

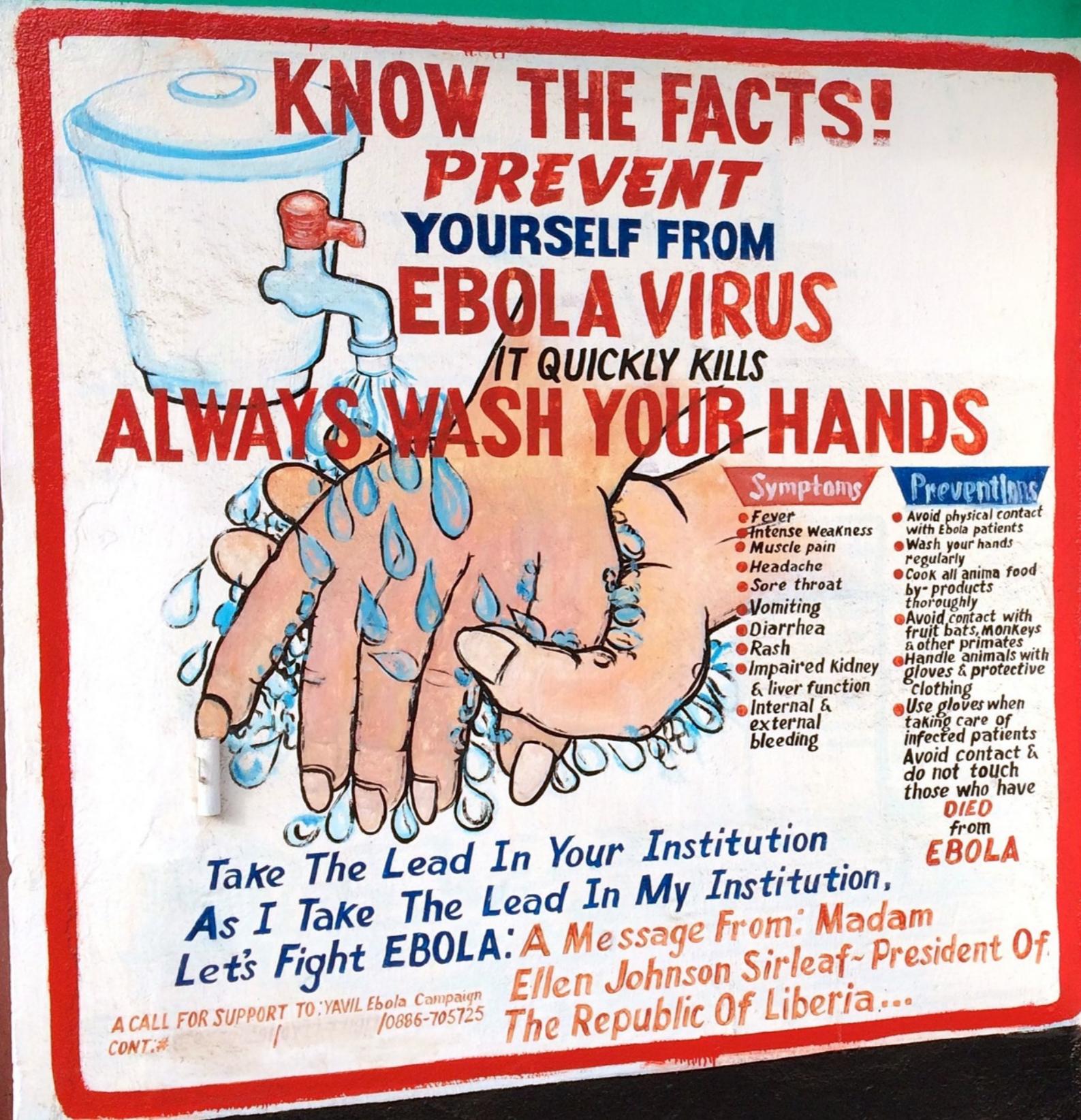
Good Tech for Hard Places: Fighting Ebola with Javascript Offline Apps

