



Open Infrastructure for a Better World



Dr Tim SMITH



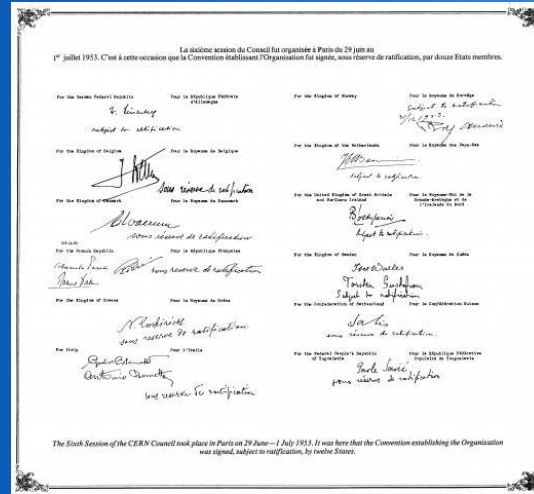
Indico 3.5 Workshop – 2023/03/20

Nurtured by the UN family

1950

Concept of CERN launched at UNESCO General Conference in Florence in June 1950, where physicist and Nobel laureate Isidor Rabi tabled a resolution authorising UNESCO to

“assist and encourage the formation of regional research laboratories in order to increase international scientific collaboration...”



The original of the CERN Convention and the instruments of ratification of all Member States are deposited with UNESCO

1951

At an intergovernmental meeting of UNESCO in Paris in December 1951, the first resolution concerning the establishment of a European Council for Nuclear Research was adopted

1952

Two months later, 11 countries signed an agreement establishing the provisional Council – the acronym CERN was born



