Indico 1.0

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Abstract. Indico has evolved into the main event organization software, room booking tool and collaboration hub for CERN. The growth in its usage has only accelerated during the past 9 years, and today Indico holds more that 215,000 events and 1,100,000 files. The growth was also substantial in terms of functionalities and improvements. In the last year alone, Indico has matured considerably in 3 key areas: enhanced usability, optimized performance and additional features, especially those related to meeting collaboration. Along the course of 2012, much activity has centred around consolidating all this effort and investment into "version 1.0", recently released in 2013.Version 1.0 brings along new features, such as the Microsoft Exchange calendar synchronization for participants, many new and clean interfaces (badges and poster generation, list of contributions, abstracts, etc) and so forth. But most importantly, it brings a message: Indico is now stable, consolidated and mature after more than 10 years of non-stop development. This message is addressed not only to CERN users but also to the many organisations, in or outside HEP, which have already installed the software, and to others who might soon join this community. In this document, we describe the current state of the art of Indico, and how it was built. This does not mean that the Indico software is complete, far from it! We have plenty of new ideas and projects that we are working on and which we have shared during CHEP 2013.

1. Introduction

The Indico (Integrated Digital Conferencing) Software was born of a European Project, a joint initiative of CERN, SISSA, University of Udine, TNO, and University of Amsterdam. The main objective was to create a web-based, multi-platform conference storage and management system. This software would allow the storage of documents and metadata related to real events. The project started in May 2002 and ended 2 years later. After the end of the European Project, CERN took over the development effort, based on the core modules that had been developed by the organization (MaKaC – "Make a Conference"). Indico started as an Open Source project and so it has remained to this day - the entirety of its source code is available online, through the project website [1] and GitHub [2].

2. Indico's evolution

CERN's initial goal for Indico was to provide a web service that would facilitate the organisation of conferences. More precisely, the service would require timetable capabilities and a "call for abstracts" module. Indico was used in production for the first time in 2004, to organise CHEP (Interlaken). This initial feature set was regularly extended over the years.

- In 2005, Indico took over another of CERN's services, *CDS Agenda*. The new set of features transformed Indico into a tool capable of organising any kind of event, from simple lectures or meetings to workshops or big conferences.
- In 2007, Indico added a full-fledged Room Booking module. Currently, this is the official room booking service at CERN.
- From 2009 to 2013, Indico became CERN's official hub for collaborative tools, providing a common user interface for videoconferencing, chat and webcasting/recording systems.

As the project grew bigger, other organizations in the High Energy Physics realm started using it, effectively creating a network of more than 120 different instances, distributed across 4 continents. The Indico Community keeps growing day by day.

3. Indico at CERN

At CERN, Indico is the standard tool for event management. Virtually every event that takes place at the organization (regular meetings, lectures, workshops and conferences) is scheduled through Indico and the website receives over 8,000 unique visits per day. Over the course of the last 5 years the number of events that are stored in CERN's Indico instance has grown dramatically – the average yearly growth is approximately 25%. Nowadays, CERN hosts around 250,000 events, more than 1 million contributions and more than 1.2 million uploaded files (around 2.5 TB).

The Room Booking Service has also become very popular. It offers more than 200 meeting rooms with different capabilities (videoconference, webcast, etc) and around 400 new bookings are created daily.

As mentioned above, Indico is also the collaboration hub at CERN. More than 4.000 videoconferences and 40 webcasts/recordings are being processed per month.

These big numbers consolidate Indico as an essential tool for anyone working at CERN.

4. Paving the way for 1.0

The accentuated growth of Indico as a service at CERN called for a faster and more scalable platform than the one that was then available. That was the main reason for the great efforts that CERN has put into enhancing Indico's performance and usability.

The intial focus was *Usability* - many web interfaces and modules have been improved and as the two user surveys [3] that were organized over the last 5 years clearly show, users' opinion on the application has significantly improved: 71% of our users are satisfied with Indico, 25% think it is ok and only a 4% do not find it satisfactory.

