**Report from the
FDSN Archive for Continuous Data
at the IRIS DMC**

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Perugia, Italy
by
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Introduction:
A significant shift has occurred since the FDSN meeting in 2005. In 2005 14 FDSN networks were sending data to the FDSN archive in real time.   In 2007 that number has grown to 31 networks with an additional member (Canada) sending data with a latency of 24 hours. Data from the majority of FDSN networks routinely flow into the FDSN Archive located at the IRIS DMC. At the IRIS DMC, data received in real time are made available in real time. After three days the real time data are archived. SPYDER® and FARM Products are routinely generated and made available through tools such as WILBER, the Data Handling Interface (DHI) and jWeed.

The DMC continues to ship large amounts of seismological data to researchers around the world.   This report will summarize current activity at the FDSN Archive for continuous data at the IRIS DMC in Seattle, Washington.

In the following summary the FDSN membership is considered to be the 65 organizations or networks from 52 countries. A few of the graphics may not correctly reflect the expanded FDSN membership but most graphics have been updated.

Real Time Data Flow
Real time data flowing into the IRIS DMC at this time is by far the common manner for data reaching IRIS.   Roughly 1600 stations contribute data in real time to the IRIS DMC.   The following map shows the locations of these real time stations.
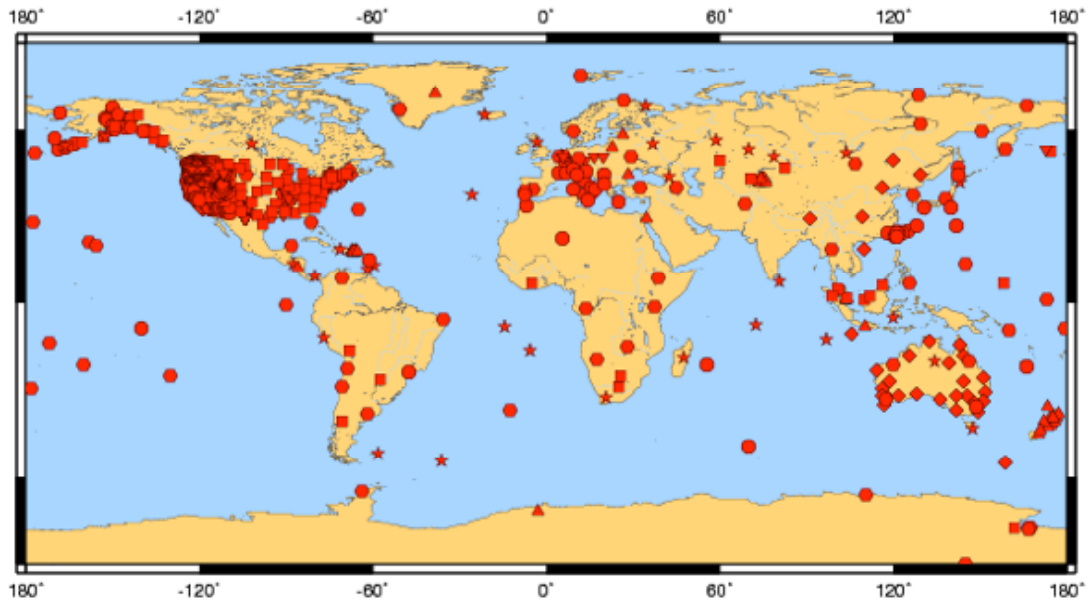
Real Time BUD Data

