## Exhibit 221



The PA Lead, PM \& Eng bits are flipped. The Monitoring Holdback project status with 1 month meeting date is set. Thanks!


Lets make it a top priority t can you nominate someone in your team to help out?

On Wed, May 9, 2018 at 10:03 AM, $\quad$ wrote:
 location accuracy is not too bad.
But we should definitely have a hold back,
A drop in low priority makes sense (as we have a limited number of low priority notifications). But it doesn't make sense for passive,
as those should not compete for each other.


As a side note, I would like to understand better why we stopped using a few months ago? Were folks aware we dropped it?
And was there a launch report? Or it was bug and nobody noticed it until now?






you wrote:

What I meant was that this change is going to go out with the GDPR change (it will have to be the default in a month's time). The result of the GDPR change is that we will have significantly fewer location updates and that by itself will be reducing overall refreshes. The integration (this launch) won't regain these because locations are not considered valid for geo fencing. I was just pointing out that given that reduction in refreshes we would naturally see fewer passive notifications that rely on these refreshes.

I am not sure I get that. With GDPR change already enabled in control, why is there a reduction on the number of location updates?

As for LOW_PRIORITY, having more weather would mean fewer At-a-Place. The fix for that is supposed targeting C2D or clicks-per-display-hour for ranking low-priority notifications (At-a-Place is short-lived). I believe this is on Randy's roadmap.

On Wed, May 9, 2018 at 8:03 AM.
wrote:
I want to clarify the $\square$ impact statement:
$+3.2 \%$ compared to current production, $+8.4 \%$ compared to GDPR change
Are the above using different controls? I.e. is " $+3.2 \%$ compared to current production" assuming the GDPR change in experiment, or using assuming production setup in experiment? That is -- when this launches with the GDPR change, will we actually see a total gain, or will it still be a partial loss?

When this launches with the GDPR change we will see a total gain even compared to today before the GDPR change.

On Tue, May 8, 2018 at 11:45 PM,

```
wwrote:
```

Thanks for providing details
$\square$
On Wed, May 9, 2018 at 2:35 PM $\square$ wrote:
On Tue, May 8, 2018 at $9: 10 \mathrm{PM}, \square$ wrote:
A few quick questions about the launch:

- Will this impact only LH-off users, or will it also impact LH-on users?
i think this will impact LH-on users also. Eg, a user can have LH-on but have the GPS turned off, in which case we will fall back to using (using cell tower data).
- Do we have precision numbers for $\quad 5 \mathrm{~km}$ ? How frequently is the location completely off?
team for more stats.
As per this dashboard the AGSA non-LH user city accuracy is $80 \%$ for US and $-65 \%$ for IN. This change will result in us getting more complains about weather location being wrong even though we dont see a drop in iHNR.

It's true that with this we'll end up having less accurate location for some users, most
especially for users who had LH off and are now being forced to have $\square$ location instead of more accurate locations via background refreshes. Hopefully this can accuracy can be improved by the separate efforts for providing coarse grained location for these users, as described in step 2 of this doc and detailed in this PRD.

An additional option we can consider to experiment with post-launch is the use of confidence before using the supplied location value. Right now we don't specify it so we're using the default confidence that's used by rest of Search. We did consider having separate arms to experiment with different confidence levels but we already had several arms in the experiment and wanted to have a simple initial integration with $\square$ and focus on getting this out as soon as we could.

- I guess we didn't have time to run GCS for the notifications?

No. Crust is currently not supporting notifications. Also, note that a few years ago we had already approved and launched the use of $\quad$ for weather low priority notifications but then it broke as part of the migration. To some extent this change is fixing it.

- Do we have any hypothesis of why other notifications are dropping? Specially the soccer, music album and webkick ones (others are less impacted)? Are the drops only for low-priority notifications or also for passive? whats the breakdown?

