



Assessment Information

[CoreTrustSeal Requirements 2020–2022](#)

Repository: Incorporated Research Institutions for Seismology (IRIS)
Website: <https://iris.edu>
Certification Date: 18 December 2020

This repository is owned by: **Incorporated Research Institutions for Seismology (IRIS)**



Incorporated Research Institutions for Seismology (IRIS)

Notes Before Completing the Application

We have read and understood the notes concerning our application submission.

True

Reviewer Entry

Reviewer 1

Comments:

Reviewer 2

Comments:

CORE TRUSTWORTHY DATA REPOSITORIES REQUIREMENTS

Background & General Guidance

Glossary of Terms

BACKGROUND INFORMATION

Context

R0. Please provide context for your repository.

Repository Type. Select all relevant types from:

Domain or subject-based repository, National repository system; including governmental, Research project repository

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

Brief Description of Repository

IRIS is a consortium of over 120 US universities dedicated to the operation of science facilities for the acquisition, management, and distribution of seismological and related data. IRIS Data Services is a Directorate within IRIS that provides services in the areas of data ingest, archival, curation, and data distribution. The core mission of IRIS Data Services is to provide reliable and efficient access to high quality seismological and related geophysical data, generated by IRIS and its domestic and international partners, and to enable all parties interested in using these data to do so in a straightforward and efficient manner.

Data Services manages seismic data from components of EarthScope (<https://www.earthscope.org/about.html>), backbone stations from networks that are members of the International Federation of Digital Seismograph Networks (FDSN, <http://www.fdsn.org>), regional networks supported by the United States Geological Survey (USGS) and states within the U.S., and stations operated by partner organizations worldwide. Collectively, this is the largest scientific archive of globally distributed broad-band seismological observational data in the world. IRIS offers a wide and growing variety of services that Earth scientists rely on in over 150 countries worldwide, increasingly through web services. Data distribution is nearing one petabyte in volume annually. IRIS is one of the many FDSN federated data centers that use standardized web services to provide data to users and IRIS is active in promoting these standards for data exchange; some IRIS web services are 'federated' in that they follow standardized behaviors also exhibited by other federated data centers in the FDSN. Additionally, IRIS provides a catalog service for connecting users to those federated centers. Data Services creates a wide range of data products as well as accepting well-documented and reviewed products from the seismological research community, such as visualizations of wave propagation for researchers and specialized products for public outreach. Data Services also plays a key role in facilitating quality control of time-series data managed at the IRIS Data Management Center (DMC).

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

Brief Description of the Repository's Designated Community.

The scientific community is global and encompasses solid-earth geophysics, seismology, tectonics, natural hazards and seismic network operators and educators at all levels in these disciplines. IRIS has been instrumental in developing global standards for data exchange through the FDSN and for providing commonly used data formats to users (e.g., miniSEED, dataless SEED, GeoCSV, SAC, ASDF, SEG-Y, StationXML).

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

Level of Curation Performed. Select all relevant types from:

C. Enhanced curation – e.g. conversion to new formats; enhancement of documentation

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

Comments

Continuous data, whether they arrive in the native format of the archive (SEED) or proprietary formats (e.g., Antelope) are converted to SEED and StationXML for archival. Data from temporary experiments may arrive in PH5 files (and HDF5 instance), which are stored in a PH5 repository.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

Insource/Outsource Partners. If applicable, please list them.

IRIS is a consortium with voting members from educational and not-for-profit institutions chartered in the United States with a major commitment to research in seismology and related fields, and non-voting members that are either educational affiliates, U.S. affiliates, or foreign affiliates. See Figure R0.1 annexed to this application or https://www.iris.edu/hq/about_iris/membership/map for map of partners and https://www.iris.edu/hq/about_iris/membership for a description of member types and lists.

These partners form an active community that interacts with IRIS in a variety of mutually supportive ways.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Summary of Significant Changes Since Last Application (if applicable).

Changes since the last application address reviewer comments - most notably to provide more information about our processes, procedures, and workflows; to better explain and provide links to our metadata; to improve our data quality explanations; and to provide a copy of our security policy.

A justification for R4 not being applicable (Compliance level 0) was added.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Other Relevant Information.

Reviewer Entry

Reviewer 1

Comments:

Reviewer 2

Comments:

ORGANIZATIONAL INFRASTRUCTURE

1. Mission/Scope

R1. The repository has an explicit mission to provide access to and preserve data in its domain.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

IRIS has been committed to sound data management, data curation and preservation since its founding in 1984. This fundamental value is reflected in the IRIS

(https://www.iris.edu/hq/files/publications/annual_reports/IRIS_Strategic_Plan.pdf) and Data Services

(https://ds.iris.edu/files/documents/Data_Services_Strategic_Plan.pdf) Strategic Plans. The relevant Mission Statements

are listed below and describe IRIS's continuing commitment to provide access to and preserve data in its domain. It

should be noted that these plans will be updated pending a merger with UNAVCO, a similar community-based organization dedicated to supporting geodetic research and education.

The IRIS Mission (2015):

The mission of the IRIS Consortium, its members, and affiliates is to:

Facilitate investigations of seismic sources and Earth properties using seismic and other geophysical methods.

Promote exchange of seismic and other geophysical data and knowledge through the use of standards for network operations and data formats, and through pursuing policies of free and unrestricted data access.

Foster cooperation among IRIS members, affiliates, and other organizations in order to advance seismological research and education, expand the diversity of the geoscience workforce, and improve Earth science literacy in the general public.

IRIS Data Management System Mission Statement (2003):

To provide reliable and efficient access to high quality seismological and related geophysical data, generated by IRIS and its domestic and international partners, and to enable all parties interested in using these data to do so in a straightforward and efficient manner (See http://ds.iris.edu/dms/pdf/DMS_Strategic_Plan.pdf).

IRIS Data Services Vision 2012:

IRIS Data Services will continue to be the worldwide leader in the collection, curation, and distribution of global time series data including seismic and related geophysical data. Furthermore, we will continue to lead the community in developing modern methodologies of distributing scientific data to the research community. Data Services will continue to improve the quality of the data and metadata we manage and continuously improve methods to engage the broad community of users and continue data quality enhancements. Data Services will be a primary resource supporting scientific analysis of these data by the broad scientific community.

The external Data Services Standing Committee works closely with IRIS Data Services to provide oversight and ensure continued attention to data completeness, quality and access, see R6.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

2. Licenses

R2. The repository maintains all applicable licenses covering data access and use and monitors compliance.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

IRIS's Mission Statement states that IRIS will "Promote exchange of seismic and other geophysical data and knowledge through ... pursuing policies of free and unrestricted data access."

Ownership/copyright of the data archived at IRIS remains vested in the seismic networks that collect the data and provide it to IRIS for long-term archive and distribution to the Designated Community. The Data Provider Agreement (DPA) signed by the network owner/operator and IRIS explicitly requires IRIS to "Expose the contributed waveform data and metadata to all users of the IRIS DMC ..." and there are no restrictions on who may use the IRIS DMC services. In some cases IRIS will accept data that have limited restricted access period (while PI's work with data and publish their findings), but "IRIS will not handle restricted data unless a clearly defined release date not exceeding 3 years is identified" (https://ds.iris.edu/files/documents/Data_Provider_Agreement.pdf).

The MetaData Aggregator (<http://ds.iris.edu/mda/>) shows the data access status for all networks, stations and channels, and provides access to metadata for all data (open or restricted) available through IRIS. In some cases, these data are archived and managed by other FDSN members federated with IRIS. In those cases, the repository holding the data is listed without an indication of access (R, P, or A).

