CERN
Welcome
to the
2nd EOS workshop
CERN, 5th + 6th February 2018
EOS
EOS Open Storage
CERN storage technology
used at the Large Hadron Collider (LHC)

Who is here?

EOS is a development project originated at the CERN Storage Group

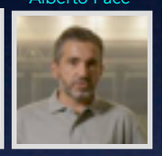
Storage Group Management

Storage Group Leader

Alberto Pace

Section Leader

Dirk Düllmann



Massimo Lamanna

German Cancio di Meglio

IT Department Head

Disk Development
EOS Development

Disk Operations
EOS Operation

Tape Dev.+ Operations
CTA Development

team members from all sections will present during the workshop

Workshop Participants

```
 4 AARNet
 1 ASGC TW
 1 Accenture AG
36 CERN
 3 CESNET
 2 CNRS / IN2P3 / IPNL
 2 Chinese Academy of Sciences (CN)
 3 Comtrade
 1 European Commission - Joint Research Centre
 2 Fermi National Accelerator Lab. (US)
 1 IBM
 1 IEPSAS-Kosice
 1 IFIN-HH(RO)
 1 IHEP
 2 JRC
 1 Johann-Wolfgang-Goethe Univ. (DE)
 5 Joint Institute for  Nuclear Research (RU)
 1 National Academy of Sciences of Ukraine (UA)
 1 Oak Ridge National Laboratory -  (US)
 1 Petersburg Nuclear Physics Institut (RU)
 1 Poznan Supercomputing and Networking Center
 1 SPbSU
 1 Slovak Academy of Sciences (SK)
 1 Technical University of Kosice (SK)
 1 Tribhuvan University
 1 Universidad de Oviedo (ES)
 1 Universidad de los Andes (CO)
 1 Universita e INFN, Bologna (IT)
 1 University of California Irvine (US)
 1 University of Washington (US)
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80 registered participants
from 30 different institutions

Workshop Location

Acknowledgements

A big thank you to the CERN IT department and our department head allowing us to host a free workshop for two days in the IT auditorium with offered free coffee breaks!

Thanks to all who are helping to make this workshop a success!

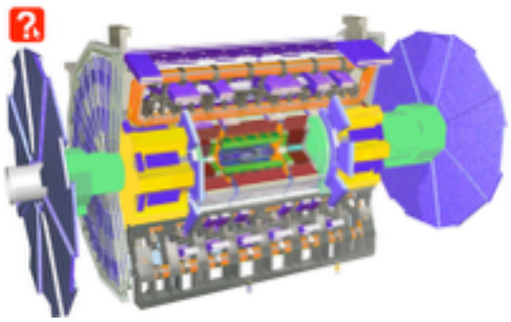
Thank you for your participation!

