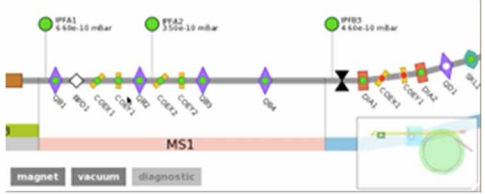
ICALEPCS 2023
Workshop Summaries

Tango Controls Workshop - Devon Petrie – SAROA
EPICS Collaboration Meeting - Karen White – ORNL
Data Science and Machine Learning – Manuel Gonzalez Berges – CERN
Cybersecurity – Stefan Lueders - CERN
Motion Control and Robotics - Mario Di Castro - CERN
PLC Based Control System – Jeronimo Ortola Vidal - CERN
Controls GUI Strategies – Chris Roderick - CERN
Efficiency Through Automation – Lukasz Burdzanowski - CERN

Tango Controls Workshop

7 October



TANGO Controls Workshop

HDB++

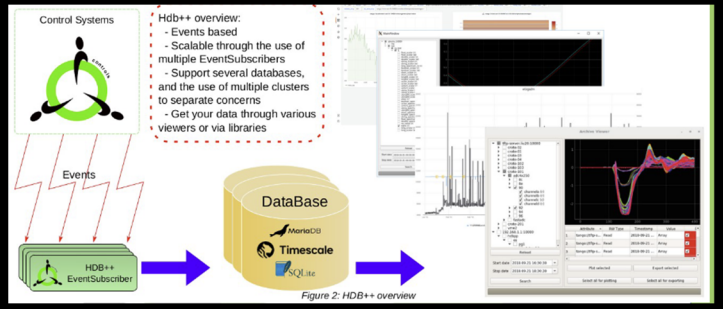
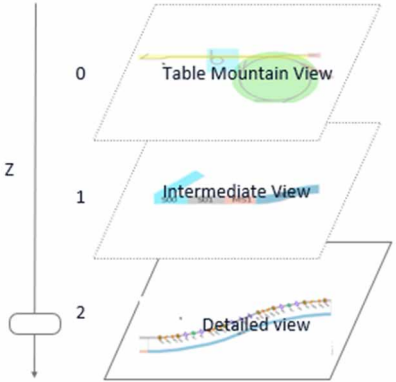
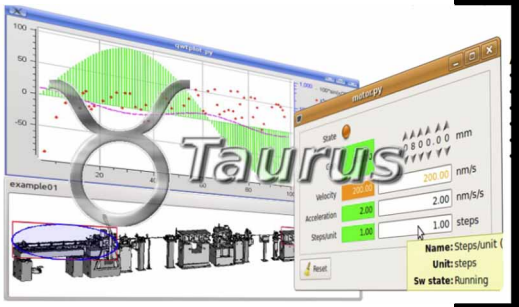
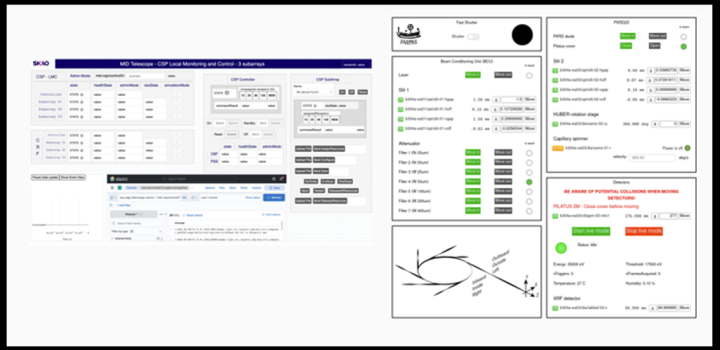


Figure 2: HDB++ overview

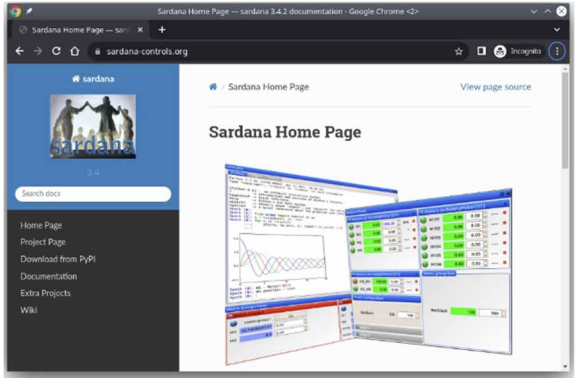
SVG Synoptic







kubernetes

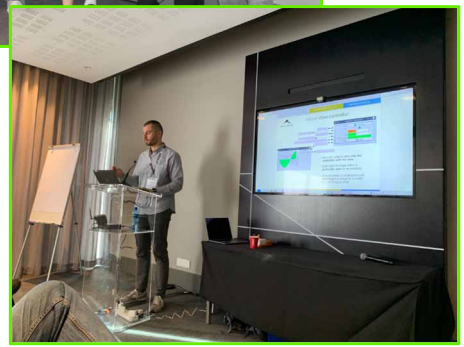


Taranta

7 October

ICALEPCS CAPE TOWN SOUTH AFRICA 2023
ACCELERATING CONTROL SYSTEMS FOR GROUNDBREAKING SCIENCE

Thank you to all the participants and speakers

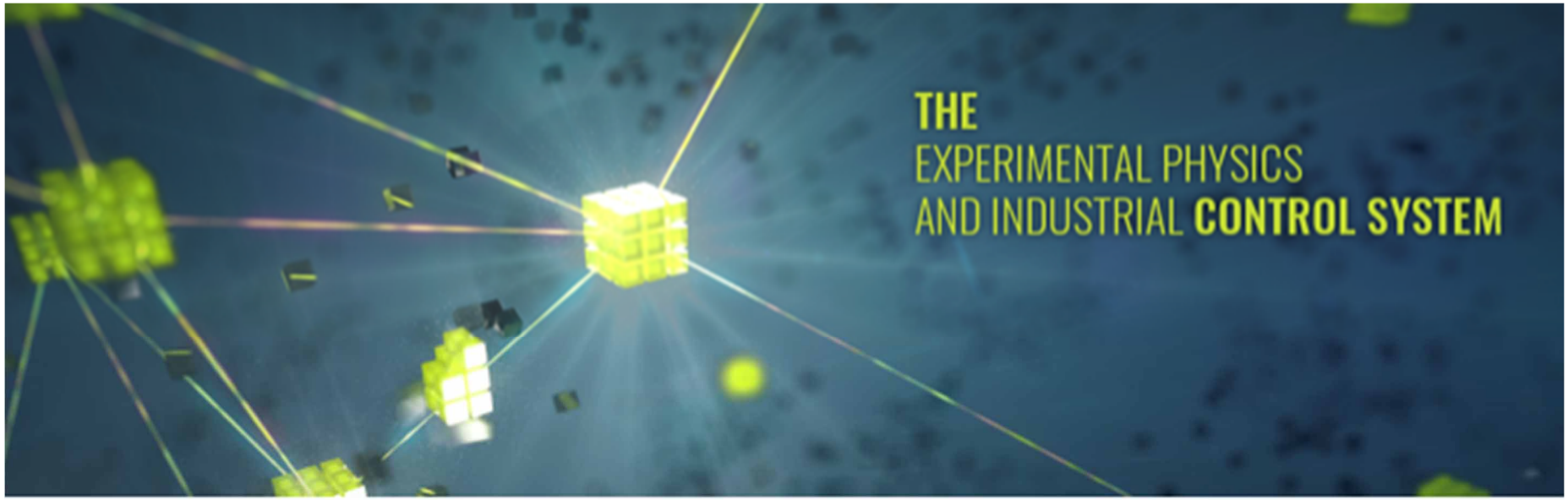


Join us on slack

https://join.slack.com/t/tango-controls/shared_invite/zt-24cp3f0j7-SdBKOYfVOl9D0cQ7DKw54w

Tango Controls docs

https://tango-controls.readthedocs.io/en/latest/



EPICS Collaboration Meeting Summary

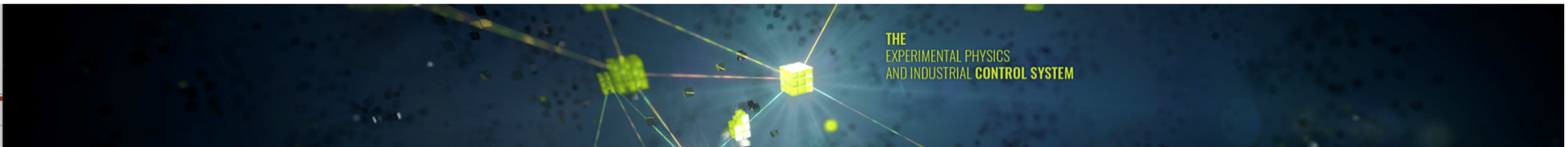
October 8, 2023

Justin Abraham, iThemba Labs

Karen S White ORNL

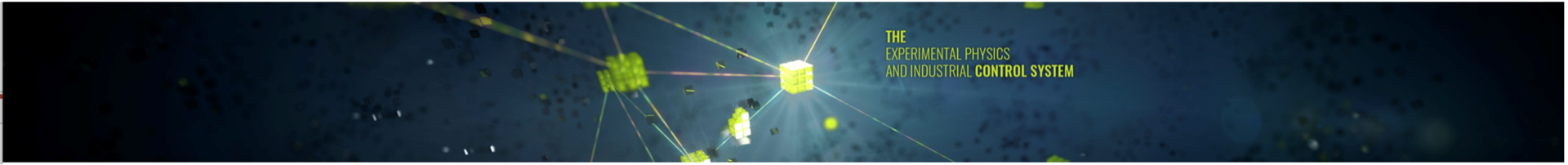
Thanks

- To ICALEPCS for providing meeting space, coffee, tea and food
- iThemba labs for serving as local meeting host – Justin Abraham
- Session chairs and speakers
- Participants



