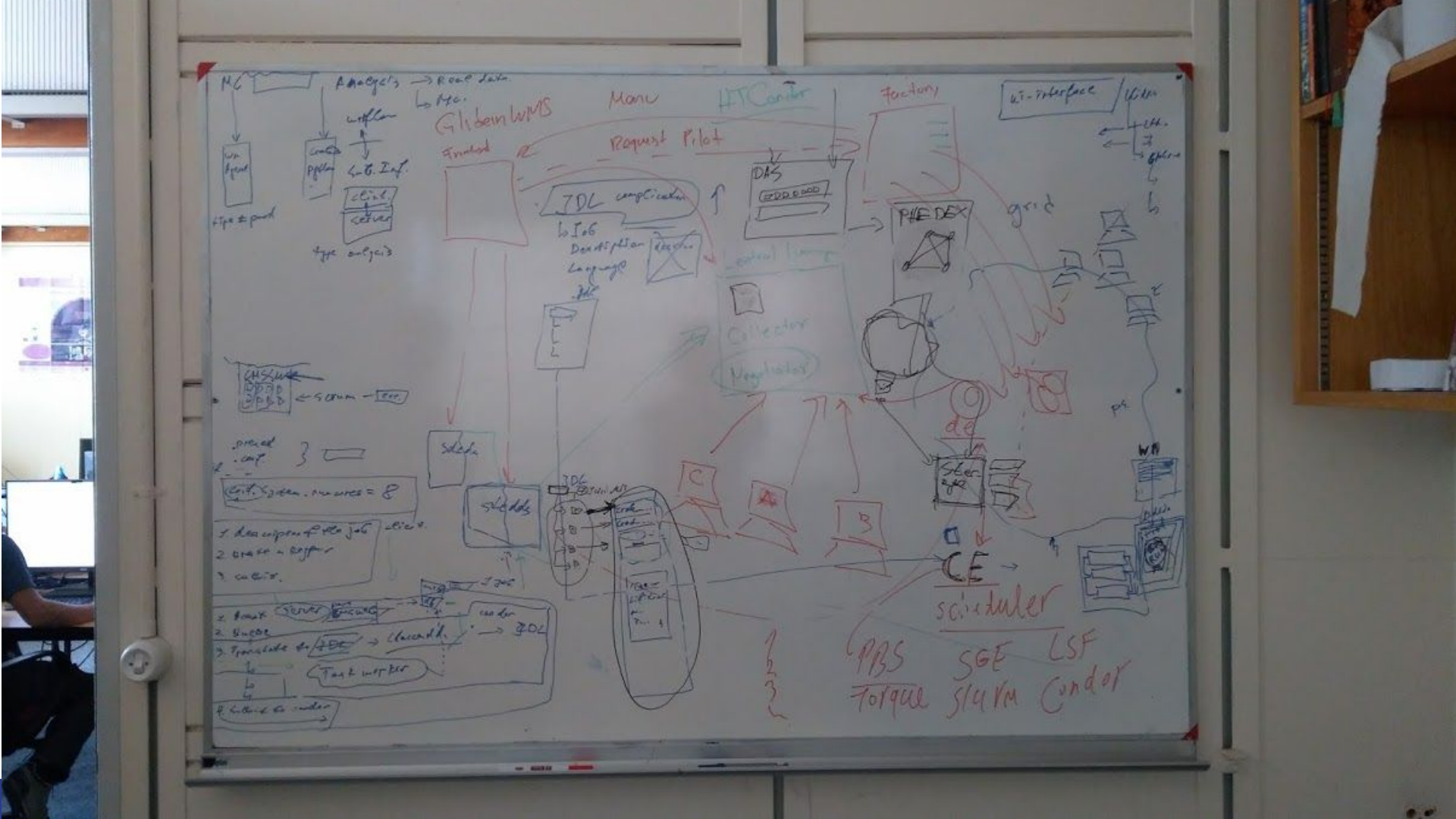
CERN WORK EXPERIENCE

Aleksandar Georgiev
Ivan Ganev

CMS Computing Infrastructure

- Physicists submit jobs (tasks) that have to be computed and analyzed.
- The jobs go through a series of machines (mediators) that prepare it for the WLCG (Worldwide LHC Computing Grid).
- The jobs are divided into several smaller jobs and they are sent to be computed at different sites, which are located all around the world and are part of the WLCG.



Manu
HTCondor
Factory
Request Pilot
JDL
DAS
PHEDEX
grid
Collector
Negotiator
CE
scheduler
PBS
SGE
LSF
Torque
Slurm
Condor

CAD | Computer Aided design

- CAD is the use of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design.

- CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids in three-dimensional (3D) space

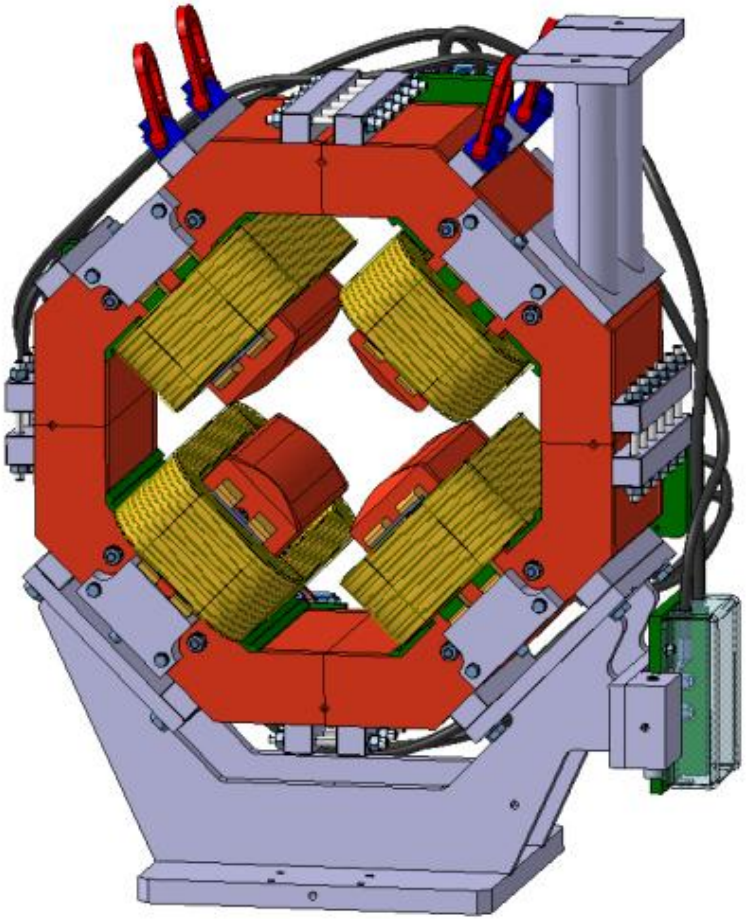


Image courtesy of CERN.

EDMS | CERN's Engineering Data Management Service

- EDMS allows to store, manage, organize and distribute large amounts of engineering information, covering a wide spectrum of fields.

- EDMS is there for supporting the full lifecycle of the collider, from its conception, through design, manufacturing and installation, up to maintenance and decommissioning.

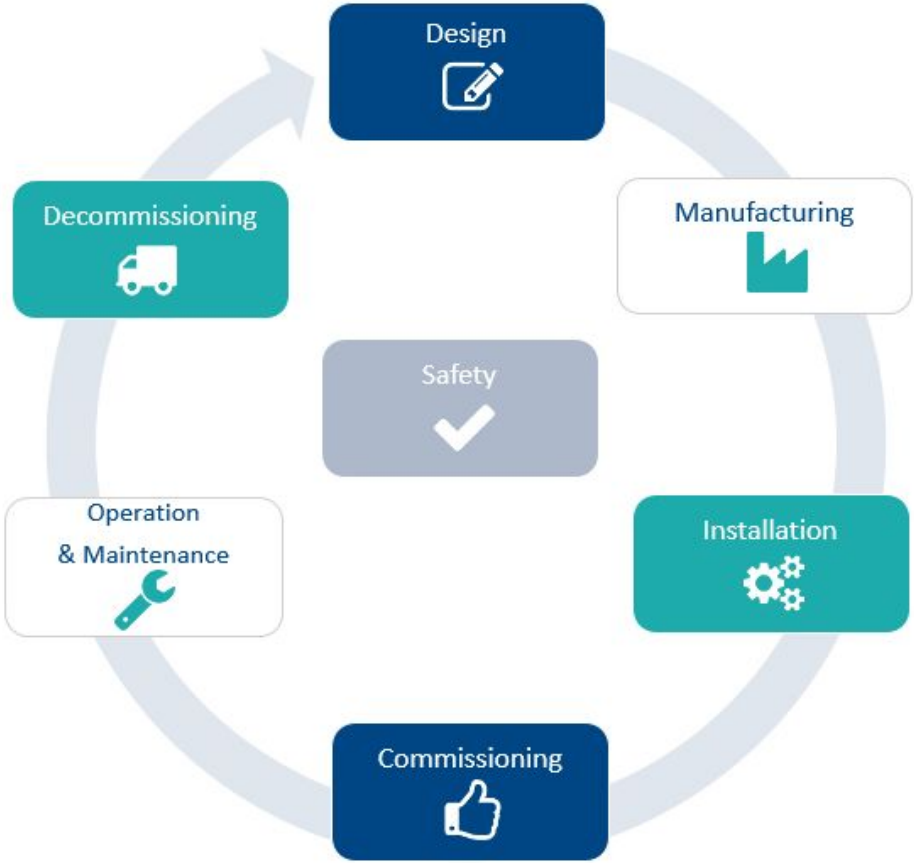


Image courtesy of CERN.

