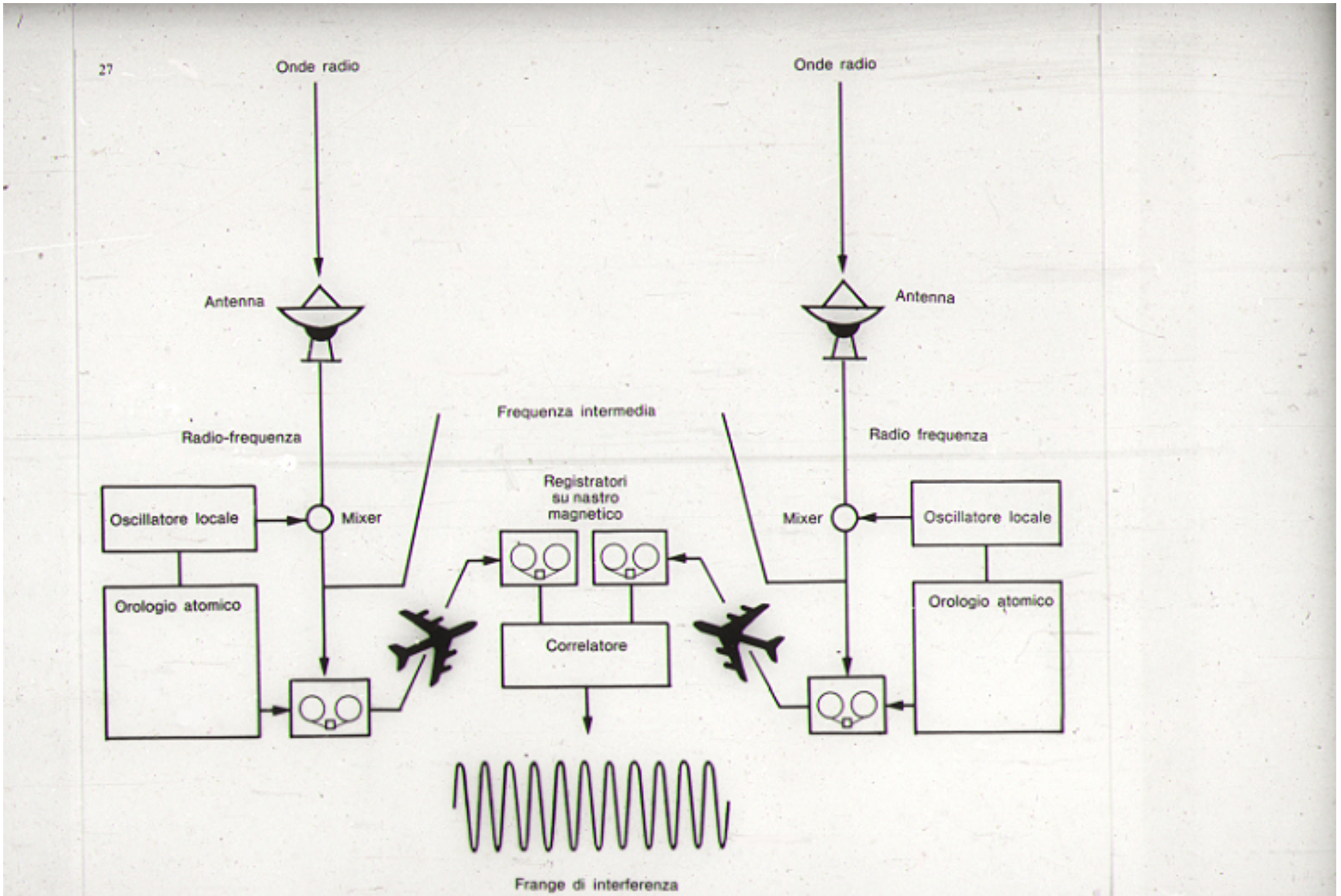
Uso delle risorse di calcolo per il Radio