Our second goal was *Performance*. The aforementioned growth was taking a toll on the application, and key features were performing poorly. We have carefully analyzed Indico's backend, rewriting algorithms, creating new and better indexes and employing caching mechanisms when possible. The last technology to make it to the Indico
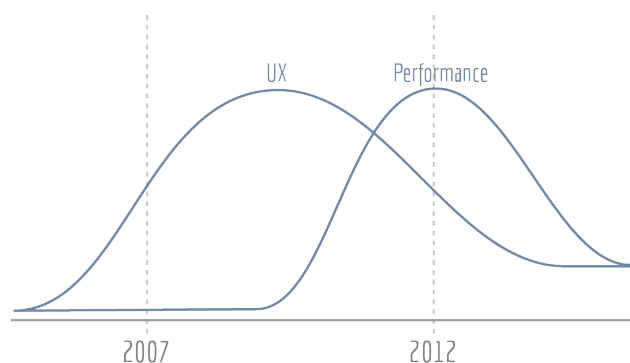

Figure 1. Development team effort orientation

software stack was Redis, an open source, BSD licensed, advanced key-value store, that is currently used to cache the heaviest and most relevant pages in the application. Today, we can confirm that performance is not an issue in Indico anymore.

None of these improvements would be possible without several changes that took part in our development process. Therefore, in constant search for greater agility and code quality, new tools, such as Git (Distributed Control Version System), Sphinx (Documentation), Trac (project management and ticketing) and Jenkins (Continuous Integration Server) were introduced. Indico development now works according to a pull request model where a figure named "integrator" ensures that the code merged into the "master" repository is correct and follows a series of pre-defined rules.

5. Indico 1.0 and beyond

In these 11 years of continuous development, 9 of which as a production service at CERN, Indico has proven to be mature and stable. Indico perfectly copes with the needs of the organization in terms of event management, room booking and doubles as the main hub for collaborative tools. After a few years of hard work on consolidating the project and the service, its reliability and performance are clearly visible. Consequently, the long-time awaited version 1.0 was packaged and released. This version does not show any radical graphical interface changes, or any revolutionary new module, since version 0.99; but it ends up summarizing the great effort that was made over the last few years, which have resulted in a stable and solid product.

At the time of the writing this paper, Indico's latest release is version 1.1, which provides many new features. Some of the most important ones are described in the following sub-sections.

5.1. Indico User Dashboard

In a server that contains more than 250.000 events, finding the events that are relevant can be challenging. Moreover, browsing the category tree the "traditional way" doesn't help much since many events are "buried" deep down in the category tree. The new User Dashboard aims to solve this situation and become a very important tool in the near future. The dashboard, already in production at CERN and accessible from the *My Profile* menu, tries to show the user what are the most important events and categories for him/her. It is divided in three boxes:

Figure 2. Indico User Dashboard

- *Your events at hand* - it shows all the events (from a few days ago to the future) in which the user is a manager, a speaker, participant, or belongs to any type of reviewing team (abstract and paper reviewing).
- *Your categories* - provides shortcuts to the user's favourite categories and those that he/she manages.
- *Happening in your categories* - events that are currently taking place and belong to the abovementioned categories.

The Indico User Dashboard is the first step towards the future. The encouraging feedback received from CERN users has led the team to consider smoothly moving this feature to the application's homepage, a change that seems not only useful but very natural, as well.

5.2. Mobile site

The handheld device market is experiencing explosive growth: smartphones and tablets have become ubiquitous. In line with this demand, which affects Indico users in the same way as it does the general public, a new mobile Indico application was developed and deployed [4]. It is an autonomous add-on
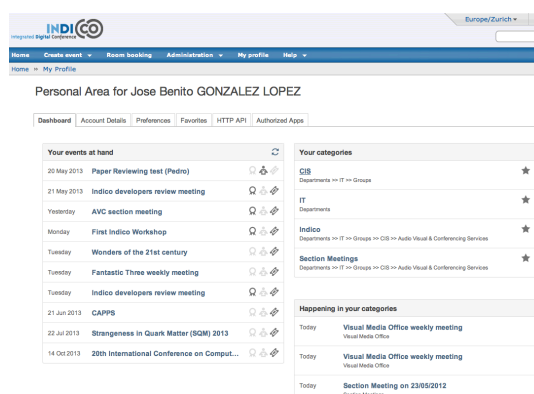
layer on top of Indico, powered by its own HTTP API, which provides a simple and functional mobile-friendly interface. The first version is already available and provides the following features:

- *On-going presentations*: list of talks that are taking place at the moment and in the near future.
- *Events*: list of current and future events.
- *Favourites*: list of events that the user has selected as favourites. This provides quick access to events that need to be visited frequently.
- *History*: the last events that have been visited.
- *Event*: provides the main information related to the event, such as the timetable, sessions, speakers and map.
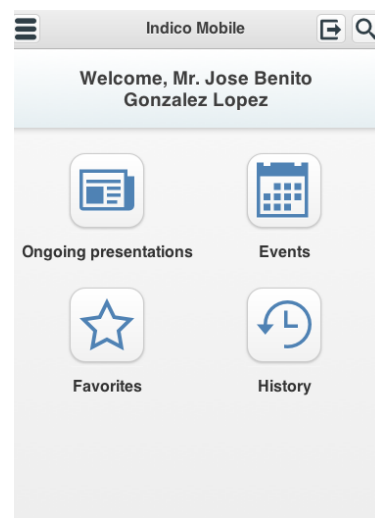
5.3. Room Booking revamped

The room booking service is one of the most used modules of Indico at CERN. Despite this fact, its interface showed many usability issues. Indico v1.1 has come with a new revamped room-booking interface. The user is presented with a simple 3-step process in which he/she must:

Figure 3. Indico User Dashboard

1. *Specify the search criteria*: users can choose which rooms (or types of rooms) they would wish to book, as well as a possible date and time.
2. *Select available period*: users are presented with a calendar which shows the available slots, based on their search criteria.
3. *Confirm reservation*: this last step displays the full booking information that the user must confirm.

6. Indico's future

Indico's future is exciting and especially challenging. Not only will many new features be released soon, but also important milestones and changes are to come in what concerns technologies and additional services.

6.1. New features

Indico version 1.2 will be released by the end of this year (2013). This version will come with many useful features; some of them are:

- *Off-line website*: tool that generates an offline copy of an Indico event. This offline event can then be stored anywhere and users can browse the website, access the timetable, download files and many other things without the need of Internet connectivity.
- *WYSIWYG Registration form*: the registration form is by far one of the most successful modules. On the other hand, it is quite difficult to manage. Its design and development dates from 2007. A new modern interface is being worked on, that makes the edition of the form a simple task. Basically, what the organiser sees while editing will be exactly what the user will also see when registering.
- *Rich Abstract Editor*: Right now, most Indico users are physicists and administrative assistants that manage physics events. It is expected that physicists will want to include formulas in their abstract submissions. At the moment, Indico misses such a tool. This year's Google Summer of Code program has provided the necessary resources for the development of a better Abstract Submission interface, with Markdown [5] and LaTeX [6] capabilities. The user will be able to write formulas and see a live preview at the same time (see figure 4).

- *E*-ticket: This brand new feature will allow conference organiser to use electronic tickets in order to control access to events. Users will receive an electronic ticket that can be read by a mobile e-reader (provided by Indico) on arrival to the conference venue. Conference organisers can also check attendees in using this mobile app.

