Managing the FAIR Control System Development

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The FAIR Project

Facility for Antiproton
and Ion Research at GSI

FAIR

- Presently under construction (to be completed 2019)
- Major extension to the present GSI accelerator complex

International project: 10 partners signed Convention (Oct 2012)

Total investment 1 B€ (2005 prices)
Financed by joint international effort: Germany 70%, international partners 30%
Countries contribute in-kind and in cash

Several accelerators to be built
FAIR start version: 4 accelerators + 2 machine-line sections (SFRS, pbar-Target) and several km of beamlines

Overall Project Management

Considering

- Substantial scope of the FAIR project
- Technical & organisational complexity
- High financial investments
- Risks (technical, financial, schedule)

German funding agency (BMBF) and FAIR Council required:

- Professional Project Management
- Adequate project lead and organisational structure

FAIR@GSI Project Organisation

To fully focus on the construction of FAIR
GSI was completely reorganized in 2012

- Project Division FAIR@GSI was formed (550 staff of 1100 total)
- Project Leader (PL) appointed / Project Division Leader
- Staff was redirected from Research to Accelerator

Matrix-like project organisation was introduced
and line managemen was aligned as much as possible (project divisions)

- Project Leader (PL) with strong mandate

- Machine Project Leaders (MPL)
  - 7 accelerators or accelerator-like sections
  - Sub-project leaders, organize respecive machine

- Work Package Leaders (WPL)
  - About 100 technical subsytems
  - Assigned to the respective machines

Project Organisation: Controls

Specific situation for Controls

- Accelerator Control System was declared in-kind contribution of the FAIR host-lab, GSI (+20% in-kind Slovenia)
- Presently 50 staff in Controls Department
- Wide scope

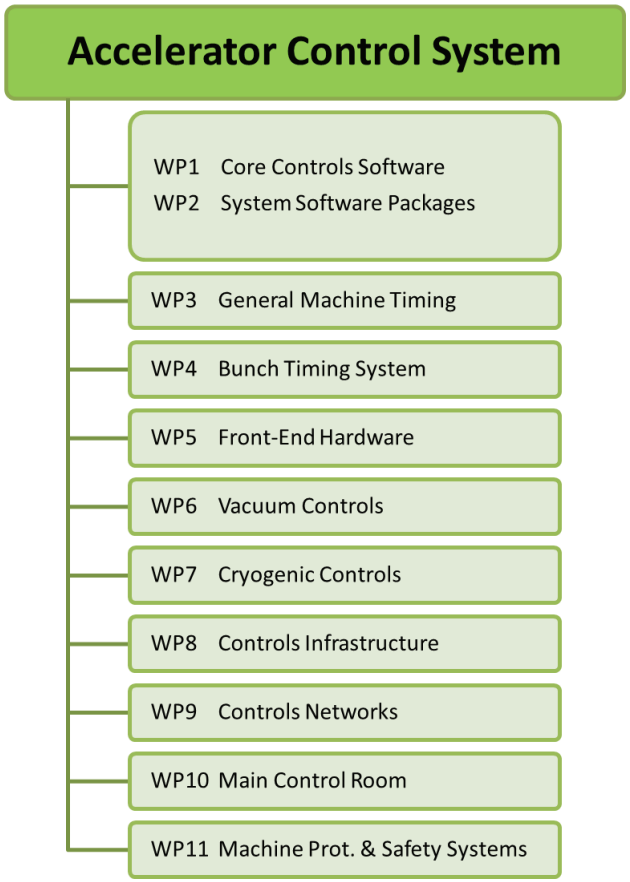
Only one integrated control system for the whole facility (FAIR & GSI)

⇨ Controls is considered orthogonal aspect (no matrix)

In respect of Project Organization, Management and Planning

- Control system is considered a „Common System"
- Considered an „Accelerator-line" machine project with MPL

Controls Workpackages



Controls Subproject Organisation

- Controls Project Leader (MPL)
- WPLs for subprojects (wide scope, even beyond Controls)

Machine Controls Coordinators (MCC)

- meetings and communication is usually organized „per machine"
- Serves as contact person for all matters concerning specific machine
- Organizes activity for respective machine within controls group

Other In-kind Contributions to Controls

Significant in-kind contribution to the Control system from Slovenia (20%)

Slovenian consortium, Controls part led by Cosylab

- Responsibility for the total system is with GSI (system design, specifications)
- Control system sub-projects with clearly defined interfaces (e.g. alarm system, interlock system, vacuum control system, hardware development, …)

Ingredients for success story so far:

- Slovenian Controls project manager/developer is permanently at GSI, interacts with development team
- Regular Jour-Fixe meetings (weeky)
- Have clearly defined by Detailed Specifications, however: better review specs shortly before start of a new subproject
- Always be aware: commercial partner…

Integrated Project Planning

Integrated Project Planning group
- Installed for professional management of time schedules & resources
- Generate reports for PL and directorate

