2021 GBFS Enhancements and Good Practice

February 16, 2021

North American Bikeshare Association | nabsa.net | hello@nabsa.net

#NABSA | @go_NABSA

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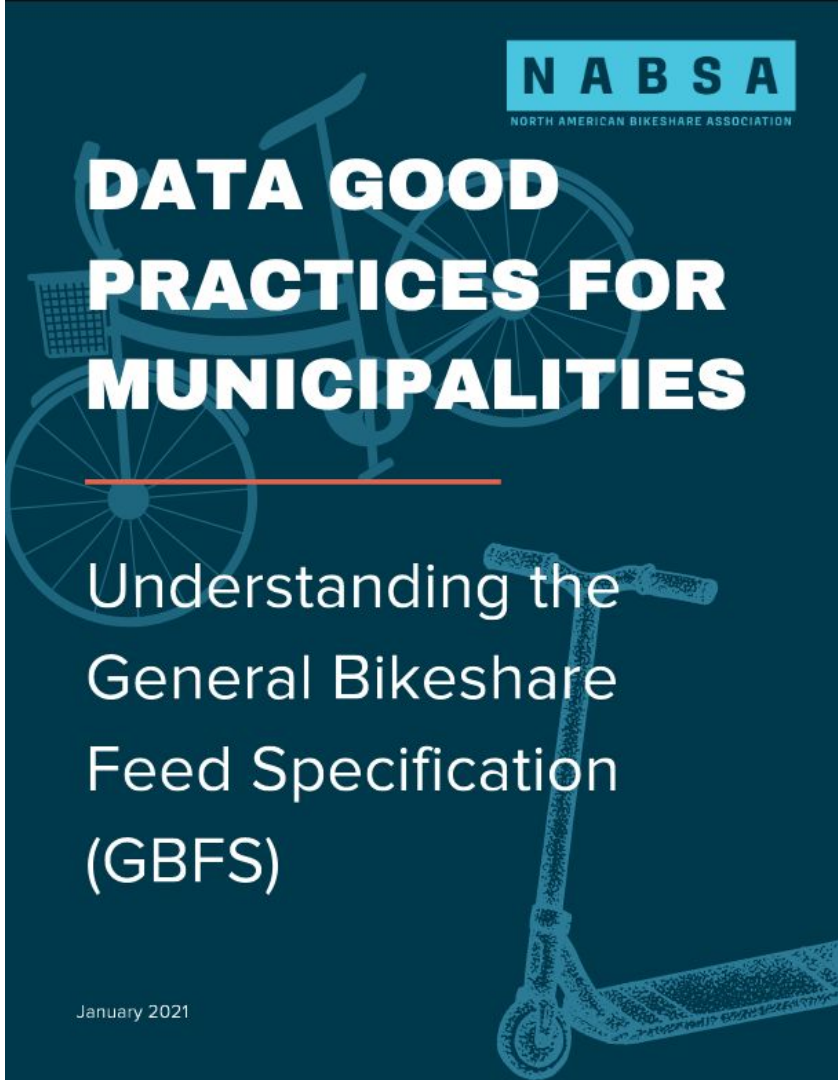
GBFS Guidance

Data Good Practices for Municipalities: Understanding the GBFS explains what GBFS is, what it is good for, and how to use it, and provides a list of recommended good practices for municipalities to ensure the most effective use of the specification.

Recommendations include:

- Requiring GBFS feeds to be publically accessible and do not require authentication
- Require that operators include their GBFS feed information in the systems.cvs file in the NABSA Github repository
- Participate in GBFS governance and enhancement directly!

nabsa.net/gbfs

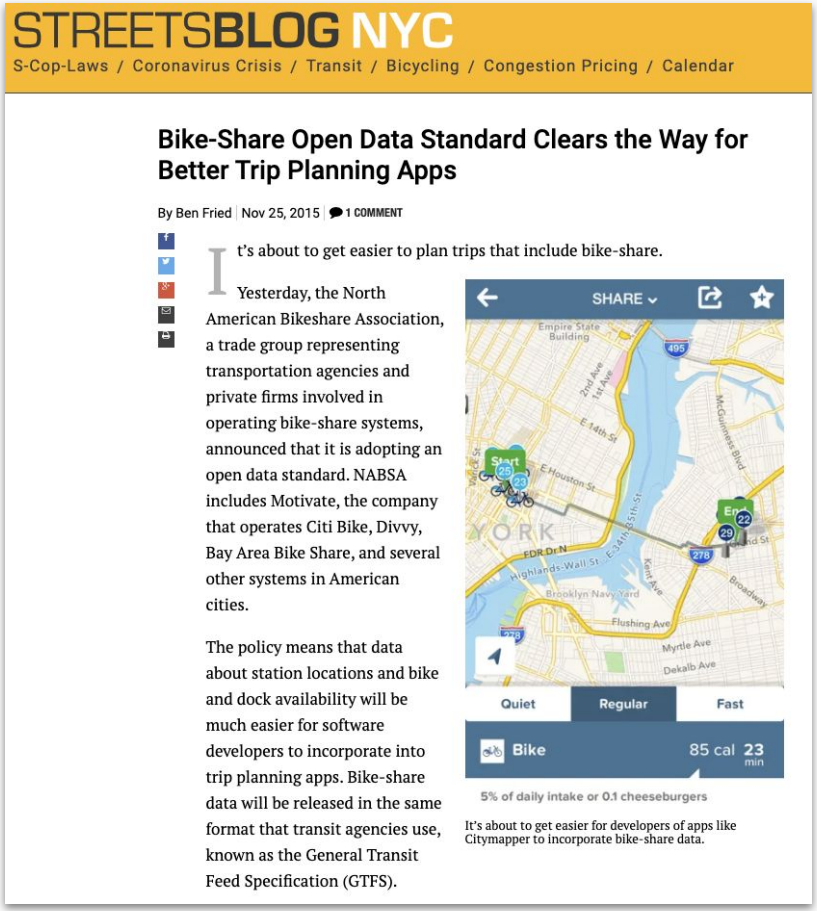


GBFS updates 2021

February 16th, 2021

Origins of GBFS

- ➔ Created by Mitch Vars in 2014 and adopted by **NABSA in 2015**.
- ➔ GBFS was first implemented by Social Bicycles in late 2015 and has since spread **across the globe.**
- ➔ In 2019, NABSA chose MobilityData to continue to **improve and enrich GBFS.**



STREETSBLOG NYC

S-Cop-Laws / Coronavirus Crisis / Transit / Bicycling / Congestion Pricing / Calendar

Bike-Share Open Data Standard Clears the Way for Better Trip Planning Apps

By Ben Fried | Nov 25, 2015 | 1 COMMENT

It's about to get easier to plan trips that include bike-share.

Yesterday, the North American Bikeshare Association, a trade group representing transportation agencies and private firms involved in operating bike-share systems, announced that it is adopting an open data standard. NABSA includes Motivate, the company that operates Citi Bike, Divvy, Bay Area Bike Share, and several other systems in American cities.

The policy means that data about station locations and bike and dock availability will be much easier for software developers to incorporate into trip planning apps. Bike-share data will be released in the same format that transit agencies use, known as the General Transit Feed Specification (GTFS).

It's about to get easier for developers of apps like Citymapper to incorporate bike-share data.

https://nyc.streetsblog.org/2015/11/25/bike-share-open-data-standard-clears-the-way-for-better-trip-planning-apps/

2014

How many bikes are available for rent?

Washington, DC	Denver, Co	Hamilton, Ont
"nbBikes": 13	"bikes": 7	"current_bikes": 9

GBFS Today

Field Name	REQUIRED	Type	Defines
`num_bikes_available`	Yes	Non-negative integer	Number of functional vehicles physically at the station that may be offered for rental. To know if the vehicles are available for rental, see `is_renting`. If `is_renting` = `true` this is the number of vehicles that are currently available for rent. If `is_renting` = `false` this is the number of vehicles that would be available for rent if the station were set to allow rentals.

