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# Introduction to the EBRAINS Software Distribution

1st ESD Hackathon

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# Ambition - a common software ecosystem

```
$ apt-get install python3-pynn
```

```
# ...
```

The following NEW packages will be installed:

```
binutils binutils-common binutils-x86-64-linux-gnu bzip2 cpp cpp-12 file fontconfig-config fonts-dejavu-core g++ g++-12 gcc gcc-12
ibverbs-providers javascript-common krb5-locales libabsl20220623 libaec0 libaom3 libasan8 libatomic1 libavif15 libbinutils
libblas3 libbloscl1 libboost-dev libboost1.74-dev libbrotli1 libbsd0 libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
libctf-nobfd0 libctf0 libcurl4 libdav1d6 libde265-0 libdeflate0 libevent-core-2.1-7 libevent-pthreads-2.1-7 libexpat1
libexpat1-dev libfabric1 libfontconfig1 libfreetype6 libfribidi0 libgav1-1 libgcc-12-dev libgd3 libgdbm-compat4 libgdbm6
libgfortran5 libglib2.0-0 libglib2.0-data libgomp1 libgprofng0 libgraphite2-3 libgssapi-krb5-2 libharfbuzz0b libhdf5-103-1
libheif1 libhwloc-plugins libhwloc15 libibverbs1 libicu72 libimagequant0 libisl23 libitm1 libjansson4 libjbig0 libjpeg62-turbo
libjs-jquery libjs-sphinxdoc libjs-underscore libk5crypto3 libkeyutils1 libkrb5-3 libkrb5support0 liblapack3 liblbfgsb0 liblcms2-2
liblerc4 liblsan0 liblzo2-2 libmagic-mgc libmagic1 libmpc3 libmpfr6 libmunge2 libnghttp2-14 libnl-3-200 libnl-route-3-200
libnsl-dev libnsl2 libnuma1 libopenblas-dev libopenblas-pthread-dev libopenblas0 libopenblas0-pthread libopenjp2-7 libopenmpi3
libpciaccess0 libperl5.36 libpmix2 libpng16-16 libpsm-infinipath1 libpsm2-2 libpython3-all-dev libpython3-dev libpython3-stdlib
libpython3.11 libpython3.11-dev libpython3.11-minimal libpython3.11-stdlib libquadmath0 libraqm0 librav1e0 librdmacm1 librtmp1
libsnappy1v5 libssh2-1 libstdc++-12-dev libsvtav1enc1 libsz2 libtiff6 libtirpc-common libtirpc-dev libtirpc3 libtsan2 libubsan1
libucx0 libwebp7 libwebpdemux2 libwebpmux3 libx11-6 libx11-data libx265-199 libxau6 libxcb1 libxdmcp6 libxext6 libxml2 libxnvctrl0
libxpm4 libxsimd-dev libyuv0 linux-libc-dev mailcap manpages manpages-dev media-types mime-support netbase neuron
ocl-icd-libopencl1 perl perl-modules-5.36 python-babel-localedata python-tables-data python3 python3-all python3-all-dev
python3-babel python3-beniget python3-cheetah python3-decorator python3-dev python3-distutils python3-gast python3-jinja2
python3-lazyarray python3-lib2to3 python3-markupsafe python3-minimal python3-neo python3-neuron python3-numexpr python3-numpy
python3-olefile python3-packaging python3-pil python3-pkg-resources python3-ply python3-pynn python3-pythran python3-quantities
python3-scipy python3-tables python3-tables-lib python3-tz python3.11 python3.11-dev python3.11-minimal rpcsvc-proto
shared-mime-info xdg-user-dirs xz-utils zlib1g-dev
```

```
0 upgraded, 200 newly installed, 0 to remove and 0 not upgraded.
```

