Accelerate High Accuracy Outdoor AMR by Time Synchronization Technology

2024 inVISION TechTalks

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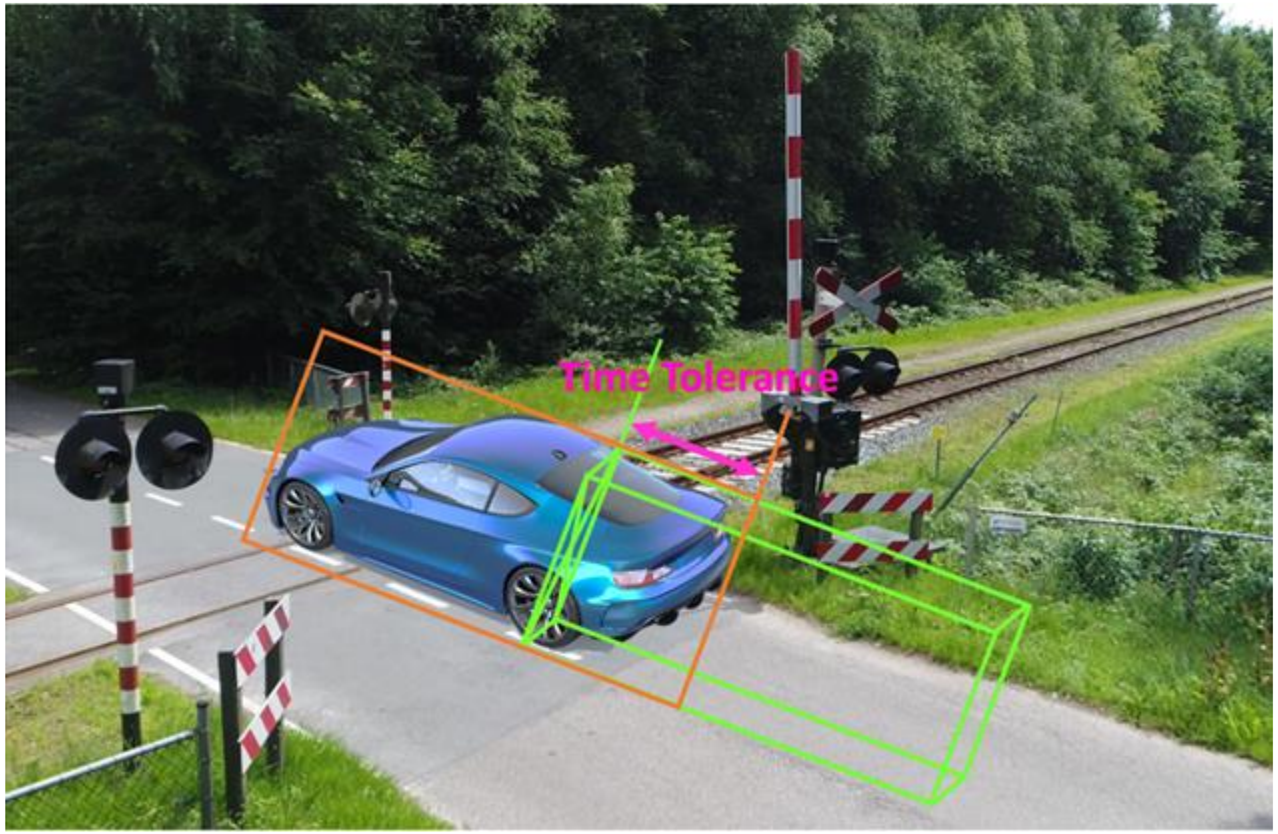
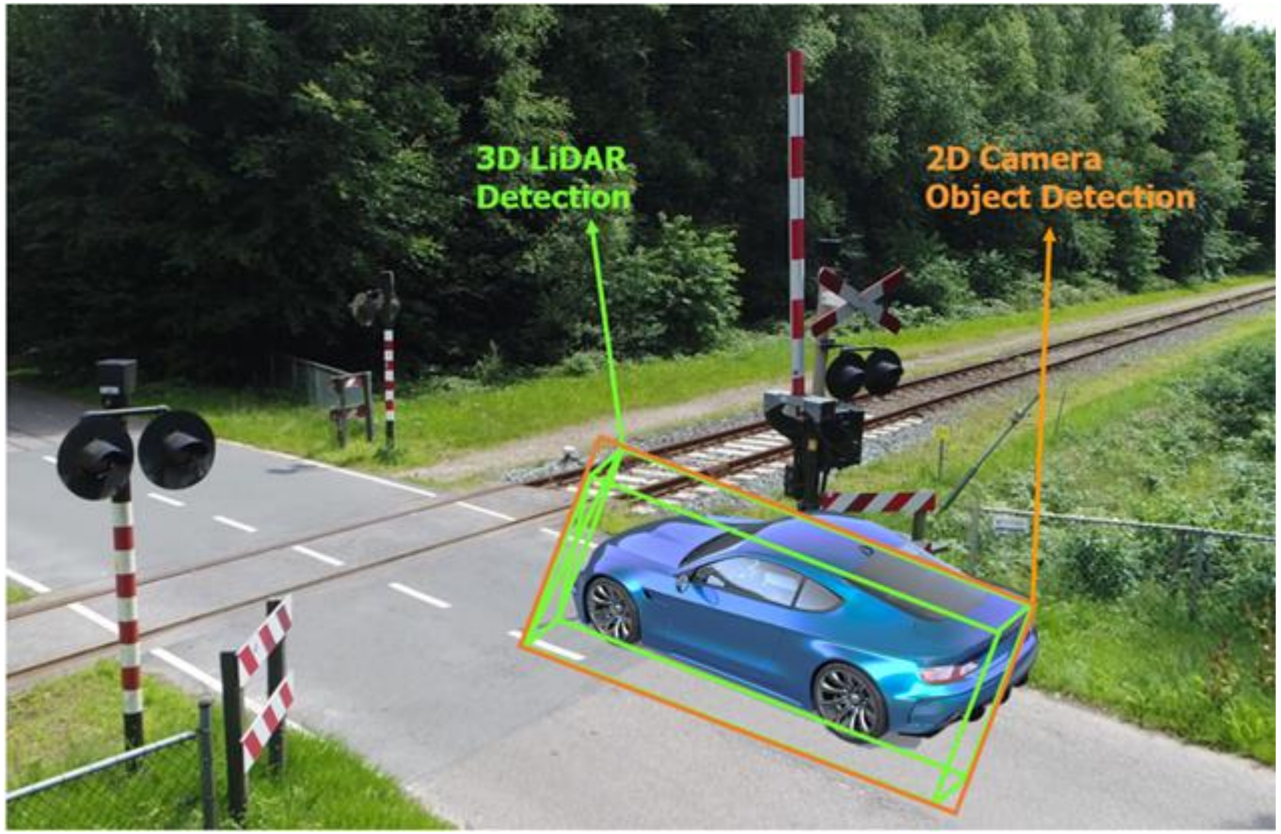
2024/03/12

