

H4H - High Performance Computing systems, tools, expertise, collaboration

ITEA Event 2016, 28 April 2016, Stockholm - Sweden

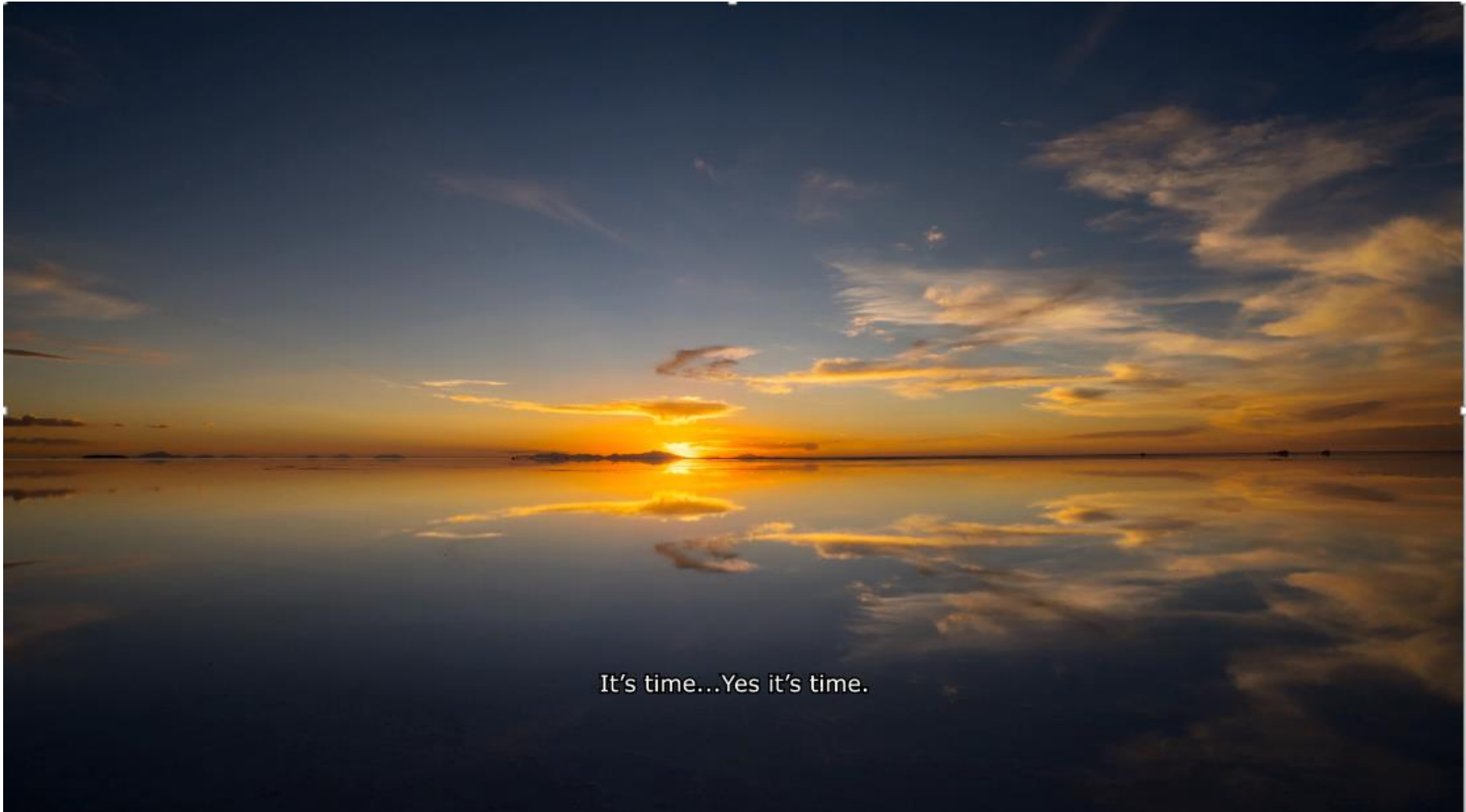
François Verbeck – ATOS/BULL

Agenda

- High Performance Computing contribution to society
- Specific challenges addressed
- Participating companies and some project figures
- Project results
- Market and Business impact
- Next steps



Hybrid Programming for Heterogeneous architectures



It's time...Yes it's time.