CERN

Science
for Peace



23 Member States
7+3 Associate MS
50 CA with non-MS

600 Universities
77 Countries
120 Nationalities



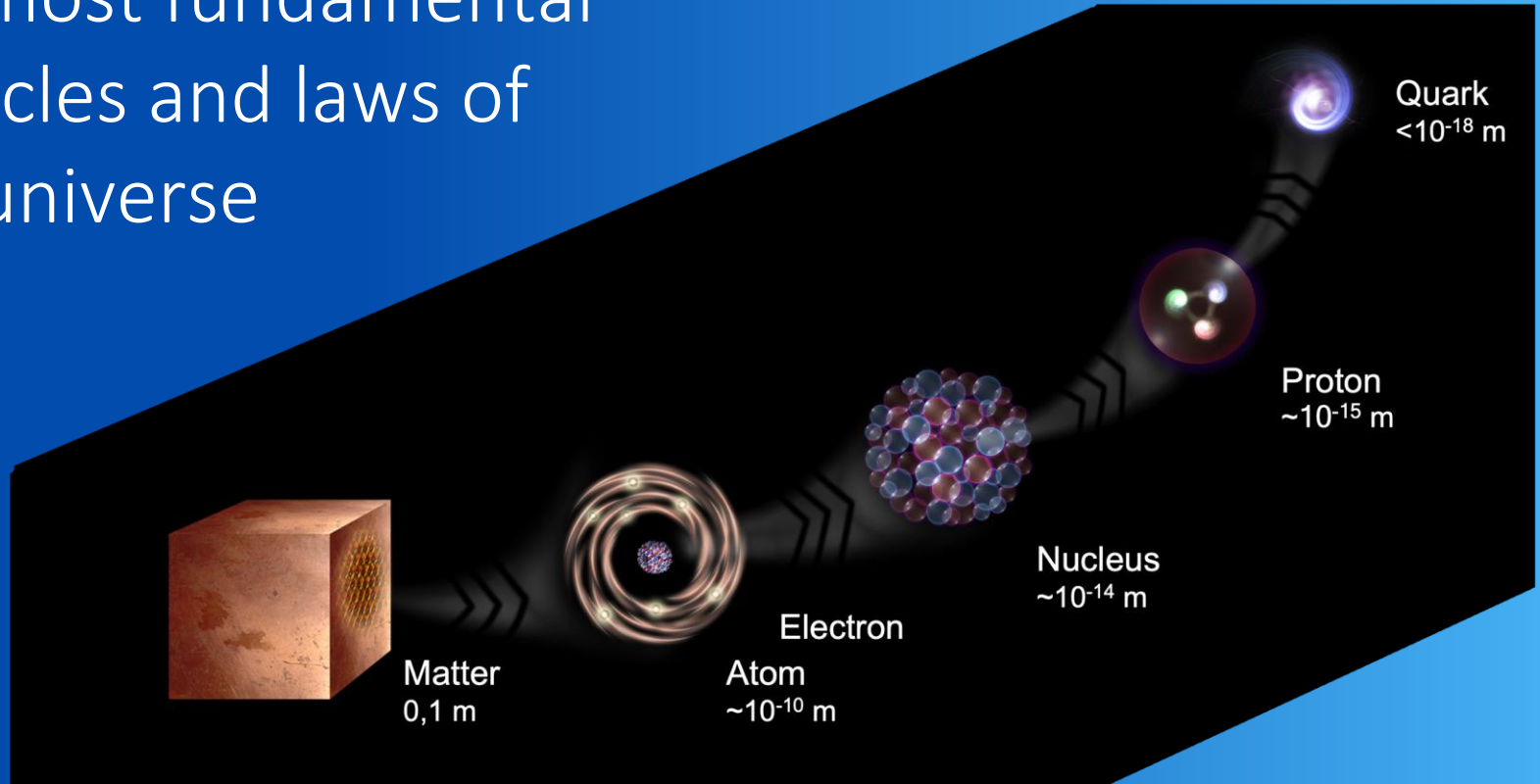
*Fundamental
Research*

Collaboration

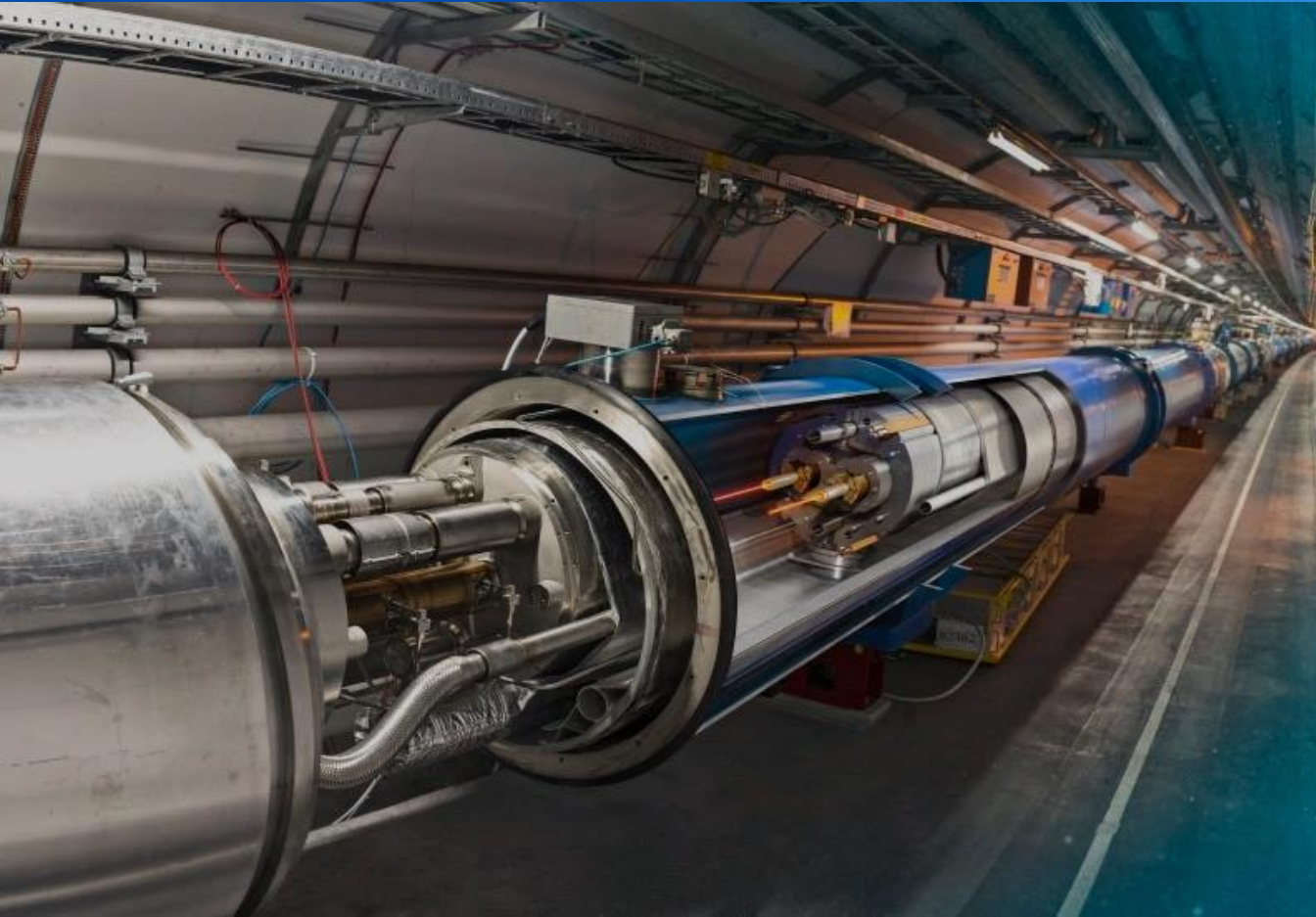
*Education &
Outreach*

*Technology &
Innovation*

To understand the most fundamental particles and laws of the universe



Large Hadron Collider (LHC)



27 km in circumference

About 100 m underground

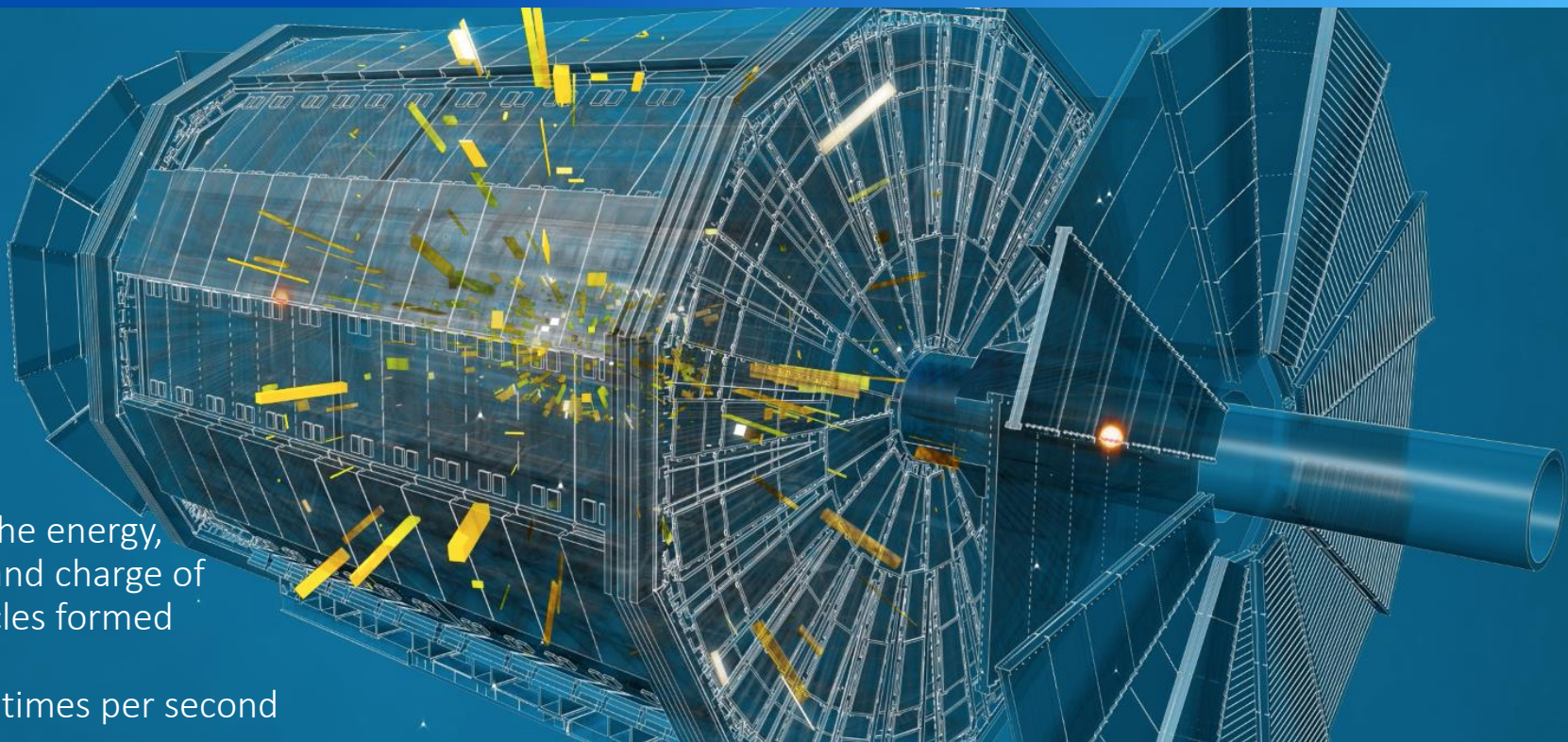
Superconducting magnets
steer the particles around
the ring

Particles are accelerated
to 99.9999991% the speed
of light

Ultrahigh vacuum

One of the coldest places in
the Universe (1.9K; -271.3°C)

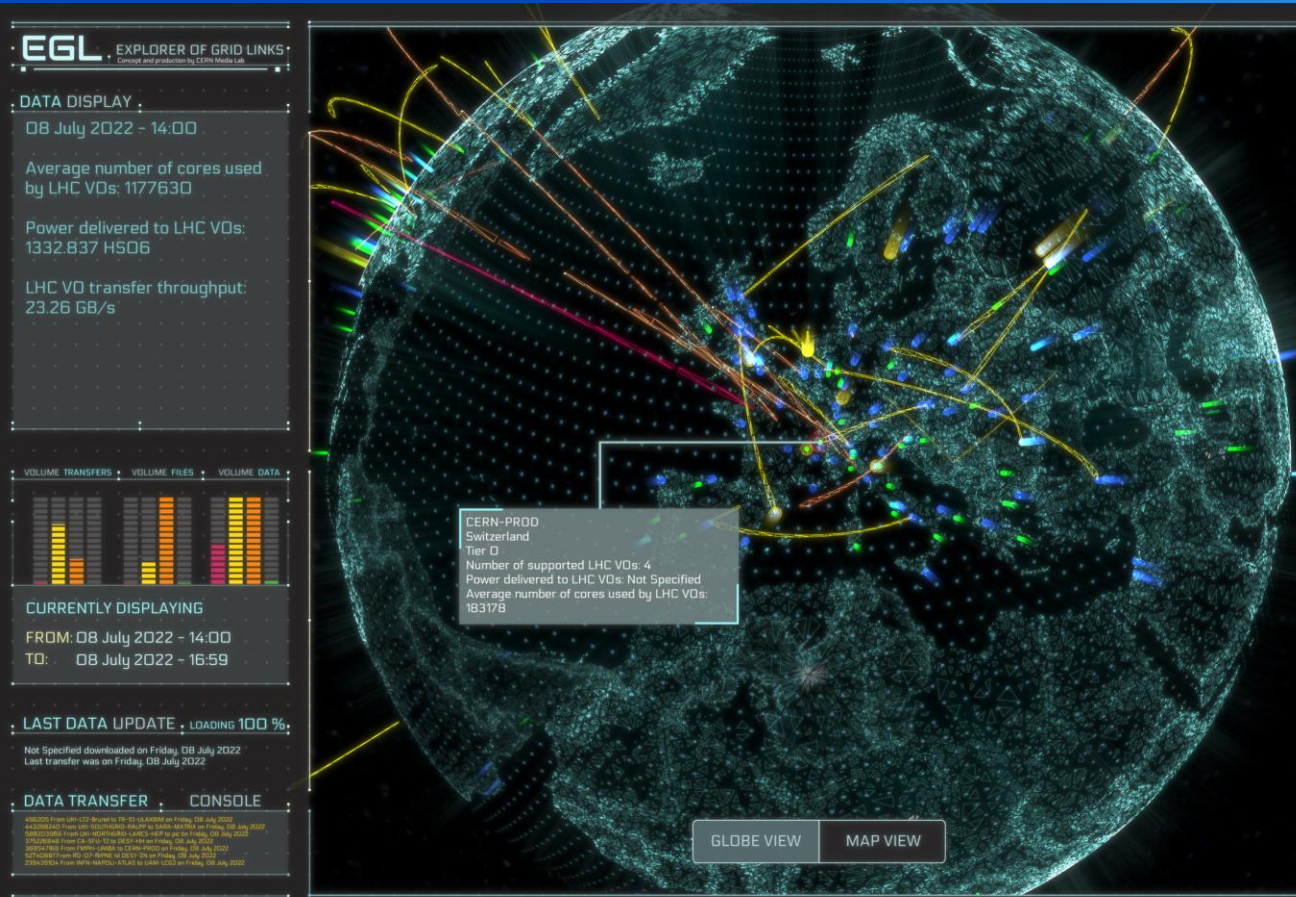
Giant detectors record the particles formed at the four collision points