Why We Need Time Synchronization

Time misalignment might cause wrong perception & wrong decision.



Time Misalignment



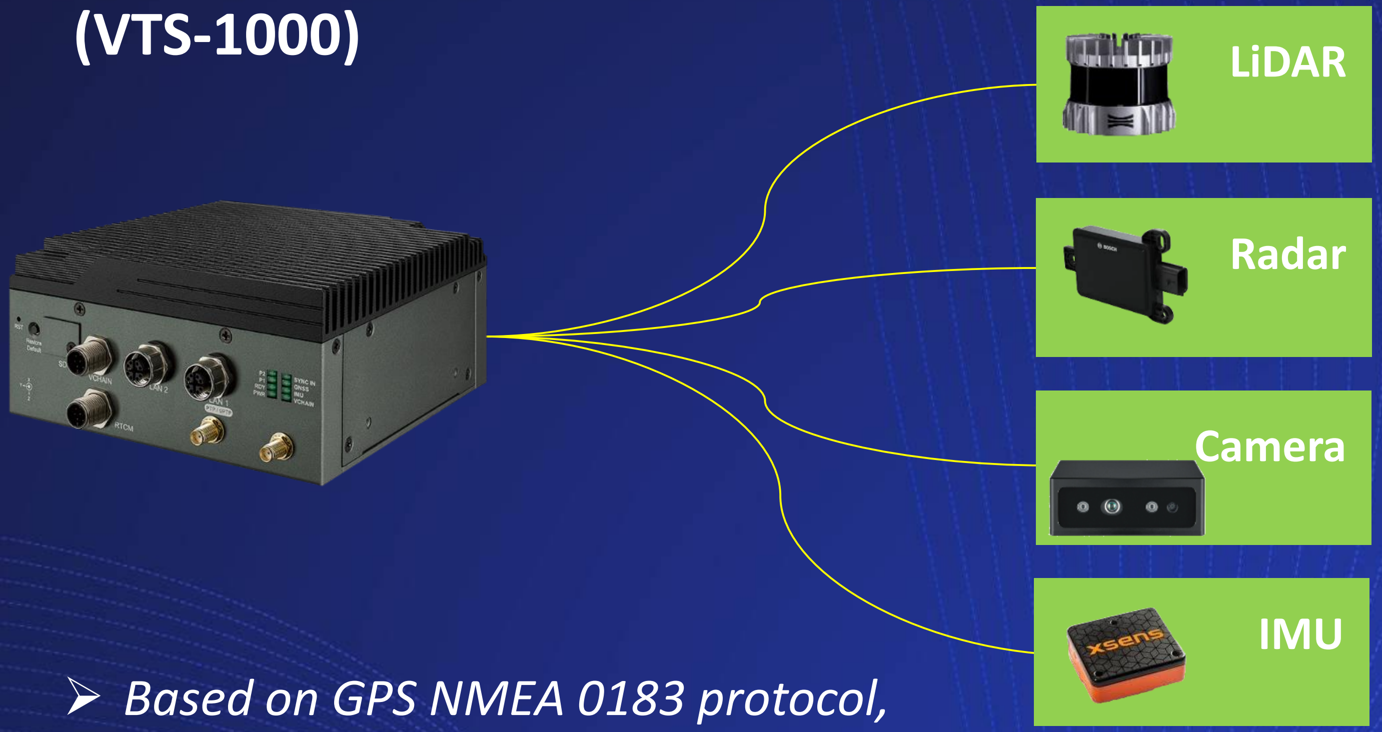
Time Synchronization

How to Carry Out Time Synchronization

GPS

Host Device (VTS-1000)

Sensors



- *Sending NMEA 0183 protocol to host device*

- *Based on GPS NMEA 0183 protocol, VTS then output time data to sensors*

Time Synchronization Framework

Applications
Agriculture | Delivery Robots | Mining | Automotive | Digital Twin

Benefits
Zero-error Perception | Nano-second Precision | Centimeter Position

Developing Functions
Mapping | Localization | Sensor Fusion | Navigation | Calibration

Software Features
Python Tool | Daisy Chain | Sensor Fusion

Time Sync Solution

Technology
Time Winding | Time Stamping | Time Keeping

Sensor Fusion Box

VTS-1200GU

Computing Platform

Vecow PLUG-IN ELECTRONIC GMBH

Key Features

Time Winding

- Push time protocol to all nodes
- Ensure all sensors are synced
- Supports various frequency

Time Stamping

- Time pulse and protocol keeping
- High precision local time data
- Anti-jamming

Time Keeping

- Align GNSS with sensor internal clock
- Continuous PPS trigger to all nodes
- Guarantee all sensor as same baseline

Software Features

Python Tool

- Meet various sensors requirement
- Support x86 and Arm-based system
- Friendly command line

