Building a highly modular user-oriented notification system

Carina Antunes (IT, CERN)

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Motivation
Notifications at CERN
Notifications @ CERN

- Face-to-face
- Mailing lists
- Chat service: Mattermost
- SMS/Phone call
- Windows Desktop Alerts
- Ticketing system: Service Now
- Issue Tracking: Jira/Gitlab
- Discussion Forums: Discourse
- ...
- Many services send direct email alerts
Motivation

Subscriptions managed by services:
- By each sending service
- Mostly by the service managers
- No easy opt-out
- No choice of targets
Motivation

- **High volume of notifications at CERN due to its scale**
  - monitoring and alerts of software, hardware and experiments, news and articles, meetings, general updates, administrative procedures…

- **Automated tools generate too many emails**
  - challenging to control and keep track of where, how and when some information was received
Motivation

- Replicated efforts in maintenance
- Inconsistent look and feel leads to lack of trust
History

Current system is the result of many iterations

- Evaluating alternatives since 2016
- Last iteration started around 2019
- Q1 2021 Prototype opened internally in IT-CDA
- Q2 2021 Pilot service opened to IT
- Q3 2021 Pilot service opened to CERN
- 2022 Service entered beta status and available for CERN-wide usage - working with the community for more features and system validation
- More will come!
Objectives

● **Empower users**
  ○ How/when/where they want to receive communications

● **Enhance and complement communication methods**
  ○ Enable efficient integration development
  ○ Avoid multiple implementations of notification handling

● **Central communication Hub**
  ○ Not a new message system: A Hub between existing message systems
  ○ Provide a common and simple entrypoint for sending communication
  ○ Highly scalable and modular, easy to add new devices types
Objective: streamline communications

Subscriptions managed by users
- On a central place
- By the user
- Easy opt-out
- Organize communication channels

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Service Overview

Functionality and architecture
Service overview
Service overview
Beam Gas Curtain: a new instrument for LHC Run 3

The Large Hadron Collider (LHC) will be restarted on 27 March 2023 following its year-end technical stop. During this stop, new instruments were installed in the LHC tunnel, including the Beam Gas Curtain (BGC).

After ten years of development, the BGC will start taking data on the LHC’s proton beam this year during Run 3. It will provide precise 2D images of the alignment of the proton beams, making data taking more precise. The BGC instrument was designed for the high-luminosity upgrade of the LHC as part of a collaboration between CERN’s Beam Instrumentation group, Liverpool University, the Cockcroft Institute and GSI.

Watch an animation of how the BGC works below:
Service overview

Preferences
Register your global and specific channel preferences for receiving notifications. Customize when, where and how to receive notifications. Creating multiple preferences by many filters such as channel or notification level is possible.

Global Preferences

<table>
<thead>
<tr>
<th>Name</th>
<th>Priority</th>
<th>Start Time</th>
<th>End Time</th>
<th>Frequency</th>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Weekly</td>
<td>Low, Normal, Important</td>
<td></td>
<td></td>
<td>WEEKLY</td>
<td></td>
</tr>
<tr>
<td>Default Daily</td>
<td>Low</td>
<td></td>
<td></td>
<td>DAILY</td>
<td></td>
</tr>
<tr>
<td>Default Live</td>
<td>Normal, Important</td>
<td></td>
<td></td>
<td>LIVE</td>
<td></td>
</tr>
</tbody>
</table>

Channel preferences
Service overview

Register your global and specific channel Mutes to disable notifications temporarily or permanently.

Global Mutes / Do Not Disturb

<table>
<thead>
<tr>
<th>Mute</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>14/05/2023, 00:00:00</td>
<td>19/05/2023, 00:00:00</td>
</tr>
</tbody>
</table>

Add Mute

Channel Mutes

<table>
<thead>
<tr>
<th>Channel</th>
<th>Mute</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>QA Channel</td>
<td>Permanent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Add preference
Service overview

### Devices List

Register your devices. Currently supported: Email, Mattermost via direct message, and browser push notifications.