Measure the energy,
direction and charge of
new particles formed

40 Million times per second

The Worldwide LHC Computing Grid (WLCG)



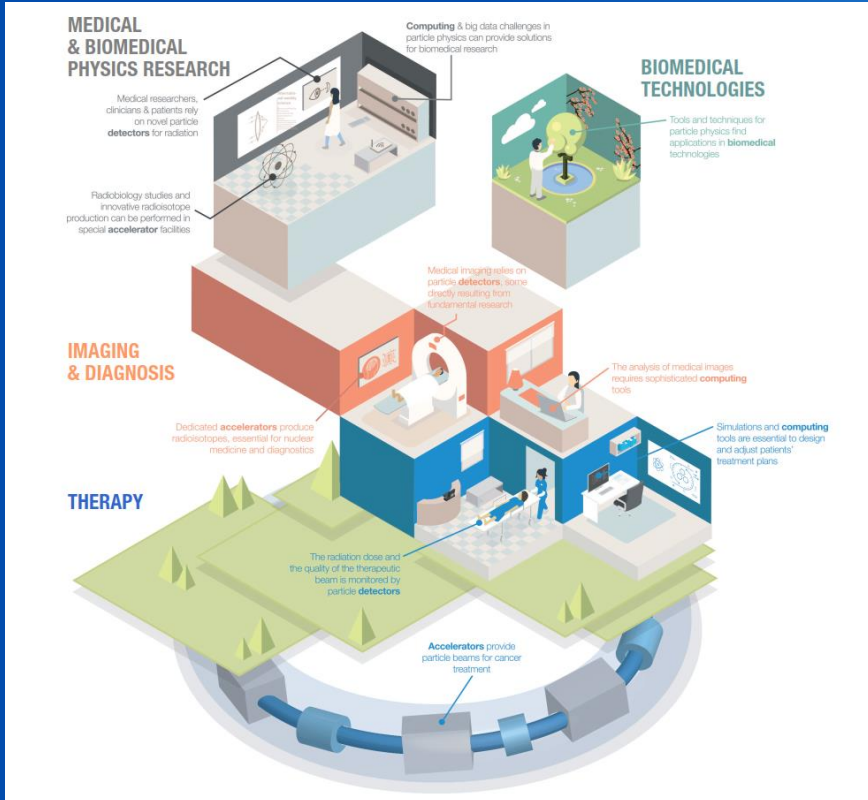
400PB @ CERN

Stores, distributes,
processes and analyses
LHC experiments' data

1.4 million processing cores
in 170 data centres
and 42 countries

1500 Petabytes
of CERN data stored
world-wide

Frontier Science ... Frontier Technology ... Shared



MedAustron started proton therapy treatments in December 2016



MARS Bio Imaging: next generation X ray finally in color using CERN chips

Aerospace Applications



Development of high energy beam for testing integrated electronic components with ESA

CERN's technological innovations have applications in many fields

+ material science,
cultural heritage,
automotive,
environment,
health & safety,
industrial processes

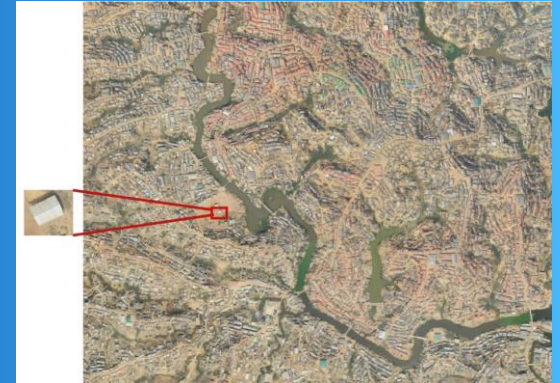


InsightART: Using CERN Medipix detector to analyse art

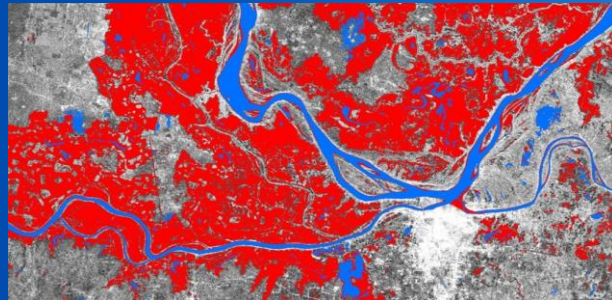
CERN as a host



UNOSAT
established at CERN in 2001,
based on IT infrastructure

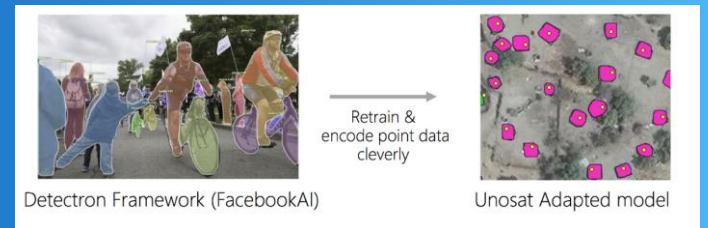


Flood detection



AI for Satellite
Imagery Analysis

Mapping shelters in refugee camps



CERN as neutral ground



1985 Disarmament Talks

The two delegations met in the evening at CERN, a neutral ground where both parties were respected

CERN is a model for open and inclusive collaboration



2600 Staff

800 Fellows

1500 Associates / Students

12,000 Visiting Scientists

Experiments: ATLAS

3800 physicists, 257

institutions, 42 countries

The CERN model...