How is it used?

CERN's mainstream use case

tape archive CASTOR
CERN Advanced STORage manager

LHC Detector



O(GB/s)

5-10 GB/s

EOS
Open Source Storage

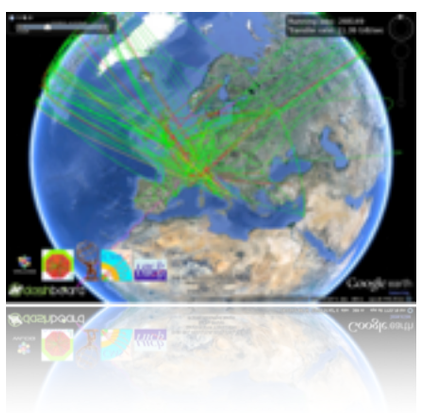
peak 100 GB/s

5-10 GB/s

local batch cluster
O(10^5 cores)

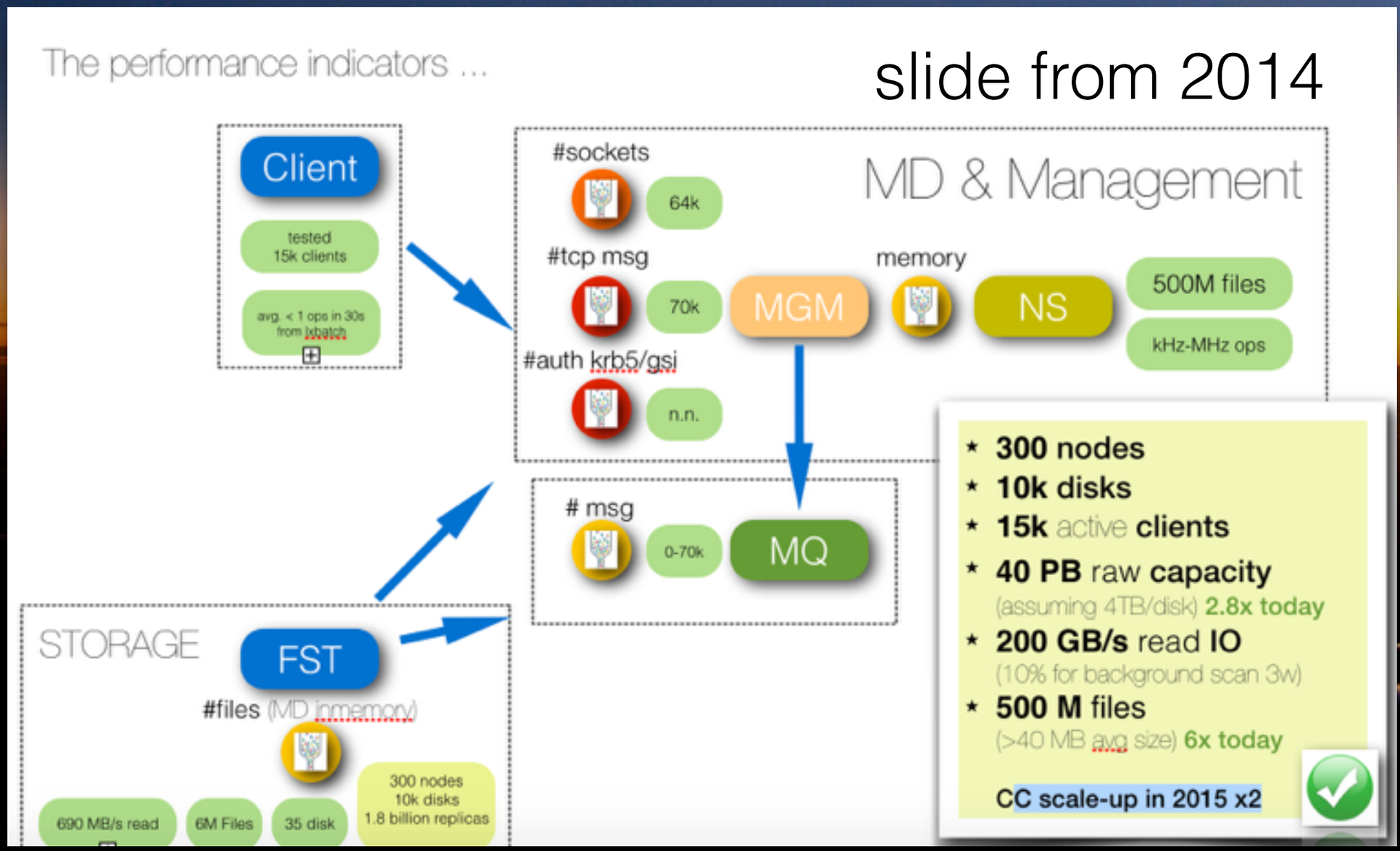
openstack™

Data Export to Worldwide Computing Grid



What happened since the last workshop

EOS architecture limits have been hit at CERN



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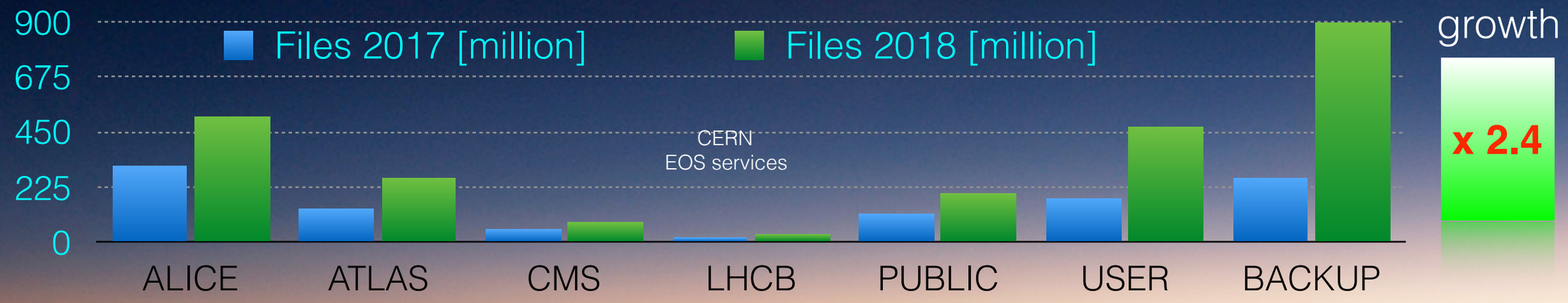
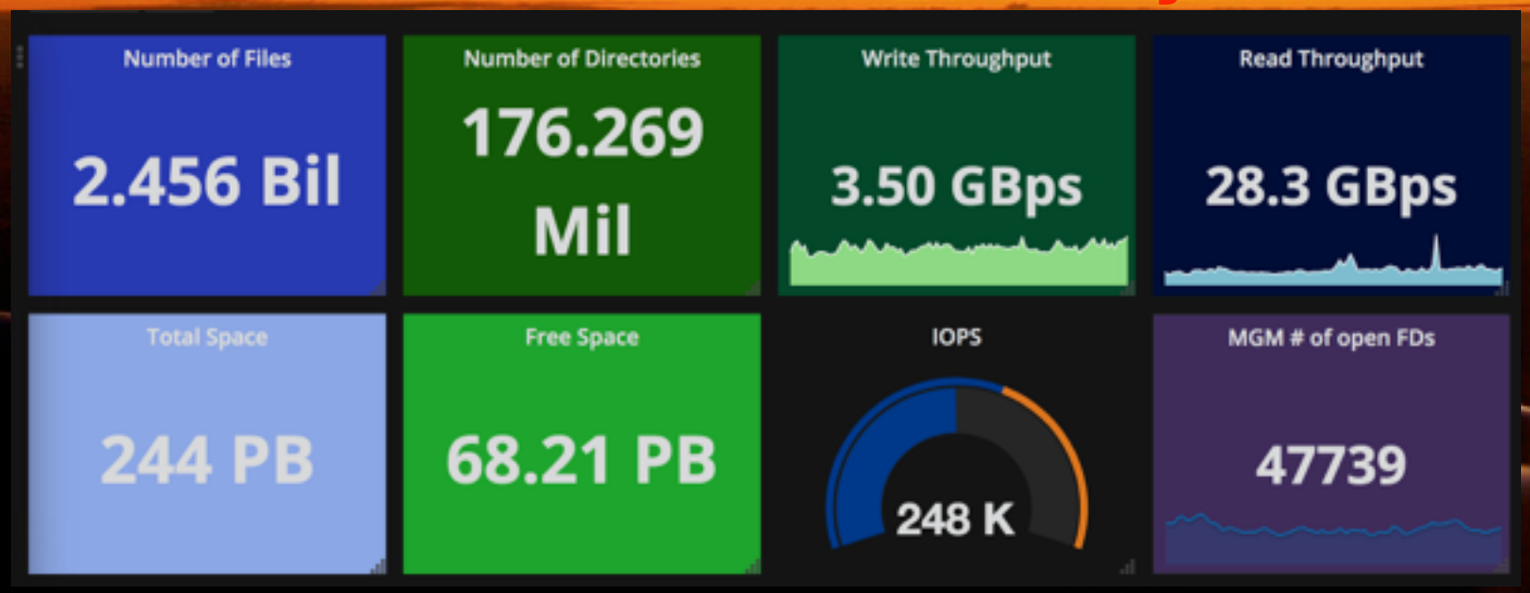


In-memory ns reaching limitations

CERN Service today



What happened since the last workshop

shown at 2017 workshop

EOS Architectural Evolution

2017

Beryl Aquamarine

V 0.3.268

2018

Citrine

V 4.2.12

META DATA

stateless

read/ write

MGM Master

MGM Slave

read only

MGM

MGM

MGM

Persistency

DATA

FST FST FST FST

FST FST FST FST

KINETIC

ceph

