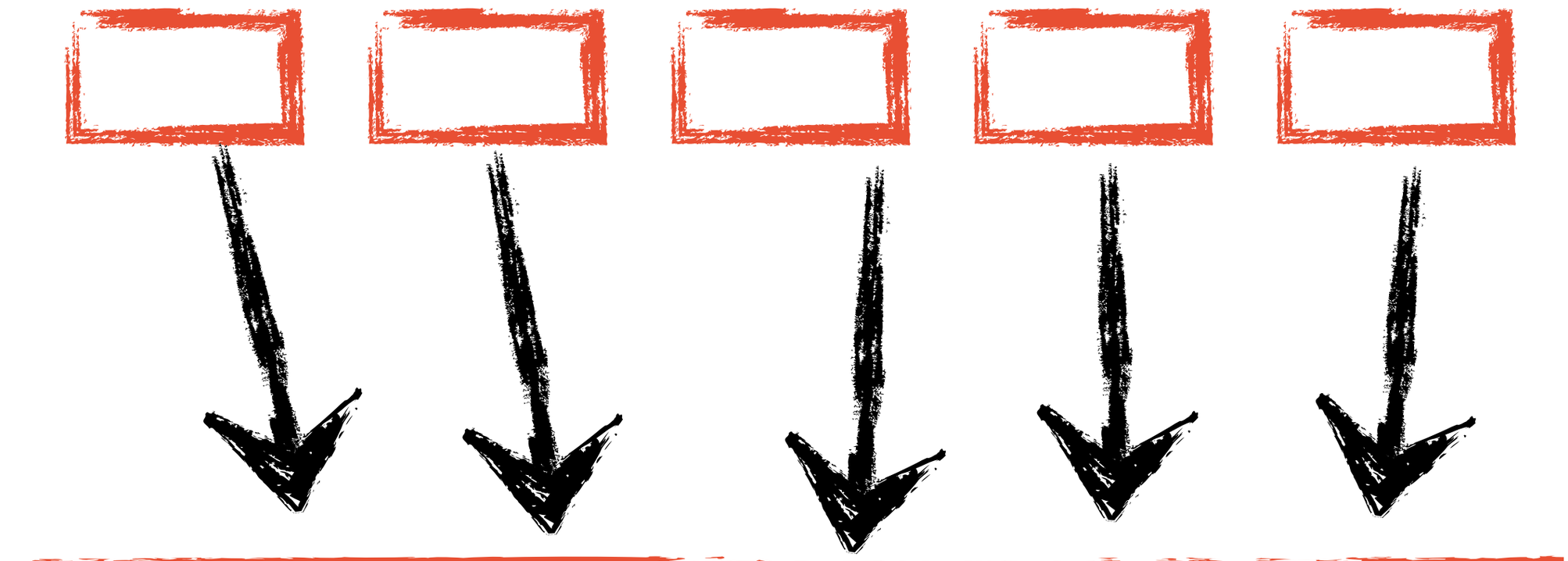
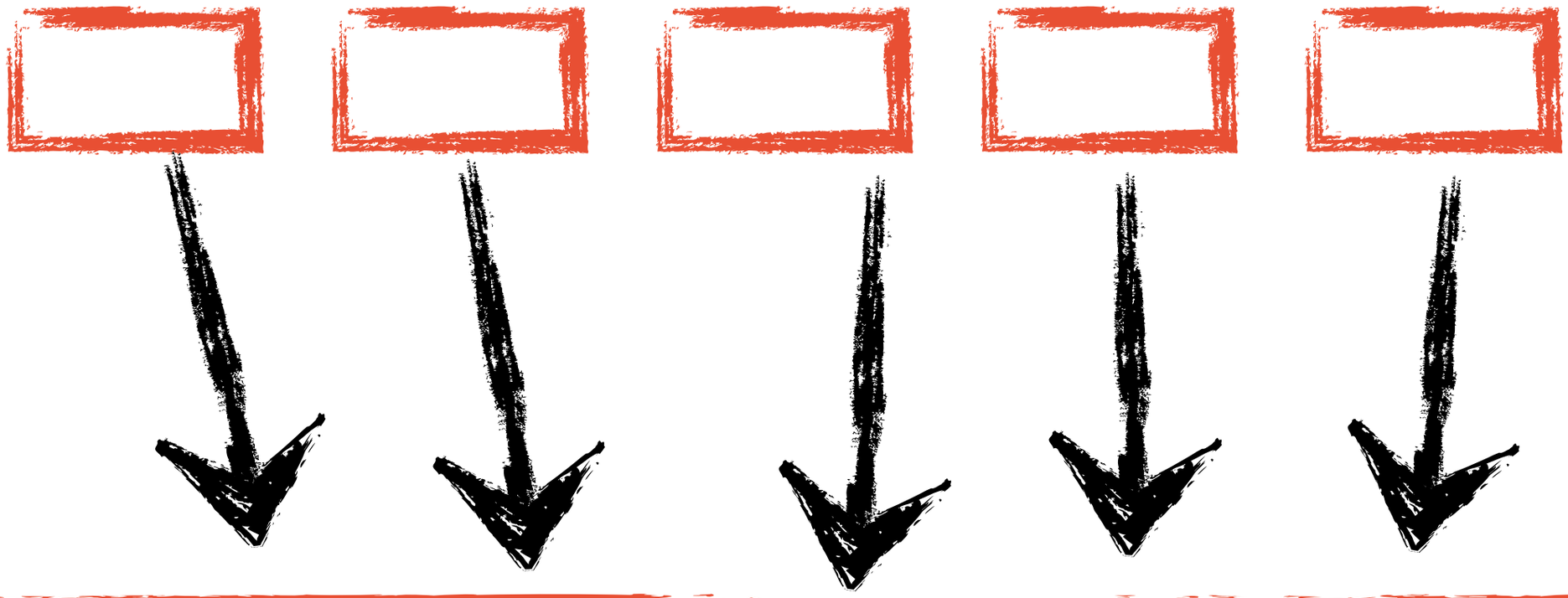
An example of Future composition in a real app