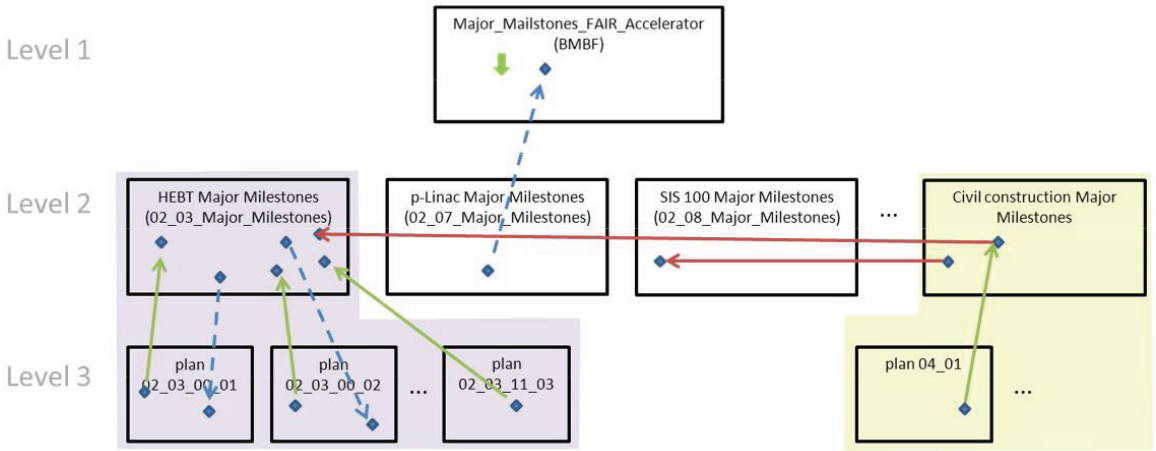
Planning
- Planning done with MS Project 2010 Server Edition
- Plans are loaded with resources (budget, generic manpower)
- 3rd party products to link plans and link to SAP

- Presently about 250 linked MS project plans

Introduction was a heavy burden (training, debugging tools, etc.)
Plans need to be weekly updated by WPL and MPL
Plan aggregation by Integrated Project Planning Group

Linked Project Plans

Master Schedule (1 Plan)



Major Milestone Plans
- One per FAIR machine
- Or major techn. subsystem
- Civil construction milestones
- About 12 plans

Milestones Links
- Hard links
- Soft links
- No wild cross links, rules!

Detailed Plans
- About 250 plans, mainly per WP
- 11 for Controls

Project Planning for Controls

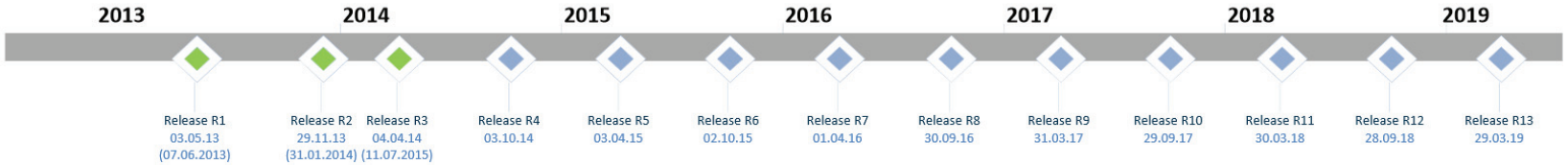
Integrated Project Planning
- Complex development may lead to too high complexity during planning
- For full project span (2019/2020) high level of uncertainties from other major plans, e.g. civil construction, changes in machine priorities, etc.

Approach:
- Keep integrated project planning complexity as low as possiible
- Follow interative approach

Development of the control system is done in iteration cycles

⇨ Introduction of a **Release Chain**
- Two major Releases per year considered optimal
- Fixed due-dates
- Adapt content / objectives to the overall FAIR machine schedule
- Derive milestones for links from the Release chain