What happened since the last workshop

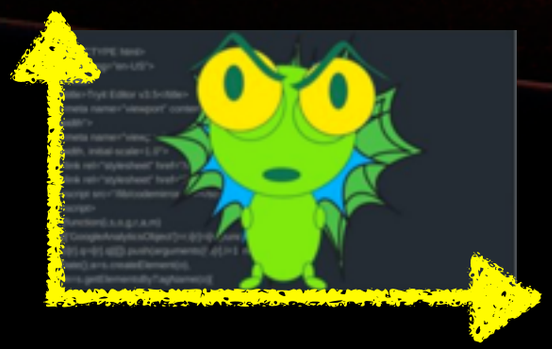
EOS Architectural Evolution

still introduced optimisations
in Aquamarine version

- parallel ns boot
- new hash implementation
- failover fixes

a lot of new tools added to reduce risk of software updates, however doing many changes reflected in service availability & stability

bugs escape rate



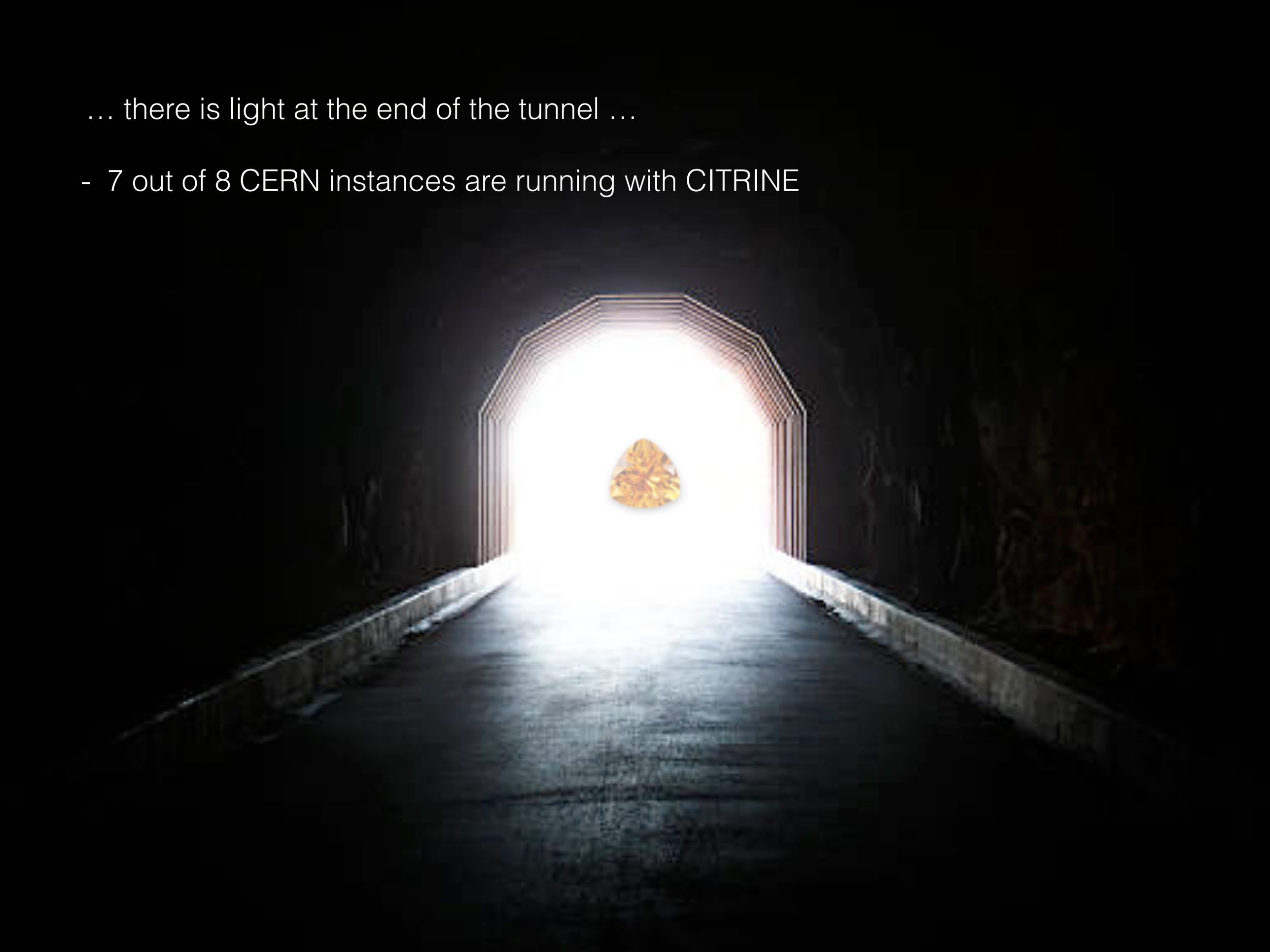
new LOC
in release

2017 transition to CITRINE in production

… there is light at the end of the tunnel …

… there is light at the end of the tunnel …

- 7 out of 8 CERN instances are running with CITRINE



… there is light at the end of the tunnel …

- 7 out of 8 CERN instances are running with CITRINE
- experimenting in pre-production system with > 2 billion files

… there is light at the end of the tunnel …

- 7 out of 9 CERN instances are running with CITRINE
- experimenting in pre-production system with > 2 billion files