No data or derivative data products at IRIS are known to be licensed. However, there is a movement within the community (and in FDSN) to encourage data licensing with special encouragement to use CC-0 or CC-BY. Data with licenses that do not allow open and unrestricted data access will not be stored in the IRIS data repository.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

3. Continuity of access

R3. The repository has a continuity plan to ensure ongoing access to and preservation of its holdings.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

IRIS is concerned with continuity of access to data throughout the lifecycle: real-time connections from data providers at the start and long-term preservation and access throughout the cycle.

On the data ingest side, IRIS receives data using several protocols for real-time data transmission and freely provides many software tools that support those protocols (see <https://ds.iris.edu/ds/nodes/dmc/services/seedlink/> for details). Expectations regarding real time data are clearly explained and usage guidelines are provided for all web services (<https://ds.iris.edu/ds/nodes/dmc/services/usage/>).

Details of the division of data responsibilities between data providers and IRIS are clearly defined in the IRIS Data Provider Agreement (DPA, 2019, https://ds.iris.edu/files/documents/Data_Provider_Agreement.pdf). This agreement covers data and metadata formats, data transmission protocols, contact information, on-going communication between IRIS and data providers, and a commitment of IRIS that data are “secure and available in perpetuity by routinely curating the data and transcribing data on a routine cycle to new media as necessary”. Other IRIS responsibilities include data discovery and distribution services, maintenance of multiple copies of the data, transforming and reformatting data, if necessary, to be compliant with IRIS data management systems, data quality assurance, and providing usage statistics to data providers.

IRIS has operated the repository under cooperative agreements with the National Science Foundation (NSF) for the past 35 years but must recompute for the funds to operate the facility every five years or so. As part of the contract awarded by NSF, data services are provided to support the scientific research community. These data services include curating the repository of data that has been collected, gathering new data as it becomes available, and providing access to this valuable resource. A Dear Colleague Letter (DCL) was released in 2020 by the NSF regarding the next facility manager (see <https://www.nsf.gov/pubs/2020/nsf20037/nsf20037.pdf>). This DCL states that the “range of seismic, geodetic, and/or related geophysical capabilities that a SAGE and GAGE successor facility would support has not yet been fully defined. However, the current capabilities comprising SAGE and GAGE may serve as a preliminary guide for the types of facility capabilities for which proposals may be sought via the planned competition.” Thus, we are confident that the repository will persist should IRIS not be awarded a contract because the entire repository and the responsibilities for maintaining it would be transferred to the new contractor.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

4. Confidentiality/Ethics

R4. The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.

Compliance Level:

0 – Not applicable

Reviewer Entry

Reviewer 1

Comments:
0 – Not applicable

Reviewer 2

Comments:
0 – Not applicable

Response:

The IRIS repository does not include data with disclosure risk. As stated in IRIS's Mission Statement, IRIS will "Promote exchange of seismic and other geophysical data and knowledge through ... pursuing policies of free and unrestricted data access." The data provider agreement that is sent to prospective data contributors makes clear that data in the IRIS archive will be shared: "The IRIS Data Management Center (DMC) manages data from the IRIS Global Seismograph Network (GSN) program, from other IRIS programs (i.e. PASSCAL) and USGS global networks, and from many non-IRIS sources. These represent valuable contributions to both IRIS and the international seismological research community who collaborate to make these data openly and freely available." The Data Provider Agreement also lists as one of IRIS's responsibilities to "Expose the contributed waveform data and metadata to all users of the IRIS DMC through its suite of access tools." Through its mission and Data Provider Agreement, IRIS ensures that data we distribute does not have any use restrictions because data with such use restrictions are not accepted. IRIS does not make any ethical or sensitivity judgements regarding the data that are accepted into its archive; IRIS promotes open exchange of all of the data it manages as the most reasonable course in all cases.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

5. Organizational infrastructure

R5. The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

IRIS is a 501c(3) not-for-profit corporation that falls under strict US federal regulations for fiscal and managerial control and accountability. Funding for IRIS and IRIS Data Management are stable and are provided through the US National Science Foundation GEO Directorate. IRIS operates under a series of 5-year Cooperative Agreements with the NSF, the most recent of which was announced during September, 2018 (<http://hosted-p0.vresp.com/1506889/fe6266a831/ARCHIVE>). This \$93M award covers October 2018 through September 2023.

The next cooperative agreement with NSF will be for a combined seismic and geodetic facility to replace those that are currently being operated by IRIS and UNAVCO, an NSF facility for geodetic data very similar to IRIS (<https://www.unavco.org/>). The two organizations have worked together for many years and may merge to compete for this award in 2023. IRIS and UNAVCO have already started working on plans for this merger in order to ensure that it builds on current capabilities and enhances their ability to serve their communities.

The IRIS Data Management System was one of the three programs included in IRIS since inception, reflecting the high priority that IRIS and the community place upon data management. This priority focus continues today and Data Services employs twenty-one permanent staff members who are either management, seismologists or computing professionals. Within Data Services are four groups: Operations (seven staff), Cyberinfrastructure (seven staff), Quality Assurance (three staff), and Products group that is managed by a Chief Architect (two staff). Five of the staff hold Ph.D. degrees in seismology, seven hold Masters degrees in geophysics or in information technology, and eight hold Bachelor's degrees. Most of the staff with geophysics expertise are members of one or more of: the American Geophysical Union (AGU), the European Geophysical Union (EGU), the Seismological Society of America (SSA), and/or the International Union of Geodesy and Geophysics (IUGG). See <https://www.iris.edu/hq/staff/chart> for a complete organizational structure.

Data Services budgets include adequate funds to ensure that travel, maintenance of infrastructure, acquisition of equipment (mass storage, servers), training of staff, and participation in domestic and international forums are at an appropriate level.

The IRIS management and governance structure provides for active collaboration between the scientific community, funding agencies, and IRIS programs. The structure is designed to ensure close involvement of the research community in the development of IRIS facilities, focus scientific talent on common objectives, encourage broad participation, and effectively manage IRIS programs.

The overarching management structure of IRIS includes business/human resources, financial services and a sponsored projects office located in Washington D.C. The Education and Public Outreach as well as the Instrumentation Services programs are managed from Washington D.C., while the Data Services program is located in Seattle, Washington, where it is hosted by the University of Washington.

IRIS governance is provided by over 50 scientists from member institutions who participate in IRIS management through its Board of Directors (https://www.iris.edu/hq/about_iris/governance/bod), eight regular committees, and ad hoc advisory groups. Standing committees maintain community oversight while program managers are responsible for day-to-day activities. Committee scientists work with the professional staff at IRIS headquarters, which is led by the President, and with Data Services staff in Seattle. Representatives of the full set of over 120 member institutions elect the nine-member Board of Directors.

A description of the overall governance of IRIS can be found at http://www.iris.edu/hq/about_iris/governance. A Summary of Roles, Responsibilities and Best Practices for Standing Committees, Standing Committee Chairs and Program Management (2017) is also available (see https://www.iris.edu/hq/files/about_iris/governance/Best_Practices_SC_11_15_17.pdf). Current and past committee membership lists are also available.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

6. Expert guidance

R6. The repository adopts mechanism(s) to secure ongoing expert guidance and feedback (either inhouse or external, including scientific guidance, if relevant).

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

IRIS as a whole secures ongoing expert guidance and feedback through several external committees and from observers on its governance committees. These committees are generally composed of seismologists and other domain experts from US Universities, the US Department of the Interior/US Geological Survey, the US Department of Energy, and members drawn from the computer science community as needed. Together these committees include over 130 community experts.

The IRIS Data Services directorate secures ongoing expert guidance and feedback through the Data Services Standing Committee (DSSC). The charge of that committee is available at (https://www.iris.edu/hq/about_iris/governance/ds). This committee meets twice per year, with meetings held at the DMC facility at least once every two years. Reports from this and other standing committees are available at (https://www.iris.edu/hq/meeting_report/).

