

Fred Posner • fred.tel • August 2025 • Cluecon • Chicago, IL USA

KAMAILIO

Moving Users to Kamailio

Scaling and Moving User Registrations, Locations, and Presence from FreeSWITCH to Kamailio

Agenda

Moving Users to Kamailio

- A) Who am I? (100 words or less)
- B) What is Kamailio? (250 words or less)
- C) **Why move users to Kamailio?** *What's wrong with keeping them on FreeSWITCH? Why do you want to rain on my parade? Who died and made you boss? Ugh.*
- D) Registration (mid-registrar vs offload)
- E) Make it happen
- F) Questions (ask me anything)

Who am I?

Hi. I'm Fred

Fred Posner - qxork.com

- #Dad
- VoIP Consultant (LOD)
 - Kamailio
 - APIBAN
- Florida
- Had a bakery pre Covid
- Loves backpacks



What is Kamailio?

Kamailio

-> kamailio.org

- *Kah-mah-illie-oh*
- Open Source SIP Server
- Stable/Mature (>20yrs)
- **Powerful**
- Lightweight / Modular



300,000

Registrations w/ 4GB RAM

5000+

CPS as Stateless Load Balancer

3000+

CPS for sustained 5000 calls on a Raspberry Pi

Kamailio

Rock Solid since 2001

- SIP Proxy Server
- SIP Registrar Server
- SIP Location Server
- SIP Application Server
- SIP Dispatcher Server
- SIP Websocket Server
- Protocol Bridge



Why Move?

Scale
Performance
High Availability

Registration

Registration

Two Main Choices

- Offload
 - Authentication -> Kamailio
 - Location -> Kamailio
 - Presence -> Kamailio
- Mid-Registrar
 - Kamailio proxies users
 - Makes FS more efficient

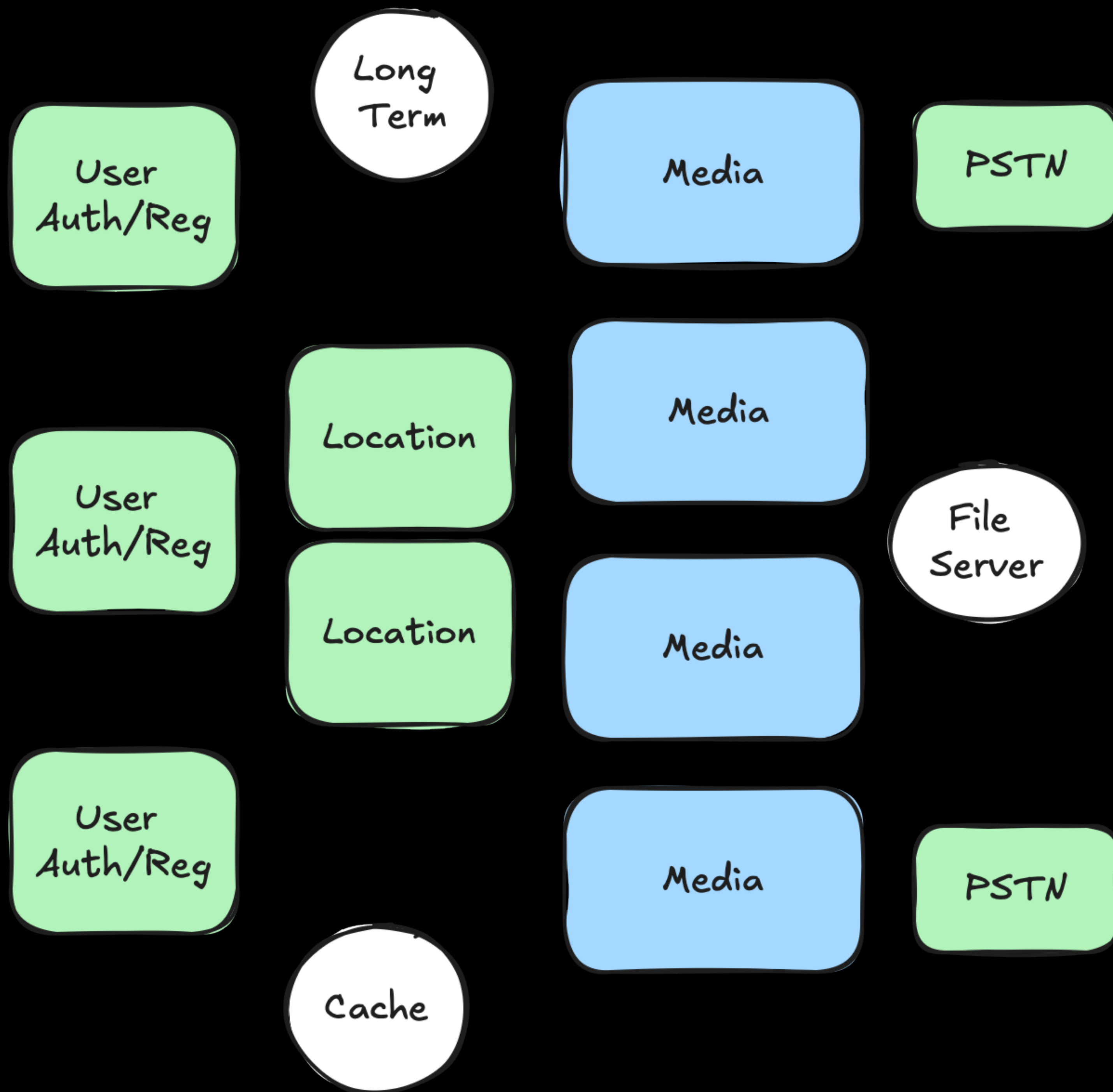


Registration

Mid-Registrar or Offload

- Existing deployment?
 - Start with Mid-Registrar, migrate to Offloaded
- New Deployment?
 - Offload from the start

