Live Qchatex

Web chat application that uses **sockets** to entirely handle client-server interactions.

Phoenix LiveView: Handles UI interactions with client's browser, such as HTML content updates, click events, forms submission, etc. It's a 2-way communication channel (websockets) so no need for polling.

Phoenix PubSub: Notifies when certain events occurred by sending messages to processes. Each process decides what "kind" of messages will "listen" by subscribing to certain topics.

Phoenix Presence: Notifies when processes (sockets) joins/leaves a certain topic. As soon as a subscribed process (socket) ends or dies, a message is broadcasted to the other subscribed processes.

Erlang Mnesia + Memento: Temporarily stores data (such as users sessions, chat rooms and messages) in a way that it doesn't get lost if the server is restarted. Uses Erlang DETS behind scenes.

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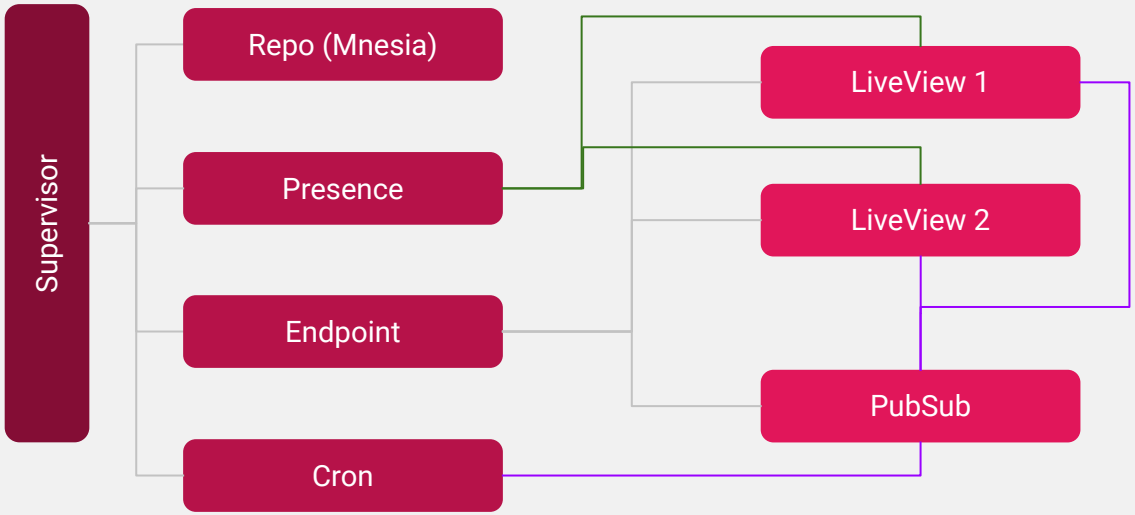
Supervision Tree

How the app is organised into distinct processes.

