Podium Technology Limited

PTWinSim

Development Tool
Software/Model/Driver-in-the-Loop
Simulation Environment

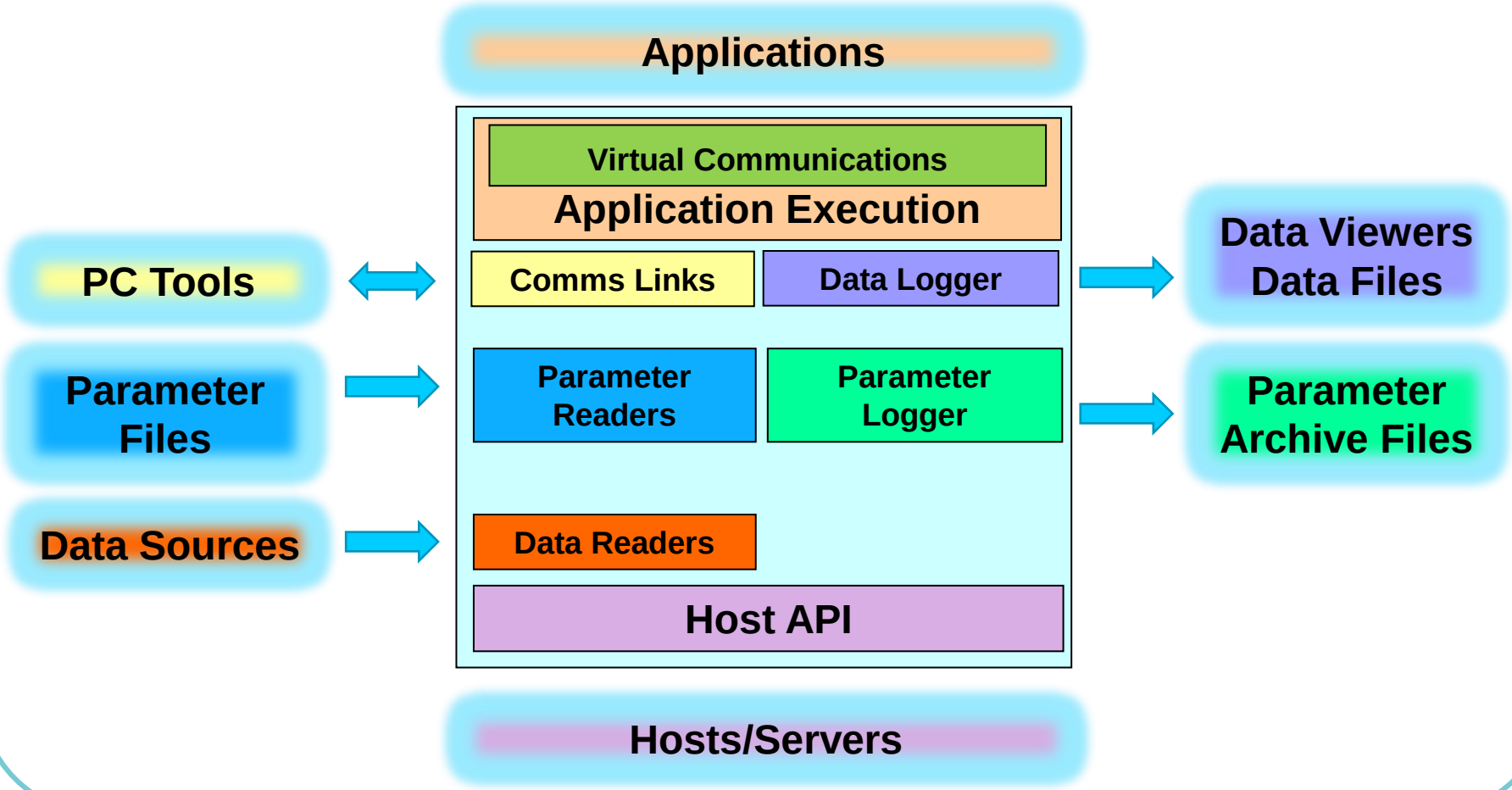
PTWinSim - Overview

- Windows based co-simulation environment (32 & 64-bit)
- Functionality implemented in a core DLL
- Execution in variety of host scenarios
- Extensive support for data sourcing and data output

