REPORT ON OpenDreamKit DELIVERABLE D2.2

Community building: Impact of development workshops, dissemination and training activities, year 1

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Lead	Université Paris-Sud (UPSud)
Progress on and finalization of this deliverable has been tracked publicly at: `https://github.com/OpenDreamKit/OpenDreamKit/issues/42`	

DELIVERABLE DESCRIPTION, AS TAKEN FROM GITHUB ISSUE'S #42 ON 2016-09-07

- **WP2:** Community Building, Training, Dissemination, Exploitation, and Outreach
- **Lead Institution:** Université Paris-Sud
- **Due:** 2016-08-31 (month 12)
- **Nature:** Report
- **Task:** T2.3 (#26)
- **Final report:** in the making

An important part of the success of the ODK project is linked to its ability to **foster a community** in the spirit of the open source projects it is built on. Part of this relies on the organization and participation to scientific and development events of many different scales and objectives. In this deliverable, we give a first overview of the actions taken during the first year of the project. This includes:

- Organization of development workshops
- Organization of dissemination workshops in different thematic linked to ODK
- Training intervention in external events
- Communication interventions and participation to external events
- Actions taken to foster a community in developing countries

We describe each event with its specific goals and explain the exact implication of ODK in the organization and realization of the event. We give a general overview of the impact of single events, thus drawing a first draft of ODK impact as a whole, and describe future directions for the years to come.

CONTENTS

1. Project meetings and development workshops

We call a development workshop an event with a restricted number of participants who meet to work on a specific task. These workshops are an inherent part of OpenDreamKit development process as described in **T2.3**: they bring together developers from within and outside of OpenDreamKit and allow effective work and discussions on many technical aspects. They also participate in building and maintaining a community of developers inside OpenDreamKit and within the open-source communities we belong to.

We list here all workshops which have been organized or co-organized by OpenDreamKit as well as external workshops which have been attended by OpenDreamKit participants with a significant impact on the project. We also include project meetings as they participate to the same goal of bringing together participants of the project and always include some development time.

Throughout the first year of the project, we have had

- 3 project meetings,
- 2 workshops fully funded and organized by OpenDreamKit,
- 2 workshops partially funded and co-organized by OpenDreamKit,
- 1 external workshop.

This includes in particular one development edition of Sage Days and one Atelier Pari that we had announced on **T2.3**: "Community Building: Development Workshops". These events had a major impact on other OpenDreamKit workpackages, tasks, and deliverables: WP3: **T3.1**, **T3.6** WP4: **T4.1**, **T4.4**, **T4.6**, D4.4, D4.7, WP6: **T6.3**, D6.2

Event 1- OpenDreamKit Kickoff meeting
Orsay (France) 2015-09-02 to 2015-09-05
ODK partners involved: UPSud UNIKL Logilab USTAN JacobsUni UWarwick USFD UVSQ UZH SOUTHAMPTON USlaski UJF Simula
34 participants
`http://opendreamkit.org/2015/09/02/KickoffMeeting/`

Main goals. Build a joint vision by giving each participant an overview of the consortium and its wide variety of expertise, and of the project's aims and specific tasks, as well as to expose them with key software components, web platforms and technologies in the ecosystem.

ODK implication. As a lead partner, Paris-Sud organized and hosted this event which was fully funded by ODK.

Event summary. The meeting started with presentations of the partners and work packages, as well as software component and technology previews. We also discussed the management structure, technical infrastructure, and planning. And we got to work – finally! – on some collaborative tasks, through brainstorms and coding sprints.

Demographic. 30 ODK participants were present, representing most of the partners. We had also invited a few external participants.

Results and impact. This event set the tone for upcoming development workshops by creating a friendly and instructive working atmosphere. It also set the different goals of project, allowing everyone to share their views and understanding of ODK tasks.

ODK Kickoff meeting

Event 2- Sage Days 70
Berkeley (US California), 2015-11-08 to 2015-11-14
ODK partners involved: UPSud
16 participants
`https://wiki.sagemath.org/days70`

Main goals. Gather developers from Sage, SageMathCloud and Jupyter together to learn the inner machineries of the different projects and code together towards common goals.

ODK implication. This event was coorganized by ODK which cofunded the participation of two ODK members and another European associate.

Event summary. The event featured many interesting talks on the inner mechanics of both SageMathCloud and Jupyter, in particular:

- How to contribute to SageMathCloud by William Stein
- *The PARI Jupyter kernel* by Jeroen Demeyer
- *Jupyter Notebook development* by Jason Grout.

Lots of time was devoted to projects and code such as: installing a development version of SageMathCloud, following tutorials on SageMathCloud development, working toward the integration of the Jupyter notebook in Sage.

Furthermore a Jupyter interface for HPC-GAP was developed, and the Jupyter interface for GAP was improved. A talk *The current status of (HPC-)GAP* was contributed.

Results and impact. This workshop was essential to some ODK planned tasks. This was especially related to WP3 and WP4. Here are some tasks that were started during the Sage Days:

- **T3.6**: "Document and modularise SAGEMATHCLOUD's codebase" Document and modularize SageMathCloud's codebase. This task was started during the workshop using the knowledge of the main developer of SageMathClod, William Stein.

- **T4.1**: "Uniform notebook interface for all interactive components" Uniform notebook interface for all interactive components. This is a major task of WP4. This workshop was an occasion to share first hand information between Sage, GAP, and Jupyter developers.

The knowledge we gathered during presentations was relevant to all tasks including notebook interfaces and cloud systems.

Event 3- Atelier PARI/GP 2016
Grenoble (FR), 2016-01-11 to 2016-01-25
ODK partners involved: UPSud CNRS UVSQ UWarwick
36 participants
`http://pari.math.u-bordeaux.fr/Events/PARI2016/`

Main goals.

The PARI/GP Ateliers were established in 2012 as a yearly meeting between developers and users of the PARI/GP system.

The main goals are advertising new features and improvements, discussing further developments, sharing best practices, and collaborative code writing (hacking sessions, doc reviews, bug-squashing parties).

