**Original text from proposal:** https://docs.google.com/document/d/1E3fD7eQ3tQwY7VZbF5n_a_C5FnOsh6a9pt0ARGkq2no/edit

### 1.1.1 Technical Roadmap

The core of the EOSC Future project is the technological delivery of an EOSC Platform with an advanced operational EOSC-Core and EOSC-Exchange which is fully engaged by researchers from all disciplines. The EOSC Platform will be realised in three main technological iterations across several technical areas by months 6, 18, and 30 as described in the technical roadmap in Table 1.1.5a below. The technical roadmap is further linked to deliverables and milestones in the WPs.

***Table 1.1.5a Technical Roadmap***

| Area | By M6 | By M18 | By M30 |
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| **User Experience - Resource Sharing and Discovery** | • Researchers can see and reach all thematic and regional portals from the EOSC Portal.<br>• Researchers can see services from the thematic clusters through EOSC.<br>• A researcher from a Science Cluster can seamlessly use compute and/or storage resources provided by the e-Infrastructures to analyse data from the Research Infrastructures using the Science Cluster identity and without having to re-register across infrastructures.<br>• A researcher from a new community not involved in EOSC can get a 'virtual tour' of available resources. | • A researcher searching on EOSC Portal sees a comprehensive set of resources from multiple communities and clusters.<br>• Usage statistics for datasets (views, downloads) will be collected and made available.<br>• Researchers using resources through EOSC will have common elements such as AAI, support, monitoring, and accounting.<br>• A researcher from PaNOSC can access an ESCAPE resource with the PaNOSC (UmbrellaID) identity.<br>• Researchers using a thematic portal see resources (services,data) pulled in from the central EOSC registry.<br>• A richer set of horizontal services to support science is offered to researchers. | • A researcher can do the full lifecycle of data processing, storage, analysis, and publishing supported by resources available and transparently integrated through EOSC.<br>• EOSC allows research communities to build cross-disciplinary portals.<br>• Researchers can gauge the quality and suitability of resources based on usage statistics and feedback from other services. |

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| **User Experience - Resource Allocation** | • A researcher can request resources offered by INFRAEOSC-07 projects through the EOSC Marketplace. | • A researcher requesting resources through the EOSC Marketplace portal can request access to EC-funded resources. | • Requesting resources through EOSC includes the possibility to access commercial or centrally funded resources.<br>• Researchers can request HPC resources (e.g from EuroHPC) directly through the EOSC Marketplace. |
| **User Experience - Resource Composability** | • Researchers can see example cases of complex workflows using multiple resource providers.<br>• Researchers can access and use EOSC computing and storage resources.<br>• Researchers can see a rich range of horizontal resources and request access to them. | • Researchers can orchestrate data analysis on computing resources provided by multiple e-Infrastructure resource providers and transfer back the output to his/her storage system. | • Researchers can compare and select resources based on how easy they are to compose and connect to.<br>• Communities can offer their users fully integrated (end-to-end) workflows and a number of these are available for various research topics. |
| **EOSC-Exchange** | • Resources onboarded through prior projects (e.g. EOSC-hub, EOSC Enhance, eInfraCentral) remain available.<br>• All horizontal resources from 07 projects are onboarded.<br>• A selection of resources from prior projects and 07 projects are integrated with functions from EOSC-Core.<br>• Initial cluster services have been onboarded and are listed in the | • First release of EOSC File Transfer Service as first service arising from the clusters to become a horizontal service.<br>• Majority of cluster resources (services, data) are available through the central resource registry and EOSC Marketplace.<br>• All main 07 horizontal services are integrated with EOSC-Core functionalities. | • Production release of EOSC File Transfer Service.<br>• First releases of other horizontal services arising from clusters and communities.<br>• Ability to create thematic execution environments/VREs based on integration of compliant thematic, horizontal, and core resources.<br>• The onboarding process allows for automated/self-service |