- Items in [square brackets] are on the road map

PTWinSimCore – Overview

Common functionality for all host scenarios



PTWinSimCore – Comms Links

Programming, Monitoring, Tuning, Configuration

- XCP: Link to standard automotive tools.
- MTP: Link to Marelli Sysma
- PTMon: PTWinSim API to user applications and PTWinSim Monitor

PTWinSim – Parameterisation

- Via comms links/PC tools
- PTWinSim formatted text files
- MATLAB format m-files
- System Monitor m-file exports
- [CLX Files]
- [MATLAB mat-files]

PTWinSim – Data Sources

- Host/Server applications
- [ZTX Marelli Data] – VMS
- [CSV Text Files]
- [ASAM MDF Automotive Standard]
- [Live Data Streams]

PTWinSim – Parameter Logger

- Saves parameter value states optionally at the start and end of a session.
- Parameter changes during a session.
- Formats:
  - PTWinSim text format
  - MATLAB m-file format
  - [Sysma CLX format]

PTWinSim – Data Logger

- Save to WinTAX ZTX
- Save to Text CSV
- Stream UDP Packets (see next slide)
- [Save to MATLAB mat format]
- [ASAM MDF Automotive Standard]

PTWinSim – UDP Recorders

- WTS Server Plugin – Stream to WinTAX
- ZTX WinTAX format
- CSV Text Format
- MAT MATLAB binary format
- PTATLASRecorder to MA ATLAS
- MoTeC T2 Server Plugin to i2 Pro
- User applications

[PTWinSim Core – Plugins]