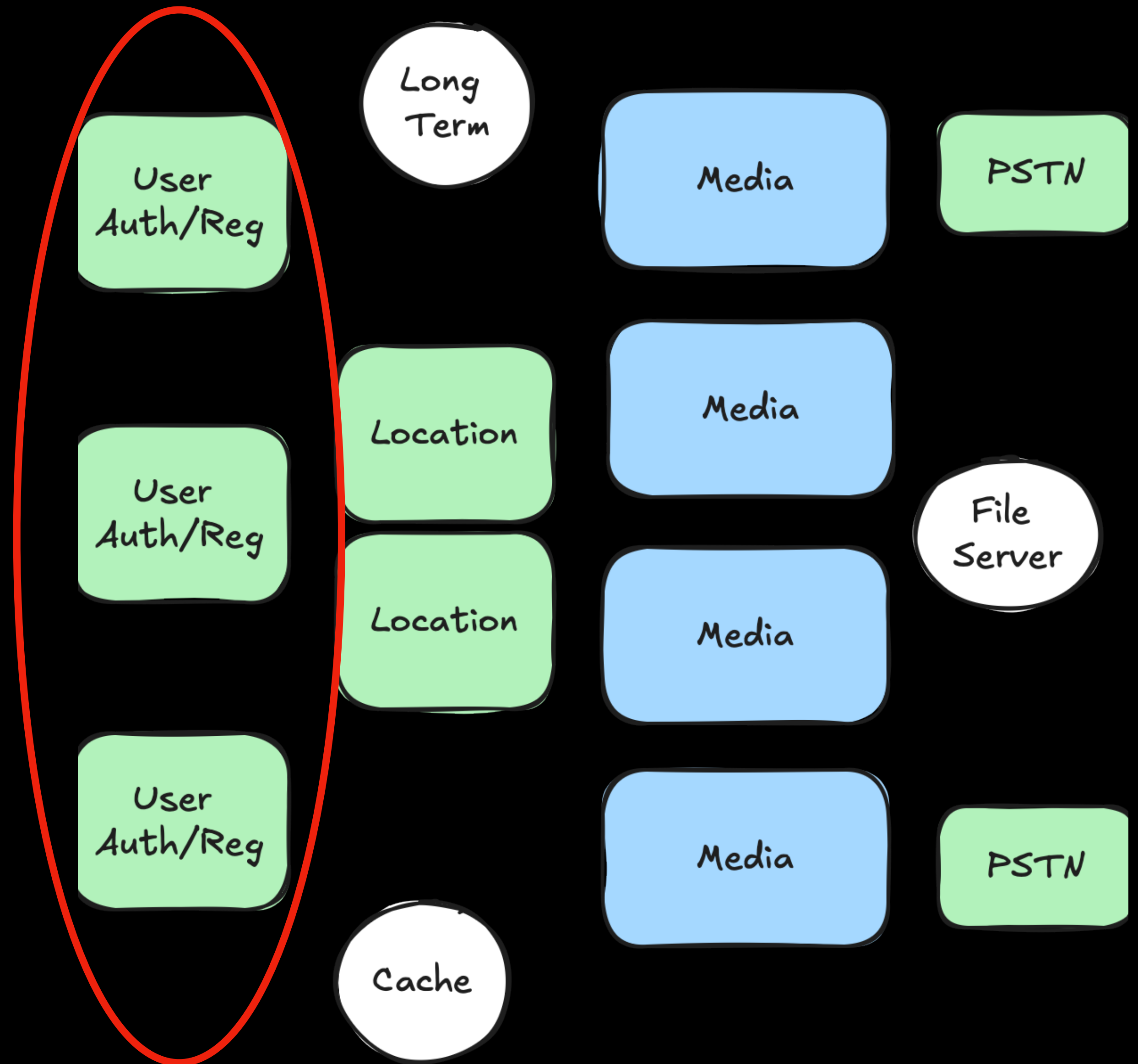
Make it happen



Make it happen

Modular Design

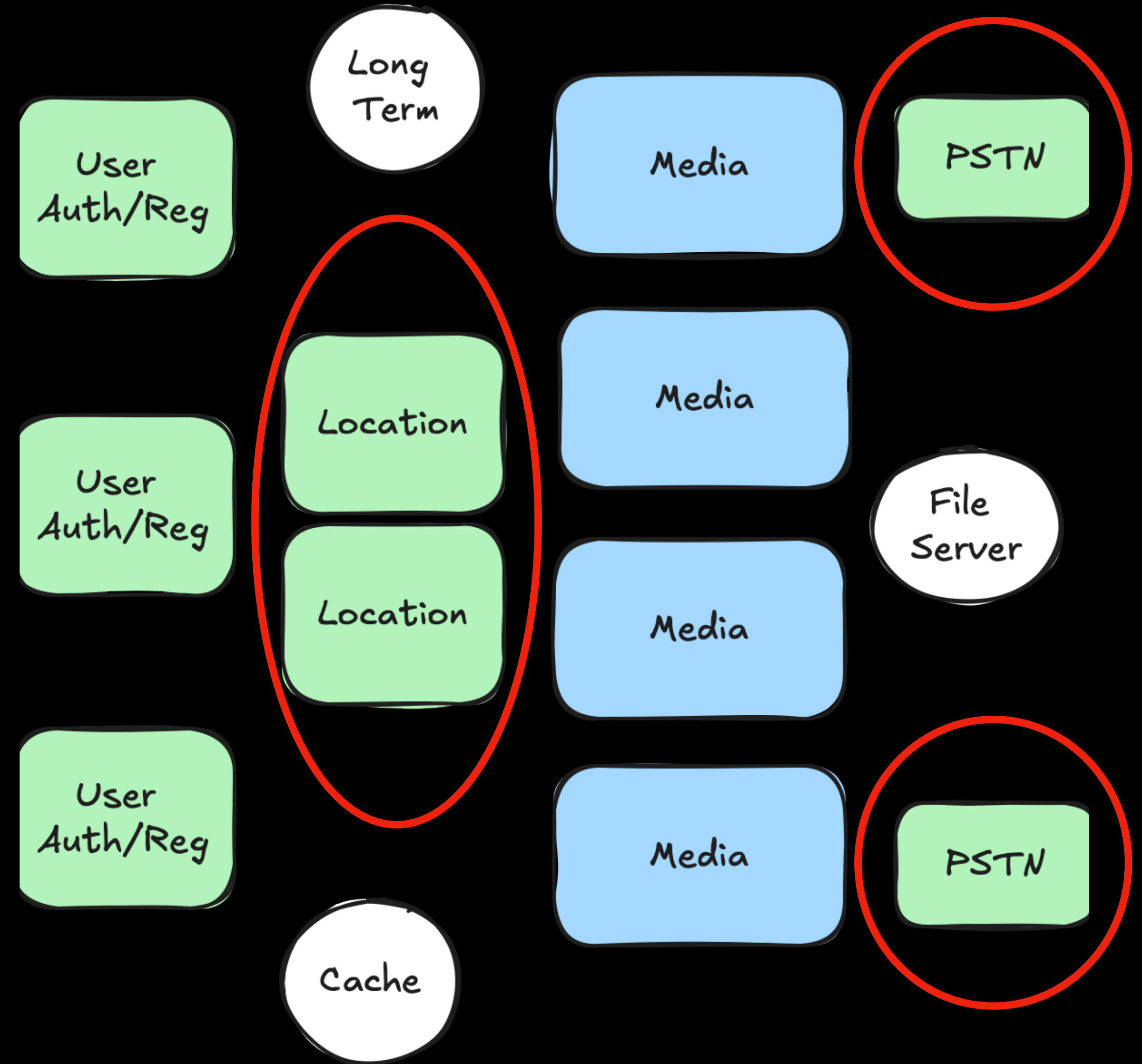
- Gateway nodes (Kamailio)
 - Registration/Authentication/Location
 - Auth can be DB, API, Redis, whatever
 - TLS/Websocket bridge
 - Media proxy/bridge



Make it happen

Modular Design

- **Location nodes (Kamailio)**
 - User -> Gateway
 - Presence
- **PSTN nodes (Kamailio)**
 - Carrier gateway
- **Media (FreeSWITCH)**
 - UDP



Mid Registrar

FreeSWITCH still handles Reg, Presence

- Examples:
 - <https://github.com/fredposner/scripts/blob/master/kamailio/mid-registrar.cfg>
 - Kamailio World 2025: Scaling The VoIP Infrastructure With Custom MID Registrars (ovoshlook / Iurii Gorlichenko)