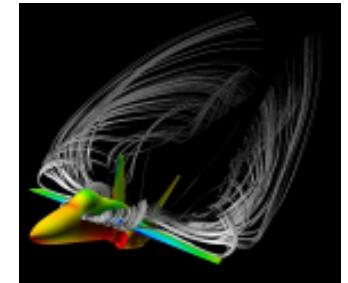
HPC - High Performance Computing



Aircraft and automotive industry, Oil and Gas, Media...



Fluid Dynamics, Electro-Magnetics, Combustion simulation, Video...



HPC market

- Forecasting 8.3% yearly growth 2014 to 2019*
- 2019 should reach \$31.2 billion*

Challenges addressed

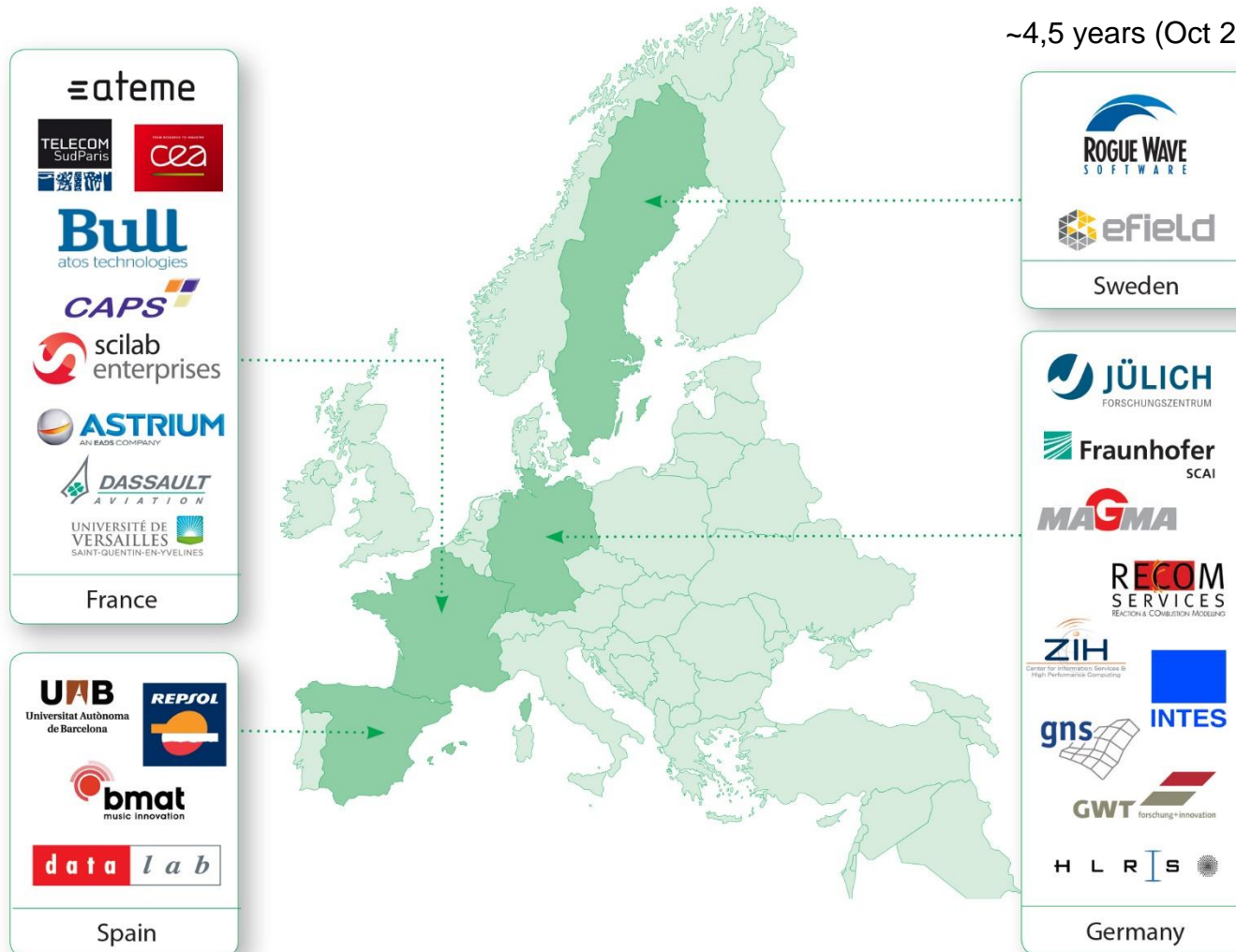
INNOVATION

- Design & integration of more and more computing intensive circuits
- Provide more dense computing power with less energy consumption