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| | Resource registry in the EOSC portal and accessible through the EOSC Marketplace.<br>● Horizontal services (publishing workflows, data transfer, data packaging, container deployment) are demonstrated through 07 service instances.<br>● Resource requests are passed to the provider. | ● Numerous other horizontal services (publishing workflows, data transfer, data packaging, VM/container deployment and orchestration) are integrated with EOSC-Core functionalities.<br>● EOSC-Exchange offers AI/ML-enabled suggestion functions for using the portal(s).<br>● EOSC-Exchange highlights which services can be easily integrated or composed.<br>● The onboarding process is extended to include validation of data sources to align to community (FAIR) metadata guidelines.<br>● The onboarding process for resources is extended to not only list them but also to include optional integration steps in the same workflow.<br>● Resource requests can lead to automatic provisioning of resources. | integration with some EOSC-Core functionalities.<br>● The onboarding process for resources is extended to include more optional integration steps in the same workflow.<br>● Resource requests integrated with procurement as well as provisioning functions.<br>● EOSC-Exchange includes numerous services from communities other than those represented by the clusters. |
| **EOSC-Core** | ● **EOSC Marketplace**<br>Shows all data collected from provider and resource profiles. Allows for scoring and rating.<br>● **Provider Portal & Resource Registry** | ● **EOSC Marketplace**<br>Connected to monitoring to be able to enrich feedback with availability data. Includes AI/ML-based suggestion engine interfaces to automatically pull in resources from other catalogues in the EOSC central registry. | ● **EOSC Marketplace**<br>Describe supported interfaces, standards, workflow languages, and metadata supported by EOSC resources. An advanced user dashboard is available. |

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| | Allows direct onboarding (web + API) but as transfer of provider and resource records from other registries and vice-versa.<br>● **EOSC AAI**<br>EOSC AAI Federation operational.<br>● **Monitoring & Accounting**<br>Allows checking of services based on availability of their web pages/endpoints. Can support better integration via specific metrics. Accounting supports usage tracking to support virtual access reimbursement by the EC.<br>● **Helpdesk**<br>Helpdesk covers core services. Customisation based on new/updated technology and connected to the Service Management System.<br>● **Order Processing**<br>Order management is set up and includes integration of providers. Already used for services inherited from EOSC-hub and others that previously enabled it.<br>● **EOSC Portal Metrics Dashboard**<br>The dashboard provides statistics about services and requests of access and is fully integrated with the EOSC Portal. | ● **Provider Portal & Resource Registry**<br>Increased automatic validation tools and automatic flagging of resources which are likely to require review.<br>● **EOSC AAI**<br>e-Infrastructure SP-proxies and cluster community AAIs fully integrated to EOSC AAI Federation. Community AAIs can integrate.<br>● **Monitoring & Accounting**<br>Automated/self-service integration of monitoring probes and metrics offered to providers. Monitoring can track availability and reliability and accounting of usage based on parameters in provider and resource profiles (location, sector, organisation type).<br>● **Helpdesk**<br>Helpdesk covers core services and can redirect tickets to providers who have their own helpdesk. Helpdesk can be tested by providers who wish to use it.<br>● **Order Processing**<br>Order management can deploy and provision resources from selected providers, including from 07 projects.<br>● **EOSC Portal Metrics Dashboard**<br>The dashboard is enriched with additional information on EOSC | ● **Provider Portal & Resource Registry**<br>Inbuilt or integrated management/workflow engine to support management of applications, review of records, auditing and quality control as well as automatic provider communication.<br>● **EOSC AAI**<br>Community AAIs seamless integration with EOSC AAI federation through self-service onboarding.<br>● **Monitoring & Accounting**<br>Automated monitoring includes automated thresholds, raising issues, or alarms in the Service Management System based on results. Accounting is related to capacity data offered by providers.<br>● **Helpdesk**<br>Helpdesk-as-a-service available as optional add-on during onboarding. Integrated with central helpdesk functions.<br>● **Order Processing**<br>Order processing for thematic services can bundle orders for horizontal or basic services needed to deliver the thematic service and include deployment and provisioning. |

