NA61 software and productions

- input from NA49 software
- NA61 AFS space and CVS repository
- NA61 software pre-releases (v0r0 & v0r1)
- NA61 environment for owners of the NA61 (wj) accounts
- tests of the reconstruction and simulation chains
- basic CVS tutorial
- task list vs manpower
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- experience from the 2007 run
- test productions
- conclusions

Boris A. Popov

Input from NA49 software

The current version of the NA61 software is based on the code developed in the framework of the NA49 collaboration. The core is taken from the existing NA49 CVS repository. The current code is a mixture of C and Fortran (including some non-standard features as POINTER and STRUCTURE).
It was developed during early 1990-ies.

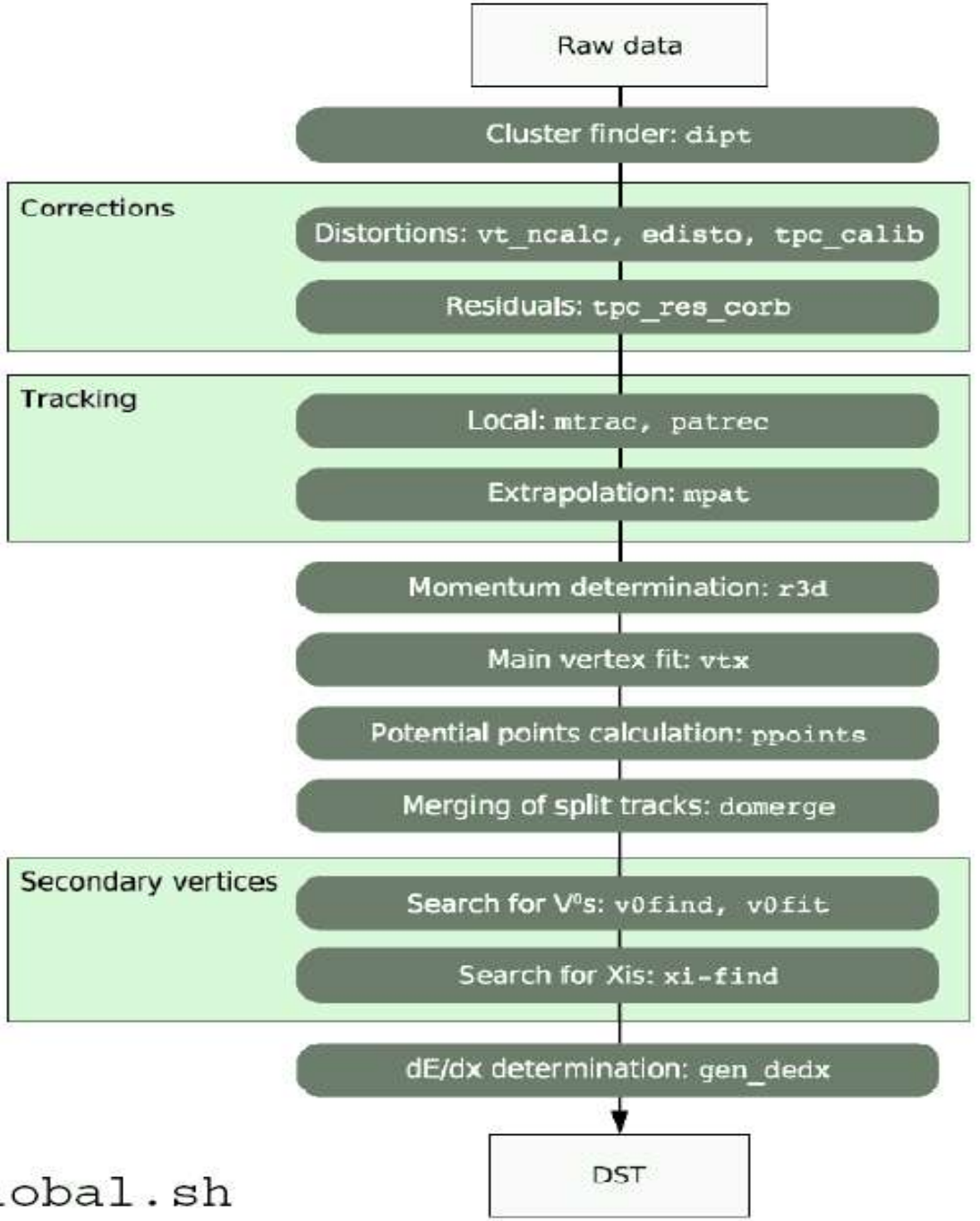
However, some important versions of the key programs are distributed over public AFS areas of NA49 collaboration members. This software should be identified and merged with the code available under CVS. The same is true for the calibration procedures. Some important changes and bug-fixes have not been propagated to the CVS. Some functionalities are now broken due to migration to a new operating system (OS) and to a new data storage (CASTOR).

