

# Building a highly modular user-oriented notification system

Carina Antunes (IT, CERN)

Norfolk, CHEP 2023

# Motivation

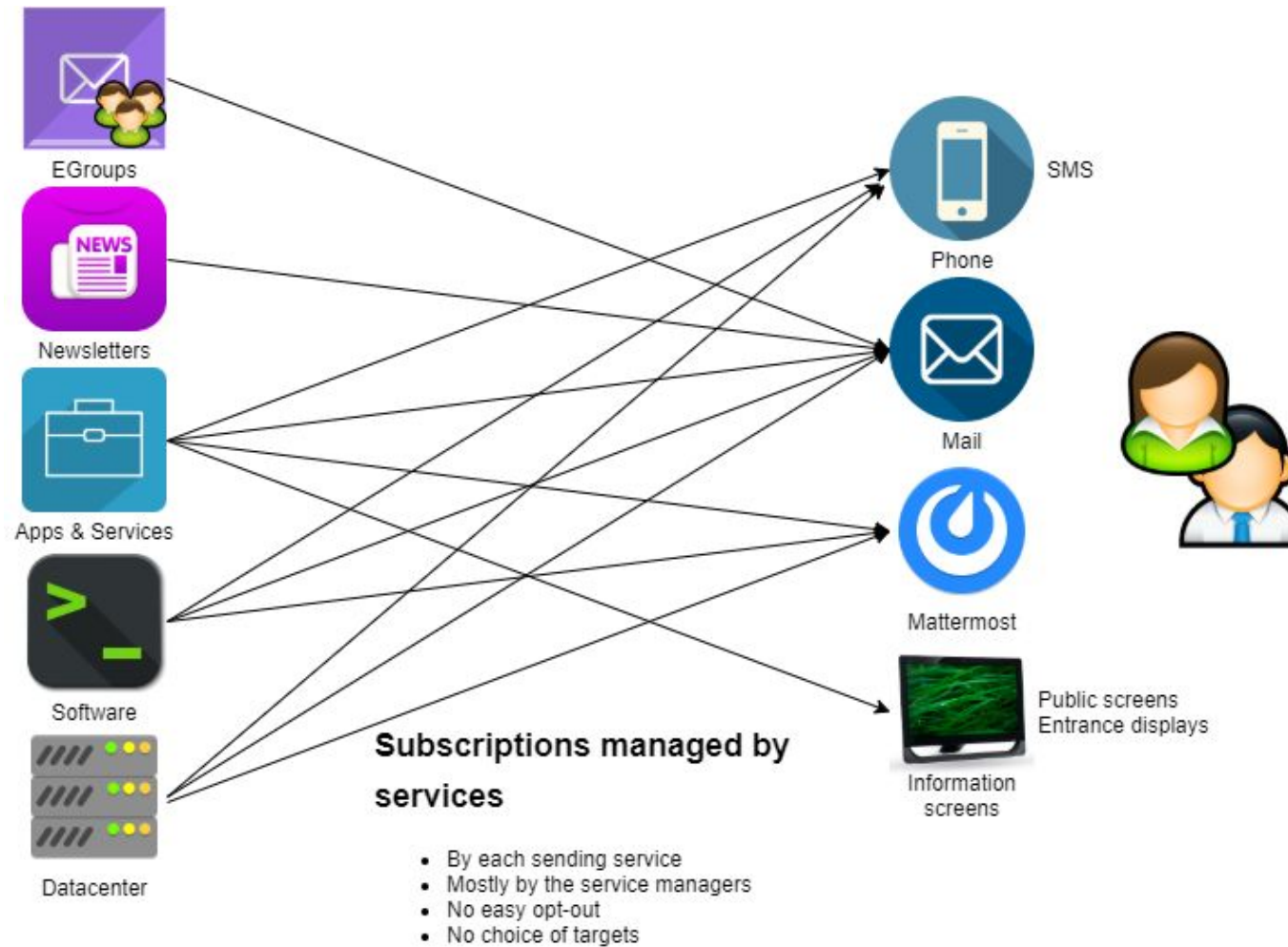
## Notifications at CERN

# 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

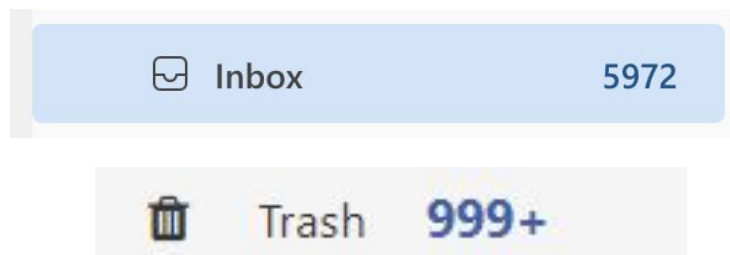


# Motivation



# 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



Mail Filter Rules					
+ Add new rule					
=	root filter	Apply	Edit	Disable	⌵
=	ICINGA filter	Apply	Edit	Disable	⌵
=	noreply filter	Apply	Edit	Disable	⌵
=	KB articles	Apply	Edit	Disable	⌵
=	noreply request	Apply	Edit	Disable	⌵
=	no reply web application	Apply	Edit	Disable	⌵
=	TSNames files filter	Apply	Edit	Disable	⌵
=	ICINGA recovery	Apply	Edit	Disable	⌵
=	Tickets not assigned to me	Apply	Edit	Disable	⌵
=	Send sentry to folder	Apply	Edit	Disable	⌵
=	Send Gitlab to folder	Apply	Edit	Disable	⌵
=	Send my tickets to folder	Apply	Edit	Disable	⌵
=	EDH into folder	Apply	Edit	Disable	⌵
=	Pay statements into folder	Apply	Edit	Disable	⌵
=	INC to 3rd line	Apply	Edit	Disable	⌵
=	INC general warning	Apply	Edit	Disable	⌵
=	Send answers to my tickets to folder	Apply	Edit	Disable	⌵
=	Short URL daily summary	Apply	Edit	Disable	⌵
=	Drupal 3rd line	Apply	Edit	Disable	⌵
=	Drupal 3rd line discard	Apply	Edit	Disable	⌵
=	Send my ticket replies to folder	Apply	Edit	Disable	⌵

