Data recording system compatible with VGOS

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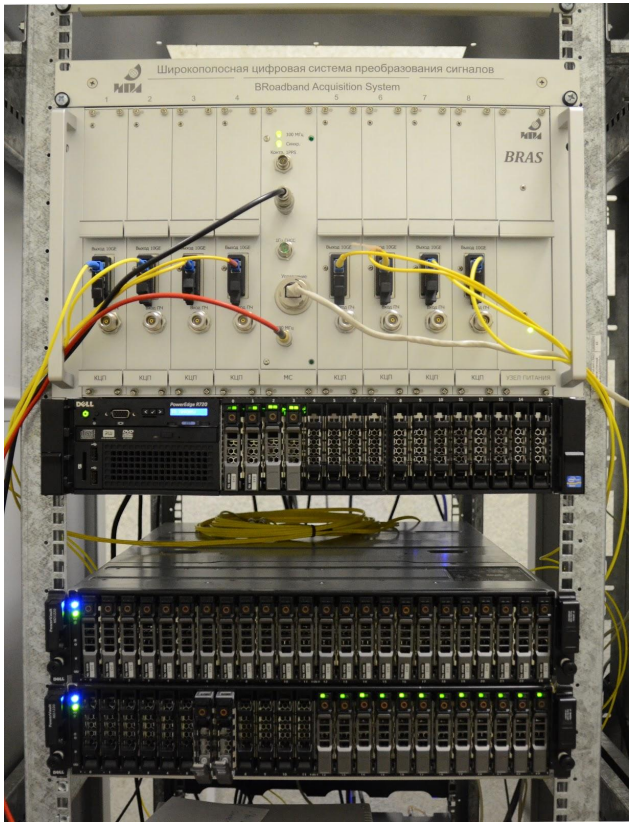
Review

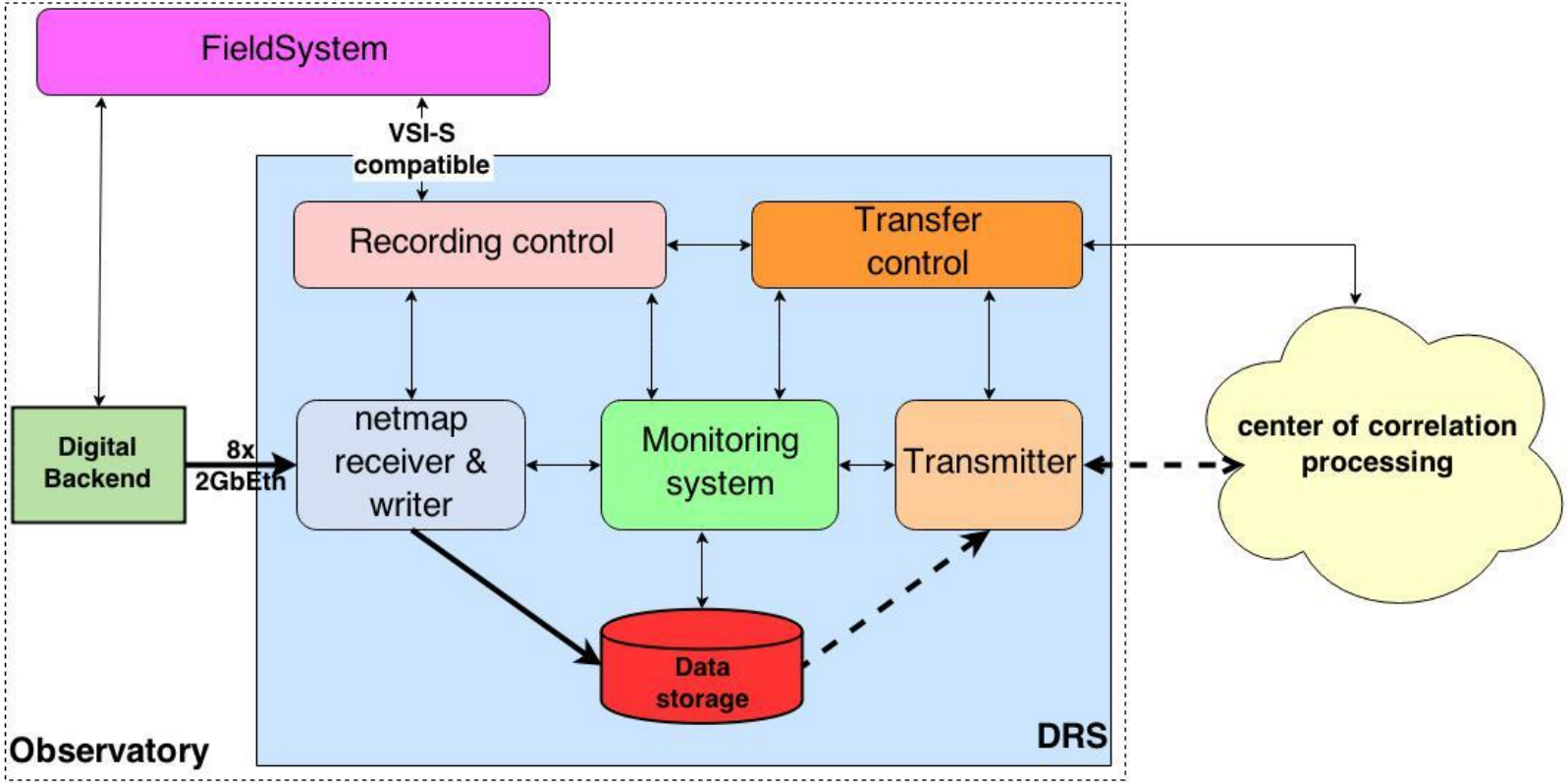
- DRS: General Key features;
- Software design;
- Hardware and Software layout;
- Disk subsystem;
- Main results and future plan.