USE

- HPC Software environment
- Programming Models
- Analysis Optimisation tools
- Demonstrate improvements

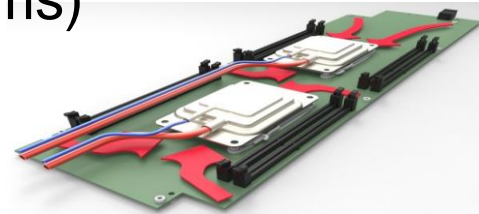
~4,5 years (Oct 2010 – Feb 2015)



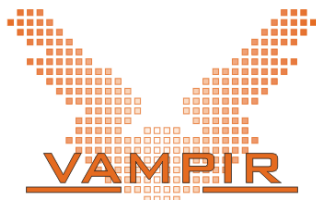
4 large/12 small companies – 5 universities – 3 research institutes



- Contributions to the next generation of HPC EXASCALE systems
- Advanced cooling design (from spatial technologies to Data Center systems)



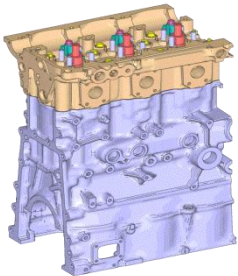
- Tools, libraries supporting new hardware architecture, with enhanced features and better user friendliness



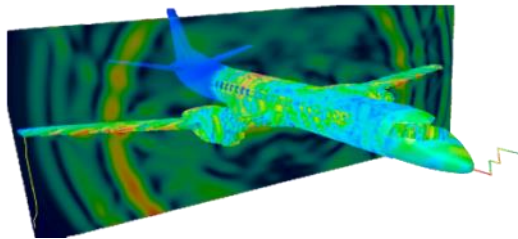
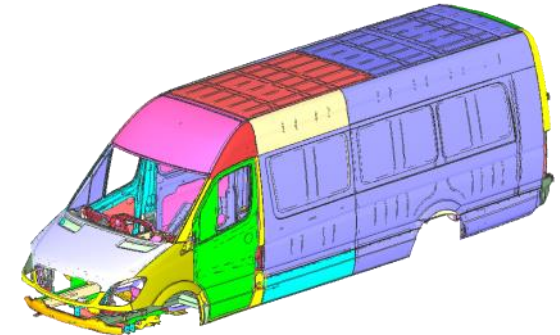
Results

Benefits for the Applications

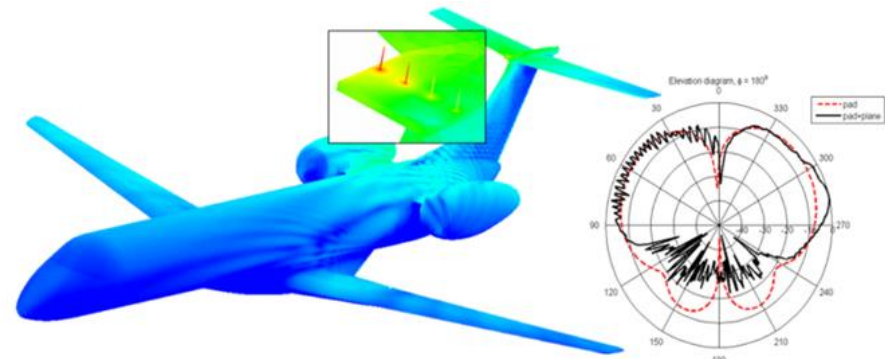
Dramatic reduced simulation time
from 6 days to 2 hours