Daisy Chain

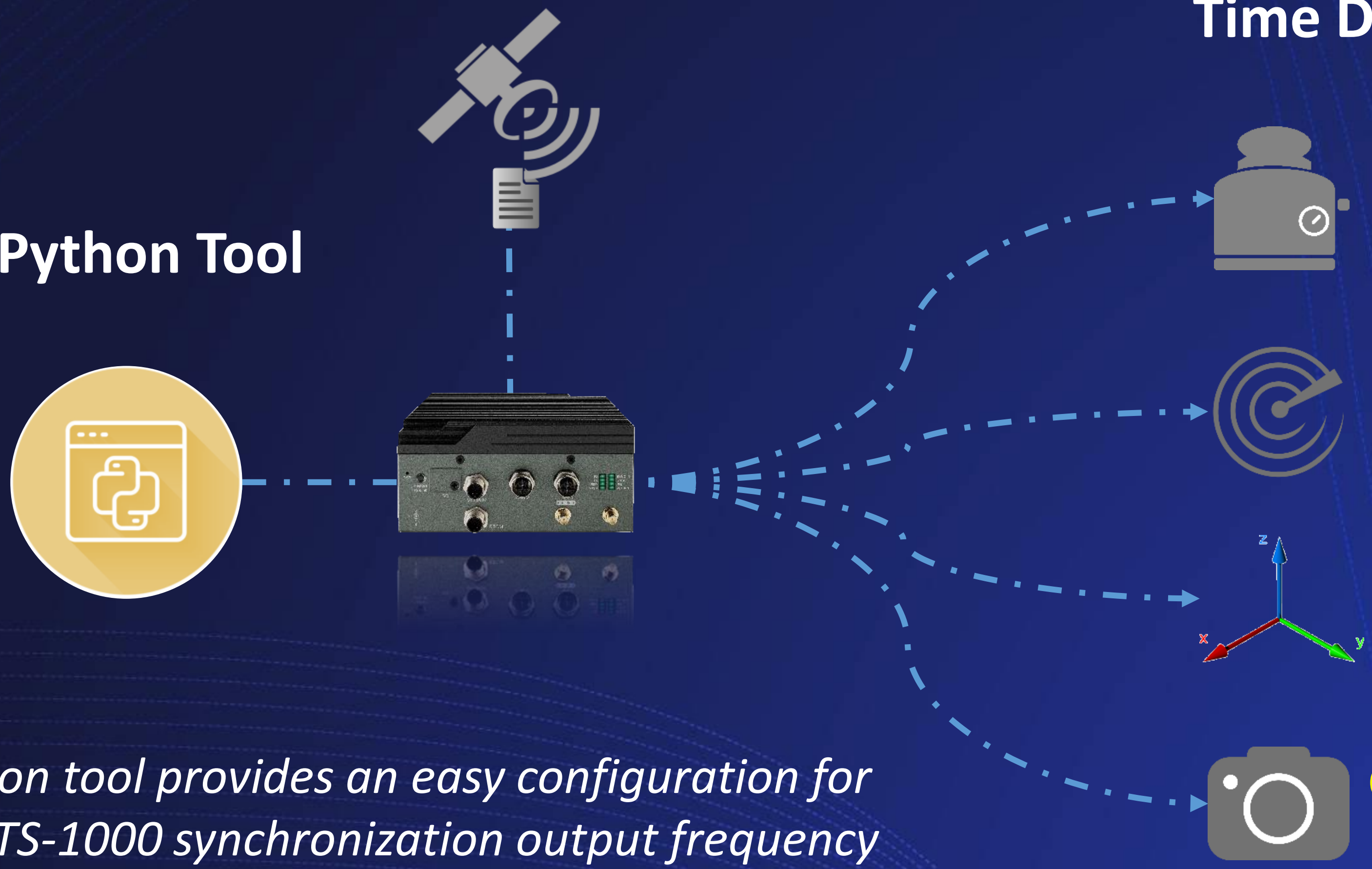
- Sensor node to sensor node sync
- Controller to Controller sync
- Auto calibration of latency
- Expand the sync channels

Sensor Fusion

- Dual GNSS and IMU yaw fusion
- Allow custom sensor fusion algorithm
- Integrated EKF algorithm

