

Status: [V0.96](#) | Final

Created: 2018-04-27 / Last updated: 2019-10-01

Google EV Location Feed Specification

OVERVIEW

The Google EV Location Feed Specification (GELFS) defines a common format for electric vehicle (EV) charging locations and associated information. GELFS enables EV charging networks to publish this data to be consumed by a variety of applications including Google Maps.

Key to this format is the ability to provide:

- Information to accurately represent the location of the charging station (address and a hosting business, if relevant),
- The connectors and power characteristics of the charging station,
- Real time usage availability,
- Future planned availability, such as reservation queues, or out of service maintenance periods.

GELFS UPDATE TYPES

GELFS supports three types of updates:

1. A **full feed** containing all charging locations and associated data
2. A **[real-time availability feed update](#)**, containing port status to enable low latency, high frequency publication of changes in port status (such as busy, reserved, available)
3. A **payments and authentication** feed, containing authorization modes that allow charging through charging ports.

GELFS ENDPOINTS

GELFS' standardized endpoints specify the feed type:

1. Full feed: <https://servername.com/gelfs/locations>
2. Real-time availability feeds: <https://servername.com/gelfs/realtime>
3. Payments and authentication: <https://servername.com/gelfs/auth>

Encoding and Compression

GELFS feed data must be encoded in UTF-8. Feeds outputs may be *optionally* supplied as zipped or tarred files to reduce file size.

Feed Authentication

While GELFS doesn't require or specify a single feed access authentication, we recommend using a static authorization token for accessing and fetching GELFS feeds from partner servers over https. This token specifically would be sent to the partner server via the *Authorization* HTTP header. (e.g. *Authorization: Token StaticToken1234*).

GELFS FEED OBJECTS

Key to the EV charging station hierarchy is a *Location* object. A *Location* is a physical location containing one or more *Stations*. *Location* object's attributes include name, label, contact information, geo coordinates, and information about access restrictions and reservations. If a set of charging stations are located along a street, next to each other, they could be grouped together under one *Location*.

Each *Station* object under a *Location* object contains an identifier, label, geo coordinates, opening hours and a set of *Port* objects. Each *Port* object indicates an individual charging port (plug or socket) with attributes such as connector type, charging level, power (kWh), along with a *Price* object, which provides structured information on pricing for EV stations.

GELFS Top-Level Object

The top-level object for GELFS contains a set of location objects as well as the gelfs_version the feed is implementing. See examples below.

Field	Type	Required	Comments
gelfs_version	string	Required	Version number of GELFS spec.
locations	Location	Required (Array)	An array of Location Objects.

Location Object

A Location object denotes a physical location such as a physical address at a specific location for a single network provider. The Location object is synonymous with a POI; for example, if there are 20 charging stations within a parking lot, this is represented via a single *Location* object.

Location objects are specified as elements inside the gelfs_data array.

Field	Type	Required	Comments
id	string	Required	A unique string identifier for each semantic location. Identifiers must be the same across feed versions (that is, a location ID must not change unless the location is moved to an entirely new location). Identifiers MUST NOT contain spaces (e.g. ABC123)
network_brand_name	string	Required	Official name of the network (for example, WonderCharge) that gets displayed on the Map. No symbols such as trademark, copyright, or others are permitted. This must correspond to driver visible branding at the location, if any exists If the location does not belong to any charging network, this field can carry the name "Non-Networked". If this field is missing, the stations are assumed to be Non-networked and will carry a generic title "EV Charging Station" (or similar)

Field	Type	Required	Comments
network_name	string	Required	Official name of the charging network that owns the charging stations. This may or may not be the external-facing brand name.
contact	Contact	Required	Contact information for the location/charging provider. Refer to Contact object.
coordinates	Coordinates	Required	Geographic coordinates of the location. Refer to Coordinates object.
address	Address	Required	Structured address of the location. Refer to Address object.
location_hint	string	Optional	Description to help locate the stations (for example, near the elevators, on the 4th level of the parking garage).
opening_hours	OpeningHours	Optional (Array)	Operational hours for this charging location.
access_restriction	AccessRestrictionEnum	Required	Restrictions to enter and/or charge at this charging location (See below for a list of access restrictions). This field should indicate the most restrictive category implied by parking and the charging station, over all times throughout the week.
host	Host	Optional	Individual business, entity or organization <i>directly</i> hosting this location (for example, Whole Foods Market). Note that “host” should not be attributed to larger business holdings, city/community councils, etc, but rather to an <i>individual</i> entity that is visually identifiable at the EV charging station.
stations	Station	Required (Array)	Information for one or more stations at this location. Refer to Station object.
onstreet_location	boolean	Optional	Whether the location is on-street or off-street. Note: If the same location has both on-street and off-street stations, create separate location objects for each group.

