



InfraVis

InfraVis Annual Report 2023



Swedish
Research
Council



UNIVERSITY OF
GOTHENBURG



SUMMARY

InfraVis is the national research infrastructure for data visualization co-funded by the Swedish Research Council, Vetenskapsrådet. Since 2022, InfraVis offers visualization support to Swedish scientists with the aim of enhancing the global impact of Swedish science by providing expert assistance in data analysis and visualization. InfraVis consists of the host organization Chalmers University of Technology (CU) and eight partner universities: Linköping University (LiU), Linnaeus University (LNU), Lund University (LU), Mid Sweden University (MIUN), Royal Institute of Technology (KTH), Umeå University (UmU), University of Gothenburg (UGot), and Uppsala University (UU).

During 2023, InfraVis carried out key infrastructure tasks, including: 1) organizational structure and process development; 2) a new website showing support examples and mapping of resources; 3) procedures and protocols for in-depth projects; 4) first call for in-depth support, which attracted 47 applications from a broad range of research areas; 5) the execution of 34 in-depth (Level-3) projects servicing a total of 91 principal and co-principal investigators; 6) the execution of 69 Level-1 and Level-2 projects; 7) user training within the in-depth projects; 8) the delivery of 22 user training activities servicing 460 users; 9) the execution of 95 communication events reaching 2348 potential users; and 10) cross-node collaboration and competence sharing through support projects and events. Furthermore, we have initiated discussions with ten research infrastructures, which have presented compelling ideas and clear motivations for collaborative development projects. The significant interest shown by research infrastructures in collaborating with InfraVis strongly reinforces the argument that it is imperative to address data visualization in scientific advancement.

Reflection on 2023 – InfraVis' second year

The infrastructure launched in 2022. During 2023, we have further optimized the operations with developed processes. Most importantly, we significantly increased user support. From our inception, we identified the most critical challenge to be that of attracting users. The launch of InfraVis' updated and informative web site in the fall 2023 has been essential for communicating our services. InfraVis helpdesk management (through TOPdesk) was launched at the end of 2022 and during the spring of 2023 the requests increased slowly. In May, the inaugural user call began, drawing in 47 applications. Concurrently with the call, the helpdesk management volume experienced a swift increase, eventually stabilizing into a consistent flow by the end of 2023. Fall 2023 was an intense period dominated by dialogues with the applicants, leading to agreements and project start-ups. Through interaction with the users, our team developed its procedural know-how towards meeting our shared goals with users. The support projects provide opportunities for extensive cross node collaboration. Ultimately, the call proved successful, facilitating a rapid ramp-up of our operations. A central procedure of rapid improvement during this period was the dialogue between the infrastructure and users necessary to define their projects' goals and scopes.

POPULAR SCIENCE SUMMARY

InfraVis¹ is a distributed national research infrastructure with financial support from the Swedish Research council and nine Swedish universities. The infrastructure offers data visualization services to academic researchers in Sweden through visualization experts, software solutions, and access to high-end visualization laboratories. InfraVis has a unique position not only in Sweden but also internationally, with respect to providing services from over 50 skilled visualization experts to all scientific domains. This provides an excellent base for catering to the growing demands and needs of the scientific community.

¹ Link to website: <https://infravis.se>

DESCRIPTION OF OPERATIONS

Time plan: Development related to milestones and deliverables

The year-2 deliverables and milestones have been accomplished (see Milestones (M) and Deliverables (D) in Attachment 1). Eight Pilot studies were completed (M3.1) in Q1 2023 and the Pilot Study Report (D4.1) was presented at InfraVis Days at LiU, Norrköping. The comprehensive evaluation process included all Node Coordinators (NC) and InfraVis Application Experts (IAE). InfraVis continuously adjusts the processes and protocols developed during the start-up phase according to M4.2, and D4.3 set for Q4 2023. The Delivery D3.6 on InfraVis Data Management Plan (DMP) was finalized in Q2. The development of InfraVis is an iterative process, in which we have started up several parallel processes to stepwise develop towards a full-fledged infrastructure. In the end of 2023, we had a full helpdesk operation and well-developed protocols, and thereby determined that we had reached the Q4 M4.1 and M4.2. The Scientific Advisory Board (SAB) had an introductory meeting in the beginning of 2023 and was assembled at InfraVis Days KTH in October 2023 (D3.5). The Steering Committee (SC) has had 7 meetings during 2023 (D3-6, D4.4).