 - <https://github.com/ovoshlook/kamailio-mid-registrar-config-snippets>
- No changes to existing FreeSWITCH
- Good transition

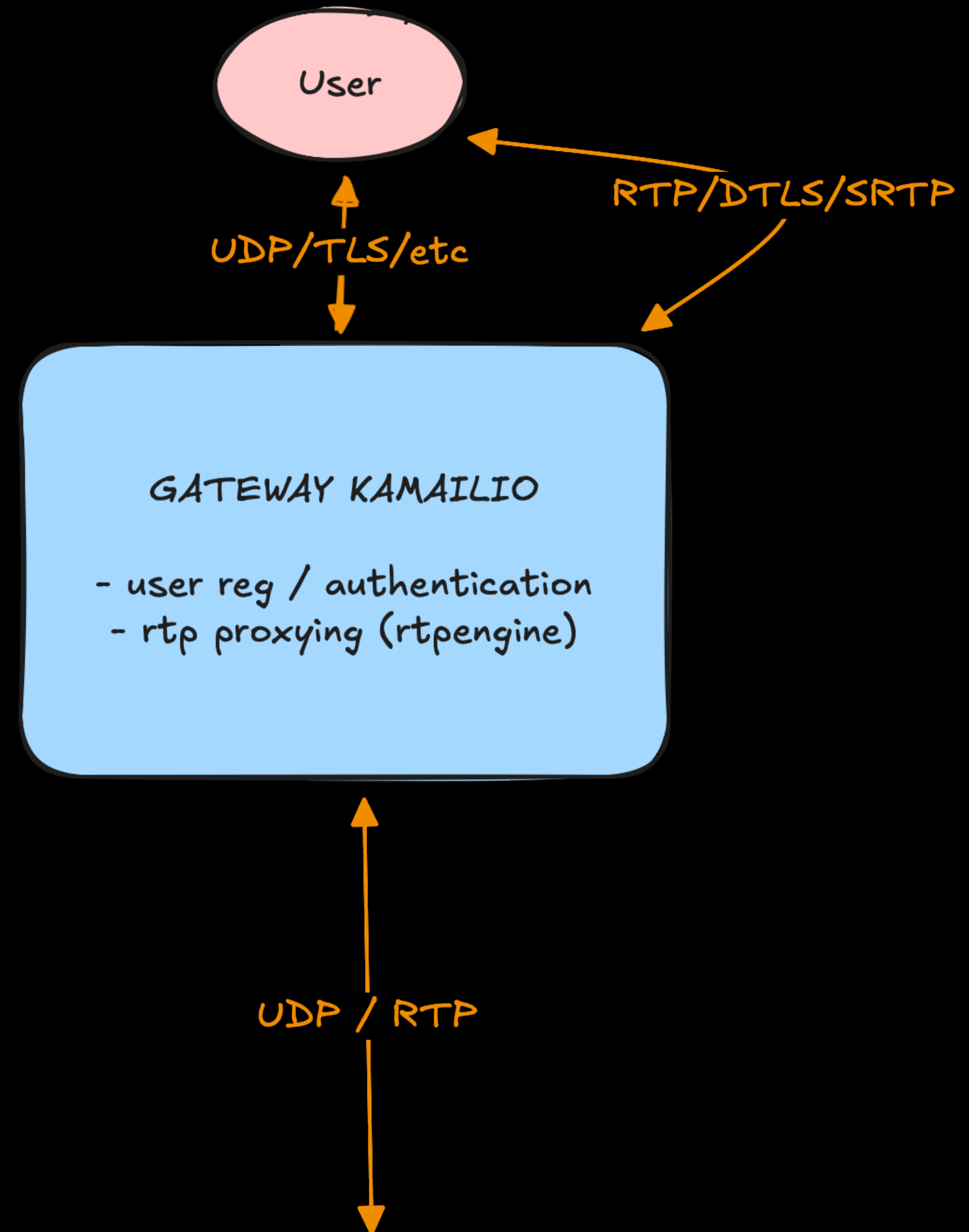
```
if (is_method("REGISTER")) {
    if ($sht(regs=>$fU@$fd)!=null) {
        if ($sht(regs=>$fU@$fd)==$_s($si:$sp)) {
            sl_send_reply("200", "OK");
            exit;
        }
    }

    $var(host) = $si + ":" + $sp;
    $var(user) = $(sel(contact.uri.user));
    remove_hf("Route");
    remove_hf("Contact");
    if (is_present_hf("Expires")) {
        remove_hf("Expires");
    }

    add_path();
    append_hf("Contact: <sip:
$var(user)@MY_PUBLIC_IP;lhst=$var(host);lm=midreg>\r\n", "
CSeq");
    append_hf("Expires: 3600\r\n", "Contact");
    $du = "sip:REGISTRAR_IP:REGISTRAR_PORT";
}
```