Matteo Stagni - 2019 ICT Workshop - Milano - 22 September 2019

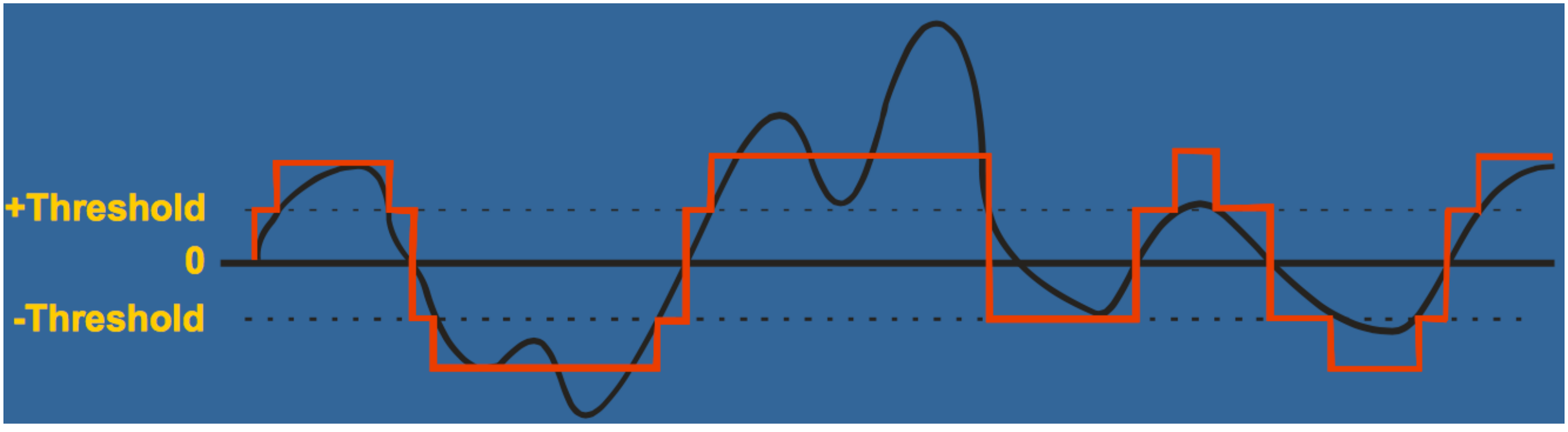
C’era una volta…



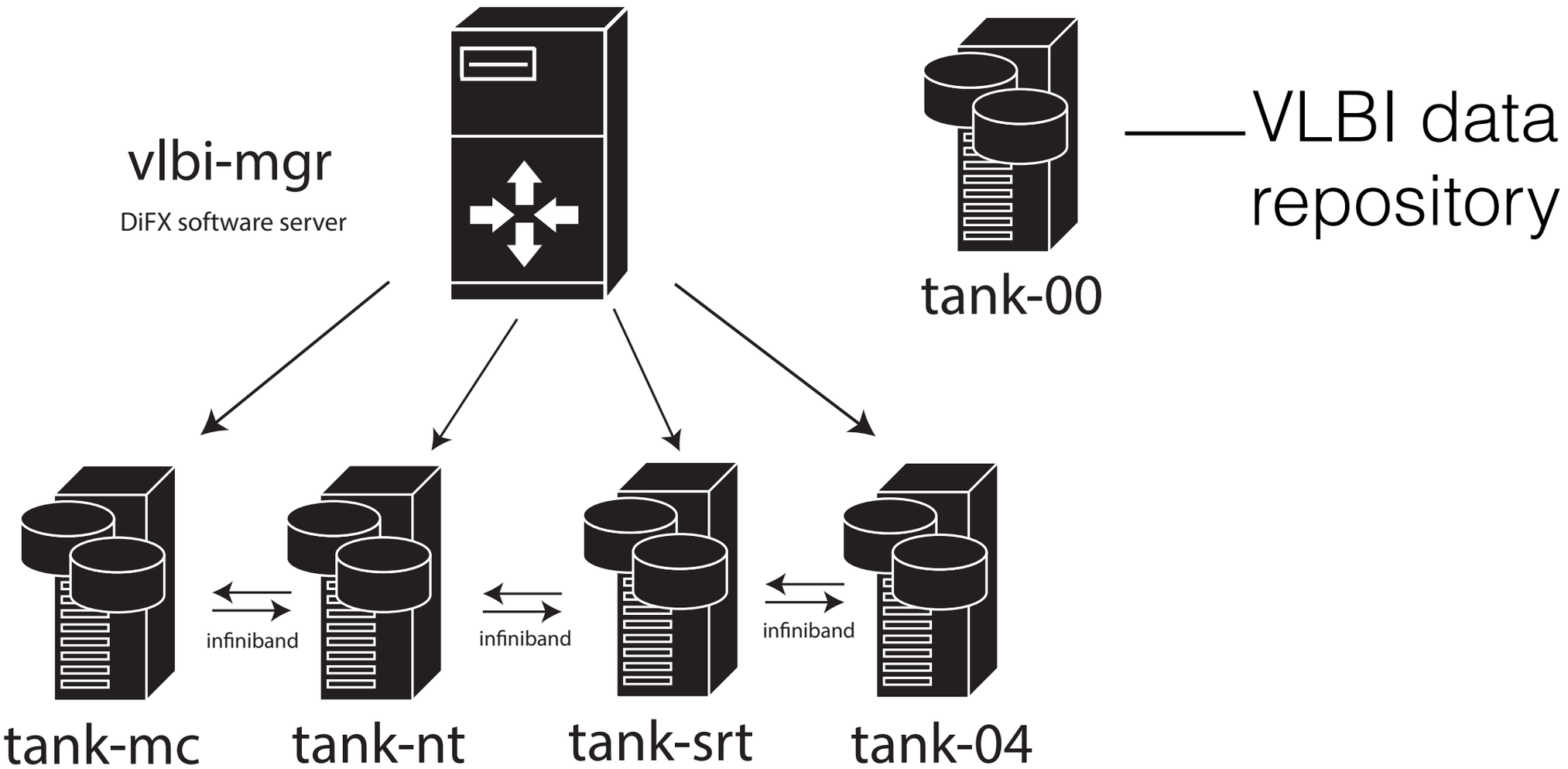
Mark5 stream: 0x64e140
  stream = File-1/1=n15m1a_mc_no0001
  format = Mark5B-1024-16-2 = 2
  start mjd/sec = 101 46800.008203125
  frame duration = 78125.00 ns
  framenum = 0
  sample rate = 32000000 Hz
  offset = 5008
  framebytes = 10016 bytes
  datasize = 10000 bytes
  sample granularity = 1
  frame granularity = 1
  gframens = 78125
  payload offset = 16
  read position = 0
  data window size = 1048576 bytes
1 1 3 1 -1 3 -1 1 -3 -3 3 -1 1 3 -1 -1

BBC analog output (mv)	Mark 4/VLBA code	
	Sign (S)	Mag (M)
>220	1	1
0→220	1	0
0→-220	0	1
<-220	0	0