ESO convention was modelled on CERN's and ESO Telescope Project Division at CERN to build 3.6m telescope



SESAME, a synchrotron light source in Jordan, is modelled on CERN's governance structure

69 years of Open Science at CERN

1953 CERN Convention:

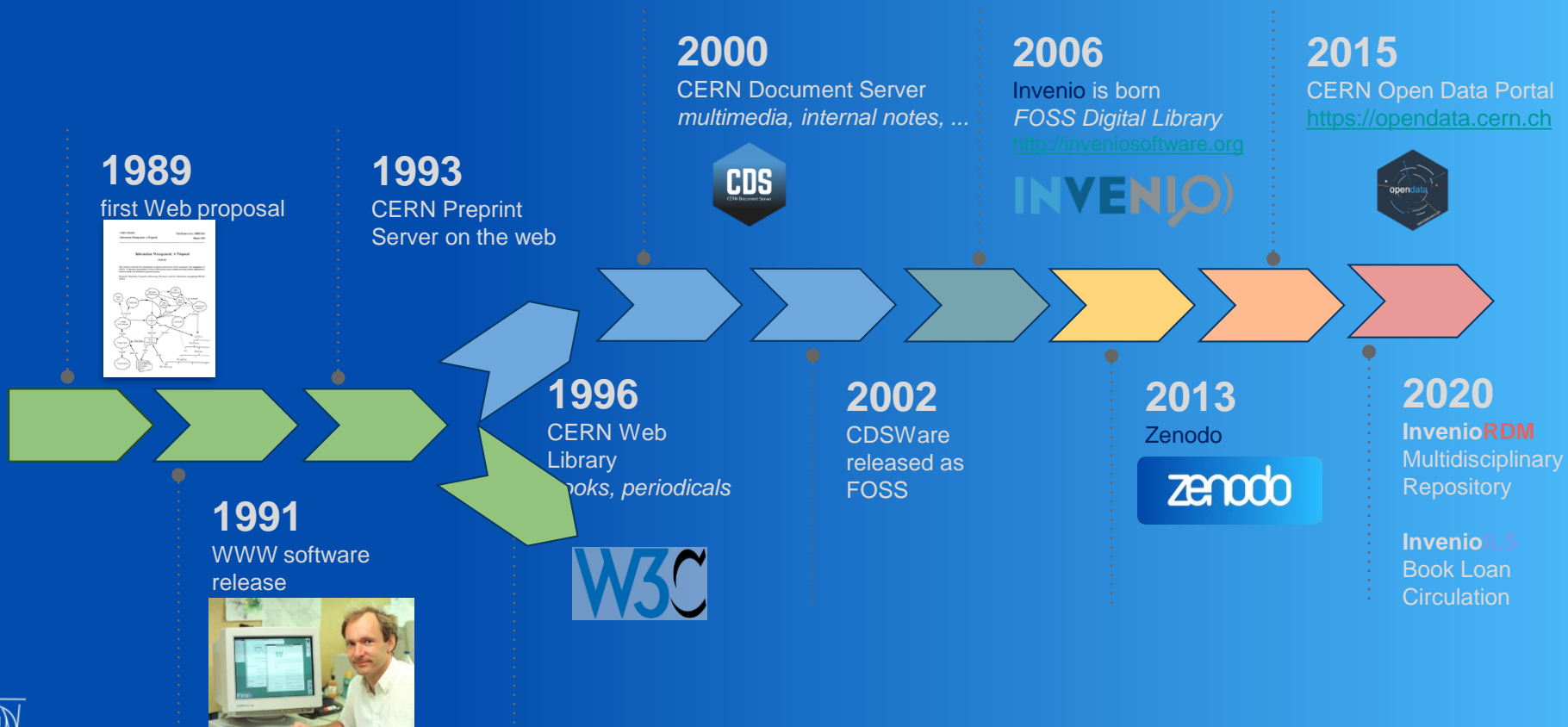
*The Organization shall provide for **collaboration** among European States in ... research of a pure scientific and fundamental character*

*... the results of its experimental and theoretical work shall be ... **made generally available***

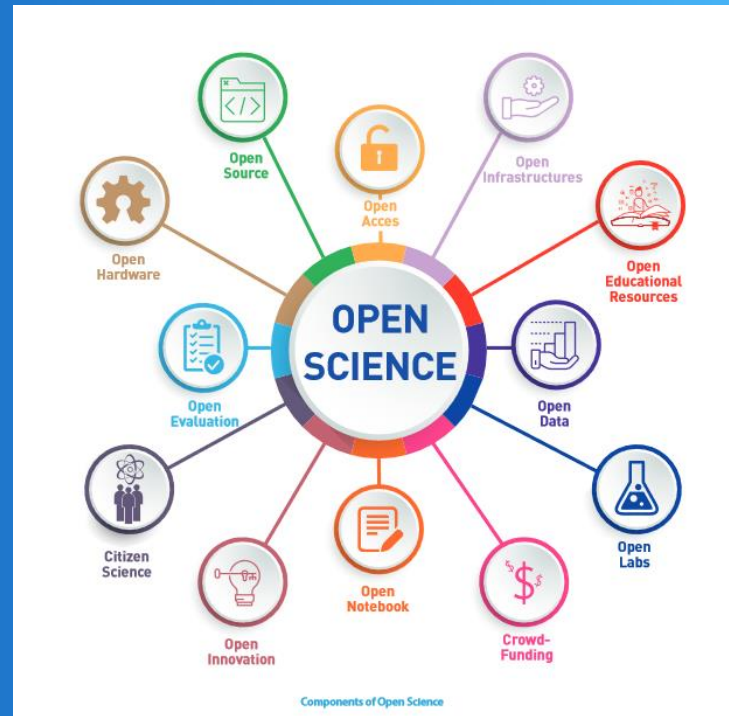
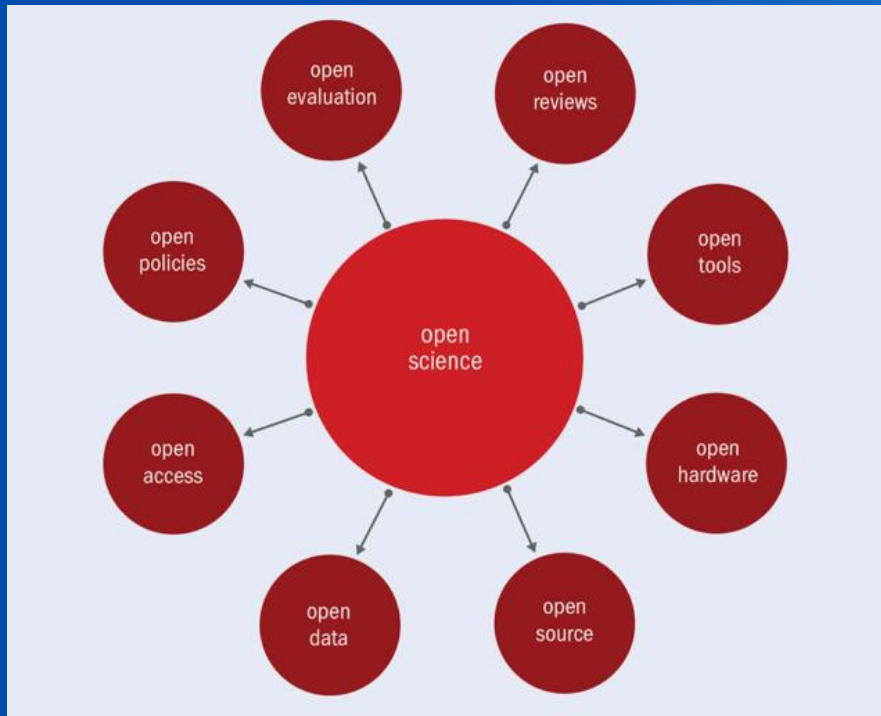
Spreading the (written) word



Evolution of knowledge sharing/preservation



Open Science Scope...