Phil Calçado
SoundCloud

the mothership



api.soundcloud.com



api.soundcloud.com

Search

Groups

Playlists

Msgs

Metadata

Stats

api.soundcloud.com

Groups

Metadata

Playlists

Search

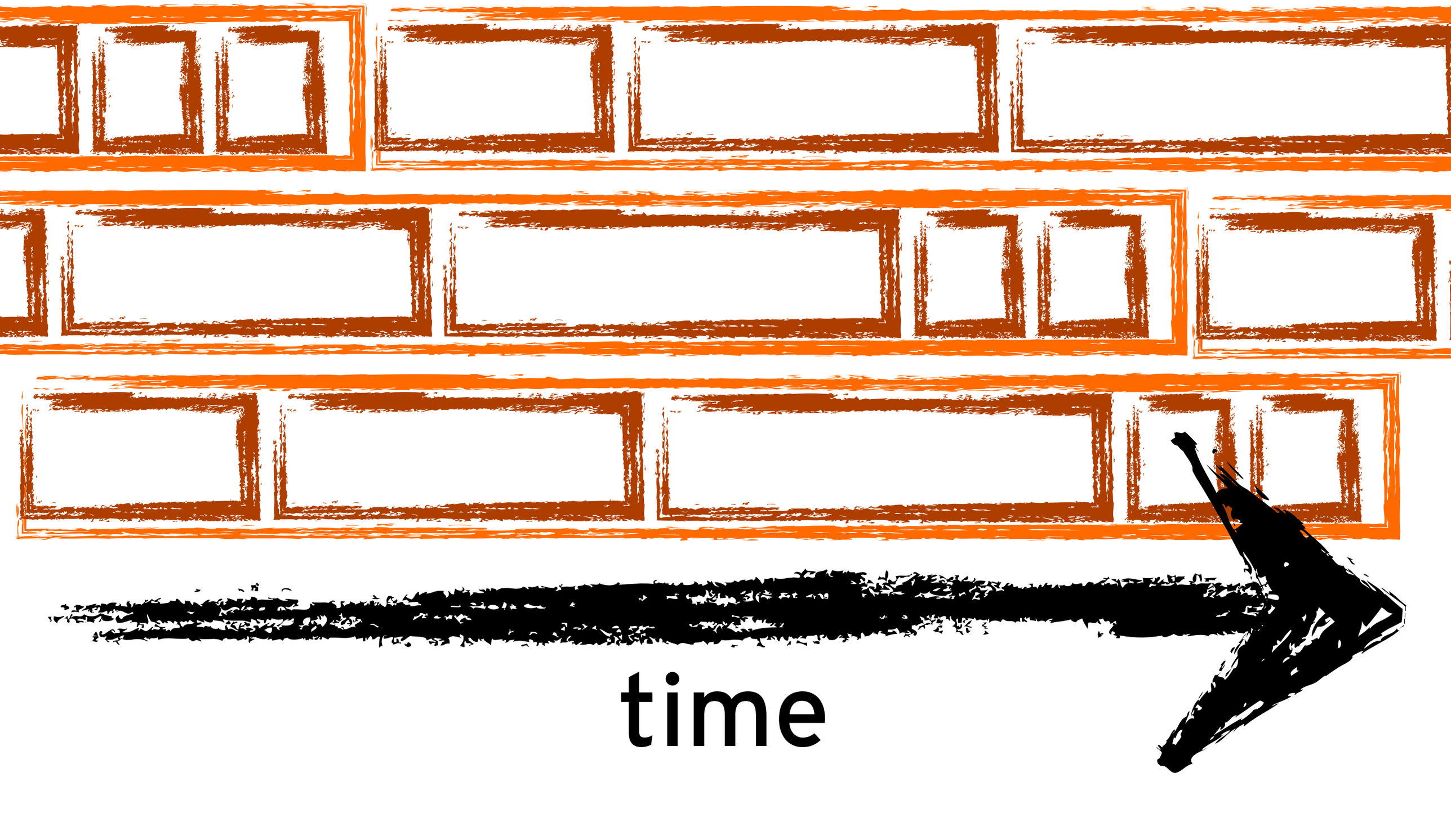
Social Graph

Messages

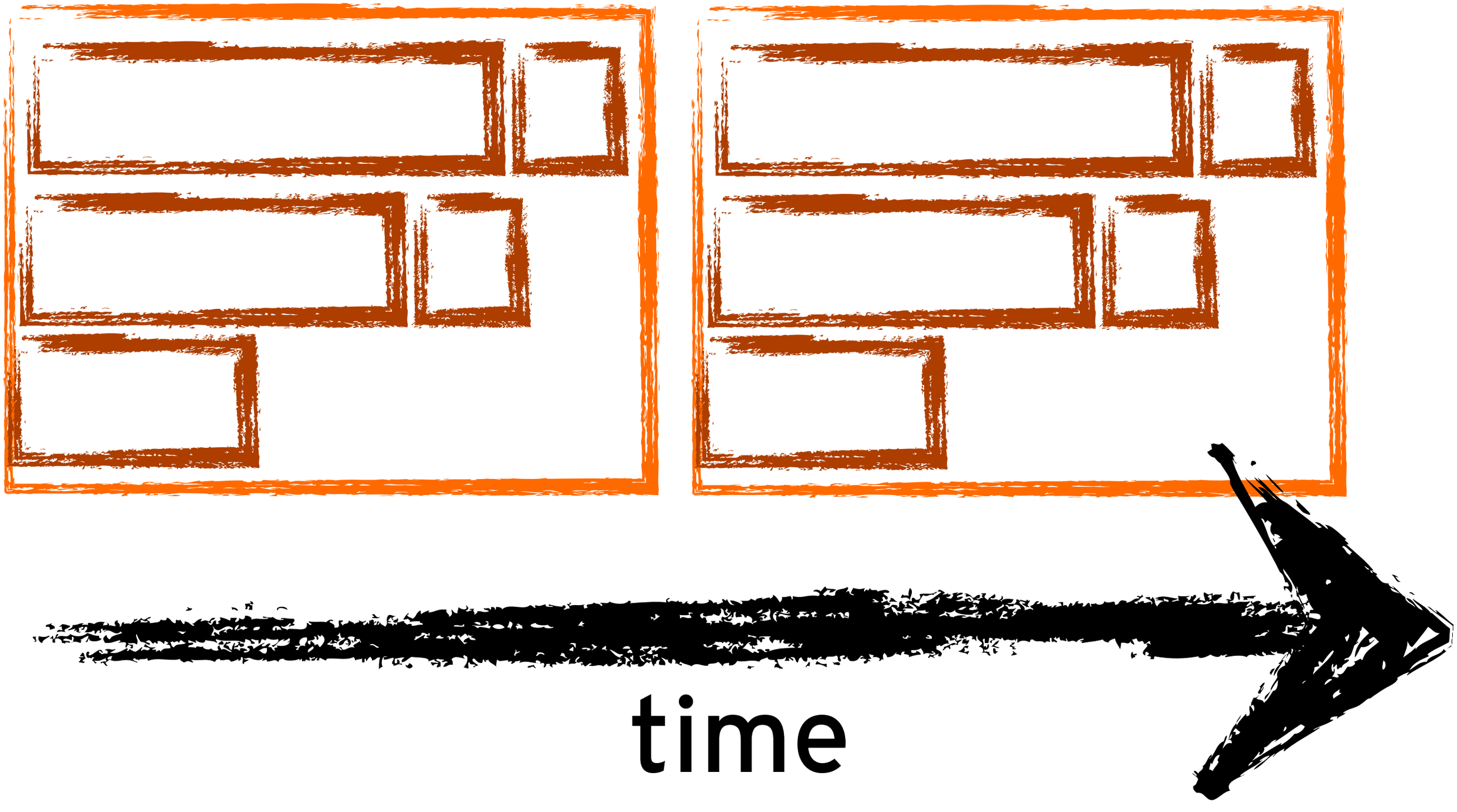
Stats

Rails doesn't like parallelism

parallelism is like



concurrency is like



ideal is like

rails is like

use case #1

sequential

```
def get_tracks_related_to(track_urn)
  related_tracks_urns = @recommender_client.get_related_to(track_urn)
  related_tracks_urns.take(5).map { |t| @metadata_client.get_data_for(t) }
end
```

use case #2

concurrent

```
def can_upload?(user_urn)
  warnings = @user_warnings_client.for_user(user_urn)
  spammer = @spam_detection_client.is_spammer?(user_urn)
  blocked = @blocked_users.is_blocked?(user_urn)
  warnings.empty? and (not spammer) and (not blocked)
end
```

enter

use case #1

sequential

```
def flatMap[B](f: A => Future[B]): Future[B]

def map[B](f: A => B): Future[B] = flatMap { a => Future { f(a) } }
```

```
def byUrn(session: UserSession, urns: Seq[Urn]): Future[Seq[Track]] = {
  urns.map { urn =>