```
EOS Console [root://localhost] |/> ns
# ------------------------------------------------------------------------------------
# Namespace Statistics
# ------------------------------------------------------------------------------------
ALL      Files                            2378942379 [booted] (9s)
ALL      Directories                      150365177
# ------------------------------------------------------------------------------------
```

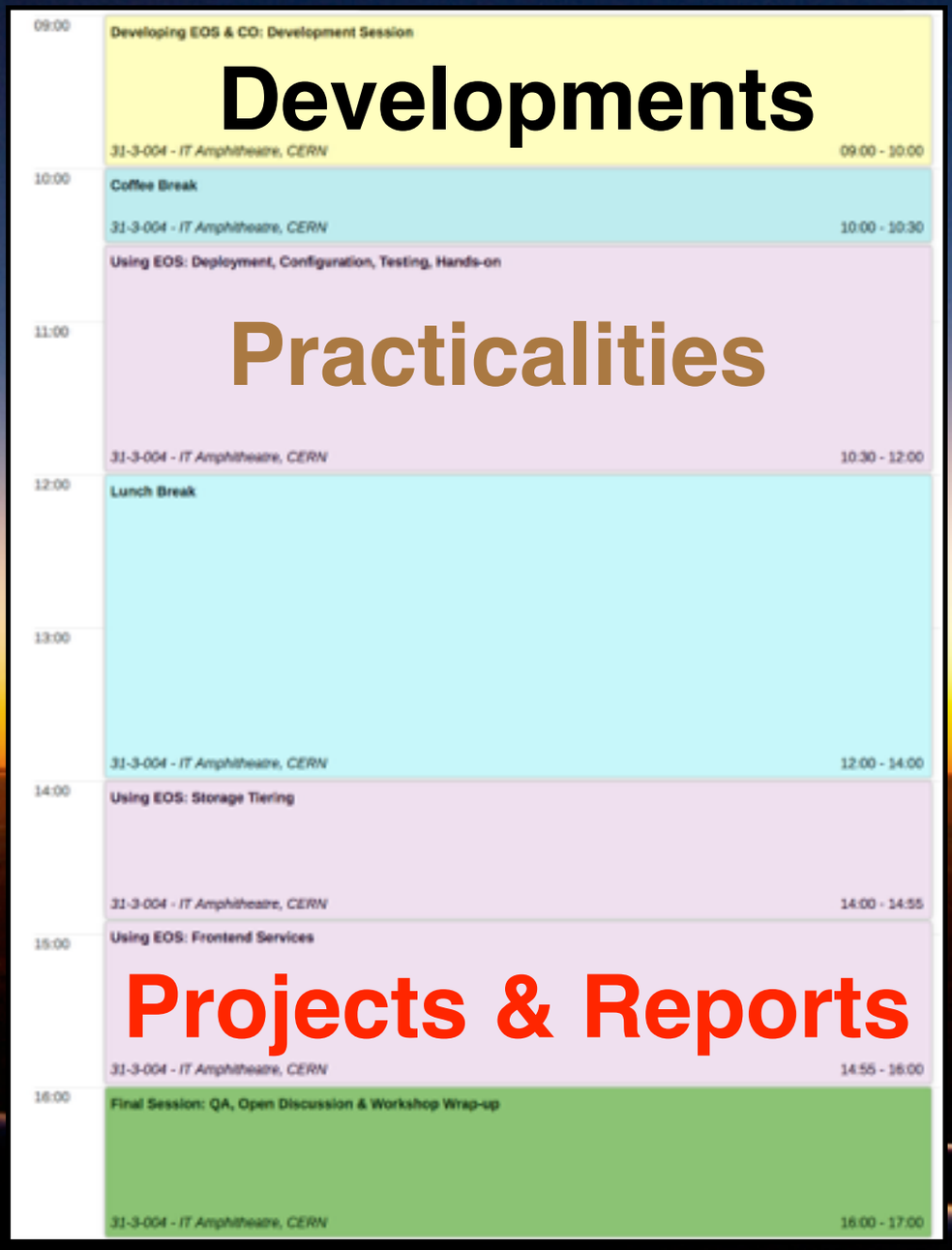
