

Software/Scientific Computing

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FLC Strategy Meeting
Albersdorf 4.-5.12.2017

Overview

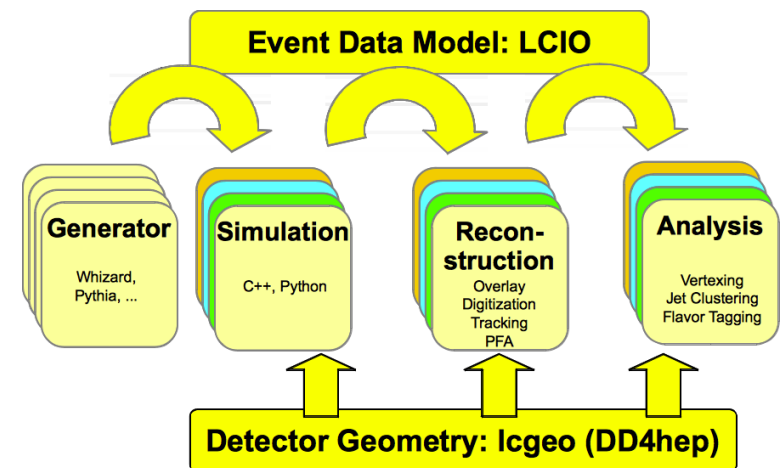
- iLCSoft
 - Status and Future plans
- Scientific Computing at DESY
 - CDCS
 - Other SC Activities
- Summary & Outlook

ILC Software

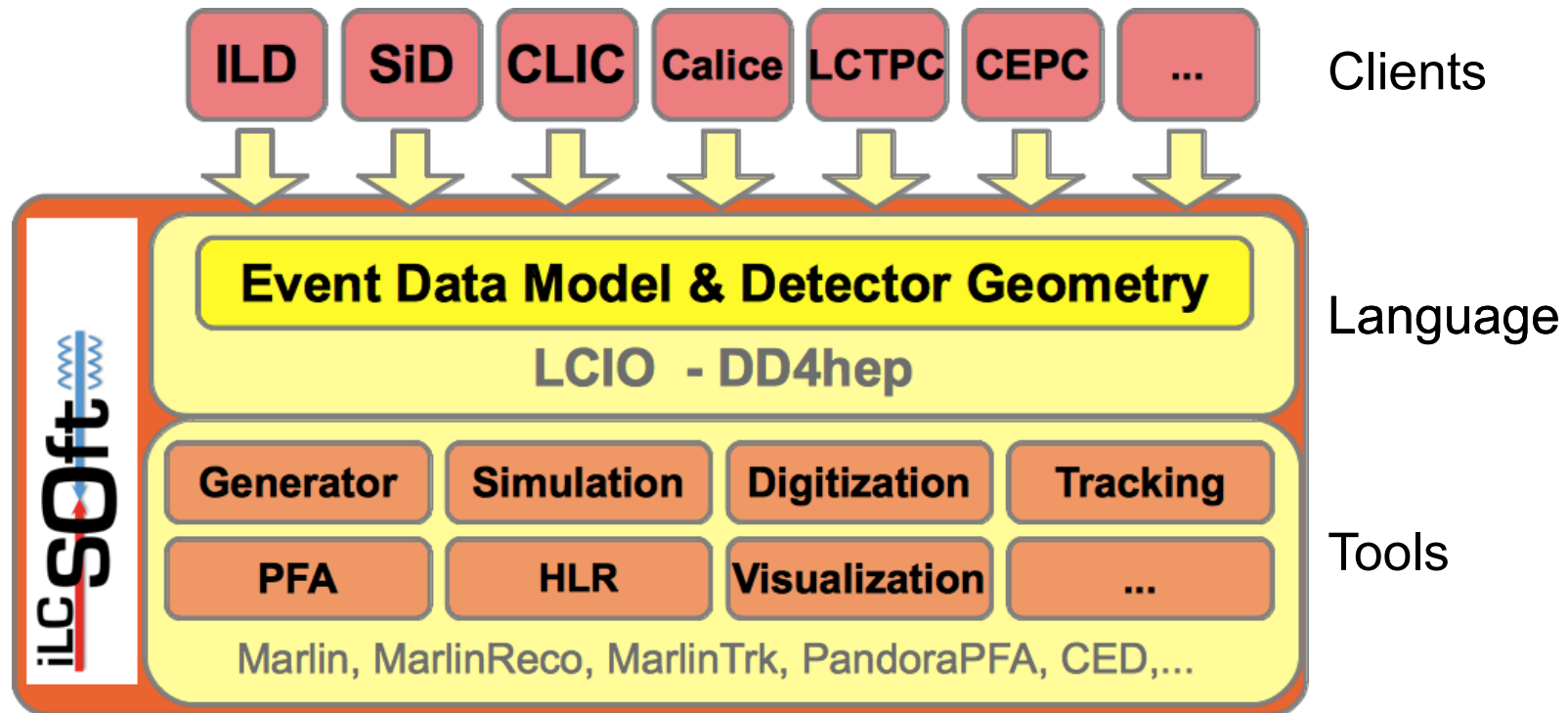
- LC community has a long tradition of collaborating on **common software** tools - **too a large extent driven by DESY !**
 - for ILC up to 4 different detector concepts in 3 regions and test beams and also **CLICdp**
- allow users to share core software tools and focus an algorithm and analysis development
=> do not re-invent the wheel