User customisable functionality

- Custom Data Sources
- Custom Data Logging Output
- Custom Parameterisation

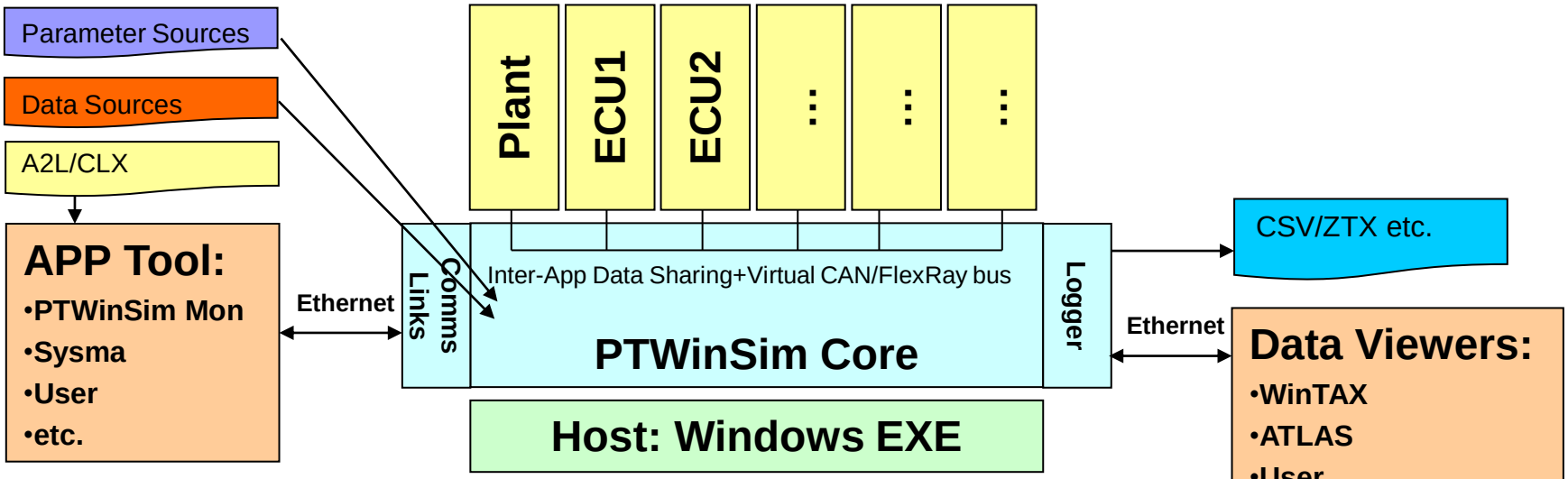
PTWinSim – Hosts/Servers

- Windows Console
- Windows GUI
- VMS (WinTAX Data Augmenter)
- rFpro/rFactor Game
- MATLAB command line (mex)
- Simulink models (S-Function)
- Bosch WinDarab Plugin

PTWinSim – Application Types

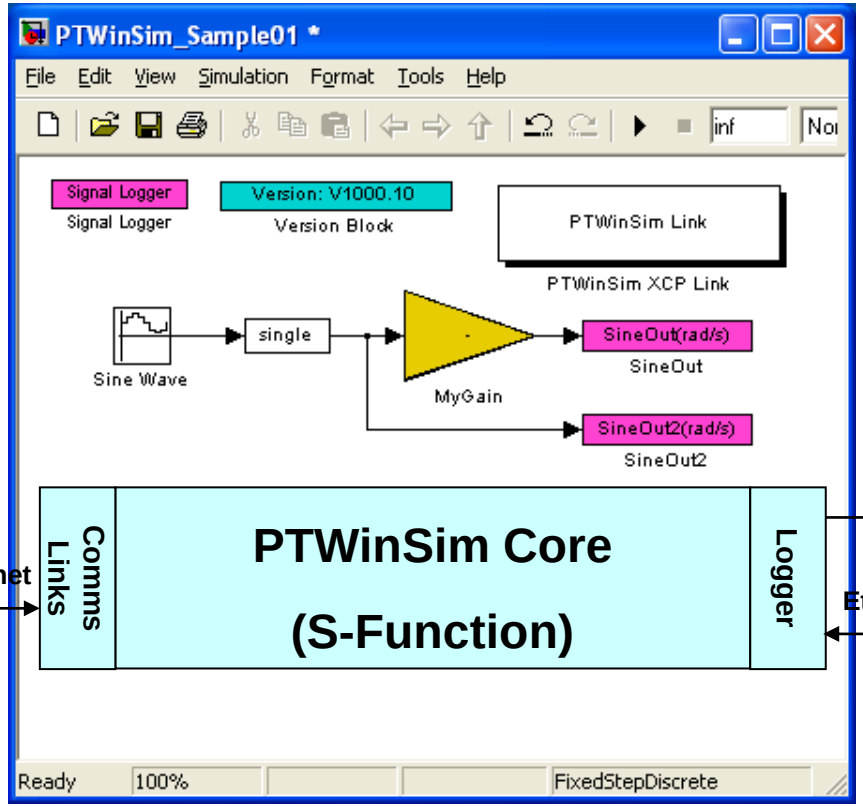
- PTWinSim Applications generated by:
  - @Source from Simulink
  - Claytex's Simulator Library from Dymola
  - C++
  - Bosch Motorsport’s CCA/Simulation Packages
- vTAG Applications
  - @Source from Simulink 32 & 64-bit
  - GDE/MCT from Simulink 32-bit only
- Function Mock-up Interface (FMUs)

Virtual HIL



The application tool provides monitoring, live tuning and data acquisition functions during model execution. There is a separate connection for each application, therefore the plant and ECU1 model can be handled by different tools on different computers.