**1 simulation per week
→ several a day**

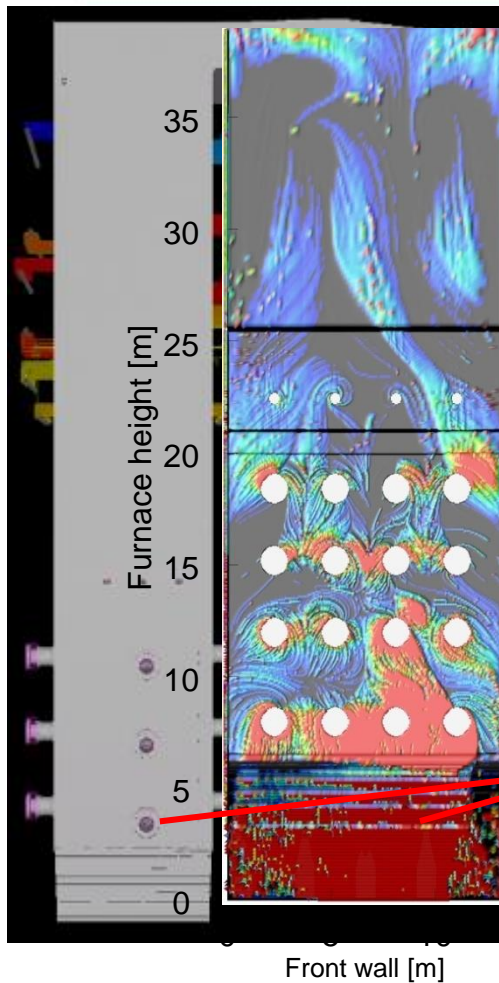


More efficient simulations
More complex simulations **x10+**



Business impact example

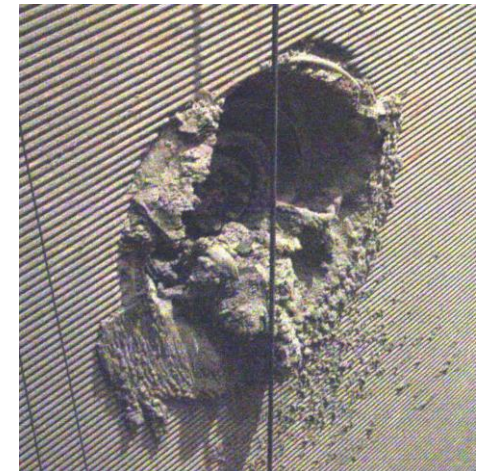
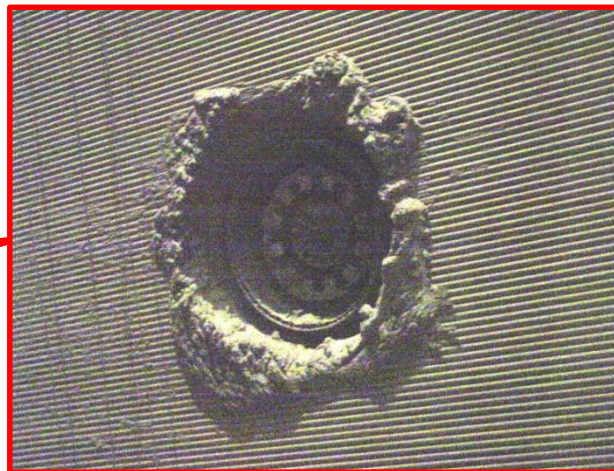
Furnace Deposit Formation (RECOM)