Field	Type	Required	Comments
opening_date	string	Optional	Opening date for this location, in YYYY-mm-dd format. For upcoming locations, this field can specify a future opening date. Note: If the exact future opening date is not available, supply the nearest possible month in YYYY-mm format.
language_code	string	Optional	2-letter ISO language code, indicating the language code for the address components
last_updated	string	Required	Timestamp when the status was last updated. This must be provided via the ISO 8601 standard string, in the form: YYYY-MM-DDThh:mm:ssTZD (eg 2019-04-12T01:02:03+0000)

AccessRestrictionEnum

Field	Enum Value	Comments
access_restriction	PUBLIC	Open to the public; no restrictions
	CUSTOMERS_ONLY	Open to customers of an organization or business entity, such as a restaurant or cafe
	GUESTS_ONLY	Open to guests of an establishment only, such as a hotel
	EMPLOYEES_ONLY	Open to employees of an organization or business entity
	STUDENTS_ONLY	Open to students attending an educational institution
	RESIDENTS_ONLY	Open to residents or tenants of a housing location
	HOME_CHARGER	Chargers located at someone's private residence. These are restricted from showing on Google

		Maps.
	UNKNOWN	Restriction unknown. Note: The chargers with this restriction might not surface on Google Maps.

OpeningHours

Field	Type	Required	Comments
weekday_begin	int	Optional	Beginning day of operation, indicated as ISO week day (Monday = 1, Tuesday = 2 , etc)
weekday_end	int	Optional	End day of weekly operation. If absent, it is assumed the location is open week-round.
hour_begin	string	Optional	Beginning hour of operation in 24 hour format (00:00). If absent, 00:00 is assumed
hour_end	string	Optional	End hour of operation in 24 hour format. If absent, 24:00 is assumed.

Contact

Field	Type	Required	Comments
operator_phone	string	Required	<p>The operator_phone field contains a single voice telephone number for either: 1) the specified charge point operator; or 2) the host business in the case of an un-networked Station.</p> <p>This field presents the telephone number as is typical for the agency's service area. It can and should contain punctuation marks to group the digits of the number.</p>
operator_website	string	Optional	<p>This value may be to a specific website representing this Location, or a general website for the operator.</p> <p>The value must be a fully qualified URL that</p>

			includes http:// or https://, and any special characters in the URL must be correctly escaped. See http://www.w3.org/Addressing/URL/4_URI_Recommentations.html for a description of how to create fully qualified URL values.
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Coordinates

Field	Type	Required	Comments
latitude	double	Required	Latitude of geo coordinate. The field value must be a valid WGS 84 latitude.
longitude	double	Required	Longitude of geo coordinate. The field value must be a valid WGS 84 latitude.

Address

Field	Type	Required	Comments
address_string	String	Optional	<p>A single string representing the street address of the Location. Other structured address fields can be provided along with this string for better interpretation of the address. Where possible avoid using this field and instead use other components in this Address object.</p> <p>For countries without suitable addressing scheme (e.g. Japan, India), please provide this field in combination with the language code and country code.</p>
street_number	string	Optional	Street number, containing either numbers or a combination of numbers, letters, and punctuation islands (e.g. 123, 1A, 1-A. etc)
street_name	string	Optional	Street name for the location
locality	string	Optional	City/locality name

admin_area	string	Optional	State, Province name or other administrative area name
postal_code	string	Optional	Postal code
country_code	string	Required	2-letter ISO country code
language_code	string	Optional	2-letter ISO language code, indicating the language code for the address components

