# From Human Brain Project to EBRAINS RI: coordinating the technical aspects of the transition

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HBP Partnering Projects Meeting: Status quo & outlook

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# What is Technical Coordination (TC)

## EBRAINS INFRASTRUCTURE PLANNING, COORDINATION AND IMPLEMENTATION

- planning, design, integration and delivery of the EBRAINS RI
- establishing common software quality principles and indicators
- monitoring development, integration, testing, and delivery of components
- ensuring the components' efficient integration and sustainable operation

# Before SGA3

- Many research teams, important – independent results

- At the beginning of SGA3 many components, tools, services, no connection between them

*creation of a comprehensive,*
***EBRAINS RI*** *components catalogue*

# SGA3

- Working Groups

- Documentation

- Co-design process-collaboration with:

  - component owners

  - use cases

  - scientific WPs

- Roadmap created from the beginning, adapted periodically

- Collaboration with HBP bodies
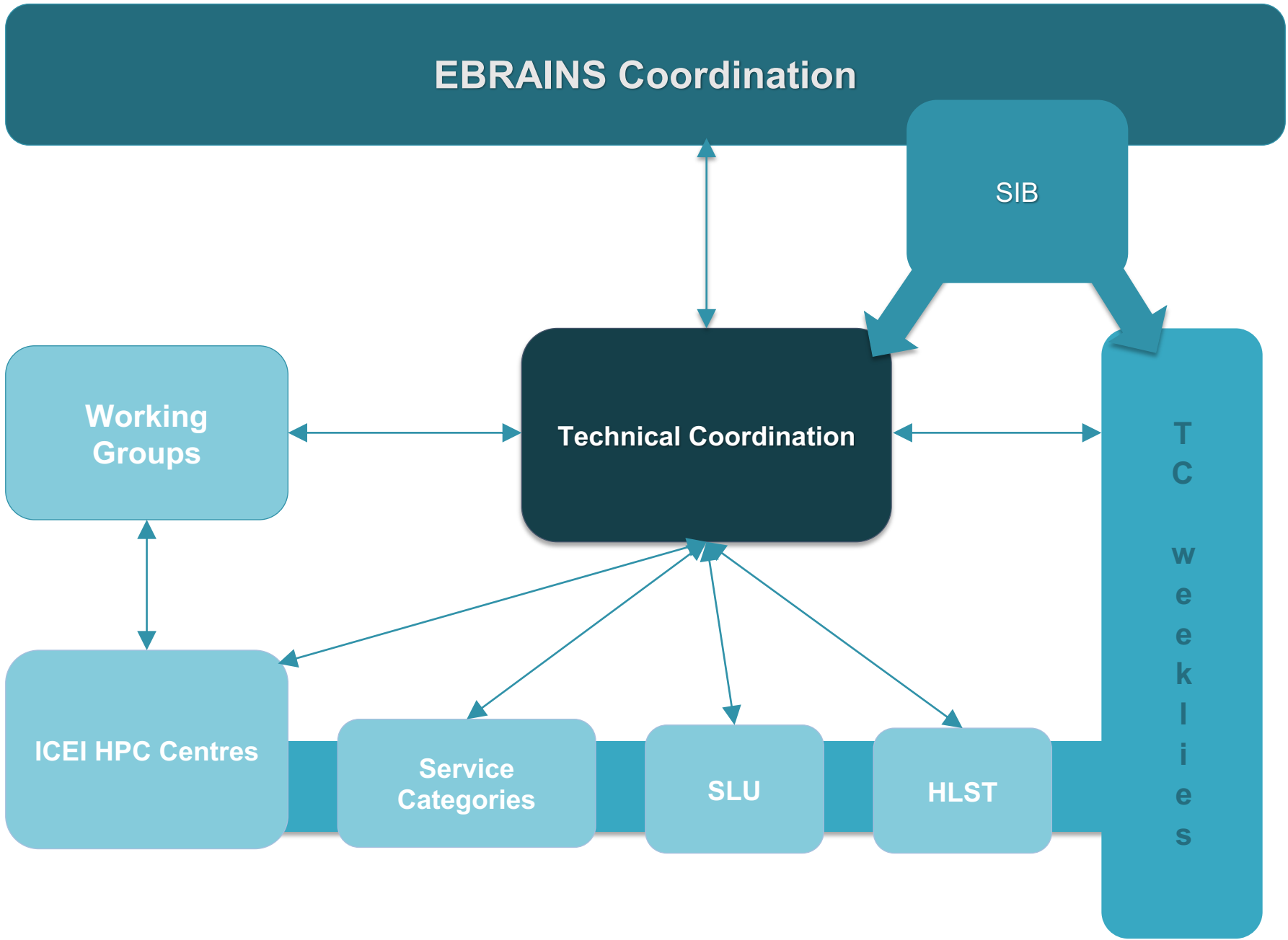
# TC weeklies



