asdar-book.org/

Corresponding BibTeX entries:

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  title = {Classes and methods for spatial data in {R}},
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  year = {2005},
  volume = {5},
  number = {2},
  pages = {9--13},
  month = {November},
  url = {http://CRAN.R-project.org/doc/Rnews/},
}

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  title = {Applied spatial data analysis with {R}, Second edition},
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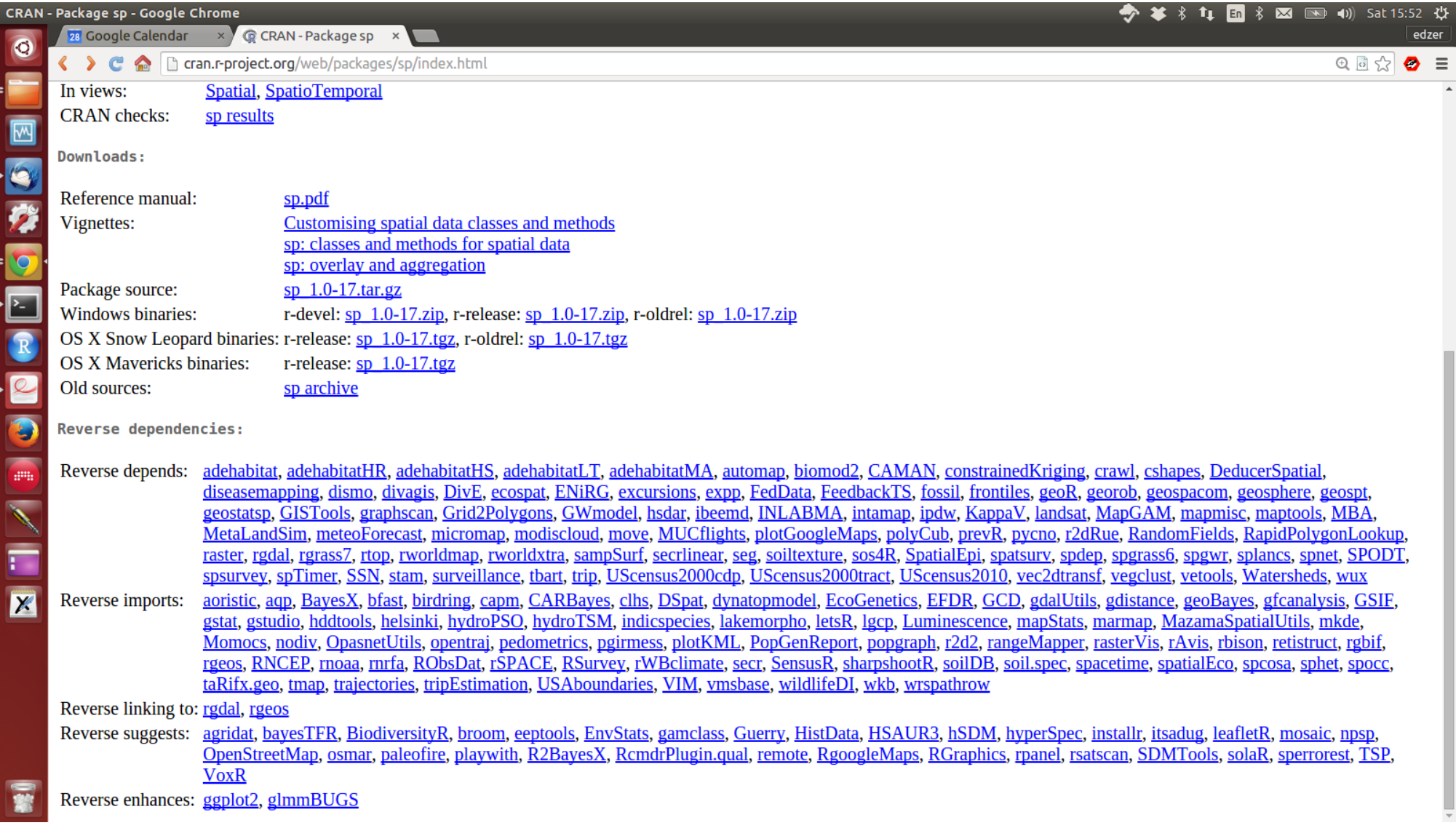

In views: Spatial, SpatioTemporal
CRAN checks: sp results

Downloads:

Reference manual:	sp.pdf
Vignettes:	Customising spatial data classes and methods sp: classes and methods for spatial data sp: overlay and aggregation
Package source:	sp_1.0-17.tar.gz
Windows binaries:	r-devel: sp_1.0-17.zip, r-release: sp_1.0-17.zip, r-oldrel: sp_1.0-17.zip
OS X Snow Leopard binaries:	r-release: sp_1.0-17.tgz, r-oldrel: sp_1.0-17.tgz
OS X Mavericks binaries:	r-release: sp_1.0-17.tgz
Old sources:	sp archive

Reverse dependencies:

Reverse depends: adehabitat, adehabitatHR, adehabitatHS, adehabitatLT, adehabitatMA, automap, biomod2, CAMAN, constrainedKriging, crawl, cshapes, DeducerSpatial, diseasemapping, dismo, divagis, DivE, ecospat, ENiRG, excursions, expp, FedData, FeedbackTS, fossil, frontiles, geoR, georob, geospacom, geosphere, geospt, geostatsp, GISTools, graphscan, Grid2Polygons, GWmodel, hsdar, ibeemd, INLABMA, intamap, ipdw, KappaV, landsat, MapGAM, mapmisc, maptools, MBA, MetaLandSim, meteoForecast, micromap, modiscloud, move, MUCflights, plotGoogleMaps, polyCub, prevR, pycno, r2dRue, RandomFields, RapidPolygonLookup, raster, rgdal, rgrass7, rtop, rworldmap, rworldxtra, sampSurf, secrlinear, seg, soiltexture, sos4R, SpatialEpi, spatsurv, spdep, spgrass6, spgwr, splancs, spnet, SPODT, spsurvey, spTimer, SSN, stam, surveillance, tbart, trip, UScensus2000cdp, UScensus2000tract, UScensus2010, vec2dtransf, vegclust, vetools, Watersheds, wux

Reverse imports: aoristic, aqp, BayesX, bfast, birdring, capm, CARBayes, clhs, DSpat, dynatopmodel, EcoGenetics, EFDR, GCD, gdalUtils, gdistance, geoBayes, gfcanalysis, GSIF, gstat, gstudio, hddtools, helsinki, hydroPSO, hydroTSM, indicspecies, lakemorpho, letsR, lgcp, Luminescence, mapStats, marmap, MazamaSpatialUtils, mkde, Momocs, nodiv, OpasnetUtils, opentraj, pedometrics, pgirmess, plotKML, PopGenReport, popgraph, r2d2, rangeMapper, rasterVis, rAvis, rbison, retistruct, rgbif, rgeos, RNCEP, rnoaa, rnrfa, RObsDat, rSPACE, RSurvey, rWBclimate, secr, SensusR, sharpshootR, soilDB, soil.spec, spacetime, spatialEco, spcosa, sphet, spocc, taRifx.geo, tmap, trajectories, tripEstimation, USAboundaries, VIM, vmsbase, wildlifeDI, wkb, wrspathrow

Reverse linking to: rgdal, rgeos

Reverse suggests: agridat, bayesTFR, BiodiversityR, broom, eeptools, EnvStats, gamclass, Guerry, HistData, HSAUR3, hSDM, hyperSpec, installr, itsadug, leafletR, mosaic, npsp, OpenStreetMap, osmar, paleofire, playwith, R2BayesX, RcmdrPlugin.qual, remote, RgoogleMaps, RGraphics, rpanel, rsatscan, SDMTools, solaR, sperrorest, TSP, VoxR

Reverse enhances: ggplot2, glmmBUGS

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Novel methods improve prediction of species' distributions from occurrence data J Elith, CH Graham, RP Anderson, M Dudík, S Ferrier, A Guisan, ... Ecography 29 (2), 129-151	3403 ★	2006
Effects of sample size on the performance of species distribution models MS Wisz, RJ Hijmans, J Li, AT Peterson, CH Graham, A Guisan Diversity and Distributions 14 (5), 763-773	550	2008
The ability of climate envelope models to predict the effect of climate change on species distributions RJ Hijmans, CH Graham Global change biology 12 (12), 2272-2281	522	2006
Computer tools for spatial analysis of plant genetic resources data: 1. DIVA-GIS RJ Hijmans, L Guarino, M Cruz, E Rojas Plant Genetic Resources Newsletter, 15-19	359	2001
raster: raster: Geographic data analysis and modeling R Hijmans, J van Etten R package version, 2.2-12	296 ★	2014
Locating Pleistocene refugia: comparing phylogeographic and ecological niche model predictions	296	2007

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Authors	R Hijmans, Jacob van Etten
Publication date	2014
Journal	R package version
Pages	2.2-12
Description	raster: raster: Geographic data analysis and modeling. Reading, writing, manipulating, analyzing and modeling of gridded spatial data. The package implements basic and high-level functions. Processing of very large files is supported. Version: 2.2-12. Depends: methods, sp (≥ 1.0-13), R (≥ 2.15.0). Suggests: rgdal (≥ 0.8-12), rgeos (≥ 0.3-1), ncdf, ncdf4, igraph, snow, tcltk, rasterVis. Published: 2014-01-20. Author: Robert J. Hijmans [cre, aut], Jacob ...
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Title 1–20	Cited by	Year
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Antonietta Mira

Journal of Statistical Software

January 2005, Volume 12, Issue 6. *http://www.jstatsoft.org/*

spatstat: An R Package for Analyzing Spatial Point Patterns

Adrian Baddeley
University of Western Australia

Rolf Turner
University of New Brunswick

Abstract

spatstat is a package for analyzing spatial point pattern data. Its functionality includes exploratory data analysis, model-fitting, and simulation. It is designed to handle realistic datasets, including inhomogeneous point patterns, spatial sampling regions of arbitrary shape, extra covariate data, and 'marks' attached to the points of the point pattern.

A unique feature of **spatstat** is its generic algorithm for fitting point process models to point pattern data. The interface to this algorithm is a function `ppm` that is strongly analogous to `lm` and `glm`.

This paper is a general description of **spatstat** and an introduction for new users.

Keywords: conditional intensity, edge corrections, exploratory data analysis, generalised linear models, inhomogeneous point patterns, marked point patterns, maximum pseudolikeli-

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Software Sustainability and Software Carpentry

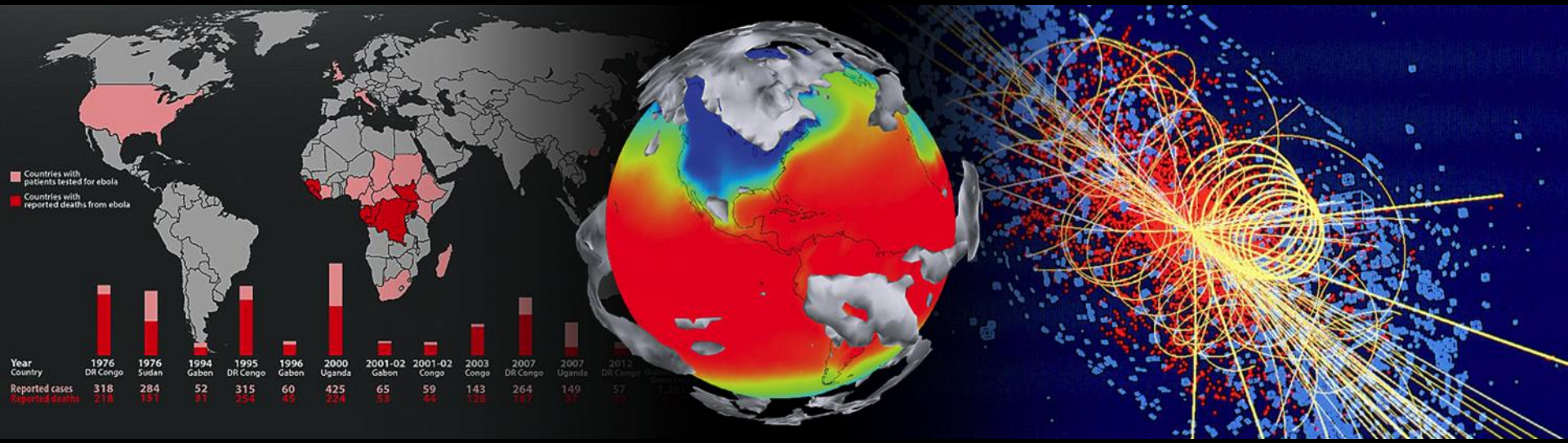
15 April 2015, Open Science Goes Geo, EGU General Assembly

Neil Chue Hong (@npch), Software Sustainability Institute
ORCID: 0000-0002-8876-7606 | N.ChueHong@software.ac.uk

Supported by EPSRC

Project funding from Jisc BBSRC NERC SCIENCE OF THE ENVIRONMENT

World-leading research relies on software



"Today there are very few science areas left which do not rely on IT and thus software for the majority of their research work. More importantly key scientific advances in experimental and observational science would have been impossible without better software."

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Pacific Northwestern National Laboratory
via change.org campaign

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SI² Program Director, National Science Foundation

Software isn't special it's mainstream

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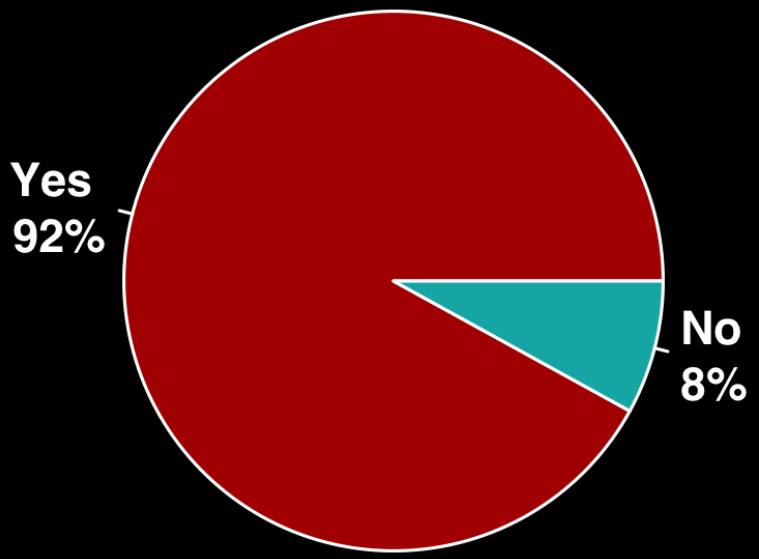
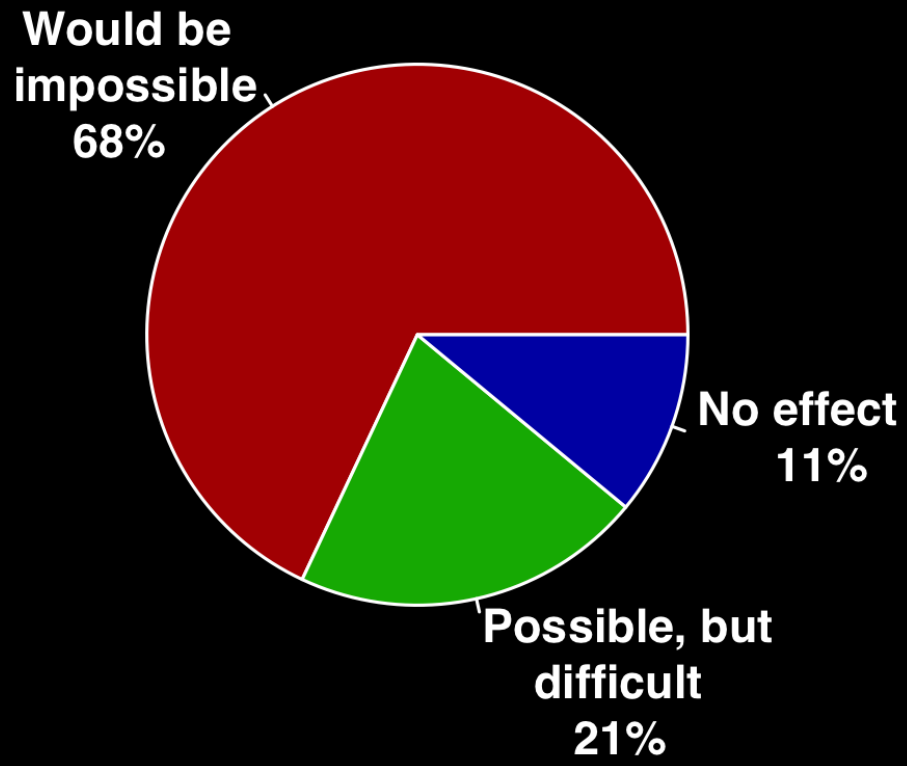


What would happen to your research without software



Survey of researchers from 15 Russell Group unis conducted by SSI between Aug- Oct 2014. 406 respondents covering representative range of funders, discipline and seniority.

The UK research community is just starting to understand the magnitude of the issue

56%

Of UK researchers develop their own research software

71%

Of UK researchers have had no formal software development training

140,000

UK researchers are relying on their own coding skills

4%

Of jobs advertised in UK universities were software related

Survey of researchers from 15 Russell Group unis conducted by SSI between Aug - Oct 2014. 406 respondents covering representative range of funders, discipline and seniority.

Researchers rely on software

- Software comes from different sources
  - "Off the shelf" commercial / open source software
  - Libraries and tools supported by consortia
  - Code provided by collaborators
  - Scripts and software written by yourself
- All reliant on effort to maintain
  - Who provides the effort, and what it's used for are where the disagreements take place!
- Scientific software development is like a startup

Open science, open software?

- What are the incentives to developing software in the open?
  - More collaborators
  - More citations
  - More benefit to others
  - Increased robustness
- Far more than the drawbacks
  - More structured collaboration

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SOFTWARE METAPAPER

A Web-based modeling tool for the SEMAT Essence theory of software engineering

Daniel Graziotin [1], Pekka Abrahamsson [1]

1. Free University of Bozen-Bolzano, Bolzano, Italy

Abstract

As opposed to more mature subjects, software engineering lacks general theories that establish its foundations as a discipline. The Essence Theory of software engineering (Essence) has been proposed by the Software Engineering Methods and Theory (SEMAT) initiative. The goal of Essence is to develop a theoretically sound basis for software engineering practice and its wide adoption. However, Essence is far from reaching academic- and industry-wide adoption. The reasons for this include a struggle to foresee its utilization potential and a lack of tools for implementation. SEMAT Accelerator (SematAcc) is a Web-positioning tool for a software engineering endeavor, which implements the SEMAT's Essence kernel. SematAcc permits the use of Essence, thus helping to understand it. The tool enables the teaching, adoption, and research of Essence in controlled experiments and case studies.

Keywords: software engineering, general theory, web positioning system, SEMAT Essence Theory, project management.

Anatomy of a software meta-paper

Introduction

Journal of open research software
Graziotin, D and Abrahamsson, P 2013 A Web-based modeling tool for the SEMAT Essence theory of software engineering. Journal of Open Research Software 1:e4, DOI: http://dx.doi.org/10.5334/jors.ag
Art.e4, p. 2 of 7

SOFTWARE PAPER

A Web-based modeling tool for the SEMAT Essence theory of software engineering

Daniel Graziotin[1] and Pekka Abrahamsson[1]
[1] Free University of Bozen-Bolzano, Bolzano, Italy

As opposed to more mature subjects, software engineering lacks general theories that establish its foundations as a discipline. The Essence Theory of software engineering (Essence) has been proposed by the Software Engineering Methods and Theory (SEMAT) initiative. The goal of Essence is to develop a theoretically sound basis for software engineering practice and its wide adoption. However, Essence is far from reaching academic- and industry-wide adoption. The reasons for this include a struggle to foresee its utilization potential and a lack of tools for implementation. SEMAT Accelerator (SematAcc) is a Web-positioning tool for a software engineering endeavor, which implements the SEMAT's Essence kernel. SematAcc permits the use of Essence, thus helping to understand it. The tool enables the teaching, adoption, and research of Essence in controlled experiments and case studies.

Keywords: software engineering, general theory, web positioning system, SEMAT Essence Theory, project management

Funding statement
This project is financially supported by the PhD grant of Free University of Bozen Bolzano.

(1) Overview

Introduction

Well-established academic disciplines emerged from practices without focusing on the underlying theory[1]. In time, however general and advanced scientific theories have been developed as they are essential for the advancement of scientific fields[2]. Software engineering is notably a young discipline[3]. As such, it is not yet overly concerned with a core, general theory; thus, the risk is to be limited to trial-and-error practices[4]. A lack of theoretical foundation inhibits the growth of a research tradition. A research tradition is essential to secure scientific beliefs but also to cause paradigm shifts[5]. Software engineering is missing such tradition. Software engineering suffers from gaps in the knowledge for understanding software development processes and their impact on each other[3].

The SEMAT initiative was born in order to "support a process to refound software engineering based on a solid theory, proven principles and best practices. [...]What will enable this is a kernel of widely-agreed elements [...] supported by industry, academia, researchers and users"[6]. The outcome of the SEMAT initiative is the Essence Theory of Software Engineering[7,8]. Strictly speaking, Essence documents the "things to work with" in software engineering", the relationship they have with each other, and the actions that involve such "things".

Essence is claimed to provide a common basis for defining software development practices, by using widely agreed elements that are present in every software engineering endeavor[6]. These elements are called Alphas. As of today, the core Alphas of Essence kernel are Opportunity, Stakeholders, Requirements, Software System, Work, Team, and Way-of-working. Alphas change in their States, thus enabling a representation of the progress and health of the endeavor. For example, the Requirements can be Conceived, Bounded, Coherent, Acceptable, Addressed, or Fulfilled. Finally, Essence Alphas are organized in three areas of Concern. Each Concern focuses on a single aspect of software engineering. They are called Customer, Solution, and Endeavor. As opposed to other attempts to create a general theory of software engineering – e.g. the Software Engineering Body of Knowledge[9] – Essence aims to generalize software engineering by identifying its universal elements and actions, and to develop a universal language to describe them. The theory was submitted to the Object Management Group (OMG) and is currently undergoing the necessary steps to become an OMG standard [8]. A simple introduction to Essence is available in the material of a special lecture held at the Free University of Bozen-Bolzano by one of the authors of this paper[10].

As of today, there is a lack of consensus of Essence as an theoretical foundation. For example, notable practitioners and researchers of Agile methodologies expressed negative comments on the SEMAT initiative (e.g.,[11, 12, 13]). Reasons include a difficulty to see Essence's utilization potential and a lack of tools for implementation. It is challenging to understand Essence before even evaluating it. As software engineering heavily relies on empirical research[14], is the need to produce the empirical data when applying Essence, in order to understand its theoretical and practical implications and to evaluate it scientifically.

This paper describes the SEMAT Accelerator (SematAcc), which is a Web-based modeling system for software engineering processes as depicted by the SEMAT's Essence kernel. SematAcc has been developed as a way to provide such needed empirical data for evaluating Essence. It aims in using and understanding the Essence theory under a practical viewpoint. SematAcc lets users model a software development process with Essence elements. A software engineering endeavor (called project in SematAcc) is an associated Essence kernel. The kernel has been implemented using the OMG submission of Essence as reference. A software engineering endeavor is represented using graphs of the Concerns' and Alphas' completion.

SematAcc is developed in JavaScript both on the client side and on the server side, on top of the recently released Meteor[15]. Meteor is an open-source platform to build JavaScript-based Web applications. By providing a unified and identical API for the development of the server and the client, Meteor target is to deliver almost real-time data transfer through latency compensation techniques and reactive programming.

SematAcc can be employed in empirical experiments and case studies on Essence theory because it registers the events triggered by its usage. The events can be easily downloaded as a CSV string. Thus, they are directly employable in statistical software.

The rest of this paper is organized as follows. The section - Implementation and Architecture - provides a brief introduction to Meteor, an illustrated guide on how to use SematAcc main functionality, and more technical details on the architecture of the system and the source code organization. It is followed by a section regarding the Quality Control that we undertake to ensure the tests and the techniques in order to ensure a high quality of the delivered software are provided. In the Availability section, details on SematAcc system requirements and dependencies are given, as well as the information on how to obtain the software. The last section - Reuse Potential - provides an overview on how to configure and run SematAcc on a local computer and on a remote server and suggestions on how to employ Essence for research purposes.

Implementation/architecture

SematAcc was implemented using the recent Meteor project[15]. Meteor is an open-source platform and framework to build JavaScript-based Web applications. It is built upon the server-side JavaScript enabling technology Node.js[16] and the NoSQL document-oriented MongoDB database[17]. As a programming framework, Meteor provides developers to write both client- and server-side applications using almost the same JavaScript APIs. Its aim is to achieve nearly real-time performance by providing latency compensation for data transfers between the server and clients (and vice versa). Data is the central point of Meteor. It is organized in data structure named collections. Meteor collections are convenient wrappers around MongoDB documents; they provide the basic create, read, update, and delete operations needed for the functionality of a Web application.

Meteor has been inspired by the reactive programming paradigm[18]: nearly all of its layers, from database access to graphical user interface (GUI), provide an event-driven interface whose operations run whenever the underlying data-dependencies change. For example, a hypothetical Meteor Web application is developed to manage a library. A template of the GUI of the application is responsible to render a list of books. A user observes a Web page with a list of books. Meanwhile, an editor inserts a new book in the database, from the application backend. The change in the data is detected by Meteor components, which automatically trigger a re-render of the GUI element interested by this operation. The user simply sees a new element added to the list, without a Web page refresh.

As an infrastructure, Meteor covers development, testing, and production phases to run the implemented open-source-code. For development, Meteor provides a local server, built on top of Node.js[16], to run the developed Website and perform tests. For testing and production, Meteor provides a freely available infrastructure of servers. More information on Meteor can be obtained on the official Website[15], in the introductory screencast[19], and on the Meteor documentation Website[20].

Before illustrating some details regarding SematAcc architecture, a brief introduction on using SematAcc is provided. Upon login, the user manages the projects (Fig. 1). The Hint Box on the left side of the screen contains suggestions, which help the user to manage the projects. The central box lists the available projects. After the user creates a project, putting the mouse over it, it will activate the available commands. A click on the arrow icon will accelerate a project with SematAcc (that is, it will start the modeling activity with Essence kernel). The other two commands are for editing a project and for deleting it.

When the user decides to accelerate a project with SematAcc, the Essence kernel is loaded with the chosen project (Fig. 2). This is the main functionality of SematAcc. The user interface is divided in three parts. The first part, to the left, is the already mentioned Hint Box, which reports information on an Alpha or a State, depending on the position of the mouse. The second part, on the center, is the Essence kernel. It shows the Alphas. If the user clicks on an Alpha, the Kernel expands and shows the corresponding States. The third part, on the right, is the project status. It displays a rose graph and a horizontal bar chart. The rose graph represents the project status in terms of Alphas' completions, whereas the horizontal bar chart provides an overview of the Concerns' completion.

When a user clicks on a State, thus expressing a change of State of an Alpha, the graphs are immediately updated. For example, in Fig. 3), the user chooses that Requirements Alpha is now in the Conceived State. The rose graphs and the horizontal bar chart on the right side of the screen are updated. The models of SematAcc derive from an analysis of the Essence theory. They are represented in the class diagram of Fig.4.

A user of the system possesses one-to-many projects. Each project has an associated Essence kernel. In SematAcc, the kernel is a graphical conceptualization and does not have a corresponding database collection. Although a kernel may have one-to-many Concerns, the current OMG standard proposal suggests three of them: "Customer", "Solution", and "Endeavor". The three Concerns contain the corresponding Alphas. Alphas have several associated States but may be in zero or one-and-only-one State.

Each Concern, Alpha, and State has a corresponding name and description taken from Essence OMG submission. In order to speed-up the Essence learning process, the descriptions of kernel elements appear in SematAcc as soon as the user hovers with the mouse over them. Finally, each project possesses events, which are employed by SematAcc to log and generate data for research purposes.

A high-level view of the most important functionality of SematAcc is represented in Fig. 5.

In the example provided in Fig. 3, the user decides that the "Requirements" are now "conceived". A mouse click on the "conceived" State in the user interface triggers an update to the server's Alpha collection. Upon a successful update in the database, the completion ratios for the Concerns and the Alphas are recalculated in order to keep the data consistent. Then, the client component of SematAcc GUI shows what is represented in Fig. 3.

The project source-code is organized by separation of concerns according to Meteor conventions. The project's root folder, according to Meteor conventions, is the client folder, there is the code executed by the client in the Web

Screenshots

Fig. 1: Project Management in SematAcc.

Fig. 4: SematAcc Models.

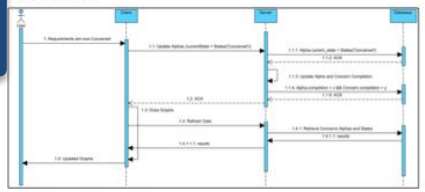

Fig. 5: High-level view of a change in Alpha State.

Implementation/Usage

Quality Control

Metadata

Reuse

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How to cite this article: Graziotin, D and Abrahamsson, P 2013 A Web-based modeling tool for the SEMAT Essence theory of software engineering. *Journal of Open Research Software* 1:e4, DOI: http://dx.doi.org/10.5334/jors.ag

Published: 2 September 2013

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Version 1 of 1

WEB TOOL

BioJS DAGViewer: A reusable JavaScript component for displaying directed graphs [v1; ref status: indexed, http://f1000r.es/2ut]

Alexis Kalderimis, Radek Stepan, Julie Sullivan, Rachel Lyne, Michael Lyne, Gos Micklem

Author affiliations

Grant information

Part of the *F1000Research* BioJS Collection

Abstract

Summary: The DAGViewer BioJS component is a reusable JavaScript component made available as part of the BioJS project and intended to be used to display graphs of structured data, with a particular emphasis on Directed Acyclic Graphs (DAGs). It enables users to embed representations of graphs of data, such as ontologies or phylogenetic trees, in hyper-text documents (HTML). This component is generic, since it is capable of displaying any kind of data that is organised as a graph. The features of this component which are useful for examining and filtering large and complex graphs are described.

Availability: http://github.com/alexkalderimis/dag-viewer-biojs; http://github.com/biojs/biojs; http://dx.doi.org/10.5281/zenodo.8303.

Article Status Summary

Referee Responses

Referees	1	2
v1 published 13 Feb 2014	✓ report	✓ report

1 **Tom Freeman**, University of Edinburgh, UK
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2 **Lynn Fink**, University of Queensland, Australia

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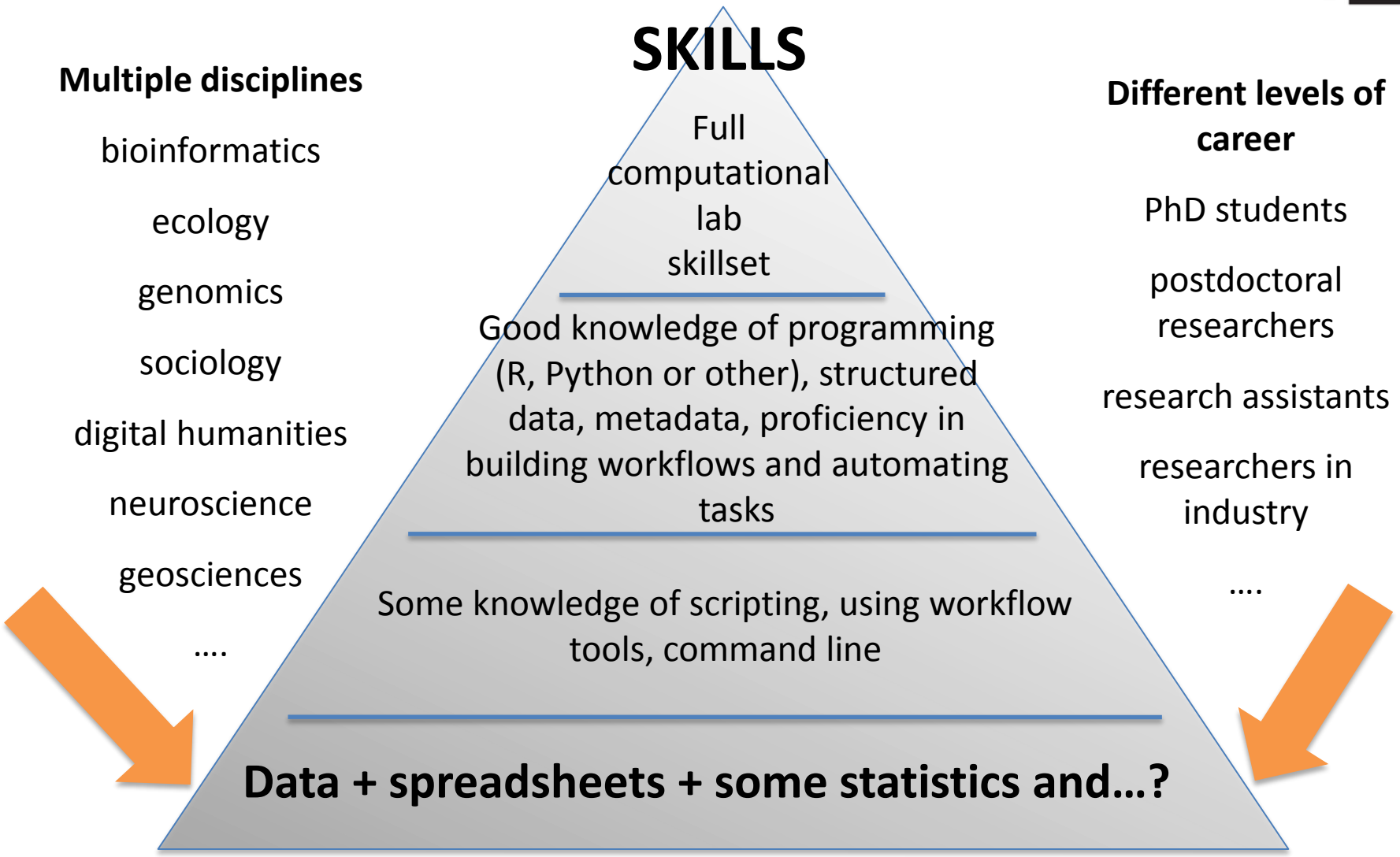

Slide courtesy of Aleksandra Pawlik, Data Carpentry

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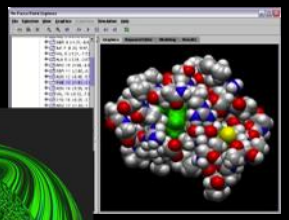
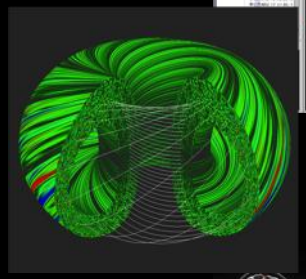
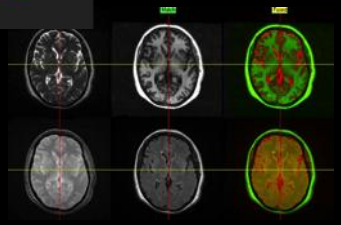




Consultancy

41 projects



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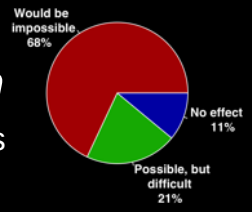

