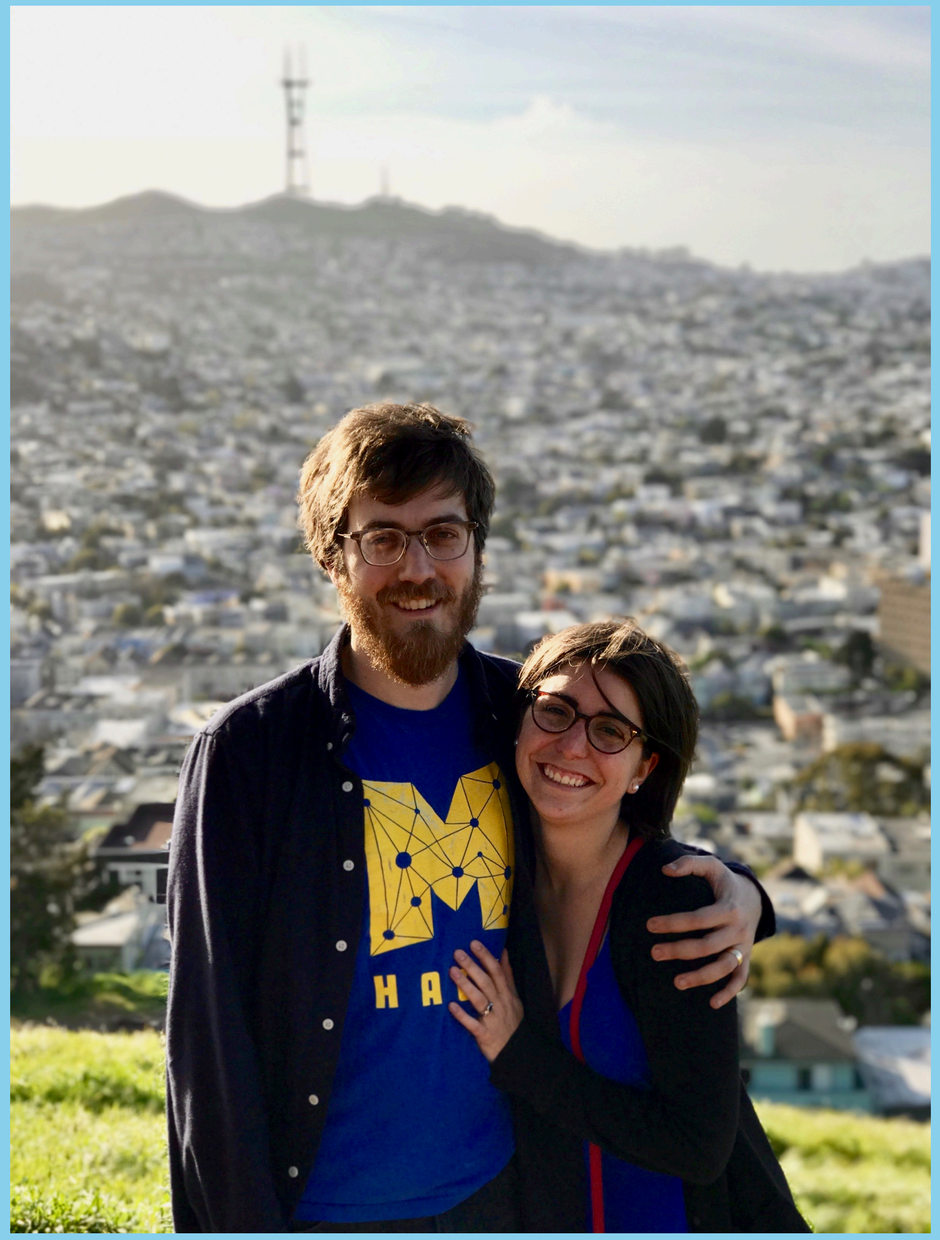
How to get away with ~~murder~~ refactoring