## ISSUES

90 closed since last review

15 in progress

25+ open issues

## WEBINARS

5 Presentations

Q&A section

Recordings

# TC activity
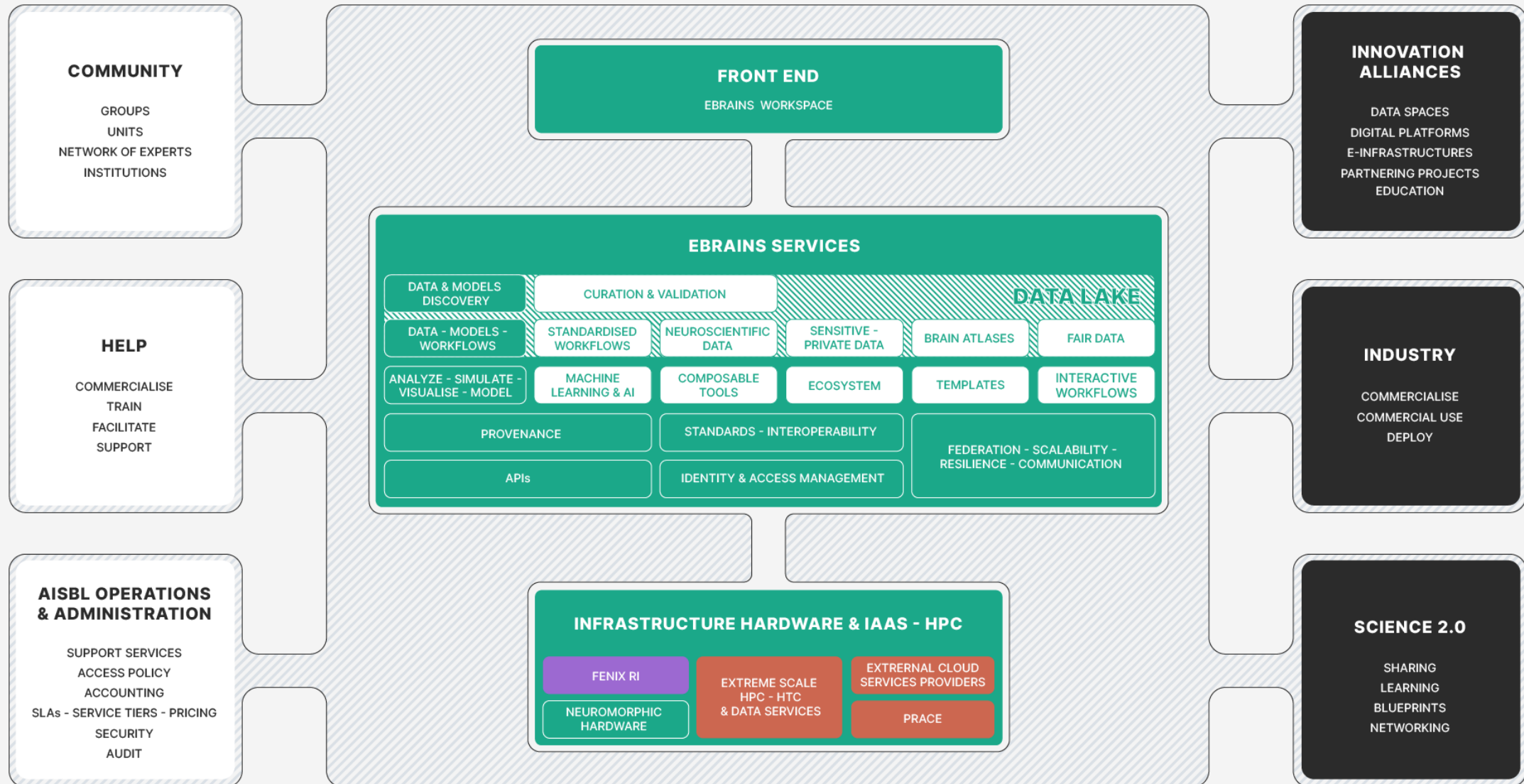
- 12 TC-TF
  - TC planning
  - Integration guidelines
  - Workflows
- 200+ meetings
- Ad-hoc meetings and presentations