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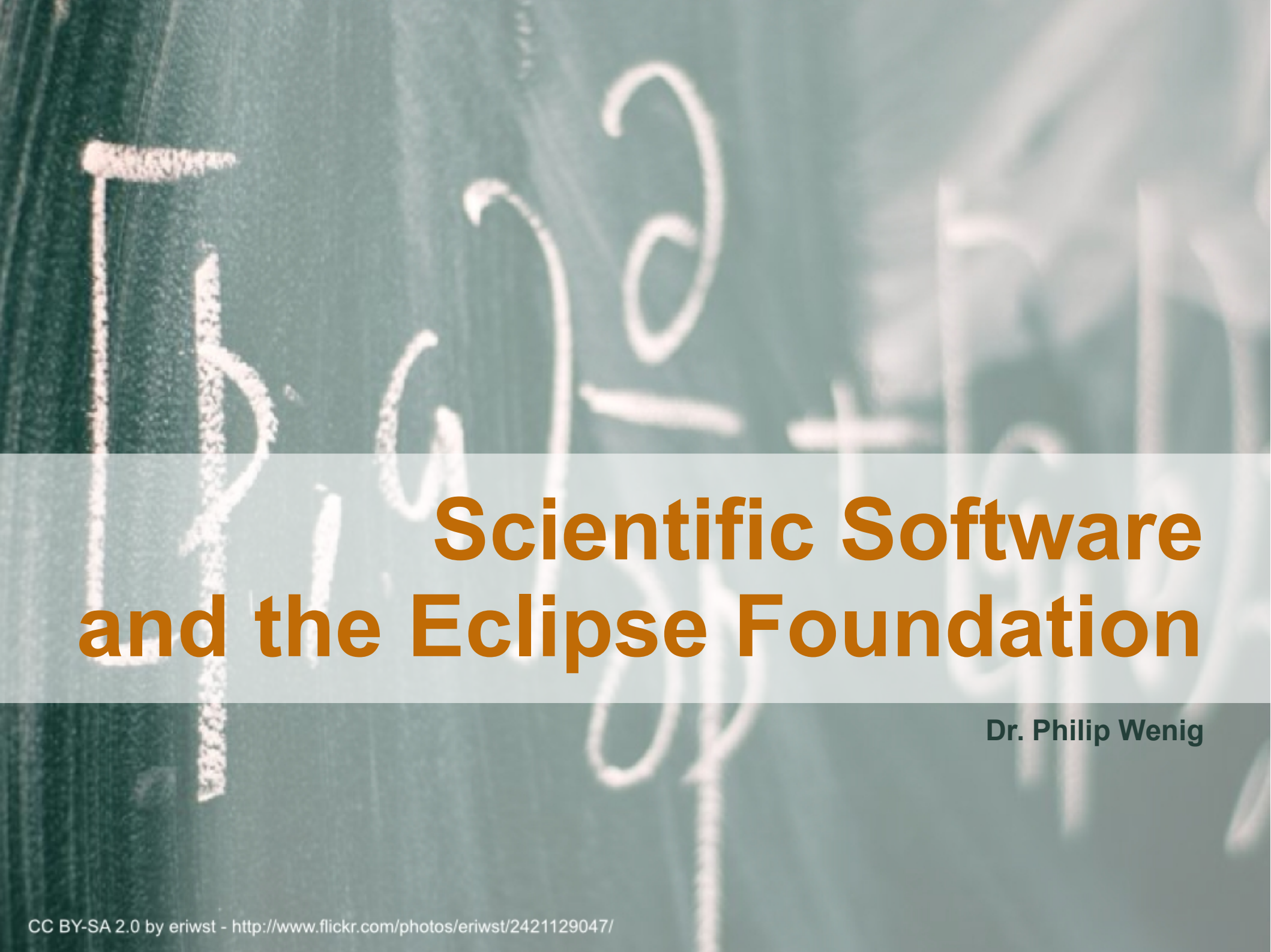
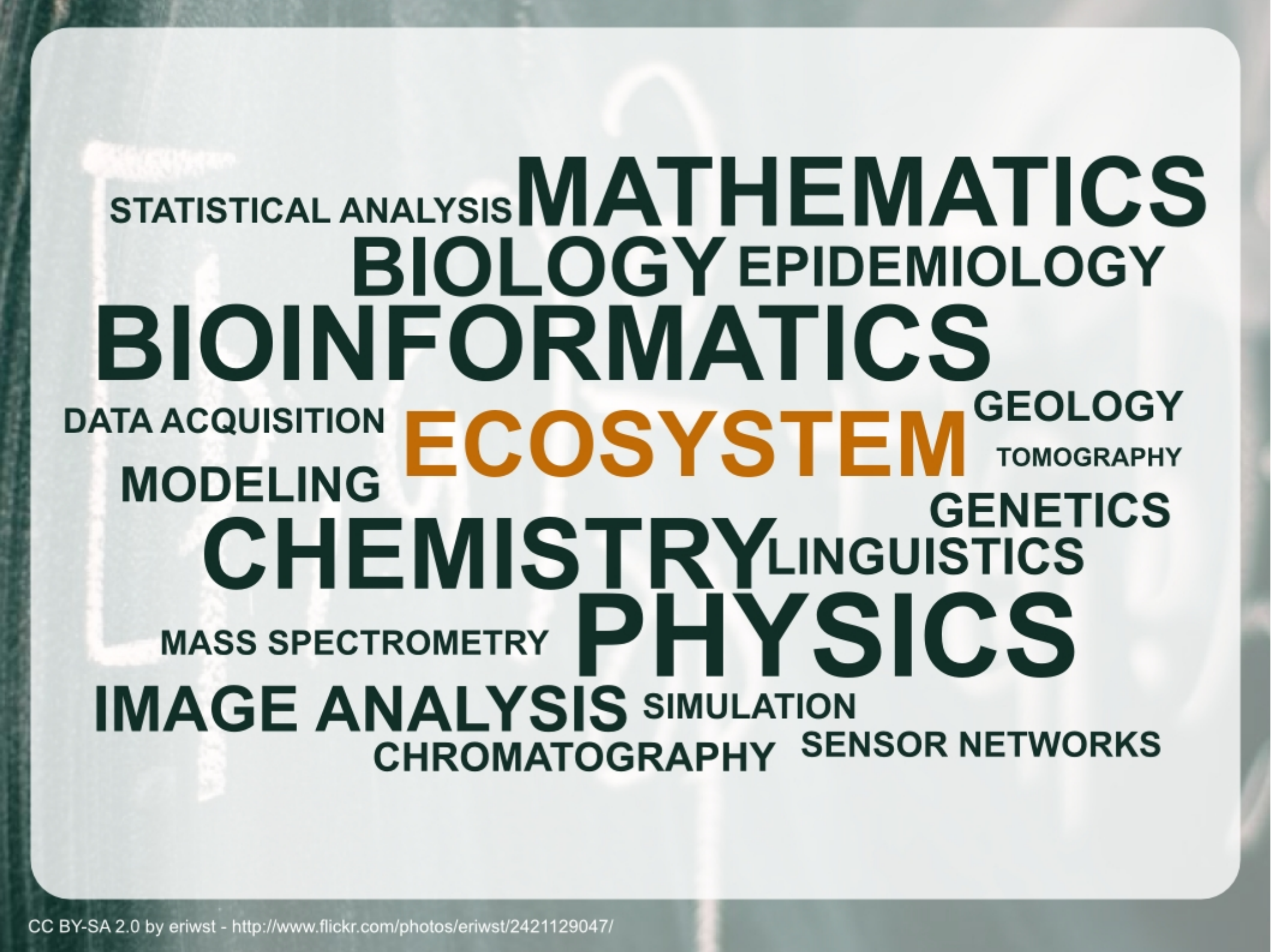


Scientific Software and the Eclipse Foundation

Dr. Philip Wenig

Eclipse Foundation

Eclipse IDE for Java developers only?



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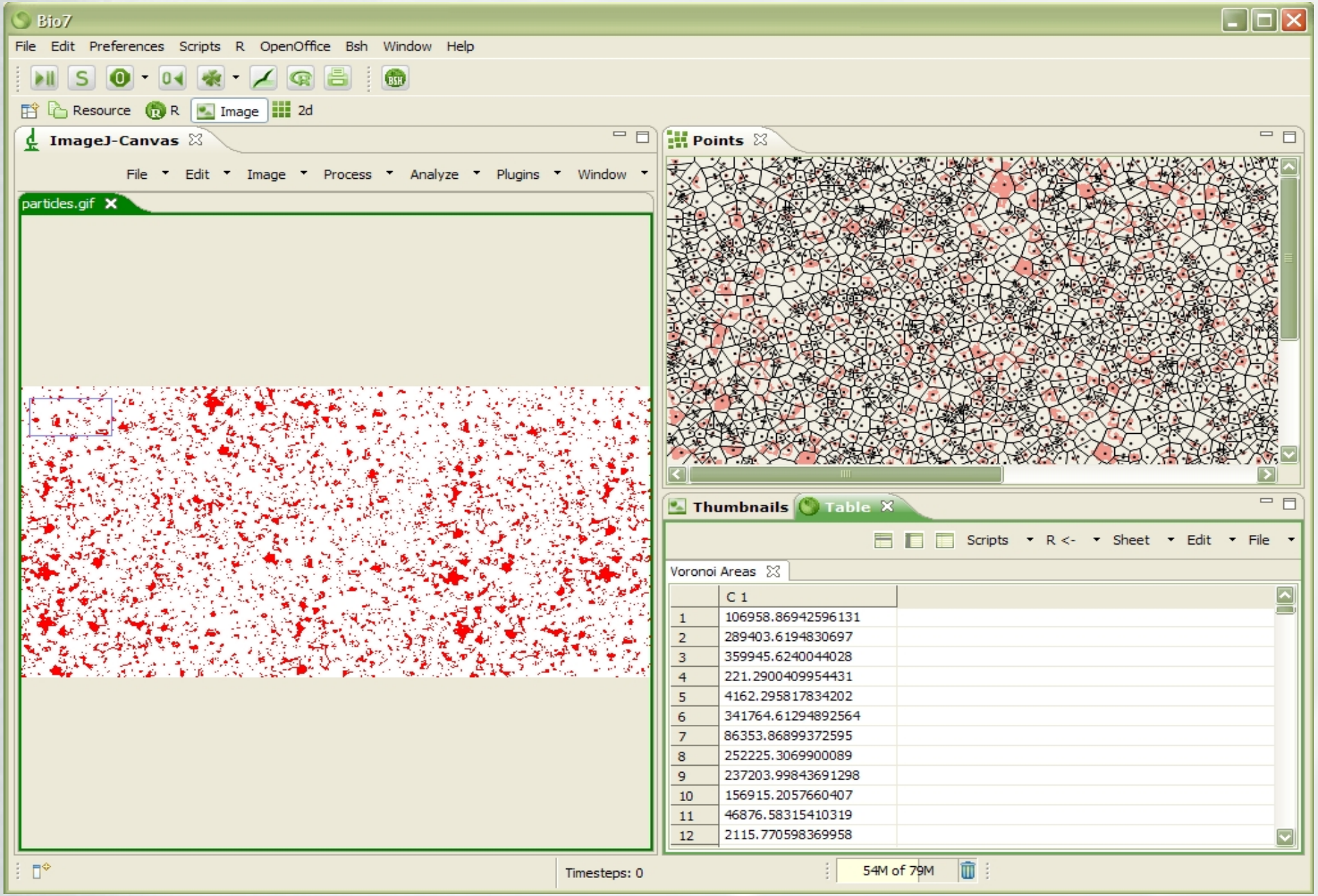
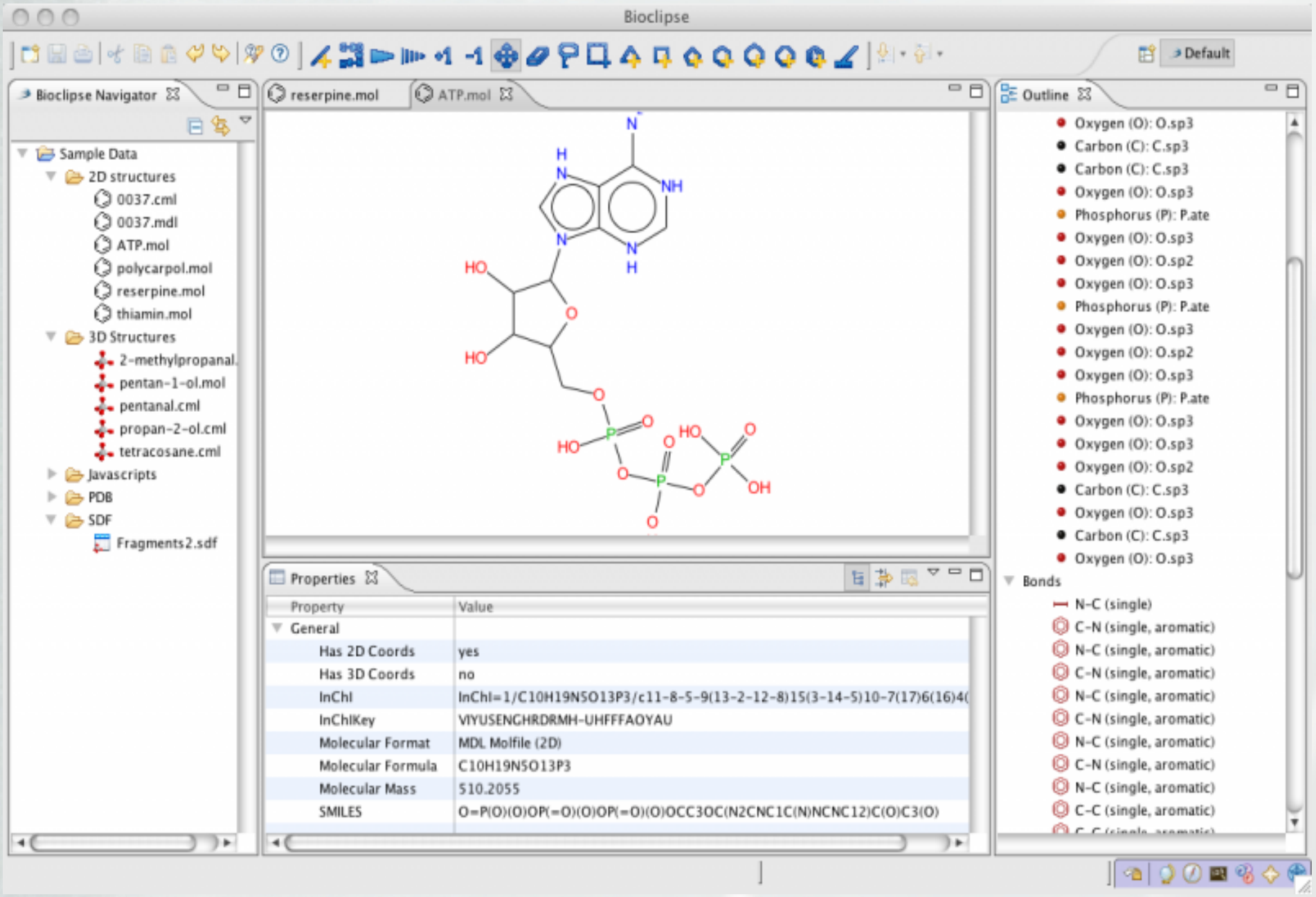
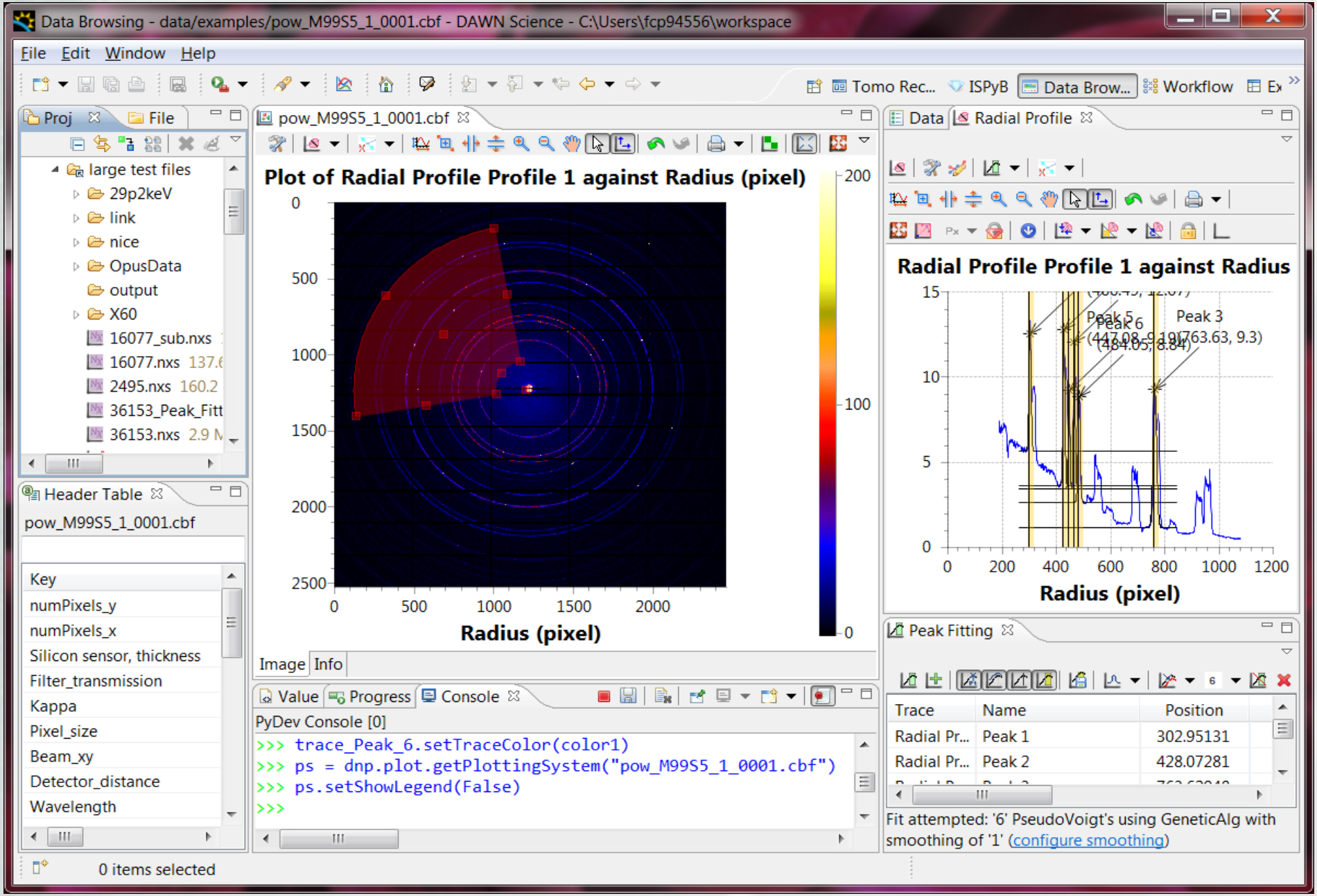
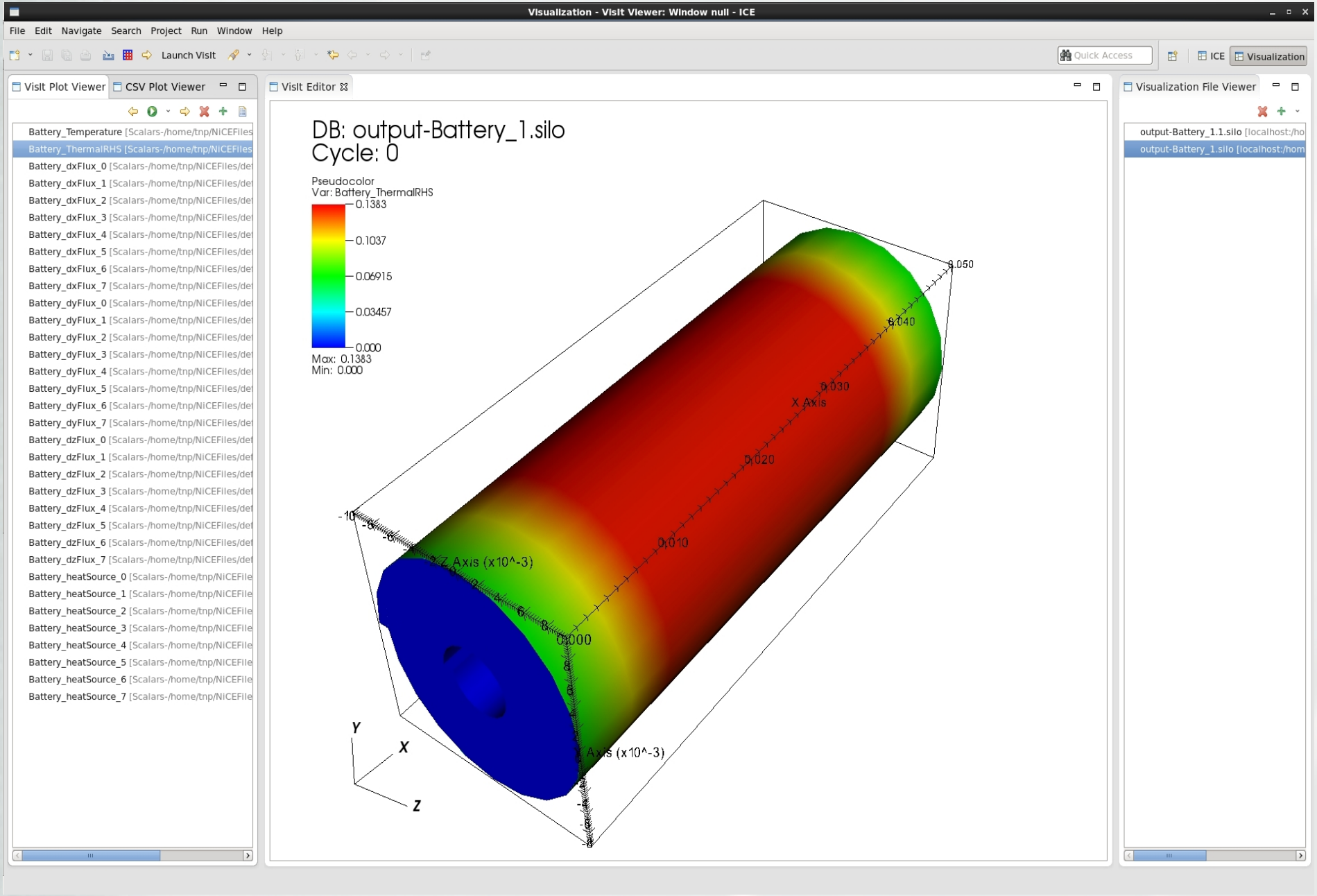
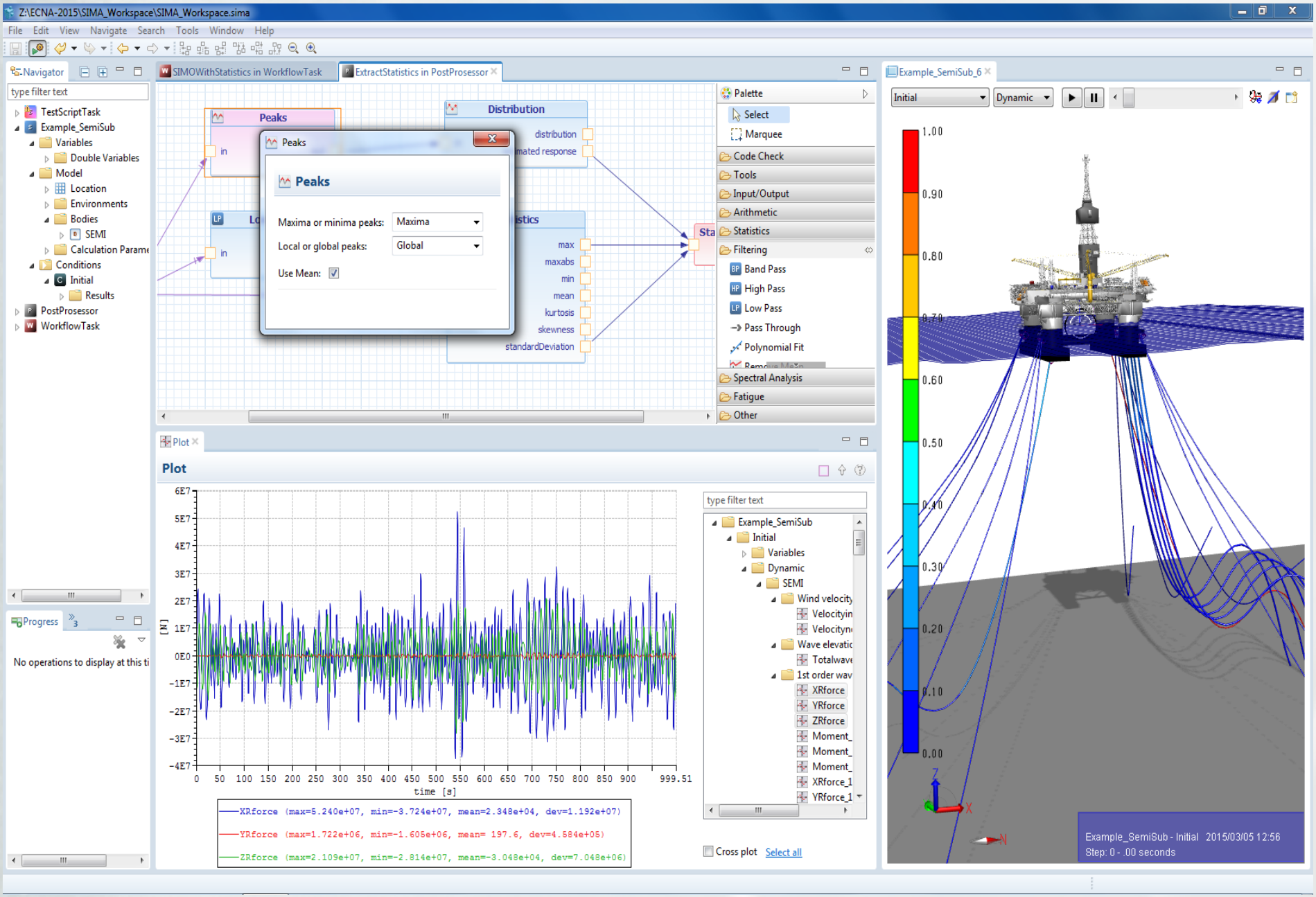






