

ESGF Tier 1 and Tier 2 Node Site Requirements

V1 (2016/05/10): ESGF Executive Committee and Eli Dart

V2 (2017/01/30): Complete revision by Michael Lautenschlager and Sebastien Denvil

V3 (2017/02/02): Integration of modifications according to ESGF-XC telco 17/02/01 by MiL

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(Living Document)

ESGF consists of data infrastructure nodes of different complexity. In this document, two classes are distinguished: Tier 1 and 2 node sites. Tier 1 and Tier 2 nodes imply different requirements with respect to the ESGF infrastructure itself and with respect to ESGF data projects like CMIP6. The ESGF infrastructure requirements relate to node functionality, provided services and service levels in development, maintenance and operation. ESGF data project requirements focus more on physical infrastructure components adapted to the data project requirements.

In what follows, the requirements are formulated in more generic rather than concrete terms. In the case of CMIP6, data project node requirements for Tier 1 and Tier 2 sites contain concrete specifications as much as possible.

Node requirements related to ESGF data infrastructure

The major differences between Tier 1 and Tier 2 sites with respect to ESGF infrastructure are the complexity of provided services and service level agreements. The list of requirements includes:

- Tier 1 sites
 - Have an uptime of >98%.
 - Provide the complete stack of ESGF services: data node, index node, identity provider, compute node (see Fig. 1).
 - Install the most recent version of ESGF software within one week.
 - Before dissemination the software must be tested in the ESGF testbed according to the rules in the ESGF Software Security Plan (<https://esgf.llnl.gov/media/pdf/ESGF-Software-Security-Plan-V1.0.pdf>)
 - Prompt upgrade in case of detected security breaches (<7 days).
 - Contribute to maintenance and operation.
 - Run the ESGF testbed.
 - Support Tier 2 data nodes (installation, configuration, act as an index node).
 - Support data providers in publishing operations.
 - Are involved in primary data publication and data replication.
 - Provide sufficient high-performance storage and network connections as required by their supported data projects.
 - Provide sufficient high-performance compute services for data analysis as required by

their supported data projects.

- Tier 2 sites
 - Have an uptime of >90%.
 - Provide the data node part of ESGF software stack.
 - Install the most recent version of ESGF software within two weeks.
 - Prompt upgrade in case of detected security breaches (<7 days).
 - Be responsible for the node maintenance and operation.
 - Exclusion of data nodes: There is an ongoing proposition to enable ESGF to exclude a data node that does not satisfy all the ESGF node operation requirements or a data node that will degrade the federation usability.
 - Are involved in primary data publication.
 - Provide sufficient storage and network bandwidth as required by their supported data projects.

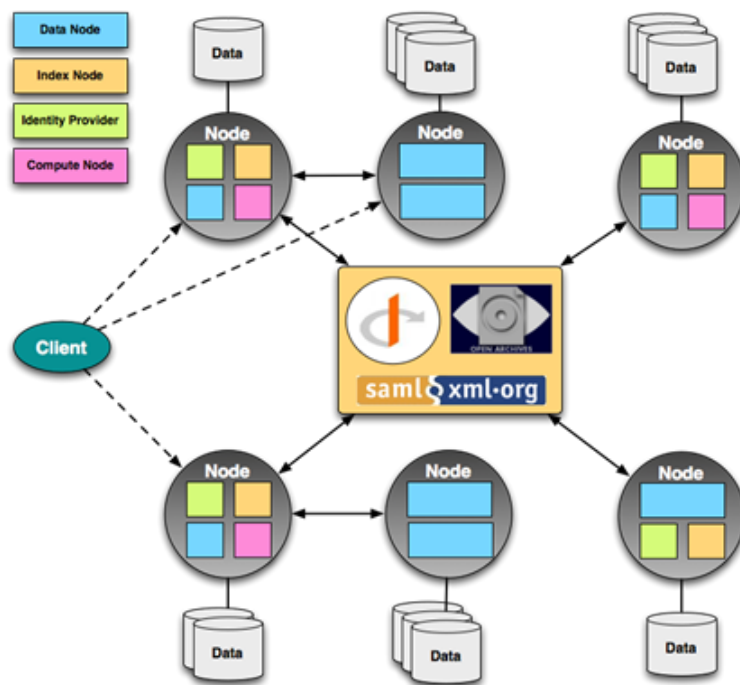


Figure 1: ESGF nodes of different complexity

Node requirements related to ESGF data projects like CMIP6

The major differences between Tier 1 and Tier 2 with respect to ESGF data projects are the Tier1/Tier2 specifications from the ESGF data infrastructure and the data projects related resource requirements. Present estimates of CMIP6 data volumes read about 20 PB for

ESGF Tier 1 and Tier 2 Node Site Requirements

compressed NetCDF data, 40 PB for uncompressed data and 2 PB core data for replication. These 2 PB for CMIP6 data replication are yet to be agreed which makes it difficult to define an overall replication strategy. The list of requirements includes:

- Tier 1 sites
 - Specifications from Tier 1 ESGF infrastructure specifications
 - Spinning disks for initial data publication and data replication according to data project requirements
 - CMIP6: a minimum of 2 PB for data replication plus storage for local needs
 - Compute resources
 - CMIP6: hard to specify, no experience yet
 - We need to identify possible contributions for CMIP6.
 - Network connection: optimization of nominal bandwidth of 10 GBit/s will result in 30 – 50 % for real bandwidth for replication and data provision.
 - Tapes for near-line to fill storage gaps in case of insufficient disc space and for long-term storage of reference data
 - CMIP6: one single tier 1 node with sufficient tape storage for long-term archiving of a complete reference data replication, data volume is not clear yet.
 - Replication strategy: is defined by the available storage resources (Disc and tapes) together with the available network bandwidth and the definition of data priorities in a data project.
 - CMIP6: Because of the huge amount of data there seems to be a need to identify hot spot and cold spot in the evolving archive for replication prioritization under consideration of local Tier 1 scientific requirements
 - Two competing replication objectives
 - data resiliency (at least one copy of each file)
 - data accessibility (US data are available at other continents and vice versa)
 - Monitor the data nodes publishing to them
 - Exclusion of data nodes: There is an ongoing proposition to enable ESGF to exclude a data node that does not satisfy all the CMIP6 requirements or a data node that will degrade the federation usability.
 - The implementation of this is currently under discussion within CDNOT and will be coordinated with ESGF-XC.

More detailed information on CMIP6 required resources are provided in the ESGF document “Data Storage and Replication Plan” (Eli and ICNWG).

- Tier 2 sites
 - Specifications from Tier 2 ESGF infrastructure specifications
 - Spinning disks for initial data publication according to data project requirements

ESGF Tier 1 and Tier 2 Node Site Requirements

- Network connection: 1 – 2 GBit/s for data provision
 - CMIP5 experience showed that each data node provides 10 times the data it hosts over a period of 4 years and the average available network bandwidth should cover this.
- Exclusion of data nodes: There is an ongoing proposition to enable ESGF to exclude a data node that does not satisfy all the CMIP6 requirements or a data node that will degrade the federation usability.
 - The implementation of this is currently under discussion within CDNOT and will be coordinated with ESGF-XC.