A detailed description of governance for Data Services can be found at (https://www.iris.edu/hq/about_iris/governance/ds). This page lists current committee membership as well as the committee charge, policies, and working groups.

The IRIS Data Services staff keeps the community informed through the IRIS Data Services Newsletter that is published two to three times a year. The complete archive of newsletters (<https://ds.iris.edu/ds/newsletter/>) is a rich resource of historical and current information about activity at IRIS Data Services and in the community of data providers.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

DIGITAL OBJECT MANAGEMENT

7. Data integrity and authenticity

R7. The repository guarantees the integrity and authenticity of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

Data archived at IRIS are received from nearly two hundred seismic networks all over the world. Each data stream must pass through IRIS's firewall and is assigned a specific port for that purpose to prevent unauthorized data entering. While IRIS is responsible for long-term preservation and access, responsibility for data and station metadata, data quality and consistency ultimately lie with the data providers (as specified in the Data Provider Agreement, https://ds.iris.edu/files/documents/Data_Provider_Agreement.pdf). The obligations of IRIS under this agreement include ensuring that "the data are secure and available in perpetuity by routinely curating the data and transcribing data on a

routine cycle to new media as necessary” and maintaining “multiple copies of the data sets to protect from loss or damage to any single physical copy.” Metadata are stored in a database and are the link to the data; they are tightly coupled.

Many of the networks that provide data to IRIS are long-lived and experience equipment problems or upgrades over time. These changes are reflected in changes in the metadata for stations and instruments that are available through the Metadata Aggregator (MDA, <http://ds.iris.edu/mda>). The MDA allows a user to explore the metadata of seismic networks that have registered with FDSN and that exist in at least one FDSN federated data center (all data stored by IRIS have FDSN network codes). A user can drill down (by clicking on active links from the network level to stations and finally to channels) and can then examine the metadata at each level. Metadata that are available through this interface include network names, network maps, station names, station coordinates, station elevations, channel names, channel orientations, channel instrument responses, channel sensitivities, units of measure, channel sample rates, and data extents. Metadata changes are also documented in records that are available through the MDA. See <http://ds.iris.edu/mda/CU/ANWB/?starttime=2007-09-07T00:00:00&endtime=2599-12-31T23:59:59> for an example of channel metadata from a Caribbean station.

Errors in data and metadata are often discovered either through a metadata validator or through data quality metrics using the MUSTANG system, which calculates metrics within several days after data ingest. Whenever data errors or inconsistencies are discovered, IRIS DMC staff informs the data provider and requests updates. All updates to the metadata are logged and available through a web service (<https://service.iris.edu/irisws/metadachange/1/>). See R11 Data Quality for more data quality details.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

8. Appraisal

R8. The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for data users.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

IRIS collects and archives different types of Earth science data from many sources.

Data flows into the archive are well established, operate continuously, and are completely automated.

IRIS benefits from long-term agreements, shared funding, and deep integration with six Data Collection Centers (DCC) that are responsible for primary data collection, quality control, and submission to the IRIS Data Management Center. For example, the Albuquerque Seismic Laboratory (ASL) and the UCSD/IDA DCCs collect data from the GSN, perform quality assurance (QA) on the data, convert the data to the standard IRIS data format (SEED) and send the data to the IRIS Data Management Center to ingest, archive, curate and distribute.

Some of the DCCs are funded through IRIS Data Services and are an integral part of the IRIS data collection and management infrastructure. DCCs funded as part of the overall IRIS Program provide seismic instrumentation, equipment maintenance, software, data archiving, training, logistics, and field installation for focused and generally large research projects (PASSCAL, <https://www.passcal.nmt.edu/>) or national networks (ANF, <https://anf.ucsd.edu/about/>).

In addition to the data from the DCCs, a large amount of data managed by IRIS Data Services are from seismic networks located all over the world. These collections are generally more diverse. Some data are related to specific scientific investigations or experiments while others are from long-term national efforts. Most of these networks participate in the International Federation of Digital Seismograph Networks (<http://www.fdsn.org/>) that IRIS plays a lead role in.

Foundational guidelines for all of these data types are included in the Strategy for Accepting New Data Sets at the IRIS DMC section of the original 2003 IRIS Data Management System Strategic Plan (http://ds.iris.edu/dms/pdf/DMS_Strategic_Plan.pdf) and detailed data responsibilities are described in the Data Provider Agreement (https://ds.iris.edu/files/documents/Data_Provider_Agreement.pdf). All of these guidelines include consideration of the costs of data management and preservation as well as potential sources of resources required to cover those costs.

Extensive information on data types at IRIS and how to submit them along with metadata is at (<https://ds.iris.edu/ds/nodes/dmc/data/#submit>). This page also includes a calculator for storage costs. Specific instructions for submitting SEED data (miniSEED) and metadata (dataless SEED) are provided at (<https://ds.iris.edu/ds/nodes/dmc/data/submitting/>).

Both metadata and data are checked for quality when they are received. Whenever metadata are received, they are

appraised using a quality assessment process that includes schema validation as well as checks against specific metadata rules and requirements. For example, metadata must be consistent across the Network, Station, and Channel hierarchy (see <https://github.com/iris-edu/stationxml-validator/wiki/StationXML-Validation-Rule-List>). If problems are identified, data providers are notified, and corrections are negotiated prior to data acceptance. Data without accessible metadata are not distributed and automated policies are in effect for triggering access as soon as metadata are received and validated. When data are flowing regularly into the system, quality metrics on day-long segments are calculated and made available to all users (see R7 and R11). Some of the metrics that are calculated are checks on the consistency of the metadata based on the data themselves. When inconsistencies are discovered, IRIS DMC staff informs the data provider and requests updates.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

9. Documented storage procedures

R9. The repository applies documented processes and procedures in managing archival storage of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The ingest and archive processes were developed and are maintained by the DMC Operations group which includes seven full-time staff in close cooperation with data providers and the Data Quality group which includes three full-time staff (see R11). The staff follow procedures that are maintained by the group and documented in internal documentation and

standard operating procedures. Although these processes and procedures are only accessible internally, we provided screenshots of the contents of the documentation and procedures wiki pages and offered to walk reviewers through the internal documentation upon request.

Primary data storage processes for seismic waveform data and metadata at IRIS are implemented and managed as part of the BUD-Archive Transfer System (BATS) which connects the Buffer of Uniform Data to the Archive (See R12). All data ingestion is handled at the Primary Data Center (PDC) in Seattle, Washington and data are automatically synchronized daily with the Auxiliary Data Center (ADC) in Livermore, California using the UNIX Rsync utility. The ADC exists to reduce the risk that the data are destroyed by fire or natural disaster and to spread the load of responding to users over two geographically separated data centers.

A system diagram for the IRIS DMC Physical Systems (see Figure R9.1 annexed to this application or http://ds.iris.edu/media/flatpages/dmc/DMC_Physical_Systems_2020.pdf) shows the PDC hardware and briefly describes the data stored on each subsystem. A similar diagram shows systems operating during at the Auxiliary Data Center (see Figure R9.2 annexed to this application or https://ds.iris.edu/media/flatpages/dmc/ADC1_Physical_Systems_2020.pdf).

All storage and computer infrastructure in both data centers are budgeted and scheduled for replacement on a 4 year cycle, so that hardware is kept technologically fresh and well-maintained, ensuring high availability. The Hitachi storage system was recently replaced with the 7th generation of storage systems since 1991.

Each storage migration includes the ability to scan each data file and carefully compare the holdings with the database tables that record every sample of data, creating an audit trail that ensures validation and data completeness.