There are many in this doc but we will need more time to narrow down. The drops are for passive notifications also.
Loss in low priority notifications (excluding
weather)
Loss in passive notifications (excluding
weather $\square$
The drops for low priority make sense because there's a limit to the number of low priority notifications we include and thus sending more weather (low-priority) notifications could affect the number of non-weather low-priority we see.

It also makes sense to have some drop in passive because reducing the number of location updates will reduce overall refreshes and thus impact passive notifications relying on refresh.

What still needs further investigation is why there's a discrepancy for a drop in notifications with and without integration. Agreed with suggestion to have a separate holdback to better understand what's going on.

On Tue, May 8, 2018 at 6:10 PM, $\square$ wrote:
$\square$
Since there are some unexplained loss of non-Weather notifications in this proposed launch here is a potential launch plan that we discussed with (subject to this launch approval)

1) Start ramping up (GDPR + this week and into next week 2) Setup a long running holdback (GDPR change Vs GDPR change + ) which we use for debugging going forward. This way we will be compliant and will have the ability to keep debugging.

On Tue, May 8, 2018 at 5:23 PM, $\qquad$ I
 wrote:

Had a typo in the experiment set up table, please see correction below


On Tue, May 8, 2018 at 2:37 PM,


Hi Quality Leads,
Above is the link to the completed Fast Track report. I have also pasted the report in full below.


- Enable inferred user location i
- Eval Information
- Overview
- Motivation
- Experiment Details
- Project Impact
- Analyst Recommendation
- Live Traffic Analvsis
- Metrics/Data Issues (Optional)
- Results
- Live Traffic Experiment Results
- Metrics Screenshots (In Comparison to GDPR Change)
- Metrics Screenshots (In Comparison to Current Production)
- Appendix
- Non-weather Notifications with Large Impression Drop


## Eval Information



For more details on the launch status, please visit the launchtool entry at:

## Overview

This launch enables inferred location in so it makes Now weather cards and notifications available for users who turned off LH (location history).
Basically this launch enables weather card notifications for those users, but this inferred location may be used for other cards/notifications using user location as well.

Related information: based weather cards and notification was launched in 2016 (Due to Now/Search unification $8 / 22$ 2016, the feature is effectively unlaunched.) $\qquad$ There was a try to launch location last year, but it wan't launched because of confounding LE results and it's deprioritized. In Q1 2018, with a GDPR change experiment, weather card and notifications lose $\sim 30 \%$ impressions because the inferred location information is missing and it's urgent to make it available.

## Motivation

GDPR change will immediately make $\sim 30 \%$ impressions loss for weather card and notifications without an alternative location information.

## Experiment Details

```
    with control = curent production
        with control = GDPR change NOT being sent for LH-off
users)
```

Note:

- In these experiments, weather notification click target is the same as production (as of 2018/05/08), i.e., going to SERP in en-* in US, IN, ID, AU, CA, UK, pt-* in BR, id-* in ID, and going to Feed card in other locales. There's concurrent discussion about whether to change that.
- In the Analyst Recommendation section, metrics are summarized assuming that we take ExperimentWith $\quad 5 \mathrm{~km}$ as the launch candidate. See metrics for all arms in the metrics screenshot section.


## Project Impact

Note: This experiment introduces a new location signal, thus increasing the weather notification impressions in a large amount: $+17.39 \%$ compared to current production, $+61.3 \%$ compared to GDPR change.
As a result, we observe Interactive DAU $+3.2 \%$ compared to current production, $+8.4 \%$ compared to GDPR change.

It is currently unknown how this launch will interact with the weather notification backoff model (launchcal).

## Analyst Recommendation

## Live Traffic Analysis

Note: The summary below is assuming that we take 5 km as the launch candidate.