Patricia Garcia @patggs

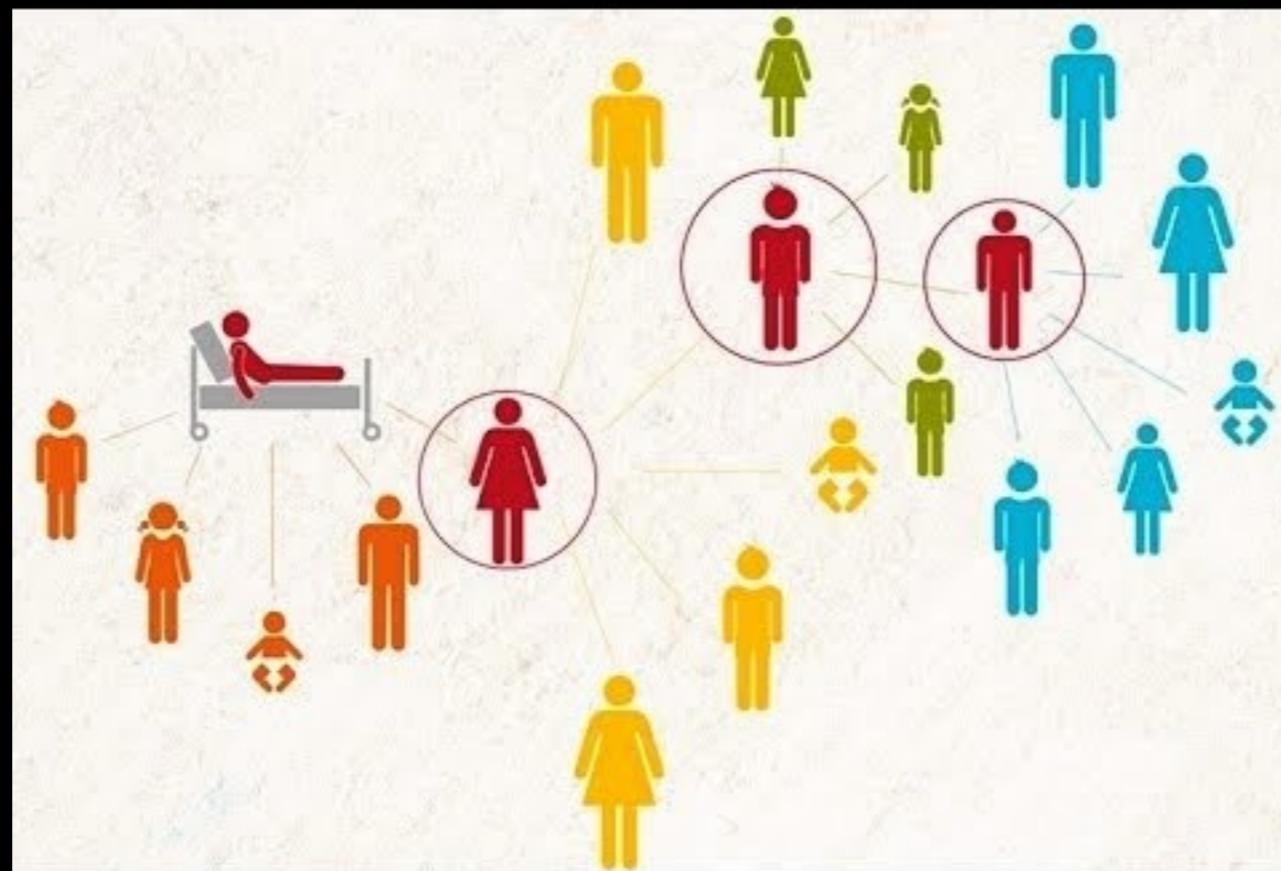


Say what?

- No confirmed treatment yet
- Contagion is by direct contact with body fluids of an infected person, no airborne
- Infected person is contagious only after developing symptoms
- Incubation period is up to 21 days



Contact tracing





If you suspect
someone with
EBOLA,
Please Call 117
immediately.