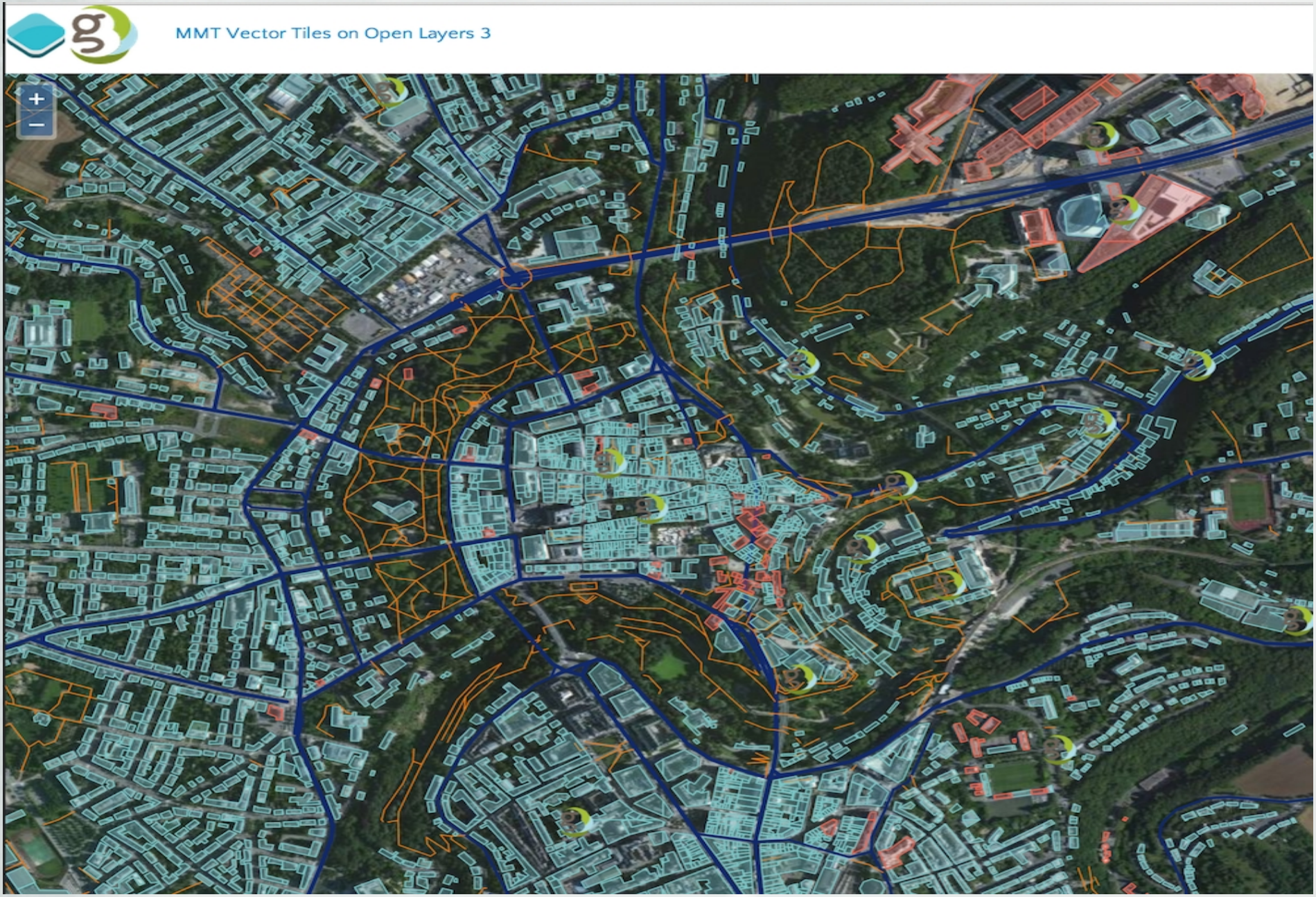


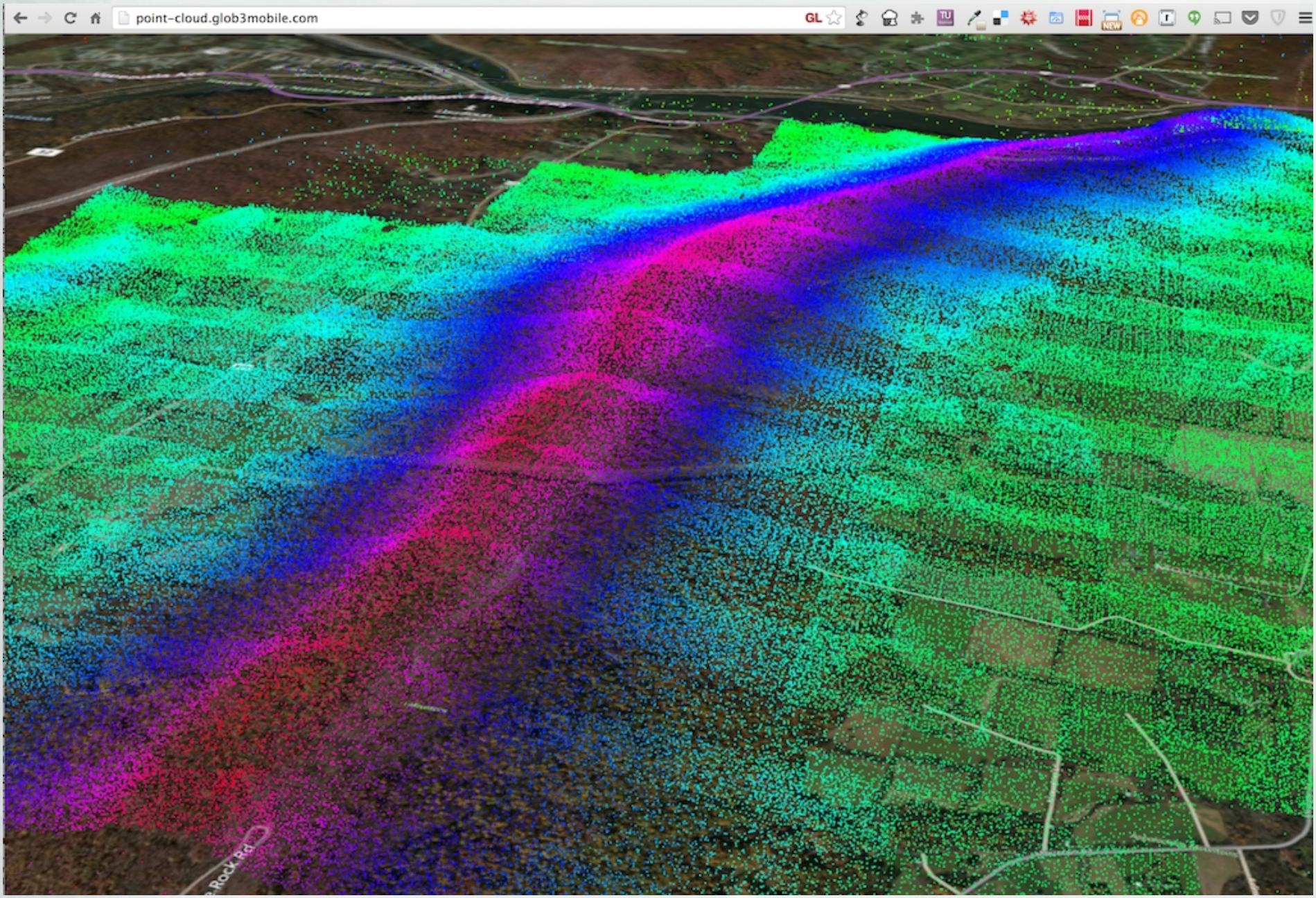


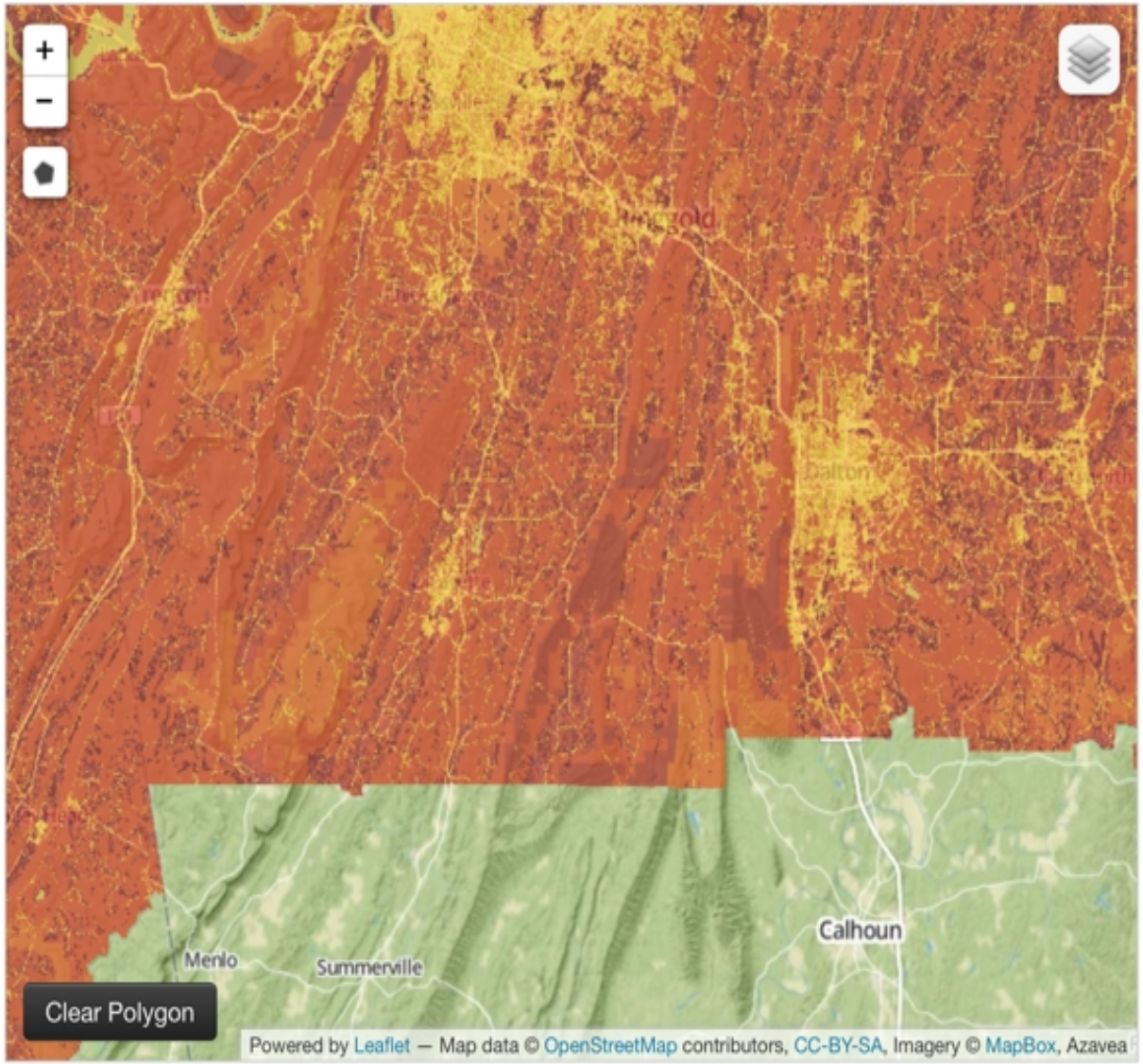
LocationTech Working Group

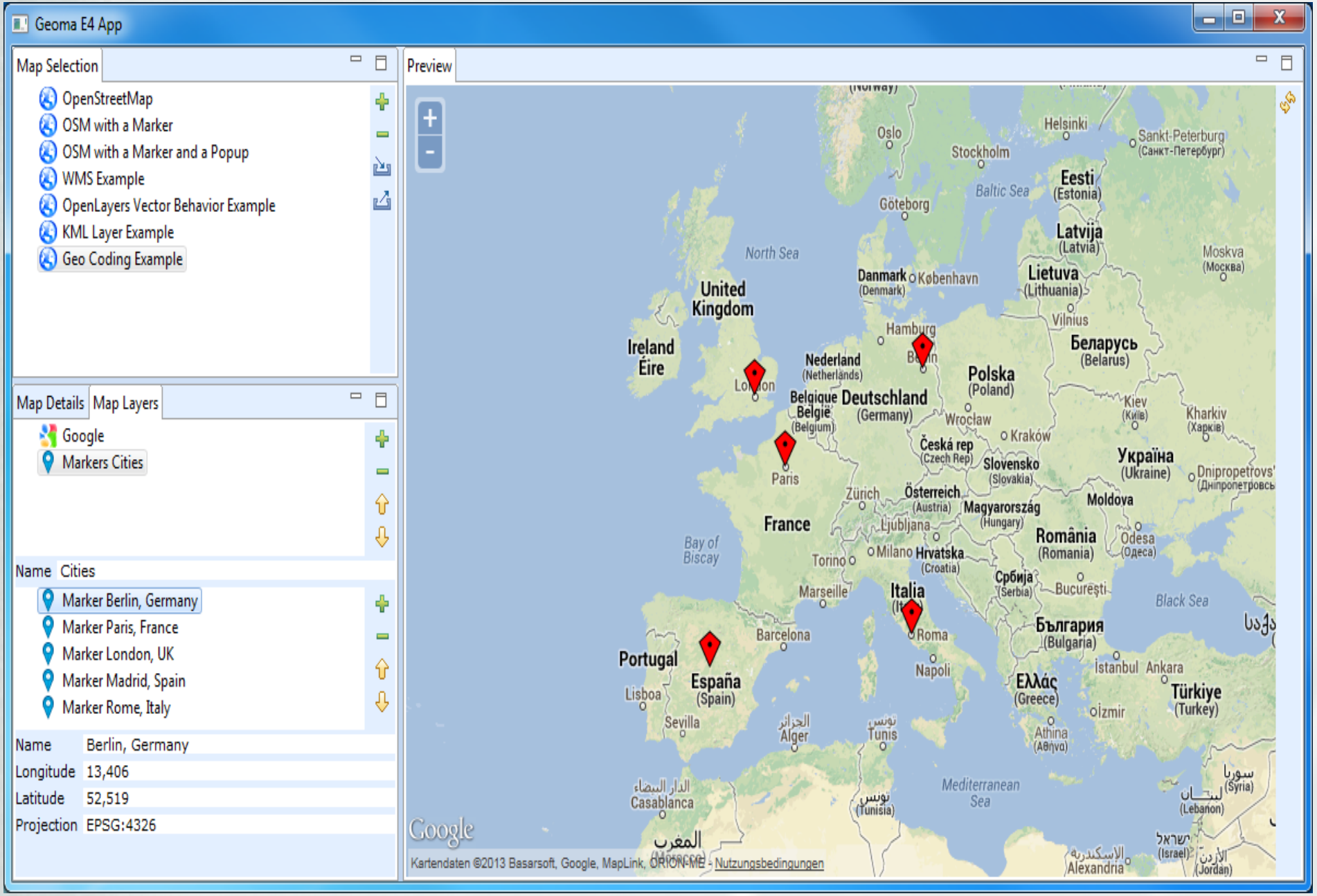
LocationTech

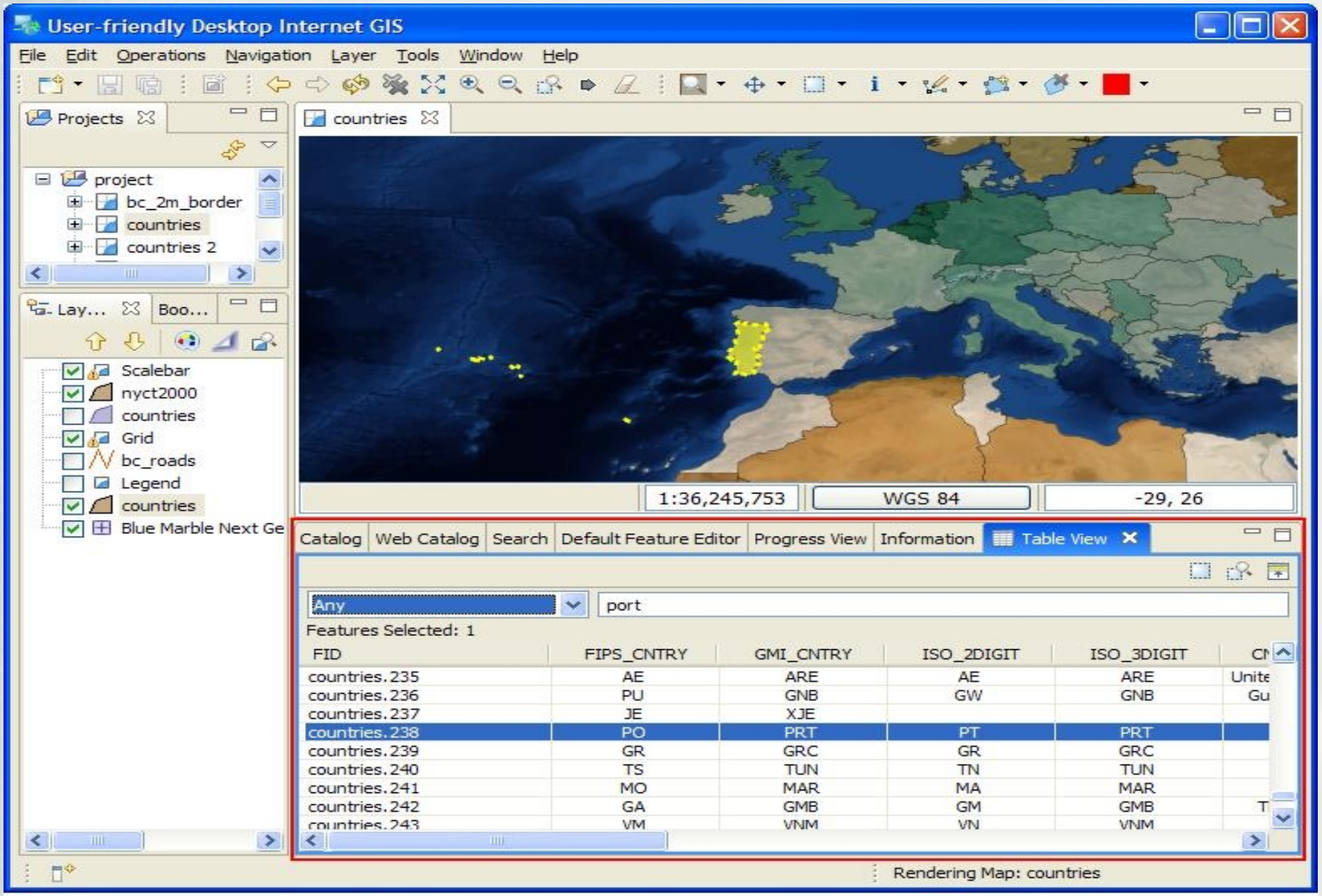
https://www.locationtech.org/members

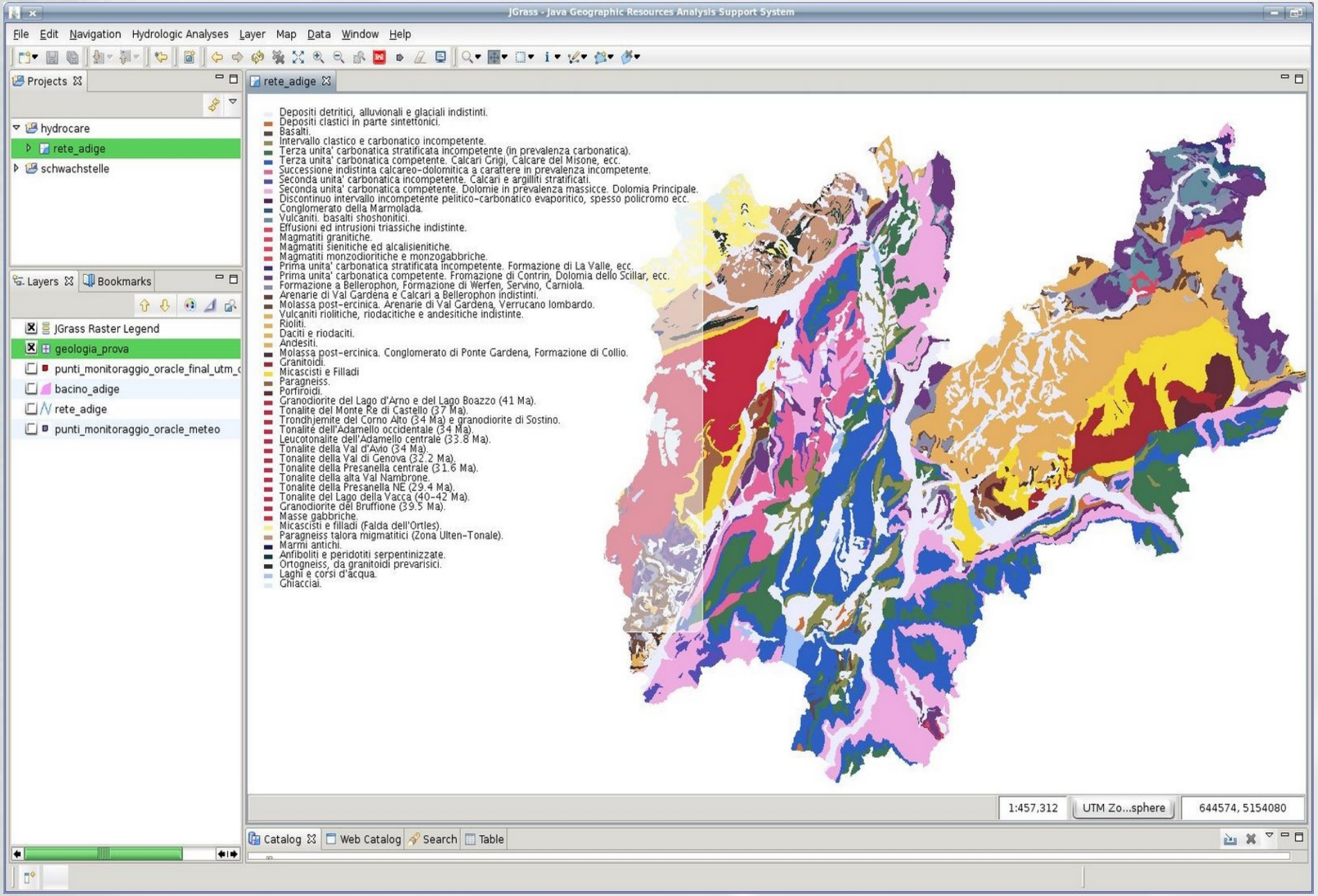


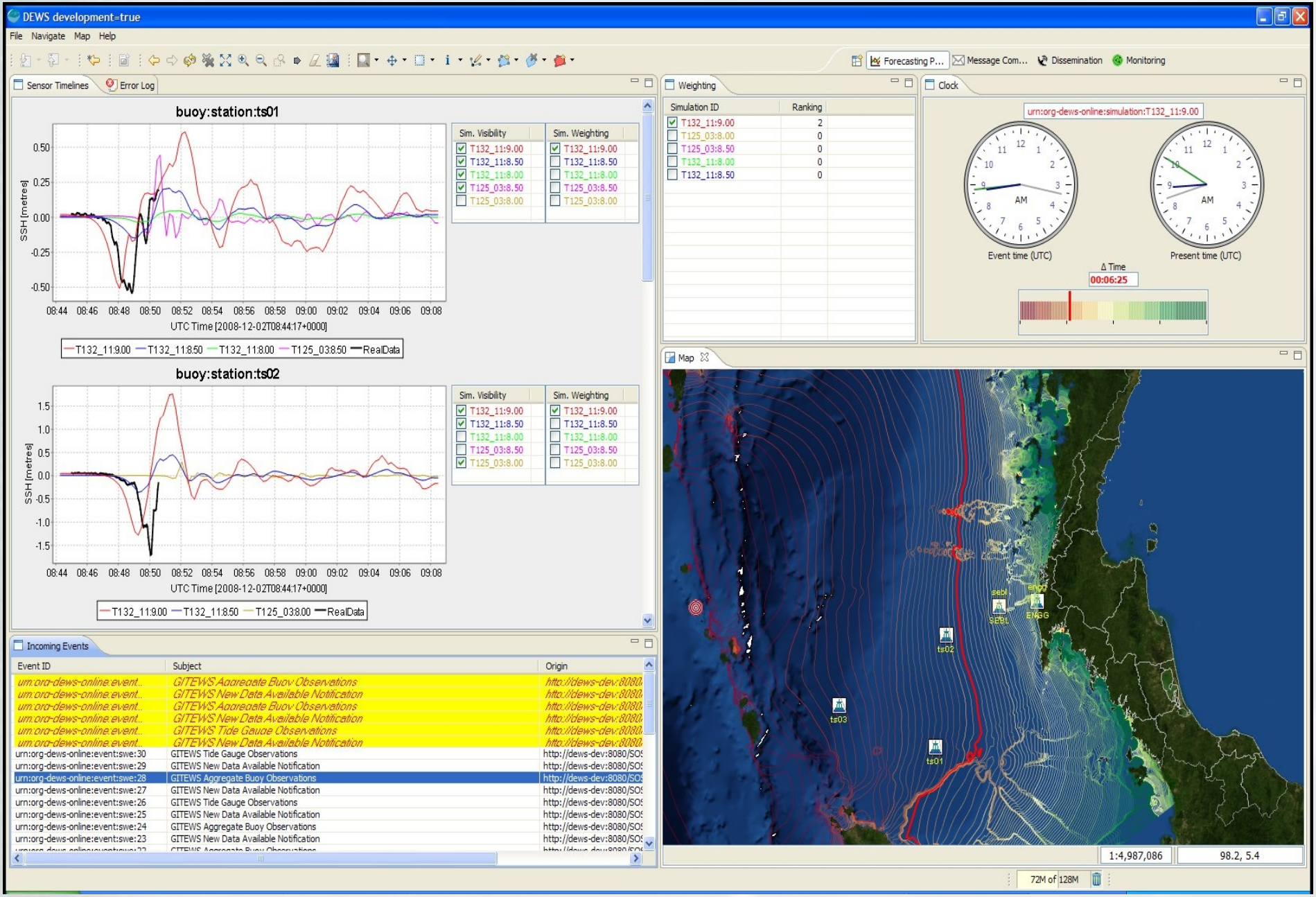












Software for Geology

Eclipse as a place for collaboration?

Software for Geology

Yes!

How to start?

Source Code

Java

JavaScript

Python

...

not focused on Java and Eclipse RCP only!

Project Proposals

Eclipse member in good standing

Eclipse Foundation: Andrew Ross

BUT BEFORE … start a discussion on ...

Mailing lists

Science WG

https://dev.eclipse.org/mailman/listinfo/science-iwg

LocationTech WG

https://locationtech.org/mailman/listinfo/location-iwg

OPENChrom

OpenChrom® - software solutions for chromatography and mass spectrometry

Lablicate UG (haftungsbeschränkt)
Dr. Philip Wenig / OpenChrom®
Martin-Luther-King-Platz 6
20146 Hamburg, Germany
philip.wenig@openchrom.net
https://www.openchrom.net

Markus Neteler
Fondazione Edmund Mach, Trento, Italy

http://www.osgeo.org

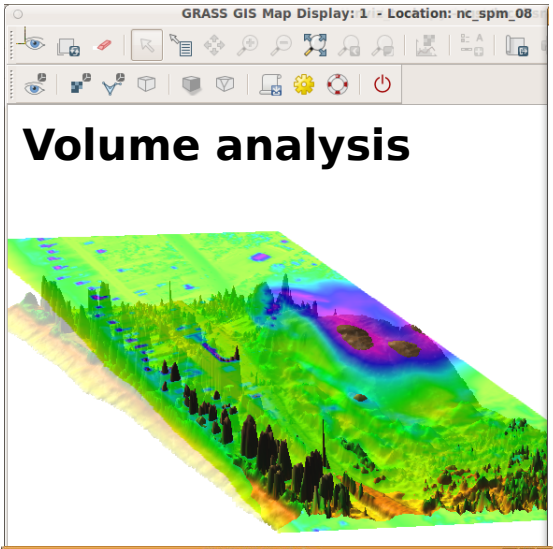
OSGeo: projects, incubation and infrastructure

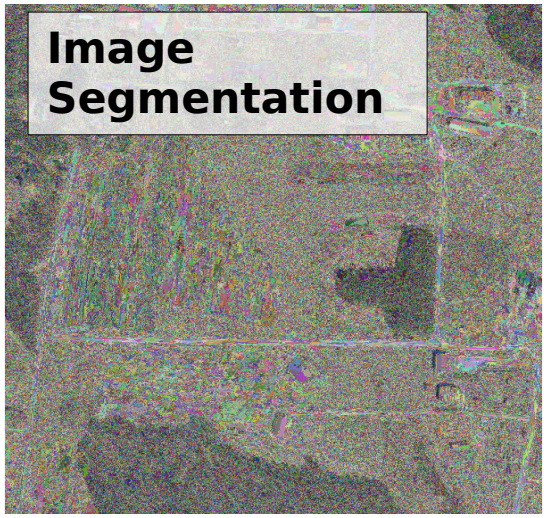
SC24: Open Science goes Geo
Part II: Scientific Software
EGU 2015, Vienna

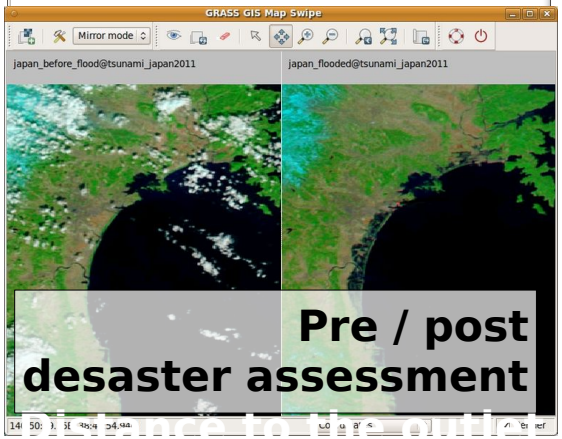

```
/******************************************************************************
 * $Id: gdalwarper.cpp 27739 2014-09-25 18:49:52Z goatbar $
 *
 * Project:  High Performance Image Reprojector
 * Purpose:  Implementation of high level convenience APIs for warper.
 * Author:   Frank Warmerdam, warmerdam@pobox.com
 *
******************************************************************************
 * Copyright (c) 2003, Frank Warmerdam <warmerdam@pobox.com>
 * Copyright (c) 2008-2012, Even Rouault
*                          <even dot rouault at mines-paris dot org>
 *
 * Permission is hereby granted, free of charge, to any person obtaining a
 * copy of this software and associated documentation files (the "Software"),
 * to deal in the Software without restriction, including without limitation
 * the rights to use, copy, modify, merge, publish, distribute, sublicense,
 * and/or sell copies of the Software, and to permit persons to whom the
 * Software is furnished to do so, subject to the following conditions:
```

```
#include "gdalwarper.h"
#include "cpl_string.h"
#include "cpl_minixml.h"
#include "ogr_api.h"
#include "gdal_priv.h"

CPL_CVSID("$Id: gdalwarper.cpp 27739 2014-09-25 18:49:52Z goatbar
/************************************************************************/
/*                       GDALReprojectImage()                           */
/************************************************************************/
/**
 * Reproject image.
 *
 * This is a convenience function utilizing the GDALWarpOperation class
 * reproject an image from a source to a destination.  In particular, this
 * function takes care of establishing the transformation function to
 * implement the reprojection, and will default a variety of other
 * warp options.
```

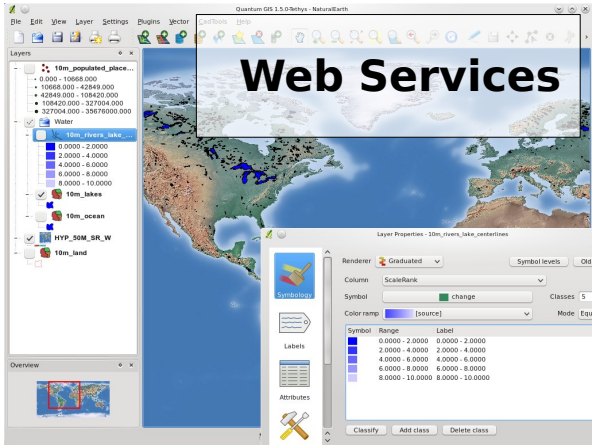
Geodata processing at its best

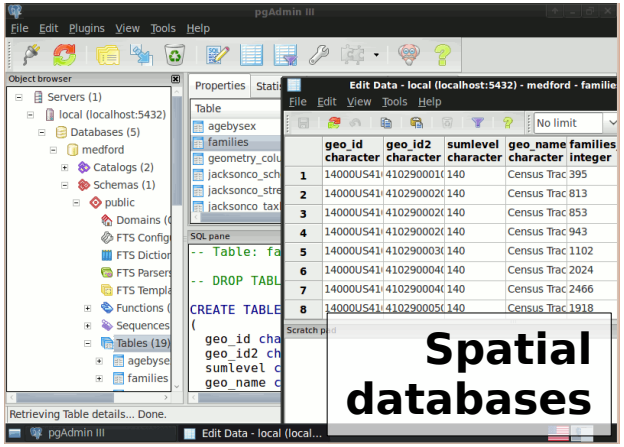


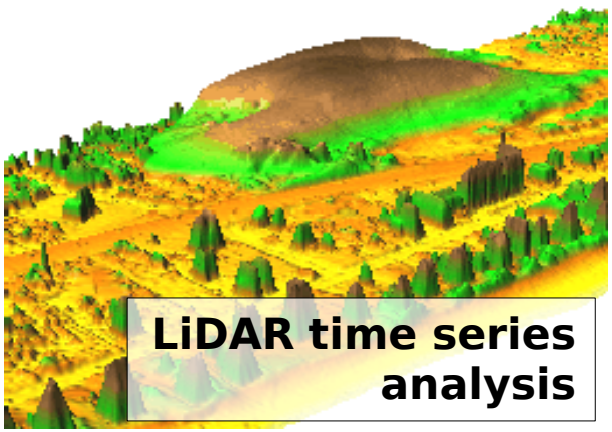




OSGeo
Your Open Source Compass







Open Source Geospatial Foundation: OSGeo projects and related

... just an Incomplete View...!

OSGeo as a platform for Free and Open Source GIS projects

What does OSGeo offer here?

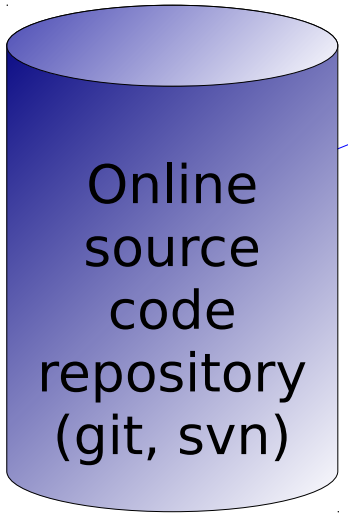
- Platform for **collaborative** software development
- Legal advice on intellectual property management and **software licenses**
- **Community** building
- Produce software **documentation**
- **Testing** and bugfixing
- **Education and Outreach**
- **Infrastructure**: source code hosting and installer packages

… all community driven!

Changing source code: what happens? (1/2)

```
tflag->description    = _("Print topology information only");

 if (G_parser(argc,argv))
   exit(EXIT_FAILURE);

 /* open input vector */
 if ((mapset = G_find_vector2(in_opt->answer, "")) == NULL) {
    G_fatal_error(_("Could not find input map <%s>"), in_opt->answer);
 }
```

Developer changes a file and submits to the online repository:
`svn ci -m“v.info: i18N macro added“ main.c`



Email with code changes (diff) is auto-generated and sent to “commit” mailing list and/or IRC

Email notification triggers updated of Quality Assessment System (e.g. coverity scan)

Changing source code: what happens? (2/2)

“Differences” (changes) email

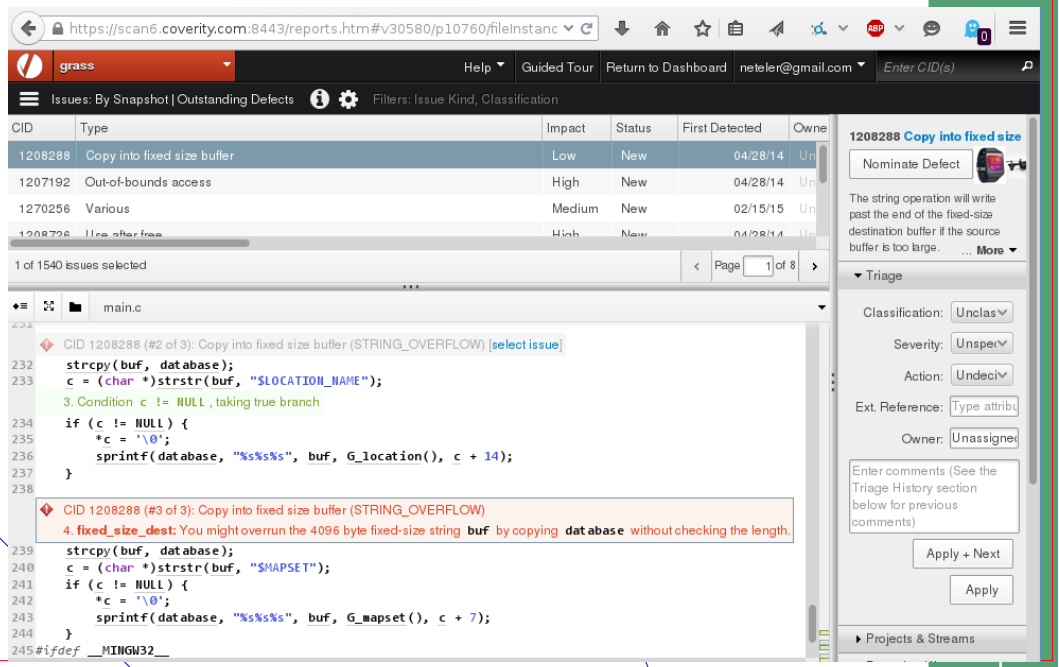
[GRASS-SVN] r65021 - grass/trunk/raster/r.random.cells

svn_grass at osgeo.org svn_grass at osgeo.org
Tue Apr 7 12:18:52 PDT 2015

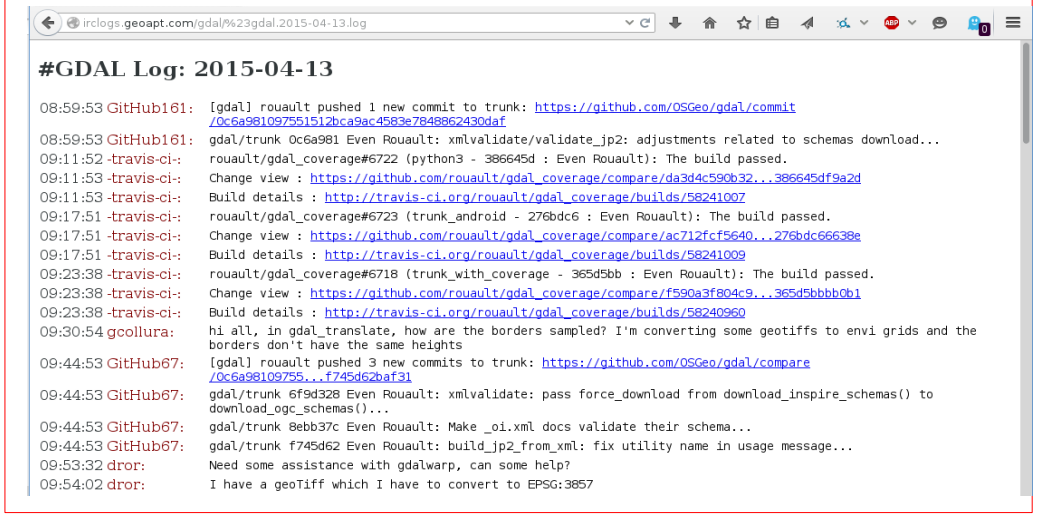
- Previous message: [GRASS-SVN] r65020 - grass-addons/grass7/imagery
- Messages sorted by: [date] [thread] [subject] [author]

```
Author: neteler
Date: 2015-04-07 12:18:52 -0700 (Tue, 07 Apr 2015)
New Revision: 65021

Modified:
   grass/trunk/raster/r.random.cells/indep.c
Log:
r.random.cells: set no data areas to Null, not 0 (fixes trac #2621)

Modified: grass/trunk/raster/r.random.cells/indep.c
===================================================================
--- grass/trunk/raster/r.random.cells/indep.c   2015-04-07 18:32:30 UTC (rev 65020)
+++ grass/trunk/raster/r.random.cells/indep.c   2015-04-07 19:18:52 UTC (rev 65021)
@@ -137,6 +137,8 @@
         G_percent(R, Rs, 2);
         for (C = 0; C < Cs; C++) {
             CellBuffer[C] = Out[R][C];
+            if(CellBuffer[C] == 0)
+                Rast_set_null_value(&CellBuffer[C], 1, CELL_TYPE);
         }
         Rast_put_row(OutFD, CellBuffer, CELL_TYPE);
     }
```

Code quality assessment



IRC robot feeds at #grass, #gdal, #qgis
IRC channel on freenode.net



#GDAL Log: 2015-04-13

```
08:59:53 GitHub161:  [gdal] rouault pushed 1 new commit to trunk: https://github.com/OSGeo/gdal/commit
                     /0c6a981097551512bca9ac4583e7848862430daf
08:59:53 GitHub161:  gdal/trunk 0c6a981 Even Rouault: xmlvalidate/validate_jp2: adjustments related to schemas download...
09:11:52 travis-ci:  rouault/gdal_coverage#6722 (python3 - 386645d : Even Rouault): The build passed.
09:11:53 travis-ci:  Change view : https://github.com/rouault/gdal_coverage/compare/da3d4c590b32...386645df9a2d
09:11:53 travis-ci:  Build details : http://travis-ci.org/rouault/gdal_coverage/builds/58241007
09:17:51 travis-ci:  rouault/gdal_coverage#6723 (trunk_android - 276bdc6 : Even Rouault): The build passed.
09:17:51 travis-ci:  Change view : https://github.com/rouault/gdal_coverage/compare/ac712fcf5640...276bdc66638e
09:17:51 travis-ci:  Build details : http://travis-ci.org/rouault/gdal_coverage/builds/58241009
09:23:38 travis-ci:  rouault/gdal_coverage#6718 (trunk_with_coverage - 365d5bb : Even Rouault): The build passed.
09:23:38 travis-ci:  Change view : https://github.com/rouault/gdal_coverage/compare/f590a3f804c9...365d5bbbb0b1
09:23:38 travis-ci:  Build details : http://travis-ci.org/rouault/gdal_coverage/builds/58240960
09:30:54 gcollura:   hi all, in gdal_translate, how are the borders sampled? I'm converting some geotiffs to envi grids and the
                     borders don't have the same heights
09:44:53 GitHub67:   [gdal] rouault pushed 3 new commits to trunk: https://github.com/OSGeo/gdal/compare
                     /0c6a98109755...f745d62baf31
09:44:53 GitHub67:   gdal/trunk 6f9d328 Even Rouault: xmlvalidate: pass force_download from download_inspire_schemas() to
                     download_ogc_schemas()...
09:44:53 GitHub67:   gdal/trunk 8ebb37c Even Rouault: Make _oi.xml docs validate their schema...
09:44:53 GitHub67:   gdal/trunk f745d62 Even Rouault: build_jp2_from_xml: fix utility name in usage message...
09:53:32 dror:       Need some assistance with gdalwarp, can some help?
09:54:02 dror:       I have a geoTiff which I have to convert to EPSG:3857
```

Discussion triggered among developers

Improved source code after review

Code vetting: stay clean!

Legal aspects

- License compliance
- Don't copy from books like “Numerical Receipes in C”
- Ensure that 3rd party contributions are clean
- Employers must agree that work time is spent on coding (if applies)

Transparency and peer review *help to minimize the risk.*

How to become OSGeo project?