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| | | resource providers and on activities of researchers in EOSC. | ● **EOSC Portal Metrics Dashboard**<br>The dashboard provides statistics related to the combined/integrated usage of EOSC resources. |
| **Clusters and Science Projects** | ● **SP Deployment**<br>Preparation phase of SPs:<br>cluster SPs started integration and adaptation of cluster/Research Infrastructure tools and services into the broader EOSC framework, including integration with AAI, data sources moved into EOSC (FAIR) data stores, and catalogued, software development and exchange platforms available, workflow deployment mechanisms adapted.<br>● **Clusters' Input to EOSC Horizontal Services**<br>List of candidate services from clusters which can be generalised to be EOSC-wide offerings, with several already being developed to be EOSC-ified. | ● **SP Deployment**<br>Initial deployment of SPs done:<br>Most of the SPs have fully operational workflows using integrated EOSC services and tools, make use of EOSC Interoperability Framework, provide feedback from the science communities to the service deployment and operation, and can use resources made available through the clusters/Research Infrastructures.<br>● **Clusters' Input to EOSC Horizontal Services**<br>EOSC software catalogue/repository populated with identified cluster-provided services and tools. | ● **SP Deployment**<br>Full scale operation of SPs to the point where many have full scientific analyses ready or close to publication as full demonstrations of open cross-disciplinary science. Demonstrations of the full lifecycle of data processing, storage, analysis and publishing supported by resources available and transparently integrated through EOSC. Workflows deployed across cluster/Research Infrastructure resources and where appropriate on commercial cloud and/or European HPC resources.<br>● **Clusters' Input to EOSC Horizontal Services**<br>General availability of Research Infrastructure-originated horizontal services (as appropriate) visible through EOSC Portal and catalogues. |

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| **EOSC Interoperability Framework** | • **Resource Description Framework**<br>Provider and resource description framework v3.2 including data sources.<br>• **Identifiers**<br>Initial overview of available PID frameworks and guidelines for selecting PID types.<br>• **AAI**<br>Initial technical guidelines for Research Infrastructures and e-Infrastructures to connect AARC-compliant AAI Proxies to the EOSC Federated AAI. EOSC AAI Federation guidelines accepted by the cluster communities and e-Infrastructures.<br>• **Metadata and Ontologies**<br>Initial guidelines for metadata discovery and exchange on the basis of existing generic guidelines (e.g. OpenAIRE, DataCite, EUDAT, DCAT).<br>• **Accounting**<br>Initial guidelines for reporting accounting metrics for virtual access by INFRAEOSC-07 projects.<br>• **Monitoring** | • **Resource Description Framework**<br>Provider and resource description framework v3.5 including research products and interoperability guidelines/best practices for horizontal services in EOSC-Exchange.<br>• **Identifiers**<br>Initial guidelines for new PID types (e.g. instruments, services, software, organisations) and standards to connect PID frameworks to PID Graphs. Draft guidelines for PID service providers for minimum Kernel Type Information<br>• **AAI**<br>Initial technical guidelines to connect IdP and AAI proxies from public and private sector service providers to the EOSC Federated AAI should become technical guidelines for cross-infrastructure credential delegation and verification for supporting multi-step agent-driven workflows.<br>• **Metadata and Ontologies**<br>Initial guidelines for communities to publish community-specific metadata and ontologies in EOSC.<br>• **Accounting** | • **Resource Description Framework**<br>Provider and resource description stable release v4.0 incorporating new features requested by the user and provider communities.<br>• **Identifiers**<br>Draft interoperability framework for a PID meta-resolver and guidelines for PID service providers for minimum Kernel Type Information.<br>• **AAI**<br>Technical interoperability guidelines for supporting cross-sector access to the EOSC Federated AAI.<br>• **Metadata and Ontologies**<br>Guidelines for minimum metadata to support the discovery, metadata exchange, and cross-walks of research products across communities.<br>• **Accounting**<br>Extended interoperability framework for service providers for automated reporting of accounting and usage metrics.<br>• **Monitoring**<br>Extended interoperability framework for service providers for monitoring service availability of services registered in the EOSC Catalogue. |