Vecow's Python Tool

Time Data



3D LiDAR *ToD supports frequency : 1, 10, or 25Hz*

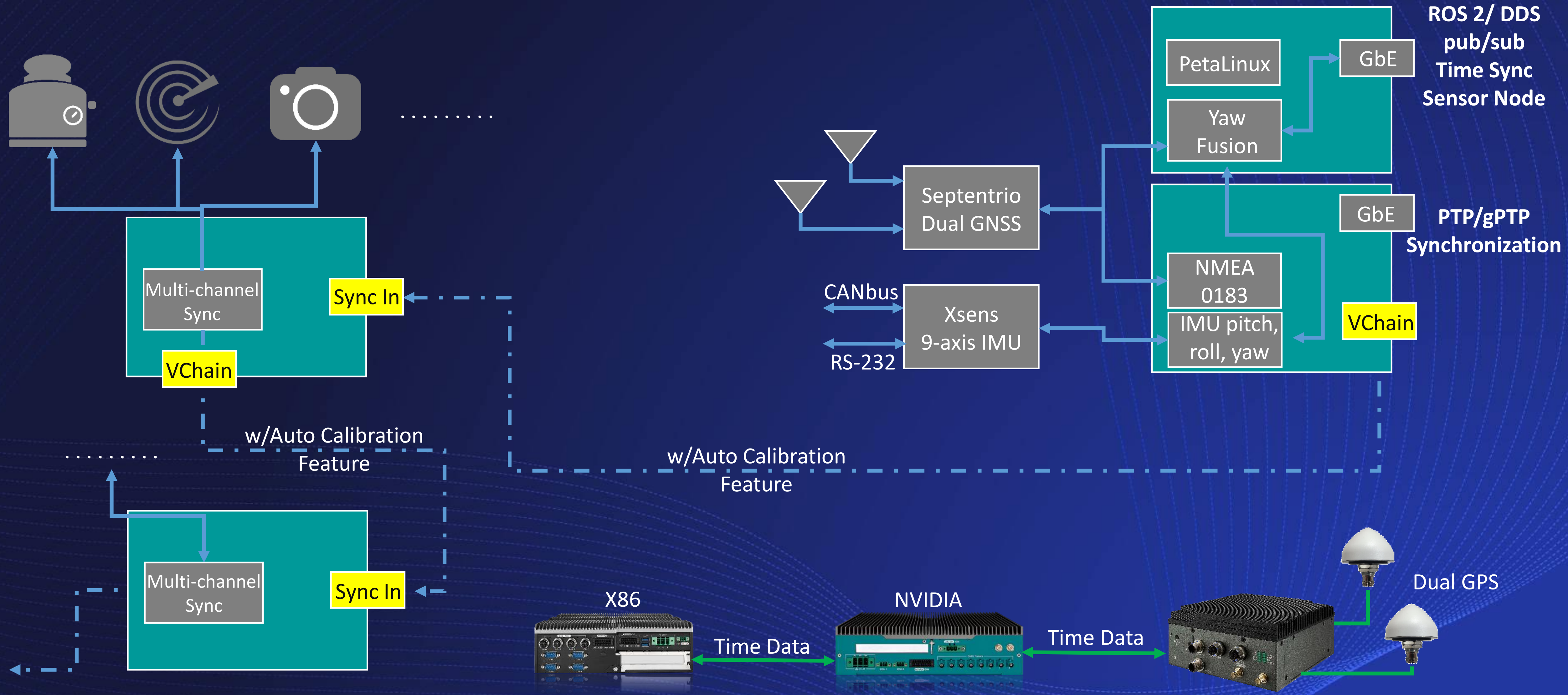
Radar *using PTP sync and frequency up to 20Hz*

IMU *data rate up to 200Hz*

Camera *support frequency : 1, 10, 25, 30, 60, 100Hz*

The Python tool provides an easy configuration for Vecow VTS-1000 synchronization output frequency and protocol, allowing for the measurement of external sensor requirements.