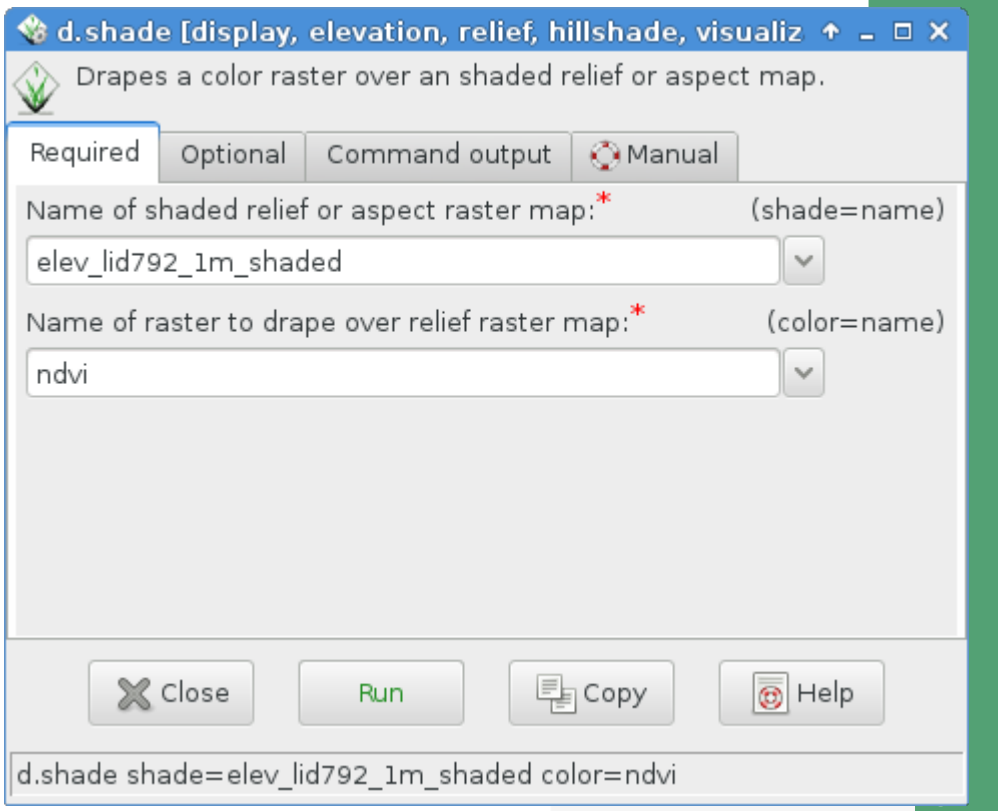
- Mentored Incubation phase:
  - code vetting (IP), **community health check**
  - Project sustainability
- Graduation (or not)

http://www.osgeo.org/incubator

Ease of coding:
Example of GRASS GIS 7 and Python API

Parser part *(for GUI autocreation and command line support):*

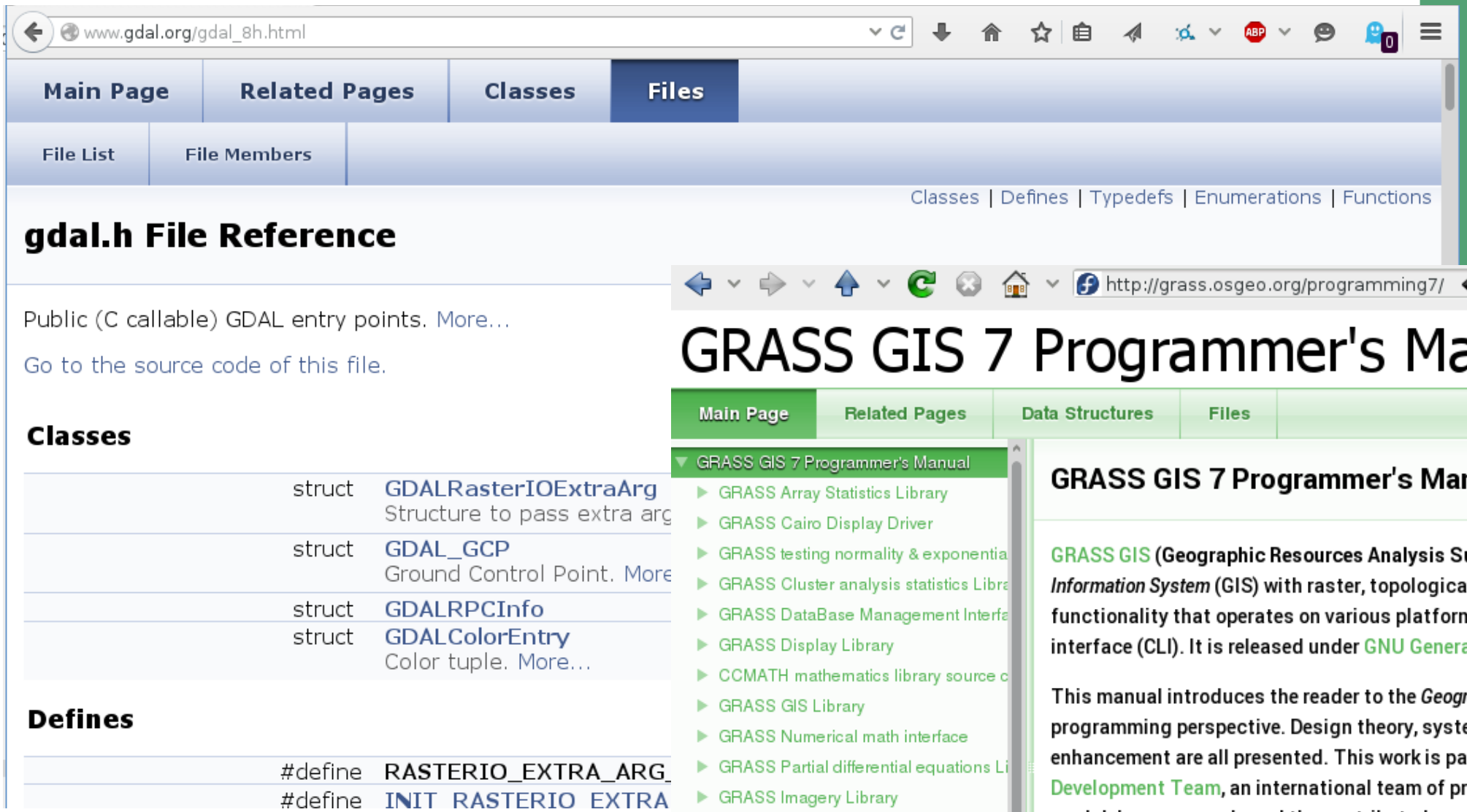
```
#%Module
#% description: Drapes a color raster over a shaded relief map using d.his
#%End
#%option
#% key: reliefmap
#% type: string
#% gisprompt: old,cell,raster
#% description: Name of shaded relief or aspect map
#% required : yes
#%end
#%option
#% key: drapemap
#% type: string
#% gisprompt: old,cell,raster
#% description: Name of raster to drape over relief
#% required : yes
#%end
```



Script part:

```
import sys
from grass.script import core as grass

def main():
    drape_map = options['drapemap']
    relief_map = options['reliefmap']
    brighten = options['brighten']
    ret = grass.run_command("d.his", h_map = drape_map,  i_map = relief_map, brighten = brighten)
    sys.exit(ret)

if __name__ == "__main__":
    options, flags = grass.parser()
    main()
```

Examples for programmer's manuals



Additionally:

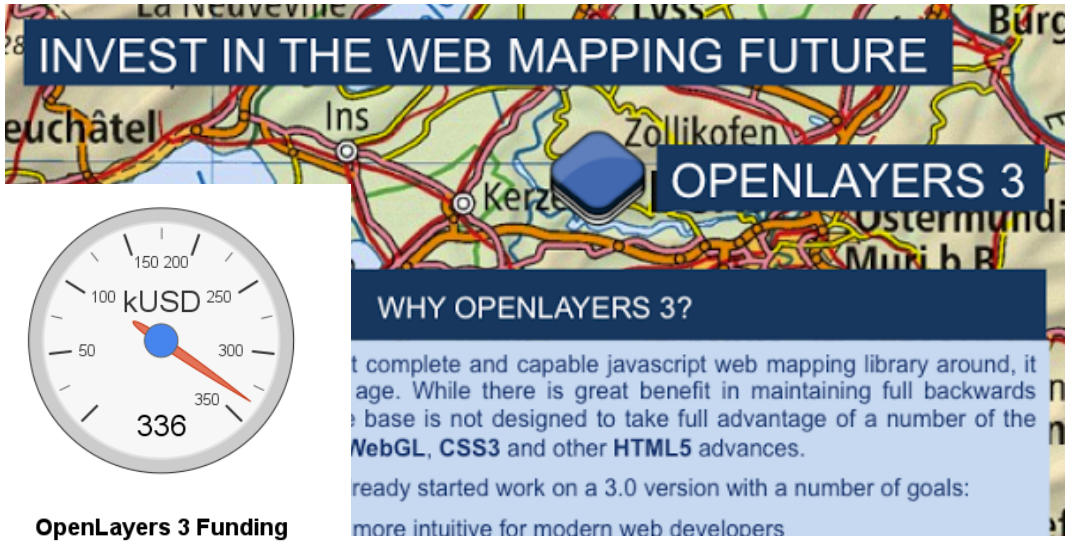
- Wiki pages
- Dev mailing lists

Funding model

Open source **development** is not gratis:

- Direct funding of developers through (scientific) projects
- Crowdfunding campaigns
- Company support
- Voluntary work
- Donations

(2013)



Example of cost analysis:

In a Nutshell, GRASS GIS... (9/2014)

... has had 50,946 commits made by 71 contributors
representing 1,344,395 lines of code

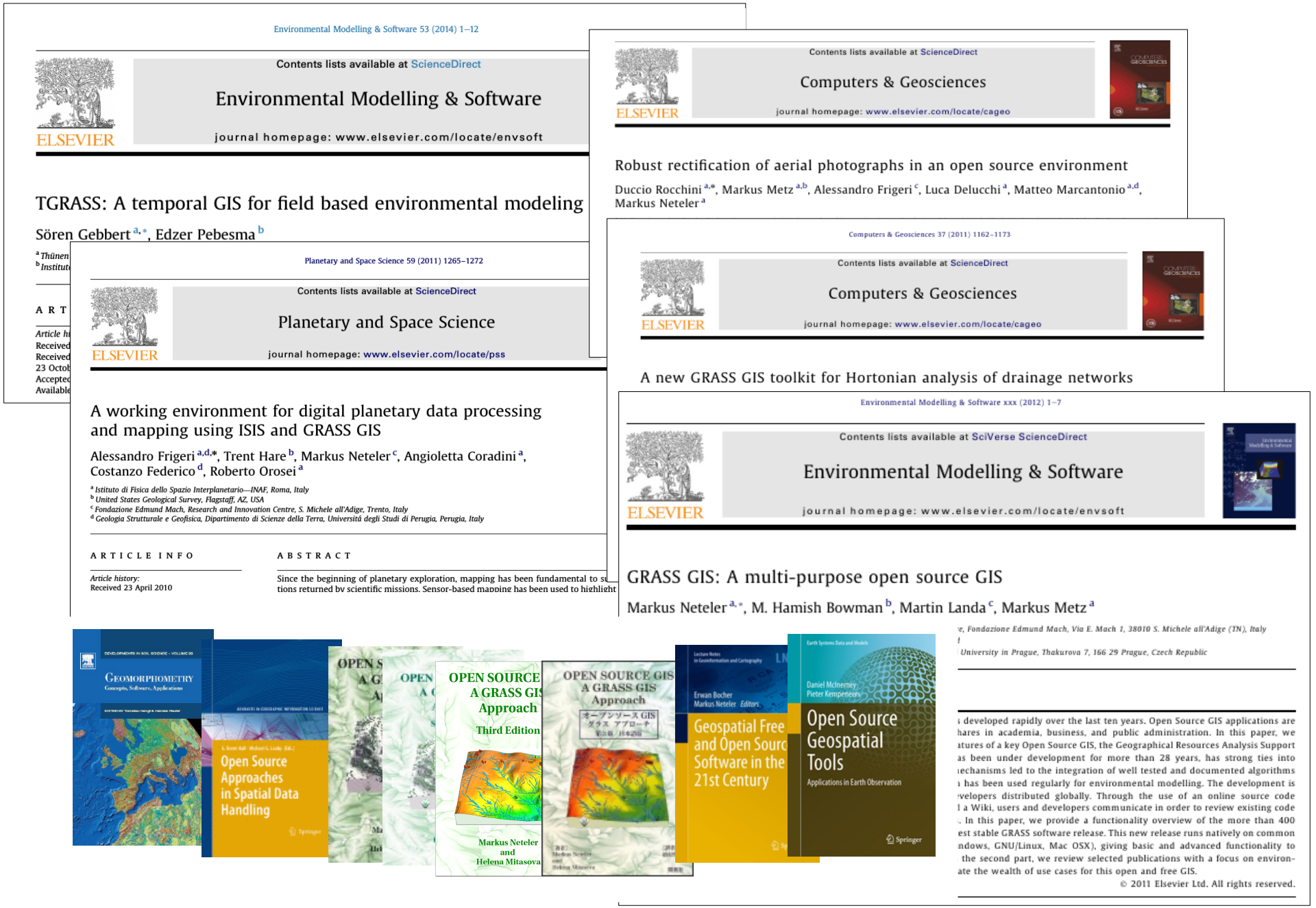
... is mostly written in C
with an average number of source code comments

... has a well established, mature codebase
maintained by a large development team
with stable Y-O-Y commits

... took an estimated 378 years of effort (COCOMO model)
starting with its first commit in December, 1999
ending with its most recent commit 2 months ago

https://www.openhub.net/p/grass_gis

Scientific Documentation of algorithms

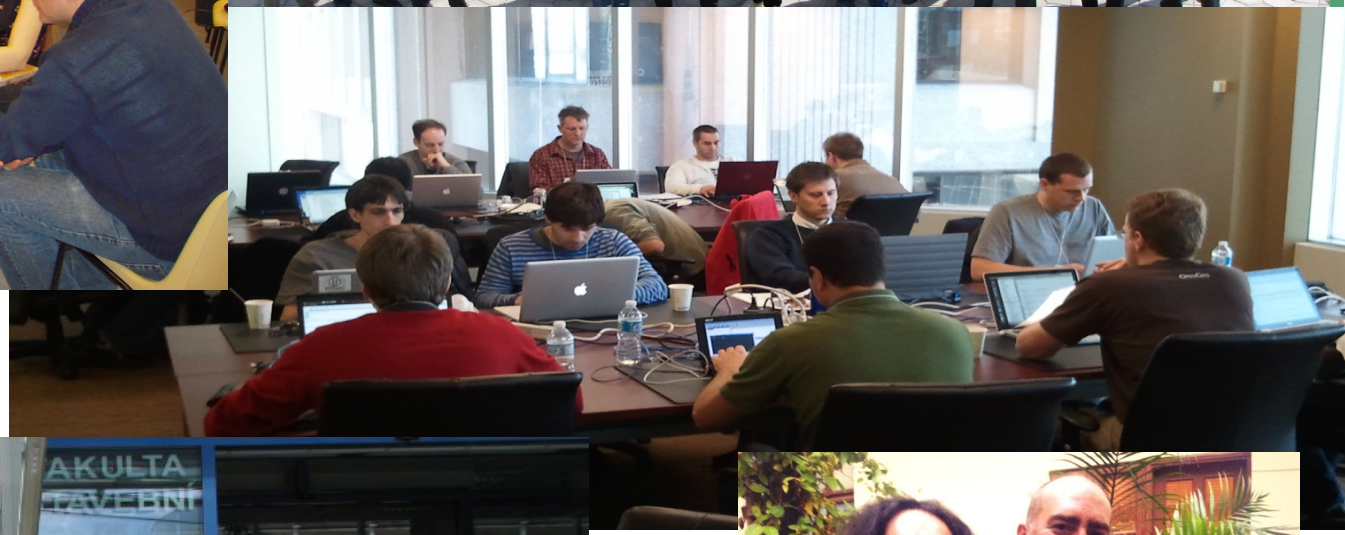


OSGeo software as a platform for sustainable Open Science!

What's on offer?

- **Reproducibility:** Open source is the natural habitat for science and research – wealth of scientific publications are documenting the algorithms
- **Return of Investment**:
  Example GRASS GIS' *r.mapcalc*: available since 1985, continuously developed, user can still run old scripts in latest GRASS GIS 7 without much update hassle while using latest implementation
- **Auto-documentation**: command line (besides GUI) generates map and command history – metadata preserved “forever”
- **Reliability**: Regression tests and quality control systems often integrated in the software itself
- **Longevity for Open Science**: code integrated in Open Source software “survives” even if original authors would not continue – 30 years of development

Coding fun at international code sprints



http://www.osgeo.org

Markus Neteler, PhD

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GIS and Remote Sensing Unit
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http://gis.cri.fmach.it
http://www.osgeo.org

markus.neteler@fmach.it
neteler@osgeo.org

OSGeo
Your Open Source Compass

Thanks!

Scientific Software Papers

Edzer Pebesma

ifgi
Institute for Geoinformatics
University of Münster

52north
exploring horizons

EGU 2015 Short Course on
"Open Science goes Geo – Part II: Scientific Software"

Apr 15, 2015

Why?

1. principle: "We need to get more code out there" (Roger Peng, Nature 501 (7468))
2. opportunity: Van Noorden, Maher, Nuzzo, Nature 514 (7524): The top 100 papers: *Nature* explores the most-cited research of all time.

   A few of the the 100 most highly cited papers of all time concern classic discoveries, but *"the vast majority describe experimental methods or software that have become essential in their fields."*

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   A few of the the 100 most highly cited papers of all time concern classic discoveries, but *"the vast majority describe experimental methods or software that have become essential in their fields."*

- Even for papers not in the top-100, software papers get cited well, in particular by those who use the software in later papers.
- Authors are more inclined to use software that has been published in a proper (citable) publication.
- After the software has been developed, writing the paper is relatively little work, and fun!

What is a software paper?

- a *scientific* publication (as opposed to the user manual)
- software, which has not been scientifically published, is the main result, and should be a scientific contribution
- the *methods* it implements may have been published otherwise
- puts the software in the context of existing solutions, discusses strenghs and weaknesses
- describes open source software
- describes a worked out use case, as illustration
- provides the software *and* use case as part of the submission, with the use case being easily reproducible
- review addresses both paper *and* software.

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- review addresses both paper *and* software.

When is software ready to be published?
How much software justifies a full scientific paper?

How gets software published?

As opposed to journal papers, software typically lives on, but a "freeze" corresponding to the published paper should be archived along with the paper:

- Computers & Geosciences in the early days used an ftp server, now has a GitHub repo, `https://github.com/cageo`, that makes a forks (static copy) of git repositories at the time of publication
- J Statitistical Software
  - serves a copy of the software on its home page (.tar.gz)
  - in case of R packages, makes sure this corresponds to a CRAN release

Computers & Geosciences, Vol. 1, pp. 3–26. Pergamon Press, 1975. Printed in Great Britain

PIP1 AND PIP2: FORTRAN IV PROGRAMS TO AID IN THE DETERMINATION OF IMPORTANT PARAMETERS IN A CLASSIFICATION SCHEME

THOMAS A. JONES and ROBERT A. BAKER

Exxon Production Research Company, P.O. Box 2189, Houston, Texas 77001, U.S.A.

(*Received* 24 *April* 1974)

Abstract—Classification and categorization, particularly the numerical classification of samples into groups or categories, are common aspects of geological investigations. However, variables are included commonly that are irrelevant to the classification or investigation. Relevant variables may be difficult to isolate, and objective methods for emphasizing them are lacking. This paper describes a semiobjective scheme, and two computer programs, for identifying important variables. The programs are used basically for computing simple arithmetic statistics to order the parameters by importance to the classification.

INTRODUCTION

A search for order in a set of data commonly reveals that only part of the data is relevant to the order. Reduction of the number of variables or parameters in an analysis generally simplifies interpretation and data handling. We have described procedures whereby the number of

METHOD OF ANALYSIS

The "quality" statistic

A good geological parameter must be: (1) easy to detect, (2) consistent, and (3) characteristic. The selection of important parameters lies in quantifying these or other qualities which may be considered essential to a good

Table A

```
C                                                                       MLK    10
C          PROGRAM PIP1                                                 MLK    20
C       PARAMETER INVESTIGATION PROGRAM                                 MLK    30
C      DETERMINE KEY PARAMETERS FOR SELECTED CLUSTERS                   MLK    40
C                                                                       MLK    50
C                                                                       MLK    60
C      T A JONES & R A BAKER                                            MLK    70
C     RELEASED BY ESSO PRODUCTION RESEARCH CO., HOUSTON, TEXAS          MLK    80
C     MAY 1, 1974                                                       MLK    90
C                                                                       MLK   100
C                                                                       MLK   110
C     DIMENSION A MUST BE ADJUSTED FOR SPECIFIC PROBLEM SET             MLK   120
C     IF DYNAMIC CORE ALLOCATION OPTIONS ARE AVAILABLE AT YOUR COMPUTER  MLK   130
C       CENTER, LEAVE  A  DIMENSIONED AS 1 & MAKE APPROPRIATE ADDITIONS MLK   140
C       AS COMMENTED BELOW.                                             MLK   150
      DIMENSION A(10000)                                                MLK   160
C                                                                       MLK   170
      COMMON NT, NCF, NS, NP, TITLE(20), FR(20), NSB                    MLK   180
     1 ,KODE1,NCT,DECKNM(20),INP                                        MLK   190
      DIMENSION NNCT( 9),NNCF( 9)                                       MLK   200
      DATA NNCT/1,0,1,0,1,0,1,0,1/                                      MLK   210
      DATA NNCF/1,1,2,2,4,4,5,5,3/                                      MLK   220
      DIMENSION TRAN1(2),TRAN2(2),STD(2),CODE1(2),CODE2(2),CODE3(2)     MLK   230
      DATA TRAN1(1),TRAN2(1),TRAN1(2),TRAN2(2),STD(1),STD(2)/           MLK   240
     1  'FIEL','DS  ','GROU','PS  ','YES ','NO  '/                      MLK   250
      DATA CODE1(1),CODE2(1),CODE3(1)/'CODE',' NAM','E   '/             MLK   260
      DATA CODE1(2),CODE2(2),CODE3(2)/'LOCA','TION',' NO.'/             MLK   270
      COMMON /MISS/ DMISS                                               MLK   280
```

Why am I standing here?

- I am Co-Editor-in-Chief for
  - *Computers & Geosciences* (since 5/2014)
  - *J Statistical Software* (since 2/2015)
- I edited a 22 paper volume on *Spatial Statistics* in J Stat Soft (volume 63)
- *Computers & Geosciences* will run a special issue on the new paper type *Software Papers*; deadline is this fall.

Contact me if you're interested!

Code sharing at Nature Publishing Group

EGU 2015, Open Science, Code
15 April 2015

Andrew L. Hufton
Managing Editor, Scientific Data
Nature Publishing Group
andrew.hufton@nature.com

nature publishing group npg

SCIENTIFIC DATA

In Oct 2014 the Nature-titled journals announced a new code sharing policy

Code sharing at the Nature journals

If custom code is used to generate results that are deemed central to the claims:

- *During peer-review*, must make the code available *upon request* to editors and reviewers.
- *Upon publication*, Nature Journals consider it best practice to release code in a way that allows readers to repeat the results.
- A "Code availability‟ section in the Methods must indicate whether and how the code can be accessed, including any restrictions to access.

Scientific Data's code policy

see editorial "Ctrl alt share", Feb 2015

Enforce Nature-title policy and require code availability section

Plus:

- Guidance on how and when to deposit code at repositories (e.g. Github, zenodo, figshare)
- Guidance on citing code
- Recording versions and parameters for software.

Why is code different from data?

- Lack of repositories that are suitable for holding code during peer-review
- Lack of clarity over documentation and support expectations
- Most script-level code is not written to be instantly portable
- Widespread use of commercial, closed-source software

SCIENTIFIC DATA

Thanks!

Managing Editor, Scientific Data
Andrew L. Hufton
andrew.hufton@nature.com

Honorary Academic Editor
Susanna-Assunta Sansone

Advisory Panel and Editorial Board including senior researchers, funders, librarians and curators

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Software publication

Earth System Science Software

Dr. Xenia van Edig

EGU 2015 Short Course: Open Science goes Geo

Copernicus Publications | Vienna, 15 April 2015

@copernicus_org

Background

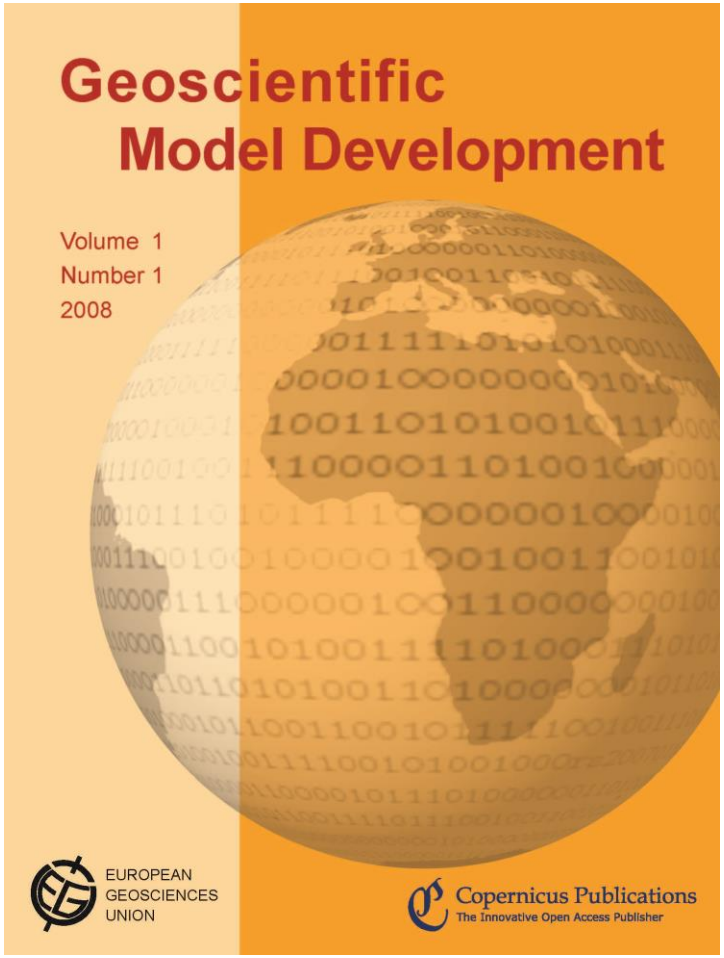
- Ideal (?) way of publishing software
  - Integration of manuscript type “software” for existing journals
  - Very different to other manuscript types (“review article”, etc.)
  - Would need a lot of programming
  - Not sure if new manuscript type gets accepted
- Alternative: new open-access journal Earth System Science Software

Background

- Publication of articles on original research data (sets)
- Data is stored on reliable repository
- Interactive Public Peer Review™
- Review also include data quality, significance of data sets, their uniqueness, usefulness, and completeness

Background

- Publication and public discussion of the description, development, and evaluation of numerical models
- Interactive Public Peer Review™
- All papers must include a section at the end of the paper entitled "code availability"

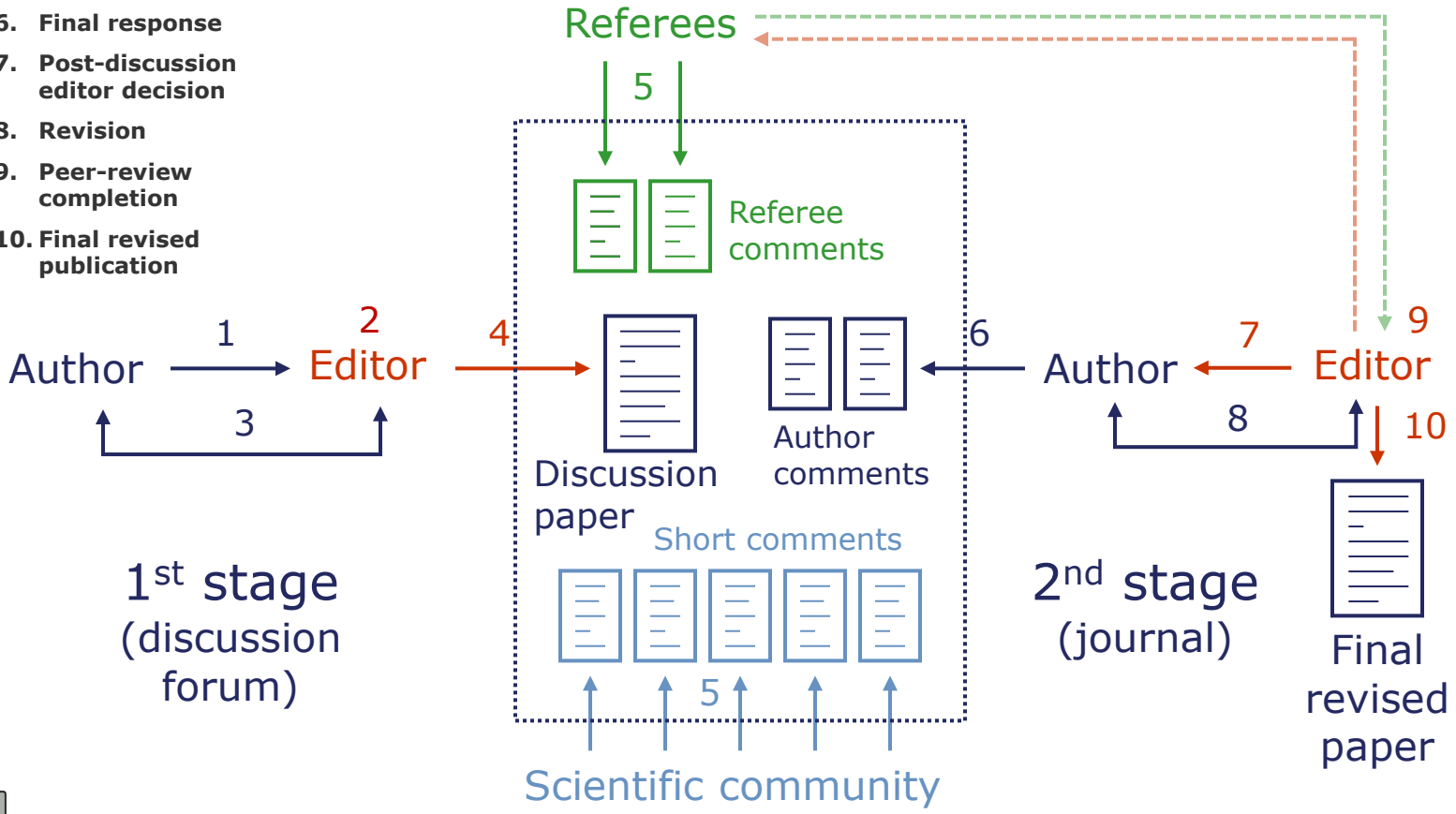


Earth System Science Software

- Paper describes the software/code
  - Paper gets DOI
  - Connection to software via persistent identifier
- Code stored in digital repository (e.g. Zenodo) or software repository (e.g. Git)
- Interactive Public Peer Review™
  - on description and code
  - transparent quality assurance
- Editors, reviewers, and authors needed

Interactive journal work flow

1. **Submission**
2. **Access review**
3. **Technical corrections**
4. **Publication as D-paper**
5. **Comments**
6. **Final response**
7. **Post-discussion editor decision**
8. **Revision**
9. **Peer-review completion**
10. **Final revised publication**



Thank you very much for your attention!

Watch the video of this presentation on YouTube.

Future Publication of Software

or the GitHub of Science

European Geosciences Union
General Assembly 2015
Vienna | Austria | 12 – 17 April 2015

SC24 Open Science goes Geo – Part II: Scientific Software

Martin Hammitzsch, Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences

Challenges


software-specific
review
traceability
skills
competencies
identifiers
reusability
executables
subject-specific
archiving
quality
versioning
productivity
value
metrics
reproducibility
measuring
source code
recognition
reputation
interdisciplinarity
impact
documentation
ecosystem
...

State of the Art

- ★ Software journals using individual policies for software related papers;
- ★ Digital Repositories minting DOIs for source code copies and software release packages;
- ★ Foundations and companies providing environment for FOSS projects;
- ★ Institutes offering software/code repositories and digital repositories for research results.