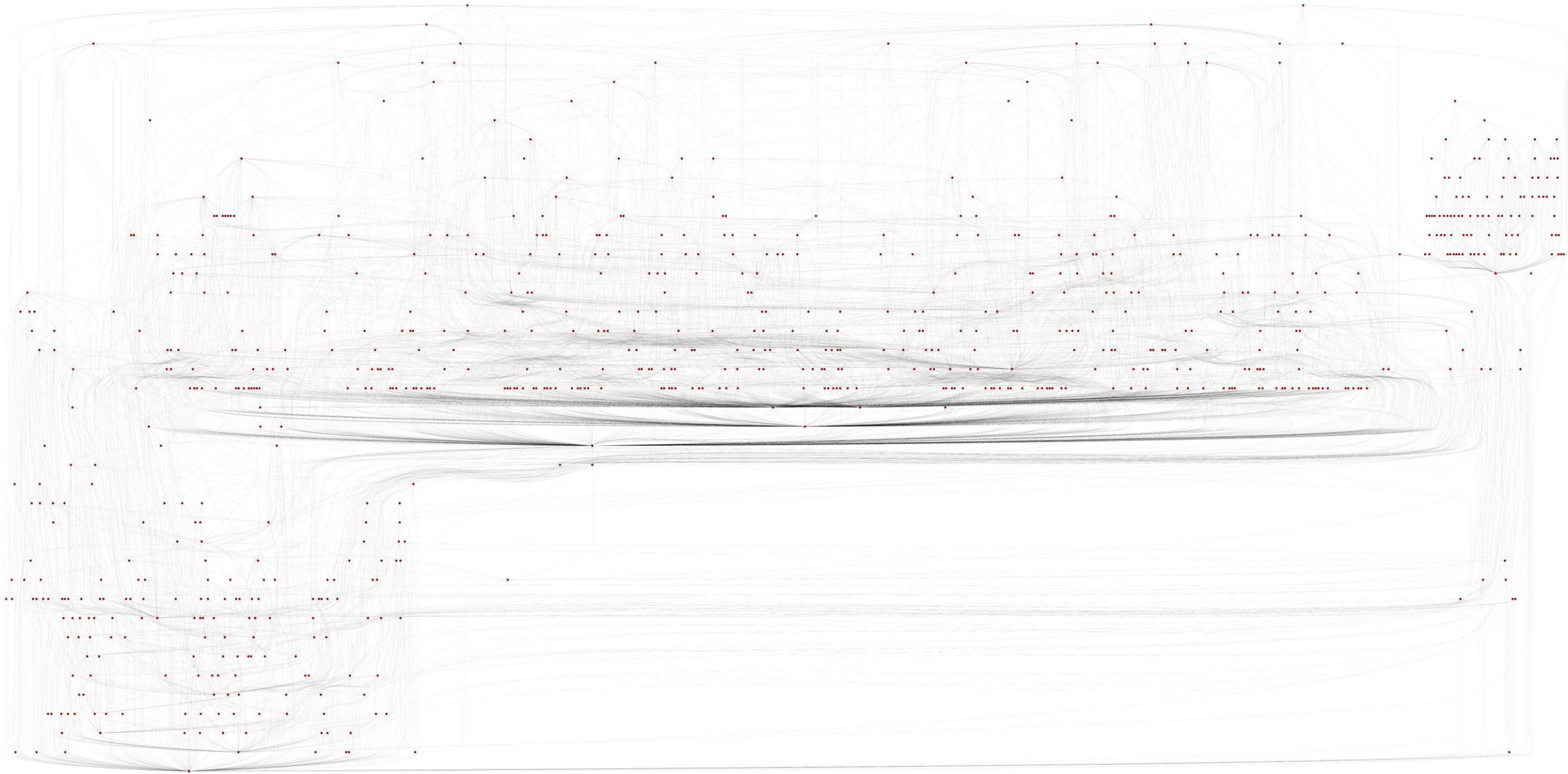
```
Need to get 187 MB of archives.
```

```
After this operation, 941 MB of additional disk space will be used.
```

```
Do you want to continue? [Y/n]
```