Structure of GBFS

A collection of 13 files, some required and some optional that **describe shared mobility solutions** (self-serve bikes, scooters, etc.).

File Name	Required	Defines
gbfs.json	Yes *(as of v2.0)*	Auto-discovery file that links to all of the other files published by the system.
gbfs_versions.json *(added in v1.1)*	Optional	Lists all feed endpoints published according to versions of the GBFS documentation.
system_information.json	Yes	Details including system operator, system location, year implemented, URL, contact info, time zone.
vehicle_types.json *(added in v2.1-RC)*	Conditionally required	Describes the types of vehicles that System operator has available for rent. Required of systems that include information about vehicle types in the station_status and/or free_bike_status files. If this file is not included, then all vehicles in the feed are assumed to be non-motorized bicycles.
station_information.json	Conditionally required	List of all stations, their capacities and locations. Required of systems utilizing docks.
station_status.json	Conditionally required	Number of available vehicles and docks at each station and station availability. Required of systems utilizing docks.
free_bike_status.json	Conditionally required	Vehicles that are available for rent. Required of systems that offer vehicles for rent outside of stations.
system_hours.json	Optional	Hours of operation for the system.
system_calendar.json	Optional	Dates of operation for the system.
system_regions.json	Optional	Regions the system is broken up into.
system_pricing_plans.json	Optional	System pricing scheme.
system_alerts.json	Optional	Current system alerts.
geofencing_zones.json *(added in v2.1-RC)*	Optional	Geofencing zones and their associated rules and attributes.

Who’s using it?

450+ systems in 45 countries (that we know of)

United Arab Emirates	Canada	Spain	Iceland	Netherlands
Argentina	Switzerland	Finland	Italy	Norway
Austria	Chile	France	Lebanon	New Zealand
Aruba	Colombia	Great Britain	Liechtenstein	Poland
Bosnia and Herzegovina	Cyprus	Croatia	Latvia	Portugal
Belgium	Czechia	Hungary	Monaco	Romania
Bulgaria	Germany	Israel	Malta	Saudi Arabia
Brazil	Denmark	India	Mexico	Sweden
Slovenia	Slovakia	Turkey	Ukraine	United States

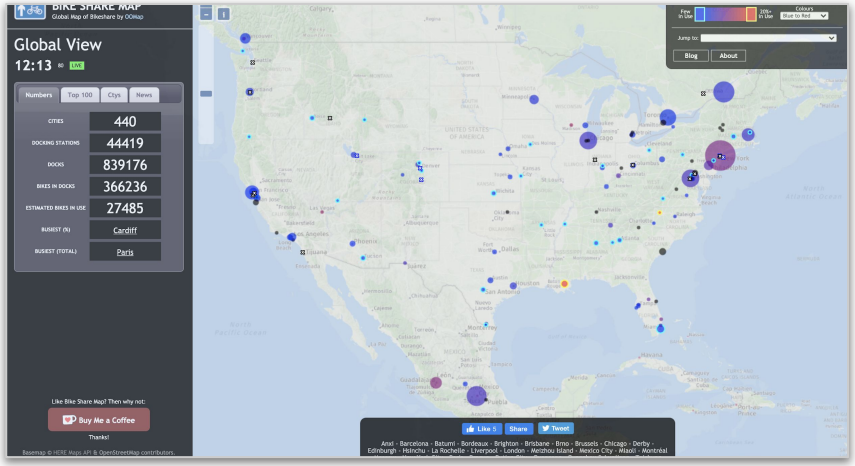
Functions of GBFS

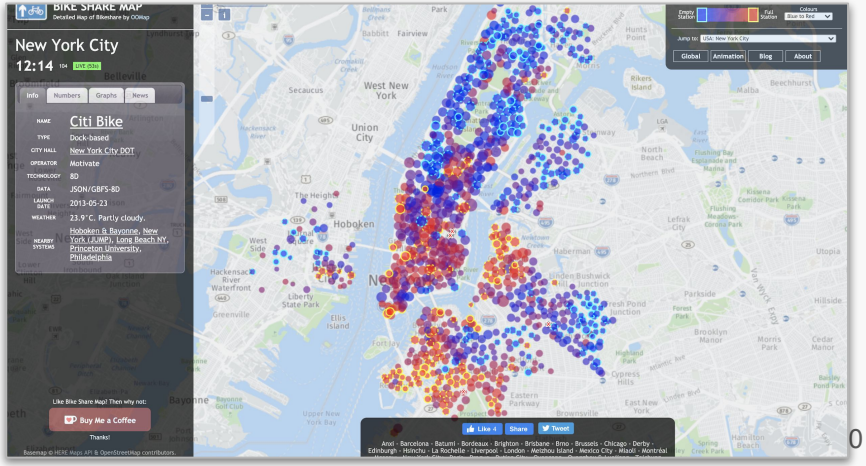
Describes the current state of a mobility system.

Supports real-time travel advice in GBFS-consuming applications.

Originally, GBFS allowed us to describe :

- ➔ Station and bike locations
- ➔ Bike and dock availability
- ➔ Station status (full or empty)
- ➔ Basic business rules and information