DRS: General Key features

1. Registration of 8 parallel data streams with a common recording rate up to 16Gbps;
2. Recording raw ethernet packets (VDIF or any protocols based on ethernet);
3. e-transfer simultaneous with the data registration;
4. Daily storage of the observational data.



DRS: Software design



DRS: software layout

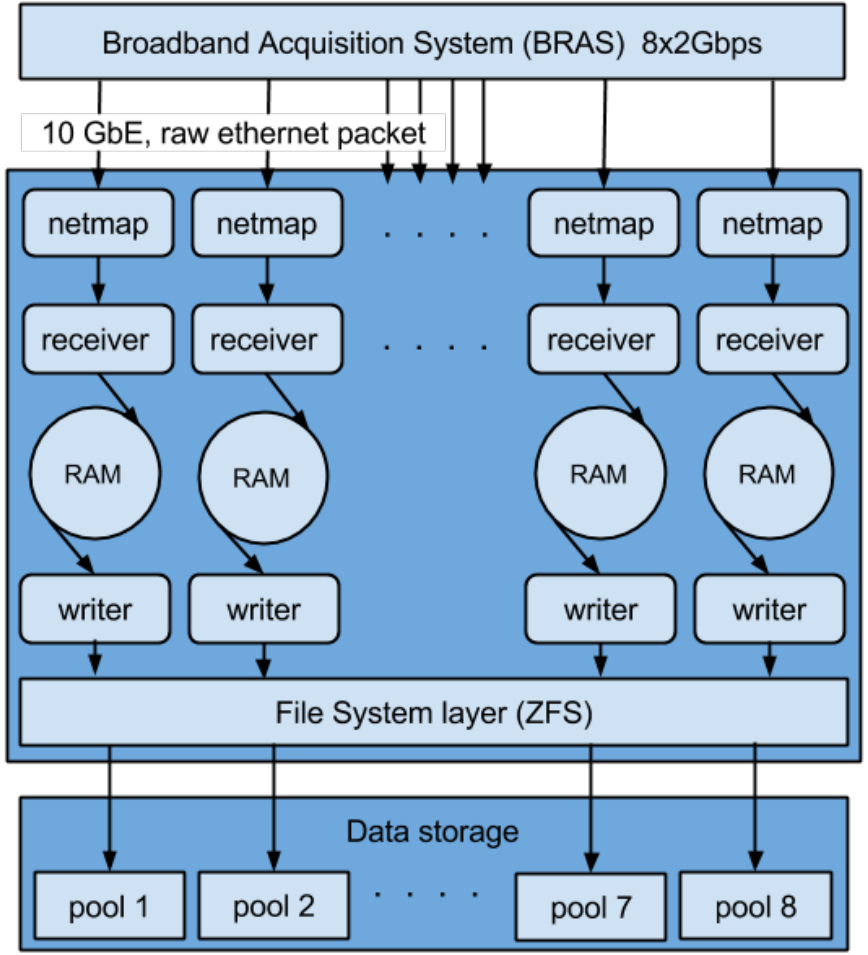
- OS: Freebsd 10.1;
- FS: ZFS (Zettabyte Filesystem);
- Netmap: a novel framework for fast packet I/O.