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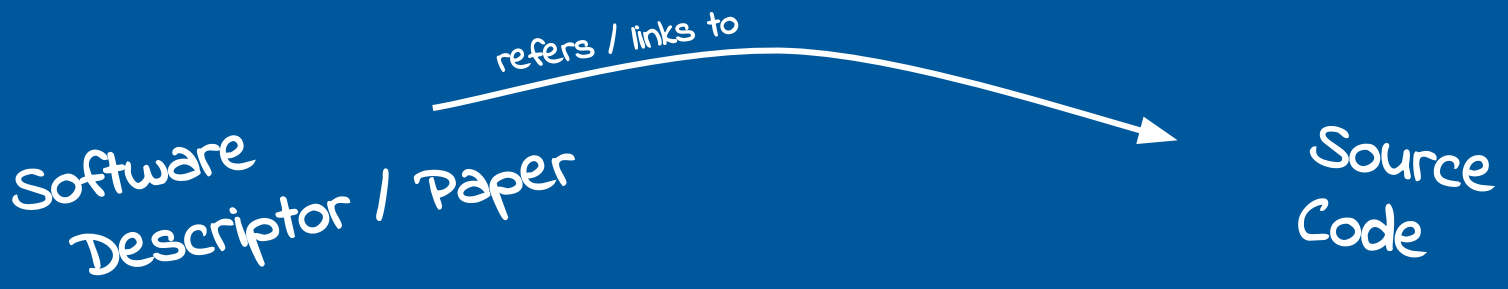
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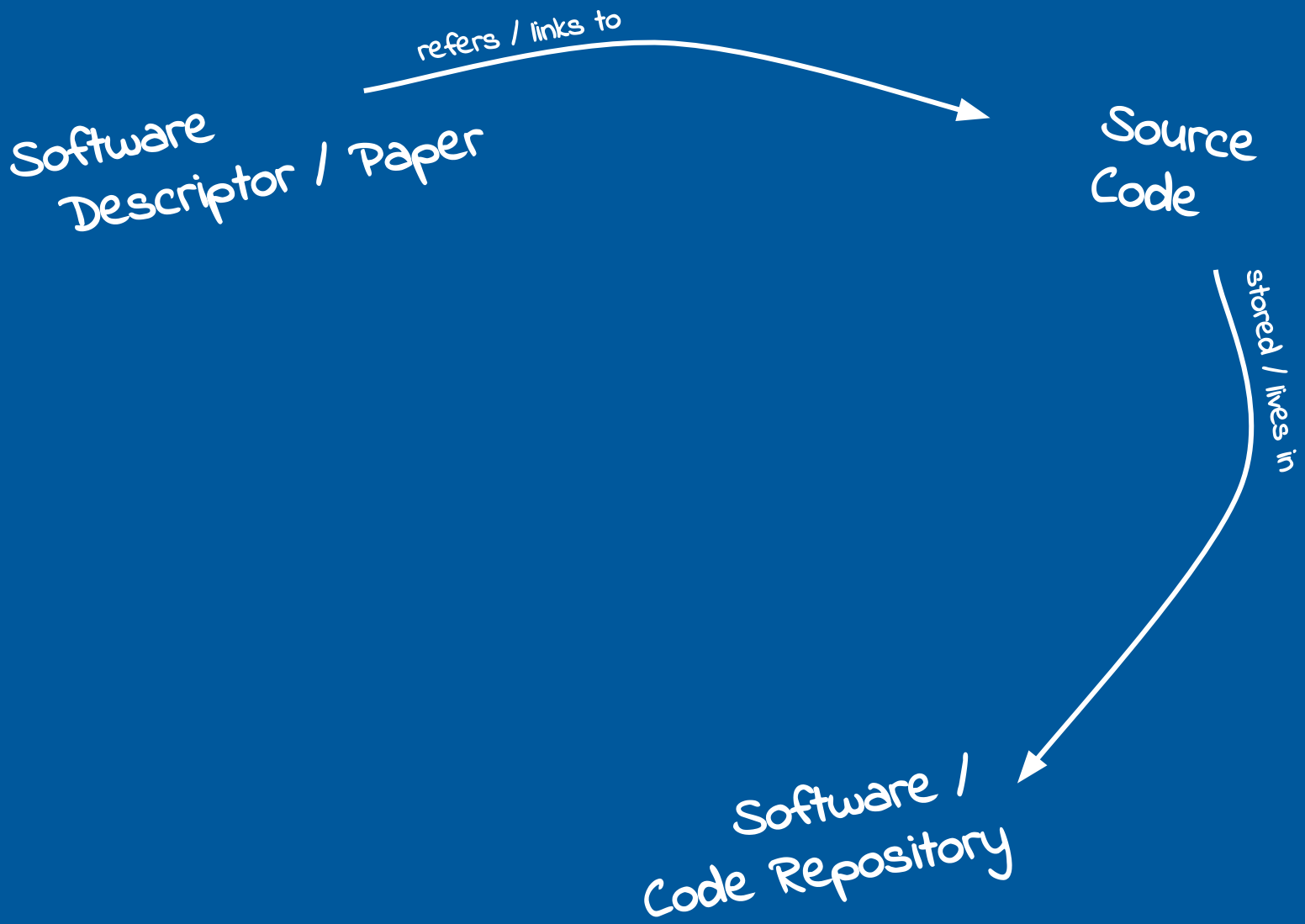
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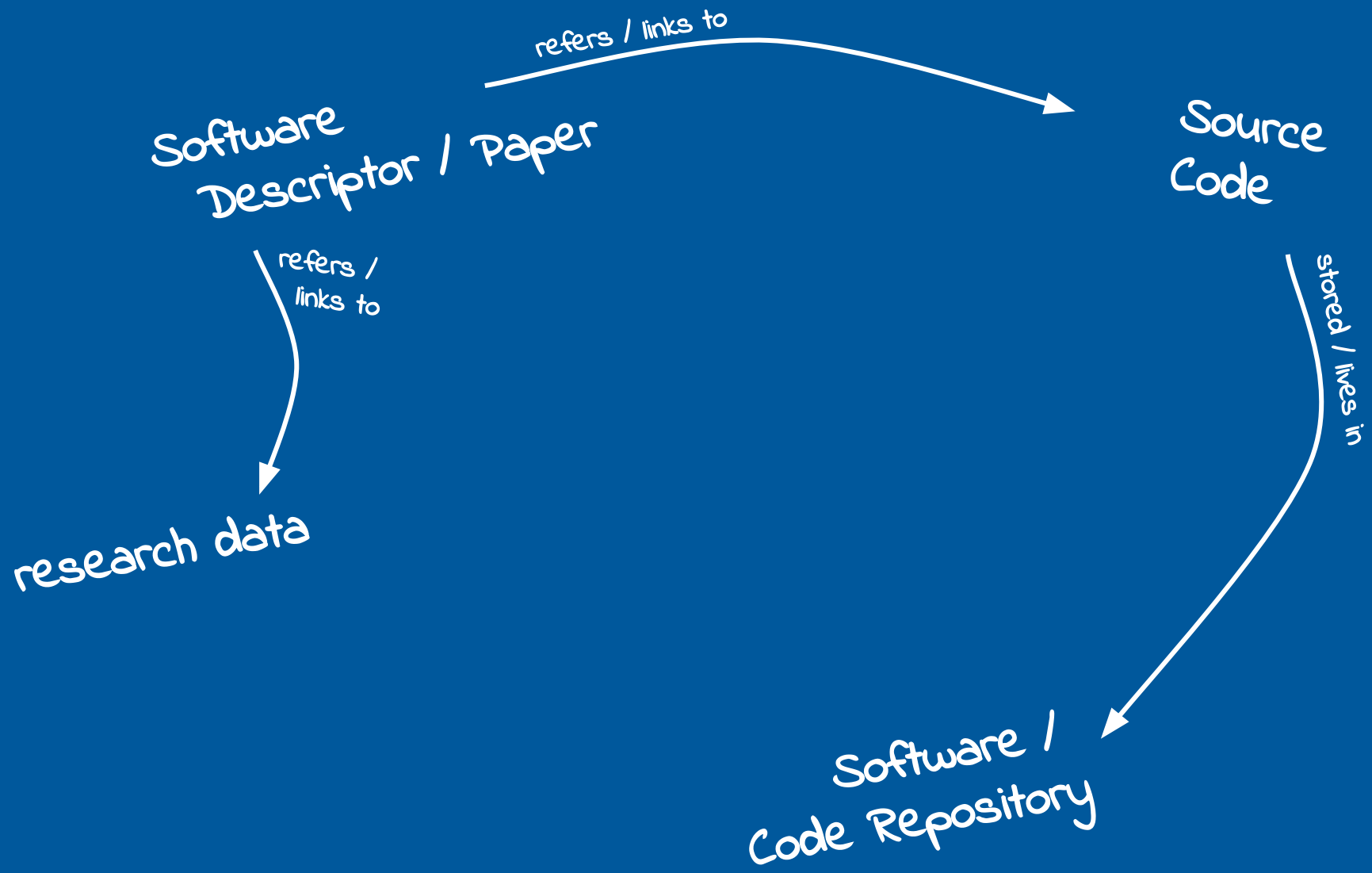
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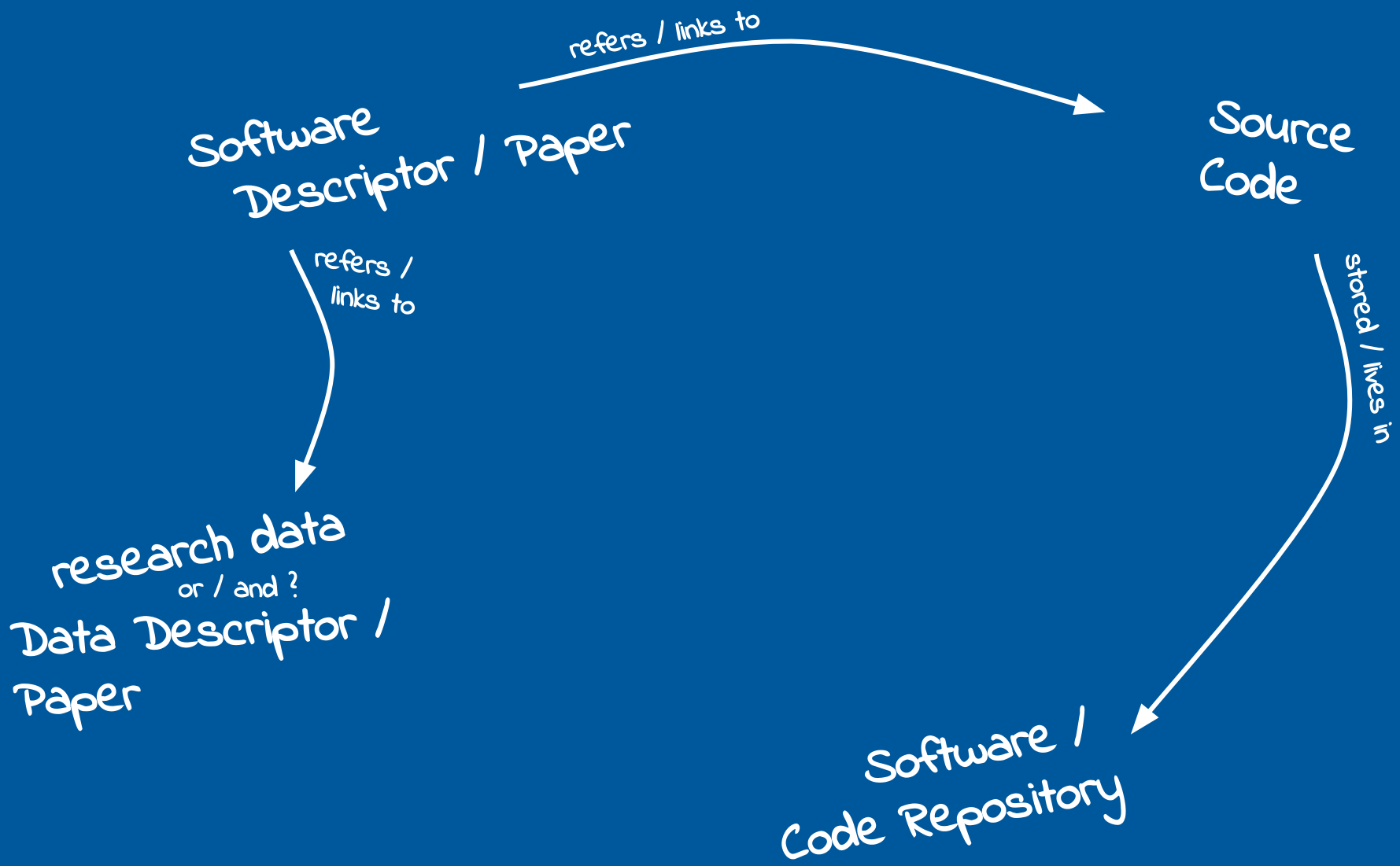
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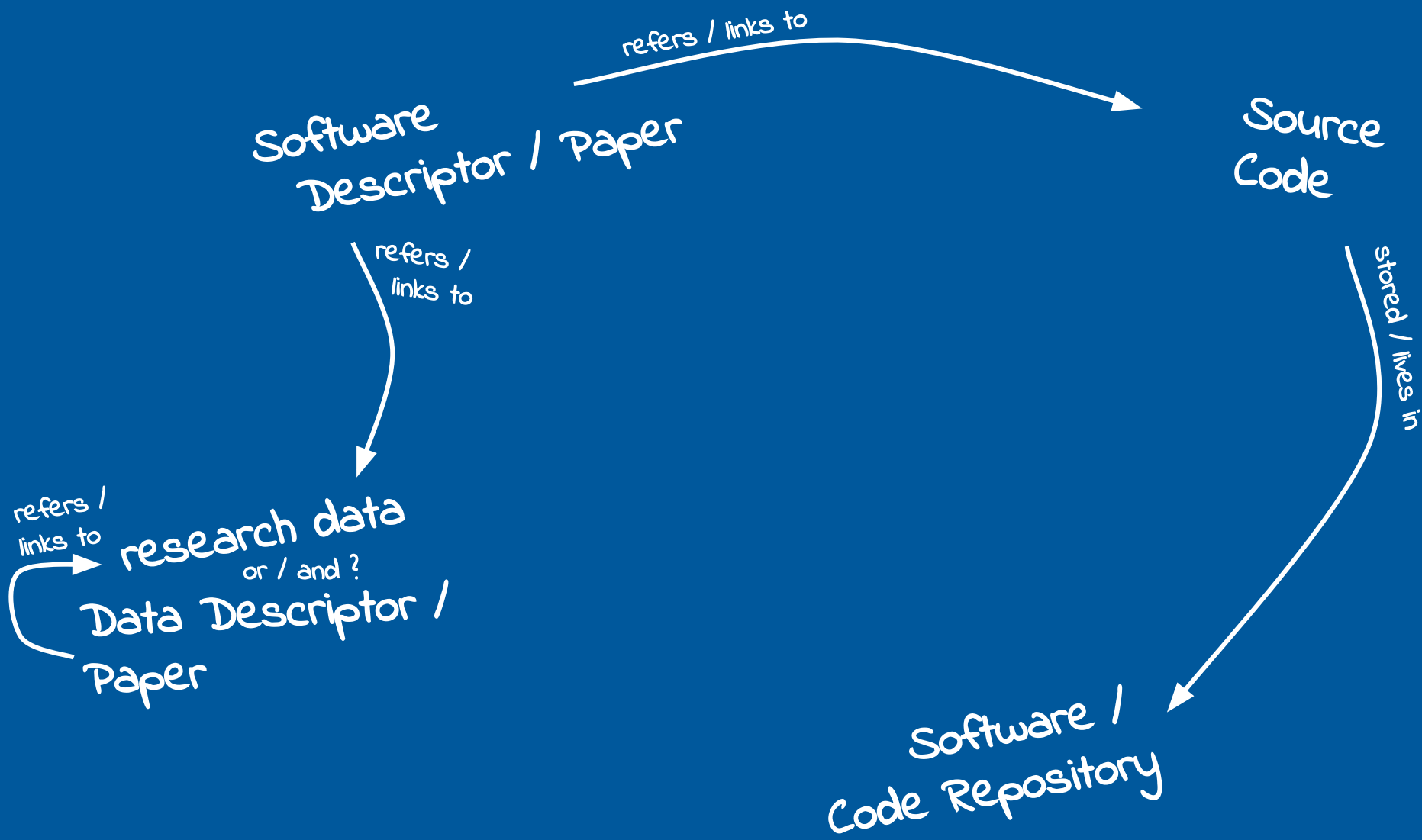
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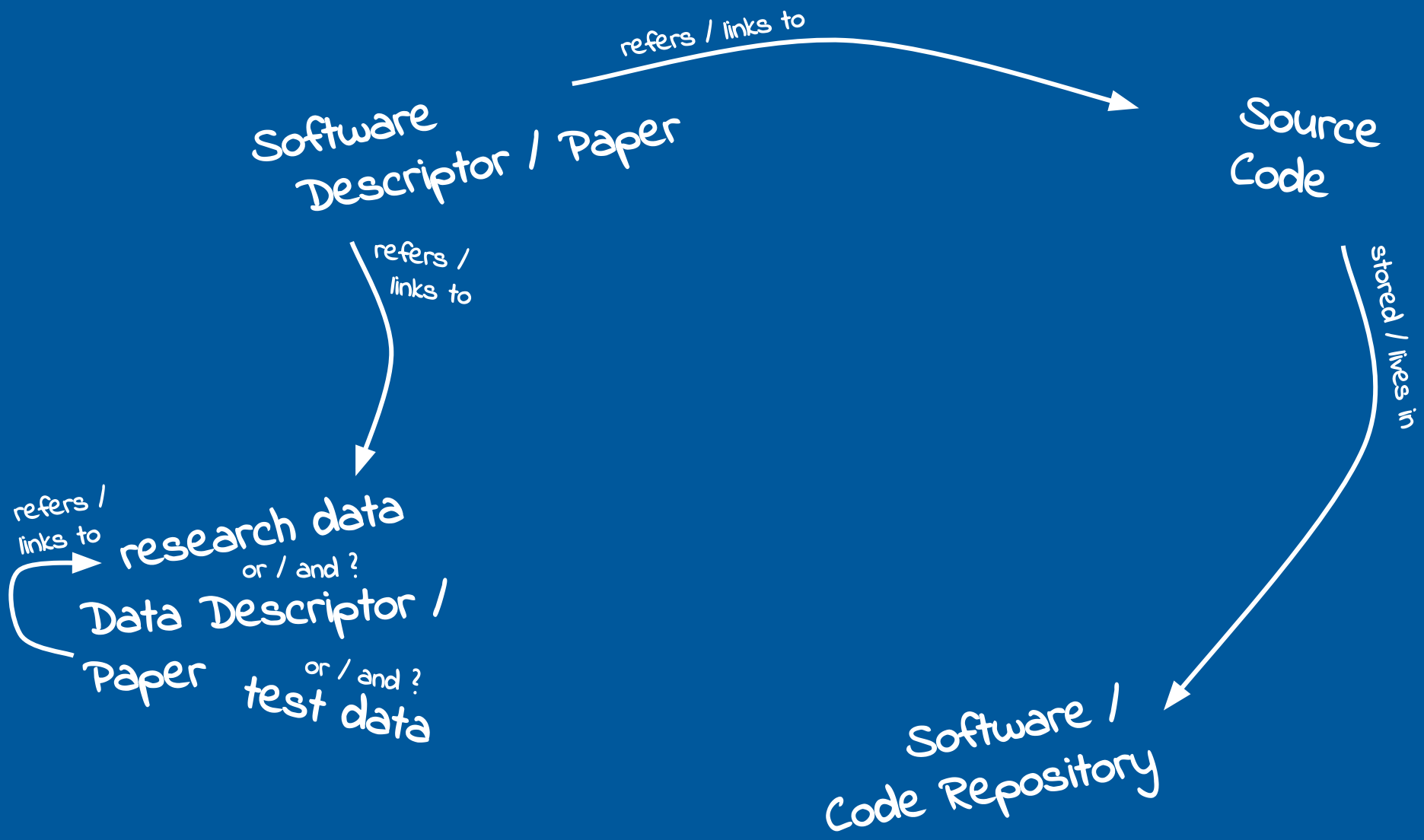
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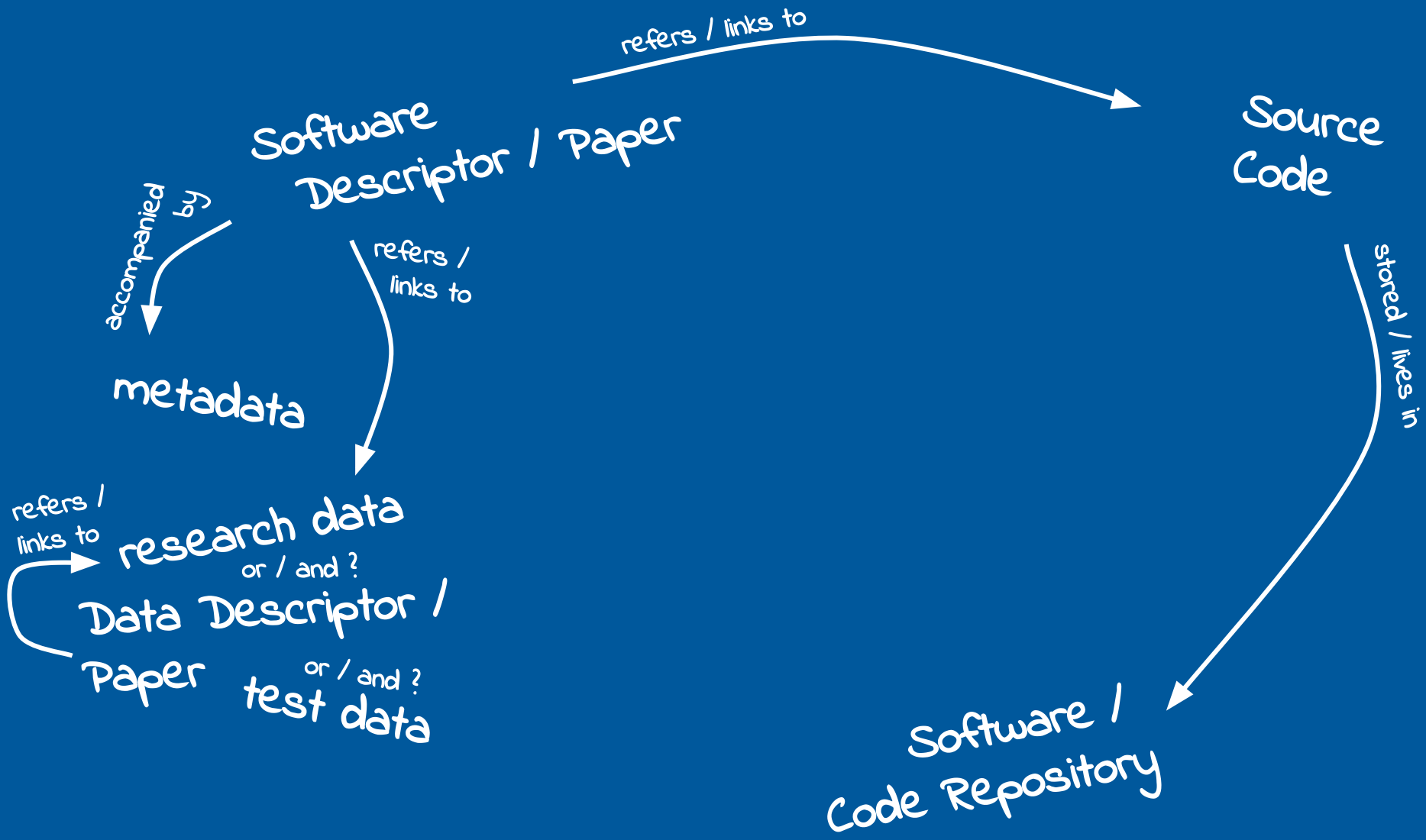
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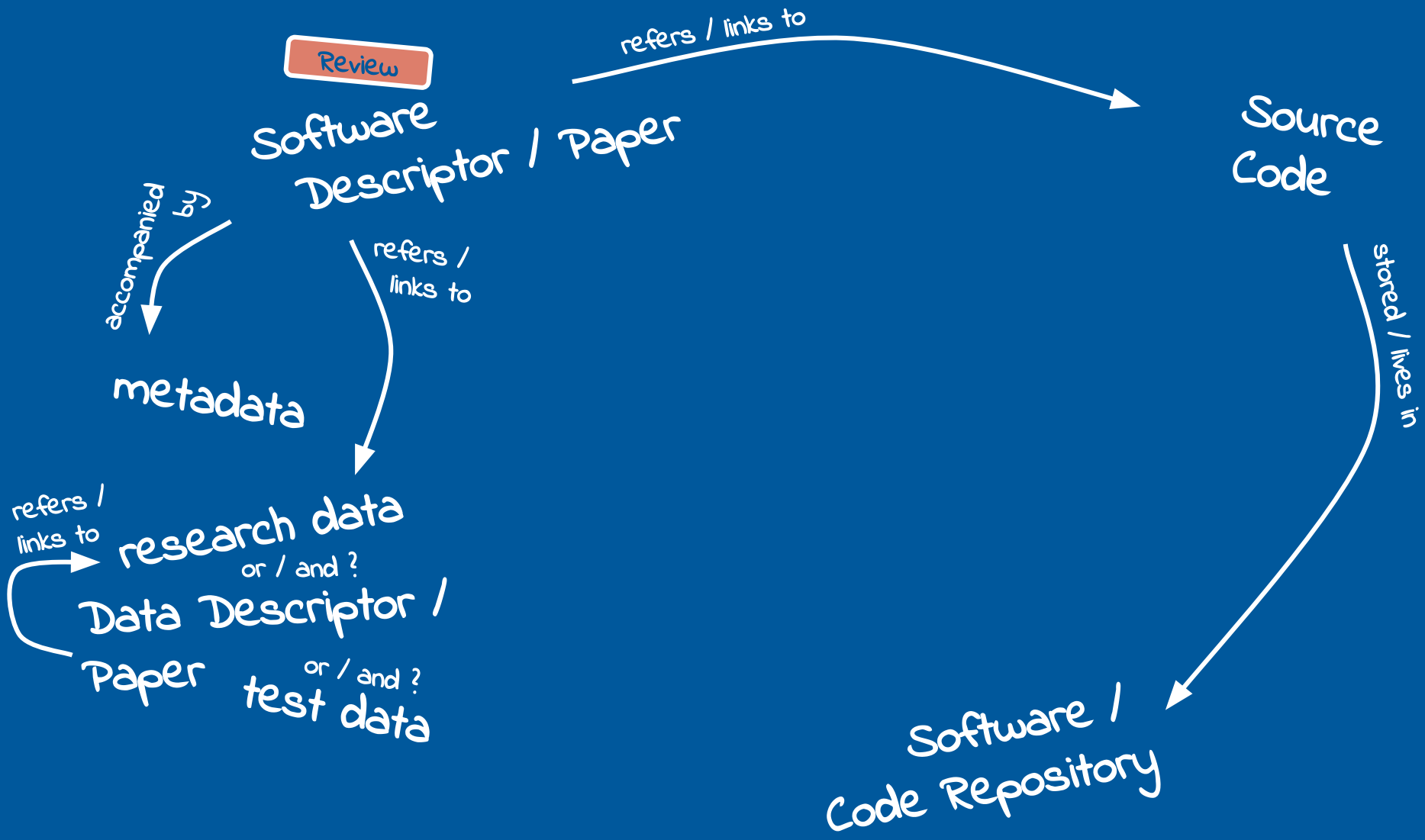
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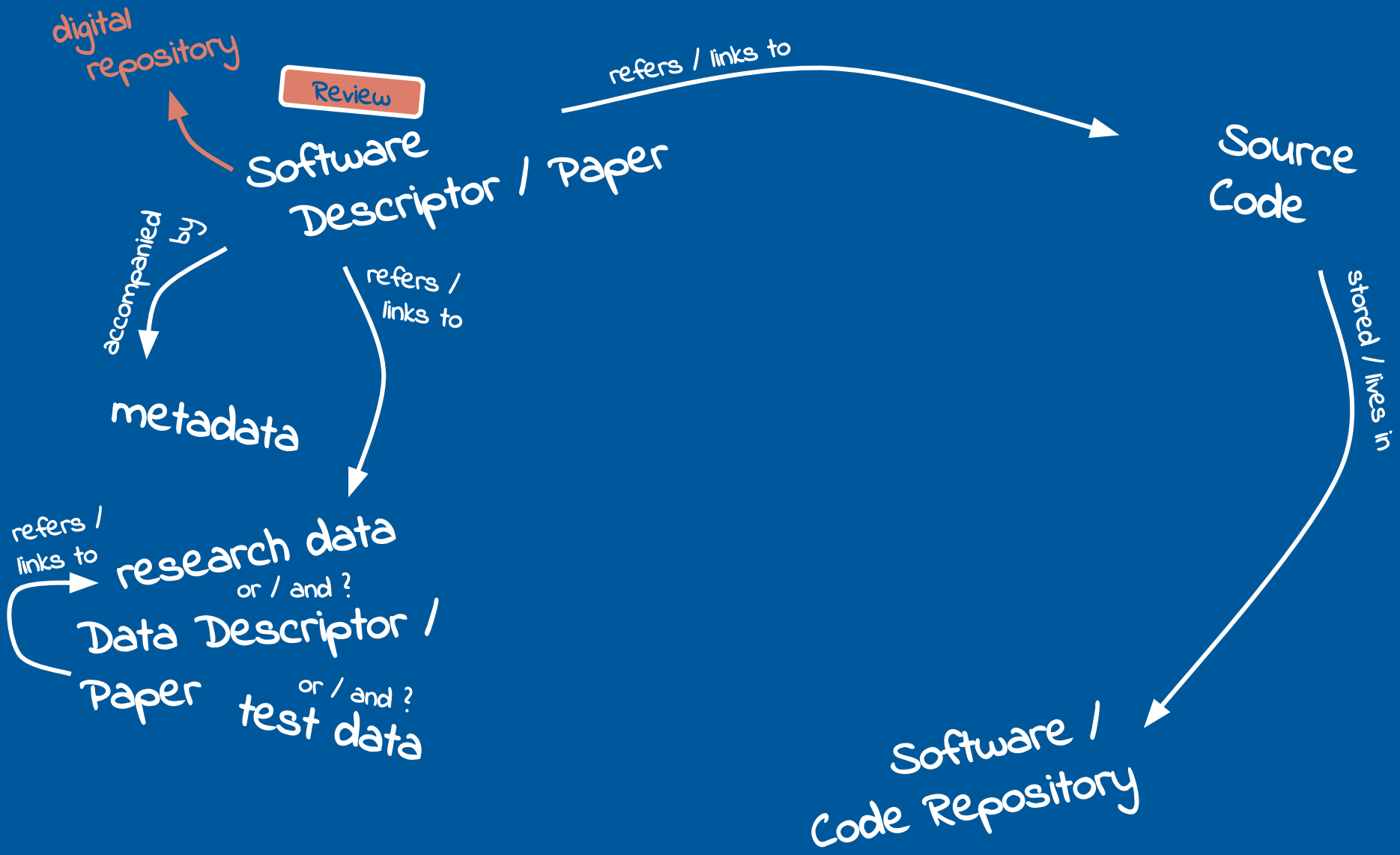
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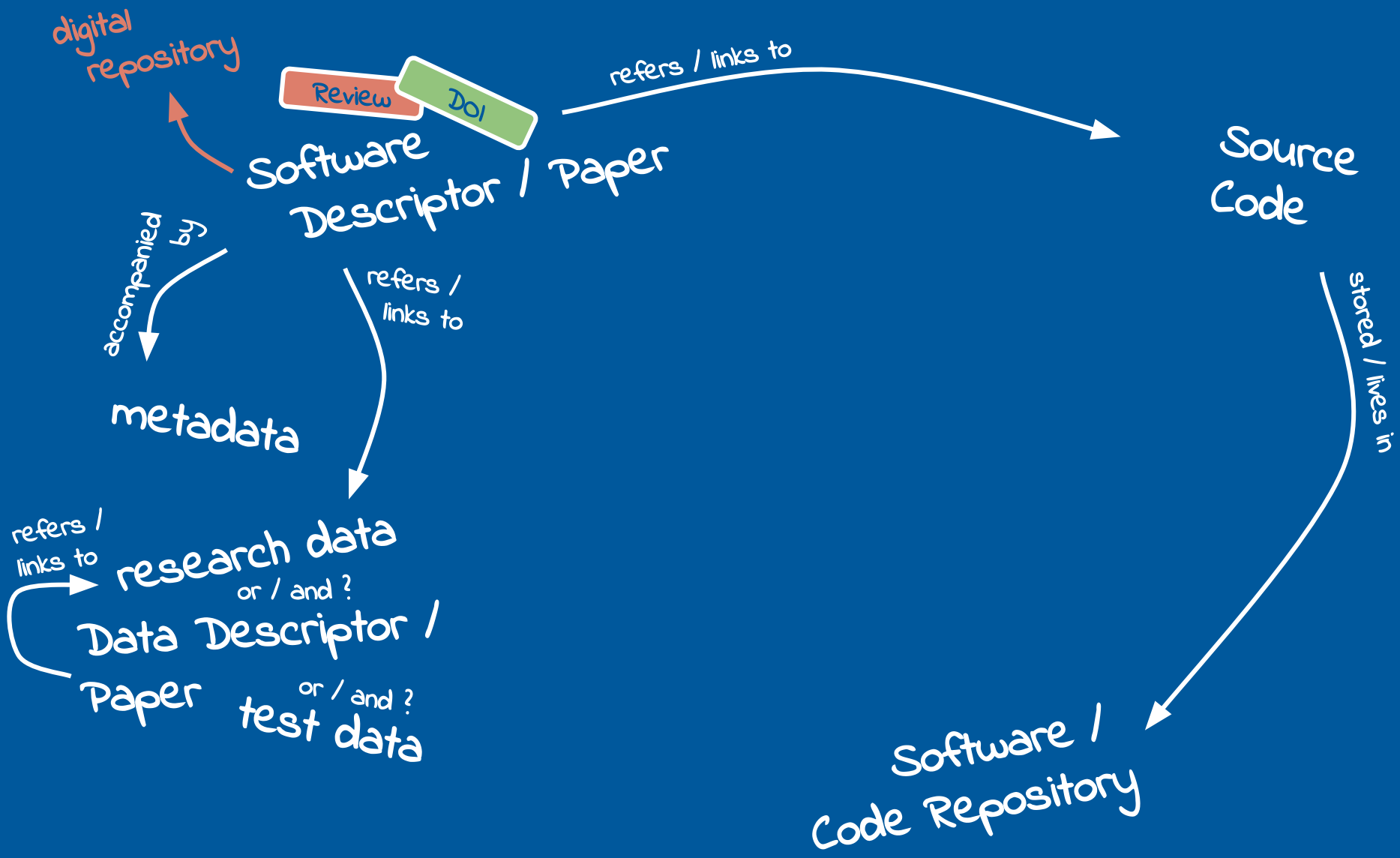
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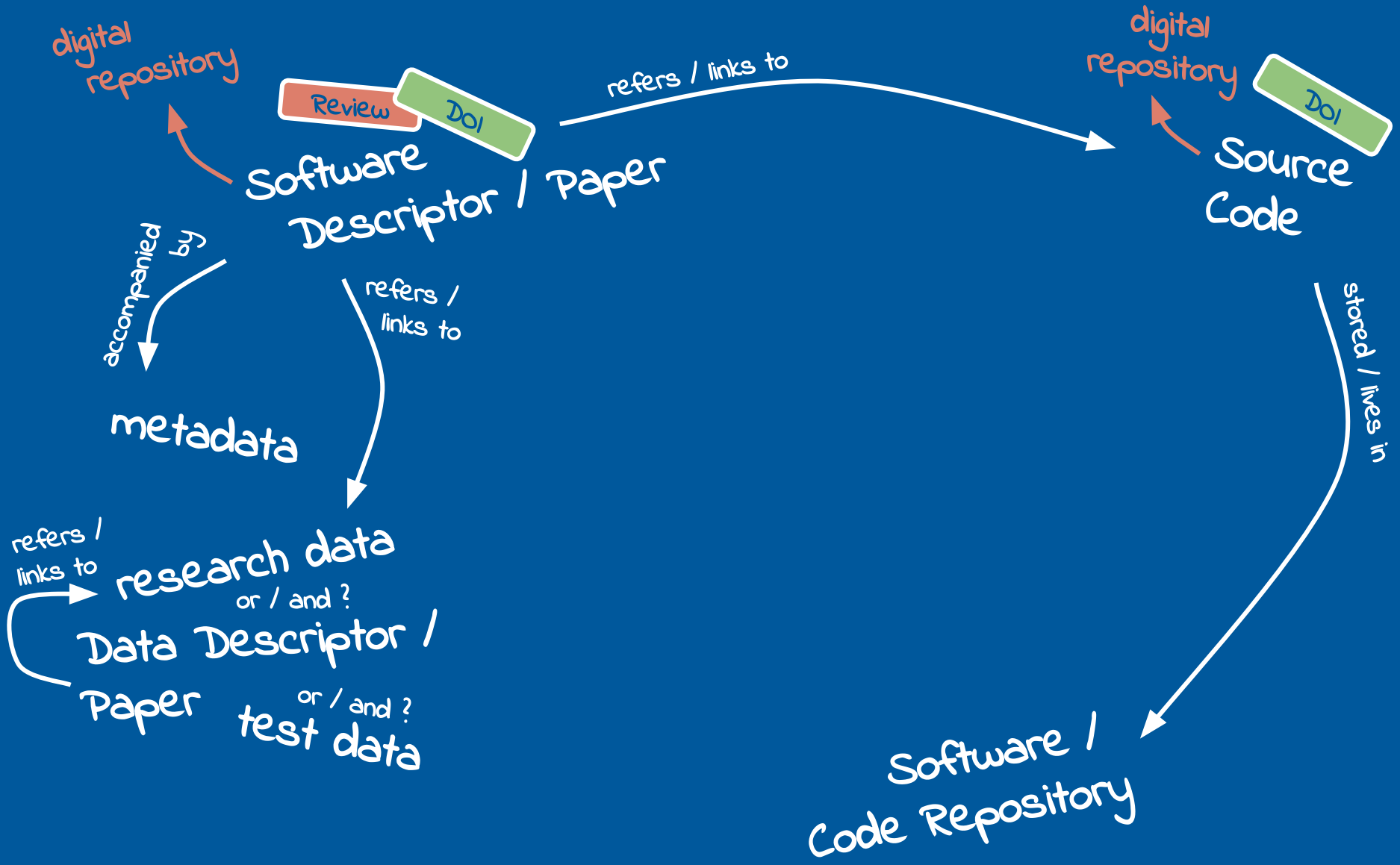
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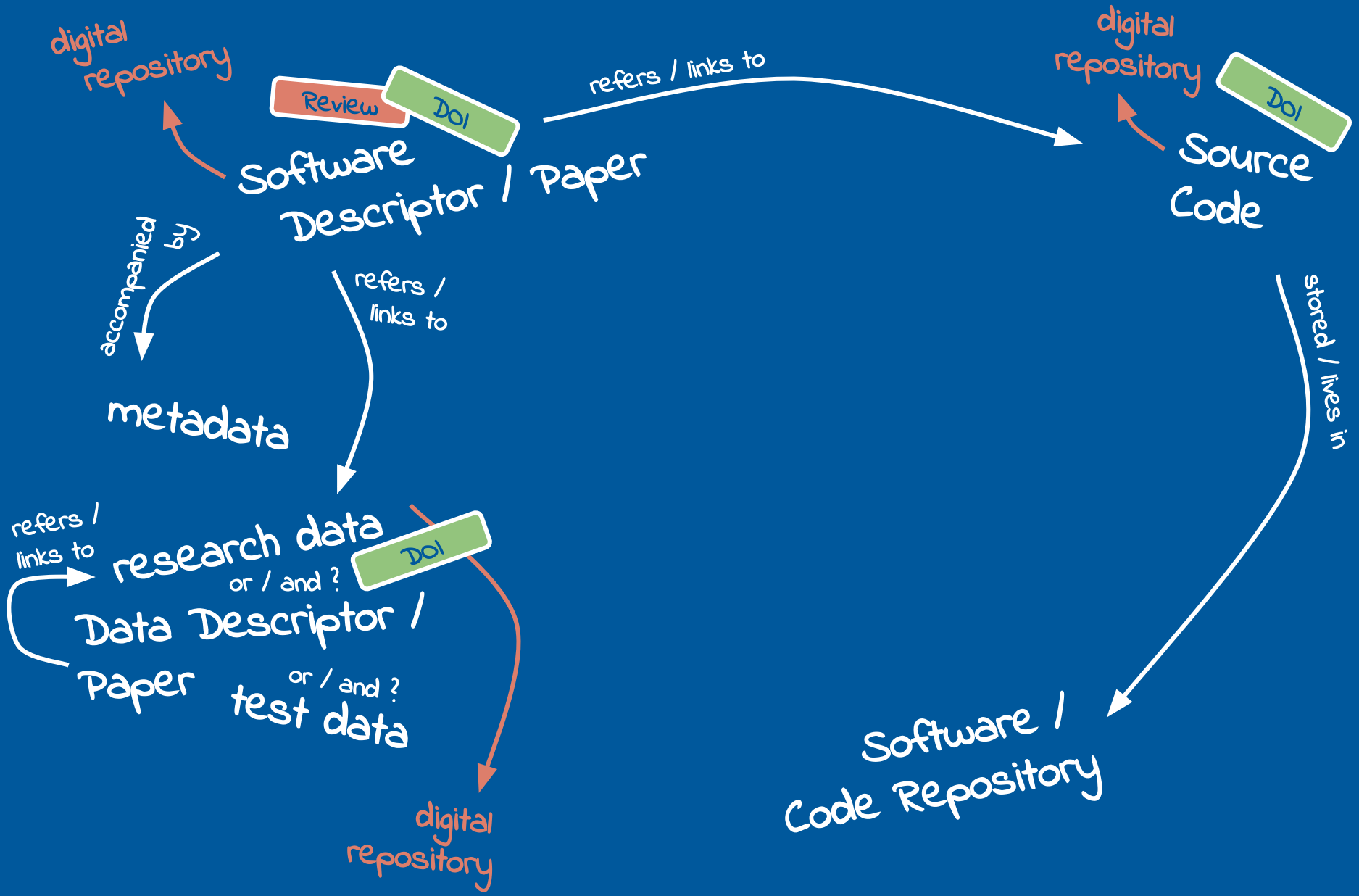
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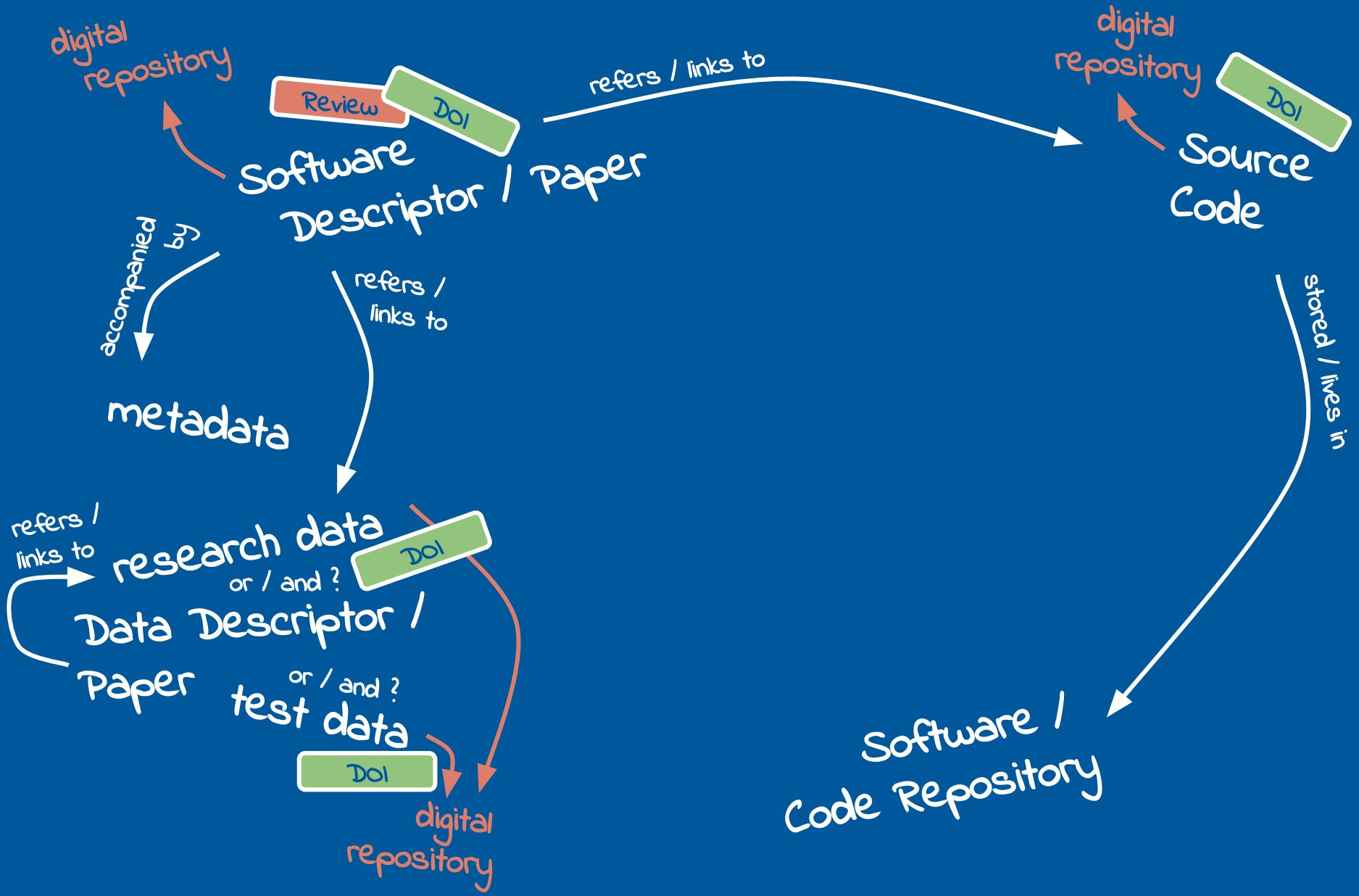
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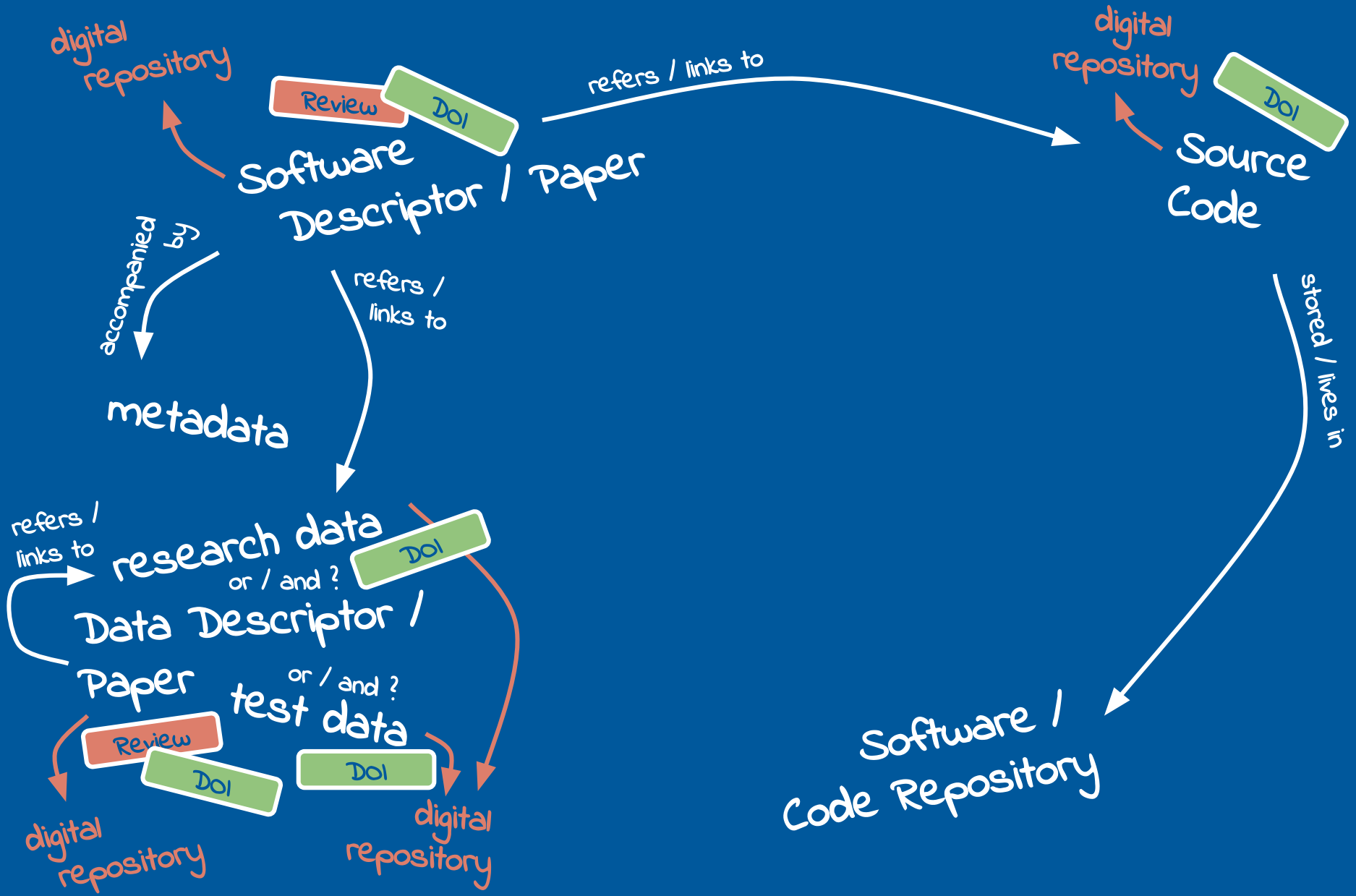
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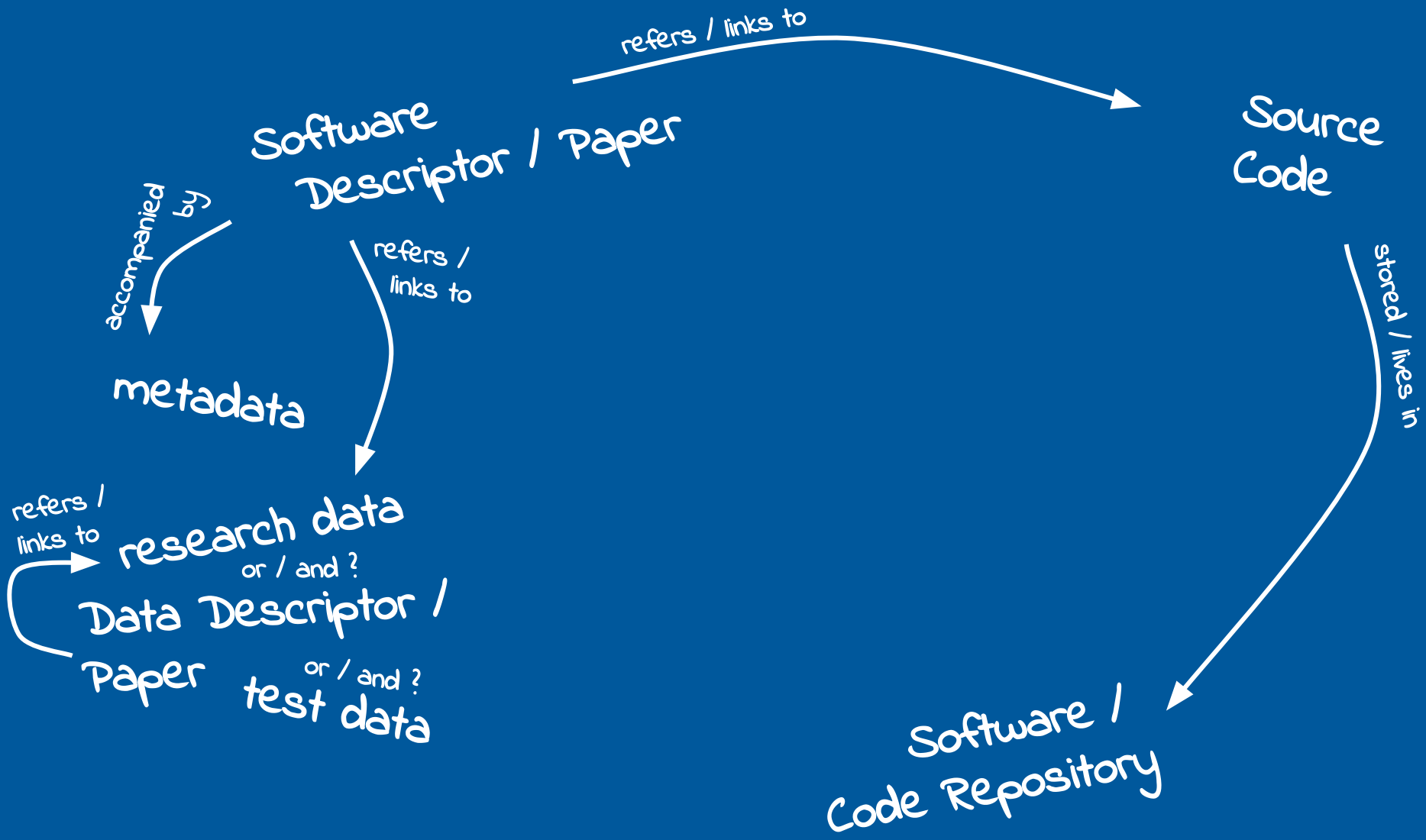