Interfacing Directly With Simulink®



A2L/Hex/CLX

APP Tool:
- **PTWinSim Mon**
- **Sysma**
- **User**
- **etc.**

Ethernet

Comms Links

PTWinSim Core (S-Function)

Logger

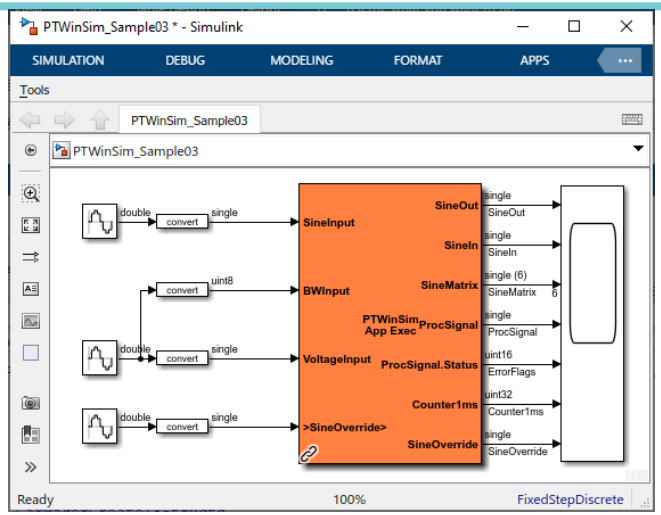
CSV/ZTX etc.

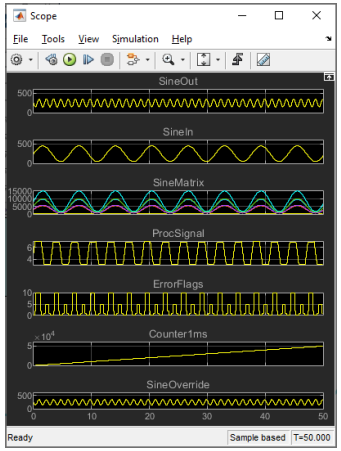
Ethernet

Data Viewers:
- **WinTAX**
- **ATLAS**
- **User**
- **etc.**

- Auto Generated A2L and Hex during model initialisation
- Live Monitoring
- Data Acquisition
- Live Tuning (without pausing model)

Executing Apps in Simulink®





Parameter Sources

Data Sources

A2L/CLX

APP Tool:
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Ethernet

Comms Links

PTWinSim Core

(S-Function)

Logger

CSV/ZTX etc.

Ethernet

Data Viewers:
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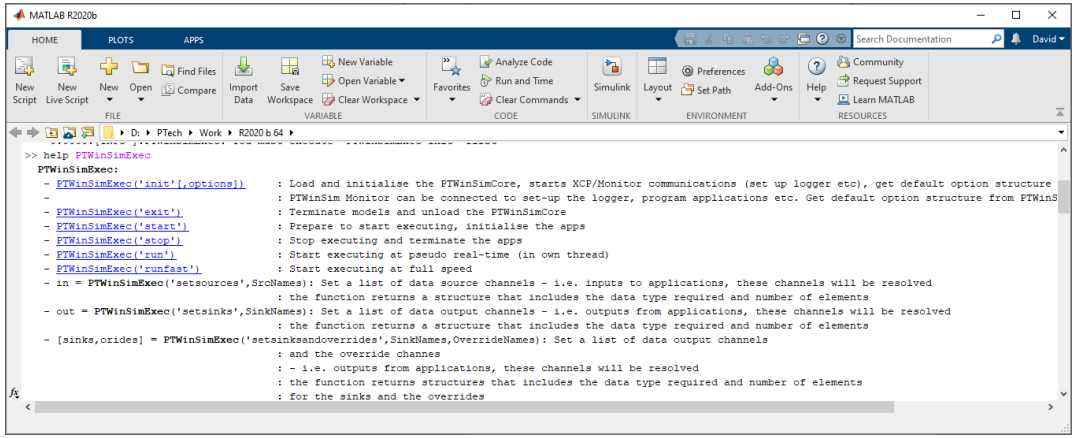
Host: Simulink S-Fcn

Executing Apps in MATLAB®

Scripting application execution, programmatic data input/output, optimise, repeat etc.



Parameter Sources

Data Sources

A2L/CLX

APP Tool:
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- **Sysma**
- **User**
- **etc.**

Ethernet

Comms Links

PTWinSim Core

(Mex-Function)

Logger

CSV/ZTX etc.

