



УНИВЕРЗИТЕТ У БАЊОЈ ЛУЦИ
UNIVERSITY OF BANJA LUKA
ЕЛЕКТРОТЕХНИЧКИ ФАКУЛТЕТ
FACULTY OF ELECTRICAL ENGINEERING



Grid Computing for Large-Scale Scientific Research in a Small Country

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Setting the scene

- Banja Luka is a small city
 - In a small country
- "Smallness" is not a physical property
 - It is a state of mind
 - It is the fear of "larger" and being judged by it
- EU projects were "few and far between"
- Isolation into silos - not helpful

SEE-GRID

- Proving grounds
- Establishing the first Grid cluster BA-01-ETFBL
 - Followed by BA-02-ETFIS
 - And BA-03-ETFSA and BA-04-PMFSA
- Opening
 - of different departments to each other
 - of different institutions to each other
- Connecting people and ideas - showing what is possible
- Friendships that outlasted any project or infrastructure





```

c01.grid.etfbl.net - ssh - You Service Shell
[antun@ece antun]$ edg-job-status https://rb.phy.bg.ac.yu:9000/AwqpbT-8Gvtbtz21G8gfn
Current Status: Scheduled
Status Reason: Job successfully submitted to Globus
Destination: c01.grid.etfbl.net:2119/jobmanager-pbs-seegrid
reached on: Sun Nov 6 11:03:22 2005
*****

[antun@ece antun]$ edg-job-status https://rb.phy.bg.ac.yu:9000/AwqpbT-8Gvtbtz21G8gfn
*****

BOOKKEEPING INFORMATION:

Status info for the Job : https://rb.phy.bg.ac.yu:9000/AwqpbT-8Gvtbtz21G8gfn
Current Status: Running
Status Reason: Job successfully submitted to Globus
Destination: c01.grid.etfbl.net:2119/jobmanager-pbs-seegrid
reached on: Sun Nov 6 11:04:50 2005
*****

antun]$

```



```

[anton@ce.anton.nl] ~
WAL 12:58:42 PM
[anton@ce.anton.nl] ~
Current Status: Running
Status Reason: Job successfully submitted to Globus
Destination: c81.grid.etfbl.net:2119/jobmanager-pbs-seegrid
reached on: Sun Nov 6 11:04:50 2005
.....
[anton@ce.anton.nl] ~$ wget -q -O- https://rb.phy.bg.ac.yu:9000/AnqpbT-8Gvtbtz21G8gfn
.....
BOOKKEEPING INFORMATION:
Status info for the Job : https://rb.phy.bg.ac.yu:9000/AnqpbT-8Gvtbtz21G8gfn
Current Status: Done (Success)
Exit code: 0
Status Reason: Job terminated successfully
Destination: c81.grid.etfbl.net:2119/jobmanager-pbs-seegrid
reached on: Sun Nov 6 11:06:07 2005
.....
[anton@ce.anton.nl] ~$

```



SEEFIRE & SEEREN projects

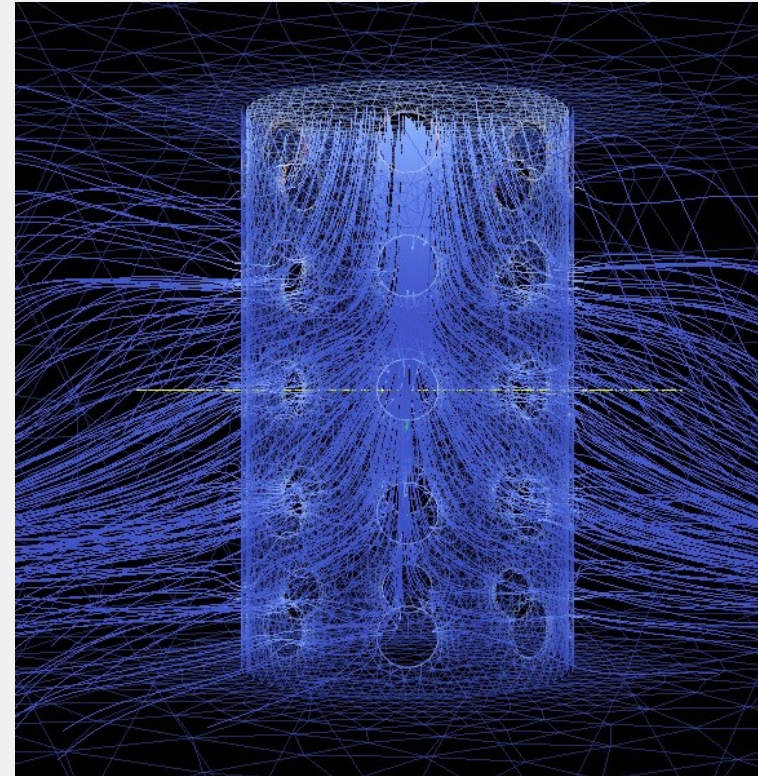
- Grid computing requires quality networking
 - In a situation where 2 Mbps were deemed "enough"
- Project events collocated with SEE-GRID
- Close-knit network of people produced working solution in record time
 - This topology still serves as the backbone of REN
 - Expansion helped several times by Grid computing