32 bit word decoded
0 when invalid



Architettura correlatore



Cluster

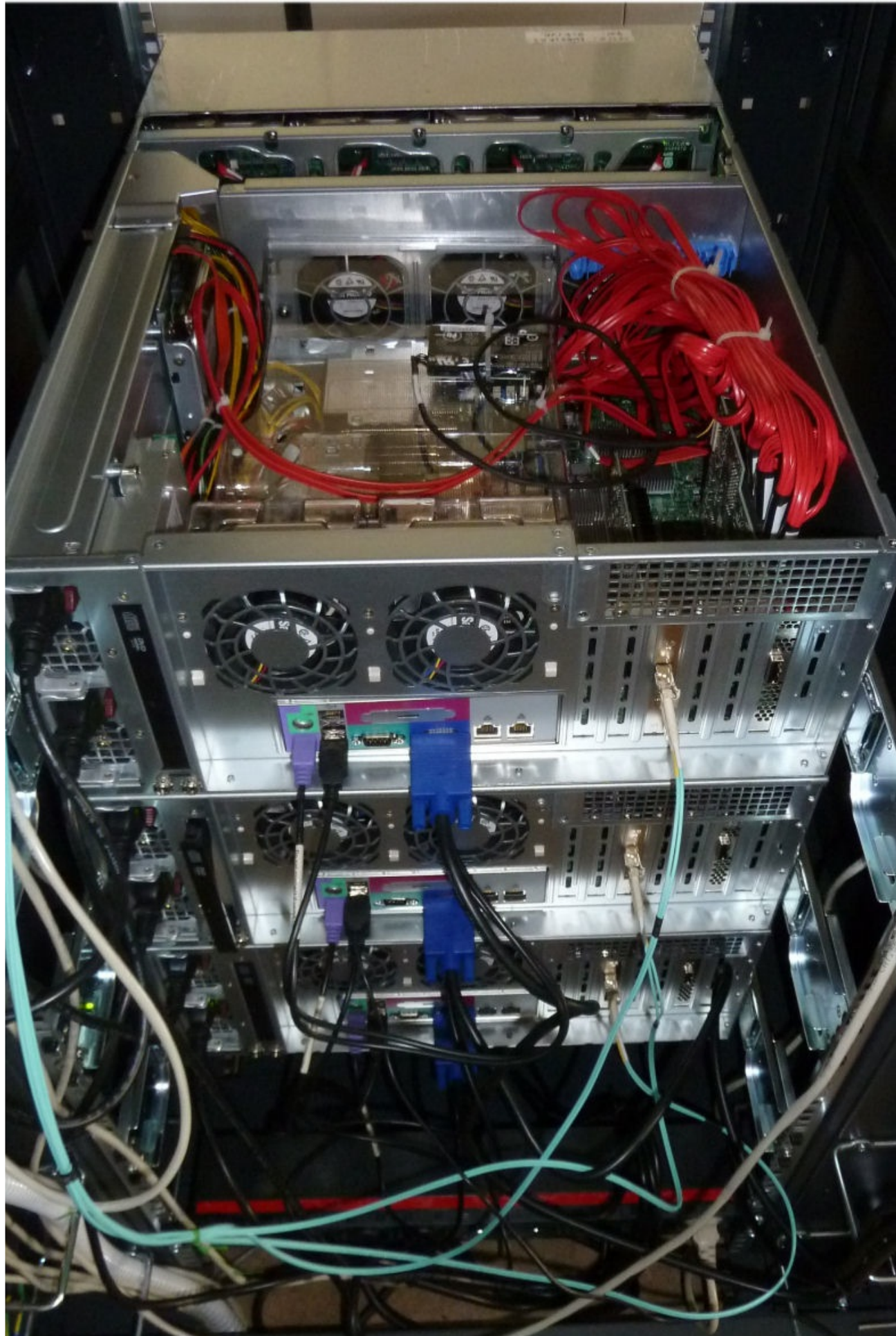
Infiniband 40Gbit

10 Gbit network

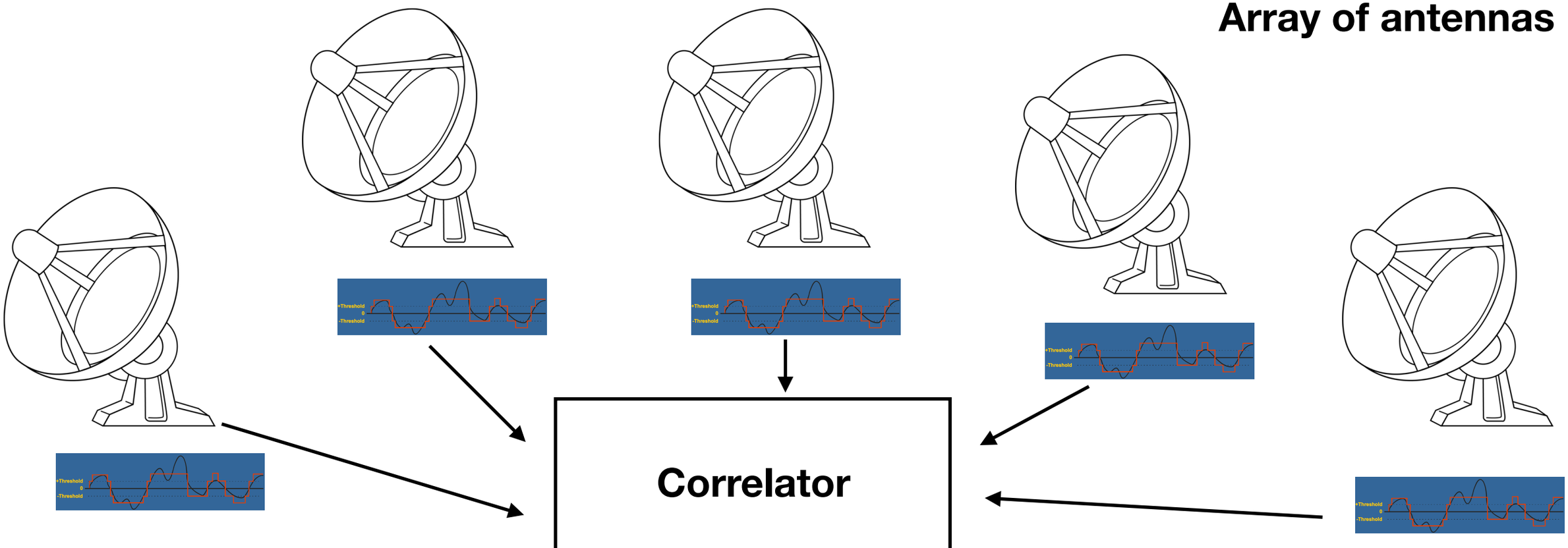
16 cores each

24 disks bay

Now 400 TB available



Array of antennas

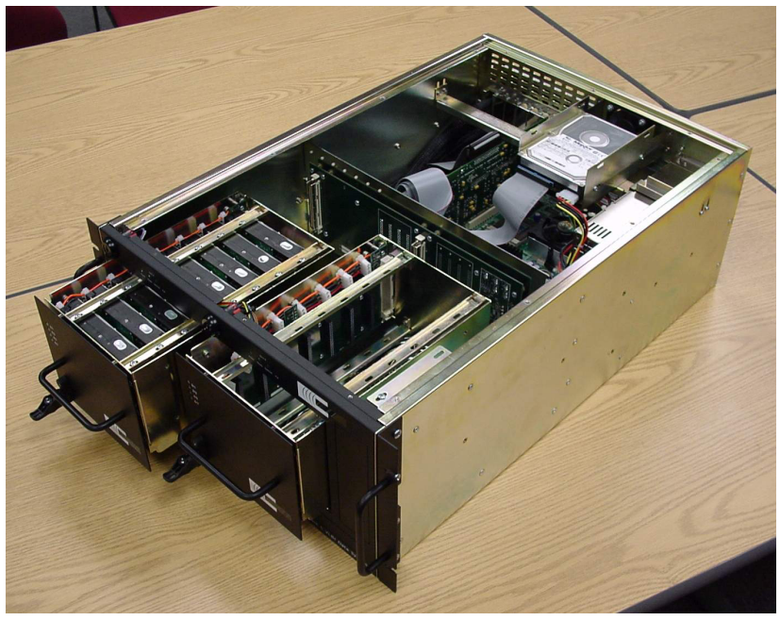


the voltage samples from the antennas are first Fourier transformed into the frequency domain, then are cross-multiplied pairwise and integrated over time

