Deliverable D1.12

GDI quarterly implementation report - draft

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Log of changes

Date	Mvm	Who	Description
15/12/2022	0v1	Juan Arenas (ELIXIR Hub)	First draft prepared

03/01/2023	0v2	Juan Arenas (ELIXIR Hub)	Version circulated to contributors and WP members for comments
13/01/2023	0v3	Juan Arenas (ELIXIR Hub)	WP comments addressed version circulated to external reviewers, GA and 1+MG Stakeholders Forum for comments
27/01/2023	1v0		External reviewers comments addressed. Version circulated to GDI Coordination for final edit and publication on the EC portal

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1. Executive Summary

The European Genomic Data Infrastructure (GDI) is a deployment project, co-funded by the Digital Europe programme. GDI's main objective is to realise the data infrastructure required by the 1+MG initiative to share high-quality genotypic and phenotypic data across borders; the 1+MG Virtual Cohort. Countries participating have committed to reach a concrete operational level before the end of the project (progressing across different phases: onboarding, deployment or operational) which will require them to fulfil technical and non-technical requirements.
In addition, the establishment of required technical capacity in each node has been identified as a critical factor for the success of the project and the long-term sustainability of the data infrastructure and the initiative.

This document presents the initial process and assets to monitor the deployment of the European Genomic Data Infrastructure that will be initially focussed on:

- **the deployment of the technical expertise** required to deploy and operate the European Genomic Data infrastructure to share access to data across borders, building the technical capacity to run the infrastructure beyond the end of the project, and,
- **the evolution of the European Genomic Data Infrastructure Nodes.** GDI Nodes will transition across different phases in their journey to be fully operational and integrated into the European Genomic Data Infrastructure.

These monitoring processes and tools are aiming to support GDI Nodes in their journey by assessing their progress on a quarterly basis and providing them with useful guidance and recommendations to reach their individual objectives, as well as the project objectives summarised in the commitment to have 6 nodes technically operational by 2024. This will be extended to 15 nodes by 2026 with three additional nodes reaching deployment and two more nodes reaching onboarding.

A summary of the information collected every quarter will be presented to the 1+MG Group (in addition to be shared with project participants) in order to gather the contributions and support of the 1+MG Group on the direction of travel and their assistance in removing any roadblocks that could be identified.

This draft version will trigger the gathering of preliminary information from the GDI Nodes which will provide feedback to improve the processes and assets that have been built to gather the information and support them in their journey. Their feedback will be incorporated into the first release due at M6 (April 2023) that will be used to establish the baseline at the country level by M7 (May 2023).

The current scope and content of the quarterly report could be updated if there is a need to modify it to better support the countries in their commitments or to facilitate reaching the overall project's initiatives. For instance, monitoring of the volume of data available in the European Genome Dashboard or via the 1+MG infrastructure could be implemented in the near future.

2. Contribution towards project outcomes

With this deliverable, the project has reached or the deliverable has contributed to the following project outcomes:

Outcomes	Contributed
Outcome 1 Secure federated infrastructure and data governance needed to enable sustainable and secure cross border linkage of genomic data sets in compliance with the relevant and agreed legal, ethical, quality and interoperability requirements and standards based on the progress achieved by the 1+MG initiative.	Yes
Outcome 2 Platform performing distributed analysis of genetic/genomic data and any linked clinical/phenotypic information; it should be based on the principle of federated access to data sources, include a federated/multi party authorisation and authentication system, and enable application of appropriate secure multi-party and/or high-end computing, AI and simulation techniques and resources.	Yes
Outcome 3 Clear description of the roles and responsibilities related to personal data and privacy protection, for humans and computers, applicable during project lifetime and after its finalisation.	No
Outcome 4	No

Business model including an uptake strategy explaining the motivation, patient incentives and conditions for all stakeholders at the different levels (national, European, global) to support the GDI towards its sustainability, including data controllers, patients, citizens, data users, service providers (e.g., IT and biotech companies), healthcare systems and public authorities at large.	
Outcome 5 Sustained coordination mechanism for the GDI and for the GoE multi-country project launched in the context of the 1+MG initiative.	No
Outcome 6 Communication strategy – to be designed and implemented at the European and national levels.	No
Outcome 7 Capacity building measures necessary to ensure the establishment, sustainable operation, and successful uptake of the infrastructure.	Yes
Outcome 8 Financial support to the relevant stakeholders to enable extension, upgrade, creation and/or physical connection of further data sources beyond the project consortium or to implement the communication strategy and for capacity-building.	No

3. Methods

As described earlier in this document, focus is on the two different monitoring activities we need to implement to support countries to reach their targeted stage.

3.1 Monitoring of the the technical expertise deployment

The crucial factor to ensure the long-term operations of the European Genomic Data Infrastructure is the availability of technical experts in each node that will be able to:

- deploy and operate the national nodes;
- contribute to the deployment and operation of the European level services;
- support the implementation of the wider national infrastructure that will have to be in place to facilitate the flow of data (discovery, access or transfers) from the data generation point to the national node.

To contribute to building the national and European capacity to operate the European Genomic Data Infrastructure, each country joining the project at the proposal stage was allocated a number of resources (Full time equivalents, FTEs[1]) according to their targeted level. As a result, resources were distributed as indicated in Table 1.