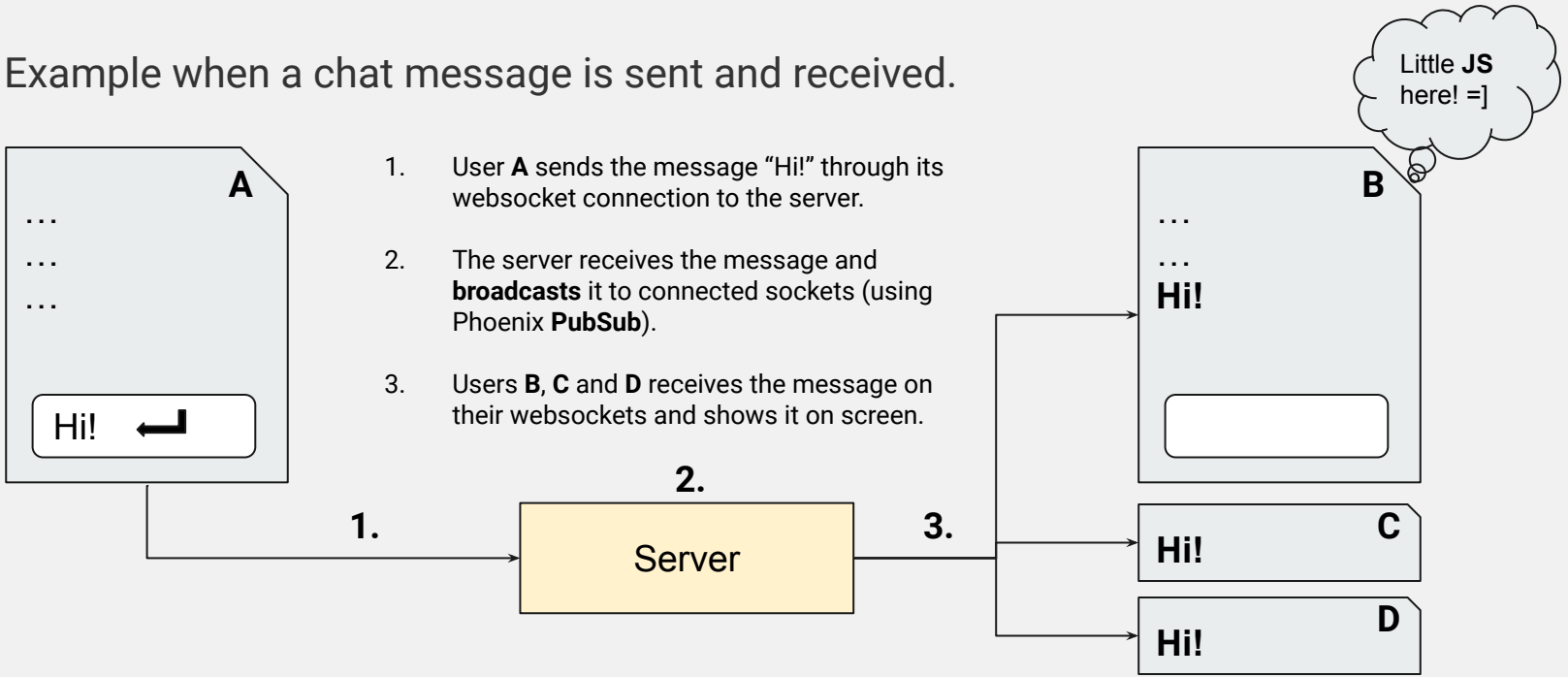


Subscriptions and links:

- Track messages
- Broadcast messages
- Process link

Phoenix LiveView

Example when a chat message is sent and received.



1. User **A** sends the message “Hi!” through its websocket connection to the server.
2. The server receives the message and **broadcasts** it to connected sockets (using Phoenix **PubSub**).
3. Users **B**, **C** and **D** receives the message on their websockets and shows it on screen.

Phoenix PubSub

Managing the communications between all the LiveView processes.

It is the **core engine** that allows us to **interact with LiveViews** by providing a way to **push real-time changes** to clients browsers about events happened in **another** process (that can be a other LiveView or **any** process).

- Each client/websocket/live-view/process is **subscribed** to certain internal **topics** on the **server** and will **react** when events/messages arrives to the **process's mailbox**.

- Then the **live-view** process/socket could **send to the client** an update to be displayed on its browser screen, such as online chats/users counters, public chats list, chat members and messages… basically everything!

That makes Phoenix **LiveView + PubSub** a perfect fit for a real-time chat app!
But what's about a client leaving a chat or even closing the browser....?
Phoenix Presence to the rescue!

Phoenix LiveView + PubSub

Example when a chat message is sent and received.

User **A** (sender)

```
PubSub.subscribe(LiveQchatex.PubSub, "chats/#{chat_id}")
```

```
def handle_event("newmsg", %{"msg" => msg}, socket) do
   PubSub.broadcast_from(LiveQchatex.PubSub, self(),
       "chats/#{chat_id}", {:chat_msg, msg})
   {:noreply, socket |> update_messages(msg)}
 end
```

User **B** (receiver)

```
PubSub.subscribe(LiveQchatex.PubSub, "chats/#{chat_id}")
```

```
def handle_info({:chat_msg, msg}, socket) do
   {:noreply, socket |> update_messages(msg)}
end

defp update_messages(%{:assigns => assigns} = socket, msg) do
   socket |> assign(:msgs, assigns.msgs ++ [msg])
end
```

By updating **socket.assigns** we “tell” LiveView to **automatically** re-render **just** the portion of the changed content (its **diff**).