.MS or .FITS file

VISIBILITIES

Sistemi registrazione VLBI

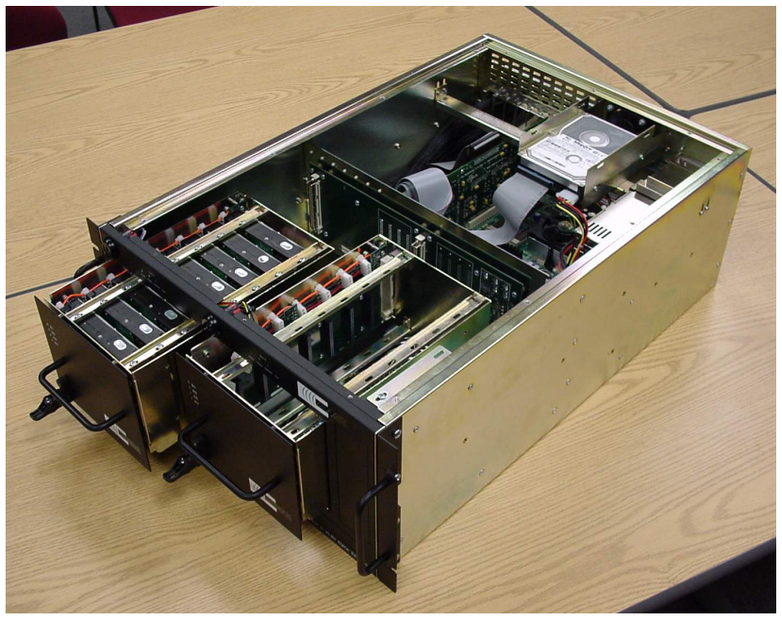


Mark5B/C

Mark6

Flexbuff

Sistemi registrazione VLBI



Mark5B/C

Scrive @ 2 Gbit (C version)

File system proprietario

Interfaccia proprietaria

Non c’e’ ridondanza

I diskpack possono essere spediti facilmente

Sistemi registrazione VLBI

Mark6

Scrive @ 16 Gbit/s

Distribuisce le scritture su disco

Monta i file con FUSE

Non c’e’ ridondanza

I diskpack possono essere spediti facilmente

Sistemi registrazione VLBI

Flexbuff

Scrive @ 16 Gbit

FUSE file system

Distribuisce le scritture su disco

Non c’e’ ridondanza

Lavora con jive5ab
(e-shipment)

Sistemi registrazione VLBI

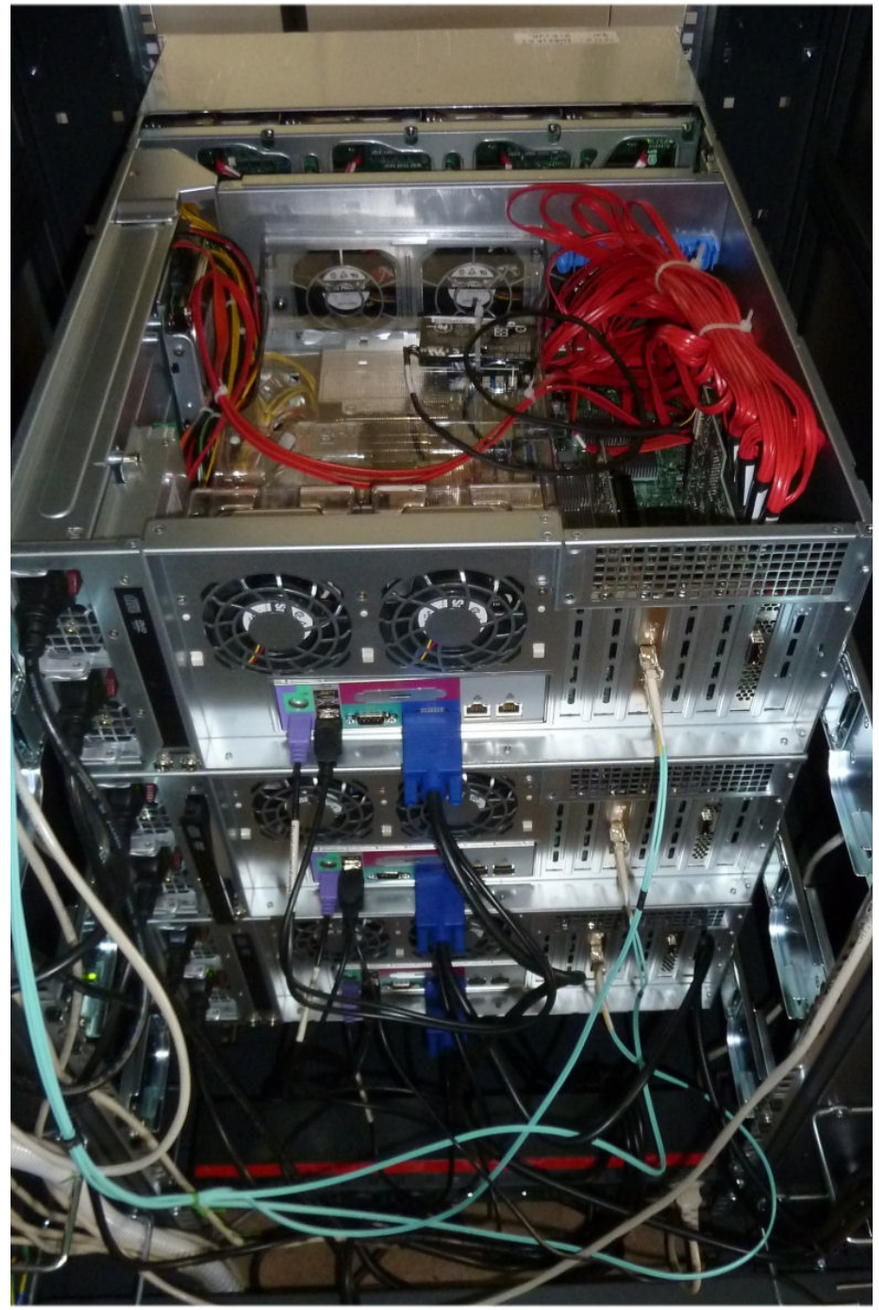
Bologna Correlator

Scrive @ 4Gbit/s (testato!)