    fetchOnlyTracksByUrn(session, urn).flatMap { onlyAvailableTracksJson =>
      buildFullTracks(session, onlyAvailableTracksJson)
    }
  }
}
```

maybe more readable

```
def byUrn(session: UserSession, urns: Seq[Urn]): Future[Seq[Track]] = {
  urns.map { urn =>
    for {
      onlyAvailableTracksJson <- fetchOnlyTracksByUrn(session, urn);
      fullTracks <- buildFullTracks(session, onlyAvailableTracksJson)
    } yield fullTracks
  }
}
```

use case #2

concurrent

```
/**
 * Take a sequence of Futures, wait till they all complete
 * successfully.  The future fails immediately if any of the joined
 * Futures do, mimicking the semantics of exceptions.
 *
 * @param fs a java.util.List of Futures
 * @return a Future[Unit] whose value is populated when all of the fs return.
 */
def join[A](fs: java.util.List[Future[A]]): Future[Unit]

/**
 * Collect the results from the given futures into a new future of
 * Seq[A]. If one or of the given Futures is exceptional, the resulting
 * Future result will be the first exception encountered.
 *
 * @param fs a sequence of Futures
 * @return a Future[Seq[A]] containing the collected values from fs.
 */
def collect[A](fs: Seq[Future[A]]): Future[Seq[A]]