Vecow's Daisy Chain



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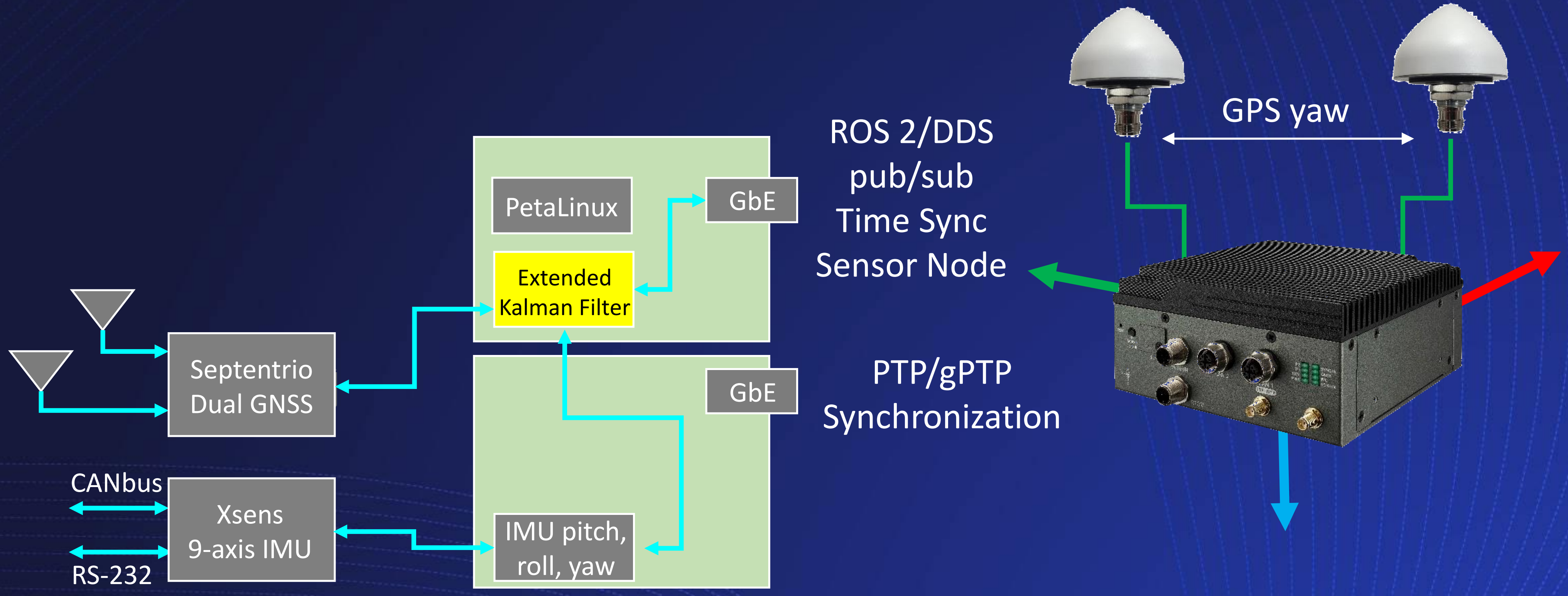
Vecow's VFusion Feature – Sensor Fusion



VFusion utilizes GNSS-IMU fusion technology and runs on FPGA, accelerating the algorithm and providing reliable data.

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Advantages of Time Synchronization

- ✓ Zero-error Perception
- ✓ Nano-second Precision
- ✓ Centimeter Position

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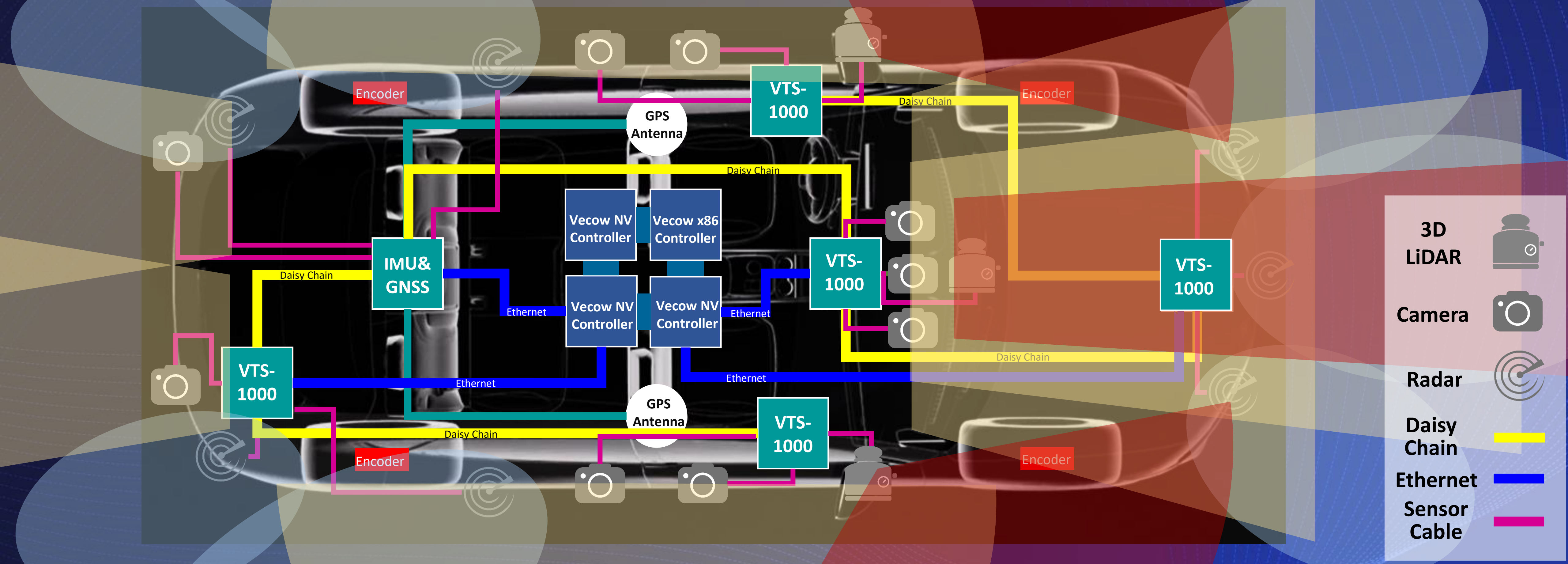
Satellite Architecture on Vehicle



