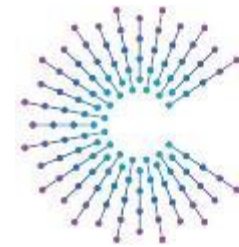


Push Notifications Overview and Potential Solutions for Automotive AOSP

Faurecia Aptoide with BMW review and contributions

26th July 2023

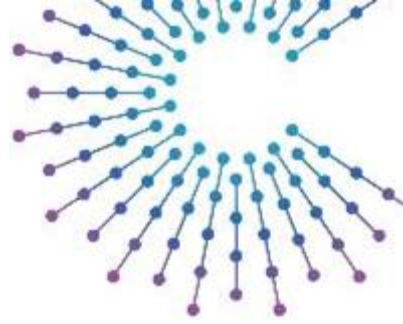


COVESA

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Agenda

1. What are (server-)push notifications and why it matters for non-GAS systems
2. Potential Alternative Solutions
3. Way Forward

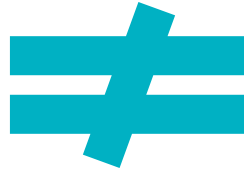




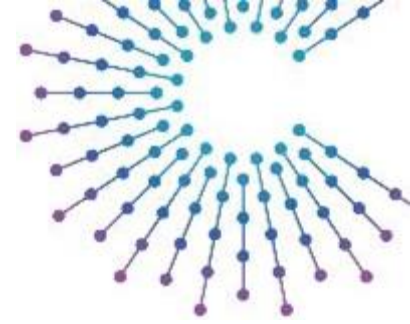
What are (server-)push notifications and why it matters for non-GAS systems

What are push notifications

Notifications



Push Notifications

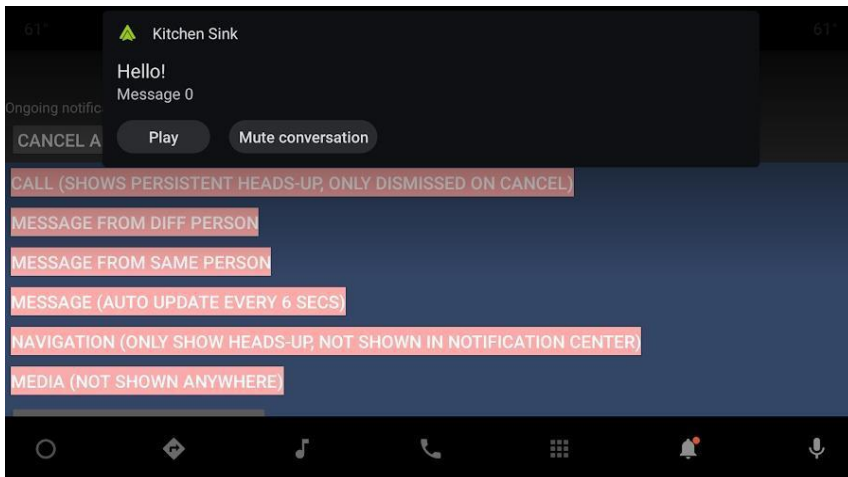


A notification is a message that Android displays outside an app to provide updates, reminders, and other timely information to users.

"also called server-push notification, is the delivery of information from a software application to a computing device without a specific request from the client."

Examples:

- Receiving VoIP calls (e.g., Zoom, Webex)
- Receiving messages (e.g., WhatsApp)