1,700,000+ Documents

4,000+ Users

3.6+ TB Data

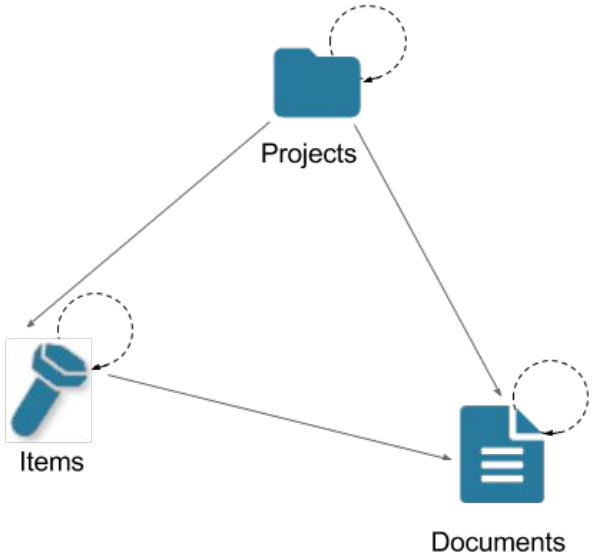


Image courtesy of CERN.

EAM | Enterprise Asset Management Software

- EAM helps CERN manage a wide array of maintenance activities for many types of equipment from the Large Hadron Collider’s magnets to everyday infrastructure like elevators and fire extinguishers.

- Minimize unscheduled accelerator downtime by optimally maintaining high tech equipment including superconducting magnets, cryogenics, radiation monitoring, controls equipment, electronics, and other equipment.

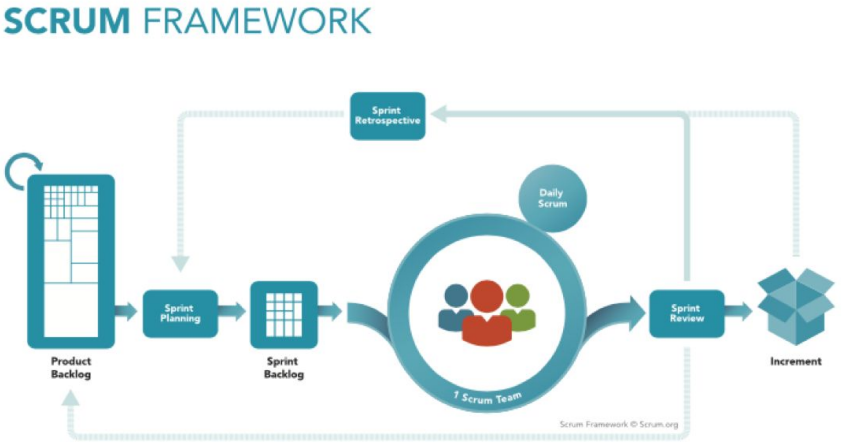
Agile

Agile software development describes a set of values and principles for software development under which requirements and solutions evolve through the collaborative effort of self-organizing cross-functional teams.

- Individuals and Interactions more than processes and tools
- Working Software more than comprehensive documentation
- Customer Collaboration more than contract negotiation
- Responding to Change more than following a plan

Scrum

- Small teams for developing software
- The work is broken down into one-week to maximum four-week cycles, called "sprints"
- check progress daily in 15-minute stand-up meetings
- deliver workable software at the end of every sprint
- Workflow: Sprint planning -> Daily Scrums -> Sprint review and retrospective