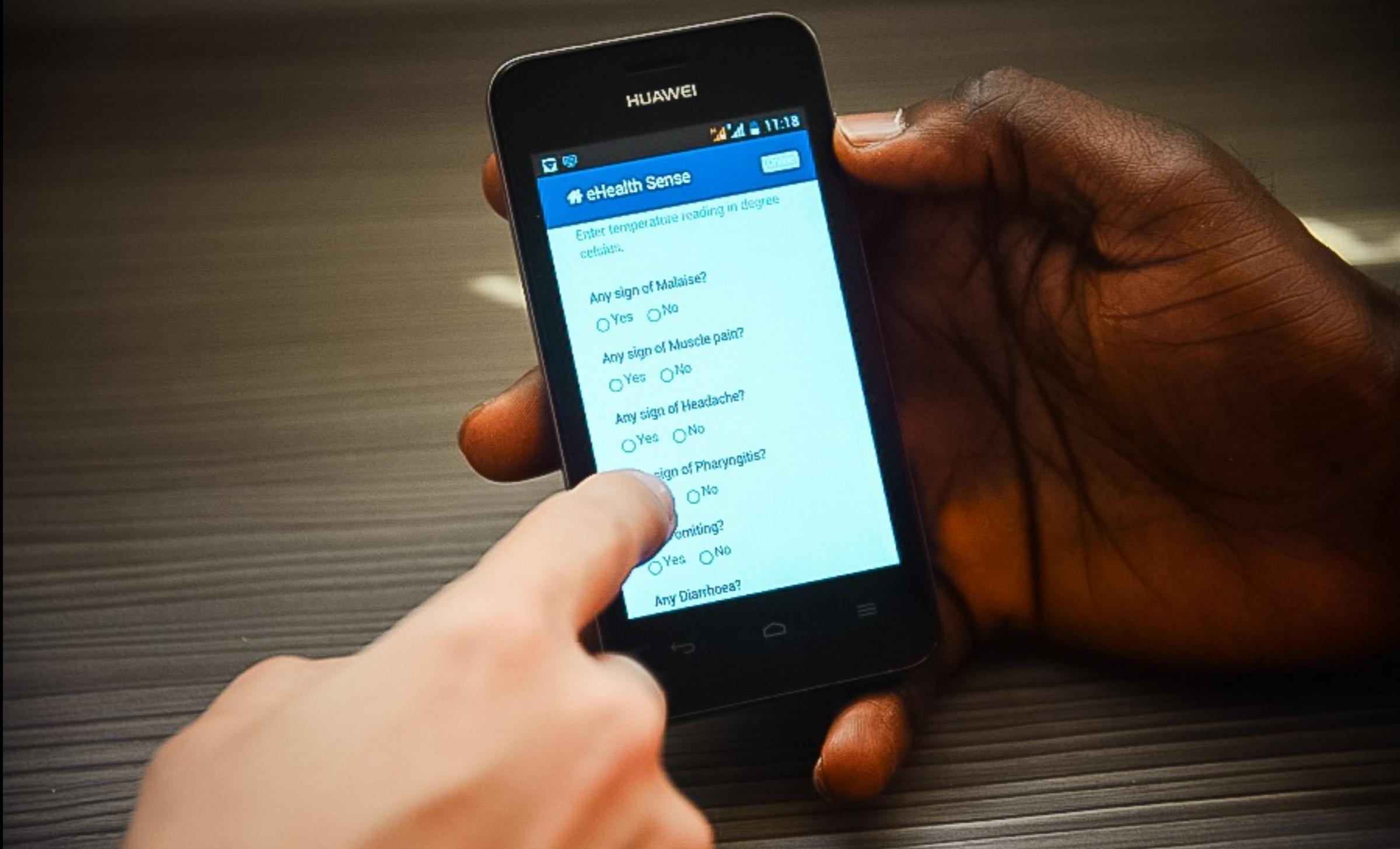
China CDC



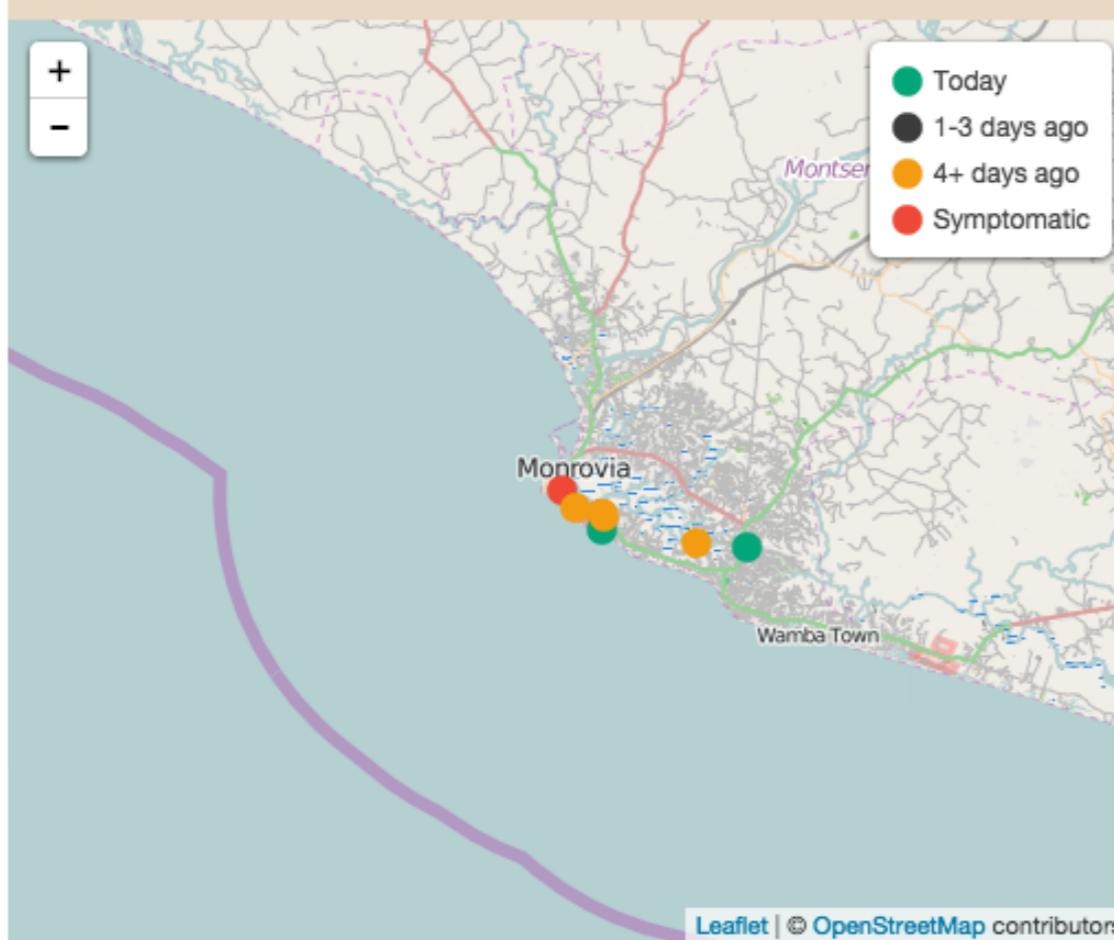
CHINESE CENTER FOR DISEASE CONTROL AND PREVENTION
NATIONAL INSTITUTE OF PUBLIC HEALTH