# Motivation

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

[https://drupal-stg.cern.ch/monitoring/#/alerts?receiver=email\_admins]View in Alertmanager

[1] Firing

Labels

alertname = TargetDown  
job = home  
namespace = home  
openshift\_io\_alert\_source = platform  
prometheus = openshift-monitoring  
service = home  
severity = warning

Annotations

description = 100% of the home/home targets in home namespace have been unreachable for more than 15 minutes. This may be a sym  
summary = Some targets were not reachable from the monitoring server for an  
[https://drupal-stg.cern.ch/monitoring/graph?  
g0.expr=100+%2A+%28count+by%28job%2C+namespace%2C+service%25

\*\*\*\*\*

--

message sent by yum-autoupdate system from drupal8p14.cern.ch  
see: /etc/sysconfig/yum-autoupdate for options.

root

To: root@webafs706.cern.ch

----- Start Rootkit Hunter Update -----

[ Rootkit Hunter version 1.4.6 ]

Checking rkhunter data files...

Checking file mirrors.dat [ No update ]

Checking file programs\_bad.dat [ No update ]

Checking file backdoorports.dat [ No update ]

Checking file suspscan.dat [ No update ]

Checking file i18n/cn [ No update ]

Checking file i18n/de [ No update ]

Checking file i18n/en [ No update ]

Checking file i18n/tr [ No update ]

Checking file i18n/tr.utf8 [ No update ]

Checking file i18n/zh [ No update ]

Checking file i18n/zh.utf8 [ No update ]

Checking file i18n/ja [ No update ]

Dear Drupal Infrastructure 3rd Line Support,  
There is a new message for you.

Ticket No: INC3384896

Opened: 15-02-2023 10:10:00

Functional Element: Drupal Infrastructure

Location: 513/R-060

Short description: [GNI] no\_contact

ace, , tel: , mobile: :

root <root@webeos610.cern.ch>

To: Web Services

Start done http\_eosweb. . .

vice/drupal8

job nocontact has been in no contact for more than 720 seconds.

This email is an automated notification, which is unable to receive replies.

9 May 2023

Carina Antunes | Building a highly modular user-oriented notification system

6

# History

## **Current system is the result of many iterations**

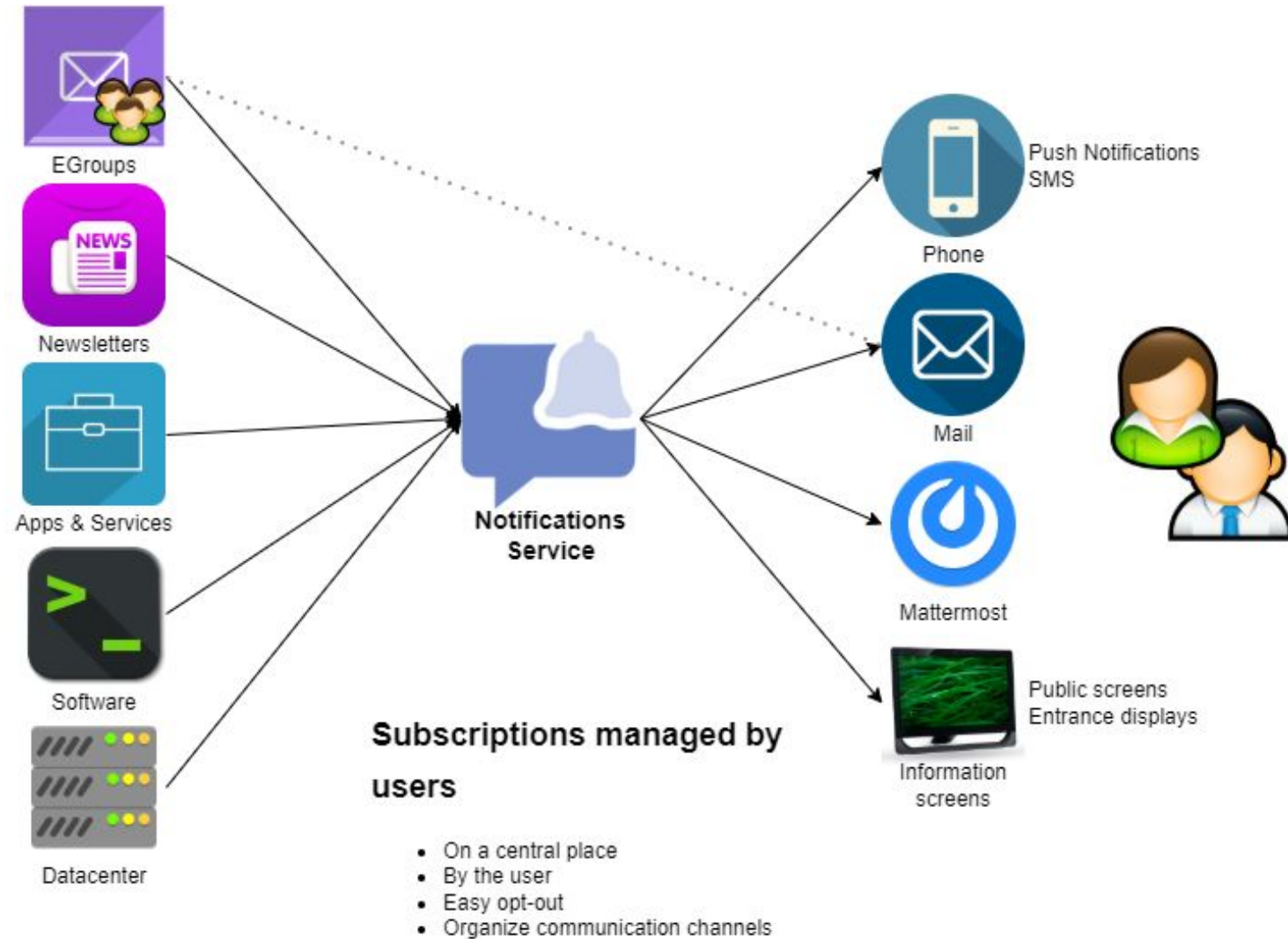
- Evaluating alternatives since 2016
- Last iteration started around 2019
- Q1 2021 Prototype opened internally in IT-CDA
- Q2 2021 Pilot service opened to IT
- Q3 2021 Pilot service opened to CERN
- 2022 Service entered beta status and available for CERN-wide usage - working with the community for more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