Release Chain

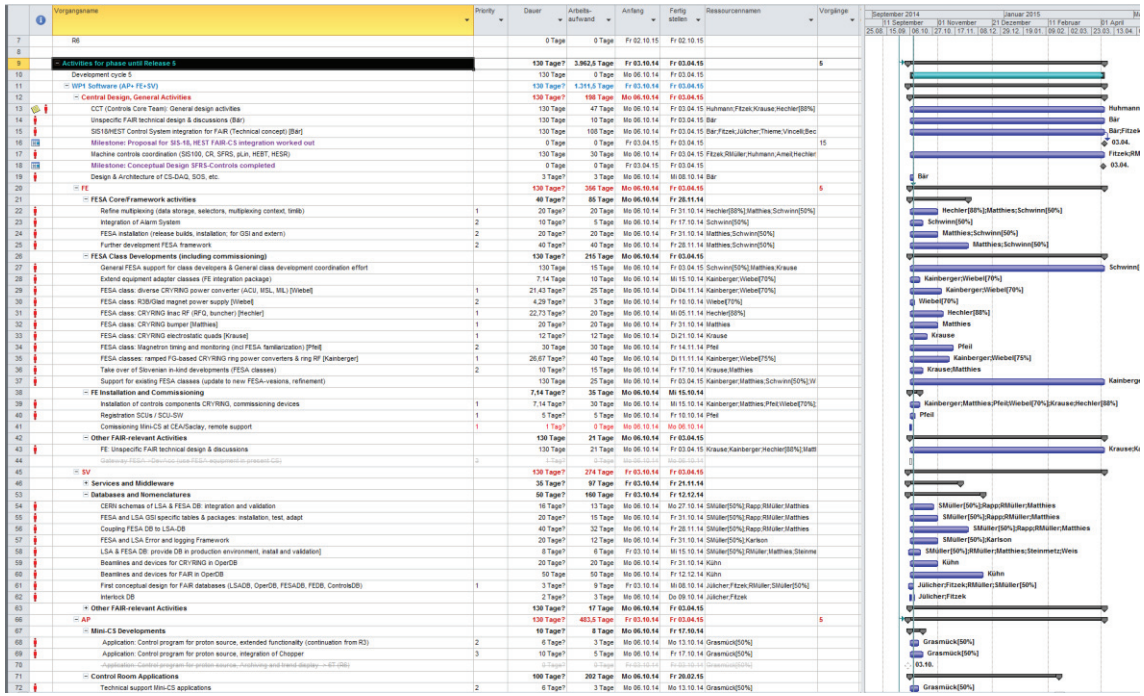


Release	Cycle (gross days)	Cycle (eff. days)	Due Day Milestone	CRYRING	HEBT	SIS-100	p-Linac	p-bar	SFRS	CR	HESR	SIS-Upgr	UNI-Upg
R1	220		03.05.2013 (07.06.2013)										
R2	150		29.11.2013 (31.01.2014)	R2									
R3	90		04.04.2014 (15.05 - 11.07.2014)	R3									
R4	130	100	03.10.2014	R4.1 R4.2									
R5	130	100	03.04.2015	R5									
R6	130	100	02.10.2015	R6									
R7	130	100	01.04.2016	R7									
R8	130	100	30.09.2016	R8	R8							R8.1 R8.2	R8
R9	130	100	31.03.2017	R9	R9	R9						R9	R9
R10	130	100	29.09.2017	R10	R10	R10	R10	R10	R10			R10	R10
R11	130	100	30.03.2018	R11	R11	R11	R11	R11	R11	R11	R11	R11	R11
R12	130	100	28.09.2018	R12	R12	R12	R12	R12	R12	R12	R12	R12	R12
R13	130	100	29.03.2019	R13	R13	R13	R13	R13	R13	R13	R13	R13	R13

CS ready for installation CS ready for test operation CS ready for beam operation

ready for installation
ready for test operation
ready for beam operation

Detailed Planning



Detailled Planning

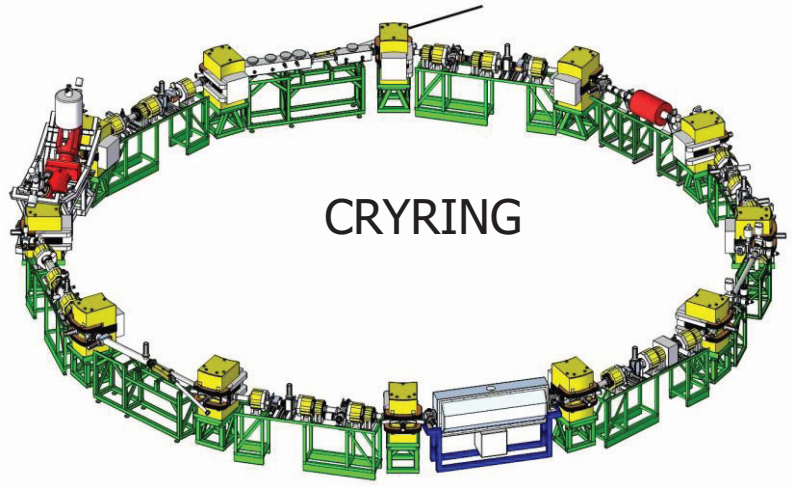
- One Release ahead (longer periode not realistic)
- Loaded with named resources
- Work of every activity is estimated
- Overload of resources can be avoided

Present plan: ~250 activities for 50 developers

Tracking of progress allows project steering,
e.g. priorities, move functions to later releases, etc.
All developers report on activities (weekly)
Plan shall be always adapted to „real life“

Testing

CRYRING
Swedish in-kind contribution heavy ion storage ring presently under installation at GSI



Test ground for the new control system
- test and validate technical concepts
- Early deployment, gaining experience under real conditions
- identify ldesign imitations

and also
- validate our project management structures and tools (planning)

Thank you for your attention

Conclusions

- Large projects need adequate structure and project management
  - Control system development for a new facility is a large project…
- Time effort for project management and planning is always underestimated
- Planning and reporting of progress is essential,
  without overview no project steering is possible
- Avoid too high complexiity in project planning
  - For long timescales, fixed Release chain seems a reasonable solution
  - Fits well to the iterative development cycles
  - Detailed planning no more than 1 year ahead possible