Follow Ups on Contacts



Follow Ups on Contacts

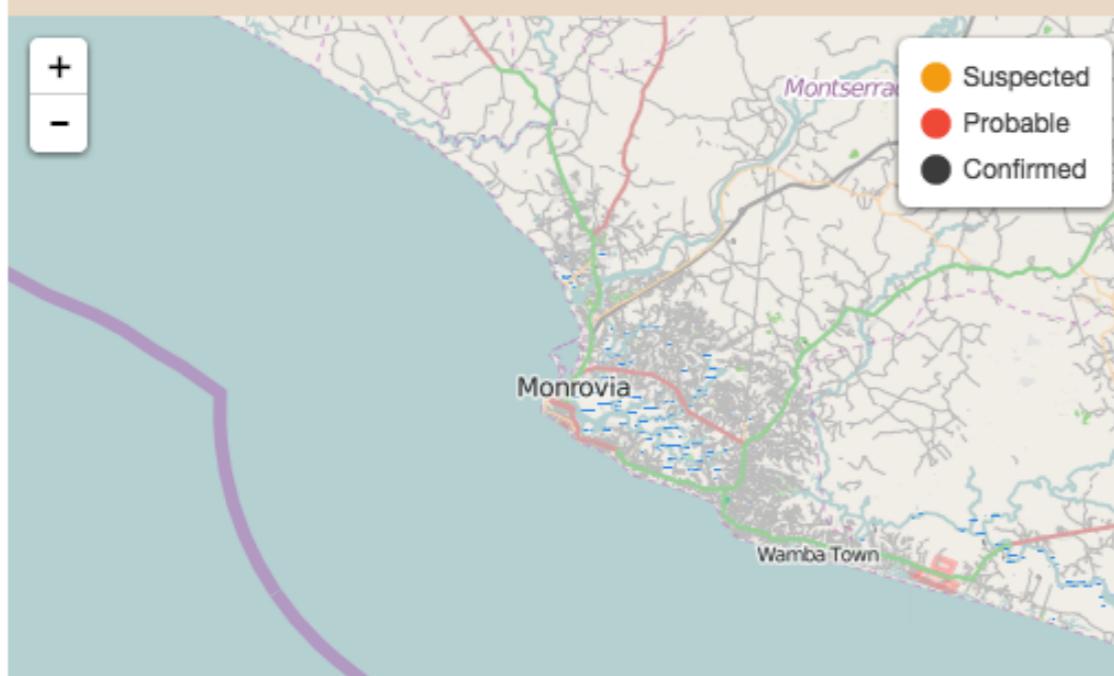
[All contacts CSV](#)
[Daily follow-up CSV](#)

Name	Time ▾	Interviewer	Temp	Mu	Mal	V	D	He	Re	P	Ha	Other
Helen Thomas	Mar 17, 2015	francesco	—	—	—	—	—	—	—	—	—	—
Helen Thomas	Mar 17, 2015	francesco	38	—	—	—	—	—	—	—	—	—
Alex Watila	Mar 17, 2015	riders name	36.9	—	—	—	—	—	—	—	—	—
Michael Wesseh	Mar 17, 2015	Francesco Kirchhoff	36.8	—	—	—	—	—	—	—	—	—
Bessie Wheeler	Mar 17, 2015	Francesco Kirchhoff	—	—	—	—	—	—	—	—	—	—
Stephen Dedalus	Mar 17, 2015	Francesco Kirchhoff	37.6	✓	—	—	✓	—	—	—	—	—
Alex Watila	Mar 17, 2015	Francesco Kirchhoff	36.8	—	—	—	—	—	—	—	—	—
Alex Watila	Mar 14, 2015	riders name	—	—	—	—	—	—	—	—	—	—
Alex Watila	Mar 14, 2015	riders name	36.9	—	—	—	—	—	—	—	—	—
Bessie Wheeler	Mar 13, 2015	Francesco Kirchhoff	—	—	—	—	—	—	—	—	—	—

Showing rows 1-10 of 577

[← Previous](#)
[Next →](#)

Cases



Symptomatic

No records available

QUARANTINE MANAGEMENT

DIGNIFIED BURIAL MANAGEMENT

DECONTAMINATION AND REPLACEMENT REPORT AS OF 10/10/2020				
1	2	3	4	TOTAL
3	3	1	1	10
2	3	1	1	7
3	1	1	1	3
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226	1	1	1	3
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Sorry NO
INTERNET Today

CouchDB to the rescue!

Apache CouchDB™ is a database
that uses JSON for documents,
JavaScript for MapReduce indexes,
and regular HTTP for its API



..and designed with distributed
systems in mind

CouchDB can be your backend!!



PouchDB is an open-source JavaScript database inspired by Apache CouchDB that is designed to run well within the browser

It enables applications to store data locally while offline, then synchronize it with CouchDB when the application is back online.



- First prototype of contact tracing app was ready in three (crunch time) days
- Same for call center app
- Both were in production within a week



“I have no idea what I’m doing”

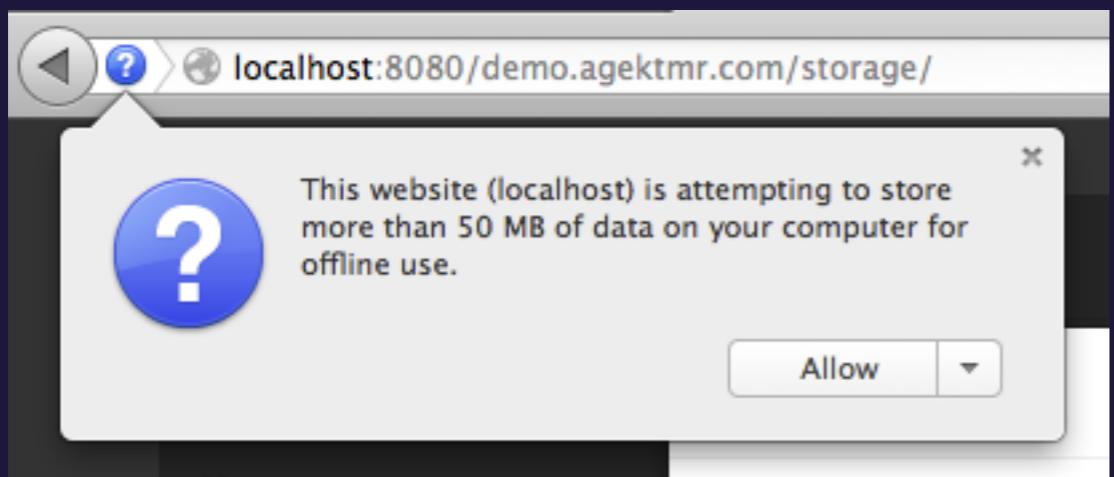
Scaling prototypes



```
PouchDB.sync('mydb', 'http://localhost:5984/mydb', {  
  live: true  
});
```