In Comparison to GDPR change (which has to launch in compliance with GDPR):

- Interactive DAU +8.4\%
- Feed Interactive Users $+4.1 \%$ (based on data since $5 / 4$ )
- Weather Notifications: overall, impressions $+61.3 \%$, CTR $+11.3 \%$, whereas iHNR -
$2.16 \%(63.9 \% \rightarrow 62.5 \%)$. iHNR is down for both WEATHER_DEFAULT_NOTIF
$(63.2 \% \rightarrow 61.8 \%)$ and WEATHER_NEXT_DAY_DEGREE_DELTA_NOTIF $(66.3 \% \rightarrow$ $64.7 \%$ ).
- CTR for weather notifications shows a strong novelty effect (screenshot).
- Non-weather notifications: impressions $-5.7 \%$, CTR $+1.96 \%$, iHNR $+3.55 \%$.
- Impression drop mainly comes from: AT_A_PLACE_LOCATION -1.94\%, SPORTS_GAME_SOCCER $-8.84 \%$, SPORTS_VIDEO_HIGHLIGHTS $-5.19 \%$, REGULAR $-2.56 \%$, WEBKICK_EXPLICIT_INTEREST - $9.19 \%$, KE_NOW_ARTIST_TO_ALBUM -25.84\%
- Webkick cards: BooleanViews $+0.42 \%$, CTR $+0.84 \%$, LikeR $+4.84 \%$.

In Comparison to current production:

- Interactive DAU $+3.2 \%$
- Feed Interactive Users $+1.58 \%$ (based on data since $5 / 4$ )

Metrics/Data Issues (Optional) Results
Live Traffic Experiment Results
Rasta with control = curent production


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## Exhibit 224



Although I know how it works and what the difference between "Location" and "Location History" is, I did not know Web and App activity had anything to do with location. Also seems like we are not very good at explaining this to users.

Here is the screenshot from "My activity" setting:

And When You click on Learn More:
cheers


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On Tue, Aug 14, 2018 at 11:28 AM wrote:
Definitely confusing from a user point of view if we need googlers explain it to us:)

There are three location-related settings on Android: Location History: this controls whether your location is recorded in your timeline in Google Maps.

Location toggle on the device: simplifying a little, this controls whether GPS is enabled and can be found in the notification pulldown. If this is off, the phone will not attempt to determine its precise location. Most people never turn this off, since it will prevent Maps from telling you where you are.

Web and App Activity: a catch-all for recording search and Assistant query history. If you turn this off, you can't use Assistant.

The complaint in this article is that if you have Web and App Activity enabled and the location toggle enabled, then your search history entries contain your approximate location at the time you made the query. It's also not possible to remove them by clearing your location history, which is counter-intuitive - you have to clear your search history instead.

On Tue, Aug 14, 2018, 09:03
wrote:
It is a bit complicated, and we might need better messaging. There is a general location tracking for figuring out your home, work locations, and routines (you go to a cafe at the same time every week, then you might get a notification for that etc). This seems to run in the background all time.

But there is also a location information passed on with individual requests, like when you search for "Walmart", or ask for weather forecast. each app, search, news, home, etc seem to have a separate setting.

There is a valid use case. I might want to keep getting local results, while disabling always on location tracking. Or disable location in weather but keep it in news, etc.

On Monday, August 13, 2018 at 6:52:57 PM UTC-7, $\square$ wrote:
I agree with the article. Location off should mean location off; not except for this case or that case.

The current UI feels like it is designed to make things possible, yet difficult enough that people won't figure it out. New exceptions, defaulted to on, silently appearing in settings menus you may never see is <redacted>.

The general concept of what I'd like to see on the location settings :
Location: On/Off (Off disables everything; On enables the ones selected items)
Enable GPS location (on/off)
Enable Bluetooth location (on/off)
Enable Bluetooth to report, even when Bluetooth is off (on/off)
Enable Web/App Activity (on/off)
Enable ... (on/off)

We already have this menu/style for non-Google apps.

This way the user can see and set, in ONE place all of the items related to location. If users find it useful for all of the bluetooth settings to be together, then have the "enable bluetooth to report location when bluetooth is off" in both menus.