Core development, device support and documentation

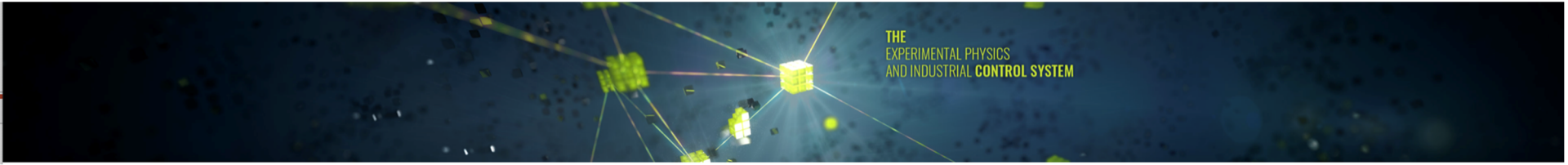
- The latest changes to Base were presented including additional features to the iocShell that were much appreciated by the community. Future plans and ideas for iocs like how to support complex structures as database fields were discussed
- Updates on the OPC UA and ECMC (EtherCAT motion control) support modules for EPICS were presented. A case study for running a major facility at ESS almost exclusively on pvAccess was also shown
- A report on the 2023 Documentathon was presented. Highlights included the development of a new structure and a well-defined process to contribute to GitHub and WordPress pages



Cyber security discussions and initiatives

- A case study was presented of how beam tuning by ML, AI, and big data are changing accelerator network architecture and cyber security at SLAC. The physics and network requirements for future controls and the need for improved cyber security was discussed

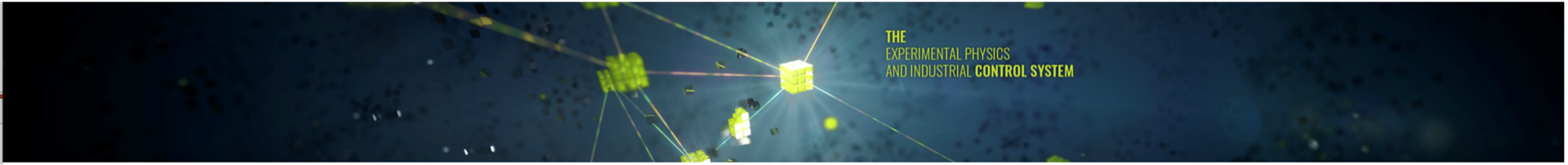
- The planned features that form part of the EPICS Security Technical Plan was presented. A demo was shown on how to create TLS certificates, configure and establish secure PVA communications



Local meet ups and project updates

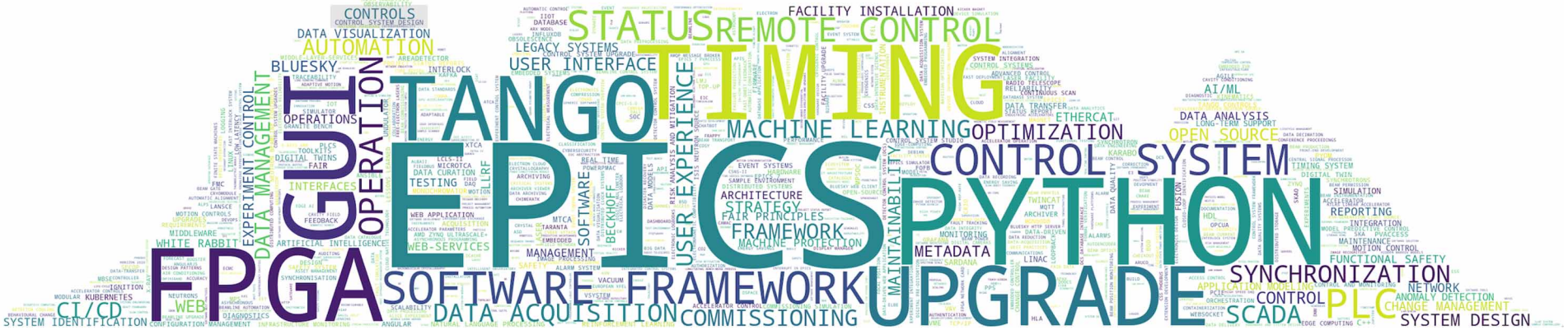
- Feedback and lessons learned from the Oxfordshire EPICS meeting series (UK) were presented. Labs were encouraged to run local meetings

- A number of facilities presented project updates and strategies including: STFC ISIS and KIT (Transition to EPICS), LNLS CNPEM (soft IOC usage), ANL (APS Upgrade), ORNL (STS Project) and DLS (Diamond-II Project)



EPICS continues to grow

- ICALEPCS 2023 abstract submission reflects the widespread impact of EPICS on accelerator and experiment controls
- 111 (of 413) abstracts mention EPICS in the title
- Word Cloud of ICALEPCS abstracts, thanks Gary Croke

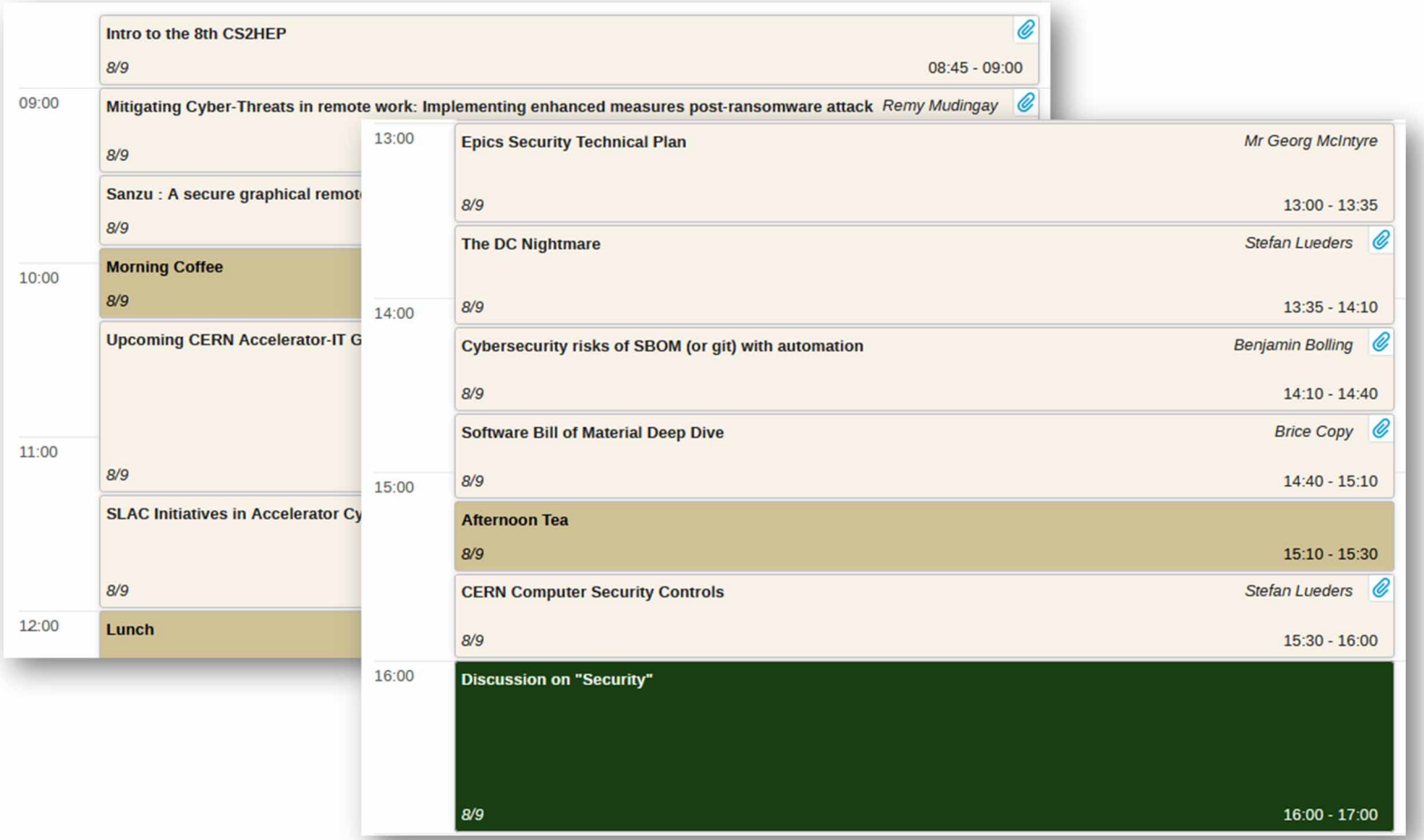


ACCELERATING CONTROL SYSTEMS
FOR GROUNDBREAKING SCIENCE

8th Control System Cyber-Security Workshop

Benjamin Bolling (ESS), Brice Copy (CERN), Antonin Fringant (CEA), Stefan Lüders (CERN), George McIntyre (Osprey DCS), Rémy Mudingay (ESS), Marc Vanden Eynden (CERN) and Gregory R White (SLAC)


Intro to the 8th CS2HEP
8/9
08:45 - 09:00
09:00
Mitigating Cyber-Threats in remote work: Implementing enhanced measures post-ransomware attack
Remy Mudingay
8/9
09:00 - 09:30
Sanzu : A secure graphical remote access solution
Antonin Fringant
8/9
09:30 - 09:55
10:00
Morning Coffee
8/9
09:55 - 10:20
Upcoming CERN Accelerator-IT Governance
Marc Vanden Eynden
11:00
8/9
10:20 - 11:20
SLAC Initiatives in Accelerator Cyber Security
Mr Gregory R White
8/9
11:20 - 12:00
12:00
Lunch



ICALEPCS 2023

Accelerating control systems for groundbreaking science

Intro to the 8th CS2HEP
8/9 08:45 - 09:00

09:00 Mitigating Cyber-Threats in remote work: Implementing enhanced measures post-ransomware attack *Remy Mudingay*
8/9