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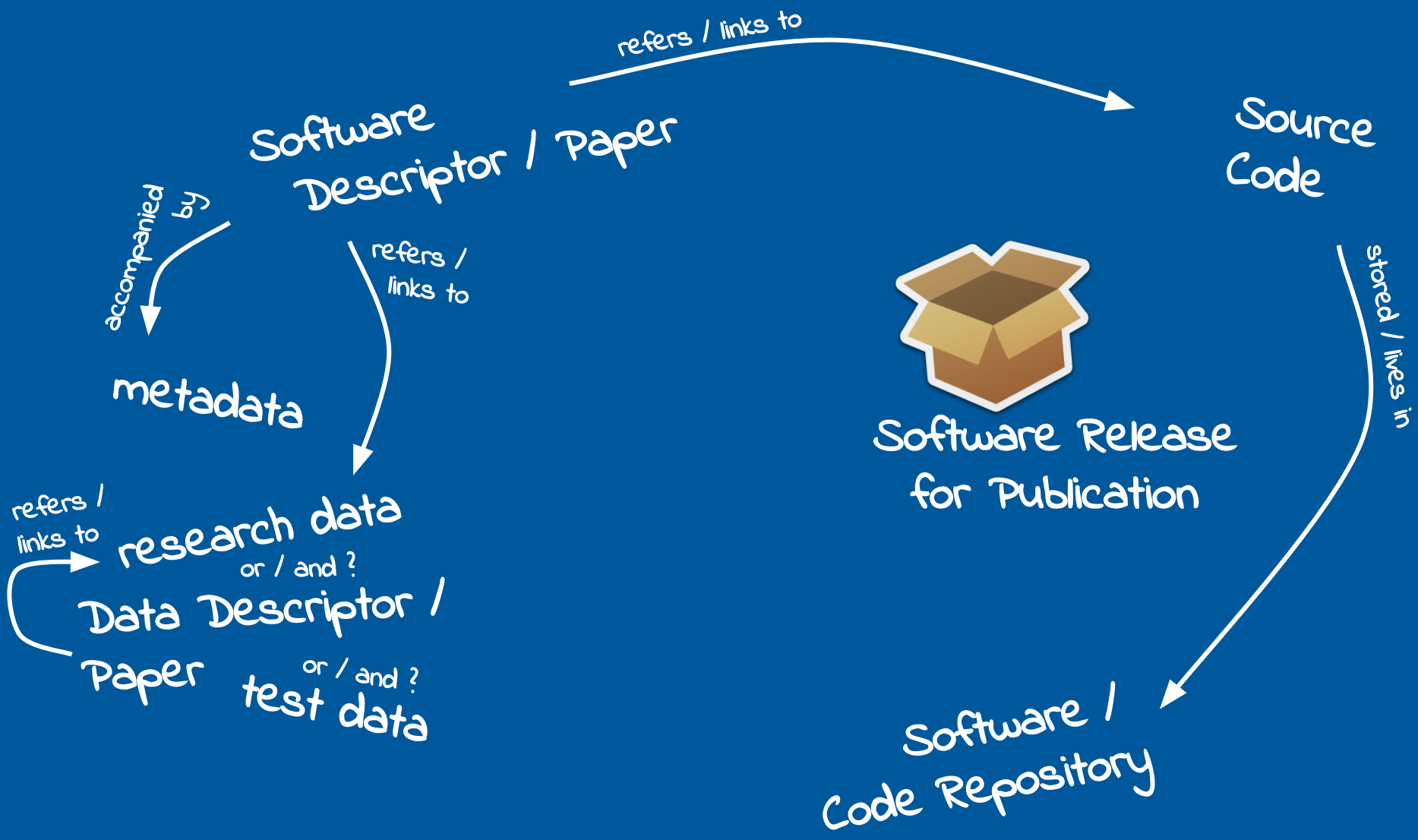
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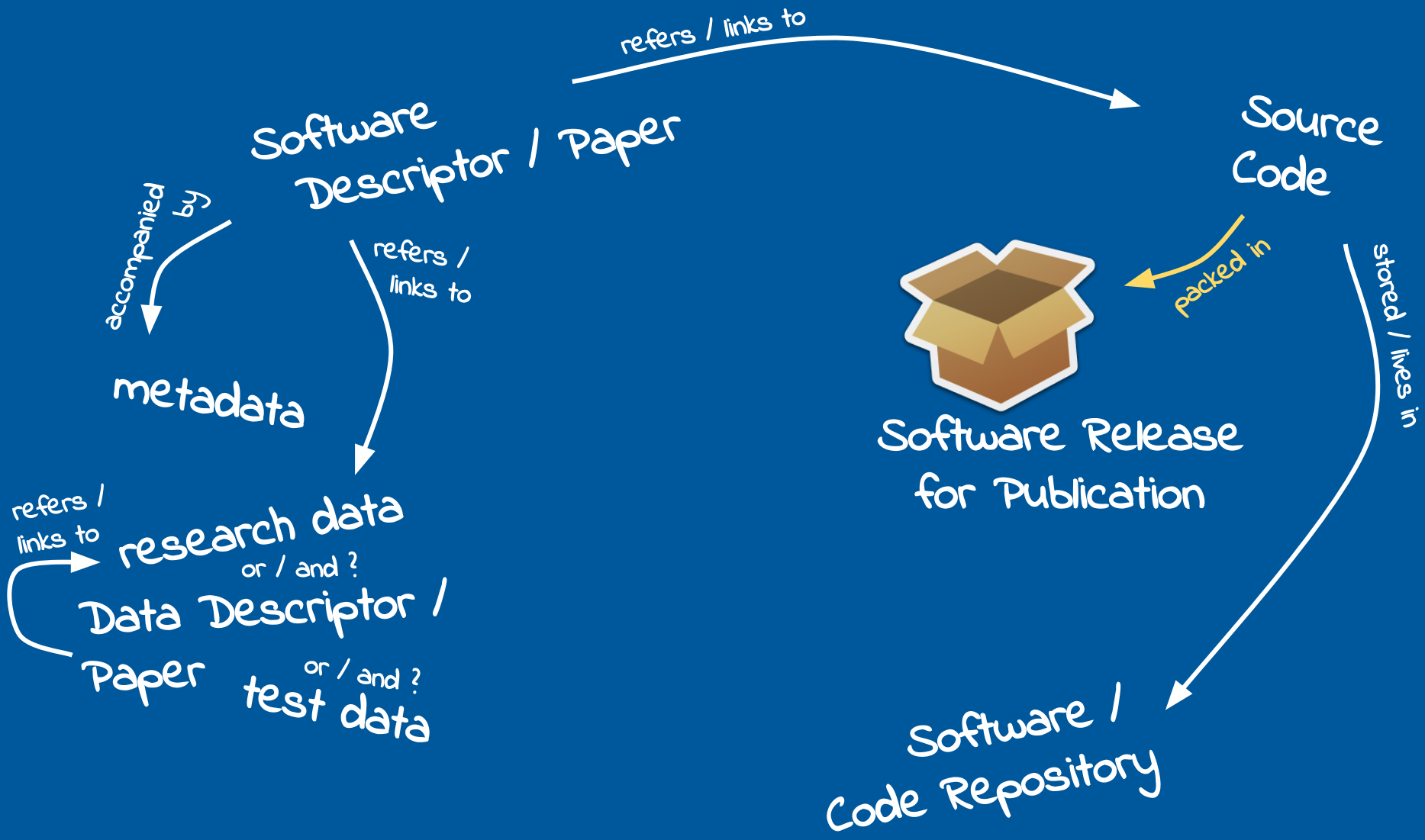
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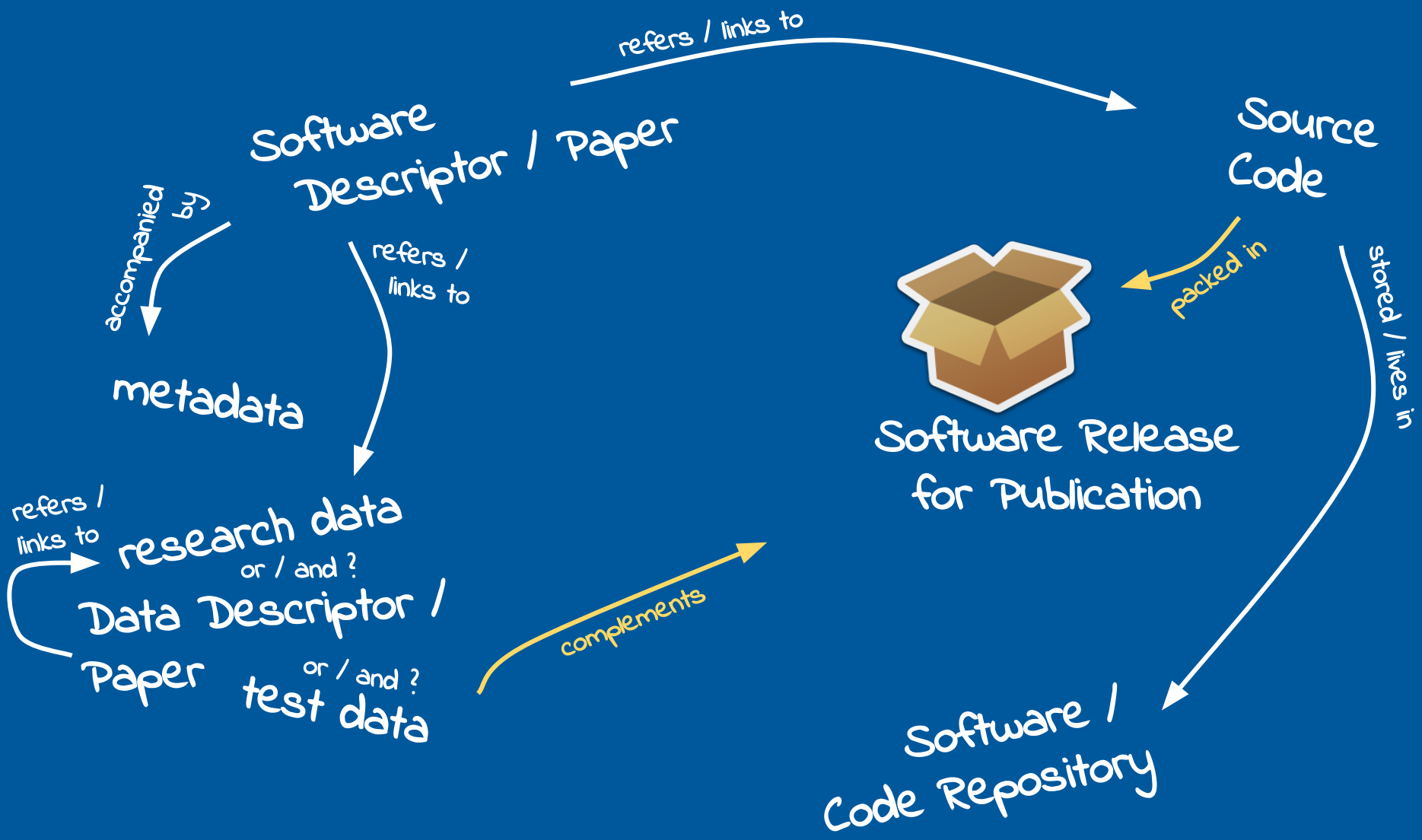
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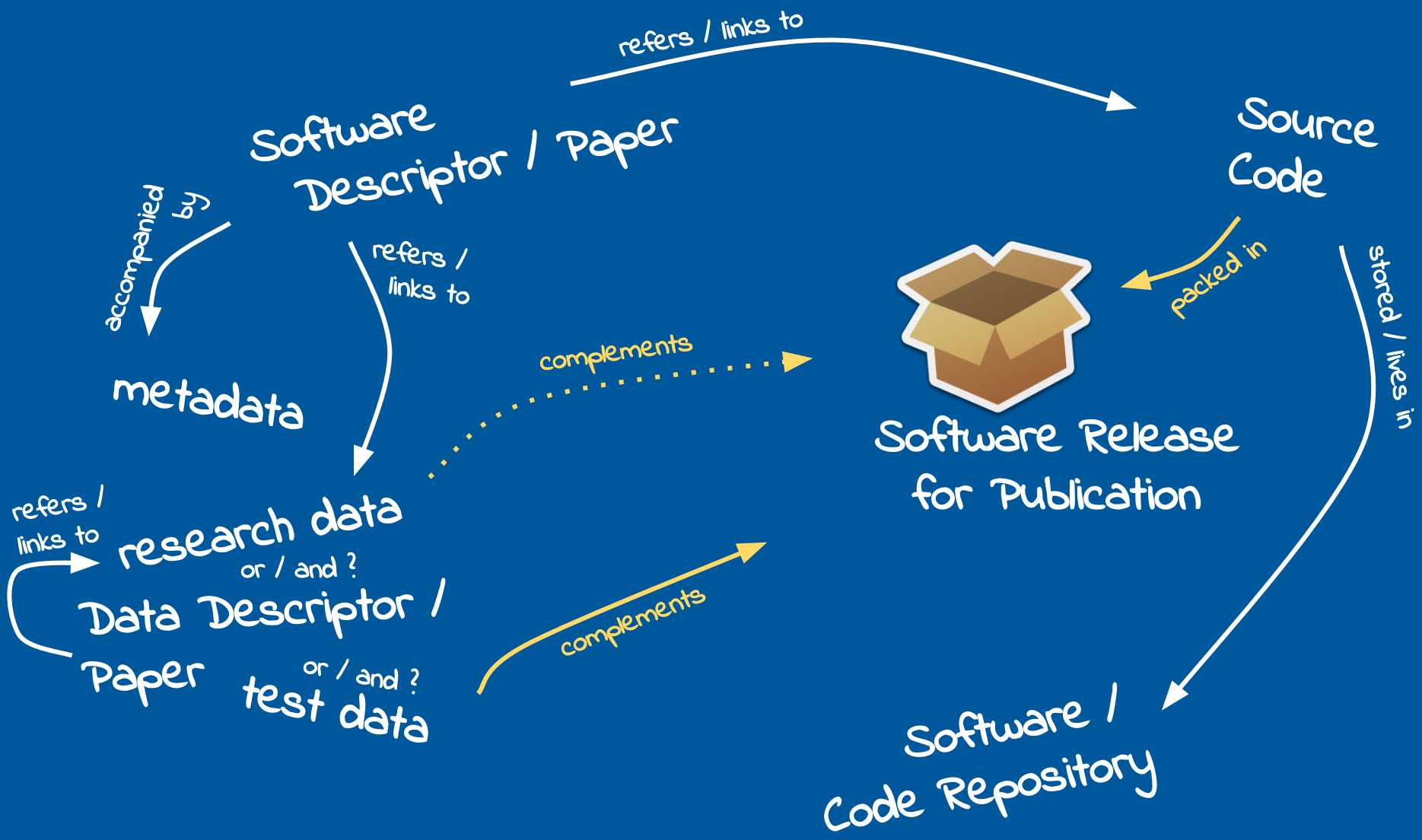
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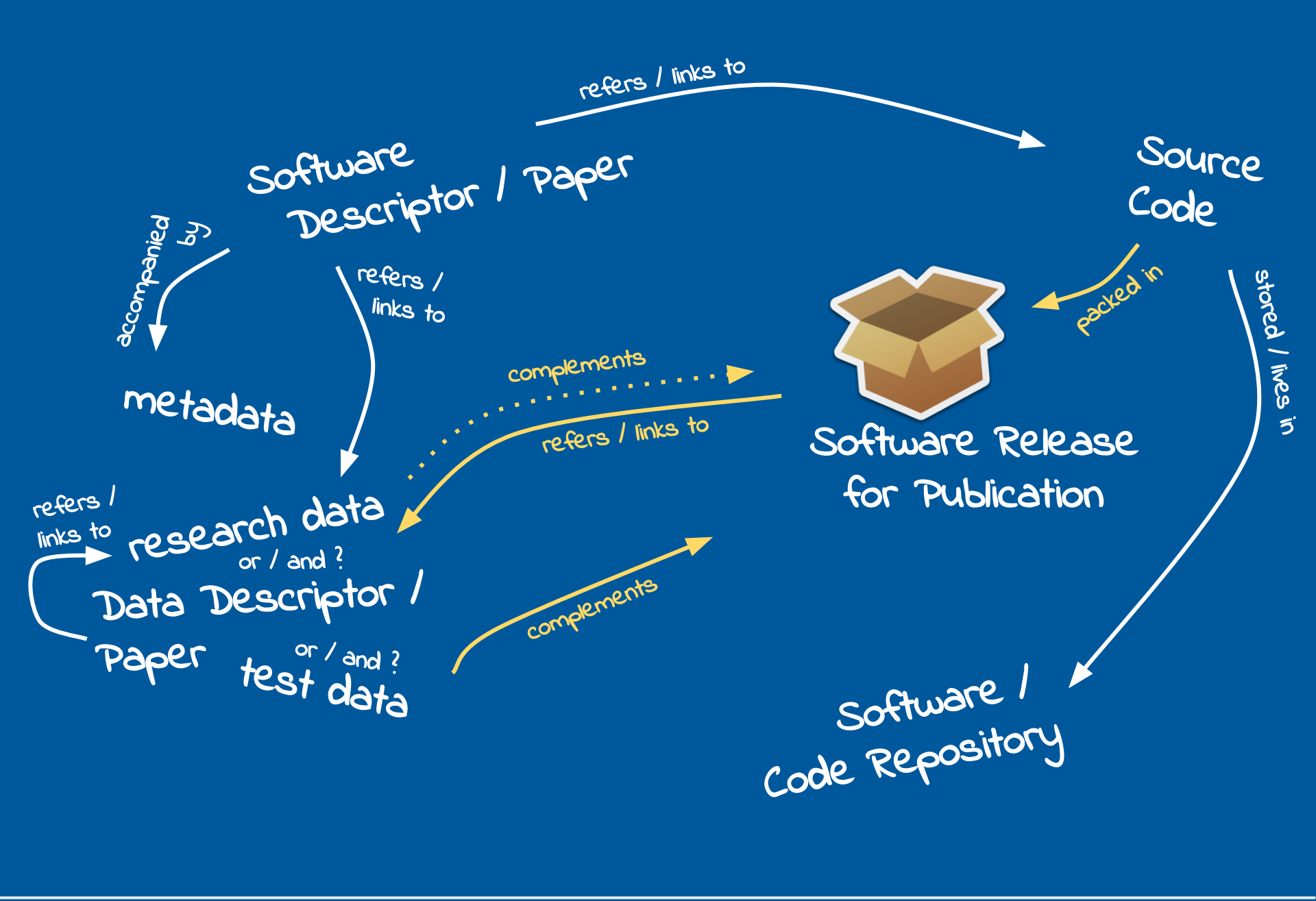
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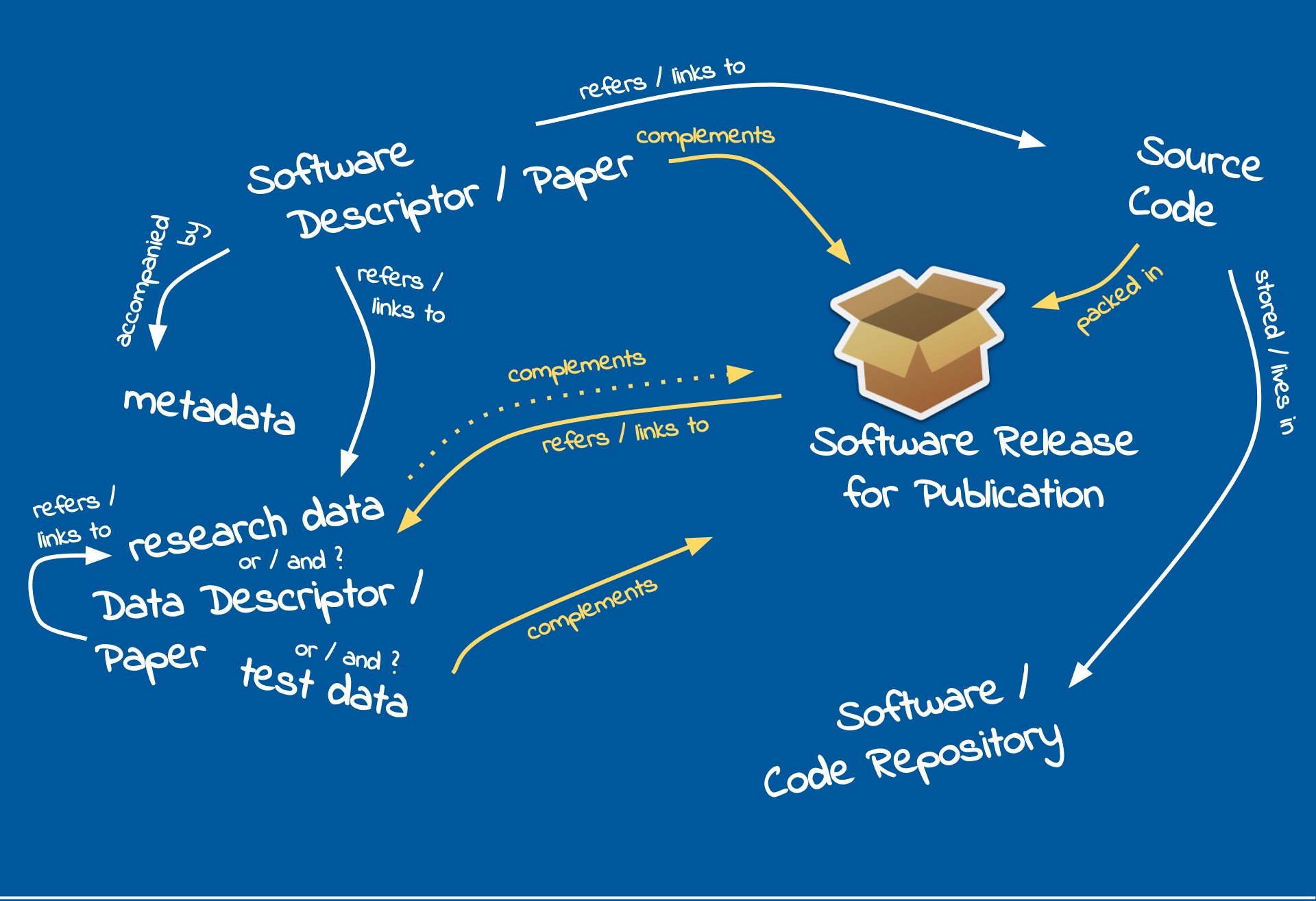
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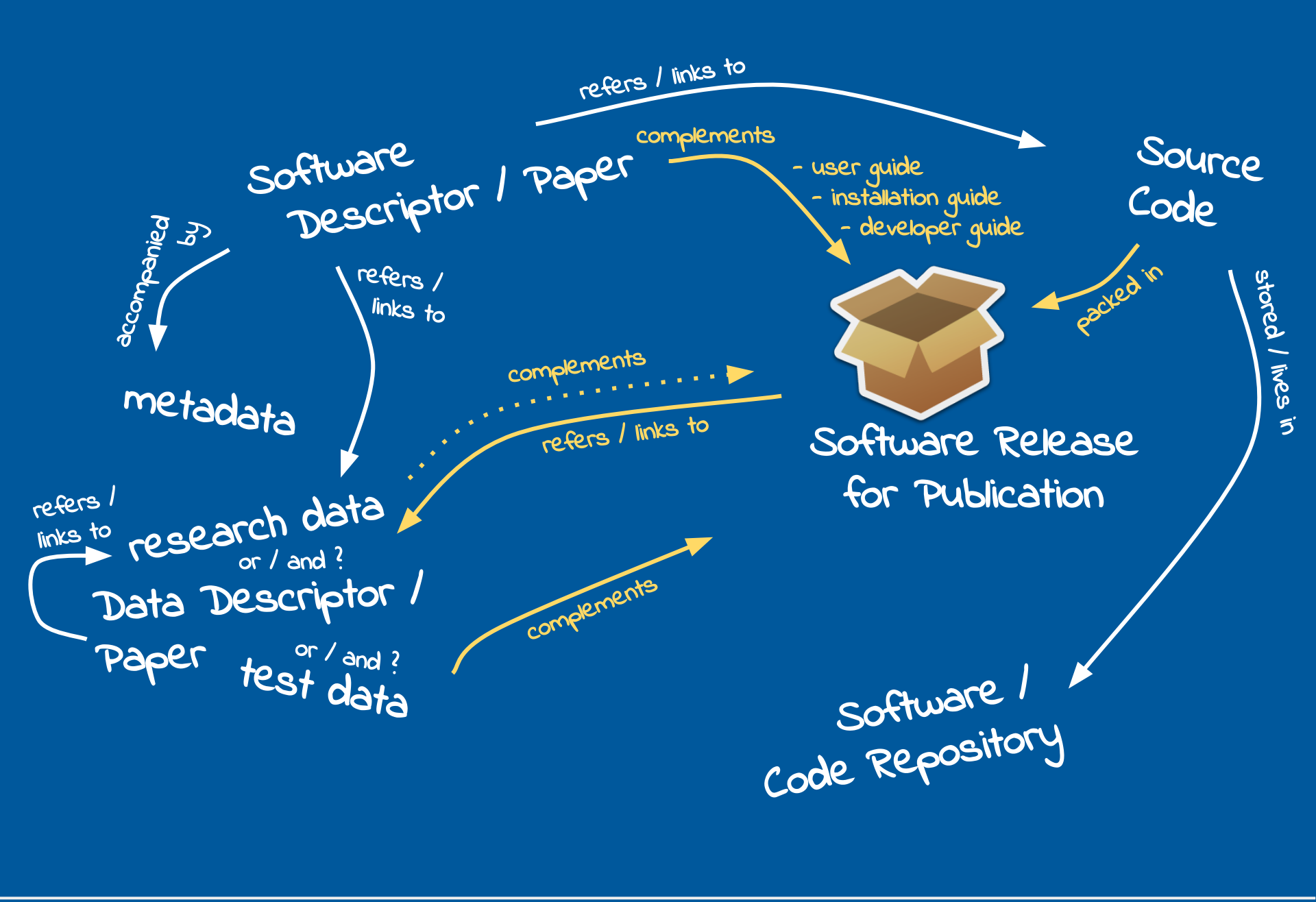
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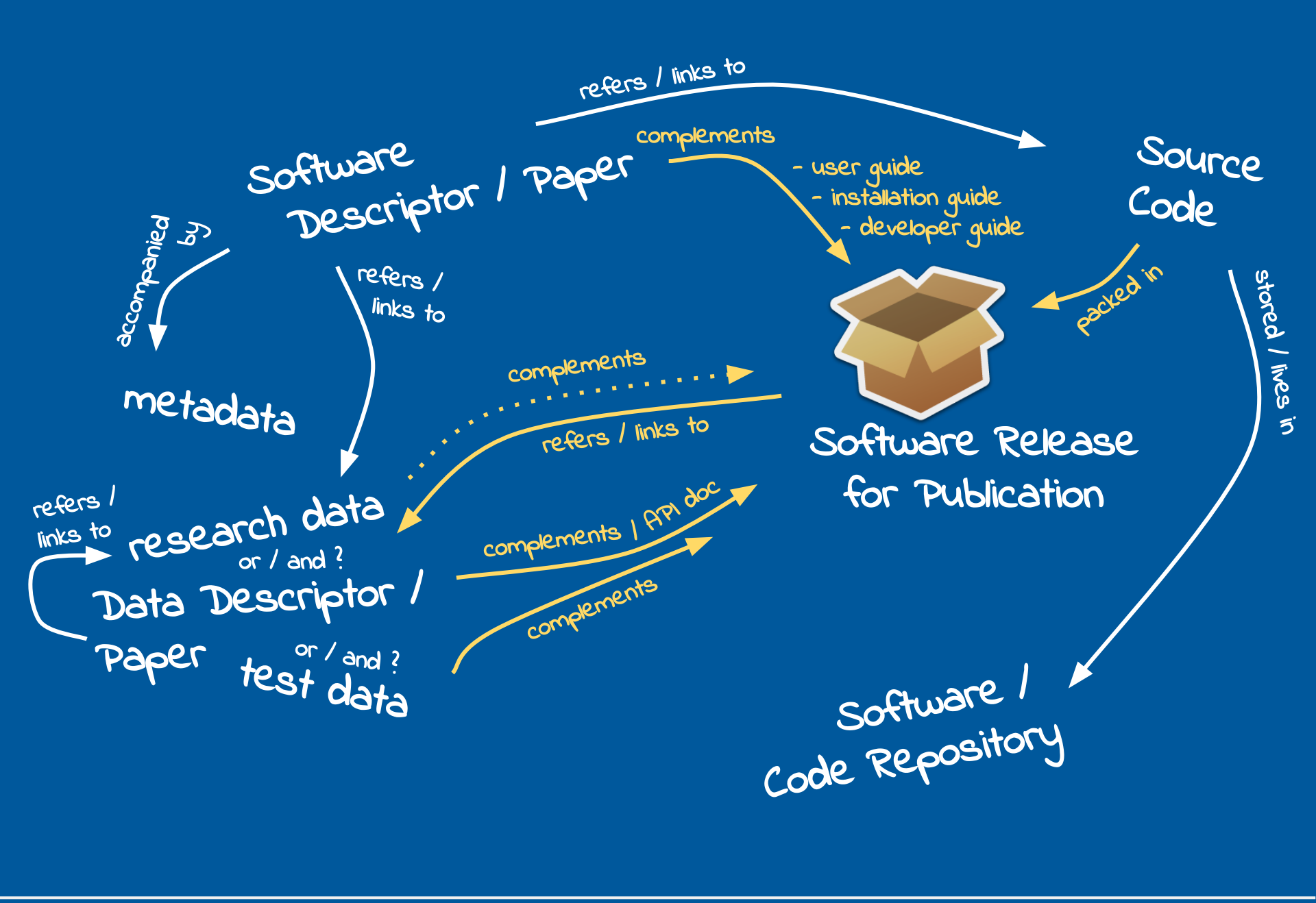
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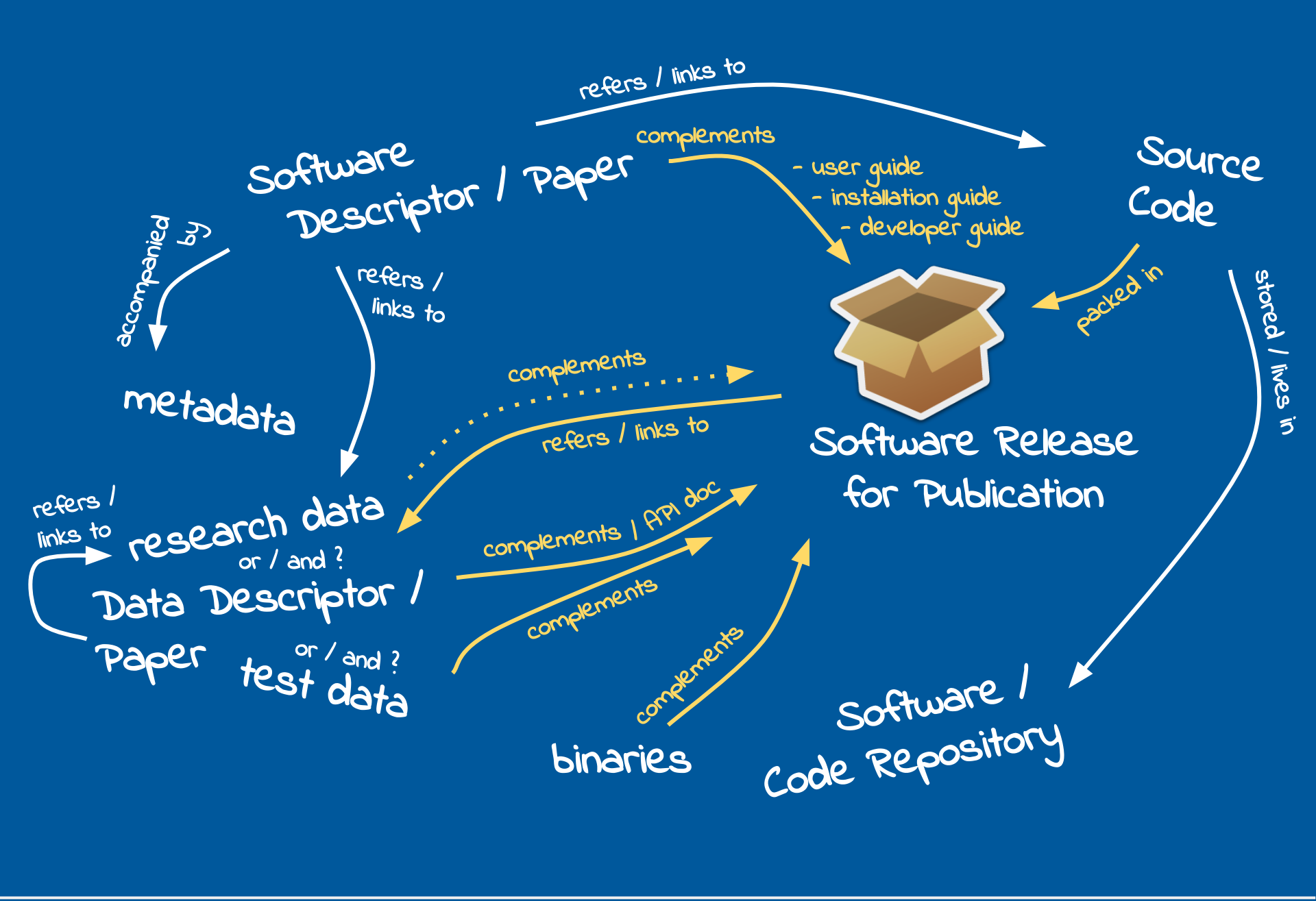
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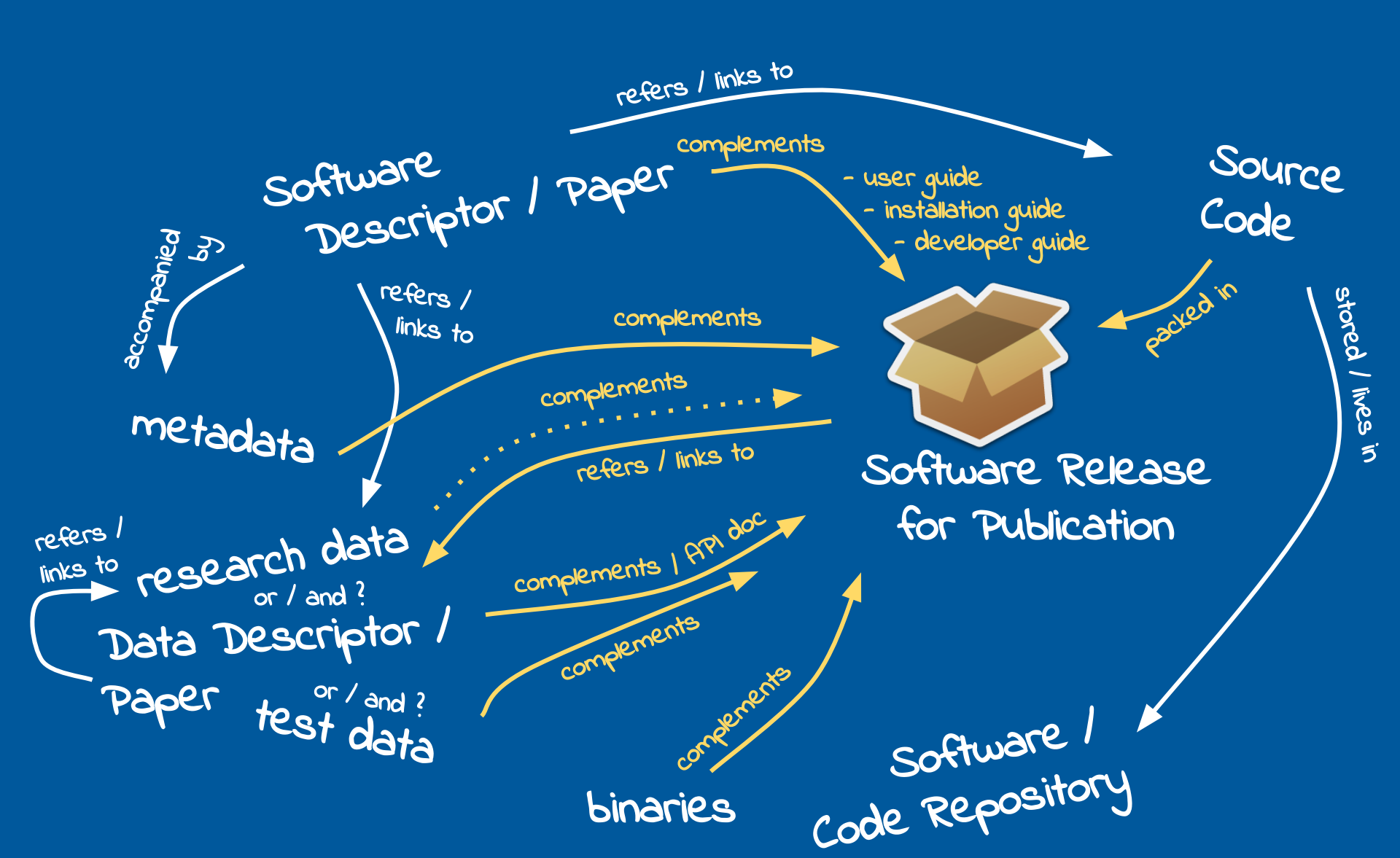
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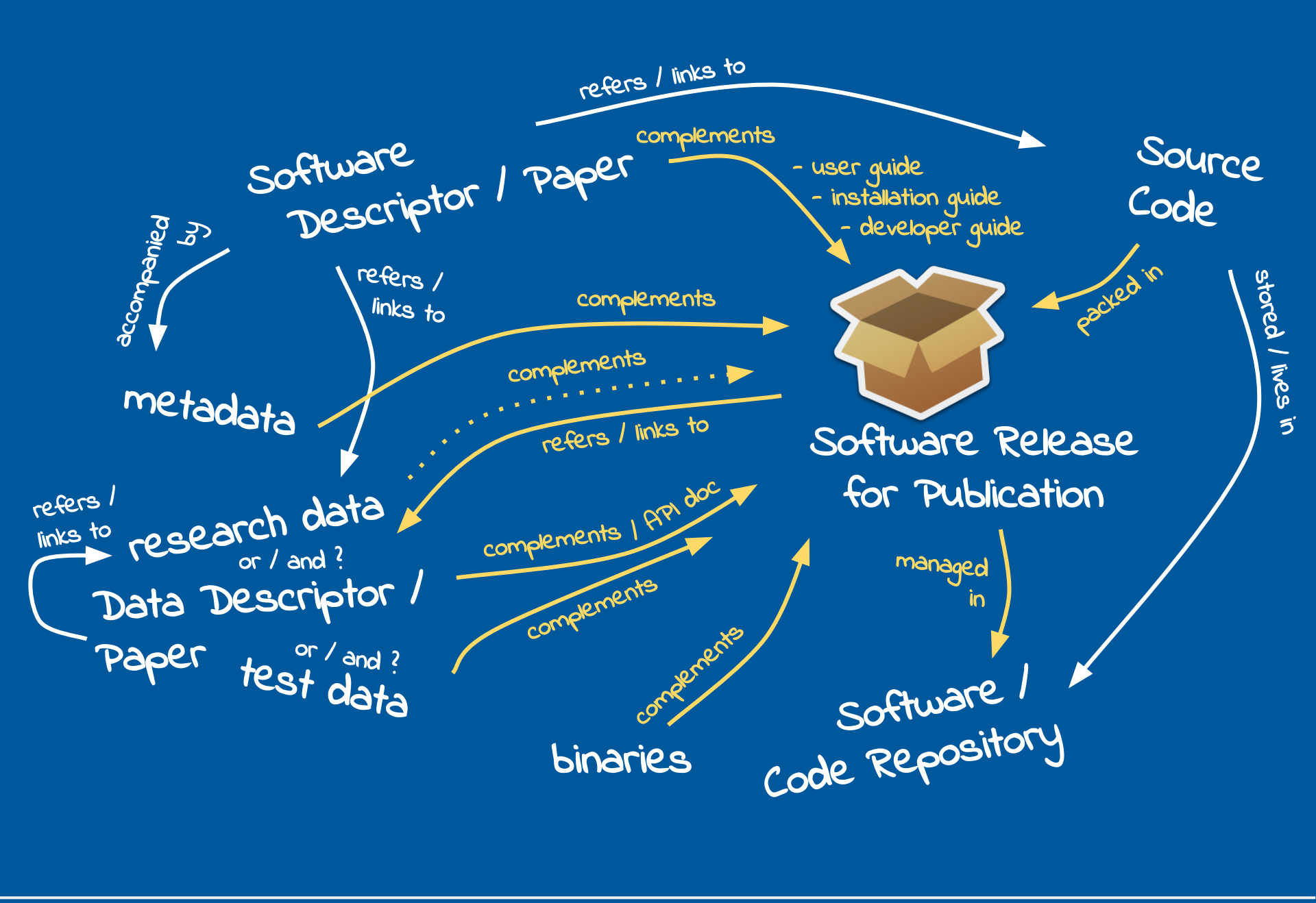
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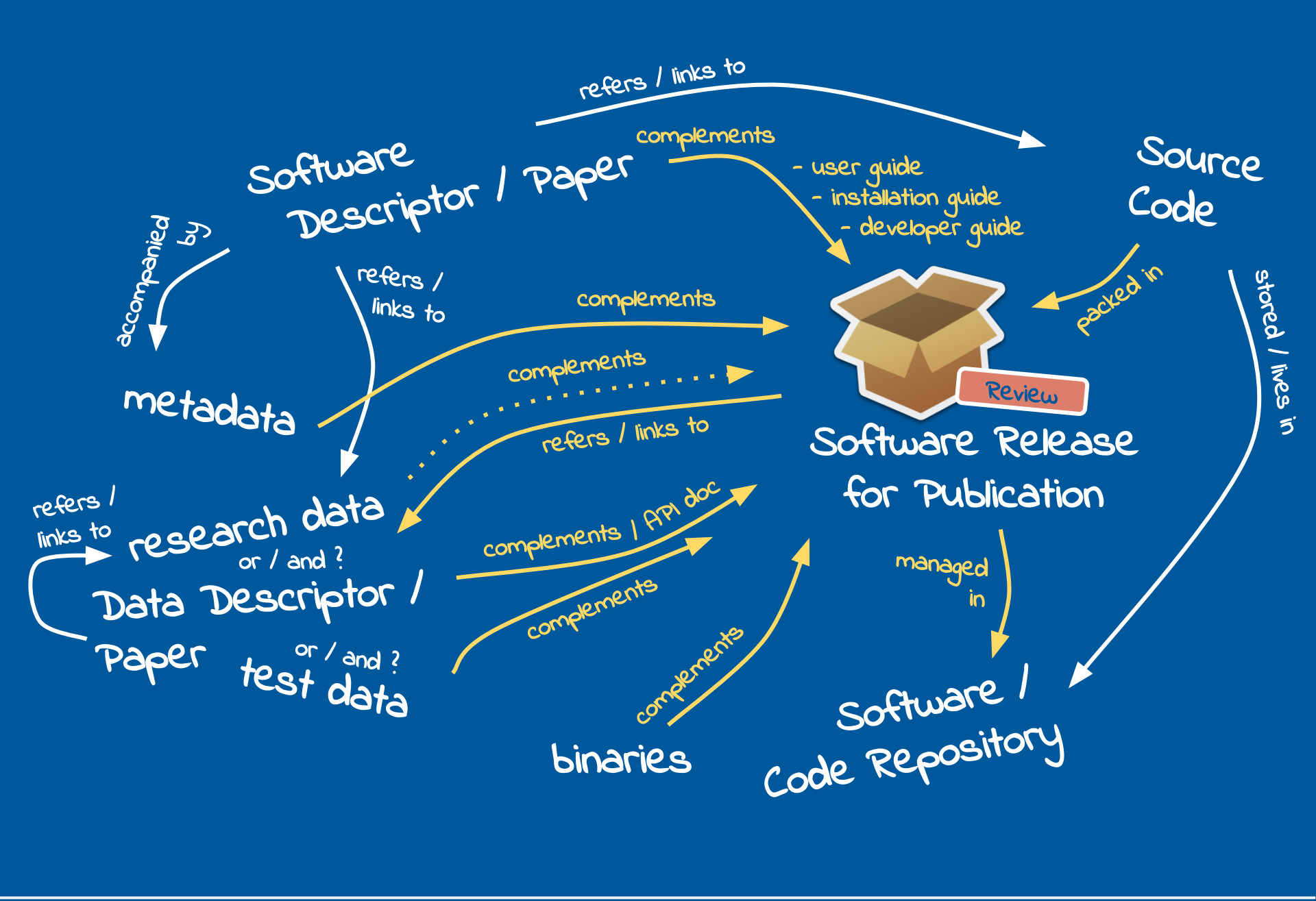
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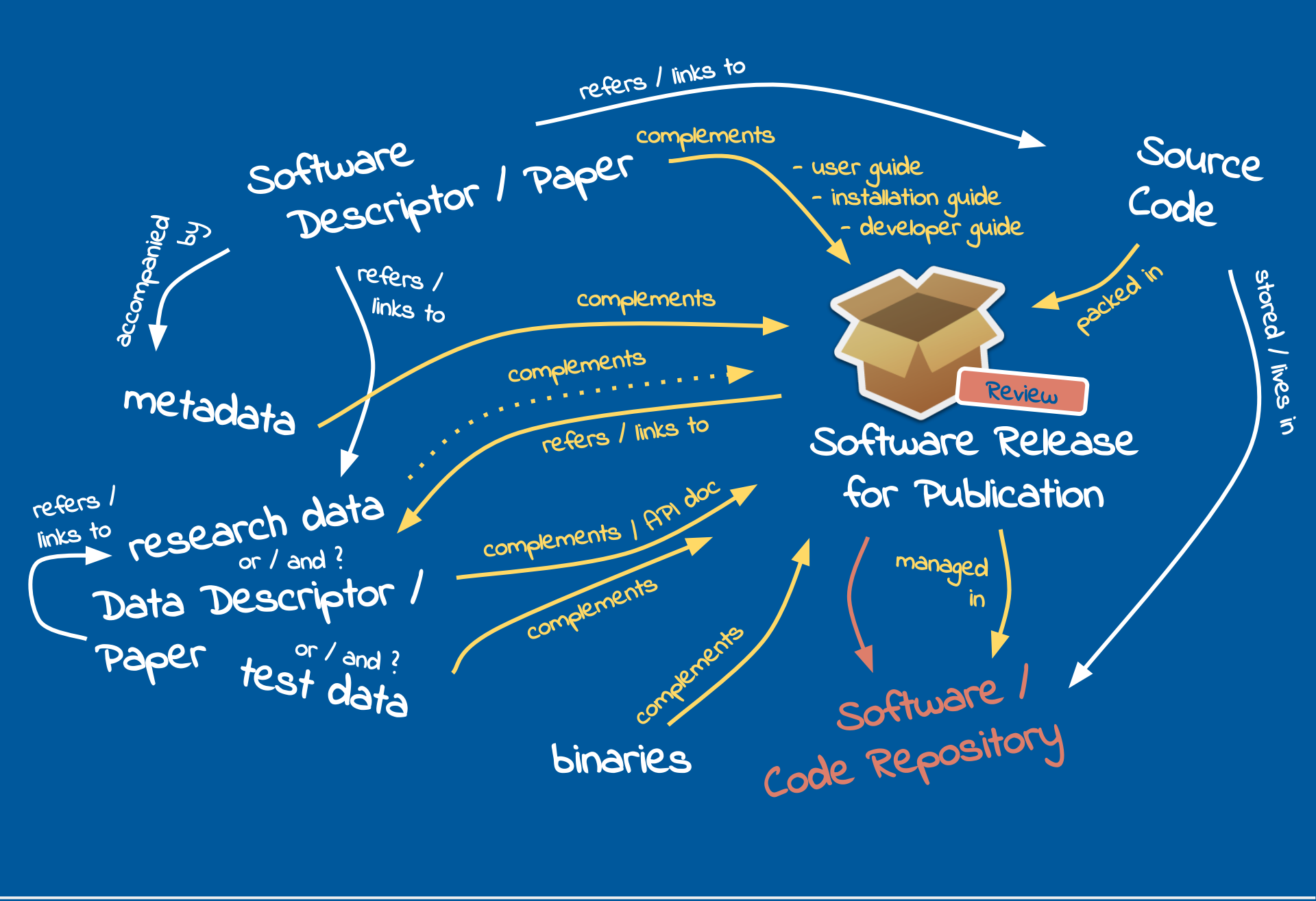
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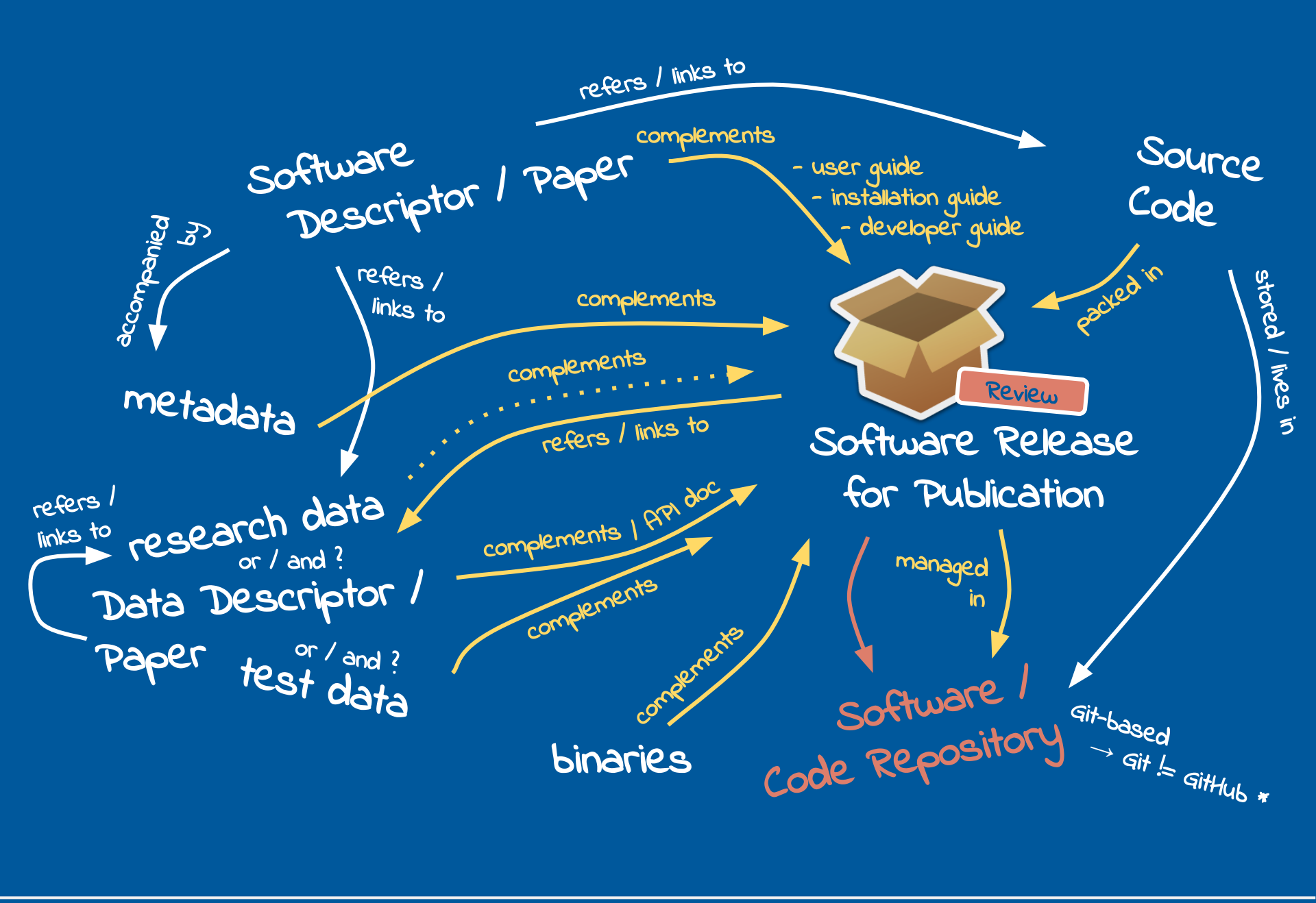
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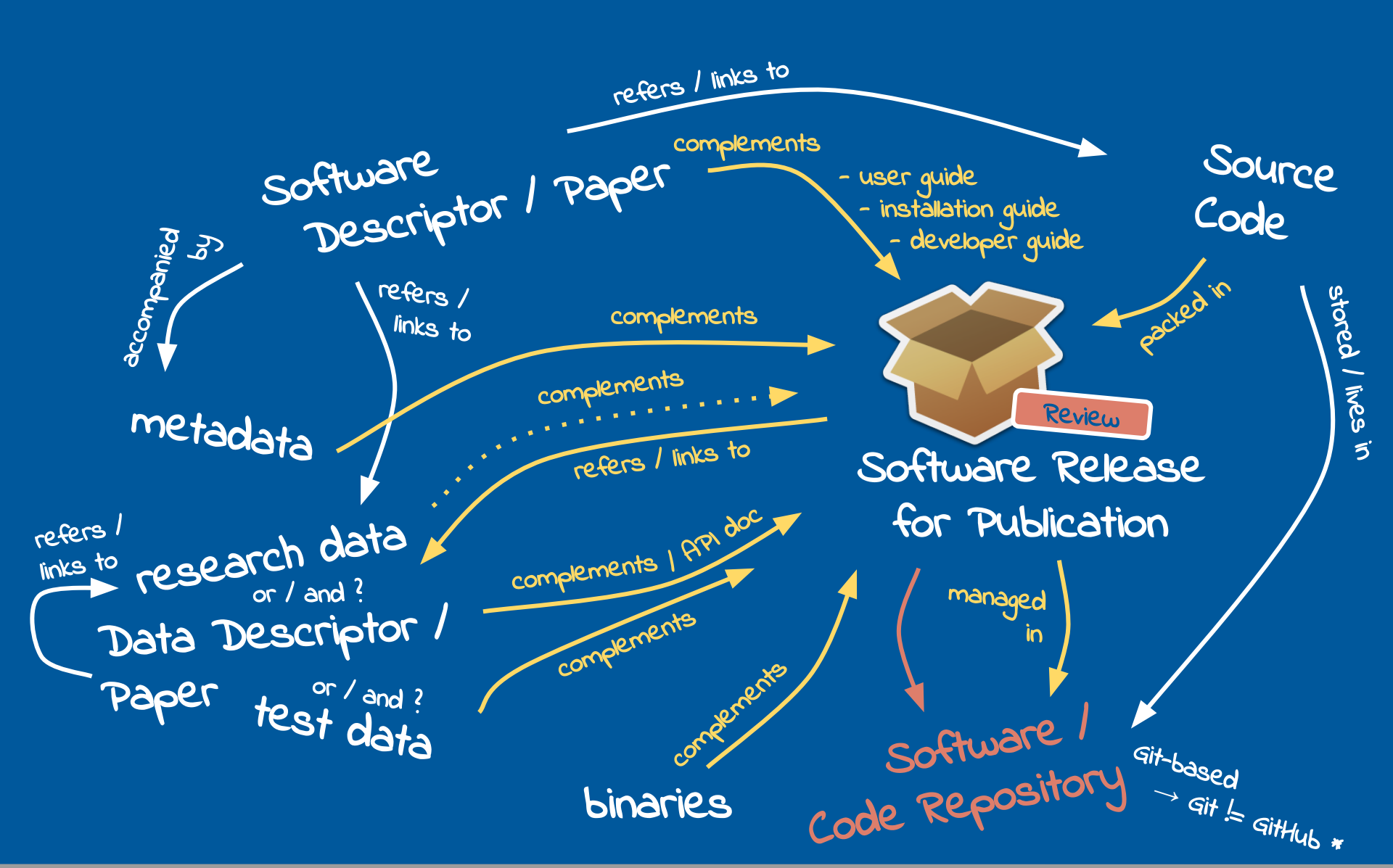
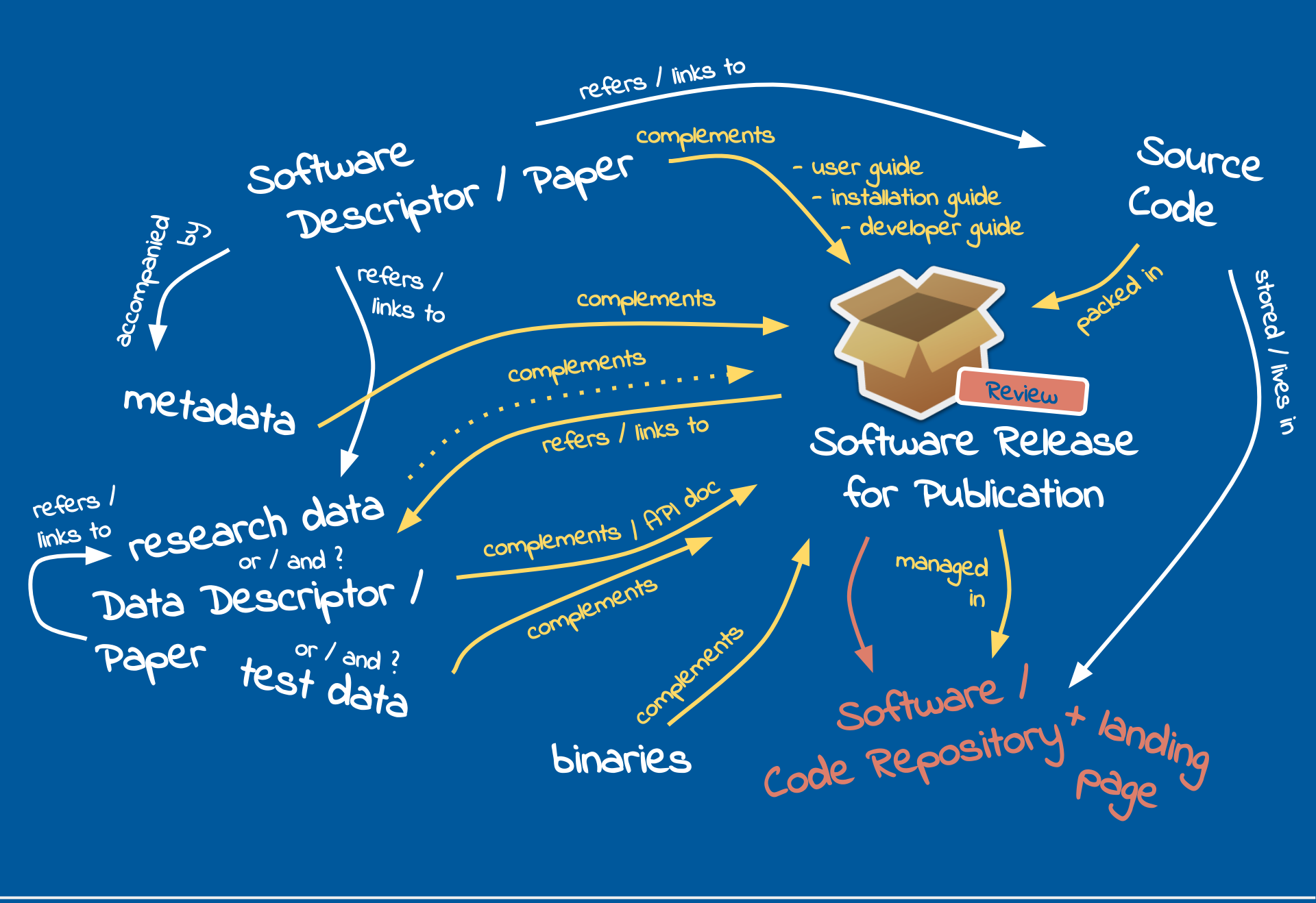
Git-based
→ Git != GitHub *