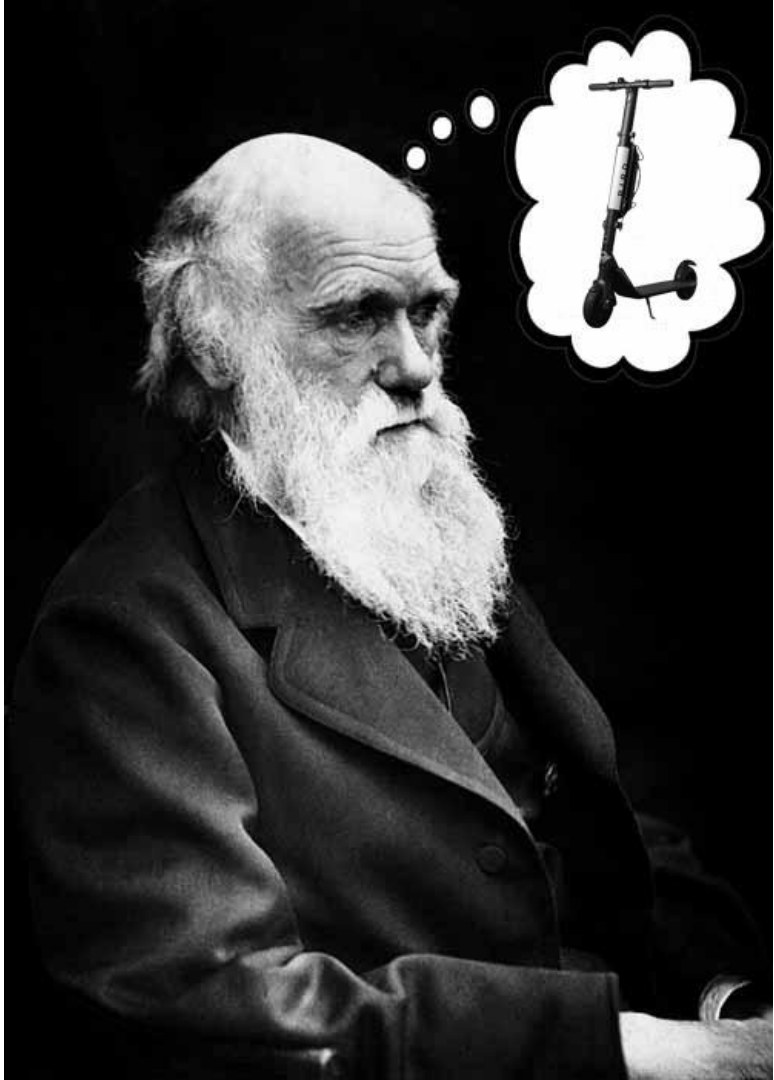


Bike Share Map

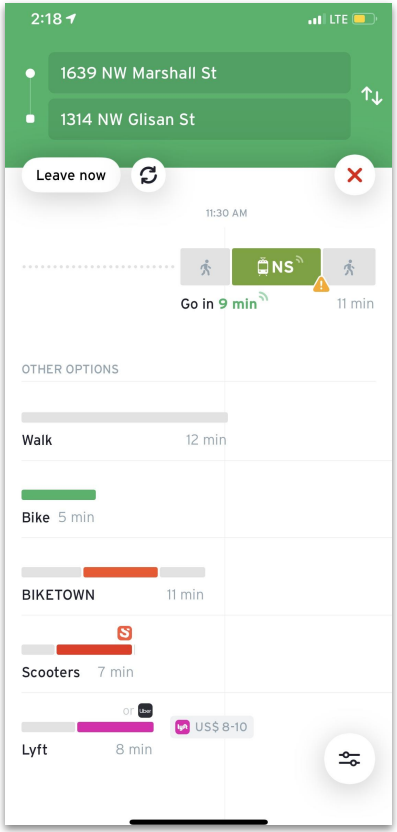
Evolution of GBFS

MobilityData has :

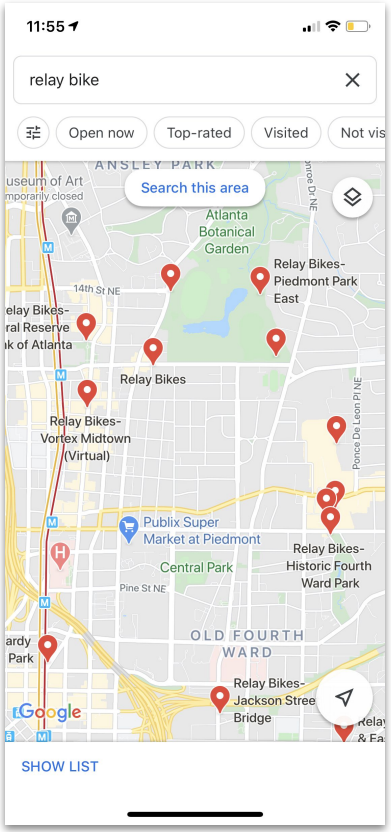
- ➔ Expanded the scope of GBFS
- ➔ Created a governance process
- ➔ Created a versioning process
- ➔ Prioritised the needs of the industry
- ➔ Revitalized the community
- ➔ Clarified, improved, and extended GBFS
- ➔ Developed best practices



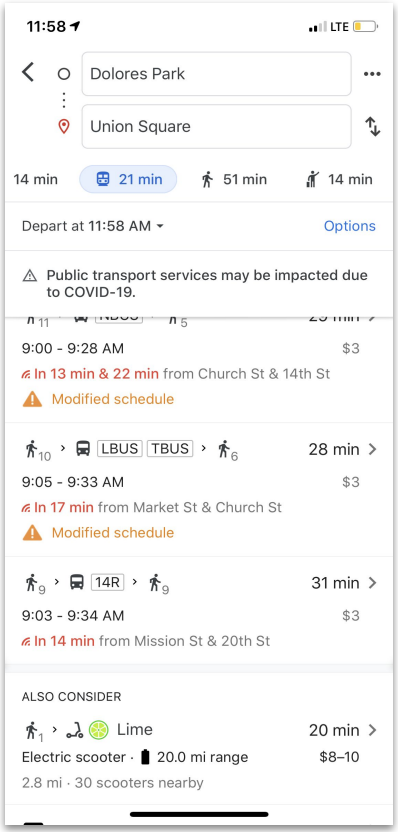
Use case examples



Transit App



Google Maps



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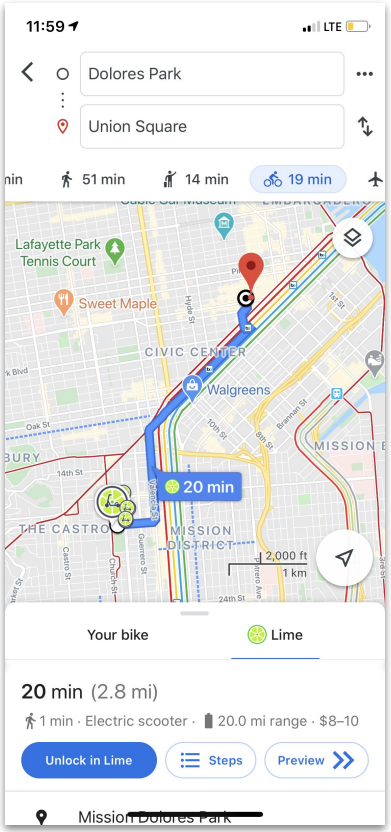


Google Maps

Where were we a year ago?

Needs:

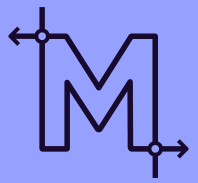
- ➔ Licensing
- ➔ Bike ID - privacy issues
- ➔ Vehicle types
- ➔ Geofencing
- ➔ Deeplinks
- ➔ Fares/pricing
- ➔ Versioning
- ➔ Best practices
- ➔ Governance

Progress since then

- ➔ Licensing - v3.0
- ➔ Bike ID - v2.0
- ➔ Vehicle types - v2.1RC
- ➔ Geofencing - v2.1RC
- ➔ Deeplinks - v1.1
- ➔ Fares/pricing - v2.1RC2
- ➔ Versioning - v1.1
- ➔ Best practices - adopted
- ➔ Governance - adopted
- ➔ JSON Schema

Future improvements

- ➔ Licensing - develop recommendations
- ➔ Bike ID - develop GBFS-Private specification
- ➔ Vehicle types - add vehicle types & accessories
- ➔ Geofencing - add more use cases & examples
- ➔ Deeplinks - require rotation
- ➔ Versioning - improved documentation
- ➔ Dataset catalog
- ➔ Car-sharing extension
- ➔ GBFS validator
- ➔ Policy guidance



Governance
&
Versioning

Governance and Overview of Change Process

- ➔ Open specification - Anyone can propose a change.
- ➔ Consensus model.
- ➔ Speculative features are discouraged.
- ➔ Backwards-compatible, when possible.

  - At least 3 votes in favor, in addition to the author of the Pull Request, are required for a proposal to pass. At least one of these votes must be from a producer and at least one from a consumer.
  - Implementation requirements are that both 1 producer and 1 consumer commit to implementing the changes.
  - Editorial changes as well as items that are not found in gbfs.md do not need to be voted on. Extensions that include new capabilities and features must be voted on.

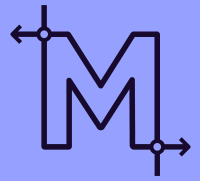
Full Governance Documentation

Versioning

- ➔ Current version is **v2.0.**
- ➔ A whole integer increase is used for breaking changes (MAJOR version). A decimal increase is used for non-breaking changes or patches (MINOR versions).
- ➔ Changes are placed into RC (Release Candidate) status pending implementation. Once implemented successfully, the changes are merged into an official release.
- ➔ v2.1RC2 (Release Candidate) has been partially implemented.

