



# Gmax Race Live Data Feed Specification - Preliminary

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- The Gmax Race system tracks race horses during real-time. Its minimal infrastructure makes it easy and economical to use, and allows the system to be shared between racecourses where travel times permit.
- The live tracking data is streamed directly from a base station located at the race course. This document describes the content and format of this live feed.
- The system is not intended to replace the information that can be readily observed by viewers from live TV pictures, commentary or photo finish systems. It is intended to complement those systems by providing greater insight into the progress of the race, particularly where views from cameras or the grandstand may be less clear, or for use cases where a video feed is not practical (such as a user with a low bandwidth mobile connection).
- Various data feeds are available. This document describes the protocol for a 'Live Data' feed, which provides the live tracked position of each horse in the race. It is intended for the development of virtual representations of the race.
- The system is under active development. Feedback on possible future improvements is welcome.

- The Gmax Race system provides the following information for each tracked horse

Description	Name	Type	Example	Notes
Message Type	K	Number	0	To aid identification of messages from this feed
Timestamp	T	String	2015-06-10T19:41:27.0Z	UTC time in ISO 8601 format
Horse/Race ID	I	String	2720150610204002	Identifier specifying racecourse, date, race start time and horse number
Longitude	X	Number	-0.4058491	Decimal Longitude using WGS-84
Latitude	Y	Number	51.4189543	Decimal Latitude using WGS-84
Speed	V	Number	17.83	The speed in meters per second
Progress	P	Number	87.5	Estimated official distance remaining to the finish
Stride Frequency	SF	Number	1.89	Stride frequency in Hz

- Each position update for each horse is formatted as a ECMA-404 JSON object, e.g.:  

```
{"T":"2015-06-10T19:41:27.0Z","I":"2720150610204002","X":-0.4058491,"Y":51.4189543,"V":17.83,"P":87.5,"SF":87.5}
```
- An update for each horse will be output at regular intervals to suit your latency requirements (e.g. twice per second)
- The Gmax Race base station will send this stream of data using UDP to a static IP address/port to be provided to Gmax in advance by the end user. The end user must open and listen to this port to receive the data. We recommend that the end user's server supports the use of 'ping' to allow basic network troubleshooting if necessary.

- **Format**
  - JSON has been selected due to its very wide usage, simplicity and efficiency. It is ideal for live data.
  - UDP is a standard protocol widely used for real-time data due to its simplicity and low latency. However, note that UDP provides for no guarantee of packet delivery, packet order, and duplicate packets may be generated by the network. Applications consuming this feed should be tolerant to such errors. The quality of network may vary between racecourses.
- **Accuracy and Latency**
  - The timestamp is synchronised to UTC time, with an estimated accuracy of  $\pm 0.02s$
  - Accuracy of the system as benchmarked by against sectional times derived from the data is approx.  $\pm 0.08s$  (1 sigma)
  - Updates will be provided at fixed intervals in the feed. Latency may vary, but will be less than 0.1s. Additional latency may be incurred as the data travels over third party networks.
- **Horse/Race identifier**
  - This allows unique identification of the race, composed as follows:  
[2-digit racecourse ID][scheduled start: YYYYMMddHHmm][Horse number]
  - The Racecourse ID value uses the same convention as that used by Weatherbys (e.g. 30 = Lingfield Park)
- **Co-ordinate system**
  - WGS-84 is a global standard and provides the unambiguous position of the horse on the Earth. If you require advice on the relationship between this and other co-ordinate systems please contact Gmax.
- **Progress**
  - The distance remaining for each horse is estimated by projecting its position to an 'official' running line. As such, it may not represent the actual distance that the horse runs to reach the finish.
- **Stride Frequency**
  - A value of 'null' will be given where the stride frequency is indeterminate
- **Sample data**
  - Sample data from previously recorded races is available in our historical 'Points' feed, please enquire for more details
  - Upon request, pre-recorded data can also be streamed live to your server for test purposes

- The Gmax Race server will attempt to maintain the feed as reliably as possible. However, we advise end users to consider the following failure modes, some of which may be beyond Gmax's control

Failure Mode	Likely Effect on data feed
Network errors between base station (racecourse) and client	There may be gaps in the data feed, packets may be duplicated or arrive in the wrong order
System wide failure – for example, due to failure on the base station.	Data feed may be interrupted
Tracker issued, but horse does not carry it*	Data may appear for the issued tracker, but unlikely to be moving along the same path as horses in the race!
Tracker is physically damaged	Data for that tracker may not appear or appear sporadically/incorrectly
Tracker dropped by horse	Horse will appear to stop
Tracker is carried on the wrong horse – for example due to error in tracker/cloth administration.	Data will appear, but the error may be apparent with reference to other information (such as TV images, official results etc.)

\*Note that this would be in contravention of BHA rules, and penalties may be applied to trainers

- Subscribers to this feed will be kept informed of updates, and as far as possible this will be introduced by extending the data feed described herein to ensure backward compatibility. End users should design their applications to be tolerant to additional JSON messages/objects appearing in the data in future.
- Consultation is currently underway on improvements to the horse/racecourse identifier to provide better support for operations globally. This will result in an increased size of racecourse identifier, and possibly the splitting of the current identifier into separate parameters.
- In future we may also consider transport layer encryption (e.g. https)

If this feed does not meet your requirements, please contact us. Other complementary feeds are also available, including:

- Live 'Progress' data feed, which summarises the progress of the race as a whole including live sectional times of the leading horse, running order of the horses and list of valid runners. Provided as a live low-latency data feed
- By prior arrangement only: a test data feed streaming replays of pre-recorded examples of one or more of the above data feeds, intended for use in final testing by client applications.
- Historical 'Points': a data feed similar to the data in the feed described herein but provided from archived races, available from an http request.
- Post-race sectional time data feed, summarising the performance of each horse by section (e.g. at furlong intervals), available from an http request.
- Racecourse 'Routes': files containing a description of the official running line at racecourses, derived from on-site surveys.
- Please let us know your requirements and we can recommend the most suitable data for your needs.

The background of the image is a hazy, golden-hour scene of a horse race track. In the foreground, several riders on horses are silhouetted against the bright, hazy sky. They appear to be in motion, possibly during a race or a training session. The track is dark and dusty, with a large cloud of dust or mist rising from the horses' hooves. In the background, a large crowd of spectators is visible, also silhouetted against the bright sky. Several tall, thin poles with rectangular signs are visible on both sides of the track. The overall atmosphere is one of a busy, active horse racing event.

# Gmax

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