* Git - distributed revision control system with an emphasis on data integrity and support for distributed, non-linear workflows;
GitHub - web-based Git repository hosting service, which offers all of the distributed revision control and source code management functionality of Git as well as adding its own features ... it provides access control and collaboration features such as wikis, task management, and bug tracking and feature requests. -- wikipedia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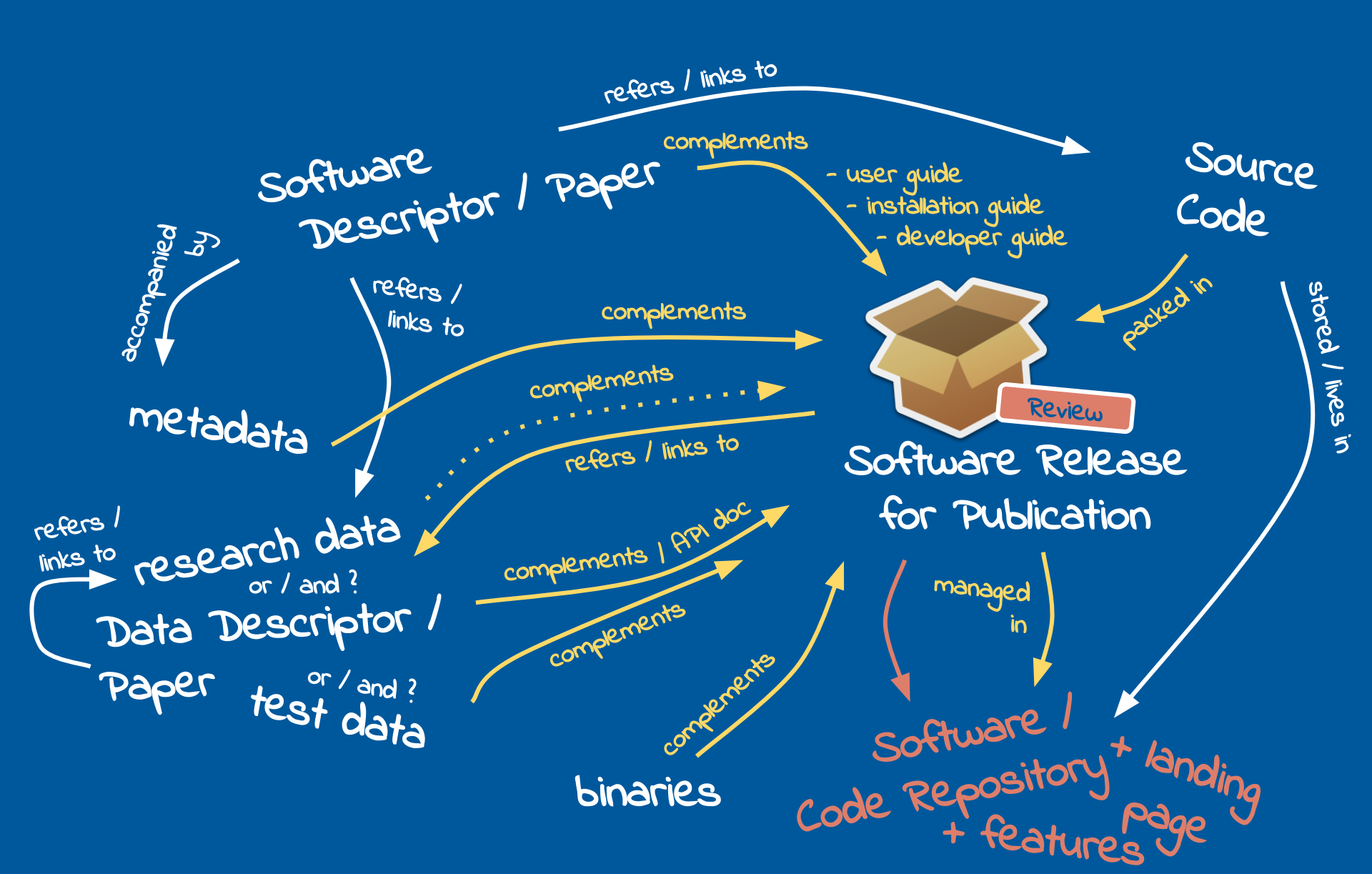
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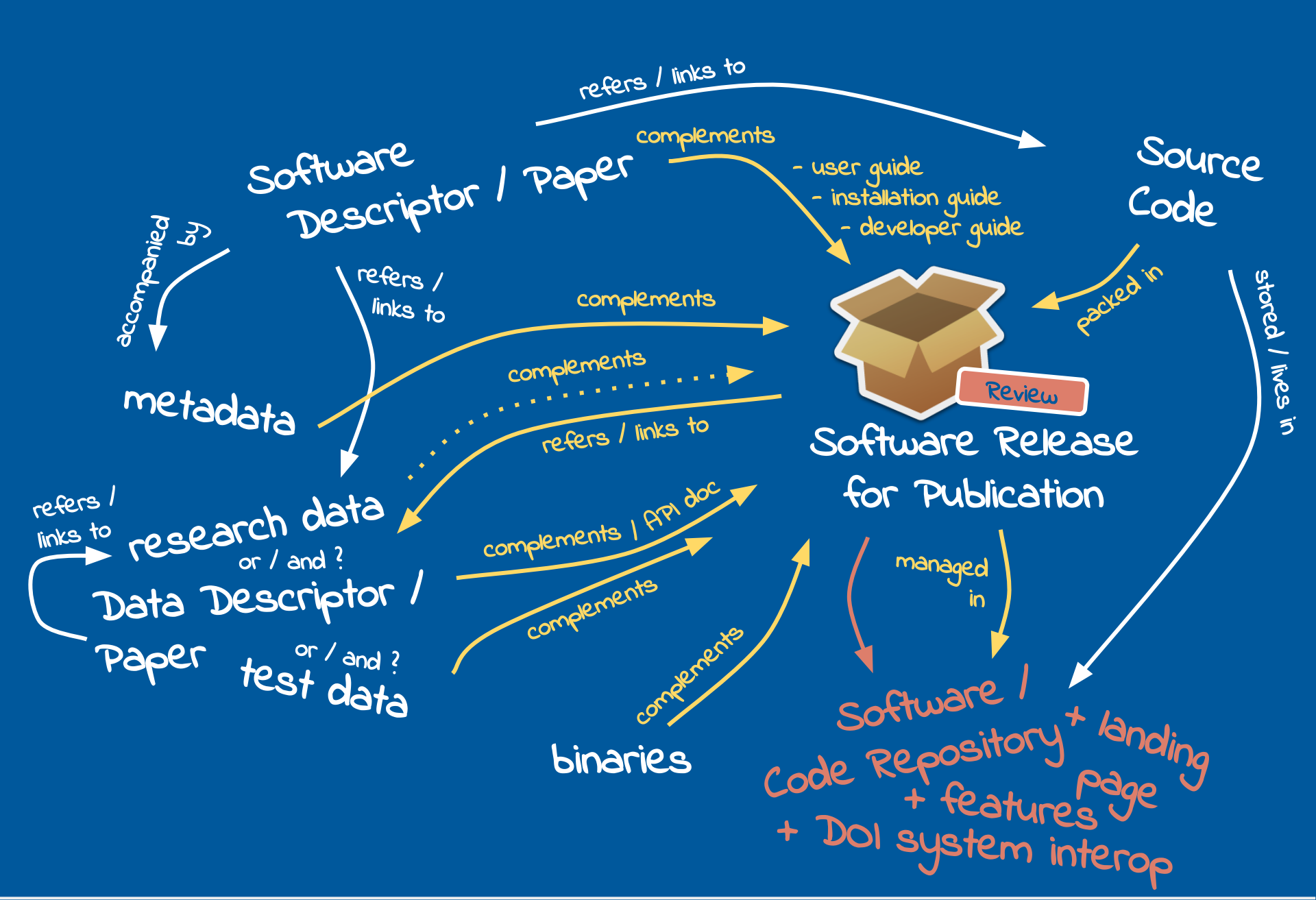
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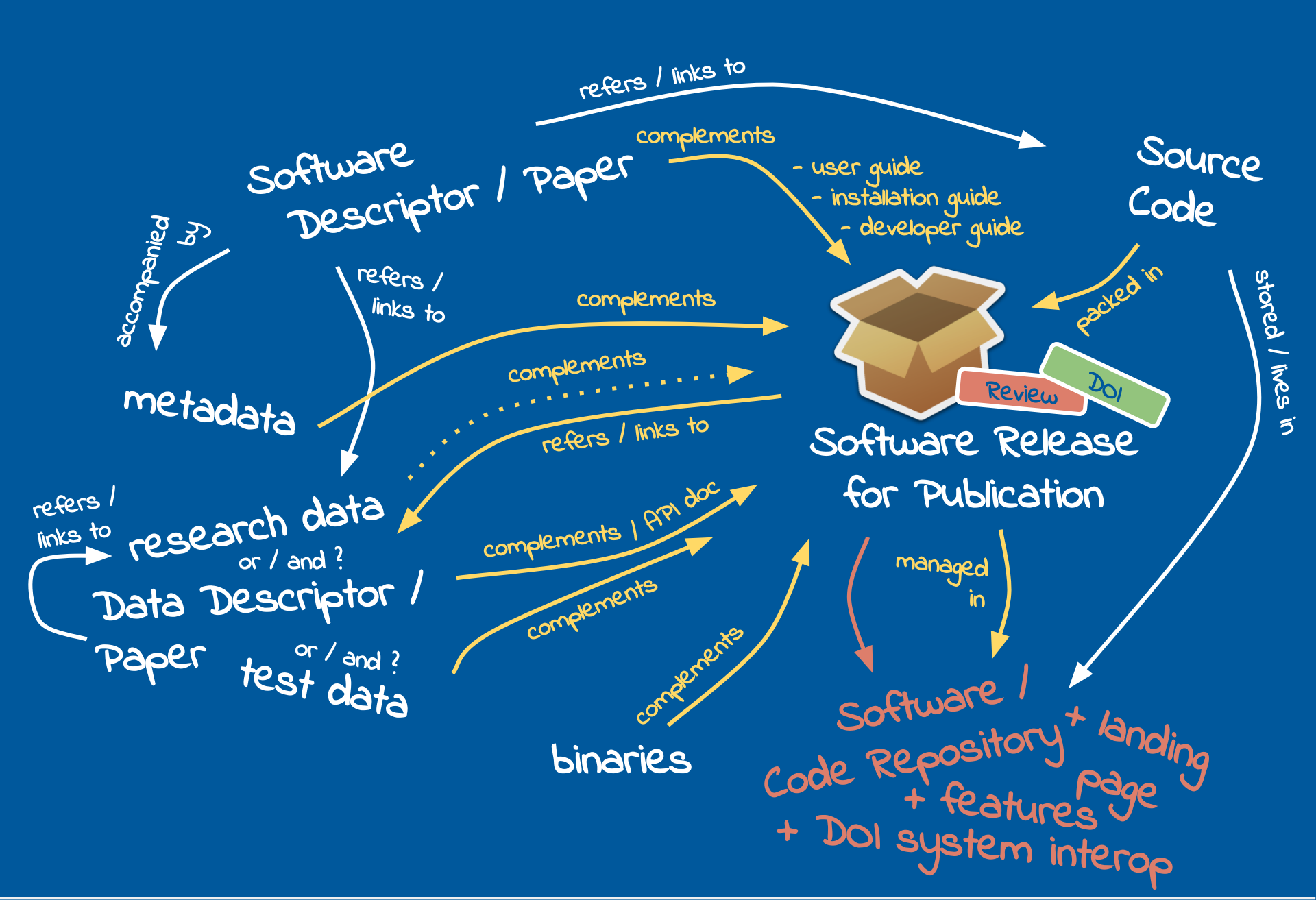
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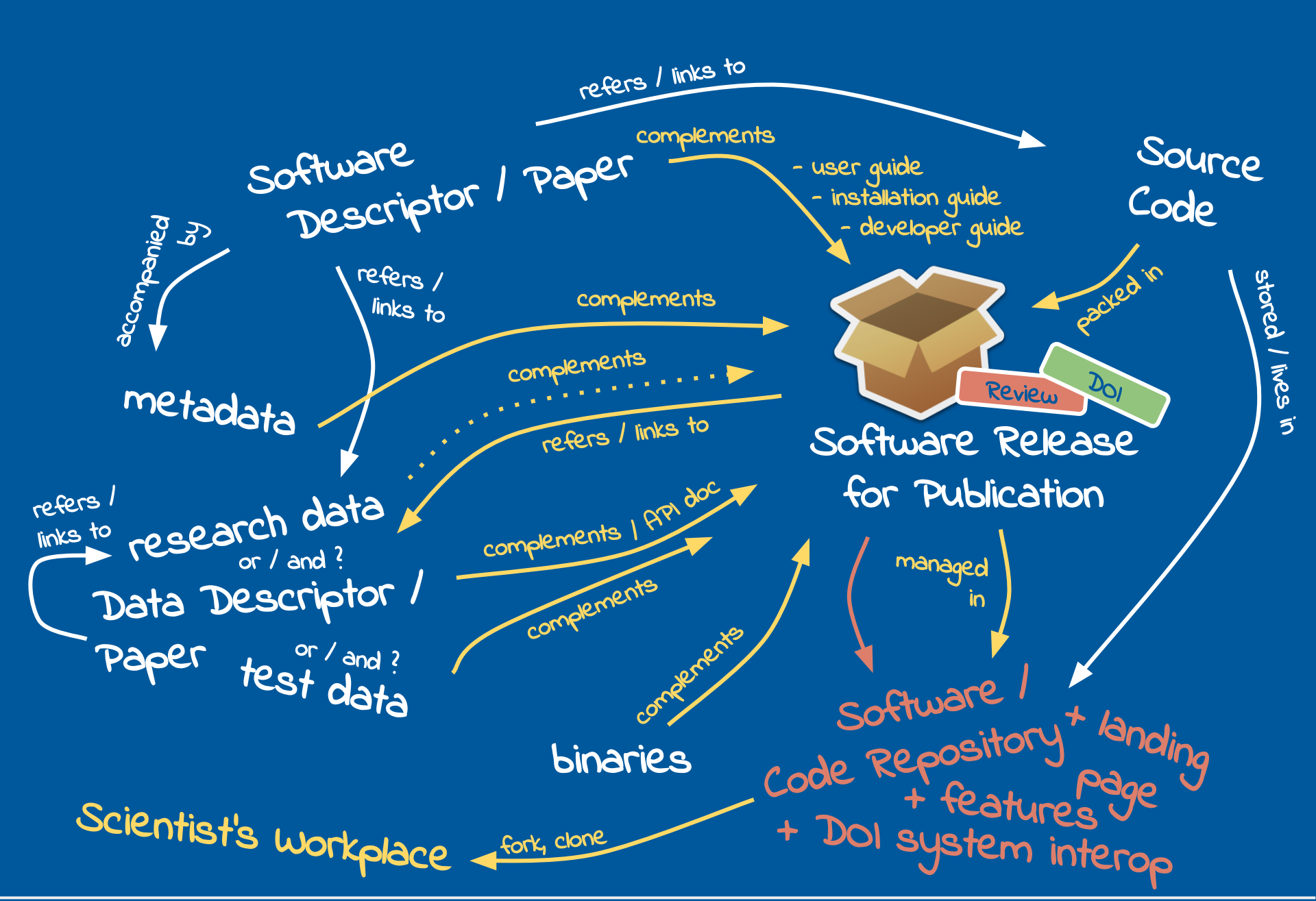
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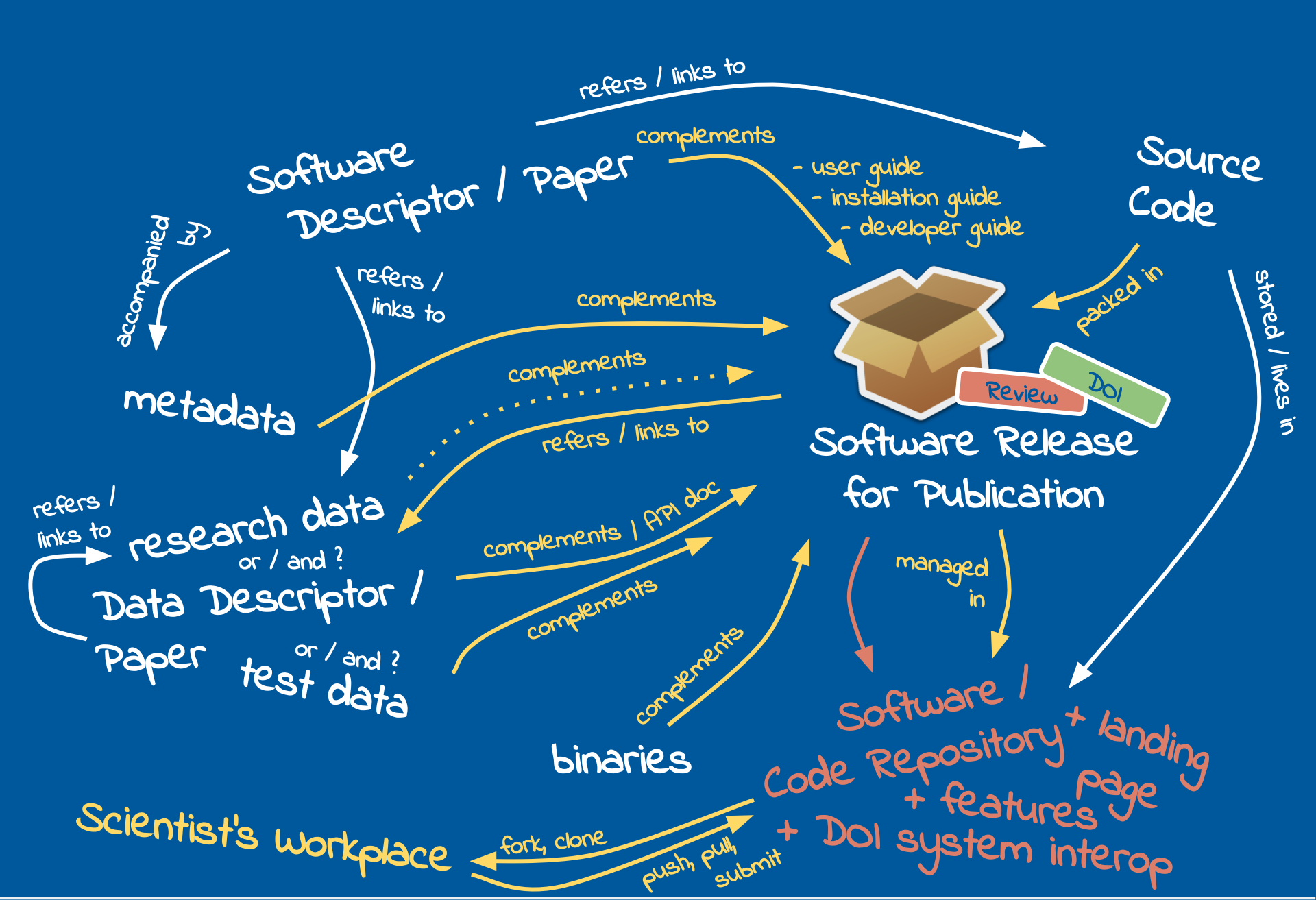
Scientist's workplace
fork, clone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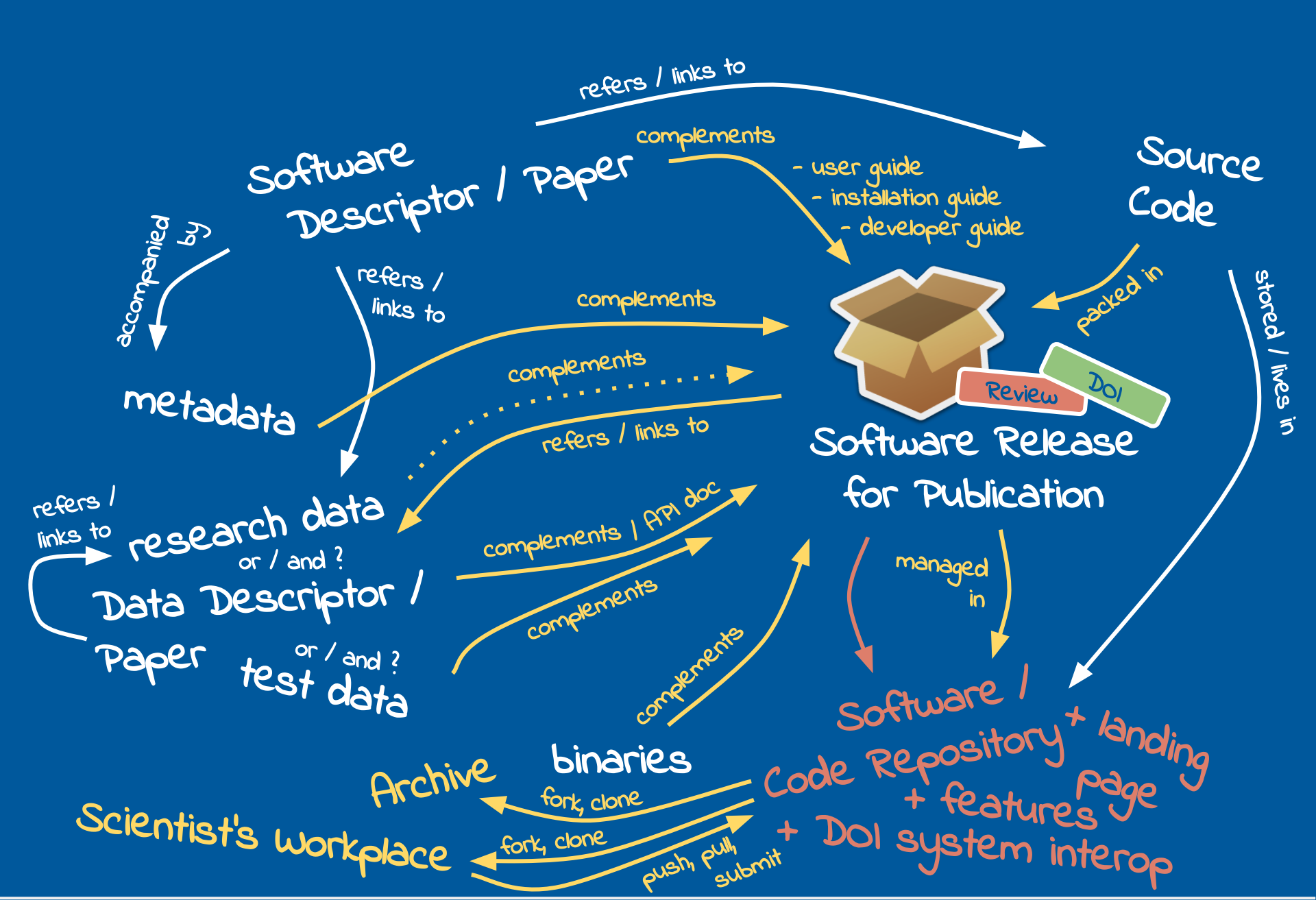
Scientist's Workplace
fork, clone
push, pull, submit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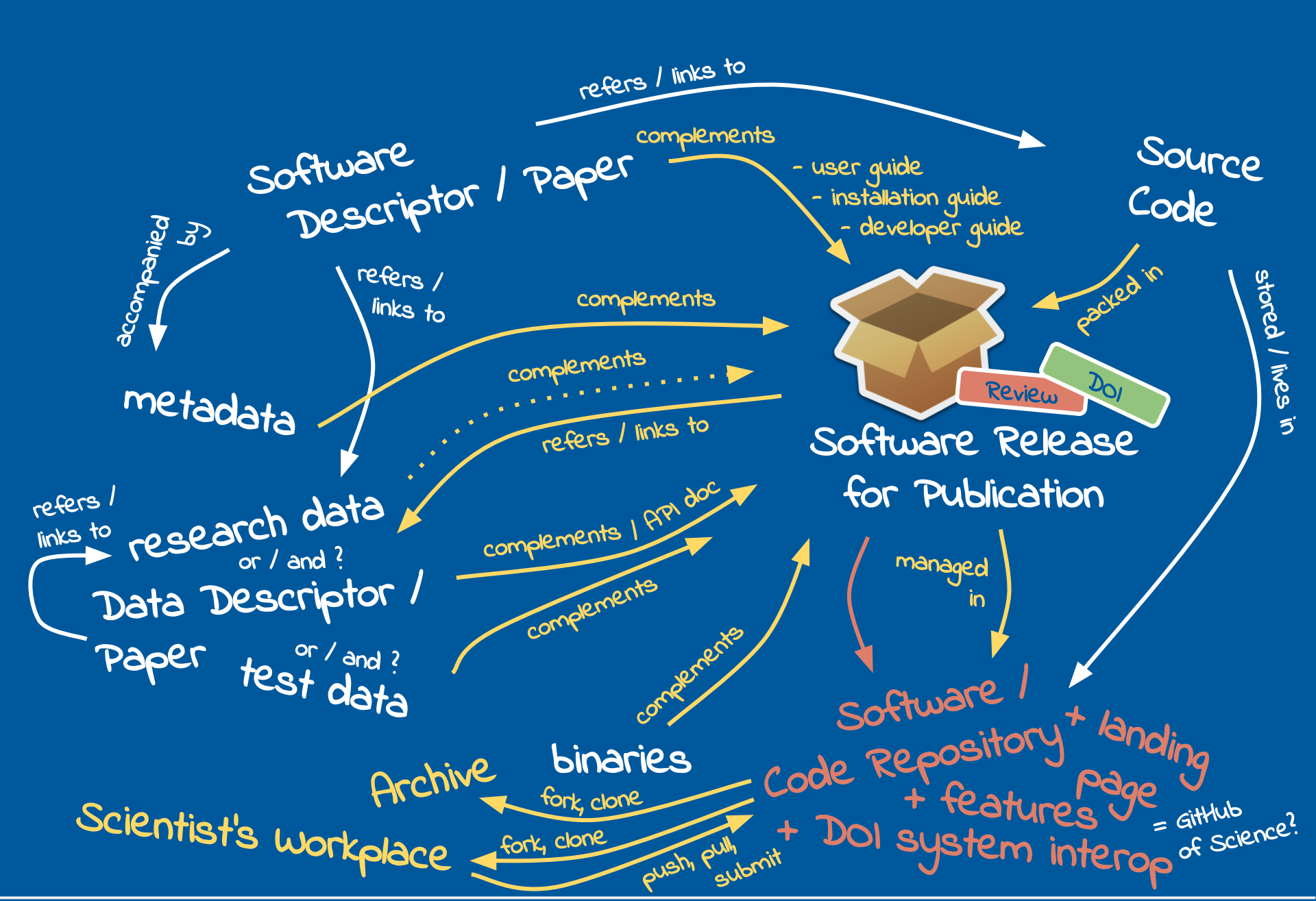
push, pull, submit
Scientist's workplace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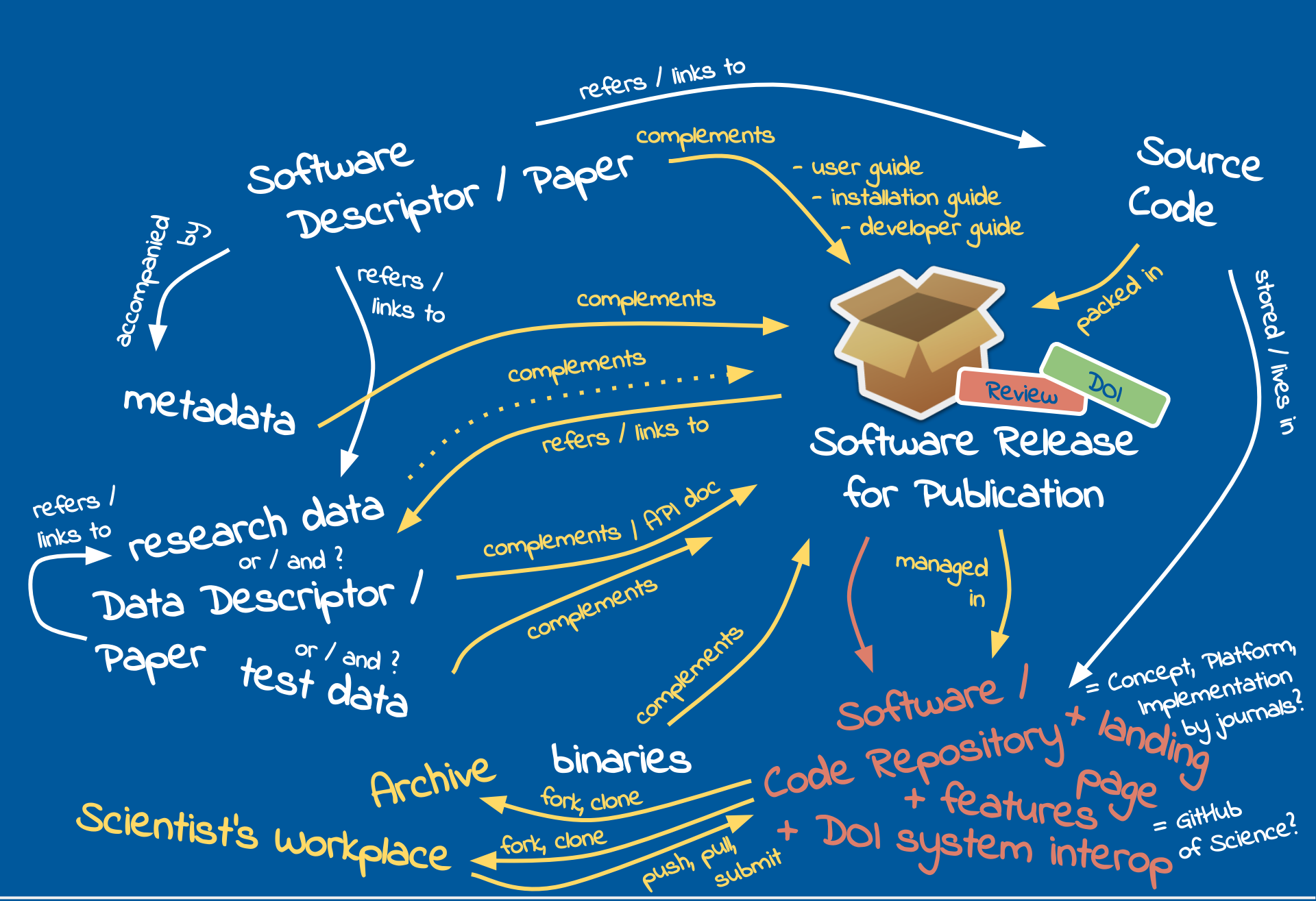
Scientist's workplace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Scientist's workplace