Host

Field	Type	Required	Comments
name	string	Required	Name of the host organization/business/entity
address	Address	Optional	Address components for the host
contact	Contact	Optional	Contact information for the host

Station

Field	Type	Required	Comments
id	string	Required	Unique identifier for the charging station. Identifiers must be identical across feed versions. Identifiers MUST NOT contain spaces (e.g. ABC123) and <u>must be universally unique</u> .
label	string	Optional	A distinctive marker associated with the station, such as something that a user sees on the physical station unit.
coordinates	Coordinates	Required	Geo coordinates indicating the exact location of the station.
ports	Port	Required (Array)	One or more charging ports associated with this charging station.

notes	string	Optional	Any additional text field describing the station.
url	string	Optional	Fully-formed URL representing the station, allowing potential deep-linking to that station on a network operator's website.

Port

Field	Type	Required	Comments
id	string	Required	Unique identifier for the port. Port numbers need to be unique within the stations they are grouped under. Identifiers MUST NOT contain spaces (e.g. ABC123).
connector_type	ConnectorTypeEnum	Required	
power_kw	float	Required	Maximum power output in kilowatts
charging_mechanism	ChargingMechanismEnum	Required	Cable or socket
port_status	PortStatus	Optional	A repeated set of PortStatus objects indicating a port status and its start/end times. See PortStatus object as well as the example feed below
last_updated	string	Required	Timestamp when the status was last updated. This must be provided via the ISO 8601 standard string, in the fom: YYYY-MM-DDThh:mm:ssTZD (eg 2019-04-12T00:09:22+0000)
authentications	Authentication	Required (Array)	Authentication and payment methods for this port.
notes	string	Optional	Any optional text related to this port.

reservable	boolean	Optional	Whether this port is reservable.
wheelchair_access_only	boolean	Optional	Whether this port is reserved as an wheelchair-accessible spot.
dedicated_parking	boolean	Optional	Whether this station has dedicated parking space(s) for the purpose of charging.

ConnectorTypeEnum

Field	Enum Value	Comments
connector_type	WALL_OUTLET	All wall outlets requiring the user to bring their own EVSE must be denoted using this type. A 110V wall outlet, or a 3 phase wall outlet is an example of such a connector that must be represented by WALL_OUTLET
	J_1772	
	MENNEKES	
	CHADEMO	
	CCS_TYPE_1	CCS Combo, Type 1
	CCS_TYPE_2	CCS Combo, Type 2
	TESLA	Tesla Connector, indicating a Destination Charger or Supercharger
	GBT	

ChargingMechanismEnum

Field	Enum Value	Comments
charging_mechanism	CABLE	A charging cable is provided at the charging port. The user can take this cable and plug it into the car directly.

	SOCKET	The charging port is a socket and requires the user to bring their own cable to connect the car to the socket.
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PortStatus

Field	Type	Required	Comments
status	PortStatusEnum	Required	Status of the port at the current moment.
start_time	time	Optional	Timestamp when the current port status is expected begin. This field could be used in cases where a port has been reserved for a certain time and the start time is available to populate. This must be provided via the ISO 8601 standard string, in the form: YYYY-MM-DDThh:mm:ssTZD (eg 2020-10-01T19:20:30+01:00)
end_time	time	Optional	Timestamp when the current port status is expected to end in the future , if available. This field could be used in cases where a port has been reserved for a certain time and the end time is available to populate. This must be provided via the ISO 8601 standard string, in the form: YYYY-MM-DDThh:mm:ssTZD (eg 2020-10-01T19:20:30+01:00)

PortStatusEnum

Field	Enum Value	Comments
current_status	AVAILABLE	Available for Charging
	IN_USE	Currently being used
	RESERVED	Currently Reserved
	OUT_OF_ORDER	Not working
	UNKNOWN	Status is not known

	UNAVAILABLE	Unavailable due to another port being IN_USE on the same station.
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Authentication

Field	Type	Required	Comments
authentication_id	AuthenticationMethod.ID	Required	Unique identifier for the authentication method.
payment_required	boolean	Optional	Specifies whether this method costs money or not. Note: it's possible for charging to have no cost, but still require authentication.
authentication_urls	AuthenticationUrl	Optional	A set of objects containing URL strings that enables deep-linking to the partner app/website, where a user may be able to view pricing details, and complete their authorization and payment for charging their EV. These are presented as most specific (charging at a specific port) to the least specific (charging at a station or location).

