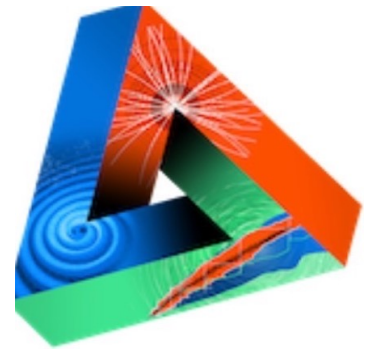# Joint ECFA-NuPECC-APPEC Computing Workshop

Luca dell'Agnello

C3SN, 3-4/7/2023
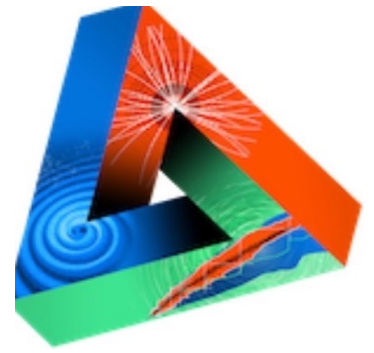
Computing for
Joint ECFA-NuPECC-APPEC (1/2)

- At the Joint ECFA-NuPECC-APPEC (JENA) Seminar in May 2022 in Madrid, both the plenary presentations and the closed session of funding agency representatives revealed that there is an increased need for discussions on the strategy and implementation of European federated computing at future large-scale research facilities.

- The status, needs and plans on a European level for large infrastructures are diverse and not coherent
  - In particle physics the concept for HL-LHC computing is discussed, in particular how the WLCG concept can be adapted to cope with the increased demands.
  - In nuclear physics the computing is currently organized mainly facility based and the community has limited access to the national computing centers
  - In astroparticle physics various totally different computing models for the distributed large-scale infrastructures exist
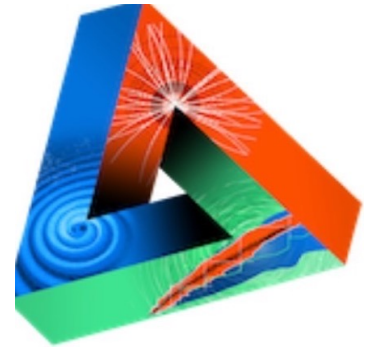
Computing for
Joint ECFA-NuPECC-APPEC (2/2)

- Therefore, APPEC, ECFA and NuPECC decided to organize a European, cross-community workshop on the strategy of computing.

- Goal: Identify the computing requirements in the next decade and the synergies that can benefit all the three communities (and funding agencies).
  - This is an initial kick-off workshop. We aim to set up working groups to explore synergies and cooperation in certain areas. The results will be discussed with representatives of the funding agencies at the next JENA symposium.

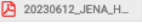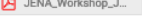- JENA 1st workshop on computing in Bologna (12-14 June 2023), organized by INFN

C3SN
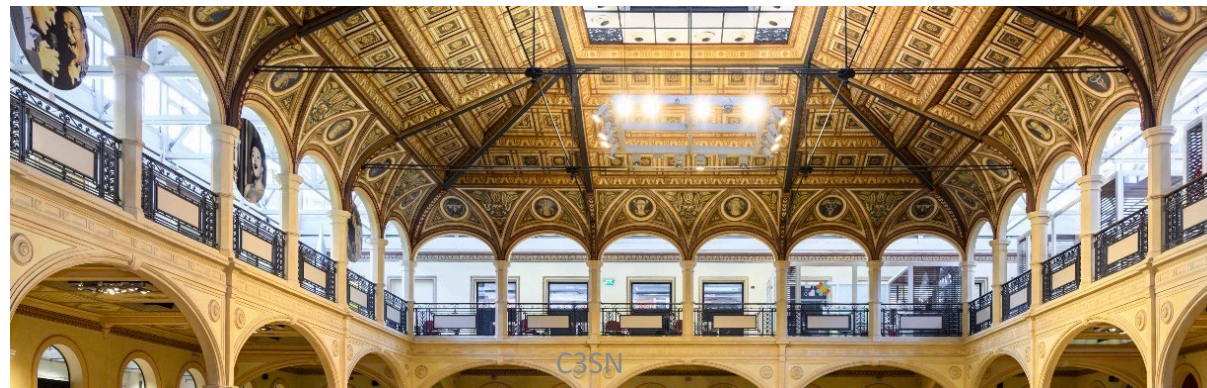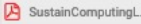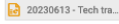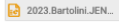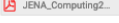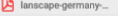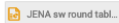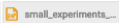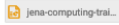
JENA Computing Workshop