Table 1. Allocation of resources based on the targeted stage.

Technical expertise deployment		
GDI Node	Operational Readiness (target)	Baseline FTEs
Belgium	Operational	4
Czech Republic	Operational	4
Denmark	Operational	4
Estonia	Operational	4
Finland	Operational	4
France	Operational	4
Germany	Operational	4
Italy	Operational	4
Luxembourg	Operational	4
Portugal	Operational	4
Slovenia	Operational	4
Spain	Operational	4
Sweden	Operational	4
The Netherlands	Operational	4
Norway	Operational	4
Bulgaria	Deployment	2

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[1] 1 FTE represents **an employee** (or fractions of different employees) working full time for the period being considered e.g. for the first quarter (M1-M3) 1 FTE is equal to a total of 3 person months (PMs) booked by 1 or more employees, half of them being paid using project funding the other half being paid using compatible funding according to the Digital Europe Programme

Latvia	Deployment	2
Lithuania	Deployment	2
Croatia	Onboarding	1
Ireland	Onboarding	1
Total		**68**

The indicated resources should be in place as soon as possible, and for the duration of the project, to ensure that technical capacity is built and that the appropriate knowledge transfer takes place in due course to support the long-term operations of the data infrastructure.

By monitoring the deployment of these resources quarterly, we will be able to make countries and participants aware of their progress in building the necessary technical expertise and allow them to take appropriate actions, when required, based on up to date information. The Management Board (coordinators and pillar leaders) would provide comments and recommendations with the aim to support countries on reaching their targets.

The information will be collected via a quarterly request sent to project participants' admin and financial teams to provide an update on the use of the project allocated resources, then the data will be aggregated and analysed as indicated in section 4.1 before it is distributed to project participants and presented to the 1+MG Group.

In Section 4 we describe the process and assets that are supporting this initial quarterly report.

3.2 Monitoring the evolution of the European Genomic Data Infrastructure Nodes

The operational readiness phases (see Table 1) are designed to facilitate countries to advance in a stepwise approach, from no involvement with the initiative to their targeted operational phase, during the duration of the project.

The following phases have been defined:

- **Onboarding**
  - The country has effectively engaged with the 1+MG initiative, has established a national plan to support their involvement and has been able to deploy the European Genomic Infrastructure starter kit in a development environment.
- **Deployment**
  - Onboarding + country has effectively deployed the European Genomic Data Infrastructure in the production environment, but it is not yet ready to provide access to data across borders
- **Operational**

- Deployment + National node fully connected to the European Genomic Data Infrastructure and contributing to the co-development, co-operation of the European Level Services

To monitor the evolution of the GDI Nodes, each phase has several technical and non-technical check points that should be validated to reach each of them. A particular phase is only reached when all checkpoints have been validated for the actual and the previous phases.

In section 4.2 we describe the process and assets that are supporting this initial quarterly report.

4. Description of work accomplished

In this section we describe the asset processes that have been put in place for this initial data gathering that will be used to improve the current processes and assets before the final version of the process is published in M6. This final version will still be open for improvement during the project lifetime in case further modifications are deemed necessary to support the delivery of the project.

4.1 Monitoring of the the technical expertise deployment

At the proposal preparation stage, resources indicated in Table 1 were allocated to Pillar II (Infrastructure deployment) in order to build the national capacity required for the deployment and operation of the European Genomic Data Infrastructure. As such, we will make use of the information gathered during the quarterly 'Use of Resources' monitoring activity to track the deployment of the technical expertise as follows:

1. All project participants will be asked to provide, within the subsequent fortnight, an update on the effort deployed (Person Months, PMs) to date to the end of each quarter (M4, M7, M10, ...). This information is normally completed by the participant admin & financial teams
2. The information provided will then be aggregated at the participant / GDI Node level and summarised as indicated in Table 3
3. The Management Board, which includes the pillar leaders and the coordinator, will then review the information and validate it against the actual contributions to the project
4. The Management Board could provide comments and recommendations when additional actions are deemed necessary, to ensure the technical capacity is available in each country. In all cases
   a. The recommendations will be discussed with participants affected gathering their inputs and feedback on the actions required to ensure the deployment of the technical expertise
   b. If required for the implementation of the recommendations, the process for an amendment will be triggered following a favourable opinion of the General Assembly
5. Aggregated Information (country level) would be presented to the 1+MG Group and incorporated into the quarterly report while projects participants will get access to the

detailed information via the project monitoring tool[2] (UoR Deployment tab) which is available on the Project Shared Drive and accessible to the consortium and external experts only.

4.1.1 Assets

4.1.1.1 Use of resources monitoring

Use of project resources (effort and budget) is monitored quarterly using the template in Figure 1. This information will provide the basis to generate the quarterly report on the deployment of the technical expertise (see sections 4.1.1.2 and 4.1.1.3). Figure 1 is a snapshot only and the live document is available to the consortium and external experts on the UoR monitoring tab of the GDI Project Monitoring document available in the Project Shared Drive.

Figure 1. Use of Resources monitoring template snapshot (Draft)

4.1.1.2 Technical expertise deployment per Pillar II participant

The countries taking part in the European Genomic Data Infrastructure have selected the organisations responsible for the deployment and operations of the national GDI Node. These organisations have been assigned resources to build technical capacity for the deployment and long-term operations of the national node. This asset will facilitate the monitoring of the allocated resources ensuring technical expertise is available and providing guidance and recommendations when required.