Sanzu : A secure graphical remot
8/9

10:00 Morning Coffee
8/9

Upcoming CERN Accelerator-IT G
8/9

11:00

SLAC Initiatives in Accelerator Cy
8/9

12:00 Lunch

13:00 Epics Security Technical Plan *Mr Georg McIntyre*
8/9 13:00 - 13:35

The DC Nightmare *Stefan Lueders*
8/9

14:00 Cybersecurity risks of SBOM (or git) with
8/9

Software Bill of Material Deep Dive
8/9

15:00 Afternoon Tea
8/9

CERN Computer Security Controls
8/9

16:00 Discussion on "Security"
8/9

16:00 - 17:00

~50 participants
9 presentations
(IMHO) Tons of great questions & excellent discussions

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8/9
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Stefan Lueders

Cyber Security for git) with
8/9

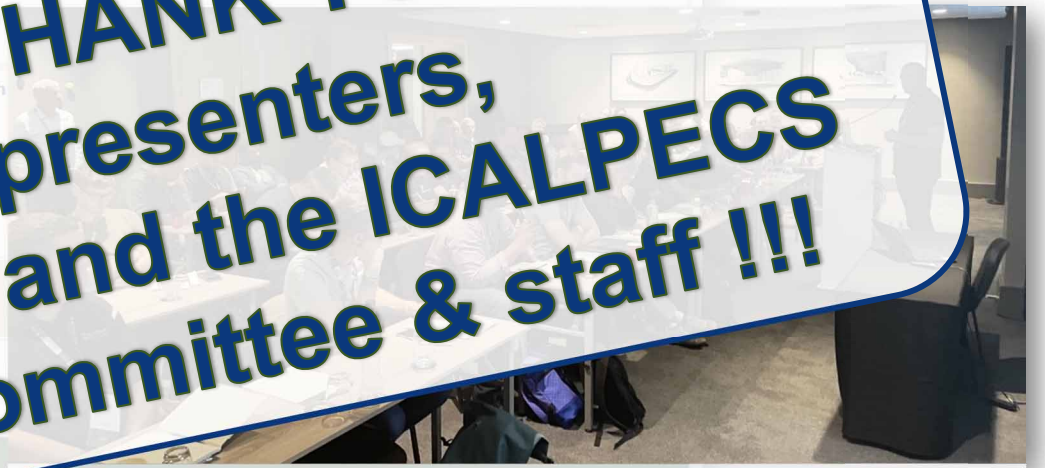
Software Bill of Materials
8/9

15:00
Afternoon Tea
8/9

Computer Security Controls
8/9

16:00
8/9
16:00 - 17:00

A big THANK YOU to all presenters, participants and the ICALPECS program committee & staff !!!



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ICALEPCS 2023
Accelerating control systems for groundbreaking science

Findings of SLAC Accelerator Cyber Review

Review your security posture

System	Authentication Authorization and Audit	Vulnerability Scanning	Malware Det. (Crowdstrike)	Backups	Accelerator Protection system	Air-gap / process-observer	Network Segmentation
MCC Accelerator Controls Networks - ~OSI 7 Layer Model levels 1-5	ssh rsa/dsa public-private key using SLAC User ID and mcclogin as a bastion host. VMS password.	No vulnerability scanning on accelerator networks, for fear of interference with ops. Yes, at DMZ level.	No malware scanning on accelerator networks, for fear of interference with ops. Yes, at DMZ level.	Yes. All NFS data and systems are backed up by coordination with OCIO. Operational to MCC (Bldg. 5). Disaster recovery to ANR (B52). Large data to AFS.	N/A	No. Direct authenticated login is supported.	Yes. Filtering Router enforces DMZ intermediates SLAC to prod. Each accelerator network is segmented into a few functional VLANs.
EPICS Accelerator Controls Networks ~OSI 7 Layer Model levels 6-7	No control network user Authentication. EPICS PV change Authorization being added.	No. IOC processes and client servers are not scanned for vulnerabilities.	No. No malware detection of EPICS processes on Production. No front end executable certification	Access Control Files backed up by virtue of AFS.	Yes, extensive but may be incomplete. Facilitated by EPICS DRV-L/H, MPS, BCS.	Not as such, but separation mediated by router is sometimes used.	Yes. Production networks are isolated via DMZ.
SLAC Science Data Facility (aka S3DF)	Kerberos (until SLAC standard federated is available)	Yes. S3DF DMZ daily. Others biannual.	Yes - DMZ & Workstations. No - HPC and core.	Yes (as of Aug 22).	N/A	Not employed. S3DF is intended for access internally and externally.	Yes.
SLAC Enterprise Networks (SLAC IT)	Networking device management requires authentication by Kerberos + DOE PIV card.	Yes, admin. by SLAC cyber.	Yes. Networking management hosts have CrowdStrike. Devices (routers etc) do not.	Yes. Backups daily to SLAC AFS and Stanford AFS.	N/A	No. SLAC IT does not operate any air-gapped enterprise networking.	Yes. SLAC Networks are segmented, access and firewall implemented individually for each.
Oracle & APEX.	UserID + Oracle db pwd or Oracle wallet. LDAP & WebAuth for APEX.	Yes, admin. by SLAC cyber.	Yes on main SLACPROD dbs. No on MCCO dbs.	Yes. Full and incremental backups daily. 30 day retention.	N/A	No.	DBs segmented by content. Diff. pwd/wallet required for each. MCCO is in DMZ.
Controlled Document Management System (CDMS)	SLAC Active Directory & MFA. MS has no access to SLAC cloud data.	Yes, admin. by MS.	Yes, administered by MS.	Yes, redundancy and resiliency by MS. We assume their diligence	Content describes Accelerator Protection Systems.	No.	Yes [2]
Engineering Drawings and Data (TC / SEDA)	TC req SLAC ID of named license holder. SEDA req SLAC ID/MFA	Yes, admin. by SLAC cyber.	Yes, admin by SLAC cyber.	TC: Yes, admin by SLAC IT. SEDA: Yes, admin by MS.	N/A	No.	Per TC system.
High Level Applications (HLA)	Presently, all HLAs are on prod, so AAA is per MCC and EPICS above.	No, not in production.	No, not in production.	Yes, per MCC.	Partly. Mostly rely on EPICS limits.	No. However do have read-only gateway.	Yes, per MCC.

Figure: Example table of cyber review findings, showing each of 8 system's cyber situation on 7 metrics

SLAC

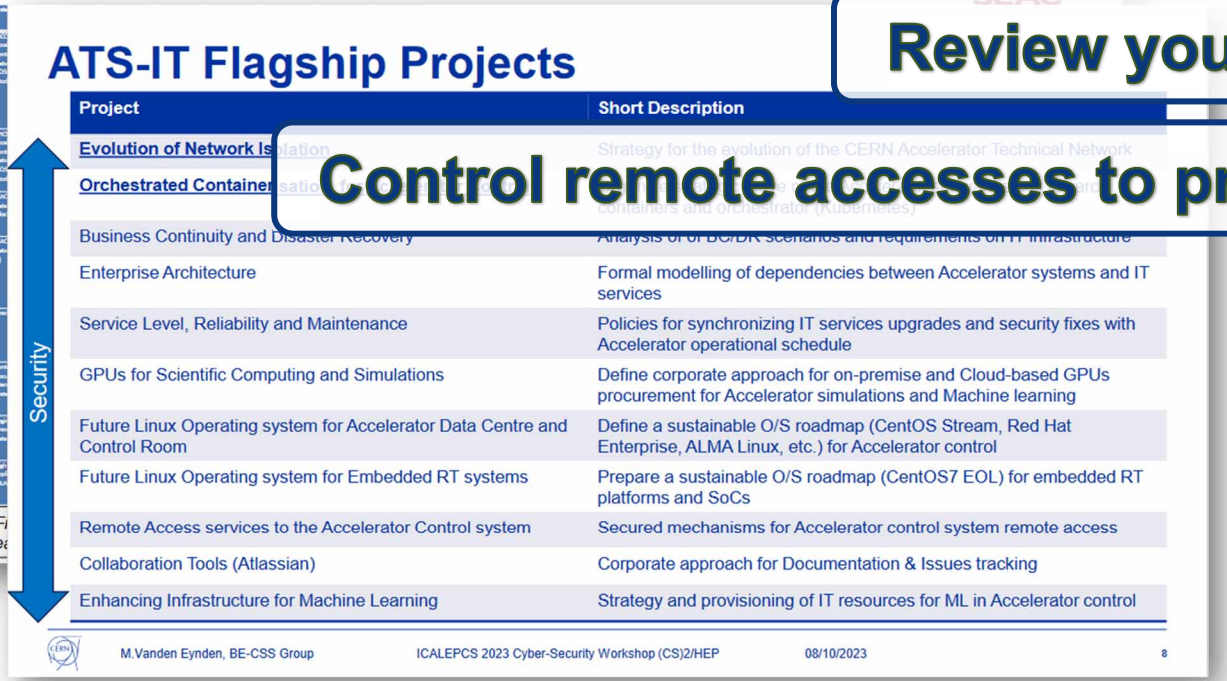
SLAC Summary: Positive Overall. Ou… was found complete with respect to common practice.

1. Login security is comparable to most facilities. Will soon be leading
2. Backups are complete
3. Malware Detection & Vulnerability Detection are complete (subject to the norm that malware detection is not run in production)
4. CA Security (authorization to change PV) is designed, in cryo IOCS, and ready for broad implementation

All EPICS Labs

However, EPICS itself is insecure. Its use is based on aging assumption of secure perimeter. Lacks strong authentication and software signing.