You can find the list of previous PARI Ateliers at `http://pari.math.u-bordeaux.fr/ateliers.html`

ODK implication.

OpenDreamKit participants: B. Allombert, K. Belabas, J. Demeyer, J.-P. Flori, L. de Feo, as well as Aurel Page from the Warwick group (LMFDB).

OpenDreamKit provided the main funding source for the workshop (accommodation, subsistence and travel expenses), for about 15k€. ERC Starting Grant ANTICS, and the LabEx PERSYVAL-Lab co-funded the event.

Event summary.

The 6th Atelier PARI/GP took place in Grenoble (France) from january 11th to 15th.

There were 36 registered participants from 16 different institutions (no registration fees).

A typical day of the workshop had introductory talks and tutorials in the morning; afternoons allowed ample time for hacking sessions, discussions and training.

The Atelier featured 10 morning talks on

- mathematical topics and implementation projects : modular forms, L-functions, polylogs & multizeta values,
- packages and interfaces : PARI Jupyter notebook, a number field database, an elliptic curve library for cryptography, CADO-NFS, GIAC/XCAS, parallel programming with GP2C.

Slides and videos for all talks are available at `https://www.youtube.com/playlist?list=PL0E0n75oNCDnWuydCHepxxSRc4UbtQQ`

Results and impact.

The workshop was very productive and was particularly beneficial to WP4 (user interfaces) and WP5 (high-performance computing):

- it was a major boost to PARI/GP development; feebackd received allowed the release of PARI/GP-2.8 in august 2016, a major release after two years of development; (**T2.3**: "Community Building: Development Workshops")
- issues related to the new PARI Jupyter notebook (D4.4, D4.7) and Sage/PARI interaction were ironed out during the meeting; discussions related to PARI parallelisation engine (D5.10)

- the PARI developers learnt about technologies and created resources for online GP deployment during the meeting using the *emscripten* compiler, see e.g. `http://pari.math.u-bordeaux.fr/gp.html`.

Event 4- First Joint GAP-SageMath Days
St Andrews (UK), 2016-01-18 to 2016-01-22
ODK partners involved: USTAN UPSud UVSQ UNIKL UOXF
19 participants
`http://gapdays.de/gap-sage-days2016/`

Main goals.

Both GAP and SageMath systems have traditions of regular developer meetings, where those interested in these systems, from newcomers to contributors, are gathering together for collaborative code writing, sharing best practices, advertising recent new features and improvements, and discussing further developments. You can find the list of previous GAP days at `http://gapdays.de/` and of SageMath days at `https://wiki.sagemath.org/Workshops`.

Following these traditions, it was decided to organise the 1st Joint GAP-SageMath Days, with the focus on improving GAP-SageMath integration and interaction between these systems and between their developers.

ODK implication.

The 1st Joint GAP-SageMath Days were mainly supported by CoDiMa – Collaborative Computational Project (CCP) in the area of Computational Discrete Mathematics (EPSRC grant EP/M022641/1, `http://www.codima.ac.uk/`). It was immediately followed by the WP7 Workshop "Knowledge representation in mathematical software and databases" on January 25th-27th, 2016, therefore OpenDreamKit participants involved in GAP and/or SageMath development could conveniently attend both events. Accommodation, subsistence and travel expenses of partners from UPSud and UVSQ were paid by the OpenDreamKit project, and those of partners from UNIKL,UOXF were reimbursed by the CoDiMa project.

Event summary.

A typical day of the workshop had one or two introductory talks to facilitate subsequent discussions and coding sprints, in particular:

- *Contributing to Sage* by Nicolas M. Thiéry and Volker Braun
- *Contributing to GAP* by Max Horn, Alex Konovalov, and Markus Pfeiffer
- *libGAP* by Volker Braun
- *GAP in the cloud* by Markus Pfeiffer

Other topics included, among others, further integration of HPC-GAP into GAP; working on the semantic-aware SageMath interface to GAP; improving the installation of GAP in SageMath and in SageMath cloud; creating and working with Docker containers; development of GAP and SageMath teaching materials for Software Carpentry, etc.

Results and impact.

The workshop was very productive. Only to the main GAP repository (`https://github.com/gap-system/gap/`) there were 51 new pull requests submitted, just 8 of which are still open; in addition, 28 new issues were created (9 of them are closed by now), and there was also progress achieved with GAP packages developed elsewhere; the work on converging GAP and HPC-GAP; discussing development workflows, etc. It helped to both GAP and SageMath teams to get further insights into each other's systems and was particularly beneficial to WP3 (component architecture), WP4 (user interfaces) and WP5 (high-performance computing).

Event 5- WP6 Workshop: Knowledge representation in mathematical software and databases
St Andrews (UK), 2016-01-25 to 2016-06-27
ODK partners involved: JacobsUni USTAN UPSud UVSQ UWarwick UZH
12 participants

Main goals. Semiannual OpenDreamKit project meeting joined with a WP6 "Data/Knowledge/Software bases" kickoff workshop dedicated to the exploration of how mathematical knowledge could be better represented and exploited within systems and for communicating between systems.

ODK implication. St Andrews hosted this event which was organized by Paris Sud (project meeting) and Jacobs Uni (WP6 workshop).

Event summary. Tuesday morning was dedicated to OpenDreamKit's semiannual steering committee meeting, including progress reports from all sites. A couple additional OpenDreamKit participants joined physically or remotely for this meeting.

The rest of the week was dedicated to Work Package 6 activities. To bootstrap the discussions, we started with a presentation by Michael Kohlhase of his ideas for a Knowledge First strategy, followed by presentations of how knowledge is represented in various components of OpenDreamKit (FindStat: Viviane Pons, LMFDB: Paul-Olivier Dehaye, GAP: Markus Pfeiffer, SageMath: Nicolas M. Thiéry), in preparation for D6.2: "Initial $\mathcal{DKS}$ base Design (including base survey and Requirements Workshop Report)". There was also a brief presentation of a proof-of-concept Knowledge-aware Sage-GAP interface developed the week before at the GAP/Sage Days. Current practices where discussed as well: commonalities in "dumping math data on the web" process (FindStat, LMFDB,...). Then came a tutorial presentation of MMT to explore how knowledge representation in MMT could serve as a generic knowledge backbone for integrating the various systems. After these warm up activities, we moved on to brainstorms and joint code sprints, developing proof-of-concepts formalizations of the knowledge in the various components and exploring applications: detecting bugs and inconsistencies in code and data, generating more complete documentation, supporting generic handle interfaces, ...