Figure 4. Rich Abstract Submission

6.2. Technological Enhancements

Version 1.2 will reveal two important technical modifications in Indico, its framework and its authentication mechanism:

- *Web framework*: up to now, the project was developed on top of a homemade framework that followed the MVC pattern. Even though the framework provided a good base for developers, it was not as powerful, stable and well documented as a third-party product, maintained by a large community. And that is why Indico version 1.2 will have Flask as its web framework. Flask [7] is a Python micro-framework, very well documented, and which implements the hard parts of a web application, allowing developers to focus on feature development instead.
- *Authentication System*: the whole authentication system core has been refactored. Thanks to this, the Authentication System performs better and is now extensible. One will be able to setup Indico with Local Authentication, LDAP and Single Sign-On out of the box.
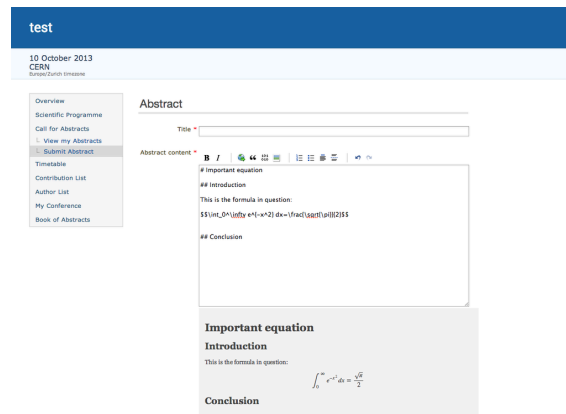
One of the most important changes will happen in Indico's own Database. At the moment, this database is ZODB, which despite being performant and stable, has presented a lot of issues when it came to executing complex queries in a performant and developer-friendly way. During the second half of 2013, a research project has been carried out, to evaluate other data storage options [8]. By the end of this year a decision will be taken and a migration boilerplate will be ready. This project will mean that all development will be frozen for new features and modules. We will put all our effort and resources to migrate Indico to the chosen database in the shortest period of time possible.

6.3. Growing big

Indico is growingly popular in the HEP community. Most of the institutions that run their own Indico server to manage their events are HEP-related. While this is good news for the project and the community, it is undeniable that this mass-adoption of the tool by the community has contributed to a certain degree to the fragmentation of knowledge: one will need to browse through several Indico servers before finding the next conference or workshop of interest. This is something that the Indico Project and CERN would like to fix, and this is why CERN's IT Department will be deploying, this year, a new service that aims to aggregate public conferences from all Indico instances around the world, and other sources as well (such as Inspire [9] and CDS [10]), into one single portal. This site will provide many modern application features as tagging, geolocation and an advanced search.

As a second step, the IT department is considering the creation of a free Indico service, targeted at the whole research community. This means that it will make an Indico server available, in which anybody will be able to create and organise events, without the need to install the application in their own server. This service is still under discussion and the final Service Level Description might be ready by the end of this year.

7. Sense of community

Indico has been Open Source from its very first days. This has allowed many organizations around the world to benefit from a software product that many of them would not be able to afford otherwise. It is clear that Indico is consolidating its *de-facto* "HEP standard collaboration tool" position. More than a hundred institutions from 4 different continents host their own Indico server [11]. Every day, Indico administrators from those institutions are reaching out to the development team and to each others, through the communication channels that the Indico product managers have made available (Mailing Lists, Jabber/XMPP).

In order to reach out and help organize this growing community, CERN's IT-CIS group organised the First Indico Workshop [12], in May 2013. The goal of this workshop was to expose Indico, inform about the project, gather feedback from external organisations and create a sense of community. The workshop took 3 full days in which different topics were discussed: User Features, Administration Tasks and Development. 20 participants from 6 different countries and 12 institutions took part in the event. Many activities were carried on, from training presentations to hands-on Indico installation, not to mention the introduction to Indico development or even the development of plugins for Indico. Participants' feedback was very positive and there was an agreement on organising such workshops regularly, every one or two years.

8. Conclusion

Indico is a mature piece of software that has been used as a production service at CERN for the last 9 years. As a consequence, Indico v1.0 has been released, reaffirming itself as a stable product. On the other hand, Indico is far from being complete and many new enhancements and modules will follow. Next year, Indico will be migrated to a different database and this important milestone will open the door to an exciting future where Indico will continue expanding further for the benefit of its users.

References

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