It was decided to setup the NA61 software at CERN using the lxplus cluster with the current version of the OS – Scientific Linux CERN (SLC4).

Input from NA49 software

Reconstruction Chain

set of executables (clients),
scripts and libraries



Script:
`$NA49/dev/SCRIPTS/src/global.sh`

NA61 AFS space and CVS repository

At the beginning of August we managed to obtain some dedicated AFS space for the NA61 experiment /afs/cern.ch/na61/ and started to develop the corresponding structure. For the moment there are six subdirectories (CvsRepository, Releases, Software, Data, MC and Production). In the first subdirectory the NA61 CVS repository has been created. This AFS area is open for writing for all users with NA61 accounts (cern:wj group). The other subdirectories are open for reading for the members of the cern:wj group and for writing for the members of the software management group (_na61_:software) and NA61 AFS management group (_na61_).

For the moment :

_na61_ (Wolfgang, Boris)

_na61_:software (Tanja, Grzegorz, Boris, prodna61)

Could be modified if needed.

NA61 environment and software pre-releases

The first two pre-releases (v0r0 & v0r1) of the NA61 software in the AFS area /afs/cern.ch/na61/Releases/ have been made (the corresponding code got CVS tags "v0r0" and "v0r1"). The default wj group environment has been set to point to /afs/cern.ch/na61/Releases/pro (keeping the same naming scheme as in NA49). The CVSROOT points to /afs/cern.ch/na61/CvsRepository

The NA61 sources were compiled on SLC4 32 bits (lx32slc4) but one should be able to run the executables on SLC4 64 bits (lxplus) as well.

Some tests have been performed by both "developers" and "users" (no major problems found up to now).

Reconstruction chain has been heavily used by Grzegorz and Boris during the 2007 run for off-line data quality checks.

Simulation chain has been tested by Sebastien and Nicolas.

Analysis tools (root49/61) have been tested by Anselmo et al.

Steps to use the new NA61 software

General information for (unexperienced) users:

- Obtain your new NA61 lxplus account (if not yet done) from Wolfgang/Boris;
- Login and test that the environment is properly set: e.g. check that the CVSROOT environment variable points to /afs/cern.ch/na61/CvsRepository:

```
env | grep CVSROOT
```

- If you just want to run already existing executables you should login to SLC4 64 bits machines: lxplus (you then gain in CPU power).
- In case you want to checkout some sources from the CVS repository, make some changes and recompile you should login to SLC4 32 bits machines: lx32slc4, e.g. you want to work on the new GEANT simulation for NA61

```
cvs checkout pro/GNA61
cd GNA61
make
```

- The IT resources have been allocated to NA61 (possible to use lxbatch system)

Simple rules to use CVS repository

We have chosen a strategy when any owner of the NA61 account could commit changes to the CVS repository.