A fine grained report of the activities is available here.

Results and impact. The Math-in-the-Middle approach was born at this workshop. This led to a joint paper at the CICM conference [1] and kicked off and fueled much of the activity on WP6 since then, in particular around **T6.3**: "$\mathcal{DKS}$ Base Design", D6.2, D6.3, and D3.9.

WP6 Workshop: Knowledge representation in mathematical software and databases

Event 6- Sage Days 77: packaging, portability, documentation tools
Cernay (France) 2016-04-04 to 2016-04-04
ODK partners involved: UPSud UVSQ Logilab
15 participants
`https://wiki.sagemath.org/days77`

Main goals. This developer meeting was focused on initiating long term work on ODK tasks related to packaging, portability and documentation tools for SageMath.

ODK implication. This event was organized and funded by OpenDreamKit (Paris Sud).

Event summary. An intensive week with some short informal presentations, and many brainstorms and coding sprints.

Demographic. 9 ODK participants from three sites together with half a dozen other Sage, Sphinx, Guix, Gentoo, and Debian experts.

Results and impact. Proper packaging and distribution has been a recurrent issue for SageMath, and is a major task for ODK (**T3.3**: "Modularisation and packaging"). Major brainstorms occurred during the week to clarify the needs, isolate the core difficulties, and explore potential approaches to tackle them. The outcome was posted on the Sage Wiki, to be shared and further edited by the community. This fostered tighter collaboration between the packaging efforts for various Linux distribution, and triggered major progress on the Debian packaging side.

Similar brainstorms and coding sprints occurred around tasks **T3.1**: "Portability", **T4.4**: "Refactor SAGE's SPHINX documentation system", **T4.6**: "Structured documents"

Altogether 20 Sage tickets were actively worked on during the week.

Event 7- WP6 Workshop (Bremen)
Bremen, Germany, 2016-05-30 to 2016-06-03
ODK partners involved: JacobsUni USTAN UPSud
7 participants

Main goals. Work meeting to understand the type systems of GAP and SAGE, and to develop a first interface between MMT, GAP, and SAGE.

ODK implication. OpenDreamKit through Jacobs Uni Bremen was the main organizer of this event to work on WP6.

Event summary. The event featured a talk about the GAP type system, and many discussions between the researchers in Bremen and Markus Pfeiffer. We developed a substantial piece of software to enable GAP to interface with MMT.

Results and impact. This workshop was essential to ODK WP6, in particular for **T6.3**: "$\mathcal{DKS}$ Base Design" and D6.2.

Event 8- OpenDreamKit annual meeting
Bremen (Germany) 2016-06-27 to 2016-07-01
ODK partners involved: UPSud Logilab USTAN JacobsUni UWarwick USFD UVSQ UZH SOUTHAMPTON USlaski Simula
24 participants
`http://opendreamkit.org/meetings/2016-06-27-Bremen/`

Main goals. Annual project meeting, interim review and workshops

ODK implication. JacobsUni (Bremen) hosted this event which was coorganized by Paris Sud and fully funded by ODK.

Event summary. The beginning of the week was dedicated to ODK's open and internal meetings, including an interim review with our Project Officer and three EU Commission reviewers. The rest of the week was dedicated to joint work sessions on WP4 (User Interfaces) and WP6 (Data/Knowledge/Software bases, aka Math-in-the-middle) activities.

Demographic. 21 ODK participants together with ODK's project officer and three reviewers from the EU Commission.

Results and impact. This meeting was the occasion to build a common overview of what was achieved during the first ten months, and plan together work on the upcoming tasks and deliverables. The project review was enormously helpful to get early feedback and start preparing for the upcoming review at Month 18 (March 2017).

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2. Dissemination and outreaching activities

We describe here all activities related to **T2.5**: these are all events oriented towards dissemination, training, and outreach. This includes events organized or co-organized by OpenDreamKit and also participating in external events and many communication activities.

2.1. Organization of Sage Days in established mathematical communities

One goal of OpenDreamKit is to support local communities of researchers and developers who contribute to the open-source softwares related to the project. For Sage, this means supporting the organization of Sage-Days workshops that arise from within all the different mathematical communities. The main goal of these workshops is mostly to improve the Sage coverage of some mathematical area. They also play a major role in training and communication. The impact for OpenDreamKit can be summarized this way:

- **Making ODK known to the end users**: by supporting Sage Days, OpenDreamKit makes itself known to the Sage community and can thus share the many developments of the project.
- **Improving the overall quality of Sage**: by fostering researchers in specific areas, Sage Days help bring interesting mathematics into the software, which is beneficial for Sage and so OpenDreamKit.
- **Training, bringing more user**: Sage Days are the perfect place for new comers, especially students, to get their first experience with the software.
- **Fostering a community**: Sage Days are helping making Sage a vibrant community, which is vital for the success of OpenDreamKit.

Throughout the first year of the project, OpenDreamKit has been organizing or co-organizing four Sage Days: one about geometry and dynamics of surfaces, one in differential geometry and topology, one in combinatorics and one in coding theory.

Event 9- Sage Days 73
Oaxaca, Mexico, 04 - 07 May 2016
ODK partners involved: CNRS
9 participants
`https://wiki.sagemath.org/days73`

Main goals. This Sage workshop was a satellite of the conference Flat Surfaces and Dynamics of Moduli Space that happened in Oaxaca May 08-13. The aim was to introduce participants to SageMath and share code and knowledge.

On the first day, we also had two participants from the University of Oaxaca.

