Engenya

GmbH

(Small) Team of (Small) Teams
- Lessons Learned Over Time -
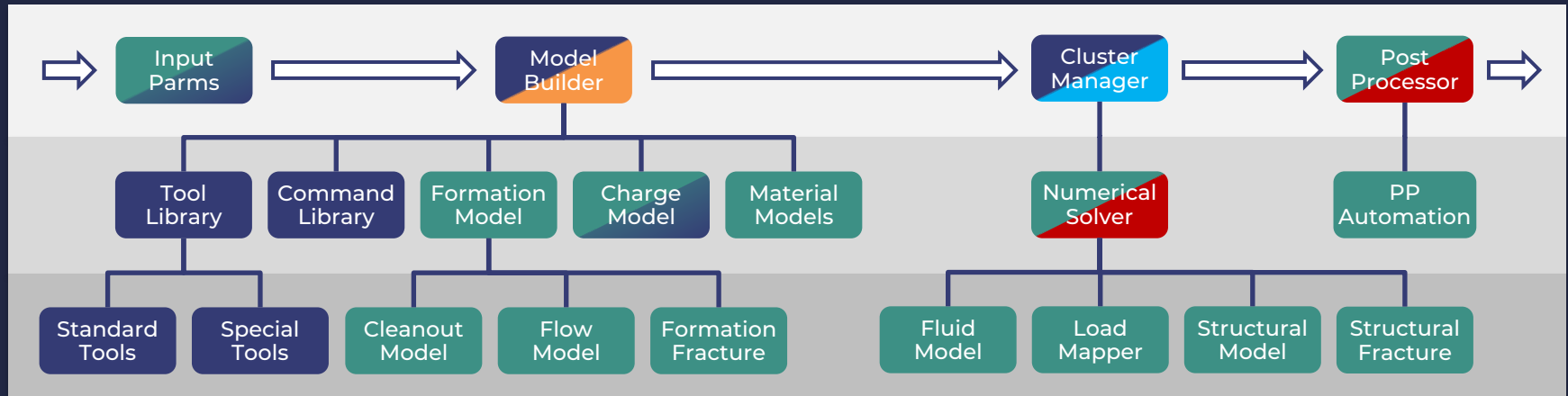
- Investigation of failures of perforation strings in offshore wells indicated a need for improved simulation tools

- Initial team (2 people on different continents) focused on developing a general solution architecture and roadmap for development

- Funding enabled the team to be expanded to execute the project

- Development, verification and validation continued in parallel for over a decade, leveraging field jobs and failure cases

- System is still evolving

System Architecture

- Teams: 4 + 1 software vendor + client
- Teams located in US, CH, IT and DE
- Majority of development elements carried by two teams
- Specialized work conducted by specialized consultants coordinated by one of the two principal teams

Team A: 5 members, located in the US
Responsible for overall project management and client liaison, system architecture development, lab and field tests, Model Builder and Cluster Manager architecture, tool library development, keyword library development

Team B: 3 members, located in CH and IT
Responsible for overall model development, development of constituent model physics, model integration, testing and verification, model calibration, solver setup, workflow development, results processing

Team C: 1 consultant, located in the US
Responsible for coding Model Builder module including model data input interface, model control interface, tool library interface, keyword library interface, model meshing algorithm and model input deck generation

Team D: 1 consultant, located in the US
Responsible for coding web based Cluster Manager module including analysis setup interface, workflow management, error trapping and correction, queue management and specialized module integration

Software Vendor: Located in DE
Provision of solver revisions to address identified bugs, coding of specialized solver function requests, provision of software licensing, technical support

- Client included in the architecture

- Arrows indicate principal connection paths – thicker is more important

- Principal communication between Team A and Team B ensures technical progress and quality

- Principal communication with client is with Team A and, when required, with Team B – technical meetings