Please, respect some very simple rules:

- when you want to commit your changes to the CVS repository you should first check for possible updates

cvs update (or rather cvs update -A -d)

- then make sure that there are no conflicts between your changes and the ones already committed by other developers (no C sign in front of any filename). If there are conflicts you have to go through them and resolve them by hand (searching for, e.g. <<< constructions inside your files). A good test would be to run make to check that the code still compiles

- if this is the case you are now ready to make

cvs commit -m “short description of what you have done”

(an automatic e-mail will be sent to the members of the software management team)

Further developments

The most urgent tasks (from my personal point of view):

- incorporate changes in the reconstruction algorithms, test them under SLC4 and make a real NA61 software release.
- validate a version of the new NA61 geometry and NA61 simulation chain, test its compatibility with the existing reconstruction chain.
- identify the most critical changes needed for the 2007 data analysis (both in the reconstruction/analysis algorithms and in the tools for the on-line monitoring and the data quality assessment). Develop missing tools asap.
- organize a more general validation procedure for all changes in the software; agree on the tools to be used and include the missing items in the standard software toolkit (put them under CVS).
- continue efforts of collecting all the useful software which is a part of the DAQ, calibration and/or validation (data-quality) procedures. This is really important for the future to keep track of all changes!
- learn how to run production on a large scale.

Software task list (without calibration)

We should try to make a "complete" software task list and to review the available manpower. My educated guess:

- Validation of the existing software (Tanja/Grzegorz ?)
- Simulation chain (Nicolas/Sebastien/Claudia ?)
- Reconstruction chain (Tanja/Grzegorz/Boris ?)
- ROOT/Analysis tools (Anselmo ?)
- Software management/Releases (Boris/Grzegorz/Tanja ?)
- On-line monitoring (Zoltan/Swiss groups ?);
- Event display, TOPVIEW (Daniel/Michael/Florin ?)
- Data quality assessment (Zoltan/Vladimir/Grzegorz)
- Off-line monitoring (Grzegorz/Boris ?)
- Production management (Tanja/Grzegorz/Boris ?) [could be critical]
  - data base handling/bookkeeping
- Software compatibility (raw data format, detector configuration e.g. GTPC)

(of course, each of the items above should be further developed and specified; additional responsibilities should be assigned to other collaboration members)

Other “critical points”

We should identify and try to overcome the existing “critical points” of the current software scheme:

1) “Data base” inherited from NA49 (which is not a data base... but just a file with calibration constants). Based on mini SQL (http://www.hughes.com.au/) The sources are now recompiled under SLC4.

The DB should be made accessible for computers outside CERN.

2) Fortran compiler. We use non-free PGI compiler (http://www.pgroup.com/) version 6.04. A license has been bought by CERN. To make the NA61 software portable it would be preferable to use a free fortran compiler. A possible candidate to replace pgf77 is the Intel fortran compiler for Linux (http://www.intel.com/cd/software/products/asmo-na/eng/282048.htm). The current software compiles with ifort... but the data access from fortran clients does not work (due to changes needed in DSPACK). Probably this would be easy to fix for a DSPACK developer (Predrag Buncic). But...

3) DSPACK - the core of the current software scheme - has been developed in early 90-es. It would be preferable to replace it with something modern, e.g. ALICE-based. Requires a lot of dedicated manpower...

General event display for NA61

Main purposes of an event display

- To display raw and reconstructed objects together with the detector geometry
- Check detector performance
- Develop and optimize reconstruction algorithms
- Compare simulated and reconstructed information
- Verify matching between different subdetectors
- etc.