```

not concurrent!

```
def byUrn(session: UserSession, urns: Seq[Urn]): Future[Map[Urn, Playable]] = {
  for {
    allTracks <- tracksRespository.byUrn(session,urns.filter(_.getCollection == "tracks"));
    allPlaylists <- playlistsRepository.byUrn(session, urns.filter(_.getCollection == "playlists"))
  } yield (allTracks ++ allPlaylists).map(p => (p.urn, p)).toMap[Urn, Playable]
}
```

ah!

```
def byUrn(session: UserSession, urns: Seq[Urn]): Future[Seq[Playable]] = {
  val allTracks:Future[Seq[Track]] = tracksRespository.byUrn(session, urns.filter(_.getCollection == "tracks"))
  val allPlaylists:Future[Seq[Playlist]] = playlistsRepository.byUrn(session, urns.filter(_.getCollection == "playlists"))

  val allFutures = allTracks.join(allPlaylists)

  allFutures.map {
    case (tracks, playlists) => (tracks ++ playlists).map(p => (p.urn, p)).toMap[Urn, Playable]
  }
}
```

example

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Phil Calçado

Phil Calçado
Berlin, Germany

1,250 | 23

Follow

Developer @ SoundCloud

PhilCalcado.com
pcalcado
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Heimatt. Phil Calçado — 1 day
Everyone's a Sinner
#Folk

