ParaView

Explore and Visualize Massive Datasets with ParaView

January 30th 2024 - François Mazen





Contact : francois.mazen@kitware.com

Who am I?

kitware

• François Mazen

- Director of Scientific Visualization at Kitware Europe, France
- Numerical Simulation Background (Ansys, Siemens PLM)

- Open-Source Software Enthusiast
- Debian Linux Distribution Developer





Kitware / Leader in AI & scientific open source solutions

Software development

Based on open source tools 300+ active projects worldwide



Sustained Growth

65% staff with PhD or Master

High Level customer expertise

Since creation of the company 100% employee-owned

230 employees Worldwide 6 offices across USA/Europe



20+ years of expertise Kitware USA, 1998 Kitware Europe, 2010





Revenue 2020 \$39M consolidated

Kitware

Applications / Universal Platforms



Areas of expertise / Built on open source



Kitware / Services





VTK / Cross-Platform Visualization Toolkit (1993)

• Open-source (BSD-3 licence), freely available, cross-platform toolkit for post-processing and visualization of scientific data











ParaView / High-Performance Post-Processing (2002)

- Open-source, multi-platform, data analysis and visualization application
- Analysis of extremely large datasets using distributed memory computing resources





ParaView

ParaView Community

- Open Source Software (BSD license)
- Run on most of Top500 HPC
- 30000+ download yearly from Kitware servers
 - More users via other unknown download channel (Linux packaging, Enterprise distribution...)
- 157k commits made by 339 contributors since 2000
- 1.6M lines of code

Kitware



Contributors per Month



Features / Application Domains





ParaView Ecosystem







Object Inspector

Kitware

13

Pipeline Browser

File Edit View Sources Filters Tools Catalyst Macros Help	120000 × 13 * (max is 4	3)	0.0.							
	XXQatat	Y -Y	1 +21 1-2	C. 2	14 C C	G Mul	tiblockAnn	otations	SeriesPrese	t Slice
Pipeline Browser	+									
📓 builtin:	nderView1 📃 🔲 🗆 🛞							S	SpreadSheet	/iew1 📄 🔲 🗆
Can.ex2		Sho	wing PlotSe	lectionOverTir	nel - Attrib	ute: Row Data	* Pre	cision:	6 2 10	I 🏛 🗔 🍙
Clp1		ACCL			Time		VEL			
glyph1		0	0	0	0	0	0	0	0	
PlotSelectionOverTime1		1 .	-6.34058e+6	-3.50169e+6	-5.26258e+6	0.000100074	7.90291	7.49194	-103.354	
⊖ – <mark>⊮</mark> PlotData1		2 .	-3.95309e+6	-8.20736e+6	-1.04924e+7	0.000199905	6.05758	230.854	-118.923	
		3	1.01494e+7	1.49177e+7	-2.40101e+7	0.000299964	328.738	1610.21	-2080.09	
		4	1.14655e+6	-2.83477e+6	1.55963e+7	0.000400087	966.404	2192.26	-2179.34	
			-5 5/3860+6	-1.00301e+7	6.83164e+6	0.000499919	150 815	1493.81	-890 183	
		0	5.343800000	7.03776-17	7.73660-17	0.000499919	436.76	710.363	-090.105	
Properties Information	A	0	5.1/651e+/	7.937768477	-7.73009e+7	0.000599935	-430.76	/19.505	-2142.25	
		7	8.08997e+6	1.04283e+7	5.95375e+6	0.000700049	-696.542	518.365	-4280.43	
Pappy Reset Delete r		8 .	-4.03387e+6	1.05407e+7	-8.53149e+6	0.000800035	-562.614	1108.98	-5347.28	
Search (Use Esc to clear text)	//	9	-3.41512e+6	-1.00193e+7	-1.1544e+7	0.000900061	-972.316	898.67	-6798.04	
Use Index For XAxis	//	10	-87973	-5.97332e+6	5.49611e+6	0.00100001	-1224.61	-35.8638	-6934.18	
X Array Name Time	a.		• = 2 _x	36 s				Qua	rtileChartV	<u>iew1</u>
Series Parameters			11						-	
Variable Legend Name		1.2	e+8-	1					- ACCL	Magnitude (gid=662) agnitude (gid=662)
✓ ACCL_Ma ACCL_Magnitude (gid	\mathcal{T}			Λ						
ACCL_Y (g ACCL_Y (gid=662)	6.1e+03	1	e+8-							
ACCL_Z (g., ACCL_Z (gid=662)	V									
DISPL_Main DISPL_X (gid=662)	- 5000	8	e+/-							
DISPL_Y (DISPL_Y (gid=662)	4000 8	~	017							
PedigreeN PedigreeNodeld (gid=	1000 plu	Ŭ								
Point Coor Point Coordinates_Ma	- 3000 g	4	e+7-							
Point Coordinates_X (Point Coordinates_Y (2000 ដ		٨							
Point Coor Point Coordinates Z (- 2000 5	2	·e+7-							
VEL Magn ■ Time (gid=662)	- 1000					~	\wedge			
□ VEL_X (gi ■ VEL_X (gid=662) -	2 70+01		0-	.0005 n.r	01 0.0011	5 0.002	0.0025	0.003	0.0035	0.004 0.00
	- 2.76401	_								