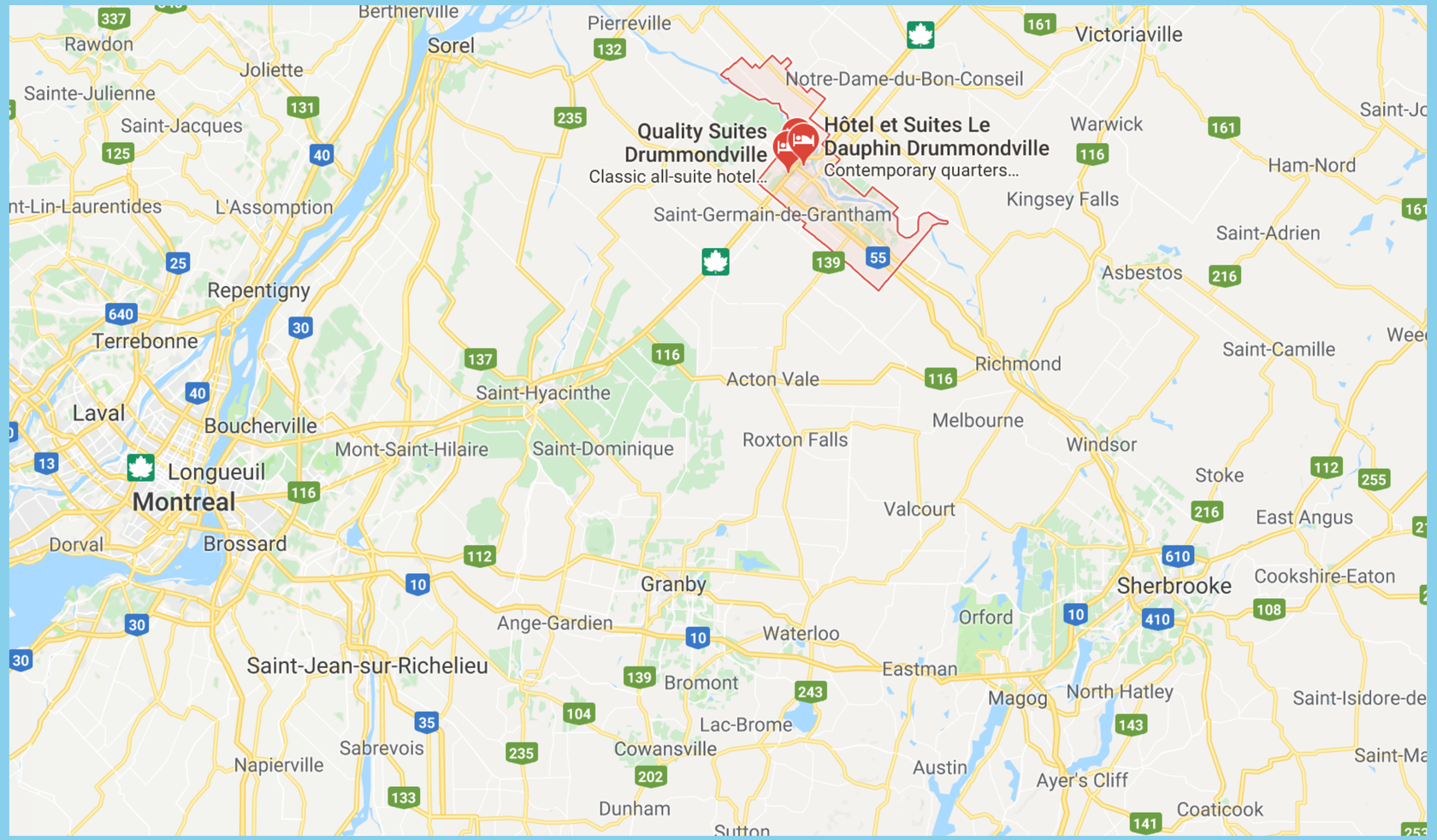
@qcmaude



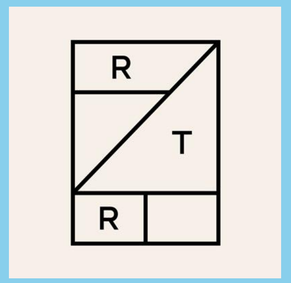
This is me
(and Chewbacca).

I work at slack
& live in San Francisco.

Drummondville, QC



McGill



Rent the Runway

WARNING:

This presentation contains pictures of cake and other baked goods courtesy of *The Great British Bake Off.*

Agenda

1. Refactoring
   - what it is
   - why do it
2. In Practice
3. Lessons Learned

Refactoring

a definition

n. the process of restructuring existing code (e.g. the *factoring*) without changing its external behaviour

Monique's Millefeuille

1. Place 1/10 inch-thick puff pastry in the oven at 350 ° F.
2. Whisk the eggs, sugar, vanilla and flour in a bowl. *(white all-purpose flour is best)*
3. Add boiled milk to the bowl.
4. Return mixture to saucepan for a few minutes until it has a cream-like texture.
5. When the puff pastry is cooked, cut into three even pieces.
6. Layer the crème pâtissière between layers of pastry and let cool.