Figure 1. Data from roughly 1600 stations are now received in real time at the IRIS DMC. These are dominated by stations in the US, Europe and Australia/New Zealand but the global extent of the coverage is impressive. We believe this is the largest concentration of real time high quality seismic data of any data center in the world.
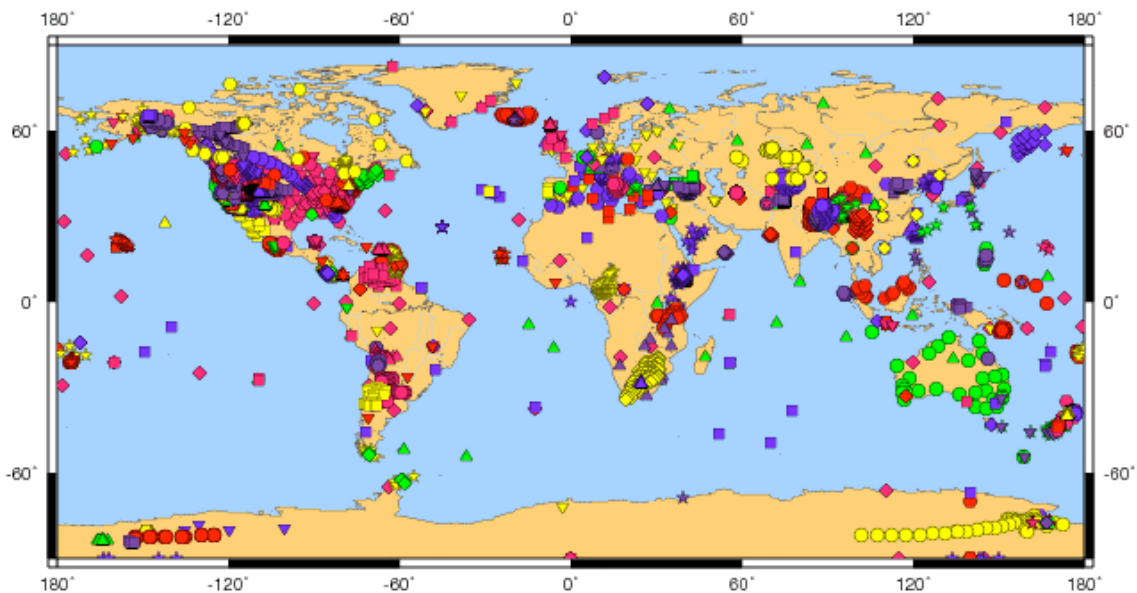
All Stations at the IRIS DMC

Figure 2. All Stations in the IRIS DMC Archive. The IRIS DMC has data from 8,512 stations available. This includes stations

operating as early as 1970. The various temporary deployments of programs like PASSCAL and SEIS-UK are clearly visible.

FDSN Data Flow into the IRIS DMC

Data are now flowing into the FDSN archive in real time from 31 of the 65 FDSN organizations and from 27 FDSN countries, nearly 50%. In most cases not all stations flow to the FDSN archive, usually just stations that are parts of the FDSN network or which provide improved global coverage and are shared as part of a bi-lateral agreement between the organization and IRIS. FDSN networks (and countries) sending data in real time include:

- AfricaArray, South Africa
- Australia,
- Belgium,
- N. California Seismic Network, Berkeley,
- S. California Seismic Network, Caltech,
- Canada,
- China,
- Czech Republic,
- Geoscope, France
- GEOFON, Germany
- Greece, Thessaloniki
- GRSN, Germany
- GTSN, USA
- Kazakhstan,
- IRIS GSN, USA
- Israel
- Malaysia,
- MedNet, Italy
- Mexico
- New Zealand,
- Netherlands, ORFEUS,
- Pacific 21, Japan
- Poland,
- Portugal,
- Russia,
- Switzerland,
- BATS, Taiwan,
- ANSS/USGS, and
- PRSN and PRSMN, Puerto Rico.
- United Nations (selected stations of the IMS)
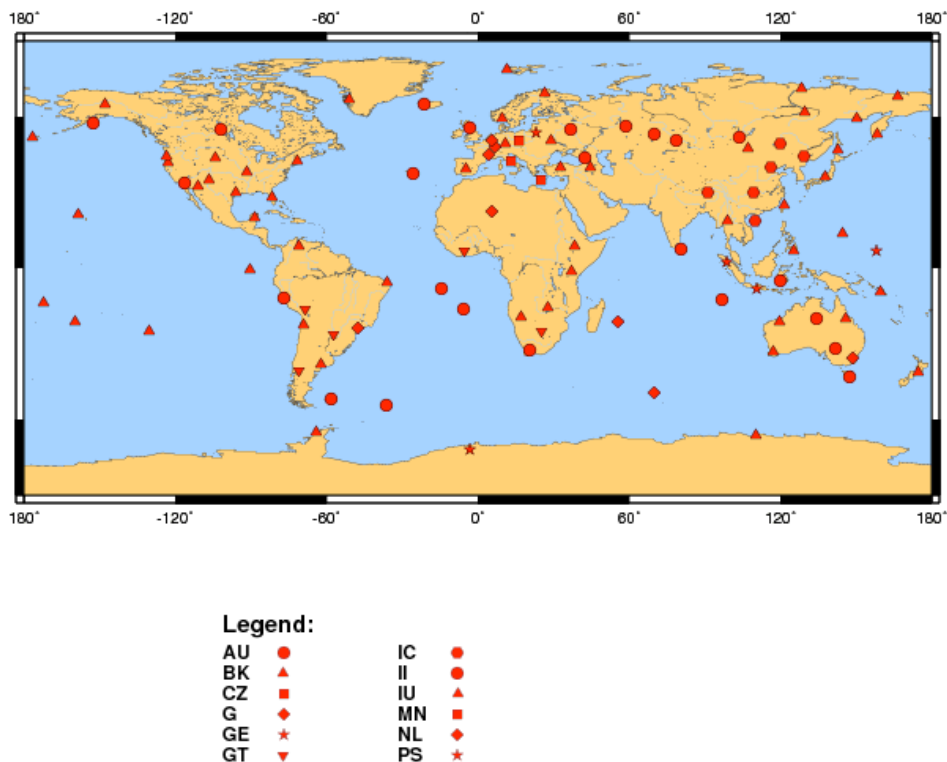
Real Time FDSN Stations 12-Jun

Figure 3. Real Time Data Flow from FDSN Stations. This figure shows the stations providing data to the FDSN archive in real time. Some networks are not presently shown. These are as specified in the _FDSN virtual network.

The FDSN holdings at the IRIS DMC have continued to increase. The holdings now exceed 6.2 terabytes. While not the most voluminous data set they are extremely important due to their wide geographic distribution and high data quality.
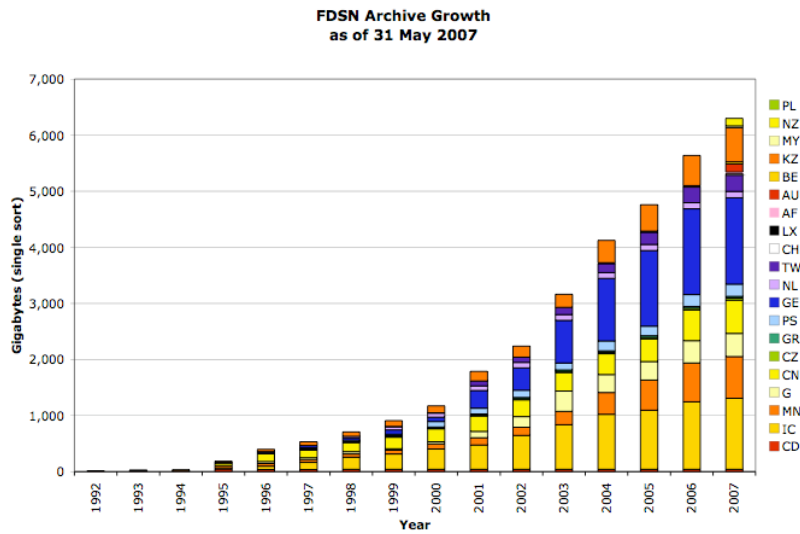
**FDSN Archive Growth
as of 31 May 2007**

