Increasing Impact with Industry Collaboration

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Recipe for Impact (according to me)

- Value / need
- Community diversity / accessibility
- Time / sustainability

Value / Need

- **DOE software is very high in value**
- **May not always match need**
- At the right place and time
- May not integrate well with existing workflows
- Cost of adoption may be too high
  - Lacking support, ability to customize, etc.

Diversity / Accessibility

- User
  - Diversity of scale - laptops to supercomputers
  - Reducing software complexity - may need a graphical interface, a simpler configuration format, etc.
  - Integration and/or interoperability with existing workflows, tools etc.
- Developer
  - Infrastructure to support diverse contributors : from casual to expert.
  - Resource to support external contributions.
  - Documentation. Process. Code structure.
- Funding
  - Diversity of resources (government, commercial, international etc.) to provide support / funding.

Time / Sustainability

- User communities are (usually) slow to change
- Decision making (corporate, government) very slow
- Open source software not usually marketed, spreads through diffusion

Industry Collaboration : Opportunities

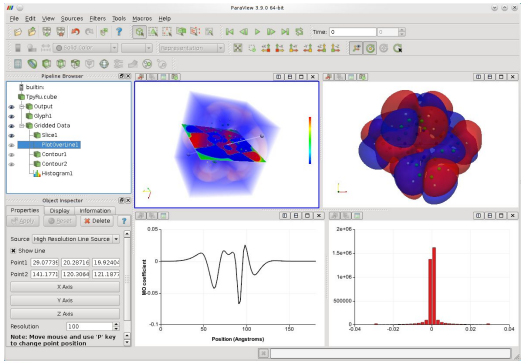
- **Value/need:** Industry is strongly focused on bridging the value/need gap
  - Bring resources to expand functionality beyond original (DOE) mission.
  - Reduce cost of adoption through support, custom development etc.
  - Marketing.
- **Diversity/accessibility:** Driven by customer community. The larger the community, the bigger the potential market.
  - Port to other OSs (Windows), scales (runs on your laptop), infrastructure (cloud)
  - Integrate with commercial workflows: with proprietary codes, industry practices etc.
- **Time/sustainability:** Access to different types of funding.
  - Government, commercial, US and abroad
  - Small to large customers

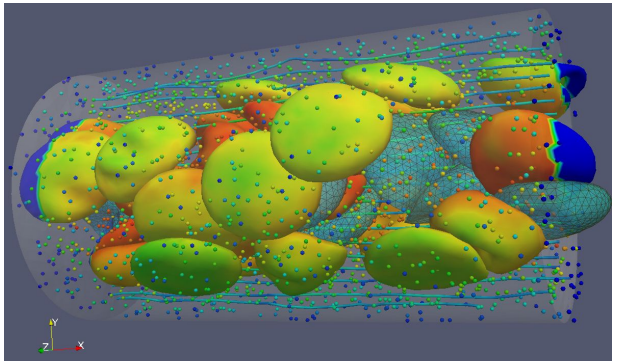
Industry Collaboration : Challenges

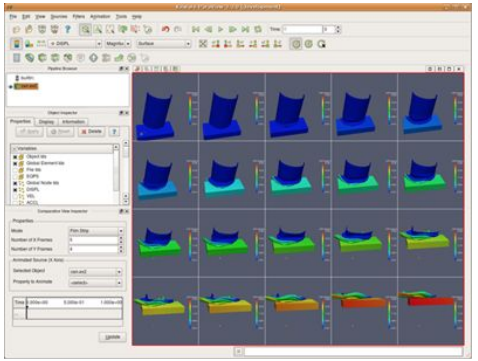
- Persistence.
  - Especially hard in the commercial world (e.g., early ROI expectations).
  - Funding challenges.
  - More susceptible to trends (e.g. AI, cloud etc.)
- Establishing strong ties with DOE partners.
- Business model / open source.

ParaView

ParaView is an **open-source**, **multi-platform**, **data analysis and visualization** application for analyzing **extremely large datasets** using desktop & distributed memory computing resources.