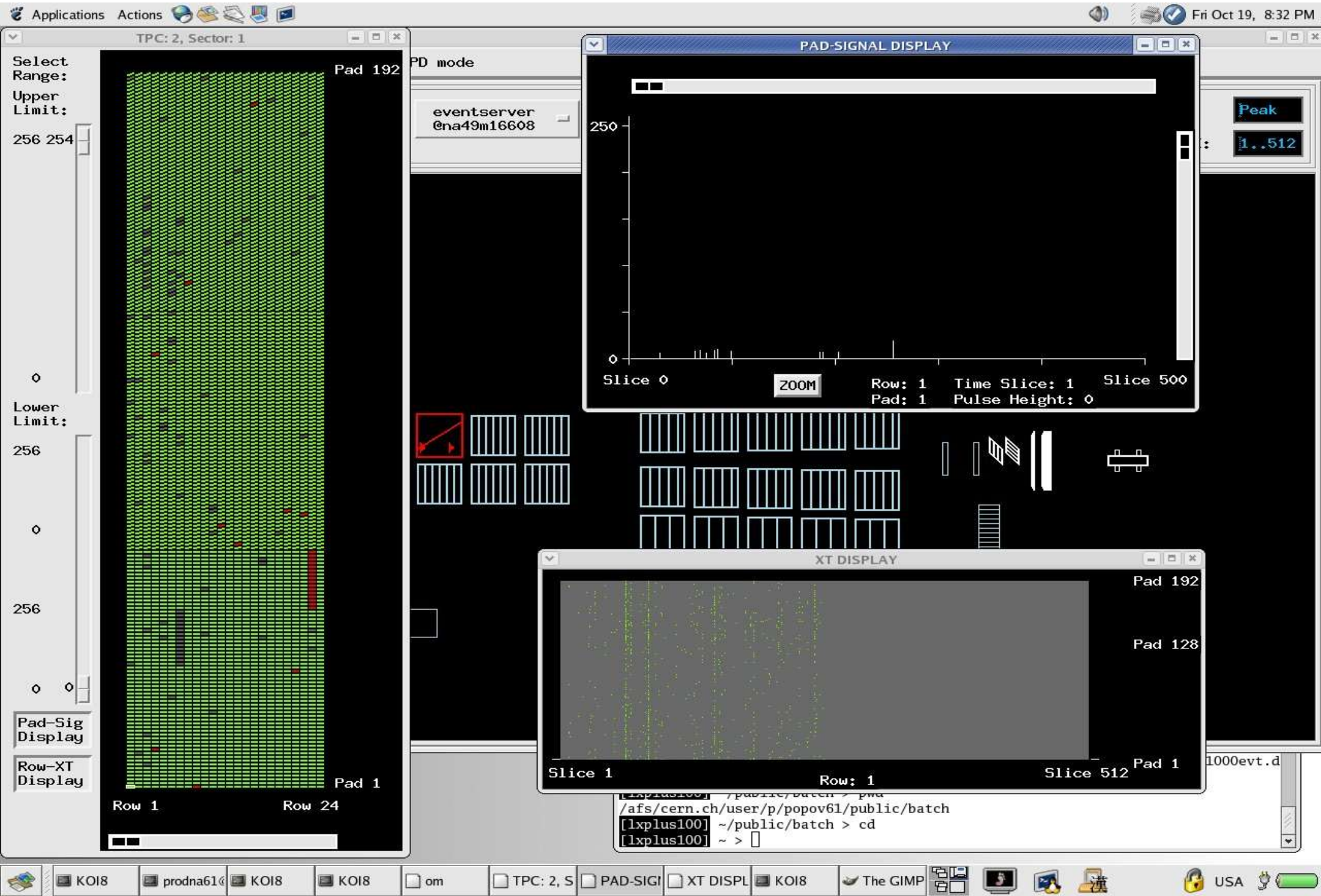
Current situation in NA61

- Some visualization tools inherited from NA49 exist already in the NA61 software toolkit
- Their performances are rather limited due to the fact that this software was developed 10-15 years ago
- We should consider seriously a possibility to develop a new general event display, e.g. based on ROOT

Existing visualization tools (inherited from NA49)

- om (on-line monitoring) / Zoltan
  - heavily used during the 2007 data-taking
  - works directly on raw data
- topview / Daniel
  - was used at the beginning of the 2007 run
  - works on raw data converted to the DSPACK format (bos2ds)
  - for more details see the topview_manual.pdf prepared by Daniel
- x3d / Boris
  - can be used to scan reconstructed events
  - works on DSPACK files
  - can display only one event which is currently in the DSPACK server
- qcdisplay / Boris
  - can be used to scan reconstructed events
  - works on DSPACK files
  - can display consecutive events from the DSPACK server
  - a possibility to save the current picture in the PostScript format