Figure 4. The FDSN archive now totals roughly 6.2 terabytes (single sorted) with data from 20 FDSN networks not including US networks. This graph has not yet been updated to show all current FDSN membership (MX and HL).
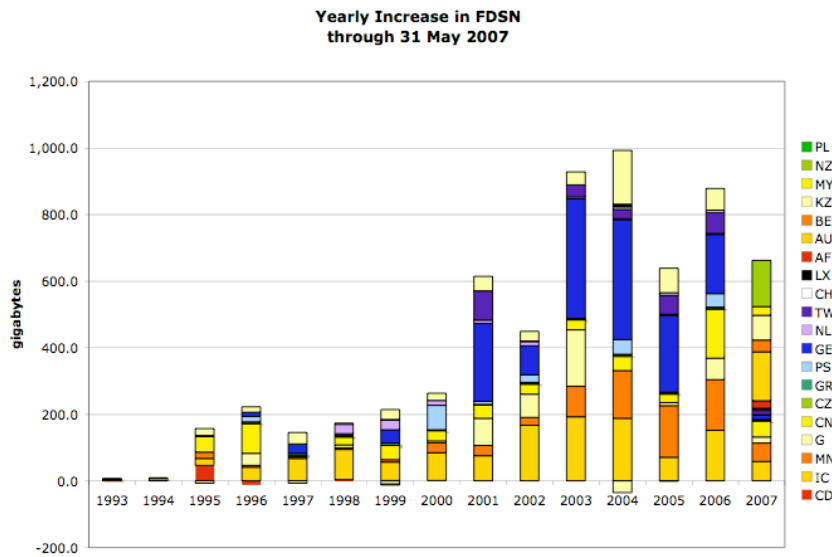

**Yearly Increase in FDSN
through 31 May 2007**

Figure 5. The above figure shows the net increase of FDSN data entering the FDSN archive by year. Data from IRIS GSN Networks of IU and II are not included. Data from US operated networks are also omitted (BK, CI, PR, GT) The figures for 2007 are valid through 31 May 2007. Data from the AU and NZ networks represent the largest contributions to the FDSN archive. Negative values reflected in the above chart are a result of removing data from the archive, usually in preparation for receiving retransmissions of the data.
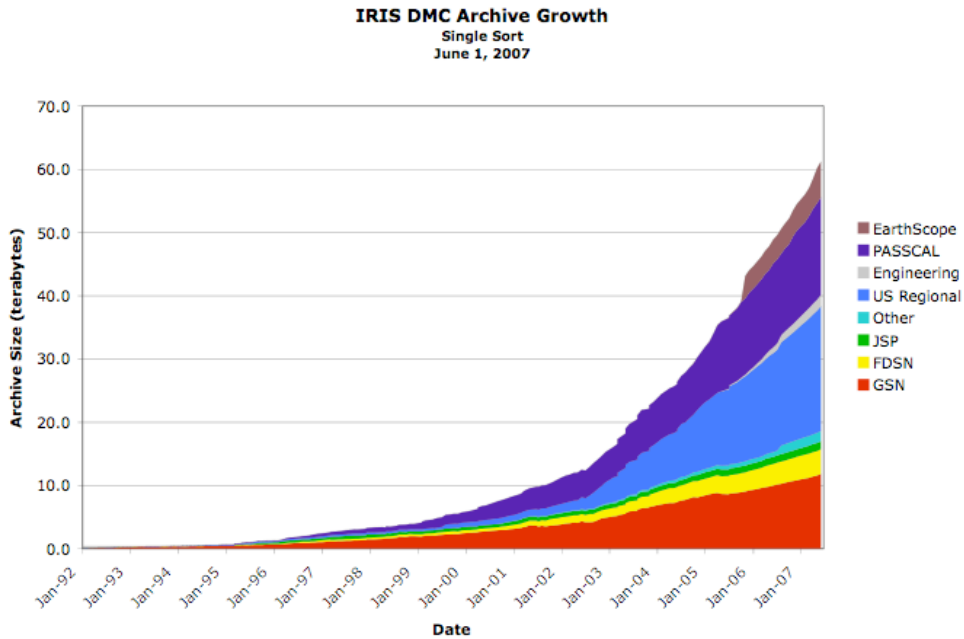

Figure 6. The above figure shows the total amount of data archived at the IRIS DMC. As of the beginning of June 2007 the IRIS DMC had a total of 61 terabytes (single copy) in the archive. The non-IRIS FDSN contributions are shown in yellow. The data from the IC network is included in the GSN value, not the FDSN value in the above chart explaining the discrepancy between Figure 4 and 5.