Boil milk in medium saucepan.

about 15 minutes on medium heat.

should take 10 minutes

* *crème pâtissière is the cream-like mixture we just made*


#GBBO
THE GREAT BRITISH
BAKE OFF

but, in the world of
business, it's a little more
complicated than that ...

Reasons to Refactor

1. ~~for fun~~
2. ~~out of boredom~~
3. ~~“happen to be passing by”~~
4. ~~to make the code more legible or extendable~~

“If it ain’t broken, don’t fix it.”

Reasons to Refactor

1. shift in product requirements
2. adopting a new technology
3. improving performance


WHAT COULD GO WRONG?

Refactoring can ...

- cause serious regressions
- unearth dormant bugs
- easily grow in scope
- introduce unnecessary complexity

So, let’s not kid ourselves …

Refactoring

the real definition

n. the process by which we take a pile of poo and turn it into a shinier pile of poo

In Practice

May 2017

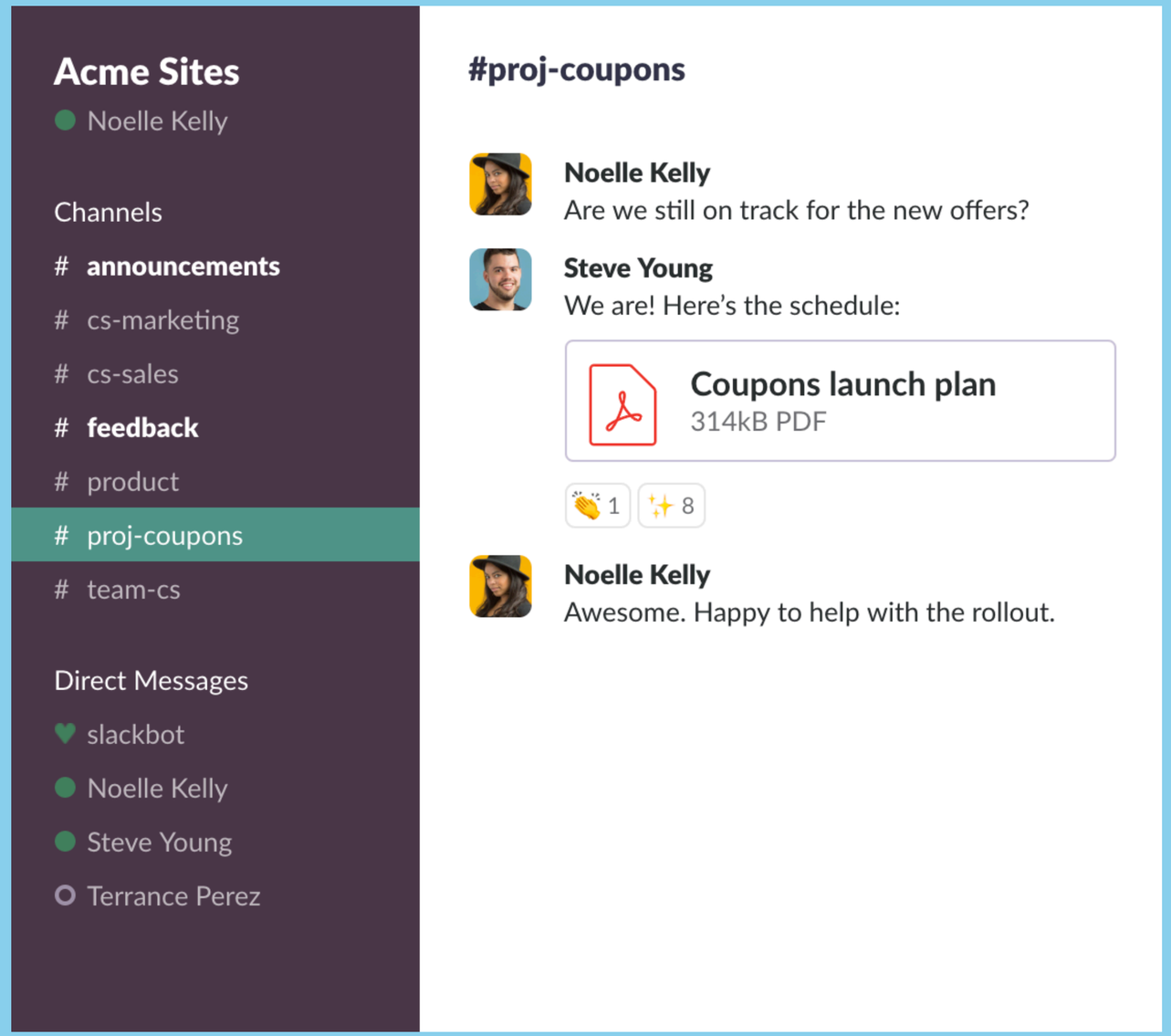
Narrow it down:

What's the *actual* problem?

unread

public and private channels

DMs and group DMs



By the numbers

# of public & private channels on top five teams*	# of channels on top five teams*	# of channel memberships on top five users*
80 301	5 841 454	~~8 338 590~~
69 296	1 926 918	102 569
60 029	1 819 719	100 647
55 043	1 527 894	66 311
49 697	1 524 953	61 101

* only looks at totals on a single team (non-aggregate view of Enterprise customers)

We have two tables that store *nearly identical* information:

1. `teams_channels` stores a row for each *public* channel
2. `groups` stores a row for each *private* channel or *group DM*

Correspondingly, we have yet another two tables that store *nearly identical* information:

1. `teams_channels_members` stores a row for each user's membership in a *public* channel
2. `groups_members` stores a row for each user's membership in a *private* channel or *group DM*

Slack in mid-2017

	public channels	private channels	DMs
channel	`teams_channels`	`groups`	`teams_ims`
membership	`teams_channels_members`	`groups_members`	
	C123456	G123456	D123456

We end up with a ton of similar queries to two tables and lots of

```
UNION
UNION ALL
LEFT (OUTER) JOIN
```

which isn't great for performance

SQL Performance 102

- `UNION` removes duplicate records.
- `UNION ALL` returns all columns (no extra distinctness check).
- `LEFT OUTER JOIN` is faster than `LEFT INNER JOIN`.
- Use `EXPLAIN` all day every day.

do some stuff

```
        $sql = "SELECT m1.channel_id, 'C' AS type, status, archive_date, delete_date
                FROM channels AS c
                JOIN members AS m1 ON
                        m1.channel_id=c.id AND
                        m1.team_id=%team_id AND
                        m1.user_id=%user_id AND
                        m1.delete_date=0
                WHERE
                        c.team_id=%team_id AND
                        m1.type=%public_chan_type AND
                        m1.join_date IN (%list:join_date)
                UNION ALL
                SELECT m2.channel_id, 'G' AS type, '0' AS status, g.archive_date, g.delete_date
                FROM groups AS g
                JOIN members AS m2 ON
                        m2.channel_id=g.id AND
                        m2.team_id=%team_id AND
                        m2.user_id=%user_id AND
                        m2.delete_date=0
                WHERE
                        g.team_id=%team_id AND
                        m2.type=%private_chan_type AND
                        m2.join_date=%private_chan_privacy";

        return db_fetch_team($team, $sql, array(
                'team_id'          => $team['id'],
                'user_id'          => $user['id'],
                'public_chan_type'     => channel_type_t::C,
                'public_chan_privacy'  => [channel_privacy_type_t::PUBLIC, channel_privacy_ty
                'private_chan_type'    => channel_type_t::G,
                'private_chan_privacy' => channel_privacy_type_t::PRIVATE,
        ));
```

do some other stuff

Get some context:

Why was it designed this way *originally*?

1. Security: keeping *private* channel information in a separate table isolates it

2. Product history: channels and private channels seemed like *vastly* different concepts

3. Inability to travel into the future

Put on you thinking cap:

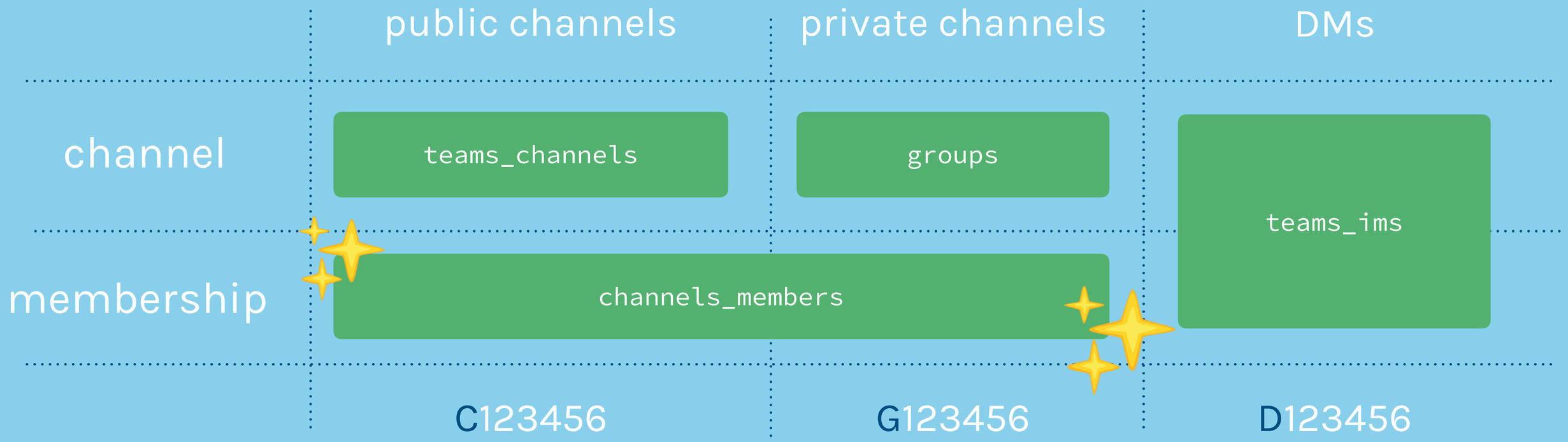
Brainstorm a Solution & Identify the Challenges

Remember this?

	public channels	private channels	DMs
channel	`teams_channels`	`groups`	`teams_ims`
membership	`teams_channels_members`	`groups_members`	
	C123456	G123456	D123456

Consolidate into a *single*
`channels_members`
table ✅

Let’s do *this*!


public channels
private channels
DMs
channel
membership
teams_channels
groups
teams_ims
channels_members
C123456
G123456
D123456

It might not be so simple …

- SQL queries are scattered throughout the code
- About 400 callsites
- ☝ embedded in old, crufty code from 3 years ago
- Little to no unit test coverage

Sell, sell, sell:

Convince your team!

1. Our biggest customers won’t be able to handle the additional latency in a few months

2. Opportunity to easily modify a key table

3. Develop a pattern for future data consolidations

Map it out:

Write a Detailed Plan of Action

`GROUPS_MEMBERS` deprecation plan

1. Write a simple `lib_ud_channel_membership` library to handle most read and write cases. Exclude complicated queries with joins. Ensure that there are unit tests for every function given a local group, a local channel, a shared group and a shared channel as input. Here are some open questions with regards to the unidata library:
   a. ~~Do we adopt `channel_privacy_types` for channels and replace `is_private`, `is_mpim` with just a single column to denote its privacy type? If we were to replace the `is_private` and `is_mpim` columns, we'd still output entirely identical information to the clients. This change would only affect the data access and very little of the webapp PHP code.~~
   b. New table called `channels_members`; this will have the same columns as `teams_channels_members` with an additional column for `channel_type` and `channel_privacy_type`.
2. Inform the data analytics and SLI teams of these changes; give them ample time to convert their pipelines to conform to the new system. Check that automated QA is testing the old endpoints (`groups.join`, etc); this'll give us a better sense of whether any changes have broken our APIs. Notify the Vitess team that they should not focus on attempting to migrate `teams_channels_members` nor `groups_members`.
3. Convert callsites one at a time. This effort would be advertised to the entire AppEng team for help converting callsites to read from the unidata library. Add new functions to the unidata library as needed.
4. Create a "copy" of `teams_channels_members` named `channels_members`; this new table will be used as the target for double writing instead of double writing new `groups_members` entries and updates to the `teams_channels_members` table. This table would have the exact same structure as that of `teams_channels_members` plus an addition `channel_type` column.
5. Once all callsites have been converted, begin double writing first in dev, then to TS, and then to all teams in production.
6. Write a consistency checker to ensure that all rows being double written to the `teams_channels_members` (or `channels_members`) table match the corresponding entry in

Be careful:
don’t bite off more than you can chew!

Expect the unexpected!