# Service Overview

Functionality and architecture

# Service overview

The screenshot displays the CERN Notifications web interface. At the top, a dark header bar contains the CERN logo and the text "Accelerating science" on the left, and "Signed in as: jlopesda (CERN)" with "Sign out" and "Directory" links on the right. Below the header, a navigation bar includes links for "Channels", "Preferences", "Mutes", "Devices", and "Help".

The main content area is titled "CERN Notifications" and features a search bar with the placeholder text "Search name or description...". On the left side, there is a sidebar with several sections:

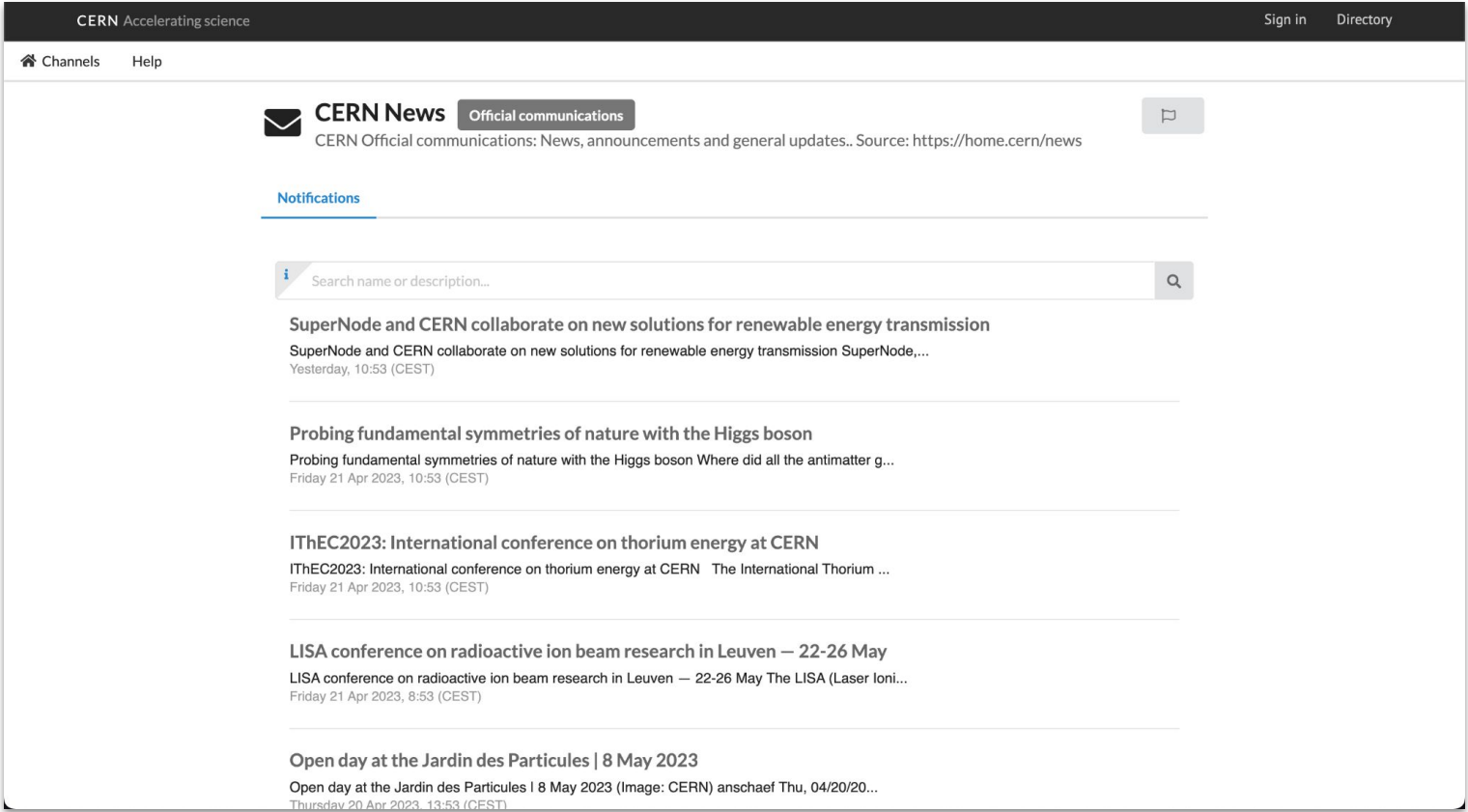
- Channel Selection:** Includes buttons for "All channels", "Channels I own or manage", "My subscriptions", and "Favorites" (which is highlighted with a yellow star).
- Filter:** Contains two dropdown menus labeled "By category" and "By tag".
- View:** Includes a toggle switch labeled "Expanded" which is currently turned on.
- Actions:** Includes a "Do Not Disturb" button with a bell icon and an "Add channel" button with a plus icon.