QuarkDB

2nd EOS workshop

focus is on CITRINE status, developments & use case driven extensions

2nd EOS workshop
Agenda

Day 1

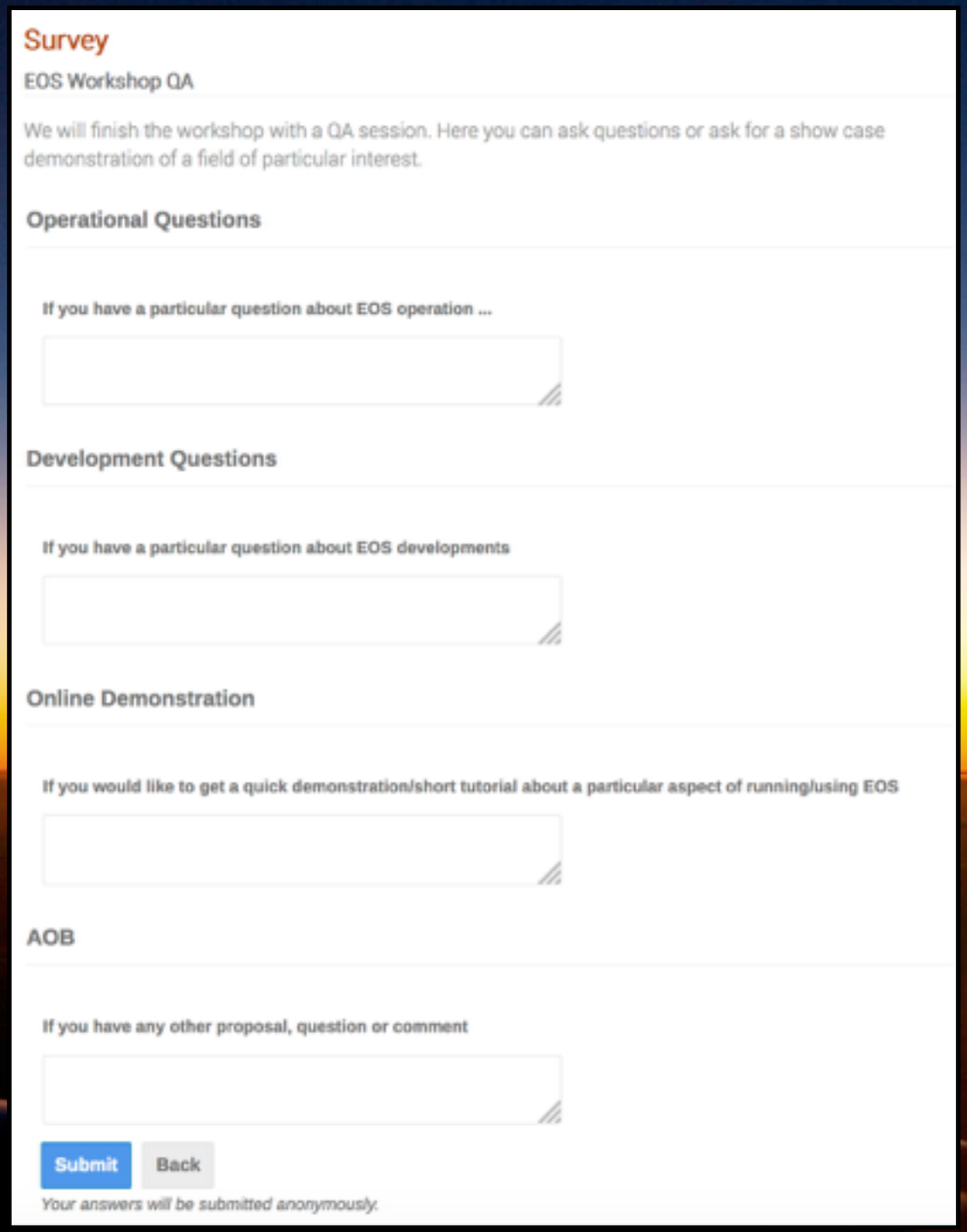


Day 2

2nd EOS workshop
QA Survey

If you have a particular problem, idea or question, which didn't get covered during the presentations or during coffee breaks, you can add this to an online survey on the workshop INDICO page.

The QA session is planned at the end of the workshop.