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| | Initial guidelines for monitoring service URLs registered in the EOSC Catalogue.<br>● **Order management**<br>Initial guidelines for managing orders specifying interfaces to forward orders to providers.<br>● **Helpdesk**<br>Initial guidelines for handling user requests for services registered in the EOSC Catalogue.<br>● **Data Platforms for Processing**<br>Initial guidelines for data ingesting and movement for processing in hybrid cloud environment.<br>● **Data Publishing and Open Data**<br>Initial guidelines for data repository.<br>● **Cloud Compute Containerisation and Orchestration**<br>Initial guidelines for VM/container management and orchestration.<br>● **HTC-HPC Compute**<br>Initial guidelines for HPC/HTC clusters on demand and multi-tenant containerised job submission.<br>● **Machine Learning**<br>Initial Interoperability guidelines for Machine Learning | Initial interoperability framework for service providers for automated reporting of accounting metrics for VA.<br>● **Monitoring**<br>Initial interoperability framework for service providers for monitoring service availability.<br>● **Order Management**<br>Initial interoperability framework for service providers for automatic dispatching of the orders for services registered in the EOSC Catalogue.<br>● **Helpdesk**<br>Initial interoperability framework for service providers for automatic dispatching and handling of user requests for services registered in the EOSC Catalogue.<br>● **Data Platforms for Processing**<br>Guidelines for data ingesting and movement for processing in hybrid cloud environment improved according to user communities' feedback.<br>● **Data Publishing and Open Data**<br>Guidelines for data repository improved according to user communities' feedback.<br>● **Cloud Compute Containerisation and Orchestration**<br>Guidelines for VM/container management and orchestration | ● **Order Management**<br>Extended interoperability framework for service providers for automatic dispatching of orders for services registered in the EOSC Catalogue.<br>● **Helpdesk**<br>Extended interoperability framework for service providers for automatic dispatching and handling of user requests for services registered in the EOSC Catalogue.<br>● **Data Platforms for Processing**<br>EOSC-endorsed guidelines for data ingesting and movement for processing in hybrid cloud environment adopted by one or more horizontal services.<br>● **Data Publishing and Open Data**<br>EOSC-endorsed guidelines for data repository adopted by one or more horizontal services.<br>● **Cloud Compute Containerisation and Orchestration**<br>EOSC-endorsed guidelines for VM/container management and orchestration adopted by one or more horizontal services.<br>● **HTC-HPC Compute**<br>EOSC-endorsed guidelines for HPC/HTC clusters on demand and |

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| | | improved according to user communities' feedback.<br>● **HTC-HPC Compute**<br>Guidelines for HPC/HTC clusters on demand and multi-tenant containerised job submission improved according to user communities' feedback.<br>● **Machine Learning**<br>Guidelines for Machine Learning/Deep Learning data analytics services improved according to user communities' feedback. | multi-tenant containerised job submission adopted by one or more horizontal services.<br>● **Machine Learning**<br>EOSC-endorsed interoperability guidelines for Machine Learning. |

## Workplan to implement the roadmap by M6

***Changes on the template***
*OK Column to add short description on how to achieve the bullets*
*OK Numbering is important to refer to.*

***Other points***
*Relationship between actions and bullets*
*Action also in other WPs (not technical)*

*Going before to WPs and Tasks and the TCB will validate and check if there's any gaps. It will be a work done in a collaborative manner.*
*Ownership of the tickets needs to be assigned*

*Actions aligned with the XWP groups. Some actions can be owned by XWP groups.*

| Area | By M6 | Short description of possible implementations (initial ideas) | WP Actions |
|---|---|---|---|
| **A. User Experience - Resource Sharing and Discovery** | • **A1-M6.** Researchers can see and reach all thematic and regional portals from the EOSC Portal. | • | WP3: update the EOSC Resource profile |
| | • **A2-M6.** Researchers can see services from the thematic clusters through EOSC. | | |
| | • **A3-M6.** A researcher from PaNOSC can seamlessly use compute and/or storage | | |

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| | resources provided by the e-Infrastructures to analyse data from the PaNOSC Research Infrastructure using the PaNOSC (UmbrellaID) identity and without having to re-register across infrastructures. | | |
| | • **A4-M6.** A researcher from a new community not involved in EOSC can get a 'virtual tour' of available resources. | | |
| **B. User Experience - Resource Allocation** | • **B1-M6.** A researcher can request resources offered by INFRAEOSC-07 projects through the EOSC Marketplace. | | - |
| **C. User Experience - Resource Composability** | • **C1-M6.** Researchers can see example cases of complex workflows using multiple resource providers. | | |
| | • **C2-M6.** Researchers can access and use EOSC computing and storage resources. | | |

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| | ● **C3-M6.** Researchers can see a rich range of horizontal resources and request access to them. | | WP3: EOSC resource profile |
| **D. EOSC-Exchange** | ● **D1-M6.** Resources onboarded through prior projects (e.g. EOSC-hub, EOSC Enhance, eInfraCentral) remain available. | | |
| | ● **D2-M6.** All horizontal resources from 07 projects are onboarded. | | |
| | ● **D3-M6.** A selection of resources from prior projects and 07 projects are integrated with functions from EOSC-Core. | | |
| | ● **D4-M6.** Initial cluster services have been onboarded and are listed in the Resource registry in the EOSC portal and accessible through the EOSC Marketplace. | | |
| | ● **D5-M6.** Horizontal services (publishing workflows, data transfer, data packaging, container deployment) are | | |