Standard XFS file system su RAID5

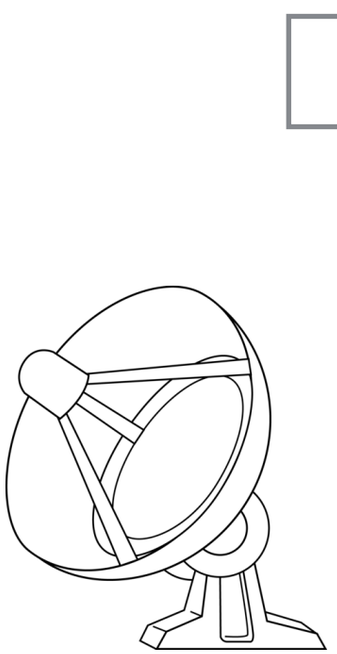
tolleranza alle rotture (1 disco alla volta)

Lavora con jive5ab
(e-shipment)



Qual e' la differenza rispetto a un flexbuff?

VLBI - IT dati



SCHED

VEX

Medicina
+
Noto
standard procedure

FieldSystem

dBBC

Fila10G (formatter)

network

VSMScheduler
+ jive5ab

Scan files

correlator (DiFX)

MK5**B**

Mark5B
as formatter

MK5**C**

Flexbuff

Correlation performance

5 antennas (Mc-Nt-Ys-Tr-Ir)

2.7 TB data each (13.5 TB total)

Setup: 1024Mbit/s bandwidth - 16 channels - 2 bits sampling

Observation time - 7 h

Correlation time 5.04 h

Quanto pesano i dati?

MWA *visibilities* = ~60 GB

ID	Url	Name	Project ID	Description	Creator	Size (bytes)	RA (deg)	Dec (deg)	FOV (deg)	Start time (UTC)
1199275384	1199275384	FIELD1_93	G0045	MWA diffuse cluster emission	msok	62886853440	20.097	-24.923	53	2018-01-06 12:02:47.961
1199275504	1199275504	FIELD1_121	G0045	MWA diffuse cluster emission	msok	60945848640	12.578	-23.399	43	2018-01-06 12:04:47.971
1199275624	1199275624	FIELD1_145	G0045	MWA diffuse cluster emission	msok	61080868800	13.079	-23.398	35	2018-01-06 12:06:47.980
1199275744	1199275744	FIELD1_169	G0045	MWA diffuse cluster emission	msok	59275431360	13.581	-23.398	30	2018-01-06 12:08:47.990
1199275864	1199275864	FIELD1_69	G0045	MWA diffuse cluster emission	msok	64940811840	14.083	-23.398	76	2018-01-06 12:10:48.000
1199275984	1199275984	FIELD1_93	G0045	MWA diffuse cluster emission	msok	61953137280	14.584	-23.398	56	2018-01-06 12:12:48.009
1199276104	1199276104	FIELD1_121	G0045	MWA diffuse cluster emission	msok	60153721920	15.086	-23.397	43	2018-01-06 12:14:48.019
1199276224	1199276224	FIELD1_145	G0045	MWA diffuse cluster emission	msok	61106356800	15.588	-23.397	35	2018-01-06 12:16:48.028

Quanto pesano i dati?

EVN *visibilities* = da decine a centinaia di GB

JIVE
Joint Institute for VLBI ERIC

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JIVE

- About JIVE
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- ERIC council
- News
- User support
- Visiting JIVE

EVN Correlator

- Correlator overview
- e-VLBI
- Operations
- Software

EVN Data Archive

- Archive home
- Archive introduction
- Browse catalogue
- Search archive
- ParselTongue

Fitsfiles

Info | Feedback | Logfiles | Standard plots | Pipeline | Fitsfiles | Abstract

EVN fitsfiles of experiment GJ014

Access status: public

Download: Use right mousebutton -> Save target.
If the connection is slow, try GNU wget. (manual).
It can be obtained from the web, if not available.

A file selection can be made by filling in the wildcard after the -A option.
To get all fitsfiles of experiment copy next line to your commandwindow:

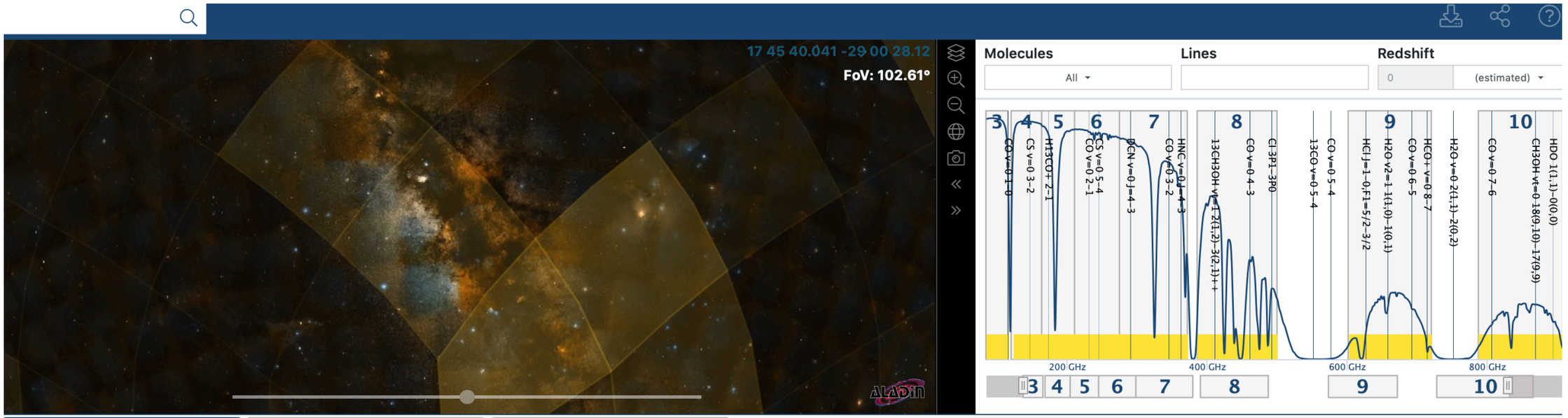
wget -t45 -l1 -r -nd http://archive.jive.nl/exp/GJ014_141021/fits -A "*"

The checksum file can be used to verify the checksum of all datafiles using:
md5sum -c gj014.checksum (on unix systems).

Filename	Length x 10^9 bytes
gj014.checksum	0.000000641
gj014_1_1.IDI1	1.937810880
gj014_1_1.IDI2	1.937810880
gj014_1_1.IDI3	1.937810880
gj014_1_1.IDI4	1.937810880
gj014_1_1.IDI5	1.937810880
gj014_1_1.IDI6	1.937810880
gj014_1_1.IDI7	1.937810880

Quanto pesano i dati?