- basic strategy:
 - use well defined and agreed upon **interfaces**
 - keep it **simple** (as simple as possible but no simpler)
 - be as **light weight, modular and flexible** as possible

- followed this strategy over the years in several projects
 - EUDET, AIDA, AIDA2020, (HSF)
 - recently scope also partly extended to beyond LC:
 - **LHC, FCC, CEPC and neutrino**

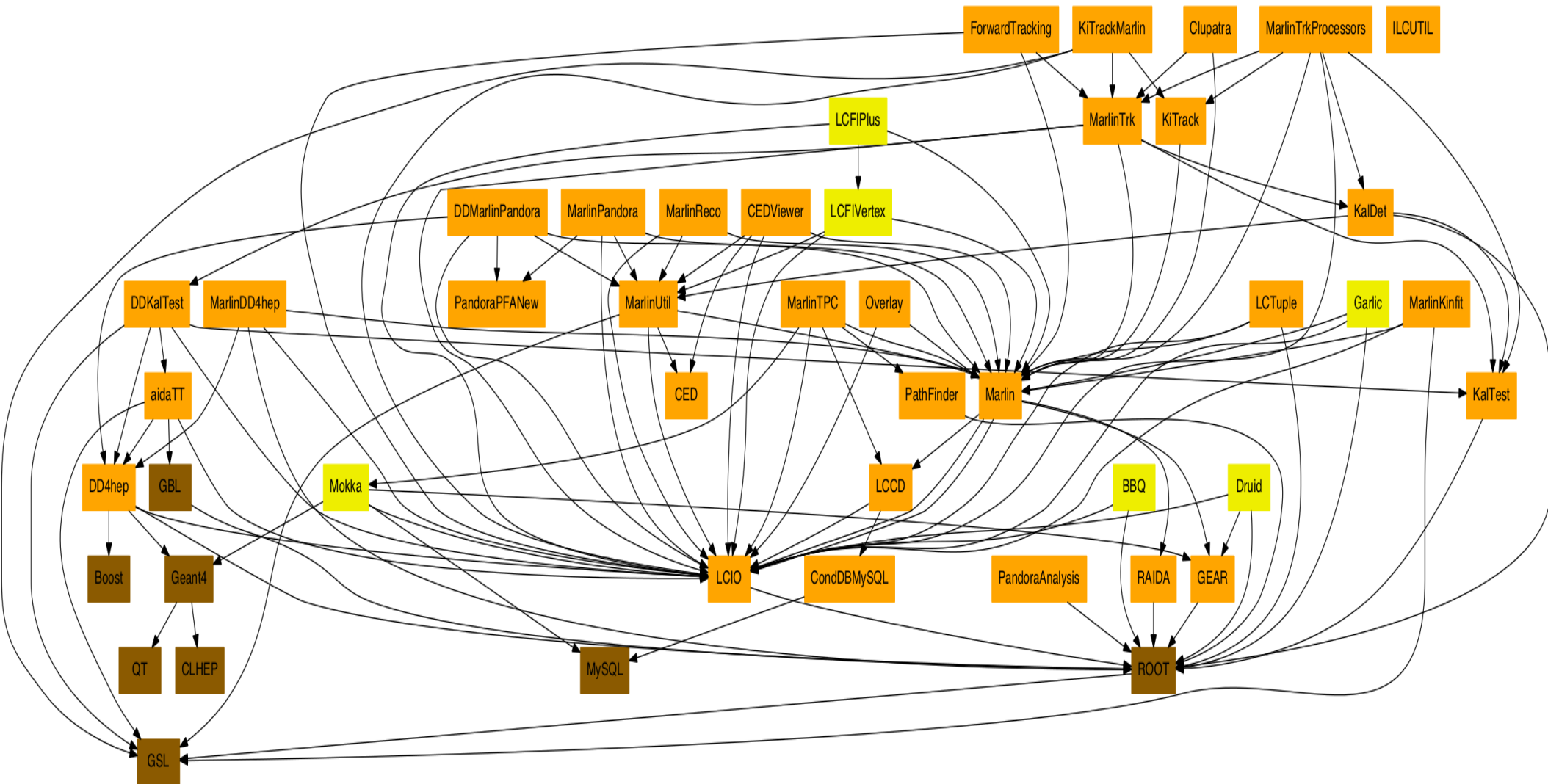