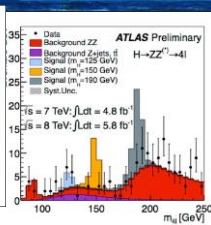
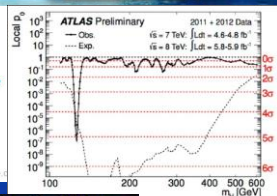
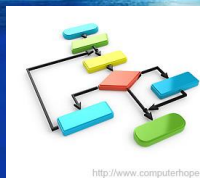
CERN Courier Volume 59, Number 2, March/April 2019

UNESCO, 2021

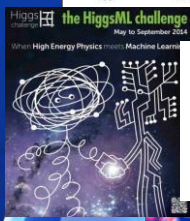
Research Iceberg



kB
1,000

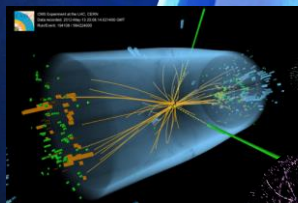


<http://www.computerhope.com>

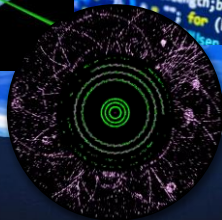


MB
1,000,000

GB
1,000,000,000



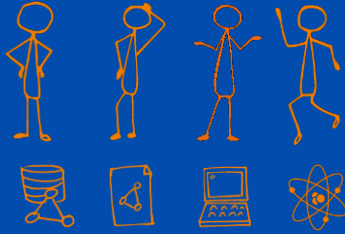
TB
1,000,000,000,000



PB
1,000,000,000,000,000

CERN Open Data

Education



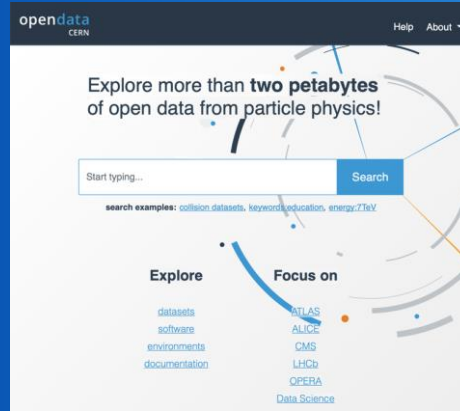
+



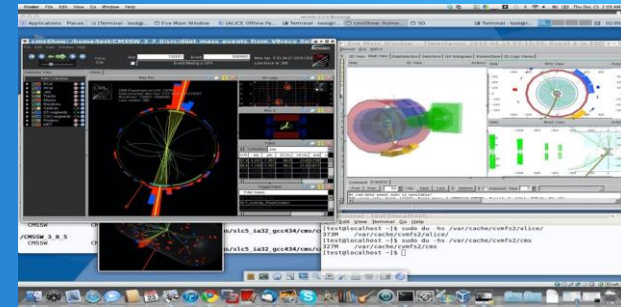
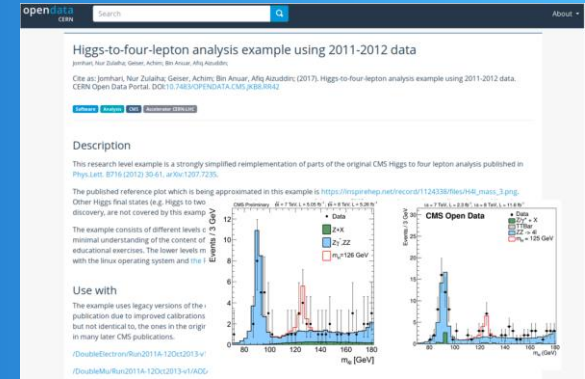
+



400 PB



<http://opendata.cern.ch>



Research

Share ≠ Publish ≠ Preserve



Dataset



Software



Article



Image



Video



Poster



Presentation



Lesson

zenodo

Lasagne: First release.

1,734 views 20 downloads

core contributors, in alphabetical order

- Eric Batenberg (@batenberg)
- Sander Dieleman (@bername)
- Danier Noun (@noun)
- Eben Olson (@ebolson)
- Akron van den Oord (@avdoord)
- Colin Raffel (@craffel)
- Jan Schriber (@jsch)
- Sander Kaiser Sandberg (@skaiser)

Files (10,348)

Citations (6)

Reducing model size in a deep learning classifier using dom...	2018	DOI	arXiv	DOI
Reducing model size in a deep learning classifier using dom...	2018	10.1386/1744-0221/3/1/110208		
Consistent nuclear morphological patterns with xenopus m...	2018	10.11038/w41023-018-009-4		
Yosh, Right, LH-Hub: A Deep Learning Backchannel Predictor	2018	10.1007/978-3-319-8062-2_28		
Fully automatic cross-modality localization and labeling of	2018	10.1007/978-1-544-018-181-8_9		
Accurate design of transitional output by a neural network...	2018	10.1007/978-3-319-8062-2_28		
Comparison of different deep learning approaches for parent...	2018	10.1101/212926		
Feature Representations for Neuroanatomic Audio Spike Streams	2018	10.1007/978-3-319-8062-2_28		
Radio Galaxy Zoo: compact and extended radio source classif...	2018	10.1007/978-3-319-8062-2_28		
Natural Gradient Deep Q-Learning	2018	10.1007/978-3-319-8062-2_28		
Consistency-based anomaly detection with adaptive multiple...	2018	10.1007/978-3-319-8062-2_28		

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Lasagne / Lasagne

1,157 commits 2 branches 1 release 65 contributors

Lightweight library to build and train neural networks in Theano

Lightweight library to build and train neural networks in Theano

1157 commits 2 branches 1 release 65 contributors

Find File Clone or download

- github Merge pull request #608 from SimonKHadd/instance_norm
- github Add github issue and PR templates
- docs Correct/refine StandardizationLayer, instance_norm and layer_norm docs
- examples Add documentation of the behavior of Iterate_minibatches
- lasagne Correct/refine StandardizationLayer, instance_norm and layer_norm docs
- coverages Ignore tests/ directory for coverage reporting
- coverages-ncgpu Ignore modules that require a GPU when running with Travis
- gignore Merge pull request #423 from Botole/objectives
- travis.yml Migrate Travis config to container-based infrastructure
- CHANGES.rst Update CHANGELOG
- LICENSE Attribute code to "Lasagne contributors"
- MANIFEST.in Add MANIFEST.in to include docs and tests in source distribution
- README.rst Add link on citing Lasagne
- requirements-dev.txt Allow building documentation locally with Sphinx <= 1.3
- requirements.txt Update Theano dependency to 0.8.2
- setup.cfg Consolidate requirements files for docs and development.
- setup.py Fix #463 by using io.open
- README.rst

GitHub Guides

Video Guides GitHub Help GitHub.com

Making Your Code Citable

10 minute read

Digital Object Identifiers (DOI) are the backbone of the academic reference and metrics system. If you're a researcher writing software, this guide will show you how to make the work you share on GitHub citable by archiving one of your GitHub repositories and assigning a DOI with the data archiving tool Zenodo.

ProTip: This tutorial is aimed at researchers who want to cite GitHub repositories in academic literature. Provided you've already set up a GitHub repository, this tutorial can be completed without installing any special software. If you haven't yet created a project on GitHub, start first by uploading your work to a repository.

Intro

Choosing Your Repo

Login to Zenodo

Check Repo Settings

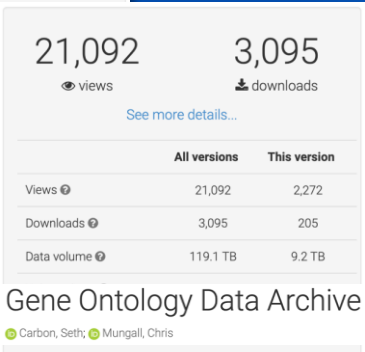
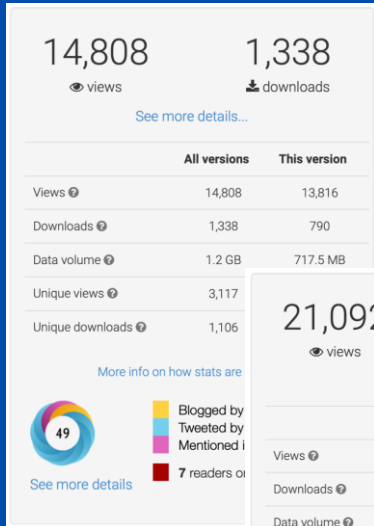
Create a New Release

Minting a DOI

Finishing up

Scholarly Innovation

Usage Statistics:



zenodo

FAIR Data Advanced Use Cases: from principles to practice in the Netherlands

13,762 views, 718 downloads

OpenAIRE

There is a **newer version** of this record available.