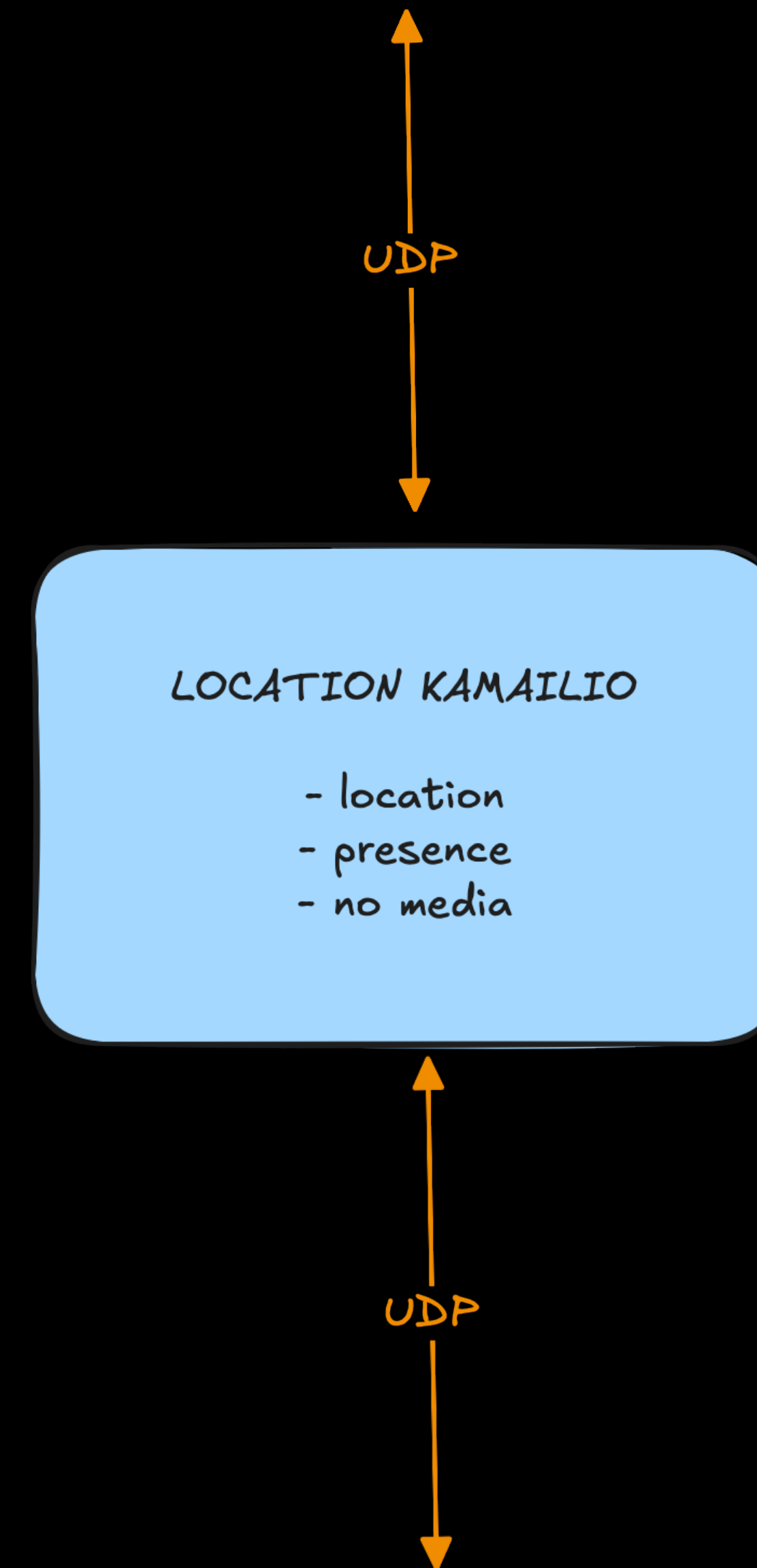
Offload Gateways

- User facing
- Bridges TLS, websockets, TCP, etc to UDP/SIP
- Can also bridge IPv6 <-> IPv4
- SIP Edge Router security
- RTP proxying (and SRTP/DTLS bridging)
- Deploy **MANY** of these nodes