AuthenticationUrl

Field	Type	Required	Comments
port_auth_url	string	Optional	Object containing authentication URL for this port.
station_auth_url	string	Optional	Object containing authentication URL for the station.
location_auth_url	string	Optional	Object containing authentication URL for the location.

Authentication and Payment

Authentication objects describe aspects of authentication methods linked to each charging port. This enables adding multiple, granular authentication methods per charging port.

As such, *authentication* describes how the user asserts that they have an identity, which in turn can be used by the network to determine appropriate access to the resource. For example, a physical membership card, an app or a credit card. Each authentication method is specified as a separate object and these objects are referred by their IDs inside the *Port* objects.

For each authentication method, whether a payment is required can be specified. Here are the objects required as part of supplying authentication information.

Authorization Top-Level Object

The top-level object for GELFS auth/payment contains a *gelfs_version* string field, along with an *ev_data* wrapper object containing AuthenticationMethod objects . See examples below.

Field	Type	Required	Comments
<i>gelfs_version</i>	string	Required	Version number of GELFS spec.
<i>authentication_methods</i>	AuthenticationMethod	Required (Array)	An array of AuthenticationMethod objects Objects.

AuthenticationMethod

Field	Type	Required	Comments
<i>id</i>	string	Required	Unique identifier for the authentication method.
<i>authentication_method</i>	Authentication Method Enum	Required	Authentication method used.
<i>description</i>	string	Optional	The commonly recognized name of the authentication method. For example, "Mastercard" or "Zappity". Note

			that this is user facing and must be a meaningful name that users can identify/recognize.
android_app_link	string	Optional	A link to recommended Android Auto embedded app in the Google Play Store that can handle the URL. This will be used as a fallback for in-car Google Maps if there is no app that can open the URL.

AuthenticationMethod Enum

Field	Enum Value	Comments
authentication_method	UNKNOWN	
	NONE	No authentication is required. Drivers can use the port without presenting any form of authentication.
	CREDIT_CARD	Credit card activates the port, either by swipe, chip or NFC
	DEBIT_CARD	Debit card activates the port, either by swipe, chip or NFC
	MEMBERSHIP_CARD	A network operator's membership card activates the port.
	MEMBERSHIP_APP	A network operator's mobile phone app.
	QR_CODE	Scanning a QR code activates the port.
	OTHER	The authentication method is known (i.e., not "UNKNOWN"), but doesn't fit any of the above methods.

FEED EXAMPLES

Static EV charging station data is to be supplied via a *locations* endpoint:

<https://servername.com/gelfs/location>

```
{
  "gelfs_version": "0.96",
  "locations": [
    {
      "id": "A123456",
      "network_brand_name": "WonderCharge",
      "network_name": "WonderCharge",
      "contact": {
        "operator_phone": "+1-123-456-789",
        "operator_website": "www.examplewebsite.com"
      },
      "coordinates": {
        "latitude": "37.4219999",
        "longitude": "-122.0840575"
      },
      "address": {
        "street_number": "123",
        "street_name": "Main St",
        "locality": "Mountain View",
        "admin_area": "CA",
        "postal_code": "94043",
        "country_code": "US",
        "language_code": "en"
      },
      "language_code": "en",
      "location_hint": "located next to elevators, on 3rd floor.",
      "access_restriction": "PUBLIC",
      "host": {
        "name": "Google",
        "address": {
          "address_string": "123 Main St",
          "locality": "Mountain View",
          "admin_area": "CA",
          "postal_code": "94043",
          "country_code": "US",
          "language_code": "en"
        },
        "contact": {
          "operator_phone": "+1-123-456-789",
          "operator_website": "www.examplewebsite.com"
        },
        "last_updated": "2019-04-12T00:09:22+0000"
      },
      "stations": [
        {
```

```
"id": "S123456",
"label": "A Charging Station",
"coordinates": {
  "latitude": "37.4219999",
  "longitude": "-122.0840575"
},
"ports": [
  {
    "id": "P12345",
    "connector_type": "J_1772",
    "power_kw": "6.6",
    "charging_mechanism": "cable",
    "port_status": [
      {
        "status": "IN_USE",
        "end_time": "2018-04-10T16:55:00"
      },
      {
        "status": "AVAILABLE",
        "start_time": "2019-04-12T00:09:21+0000"
      }
    ],
    "last_updated": "2019-04-12T00:09:22+0000",
    "reservable": "true",
    "authentications": [
      {
        "authentication_id": "A1",
        "authentication_urls": [
          {
            "station_auth_url": "https://charge.com/L123/S123"
          },
          {
            "location_auth_url": "https://charge.com/L123456"
          },
          {
            "port_auth_url": "https://charge.com/L123/S123:P123"
          }
        ]
      }
    ]
  }
]
}
```