FreeBSD®

OpenZFS

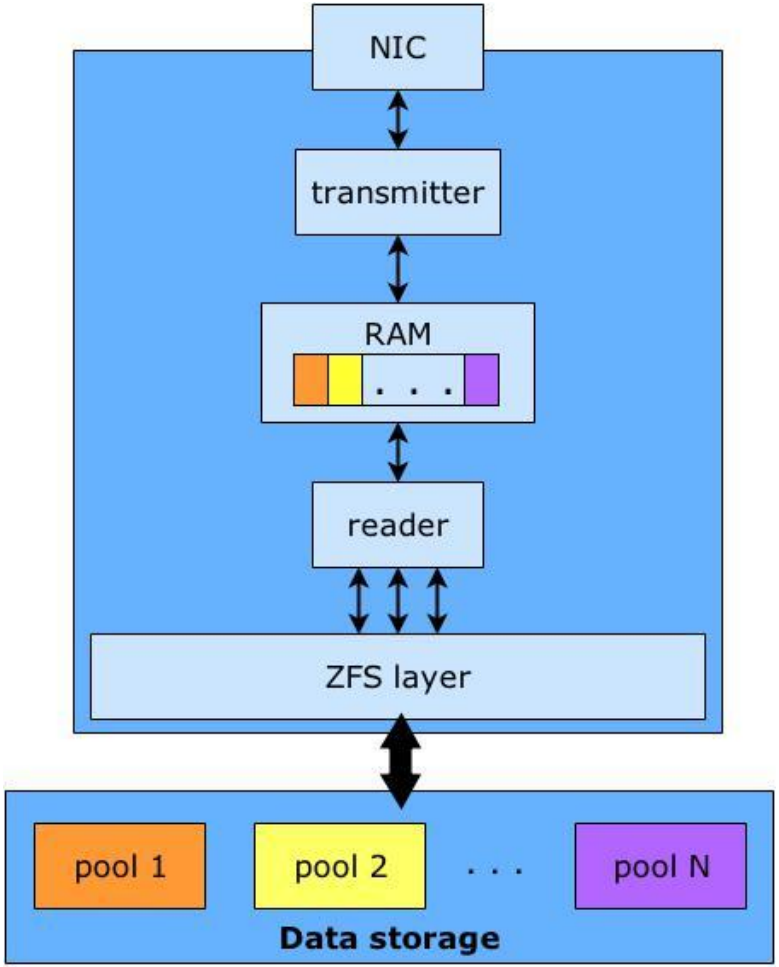
Receiver & Writer

- Each channel digital backend processed separately;
- Data is stored as a file;
- By default, the file size is limited to 256MB(1 sec).



Transmitter design

- transmit data at a speed of external channel to CCP;
- ZFS I/O sheduler & write throttle.



Monitoring system

Main goal:

- synchronization;
- supervision.

Monitoring:

- NIC (netstat);
- disk subsystem (iostat, zfs utilities);
- CPU and memory (vmstat).

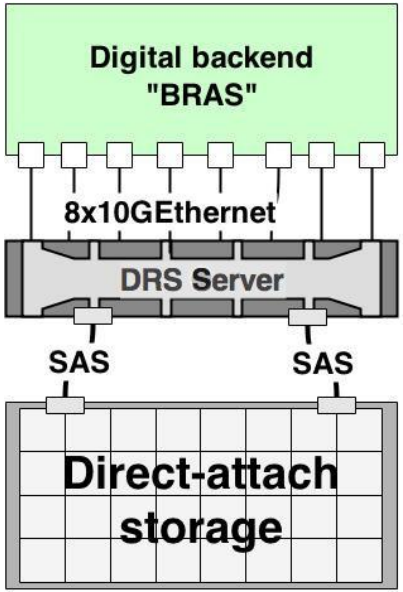
DRS: hardware layout

Direct-attached storage	
HBAs, 6Gb/s SAS	PERC H800
Drives	Up to 24 2.5” hot-pluggable SAS or SSD/NL-SAS/SATA