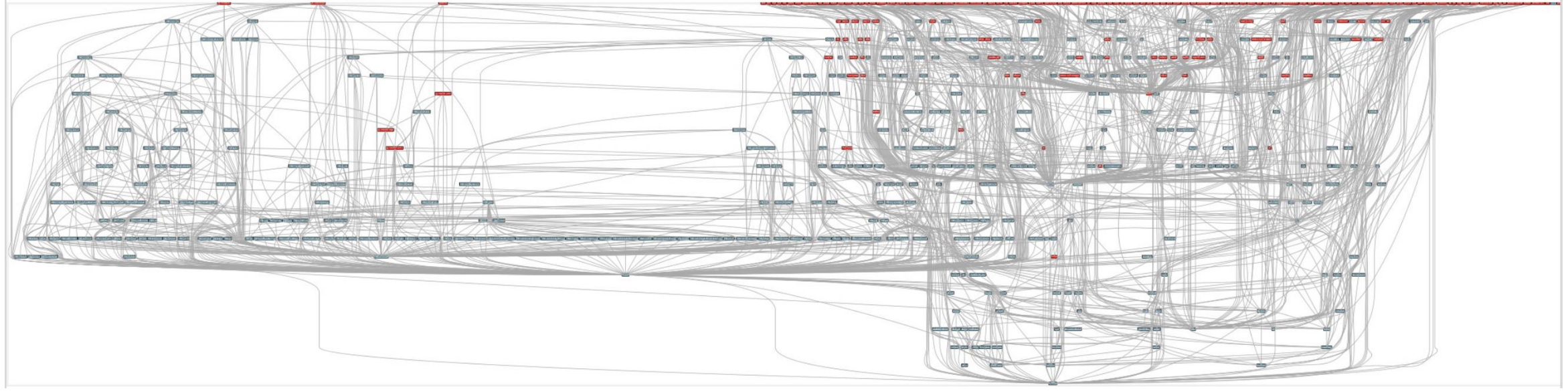


# Current ESD Dependency Graph





# Dependency Graph





# The EBRAINS Software Distribution



**Unified, consistent** EBRAINS software ecosystem containing:

- all EBRAINS tools: **simulator engines**, data **analysis and visualisation** tools, client libraries of **EBRAINS services** (**service deployments** in the ESD also possible soon)
- the optimal tree of all their (transient) **dependencies**
- **EBRAINS workflows** (software dependencies & tests)

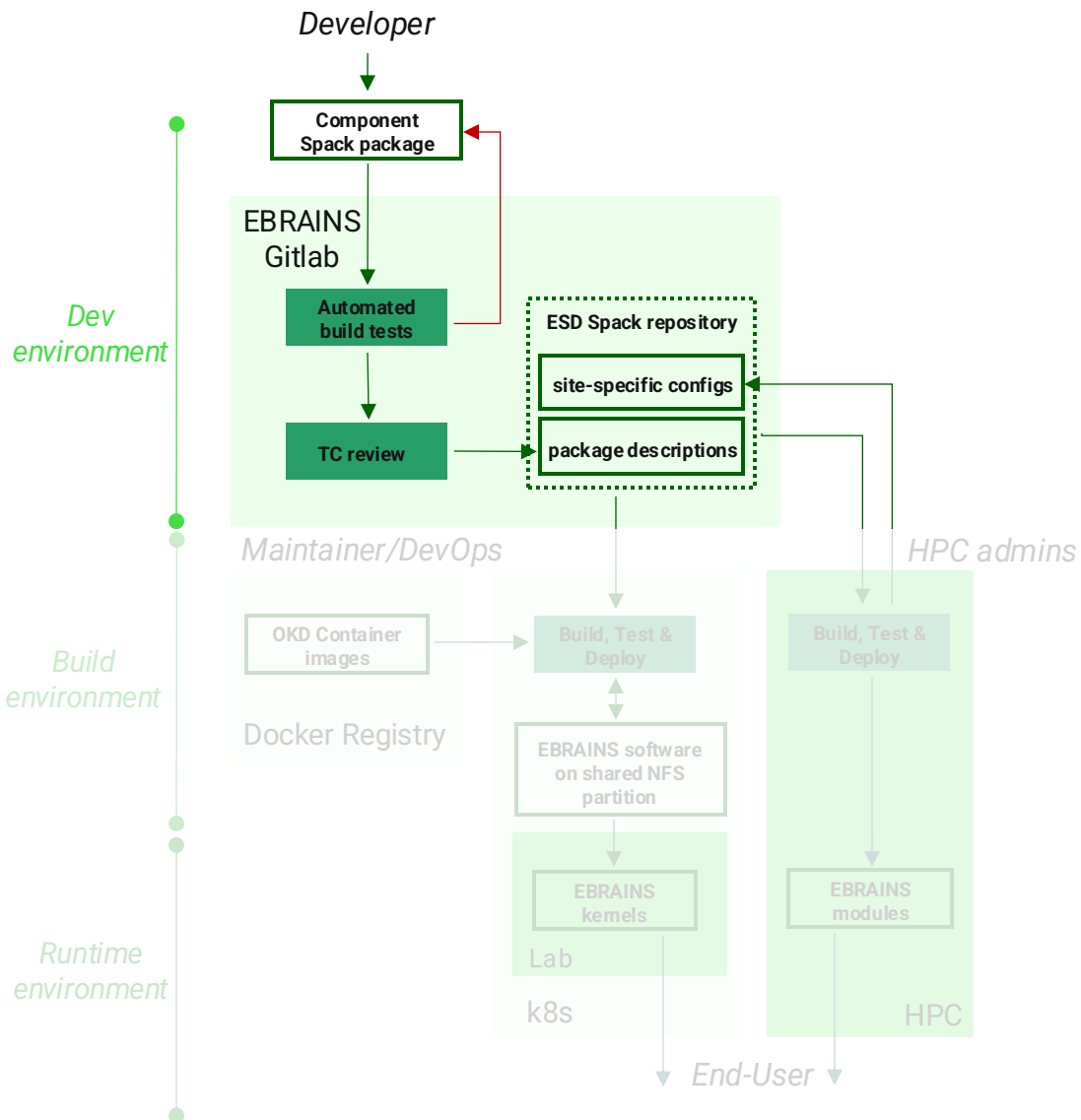
# The EBRAINS Software Distribution



## Goals:

- automated **dependency management**
- ensuring **consistency** (no conflicts)
- **reproducible** software environment
- tool unit/interoperability **testing**
- versioned, tested, validated **releases** on structured schedule
- **transparency** to users: EBRAINS kernels in the Lab, EBRAINS modules on HPC systems