SEE-GRID-2 & SEE-GRID-SCI

- Expansion of services and applications
- BBmSAM
- PFE for CBIR
- PARSIMLOC
- METSTARS
- OAAforDCPP, OGRGrid, PAMSSeeGrid

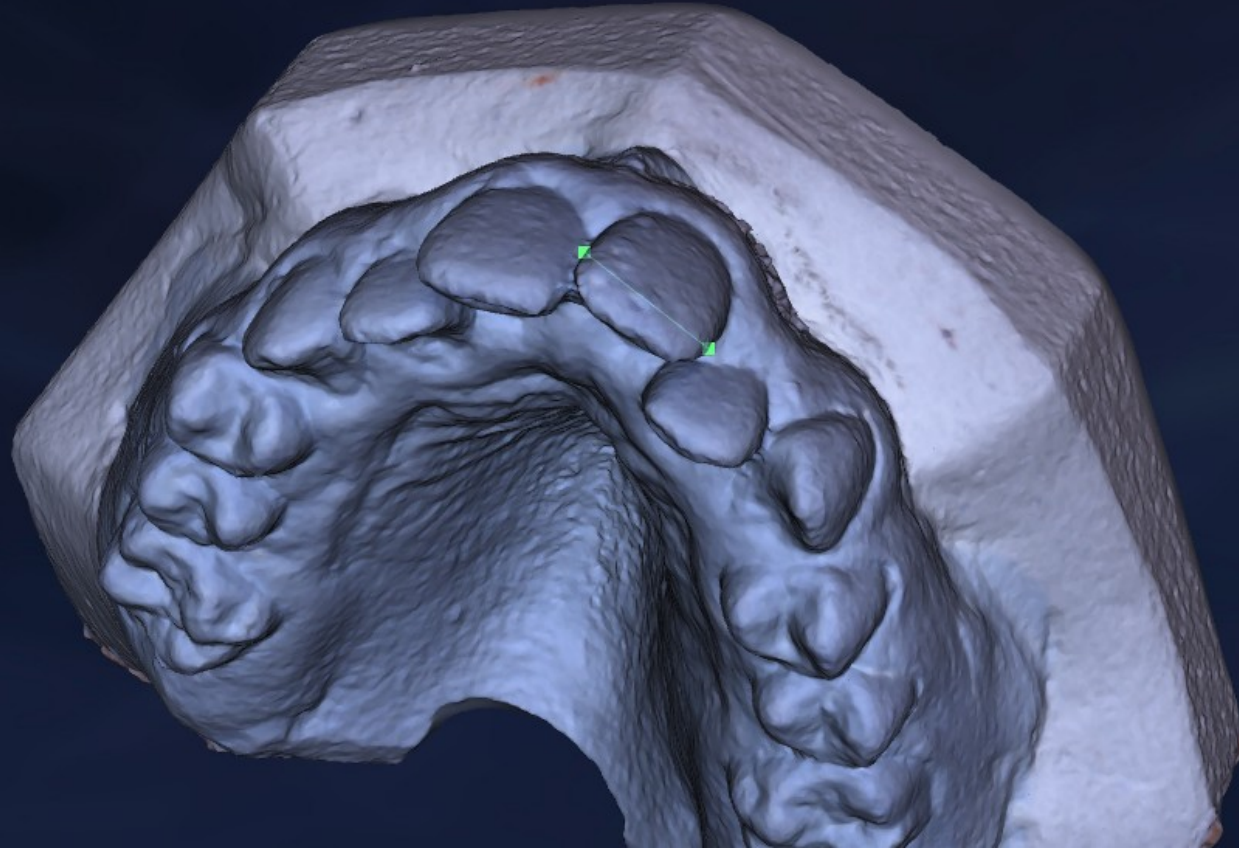
HP-SEE

- Inclusion of wider field of scientists
- PhyloTree
 - Geneticists
- SFHG
 - Mathematicians and physicists
- CFD OF
 - Engineers and chemists