- EBRAINS events
  - Summit 2021, 2020
  - Codejam 2021, 2020
- Workshops and Educational events
  - TVB-EBRAINS workshop
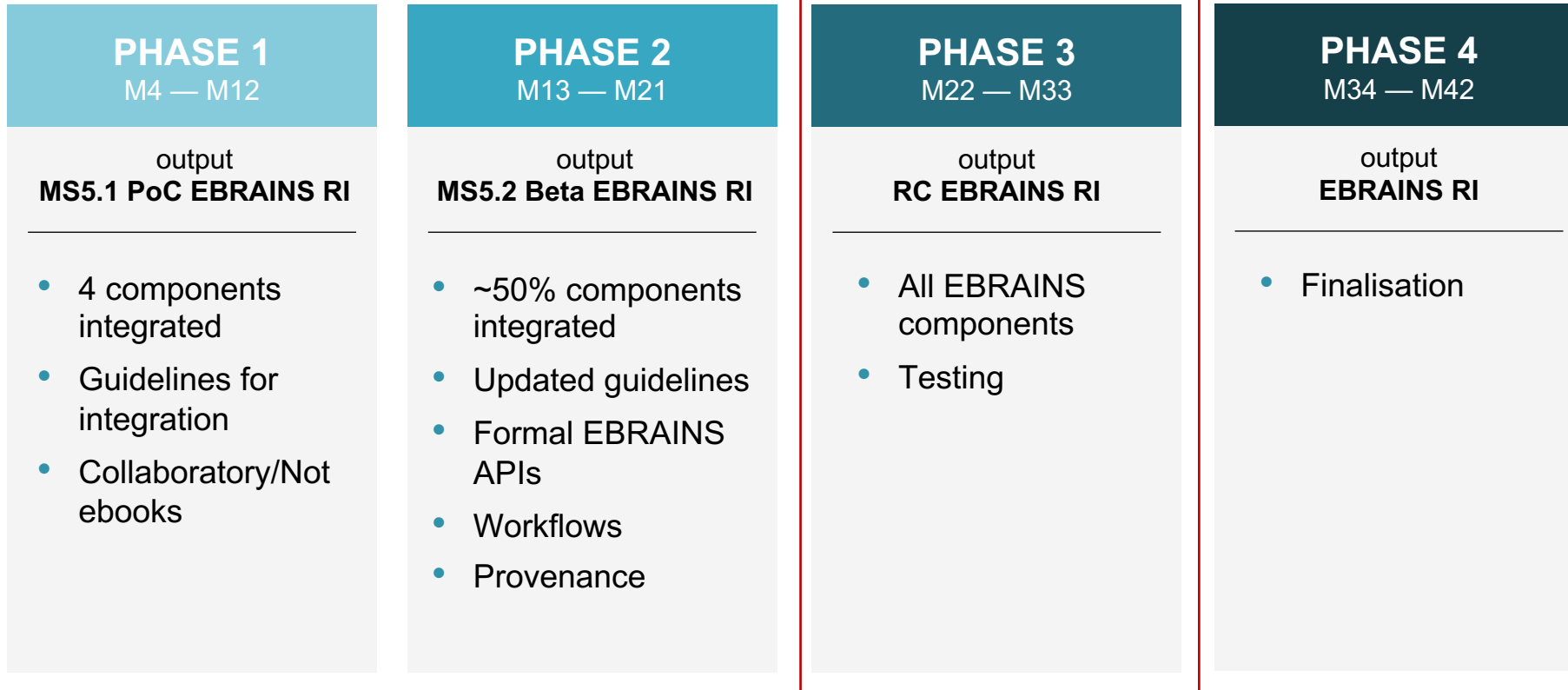  - Young Researchers Event