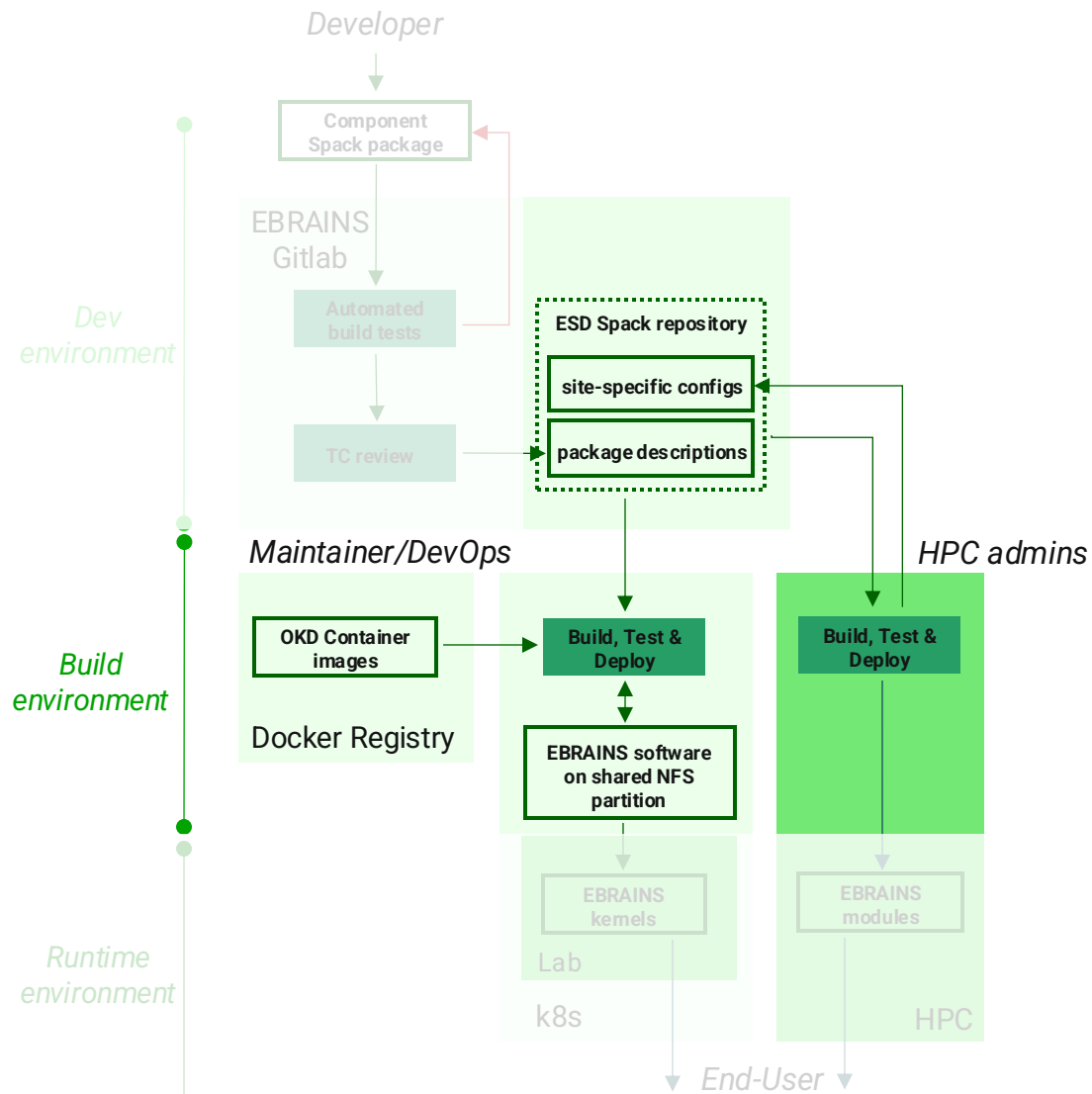
# Development and Release Flow



- **Official ESD repository:**  
<https://gitlab.ebrains.eu/ri/tech-hub/platform/esd/ebrains-spack-builds>
- **Spack** used to define the software stack, dependencies and build instructions:  
`spack create <url>`
- **MR** in official ESD repository
- **automated build tests** triggered on each commit and MR
- acceptance criteria:
  - passing **build test pipeline**
  - passing **Software Quality Checklist**