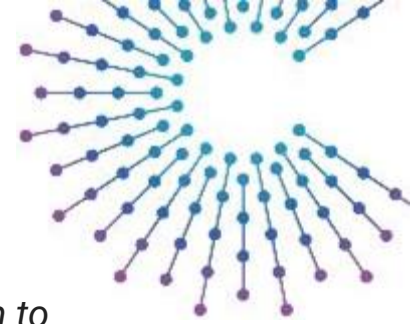


<https://source.android.com/docs/automotive/hmi/notifications>

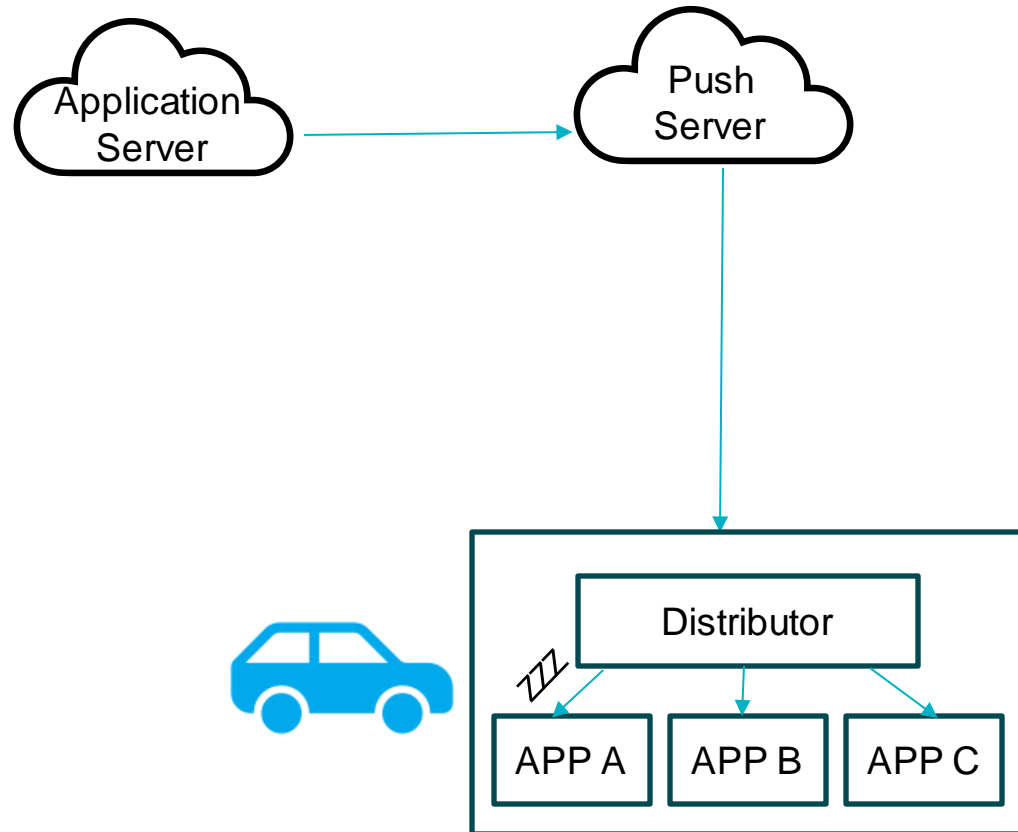
<https://www.techtarget.com/searchmobilecomputing/definition/push-notification>



Push notifications



Server-push notification example

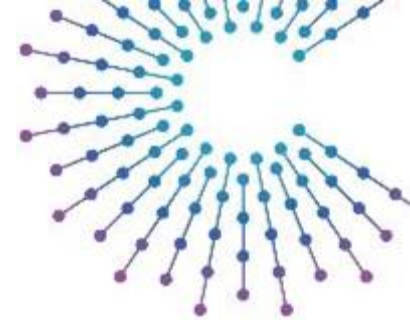


While it is technically possible for each application to connect to its own server and receive notifications directly, there are several reasons why this approach may not be practical or effective.

- Distributor app has special permissions to be always running and distributing the messages to registered apps
- Receiver Apps (A, B, C) don't need to be running in the background to receive the messages (system resource optimization)
- Usually, there is a single distributor app in the system
- A push notification service consists of both a backend API and a client service

<https://f-droid.org/en/2022/12/18/unifiedpush.html>

Push notifications in Android



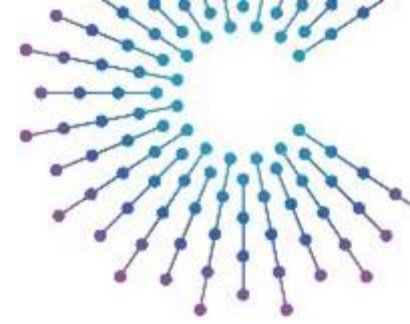
On mobile, Firebase Cloud Messaging (FCM) is the most popular push notification service for Android devices with Google Play Services

Google Play services for cars does not seem to include, as of today, FCM (at least from the official documentation)
Non-GAS OEMs are not expected to get access to FCM