- v1.0
  - 2019 December 20 - GBFS copyright transfered to NABSA
  - 2015 November 05 - GBFS V1.0 Adopted by NABSA board - Original draft spec in a Google doc (reference only)
  - 2015 August - Latest changes incorporated and name change to GBFS (comments from Motivate, 8D, others)
  - 2015 June - Proposed refinements (prepared by Jesse Chan-Norris on behalf of Motivate)
  - 2015 January - NABSA Draft (prepared by Mitch Vars)
- v1.1-RC (Release Candidate)
  - #25 - Add deep links for iOS, Android, and web apps
  - #181 - Add `feed_contact_email` field to `system_information.json`
  - #188 - GBFS documentation versioning and and feed conformance (adds `gbfs_versions.json`)
- v1.1
  - #25 - Add deep links for iOS, Android, and web apps
  - #181 - Add `feed_contact_email` field to `system_information.json`
  - #188 - GBFS documentation versioning and and feed conformance (adds `gbfs_versions.json`)
- v2.0-RC (Release Candidate)
  - #182 - Require `license_url` , add attribution fields
  - #189 - Require autodiscovery gbfs.json file, define feed names
  - #195 - Clarify `num_bikes_available` and `num_docks_available`
  - #196 - Change boolean from 1/0 to true/false
  - #147 - Rotate `bike_id` on `free_bike_status`
- **v2.0: Current version**
  - #189 - Require autodiscovery gbfs.json file, define feed names
  - #195 - Clarify `num_bikes_available` and `num_docks_available`
  - #196 - Change boolean from 1/0 to true/false
  - #147 - Rotate `bike_id` on `free_bike_status`
- v2.1-RC (Release Candidate)
  - #136 - Add vehicle type definitions
  - #219 - Add geofencing, virtual station, and dockless support
- v2.1-RC2 (Release Candidate)
  - #261 - Aggregate available vehicle_types at a station
  - #252 - Extend system_pricing_plans.json
- v3.0-RC (Release Candidate)
  - #182 - Require `license_url` , add attribution fields

Version History



Licensing

Common Data Licenses

Licensing of GBFS data provides certainty to GBFS consumers, allowing them to integrate GBFS data into their work. A permissive license will likely permit more apps and developers to ingest GBFS data.

- Open Source (SPDX) or custom
- Specified using **`license_id`** or **`license_url`**
- Required starting with v3.0

SPDX License Identifier	*Full name*	*Human-readable license summary*	*License text*	*Requires attribution*	*Share-alike (viral)*
CC0-1.0	Creative Commons Universal Public Domain Dedication 1.0	Summary @ creativecommons.org	Text @ creativecommons.org	No	No
CC-BY-4.0	Creative Commons Attribution 4.0 International	Summary @ creativecommons.org	Text @ creativecommons.org	Yes	No
CDLA-Permissive-1.0	Community Data License Agreement Permissive 1.0	Summary @ cdla.io	Text @ cdla.io	Yes	No
ODC-By-1.0	Open Data Commons Attribution License 1.0	Summary @ opendatacommons.org	Text @ opendatacommons.org	Yes	No

Common Data Licenses

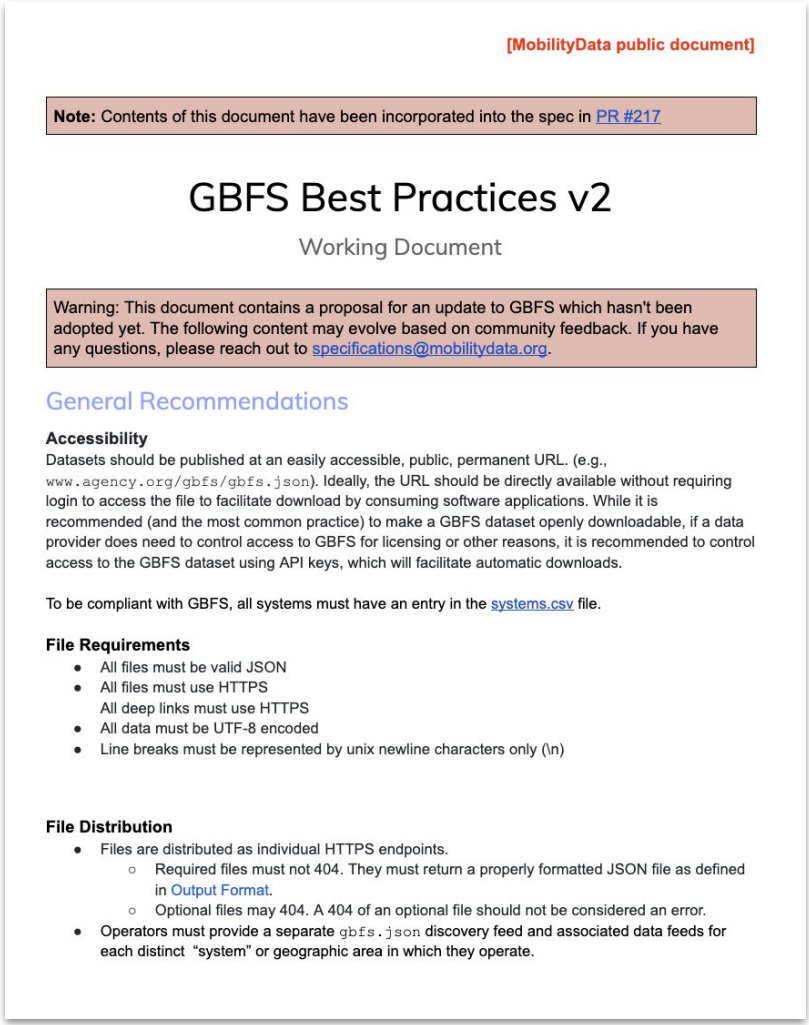
Best Practices

Best Practices work began at 2019 developers workshop.

Guidance was incorporated into the specification in PR#271 in accordance with RFC2119.

These additions touch many areas of the specification but generally fall into the following three categories:

- ➔ Clarifying the intended use of various GBFS endpoints and fields.
- ➔ Ensuring uninterrupted access to GBFS data.
- ➔ Improving the overall quality and completeness of GBFS feeds.



[MobilityData public document]

Note: Contents of this document have been incorporated into the spec in PR #217

GBFS Best Practices v2

Working Document

Warning: This document contains a proposal for an update to GBFS which hasn't been adopted yet. The following content may evolve based on community feedback. If you have any questions, please reach out to specifications@mobilitydata.org.

General Recommendations

Accessibility

Datasets should be published at an easily accessible, public, permanent URL. (e.g., `www.agency.org/gbfs/gbfs.json`). Ideally, the URL should be directly available without requiring login to access the file to facilitate download by consuming software applications. While it is recommended (and the most common practice) to make a GBFS dataset openly downloadable, if a data provider does need to control access to GBFS for licensing or other reasons, it is recommended to control access to the GBFS dataset using API keys, which will facilitate automatic downloads.

To be compliant with GBFS, all systems must have an entry in the systems.csv file.

File Requirements

- All files must be valid JSON
- All files must use HTTPS
  All deep links must use HTTPS
- All data must be UTF-8 encoded
- Line breaks must be represented by unix newline characters only (\n)

File Distribution

- Files are distributed as individual HTTPS endpoints.
  - Required files must not 404. They must return a properly formatted JSON file as defined in Output Format.
  - Optional files may 404. A 404 of an optional file should not be considered an error.
- Operators must provide a separate `gbfs.json` discovery feed and associated data feeds for each distinct "system" or geographic area in which they operate.

Vehicle types

Need & scope

- ➔ In 2015, shared micromobility = docked bikeshare.
- ➔ The introduction of shared electric scooters, dockless bikes and e-bikes, and mopeds started after GBFS' initial creation.
- ➔ Travelers need access to information about the new vehicle types and services being introduced, and GBFS is positioned to provide that.