Findings of SLAC Accelerator Cyber Review



ATS-IT Flagship Projects

Project	Short Description
Evolution of Network Isolation	Strategy for the evolution of the CERN Accelerator Technical Network
Orchestrated Container	Containers and orchestrator (Kubernetes)
Business Continuity and Disaster Recovery	Analysis of of BC/DR scenarios and requirements on IT infrastructure
Enterprise Architecture	Formal modelling of dependencies between Accelerator systems and IT services
Service Level, Reliability and Maintenance	Policies for synchronizing IT services upgrades and security fixes with Accelerator operational schedule
GPUs for Scientific Computing and Simulations	Define corporate approach for on-premise and Cloud-based GPUs procurement for Accelerator simulations and Machine learning
Future Linux Operating system for Accelerator Data Centre and Control Room	Define a sustainable O/S roadmap (CentOS Stream, Red Hat Enterprise, ALMA Linux, etc.) for Accelerator control
Future Linux Operating system for Embedded RT systems	Prepare a sustainable O/S roadmap (CentOS7 EOL) for embedded RT platforms and SoCs
Remote Access services to the Accelerator Control system	Secured mechanisms for Accelerator control system remote access
Collaboration Tools (Atlassian)	Corporate approach for Documentation & Issues tracking
Enhancing Infrastructure for Machine Learning	Strategy and provisioning of IT resources for ML in Accelerator control

Security

M.Vanden Eynden, BE-CSS Group ICALEPCS 2023 Cyber-Security Workshop (CS)2/HEP 08/10/2023 8

Review your security posture

Control remote accesses to production systems

Findings of SLAC Accelerator Cyber Review

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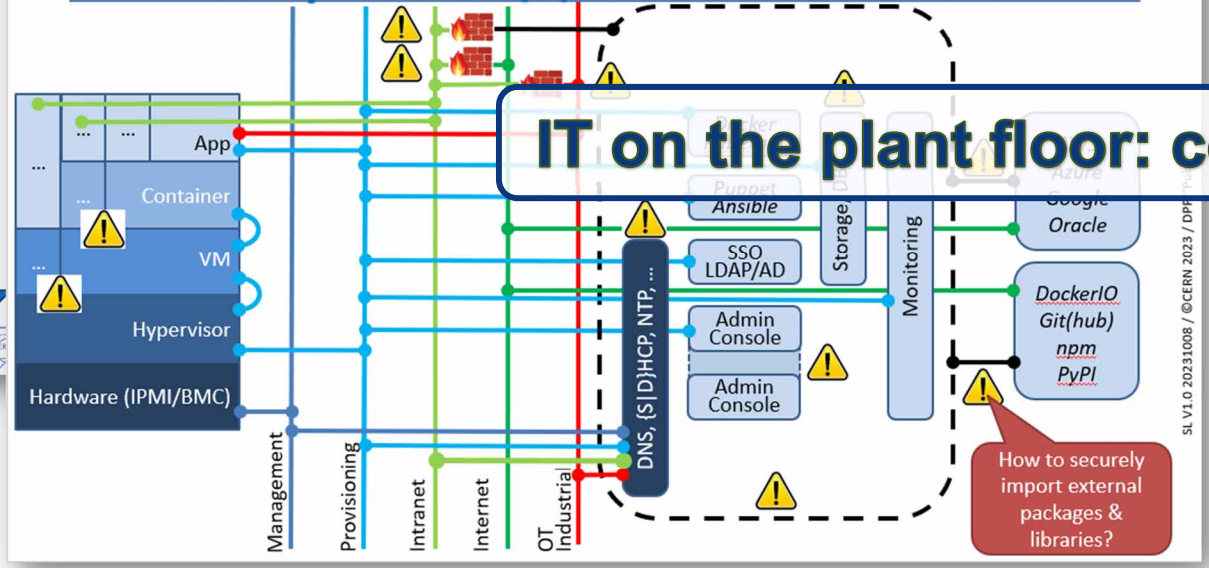
Review your security posture

Control remote accesses to production systems

Complication (9): External Software



IT on the plant floor: containers, ML, …

Findings of SLAC Accelerator Cyber Review

ATS-IT Flagship Projects

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Orchestrated Container	

Security

Examples

Supply chain attacks on user accounts with admin rights

Rest-client git maintainer, August 2019

- Attackers published a series of rest-client versions from 1.6.10 to 1.6.13
- The credentials of a rest-client maintainer was compromised and used
- Consequence:
  - Activated in Rails installations
  - Downloaded code from a URL and execute it
  - Reportedly phoned home to execute instructions

Toyota, user credentials, revealed in October 2022

- Consequence:
  - Identification numbers and emails of over 290,000 customers (luckily, credit card data, phone numbers, or any GitHub user account credentials were not stored in this database)
  - No signs that this breach would allow bad actors to do more than just harvest emails and the associated customer management numbers

2023-10-08

15

Review your security posture

Control remote accesses to production systems

Control software imports…

IT on the plant floor: containers, ML, …

Findings of SLAC Accelerator Cyber Review

ATS-IT Flagship Projects

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Security

Examples

Supply

Rest-clie

- Attack
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  - Activa
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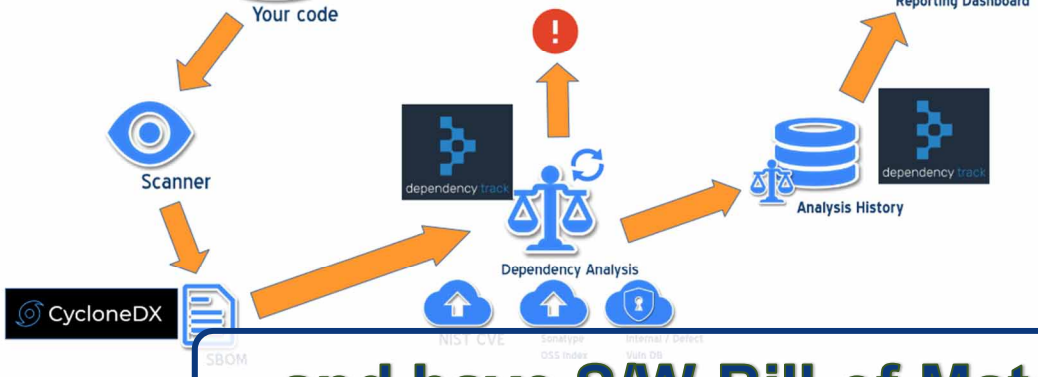
  - Repor

SBOM life cycle – in CERN Acc Controls



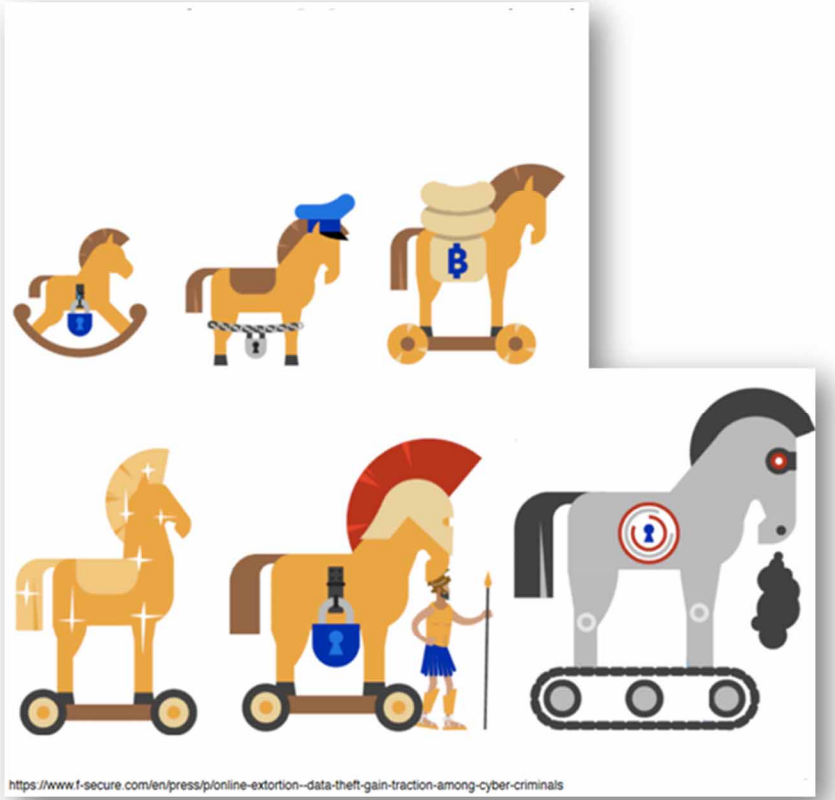
Review your security posture

Control remote accesses to production systems

Control software imports…

IT on the plant floor: containers, ML, …

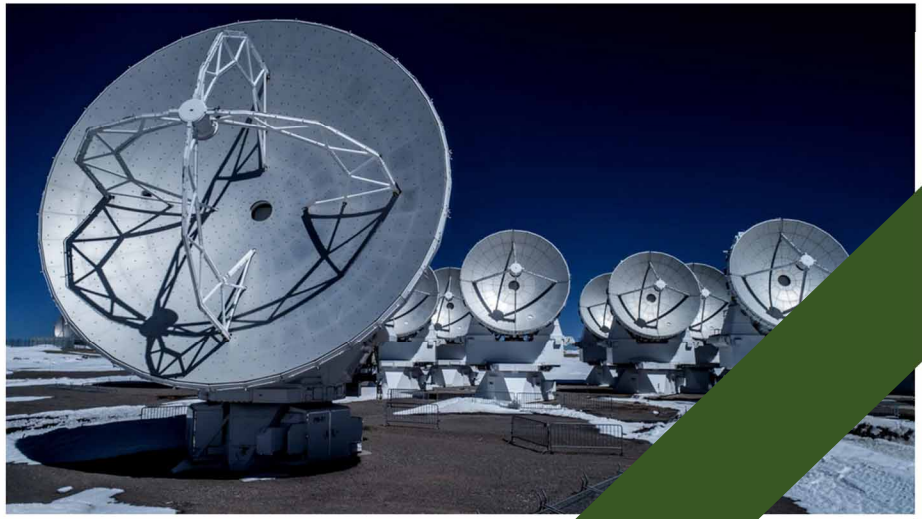
…and have S/W-Bill-of-Materials (SBOM)


https://www.f-secure.com/en/press/p/online-extortion--data-theft-gain-traction-among-cyber-criminals


With Love!
RANSOMWARE
Vice Society
FOR JOURNALISTS
FOR VICTIMS
OUR BLOG
V-society.official@onionmail.org, ViceSociety@onionmail.org

ALMA Observatory shuts down operations due to a cyberattack

By **Bill Toulas** November 3, 2022 10:46 AM 0



The Atacama Large Millimeter Array (ALMA) Observatory in C… …l astronomical observation operations and taken its public website offline f… …k on Saturday, October 29, 2022.