Based on the use of resources monitoring (see section 4.1.1.1), the deployment of the resources allocated to each participant is monitored on a quarterly basis by the Management Board, who may

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[2] Project Monitoring Tool (UoR Deployment tab) which is accessible accessible to the consortium and external experts only: https://docs.google.com/spreadsheets/u/0/d/1i0FrJO5PL5ZUFs5L_r3tQYTKlUkw7ngjk0aUgNHO8cw/edit

provide comments and recommendations at the participant level (see Table 2). This information would be available for the General Assembly members and projects participants in the UoR Deployment tab of the GDI project monitoring document[3] stored on the Project Shared Drive.

Tabel 2. Technical expertise deployment by Pillar II participant (Draft)

Technical expertise deployment by Pillar II participants		By M03				
Participant	Node	Pillar II Actuals	Baseline FTEs	Actuals FTEs	Actuals - Linear	Actuals / Baseline	GDI Management Board comments
VIB	BE	0	2.0	0.0	-2.0	0.0	
SC	BE	0	2.0	0.0	-2.0	0.0	
MUS	BG	0	1.8	0.0	-1.8	0.0	
MUNI	CZ	0	4.0	0.0	-4.0	0.0	
UT	DE	0	2.0	0.0	-2.0	0.0	
DKFZ	DE	0	2.0	0.0	-2.0	0.0	
NGC	DK	0	4.0	0.0	-4.0	0.0	
UTARTU	EE	0	4.0	0.0	-4.0	0.0	
CRG-CERCA	ES	0	3.0	0.0	-3.0	0.0	
BSC	ES	0	2.0	0.0	-2.0	0.0	
CSC	FI	0	4.7	0.0	-4.7	0.0	
RBI	HR	0	1.0	0.0	-1.0	0.0	
RCSI	IE	0	1.0	0.0	-1.0	0.0	
UCSC	IT	0	0.4	0.0	-0.4	0.0	
CNR	IT	0	2.5	0.0	-2.5	0.0	
UniSR	IT	0	0.4	0.0	-0.4	0.0	
VULSK	LT	0	0.7	0.0	-0.7	0.0	
KK	LT	0	0.7	0.0	-0.7	0.0	
NVI	LT	0	0.7	0.0	-0.7	0.0	
UNILU	LU	0	4.3	0.0	-4.3	0.0	
LBMC	LV	0	2.0	0.0	-2.0	0.0	

HRI	NL	0	5.0	0.0	-5.0	0.0
UIO	NO	0	4.0	0.0	-4.0	0.0
INSA	PT	0	1.0	0.0	-1.0	0.0
UAVR	PT	0	0.9	0.0	-0.9	0.0
UM	SI	0	1.8	0.0	-1.8	0.0

4.1.1.3 Use of resources per country

Based on the information obtained in 4.1.1.1 and 4.1.12, a GDI Node level overview of the deployment of the technical expertise is provided through this asset, with comments and recommendations from the GDI Management Board. This information will be made available to the 1+MG Group (at their quarterly meetings) and included in the quarterly report deliverables.

The General Assembly, project participants and external experts will have access to the live document in the UoR Deployment tab of the GDI project monitoring document[4] available on the project Shared Drive. See Table 3 below for a snapshot of the dashboard.

Table 3. Technical expertise deployment at the GDI Node level (Draft)

Technical expertise deployment Pillar II		By M03				
GDI Node	**Operational Readiness (target)**	**Baseline FTEs**	**Actuals FTEs**	**Actuals - Linear**	**Actuals / Baseline**	**GDI Management Board comments**
Belgium	Operational	4.0	0.0	-4.0	0%	
Czech Republic	Operational	4.0	0.0	-4.0	0%	
Denmark	Operational	4.0	0.0	-4.0	0%	
Estonia	Operational	4.0	0.0	-4.0	0%	
Finland	Operational	4.7	0.0	-4.7	0%	
France	Operational	4.0	0.0	-4.0	0%	
Germany	Operational	4.0	0.0	-4.0	0%	
Italy	Operational	3.9	0.0	-3.9	0%	
Luxembourg	Operational	4.3	0.0	-4.3	0%	

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[4] Accessible for the General Assembly members, projects participants and external experts only:
https://docs.google.com/spreadsheets/d/1i0FrJO5PL5ZUFs5L_r3tQYTKlUkw7ngjk0aUgNHO8cw/edit#gid=1452792266

Portugal	Operational	4.0	0.0	-4.0	0%	
Slovenia	Operational	4.0	0.0	-4.0	0%	
Spain	Operational	5.0	0.0	-5.0	0%	
Sweden	Operational	5.0	0.0	-5.0	0%	
The Netherlands	Operational	5.0	0.0	-5.0	0%	
Norway	Operational	4.0	0.0	-4.0	0%	
Bulgaria	Deployment	1.8	0.0	-1.8	0%	
Latvia	Deployment	2.0	0.0	-2.0	0%	
Lithuania	Deployment	2.0	0.0	-2.0	0%	
Croatia	Onboarding	1.0	0.0	-1.0	0%	
Ireland	Onboarding	1.0	0.0	-1.0	0%	
		71.6	**0.0**	**-71.6**	**0.0%**	

4.2 Monitoring the evolution of the European Genomic Data Infrastructure Nodes

The main goal of the European Genomic Data Infrastructure project is to realise the data infrastructure required for the 1+MG initiative. The aim is for six countries to reach operational readiness by 2024, increasing to 15 countries by 2026. The monitoring of the evolution of the operational readiness of each GDI Node is aiming to assist them in reaching their individual target as well as the project target mentioned earlier.