Photo: Heidi Guenin

Vehicle type definitions (v2.1RC)

➔ Allowing **vehicle type** definitions

- Form factors
- Propulsion types
- Vehicle range
- Station capacities by type

Photo: Heidi Guenin

Limitations

- ➔ Further form factor refinements
  (cargo bike vs road bike vs mountain bike, etc)
- ➔ Vehicle attributes
  (cargo capacity, seated/standing, passengers)
- ➔ Motor specifications
  (watts/hp, fuel capacity, refueling needs, etc)
- ➔ Vehicle accessories
  (enclosure type, baskets, lights, child seats, etc)

Photo: Voi

Geofencing

Need & scope

https://github.com/NABSA/gbfs/pull/219

- ➔ **GBFS v1.0**
  - represented bikeshare docks, including number of available docking stations
- ➔ **GBFS v2.1RC**
  - Dockless vehicles introduced the need to represent where travelers can pick up and drop off shared mobility vehicles (i.e. dedicated areas), and
  - The need to represent new rules for E-bikes and scooters (i.e. speed limit zones, restricted areas)
- ➔ **Scope limit**
  - More complicated rules, such as for car-sharing, still need to be modeled

Photo: Leo Frachet

Geofencing (v2.1RC)

➔ **What is geofencing?**

- A virtual boundary set up around a geographical location.
- Allows the triggering of events when a vehicle enters or exits a geofenced area.

➔ **Geofencing in GBFS**

- May be used to delineate pick up and drop off zones, no-ride zones, speed limit zones, equity zones, etc.

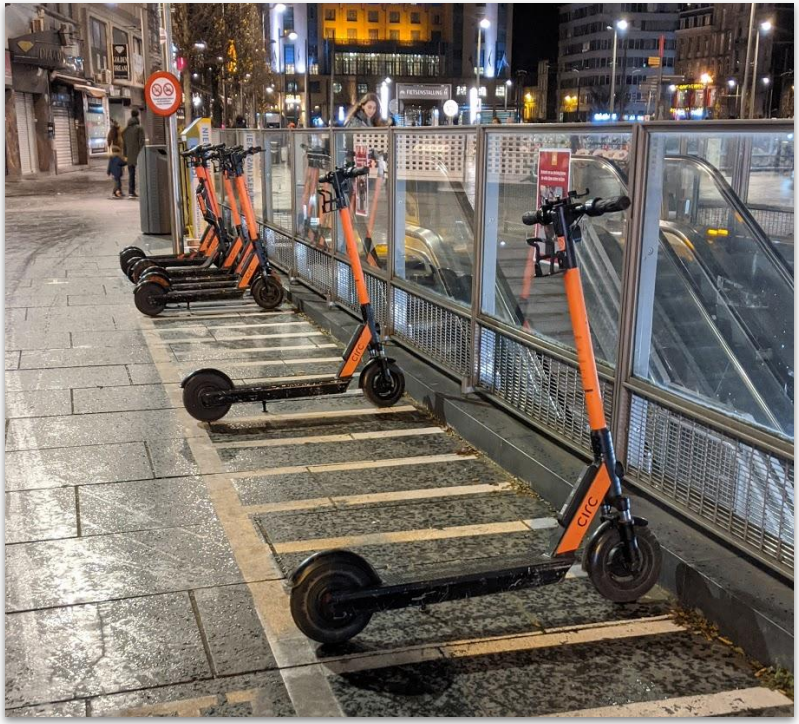


Photo: Heidi Guenin

https://github.com/NABSA/gbfs/pull/219

Virtual stations

- ➔ Vehicles can be dropped off or picked up from a defined area where there is no physical infrastructure (i.e. docks) installed
- ➔ Delineated using geofence via `station_area` or as a point using `lat/lon`
- ➔ Defined like a physical station with similar attributes

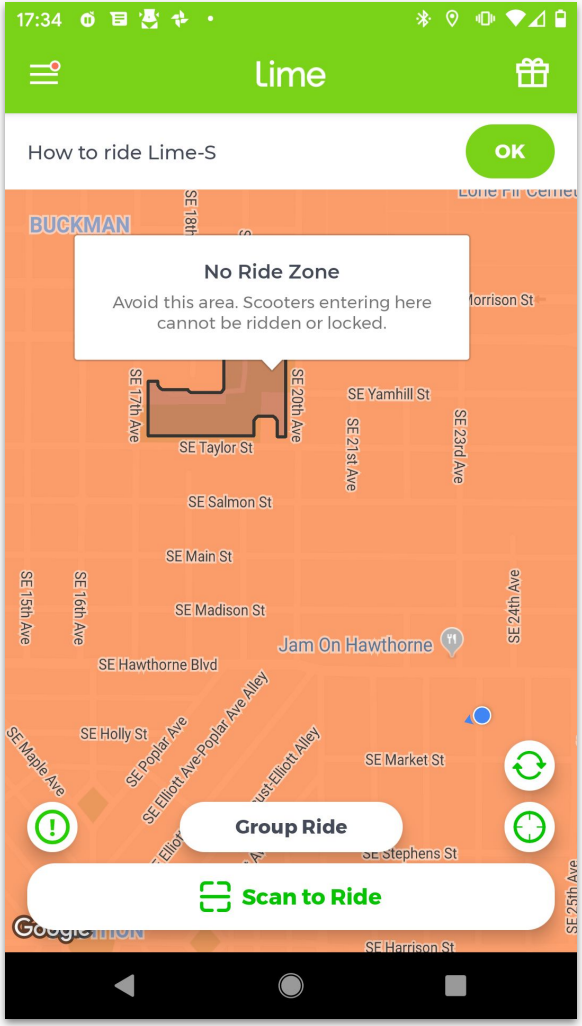
Photo: Alta Planning

Photo: @dcrainmakerblog (Twitter)

https://github.com/NABSA/gbfs/pull/219

Regulated areas

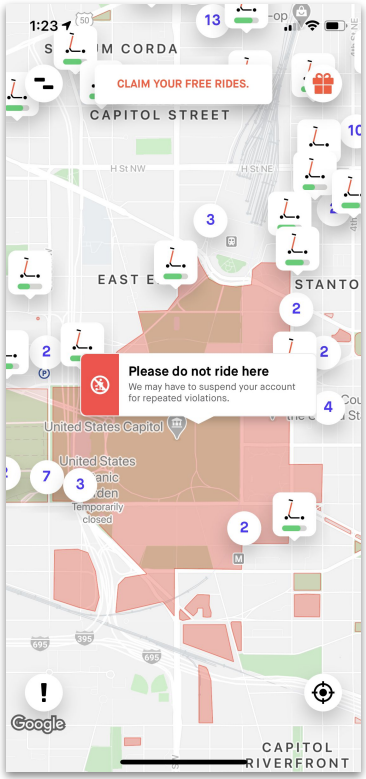
- ➔ Areas where vehicles cannot go
- ➔ Areas where vehicles must obey speed limits
- ➔ Areas where vehicles cannot be on the sidewalk
- ➔ No parking zones