Home | Newsroom

BESSY II back in operation after cyber attack on Helmholtz-Zentrum Berlin (HZB)

Since Monday 3 July 2023 BESSY II light source produces br… again. It was shut down as a precaution after a hacker … at Helmholtz-Zentrum Berlin (HZB) mid-June. The Physi… Bundesasntalt (PTB, national metrology center) … experimental stations at BESSY II, can now … urements. The beamlines and experimental stations of … endently of the HZB grid in a self-sufficient network … tsource, which is operated by the HZB, was not pa… running trouble-free. The

ICALEPCS 2023

Accelerating control systems for groundbreaking science

The Elephant has arrived…
What do you do to protect your operations ?

ALMA Observatory shuts down operations due to a cyberattack

By Bill Toulas

November 3, 2022 10:46 AM

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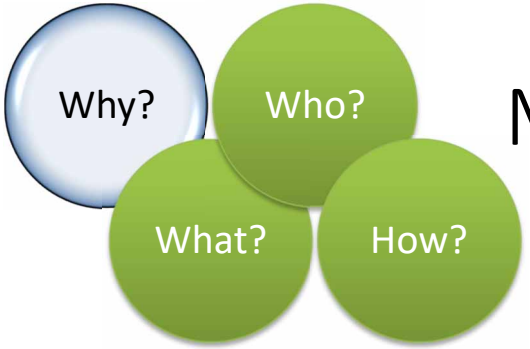
ICALEPCS 2023

Accelerating control systems for groundbreaking science

8th workshop dedicated to Motion Control and Robotic Applications in large Facilities

Yves-Marie ABIVEN (SOLEIL), Mario Di Castro (CERN) , Nicola Coppola (EuXFEL), Christer Engblom (SOLEIL), Xavier Serra Gallifa (Alba), Laura Muñoz(SOLEIL), Brian Nutter(Diamond)



MOCRAF Workshop

Motion control and Robotics are **key element** ,which enable high level of performance at scientific facilities

A long tradition now with 7 previous MOCRAF Workshop

(2011 in SOLEIL, 2012 in Diamond, 2013 ICALEPCS San Francisco, 2015 ICALEPCS Melbourne, 2017 ICALEPCS Barcelona, 2019 ICALEPCS New York, 2021 ICALEPCS Shanghai)

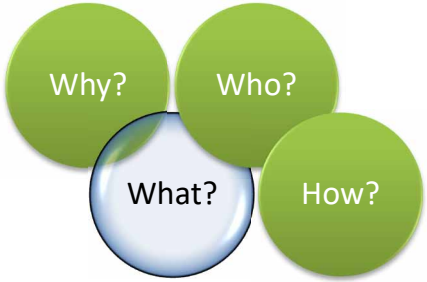
ICALEPCS 2023 in CAP TOWN is an ideal place for the 8th WS, …

…meeting new friends

… Sharing expertise, methods, tools,

… Exchanging experience, solutions, lessons learned

…Initiating collaboration



MOCRAF Workshop

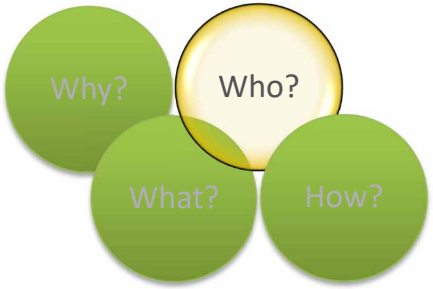
- **Frequency vs Time Domain**
  Discover how we employ frequency vs time domains to enhance our mechatronic systems. Join the discussion on control loops, mechanics, metrology, and other relevant aspects.

- **Robotic Frameworks**
  Explore the implementation of robotic frameworks within different facilities. Share your experiences and insights on the various types of frameworks utilized in diverse contexts.

- **Digital Twins**
  Uncover how digital simulations can be used in optimizing and augmenting existing systems. Learn how digital twins contribute to anti-collision systems, hardware-in-the-loop setups, advanced sensor integrations, and more.

- **Overcoming Existing System Limits**
  Find out how we overcome limitations in motion control systems. Engage in conversations about handling obsolete controllers, improving motor resolutions, and other innovative solutions.

- **Advanced Motion Control Algorithms**
  Gain valuable knowledge about cutting-edge algorithms employed in motion control applications. Delve into topics such as Kalman filters, iterative learning control, model predictive control (MPC), applicative machine learning, and other advanced techniques.



MOCRAF Workshop

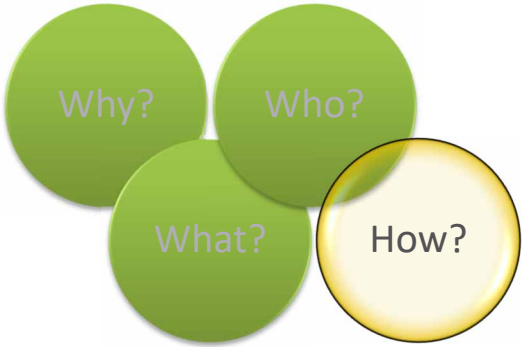
→47 attendees

→8 countries

→21 Institutes

→3 trading companies

→https://www.google.com/maps/d/edit?hl=en&mid=1IJHQnihWT_Sk_-aLoR_gkVmAY2g&ll=5.108998801646877%2C0&z=2



MOCRAF Workshop

Workshop sessions

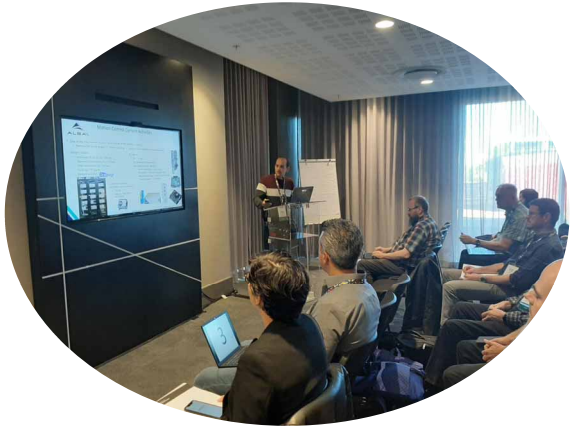
Update of the status and challenges at each facilities

5 tracks related presentation feature talks followed by 45 min round table discussion in groups, with a 5 minutes summary from the groups

MOCRAF 2023

08H30		Introduction			
08H35	Morning session	short presentations (2-3")	ir: Yves-Marie ABI	speaker	Timekeeper
	1	ALBA Synchrotron			
	2	Argonne National Laboratory			
	3	Australian Synchrotron - Ansto			
	4	AWE PLC			
	5	CERN			
	6	Diamond Light Source			
	7	Esrf			
	8	European XFEL GmbH			
	9	European X-Ray Free-Electron Laser Facility GmbH			Mario Di Castr
	10	Fmb Feinwerk Und Mezztechnik Berlin Gmbh			
	11	Forschungszentrum Jülich			
	12	Helmholz-Zentrum Berlin			
	13	Lawrence Livermore National Laboratory			
	14	MAX IV Laboratory			
	15	Michigan State University			
	16	Necsa SOC Limited			
	17	Nrf Ithemba Labs			
5h30		coffee			
10H00	Morning session	short presentations (3")	hair: Nicola Coppol	speaker	Timekeeper
	18	Oak Ridge National Laboratory			
	19	Paul Scherrer Institut			
	20	SLAC National Accelerator Laboratory			vier Serra Gall
	21	South African Radio Astronomy Observatory			
	22	Synchrotron SOLEIL			
	23	Umcg-partrec			
10H25	Morning Session	Frequency vs Time Domain	hair: Mario Di Cast	speaker	Timekeeper
	15"	Metrology experience at Alba	Alba	Xavier Serra Gallifa	
	15"	rFrequency tuning tools	DLS	Brett Sing-Gen	Laura Munoz
	15"	Advanced Motion Control Algorithms	Faraday motion		
11H30		Lunch			
12h30	ternoon sessio	Robotic Frameworks	Chair: Laura Munoz		Timekeeper
	15"	CERN robotic framework	CERN	Mario Di Castro	
	15"	Robotic organisation at DLS TBC	DLS		Nicola Coppol
	45"	Round table & discussion by group			
	45"	summarize by group			
14H30		coffee			
15h	ternoon sessio	Overcoming Existing System Limits	ir: Xavier Serra Gal	speaker	TimeKeeper
	15"	SOLEIL feedback with nanopositionner	SOLEIL	Laura Munoz	
		Digital Twins	ir: Xavier Serra Gal	speaker	
	15"	Digital twin at CERN	CERN	Mario Di Castro	Yves-Marie ABIVEN
	45"	Round table & discussion by group			
	45"	summarize by group			
17h	30"	Workshop summary			
17H30		END			

Workshop Summary



Dynamic and interactive day!