Offload Location

- Location (user to gateway node)
- Presence
- No media
- Can also handle PUSH/Resume



Sending Location

Based on “REGISTER Replication” from @miconda

- Kamailio World 2019: “Replication Mechanisms” from Daniel-Constantin Mierla
- <https://www.kamailio.org/events/2019-KamailioWorld/Day2/99-Daniel-Constantin.Mierla-Kamailio-Replication.pdf>
- Store in HTABLE

```
##-- GATEWAY
if (is_method("REGISTER")) {
    if (!save("location"))
        sl_reply_error();

    $uac_req(method)="KUSRLOC"
    $uac_req(ruri)="sip:store@centralnode.kamailio.org";
    $uac_req(furi)="sip:server@server1.kamailio.org";
    $uac_req(hdrs)="Content-Type: text/kusrloc\r\n";
    pv_printf("$uac_req(body)", "$fu@fd");
    uac_send_req();

    exit;
}

##-- LOCATION
if(method=="KUSRLOC" && $rU=="store") {
    $sht(kusrloc=>$rb) = "sip:" + $si + ":" + $sp;
    send_reply("200", "Stored");
    exit;
}

# handle standard SIP requests
if($sht(kusrloc=>$rU@$rd)!=null) {
    $du = $sht(kusrloc=>$rU@$rd);
    t_relay();
    . . .
}
```

Presence

Nodes send to Location Server

- Gateway forwards off to Location
- Location handles presence
- Use PUA
 - pua_json
 - Emmanuel Schmidbauer: “kamailio: controlling presence with new module `pua\_json`”
 - <https://blog.voipxswitch.com/?p=144>