3.31

▶ 2,438 | ♥ 81 | 28 | 14

Zap Records Phil Calçado — 1 day
Daniel Wilson - Young Rubbish EP
#Young Rubbish

15.04

iTunes — ♥ 111 | 47

Please Dream Again	▶ 6,889
Trigger Dance	▶ 4,117
Will You	▶ 10,355
Young Rubbish	▶ 2,208
If You Talk	▶ 1,656

View all tracks ›

35 playlists — View all


Phil Calçado
Stuff I found today
♥ 1


Phil Calçado
Liza meets Janine


Phil Calçado
Tarde de Sol
♥ 1

♥ 871 likes — View all

example

```
2014-07-07_12 INFO  [METADATA] - [49 ms] G  /playlists/soundcloud:playlists:998852/tracks -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [5 ms] GET /tracks/soundcloud:tracks%3A20474067 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks%3A20473473 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [METADATA] - [49 ms] G  /playlists/soundcloud:playlists:239774/tracks -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [5 ms] GET /tracks/soundcloud:tracks:20473473/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:20474067/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [METADATA] - [75 ms] GET /playlists/soundcloud:playlists:591159/tracks -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A3945911 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [METADATA] - [77 ms] GET /tracks/fetch?urns=soundcloud%3Atracks%3A50041[...]acks%3A3630226 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [8 ms] GET /tracks/soundcloud:tracks:3945911/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [2 ms] GET /visuals?urn=soundcloud%3Atracks%3A10630536 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [5 ms] GET /visuals?urn=soundcloud%3Atracks%3A10631916 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [5 ms] GET /visuals?urn=soundcloud%3Atracks%3A10631857 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [6 ms] GET /tracks/soundcloud:tracks:10631430/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [3 ms] GET /visuals?urn=soundcloud%3Atracks%3A8093842 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [8 ms] GET /tracks/soundcloud:tracks:10630536/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [8 ms] GET /visuals?urn=soundcloud%3Atracks%3A10631430 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A10630536 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:10631857/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A3631919 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A10631430 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [5 ms] GET /visuals?urn=soundcloud%3Atracks%3A4121006 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [6 ms] GET /visuals?urn=soundcloud%3Atracks%3A11932196 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A108647886 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [11 ms] GET /tracks/soundcloud:tracks:10631916/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [3 ms] GET /visuals?urn=soundcloud%3Atracks%3A122846830 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [7 ms] GET /tracks/soundcloud:tracks:134748154/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A5625837 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:10630536/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [7 ms] GET /visuals?urn=soundcloud%3Atracks%3A6183904 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [6 ms] GET /visuals?urn=soundcloud%3Atracks%3A3632399 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [7 ms] GET /visuals?urn=soundcloud%3Atracks%3A6183904 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [6 ms] GET /visuals?urn=soundcloud%3Atracks%3A3632399 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [4 ms] GET /visuals?urn=soundcloud%3Atracks%3A28651320 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [5 ms] GET /visuals?urn=soundcloud%3Atracks%3A5004134 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [6 ms] GET /visuals?urn=soundcloud%3Atracks%3A3630226 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [7 ms] GET /tracks/soundcloud:tracks:23947948/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [7 ms] GET /tracks/soundcloud:tracks:20473473/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [7 ms] GET /visuals?urn=soundcloud%3Atracks%3A17671873 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:3631919/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [11 ms] GET /tracks/soundcloud:tracks:8093842/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [7 ms] GET /visuals?urn=soundcloud%3Atracks%3A93518877 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:6953476/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [10 ms] GET /tracks/soundcloud:tracks:3630226/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:10631857/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [11 ms] GET /visuals?urn=soundcloud%3Atracks%3A6953476 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [8 ms] GET /tracks/soundcloud:tracks:11932196/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [8 ms] GET /tracks/soundcloud:tracks:23949338/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [7 ms] GET /tracks/soundcloud:tracks:109573017/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:4121006/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [10 ms] GET /tracks/soundcloud:tracks:108647886/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [12 ms] GET /tracks/soundcloud:tracks:10631430/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [12 ms] GET /tracks/soundcloud:tracks:28651320/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:17671873/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [11 ms] GET /tracks/soundcloud:tracks:93518877/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [11 ms] GET /tracks/soundcloud:tracks:5004134/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [8 ms] GET /tracks/soundcloud:tracks:112244513/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [VISUALS] - [7 ms] GET /visuals?urn=soundcloud%3Atracks%3A23949338 -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [16 ms] GET /tracks/soundcloud:tracks:6183904/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [16 ms] GET /tracks/soundcloud:tracks:3632399/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [13 ms] GET /tracks/soundcloud:tracks:10631916/purchase_links -> 200 OK (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [19 ms] GET /tracks/soundcloud:tracks:20474067/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [14 ms] GET /tracks/soundcloud:tracks:122846830/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  [PURCHASE] - [20 ms] GET /tracks/soundcloud:tracks:5625837/purchase_links -> 404 Not Found (soundcloud:applications:46941)
2014-07-07_12 INFO  API-V2 - [152 ms] GET /profile/soundcloud%3Ausers%3A200380?offset=6&limit=50 -> 200 OK (unknown)
```