ODK implication. ODK, via its Bordeaux node, supported the expenses of participants. Vincent Delecroix made introductory and advanced talks about SageMath and Python.

Event summary. The first day was dedicated to a SageMath introduction. Each day in the afternoon, we had a demonstration from a participant. The rest of the time was dedicated to programming.

Demographic. 11 persons took part in these Sage Days: 2 females and 9 males, originating from the following countries: Mexico (3), Canada (3), France (3), USA (2)

Results and impact.

- A step toward the convergence of the IPython and SageMath notebooks with `https://trac.sagemath.org/ticket/20562` (D4.5)
- A fix in SageMath for a problem discovered Maxime Fortier-Bourque during the workshop (`https://trac.sagemath.org/ticket/20566`)

- Charles Fougeron's code about Lyapunov exponents gets integrated in `https://github.com/videlec/sage-flatsurf`.
- New visualization tools for geometry of translation surfaces at `https://github.com/videlec/flatsurf-package`.
- And several experimentations by the other participants.

Event 10- Sage Days 74: Differential geometry and topology
Observatoire de Paris, Meudon, France, 30 May - 2 June 2016
ODK partners involved: UPSud CNRS
26 participants
`https://wiki.sagemath.org/days74`

Main goals. This workshop was dedicated to the implementation of some topology and differential geometry in SageMath, partly in connection with the SageManifolds project `http://sagemanifolds.obspm.fr/`. 3D visualisation in the Jupyter notebook was also discussed.

ODK implication. ODK, via its Orsay and Bordeaux nodes, supported the travel and living expenses of 7 speakers:

- Marck Bell (U. Illinois, Urbana-Champaign)
- Marck Culler (U. Illinois, Chicago)
- Nathan Dunfield (U. Illinois, Urbana-Champaign)
- Patrick Hooper (City College of New York)
- Vincent Delecroix (U. Bordeaux)
- Jeremy L. Martin (U. Kansas, Lawrence)
- John Palmieri (U. Washington, Seattle)

Event summary. Morning sessions were devoted to talks on various topics relevant to the workshop theme, some of them involving codes that are not part of SageMath (SnapPy, Flipper, Gyoto). Afternoon sessions were devoted to working groups and coding sprints.

Demographic. 26 persons took part in these Sage Days: 5 females and 21 males, originating from the following countries: France (11), USA (8), Poland (3), Germany (2), Russia (1) and UK (1).

Results and impact. 41 SageMath tickets have been written or reviewed during the workshop; the list of them is available at `https://trac.sagemath.org/query?keywords=~sd74&or&keywords=~days74` Progresses on the K3D-jupyter visualisation are reported at `https://wiki.sagemath.org/K3D-tools`.

Event 11- Sage Days 78: Combinatorics
Vancouver (Canada), 2016-06-29 to 2016-07-01
ODK partners involved: UPSud CNRS
30 participants
`https://wiki.sagemath.org/days78`

Main goals. The event was organized as a satellite event of the yearly international conference in algebraic combinatorics FPSAC. The objective was to gather the combinatorics community around Sage development, to introduce Sage to newcomers (especially graduate students) and to bring new Sage contributions.

ODK implication. the event was co-organized by ODK (through Viviane Pons) and the Pacific Institute for the Mathematical Science where it was hosted. The event costed around 4000 CAD (2000 CAD from ODK). A short presentation about ODK was made during the conference to present the project to the participants.

Event summary. We started the event by some introduction presentations and tutorials so that the participants would familiarize themselves with Sage. Then the time was shared between lectures and coding sprints. Here are some highlights:

- Our invited speaker **Mike Zabrocki** (York Univ.) gave a lecture on *Open Problems in Combinatorial Representation Theory*.
- **Emily Gunawan** (Univ. of Minnesota) and **Jessica Striker** (North Dakota State Univ.) gave respectively a tutorial and a lecture on *Research-based coding* for Sage.
- An undergrad student **Amit Jamadagni** gave a presentation of the extensive package on *Knot Theory* that he developed during a Google Summer of code project.

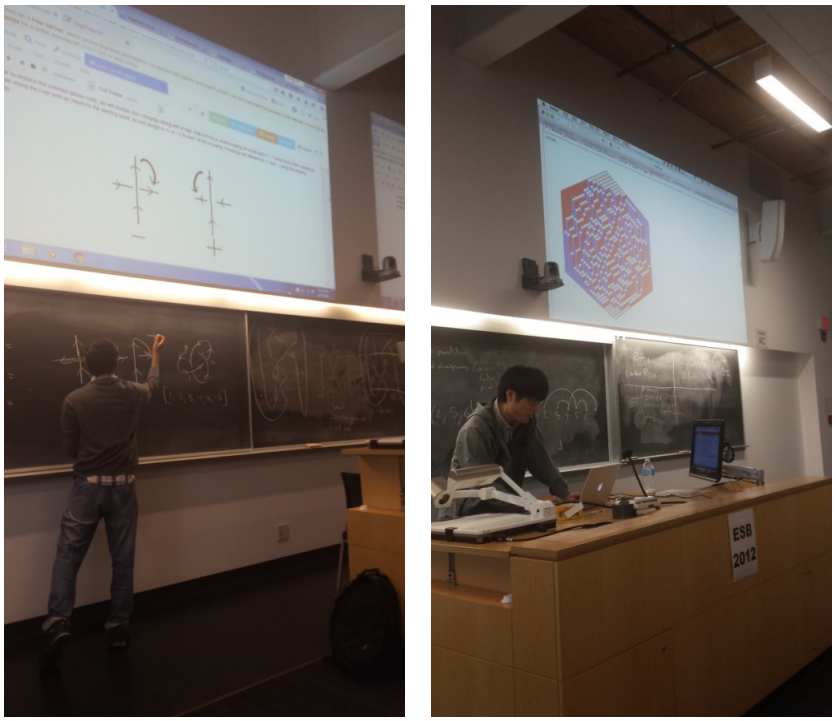
The full program can be found on the hrefhttps://wiki.sagemath.org/days78website. We planned lots of time for participants to work on development projects such as: Plane partitions, plotting functions for combinatorics objects, Lie algebras, Rook placements, ...