- TC Resources
- Guidelines
- Common tools and environments
- Standardised processes

Co-funded by the European Union

# SGA3 - Architecture



**COMMUNITY**

GROUPS
UNITS
NETWORK OF EXPERTS
INSTITUTIONS

**HELP**

COMMERCIALISE
TRAIN
FACILITATE
SUPPORT

**AISBL OPERATIONS & ADMINISTRATION**

SUPPORT SERVICES
ACCESS POLICY
ACCOUNTING
SLAs - SERVICE TIERS - PRICING
SECURITY
AUDIT

**FRONT END**

EBRAINS WORKSPACE

**EBRAINS SERVICES**

DATA & MODELS DISCOVERY

CURATION & VALIDATION

DATA LAKE

DATA - MODELS - WORKFLOWS

STANDARDISED WORKFLOWS

NEUROSCIENTIFIC DATA

SENSITIVE - PRIVATE DATA

BRAIN ATLASES

FAIR DATA

ANALYZE - SIMULATE - VISUALISE - MODEL

MACHINE LEARNING & AI

COMPOSABLE TOOLS

ECOSYSTEM

TEMPLATES

INTERACTIVE WORKFLOWS

PROVENANCE

STANDARDS - INTEROPERABILITY

FEDERATION - SCALABILITY - RESILIENCE - COMMUNICATION

APIs

IDENTITY & ACCESS MANAGEMENT

**INFRASTRUCTURE HARDWARE & IAAS - HPC**

FENIX RI

EXTREME SCALE HPC - HTC & DATA SERVICES

EXTERNAL CLOUD SERVICES PROVIDERS

NEUROMORPHIC HARDWARE

PRACE

**INNOVATION ALLIANCES**

DATA SPACES
DIGITAL PLATFORMS
E-INFRASTRUCTURES
PARTNERING PROJECTS
EDUCATION

**INDUSTRY**

COMMERCIALISE
COMMERCIAL USE
DEPLOY

**SCIENCE 2.0**

SHARING
LEARNING
BLUEPRINTS
NETWORKING

**EBRAINS RI**

■ EBRAINS PLATFORM   ■ FENIX RI   ■ EXTERNAL CLOUD SERVICE PROVIDERS   ■ SCIENCE - TECHNOLOGY - INDUSTRY LIAISON   □ EBRAINS BODIES

Union

# SGA3 – Integration Phases

| PHASE 1 | PHASE 2 | PHASE 3 | PHASE 4 |
|---|---|---|---|
| M4 — M12 | M13 — M21 | M22 — M33 | M34 — M42 |
| output **MS5.1 PoC EBRAINS RI** | output **MS5.2 Beta EBRAINS RI** | output **RC EBRAINS RI** | output **EBRAINS RI** |
| • 4 components integrated<br>• Guidelines for integration<br>• Collaboratory/Notebooks | • ~50% components integrated<br>• Updated guidelines<br>• Formal EBRAINS APIs<br>• Workflows<br>• Provenance | • All EBRAINS components<br>• Testing | • Finalisation |

