

Data Transfer from MPIfR to ASC

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Raw VLBI Data and Correlation

- Rough estimate of AO-4 storage is ~34 experiments, ~20 stations, ~2 TB recorded on each Mark5 module => ~1 PB total of data

Experiment codes (EVN) in AO-4: BK196E BK196F
EB055 EB055A EB055B EB055C EB055D EG089C EG089D
EG094A EG094B EL053E EL053G EL053H EL053I EL053J
GA038 GB079 GG079A GG079B GG079C gg079d GG080
GG081A GG081B GG081C GG081D GG081E GG081G
GG081H GG081I GG081J GG083A GR039

Stations: Jb Jb2 Ef On60 Wb T6 Sh Ur Tr Mh
Ys Nt Hh Sv Zc Bd Kt Ky Ku Ro Pu Gb Gt Hn Sc
NI Br La Kp Fd Pt Ov Mk Y Y27 Cd Ho At Mp ...

Rates: 128 Mbps – 1024 Mbps

- Station VLBI data are received on Mark5 modules at MPIfR and JIVE
- Some experiments are correlated at ASC. Also storage in ASC Archive.
- Have to deliver station VLBI data to ASC

Data Delivery Options – Cost vs. Speed



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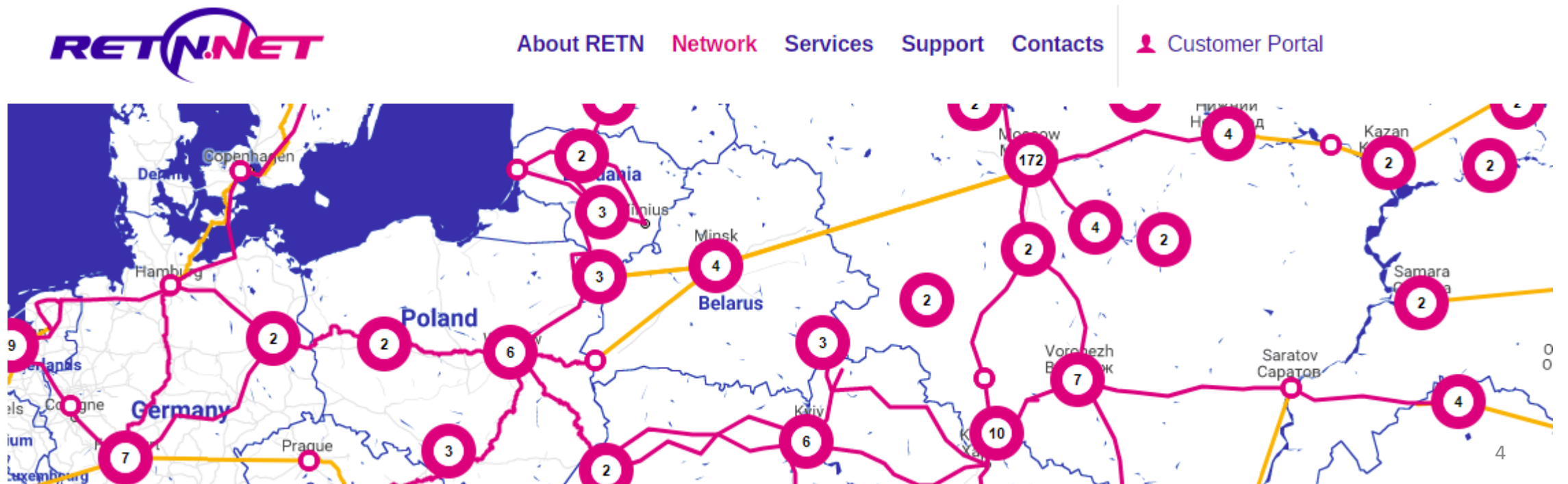
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Internet Data Transfer – Network

- MPIfR has 1G “unidirectional” by geodetic institute plus another 1G
- ASC has 600 Mbps “unidirectional”

Bonn 1G → DFN X-Win 100G → GEANT2 → RETN → VSD-Net → ASC 600M



Internet Data Transfer – Software

- Initially we used *Filezilla* for FTP upload Bonn→ASC
 - Total transfer rate very poor <50 Mbps despite parallel file uploads
- Measured available bandwidth using *iperf* Bonn<->ASC
 - UDP reached ~450 Mbps before notable packet loss
 - TCP ~300 Mbps but only with 96 parallel streams, and Filezilla max. is 10!
- Evaluated UDP-based JIVE *m5copy* for upload Bonn→ASC
 - Failed to work despite extensive troubleshooting by H. Verkouter from JIVE
- Using now UDP-based *Tsunami* for Bonn→ASC download
 - Tsunami is a protocol that is (still) often used in geodetic VLBI transfers
 - Transferring at 250—350 Mbps, about x10 faster than Filezilla FTP

Internet Data Transfer – Steps

1. Bonn receives Mark5 modules from stations
2. ASC specifies desired Mark5 modules to be copied to ASC
3. Bonn extracts files off from Mark5 modules onto local servers
4. ASC initiates download of the files from Bonn servers
5. ASC verifies that the received files are complete and intact
6. ASC confirms when Mark5 modules can be released (erased)
7. Bonn releases the completed modules

Repeated from (2) with the next set of Mark5 modules

Extraction of Mark5 VLBI Recordings to Files

- Data are relatively “inaccessible” on non industry standard Mark5 modules
- Copy modules onto distributed file system (~0.8 PB capacity) of DiFX cluster
- Options to produce files from modules
 - Haystack drs/disk2file not installed
 - DiFX mk5cp apparently buggy
 - JIVE jive5ab/m5copy mostly works
 - fuseMk5 works
- files for Internet transfer, or portable disks



Verification of Data Integrity

- At stage of Mark5 module extraction into files
 - ASC found a strange issue: parts of VLBI data transferred previously (*Filezilla*) were inconsistent with re-extracted re-transferred same data (*Tsunami*)
 - Tracked down issue: previously used extraction tool (DiFX *mk5cp*) corrupts files
 - To determine correct extraction we compared three methods (*mk5cp*, *jive5ab*, *fuseMk5*), also tested internal file integrity with a Mark5 data utility (*m5test*)
 - Confirmed corruption in earlier-used *mk5cp*, no bugfix yet.
 - No corruption in *jive5ab* and *fuseMk5*! Output files mutually consistent.

Verification of Data Integrity

- At stage of Internet data transfer Bonn → ASC
 - Bonn generates MD5 sums for all files to be transferred
 - ASC scripted download includes a comparison of MD5 sums
- No corruption during data transfers

Current Status

- Reason of earlier data corruption has been resolved
- Transfer rate ~350 Mbps with Tsunami is x10 faster than Filezilla
- Effective progress of Bonn->ASC transfer is “slow” due to overheads
- Current workaround to speed things up
 - ~16 “random” Mark5 modules copied onto HDD for bringing as “souvenirs”
 - ~450TB(?)b remaining Mark5 modules to be transferred over Internet
- Completion in a few months(?) for those ASC-destined modules that are currently in Bonn correlator storage

Added after discussions

- ASC will look into provide log-in for Bonn people, so that one coordination step during data transfer can be avoided...
- Holidays Dec/Jan in Russian/Germany might cause further delays...