Data Shipments from the Archive (Excluding Real Time and DHI Data Shipments)

The IRIS DMC has seen a significant increase in the number of shipments this year. At the present time we are estimating that just under 300,000 will be serviced for 2007. This is roughly the same as last year.
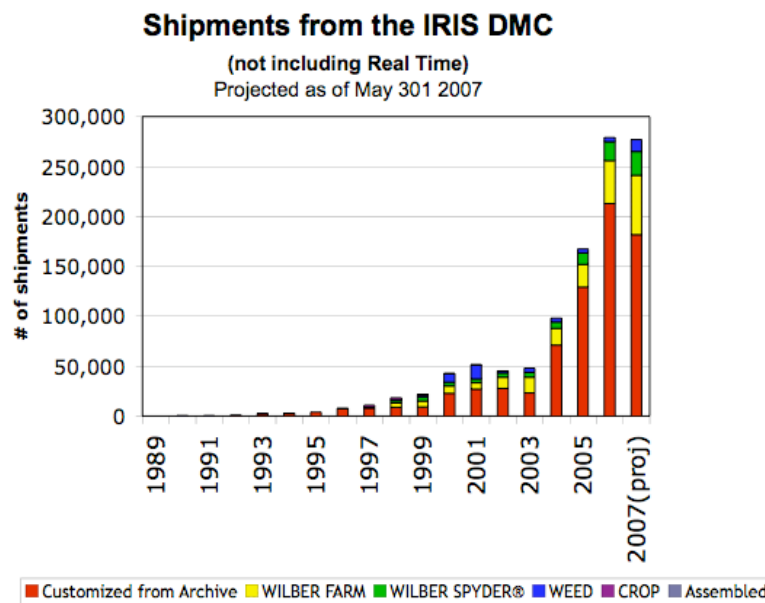

Figure 7. This figure shows the number of shipments from the Archive, and the SPYDER® and FARM products through WILBER that we project will be shipped this year. A significant fraction of this increase is FDSN members outside the United States. This graph is projected based on shipments through May 31, 2007 but projected for the entire year of 2007.

Of the 300,000, approximately 100,000 are being shipped outside the United States with France generating the most requests other than the US as shown in Figure 9.
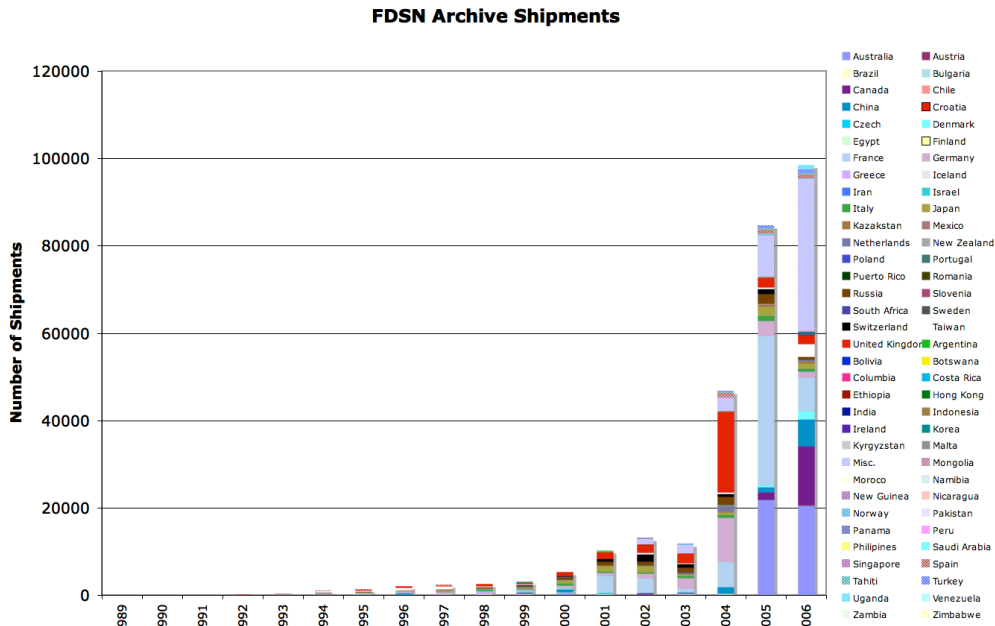
FDSN Archive Shipments

Figure 8. This figure shows the number of shipments flowing outside the United States. This contains information through the end of 2006.