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| | demonstrated through 07 service instances. | | |
| | ● **D6-M6.** Resource requests are passed to the provider. | | |
| **E. EOSC-Core** | ● **E1-M6. EOSC Marketplace**<br>Shows all data collected from provider and resource profiles. Allows for scoring and rating. | | |
| | ● **E2-M6. Provider Portal & Resource Registry**<br>Allows direct onboarding (web + API) but as transfer of provider and resource records from other registries and vice-versa. | | *T2.2: Develop the agreement structure between EOSC Portal (Future) and catalogue owners to register resources.*<br>*T6.1: Develop an onboarding workflow for onboarding catalogues into the EOSC Catalogue.* |
| | ● **E3-M6. EOSC AAI**<br>EOSC AAI Federation operational. | | |
| | ● **E4-M6. Monitoring & Accounting**<br>Allows checking of services based on availability of their web pages/endpoints. Can support better integration via specific metrics. Accounting supports usage tracking to support virtual access reimbursement by the EC. | | |
| | ● **E5-M6. Helpdesk** | | , WP7 |

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| | Helpdesk covers core services. Customisation based on new/updated technology and connected to the Service Management System. | | |
| | ● **E6-M6. Order Processing**<br>Order management is set up and includes integration of providers. Already used for services inherited from EOSC-hub and others that previously enabled it. | | |
| | ● **E7-M6. EOSC Portal Metrics Dashboard**<br>The dashboard provides statistics about services and requests of access and is fully integrated with the EOSC Portal. | | |
| **F. Clusters and Science Projects** | ● **F1-M6. SP Deployment**<br>Preparation phase of SPs:<br>cluster SPs started integration and adaptation of cluster/Research Infrastructure tools and services into the broader EOSC framework, including integration with AAI, data sources moved into EOSC (FAIR) data stores, and catalogued, software development and exchange platforms available, workflow | **ESCAPE** | |
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| | | **ENVRI-FAIR** | |
| | | **PaNOSC** | |

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| | deployment mechanisms adapted. | | |
| | ● **F2-M6. Clusters' Input to EOSC Horizontal Services**<br>List of candidate services from clusters which can be generalised to be EOSC-wide offerings, with several already being developed to be EOSC-ified. | | |
| **G. EOSC Interoperability Framework** | ● **G1-M6. Resource Description Framework**<br>Provider and resource description framework v3.2 including data sources. | | |
| | ● **G2-M6. Identifiers**<br>Initial overview of available PID frameworks and guidelines for selecting PID types. | | |

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| | ● **G3-M6. AAI**<br>Initial technical guidelines for Research Infrastructures and e-Infrastructures to connect AARC-compliant AAI Proxies to the EOSC Federated AAI. EOSC AAI Federation guidelines accepted by the cluster communities and e-Infrastructures. | | |
| | ● **G4-M6. Metadata and Ontologies**<br>Initial guidelines for metadata discovery and exchange on the basis of existing generic guidelines (e.g. OpenAIRE, DataCite, EUDAT, DCAT). | | |
| | ● **G5-M6. Accounting**<br>Initial guidelines for reporting accounting metrics for virtual access by INFRAEOSC-07 projects. | | |
| | ● **G6-M6. Monitoring**<br>Initial guidelines for monitoring service URLs registered in the EOSC Catalogue. | | |
| | ● **G7-M6. Order management** | | |

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| | Initial guidelines for managing orders specifying interfaces to forward orders to providers. | | |
| | ● **G8-M6. Helpdesk**<br>Initial guidelines for handling user requests for services registered in the EOSC Catalogue. | | |
| | ● **G9-M6. Data Platforms for Processing**<br>Initial guidelines for data ingesting and movement for processing in hybrid cloud environment. | | |
| | ● **G10-M6. Data Publishing and Open Data**<br>Initial guidelines for data repository. | | |
| | ● **G11-M6. Cloud Compute Containerisation and Orchestration**<br>Initial guidelines for VM/container management and orchestration. | | |
| | ● **G12-M6. HTC-HPC Compute**<br>Initial guidelines for HPC/HTC clusters on demand and | | |

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| | multi-tenant containerised job submission. | | |
| | ● **G13-M6. Machine Learning**<br>Initial Interoperability guidelines for Machine Learning. | | |