Construction, development and operation of the infrastructure

M = Module. Other abbreviations will be explained as they occur.

M1 Organization and Leadership

The Management Team (MT) is responsible for the coordination of activities across all consortium partners. MT coordinates activities within the modules and is responsible for all central InfraVis administration. The three Technical Managers (TM) share the coordination efforts of the six technical modules between them. The node coordinators (NC) are also a part of Module 1 (M1) and are active in the development of InfraVis activities. M1 has been working according to the Operational plan 2023, with the only exception of organizing a user forum at InfraVis Days KTH. The high demand for user support required a full focus on user dialogues, agreements and plans. This way we made good contact with users from diverse research areas and learned their needs thoroughly, and plan to establish the User Forum at InfraVis Days in March 2024.

M2 Outreach and Communication

A crucial role of InfraVis is to engage researchers and empower them to enhance their scientific discoveries and productivity through visualization. InfraVis achieves this by primarily leveraging three channels: 1) the InfraVis website at infravis.se; 2) social media platforms; and 3) outreach events. The InfraVis M2 has a well-attended weekly meeting to coordinate, plan and work on material for all three channels above. The InfraVis newsletter was distributed in alternating internal and external versions.

A major activity during 2023 was the development and relaunch of the web site infravis.se. The new version shows both an inventory of IAE skills as well as what resources the nodes provide. During 2023, InfraVis organized and participated in 95 seminars, workshops, and hackathons. Participants have mainly come from Swedish universities, but there has also been representation from Swedish companies, e.g., Tetra Pak, as well as universities and research institutes from abroad, e.g., Danish Technical University, Danish Technical Institute, University of Copenhagen, University of Bergen, Institut Laue Langevin, Grenoble France, Slovenian National Building and Civil Engineering Institute. We have noticed a significant and positive interest in InfraVis from universities and research institutes outside of Sweden.

M3 User Training

Advanced user training is a key factor to ensure Sweden's scientific competitiveness in the ongoing transformation of today's science into research with large-scale data. InfraVis user training involves spreading knowledge via workshops, tutorials, and courses. During 2023, M3

initially worked according to plan and made user training as a standing item on the NC meeting agenda with an NC as assigned coordinator. We have offered 22 training events, focusing on e.g.: MATLAB, Inviwo, Urban digital twins, and Visualization of X-ray and neutron imaging datasets. However, the large number of user calls changed our earlier plans on arranging open events and data clinics at all nodes. Instead, we focused on training within the support projects. It has resulted in hundreds of user training hours within the projects.

M4 User support

InfraVis employs a helpdesk model to support projects: 1) Level 1 support is up to 10 hours; 2) Level 2 support is up to 80 hours; and 3) Level 3 support is an extensive form of tailored assistance, which, from 2023, will require co-funding from the users.

InfraVis helpdesk has been running since the end of 2022. We have developed a detailed workflow and all IAEs have been trained in the system. We have received a total of 66 helpdesk-tickets (2022-2023) whereof 46 were received during 2023. Outreach activities produce a steady stream of tickets in the helpdesk. We conclude that it is a strong advantage to have a distributed infrastructure with one common entrance through a helpdesk. The variations in numbers of requests due to uneven outreach activities at the nodes is leveled out and the support resources shared and distributed as needed.

The call for in depth support received 47 applications and dealing with them framed our user support for 2023 and Q1-Q2 2024. The high demand meant that we were at full capacity and thereby could plan our tasks and develop our structure in an efficient way.

M5 Software Curation and Development

InfraVis has, during 2023, provided curation of 37 software instances, in both specific user support projects and as well as development of software to provide as a service for the user community. Moreover, M5 has made an inventory of skills and available software presented on the reorganized web site.

M6 Infrastructure development to improve services

See below for section Interaction with other research infrastructures.

M7 Internal training and self-evaluation

The central assets of the InfraVis service infrastructure are knowledge and skills. The IAEs need to have in-depth complementary competences meanwhile understanding the broad area of user needs and the stages of the service pipeline. The InfraVis inventory matrix of IAE skills and resources provides the NCs an overview when planning user support teams (M4) and is used to survey internal training needs (M7). An important activity in Q1 was experience sharing and self-evaluation of the pilot projects. Training has been carried out in state-of-the-art visualization, software and tools. All IAEs had TOPdesk education and were involved in cross-node collaboration and experience sharing within the in-depth projects. The IAEs were also engaged in planning internal training workshops for the InfraVis Days.