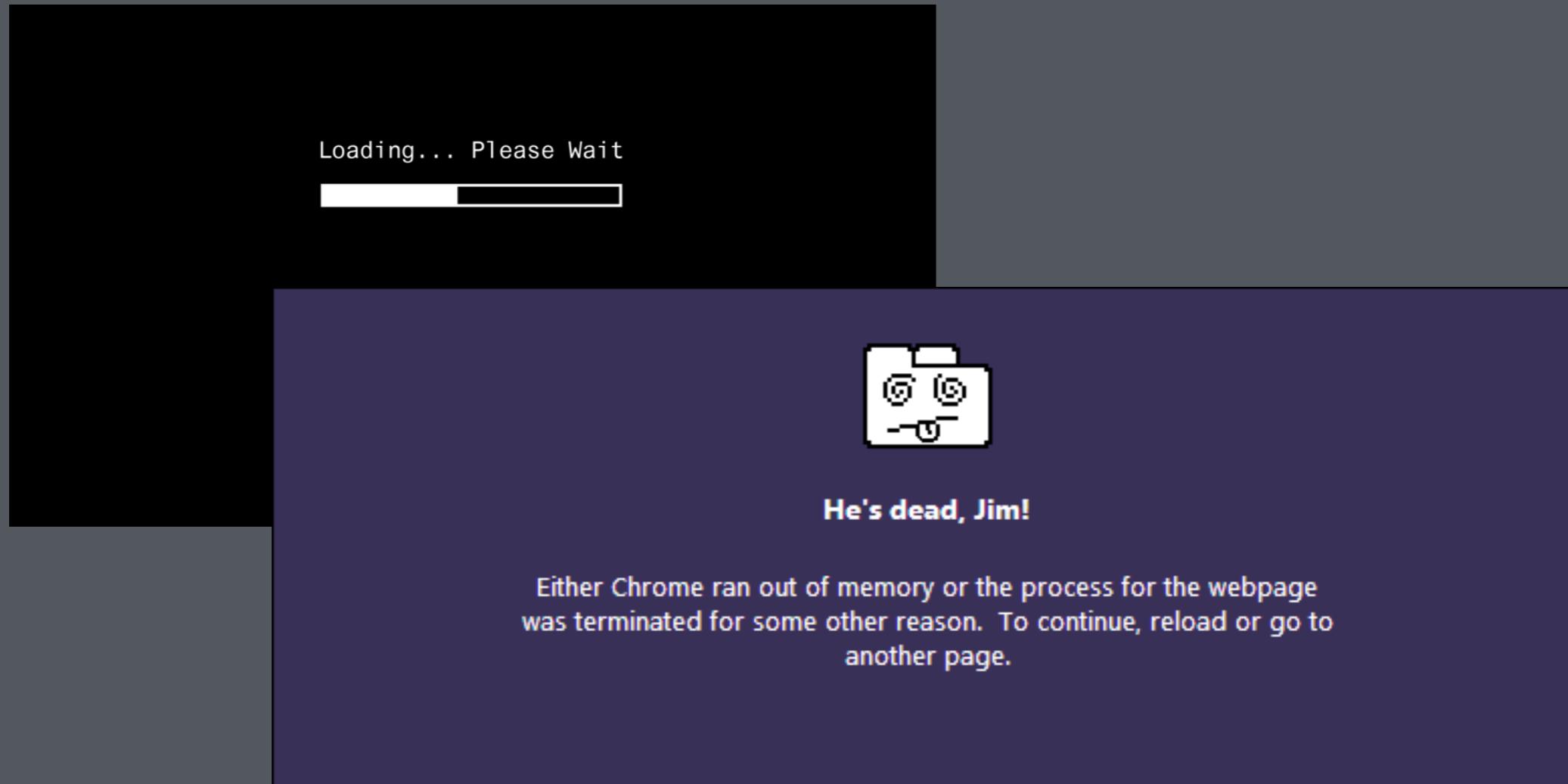
Not enough space

Browsers limit for IndexedDB:



- Firefox: prompt at 50 MB
- IE 10+: prompt at 10 MB, hard limit of 250 MB
- Chrome: 6.66 % of hard drive free space
- ...

Slow replication



Description

CouchDB replication is too slow.

And what makes it so slow is that it's just so unnecessarily chatty. During replication, you have to do a separate GET for each individual document, in order to get the full `_revisions` object for that document (using the `revs` and `open_revs` parameters – refer to [the TouchDB writeup](#) or [Benoit's writeup](#) if you need a refresher).

So for example, let's say you've got a database full of 10,000 documents, and you replicate using a batch size of 500 (batch sizes are configurable in PouchDB). The conversation for a single batch basically looks like this:

- REPLICATOR: gimme 500 changes since seq X (1 GET request)
 - SOURCE: okay
- REPLICATOR: gimme the `_revs_diff` for these 500 docs/`_revs` (1 POST request)
 - SOURCE: okay
- repeat 500 times:
 - REPLICATOR: gimme the `_revisions` for doc n with `_revs` [...] (1 GET request)
 - SOURCE: okay
 - REPLICATOR: here's a `_bulk_docs` with 500 documents (1 POST request)
 - TARGET: okay

See the problem here? That 500-loop, where we have to do a GET for each one of 500 documents, is a lot of unnecessary back-and-forth, considering that the replicator already knows what it needs before the loop starts. You can parallelize, but if you assume a browser (e.g. for PouchDB), most browsers only let you do ~8 simultaneous requests at once. Plus, there's latency and HTTP headers to consider. So overall, it's not cool.