The process described in Table 4 has been drafted and will be validated (M4 - M6) following the submission of this deliverable. The feedback received will be incorporated in the next version of the quarterly report.

Who will be involved:

- **ELIXIR Hub** as project coordinator will be driving the process and supporting nodes on their self-evaluation (gdi-implementation@elixir-europe.org)
- **Pillar II institutions nominated by countries representatives** to build the national GDI Node will provide the information on their operational readiness. Ideally, a single point of contact should be agreed by the PIs of the institutions deploying/operating the national node and the country representatives in the project. The coordinator recommends that a technical expert is nominated due to the weight of the technical requirements in these monitoring activity
- **GDI Management Board** (coordinator and pillar leaders) on reviewing the information gathered and providing comments and recommendations

- **1+MG Group** will receive a periodic report on the evolution of the GDI Nodes to gather their inputs, support and assistance on removing any impediments

Table 4. Monitoring process for the evolution of the European Genomic Data Infrastructure Nodes

When	What	How	Who
M4, M7, M10, …	Request to GDI Nodes to fill in their self assessment	Using GDI Node specific tab (labelled with the GDI Node country) on the quarterly report[5] an indication should be provided if each of the steps has been met or not as well as the corresponding evidence (e.g links to live documents). GDI Node status is automatically calculated based on information provided in the node tab.	GDI Node nominated person
M4 + 2 weeks	Data collection is finalised. Data start to be reviewed by Management Board	Using GDI Node status tab on the quarterly report[6]	GDI Management Board
M5, M8, …	Next version of the quarterly report is generated and circulated	Using deliverables template	ELIXIR Hub (Coordinator)
1+MG Group meetings	Latest status available presented to 1+MG Group	During 1+MG Group meetings scheduled by the initiative	ELIXIR Hub (Coordinator)

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[5] Accessible for the General Assembly members, projects participants and external experts only: https://docs.google.com/spreadsheets/d/1m9QckgkYXy-6JLSwzcMXNhERpV61nW_OO2Vq1KS55l0/edit#gid=355002612
[6] Accessible for the General Assembly members, projects participants and external experts only: https://docs.google.com/spreadsheets/d/1m9QckgkYXy-6JLSwzcMXNhERpV61nW_OO2Vq1KS55l0/edit#gid=355002612

4.2.1 Assets

4.2.1.1 GDI operational readiness. GDI Nodes timelines (Draft)

An initial draft of the individual timelines for each GDI Node to reach their targeted operational readiness is provided within the GDI Operational Readiness Monitoring template[7] available to the General Assembly members, projects participants and external experts on the project Shared Drive. A snapshot of the timelines is shown in Figure 2; these timelines are only provided as an initial reference point and will have to be aligned with the timelines defined in Pillar II activities during the first year of the project.

GDI Node Operational Readiness	Start date / Duration / By Month															
Target Phase (2026)	**GDI Node**	**3 / 6**	**9**	**12**	**15**	**18**	**21**	**24**	**27**	**30**	**33**	**36**	**39**	**42**	**45**	**48**
Operational	Belgium	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	Czech Republic	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Operational	Operational	Operational
Operational	Denmark	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Operational	Operational	Operational
Operational	Estonia	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Operational	Operational	Operational
Operational	Finland	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	France	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Operational	Operational	Operational
Operational	Germany	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	Italy	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Deployment	Deployment	Deployment	Operational
Operational	Luxembourg	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	Portugal	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Operational	Operational	Operational
Operational	Slovenia	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment	Operational	Operational	Operational
Operational	Spain	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	Sweden	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	The Netherlands	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Operational	Norway	TBD TBD	Onboarding	Onboarding	Onboarding	Onboarding	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Deployment	Bulgaria	TBD TBD	TBD	TBD	TBD	TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment
Deployment	Latvia	TBD TBD	TBD	TBD	TBD	TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment
Deployment	Lithuania	TBD TBD	TBD	TBD	TBD	TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Deployment	Deployment	Deployment	Deployment	Deployment
Onboarding	Croatia	TBD TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding
Onboarding	Ireland	TBD TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding	Onboarding

GDI timelines (Draft). Provided as initial indications until an agreement is reached in WP3

Figure 2. Draft timelines for the evolution of the GDI Nodes according to their targeted operational level, to be reviewed with Pillar II
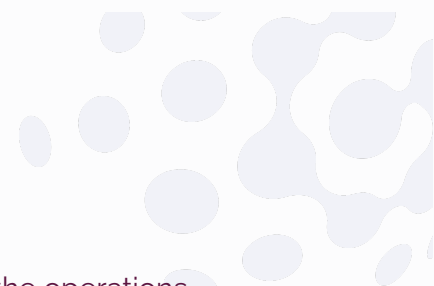
4.2.1.2 GDI operational readiness. GDI Nodes status .