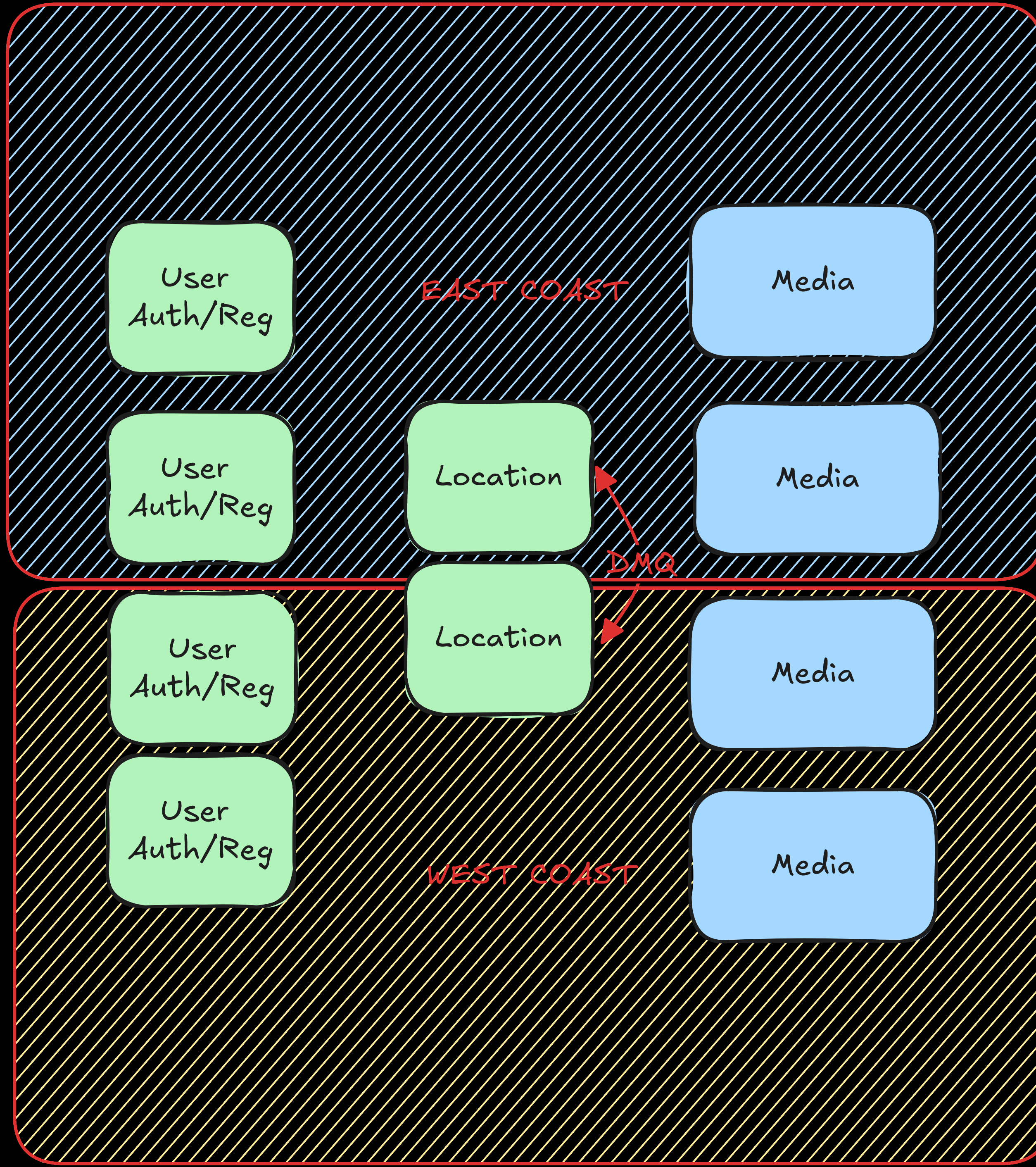
```
#-- GATEWAY
if (is_method("PUBLISH|SUBSCRIBE")) {
    $du = $_s(sip:LOCATIONSERVER:5080);
    record_route();
    route(RELAY);
}

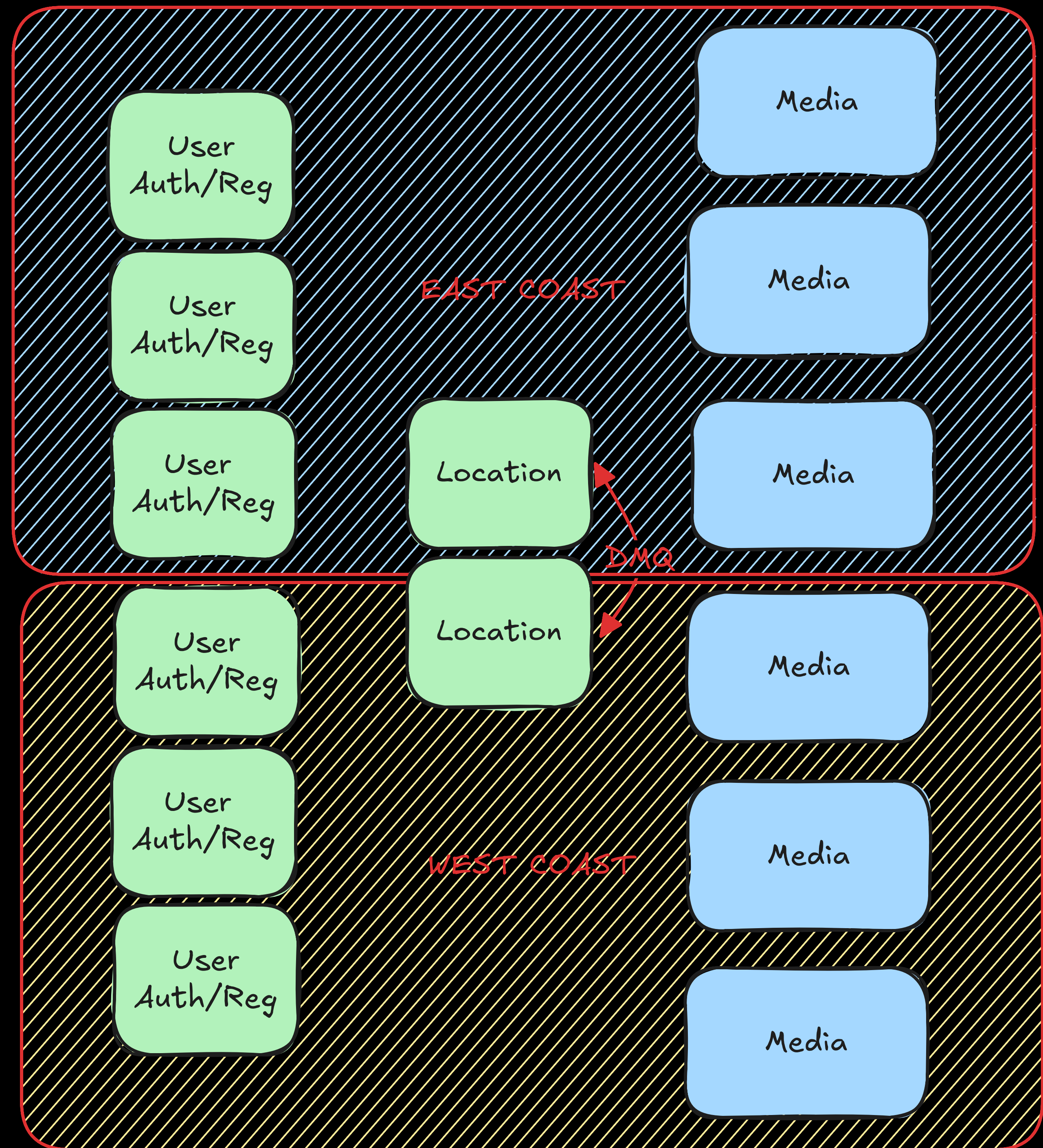
#-- LOCATION
if(!is_method("PUBLISH|SUBSCRIBE")) {
    exit;