This is a huge problem, especially in PouchDB where we often have to deal with CORS, meaning the number of HTTP requests is doubled. So for those 500 GETs, it's an extra 500 OPTIONS, which is just unacceptable.

What we have...

- Out of the box sync replicates the WHOLE DATABASE. Takes too much space
- Replication is too slow
- The number of requests is HUGE, can even crash the browser
 - * fixed in next version of CouchDB and PouchDB

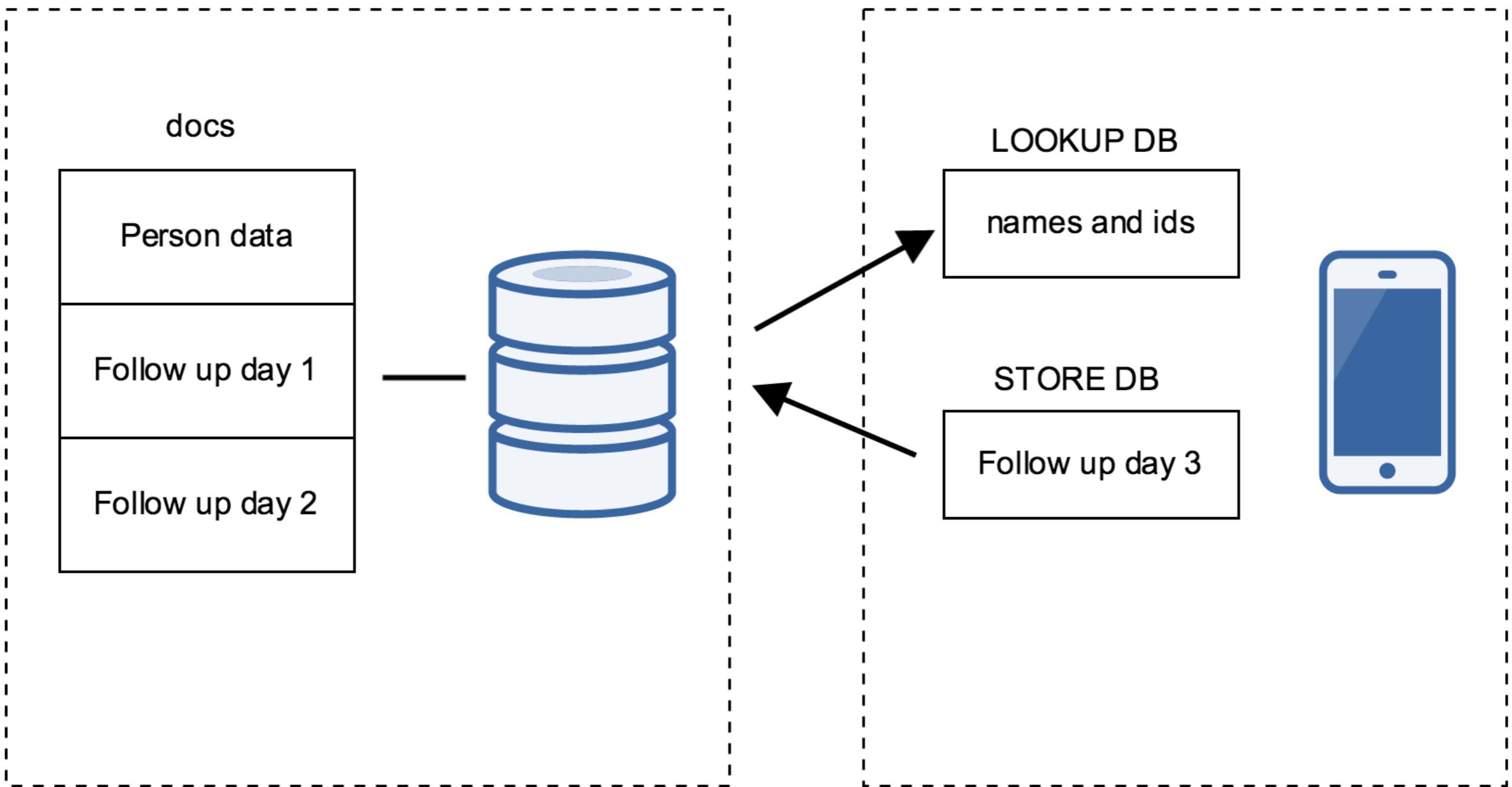
Think twice about using *just* sync with big databases!

Use your domain
knowledge!