- Workshop with European focus, with worldwide implications
  - Quite interesting [agenda](#) and fruitful discussions
    - Similarities with ESCAPE "noted"

- ~60 participants from the 3 communities (by invitation only)
  - Several European WLCG members were present and a representative from OSG (Frank W.)
  - Also talk from EuroHPC JU
  - ~10 INFN

- Conclusions - five areas were identified

C3SN

Day 1

- **11:00 → 12:30 Registration** — 1h 30m — Auditorium Biagi
- **12:30 → 14:00 Lunch** — 1h 30m — Auditorium Biagi
- **14:00 → 16:30 Opening and status of ENA Computing** — Auditorium Biagi
  - **14:00 Welcome, goal of workshop, and presentation of local institutions** — 30m
    - Speakers: Diego Bettoni (Istituto Nazionale di Fisica Nucleare), Andreas Haungs (Karlsruhe Institute of Technology), Karl Jakobs (Universitaet Freiburg (DE)), Marek Lewitowicz (GANIL)
    - Bettoni INFN.pptx
  - **14:30 Challenges in (federated) Computing in Particle Physics** — 30
    - Speaker: Concezio Bozzi (Istituto Nazionale di Fisica Nucleare)
    - 20230612_JENA_H...
  - **15:00 Challenges in (federated) Computing in Astroparticle Physics** — 30
    - Speaker: Stefan Schlenstedt (CTAO)
    - 230612-JENAA-Sch...
  - **15:30 Challenges in (federated) Computing in Nuclear Physics** — 30
    - Speaker: Johan Messchendorp (KVI-CART/University of Groningen)
    - JENA_Workshop_J...
  - **16:00 Discussion on synergies in the challenges** — 30
- **16:30 → 17:00 Coffee Break** — 30m — Aud...
- **17:00 → 19:20 European federated Computing** — Auditorium Bi...
  - **17:05 The ESCAPE project for fundamental physics** — 35
    - Speaker: Ian Bird (LAPP)
    - ESCAPE-JENA-Bolo...
  - **17:40 Horizon Europe (EOSC...)** — 35
    - remote presentation
    - Speaker: Giovanni Lamanna (LAPP)
    - JENA23_GLAMANN...
  - **18:15 Euro-HPC** — 35
    - remote presentation
    - Speaker: Evangelos Floros (EuroHPC JU)
    - EuroHPC - FLOROS...
  - **18:50 landscape of federated computing in the US** — 30
    - Speaker: Frank K Wuerthwein (UCSD)
    - jena2023.pdf