} else {
    if (!t_newtran()) {
        xwarn("new tran error");
        sl_reply_error();
        exit;
    }

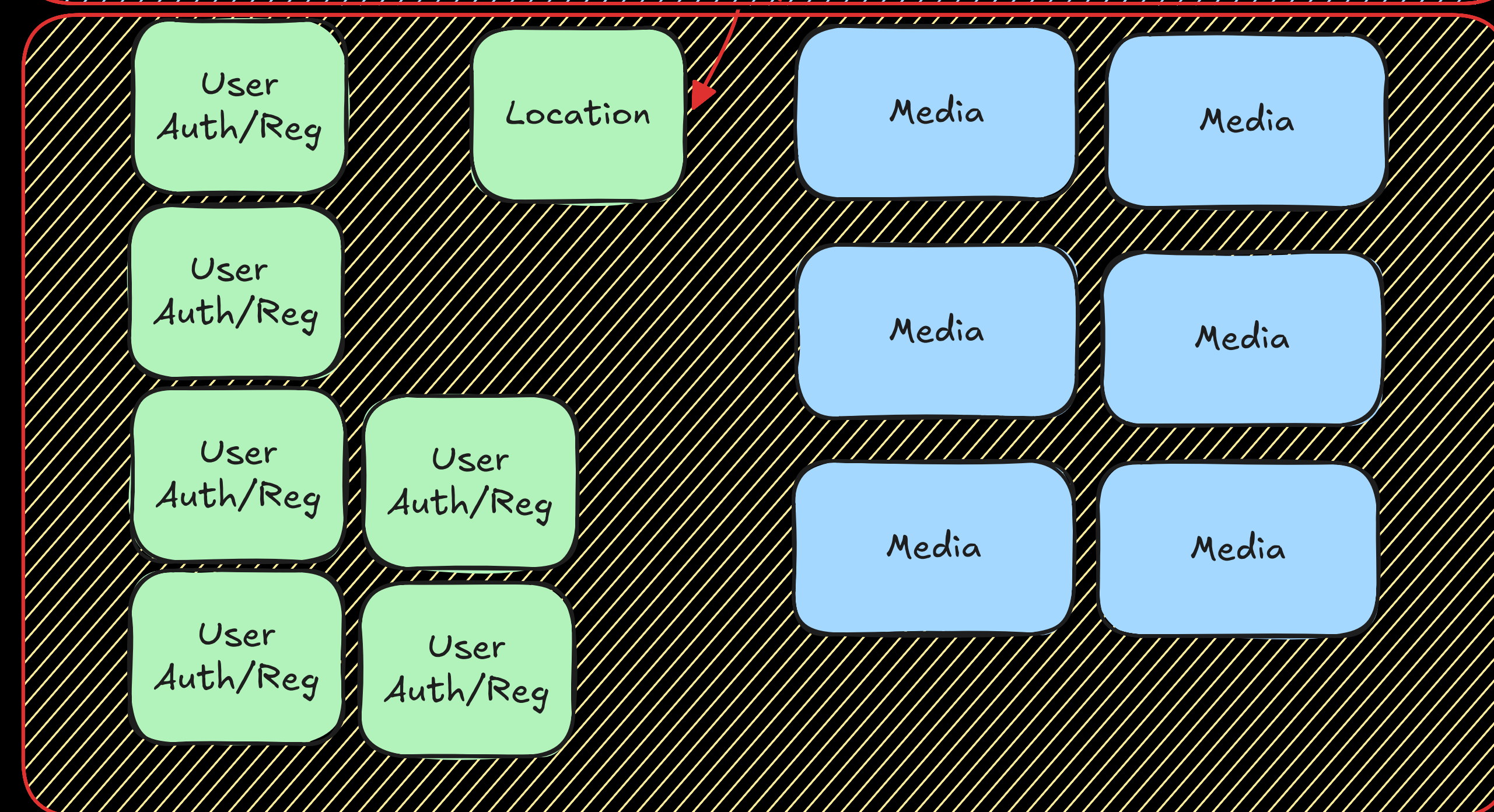
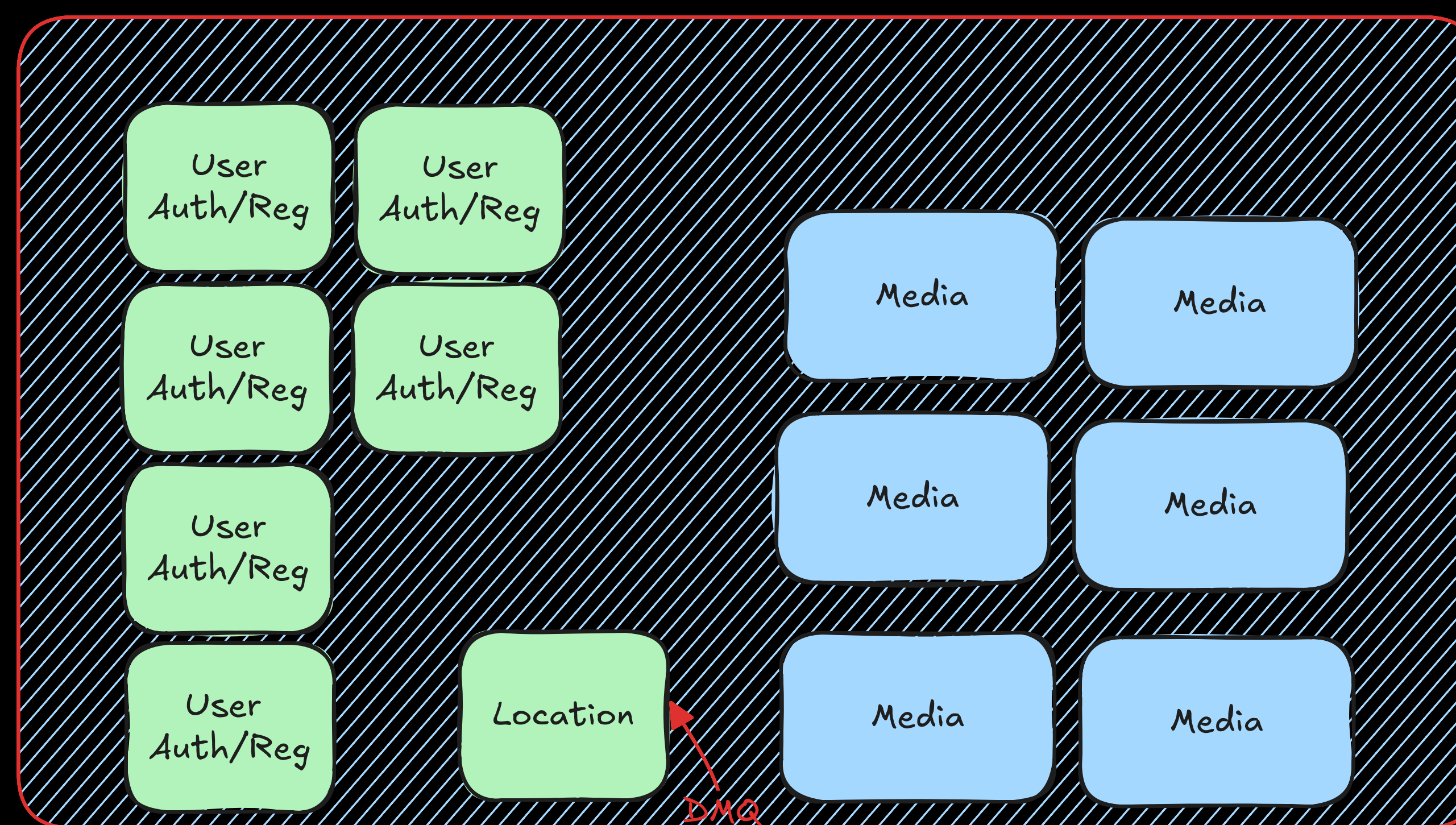
    if (is_method("PUBLISH")) {
        handle_publish();
    } else if (is_method("SUBSCRIBE")) {