- Although Team A manages the overall progress, Team B has the largest number of connections
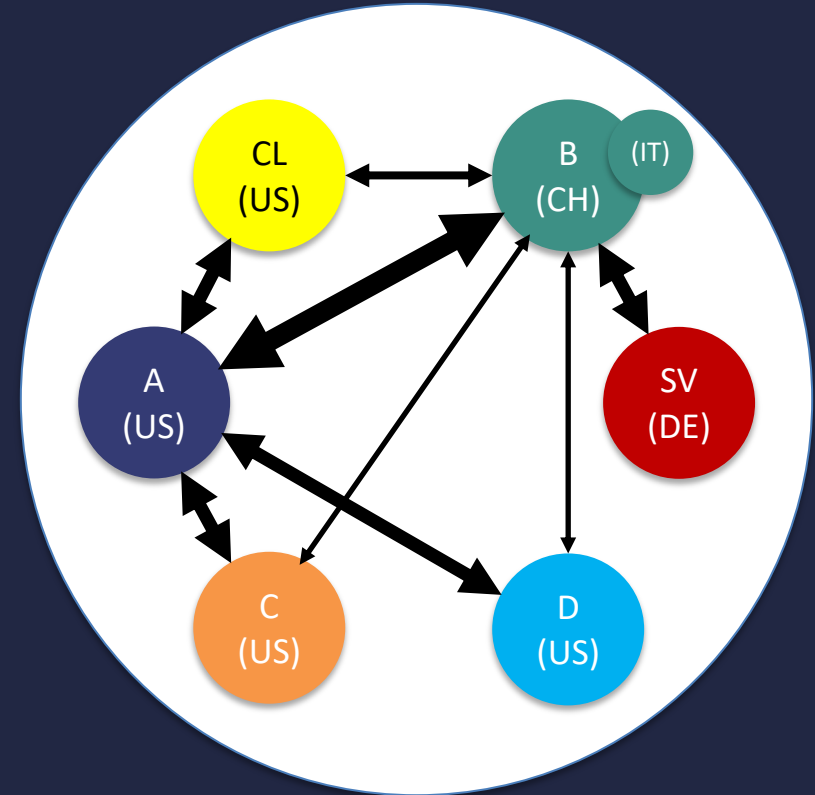
Team Activity
Involvement through project timeline

- Initial activity by Teams A and B aimed at understanding field failures
- Once need for improved method identified, work began to set development plan, develop architecture and begin building the system
- Specialized capabilities brought in as needed
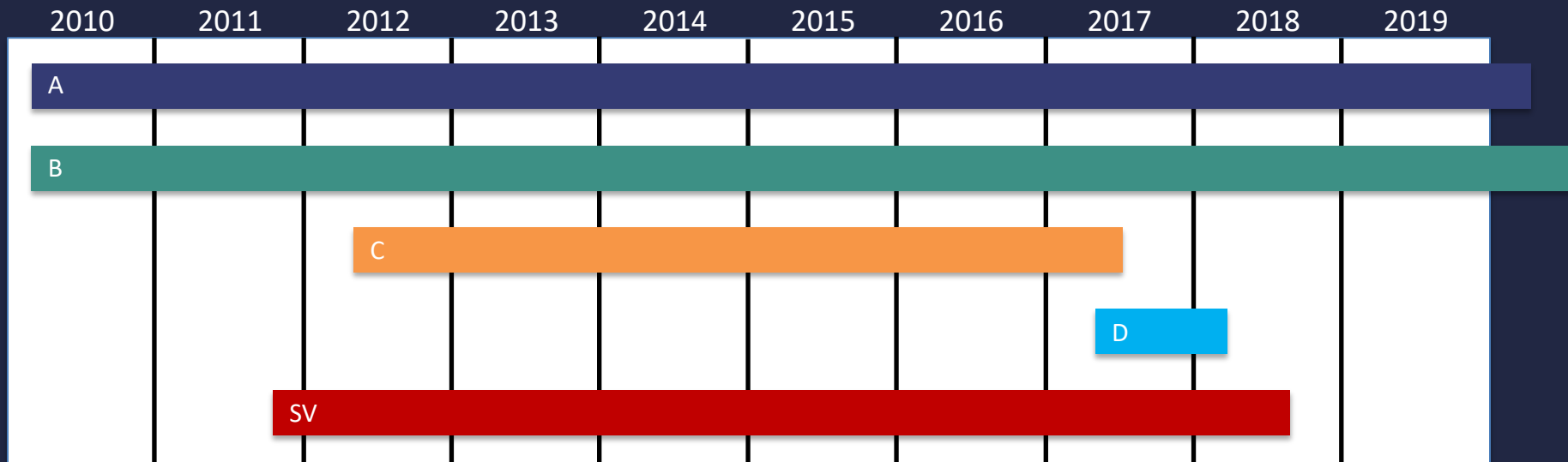
- Initial disruption as a result of the addition of new team members that were not commonly known to the two initial members

- Language barriers

- Resource procurement

- Multiple management changes on client side throughout project

- Maintaining a sufficiently varied portfolio

- Developing on the front line

- Managing employees

Successes
What worked well

- Team setup
  - Key members selected based on known competence
  - Prior personal relationships fostered trust
  - Crucial individual commitment
  - Flexibility and responsiveness
- Communication
  - Frequency and openness of internal communication
  - Management of client communication
  - Management of expectations
  - Effective remote collaboration

- Communication (goes without saying)

- Vested interest is key

- Flexibility of team members

- Commitment to success

- Dependability

- Trust

- Trust

- ## Trust

- Personal relationships between key members were a determining factor

- Tools currently being used to optimize a series of well completions in some heavily depleted reservoirs off the coast of Africa as well as for planning offshore perforation jobs in Asia

- Through this work the tool capabilities, particularly in data analysis are constantly being strengthened

- Currently planning to leverage architecture to support migration of tools to run on an open source platform, requiring some additional development