ALMA *visibilities* = centinaia di GB



Observations (34833) | Projects (2994) | Publications (1521)

Project code	Source	Ra (h:m:s)	Dec (d:m:s)	Band	Cont. sens. (mJy/beam)	Frequency support	↑Release date	Publications	Ang. res. (arcsec)	Min. vel. res. (km/s)	Array	Mosaic	Max. reco. scale (arcsec)	FOV (arcsec)	Scientific ca
2011.0.00191.S	Fomalhaut b	22:57:38.685	-29:37:12.616	7	0.10	343.08..358.84GHz	2012-12-06	2	1.18	0.82	12m		14.43	16.59	Disks and pl
2011.0.00101.S	GRB021004	00:26:54.680	+18:55:41.600	7	0.10	337.01..353.00GHz	2012-12-06	2	1.13	26.54	12m		9.16	16.88	Active galax
2011.0.00131.S	R Scl	01:26:58.079	-32:32:36.424	7	0.74	330.25..346.11GHz	2012-12-06	5	1.25	0.85	12m	mosaic	14.98	62.01	Stars and st
2011.0.00397.S	J041754.10-28165...	04:17:54.100	-28:16:55.900	7	0.48	337.02..353.01GHz	2012-12-20	3	1.26	26.54	12m		8.83	16.88	Active galax
2011.0.00397.S	J061200.23-06220...	06:12:00.230	-06:22:09.600	7	0.49	337.00..352.99GHz	2012-12-20	3	1.43	26.54	12m		9.99	16.88	Active galax
2011.0.00397.S	J063027.81-21205...	06:30:27.810	-21:20:58.600	7	0.47	337.00..352.99GHz	2012-12-20	3	1.43	26.54	12m		10.03	16.88	Active galax
2011.0.00397.S	J035448.24-3308...	03:54:48.240	-33:08:27.200	7	0.48	337.02..353.01GHz	2012-12-20	3	1.37	26.54	12m		9.62	16.88	Active galax

Quanto pesano i dati?

LOFAR *visibilities* = centinaia di GB

LOFAR Long Term Archive

LOGIN

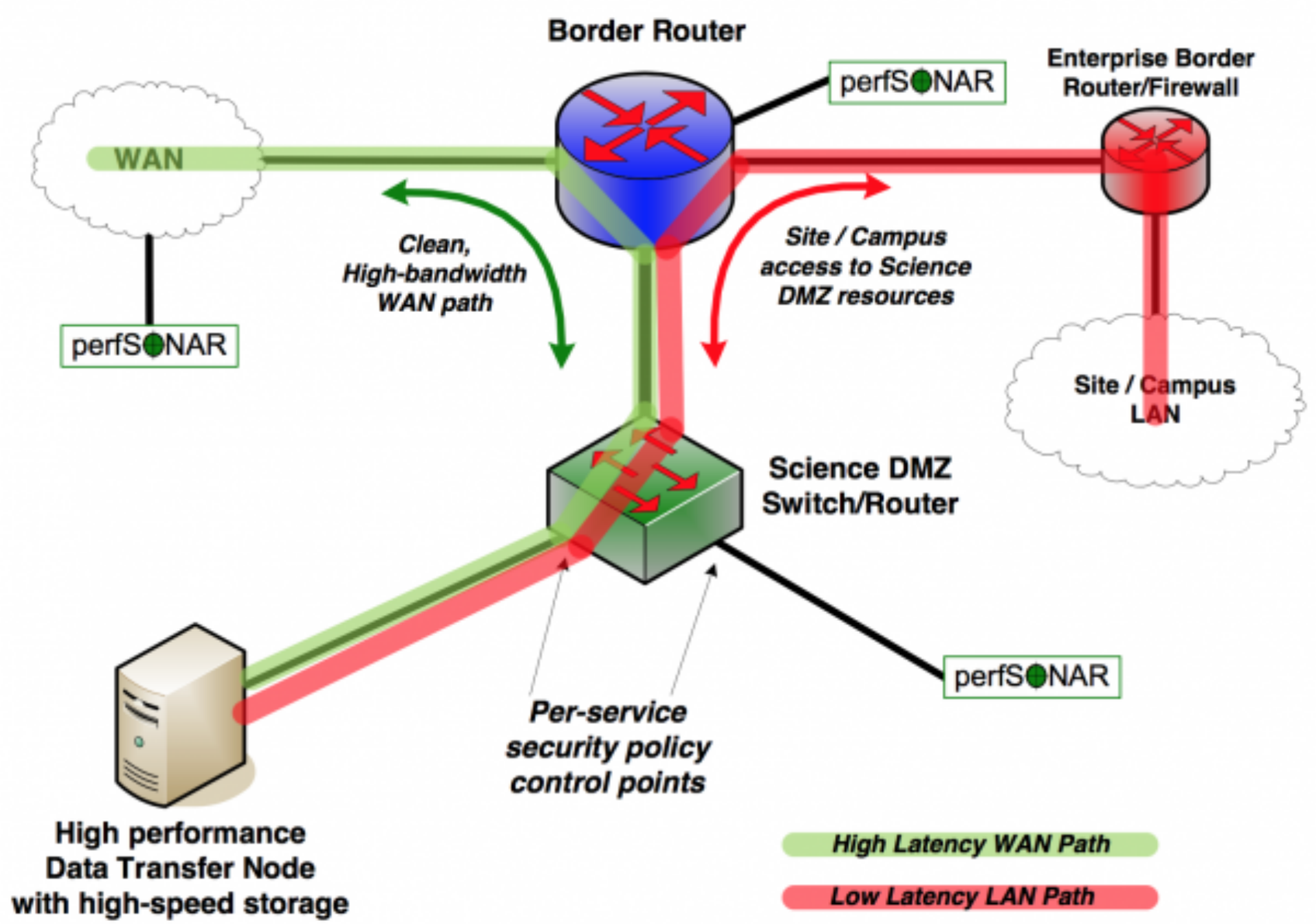
HOME SEARCH DATA BROWSE PROJECTS HELP LC9_015