All miniSEED data that are received at the PDC are kept in their raw, unsegmented forms at both the PDC and the ADC. Data are sometimes received multiple times from the same source and must be deduplicated and merged when moved to the archive from which users may obtain data. In these cases, the latest data received are archived. As this process is synced with the ADC, both the PDC and the ADC have copies of both the data received and the data archived in the SEED repository.

Data may also be received in the PH5 format, which is an HDF5 format developed and used by PASSCAL for most temporary deployments. PH5 data are received as files and archived at both the PDC and ADC.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

10. Preservation plan

R10. The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

IRIS manages and distributes data from several distinct sources with several distinct funding sources (see <https://www.iris.edu/hq/programs/ds> for brief descriptions) and data streams.

Details of the division of data responsibilities between data providers and IRIS are clearly defined in the IRIS Data Provider Agreement (2019, https://ds.iris.edu/files/documents/Data_Provider_Agreement.pdf). This agreement covers data and metadata formats, data transmission protocols, contact information and on-going communication between IRIS and data providers, and a commitment of IRIS ensuring that data are “secure and available in perpetuity by routinely curating the data and transcribing data on a routine cycle to new media as necessary”. Other IRIS responsibilities include data discovery and distribution services, maintenance of multiple copies of the data, transforming and reformatting data, if necessary, to be compliant with IRIS data management systems, data quality assurance, and providing usage statistics to data providers.

Complete information on data submission for all data types is provided at (<https://ds.iris.edu/ds/nodes/dmc/data/#submitting>). This page also provides links to data and metadata tools for data submission and access as well as data quality summaries and help pages.

In addition to planning for future funding from NSF (See R5. Organizational infrastructure), IRIS actively pursues new resources to support maintenance of existing and development of new data management technologies. For example, the IRIS Data Services Strategic Plan (2014) includes Diversify and Expand Funding as a strategic direction, and the IRIS Strategic plan (2016) includes strategic priority Acquiring New Resources to Develop a More Diversified Funding Base with objectives and actions aimed at ensuring the longevity of IRIS by diversifying funding sources (Federal, Non-Profit) and new data types.

See R5. Organizational Infrastructure for description of management of the IRIS Data Center.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

11. Data quality

R11. The repository has appropriate expertise to address technical data and metadata quality and ensures that sufficient information is available for end users to make quality-related evaluations.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

IRIS benefits from deep, on-going engagement with data providers and users across the complete data life cycle from instrumentation design and deployment to data collection and archiving to distribution and use. IRIS Instrumentation Services (IS) helps provide the infrastructure for seismic observations all over the world, whether by deploying and operating stations, making sensors available to others, setting and promoting global standards, or guiding the development of new observational technologies. Further, IRIS ensures that these varied efforts are coordinated and efficient; best practices are identified, implemented, and documented; and knowledge is shared toward the common goal of enhancing capability, quality, and cost performance of observational seismology.

Data, metadata and product quality are addressed through a variety of methods designed to discover errors early and correct them. All are checked before being accepted into the repository, and once they have been accepted, comprehensive data and metadata quality metrics are computed, used to correct problems, and made available to users.

The organizational commitment to data quality throughout the life-cycle is reflected in the IRIS Quality Principles for Data Collection, Distribution, and Use (https://www.iris.edu/hq/files/programs/is/IS_Quality_Principles_v6.pdf) which lists eight quality principles and identifies organizational entities responsible for implementation of these principles. The six principles for which DS is responsible include:

2. All users shall have information available to them that identifies the data quality assurance process utilized by the facility. (responsibility: IS, Data Services (DS))
3. There shall be mechanisms for operators to pass through to data users key information obtained as part of their data collection and quality assessment processes, including information that quantifies the integrity and state of the data time series and the validity and goodness of metadata and data time series. (responsibility: IS, DS)
4. All users of data shall have metrics describing data quality available to them, in a manner that allows use either directly by humans (e.g., web browser) or through computer interfaces (e.g., web services) where metrics can be directly included in workflows. (responsibility: DS)
5. The facility shall always strive to provide the most accurate metadata possible and will update metadata when new information becomes available. (responsibility: IS, DS)
6. There shall be a mechanism for data users who register to report data quality information into the system. (responsibility: DS)
7. There shall be a mechanism for data users to obtain updates regarding data or metadata changes. (responsibility: DS)

When data are received from a supplier, four levels of metadata checking are performed (from network, to station, to channel, then response; see <https://github.com/iris-edu/stationxml-validator/wiki/StationXML-Validation-Rule-List>). If errors or internal metadata inconsistencies are found, then a process of interaction between the repository staff and the data supplier is triggered to correct the errors before the data or their metadata are placed in the repository. This process contributes to addressing Quality Principles 3 and 5.

All seismic data that are accepted into the repository are processed to calculate quality metrics using the Modular Utility for STATistical kNOWLEDGE Gathering system (MUSTANG). Mustang encapsulates the IRIS approach to sharing data quality metrics with network operators and the entire user community. MUSTANG automatically calculates metrics on data latency, availability, simple data statistics, noise characteristics, metadata consistency with data, signal anomalies, and counts of quality flags embedded in the data. Forty-six metrics are calculated at present and new metrics are added as suggested and approved by the community. If the data and metadata are not consistent, the data supplier is contacted to correct the metadata. The metadata are updated, the changes are documented and made available to users as in <http://ds.iris.edu/mda/CU/ANWB/?starttime=2007-09-07T00:00:00&endtime=2599-12-31T23:59:59> (click on any of the channel names to see the channel metadata), and the MUSTANG metrics are recalculated using the new metadata. All data quality metrics calculated by MUSTANG are made available to data users via web service interfaces and also through easy-to-use client tools. <http://ds.iris.edu/ds/nodes/dmc/quality-assurance/mustang/> provides an introduction to MUSTANG; <http://ds.iris.edu/mustang/databrowser/> is a direct interface to MUSTANG metrics through plots and box plots;

and <http://ds.iris.edu/mustang/mustangular/#/form> provides a map view of metric measurements (see example). An article describing the creation and construction of MUSTANG, as well as current and envisioned uses of its data quality measurements is in the seismological literature (<https://doi.org/10.1785/0220170191>) and the MUSTANG source code for metric calculations is open and available on the Comprehensive R Archive Network (CRAN) (<https://cran.r-project.org/web/packages/IRISMustangMetrics/>). These processes and tools contribute to addressing Quality Principles 2, 3, 4, 5 and 7.

Occasionally, data suppliers or users find errors in the data or metadata and contact the Operations section at IRIS Data Services to report the finding. In these cases, the claim is investigated with the data supplier who works with IRIS to correct the error. Any changes are documented, and the MUSTANG metrics are recalculated using the new data/metadata. IRIS also provides an searchable archive of experiment and data reports received over the life of the archive (<https://ds.iris.edu/data/reports/>). These reports are in a variety of formats and include general information about networks and experiments as well as detailed data about specific instruments and channels. These processes address Quality Principles 3, 5, 6, and 7.

In addition to raw and quality-controlled time series data (level 0 and 1), IRIS also produces as well as accepts products derived from data. These higher-level data products vary from relatively simple processing of time series to derived Earth models (levels 2 and 3), and are listed at <https://ds.iris.edu/ds/products/>. The process for maintaining the quality of the derived data products includes an initial review by the Data Services Standing Committee (DSSC) on whether or not to accept the product for distribution. Almost all products, whether generated by the research community or internally at IRIS, are automatically generated (e.g., EventPlots). Externally generated products are delivered to the data center through a web service interface. During development of a derivative product, the quality and appropriateness is thoroughly evaluated by the internal team of experts with additional review by the DSSC. Automatically produced products are monitored periodically to ensure high quality. Products that are manually generated are checked during their creation.