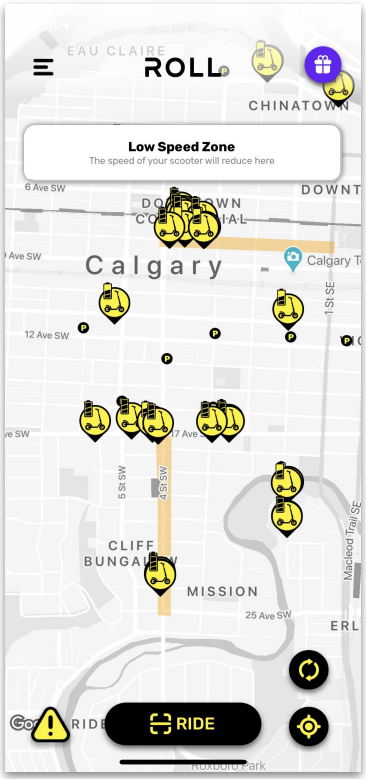
Lime App

https://github.com/NABSA/gbfs/pull/219

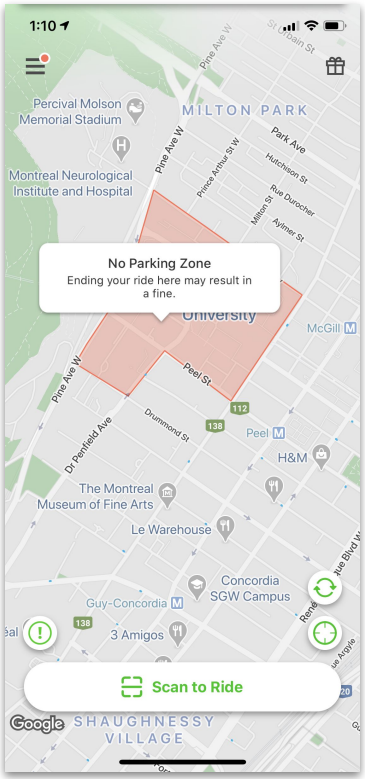
App examples



Spin



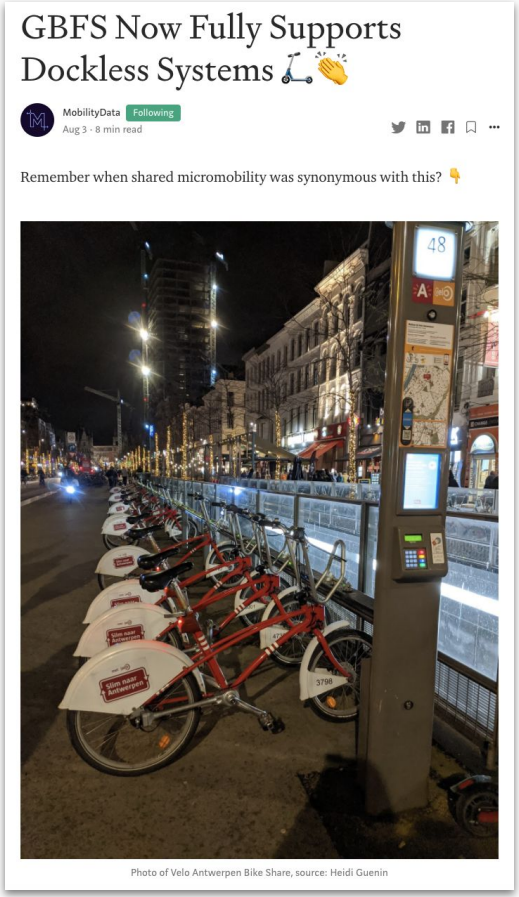
Roll



Lime

More details

- ➔ See the “GBFS Now Fully Supports Dockless Systems” article on Medium for more details
- ➔ Also available in Spanish “GBFS ahora es totalmente compatible con sistemas sin estación”

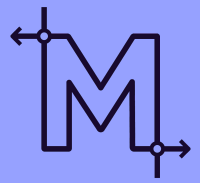

GBFS Now Fully Supports Dockless Systems 🛴👋

MobilityData Following
Aug 3 · 8 min read

Remember when shared micromobility was synonymous with this? 👇

Photo of Velo Antwerpen Bike Share, source: Heidi Guenin

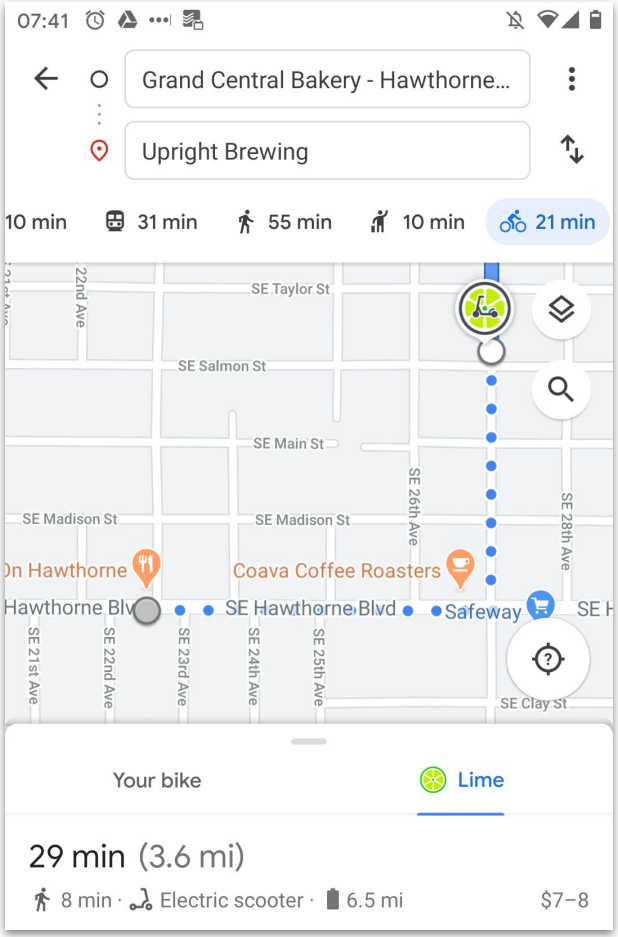
https://medium.com/@mobilitydata/gbfs-now-fully-supports-dockless-systems-289efb6b7c6f



Deeplinks

Need & scope

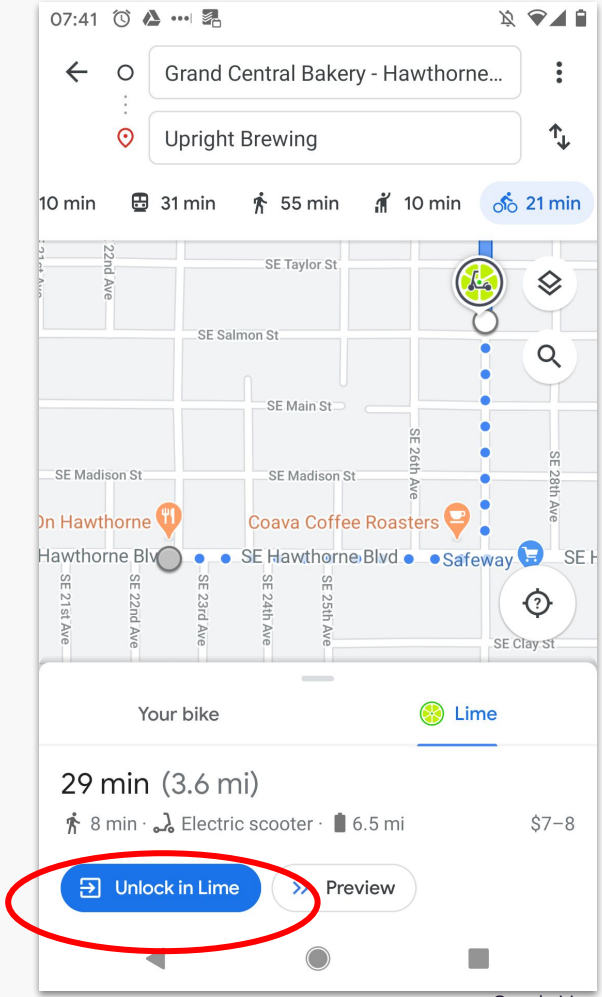
- ➔ GBFS v1.0 allowed apps to show bikes/scooters on map and as part of trip plans
- ➔ The next step is for the user to book the vehicle:
  - ◆ User has to open provider app and find the same vehicle, or
  - ◆ Custom integration for each producer / consumer
- ➔ How to improve booking experience?