Day 2

- **09:00 → 10:30 Computing Technologies: Computing Technologies**
  - **09:00 Quantum Computing**
    - remote presentation
    - Speaker: Denis Lacroix (IN2P3)
    - Lacroix_JENABolog...
  - **09:30 Hardware Technologies and their evolution**
    - Speaker: Andrea Chierici (Istituto di Fisica Nucleare)
    - 20230613 - Tech tra...
  - **10:00 High-performance RISC-V systems – recent development**
    - Speaker: Andrea Bartolini (Bologna)
    - 2023.Bartolini.JEN...
- **10:30 → 11:00 Coffee break**
- **11:00 → 12:30 (Federated) Computing Models (on national levels): (Federated) Computing Modles (on natio...**
  - **11:00 Introductory statements by panel members** — 30m
  - **11:30 Round Table Disuccsion** — 1h
    - Speakers: Andreas Petzold (KIT), David Britton (Glasgow), Fabio Hernandez (Lyon), Frank K Wuerthwein (UCSD), Mattias Wadenstein (Lund), Sabine Crépé-Renaudin (IN2P3)
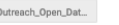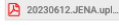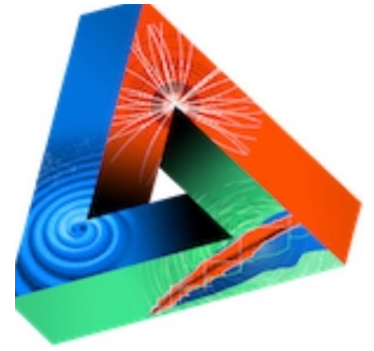   - 20230612-Nordics..., BRITTON-230613_J..., JENA_Computing2..., lanscape-germany-...
- **12:30 → 14:00 Lunch** — 1h 30m — Auditorium Biagi
- **14:00 → 15:30 Software developments (close to federated infrastructures)** — Auditorium Biagi
  - **14:00 Introduction** — 30m
  - **14:30 Round Table Disucssion** — 1h
    - Speakers: Guenter Duckeck, Liliana Teodorescu (London), Mohammad Al-Turany (GSI), Tommaso Boccalli (INFN)
    - JENA sw round tabl..., small_experiments_...
- **15:30 → 16:00 Coffee break** — 30m — Auditorium Biagi
- **16:00 → 18:00 Computing and Society** — Auditorium Biagi
  - **16:00 Education and Training in computing** — 30m
    - Speaker: several speakers (few)
    - jena-computing-trai..., JENA CSC.pptx, Outreach_Open_Dat...
  - **16:30 plenary discussion on Education and Training in Computing** — 30m
  - **17:00 Requirements on FAIR Data Management / Open Data Access / Outreach** — 30m
    - Speaker: Thomas Schoerner-Sadenius (PUNCH4NFDI / DESY)
    - 20230612.JENA.upl...
  - **17:30 open discussion on Ressource Dependent FAIR Data Management** — 30m
- **18:00 → 20:30 Visit to Tecnopolo**
- **20:30 → 23:30 Social Dinner** — 3h — Ristorante Da Cesari

Day 3

- **09:00 → 10:00 Closed Session for preparing the wrap up (Orga Team)** — 1h — Auditorium Biagi
- **10:00 → 11:30 Shaping the next decade** — Auditorium Biagi
  - **10:00 Wrap-up Presentations: Requirements on Computing; Requirements on Storage; Requirements on Software** — 45m
    - Speakers: Gonzalo Merino, Graeme A Stewart (CERN), Marc Labiche, Simone Campana (CERN), Stefano Bagnasco (Istituto Nazionale di Fisica Nucleare), Ulf-G. Meißner (Univ. Bonn and FZ Jülich)
  - **10:45 discussion, input / feedback from audience ==> working groups for JENAS 2024/25** — 45m
    - Speakers: Andreas Haungs (Karlsruhe Institute of Technology), Karl Jakobs (Universitaet Freiburg (DE)), Marek Lewitowicz (GANIL)
- **11:30 → 13:30 Next steps** — Auditorium Biagi
  - **11:30 Coffee break** — 30m
  - **12:00 Sustainability in particle, nuclear and astroparticle physics - Spotlight on Computing** — 30m
    - Speaker: Kristin Lohwasser (Sheffield / CERN)
    - SustainComputingL...
  - **12:30 Open discussion on sustainability (in computing)** — 30m
  - **13:00 Closing** — 30m
- **13:30 → 15:00 Lunch/adjourn** — 1h 30m — Auditorium Biagi

Conclusions: HPC

- The relationship with HPC centers and the integration of HPC resources with our computing infrastructures
  - For Europe, there is a need to engage at a higher level with EuroHPC. Contrarily to the past, there is an opportunity to shape the evolution and policies of HPC facilities towards the ENA sciences needs.
  - S. Campana and G. Merino tasked to organise a working group around this area.
    - *Luca and Tommaso have volunteered to join the wg*

Almost verbatim from Simone's and Brittons' notes

Conclusions: Software and Heterogeneous Architectures
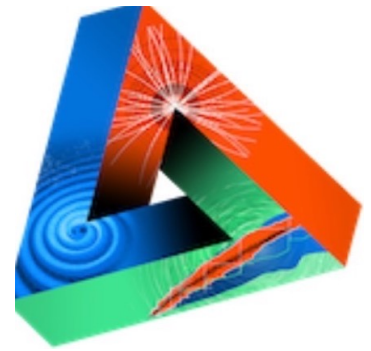
- Common software can promote quality whilst reducing overall cost

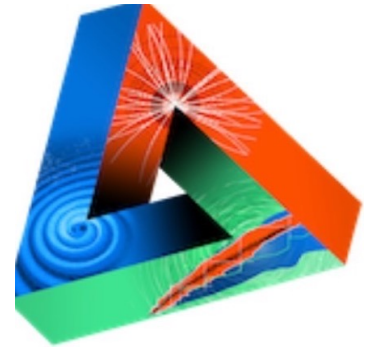- Ability to use heterogenous architectures important for cost and environmental sustainability reasons. The latter may also drive choice of future programming languages and use of techniques such as AI/ML.