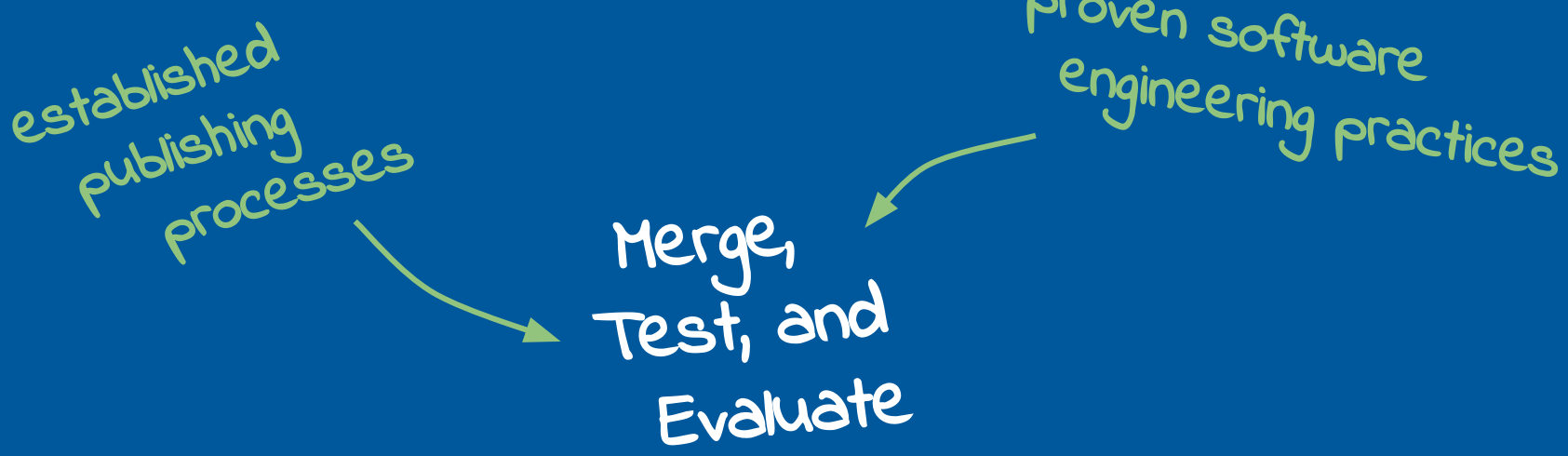
Approach

Approach

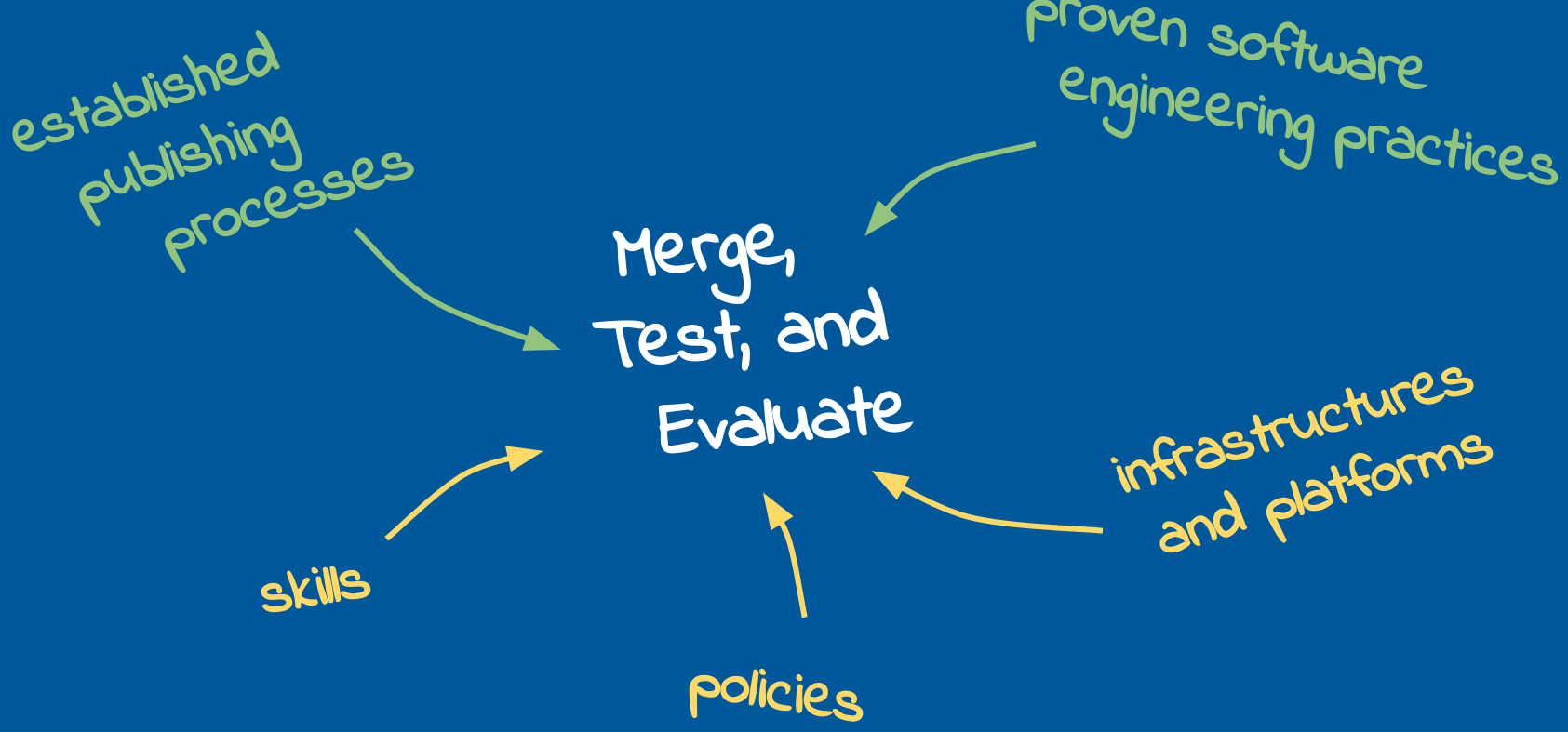
established publishing processes

proven software engineering practices

Approach


established publishing processes
proven software engineering practices
Merge, Test, and Evaluate

Approach


established publishing processes
proven software engineering practices
Merge, Test, and Evaluate
skills
infrastructures and platforms
policies