The Quality Assurance Advisory Committee, QAAC (https://www.iris.edu/hq/about_iris/governance/qaac) exists to improve the overall quality of seismic and other data collected and managed by IRIS by promoting these principles; coordinating the development and use of tools to measure data quality, and enhancing quality control feedback to network operators, thus encouraging high-quality, seismic datasets for the broad community. The QAAC includes representatives from various aspects of research and applied seismology and advises the activities of IRIS as they relate to the quality of seismological datasets collected and/or managed by IRIS.

See R13 for information about citations to IRIS data.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

12. Workflows

R12. Archiving takes place according to defined workflows from ingest to dissemination.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

Workflows for data ingestion, curation and dissemination are documented internally in wiki pages (these pages were provided to the reviewers and included a screenshot of the contents of the Operations documentation and procedures wiki pages). There are far too many pages of internal processes, procedures and workflow documentation to present here and we would be glad to walk reviewers through this internal documentation upon request.

Data Ingest

Seismic networks all over the world use a variety of commercial and home-grown systems to collect and manage seismic data and transmit those data to IRIS for global access, long-term archive and stewardship. IRIS Data Services currently (as of Feb 2020) receives time series data and metadata from 190 collaborating networks, each of which are members of the FDSN and have been approved to submit data to IRIS using moderated, firewall-configured network protocols. Data that are not properly formatted are not accepted. All systems are documented and continually monitored, which provides the highest level of uptime for the sake of a primary goal: completeness of the seismological record from a globally distributed network of stations.

The IRIS DMC developed the Buffer of Uniform Data (BUD) system which can ingest data from most seismic networks through a series of protocol adapters to manage this diverse data flow. See Figure R12.1 annexed to this application for a schematic diagram of IRIS data ingest systems. The data are stored in a simple directory structure and a series of tools support real-time access to the data and migration to the archive. Data latency for all networks/stations can be monitored in real-time using the Bud Monitor (http://buddy.iris.washington.edu/bud_stuff/dmc/bud_monitor.ALL.html).

Real-time users can access the BUD archive using the SeedLink protocol. The BUD to Archive Transfer System (BATS)

moves real-time BUD data to the DMC Archive several times a day. Multiple copies are made and the unix utility rsync is used to synchronize the primary and auxiliary data centers.

Data Curation

Perpetual curation of data in the IRIS DMC's archive requires on-going maintenance of waveform files and, equally important, the metadata that describe the waveforms. The greatest challenge DS faces in this area is developing strong linkages between the IRIS DMC and the various groups that operate and maintain seismic networks around the globe. While the DMC maintains high availability from the perspective of the international community of researchers, it is constantly curating the waveforms and metadata that it manages behind the scenes. The DMC actively refreshes and updates the waveform files to maintain compatibility with current FDSN standards.

Data Dissemination

Data and metadata dissemination at IRIS is accomplished through a comprehensive set of web services described and accessible at (<http://service.iris.edu/>). These services provide a wide variety of capabilities to users while, at the same time, providing well known, secure, and controlled workflows for archive access.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

13. Data discovery and identification

R13. The repository enables users to discover the data and refer to them in a persistent way through proper citation.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

Data Discovery:

IRIS manages and distributes multiple data types used by a variety of sophisticated and typically specialized science communities, so multiple discovery tools and approaches are supported. Information about data and data access is provided in R14 and details are at (<https://ds.iris.edu/ds/nodes/dmc/data/#requests>).

The primary mode of data discovery is via REST-like web services that are available to users around the clock, and support the discovery of data from more than 118,000 seismic stations covering five decades. Many client tools are available to enhance this discovery, such as the GMAP (<https://ds.iris.edu/gmap>) and MDA (<https://ds.iris.edu/mda>) web utilities. The web services that IRIS provides (<https://service.iris.edu>) allow for sophisticated filtering to help users find just the sources of data they are looking for. In addition, the web services provide an international catalog reference to data repositories around the world, expanding the discovery of data beyond IRIS itself (<https://service.iris.edu/irisws/fedcatalog/1>).

IRIS has participated in the NSF EarthCube effort to develop a high level search capability across scientific domains and provide ubiquitous references to persistently identified datasets using schema.org metadata. Currently, IRIS data products have been registered in the EarthCube catalog, making many discoverable on Google Dataset Search ([https://datasetsearch.research.google.com/search?query=IRIS Data Products](https://datasetsearch.research.google.com/search?query=IRIS+Data+Products)).

In addition to these data discovery tools on the IRIS website, IRIS has registered over 92,000 Digital Object Identifiers (DOIs) at datacite.org since 2014, providing persistent identification for the seismic networks that provide data, Earth models, and many types of datasets.

The website tools for data discovery will be updated pending the merger of IRIS and UNAVCO. The existing tools will remain, and new multi-disciplinary data discovery tools will be offered in a redesigned web presence.

Citation:

IRIS maintains up-to-date lists of papers that have used and cited IRIS data as well as specific guidance and examples of how to cite IRIS data resources (see https://www.iris.edu/hq/iris_citations). The International Federation of Digital Seismograph Networks (FDSN) that IRIS is a member of also provides guidance for citing member networks (<http://www.fdsn.org/networks/>). FDSN is the international body that assigns network codes and encourages network operators to either provide DOIs for their networks or allow FDSN to mint DOIs for them via IRIS. For example, EarthScope acquired the network code "TA" and had the following DOI minted so that the data from the TA network could be cited: (<https://doi.org/10.7914/SN/TA>). Many networks have DOIs with landing pages that provide summary information and maps of their stations (if available). DOIs and related information about the networks are maintained, even after the networks close.

Seismological data can be referenced through the data network DOIs (although the practice is not widely embraced). An example of a paper that cites data DOIs is provided in (<https://doi.org/10.1002/essoar.10502570.2>). To assist users with citations and encourage the practice, IRIS developed a tool for the FDSN website that returns a list of network citations

based on a user-entered list of networks or the “dataselect” POST request that the user submitted when they obtained the data (see <https://fdsn.org/networks/citation/> ; enter a network code such as TA, click the ‘Get Citations’ button and the citation(s) will appear near the top of the page).

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

14. Data reuse

R14. The repository enables reuse of the data over time, ensuring that appropriate metadata are available to support the understanding and use of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

Data reuse is at the heart of the IRIS mission whether to improve understanding of the Earth or to advance seismological research and education around the world. IRIS manages and distributes multiple data types used by a variety of sophisticated and typically specialized science communities, so multiple discovery tools and approaches are supported.

Access tools for event, time series, data quality data and metadata are summarized and compared at (<https://ds.iris.edu/ds/nodes/dmc/tools/##>). These tools support multiple access approaches (API, browse, email, monitor, and query) for humans or machines and data formats (dataless SEED, miniSEED, StationXML, QuakeML, GeoCSV, ASDF, SEG Y, and SAC). Most of these tools are developed, tested and maintained as collaborative projects between

IRIS and members of the global seismological community. As data formats evolve through both minor and major revisions or new formats become widely accepted by the community, IRIS adapts to support those formats with guidance from their community governance.

Access to metadata for all of the waveform data available through IRIS is provided by the Metadata Aggregator (<http://ds.iris.edu/mda/>). Most of these datasets are archived at IRIS, but metadata for data from other sources is also provided as a “one-stop” global directory of seismological data.

A web service provides information related to historical changes that have been made to SEED metadata. Results are returned in XML by default. Metadata changes can be searched by SEED channel constraint parameters, time of metadata change, or type of metadata change (<https://service.iris.edu/irisws/metadatachange/1/>).