- Common software exists at:
    - Infrastructure level
        - Containerization and Orchestration (e.g., Docker and Kubernetes);
        - Monitoring and Logging (e.g., Prometheus, Grafana and Kibana);
        - Security and Identity Management (e.g., Keycloak, Okta or Auth0);
        - Collaboration and Version control (e.g., Github and GitLab).
    - Higher level with things like AAI stacks, ticketing, accounting systems, Data Management and Workload Management. ESCAPE combined tools from HEP domain into a demonstrator.
    - Within domains: e.g., for HEP ROOT, Geant4, Corsika, MC generators, … and using tools such as Tensorflow, Keras, ONNX, …TBB, CUDA, …
    - More recently Python ecosystem e.g., Scikit-HEP, gammapy (for gamma ray astronomy)

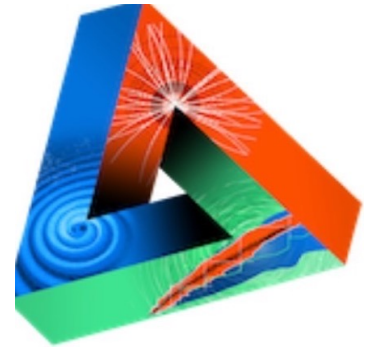*Almost verbatim from Simone's and Brittons' notes*

Conclusions: Federated Data Management, Virtual Research Environments and FAIR/Open Data

- Very positive feedback about the work done in ESCAPE in this area. The ESCAPE collaboration should be leveraged to strengthen synergies between the three sciences around data management and federated identities.

- The ECFA/NuPECC and APPEC chairs are in the ESCAPE advisory board and will recommend that ESCAPE focuses on those areas and the evolution of the tools and services for the next decade.

*Almost verbatim from Simone's and Brittons' notes*

Conclusions: ML and AI

- The approach seems slightly different between communities

- ECFA is beyond the phase of scepticism, and is willing to explore also end-to-end approaches to workflows like reconstruction (with Graphs) and GANs (Generative adversarial networks) for large parts of Geant4

- NuPECC and ApPEC still consider AI an immature tool, with possible use as a piecewise substitution for certain algorithms; but they are still concerned by the black box approach and the lack of explainability
  - Both agree that solid and easy to use ML-oriented infrastructures are needed for R&D but also as training facilities for experiments

- Lucio Anderlini and Tommaso Dorigo have volunteered

Conclusions: Training, Dissemination, Education
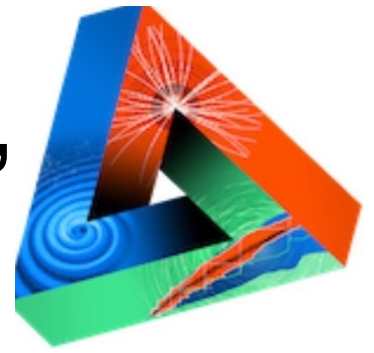
- **Training**: leverage the experience in the HSF training initiative and find common ground with other sciences. Share/reuse material and possibly understand if some common training event can be organised.

- **Dissemination**: we considered the idea to organise a conference on scientific computing similar to CHEP but embracing more sciences (largely beyond ENA). In Europe there are 5 science clusters: ENVRI-FAIR, EOSC-Life, ESCAPE, PaNOSC, SSHOC. They are working on common aspects of scientific computing, and this would be a natural one.

- **Education**: ECFA has an initiative on a European master program for detector physicists and engineers. We discussed the idea to initiate a similar initiative on scientific software and computing. The ECFA chair will start discussing this in the ECFA context.

Almost verbatim from Simone's and Brittons' notes