        handle_subscribe();
    }

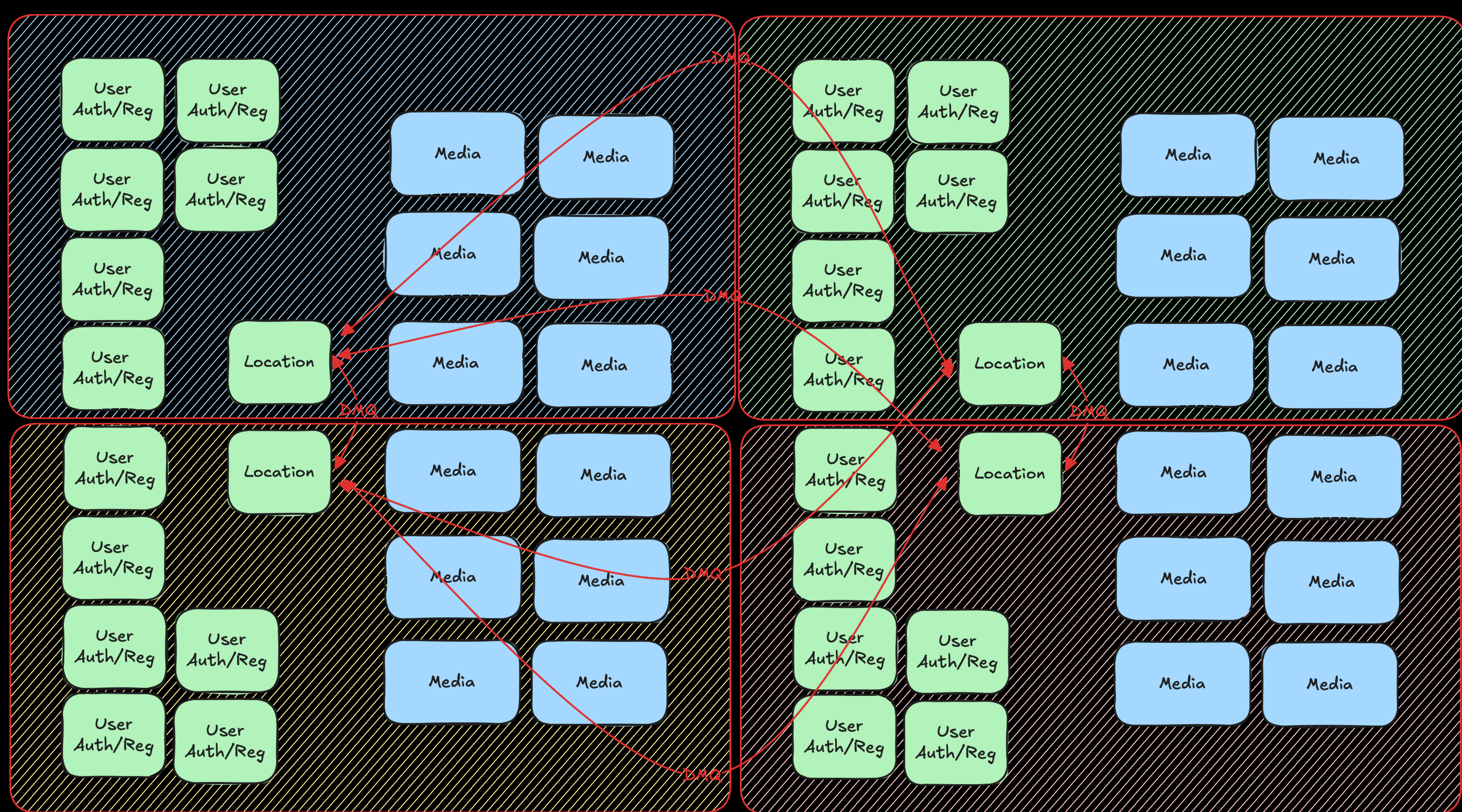
    t_release();
    exit;
}
```

Does it Scale?









Yes.

Questions?

Ask Me Anything

Thank you Cluecon!

- qxork.com
- fredp.xyz
- Slides/links:
 - pgpx.io/cc2025
- Always be kind