<https://firebase.google.com/docs/cloud-messaging>

<https://developer.android.com/training/cars/google-services>

FCM Capabilities



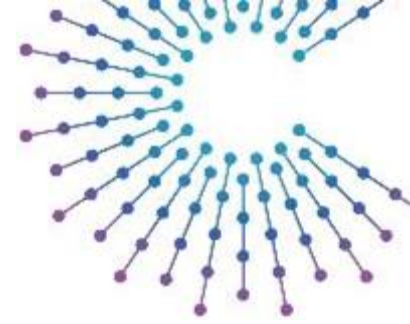
Key capabilities	Details
Send notification messages or data messages	<ul style="list-style-type: none">• Data structured with all the necessary components for a standard Android notification.• Data messages to enable specific functionalities within the application without necessarily triggering a notification.
Versatile message targeting	<ul style="list-style-type: none">• Single devices• Groups• Devices subscribed to a given "topic"
Send messages from client apps	<ul style="list-style-type: none">• Send data directly to the server

<https://firebase.google.com/docs/cloud-messaging>



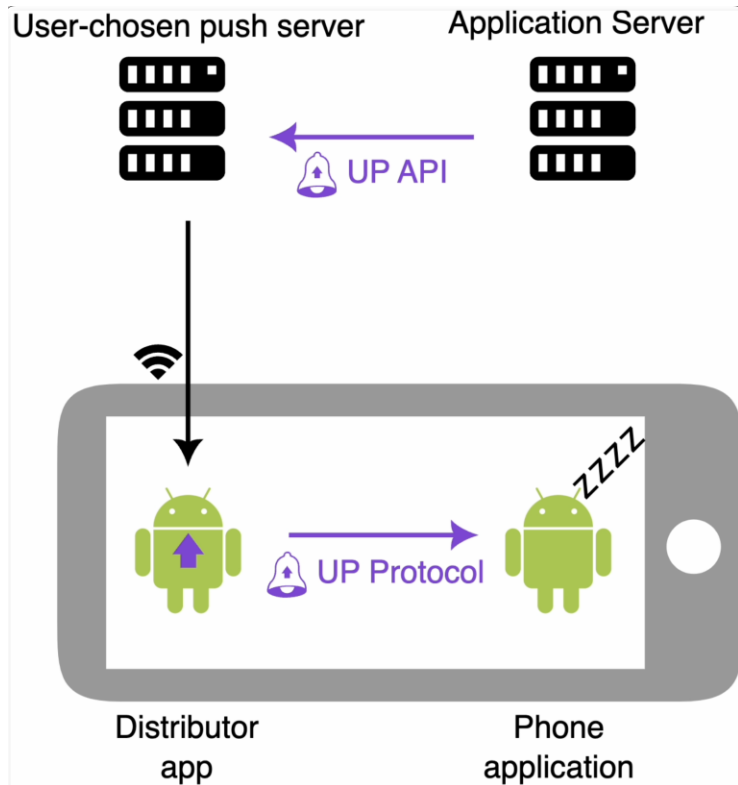
Potential Alternative Solutions for Server-Push Notifications on Automotive AOSP (non-GAS Systems)

Potential Alternatives (not exhaustive)



- Open
 - UnifiedPush (<https://unifiedpush.org/>, <https://f-droid.org/en/2022/12/18/unifiedpush.html>)
 - microG (<https://microg.org/>, <https://github.com/microg/GmsCore>)
- Paid
 - Pushy (<https://pushy.me/>)
- Automotive specific
 - Remote Access HAL (different technical approach than server-push) (<https://cs.android.com/android/platform/superproject+/master:hardware/interfaces/automotive/remoteaccess/>)

UnifiedPush Protocol

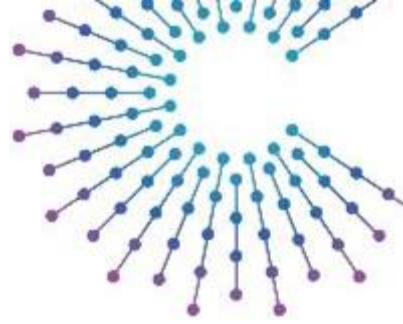


<https://unifiedpush.org/>

<https://f-droid.org/en/2022/12/18/unifiedpush.html>

- UnifiedPush is a specification, split in two:
 - Client side - App-Distributor API: API to allow any application (ex. a messaging app) to communicate with any distributor application (ntfy, NextPush, etc.)
 - Server side – App server-Push server API: on the server side, the API describes how the application server sends messages to the push server
 - → basic compatibility with RFC 8030 (web push)
- **All distributors are compatible with all apps**
- Client libraries and the reference proxies assist in implementing both sides of the specification, respectively.
- Multiple “ready to use” implementations already exist (see: <https://unifiedpush.org/users/distributors/>)