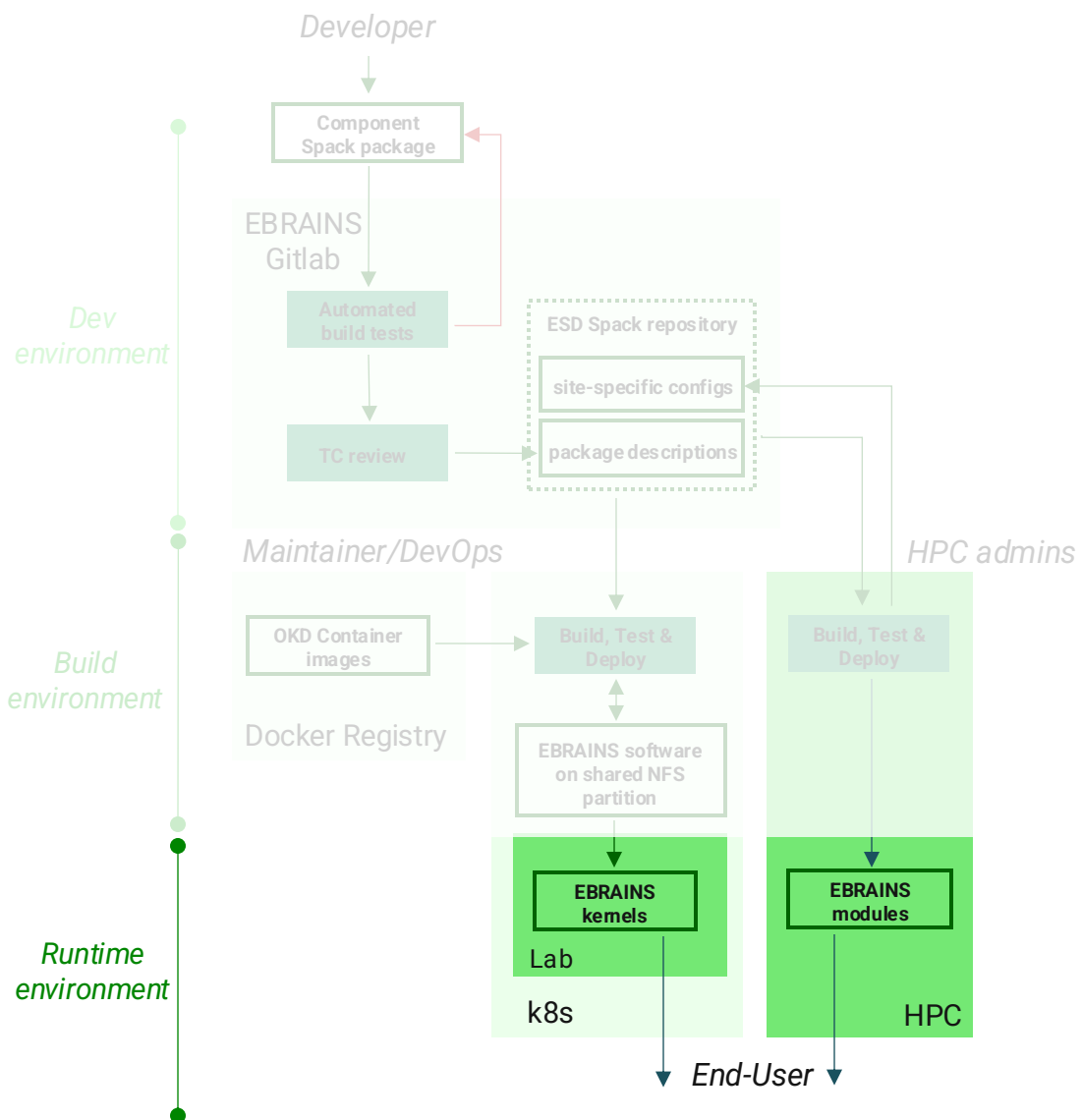


# Development and Release Flow



- **Official ESD repository:**  
<https://gitlab.ebrains.eu/ri/tech-hub/platform/esd/ebrains-spack-builds>
- **centralized process**, coordinated and performed in GitLab: **fully automated (testing and deployment) flow** using GitLab CI
- **site-specific configurations** decoupled from ESD definition
- deployment to:
  - **EBRAINS JupyterLab** (fully automated)
  - **HPC sites** (manual build and deployment)
  - **EBRAINS Gitlab runners** (loaded in CI jobs)