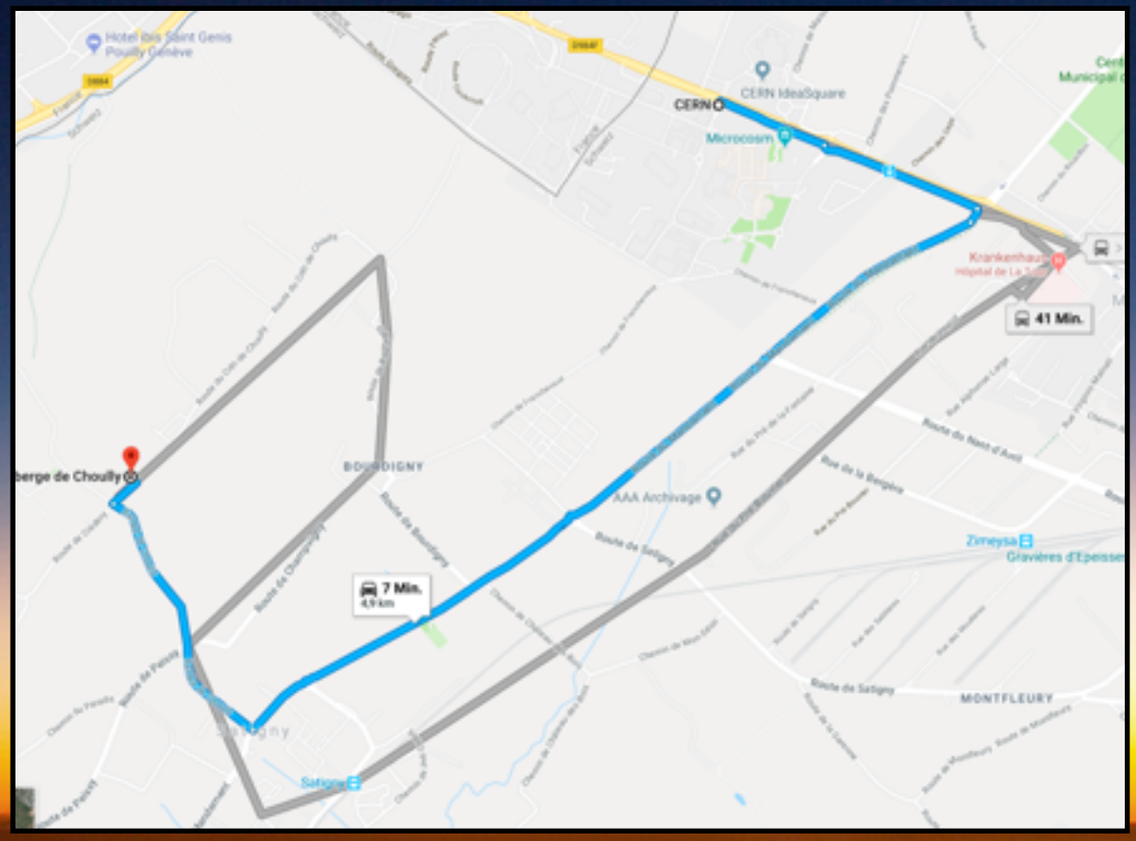
https://indico.cern.ch/event/656157/surveys/688

2nd EOS workshop
Social Dinner

Auberge de Choully

Le Chef Pierre-Louis Descloux se réjouit de vous recevoir
et de vous concocter les mets raffinés qui sauront surprendre votre palais,
arrosés de nectars d'ici et d'ailleurs pour la joie du coeur !

Meetings Point
18:45 Entrance Gate A
19:00 Choully
Route du Crêt-de-Choully 19, 1242
Choully, Switzerland



Enjoy the

Workshop