The main list of channels on the right includes:

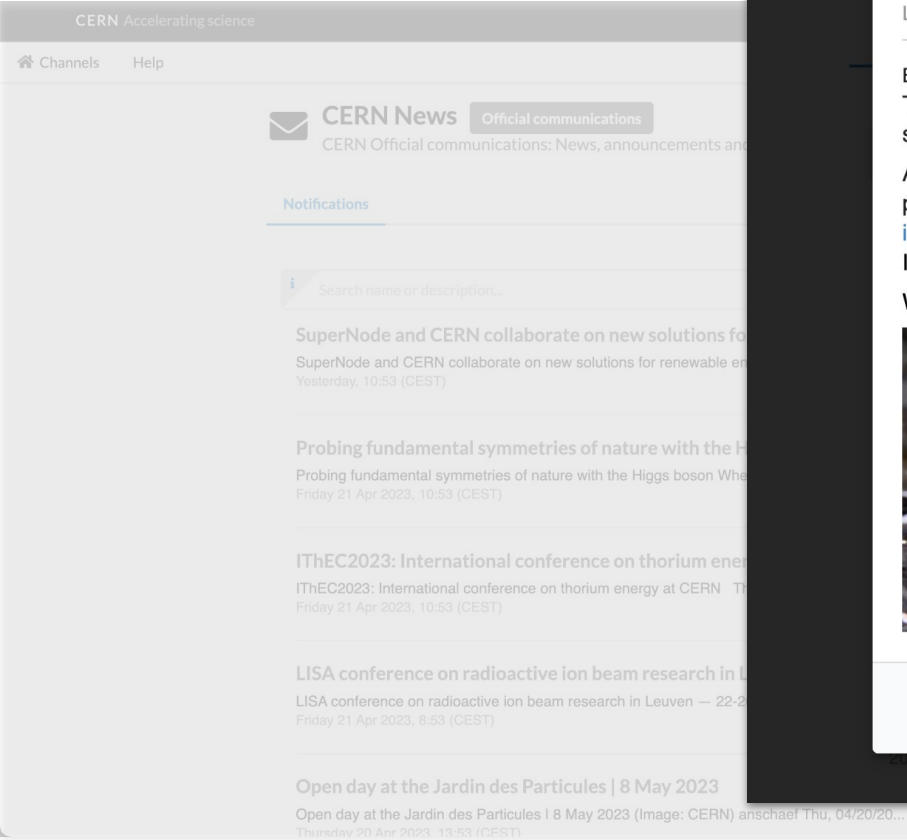
- CDA - Web Frameworks:** Official channel for notifications in the IT-CDA-WF context. It shows 44 members and includes buttons for "Unsubscribe", "Mute", "Manage", and "Send".
- IT-PW - Web & Authoring:** Official channel for notifications in the IT-PW-WA context. It shows 8 members and includes buttons for "Unsubscribe" and "Mute".
- macOS News:** News about macOS, macOS Security Announcements, tips and hints for macOS users. It shows 2 members and includes buttons for "Unsubscribe" and "Mute".
- Notifications Service News:** Latest news from the CERN notifications service team. It shows 11 members and includes buttons for "Unsubscribe", "Mute", "Manage", and "Send".

Each channel entry also features a yellow star icon and a dropdown arrow for additional actions.

# Service overview



# Service overview



### Beam Gas Curtain: a new instrument for LHC Run 3

21 Mar 2023, 14:53 (CET)


Link: <https://home.cern/news/news/accelerators/beam-gas-curtain-new-instrument-lhc-run-3>

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:



Beam Gas Curtain: a new instrument for LHC Run 3

Copiar link

Share

Close

# Service overview

CERN Accelerating science

Channels Help

CERN News Official communications

Notifications

Search

SuperN Yesterday

Probing Friday 2

IThEC2 Friday 2

LISA co Friday 2

Open Thursday

Beam Gas Curtain: a new instrument for LHC Run 3

21 Mar 2023, 14:53 (CET)

Link: <https://home.cern/news/news/accelerator/beam-gas-curtain-new-instrument-lhc-run-3>

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

ear during Run 3. It will

se. The BGC












between CERN's Beam

Share Close

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

Name	Priority	Start Time	End Time	Frequency	Targets
Default Weekly	Low, Normal, Important			WEEKLY	  
Default Daily	Low			DAILY	  
Default Live	Normal, Important			LIVE	    

Add preference

?