A few other tips

1. Get feedback from folks on other teams
2. Think outside your codebase: could your changes affect other services, other folks' pipelines, third-party developers, etc.
3. Be generous in your estimates

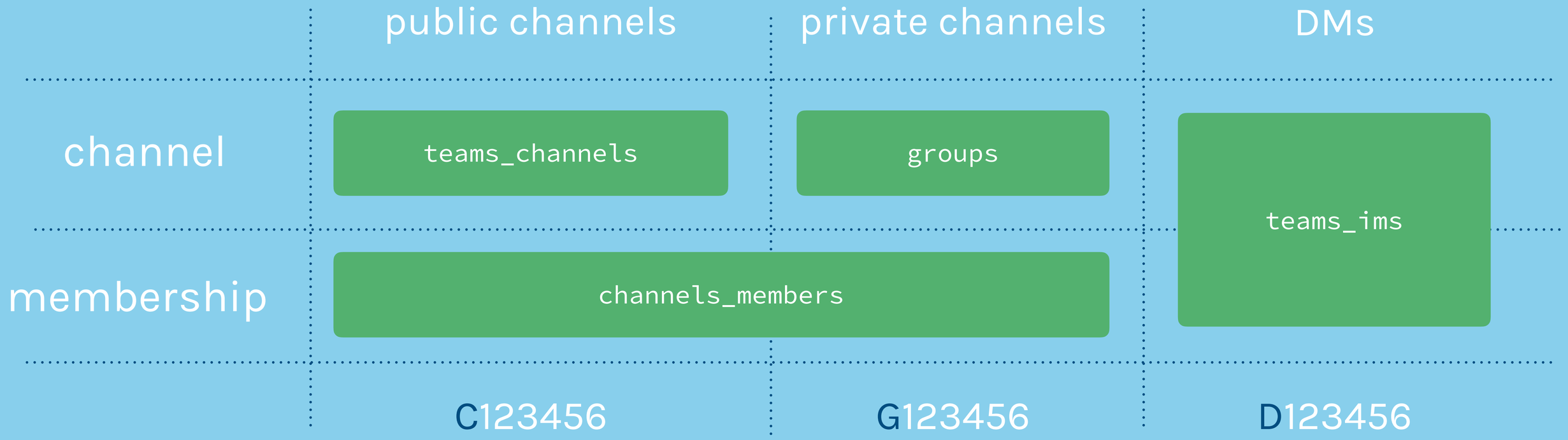
Go, go, go:

Execute!

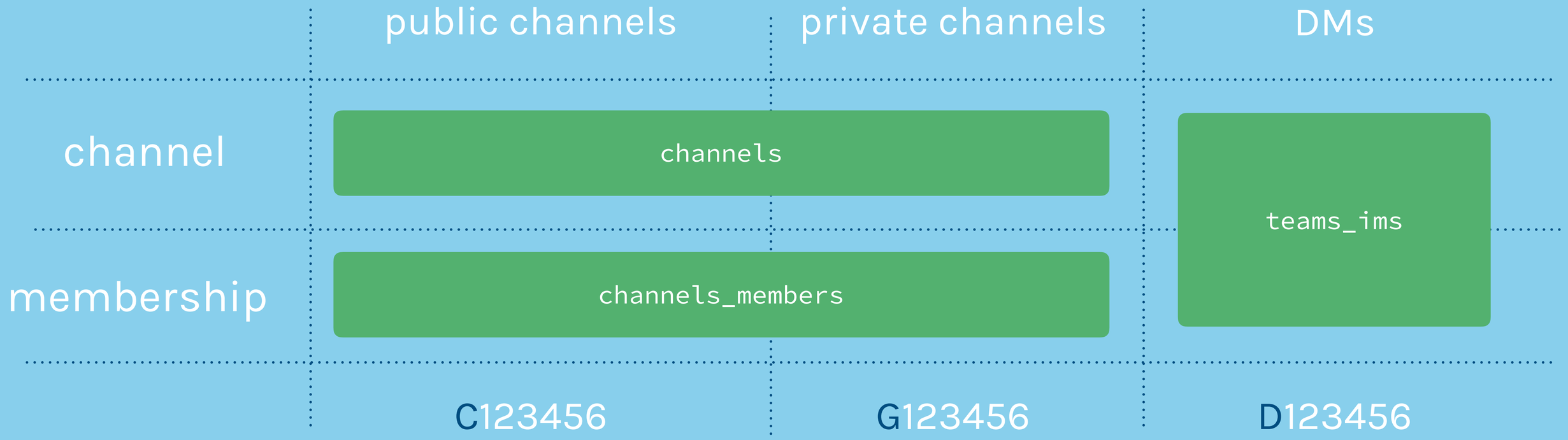
Feature flags are your *friend*.