IRIS also provides access to a variety of derived products through the Searchable Product Depository (SPUD, <https://ds.iris.edu/spud/>). Each product included in SPUD has descriptive materials that include descriptions, usage instructions, recommended citations (many with DOIs), and credits. Most of these tools are developed and maintained by members of the IRIS community and they are provided through SPUD as a service to that community.

IRIS also provides several tools, maps and special collections aimed at serving the needs of the general public and educators. These include: Recent Earth Map, Earthquake Browser, Recent Earthquake Teachable Moments earthquake related presentations for teachers), Station Monitor App, an archive of special event data, and a BirthQuake tool that looks up the largest earthquakes on someone's birthday. These tools reflect IRIS's on-going support for education and outreach related to seismology and other geophysical sciences.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

TECHNOLOGY

15. Technical infrastructure

R15. The repository functions on well-supported operating systems and other core infrastructural software and is using hardware and software technologies appropriate to the services it provides to its Designated Community.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The IRIS Data Management Center (DMC) is a state-of-the-art data center located in Seattle, Washington with over twenty full-time staff members dedicated to ensuring that the highest quality seismic data is readily available to scientists around the globe.

The IRIS software stack is made up of well-known open-source tools (PostgreSQL databases, Apache Web Servers, RabbitMQ messaging, ...) combined with open-source tools developed in house (MUSTANG, StationXML Converter, ROVER) or in the seismological and Earth Science communities (Antelope, ObsPy...). See Figure R15.1 annexed to this application or https://ds.iris.edu/media/flatpages/dmc/DMC_Software_Stack.pdf for an illustration of the IRIS software stack.

The IRIS mass storage systems are duplicated at two distinct sites for reliability, redundancy and for distributing the data access load (see R.9). Within either site, new drives can be hot-added and are running RAID 10 (2+2). This design ensures uninterrupted data collection and access services for IRIS providers and users. The bandwidths for the data centers are about 4G sustained. During maintenance, network outages or other unforeseen events, either Data Center can support community access needs. On average, IRIS Data Services up time over the last five years has been 99.95% (see Figure R15.2 annexed to this application).

IRIS technical staff is constantly tracking technology and data management trends and capabilities (see <https://ds.iris.edu/ds/newsletter/vol14/no3/344/new-dmc-primary-archive-disk-replacement/> for a historical perspective on archive technology evolution).

Another important element of keeping up with technology trends is evaluation of cloud providers and technologies for data storage and access. IRIS partnered with UNAVCO and received funding from the NSF Earthcube Program to explore cloud capabilities by comparing Amazon Web Services and NSF's Extreme Science and Engineering Discovery Environment (XSEDE). This project started during 2016 (see this Winter 2016 Data Services Newsletter Article, <https://ds.iris.edu/ds/newsletter/vol18/no3/471/geoscicloud-running-data-centers-in-cloud-computing-environments/> and

initial results were shared during 2018 in this Data Services Newsletter Article, <https://ds.iris.edu/ds/newsletter/vol20/no2/498/geoscicloud-exploring-the-potential-for-hosting-a-geoscience-data-center-in-the-cloud/>).

A presentation at the Earth Science Information Partners (ESIP) meeting during 2019 (https://esip.figshare.com/articles/From_Data_Lakes_To_Rivers_Improving_the_Value_and_Reach_of_a_Seismic_Data_Archive/8945210) described how big data access in the cloud was combined with IRIS web services to study seismic noise associated with wind turbines and prediction of ground motion at the Laser Interferometer Gravitational-Wave Observatory (LIGO) during earthquakes. This is an example of IRIS's focus on close collaboration with their community to provide innovative solutions in unanticipated data reuse. Thus data storage in the cloud with access through well-defined and tested web services is a clear near-future direction for IRIS.

Standards

One of the guiding principles in the IRIS Strategic plan is "Promote exchange of seismic and other geophysical data and knowledge through the use of standards for network operations and data formats". This reflects organizational values of collaboration and efficiency in data creation, access, and utilization. Many of the standards used by IRIS emerge from and are implemented in collaboration with the International Federation of Digital Seismograph Networks (<https://www.fdsn.org/>), an international community of seismic network operators and data users. A recent article in the IRIS Newsletter (<https://ds.iris.edu/ds/newsletter/vol21/no3/518/evolving-standards-and-their-impact-on-researchers/>) demonstrates IRIS's commitment to inform their users about standards and the potential impact of standards adoption and evolution on their user community.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

16. Security

R16. The technical infrastructure of the repository provides for protection of the facility and its data, products, services, and users.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

IRIS Data Services has formalized security practices in its Security Policy. The policy was finalized and distributed to all employees in early 2020. The policy (which was made available to the reviewers) represents the core information security policies and procedures and includes information security-related roles and responsibilities; references to other, special purpose policies; and the core procedures for developing, implementing, and maintaining the information security program.

Our information security program is a structured approach to develop, implement, and maintain an organizational environment conducive to appropriate information security and levels of information-related risk. This program involves ongoing activities to address relevant policies and procedures; technology and mitigations; and training and awareness.

The policy applies to all IRIS DS computer, network, and associated technology assets, its employees, data assets, and any external organizations with access to IRIS DS systems and facilities as well as any and all facilities or field sites under the operational control of IRIS Data Services.

The table of contents for the policy is reproduced below:

- Introduction
- Scope
- Roles and Responsibilities
- Developing, Implementing, and Maintaining the Cybersecurity Program
- Information Security Risk Management Process
- Enforcement
- Modifications to the Information Security Policies and Procedures
- Physical Security
- Facilities
- User Devices
- Network Security
- Firewall Policy
- VPN Policy
- Wireless Internet Policy
- Server and Server Access
- Data Backup Policy

- Guidelines for Security Related Events
- Personal Use of Computers
- Network Use
- Passwords
- Other Policies and Procedure Documents

IRIS system administrators attend formal security training classes annually to stay up to date on security problems and how to address them.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

APPLICANT FEEDBACK

Comments/feedback

These Requirements are not seen as final, and we value your input to improve the CoreTrustSeal certification procedure. Any comments on the quality of the Requirements, their relevance to your organization, or any other contribution, will be considered as part of future iterations.

Response:

Reviewer Entry

Reviewer 1

Comments:

Reviewer 2

Comments:

ANNEXES



Figure R0.1. Map showing locations of IRIS partners of several types.