Channel preferences

# Service overview

CERN Accelerating science

Channels

Help

CERN News

CERN Official communication

Preferences

Register your preferences

Customize

Notifications

Search name or description

Global Preferences

SuperNode and CERN collaboration

SuperNode and CERN collaboration

Yesterday, 10:53 (CET)

Name

Default

Probing fundamental symmetries

Probing fundamental symmetries

Friday 21 Apr 2023, 10:53 (CET)

Default

IThEC2023: International Theory and Experiment Conference

IThEC2023: International Theory and Experiment Conference

Friday 21 Apr 2023, 10:53 (CET)

Default

LISA conference on relativistic astrophysics

LISA conference on relativistic astrophysics

Friday 21 Apr 2023, 8:51 (CET)

Default

Open day at the Jardin des Sciences

Open day at the Jardin des Sciences

Thursday 20 Apr 2023, 13:53 (CET)

Default

Beam Gas Curtain: a new instrument for LHC Run 3

21 Mar 2023, 14:53 (CET)

Link: <https://home.cern/news/news/accelerators/beam-gas-curtain-new-instrument-lhc-run-3>

Mutes

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

Global Mutes / Do Not Disturb

Mute	Start Date	End Date	
Range	14/05/2023, 00:00:00	19/05/2023, 00:00:00	<div><div></div><div></div></div>

Add Mute

?

Channel Mutes

Channel	Mute	Start Date	End Date	
QA Channel	Permanent			<div><div></div><div></div></div>

The image is a composite showing a mobile application interface and its desktop browser version. The mobile app (left) features a 'Device type' section with a list of devices and a 'Try me' button. The desktop browser (right) shows the same app running on a computer, with a 'Share' button visible. The background is a blurred image of a person's face.



# Service overview

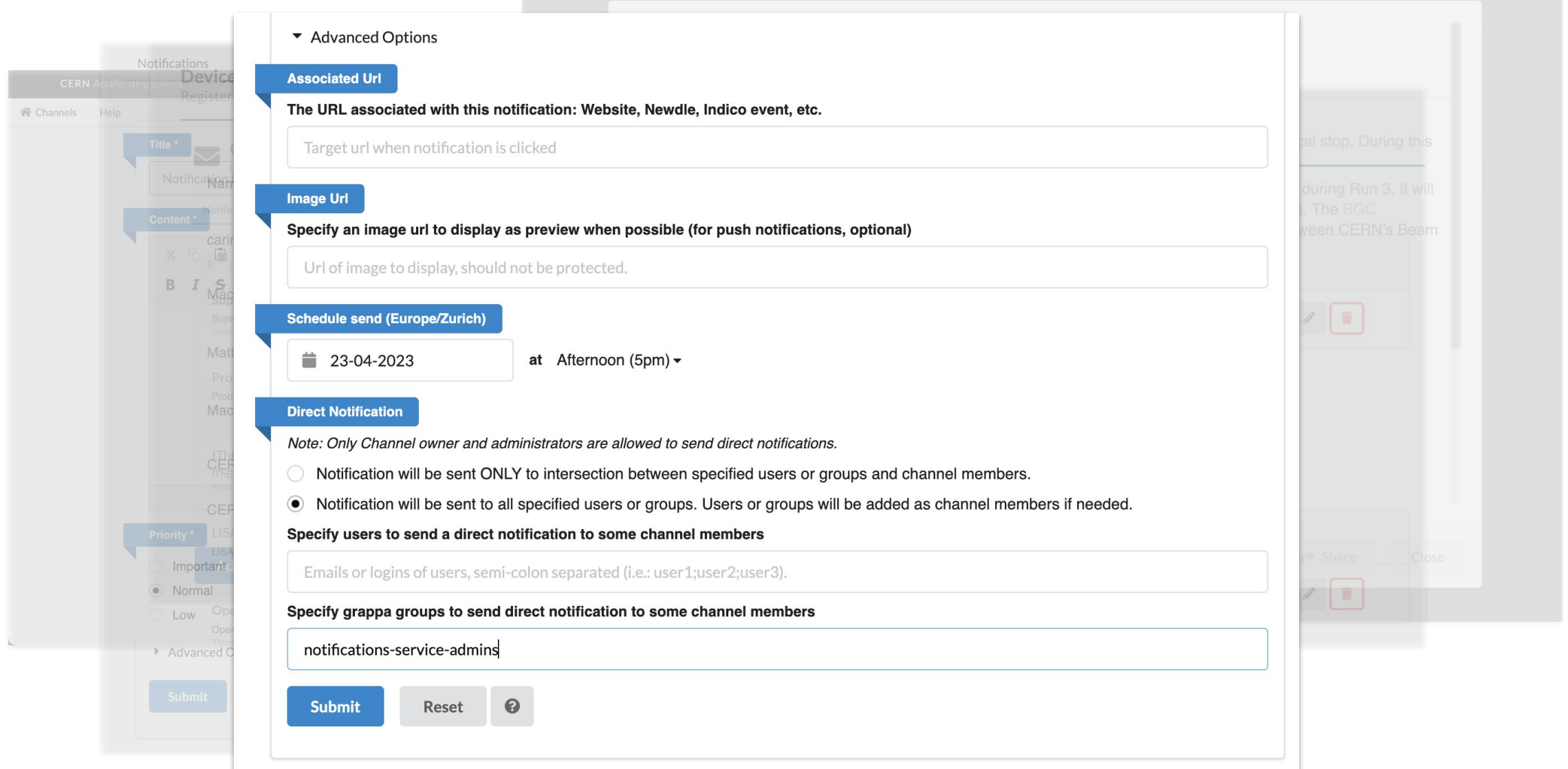
The image displays a notification service interface in the foreground, overlaid on a background image of a news article. The notification interface has three tabs: "Notifications", "Send Notification" (which is active), and "Preferences".