Observation (total 18)

edit columns

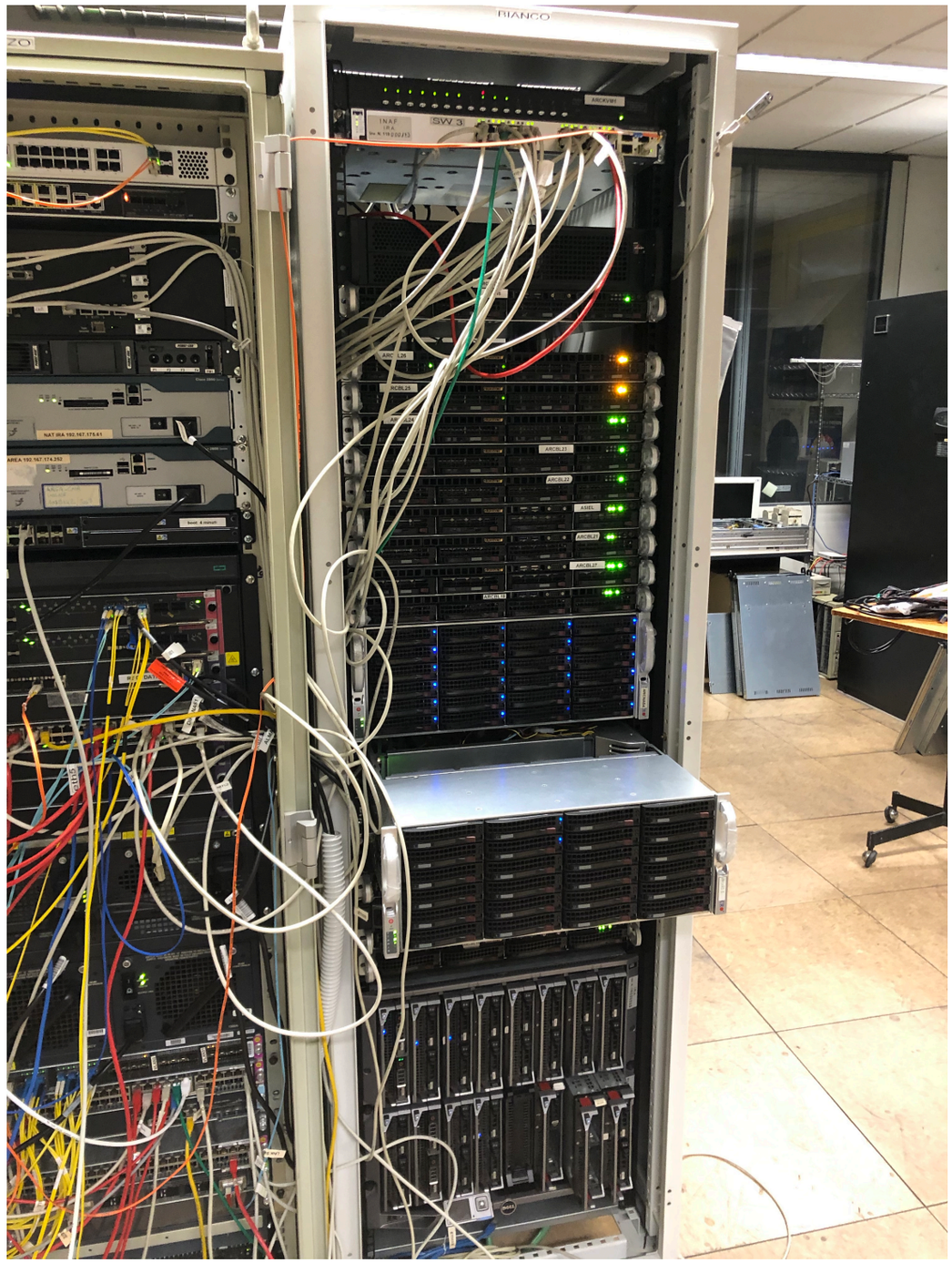
#	Project	Release Date	SAS Id	Antenna Set	Instrument Filter	Channel Width [MHz]	Number Of SubArray Pointings	Nr Stations Core	Nr Stations Remote	Nr Stations International	Number Of Stations	Number Of Correlated DataProducts	Number Of BeamFormed DataProducts
1	LC9_015	2019-01-11	632515	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	12	50	243	0
2	LC9_015	2019-01-11	632509	HBA Dual Inner	110-190 MHz	0.000000	3	24	14	12	50	486 / 487	0
3	LC9_015	2019-01-11	632505	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	12	50	243	0
4	LC9_015	2019-01-11	632529	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	13	51	243	0
5	LC9_015	2019-01-11	632523	HBA Dual Inner	110-190 MHz	0.000000	3	24	14	13	51	486 / 487	0
6	LC9_015	2019-01-11	632519	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	13	51	243	0
7	LC9_015	2019-01-11	632233	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	13	51	243	0
8	LC9_015	2019-01-11	632227	HBA Dual Inner	110-190 MHz	0.000000	3	24	14	13	51	486 / 487	0
9	LC9_015	2019-01-11	632223	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	13	51	243	0
10	LC9_015	2019-01-11	626682	HBA Dual Inner	110-190 MHz	0.000000	1	24	14	13	51	243	0
11	LC9_015	2019-01-11	626676	HBA Dual Inner	110-190 MHz	0.000000	3	24	14	13	51	486 / 487	0

Data Transfer Nodes (DTN)