## Workplan to implement the roadmap by M18

| Area | By M18 | Short description of possible implementations (initial ideas) | WP Actions |
|---|---|---|---|
| **A. User Experience - Resource Sharing and Discovery** | ● **A1-M18.** A researcher searching on EOSC Portal sees a comprehensive set of resources from multiple communities and clusters. | | |
| | ● **A2-M18.** Usage statistics for datasets (views, downloads) will be collected and made available. | | |
| | ● **A3-M18.** Researchers using resources through EOSC will have common elements such as AAI, support, monitoring, and accounting. | | |
| | ● **A4-M18.** A researcher from PaNOSC can access an ESCAPE resource with the PaNOSC (UmbrellaID) identity. | | |
| | ● **A5-M18.** Researchers using a thematic portal see resources (services,data) | | |

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| | pulled in from the central EOSC registry. | | |
| | ● **A6-M18.** A richer set of horizontal services to support science is offered to researchers. | | |
| **B. User Experience - Resource Allocation** | ● **B1-M18.** A researcher requesting resources through the EOSC Marketplace portal can request access to EC-funded resources. | | |
| **C. User Experience - Resource Composability** | ● **C1-M18.** Researchers can orchestrate data analysis on computing resources provided by multiple e-Infrastructure resource providers and transfer back the output to his/her storage system. | | |
| **D. EOSC-Exchange** | ● **D1-M18.** First release of EOSC File Transfer Service as first service arising from the clusters to become a horizontal service. | | |
| | ● **D2-M18.** Majority of cluster resources (services, data) are available through the central resource registry and EOSC Marketplace. | | |

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| | ● **D3-M18.** All main 07 horizontal services are integrated with EOSC-Core functionalities. | | |
| | ● **D4-M18.** Numerous other horizontal services (publishing workflows, data transfer, data packaging, VM/container deployment and orchestration) are integrated with EOSC-Core functionalities. | | |
| | ● **D5-M18.** EOSC-Exchange offers AI/ML-enabled suggestion functions for using the portal(s). | | |
| | ● **D6-M18.** EOSC-Exchange highlights which services can be easily integrated or composed. | | |
| | ● **D7-M18.** The onboarding process is extended to include validation of data sources to align to community (FAIR) metadata guidelines. | | |
| | ● **D8-M18.** The onboarding process for resources is extended to not only list them but also to include optional integration steps in the same workflow. | | |

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| | ● **D9-M18.** Resource requests can lead to automatic provisioning of resources. | | |
| **E. EOSC-Core** | ● **E1-M18. EOSC Marketplace**<br>Connected to monitoring to be able to enrich feedback with availability data. Includes AI/ML-based suggestion engine interfaces to automatically pull in resources from other catalogues in the EOSC central registry. | | |
| | ● **E2-M18. Provider Portal & Resource Registry**<br>Increased automatic validation tools and automatic flagging of resources which are likely to require review. | | |
| | ● **E3-M18. EOSC AAI**<br>e-Infrastructure SP-proxies and cluster community AAIs fully integrated to EOSC AAI Federation. Community AAIs can integrate. | | |
| | ● **E4-M18. Monitoring & Accounting**<br>Automated/self-service integration of monitoring probes and metrics offered to providers. Monitoring can track | | |

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| | availability and reliability and accounting of usage based on parameters in provider and resource profiles (location, sector, organisation type). | | |
| | ● **E5-M18. Helpdesk**<br>Helpdesk covers core services and can redirect tickets to providers who have their own helpdesk. Helpdesk can be tested by providers who wish to use it. | | |
| | ● **E6-M18. Order Processing**<br>Order management can deploy and provision resources from selected providers, including from 07 projects. | | |
| | ● **E7-M18. EOSC Portal Metrics Dashboard**<br>The dashboard is enriched with additional information on EOSC resource providers and on activities of researchers in EOSC. | | |
| **F. Clusters and Science Projects** | ● **F1-M18. SP Deployment**<br>Initial deployment of SPs done:<br>Most of the SPs have fully operational workflows using integrated EOSC services and tools, make use of EOSC Interoperability | **ESCAPE** | |
| | | **SSHOC** | |