Demographic. The participants were required to fill out a demographic survey. We had 29 participants (24 males and 5 females), 27 identified as academics: 7 professors, 6 postdoc, 11 graduate students, and 3 undergrads. 19 participants were from North America (10 from Canada and 9 from the US), 8 were from Europe (France, Austria, and Switzerland), and 3 from Asia (South Korea and India).

Results and impact.

- **Newcomers got to use Sage for the first time:** around one third of the participants had zero or very little experience with Sage before the meeting. By the end of the three days, everyone had a way to use Sage (either online or on their machines) and had written a bit of code.
- **Newcomers got to contribute to Sage:** a lecture was given on how to contribute to Sage and groups were formed on different projects mixing more experienced people with newcomers so that the code that was written could end up being merged to the software. In particular, a implementation of Plane Partitions was put together by a participant who had never used Sage before.
- **New contributions were made in the combinatorics component of Sage:** we used the keyword **days78** on the trac server of Sage to track the contributions that were submitted during the workshop. Altogether the participants worked on 17 different tickets either reviewing existing ticket, implementing, or creating new tickets. 6 of them already got positive reviews and are on the process of being merged to the software.

Participants of Sage Days 78 making Sage demo



Event 12- Sage Days 75: Coding theory
Cernay la Ville (France), 2016-08-22 to 2016-08-26
ODK partners involved: UPSud UVSQ UJF
30 participants
`https://wiki.sagemath.org/days75`

Main goals. The event was organized primarily by the Inria project Actis, to celebrate the termination of its two year lifetime period. The purpose of the project was a major redesign and implementation of the coding theory features of SageMath. Hence the workshop gathered researchers from coding theory, and related topics, including cryptography, group theory, combinatorics, and linear algebra. The goal was to expose the results of the project to the community ensure its proper integration into the main frame of the software, and initiate new projects, so that its development would carry over with, after the end of the Actis engineer position

ODK implication. the event was co-organized by ODK (through Clément Pernet, UJF) and Inria's Actis project. The event costed around 5000€ (including 300€ for ODK). A short presentation about ODK was made during the conference to present the project to the participants.

Event summary. We started the event by some introduction presentations and tutorials so that the participants would familiarize themselves with Sage. Then the time was shared between lectures and coding sprints.

The full program can be found on the website.

2.2. Training activities for Sage in developing countries

As open-source software developers, we wish our products to be accessible to as many people as possible. Even though we offer a free access, there is still a technical gap in many developing countries that often prevents schools and researchers to benefit from our softwares. This is why we believe the role of OpenDreamKit is to foster a wider community that does not leave a part of the world behind. In this section, we describe training activities that have been conducted through OpenDreamKit in this regard.

The events 13, 14, and 15 described in this section are part of a long term plan from Adrien Boussicault (Bordeaux University) to create an active and autonomous Sage community in the Mediterranean area by repeated events and the creation of a local team. We also include event 16, where Viviane Pons (Université Paris-Sud) represented OpenDreamKit (ODK), which took place in Colombia and was a positive example of the inclusive and open spirit we want to achieve.

Event 13- Conference-school on Discrete Mathematics and Computer Science 2015
University of Sidi Bel Abbès, Algeria – 15-19 November 2015
ODK partners involved: CNRS
30 participants
`https://www.univ-sba.dz/ldm/dimacos/`

Main goals. DIMACOS 2015 is a mathematical conference that took place in Algeria. The first goal of ODK was to make an initiation on SageMath. The second goal was to create a team of sage developers in Algeria.

ODK implication. A. Boussicault was sent by ODK to deliver training sessions on Sage Math. ODK paid the travel and accommodation of A. Boussicault.

Event summary. This was a one-week event, with a two hour session per day. The sessions were conducted and prepared by an Algerian researcher (Professor A. Belahcene). A Linux installfest on laptops took place every evening. The evening sessions were beginning at 20h30 and ended at midnight.

The sessions were presented by A. Boussicault (University of Bordeaux) and Z. Chemli (University of Paris-Est). The purpose was to present and make mathematical calculus with Sage. The sessions covered also background in Python and Combinatorics.

During that event, we discussed with professor H. Belbachir (University USTHB in Alger) and professor I. Boudabbous (University of SFAX in Tunisia) to plan another Sage event in the conference ”Combinatoire, Algèbre et Théorie des Nombres” in Monastir - Tunisia.

Demographic. 30 participants were present at the sessions. DIMACOS being an international conference, the people present came from Lebanon, Algeria, Tunisia, Morocco, etc.

Results and impact. This event allowed us to work with Imad Eddine Bousbaa, a PhD student. He helped us during the Sage sessions. It was the starting point of a collaboration that allowed us to recruit him in the ODK project.

His recruitment is part of the will to build a team of Sage developers in Algeria.

We could use this event to prepare the next conference : ”Combinatoire, Algèbre et Théorie des Nombres” in Tunisia (event 15).

Event 14- School in Lebanon University
Lebanese University, HADAT – 05-11 Mars 2016
ODK partners involved: CNRS
7 participants

Main goals. The goal was to organise a class on Polya theory and then to deliver training sessions on Sage Math to implement Polya Theory.

ODK implication. A. Boussicault was funded by OpenDreamKit for the travel.

Event summary. The event was one-week long, with a 4 hour-long intervention per day

Demographic. 7 Students in their second year of Master's degree in mathematics at the Lebanese University.

Results and impact. This was the occasion of a first contact with Amine Sahili, the students' professor.

Event 15- Conference Combinatoire, Algèbre et Théorie des Nombres
Monastir, Tunisia – 24-28 Mars 2016
ODK partners involved: CNRS
30 participants
`http://www.edsf.fss.rnu.tn/Colloque1/colloque3.html`

Main goals. CTAN 2016 was a mathematical conference that took place in Tunisia. The first goal of ODK was to make an initiation on SageMath. The second goal was to create a Sage developer team in Tunisia.