Google Maps

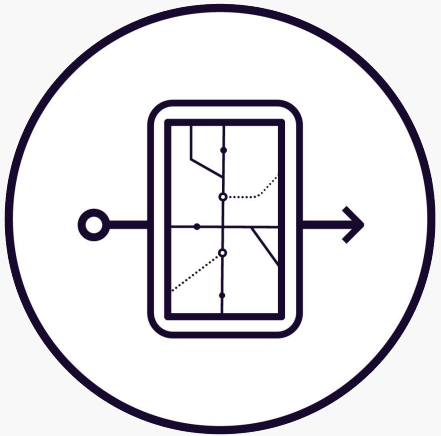
Deep links (new in v1.1)

- ➔ Support for **deep links** for iOS, Android, and web apps
- ➔ Producers:
  - ◆ BCycle
  - ◆ Lime
- ➔ Consumers:
  - ◆ Google Maps
  - ◆ Transit App



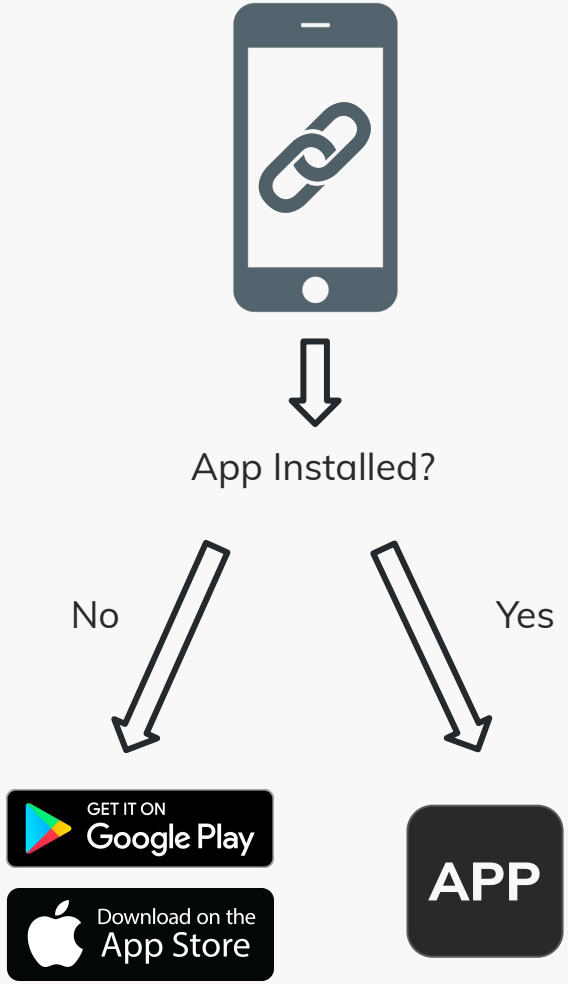
In a nutshell...

- ➔ You can now tap on a bike or scooter in a third party app, and the provider's rental app is immediately opened to that **particular vehicle or station** to complete the transaction.
- ➔ Scope: Minimum amount of information needed to identify a free vehicle or station



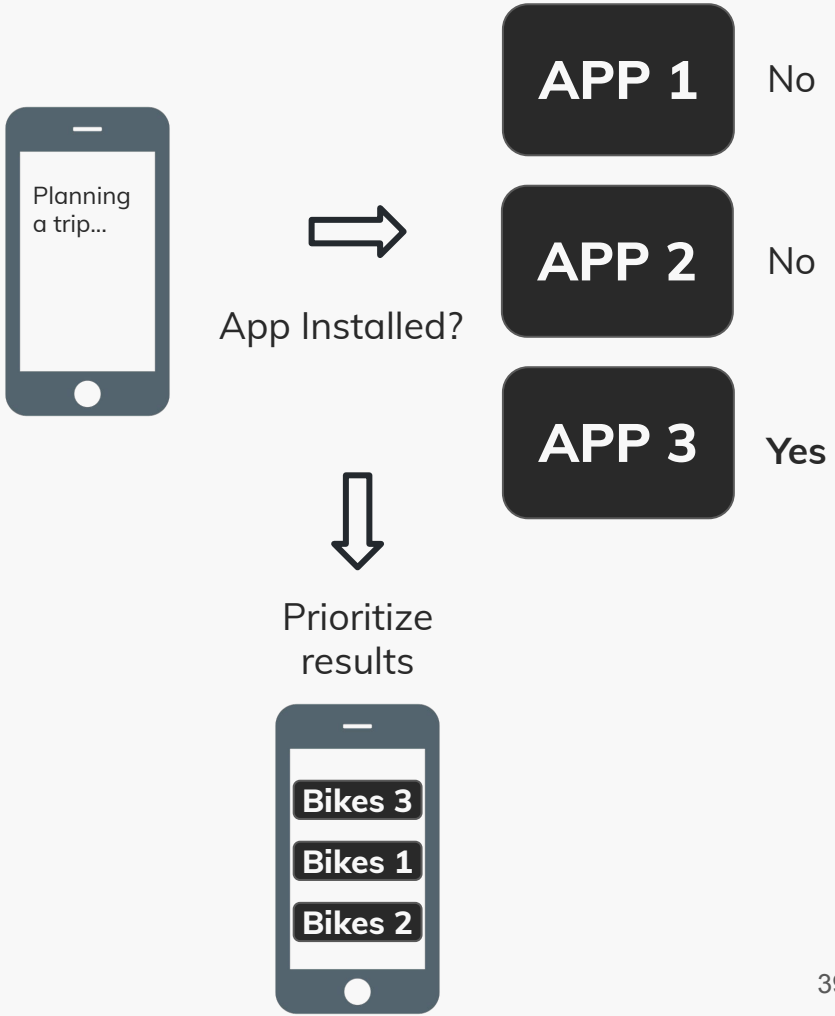
App Links (Android) and Universal Links (iOS)

- ➔ Preferred deep links implementation:
  - ◆ No dialogs - always opens correct app. More secure.
  - ◆ The operating system checks if the provider app is installed. If not, the user is redirected to app store.
  - ◆ Providers can define links that work across web and native apps
- ➔ Example: BCycle [station_information.json]



Prioritize installed apps for user convenience

- ➔ Third-party apps can prioritize trip planning or search results from providers the traveler already uses
- ➔ Avoids showing the traveler results that aren't relevant

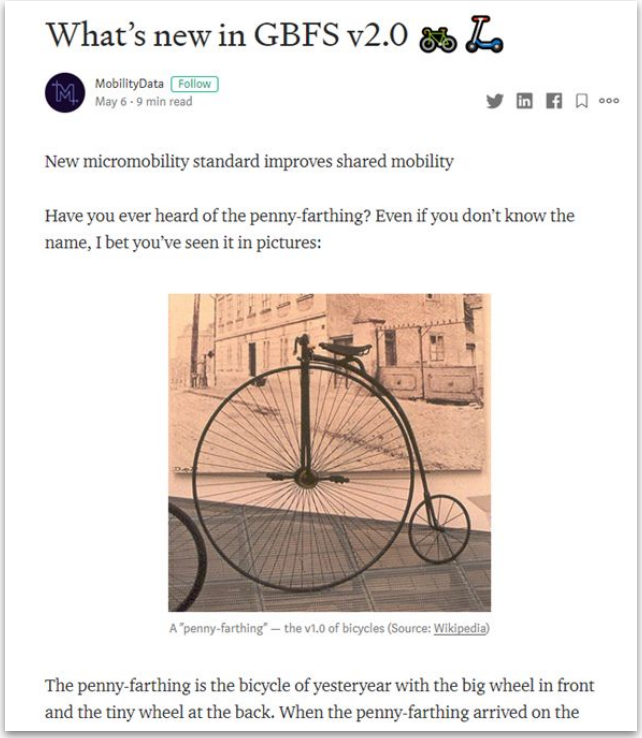


Analytics fields

- Third-party app can add their identity to a deep link:
  - `...&client_id=abc.com`
- ...and advertising account information:
  - `...&ad_id=12345ABCDEF`
- ...and token identifiers (e.g., API keys):
  - `...&token=xyz`
- Info outside GBFS scope can be added / returned (future adoption?)