Real-time Feeds

For real-time updates to port status, updates can be provided via the GELFS real-time endpoint.. In the real-time mode, a feed creator can provide just the essential parts of the feed. These include the location ID in the location object, station ID in the station object, and port ID, port status, and last updated elements. This will enable a very lightweight data transfer and will reduce latency of data ingestion.

Note that for real-time feeds, it is highly recommended to include a `last_updated` timestamp so that we can appropriately determine the latency/staleness of a real-time status at a port

Real-time feeds must be supplied via a *real-time* endpoint:

<https://servername.com/gelfs/realtime>

Real-time Feed Object

Field	Type	Required	Comments
<code>gelfs_version</code>	string	Required	GELFS feed version
<code>locations</code>	Status	Required (Array)	A list of modified location objects, providing only the location id, an array of stations with station ids and <i>ports</i> objects with port ids and <i>port_statuses</i>

Here's an example of the real-time feed:

```
{
  "gelfs_version": "0.96",
  "locations": [
    {
      "id": "A123456",
      "network_name": "WonderCharge",
      "stations": [
        {
          "id": "S123456",
          "ports": [
            {
              "id": "P12345",
              "port_status": [
                {
                  "status": "IN_USE",
                  "end_time": "2018-04-10T16:55:00"
                }
              ]
            }
          ]
        }
      ]
    }
  ]
}
```

```

    },
    {
      "status": "AVAILABLE",
      "start_time": "2018-04-10T16:55:01"
    }
  ],
  "last_updated": "2018-10-10T16:50:00"
}
]
}
]
}
]
}
}

```

Multi-port station with fewer active ports than total ports

Below is an example of a location with one charging station containing two ports:

- CCS Combo (Type 1) and
- CHAdeMO.

This station permits only one port to be energized at a time despite having two ports which can each be plugged into a car at once.

This can be indicated by the port currently being used as IN_USE and the other port as UNAVAILABLE.

```

{
  "gelfs_version": "0.96",
  "locations": [
    {
      "id": "A123456",
      "network_brand_name": "WonderCharge",
      "network_name": "WonderCharge",
      "contact": {
        "operator_phone": "+1-123-456-789",
        "operator_website": "www.examplewebsite.com"
      },
      "coordinates": {
        "latitude": "37.4219999",
        "longitude": "-122.0840575"
      },
      "address": {