Contact tracing mobile app

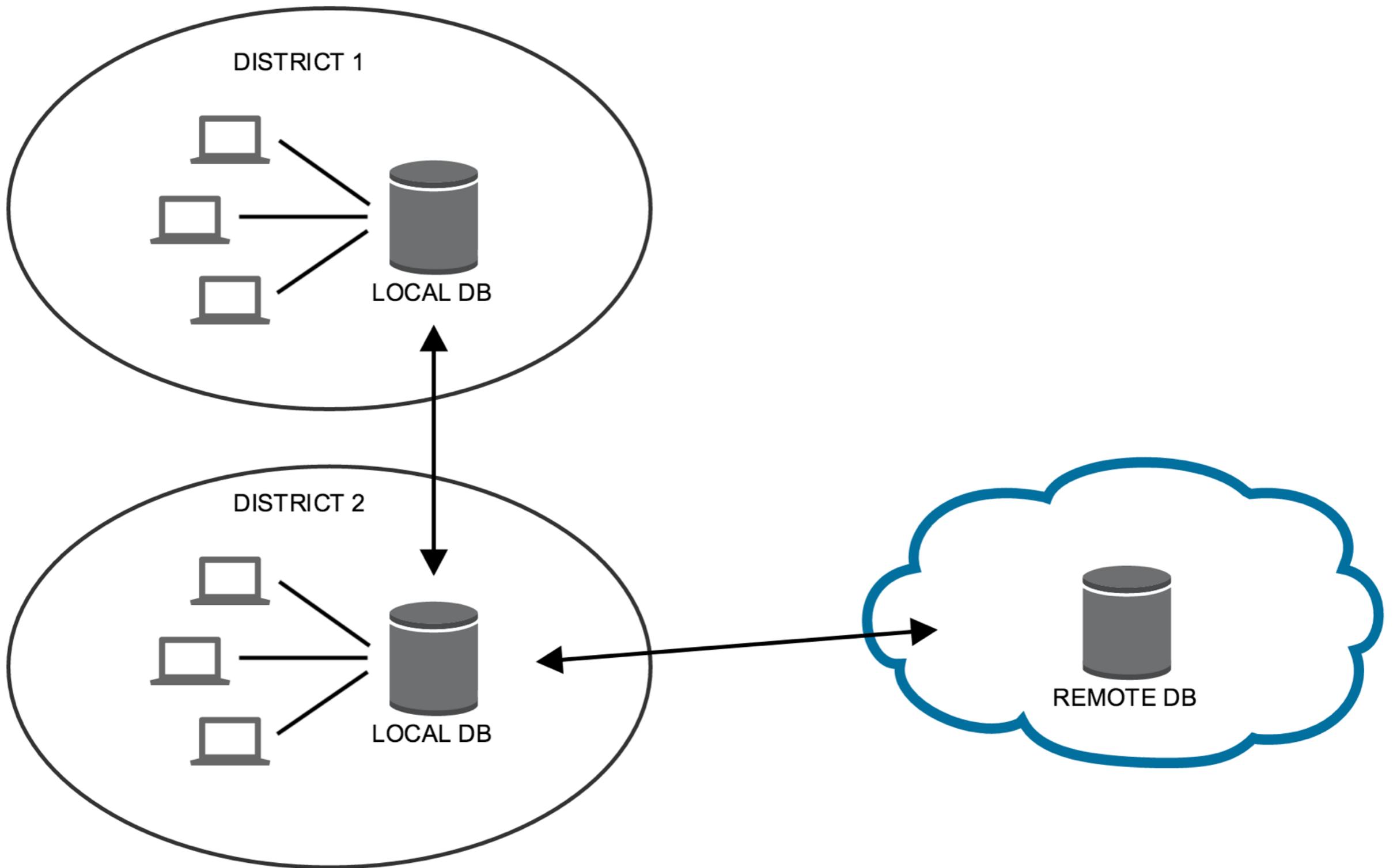
Which docs do we need in the local database?

- contacts created less than 21 days ago
- in my area
- not infected
- from those only the names and ids!



Call center

- Needed dataset much bigger than for contact tracing app
- Speed of sync between computers matters