The "Send Notification" tab contains the following fields and controls:

- Title \***: A text input field with the placeholder text "Notification title".
- Content \***: A rich text editor with a toolbar containing icons for undo, redo, bold, italic, strikethrough, text color, background color, link, unlink, list, indent, outdent, quote, and source. Below the toolbar is a large text area for the notification content.
- Priority \***: A section with three radio buttons: "Important", "Normal" (selected), and "Low". Below these is a link to "Advanced Options".
- Buttons**: "Submit", "Reset", and a help icon (?) at the bottom.

The background image shows a news article titled "Beam Gas Curtain: a new instrument for LHC Run 3". The article text is partially visible, mentioning "LHC 2023 following its year-end technical stop. During this stop, including the Beam Gas Curtain (BGC)", "proton beams, making data taking more precise. The BGC", and "channel or notification level is possible".

# Service overview



The image shows a web application interface for configuring notifications. In the background, a notification card is visible with fields for Title, Content, Priority, and a Submit button. Overlaid on this is a modal window titled 'Advanced Options' which contains several configuration sections: 'Associated Url' with a text input and a description; 'Image Url' with a text input and a description; 'Schedule send (Europe/Zurich)' with a date and time selector; 'Direct Notification' with a note, radio button options, and two text inputs for specifying users and grappa groups. At the bottom of the modal are 'Submit', 'Reset', and a help icon buttons.

▼ 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-admins

Submit Reset ?

# Service overview

## Notification Service API 1.0.0 OAS3

[/swagger/swagger.json](#)

API documentation for the CERN Notification Service

Servers

https://notifications-dev.web.cern.ch/api

Authorize

Filter by tag

### Notifications

GET

/notifications/{id}

Returns the Notification with the provided notification id.

▼

🔒

GET

/notifications/{id}/audit

Returns the audit of the Notification with the provided notification id.

▼

🔒

POST

/notifications

Send a Notification.

▼

🔒

PUT

/notifications/{id}/retry

Retries to send Notification with provided notification id. For internal use.

▼

POST

/notifications/unauthenticated

Sends Notification without the need for Auth. Internal use only.

▼

### Devices

POST

/devices

Creates a new user device as specified in the body param. For internal use.

▼

# Functionality

Channel visibility	Notification priority	Notification targets
<div><b>Public</b> Always listed in the portal, for all users</div> <div><b>Internal</b> Visible only for authenticated users</div> <div><b>Restricted</b> Visible only for owners, administrators and members of channel.</div>	<div><div>Bypass user preferences</div><div>Critical</div><div>Important</div><div>Normal</div><div>Low</div></div>	<div><div>General</div><div>Channel members</div></div> <div><div>Direct</div><div>Members</div><div>Targets</div></div>

# Functionality


## Channel Members

### Users


Added by channel owners or self subscription

### Groups

Added by channel members  
Managed via Identity Services

 **CHEP 2023**  
Manage channel


[Edit Channel](#) [Advanced Settings](#) [Members](#) [Send Notification](#)

User name	Email	
crdeoliv	carina.antunes@cern.ch	

10

[«](#) [<](#) **1** [>](#) [»](#)