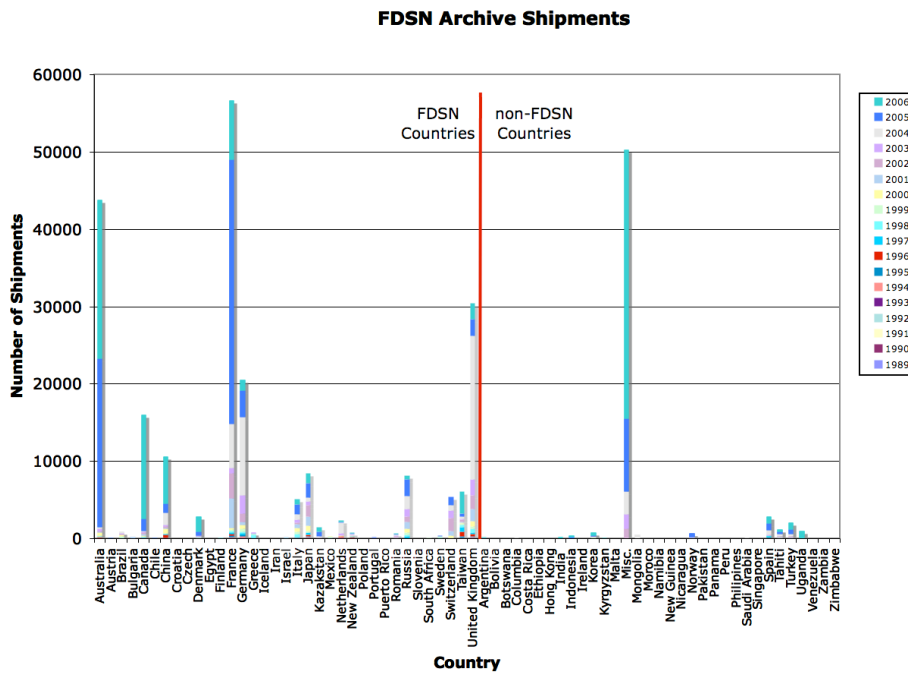

FDSN Archive Shipments

Figure 9. This figure shows that France is now the country (other than the US) that has requested data from the FDSN archive most frequently. Large numbers of requests also come from Australia, United Kingdom, Germany and Canada. The vertical red line divides FDSN countries to the left of the line from non-FDSN countries to the right of the red line. The column labeled Misc contains requests where the country of the requester could not be determined.
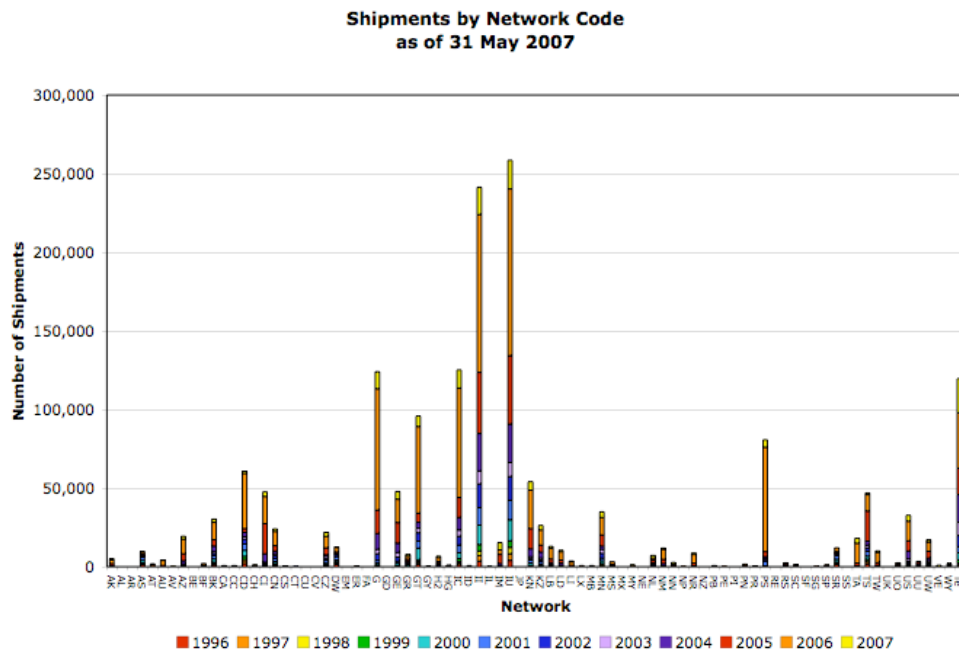
**Shipments by Network Code
as of 31 May 2007**