microG GmsCore



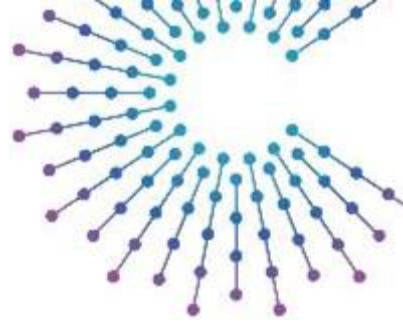
- Is a free software reimplementation of Google's Play Services
- It allows applications calling proprietary Google APIs to run on AOSP, acting as a free replacement for the non-free, proprietary Google Play Services
- The Android system needs to support signature spoofing so GmsCore can pretend the existence of the official Play Services to applications calling Google APIs

<https://microg.org/>

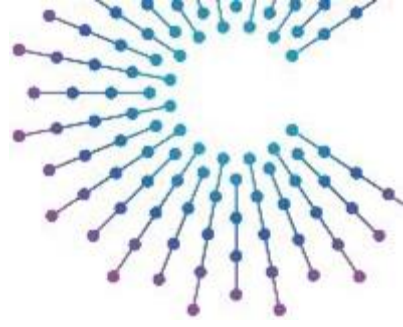
Pushy

- Proven cross-platform notification service
- Proprietary, closed-source, but allows self-hosting
- Not designed to be integrated by an OEM
 - Needs cooperation between the OEMs and the vendor to integrate into the respective OEM system
- Each 3rd Party must have a Pushy account and pay for each device their app is installed on

<https://pushy.me/>

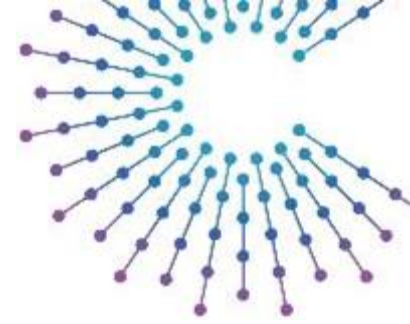


Android Automotive Remote Access HAL



- Coming in Android 14, the Remote Access HAL
- <https://cs.android.com/android/platform/superproject/+master:hardware/interfaces/automotive/remoteaccess/>
- Can potentially be used to “wake up” apps that are not running
- Not clear if it is designed to be used by 3rd party apps or mostly by OEM apps
- No public details yet or reference implementation

Preliminary comparison of initially identified alternatives



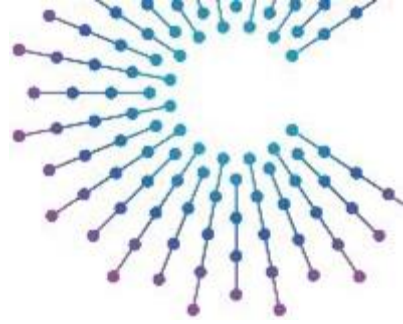
	UnifiedPush	Pushy	Remote VHAL
Openness	Open source Open specification Being proposed to Lineage OS	Proprietary	AOSP
Scalability / Stability	Limited use so far / Depends on chosen implementation	Proven scalability	Not released yet
Fit for purpose	Flexible to allow each OEM to have it's own distributor and push server	Proven usage on mobile / Not designed to be integrated by an OEM	Not clear if it was designed to be used for 3PA in a scalable way



Next Steps

Next steps

- Collect feedback from COVESA App Framework Standardization participants
- Collect feedback from App Publishers (particularly messaging apps)
- Explore further / benchmark one or two of the presented (or other proposed) options
- Propose a way forward for COVESA server-push notifications





COVESA

Accelerating the future of connected vehicles

Push Notifications Overview and Potential Solutions for Automotive AOSP

Faurecia Aptoide

24th July 2023