example

50 or so 10-40ms requests

```
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:4121006/purchase_links -> 200 OK (soundcloud:applic
2014-07-07_12 INFO  [PURCHASE] - [10 ms] GET /tracks/soundcloud:tracks:108647886/purchase_links -> 200 OK (soundcloud:app
2014-07-07_12 INFO  [PURCHASE] - [12 ms] GET /tracks/soundcloud:tracks:10631430/purchase_links -> 200 OK (soundcloud:appl
2014-07-07_12 INFO  [PURCHASE] - [1  ms] GET /tracks/soundcloud:tracks:28651320/purchase_links -> 404 Not Found (soundclou
2014-07-07_12 INFO  [PURCHASE] - [9 ms] GET /tracks/soundcloud:tracks:17671873/purchase_links -> 404 Not Found (soundcloud
2014-07-07_12 INFO  [PURCHASE] - [11 ms] GET /tracks/soundcloud:tracks:93518877/purchase_links -> 404 Not Found (soundclou
2014-07-07_12 INFO  [PURCHASE] - [11 ms] GET /tracks/soundcloud:tracks:5004134/purchase_links -> 200 OK (soundcloud:appli
2014-07-07_12 INFO  [PURCHASE] - [8 ms] GET /tracks/soundcloud:tracks:112244513/purchase_links -> 404 Not Found (soundclou
2014-07-07_12 INFO  [VISUALS] - [7 ms] GET /visuals?urn=soundcloud%3Atracks%3A23949338 -> 200 OK (soundcloud:applications
2014-07-07_12 INFO  [PURCHASE] - [16 ms] GET /tracks/soundcloud:tracks:6183904/purchase_links -> 200 OK (soundcloud:appli
2014-07-07_12 INFO  [PURCHASE] - [16 ms] GET /tracks/soundcloud:tracks:3632399/purchase_links -> 404 Not Found (soundcloud
2014-07-07_12 INFO  [PURCHASE] - [13 ms] GET /tracks/soundcloud:tracks:10631916/purchase_links -> 200 OK (soundcloud:appl
2014-07-07_12 INFO  [PURCHASE] - [19 ms] GET /tracks/soundcloud:tracks:20474067/purchase_links -> 404 Not Found (soundclou
2014-07-07_12 INFO  [PURCHASE] - [14 ms] GET /tracks/soundcloud:tracks:122846830/purchase_links -> 404 Not Found (soundcl
2014-07-07_12 INFO  [PURCHASE] - [20 ms] GET /tracks/soundcloud:tracks:5625837/purchase_links -> 404 Not Found (soundcloud
2014-07-07_12 INFO  API-V2 - [152 ms] GET /profile/soundcloud%3Ausers%3A200380?offset=6&limit=50 -> 200 OK (unknown)
```

total response time is 152ms

interesting challenge:

how to detect/type missed concurrency opportunities?˝
aka. for comprehension abuse

phil calçado

http://philcalcado.com˝
@pcalcado˝

www.soundcloud.com˝