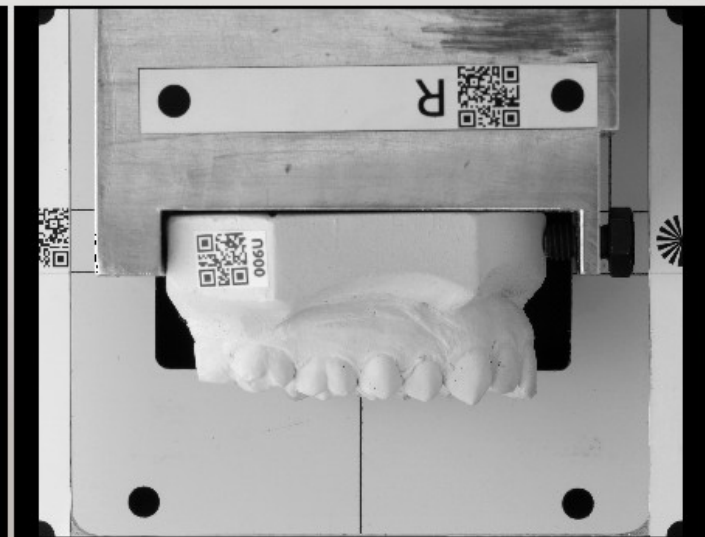
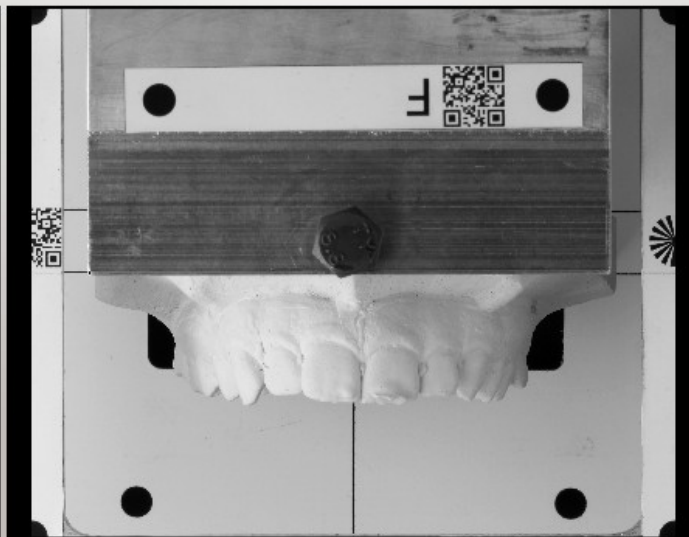


- OP4D - OrthoPhoto4D
 - Digitization and measurements of orthodontic study models
- CH-CBIR
 - Aerial images with annotated land cover types
 - Learned image representations for imagery in the areas of cultural heritage and remote sensing
- CHERE
 - SfM, 3D models, gigapixel images and panoramic images
 - The first Digital Cultural Heritage Repository

VI-SEEM



| Object: Test object | |
|---------------------|------|
| 16 | 0.00 |
| 15 | 0.00 |
| 14 | 0.00 |
| 13 | 0.00 |
| 12 | 0.00 |
| 11 | 0.28 |
| 21 | 0.00 |
| 22 | 0.00 |
| 23 | 0.00 |
| 24 | 0.00 |
| 25 | 0.00 |
| 26 | 0.00 |
| 16-15 | 0.00 |
| 14-13 | 0.00 |
| 12-11 | 0.00 |
| 2122 | 0.00 |
| 23-24 | 0.00 |
| 25-26 | 0.00 |
| ICD 13-23 | 0.00 |
| IMD 16-26 | 0.00 |
| Save | |
| Cancel | |



| | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 16 | 15 | 14 | 13 | 12 | 11 | 21 | 22 | 23 | 24 | 25 | 26 |
| D | D | D | D | D | D | D | D | D | D | D | D |
| M | M | M | M | M | M | M | M | M | M | M | M |

| | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 46 | 45 | 44 | 43 | 42 | 41 | 31 | 32 | 33 | 34 | 35 | 36 |
| D | D | D | D | D | D | D | D | D | D | D | D |
| M | M | M | M | M | M | M | M | M | M | M | M |

| | | | | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|----|----|----|----|----|----|----|----|
| ICDMX | IMDMX | 16-15 | 14-13 | 12-11 | 21-22 | 23-24 | 25-26 | | | | | | | | |
| 14 | 24 | 16 | 26 | 16 | 15 | 14 | 13 | 12 | 11 | 21 | 22 | 23 | 24 | 25 | 26 |

| | | | | | | | | | | | | | | | |
|-------|--------|-------|-------|-------|-------|-------|-------|----|----|----|----|----|----|----|----|
| ICDMD | IMD MD | 46-45 | 44-43 | 42-41 | 31-32 | 33-34 | 35-36 | | | | | | | | |
| 35 | 45 | 36 | 46 | 46 | 45 | 44 | 43 | 42 | 41 | 31 | 32 | 33 | 34 | 35 | 36 |



| | | | | | |
|-----|---------|-----|---------|---------|---------|
| 16: | 0.00 mm | 46: | 0.00 mm | ICDMX: | 0.00 mm |
| 15: | 0.00 mm | 45: | 0.00 mm | IMDMX: | 0.00 mm |
| 14: | 0.00 mm | 44: | 0.00 mm | 16-15: | 0.00 mm |
| 13: | 0.00 mm | 43: | 0.00 mm | 14-13: | 0.00 mm |
| 12: | 0.00 mm | 42: | 0.00 mm | 12-11: | 0.00 mm |
| 11: | 0.00 mm | 41: | 0.00 mm | 21-22: | 0.00 mm |
| 21: | 0.00 mm | 31: | 0.00 mm | 23-24: | 0.00 mm |
| 22: | 0.00 mm | 32: | 0.00 mm | 25-26: | 0.00 mm |
| 23: | 0.00 mm | 33: | 0.00 mm | ICD MD: | 0.00 mm |
| 24: | 0.00 mm | 34: | 0.00 mm | IMD MD: | 0.00 mm |
| 25: | 0.00 mm | 35: | 0.00 mm | 46-45: | 0.00 mm |
| 26: | 0.00 mm | 36: | 0.00 mm | 44-43: | 0.00 mm |
| | | | | 42-41: | 0.00 mm |
| | | | | 31-32: | 0.00 mm |
| | | | | 33-34: | 0.00 mm |
| | | | | 35-36: | 0.00 mm |

006 Vilica: Maxilla Učitaj Snimi

Project Stone monument

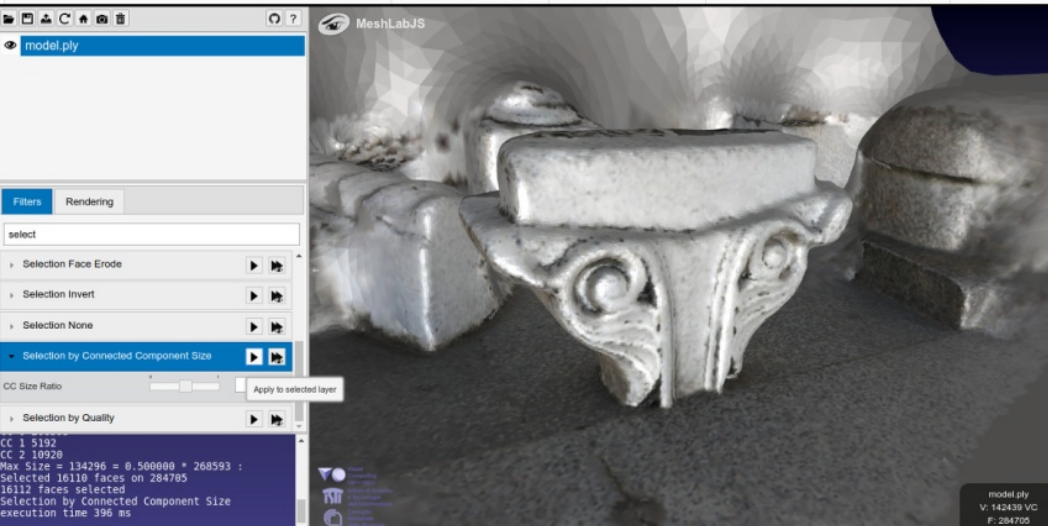
[Update](#) [SIM Reconstruct](#) [Delete](#)

| | |
|--------------------|--|
| Name | Stone monument |
| Description | Part of the stone monument in Banja Luka |
| Public | Private |