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| | Framework, provide feedback from the science communities to the service deployment and operation, and can use resources made available through the clusters/Research Infrastructures. | **EOSC-Life** | |
| | | **ENVRI-FAIR** | |
| | | **PaNOSC** | |
| | ● **F2-M18. Clusters' Input to EOSC Horizontal Services**<br>EOSC software catalogue/repository populated with identified cluster-provided services and tools. | | |
| **G. EOSC Interoperability Framework** | ● **G1-M18. Resource Description Framework**<br>Provider and resource description framework v3.5 including research products and interoperability guidelines/best practices for horizontal services in EOSC-Exchange. | | |
| | ● **G2-M18. Identifiers**<br>Initial guidelines for new PID types (e.g. instruments, services, software, organisations) and standards to connect PID frameworks to PID Graphs. Draft guidelines for PID service providers for | | |

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| | minimum Kernel Type Information | | |
| | ● **G3-M18. AAI**<br>Initial technical guidelines to connect IdP and AAI proxies from public and private sector service providers to the EOSC Federated AAI should become technical guidelines for cross-infrastructure credential delegation and verification for supporting multi-step agent-driven workflows. | | |
| | ● **G4-M18. Metadata and Ontologies**<br>Initial guidelines for communities to publish community-specific metadata and ontologies in EOSC. | | |
| | ● **G5-M18. Accounting**<br>Initial interoperability framework for service providers for automated reporting of accounting metrics for VA. | | |
| | ● **G6-M18. Monitoring**<br>Initial interoperability framework for service providers for monitoring service availability. | | |

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| | ● **G7-M18. Order Management**<br>Initial interoperability framework for service providers for automatic dispatching of the orders for services registered in the EOSC Catalogue. | | |
| | ● **G8-M18. Helpdesk**<br>Initial interoperability framework for service providers for automatic dispatching and handling of user requests for services registered in the EOSC Catalogue. | | |
| | ● **G9-M18. Data Platforms for Processing**<br>Guidelines for data ingesting and movement for processing in hybrid cloud environment improved according to user communities' feedback. | | |
| | ● **G10-M18. Data Publishing and Open Data**<br>Guidelines for data repository improved according to user communities' feedback. | | |

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| | ● **G11-M18. Cloud Compute Containerisation and Orchestration**<br>Guidelines for VM/container management and orchestration improved according to user communities' feedback. | | |
| | ● **G12-M18. HTC-HPC Compute**<br>Guidelines for HPC/HTC clusters on demand and multi-tenant containerised job submission improved according to user communities' feedback. | | |
| | ● **G13-M18. Machine Learning**<br>Guidelines for Machine Learning/Deep Learning data analytics services improved according to user communities' feedback. | | |

## Workplan to implement the roadmap by M30

| Area | By M30 | Short description of possible implementations (initial ideas) | WP Actions |
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| **A. User Experience - Resource Sharing and Discovery** | ● **A1-M30.** A researcher can do the full lifecycle of data processing, storage, analysis, and publishing supported by resources available and transparently integrated through EOSC. | | |
| | ● **A2-M30.** EOSC allows research communities to build cross-disciplinary portals. | | |
| | ● **A3-M30.** Researchers can gauge the quality and suitability of resources based on usage statistics and feedback from other services. | | |
| **B. User Experience - Resource Allocation** | ● **B1-M30.** Requesting resources through EOSC includes the possibility to access commercial or | | |

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| | centrally funded resources. | | |
| | ● **B2-M30.** Researchers can request HPC resources (e.g from EuroHPC) directly through the EOSC Marketplace. | | |
| **C. User Experience - Resource Composability** | ● **C1-M30.** Researchers can compare and select resources based on how easy they are to compose and connect to. | | |
| | ● **C2-M30.** Communities can offer their users fully integrated (end-to-end) workflows and a number of these are available for various research topics. | | |
| **D. EOSC-Exchange** | ● **D1-M30.** Production release of EOSC File Transfer Service. | | |
| | ● **D2-M30.** First releases of other horizontal services arising from clusters and communities. | | |
| | ● **D3-M30.** Ability to create thematic | | |

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| | execution environments/VREs based on integration of compliant thematic, horizontal, and core resources. | | |
| | ● **D4-M30.** The onboarding process allows for automated/self-service integration with some EOSC-Core functionalities. | | |
| | ● **D5-M30.** The onboarding process for resources is extended to include more optional integration steps in the same workflow. | | |
| | ● **D6-M30.** Resource requests integrated with procurement as well as provisioning functions. | | |
| | ● **D7-M30.** EOSC-Exchange includes numerous services from communities other than those represented by the clusters. | | |