ANNEXES

IRIS DMC Physical Systems

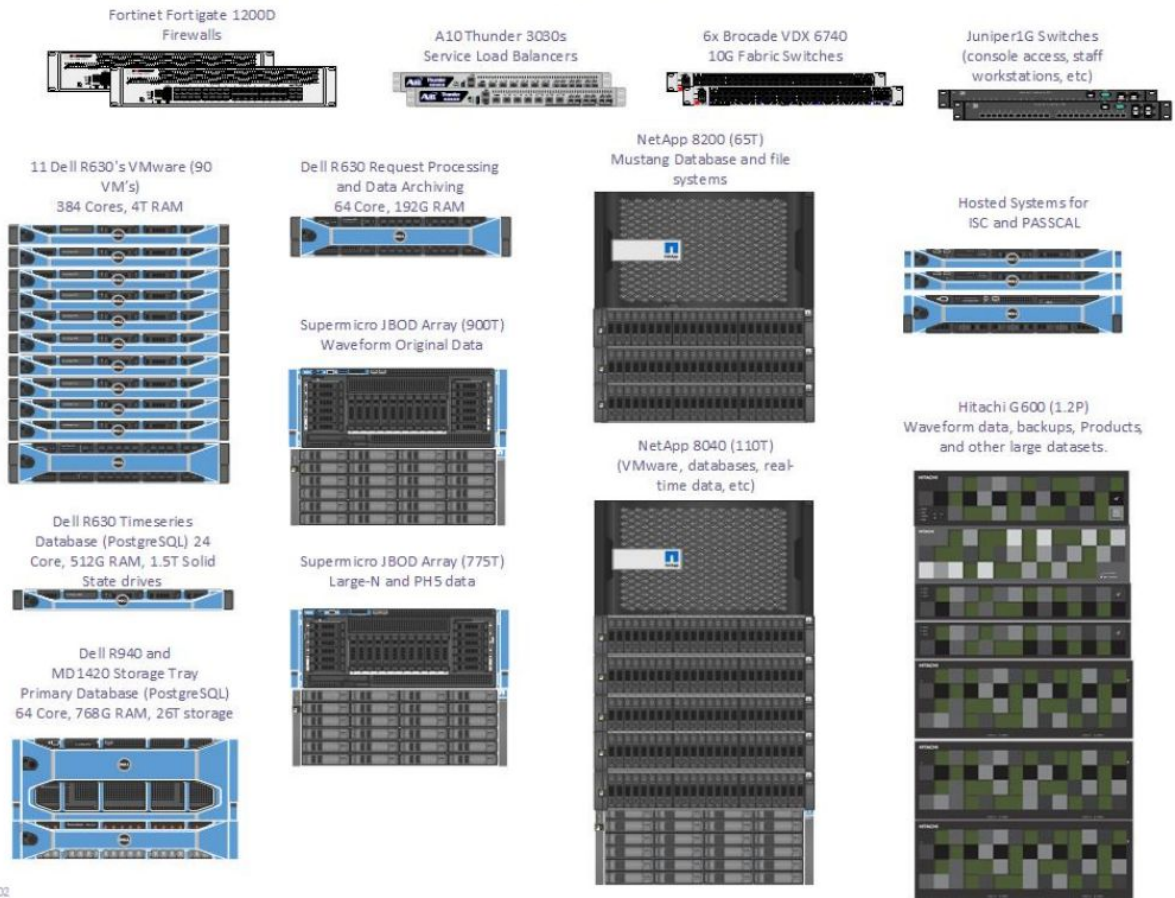
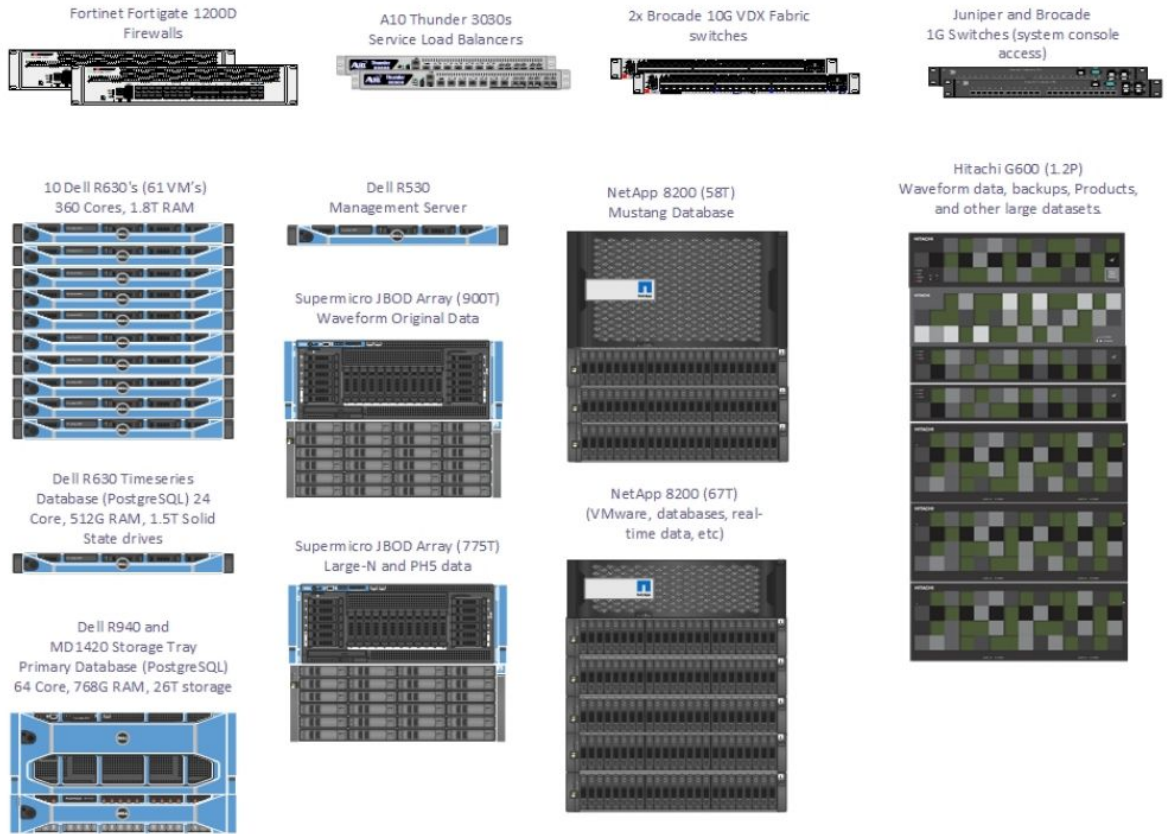


Figure R9.1. IRIS Primary Data Management Center Physical Systems (2020).

ANNEXES

IRIS ADC1 Physical Systems



V1.2 2020-08

Figure R9.2. IRIS Auxiliary Data Center Physical Systems (2020).

ANNEXES

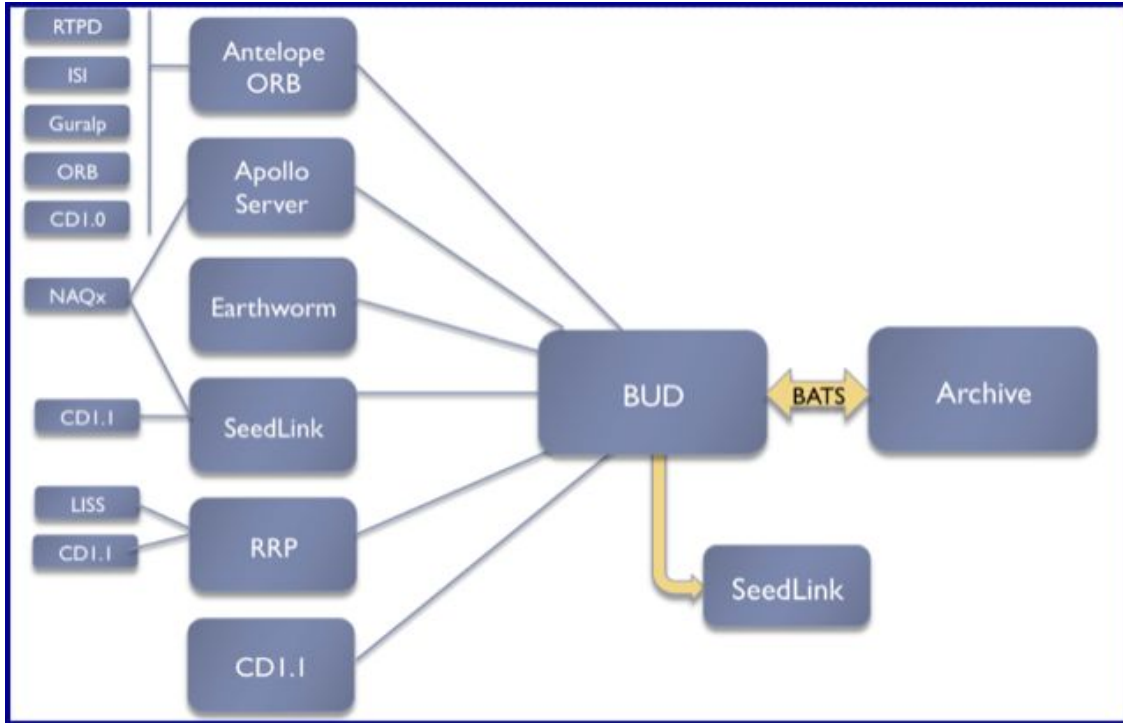


Figure R12.1. Schematic diagram of IRIS data ingest systems.