GDI Nodes quarterly report summarise the progress of each GDI Node toward the operations readiness phase they are targeting, the live template (draft)[8] is available on the project Shared Drive and a snapshot is shown in Figure 3.

It includes:

- the operational phase being targeted by each country participating in GDI
- the expected phase they should be in at the time of the reporting
- The GDI Node contact point providing the self assessment as identified in specific GDI Node tab (country tab in the same document)
- The current phase the node has reached according to the information provided in the specific GDI Node tab (country tab in the same document)
- The GDI Node comments, if any, form the specific GDI Node tab (country tab in the same document)
- The specific comments/recommendations, if any, from the GDI Management Board (coordinator and pillar leaders)
- The overall GDI operational readiness status based on the status reported by the individual nodes and the metrics at the bottom.

Work in progress			**Instructions:** Filling your GDI Node tab (columns G & H) indicating which steps have been completed for each phase providing evidence (or link to them) when applicable. The corresponding phase will be automatically updated in this tab under the column **"Current Phase"** as well as the **"GDI Node contact person"** fling in the information.					**^ click on the symbol above the column "I" header => "+" to expand draft timelines and "-" to collapse**
GDI Node Operational Readiness	**Start date**	2022-11	**Overall status:**					
	Duration	48						
	By Month	3 2023-1						
Target Phase (2026)	**GDI Node**	**Vanguard Node?**	**Expected Phase**	**GDI Node contact person**	**Current Phase**	**Node Comments**		**Management Board comments and recommendations**
Operational	Belgium	Yes	TBD		Onboarding			
Operational	Czech Republic		TBD		TBD			
Operational	Denmark		TBD		TBD			
Operational	Estonia		TBD		TBD			
Operational	Finland	Yes	TBD		TBD			
Operational	France		TBD		TBD			
Operational	Germany	Yes	TBD		TBD			
Operational	Italy		TBD		TBD			
Operational	Luxembourg	Yes	TBD		TBD			
Operational	Portugal		TBD		TBD			
Operational	Slovenia		TBD		TBD			
Operational	Spain	Yes	TBD		TBD			
Operational	Sweden	Yes	TBD		TBD			
Operational	The Netherlands	Yes	TBD		TBD			
Operational	Norway	Yes	TBD		TBD			
Deployment	Bulgaria		TBD		TBD			
Deployment	Latvia		TBD		TBD			
Deployment	Lithuania		TBD		TBD			
Onboarding	Croatia		TBD		TBD			
Onboarding	Ireland		TBD		TBD			
		Phases (Metrics)	**Plan**		**Actual**	**Actuals - Plan**		
		Onboarding	0		1	1		
		Deployment	0		0	0		
		Operational	0		0	0		
		TBD	20		19	(1)		

Figure 3. GDI Nodes Operational Readiness monitoring.

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[8] Accessible for the General Assembly members, projects participants and external experts only:
https://docs.google.com/spreadsheets/d/1m9QckgkYXy-6JLSwzcMXNhERpV61nW_OO2Vq1KS55lo/edit#gid=1439645573

4.2.1.2 GDI Node operational readiness checklist

The GDI Node checklist (individual country tabs)[9] is available on the project Shared Drive. See snapshot on Figure 4. The checklist allows each GDI Node to self-assess their current status against the steps (technical and non technical) that have to be checked to complete each phase. The document provides a description of each step, the corresponding clarifications, their relevance for the Technical Readiness Levels as defined by the EC (for technical steps) and the editable fields for the GDI Node contact person to indicate if each steps have or have not been achieved and what evidence supports their assessment. It also includes/will include, in the last column, the link to the existing Standard Operational Procedures (SoPs), technical maturity models and any other resources identified as relevant to support GDI Nodes on achieving each of the steps.

	Phase archived	Steps	Steps completed	Archived
GDI Node contact:			Help => GDI-implementation@elixir-europe.org	
GDI Node comments (short)	Onboarding	11	10	No
Phase archived (automatic)	Deployment	12	0	No
TBD	Operational	11	0	No

Code	Phase	Type	Step	Clarifications	TRL	Met	Justification / Evidences	How to achieve
1.1.1	Onboarding	Technical	API use cases considered, specifications drafted and implementation in progress	Specific MS use case and associated requirements determined, and the specifications drafted which are required to meet these requirements, plus an implementation plan with demonstrable progress towards implementation	TRL 1. Basic principle observed	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.1.2	Onboarding	Non Technical	Have started to build national capacity (ELSI, data quality, data standards, technical infrastructure functions) for the deployment of the 1+MG node and to support data flow.	Resources (human, technical, financial) have been identified and efforts initiated to procure these resources where capacity needs building		No		Link to maturity model / Guidance / experts (help desk) / SoPs
1.1.3	Onboarding	Non Technical	Have developed the 1+MG NMG or equivalent structure to contribute to the 1+MG Initiative.	The country has nominated representatives to 1+MG Working Groups and has established a National Mirror Group or equivalent structure to deploy the 1+MG recommendations at the country level		Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.1.4	Onboarding	Non Technical	Have developed a national genomic plan or similar that secures long-term funding that matches the target implementation level.	A long-term commitment has been established at the national level providing enough resources to support the stage targeted by the country		Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.2.1	Onboarding	Technical	Decision on services and components utilised	Software aservices and componenets identified which support the identitifed use cases	TRL 2. Technology concept formulated	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.2.2	Onboarding	Technical	Software development best practises identified and implemented at the node		TRL 2. Technology concept formulated	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.3.1	Onboarding	Technical	Security mitigation, management, and reporting system being drafted.		TRL 2. Technology concept formulated	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.4.1	Onboarding	Technical	Compliance and stress tests drafted and refined in context of 1+MG requirements	While supporting the requirements of 1+MG (including recommendations from B1MG) the compliance and stress tests for the MS use cases and requirements have been drafted	TRL 2. Technology concept formulated	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.5.1	Onboarding	Technical	Have deployed or made available the initial physical infrastructure for the evaluation of the current PoC, or an upgraded version incorporating other additional use cases.	Physical infrastructure suitable for the PoC current at the time is available ready for the experimental node PoC to be deployed	TRL 2. Technology concept formulated	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.6.1	Onboarding	Technical	Have deployed and validated an instance or PoC or an upgraded version incorporating additional use cases	The experimental PoC has been deployed, and testing (unit, integration, functional, end-to-end, acceptance, and performance) has been successfully been completed	TRL 3. Experimental proof of concept	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs
1.7.1	Onboarding	Technical	Load of synthetic data, functionalities demonstrated in development environment		TRL 4. Technology validated in a laboratory	Yes		Link to maturity model / Guidance / experts (help desk) / SoPs