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| **E. EOSC-Core** | ● **E1-M30. EOSC Marketplace**<br>Describe supported interfaces, standards, workflow languages, and metadata supported by EOSC resources. An advanced user dashboard is available. | | |
| | ● **E2-M30. Provider Portal & Resource Registry**<br>Inbuilt or integrated management/workflow engine to support management of applications, review of records, auditing and quality control as well as automatic provider communication. | | |
| | ● **E3-M30. EOSC AAI**<br>Community AAIs seamless integration with EOSC AAI federation through self-service onboarding. | | |
| | ● **E4-M30. Monitoring & Accounting**<br>Automated monitoring includes automated thresholds, raising issues, or alarms in the Service | | |

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| | Management System based on results. Accounting is related to capacity data offered by providers. | | |
| | ● **E5-M30. Helpdesk**<br>Helpdesk-as-a-service available as optional add-on during onboarding. Integrated with central helpdesk functions. | | |
| | ● **E6-M30. Order Processing**<br>Order processing for thematic services can bundle orders for horizontal or basic services needed to deliver the thematic service and include deployment and provisioning. | | |
| | ● **E7-M30. EOSC Portal Metrics Dashboard**<br>The dashboard provides statistics related to the combined/integrated usage of EOSC resources. | | |
| **F. Clusters and Science Projects** | ● **F1-M30. SP Deployment**<br>Full scale operation of SPs to the point where many have full scientific analyses ready or close to publication | **ESCAPE** | |
| | | **SSHOC** | |

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| | as full demonstrations of open cross-disciplinary science. Demonstrations of the full lifecycle of data processing, storage, analysis and publishing supported by resources available and transparently integrated through EOSC. Workflows deployed across cluster/Research Infrastructure resources and where appropriate on commercial cloud and/or European HPC resources. | **EOSC-Life** | |
| | | **ENVRI-FAIR** | |
| | | **PaNOSC** | |
| | ● **F2-M30. Clusters' Input to EOSC Horizontal Services**<br>General availability of Research Infrastructure-originated horizontal services (as appropriate) visible through EOSC Portal and catalogues. | | |
| **G. EOSC Interoperability Framework** | ● **G1-M30. Resource Description Framework**<br>Provider and resource description stable release v4.0 incorporating new features requested by the user and provider communities. | | |

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| | ● **G2-M30. Identifiers**<br>Draft interoperability framework for a PID meta-resolver and guidelines for PID service providers for minimum Kernel Type Information. | | |
| | ● **G3-M30. AAI**<br>Technical interoperability guidelines for supporting cross-sector access to the EOSC Federated AAI. | | |
| | ● **G4-M30. Metadata and Ontologies**<br>Guidelines for minimum metadata to support the discovery, metadata exchange, and cross-walks of research products across communities. | | |
| | ● **G5-M30. Accounting**<br>Extended interoperability framework for service providers for automated reporting of accounting and usage metrics. | | |

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| | • **G6-M30. Monitoring**<br>Extended interoperability framework for service providers for monitoring service availability of services registered in the EOSC Catalogue. | | |
| | • **G7-M30. Order Management**<br>Extended interoperability framework for service providers for automatic dispatching of orders for services registered in the EOSC Catalogue. | | |
| | • **G8-M30. Helpdesk**<br>Extended interoperability framework for service providers for automatic dispatching and handling of user requests for services registered in the EOSC Catalogue. | | |
| | • **G9-M30. Data Platforms for Processing**<br>EOSC-endorsed guidelines for data ingesting and movement for processing in hybrid cloud environment | | |

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| | adopted by one or more horizontal services. | | |
| | • **G10-M30. Data Publishing and Open Data**<br>EOSC-endorsed guidelines for data repository adopted by one or more horizontal services. | | |
| | • **G11-M30. Cloud Compute Containerisation and Orchestration**<br>EOSC-endorsed guidelines for VM/container management and orchestration adopted by one or more horizontal services. | | |
| | • **G12-M30. HTC-HPC Compute**<br>EOSC-endorsed guidelines for HPC/HTC clusters on demand and multi-tenant containerised job submission adopted by one or more horizontal services. | | |

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| | • **G13-M30. Machine Learning**<br>EOSC-endorsed interoperability guidelines for Machine Learning. | | |