Version	DOI	Date
Version Final	10.5281/zenodo.1250535	Apr 23, 2018
Version with preliminary conclusions, which will be updated after the FAIR data workshop May 22 2018	10.5281/zenodo.1226847	Apr 23, 2018
Version Preprint	10.5281/zenodo.1226848	Apr 23, 2018

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zenodo

There is a **newer version** of this record available.

Version Final 10.5281/zenodo.1250535

Version with preliminary conclusions, which will be updated after the FAIR data workshop May 22 2018

Version Preprint 10.5281/zenodo.1226848

Cite all versions: You can cite all versions by using the DOI 10.5281/zenodo.620228. This DOI represents all versions, and will always resolve to the latest one. Read more.



Multi-Disciplinary Digital Age Scholarship

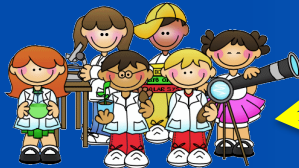


A screenshot of the Binder website. The main heading is 'Turn a Git repo into a collaborative notebook'. Below it, there are instructions: 'Have a repository full of Jupyter notebooks? With Binder, you can create a reproducible environment, making your code immediately available to others.' There are input fields for 'Zenodo DOI (10.5281/zenodo.3242074)', 'Git branch, tag, or commit', and 'Path to a notebook file'. A 'Learn more' button is visible.

Research
Centric

The ReScience Journal

A screenshot of a GitHub repository for 'ReScience / ReScience'. The repository is on the 'master' branch and contains a file named 'ReScience / Volume 2 - Issue 1.md'. The file has 73 lines, 54 slots, and 7.24 KB. The commit was made by 'oliviaguest' on Dec 12, 2016. The repository has 61 watches, 550 stars, and 25 forks. The file content shows a list of articles, including 'How Attention Can Create Synaptic Tags for the Learning of Working Memories in Sequential Tasks' by Erwan Le Masson and Frédéric Alexandre.



zenodo

Research Needs A
Reuse Feedback

OPENREUSE
Join Open Re-use Movement

the Learning of Working Memories in Sequential Tasks, Erwan Le Masson and Frédéric Alexandre, ReScience, volume 2, issue 1, 2016. DOI: 10.5281/zenodo.200334

InvenioRDM

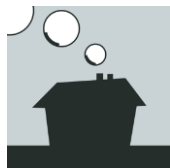
inveniosoftware.org/products/rdm

data futures



TÜBITAK

Caltech Library



COTTAGE LABS

BROOKHAVEN
NATIONAL LABORATORY



NORTHWESTERN
UNIVERSITY



Joint Research Centre



ek
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FOR DATA TO HEALTH

GEO GROUP ON
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InvenioRDM

inveniosoftware.org/products/rdm



OPEN SOURCE

Free Open Source Software

Customisable: adapt to your style

Flexible: adapt to your case

Fast: tested with big files

Reliable: tested at scale

Interoperable: OAI-PMH & standards

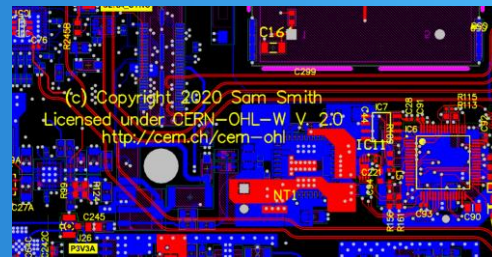
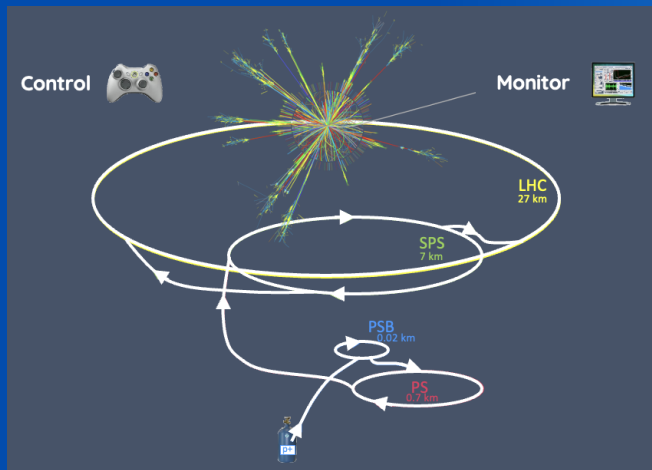
Secure: providing upgrades

Multi-domain and FAIR

making knowledge accessible
beyond physical science

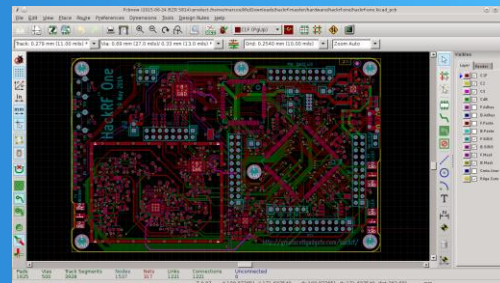
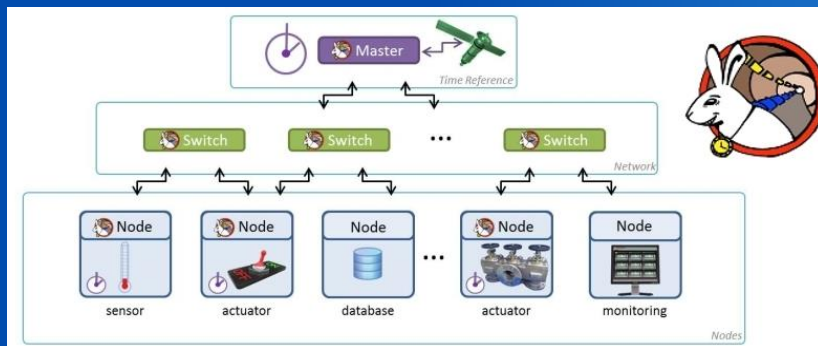