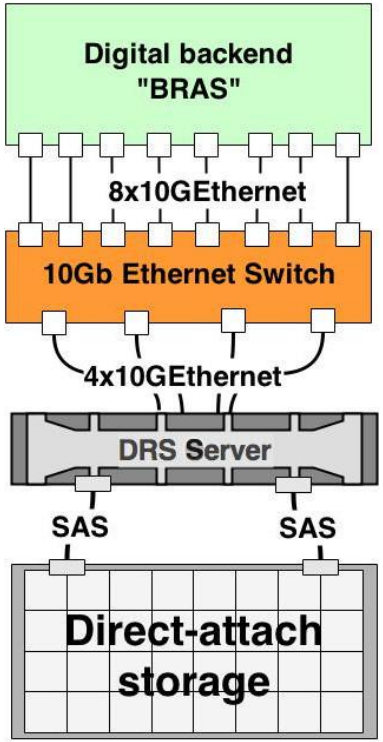
Server	
CPU	2 x Intel Xeon Processor E5-2643 V2 @3.50 GHz
RAM	256 Gb 1600 MHz
PCI-express v 3.0	1 x16; 6 x8
Internal HBAs (SAS2008)	PERC H310 (analog LSI SAS 9211-8i)
External HBAs (SAS2008)	2 x 6Gbps SAS HBA (analog LSI SAS 9200-8e)
NIC	4 x Intel(R) 10G 2P X520 Adapter
Disk	up to 16 2.5” SAS/SSD/NL-SAS/SATA

DRS: optional equipment

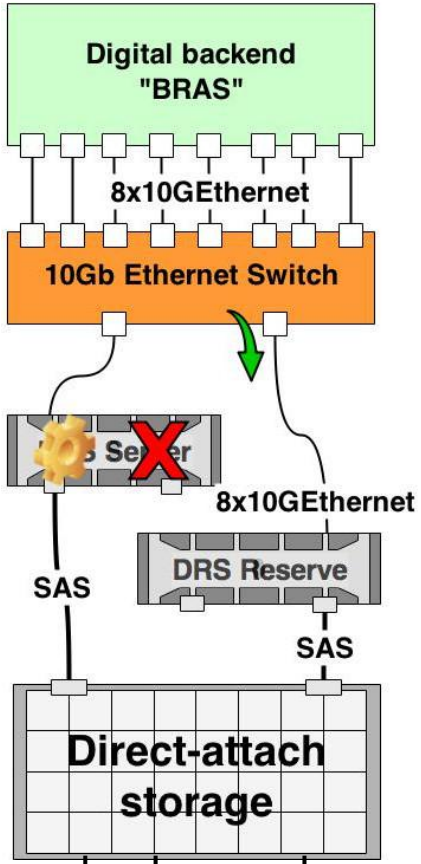
10Gb Ethernet Switch



a) direct connect



b) link aggregation



c) redundancy scheme

Disk subsystem

- Registration of 8 parallel data streams with a common recording rate up to 16Gbps (2Gbps from each channel);
- e-transfer simultaneous with the registration data (e-transfer rate -> recording rate);
- Fault tolerance disk storage (soft raid).

We tested:

- SAS 10k rpm;
- low cost MLC SSD;
- NL SAS 7.2k rpm;
- 3.5 SATA 7.2k rpm drives.

Test utilities:

- dd;
- netmap packet generator;
- digital backend BRAS.

Disk subsystem: results

Results of testing disk performance for various observation cycle

Observational cycle recording/pointing, sec	1 channel write rate, MBps	type of disks
guiding the source	250	SAS
40/20	190	SAS
30/30	141	SAS/SATA
7.5/22.5	65	SAS/SATA