Figure 10. The above figure shows how requests vary by Network Code. The IRIS networks of IU, II, IC, G and the temp networks dominated by PASSCAL are the most numerous of our requests but shipments from GT, PS, CD and KN are also numerous.

Shipments via all methods (Archive, DHI and Real Time)

Just as the IRIS DMC is now receiving data in near real time through automated techniques, we are also beginning to support distribution of data via streaming mechanisms. We currently support streaming in one of three ways:

1. Live Internet Seismic Server (LISS) Developed by USGS/ASL
2. Data Handling Interface (DHI) Developed by the IRIS DMC and University of S. Carolina
3. SeedLink. Developed by the GEOFON group at GFZ.
4.

The DMC also released a new version of the autoDRM software that provides access to data in the BUD system. The IRIS DMC shows availability from more seismic channels than any other system that is monitored by Waves4U (http://www.seismo.ethz.ch/waves4u/) at ETH.
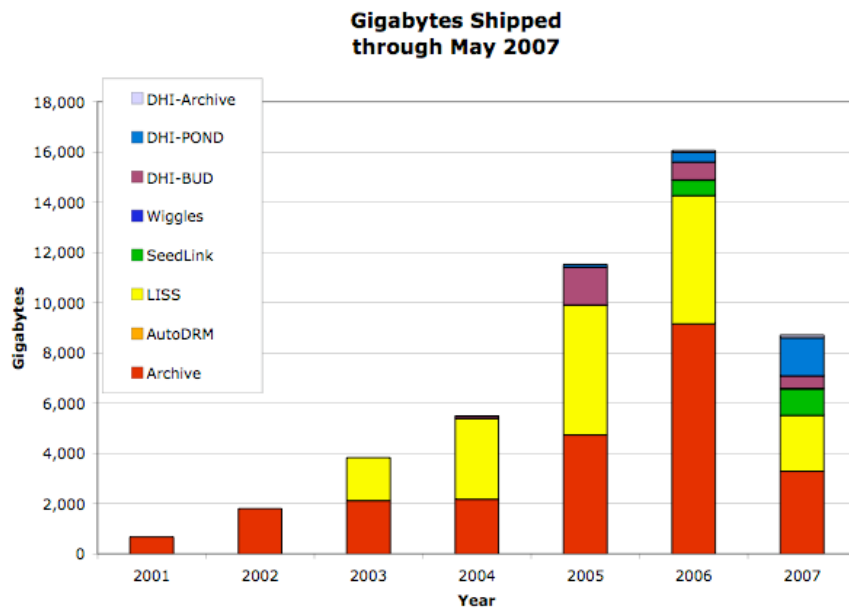
Gigabytes Shipped through May 2007

Figure 11. This figure shows the number of gigabytes of data shipped conventionally from the archive in red and the amount of data shipped through the two real time methods of (LISS and SeedLink) and DHI based techniques. Data shipped from the archive and real time data shipments made by LISS and SeedLink are roughly equal. It also shows the increase in the amount of data shipped through the DHI interfaces.

The IRIS DMC will ship a total of more than 21 terabytes of waveform data this year if shipments continue at the current rate.