Open Hardware

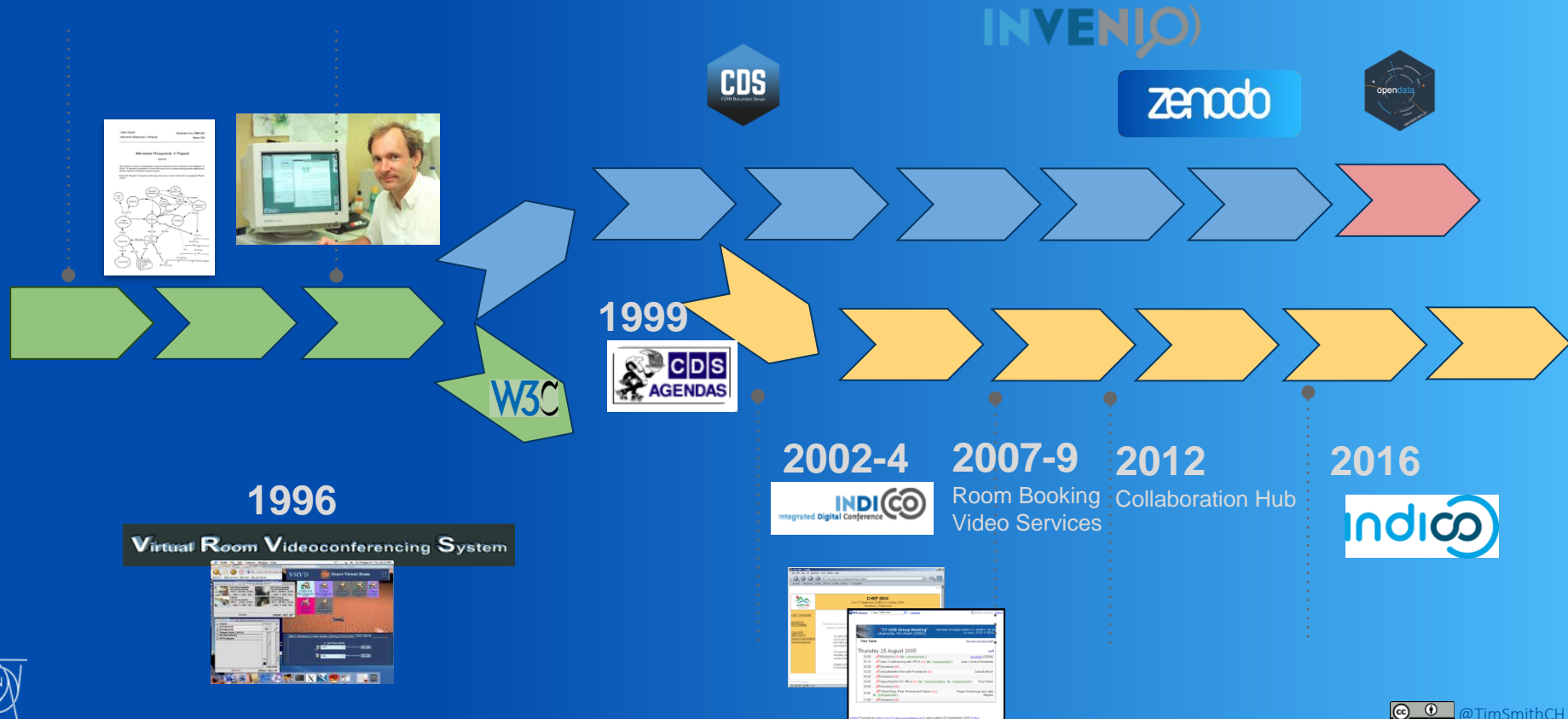


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Source location: <https://example.url>
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<https://ohwr.org/cernohl>



Further History of Collaborative Software





FIRST INDICO WORKSHOP

27-29 May 2013 CERN

Overview

General Information

Timetable

Contribution List

Speakers

Registration

Participant List

Support

✉ indico-team@cern.ch

Timetable

< **Mon 27/05** Tue 28/05 Wed 29/05 All days >



Print

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Full screen

Detailed view

Filter

Session legend

Indicos Worldwide

Using Indico

Welcome Session



09:00	Welcome to CERN <i>Thomas Baron</i>
	513/1-024, CERN 09:00 - 09:30
	Indico Project Status <i>Mr Jose Benito Gonzalez Lopez</i>
	513/1-024, CERN 09:30 - 10:00
10:00	Introduction to Indico <i>Thomas Baron</i>
	513/1-024, CERN 10:00 - 10:30
	Coffee break
	513/1-024, CERN 10:30 - 10:50
11:00	Lectures and Meetings <i>Alejandro Aviles Del Moral</i>
	513/1-024, CERN 10:50 - 11:30

Community



Born in Science

CERN DD/OC

Tim Berners-Lee, CERN/DD

Information Management: A Proposal

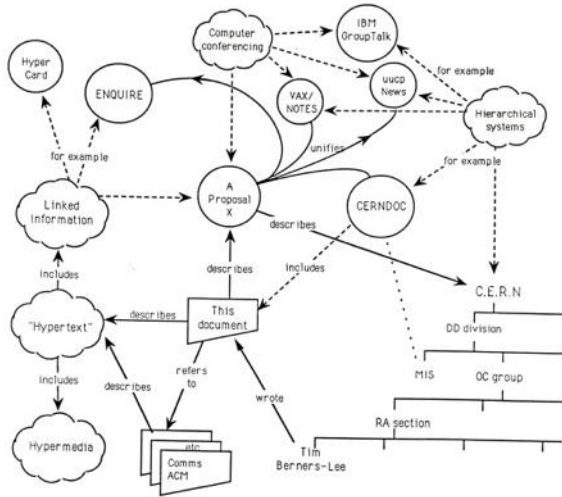
March 1989

Information Management: A Proposal

Abstract

This proposal concerns the management of general information about accelerators and experiments at CERN. It discusses the problems of loss of information about complex evolving systems and derives a solution based on a distributed hypertext system.

Keywords: Hypertext, Computer conferencing, Document retrieval, Information management, Project control



Let's Share What We Know



World Wide Web

©CERN



Collaborative development of new tools
Universal access to information - a human right

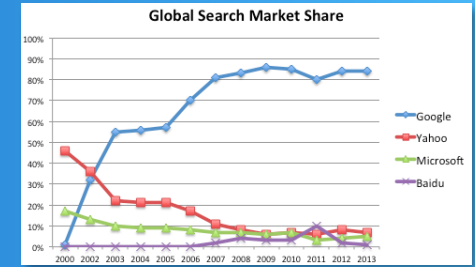


Theme of Concern:
monopolies as gatekeepers
steer for profit, not for humanity

The Concentration of Power

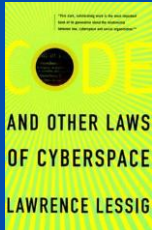


Handful of platforms control which ideas and opinions are seen and shared



Ads

Engagement platforms
Competitive advantage from User giving data



SW creators decide fundamental issues like freedom and privacy
Which content to remove, which users to kick-off
Private Law: EULA

**WEAPONIZED
AT SCALE**

Conspiracy theories trend on social media platforms
Fake Twitter and Facebook accounts stoke social tensions
External actors interfere in elections

The {Mis|Dis}Information Age

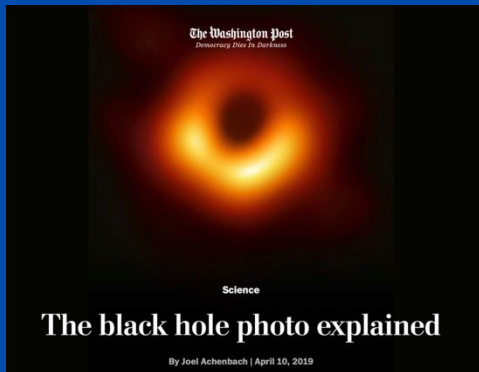
- Word-of-the-Year 2018: Misinformation
 - Election tampering
 - Weaponization of falsity
 - Surveillance capitalism
 - Fake news
- Word-of-the-Year 2020: Pandemic
 - Vaccine distrust
 - Climate Change denial
 - Alternative facts

F A C T
K E



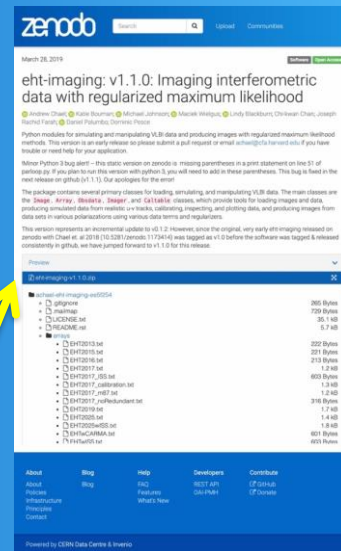
- Public mistrust
- Skepticism among government leaders

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A publishing partnership

OPEN ACCESS

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97856 Total downloads

Citations 6

Turn on MathJax

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The Event Horizon Telescope Collaboration, Kazunori Akiyama^{1,2,3,4}, Anton Alberdi⁵, Walter Alef⁶, Keiichi Asada⁷, Rebecca Azulya^{8,9,6}, Anne-Kathrin Baccko⁶, David Ball^{1,0}, Mislav Baloković^{4,11}, John Barrett² + Show full author list

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[The Astrophysical Journal Letters, Volume 875, Number 1](#)

Other fields which use this algorithm...

Different algorithms used for this technique...