Bugs are inevitable.

In case you'd forgotten



One step further



1. Dark mode: Read from both tables, compare the results, return the value from the *old table*.

2. Light mode: Read from both tables, compare the results, return the value from the *new table*.

1. Dark mode in dev environments.
2. Dark mode in production for a few weeks.
3. Light mode in dev for a two weeks.
4. Light mode to *our* team for one week.
5. Light mode to increasing % of teams in production over a 2 week period.

Document, document, document.

~8.2 million unique DMs

“I’m afraid I don’t understand, I’m sorry!”

Soft Deletion

team_id channel_id user_id … date_joined … ✨date_deleted✨

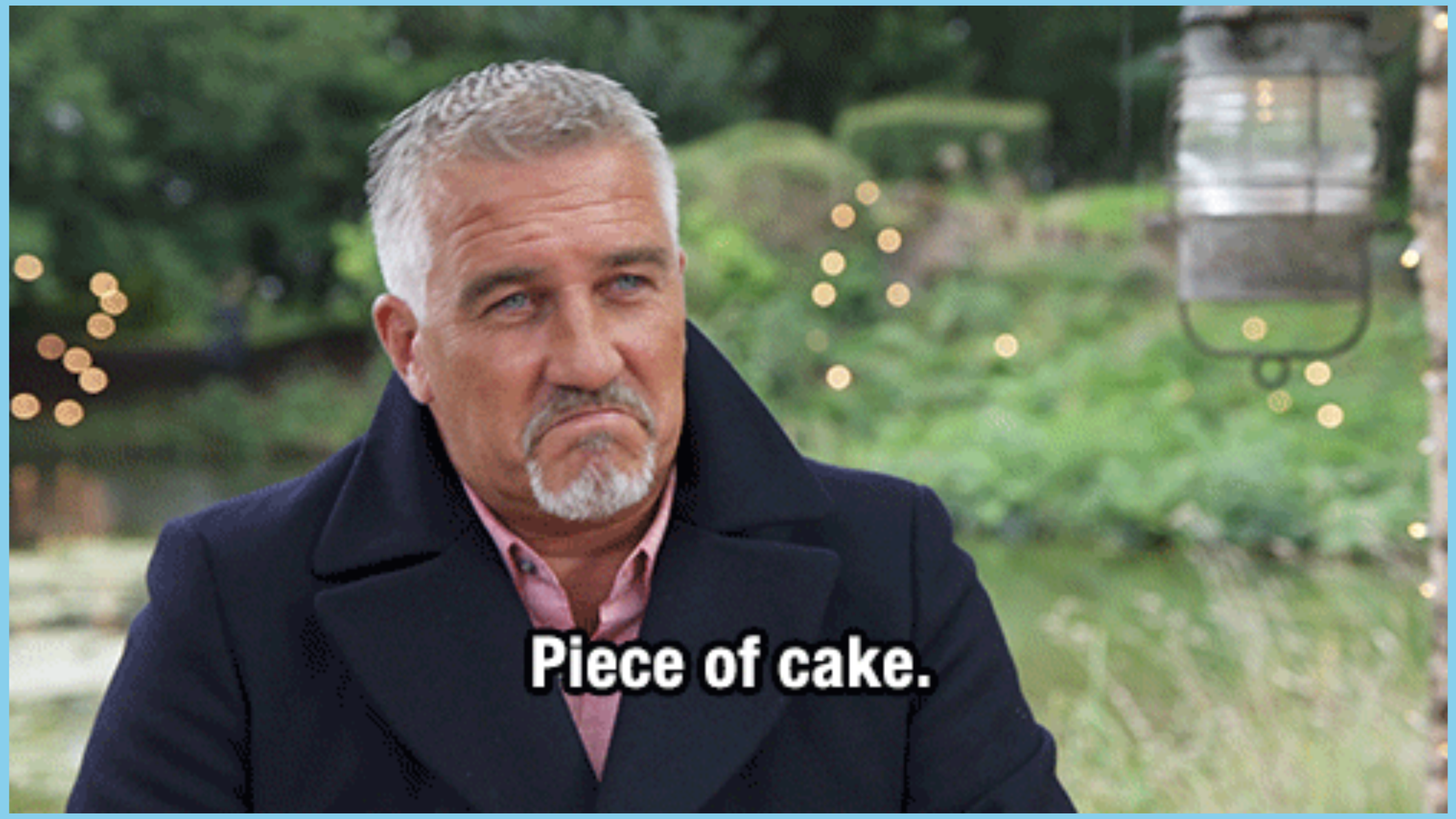
Do the boogie:

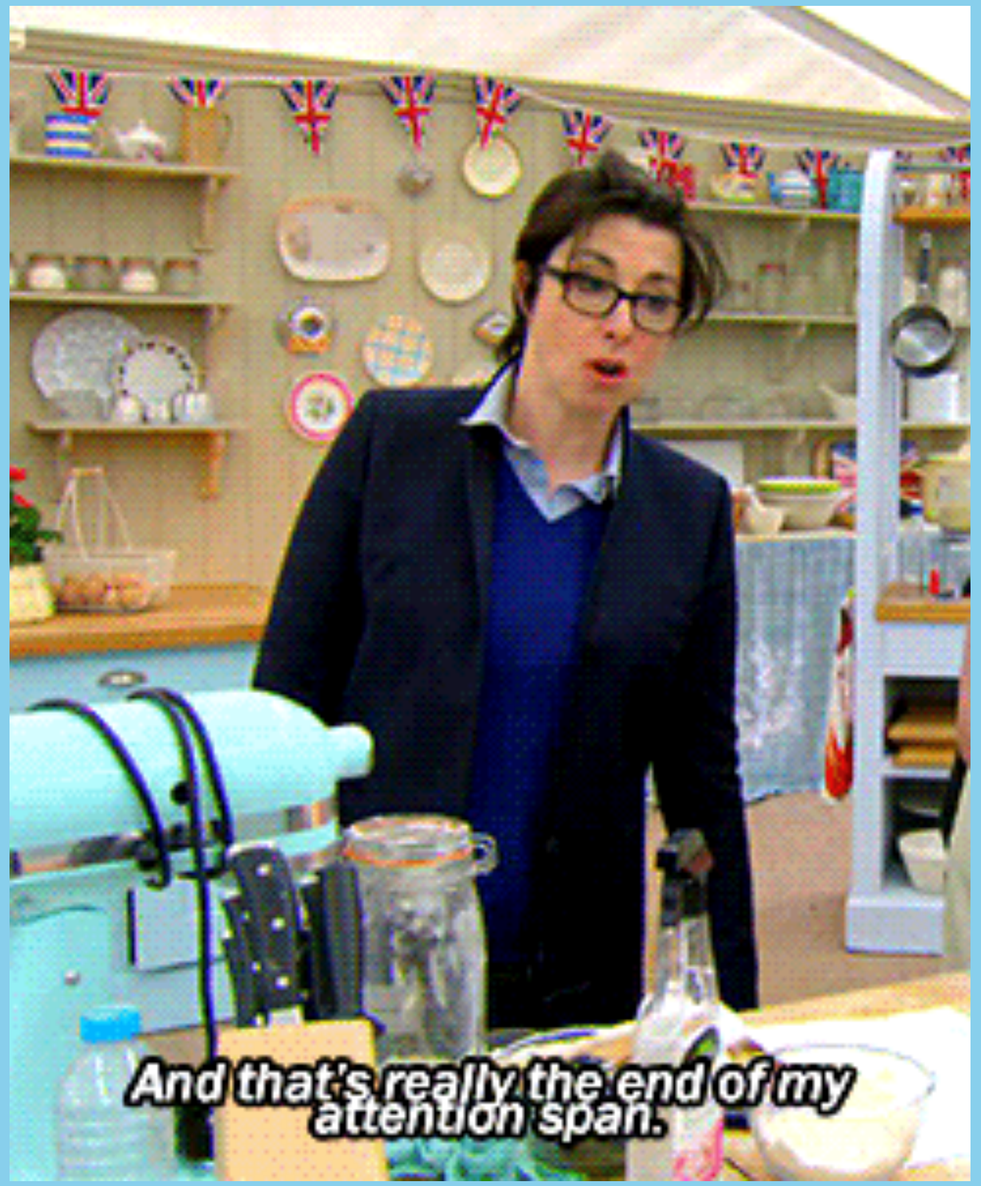
Celebrate!


You’re not done yet:
Clean Up

In Review

Refactoring can be a win-win for both engineers & your business but … it has to be carefully scoped & planned out.


Piece of cake.



Merci!

Send questions, puns,
& concerns to
@qcmaude