ODK implication. A. Boussicault was sent by ODK to deliver training sessions on SageMath. ODK paid the travel and accommodation of A. Boussicault.

Event summary. The event wasone-week long, with a 2-hour long intervention per day. Trainings were given on participants' computers. We worked with Sage by using a Debian live USB stick.

A Linux installfest on participants' laptops took place every evening. The evening sessions were beginning at 20:30 and ended at midnight.

The session was conducted by A. Boussicault (University of Bordeaux) and Imad Eddine Bousbaa (University of USTHB of Algeria), who was met during a previous conference in Algeria (13). The purpose was to present and make mathematical calculus with Sage. We also gave classes on Python and on Combinatorics.

During that event, we discussed with CTAN organizers and some researchers to organize some important mathematical events in Tunisia, Algeria, Morocco and Lebanon. Many researchers were present in the discussion. For example, there were Professor H. Belbachir (University USTHB in Alger), Professor I. Boudabbous (University of Sfax in Tunisia) Professor O. Khadir (University Hassan II of Casablanca), Professor M. Pouzet (University of Lyon1), professor H. Kheddouci, (University of Lyon1). We decided to organize, in the next year, an event with the mathematical conference CTAN followed by mathematical schools and some Sage Days. In the school, we could give some Sage classes and we could implement ideas and mathematical tools during the Sage Days.

Demographic. 30 participants. CTAN being an international conference, participants came from Lebanon, Algeria, Tunisia, Morocco, etc.

Results and impact. The will to organize an event with a mathematical conference followed by mathematical schools, and Sage Days in Morocco or in Algeria.

We made some Tunisian contacts to create a developer team in University of Sfax.

Event 16- 5th Encuentro Colombiano de Combinatoria
Medellin (Colombia), 2016-06-13 to 2016-06-24
ODK partners involved: UPSud

130 participants
`http://ecco2016.combinatoria.co/`

Main goals. ECCO is a combinatorics summer school organized every other year in Colombia. It welcomes students from all over the world of all levels: from undergraduates to postdocs. It is known to be a very interesting event and to have a great impact for combinatorics in Colombia and South America in general. The Sage community in combinatorics being very active, it was a great occasion to introduce Sage to a new generation of researchers.

ODK implication. Viviane Pons was sent by ODK to give two Sage interventions during the school.

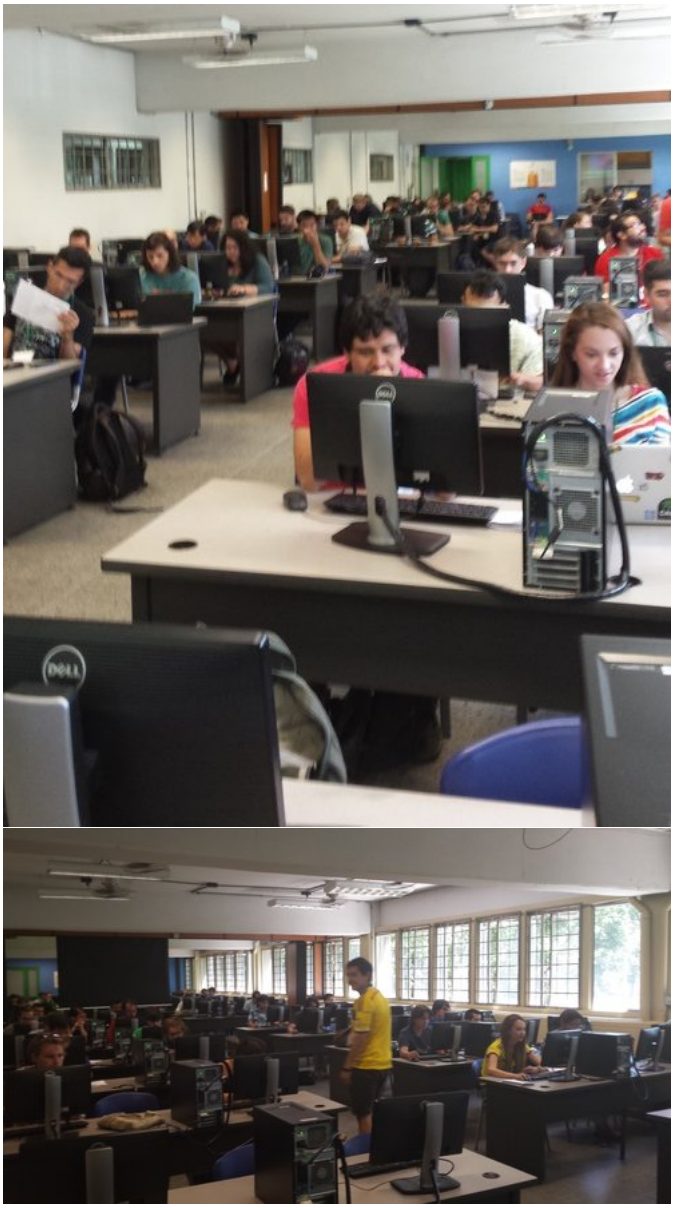
Event summary. Each intervention was 2 hours long with around 50 participants each time. Most participants were using the university computers. 50 USB sticks were bought previous to the conference and set up with bootable Linux and sage, allowing for a very quick setup during the two sessions without relying on on-line options. The students worked on some introduction tutorials and also specifically made tutorials in relation with the on-going classes.

Demographic. 66 participants came from South and Central America, 34 from North America and 30 from Europe.

Results and impact.