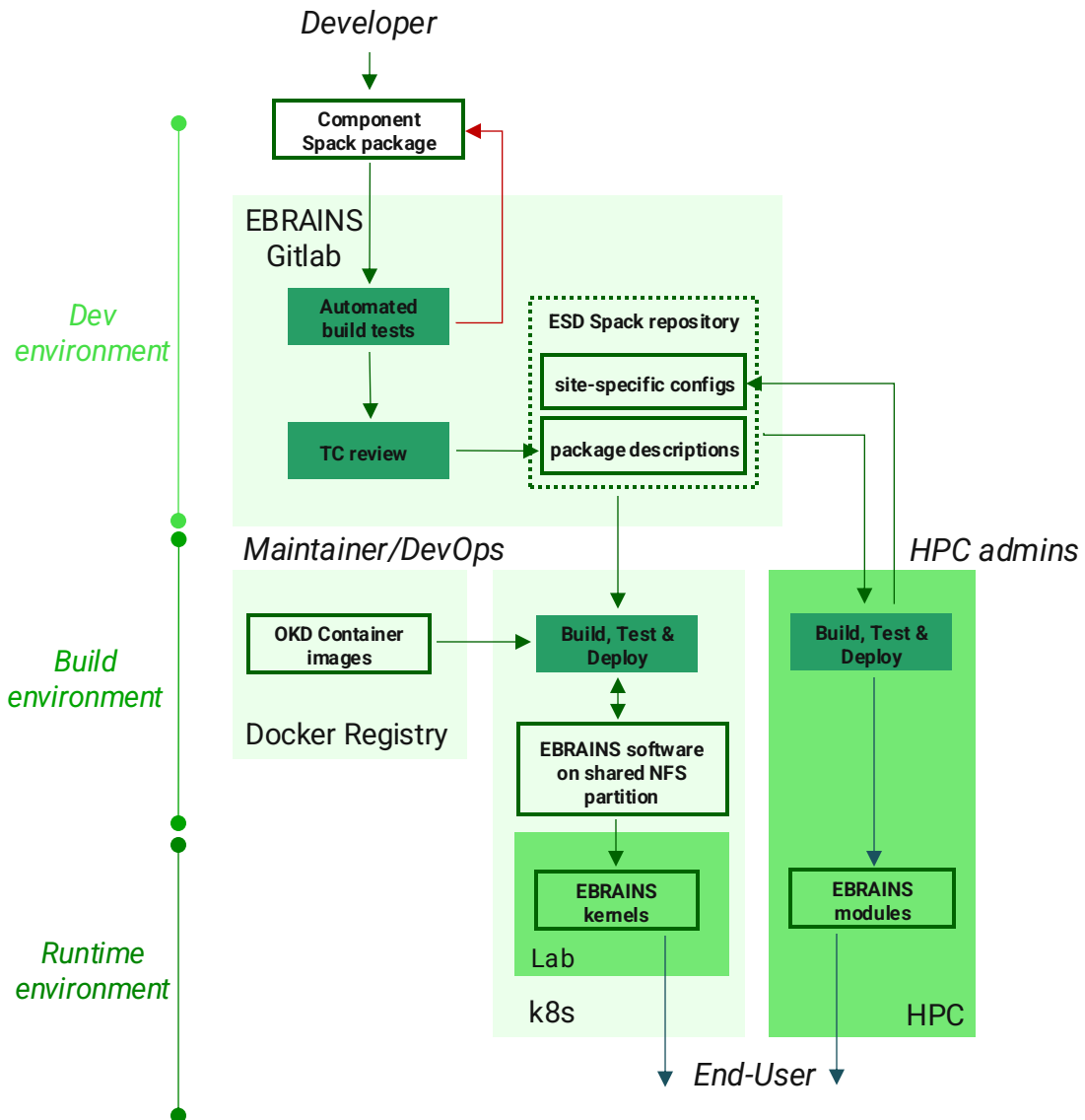
# Development and Release Flow



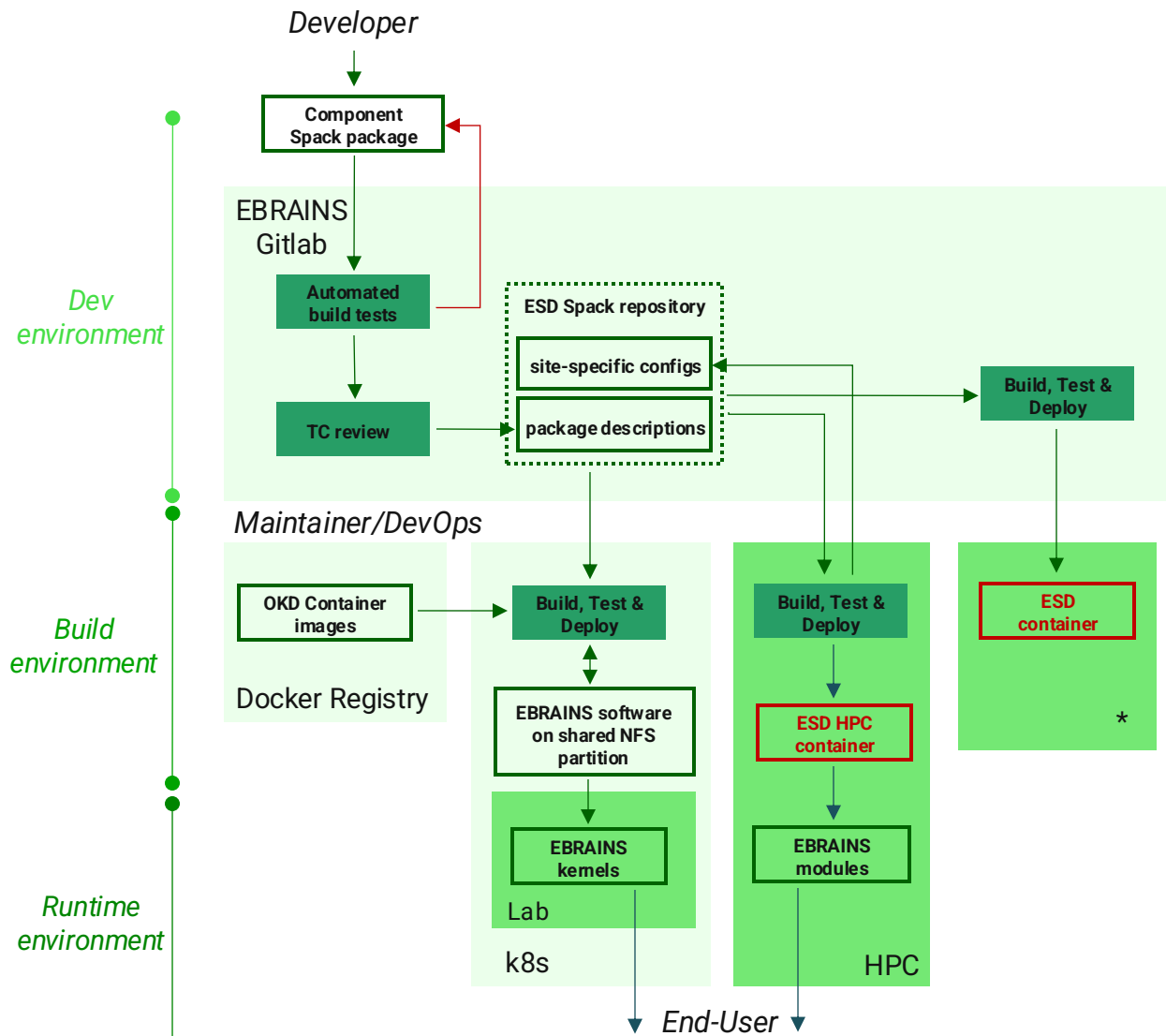
## Notebook

Python 3 (ipykernel)	EBRAINS_release_v0.1_202109	EBRAINS-22.07	EBRAINS-22.10	EBRAINS-23.02
EBRAINS-23.06	EBRAINS-23.09	EBRAINS-24.04	EBRAINS-experimental	R 3.6.3
R-EBRAINS-23.02	R-EBRAINS-23.06	R-EBRAINS-23.09	R-EBRAINS-24.04	R-EBRAINS-experimental