the iLCSoft framework



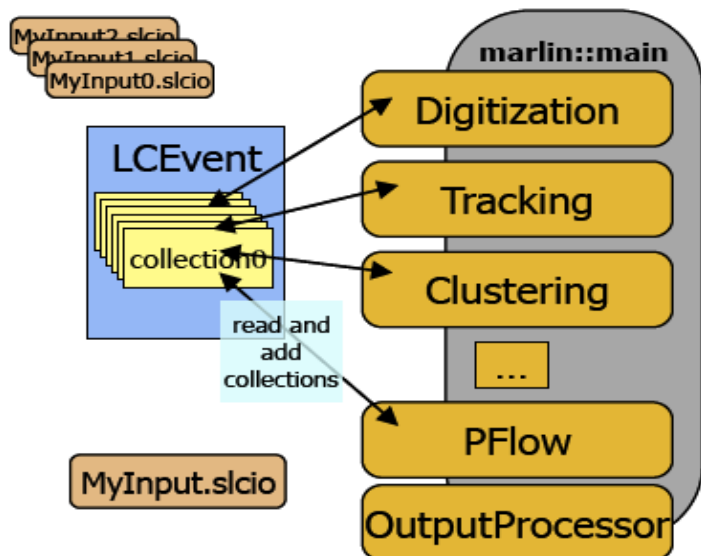
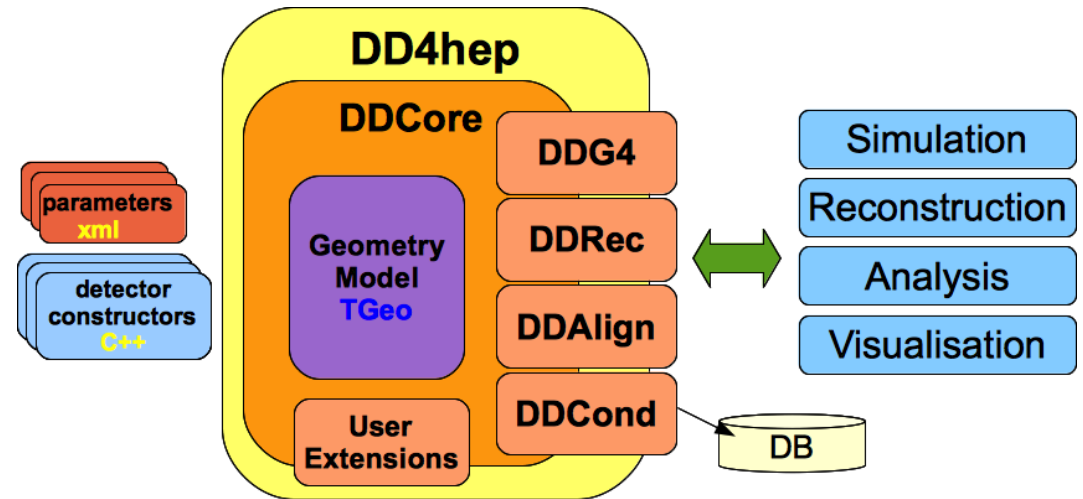
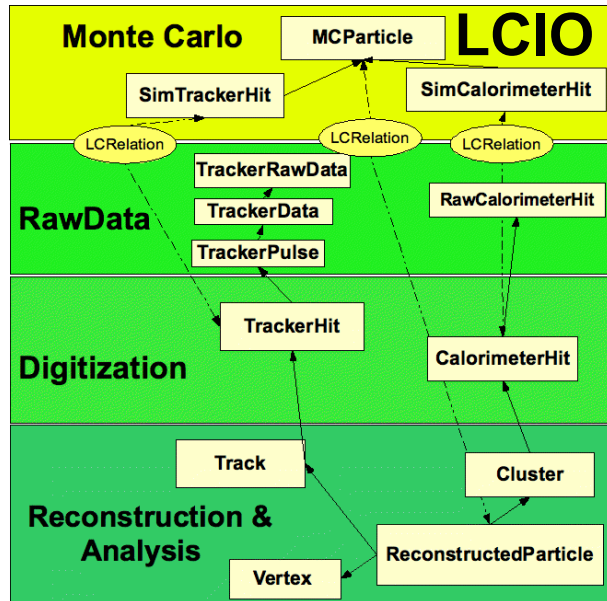
- well defined **interfaces** to **Event Data** and **Detector Geometry**
- define “Language” through which actual tools are used
- allows for flexible re-use of tools by many clients
 - DESY involved in almost all aspects of the framework