Prevent excessive slag growth



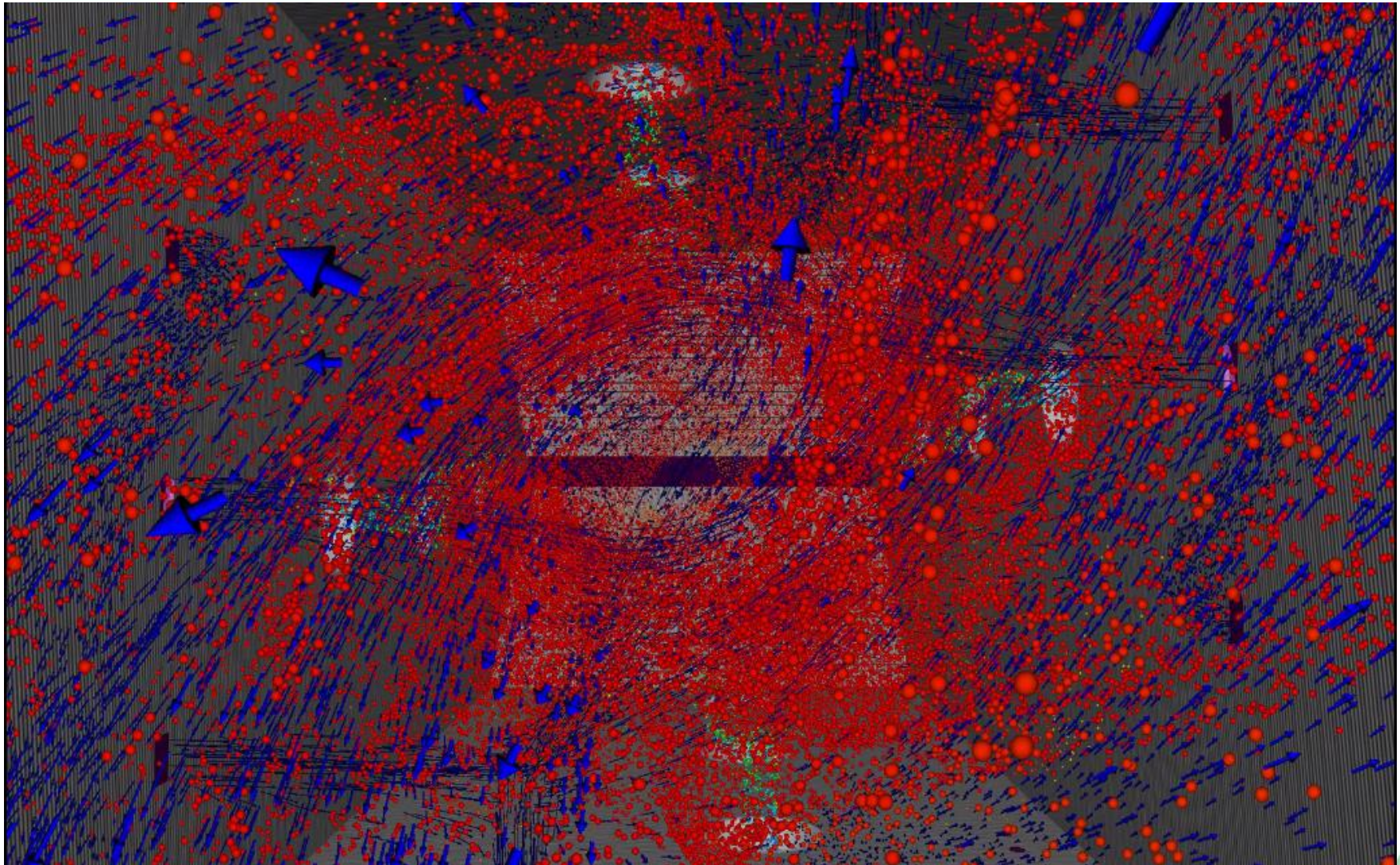
Identification of parameters that reduce slagging