- The organizers were very happy that ODK would propose to send someone at the school. They did not have anyone who could carry such an intervention which requires both Sage and technical skills.
- It was quite a challenge to get Sage to work in approximatively 10 minutes for 50 computers all together. The solution of the bootable USB sticks has been developed by Thierry Monteil but is not well known nor well documented. This was an occasion to test this solution in this particular setup and improve our experience for future events.
- The bootable USB keys were very successful and many students brought their own sticks to get a copy of the software. During the sessions, we could also help students install Sage on their own computers.
- Many of the students, especially the younger ones from South America, had never used Sage before. We proposed many different tutorials so that everyone could have something to work on and we created exercises related to the class content of the two weeks. We received enthusiastic feedbacks for the sessions.
- Some of the introduction tutorials of the Sage documentation were translated into Spanish for the sessions and will eventually be added to Sage.
- The conference in general was a very rewarding event. It has been growing and successful for the past ten years with a strong focus on inclusivity and impact. It was a great occasion to be part of the event and learn from their experience. A blog post from Viviane Pons was published by the *AMS Blog, On Teaching and learning mathematics*[4].

Participants of ECCO at the Sage sessions



2.3. **Communication and participation to external events**

Dissemination activities also include the participation of OpenDreamKit members to many different conferences of various size and topics in computer science, mathematics, physics, and more. The goal is to reach potential end-users, build bridges between communities and stay aware of current development in the scientific community.

We list here major events and communication. We have also put in place a blog on our website: `http://opendreamkit.org/activities/` to track these activities.

Event 17- PyConFr
Pau (France), 2015-10-17 to 2015-10-18
ODK partners involved: UPSud
around 200 participants
`http://www.pycon.fr/2015/`

Main goals. PyConFr is the main gathering of the python community in France. It is a good place to meet the French open source Python community and to talk and learn about projects.

ODK implication. Viviane Pons was present at the meeting and she gave a talk on her teaching experience using SageMathCloud [5] (peer-reviewed submission). She was also part of a panel on diversity.

Results and impact. This event was an occasion to introduce ODK to the larger python community in France as well as to keep active the link between Sage development and other Python open source projects. It is always a great occasion to discuss subjects such as user interfaces, cloud servers, best practices, communities, etc. The diversity panel in particular was a great success bringing together most of participants of the event. As this is a great concern for ODK, we were happy to be part of it.

Event 18- Finite Simple Groups: Thirty Years of the Atlas and Beyond
Princeton (US California), 2015-11-02 to 2015-11-05
ODK partners involved: USTAN
94 participants
`http://math.arizona.edu/~grouptheory/princeton/`

Main goals. Gather contributors to and users of the "Atlas of Finite Simple Groups" and other mathematical databases to learn about past, presence, and future.

ODK implication. ODK was not the main organizer of this event, it was used to fund one project member (Markus Pfeiffer).

Event summary. The event featured talks by high-profile mathematicians, such as John H. Conway, John Thompson, Michael Aschbacher, and many more.

Discussion sessions highlighted the need for mathematical knowledge stored in databases. Some major examples that were discussed are

- The "ATLAS of Finite Group Representations - Version 3" http://brauer.maths.qmul.ac.uk/Atlas/v3/
- The "Online Encyclopedia of Integer Sequences (OEIS)" http://oeis.org
- The "Modular forms and L-functions database (LMFDB)" http://lmfdb.org
- The "Small Groups Database" (small)

Most of these databases share common issues such as *reliability* of the data, the *reliability* and *longevity* of the storage, *maintenance*, and *managing contributions*.

Results and impact. The attendance of this conference shed light on how some mathematicians view mathematical databases, and what issues they see. This is an important contribution for WP6. It also contributed to the attendee's understanding of the needs of our potential users (WP4).

- **T6.1**: "Survey of existing $\mathcal{DKS}$ bases, Formulation of requirements" Survey of existing DKS bases, Formulation of Requirements
- **T6.10**: "Math Search Engine" Math Search Engine

Further discussions with GAP users and developers about HPC-GAP were a side-effect of the attendance of this event.

Event 19- 13th Joint Magnetism and Magnetic Materials (MMM) - Intermag Conference
San Diego (CA, USA), 2016-01-11 to 2016-01-15
ODK partners involved: SOUTHAMPTON
30 participants

`https://magnetism.org`

Main goals. The main goals of presenting the project at this important international Joint Magnetism and Magnetic Materials and Intermag conference was to introduce the Micromagnetic Virtual Reasearch Environment (VRE) to our target user audience - the micromagnetic scientific community.

ODK implication. The OpenDreamKit project has sent the speaker (Hans Fangohr), and paid expenses for the trip.

Event summary. Hans Fangohr submitted a talk [3] that was peer reviewed and accepted for presentation. In the talk, he outlined the vision for the project and invited feedback from the community.

The ODK project for computational micromagnetics was discussed with various attendees informally throughout the conference.

In addition, we organised a meeting with the main developers of the OOMMF micromagnetic simulation code, Dr M. Donahue and Dr D. Porter, in order to discuss the project's vision, our plans for interfaces to get early feedback.

Results and impact. We announced the project and its website to the community and encouraged input to extend our vision, to make sure the tool we develop can be as practical and efficient for as large parts of the community as possible.

Event 20- International Workshop on Software Engineering for Science
Austin (TX, USA), 2016-05-16
ODK partners involved: SOUTHAMPTON
15 participants
`http://se4science.org/workshops/se4science16/`

Main goals. Spread recommendations to support better science in the area of software engineering for computational research.

ODK implication. The work presented has been created with the upcoming Jupyter OOMMF integration in mind, and is of wider interest to the OpenDreamKit partners and users. The conference attendance was paid from a different grant.

Event summary. Hans Fangohr delivered a talk on Software Engineering for Computational Science, in particular reviewing technical and social aspects of a computational science code that was developed about 10 years ago. The presentation, and associated publication [2] extracted lessons learned from the past and with the aim to enable the community to identify potential mistakes sooner. The presentation and work provides recommendations to enable better science in the field of computational science and engineering; in particular focusing on software engineering for computational science and research codes.

The talk was the keynote presentation of the morning session in the workshop on Software Engineering for Science (30 minutes).

Demographic. About 15 people were present, 3 female.

Results and impact. We reported evidence from the effectiveness of particular sofware engineering techniques and provided recommendations for future projects (including user interface, testing, version control, documentation, installation).