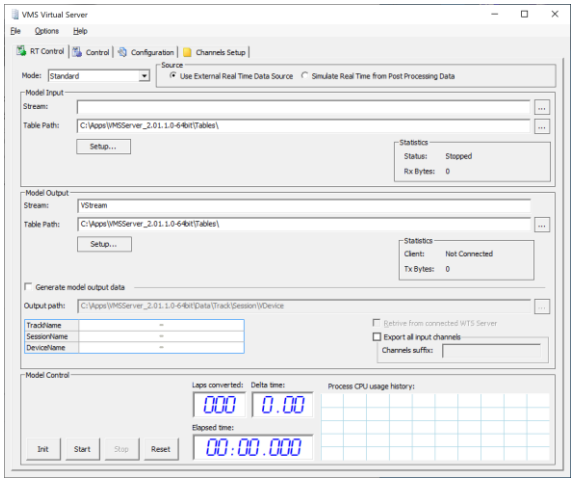
Ethernet

Data Viewers:
- **WinTAX**
- **ATLAS**
- **User**
- **etc.**

Host: MATLAB/mex

Augmenting WinTAX Data with VMS

Logged or live streamed data as input, calculated channels as output



Parameter Sources

A2L/CLX

APP Tool:

- **PTWinSim Mon**
- **Sysma**
- **User**
- **etc.**

Ethernet

Comms Links

PTWinSim Core

(Mex-Function)