iLCSoft packages



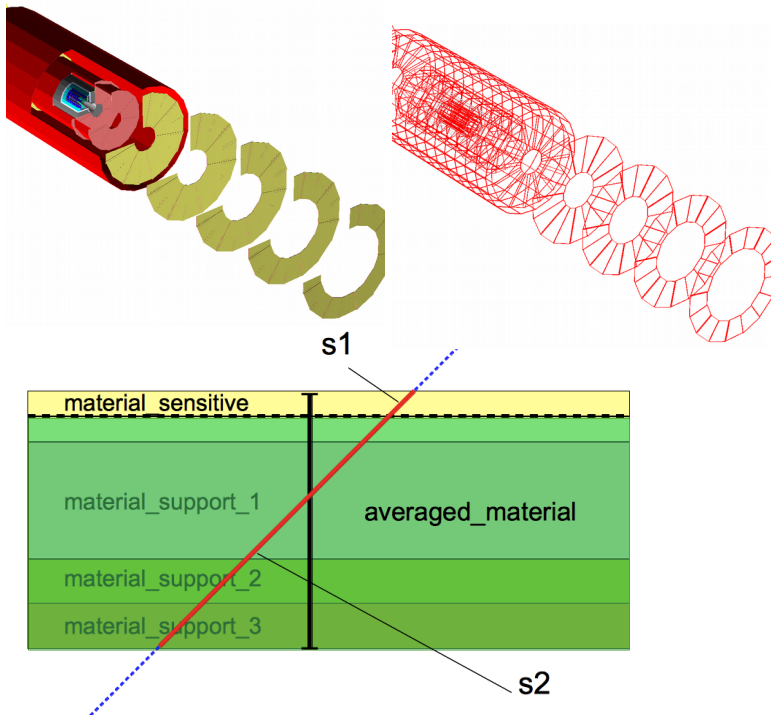
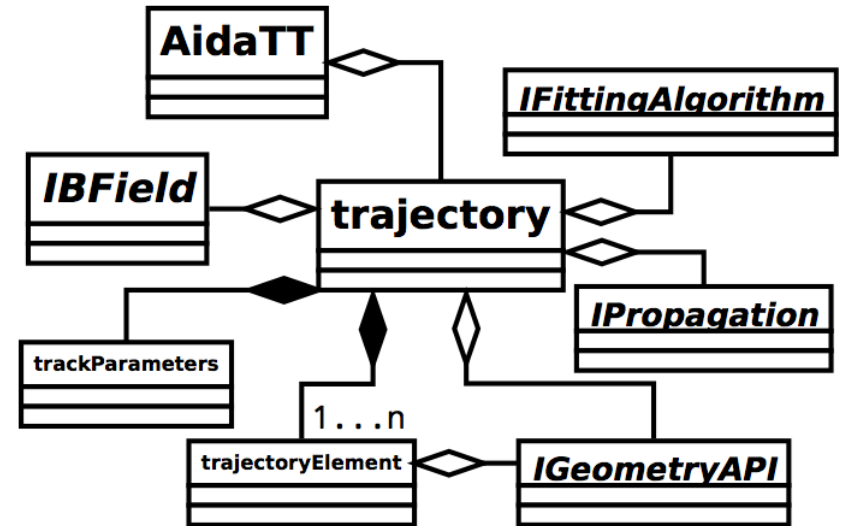
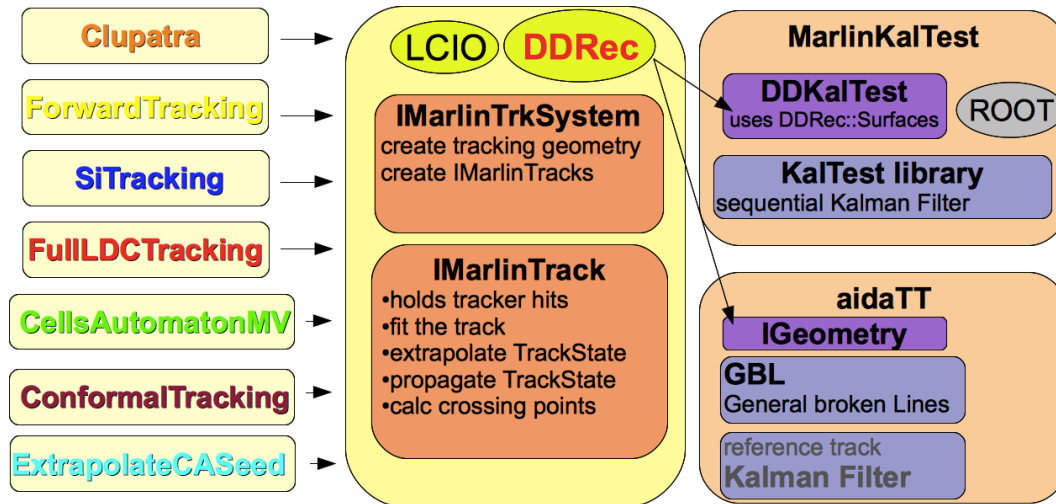
DESY is developing, maintaining or contributing to **almost all** iLCSoft packages

Core Tools done @ DESY



- **LCIO** & **Marlin** 'exclusively'
- done @ DESY
- strong contributions to design and development of **DD4hep**
main developer @ CERN
- plus build system, software installations, nightly builds, test systems, documentation,...