Btw. Thank you whomever added the option for bluetooth to not respond to queries when bluetooth is off. (It used to respond, thereby giving location information away, even when location and bluetooth were off.)

On Mon, Aug 13, 2018 at 7:06 AM, $\square$ wrote:

IIRC we've had reports like this in the past on this list but I don't remember major outlets like AP reporting this.
https://apnews.com/828aefab64d4411bac257a07claf0ecb
---

SAN FRANCISCO (AP) - Google wants to know where you go so badly that it records your movements even when you explicitly tell it not to.

An Associated Press investigation found that many Google services on Android devices and iPhones store your location data even if you've used privacy settings that say they will prevent it from doing so.

Computer-science researchers at Princeton confirmed these findings at the AP's request.

For the most part, Google is upfront about asking permission to use your location information. An app like Google Maps will remind you to allow access to location if you use it for
navigating. If you agree to let it record your location over time, Google Maps will display that history for you in a "timeline" that maps out your daily movements.

Storing your minute-by-minute travels carries privacy risks and has been used by police to determine the location of suspects - such as a warrant that police in Raleigh, North Carolina, served on Google last year to find devices near a murder scene. So the company will let you "pause" a setting called Location History.

Google says that will prevent the company from remembering where you've been. Google's support page on the subject states: "You can turn off Location History at any time. With Location History off, the places you go are no longer stored."

That isn't true. Even with Location History paused, some Google apps automatically store timestamped location data without asking.

For example, Google stores a snapshot of where you are when you merely open its Maps app. Automatic daily weather updates on Android phones pinpoint roughly where you are. And some searches that have nothing to do with location, like "chocolate chip cookies," or "kids science kits," pinpoint your precise latitude and longitude - accurate to the square foot - and save it to your Google account.

The privacy issue affects some two billion users of devices that run Google's Android operating software and hundreds of millions of worldwide iPhone users who rely on Google for maps or search.

Storing location data in violation of a user's preferences is wrong, said Jonathan Mayer, a Princeton computer scientist and former chief technologist for the Federal Communications Commission's enforcement bureau. A researcher from Mayer's lab confirmed the AP's findings on multiple Android devices; the AP conducted its own tests on several iPhones that found the same behavior.
"If you're going to allow users to turn off something called 'Location History, then all the places where you maintain location history should be turned off," Mayer said. "That seems like a pretty straightforward position to have."

Google says it is being perfectly clear.
"There are a number of different ways that Google may use location to improve people's experience, including: Location History, Web and App Activity, and through device-level Location Services," a Google spokesperson said in a statement to the AP. "We provide clear descriptions of these tools, and robust controls so people can turn them on or off, and delete their histories at any time."

To stop Google from saving these location markers, the company says, users can turn off another setting, one that does not specifically reference location information. Called "Web and App Activity" and enabled by default, that setting stores a variety of information from Google apps and websites to your Google account.

When paused, it will prevent activity on any device from being saved to your account. But leaving "Web \& App Activity" on and turning "Location History" off only prevents Google from adding your movements to the "timeline," its visualization of your daily travels. It does not stop Google's collection of other location markers.

You can delete these location markers by hand, but it's a painstaking process since you have to select them individually, unless you want to delete all of your stored activity.

You can see the stored location markers on a page in your Google account at myactivity.google.com, although they're typically scattered under several different headers, many of which are unrelated to location.

To demonstrate how powerful these other markers can be, the AP created a visual map of the movements of Princeton postdoctoral researcher Gunes Acar, who carried an Android phone with Location history off, and shared a record of his Google account.

The map includes Acar's train commute on two trips to New York and visits to The High Line park, Chelsea Market, Hell's Kitchen, Central Park and Harlem. To protect his privacy, The AP didn't plot the most telling and frequent marker - his home address.