# Integration
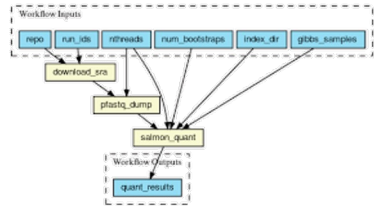
**EBRAINS Integration = technical integration**

## INTEGRATION STEPS

- Components' assessment

- Components' prioritization based on their maturity

- Checklist available at the beginning of every Phase

- Collaboration with component owners

# At the end of Phase 2

## Meeting Phase 2 Integration Requirements



| | | | |
|---|---|---|---|
| Code repositories — 50% | CI runs — 90% | TC Collab wiki page — 60% | Deployment — 80% |
| EBRAINS Docker registry — 85% | Centralized Authentication/Authorization — 85% | SGAs Acknowledgment — 60% | Monitoring & Observability — 62% |
| Licensing — 100% | Documentation — 100% | Knowledge Graph entries — 60% | HLST point of documentation — 80% |
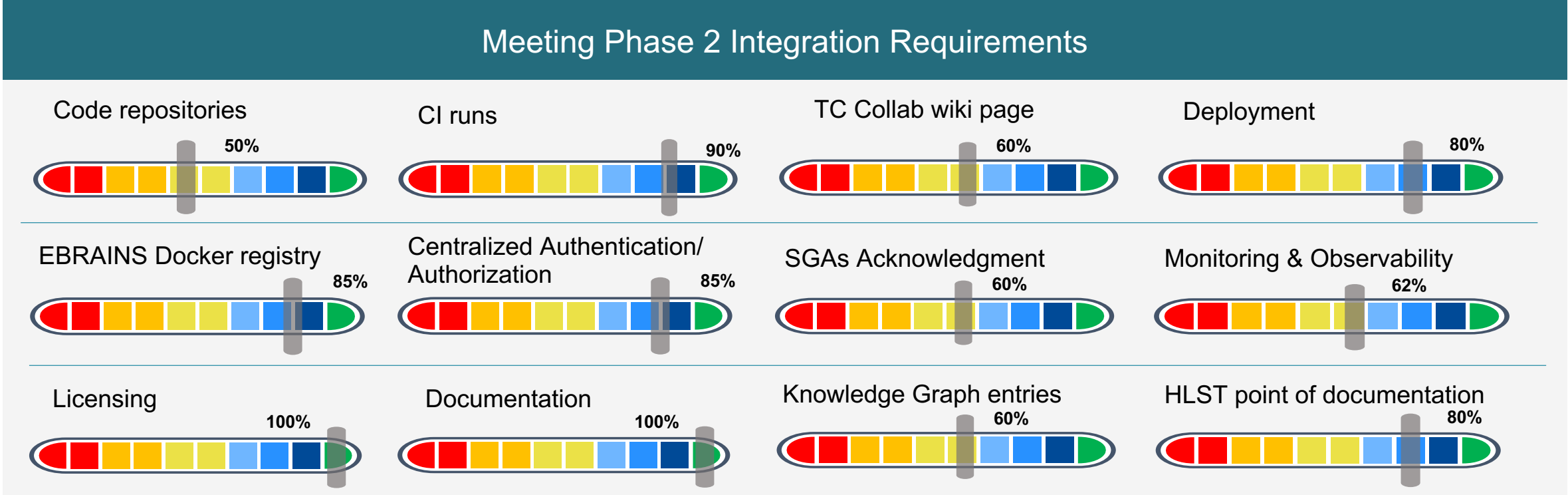
# Workflows in EBRAINS



*Series of non-interactive EBRAINS tools and services, linked together to create graphs, loops or branches defined as structured, common recipes, executed via compatible software*

## Environments

EBRAINS Collaboratory — — — Collaboratory.Lab UNICØRE

| Offerings | Limitations *What is missing* | Goal |
|---|---|---|
| • Collaboration | • Reproducibility | • **Standardised** |
| • Code sharing | • Shareability | • **Automated** |
| • Data sharing | • Portability | • **FAIR** |
| • Documentation | • Findability | |
| • Launch HPC jobs | | |

# Standardisation

## EBRAINS

| FAIR Data | FAIR Tools | FAIR Workflows |
|-----------|------------|----------------|
| KG | KG  TC | TC  SLU |