Interaction with other research infrastructures

Engagement with other research infrastructures forms a crucial aspect of M6. Achieving interoperability with these infrastructures necessitates tailored solutions for data management and analysis. Throughout 2023, InfraVis received inquiries from numerous research infrastructures keen on comprehending how they, as infrastructures, and more significantly, their users, can leverage the expertise and resources provided by InfraVis. Collaborative development projects have been discussed with several research infrastructures, exploring strategies for coordinated efforts and customized visualization activities for specific user communities. The infrastructures InfraVis has engaged with during 2023 include national infrastructures, e.g., MyFab, MAX IV, SND, NGI, BDI and SLU but also several local research infrastructures.

Data management and need for supporting e-infrastructure

The IAEs work according to the InfraVis data management plan (DMP). The supporting e-infrastructure for InfraVis during the set-up has been Chalmers E-infrastructure E-commons. SNIC was replaced with NAISS, and we will continue to develop a close and constructive collaboration. In 2023, InfraVis interacted with SND and planned to further develop the engagement in the SND working group for the new data portal.

Changes in the organization

In 2023, we have recruited new IAEs and increased the staff from 14,06 FTE to 20,49 FTE.

UmU and LU have changed NCs and Chalmers has replaced the InfraVis administrator and the financial officer. InfraVis Communication Officer (based at LU) left InfraVis in August and we have made a recruitment for 2024. UU has replaced 2 IAEs.

The work of the Steering Group

Olof Karis was appointed as a new SG member. The steering group had seven meetings to monitor and support the development of InfraVis. The main questions addressed were: 1) launch of a user call; 2) the improvement of in-depth support projects; 3) follow up on outreach and communication; 4) follow up on recruitment processes; 5) follow up on user support processes development; 6) IAEs training, competence mapping and development; and 7) The Scientific Advisory Board.

Financial outcome

We expanded both our capacity and staff during 2023. Compared to the original budget the expenditure is 5,763 million lower. According to our budget prognosis for the whole period 2022-2026, the budget is in financial balance and in line with the financial plan for 2023 including 52% VR funding and 48% co-financing. During the start-up phase, the separation into modules has not been fully developed. 62% was reported in M4, 5% in M2, 7% in M3 and 4% in M5. The reported activities (22 user training and 95 communication) in M2 and M3 suggest that more time than shown in the financial report was spent on M2 and M3. The 37 curated software items reflect that the M5 activities are financially reported mainly in M4. Neither the percentages in M6 nor M7 reflect the time spent on these modules. The time for the M6 and M7 activities has been partially accounted for M1.

During 2023, we successfully started to implement the user-fee model including both in-kind contribution from users spending time on visualization in support projects and user-fee in cash (the cash contribution was 200,000 SEK and for one in-depth project).

We have postponed purchasing licenses for software to 2024. There were no costs for the use of supporting e-infrastructures (SNIC/NAISS) during the start-up years. 400,000 SEK of the salary cost has been replaced by contracted services (köpta tjänster), due to one IAE (Oskar Ivarsson), having transitioned to Chalmers Foundation.

Key Performance Indicators (KPIs)

Category 1 - InfraVis staff. During 2023 InfraVis had 67 staff members on 20,49 FTEs. Most individuals are involved in several modules. Over 62% of the FTEs are allocated to M4.

Category 2 - services (M3-M5). **M3**: 22 user training. **M4**: 38 help-desk support projects (L1), 28 mid-level (L2) and 34 in-depth (L3). In total 100 M4 support projects. **M5**: 37 SW items.

Category 3 - individual users. 460 user training participants (M3), 2323 participants in outreach and communication events (M2), and 192 users of M4 & M5 services (helpdesk/mid-level/in-depth support and software development).

Category 4 – type and quantity of use. The InfraVis staff provided, in total, 270 hours of M2 and 118 hours for M3 activities for users (e.g., workshops and courses). The lab facilities are regularly used for user support (M4), development (M5) and internal training (M7).

Category 5 and 6 – gender and positions for employees at InfraVis and governing/advising bodies. Comments concerning gender are dealt with in the gender equality section below. Recruitment to the User Forum started 2023 with users from the user call. The first Forum will be in March 2024.