Add user

Group name	
chep-members	

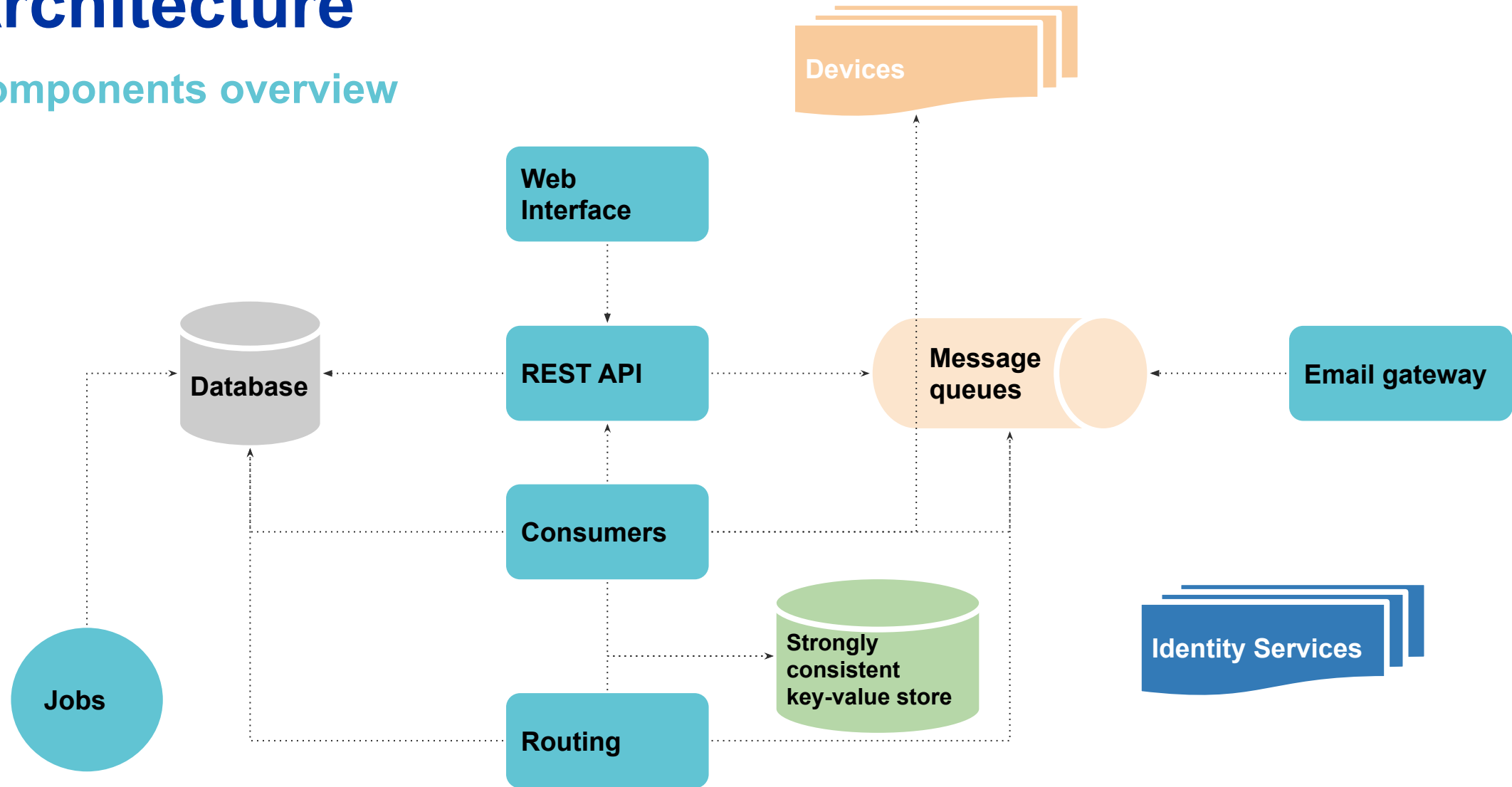
10

[«](#) [<](#) **1** [>](#) [»](#)