Views

From Academia

From News Media

From Social Media

New Phytologist
Tansley review | Free Access
The growing and vital role of botanical gardens in climate change research
Richard B. Primack, Elizabeth R. Ellwood, Amanda S. Gallinat, Abraham J. Miller-Rushing
First published: 23 April 2021 | <https://doi.org/10.1111/nph.17410>

Global Change Biology
RESEARCH REVIEW | Full Access
Forest microclimates and climate change: Importance, drivers and future research agenda
Pieter De Frenne, Jonathan Lenoir, Miska Luoto, Brett R. Scheffers, Florian Zellweger, Juha Aalto, Michael B. Ashcroft, Ditte M. Christiansen, Guillaume Decocq, Karen De Pauw. ... See all authors
First published: 16 March 2021 | <https://doi.org/10.1111/gcb.15569> | Citations: 3

One Earth
Volume 4, Issue 1, 22 January 2021, Pages 88-101

Review
A review of the interactions between biodiversity, agriculture, climate change, and international trade: research and policy priorities
Andra Monica D. Ortiz, Charlotte L. Outhwaite, Carole Dalin, Tim Newbold
Share | Cite
<https://doi.org/10.1016/j.oneear.2020.12.008> | Get rights and content

Summary
Striving to feed a population set to reach almost 10 billion people by

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ENGLISH | **NEWS**
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Did Germany's h climate change p

The German Federal Const government's constitutiona

Figaro Live > Le chocolat disparaîtra-t-il d'ici 2050?

The Washington Post
Democracy Dies in Darkness | Get one year for €20

Sections | **Climate and Environment**

Today's kids will live through three times as many climate disasters as their grandparents, study says
Published in the journal Science, the findings quantify the "intergenerational inequality" of climate change.
Listen to article 6 min

Post

MYTH 1
Global warming can't be real because the winters are getting colder

QLD: 101 people picked up for setting fires in the bush - 52 adults and 49 juveniles
SA: 10 arrested or reported for intentionally lighting bushfires
VIC: 43 charged in 2019
TAS: 5 caught setting fire to vegetation
NSW: 24 arrested for deliberately starting bushfires

636 Comments | 1.4K Shares





Evidence Chains



*The research behind
this announcement...*



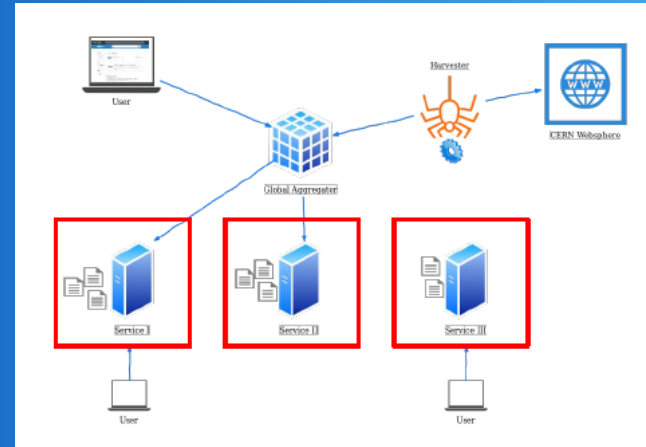
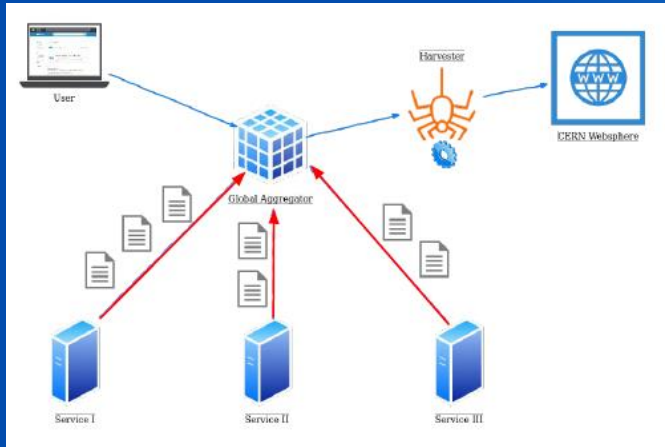
*The data this research
was based on...*



*The dominant theory in academia
The alternatives being discussed*

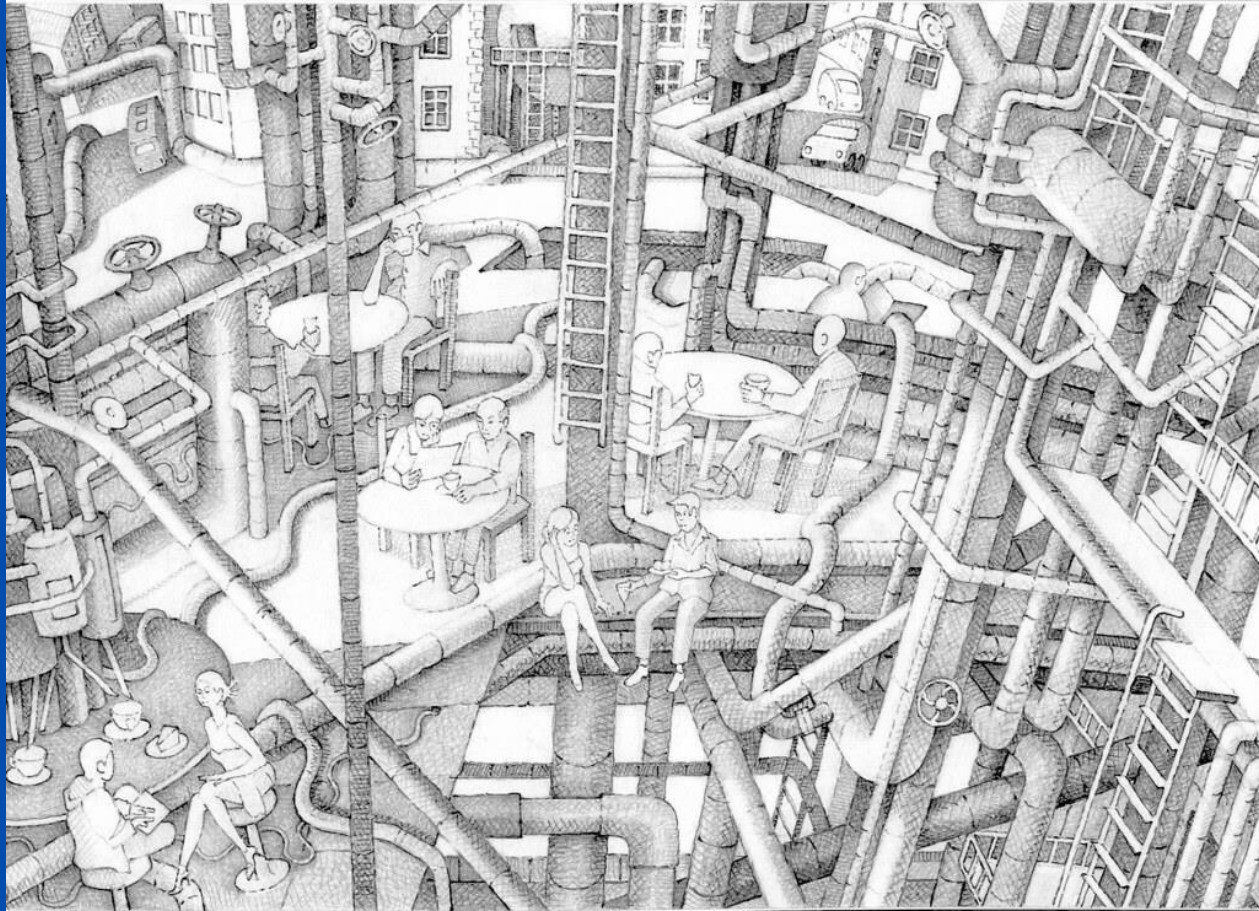
Search @ CERN

Moving from a centralized commercial Enterprise Search solution ...



... to a distributed Open Source Enterprise Search solution

Decentralisation ... Openness



Internet
Plumber's Delight
<https://flickr/photos/3505407/>

OPEN ~~Science~~ Infrastructures

to make multilingual knowledge openly available, accessible and reusable for everyone, to increase collaborations and sharing of information for the benefits of science and society

to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community