Phoenix Presence

Detecting when processes joins or leaves certain topics.

It provides a way to **notify subscribed processes** that **another process** was connected or disconnected to a given topic. It can also notify **updates** when a process changes its “presence information”.

- Same as **PubSub**, each client/websocket/live-view/process is **subscribed** to certain internal **topics** on the **server** and will **react** when events/messages arrives to the **process’s mailbox**.
- Then, same as **PubSub**, the **live-view** process/socket could **send to the client** an update to be displayed on its browser screen, such as member join/quit a chat room, member typing status, nickname changes, etc.

When an user **leaves** a chat room or **closes** its browser, the underlying socket/process is **destroyed** and Presence will **notify** the subscribers that this **PID** is no longer amongst the living!

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Phoenix Presence

Example when an user leaves the chat room.

User **A** (sender)

```
PubSub.subscribe(LiveQchatex.PubSub, "chats/#{chat_id}")
Presence.track(self(), "chats/#{chat_id}", user.id, user)
```

User **B** (receiver)

```
PubSub.subscribe(LiveQchatex.PubSub, "chats/#{chat_id}")
Presence.track(self(), "chats/#{chat_id}", user.id, user)
```

The user **closes** its browser, so this **PID** dies!

```
def handle_info(%{event: "presence_diff", topic: topic, payload: _p}, socket) do
    {:noreply, socket |> assign(members: Presence.list(topic))}
end
```

By updating **socket.assigns** we “tell” LiveView to **automatically** re-render **just** the portion of the changed content (its **diff**).

Erlang Mnesia + Memento

An out-of-the-box distributed database engine running on the BEAM.

It uses **ETS** or “Erlang Term Storage” to manage **ram based key-value** storage objects, so it’s **super fast**.
The chat app uses **D**ETS since it needs to **persist the data to disk** in order to keep it between server restarts.

- You can **store any valid struct** as it is in its native representation, no conversions or mutations needed.
- You can have **multiple nodes** running Mnesia and easily connect them together to **distribute** the load.

The chat app uses **Memento** as a **wrapper** to abstract Mnesia usage from **Elixir**.
It provides a friendly interface to run **CRUD** operations in an easy and simple way.

The app only needs to define 3 “model” structs: **User, Chat and Message**.

App Features

Some interesting features supported by the app.

- Chats and its messages are **kept** for a certain period of time, even if the chat room is empty.
- A **cron** process (GenServer) that periodically **clears** expired users, chats and messages.
- A "**heartbeat**" is sent from idle clients in order to refresh users and chats expiration times.
- Chat rooms can be **private or public** and can be changed on-the-fly (only by chat room owner/creator).
- Public chats are **listed** at home page, dynamically updating its titles and members amount.
- Support for update chat **title** (only by chat room owner/creator).
- Support for update user **nickname** by clicking yourself on members list or sending a message: `/nick MyName`
- The chat member list displays 3 dots "..." while an user is **typing** (with a *3s* timeout).
- Clicking in a chat member inside a chat room, will issue a **private chat request**.
- Private chat **invites** will be displayed on screen and will open a new chat window if accepted.
- A private chat between 2 users is **just another** private chat room like any other, so ir re-uses the same logic.

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Thanks! =]

Some useful links for more info about this wonderful technologies!

App Repo: https://github.com/fiqus/lqchatex
Live Demo: https://lqchatex.fiqus.coop/

Phoenix LiveView: https://github.com/phoenixframework/phoenix_live_view
Phoenix PubSub: https://hexdocs.pm/phoenix_pubsub/
Phoenix Presence: https://hexdocs.pm/phoenix/Phoenix.Presence.html

Erlang Mnesia: https://learnyousomeerlang.com/mnesia
Memento: https://github.com/sheharyarn/memento

Visit us at **https://fiqus.coop**