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VTS-1000 Time Sync Box

- Time Sync Box, based on **Xilinx Ultrascale+ MPSoC**
- Linux System , **ROS 2 Humble** framework
- **8-channel Sync Out** for cameras, Lidars, Radars, IMU
- 1 GigE LAN, 1 Network Sync LAN with **PTP/gPTP** support
- Support **External GNSS** input and **Daisy Chain** sync out
- Support RTK RTCM **Centimeter Level** position accuracy
- Integrated Septentrio high precision **Dual-Antenna GPS**
- Integrated Xsens MTi-670 high precision **6-axis IMU**
- **5V to 60V** wide DC input, **-40˚C to 75˚C** operating temp.

VTS-1100	Xilinx ZU5EG	2 LAN	1 Sync In	5 Sync Out	-	-	-	-
VTS-1200	Xilinx ZU5EG	2 LAN	1 Sync In	8 Sync Out	1 RTCM	1 UART	-	-
VTS-1200GU	Xilinx ZU5EG	2 LAN	1 Sync In	8 Sync Out	1 RTCM	1 UART	1 GPS	1 IMU

Vecow PLUG-IN ELECTRONIC GMBH

Machine Vision

In-Vehicle Computing

Factory Automation

Public Security

- ✓ 24-core Intel® Core™ i9/i7/i5/i3 14th Gen processor (codename Raptor Lake/Alder Lake) + R680E PCH
- ✓ 9 LAN : 8 Independent 2.5G LAN with 4 IEEE 802.3at PoE+
- ✓ 6 USB 3.2 Gen 2, 4 M.2 SSD Tray, TSN supported
- ✓ DC 9V to 50V Power Input, Software Ignition Control
- ✓ Optional multiple 10G LAN/2.5G LAN/GigE LAN/SIM Socket
- ✓ Intel® vPro, TCC, TSN, TPM 2.0 supported

ECX-3000

Workstation-grade Fanless System

In-vehicle Computing

Robotic Control

Public Security

Medical Image

5G

AI

NVIDIA

8K

GMSL

CAN Isolated

- ✓ Advanced NVIDIA® Jetson AGX Orin™ platform delivers up to 275 TOPS AI performance
- ✓ PCIe Gen4 x8 expansion slot supports optional multiple 10GigE/PoE LAN/USB connections
- ✓ 6 GigE LAN with 4 PoE+, 5 USB 3.1, 2 Isolated CAN Bus, 16 Isolated DIO
- ✓ Supports 8 GMSL 1/2 automotive cameras with Fakra-Z connectors
- ✓ DC 9V to 50V wide range power input

EAC-5000

Expandable Embedded AI Computing System

Vecow PLUG-IN ELECTRONIC GMBH

Vecow

Everyone deserves a better system