Logger

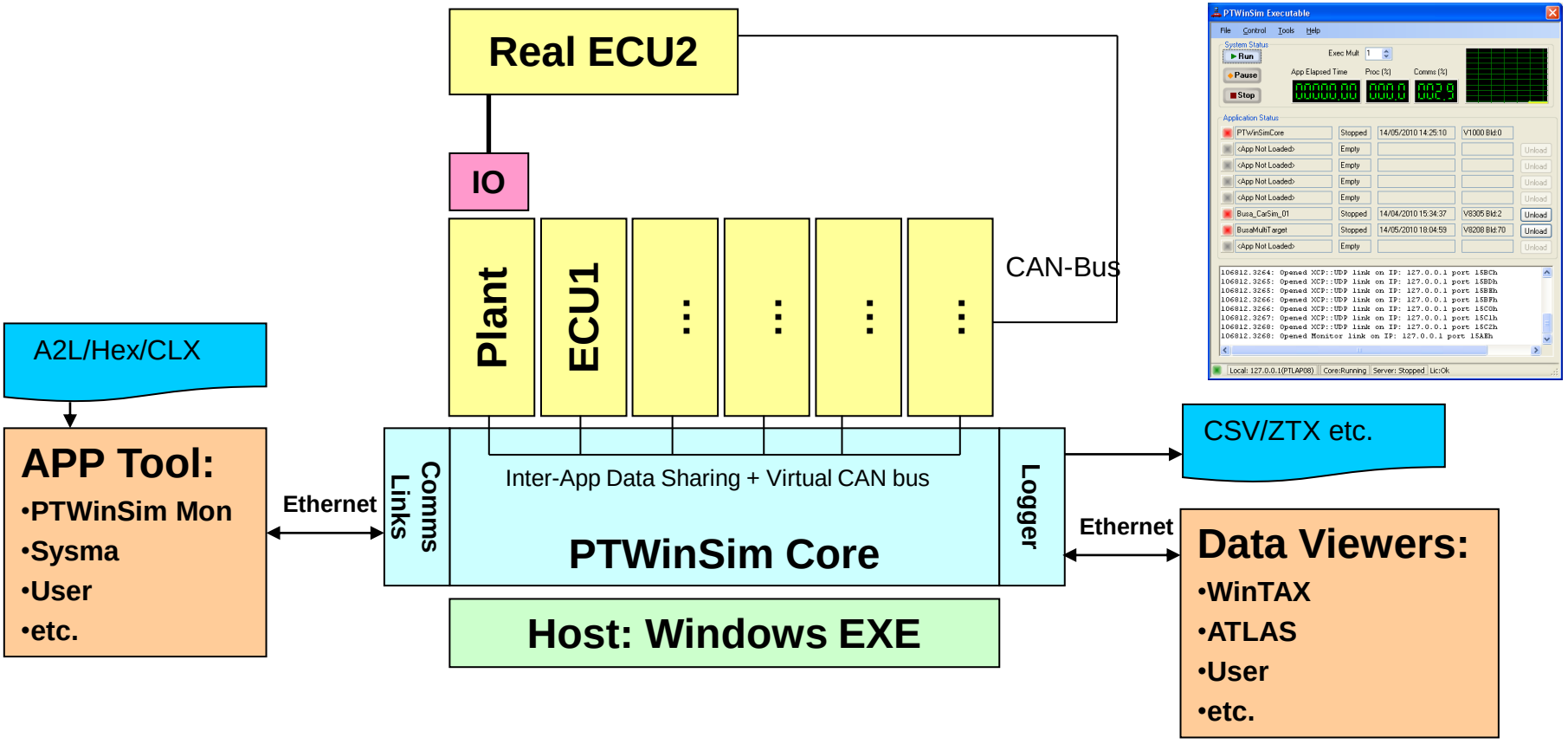
Host: VMS

Provides addition data inputs and extracts simulation outputs

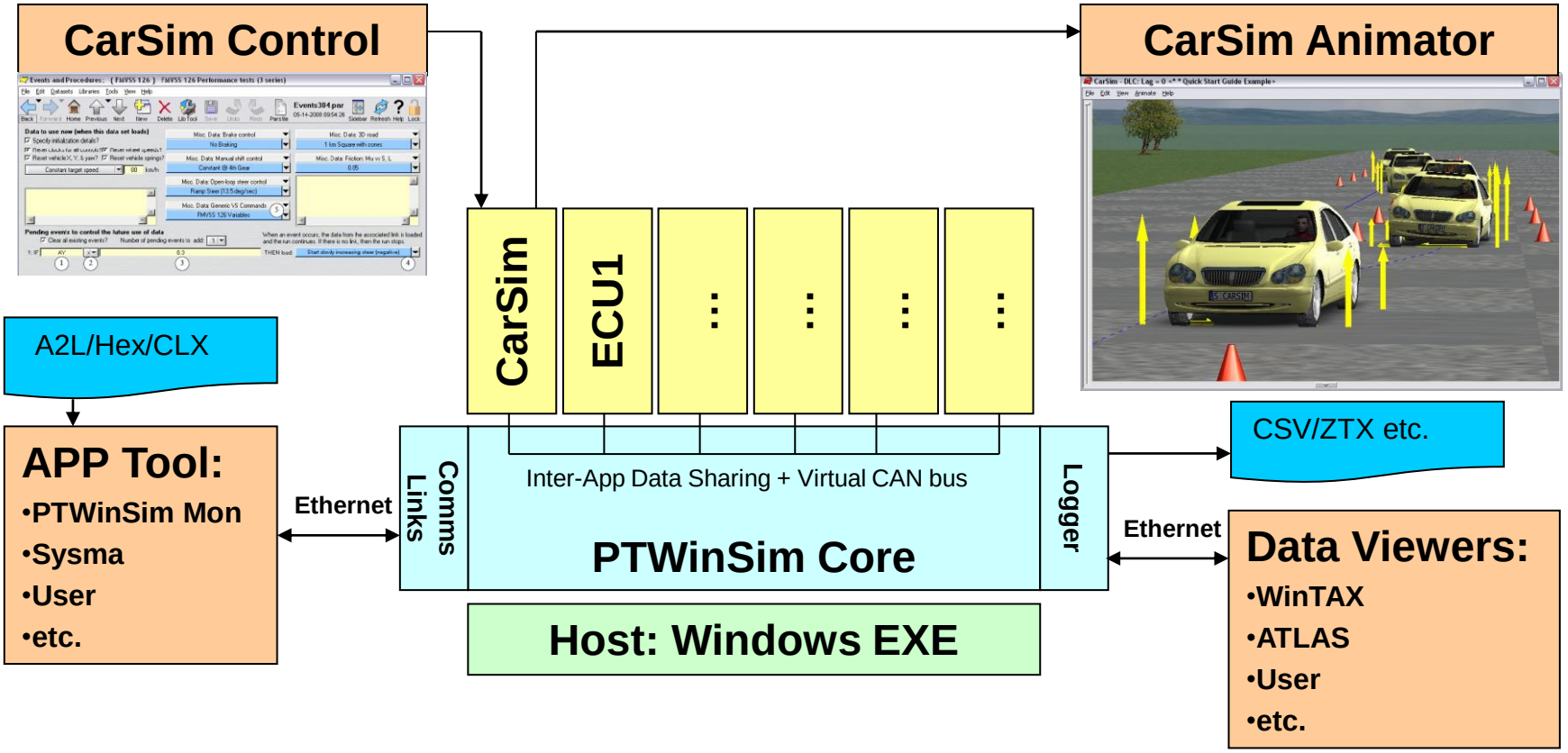
ZTX Data

ZTX Data

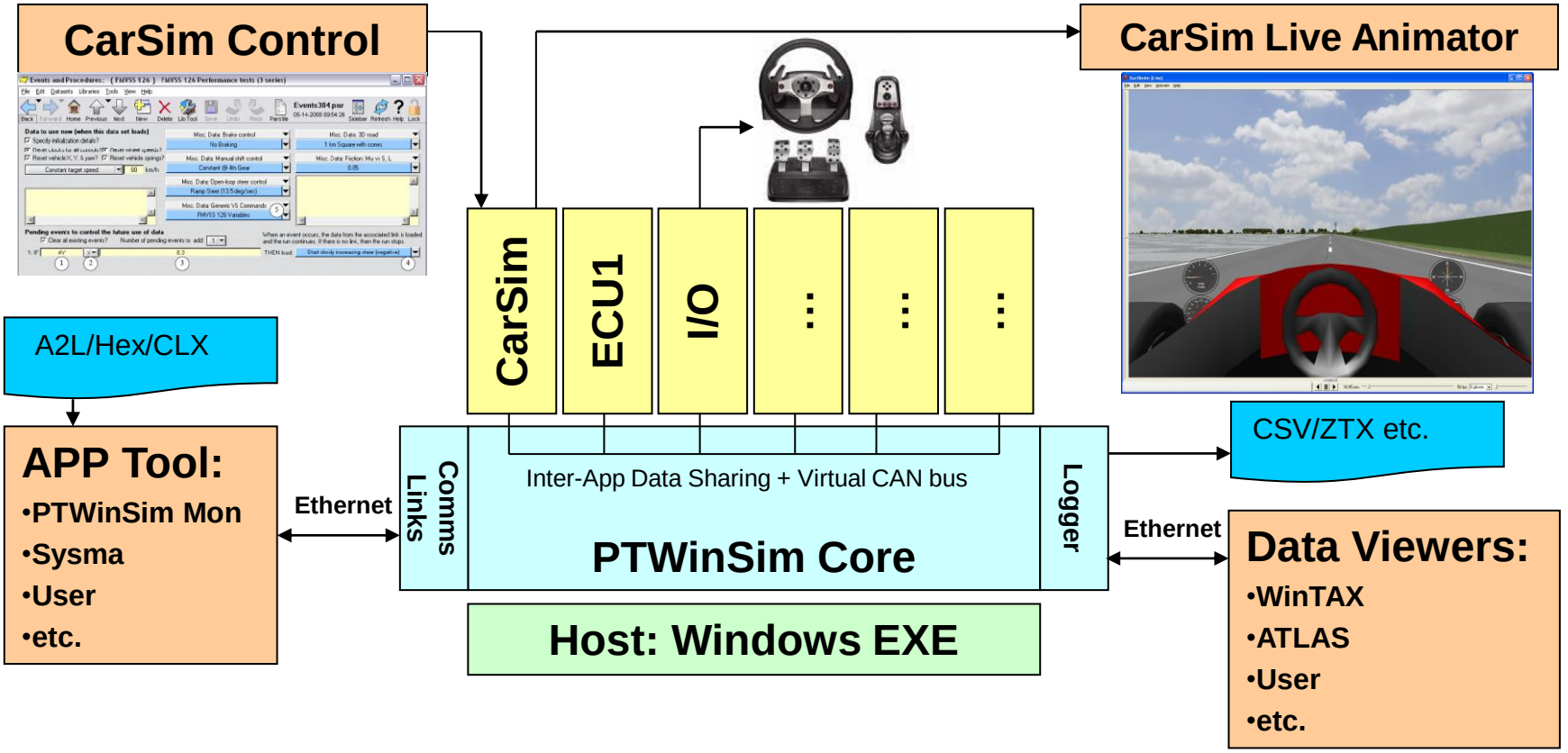
Virtual HIL + Real World Links



Virtual HIL Using CarSim/TruckSim/BikeSim®



Driving Simulator Using CarSim®



Virtual HIL + rFpro (internal vehicle model)

Real ECU2

IO

CAN-Bus

rFpro I/F

ECU1

...

A2L/Hex/CLX

APP Tool:
- PTWinSim Mon
- Sysma
- User
- etc.

Ethernet

Comms Links

Inter-App Data Sharing + Virtual CAN bus

PTWinSim Core

Logger

CSV/ZTX etc.

Ethernet

Data Viewers:
- WinTAX
- ATLAS
- User
- etc.

Host: rFpro Plugin

rFpro

rFpro + User Vehicle Model (Simulink, SIMPACK, Dymola etc.)

Real ECU2

IO

CAN-Bus

rFpro I/F

User Model

ECU1

I/O

...

...

A2L/Hex/CLX

APP Tool:
- PTWinSim Mon
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- etc.

Ethernet

Comms Links

Inter-App Data Sharing + Virtual CAN bus

PTWinSim Core

Logger

CSV/ZTX etc.

Ethernet

Data Viewers:
- WinTAX
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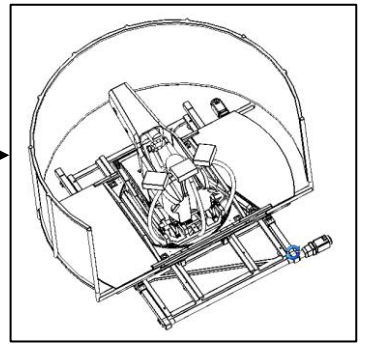
- User
- etc.

Host: rFpro Plugin

rFpro

rFpro + User Vehicle Model + DIL Simulator



ansiblemotion

Real ECU2

IO

CAN-Bus

rFpro I/F | User Model | ECU1 | I/O | Cueing | Motion Ctrl

A2L/Hex/CLX

APP Tool:
- PTWinSim Mon
- Sysma
- User
- etc.

Ethernet

Comms Links

Inter-App Data Sharing + Virtual CAN bus

PTWinSim Core

Logger

CSV/ZTX etc.

Ethernet

Data Viewers:
- WinTAX
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- User
- etc.

Host: rFpro Plugin

rFpro

PTWinSim Application Examples

- Plant Models Developed In:
  - Simulink @Source/GDE/MCT/Bosch CCA
  - Mechanical Simulation CarSim/BikeSim/TruckSim etc.
  - VI-Grade VI-CarRealTime
  - IPG CarMaker/MotorcycleMaker/TruckMaker
  - SimPack – Planes, Trains and Automobiles, and more
  - Dymola
- ECU Control Models
- Hardware Interface
- rFpro Interface

.NET API Libraries

- Access to comms functions to control and monitor PTWinSimCore in whatever host environment is used.
- Methods for creating own UDP recorder to create own output format.
- Visual Studio samples provided

C++ API Libraries

- Methods for creating own UDP recorder to create own output format.
- Visual Studio sample provided

PTWinSim Monitor

- Used where no user GUI to Core (eg rFpro)
- Communicates to Core via network
- Monitor Activity
- Load Application
- Display Application Status
- Control Run State