Figure 4. GDI Node Operational Readiness checklist.

In the following sections we detail the steps/checkpoints that have been identified for each of the phases GDI Nodes will have to transition in order to reach operational readiness.

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[9] Accessible for the General Assembly members, projects participants and external experts only: https://docs.google.com/spreadsheets/d/1m9QckgkYXy-6JLSwzcMXNhERpV61nW_OO2Vq1KS55l0/edit#gid=1439645573

4.2.1.2.1 GDI Node operational readiness checklist

Current snapshot of the GDI Node operational readiness checklist that will be updated with participants contributions until M6. The live document[10] is available on the project Shared Drive.
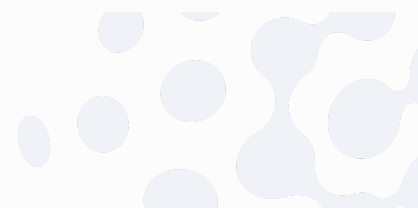
Tablet 5. Snapshot of the GDI Node operational readiness checklist template

Work in progress	GDI Node contact:			Help =>	GDI-implementation@elixir-europe.org			
	GDI Node comments (short)				Phase archived	Steps	Steps completed	Archived
					Onboarding	11	0	No
				Phase archived (automatic)	Deployment	12	0	No
				TBD	Operational	11	0	No

Code	Phase	Type	Step	Clarifications	TRL	Met	Justification / Evidences	How to achieve
1.1.1	Onboarding	Technical	API use cases considered, specifications drafted and implementation in progress	Specific GDI Node/ MS use case and associated requirements determined, and the specifications drafted which are required to meet these requirements, plus an implementation plan with demonstrable progress towards implementation	TRL 1. Basic principle observed		Potential evidence to consider: - link to requirements and specifications documents - link to the implementation plan	Link to maturity model / Guidance / experts (help desk) / SoPs
1.1.2	Onboarding	Non Technical	Have started to build national capacity (ELSI, data quality, data standards, technical infrastructure functions) for the deployment of the 1+MG Node and to support data flow.	Resources (human, technical, financial) have been identified and efforts initiated to procure these resources where capacity needs building			Potential evidence to consider: - genomic national plan or equivalent	Link to maturity model / Guidance / experts (help desk) / SoPs