Huge tech companies are under increasing scrutiny over their data practices, following a series of privacy scandals at Facebook and new data-privacy rules recently adopted by the European Union. Last year, the business news site Quartz found that Google was tracking Android users by collecting the addresses of nearby cellphone towers even if all location services were off. Google changed the practice and insisted it never recorded the data anyway.

Critics say Google's insistence on tracking its users' locations stems from its drive to boost advertising revenue.
"They build advertising information out of data," said Peter Lenz, the senior geospatial analyst at Dstillery, a rival advertising technology company. "More data for them presumably means more profit."

The AP learned of the issue from K. Shankari, a graduate researcher at UC Berkeley who studies the commuting patterns of volunteers in order to help urban planners. She noticed that her Android phone prompted her to rate a shopping trip to Kohl's, even though she had turned Location History off.
"So how did Google Maps know where I was?" she asked in a blog post .
The AP wasn't able to recreate Shankari's experience exactly. But its attempts to do so revealed Google's tracking. The findings disturbed her.
"I am not opposed to background location tracking in principle," she said. "It just really bothers me that it is not explicitly stated."

Google offers a more accurate description of how Location History actually works in a place you'd only see if you turn it off - a popup that appears when you "pause" Location History on your Google account webpage. There the company notes that "some location data may be saved as part of your activity on other Google services, like Search and Maps."

Google offers additional information in a popup that appears if you re-activate the "Web \& App Activity" setting - an uncommon action for many users, since this setting is on by default. That popup states that, when active, the setting "saves the things you do on Google sites, apps, and services ... and associated information, like location."

Warnings when you're about to turn Location History off via Android and iPhone device settings are more difficult to interpret. On Android, the popup explains that "places you go with your devices will stop being added to your Location History map." On the iPhone, it simply reads, "None of your Google apps will be able to store location data in Location History."

The iPhone text is technically true if potentially misleading. With Location History off, Google Maps and other apps store your whereabouts in a section of your account called "My Activity," not "Location History."

Since 2014, Google has let advertisers track the effectiveness of online ads at driving foot traffic , a feature that Google has said relies on user location histories.

The company is pushing further into such location-aware tracking to drive ad revenue, which rose 20 percent last year to $\$ 95.4$ billion. At a Google Marketing Live summit in July, Google executives unveiled a new tool called "local campaigns" that dynamically uses ads to boost in-person store visits. It says it can measure how well a campaign drove foot traffic with data pulled from Google users' location histories.

Google also says location records stored in My Activity are used to target ads. Ad buyers can target ads to specific locations - say, a mile radius around a particular landmark - and typically have to pay more to reach this narrower audience.

While disabling "Web \& App Activity" will stop Google from storing location markers, it also prevents Google from storing information generated by searches and other activity. That can limit the effectiveness of the Google Assistant, the company's digital concierge.

Sean O'Brien, a Yale Privacy Lab researcher with whom the AP shared its findings, said it is "disingenuous" for Google to continuously record these locations even when users disable Location History. "To me, it's something people should know," he said.
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## Exhibit 227



Launch information:


Approvers:



Launch Attributes:


## Search attributes

| Motivation | Motivation: Example Before Screenshot: Example After Screenshot: |
| :---: | :---: |
| Impact Summary |  |
| Demo |  |
| Project status | Pre-Launch (in development) |
| Analyst |  |
| Analyst |  |
| Impact Summary |  |
| Scope \& Platforms |  |
| Accessibility attribut |  |
| Needs accessibility review | No |
| GAR assessment Link or justification |  |
| Production attributes |  |
| Production Ticket ID |  |
| LCE status | None |
| SREs |  |
| GWS SRE |  |
| Search consulting |  |
| LCE tracking |  |
| Risky reason |  |
| LCE notes |  |
| Security attributes |  |
| Needs security review | No |
| Security Justification | Pc see |
| Security ticket(s) |  |

## Recipients:

