

Add Real-Time Features to your Mobile App

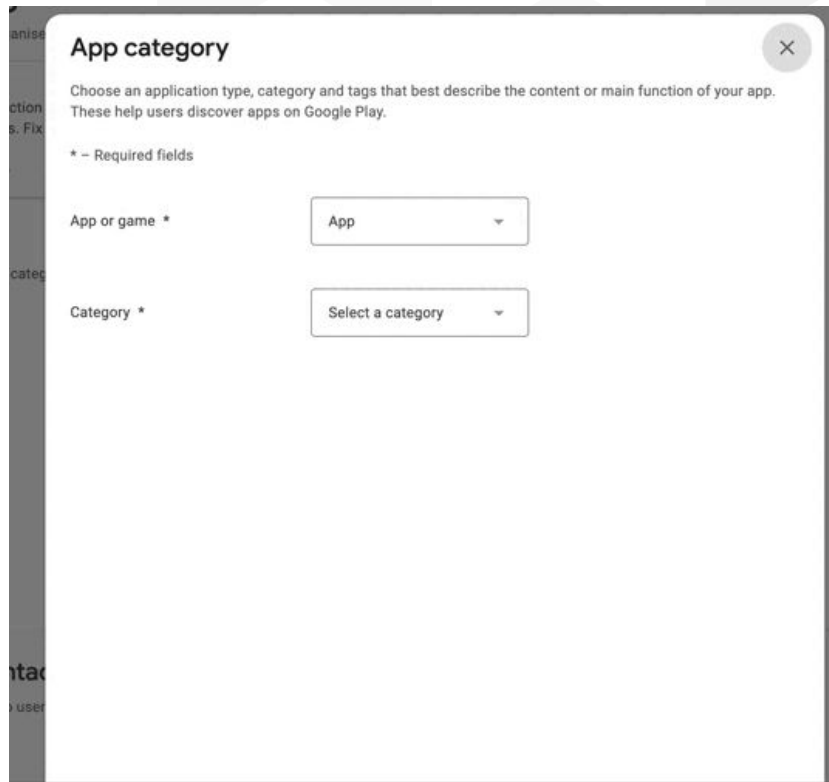
AGENDA

- 1 The Problem Space: What is a Real-Time feature; what real-time use cases should you consider based on app category
- 2 Architecture: Designing an architecture that will scale with your application, horizontally and vertically.
- 3 Real-time challenges on mobile, with focus on foreground vs. background behaviour as well as cross-platform requirements.
- 4 Implementation options: An unbiased analysis and comparison of available libraries, with emphasis towards IAAS
- 5 Resources: Comprehensive list of resources and further reading related to real-time development

What is a Real-Time Feature??













Depends on the sort of application...

New message received, i<38008135 has been reported for an inappropriate username, somebody has reacted to your message, a Twitch stream is starting soon, your food is with the kitchen, your delivery driver will be with you shortly, you need to pick Erica up from the airport, Frank has just walked 10000 steps - do you want to send him a 🍕? It will rain at 1pm, Harpal has updated your document, there is a McDonalds nearby! Adkc886 just bested your top Frogger score, Jim wants you to join their lobby, the printer has run out of paper, your friend has left the chat, etc. etc. etc.

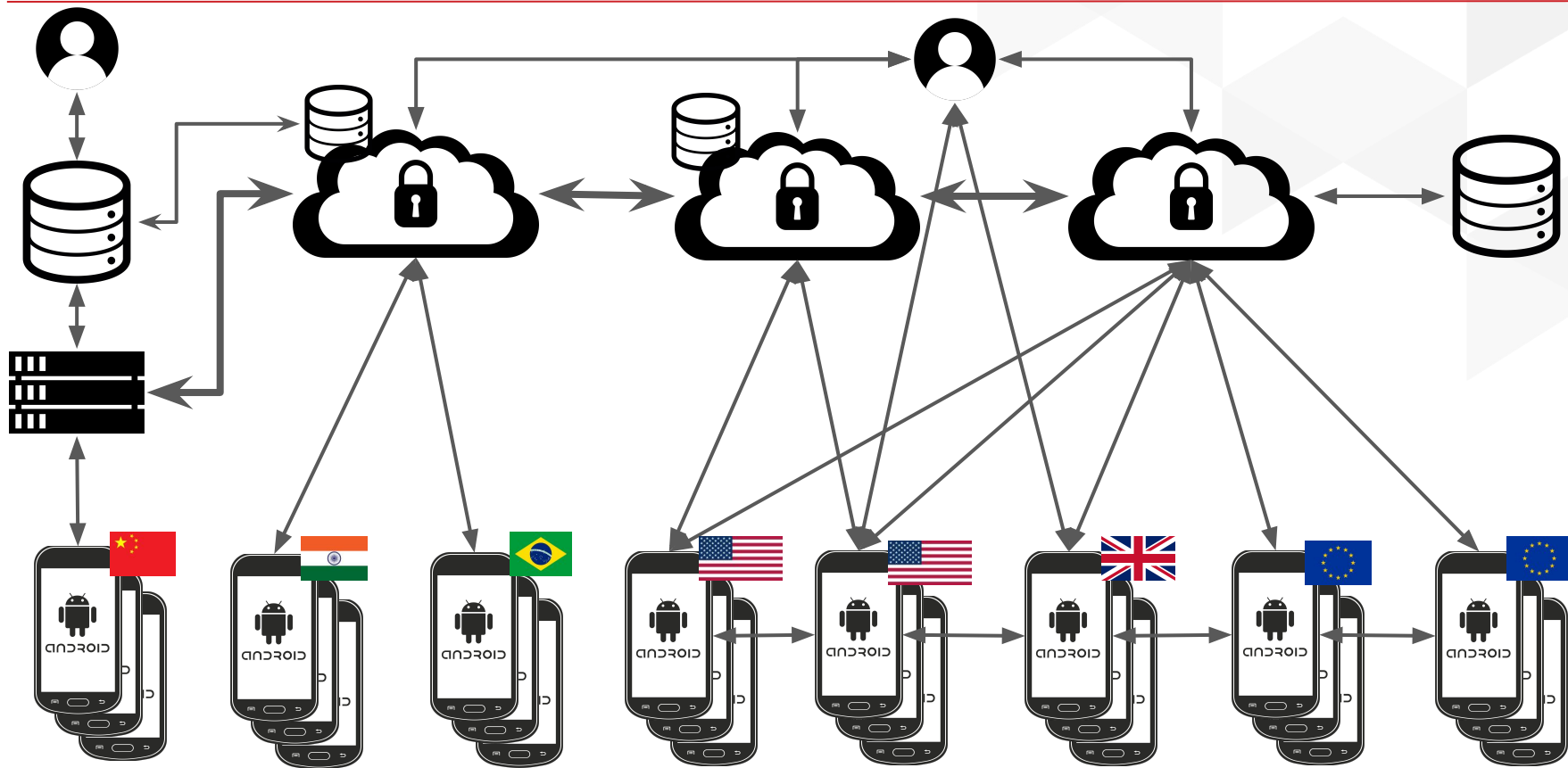


The screenshot shows the 'App category' selection screen from the Google Play Store. At the top, it says 'App category' with a close button (X) in the top right corner. Below the title, there is a subtitle: 'Choose an application type, category and tags that best describe the content or main function of your app. These help users discover apps on Google Play.' Underneath, it says '* - Required fields'. There are two required fields: 'App or game *' with a dropdown menu showing 'App', and 'Category *' with a dropdown menu showing 'Select a category'.

What is a Real-Time Feature??

Category	Real-Time Features		Category	Real-Time Features
Dating	New Match notifications Chat & presence Who is nearby? 		Educational	Collaborative document editing Live Q&A User presence / absence 
Maps & Navigation	Share live location Track friends Contextual data 		Gaming	Sharing in-game events Lobby creation, Leaderboards Foster a safe and engaging community 
Sports	Score updates Live streaming Reactions to stream 		Health & Fitness	Sharing goals Sharing achievements Encouraging others 
Trivia	Update Questions Reveal answers Detect cheating 		Food & Drink	Sharing recipes Tracking achievements New content alerts 
Weather	Storm update Weather changing Alerts from (IoT) stations 		Music & Audio	Share what you are listening to Suggestions based on current behaviour 
Communication	Live chat User Presence 'Message Read' checkmark 		Shopping	Your order is ready Customer is arriving to collect order (BOPIS) Dynamic demand tracking 

Architecting Your Real-Time Solution



Challenges of Real-Time on Mobile



Foreground / Background

Applications in the **background** can only be woken up using **Push Notifications**



Time-Sensitive Information

Real-time information **may or may not be time-sensitive**. Consider a driver's location, which changes frequently, with their delivery ETA



Cross-Platform Support

Most applications will run on both **iOS** and **Android**, as well as have a **web client**



Network Bandwidth

Mobile developers are always cognizant of their **bandwidth usage, especially so where data is expensive**; real-time data will add to this total.



Database Sync

Should you **cache historic data**? Especially for cross-region storage. **Real-time data is different** is different from other 'organization' data you are syncing.



Plus...

What **uptime** SLA do you need? How will your solution **scale geographically and #devices**? system **maintainability**? **24/7 support**? Do **costs** align with your revenue model?

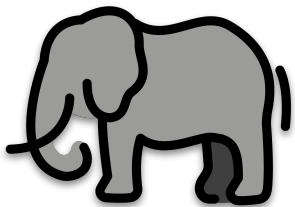
A Complete Guide to Implementation

This is just Push messaging, right? I'll just use Firebase Cloud Messaging / APNS

- For occasional messages, FCM / APNS is great. Especially to get people to revisit your app

But:

- Remember: Users can prevent your app receiving FCM / APNS in the app settings
- Android will throttle FCM for power-saving reasons
- Delivery is not guaranteed
- Need to have server infrastructure in place
- Forced to use Firebase (though you are probably using it anyway)
- How would you handle user presence through Push Messaging, for example?



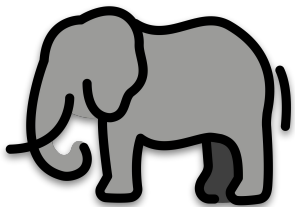
A Complete Guide to Implementation

Firestore is more than just cloud messaging (obviously)

- You could use the Realtime Database to sync real time changes between devices
- Practical solution for a simple chat app, especially cross-platform

But:

- How would you implement message threads, private conversations, message reactions, moderation, etc?
- What about the non-chat use cases mentioned previously
- Take care to avoid fitting a square peg in a round hole



A Complete Guide to Implementation

Build your own Real-Time Infrastructure

- Start off using Node.js and WebSockets (for example)

But:

- Everything I mentioned a few slides back 🤔



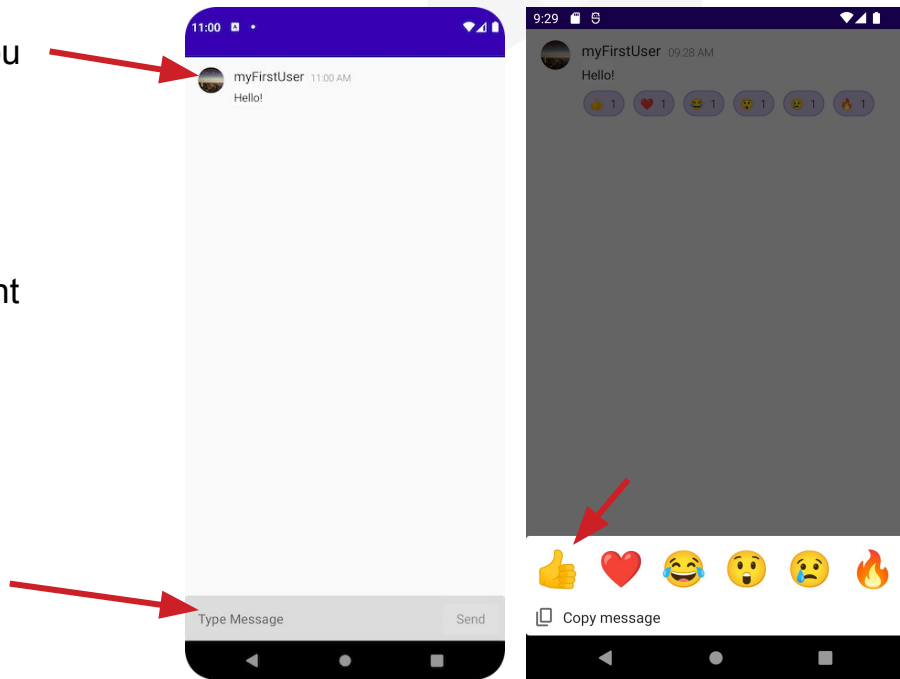
A Complete Guide to Implementation

Use Pre-built components that offer the exact functionality you need

- Based on use-case
- Great if you can find such a component
- E.g. a chat component that handles everything for you

But:

- Very inflexible approach
- What if you need to add features
- What if you need to add customization?
- You are locked into the architecture of that component