# Development and Release Flow



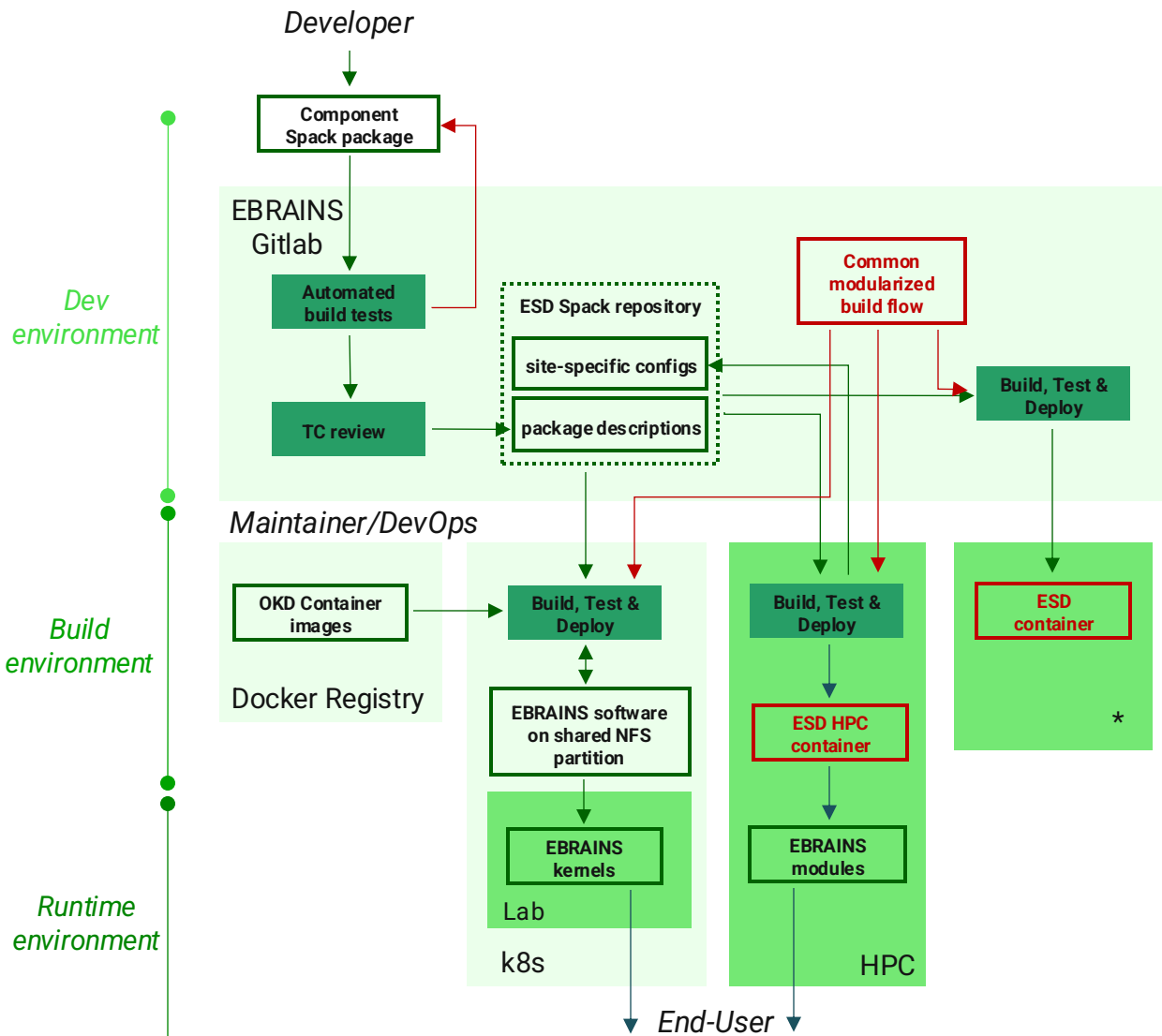
# Development and Release Flow



Soon:

- ESD (generic & HPC) containers

# Development and Release Flow



Soon:

- ESD (generic & HPC) containers
- Common, modularised build flow

# Official ESD Releases

- **EBRAINS official release**

- on a **quarterly basis** (older releases remain available)
- "release candidate" created for testing by end users before each new official release

- **EBRAINS experimental release**

- on a **weekly basis** (replaced by the next experimental release)
- not as verified or tested: bleeding edge delivery of new tool features



Release v0.1	EBRAINS 22.07	EBRAINS 22.10	EBRAINS 23.02	EBRAINS 23.06	EBRAINS 23.09	EBRAINS 24.04	experimental release
9 EBRAINS tools	21 EBRAINS tools	26 EBRAINS tools	36 EBRAINS tools	55 EBRAINS tools	59 EBRAINS tools	61 EBRAINS tools	latest versions (weekly)

available in **EBRAINS Lab** (CSCS and JSC) in **Python kernels**

automated, centralised **build and deployment process**

available also in **R kernel** in EBRAINS Lab

automated **deployment and unit testing**

deployed on ICEI **HPC sites**



# The team / Get Involved

- **EBRAINS Software Distribution: Integration and Quality WG**
  - Tuesday, 11:00 CEST
  - all ESD-related topics: integration and testing aspects, software quality, (non-HPC) container images, workflow packages, etc
- **EBRAINS Software Distribution on HPC WG**
  - Friday, 10:00 CEST
  - all ESD HPC-related aspects such as deployment, (performance) optimization and packaging
- **Rocketchat channel:** <https://chat.ebrains.eu/channel/ebrains-releases>



**EBRAINS**

EBRAINS 2.0

**Thank you!**



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