Add group

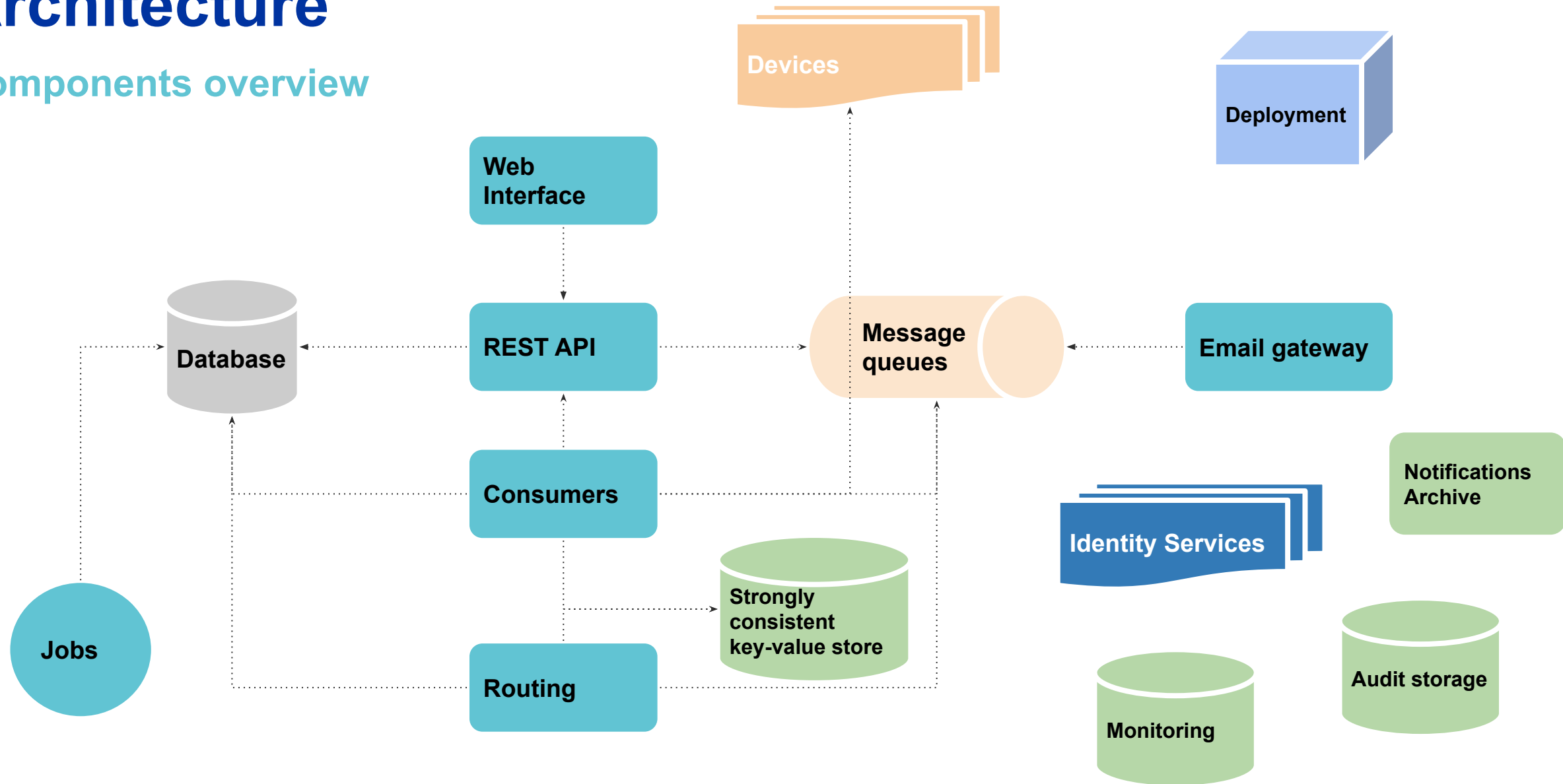
# Architecture

## Components overview



# Architecture

## Components overview



# Architecture

## Stack overview - open source by design

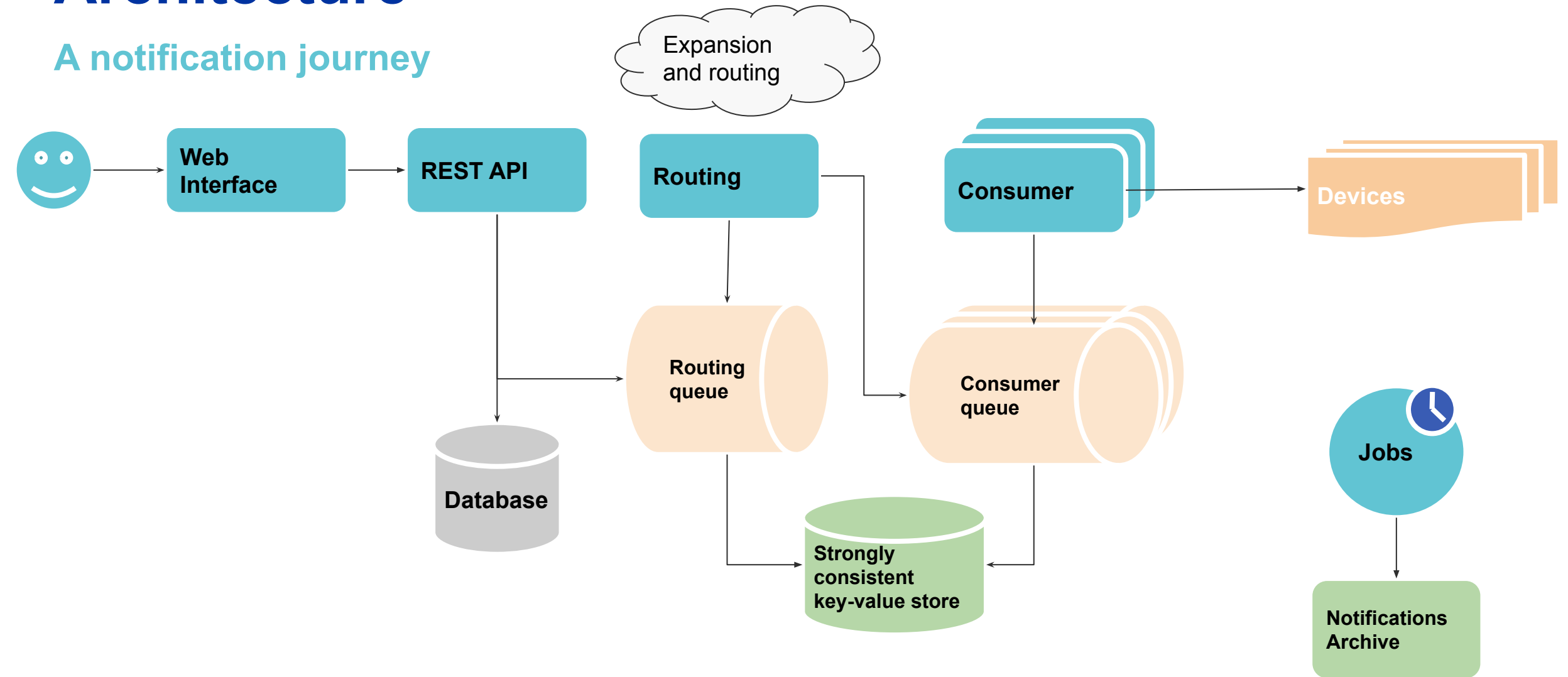
- Python
- Typescript
- ReactJS
- Helm
- OKD
- OpenSearch
- ActiveMQ
- Postgres
- ETCD
- Nginx
- ...





# Architecture

## A notification journey



# 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**

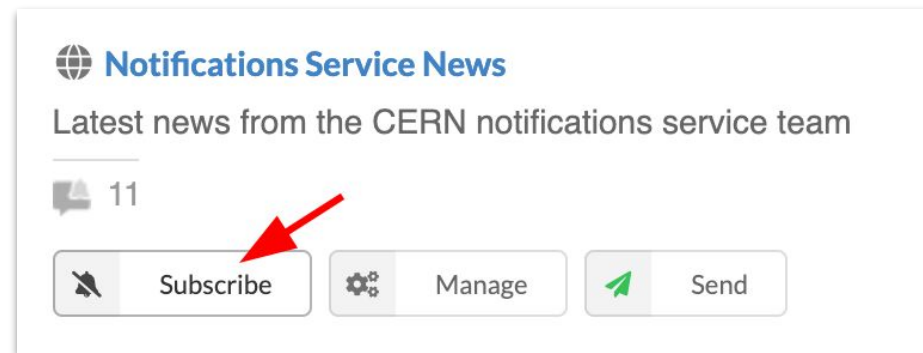
# Next steps

## 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://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](https://cern.ch/notifications): cern.ch/notifications
- Read the [documentation](https://notifications.docs.cern.ch)
  - <https://notifications.docs.cern.ch>
- Reach us at [notify@cern.ch](mailto:notify@cern.ch)





[home.cern](https://home.cern)