A Complete Guide to Implementation

Infrastructure as a Service

- Many services exist that offer real-time features over Pub/Sub
- Including services built on top of MQTT, but ideally, **you shouldn't have to worry about the architecture**
 - Though this can be challenging on Android, with apps not running in the background
- **Ideally, the pub/sub service will also incorporate Push support (FCM/APNS)**, to handle background apps
- Takes care of the infrastructure considerations for you, so you can focus on your app's specific use cases
- Most flexible approach*

Personally, I would recommend **PubNub** but **don't take my word for it...** Stack Overflow user Shubhank Gupta also agrees in [this answer](#), which is the top Google result if you search for “*Android real-time communication*”

About 172,000,000 results (0.28 seconds)



Stack Overflow

<https://stackoverflow.com> › questions › what-is-the-best... ⋮

1 what is the best way for real-time communication between ...

26 Nov 2017 — It's not all about WhatsApp, there are tons of instant messengers. We've rounded up the best Android has to offer, so you can choose the one ...

How to use WebRTC on **Android for Real Time Communication?** 30 Jul 2016

How to make an app **communicate** with another one in ... 29 Sept 2019

Android real time messaging - client server - Stack Overflow 24 Apr 2012

Should I use GCM for **real time communication** between ... 10 May 2015

[More results from stackoverflow.com](#)

* excluding building your own, of course

PubNub

Security



Encryption

Point-to-point and end-to-end
AES 256
You hold encryption keys



Access Control

Token-based authorization
Use your own authentication
Fine-grain resource grant/revoke
Vault for 3rd party access secrets



Attack Prevention

No inbound open ports removes
attack vector
Can route to different data centers
to thwart regional attacks



Compliance

GDPR
SOC 2 Type 2
HIPAA

APIs



Edge Messaging

Pub/Sub (< 100ms)
No concurrency limits
Message persistence
Message filtering
Unlimited channels



Functions

Create and execute business
logic at edge (<10ms trigger,
sync/async, auto-scale).
Route, augment, filter,
transform, aggregate data,
call 3rd party APIs, etc.



Presence & State

On/offline detection
Measure channel
occupancy
Monitor custom state
Webhook alerts



Events & Actions

Integration engine:
Webhooks, S3, Kinesis,
SQS, Kafka, etc.
Powerful filters: send only
relevant events



App Context

Store user/room
relationships
Auto-notify on changes



Mobile Push

Automatic fallback to
APNS/FCM push
notifications for
important messages
when user offline.

Time to Market



50+ SDKs

All IoT, Mobile, Server, Web
In-built AES encryption
Lightweight / low profile



Solution Kits

Pre-built chat components
Quickstarts for many use cases:

- Live mapping
- Trivia, polls, whiteboard
- IoT device control



Business Insights

Dashboards for tracking aggregate user
engagement
Operational monitoring & actioning
Pricing and billing projections
"Analyze with AI"



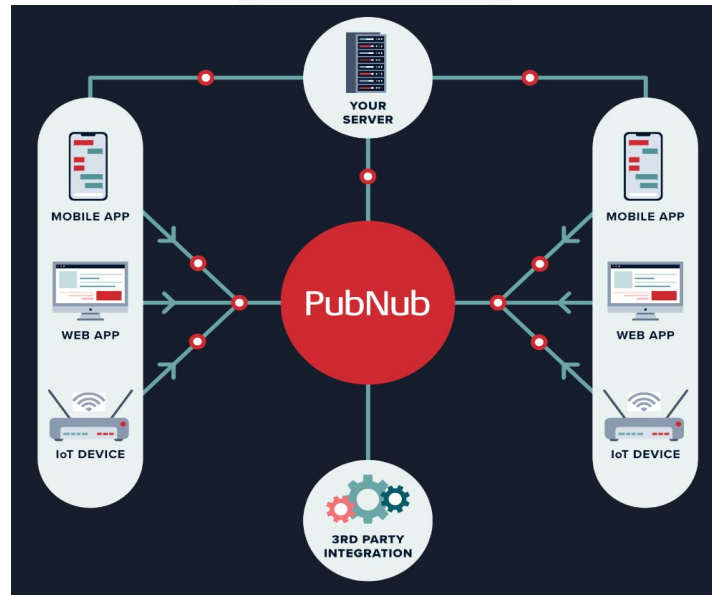
Admin Dashboard

Powerful config and tuning options
Team access
SSO authentication

PubNub

Interactions and decisions for any online app

PubNub connects over a billion devices, humans, and AIs letting businesses power every form of interaction, while making real-time decisions for their app across IoT, chat, geolocation, and more.



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QUESTIONS?

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