ANNEXES

DMC SOFTWARE STACK (2017-10-9)

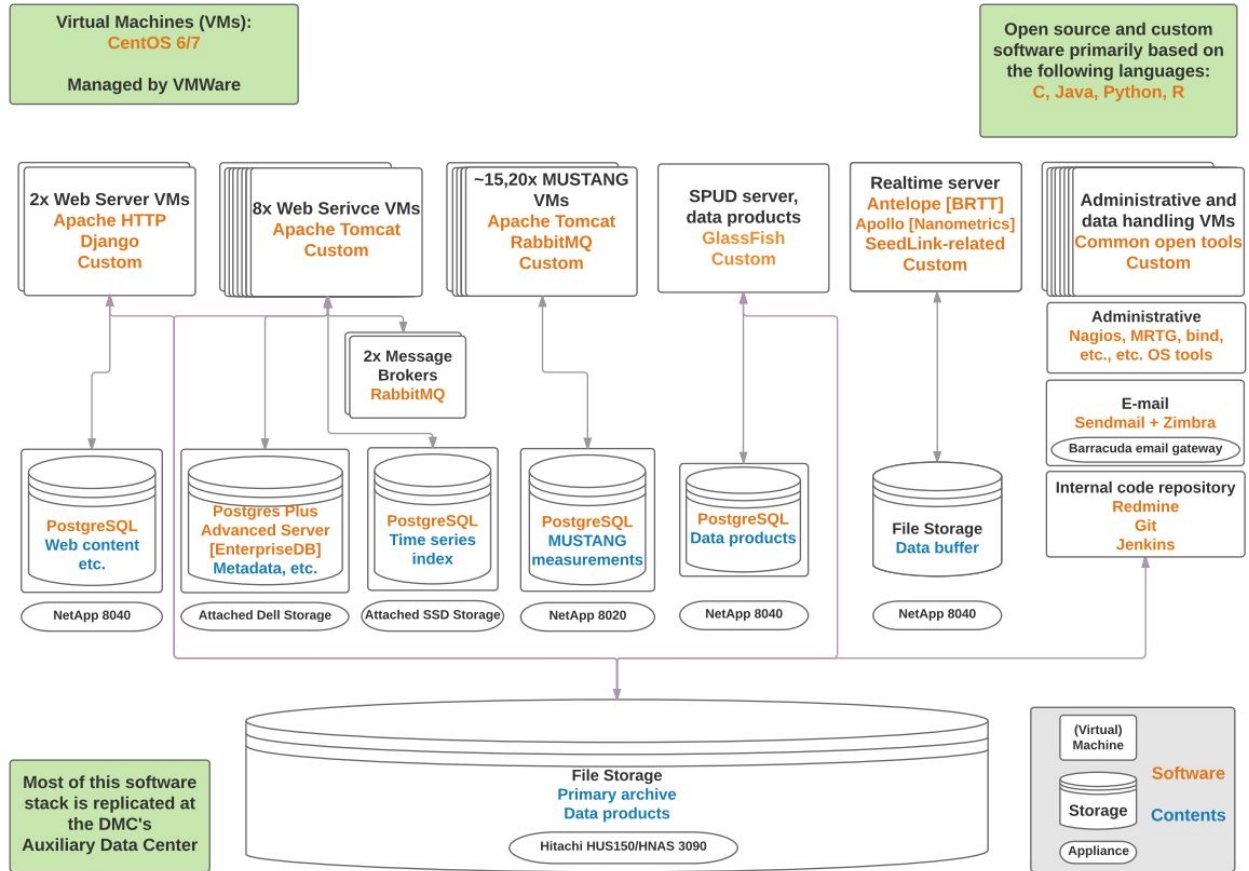


Figure R15.1. Schematic diagram of IRIS data center software stack for ingest, distribution and support systems.

ANNEXES

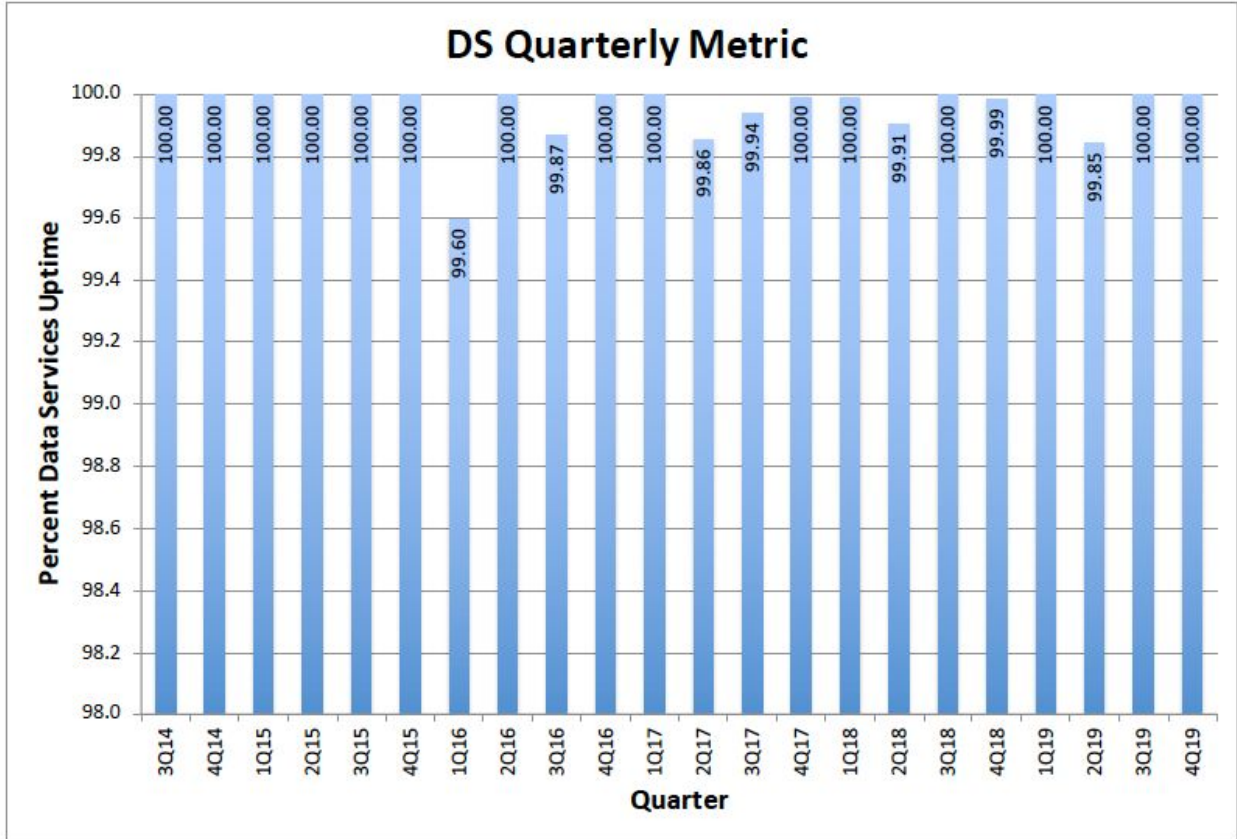


Figure R15.2 Data Services uptime (%) 2014 - 2019