```

```
    "street_number": "123",
    "street_name": "Main St",
    "locality": "Mountain View",
    "admin_area": "CA",
    "postal_code": "94043",
    "country_code": "US",
    "language_code": "en"
  },
  "language_code": "en",
  "location_hint": "located next to elevators, on the 3rd floor.",
  "access_restriction": "PUBLIC",
  "host": {
    "name": "Google",
    "address": {
      "address_string": "123 Main St",
      "locality": "Mountain View",
      "admin_area": "CA",
      "postal_code": "94043",
      "country_code": "US",
      "language_code": "en"
    },
    "contact": {
      "operator_phone": "+1-123-456-789",
      "operator_website": "www.examplewebsite.com"
    },
    "last_updated": "2019-04-12T00:09:22+0000"
  },
  "stations": [
    {
      "id": "S123456",
      "label": "A1 Charging Station",
      "coordinates": {
        "latitude": "37.4219999",
        "longitude": "-122.0840575"
      },
      "ports": [
        {
          "id": "P123456",
          "connector_type": "CCS_COMBO_1",
          "power_kw": "50.0",
          "charging_mechanism": "cable",
          "port_status": [
            {
              "status": "IN_USE",
              "end_time": "2019-04-12T00:10:20+0000"
            }
          ],
          "last_updated": "2019-04-12T00:09:22+0000",
          "reservable": "true",
          "authentications": [
            {
              "authentication_id": "A1",
              "authentication_urls": [
```

```
        {
          "station_auth_url": "https://charge.com/L123/S123"
        },
        {
          "location_auth_url": "https://charge.com/L123456"
        },
        {
          "port_auth_url": "https://charge.com/L123/S123:P123"
        }
      ]
    }
  ],
},
{
  "id": "P67890",
  "connector_type": "CHADEMO",
  "power_kw": "50.0",
  "charging_mechanism": "cable",
  "port_status": [
    {
      "status": "UNAVAILABLE",
      "end_time": "2018-04-10T16:55:00"
    }
  ],
  "last_updated": "2019-04-12T00:09:22+0000",
  "reservable": "true",
  "authentications": [
    {
      "authentication_id": "A1",
      "payment_required": "true"
    }
  ]
}
]
}
]
}
]
}
```

Authentication Feed Example

The authentication module must be supplied via an “auth” endpoint, such as <https://servername.com/gelfs/auth>. Note that the authorization feed is wrapped inside an *ev_payments* object.

```
{
  "gelfs_version": "0.96",
  "authentication_methods": [
    {
      "id": "A1",
      "authentication_method": [
        "MEMBERSHIP_CARD",
        "MEMBERSHIP_APP"
      ],
      "description": "ChargeEasy",
      "android_app_link":
"http://play.google.com/store/apps/details?id=evse_app_package_name"
    },
    {
      "id": "A2",
      "authentication_method": [
        "CREDIT_CARD",
        "DEBIT_CARD",
        "MEMBERSHIP_APP"
      ],
      "description": "PayToCharge",
      "android_app_link":
"http://play.google.com/store/apps/details?id=evse_app_package_name"
    }
  ]
}
```

Revision History

Version	Date	Major Changes
v0.96	01 October 2019	<ul style="list-style-type: none">• Revert changes to real-time feed to v0.94• Add section of feed access authentication
v0.95	25 March 2019	<ul style="list-style-type: none">• Require station IDs to be universally unique• Update specification for real-time feeds• Introduce a network_name attribute for location• Remove timezone field and update last_updated to include full date/time based on ISO 8601 standard
v0.94	13 March 2019	<ul style="list-style-type: none">• Replace ev_data object with locations array• Replace ev_payments object with authentication_methods array
v0.93	12 February 2019	<ul style="list-style-type: none">• Add android_app_link to AuthenticationMethod• Add details on encoding and compression
v0.92	18 December 2018	<ul style="list-style-type: none">• Move OpeningHours to location object• Add Play Store link for Android Embedded• Rename gelfs_data to ev_data
v0.91	11 November 2018	<ul style="list-style-type: none">• Add field for opening date for locations• Add object for AuthenticationUrls
v0.90	22 October 2018	<ul style="list-style-type: none">• Remove gelfs_metadata object• Standardize GELFS endpoints for location, real-time, auth modules• Remove payments schema; replace with simple boolean (payment_required)• Add authentication urls to enable deep-linking to other apps/websites• Change access_restricted boolean to access_restrictions enum• Rename gelfs_feed_data to gelfs_data
v0.89	15 August 2018	<ul style="list-style-type: none">• Remove DIFFERENTIAL feed type• Clarified all 'id's must not contain spaces
v0.88	2 August 2018	<ul style="list-style-type: none">• Remove ev_data object, rename feed_data and feed_metadata to gelfs_feed_data and gelfs_feed_metadata
v0.87	29 June 2018	<ul style="list-style-type: none">• Remove voltage and amps

		<ul style="list-style-type: none">• Move dedicated parking and wheelchair accessibility to the Port object from Station• Introduce an Authentication object associated with each port. Associate Payment with Authentication.• Add min_rate, max_rate, tax_included, plan_name to Payment• Remove membership_required and payment_plans_supported from Payment• Introduce authentication and payment feed type
--	--	--