Tracking Tools



- developed a rather generic tracking toolkit:
 - track fitting for any DD4hep based geometry
 - some geometry agnostic pattern recognition
- used by ILD, SiD and CLICdp
- potentially applicable to other (small) experiments
 - ↔ ACTS (ATLAS tracking code) released and
- used by FCC
- need to **investigate use for iLCSoft**

Software plans (AIDA2020 - WP3)

- **commitments in WP3 until end of 2018**

- DD4hep - **done**
 - make thread safe, alignment & conditions
 - simulation toolkit DDG4

- aidaTT (MarlinTrk) - **open**

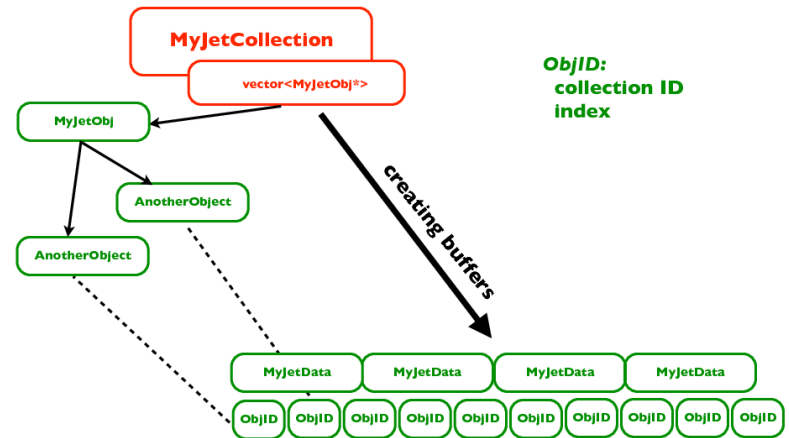
- parallelize fitting (and pat rec ?)
- plan to move to **ACTS**

- PODIO - **open**

- new EDM toolkit (replace I/O of LCIO !?)
- together w/ FCC

- Marlin - **open**

- parallelize framework (w/ LAL)



Opportunities for collaboration

- CLICdp
 - obvious - we are doing this anyhow
- CEPC
 - straight forward, as they use (right now) iLCSoft
- Belle II
 - could contribute in tracking software
 - expertise and potentially also w/ tools (using ACTS !?)
- FCCee
 - could use DD4hep as entry point into collaboration
 - could seek collaboration on tracking software (ACTS ↔ aidaTT)
- DUNE and others
 - could potentially provide some tools from ILC (near detector)
 - can always contribute w/ **expertise and know how**

software opportunities for FLC are clearly **manpower limited**

Scenarios (from last Strategy Meeting)