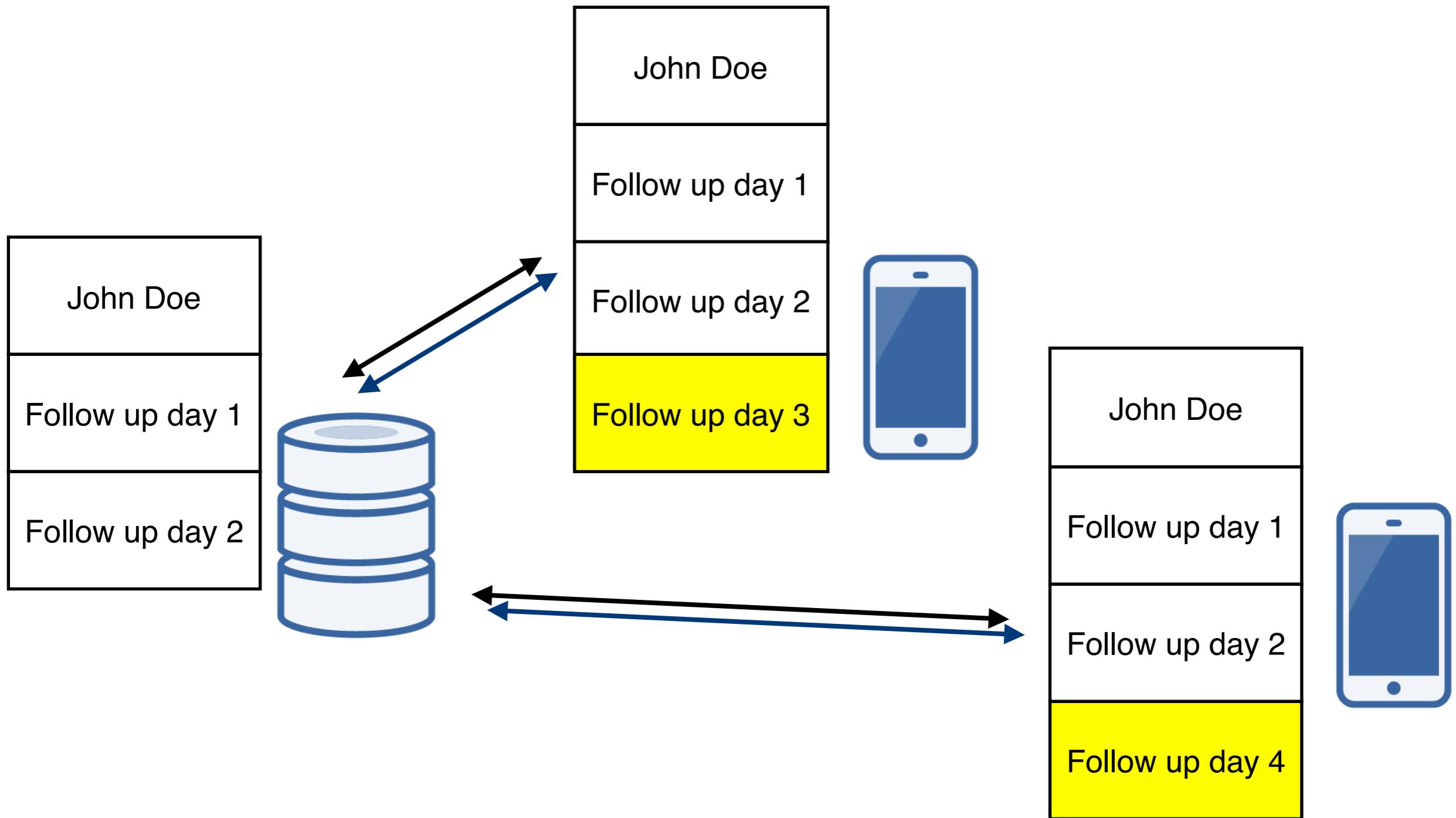


Solve real world problems

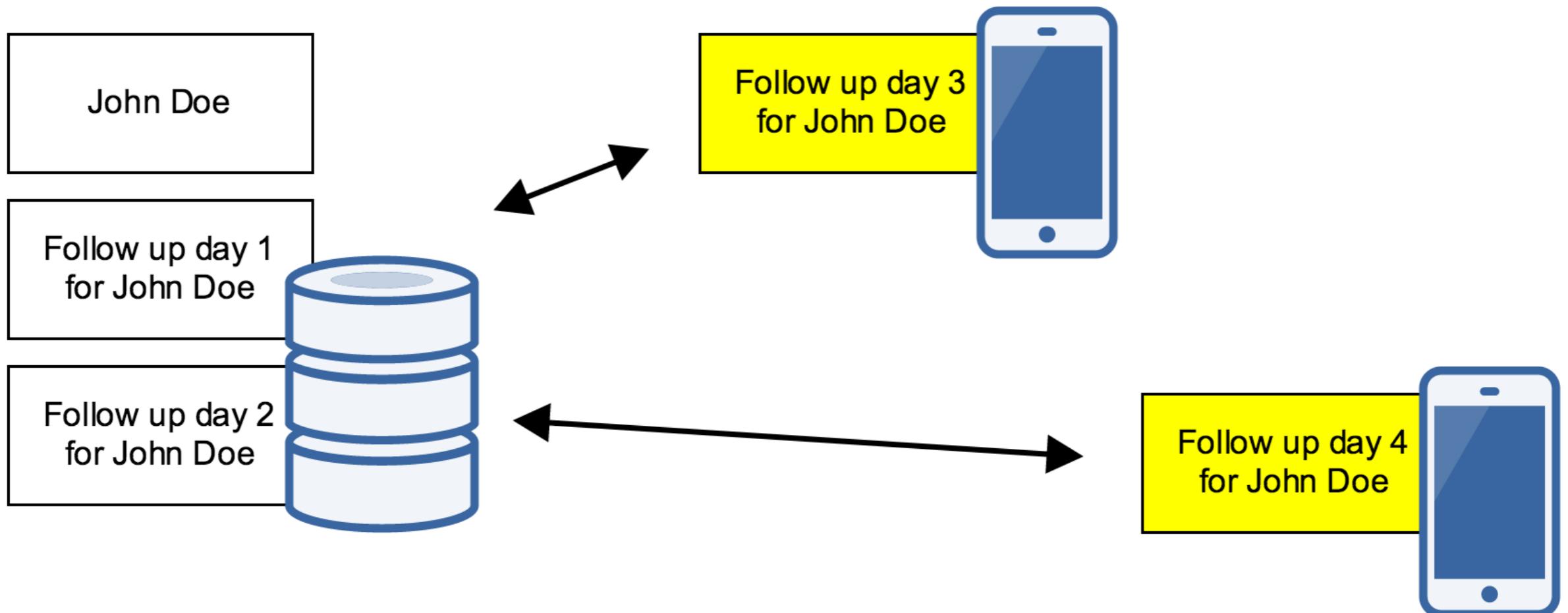
.. i.e. replicate only what you need

Conflicts





- Avoids conflicts
- Keeps the number of revisions low:
 - improves replication performance
 - use less storage



Choose your data
model wisely

Data loss



IndexedDB: temporary storage!

(Chrome)



→ When running out of temporary storage: ENTIRE data stored for the least recently used host gets deleted

https://developer.chrome.com/apps/offline_storage#temporary

Early Video Dating



Image: AP

State of the art tech

Get an expert if you
can

West Africa Ebola Outbreak

- **Guinea:** 2 new cases last week
- **Sierra Leone:** no new cases last week
- **Liberia:** outbreak ended Sep 15
- **Nigeria:** outbreak ended Oct 14

“Eventually—though no one can say when—the Ebola fighters are going to be victorious. The fog will clear, leaving the hard truth in view: this won’t be the last epidemic. And when the next one comes, the world must learn the lessons of this one: be better prepared, less fearful, less reactive. Run toward the fire and put it out together. “

Time Magazine, December 10, 2014, “The Ebola Fighters: The Ones Who Answered The Call”



Thanks!

@patggs