Project files

| File name | File size [B] | Date | Action | Delete |
|---------------------|---------------|---------------------|--------------------------|-----------------------------|
| /input/11230061.JPG | 9,366,525 | 2018-01-22 12:31:05 | Download | Delete file |
| /input/11230062.JPG | 9,296,248 | 2018-01-22 12:31:06 | Download | Delete file |
| /input/11230063.JPG | 8,932,943 | 2018-01-22 12:31:06 | Download | Delete file |
| /input/11230064.JPG | 9,352,731 | 2018-01-22 12:31:06 | Download | Delete file |
| /input/11230065.JPG | 9,795,030 | 2018-01-22 12:31:07 | Download | Delete file |
| /input/11230066.JPG | 9,600,372 | 2018-01-22 12:31:07 | Download | Delete file |

| | | | | |
|--|------------|---------------------|--|-----------------------------|
| /output/clean.mlx | 1,687 | 2018-01-27 01:33:12 | Download | Delete file |
| /output/model.nxs | 9,762,048 | 2018-01-27 01:38:28 | Download Measure | Delete file |
| /output/model.ply | 5,980,474 | 2018-01-27 01:33:23 | Download Edit Measure To NXS | Delete file |
| /output/sfm.nvm | 165,400 | 2018-01-27 01:25:17 | Download | Delete file |
| /output/sfm.nvm.cmvs/00/bundle.rd.out | 164,360 | 2018-01-27 01:25:18 | Download | Delete file |
| /output/sfm.nvm.cmvs/00/cameras_v2.txt | 7,824 | 2018-01-27 01:25:18 | Download | Delete file |
| /output/sfm.nvm.cmvs/00/centers-0000.ply | 409 | 2018-01-27 01:25:59 | Download Edit Measure To NXS | Delete file |
| /output/sfm.nvm.cmvs/00/centers-all.ply | 759 | 2018-01-27 01:25:59 | Download Edit Measure To NXS | Delete file |
| /output/sfm.nvm.cmvs/00/list.txt | 345 | 2018-01-27 01:25:18 | Download | Delete file |
| /output/sfm.nvm.cmvs/00/models/option-0000.ply | 39,801,270 | 2018-01-27 01:30:18 | Download Edit Measure To NXS | Delete file |
| /output/sfm.nvm.cmvs/00/option-0000 | 219 | 2018-01-27 01:25:59 | Download | Delete file |
| /output/sfm.nvm.cmvs/00/pmvs.sh | 25 | 2018-01-27 01:25:59 | Download | Delete file |
| /output/sfm.nvm.cmvs/00/ske.dat | 42 | 2018-01-27 01:25:59 | Download | Delete file |



```

Conversion program output:

Mesh with colors
Normals enabled.
Colors enabled.
Creating level 0
Creating level 1
Creating level 2
Creating level 3
Creating level 4
Creating level 5
Creating level 6
Saving to file: /var/chere/user_projects/20b2756cdf7011e7883dbe061497674f/output/model.nxs
Unifying normals
Textures size: 0
    
```


Project Stone monument

[Refresh](#) [Update](#) [SIM Reconstruct](#) [Delete](#)

| | |
|--------------------|--|
| Name | Stone monument |
| Description | Part of the stone monument in Banja Luka |
| Public | Private |



Bag No. 340 Initials: JF Date: 05/09/2012
 Photo: 340-3309; 3311, 3313, 3314 Profile No. _____ Plan: _____

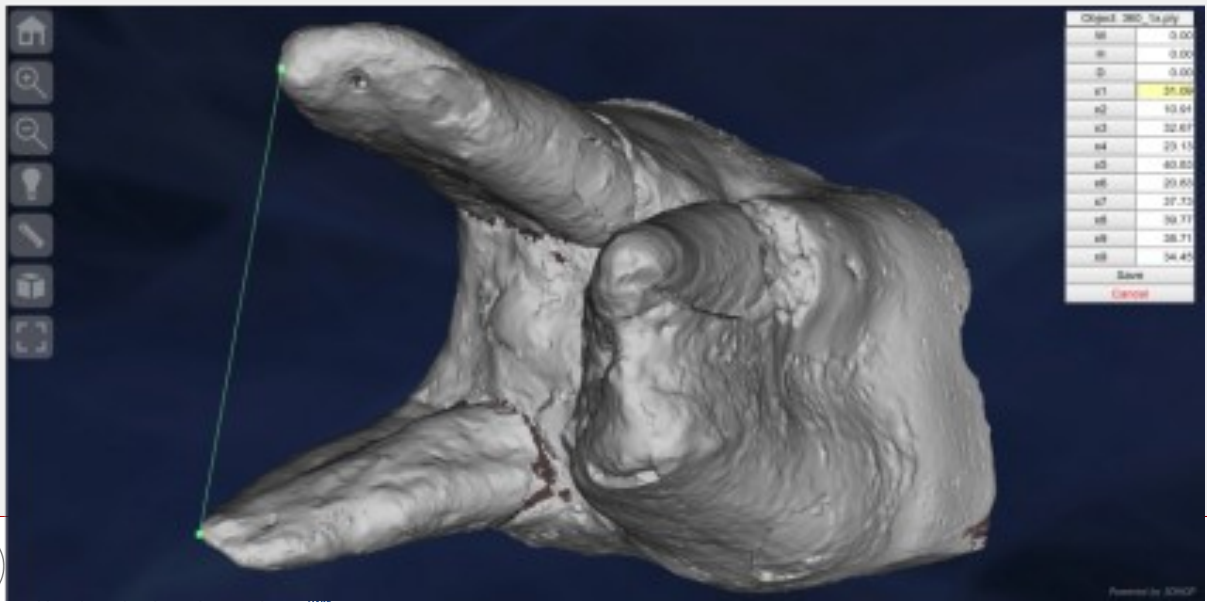
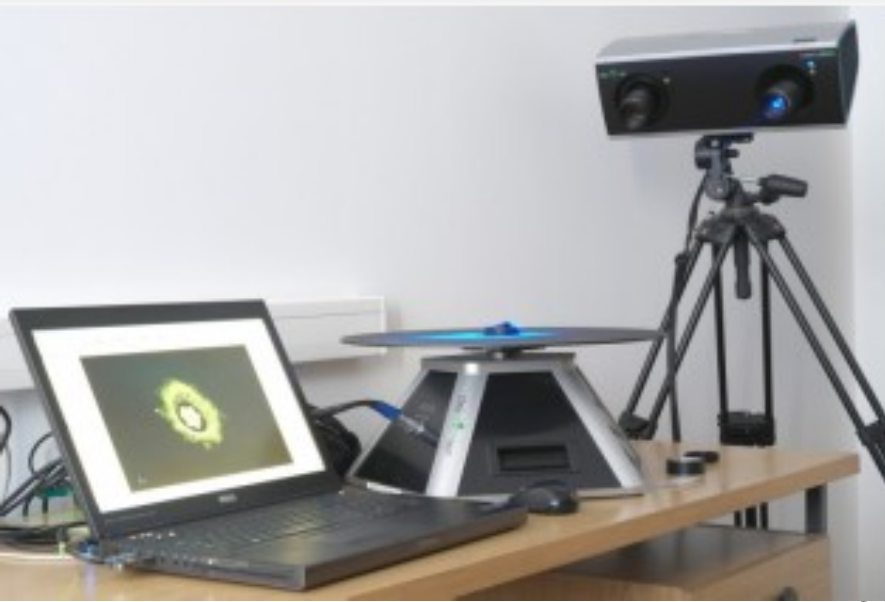
| FLOAT/ENVIRONMENTAL | | MATRIX | |
|---|------------------|------------|--|
| Number:  | <u>148</u> | <u>149</u> | |
| Quantity: | <u>150</u> | | |
| SIEVING | | | |
| Wet <input checked="" type="checkbox"/> Dry <input type="checkbox"/> | Mesh: <u>3mm</u> | | |
| Volume/quantity: <u>204L</u> | <u>151</u> | | |
| stones: <u>10</u> | | | |