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Brief History

- 2000: Project starts. Collaboration between LANL & Kitware. ASCI funding.
- 2002: DoD SBIR (ARL) funds major restructuring and Web interface.
- 2004: Sandia adopts ParaView as a production tool. Starts contributing.
- 2005: ParaView 3 starts under Sandia lead. Complete rewrite of user interface and support for quantitative visualization.
- 2008: DOE SBIR funds major restructuring, collaboration and Web visualization.
- 2009: DoD SBIR to support co-processing (in situ) in ParaView which later becomes Catalyst.
- 2010: BER UVCDAT project funded, including ParaView.
- 2011: SciDAC (3) SDAV institute funded, including ParaView in its portfolio.
- 2016: SciDAC (4) RAPIDS institute funded.
- 2017: ECP Alpine starts.
- 2020:SciDAC (5) RAPIDS2 institute funded.
- 2023: ParaView deployed on Frontier.

Many other contributions from: industry (Total, EDF, Altair and many others under NDA) and academia.

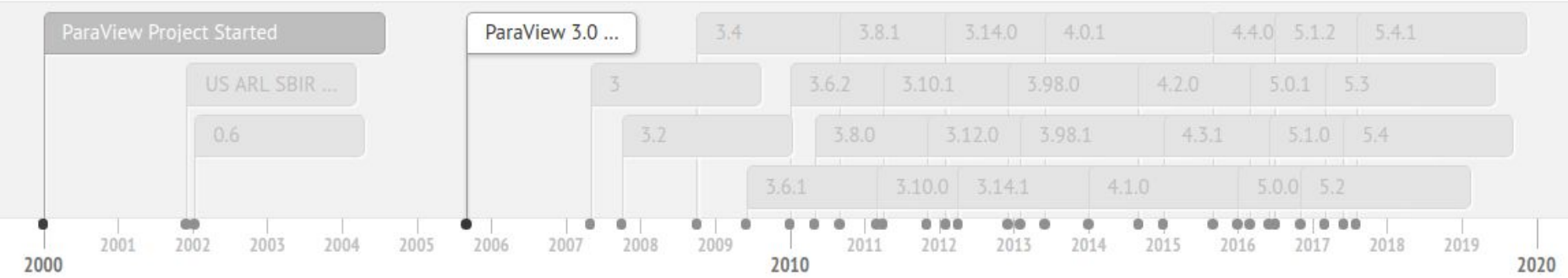
Value/Need

- Originally a deployment tool for novel parallel visualization techniques (research).
- Later production use for large scale.
- Broaden use early on - small scale use, Windows support, file formats, customization, integration of broader VTK.
- Extend use: Web support, applications for other uses (CMB for preprocessing, LidarView for LIDAR data etc.)
- Broad marketing.

Diversity / Accessibility

- General purpose - applicable to many domains including science, engineering, medical imaging etc.
- Very diverse funding stream. DOE (NNSA, SciDAC, ECP, ASCR grants, SBIRs, …), DoD, NASA, NIST, French government, CEA, EDF, many commercial customers
- ParaView is now a standard and is leveraged to broaden impact of other R&D efforts through integration (e.g. VTK-m, Catalyst).

Time / Sustainability



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Thank you.

Sustainability Matrix

Values	*Metrics*	*Summary Description*
Impact	Perceived value	An assessment of the value of the software (societal, technological, and/or commercial).
	User Base	The size of the current and/or potential user base.
	Business model	The ability to support, motivate, inspire others to contribute to, and otherwise sustain the software.
Risks	IP & License	Open source is better; permissive is best. Proprietary software may disappear. Might government regulation (e.g., export control) shut it down?
	Bus Rule	Will the software survive a key developer being hit by a bus?
	Dependencies	What external resources/software does the software depend on, what is the sustainability of these dependent packages?
	Competition	Are there other successful systems that provide similar capabilities?
Community	Culture	Welcoming, supportive, diverse culture that values contributions, feedback, and community members
	Software Process	Rigorous software process, testing, standard hosting platforms / version control
	Outreach	Documentation, tutorials, vital communication across users and developers
	Governance	Mechanisms for strategic planning; dealing with conflict; recognizing accomplishment.
Technology	Latest & Greatest	Use of modern computing systems and practices.
	Architecture	Provides a flexible, fluid, extensible environment to accommodate ongoing technology development.
	Interoperability	Readily integrates with other valued systems (hardware and software)

References

- How Sustainable is Your Software?
- Scoring Software Sustainability
- Sustainability in Action: Cleaver

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