**+** **+**

**=**

## FAIR e-Infrastructure
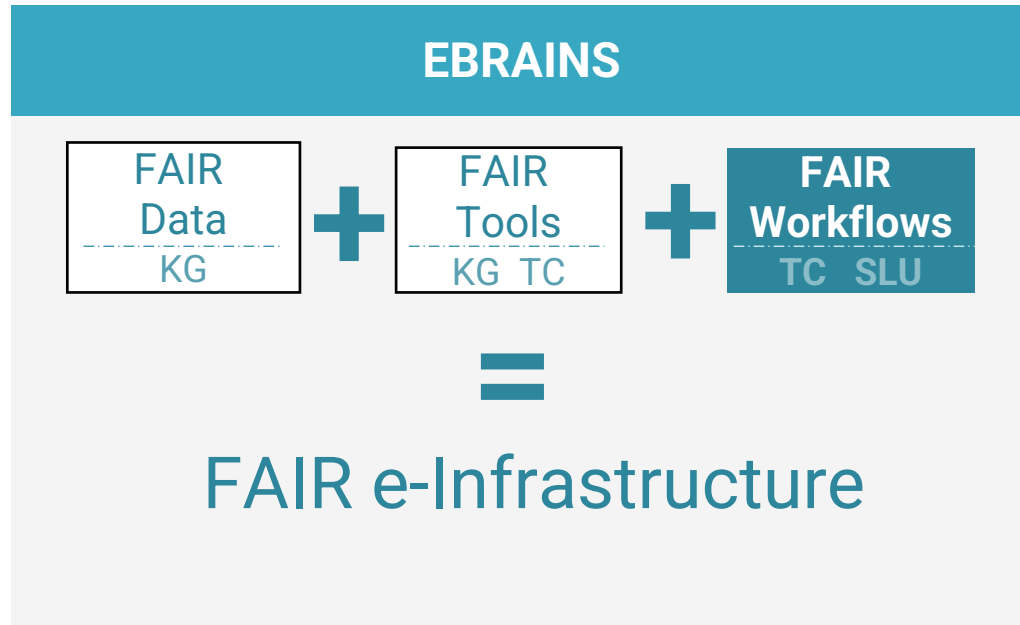
## EBRAINS users

- Reproducibility and Reusability
  - well-documented and structured recipes
- Flexibility
  - no need for familiarization with technical execution details
- Shareability and Association
  - via Knowledge Graph

TC: Technical Coordination
KG: Knowledge Graph
SLU: Scientific Liaison Unit

# Common Workflow Language (CWL)

Open, common, standard format to describe data analysis & simulation workflows as recipes

## EBRAINS tools

- **Defined** via CWL

- **Bundled** via Containerization methods/ Package managers with dependencies, libraries and binaries