Category 7 – output. 37 curated software were created within the user support projects and infrastructure development projects. InfraVis, being newly established, expects many high-quality publications in the coming years. This far, there have been several conference presentations, abstracts and manuscripts, as well as 2 peer-reviewed publications.

Gender equality

InfraVis monitors all activities and reflects upon gender distribution. The user support projects (M4 L1+L2+L3) included more men (116 M users) than women (46 W users). Regrettably, complete gender documentation for outreach events is lacking. However, based on the available data, participation comprises 60% men and 40% women. The management and steering of InfraVis 2023 was well-balanced at the level of Steering Group (3W:4M), core-management team (2W:2M), and SAB (2W:2FM). InfraVis, having 17% women as IAEs, could be compared to 11% women graduating from computer technology civil engineer and 10% university engineer computer technology.

Risk Analysis

Challenges for the start-up phase of InfraVis include: 1) *recruiting of the IAEs*. We have been recruiting IAEs under 2023 and plan a few recruitments in 2024; 2) *lack of cohesion of processes and procedures within a distributed organization*. We have addressed this challenge from the start and worked consistently with developing a joint toolbox of protocols and processes during 2023; 3) *volume of usage*. During 2022 and the first half of 2023, many resources have been used for outreach activities (M2) and user training (M3). The challenge of reaching out and attracting new users made us quickly announce a user call for in-depth support in May. The call facilitated a rapid ramp-up of our operations. At the same time, the attention the call gave increased our TOPdesk requests. Consequently, we had to adapt to the high demand for support and prioritize and postpone other tasks to manage the workload effectively; 4) *stay up-to-date in technology and methods*. This is an on-going discussion with SG and internal training and competence development has been prioritized in 2023. Collaboration and shared experiences based on the in-depth support projects is one important way for this. However, we also need to prioritize time for seminars with senior visualizations researchers.

Educational activities, outreach and user support

Educational activities, outreach and user support are all central activities in InfraVis and described in M2, M3, M4, M5 and M7 above.

Attachment 1

InfraVis updated timeplan as a Gantt chart based on the original VR application.

InfraVis Milestones (M) & Deliverables (D)

2022			2023		2024		2025		2026	
March (0) Startup	June (1) 6-month M&D	December (2) 12-month M&D	June (3) 18-month M&D	December (4) 24-month M&D	June (5) 30-month M&D	December (6) 36-month M&D	June (7) 42-month M&D	December (8) 48-month M&D	June (9) 54-month M&D	December (10) 60-month M&D
M0.1. Pre-kickoff meeting KH Nov 9 2021	M1.1. Definition of recruitment process	M2.1. All internal & most external recruitment completed	M3.1. Pilot studies completed	M4.1. Optimized full TOPdesk operation	M5.1. User group mapping	M6.1. Full evaluation of 2- ops	M7.	M8.1.	M9.	M10.1. Evaluation for the full period
M0.2. Kickoff at Gothenburg March 23	M1.2. Development of operations and protocols	M2.2. All currently needed HW & SW purchased	M3.2. Proposed adjustments	M4.2. Optimized InfraVis protocols	M5.2. Define development project with at least 1 other RI	M6.2. Start up development project with at least 1 other RI			D9.1. Continuation application	M10.2. Implement continuation
D0.1. Steering Committee meeting - Jan	D1.1. Pilot project plan to develop infrastructure	M2.3. All protocol definitions outlined	D3.3. Protocols for interfacing with InfraVis In: Box, Trello, Meetings, documents	D4.1. Pilot study report	M5.3. Follow-up of user call 2023	M6.	D7.1. Send application and application 2027 and onwards	D8.1. Evaluation report	D9.2. Activity plan	D10.1. Evaluation report
D0.2. Steering Committee meeting - Feb	D1.2. InfraVis Plan for Gender Equality	M2.4. Full operation TOPDesk Nov?	D3.4. Report to VR	D4.2. InfraVis adjustments proposal	D5.1. Report to VR	M6.2. Present plan and strategy for application	D7.2. Report to VR		D3.4. Report to VR	
D0.3. Steering Committee meeting - Mar	D1.3. Steering Committee meeting - April	D2.1. User training workshops and courses	D3.5. Scientific Advisory Board assembled	D4.3. Validated protocols document		D5.1. User Call 2024				
	D1.4. Steering Committee meeting - May	D2.2. InfraVis Communication Strategy	D3.6. InfraVis Data Management Plan DMP	D4.4. Steering Committee meetings	D5.2. Steering Committee meetings (at least 2/half year)	D6.2. Steering Committee meetings (at least 2/half year)	D7.1. Steering Committee meetings (at least 2/half year)	D8.1. Steering Committee meetings (at least 2/half year)	D9.3. Steering Committee meetings (at least 2/half year)	D19.2. Steering Committee meetings (at least 2/half year)
	D1.5. Steering Committee meeting - June	D2.3. Steering Committee meeting - Sep	D3.7. Steering Committee meeting - Jan		D5.3. InfraVis Days Umeå	D4.3. InfraVis Days Lund	InfraVis Days	InfraVis Days	InfraVis Days	InfraVis Days
		D2.4. Steering Committee meeting - Oct	D3.8. Steering Committee meeting - Mar		D5.4. InfraVis Internal/external Newsletter (3/half year)	D5.4. InfraVis Internal/external Newsletter (3/half year)	D5.4. InfraVis Internal/external Newsletter (3/half year)	D5.4. InfraVis Internal/external Newsletter (3/half year)	D5.4. InfraVis Internal/external Newsletter (3/half year)	D5.4. InfraVis Internal/external Newsletter (3/half year)
		D2.5. Steering Committee meeting - Nov	D3.9. Steering Committee meeting - April							
			D3.10. Steering Committee meeting - June							