ICALEPCS
CAPE TOWN 2023
SOUTH AFRICA
MOCRAF WORKSHOP

Workshop Summary

- Main takeovers:
  - ✓ Interactive format has been appreciated by attendees
  - ✓ Standardisation of motion control solution should be strived for
  - ✓ For challenging motion control applications open solutions might give better understanding and ease integration
  - ✓ Collaboration among institutes should be highly encouraged, this type workshop/forum are suitable to build new partnership
  - ✓ Robotics: more and different types as previously foreseen have been shown.
    It is a optimal point in time to decide to have common and standard solutions
  - ✓ Digital twins: powerful engineering tool, not explored yet in motion control, started recently in robotics, tools and knowledge should be built and shared
  - ✓ Fruitful discussion with participants from industry who informed us that feedbacks from institutes on future developments and features are needed
  - ✓ Workshop will be followed up in future with topical discussions (~every 6 months)
  - ✓ **Looking forward for the 9th workshop edition!**

PLC Based Controls Systems workshop summary

Jeronimo ORTOLA
on behalf of Bard SCHOFIELD and Enrique BLANCO

Goals

4th edition of the PLC workshop

- Create **collaborative** atmosphere
- Promote **exchange** of expertise, methods, tools, solutions, lessons learned…
- Seek for collaboration opportunities

Scope

Control systems specification: Formalisation

Engineering: standardisation, automated code generation, versioning

Testing and verification: methods, automated testing, virtual commissioning

Maintenance: Obsolescence, upgrades, asset management

Organisation

Two sessions:

- 9 general presentations from the institutions: UMCG-PARTREC, STFC - ISIS Neutron and Muon Source, SLAC, ELBE (Helmholtz-Zentrum Dresden-Rossendorf), EBG MedAustron GmbH, CEA Paris-Saclay, NFN-LNL, SOLEIL.

- 5 talks on specific topics:
  - Virtual Commissioning for Advanced Controllers
  - Optimizing control: Engineering lifecycle
  - XFEL. PLC framework
  - Database driven control system specification
  - Full Stack PLC to EPICS Integration at ESS

Participation

55 participants: 19 institutes, 7 companies, 12 countries

- Australian Nuclear Science And Technology Organization
- CEA Paris-Saclay. France
- CERN. Switzerland
- ELETTRA Synchrotron Trieste. Italy
- European Spallation Source. Sweden
- European XFEL (X-Ray Free-Electron Laser Facility). Germany
- Helmholtz. Germany
- INFN-LNL. Laboratori Nazionali di Legnaro. Italy
- Institute of High Energy Physics, CAS. China
- Institute of Modern Physics, Chinese Academy of Sciences. China
- King Faisal Specialist Hospital And Research Centre. Saudi Arabia
- Lawrence Livermore National Laboratory. United States
- LNLS. Laboratório Nacional de Luz Síncrotron. Brazil
- Oak Ridge National Laboratory. United States
- NRF-iThemba LABS. South Africa
- SLAC National Accelerator Laboratory. United States
- UKRI. UK Research and Innovation. UK
- PARTREC. Particle Therapy Research Center. Netherlands
- SARAO. South African Radio Astronomy Observatory

1st	Barcelona 2017	45
2nd	New York 2019	34
3rd	Shanghái 2021	57
4th	**Cape Town 2023**	**55**

- AWE
- Beckhoff
- Medaustrron
- FMBFeinwerk Und Messtechnik
- PROCON
- Observatory Sciences Ltd.
- Nusano

Outcome

- High quality presentations
- Great participation and discussions
- Follow-up sessions to be organised on:
  - Asset management
  - Modern software development (Test driven development, CI, Automated code generation)
  - Versioning
  - Use of AI techniques in PLCs (ML, Model predictive control,…)
- Interest from many participants in a PLC experts and users online community


Control system software upgrade?

Program and presentations available at

https://indico.cern.ch/event/1250169/timetable/#20231007.detailed

Workshop on Controls GUI Strategies

11th October 2023

Workshop Summary – Chris Roderick

https://indico.cern.ch/e/controls-guis-2023

Workshop – Motivation & Aims

GUIs have the potential to make peoples work much easier (often hiding complexity)

GUIs present many challenges: UX design, inevitable technology evolution

1st GUI Strategies Workshop in 2022 → a lot of interest and some topics to be followed-up:

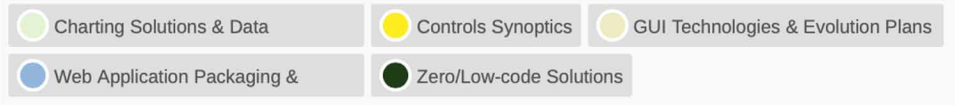
- Extended discussions around Charting, Data Decimation, & Synoptics, Web application Packaging
- Collaborations / Institutes developing zero/low code GUI platforms

This workshop aimed to bring the interested people together again, in person (!), as a community, to share knowledge, discuss, & hopefully, make new connections & get inspired

Agenda

Introduction & workshop overview	*Chris Roderick*	
Room 8/9, Cape Town (South Africa)	08:30 - 08:40	
GUI Situation & Strategy @ CERN	*Stephane Deghaye*	
Room 8/9, Cape Town (South Africa)	08:40 - 09:15	
GUI Situation & Strategy @ MAX IV	*Vincent Hardion*	
Room 8/9, Cape Town (South Africa)	09:15 - 09:50	
Tea / Coffee - offline discussions		
Room 8/9, Cape Town (South Africa)	09:50 - 10:20	
GUI Strategy @ CEA	*Katy Saintin*	
Room 8/9, Cape Town (South Africa)	10:20 - 10:40	
GUI Strategy @ ESRF	*Matias Guijarro*	
Room 8/9, Cape Town (South Africa)	10:40 - 11:00	
GUI Strategy @ ESS	*Benjamin Bolling*	
Room 8/9, Cape Town (South Africa)	11:00 - 11:25	
GUI Situation & Strategy @ Other Institutes	*Chris Roderick*	
Room 8/9, Cape Town (South Africa)	11:25 - 12:10	
Lunch		
Room 8/9, Cape Town (South Africa)	12:10 - 13:10	

Taurus	*Mr Zbigniew Reszela*	
Room 8/9, Cape Town (South Africa)	13:10 - 13:40	
Taranta Status Update & Demo	*Matteo Canzari*	
Room 8/9, Cape Town (South Africa)	13:40 - 14:10	
CERN Accelerator Controls WRAP GUI Platform	*Stephane Deghaye*	
Room 8/9, Cape Town (South Africa)	14:10 - 14:40	
Tea / Coffee - offline discussions		
Room 8/9, Cape Town (South Africa)	14:40 - 15:00	
Radiasoft low-code GUIs	*Evan Carlin et al.*	
Room 8/9, Cape Town (South Africa)	15:00 - 15:30	
Example Charting & Data Decimation @ CERN	*Anti Asko*	
Room 8/9, Cape Town (South Africa)	15:30 - 15:55	
Open discussion around Charting & Data Decimation	*Chris Roderick*	
Room 8/9, Cape Town (South Africa)	15:55 - 16:10	
SVG Synoptics	*Vincent Hardion*	
Room 8/9, Cape Town (South Africa)	16:10 - 16:20	
Synoptic generation based on accelerator data & SSVGs	*Stephane Deghaye*	
Room 8/9, Cape Town (South Africa)	16:20 - 16:40	
Packaging the WRAP application for the CERN Control Centre	*Anti Asko*	
Room 8/9, Cape Town (South Africa)	16:40 - 17:10	
Workshop Closeout	*Chris Roderick*	
Room 8/9, Cape Town (South Africa)	17:10 - 17:15	



A Broad & Rich Participation

~60 Participants from ~23 institutes

ANL: Argonne National Laboratory
BNL: Brookhaven National Laboratory
CEA Saclay
CERN
DLS: Diamond Light Source, UK
EBG MedAustron GmbH
Elettra Sincrotrone Trieste
ESO: European Southern Observatory
ESRF: European Synchrotron Radiation Facility
ESS: European Spallation Source
Fermilab
HZB: Helmholtz-Zentrum Berlin
HZDR: Helmholtz-Zentrum Dresden-Rossendorf
LBNL: Lawrence Berkeley National Laboratory
LNLS/CNPEM, Brazilian Synchrotron Light Laboratory
MAX IV Laboratory
PSI: Paul Scherrer Institute
Radiasoft LLC
ISIS, Science and Technology Facilities Council
SLAC National Accelerator Laboratory
SNRC: Soreq Nuclear Research Center
SARAO: South African Radio Astronomy Observatory
UMCG-PARTREC

Brief High-Level Summary

PyQt and Web are now mainstream, with Java (for GUIs) declining

Growing adoption & investment in zero/low-code solutions (Taurus, Taranta, WRAP)

not obvious if there is any strong investment in this topic for a generic EPICS solution?

Some institutes look close to switching 100% to Web

No perfect Charting solutions out there – performance Vs advanced features:
→ 2 solutions for different needs? Data decimation can go a long way. Code sharing proposed.

Synoptics generation is a common need & there is wide interest. To be followed up.

Promising results for packaging Web applications as desktop applications (aids user acceptance)

Open questions around GUI Testing (& Testing in general) → not on the agenda → future workshop?

Lots of interesting discussions:

- Some existing, new, and potential future EPICS users got connected, and will help one another 😀
- Some UX aspects (e.g. use of fixed colours → good or bad? UX by developers of UX specialists)
- Who develops GUIs? (e.g. professional software development team Vs physicists, equipment experts, etc.)
- Best approaches to data decimation (e.g. client-side Vs server-side)
- … other things I forgot for now…

Mission Accomplished

Advertised Objectives:

- *Listen, discuss, and exchange knowledge and ideas on various aspects of GUI development in a Controls environment.*
- *Establish contact with people in other institutes facing similar challenges or with interesting solutions.*

This was a workshop

plenty of discussion, people took part

& shared their questions, ideas, feedback, experience, etc.