Event 21- PyCon
Portland (Oregon), 2016-05-28 to 2016-06-02

ODK partners involved: UPSud
around 3000 participants
`https://us.pycon.org/2016/`

Main goals. PyCon is the biggest Python conference in the world. It is the best place to learn about the python community, open-source tools, new technologies, etc. It is also a good place to grow a network in the software development community.

ODK implication. Viviane Pons was present at the meeting for the third time in a row, consolidating her effort to build links between Sage and Python communities. In 2015, she had given a talk and organized a parallel Sage Days event. It was not possible to do so this year but a Sage sprint was still maintained.

Results and impact. The conference itself was very instructive as usual in thematics such as: efficient programming, parallel computing, open-source community building, teaching, inclusivity. It was a good occasion to discuss with other python programmers and introduce the ODK project. The academic community did not seem as present as it had been in the previous years. In the future, we might want to target smaller events such as SciPy and EuroScipy.

Event 22- Invited Seminar Talk at "Universidade Nova de Lisboa"
Lisbon, Portugal), 2016-07-19
ODK partners involved: SOUTHAMPTON
6 participants participants

Main goals. Advertise capabilities of OpenDreamKit with a research talk that showcases the GAP Jupyter interface.

ODK implication. Markus Pfeiffer showcased the GAP Jupyter notebook interface as part of a research seminar talk on search in permutation groups.

Results and impact. This seminar talk was a good opportunity to advertise OpenDreamKit outside of our core developer or user groups.

Event 23- EuroSciPy
Erlangen (Germany), 2016-08-24 to 2016-08-27
ODK partners involved: Simula
around 100 participants
`http://euroscipy.org/2016/`

Main goals. EuroSciPy is a gathering of the scientific Python community in Europe. It brings together Scientific users and tools developers. Attending EuroSciPy is a great way to confront ideas about the future of scientific development in relations with OpenDreamKit work plan.

ODK implication. Benjamin Ragan-Kelley presented on the Jupyter project as a whole. Thomas Kluyver discussed Jupyter notebooks as academic publications. Vidar Fauske presented on nbdime, a deliverable in Work Package 4. A sprint was organized, gathering some new contributors for Jupyter projects, and useful discussion was had on the prospects of nbdime in the scientific software community.

Results and impact. The conference produced good conversations on the future of the Jupyter project and how Work Package 4 can improve scientific and open source work. There were many discussions on the prospect of open source practices improving the scientific process, which inform how OpenDreamKit can have the most impact moving the scientific community forward.

Event 24- CICM 2016
July 25-29, Bialystok, Poland
ODK partners involved: UPSud JacobsUni
around 50 participants
`http://www.cicm-conference.org/2016`

Main goals. Since a decade, CICM collocates several workshops: Calculemus (automated reasoning systems and Computer algebra), DML (Digital Math Library), MKM (Mathematical Knowledge Management), AISC (Artificial Intelligence and Symbolic Computation) with the deliberate strategy to bring together a diverse crowd of people. In particular, the Tetrapod workshop is meant to exchange ideas between people involved in the four main areas of *mechanized mathematics*: computation, data, knowledge management, and deduction (proof systems).

ODK implication. Five OpenDreamKit participants attended the conference, Michael Kohlhase from JacobsUni as General chair together with Florian Rabe, Tom Wiesing, and Dennis Müller from his group, and Nicolas Thiéry from UPSud as invited speaker. They delivered several talks, including about the WP6 paper [1], and an MMT tutorial.

Results and impact. CICM was a prime occasion to advertise and brainstorm with the larger community about the WP6 advances, and get very interesting feedback. For details, see this blog post.

3. Upcoming events and plans for the future

This past year, OpenDreamKit has been organizing or co-organizing 14 different events, thus helping and supporting the open-source communities on which the project is built. Some of these events had been announced in the proposal: the Sage development workshop (event 6) , the Atelier Pari (event 3), the FPSAC Sage Days (event 11), as well as the events in developing countries. We have also decided to support extra events which were directly helping OpenDreamKit goals or beneficial for the entire community. We believe that this persistent presence of the OpenDreamKit project within the open-source community activities is a key part of our success and we plan on keeping it on. The next few years look just as much eventful as this past year.

- Some **development workshops** are already planned such as **Atelier Pari** in Lyon, a **high performance computing** in Grenoble and probably at least one **Sage Days** in Orsay.
- We are working on three **major dissemination events** that should tentatively take place at CIRM, Dagstuhl, and ICMS. We have formed organizing committees and are working on proposals.
- The first ever **Women in Sage** in Europe has been announced and will take place in France in January.

References

[1] Paul-Olivier Dehaye, Michael Kohlhase, Alexander Konovalov, Samuel Lelièvre, Markus Pfeiffer, and Nicolas M. Thiéry. Interoperability in the OpenDreamKit project: The math-in-the-middle approach. in press, 2016.

[2] H. Fangohr et al. Maximilian albert and matteo franchin nmag micromagnetic simula- tion tool - software engineering lessons learned. *Proceedings of the International Workshop on Software Engineering for Science, at ICSE2016 SE4Science '16, Austin, Texas, US*, pages 1–7, 2016. Associated presentation, slides as PDF `http://www.southampton.ac.uk/~fangohr/publications/talk/2016-05-16-ICSE-SE4Science-Austin-Texas-US.pdf`.

[3] H. Fangohr, R. Pepper, and M. Beg. Oommf python interface and jupyter integration: the joommf project. *international Joint Magnetism and Magnetic Materials and Intermag conference*, 2016. Conference talk, `http://joommf.github.io/assets/2016-01-12-MMM2016-AD02-Jupyter-OOMMF.pdf`.

[4] V Pons. An inclusive maths conference: Ecco 2016. `http://blogs.ams.org/matheducation/2016/08/22/an-inclusive-maths-conference-ecco-2016/`.

[5] V. Pons. Enseigner avec sagemathcloud : retour sur expérience. *PyConFr*, 2015. Conference talk, `http://www.pycon.fr/2015/schedule/presentation/16/`.

All referenced ODK talks are available as annexes