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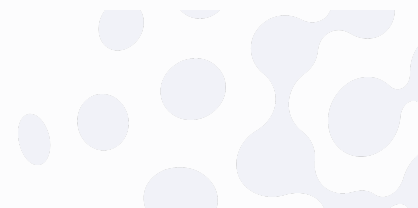[10] Accessible for the General Assembly members, projects participants and external experts only: https://docs.google.com/spreadsheets/d/1m9QckgkYXy-6JLSwzcMXNhERpV61nW_OO2Vq1KS55l0/edit#gid=1439645573
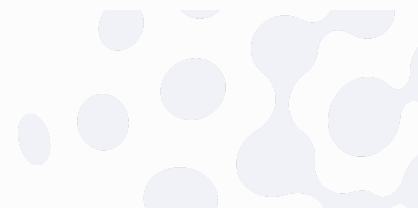
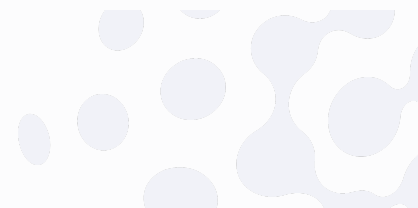|							
1.1.3	Onboarding	Non Technical	Have developed the 1+MG NMG or equivalent structure to contribute to the 1+MG Initiative.	The country has nominated representatives to 1+MG Working Groups and has established a National Mirror Group or equivalent structure to deploy the 1+MG recommendations at the country level		Potential evidence to consider: - Number of 1+MG WGs where the country has nominated representatives - Evidences of 1+MG NMG meetings	Link to maturity model / Guidance / experts (help desk) / SoPs
1.1.4	Onboarding	Non Technical	Have developed a national genomic plan or similar that secures long-term funding that matches the target implementation level.	A long-term commitment has been established at the national level providing enough resources to support the stage targeted by the country		Potential evidence to consider: - genomic national plan or equivalent	Link to maturity model / Guidance / experts (help desk) / SoPs
1.2.1	Onboarding	Technical	Decision on services and components utilised	Software services and components identified which support the identified use cases	TRL 2. Technology concept formulated	Potential evidence to consider: - link to the implementation plan	Link to maturity model / Guidance / experts (help desk) / SoPs
1.2.2	Onboarding	Technical	Software development best practises identified and implemented at the node		TRL 2. Technology concept formulated	Potential evidence to consider: - link to the implementation plan	Link to maturity model / Guidance / experts (help desk) / SoPs
1.3.1	Onboarding	Technical	Security mitigation, management, and reporting system being drafted.		TRL 2. Technology concept formulated	Potential evidence to consider: - link to Security mitigation, management, and the reporting system plans	Link to maturity model / Guidance / experts (help desk) / SoPs
1.4.1	Onboarding	Technical	Compliance and stress tests drafted and refined in context of 1+MG requirements	While supporting the requirements of 1+MG (including recommendations from B1MG) the compliance and stress tests for the MS use cases and requirements have been drafted	TRL 2. Technology concept formulated	Potential evidence to consider: - link to compliance and stress test platform or plans	Link to maturity model / Guidance / experts (help desk) / SoPs
1.5.1	Onboarding	Technical	Have deployed or made available the initial physical infrastructure for the evaluation of the current PoC, or an upgraded version incorporating other additional use cases.	Physical infrastructure suitable for the PoC current at the time is available ready for the experimental node PoC to be deployed	TRL 2. Technology concept formulated	Potential evidence to consider: - PoC running in GDI Node	Link to maturity model / Guidance / experts (help desk) / SoPs

1.6.1	Onboarding	Technical	Have deployed and validated an instance or PoC or an upgraded version incorporating additional use cases	The experimental PoC has been deployed, and testing (unit, integration, functional, end-to-end, acceptance, and performance) has been successfully been completed	TRL 3. Experimental proof of concept		Potential evidence to consider: - Link to test platform or reports	Link to maturity model / Guidance / experts (help desk) / SoPs
1.7.1	Onboarding	Technical	Load of synthetic data, functionalities demonstrated in development environment		TRL 4. Technology validated in a laboratory		Potential evidence to consider: - PoC running in GDI Node with synthetic data	Link to maturity model / Guidance / experts (help desk) / SoPs
2.1.1	Deployment	Non Technical	Storage and network capacity needs achieved ad hoc by hosting institution	Network and storage capacity requirements have been determined based on the MS use case and requirements, and resources meeting these requirements have been met by the hosting institution(s)			Potential evidence to consider: - link to GDI Node storage and computational capacity requirements	Link to maturity model / Guidance / experts (help desk) / SoPs
2.1.2	Deployment	Non Technical	Common software development best practises employed				Potential evidence to consider: - link conformance test reports	Link to maturity model / Guidance / experts (help desk) / SoPs
2.2.1	Deployment	Technical	Minimal set of APIs for the five functionalities		TRL 4. Technology validated in a laboratory		Potential evidence to consider:	Link to maturity model / Guidance / experts (help desk) / SoPs
2.2.2	Deployment	Non Technical	Have built national capacity (ELSI, data quality, data standards, technical infrastructure functions) for the deployment of the 1+MG Node and to support data flow	Resources identified in 1.1.2 have been procured and allocated ensuring the required national capacity has been achieved			Potential evidence to consider: - genomic national plan or equivalent	Link to maturity model / Guidance / experts (help desk) / SoPs
2.3.1	Deployment	Non Technical	Network and storage meets reliability, robustness, performance, security, and capacity requirements	Evidence that the physical infrastructure meets the requirements has to be available before any real data can be uploaded. Test should be conducted regularly to ensure the Physical infrastructure remains fit for purpose and adapts to the evolving need of the GDI Nodes			Potential evidence to consider: - Last physical infrastructure conformance reports	Link to maturity model / Guidance / experts (help desk) / SoPs

					TRL			
2.3.2	Deploy ment	Techni cal	Deployment of 1+MG national node for connection to the staging environment with synthetic data loaded	National deployment and operations	TRL 4. Technology validated in a laboratory		Potential evidence to consider: - GDI National Node endpoint is reachable	Link to maturity model / Guidance / experts (help desk) / SoPs
2.4.1	Deploy ment	Techni cal	Implementation & successful performance of compliance and stress tests of node in isolation	APIs have been implemented and meet or exceed the requirements to pass the compliance and stress tests defined in 1.1	TRL 5. Technology validated in a relevant environment		Potential evidence to consider: - Link to latest compliance and stress test results	Link to maturity model / Guidance / experts (help desk) / SoPs
2.5.1	Deploy ment	Techni cal	Have completed the initial data load of synthetic data and linking to staging version of 1+MG European Infrastructure	The node has successfully completed the tests (end-to-end, acceptance, and performance) demonstrating the required functionalities using synthetic data and integration tests with the staging 1+MG infrastructure	TRL 5. Technology validated in a relevant environment		Potential evidence to consider: - Link to latest end-to-end, acceptance and performance test results - Links to the recording of the functional demo	Link to maturity model / Guidance / experts (help desk) / SoPs
2.6.1	Deploy ment	Techni cal	Deployment of 1+MG national Node but it is not yet connected to the 1+MG Infrastructure	National deployment and operations	TRL 5. Technology validated in a relevant environment			Link to maturity model / Guidance / experts (help desk) / SoPs
2.7.1	Deploy ment	Techni cal	Communication established with user portal and 1+MG Infrastructure		TRL 5. Technology validated in a relevant environment		Potential evidence to consider: - Data is discoverable through user portal / beacon query	Link to maturity model / Guidance / experts (help desk) / SoPs
2.8.1	Deploy ment	Techni cal	Have finalised the initial deployment of national 1+MG production node enabling data access across borders in a staging environment	The technical deployment of the Node is complete, including the storage, compute, APIs, operational SOPs and the deployment meets the national and 1+MG use case requirements. Performance has been demonstrated using synthetic data and the staging 1+MG infrastructure	TRL 6. Technology demonstrated in a relevant environment			Link to maturity model / Guidance / experts (help desk) / SoPs