ICALEPCS 2025

Thanks very much! See you next time…

Data Science & Machine Learning Workshop Summary

Manuel GONZALEZ-BERGES (CERN)

Participants

- Conference registration: 57people (36 Institutes/Companies)
- **Diverse backgrounds & interests**

Pre-workshop Survey

DS/ML Experience	
New field to me	41%
Some experience	22%
Regular experience	37%

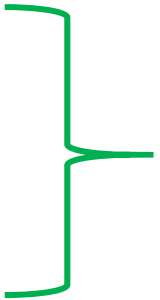
Programming level	
No knowledge	2%
Beginner programmer	17%
Regular programmer	54%
Expert programmer	27%

Interests:

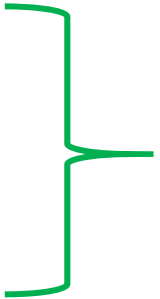
- Anomaly detection
- NLP
- Computer Vision
- Denoising
- Predictive Maintenance
- Parameter optimization
- Advanced control
- Calibration
- Time series modelling
- Real-world applications
- etc

Workshop Structure

- Introduction
- Tutorials
- Project Specific Presentations
- Open Discussion Session

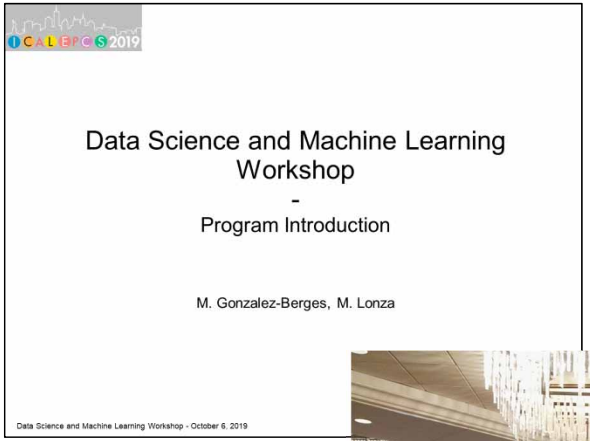


Morning



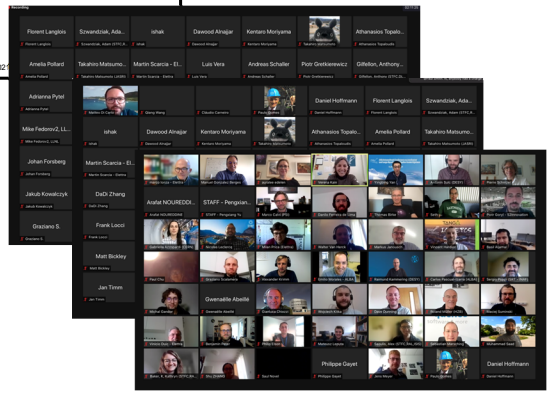
Afternoon

ICALEPCS 2019 – New York



ICALEPCS 2023 – Data Science & Machine Learning Workshop

ICALEPCS 2021 – Shangai



130 attendees (>200 registered)

Tracks with ML related papers

Conferences	Tracks
ICALEPCS 2013	• Knowledge-based Techniques
ICALEPCS 2015	• Feedback Systems, Tuning
ICALEPCS 2017 (first time ML mentioned in descriptions)	• Data Analytics • Feedback Control and Process Tuning
ICALEPCS 2019	• Data Analytics • Feedback Control and Process Tuning • Experiment Control
ICALEPCS 2021	• Data Analytics • Feedback Control, Machine Tuning & Optimization • Experiment Control • Timing Systems, Synchronization & Real-Time Apps
ICALEPCS 2023	Many tracks (~35 papers mention ML) Specially: • Artificial Intelligence & Machine Learning

Tutorials Session

Gianluca Valentino
University of Malta

Linear Regression: example

- Consider apartment prices in Cape Town as a function of size.

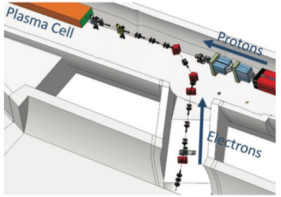
- We would like to build a model that predicts price given a certain size.
- This is a case of *supervised learning*

2 hours tutorial

Examples of Reinforcement Learning

Fly a helicopter

Ensure a corrected orbit



Manage an investment portfolio

Play Atari games better than humans

Project Presentations

Neural Networks for Anomaly Detection in LINACs, Injectors, and Transfer Lines

Jonathan Edelen, Dan Abell, Evan Carlin, Paul Moeller, Mike Keilman, Rob Nagler (RadiaSoft),
Kevin Brown and Vincent Schoefer (Brookhaven National Laboratory)
Chris Tennant, Brian Freeman, Reza Kazimi, and Daniel Moser (Jefferson Laboratory)

October 7th 2023

ICALEPCS 2023: 3rd Data Science and Machine Learning Workshop

This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics under Award Number DE-SC0019682

radiasoft

Boulder, Colorado USA | radiasoft.net

U.S. DEPARTMENT OF ENERGY | Office of Science

Project Presentations

Logbooks & Large Language Models

for accelerator(s)

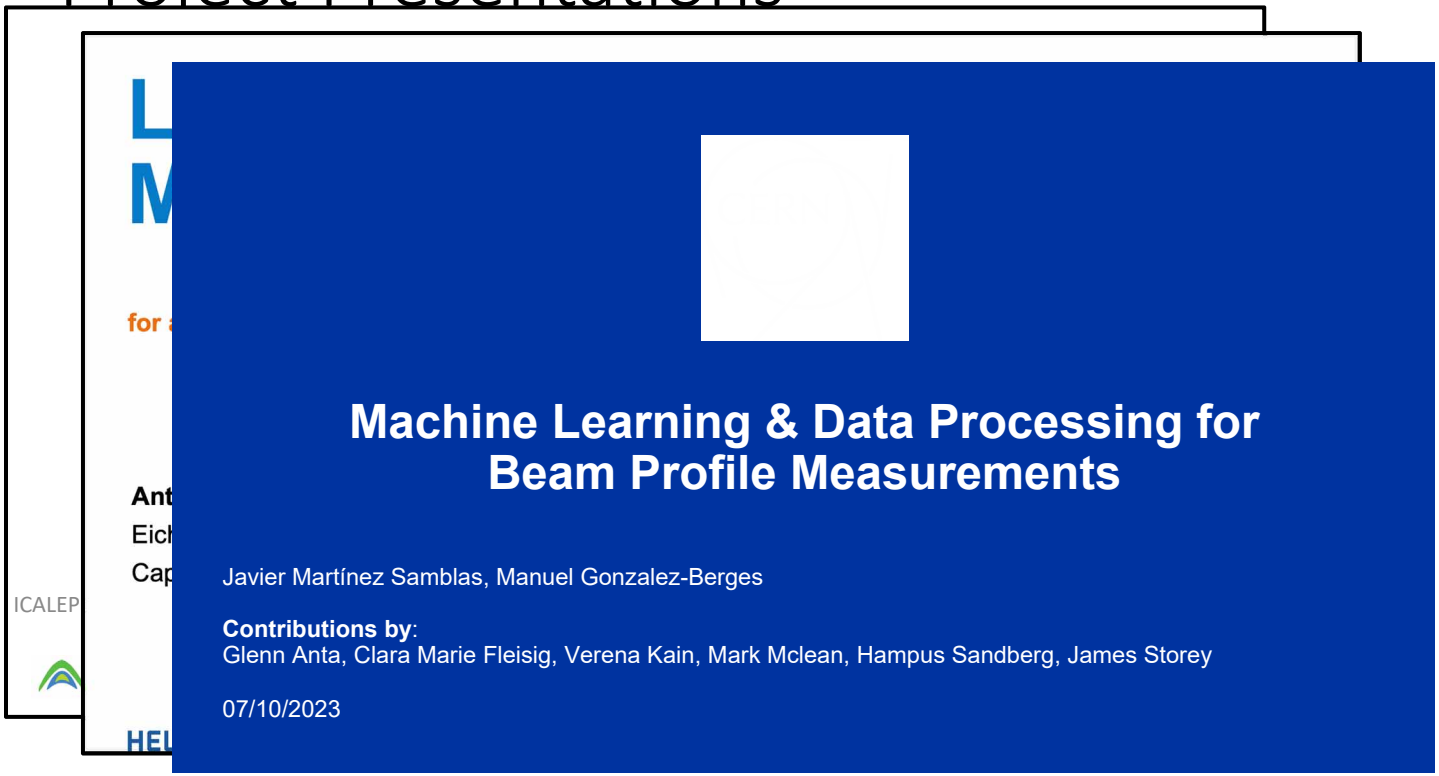
Antonin Sulc, Raimund Kammering, Annika Eichler, Tim Wilksen
Cape Town,