More details

- ➔ See the “What’s new in GBFS v2.0” article on Medium for more details
- ➔ Also available in French: “Du nouveau pour la version 2.0 de GBFS”
- ➔ And in Spanish: “¿Qué hay de nuevo in GBFS v2.0?”



What’s new in GBFS v2.0 🚲 🛴

MobilityData Follow
May 6 · 9 min read

New micromobility standard improves shared mobility

Have you ever heard of the penny-farthing? Even if you don’t know the name, I bet you’ve seen it in pictures:

A “penny-farthing” — the v1.0 of bicycles (Source: Wikipedia)

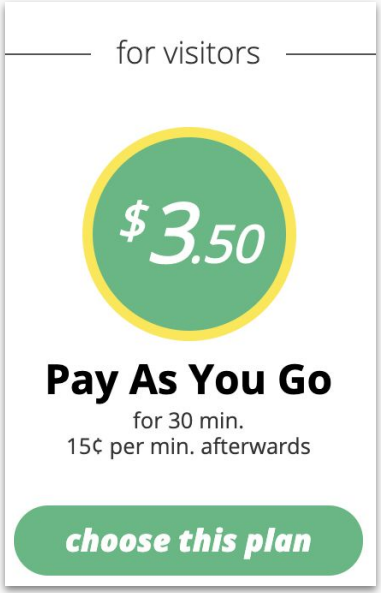
The penny-farthing is the bicycle of yesteryear with the big wheel in front and the tiny wheel at the back. When the penny-farthing arrived on the

https://lickst.at/MobilityDataGBFSv2-0

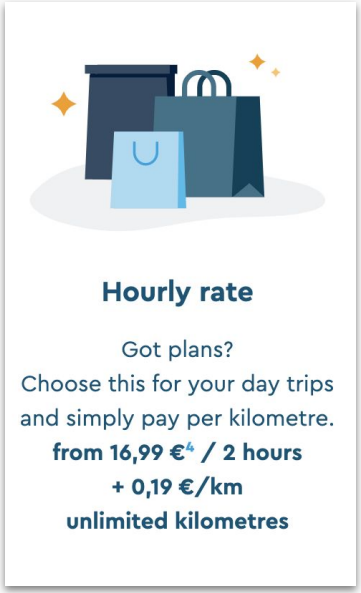
Pricing

Need and Scope

- ➔ Most shared mobility services have a base fee to unlock and then a per minute or per km rate.
- ➔ Providing accurate pricing information can help users in their decision-making process.
- ➔ Long-term integration of carshare.



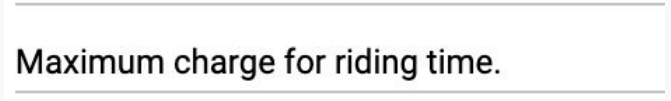
Relay



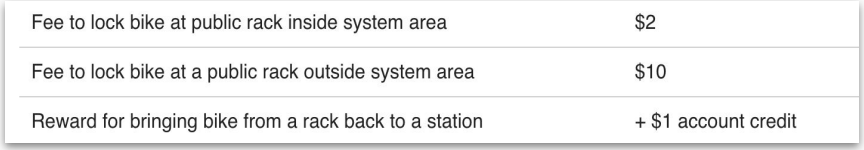
ShareNow Austria

Considerations

- Prices may depend on day of the week, time of day, etc.
- Prices may depend on where a vehicle is dropped off or picked up
  - Ex: outside of service area, airport, etc.
- Prices may be capped after a certain period of time, distance, or total price
- Reservation fees



Grid Bikes



Fee to lock bike at public rack inside system area	$2
Fee to lock bike at a public rack outside system area	$10
Reward for bringing bike from a rack back to a station	+ $1 account credit

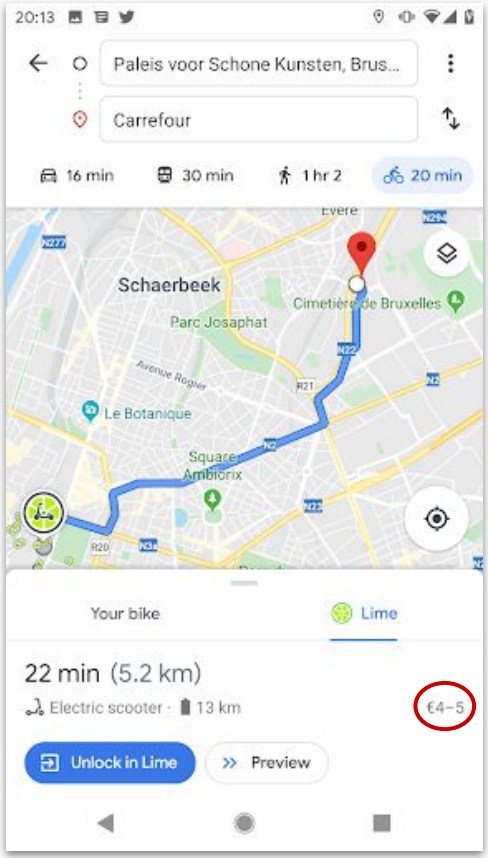
Biketown

Modo

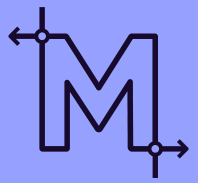
Now

PR #252 - extending system_pricing_plans.json

- ➔ GBFS-Pricing (core)
- ➔ Coming soon:
  - ◆ GBFS-ZonePricing
  - ◆ GBFS-MultiUnitPricing
  - ◆ GBFS-CapPricing



Google Maps



Coming Up

Private GBFS

Need & scope

- ➔ Rotation of `bike_id` broke city & third-party use cases
- ➔ Increasingly detailed information about vehicles has similar implications to stable `bike_id`
- ➔ Data that cities want but causes competitive concerns for operators
- ➔ Create alignment between public and private sector on how these data are generated
- ➔ Scope to be determined by working group

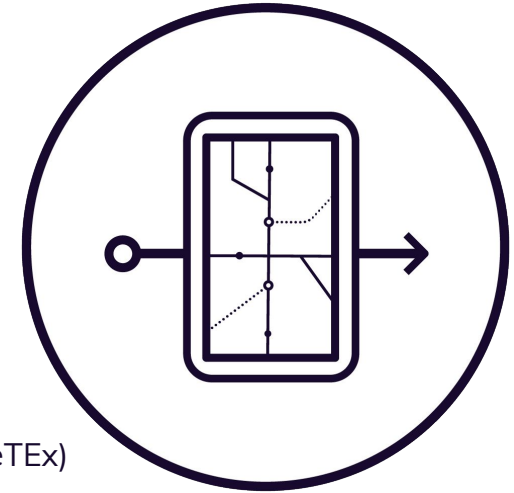
Photo: Heidi Guenin

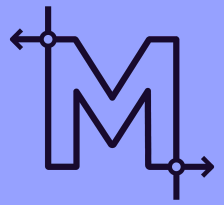
Challenges

- ➔ Ensuring user privacy
- ➔ Preventing over collection of data
- ➔ Consensus building between regulators and providers

What’s Next for GBFS at MobilityData?

- ➔ Repository of public GBFS datasets & related tools
- ➔ Continued enhancement of GBFS
- ➔ Increasing adoption of GBFS in the Americas and Europe
- ➔ Model policy language
- ➔ GBFS validator
- ➔ GBFS resources and training library
- ➔ Member workshops
- ➔ Coordinating with related specifications (e.g. CurbLR, GTFS, TOMP API, NeTEx)
- ➔ Carsharing support
- ➔ MobilityData Academy





Thanks!

For questions, contact:
sharedmobility@mobilitydata.org

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Q&A