## Workflows

- **Defined** via CWL as recipes

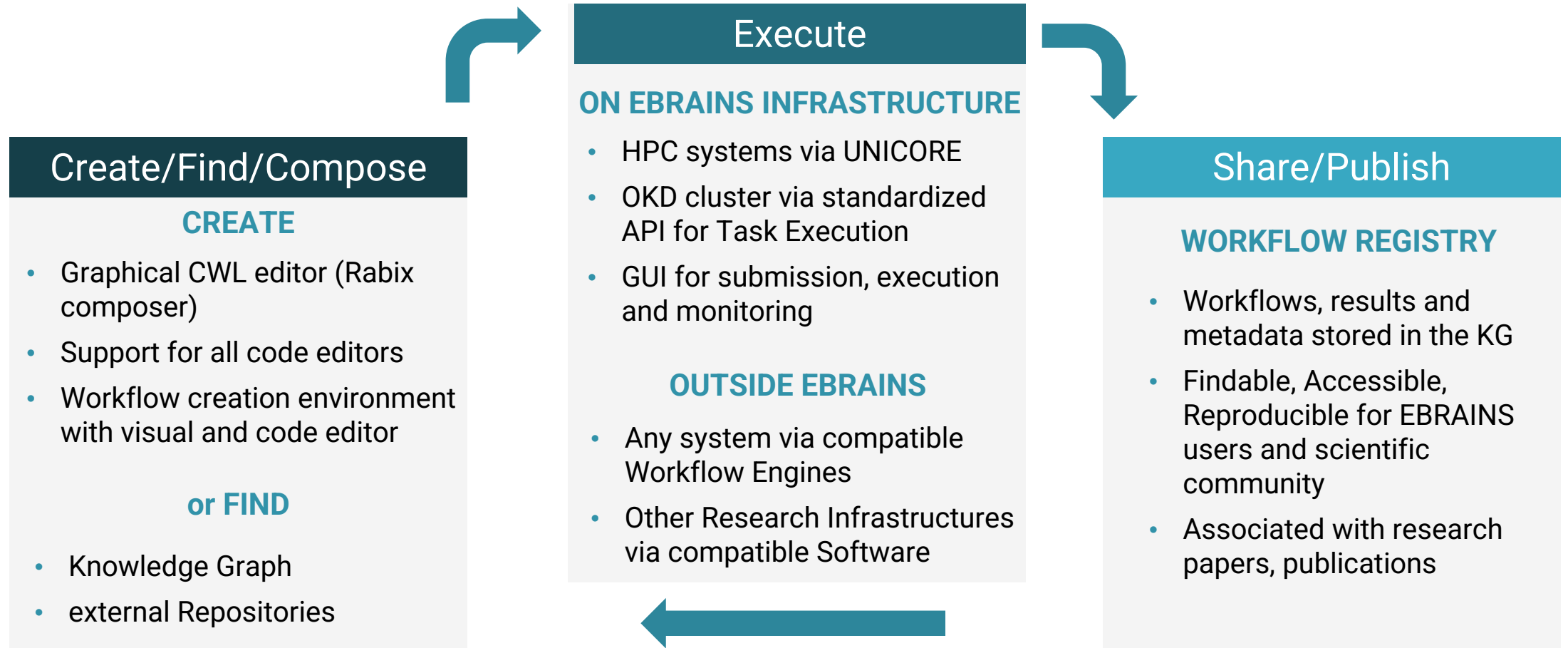- **EBRAINS tools** - graphs, loops and branches for scientific objectives

## So far…

- **Workshops**, **Summit, Codejam**

- **Familiarizing** users with standardization methods and technologies

- **Workflow management systems** installation

- **TC**-**SLU**-**Showcases** co-design / co-planning

## Ongoing

- **UNICORE – CWL** compatibility

- **Workflow Registry** via Knowledge Graph

- **Dashboard** for submitting, monitoring, fetching results and logs

# Workflows Lifecycle in EBRAINS

## Create/Find/Compose

### CREATE

- Graphical CWL editor (Rabix composer)
- Support for all code editors
- Workflow creation environment with visual and code editor

### or FIND

- Knowledge Graph
- external Repositories

## Execute

### ON EBRAINS INFRASTRUCTURE

- HPC systems via UNICORE
- OKD cluster via standardized API for Task Execution
- GUI for submission, execution and monitoring

### OUTSIDE EBRAINS

- Any system via compatible Workflow Engines
- Other Research Infrastructures via compatible Software

## Share/Publish

### WORKFLOW REGISTRY

- Workflows, results and metadata stored in the KG
- Findable, Accessible, Reproducible for EBRAINS users and scientific community
- Associated with research papers, publications

# End of SGA3

- EBRAINS RI is operated by EBRAINS AISBL with the participation of National Nodes

- ESFRI

- European research projects

# Main benefit from TC

- A platform, not just a catalogue of tools, with a single-entry point

- Collaboration between "scientific" and "technical" WPs

- Collaboration of Showcases and TC

# What is next?

- We need more use cases, different types of users

- Show that research activity becomes easier, quicker, more expressive, more accessible on mature platform + ecosystem, compared to wrangling tools & configs manually.

- Difficult but crucial to keep distilling "user experience" (UX) feedback from scientific "target audience".

- Provide reusable scientific workflows as productivity shortcuts & even micro-workflows for fast composition of high-level workflows.

- Your input will tangibly influence creation of the platform you want.

contact us: **hbp-tc@athenarc.gr**

# Thank you

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