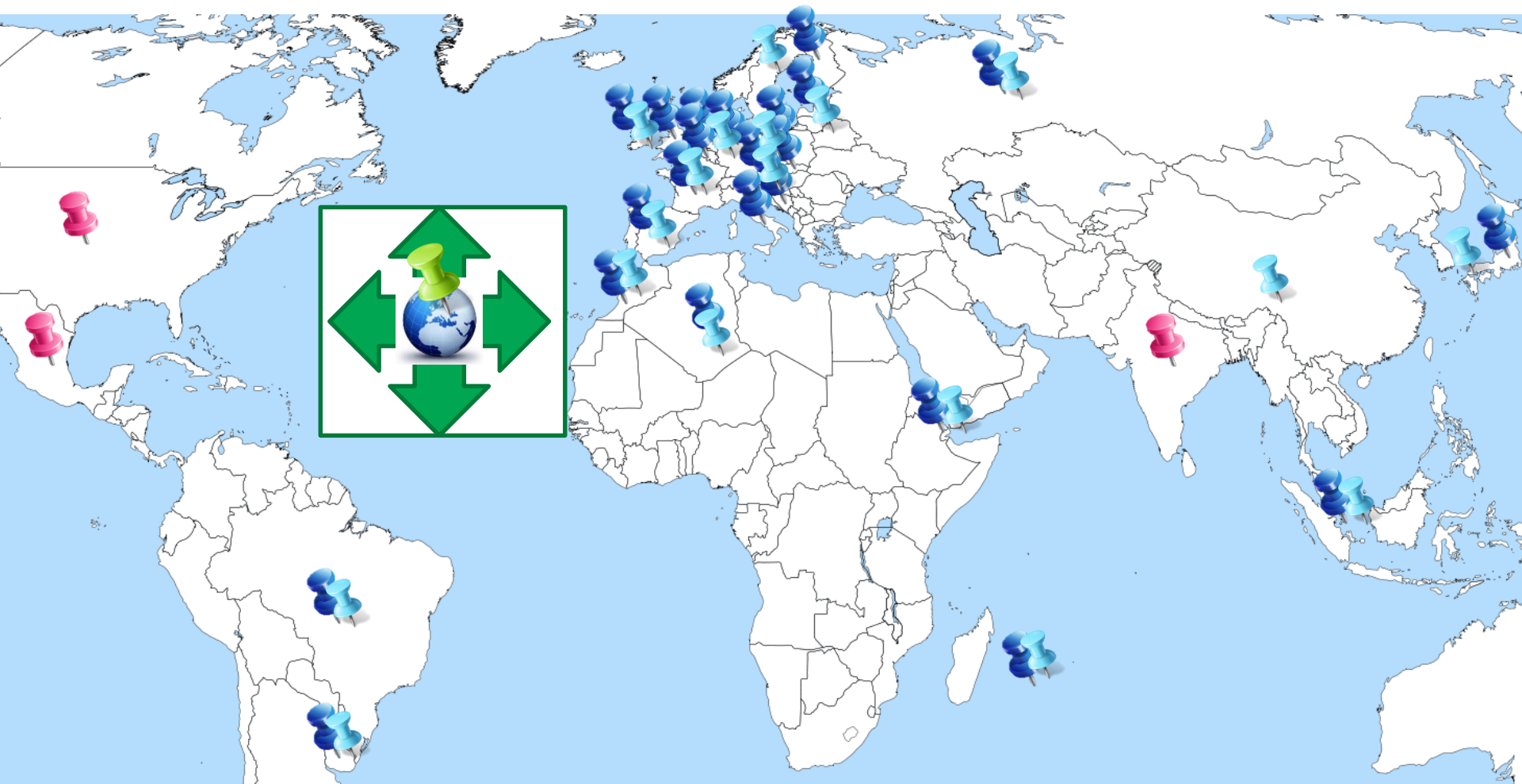
Optimise Electricity production

Avoid unexpected furnace stops (>5M€ loss)

Deposit Formation Simulation



H4H exploitation worldwide



HPC servers

New targeted markets



Optimisation tools
& Simulation SW



Open Source HPC SW

After H4H Business Impact

- Industrialisation & Integration of latest H4H developments SW developments in simulation products
 - Implementation by Dassault Aviation of optimisation strategies developed in H4H on proto applications to the industrial code
- 
- Runtime Analysis of Parallel applications for Industrial software Development: Siemens-funded Collaboration (2014-2015) between
 - Jülich Supercomputing Centre (H4H partner)
 - Corporate Technology Multicore Expert Center of Siemens AG
 - Bull sequana system - the 1st range of Exascale ready supercomputers! Announcement in SC'15 US Nov.15, Preview Paris Apr.16



Next steps

■ Challenges:

- Improve Performance, HPC resources usage efficiency, Data Locality, ...
- Energy efficiency:
 - Maintain low energy consumption
- Massive data sets



■ Market expectations:

- HPDA (High Performance Data Analysis): Big Data using HPC – in 2016: HPDA servers ~1.2B\$, HPDA storage ~800M\$
- Improved simulations systems with **Exascale Systems (10^{18}) starting in 2020**



 Large space for innovating projects

Thank you for your attention