<table>
<thead>
<tr>
<th>Name</th>
<th>Information</th>
<th>Device type</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:carina.antunes@cern.ch">carina.antunes@cern.ch</a></td>
<td>Default</td>
<td></td>
</tr>
<tr>
<td>Mattermost</td>
<td><a href="mailto:carina.antunes@cern.ch">carina.antunes@cern.ch</a></td>
<td></td>
</tr>
<tr>
<td>Mac Chrome</td>
<td>Mozilla5.0 (Macintosh; Intel Mac OS X 10.15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/106.0.0.0 Safari/537.36</td>
<td></td>
</tr>
<tr>
<td>Mac Safari</td>
<td>Mozilla5.0 (Macintosh; Intel Mac OS X 10.15_7) AppleWebKit/Komodo/605.1.15 (KHTML, like Gecko) Version/16.3 Safari/605.1.15</td>
<td></td>
</tr>
<tr>
<td>CERN Phone</td>
<td>+41754111111</td>
<td></td>
</tr>
</tbody>
</table>

Add device

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Beam Gas Curtain: a new instrument for LHC Run 3

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Service overview

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Service overview

- **Advanced Options**
  - **Associated URL**
    - The URL associated with this notification: Website, Newdle, Indico event, etc.
    - Target url when notification is clicked
  - **Image URL**
    - Specify an image url to display as preview when possible (for push notifications, optional)
    - Url of image to display, should not be protected
  - **Schedule send (Europe/Zurich)**
    - 23-04-2023 at Afternoon (5pm)
  - **Direct Notification**
    - **Note:** Only Channel owner and administrators are allowed to send direct notifications.
    - Notification will be sent ONLY to intersection between specified users or groups and channel members.
    - Notification will be sent to all specified users or groups. Users or groups will be added as channel members if needed.
    - Specify users to send a direct notification to some channel members
      - Emails or logins of users, semi-colon separated (i.e.: user1;user2;user3).
    - Specify grappa groups to send direct notification to some channel members
      - notifications-service-admin

Submit  Reset  Help
# Functionality

## Channel visibility

<table>
<thead>
<tr>
<th>Visibility</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>Always listed in the portal, for all users</td>
</tr>
<tr>
<td>Internal</td>
<td>Visible only for authenticated users</td>
</tr>
<tr>
<td>Restricted</td>
<td>Visible only for owners, administrators and members of channel.</td>
</tr>
</tbody>
</table>

## Notification priority

- **Bypass user preferences**
  - Critical
  - Important
  - Normal
  - Low

## Notification targets

- **General**
- **Direct**
  - Channel members
  - Members
  - Targets
Functionality

Channel Members

**Users**  
Added by channel owners or self subscription

**Groups**  
Added by channel members  
Managed via Identity Services
Architecture

Components overview

- Web Interface
- REST API
- Consumers
- Routing
- Database
- Jobs
- Devices
- Message queues
- Email gateway
- Identity Services
- Strongly consistent key-value store
Architecture

Components overview

- Database
- REST API
- Consumers
- Routing
- Web Interface
- Message queues
- Strongly consistent key-value store
- Devices
- Deployment
- Email gateway
- Identity Services
- Notifications Archive
- Audit storage
- Monitoring
- Jobs
Architecture

Stack overview - open source by design

- Python
- Typescript
- ReactJS
- Helm
- OKD
- OpenSearch
- ActiveMQ
- Postgres
- ETCD
- Nginx
- ...


Architecture

A notification journey

- Web Interface
- REST API
- Routing
- Consumer
- Devices
- Database
- Routing queue
- Consumer queue
- Strongly consistent key-value store
- Jobs
- Notifications Archive

Expansion and routing
The Future

Next steps and how to reach us
Next steps

Requested features and use-cases

- Customisation / white labelling for specific limited official channels
  - CERN Bulletin, CERN Store, …
- Recurrent notifications
- Templates
- Indico integration
  - open-source event management system, popular in the HEP community
- Statistics
- Built-in media hosting
- My Notifications page
Next steps

Going open source

- We want to provide a notifications hub that is flexible enough to be integrated with any device system
- New public repository coming soon
  - [https://gitlab.cern.ch/push-notifications](https://gitlab.cern.ch/push-notifications)
  - [https://github.com/hermodnotifications](https://github.com/hermodnotifications) (coming soon)
- Moving into a Flexible Plug-in architecture
  - Contain CERN specific resources
  - Extension points, interfaces and configurable modules
  - Devices as extensible plugins
  - Packaged as an Helm chart for easy deployment
Reach out to us

- Stay up to date on new features
  - Subscribe Notifications Service News: cern.ch/notifications
- Read the documentation
  - https://notifications.docs.cern.ch
- Reach us at notify@cern.ch