OM


Applications Actions
Fri Oct 19, 8:32 PM
TPC: 2, Sector: 1
Select Range:
Upper Limit:
256 254
0
Lower Limit:
256
0
256
0 0
Pad-Sig Display
Row-XT Display
Pad 192
Pad 1
Row 1
Row 24
PD mode
eventserver @na49m16608
Peak
1..512
PAD-SIGNAL DISPLAY
250
0
Slice 0
ZOOM
Row: 1
Pad: 1
Time Slice: 1
Pulse Height: 0
Slice 500
XT DISPLAY
Pad 192
Pad 128
Pad 1
Slice 1
Row: 1
Slice 512
1000evt.d
/afs/cern.ch/user/p/popov61/public/batch
[lxplus100] ~/public/batch > cd
[lxplus100] ~ >
KOI8
prodna61@
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KOI8
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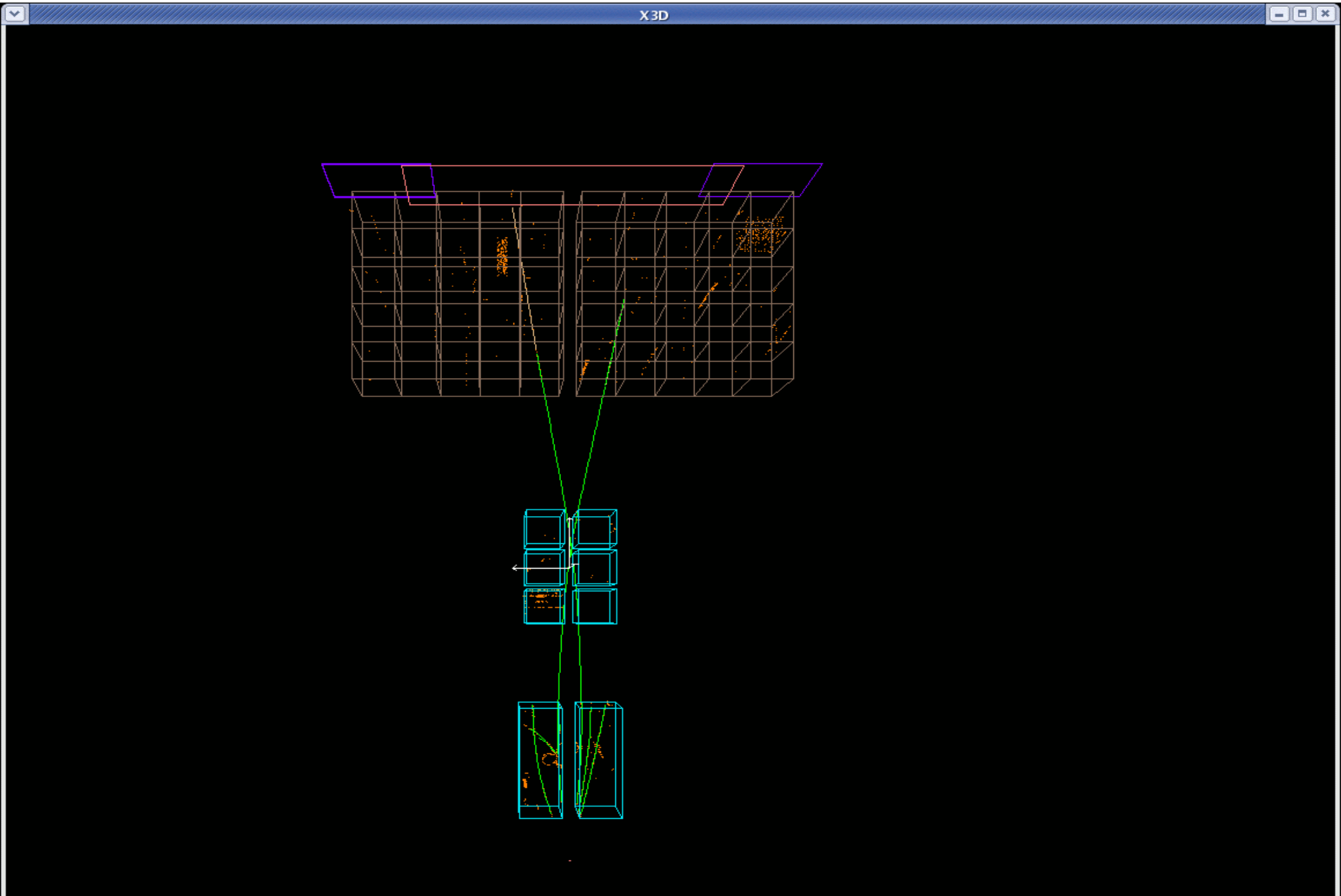
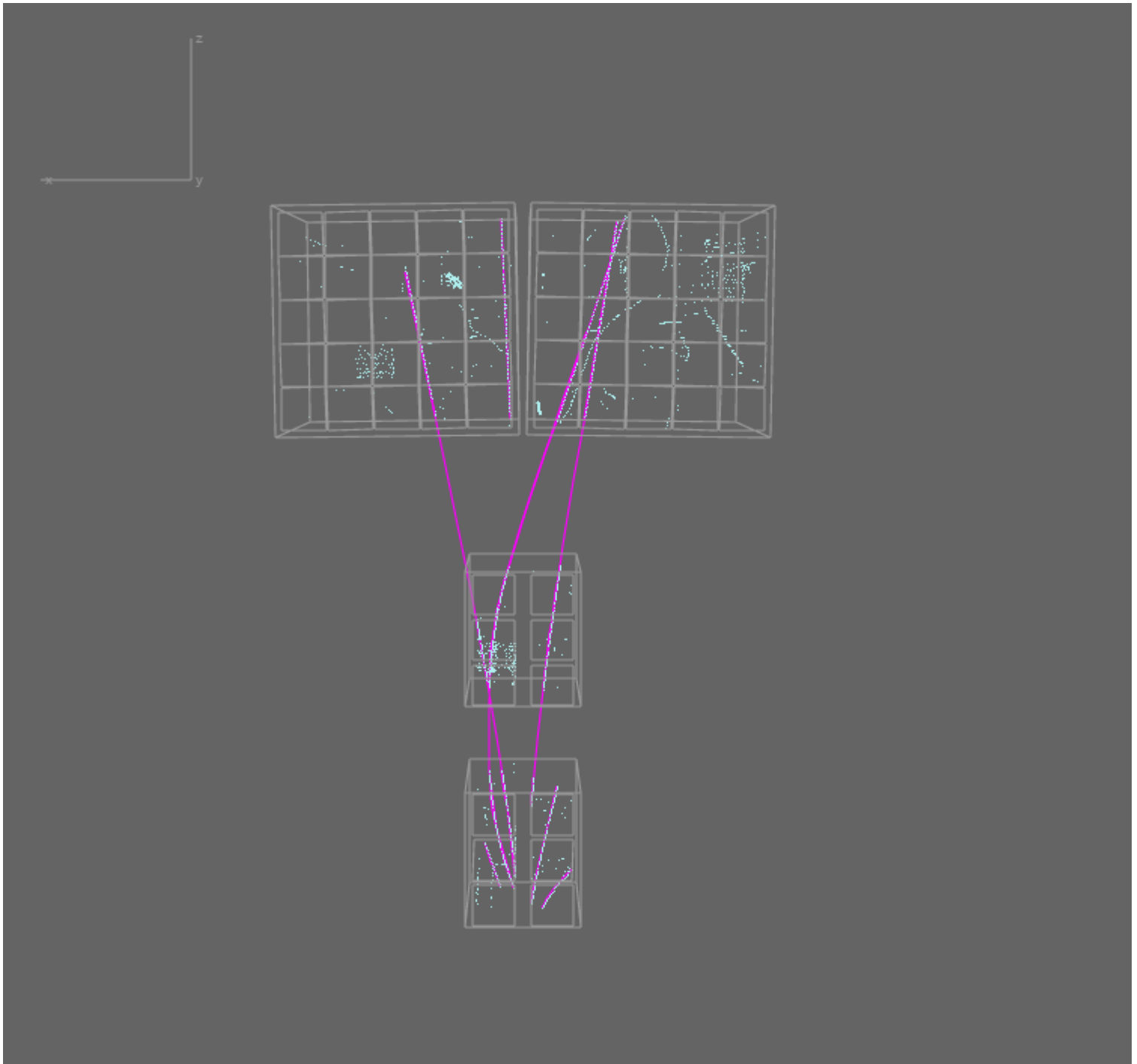
NA61 events in x3d