|							
2.9.1	Deployment	Technical	Production version ready to be deployed into production within the wider GDI		TRL 7. System prototype demonstration in an operational environment		Link to maturity model / Guidance / experts (help desk) / SoPs
3.1.1	Operational	Technical	Periodic review of security of existing infrastructure to make sure it complies with current best practice		TRL 7. System prototype demonstration in an operational environment		Link to maturity model / Guidance / experts (help desk) / SoPs
3.2.1	Operational	Technical	APIs assessed against users needs and feedback, updates scheduled		TRL 7. System prototype demonstration in an operational environment		Link to maturity model / Guidance / experts (help desk) / SoPs
3.3.1	Operational	Technical	Periodic auditing and revision of network and storage capacity to ensure stakeholders needs are met		TRL 7. System prototype demonstration in an operational environment		Link to maturity model / Guidance / experts (help desk) / SoPs
3.4.1	Operational	Technical	Compliance and stress tests regularly reviewed to ensure correspond to updated requirements and use cases		TRL 7. System prototype demonstration in an operational environment		Link to maturity model / Guidance / experts (help desk) / SoPs
3.5.1	Operational	Technical	Deployment of national 1+MG Infrastructure Node (production) enabling data access across borders when agreement allowing it are in place	National deployment and operations	TRL 8. System complete and qualified		Link to maturity model / Guidance / experts (help desk) / SoPs
3.6.1	Operational	Technical	Continuous support to node interoperability, development, and security		TRL 8. System complete and qualified		Link to maturity model / Guidance / experts (help desk) / SoPs
3.7.1	Operational	Technical	Continuous 1+MG infrastructure developments to meet use cases needs		TRL 8. System complete and qualified		Link to maturity model / Guidance / experts (help desk) / SoPs
3.8.1	Operational	Technical	Evaluate and support technical solutions tested and and proposed by pillar III based		TRL 8. System complete and		Link to maturity model / Guidance / experts

					qualified			(help desk) / SoPs
			on explicit use cases requirements					
3.9.1	Operatio nal	Techni cal	Node meets technical KPIs		TRL 9. Actual system proven in operational environment			Link to maturity model / Guidance / experts (help desk) / SoPs
3.?.?	Operatio nal	Non Techni cal	Continuous Capacity building at European level	Technical outreach to promote solutions	TRL 9. Actual system proven in operational environment			Link to maturity model / Guidance / experts (help desk) / SoPs
3.?.?	Operatio nal	Non Techni cal	Continuous support to EU users via node helpdesk (ELSI, data quality, data standards, technical infrastructure functions)	Node helpdesk operational to provide 1st and 2nd line support to end users either directly or via the European helpdesk	TRL 9. Actual system proven in operational environment			Link to maturity model / Guidance / experts (help desk) / SoPs
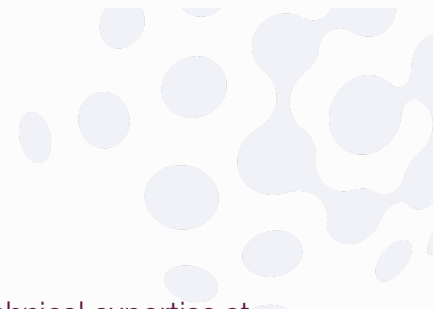
5. Results

The initial processes and assets for the monitoring of the deployment of the technical expertise at each node, as well as the assessment of the GDI Nodes operational readiness, have been presented and will now be rolled out to gather additional feedback from GDI Nodes.

6. Discussion

The GDI quarterly report aims to be a tool to assist countries in their journey to reach the targeted operational readiness facilitating the monitoring of the current commitments providing comments, recommendations and guidance as required. It will be an instrument to communicate to the 1+MG Group and to gather their support and assistance on removing any obstacles to progress with the implementation of the European Genomic Data Infrastructure.

7. Conclusions & Impact

Not applicable.

8. Next steps

The current processes and assets presented in this deliverable will be rolled out and tested by GDI Nodes (M4 - M6). The feedback received will be incorporated into the next version of the deliverable, M6, which will become the first operational version.

Extension and modification to the implementation report are expected and can be incorporated in each quarterly update in order to support the project objectives.