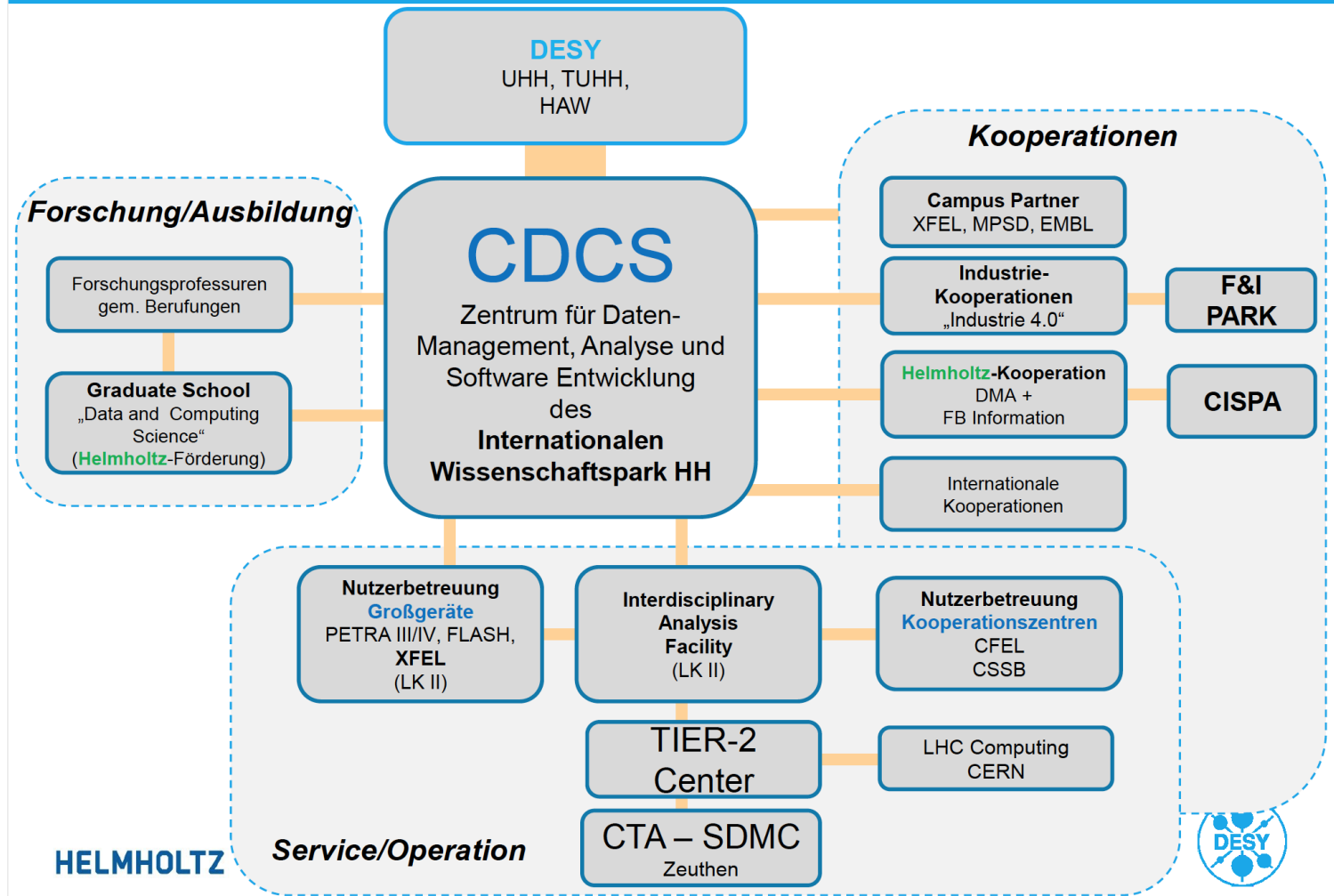
- **A:** Green Light for ILC in 2018
 - should of course continue to play leading role in Software: need to increase manpower
 - a small contribution to Belle II tracking might be useful to learn sth. from contributing to software and computing of a real running experiment
- **B:** ILC continues to be uncertain with slipping timeline
 - continue supporting iLCSoft but proactively look for a real world application
 - depending on the general FLC direction in this scenario
 - with new DESY strategy this is probably similar to **C**
- **C:** Red Light for ILC (from wherever)
 - rather unclear what would happen to FLC software activities

Scientific Computing at DESY

- various activities at DESY to strengthen the Scientific Computing activities:
 - mostly driven by needs from XFEL and Petra III
- competence team: big data - scientific computing
- plan to found new institute **CDCS** – Center for Data and Computing Science (at Trabrennbahn)
- new activity in Helmholtz POF IV: DMA – Data Management and Analysis (part of Mater and Technology)
- creation of a virtual group for Scientific Computing
- DESY strategy: if no clear signal from Japan by end of 2018 will stop ILC activities (accelerator only !?) and move resources into Scientific Computing instead