NA61 event in qcdisplay



Personal remarks

- Since the code for the existing visualization tools has been developed more than 10 years ago it is now rather difficult to include more functionalities
- For example, if we want to include TOF information into these tools we would need to go through low level drawing routines
- If there is a dedicated manpower available (or if there is somebody just interested) it would be preferable to build a new event display, e.g. based on ROOT:
  - the major ingredients are already there (geometry description in GEANT3 could be extracted and converted to ROOT; access routines to get objects from the DSPACK server could be extracted from the existing software);
  - only the drawing of objects in the ROOT format should be added.

(not too difficult from my point of view... but we could really profit from this afterwards when developing further reconstruction algorithms or just scanning events at the analysis level since the analysis and visualization tools would be unified).

First experience from the 2007 run

- Raw data storage
  - transfer data to CASTOR (transfer speed from na61pc001 to CASTOR is about 50 Mb/s); could become critical after TPC read-out upgrade...
  - special account prodna61 for data management and production is created
  - we obtained a dedicated NA61 space on CASTOR (/castor/cern.ch/na61)
  - the 2007 raw data are stored in /castor/cern.ch/na61/07/T2K/thin and /castor/cern.ch/na61/07/T2K/replica ... but we had some problems...
- Raw data format
  -after the TOF read-out upgrade the format of the TOFD bosbank is different
    https://twiki.cern.ch/twiki/bin/view/Sandbox/NA61TofDaqUpgrade
  - the corresponding decoding routine has been included in check_raw_data
- Data base, calibration constants and the corresponding mini client
  - as expected the most critical item
  - still to be solved in order to run the reconstruction chain on 2007 data with the full functionality

First experience from the 2007 run

- Data processing
  - run mini-productions using lxbatch on randomly selected runs for the off-line data quality checks; turned out to be extremely useful; some output files in both DSPACK and ROOT format are stored in /afs/cern.ch/na61/Data/07/T2K (more data -mainly DSPACK files - are available on CASTOR in /castor/cern.ch/user/p/popov61and /castor/cern.ch/user/p/prodna61)
- Real production
  - should include software certification procedure
  - we have to make a real NA61 software release tagging the code under CVS
  - production should include several stages (first stage for calibration purposes)
  - validation of calibration constants, data base and relevant mini clients
  - final stage down to the ROOT mini-DST level (should decide on the DSPACK output)
  - organize a proper bookkeeping, etc.

Conclusions

- NA61 software and CVS repository have been setup on lxplus at CERN
- the reconstruction and simulation chains have been tested
- the data from 2007 run are stored using the CERN infrastructure
- first NA61 mini-productions have been run
- first tests on the portability of the existing software have been performed (installation at the computer cluster in Lyon)
- the DB issues are being worked on

However...

- It is important to reinforce the current NA61 software group: we have to divide tasks and to work in close contact (make a list of tasks and to review available manpower)

On the other hand, the atmosphere in the NA61 software group is friendly...