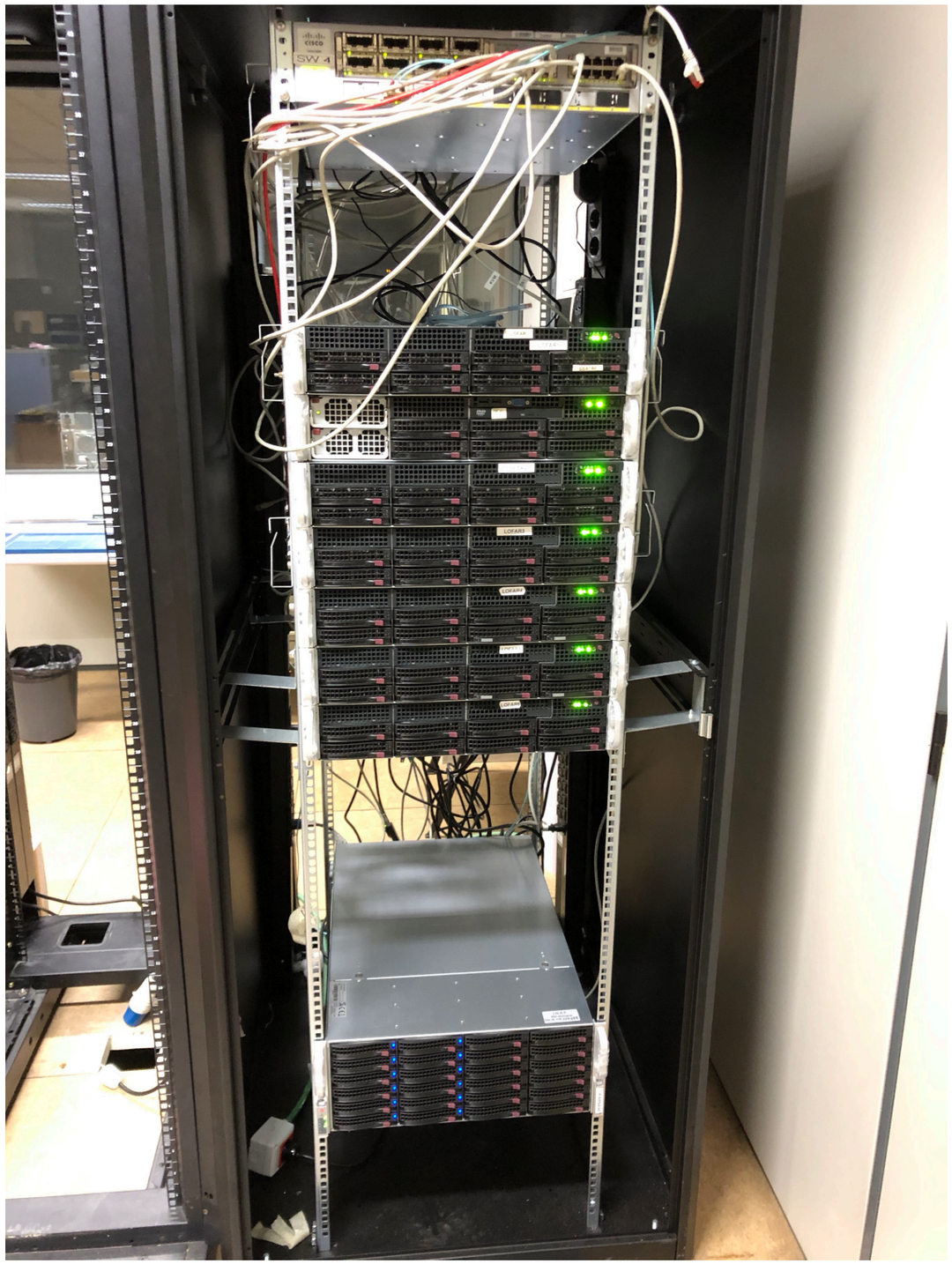
Cluster ALMA

- ~15 nodi
- /local/work scratch SSD or RAMDISK
- 200t storage su LUSTRE
- 10 Gbit networking

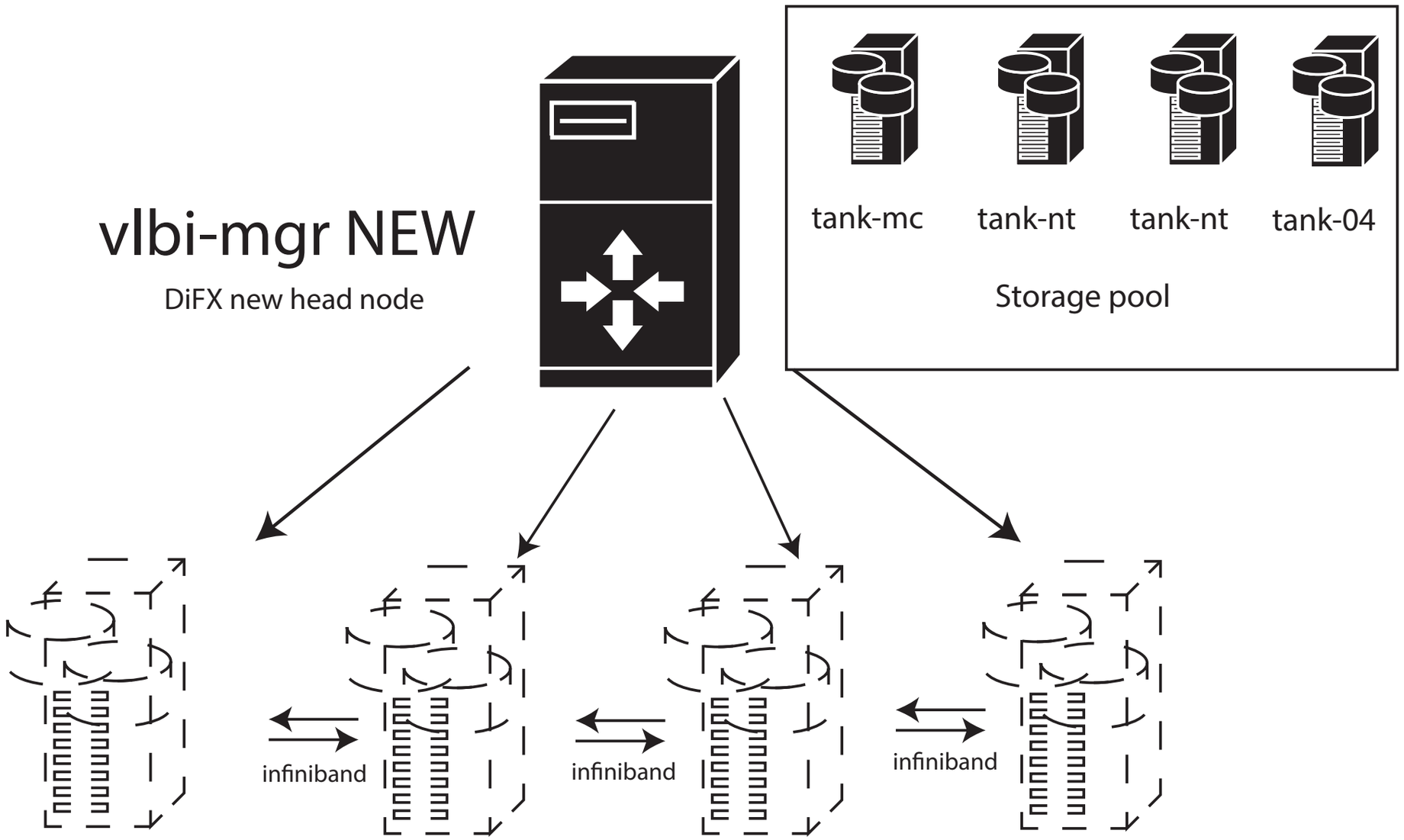


Cluster LOFAR

- 6 nodi + 1 storage
- /local/work scratch SSD or RAMDISK
- 90TB storage su btrfs
- 10 Gbit networking



Update correlatore



Update correlatore

NEW Compute nodes

- Aggiornamento CPU
- Aggiornamento storage su SSD
- Infiniband per mantenere bassa latenza
- Separazione tra nodi dedicati storage/trasferimento e nodi correlatore

Domande - commenti?