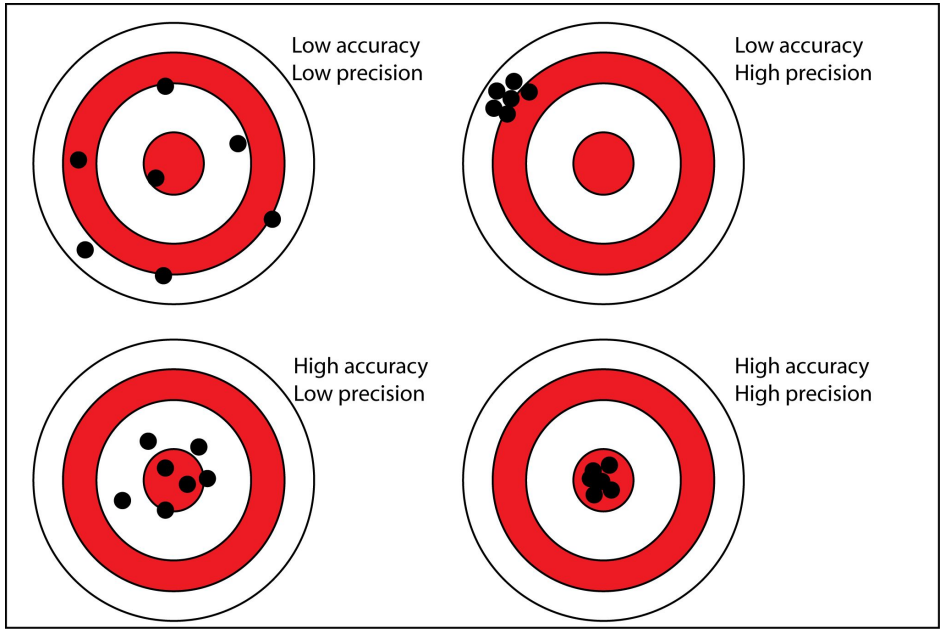


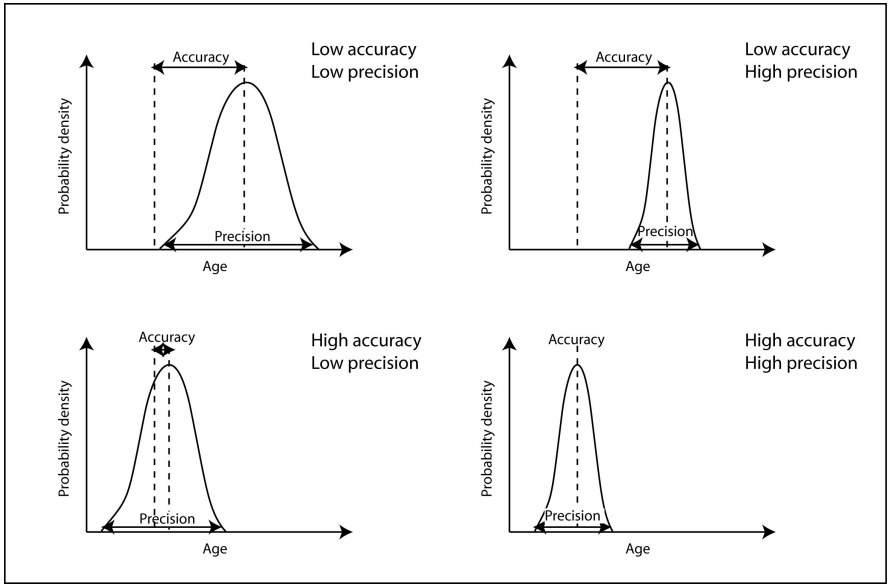
Java problem from an Interview

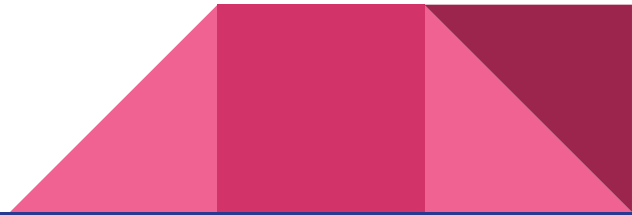
$$(x-1)(x+2)(x+3)(x+5) = x^4 + 9x^3 + 21x^2 - x - 30$$

```
1 class PolynomialTools {
2     public int[] expand (int[] p1) {
3         int i, j, n = p1.length;
4         int[] exp = new int[n + 1];
5
6         exp[0] = p1[0];
7         exp[1] = 1;
8         for (i = 2; i < n; i ++)
9             exp[i] = 0;
10
11        for (i = 1; i < n; i ++)
12        {
13            for (j = i + 1; j > 0; j --)
14            {
15                exp[j] *= p1[i];
16                exp[j] += exp[j - 1];
17            }
18            exp[0] *= p1[i];
19        }
20        return exp;
21    }
22
23 }
24
25 public class MyClass {
26     public static void main(String args[]) {
27         int[] test_arr = {-1, 2, 3, 5};
28         int[] test_exp = (new PolynomialTools ()).expand (test_arr);
29
30         for (int i = test_exp.length - 1; i >= 0; i --)
31             System.out.print(test_exp[i] + " ");
32         System.out.print("\n");
33     }
34 }
```

Difference between precision and accuracy





Thank you for your attention

Special thanks to Todor, Tsvetelin, Fani, Yordan and Lukasz.