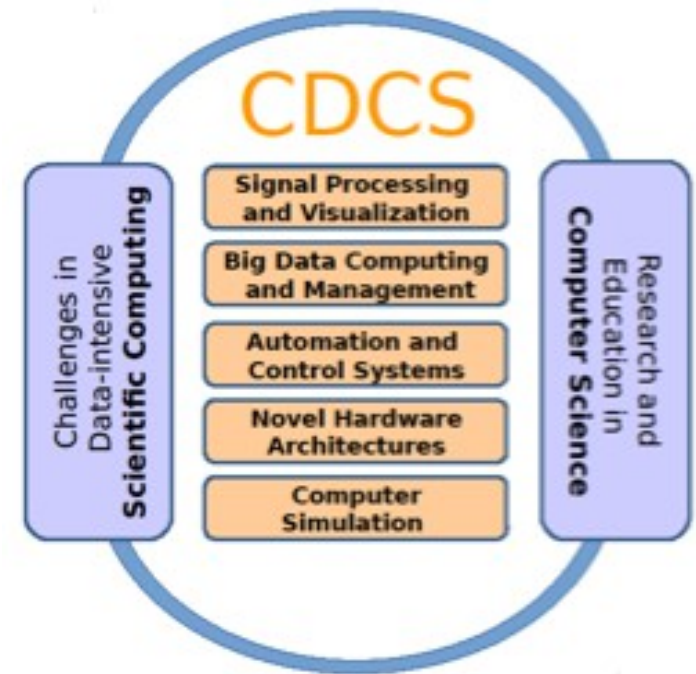
CDCS – Big Picture

Proposal „Center for Data & Computing Science“ (CDCS).



CDCS - Overview

- **interdisciplinary research center** for data science and scientific computing
- supporting the **science done at DESY**
 - Photon Science, Accelerators, **High-energy** and Astroparticle Physics
- central platform to:
 - collect experts and exploit synergies to solve challenges for DESY projects
 - enhance and preserve expertise in Scientific Computing (SC) and Computer Science (CS)
 - carry out research in applied CS
 - planning, implementation and operation of large computing infrastructure for DESY (and Helmholtz)



CDCS current plans

- new building on Trabrennbahn
 - construction until 2025
 - potentially as *Hamburg ProjectX*
- start operating in 2018 as a virtual center and umbrella for several activities as:
- Implementation of projects identified in match making workshop: pilot projects
 - Grad school
 - CDCS in POF IV (DMA)
 - data science workshop
 - preparation of “data science summer school 2019

CDCS organization

- current ideas (K.Ehret et al)
 - six working groups
 - about 100 people
 - 3 CS professorships – 3 SC scientists or professors (physicists !?)
 - governance: all DESY divisions and partners should be represented
 - plan to set up a Scientific Advisory board for Data Science and Scientific Computing at DESY in 2018
 - focus on CDCS and SC @ DESY in general
 - human resources
 - all three DESY divisions
 - people from IT
 - new hires
 - personal remark: there will have to be some resources from DESY budget that go into CDCS (and are taken away from other activities)

other Scientific Computing Activities

- new activity in Helmholtz POF IV: **DMA** - *Data Management and Analysis* as sup-topic of Mater and Technology
- lead at DESY by V.Guelzow
- strong connection/overlap with CDCS activities
- details unclear ...
- plan to set up a **virtual group** for Scientific Computing
- also as preparation for CDCS
- members from all divisions
- details unclear ...

Summary & Outlook

- have put a strong focus on developing the iLCSoft tool chain w/ DD4hep for ILD
 - in collaboration w/ CLIC (and SiD)
 - very limited manpower
- will need to fulfill AIDA2020 commitments in 2018
- continue to (try to) follow the developments at DESY wrt CDCS et al
- by end of 2018 we know more:
 - **if green light** for the ILC: fully focus on ILC software and computing
 - **else**: many possibilities that depend on overall European, DESY and FLC strategy and roadmap
- we live in interesting times...