Mod.	Modules, Activities & Deliverables	2022				2023				2024				2025				2026				
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
	Milestones*	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11										
	Deliverables*	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11										
1	Organization and Leadership	2022				2023				2024				2025				2026				
1.1	Daily operation management	X	X	X	X	X	X	X	X	X	X	X										
1.2	Kick-off meeting	X																				
1.3	Recruitment process overview	X	X																			
1.4	Protocols and processes	X	X																			
1.6	Start-up and recruit members to the User Forum	X	X																			
1.7	InfraVis Days: Mars/April & September				X			X	X													
1.7.2	User Forum Mars/April				X			X	X													
1.7.3	Scientific Advisory Board (SAB)				X			X	X													
1.8	Steering Group meetings	X	X	X	X	X	X	X	X													
1.9	Half-way evaluation																					
1.10	Plan for next step - the direction after Year 5																					
2	Outreach and Communication	2022				2023				2024				2025				2026				
2.1	Website and social media	X	X	X	X	X	X	X	X	X	X	X										
2.2	Newsletter		X		X		X		X													
2.3	Information material (printed and digital)		X	X																		
2.4	Outreach activities	X	X	X	X	X	X	X	X	X	X											
2.5	Open house		X		X																	
3	User Training	2022				2023				2024				2025				2026				
3.1	Definition of event types and target groups	X	X	X	X			X														
3.2	Pedagogical design of training events		X	X																		
3.3	Pilot studies of training events		X	X																		
3.4	Execution of training events							X														
3.5	Evaluation and analysis																					
4	User Support	2022				2023				2024				2025				2026				
4.1	Set-up helpdesk, support operations				X	X	X	X	X	X	X											
4.2	Protocols for mid-level			X	X	X	X	X	X													
4.3	Protocols for in-depth support			X	X	X	X	X	X													
4.4	Evaluation protocols and analysis							X	X													
4.5	Execute User support			X	X	X	X	X	X	X												
5	Software Curation and documentation	2022				2023				2024				2025				2026				
5.1	Survey of existing platforms, state-of-the-art				X	X	X	X														
5.2	Define and produce documentation templates					X	X															
5.3	Define, setup and maintain repository					X	X	X	X													
6	Infrastructure development to improve services	2022				2023				2024				2025				2026				
6.1	Needs elicitation from other infrastructures	X	X					X	X													
6.2	Monitor needs from User Support				X	X	X	X	X													
6.3	Pre-studies for development			X	X			X	X													
6.4	Defined projects execution					X	X	X	X													
7	Internal training & self-evaluation for knowledge sharing	2022				2023				2024				2025				2026				
7.1	Survey internal training needs							X	X													
7.2	Define continuous evaluation methodology							X	X													
7.3	Pedagogical design of internal training events		X	X																		
7.4	Execution of training events		X	X		X	X	X	X	X												
7.5	Evaluation and analysis							X														