«kitware

Extremely Large Data

1 billion cell asteroid detonation simulation



Sandia National Laboratories

¹/₂ billion cell weather simulation



Source: Sandia National Lab



Fast Large Data Interaction

CFD simulation of 20-30 million cells with load balancing



«kitware



Source: Swiss supercomputing center



Going Further ...

- ParaView User Doc (Guide) Official user's manual and reference guide
 - Accessible in the binary version of ParaView
 - Freely available as a website: <u>https://docs.paraview.org</u>
 - Printed version on Amazon
- Wiki and Forum
 - Plenty of user and developer resources
 - <u>https://discourse.paraview.org/</u>
- Kitware

Kitware

<u>https://www.kitware.eu/contact/</u>

at categories				x = w
				+ New Topic
FAQ Common questions about ParaView. Check here first to see if your question has been answered.			Embed 3D topography on 3D winds (lat, lon, pressure level) Parathere Support	7 21m
ParaView Support A plans for questions shoul Familytew usage, building, and installation as unellas general discussion about ParaView. If this is your family family desized exact ParaView FAQ before			Extracting Points other than already existing extractions e Pan/Wey Support	0 2h
In Situ Support			Extracting remaining points	0 th
A place for questions about in situ visualization with ParaWiew including ParaWiew Catalyst.				
Web Support			Superbuild on Windows 11 No Paraview Application Development	27 15
LidarView, Lidar, and SLAM Discussion of topics related to LidarView, Lidar, and SLAM.				2 Ih
VR/AR A place to discuss Vitual Bealty and Augmented Bealty superts of ParaView.			© Gradient of unstructured datasets in paraview giving zero values at the walls.	6 හා
Development				
The Development category is for the discussion of Panit/New development, including potential bugs, plugin development, Panit/New-derived applications, software testing, and related topics.			© "Zigzagging" / "Jagged" sidesets with 2D out-of-plane triangular meshes Development	11 41
Tips and Tricks This category is a place for correnarity-contributed tips and				5 7h
tricks. Support questions should be posted under the category ParaView Support. New posts in this category should have a clear description of what the tip achieves and how to do it. Tips and initiation of what the tip achieves and how to do it. Tips				2 Th
	teams to D	araView D	ocumentation !	View page sou
ParaView Documentation Docs > We latest	come to Pa			
ParaView Documentation Docs • Wel archidocs	come to Ps			
A ParaView Documentation Latest archidos Welcos KAVIEW USER'S CUIDE	me to	Para	/iew Documentation !	
A ParaView Documentation Loss Loss Loss Cors + Wel Cors	me to	Para	Jiew Documentation ! plames. The User's Galde covers various a	pects of data analy
ParvView Documentation Livest Docs + Wel Docs + W	me to an be split	Para ¹ into two v ParaView.	Jiew Documentation ! olumes. The User's Guide covers various a	pects of data analy
Preview Documentation Livest Docs - wee Livest Construction Constr	me to an be split stion with I	Para' into two v ParaView. vides deta	View Documentation ! olumes. The User's Guide covers various a lis on various components in the UI and the	pects of data analy escripting API.
	me to an be split stion with I Aanual pro	Para ¹ into two v ParaView. vides deta r's Gui	Jiew Documentation ! ohumes. The User's Guide covers various a lis on various components in the UI and the de	spects of data analy e scripting API.
	me to an be split stion with I fanual pro w Use s Gar	Para' into two v ParaView. vides deta r's Gui	View Documentation ! ohumes. The User's Guide covers various a this on various components in the UI and the de	spects of data analy e scripting API.
	me to an be split ation with I danual pro w Use v User's Gu roduction	Para' into two v ParaView. vides deta r's Gui tide to ParaVie	View Documentation ! olumes. The User's Guide covers various a lis on various components in the UI and the de	spects of data analys escripting APL

5. Filtering Data
 6. Selecting Data

ParaView Reference Manual

6. Remote and parallel vis
 7. Memory Inspector
 8. Multiblock Inspector

9. Annotations
 10. Axes Grid
 11. Customizing





Kitware Europe kitware@kitware.eu +33 (0)4 37 45 04 15 Kitware USA kitware@kitware.com +1 (518) 371-3971

Contact : francois.mazen@kitware.com