ICALEP

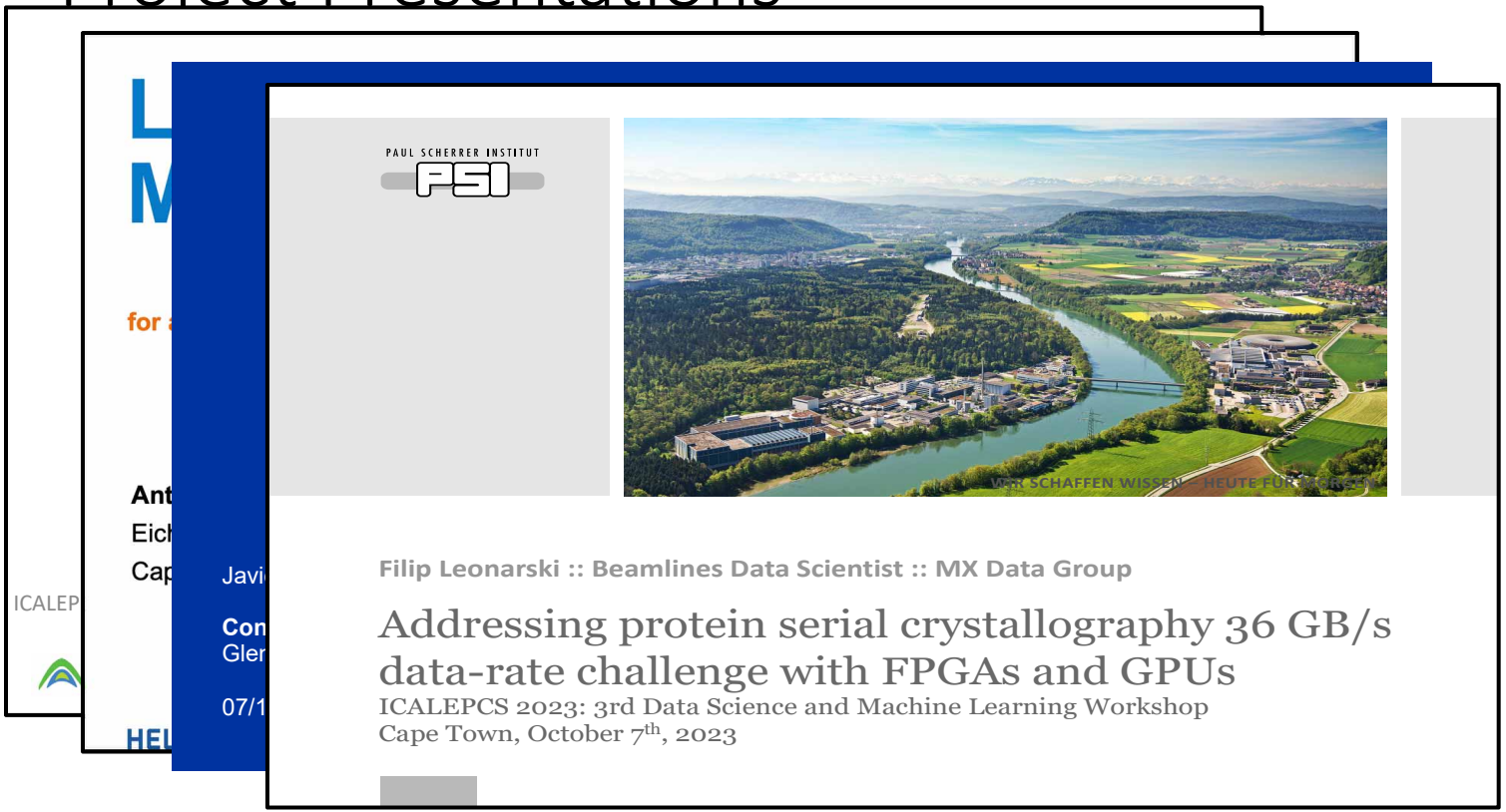
HELMHOLTZ

DESY.

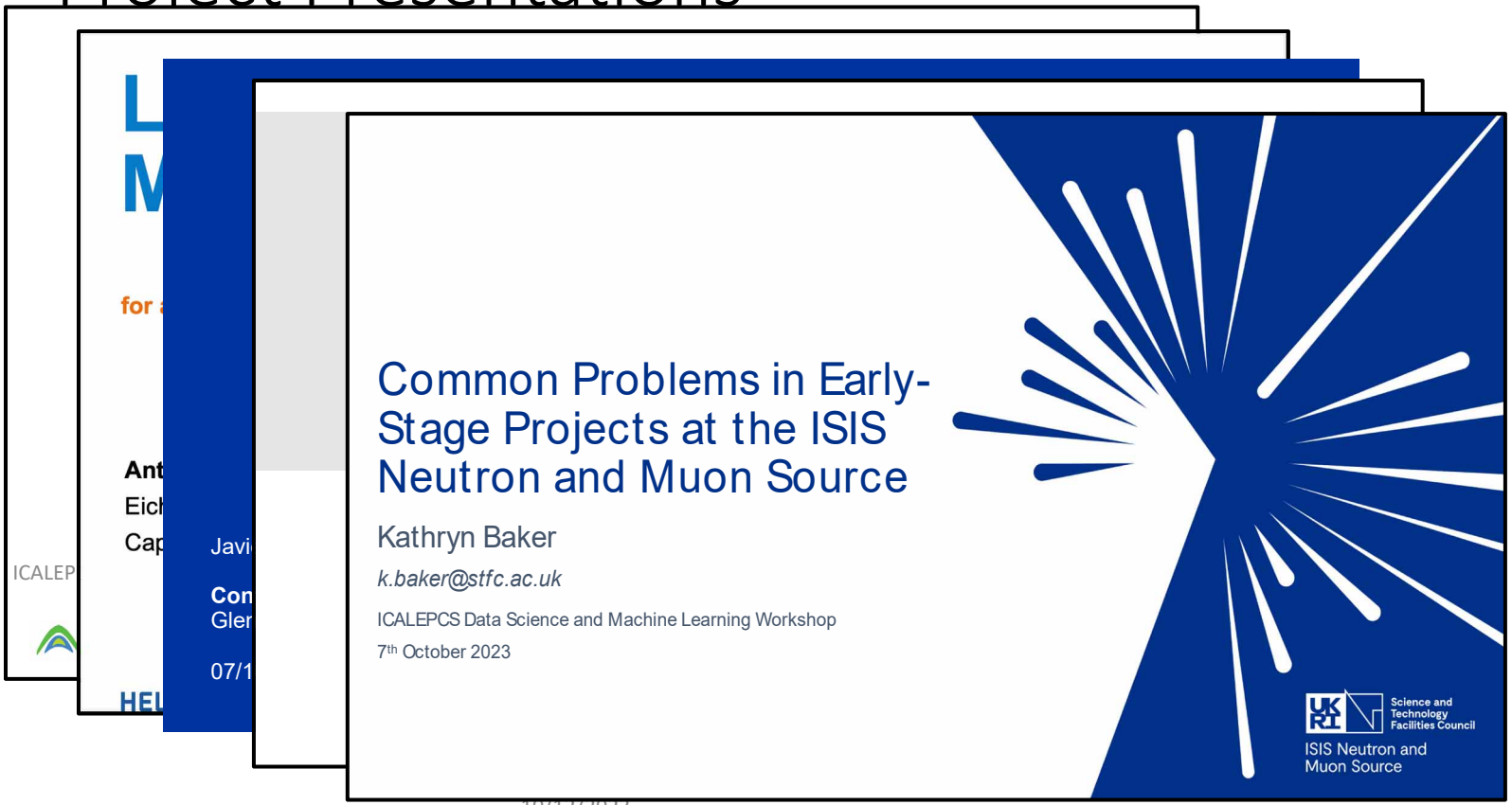
Project Presentations



Project Presentations



Project Presentations



Discussions

- Many questions and cross-project suggestions throughout the day
- Selected topics: necessary data for ML, correlations, taking systems to production, etc
- Last discussion focussed on the use of **assistants**
  - Programming (e.g. GitHub Copilot, ChatGPT, Amazon CodeWhisperer)
  - Design of systems (e.g. electronics circuit, particle accelerator)
  - etc

4 participants make regular use

Thanks!

- Workshop participants
- Presenters
- Organizers & LOC
- Room technicians

https://indico.cern.ch/event/1296634/

1st edition of "Efficiency through Automation" workshop

- *~50 participants, 20 institutes,*
- *half-day, discussion focused event*
- *a break-out session*
- *3 talks to stimulate the discussions*

Objectives:

- Gauge the interest in *(a very abstract & broad)* topic of efficiency and automation software
- Identify the focal areas and opportunities to collaborate, to exchange, to learn & help from each other

"Efficiency and Automation"

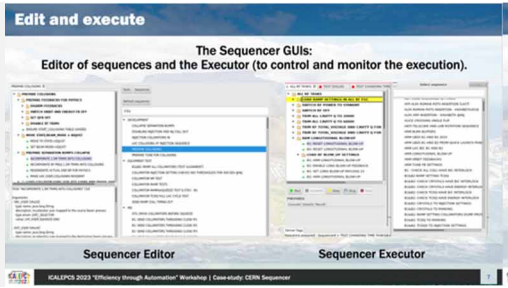
introduction to the workshop

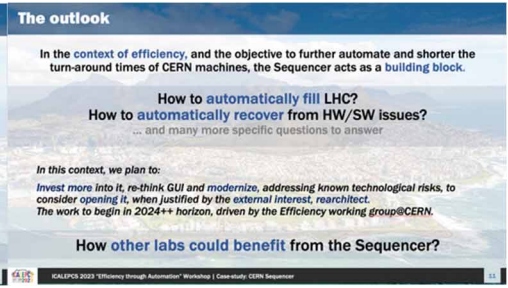
strong interest in areas such as workflows and processes, usability, human aspects, KPI, auto-discovery, and many more…

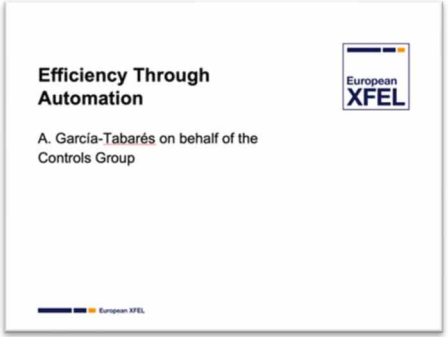
"Case-study: CERN Sequencer"

Introduction to accelerator operations automation software

@ from the Monday morning: *"What specifications can you share for the Sequencer? We really liked the features we saw and would be interested in duplicating it for our stack."*







"Automation at EuXFEL: a success story"

Ana García-Tabarés / on behalf of the XFEL Controls Group

Success story of "Recovery portal", triggering variety of questions thanks to shared practical experiences.

thank you Marie, for the idea & help

Breakout session focus groups:

Workflows and processes | Usability and ergonomics | Software solutions

Under the shared theme: ~“Efficient recovery from an error”

Workshop take-aways:

- Great atmosphere and the discussions, engagement from all the participants!
- Much in common among us all: the challenges and solutions.
- Several areas of interest to follow-up, an online workshop next year?

Big thank you…

Adam, Adriaan, Alejandro, Alexandre, Ana, Andy, Bartek, Daniel, David, Diogo, Elif, Eric, Hamza, Jonathan, Ken, Kenneth, Krzysztof, Liang, Linh, Loris, Luis, Lukas, Malte, Manuel, Marcell, Margaret, Martin, Marie, Mateusz, Matthias, Oliver, Oscar, Patrick, Piotr, Raelyn, Sandor, Shanaka, Sipho, Thomas B., Thomas O., Thomas W., Umkhulu, Vinod, Wojciech, Xiaomin, Xitsembiso, Tyler

… for making the 1st EtA workshop a great experience.