*We recommend using SAS or NL SAS drives

Main results

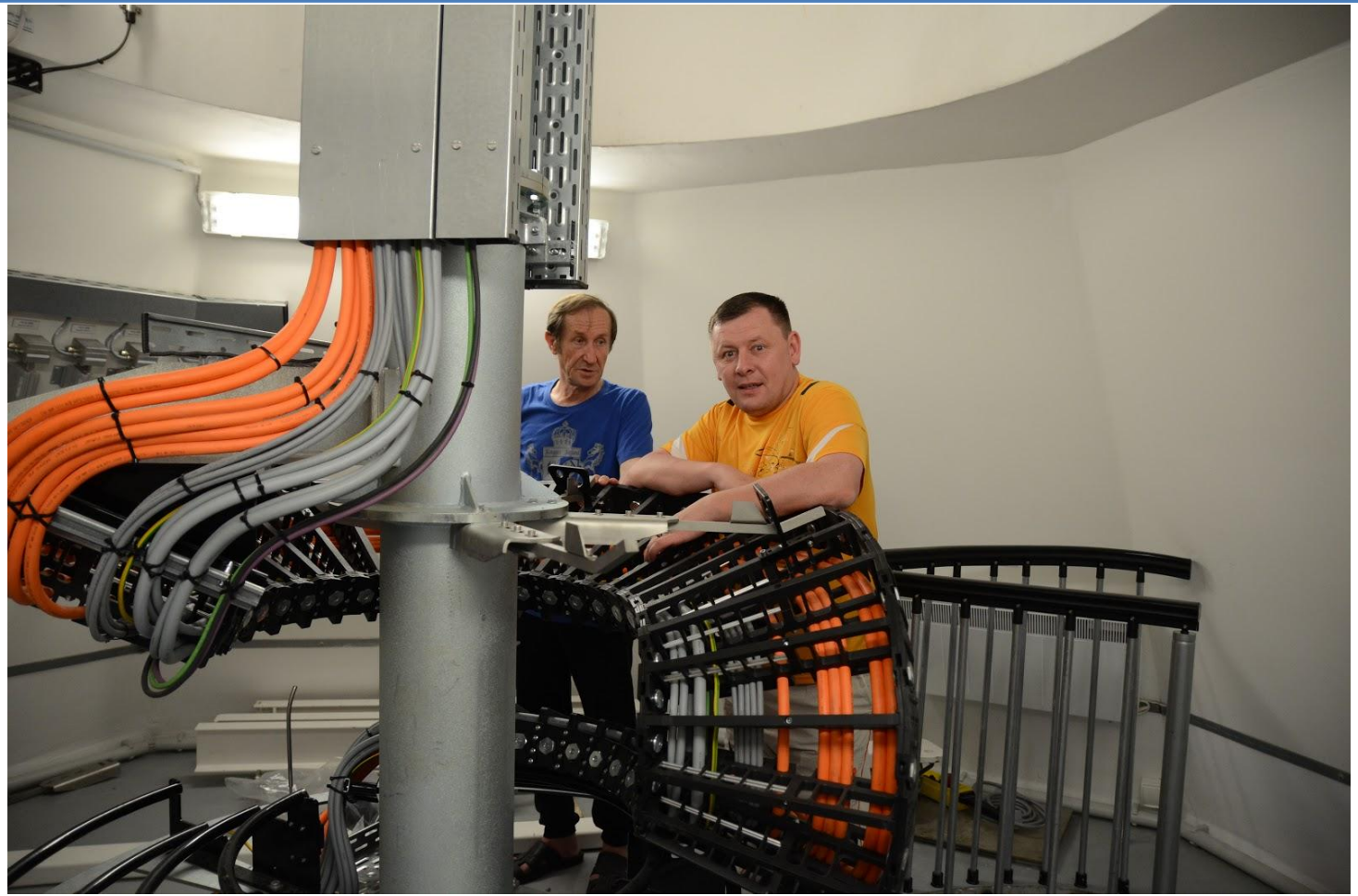
- Recording 16 Gbps (8x2Gbps BRAS). Without packet loss;
- e-transfer simultaneous with the data recording;
- Test recording 32 Gbps (8x4Gbps netmap packat generator);
- Currently, our system is installed in the observatories "Zelenchukskaya" and "Badary".

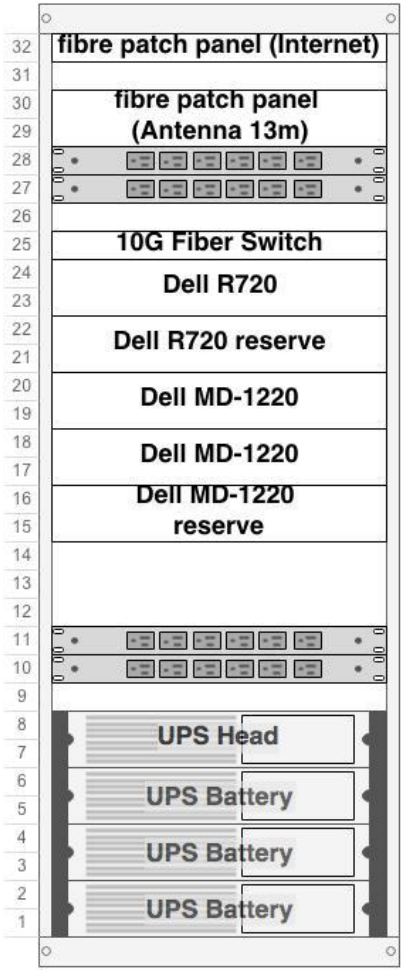
Upcoming plans

- Complete development of software components;
- In the near future we plan to record intensive session on the basis of a 32-meter radio telescope complex Quasar-KVO using two channels (out of eight) of BRAS;
- After that we plan to conduct record of all 8 channels on new 13-meter antennas.

Thank you for your attention


SUBREFLECTOR CONTRO

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fibre patch panel (Internet)
fibre patch panel (Antenna 13m)
10G Fiber Switch
Dell R720
Dell R720 reserve
Dell MD-1220
Dell MD-1220
Dell MD-1220 reserve
UPS Head
UPS Battery
UPS Battery
UPS Battery