

## **Technical specification**

**of City Car Driving Enterprise Edition data export functionality for use in motion platforms**

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## Overall description

There is a functionality to export data needed to drive a motion platforms in the **City Car Driving Enterprise Edition** application, which is intended to be used with motion platforms of arbitrary design and manufacturer. This is achieved by providing most basic, abstract set of motion data (for ex., car position, orientation and velocity in virtual world space), and using data export technology which is easily adapted by any motion platform driver application created by any manufacturer. The ability to work without motion platform is also retained with no additional setup.

This functionality is provided in product **City Car Driving Enterprise Edition** starting with **2.3.0** version, and has its own separate licensing protection.

## Data exchange schema

The data exchange between simulator and motion platform driver applications is performed via OS Windows two-way named pipe. The Driver app creates a pipe with name **DynamicCabPipe**, and awaits connection. Below is sample code for creating such a pipe in C# language:

```
using (NamedPipeServerStream pipe = new NamedPipeServerStream(
    "DynamicCabPipe",
    PipeDirection.InOut,
    10,
    PipeTransmissionMode.Byte,
    PipeOptions.Asynchronous,
    inBufferSize,
    outBufferSize))
{
    // ...
}
```

The Simulator app tries to connect to the pipe each frame of the driving session. When connection is established, the applications start per-frame data exchange in a way described below:

Simulator app	Driver app
data ->	
	<- reply
data ->	
	<- reply
...	

Immediately after connection the Simulator sends an **Initialization Data Package**, and waits the Driver for **Initialization Reply Package**. Rest of the time it sends a **Per-Frame Data Packages**, and awaits **Per-Frame Reply Packages**. However, currently the reply packages are received but not used. Detailed package description see in next chapter.

## Data exchange protocol

Initialization Data Package (from Simulator):

Size (bytes)	Data type	Measure	Description
2	integer	bytes	Package full size
1	integer		Package type, must be 1
12	(float, float, float)	meters	Driver position in car local coordinates system. <b>Currently unused.</b>
12	(float, float, float)	meters	"Forward" axis in car local coordinates system
12	(float, float, float)	meters	"Up" axis in car local coordinates system

Initialization Reply Package (from Driver):

Size (bytes)	Data type	Measure	Description
2	integer	bytes	Package full size
1	integer		Package type, must be 0
2	integer		Identifier. <b>Currently unused.</b>
1	integer		Protocol version number. <b>Currently unused.</b>

Per-Frame Data Package (from Simulator):

Size (bytes)	Data type	Measure	Description
2	integer	bytes	Package full size
1	integer		Package type, must be 2
8	double	seconds	Last frame time
12	(float, float, float)	meters	Car position in world coordinates system
12	(float, float, float)	meters	<b>Currently unused</b>
16	(float, float, float, float)		Car orientation quaternion in world coordinates system
12	(float, float, float)	meters per second	Car linear velocity in world coordinates system
12	(float, float, float)	meters per second <sup>2</sup>	Car linear acceleration in world coordinates system
12	(float, float, float)	radian per second	Car angular velocity in world coordinates system
12	(float, float, float)	radian per second <sup>2</sup>	Car angular acceleration in world coordinates system
4	float	Hz	Force feedback frequency. <b>Currently unused.</b>
4	float	meters	Force feedback amplitude. <b>Currently unused.</b>

Per-Frame Reply Package (from Driver):

Size (bytes)	Data type	Measure	Description
2	integer	bytes	Package full size
1	integer		Package type, must be 1
1	integer		Reply code. <b>Currently unused.</b>

**World coordinates system** is right-handed system, where Y axis is assumed to point “Up”.

### Licensing protection

Motion data export functionality has its own licensing protection, which is separate from one of the main application. The main **City Car Driving Enterprise Edition** application requires hardware HASP USB dongle with appropriate HASP feature burned on it, or it will not launch nor work (such dongle is provided with each product copy purchased). And by default it will not have motion data export enabled. In order to enable the data export, there must be separate HASP feature present on the HASP dongle. This could be the same dongle which holds the main license, or separate one accessible from this computer. So, motion data export functionality should be explicitly required at time when product is being purchased.