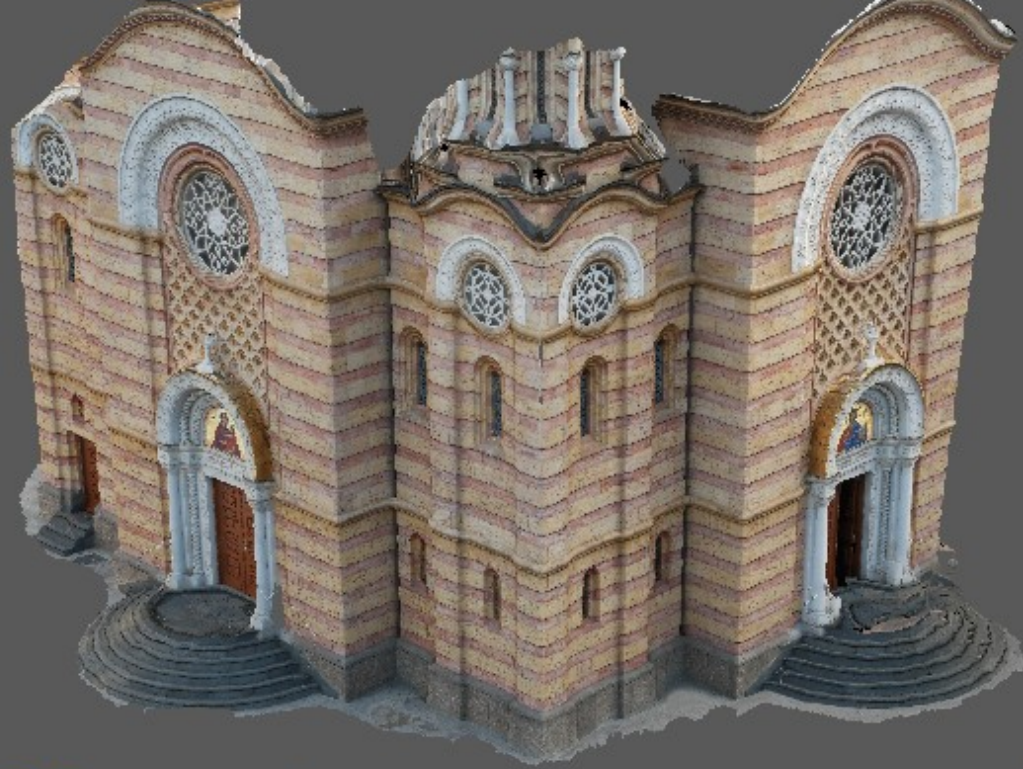
FINDS: There are fewer finds than in the previous layer. Long bones of *A. lact* (mammals), while the bones of other mammals (Cervidae - deer) have

| | Fish | Bone | Small shell | Charcoal | Ceramics |
|----------|------|------|-------------|----------|----------|
| All kept | X | X | | | |
| Sampled | | | | | |

1. *lorallois* flake

INTERPRETATION: It's an arbitrary layer, thickness about 0.10m but near by to southern profile, layer is removed to the Cad race which is down from south to Koffu.





11230007.JPG
11230008.JPG
11230009.JPG
11230010.JPG
11230011.JPG
11230012.JPG
11230013.JPG
11230014.JPG
11230015.JPG
11230016.JPG
11230017.JPG
11230018.JPG
11230019.JPG
11230020.JPG
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11230057.JPG
11230058.JPG
11230059.JPG

After Grid ...

- Direct consequences of long work
- NI4OS-Europe
- EOSC
- WBC-RRI.NET, SEADDA, DeepGreenInno
- Open Science movement and its systematic inclusion
- Digital repository of University
- OpenAIRE NOAD
- ACROSS University Alliance

In place of conclusion

- The science performed on Grid clusters was important.
- High-speed networking was important.
- Infrastructure was important.
- The really important network is the human one.
 - Selfless work and help provided by numerous members of a series of Grid computing projects.
 - Lives of countless individuals were affected in positive manner.
 - Actual and visible institutional and societal changes were implemented.
- Projects end - ideas and true human values live on.

Thank you for your attention

Any questions?

