

**2021 IEEE Autonomous
Driving AI Test Challenge**

Co-Sponsored by IEEE AI Test Conference 2021

Aug. 23-26, 2021
Online (Worldwide)



SVL Simulator 2021.1

For 2021 IEEE AD AI Test Challenge

Steve Lemke (4/9/2021)



Agenda

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- Training Materials
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- Demo
- Getting Help
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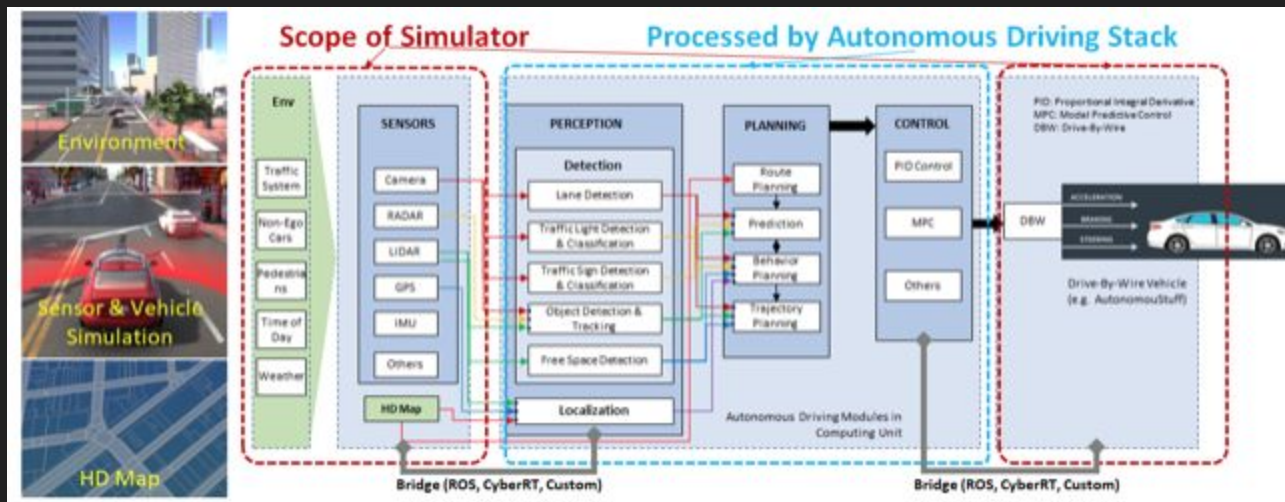




Introduction

- Challenge information - see <http://av-test-challenge.org/>
 - First phase challenge submission: April 30
 - Second phase challenge submission: July 15
 - Submission info: *More details to come*
- Challenge Phases
 - *First Phase uses LGSVL Simulator 2020.06*
 - **Second Phase uses SVL Simulator 2021.1 (released 3/25/21)**
 - This training (April 9 and 10) covers **SVL Simulator 2021.1**

AD Simulation Overview



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GPU ACCELERATED 128 BEAM LIDAR





System Requirements

- Graphics workstation or gaming laptop
 - ~4 GHz, Quad core (or better), 16+ GB of RAM
- GPU required for Simulator and for Apollo
 - Nvidia GTX-1070/1080 (“Pascal”) – works with Apollo 5.0 or newer
 - Nvidia RTX-2070/2080 (“Touring”) – requires Apollo 5.5 or newer
 - Nvidia RTX-3060+ (“Ampere”) – requires Apollo “master” (aka Apollo 6.1+)
 - **8+ GB of GPU memory** (large maps and/or sharing with Apollo requires more memory)
- One machine or two?
 - Two is better but one (8+ GB GPU) should be usable (with “modular testing”)
- **Windows 10** or preferably **Linux** (Ubuntu 18.04/20.04) – *or one of each*

Training Materials

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- All new SVL Simulator web site for new release
 - “LGSVL Simulator” is now “SVL Simulator” (as of 2021.1, released on 3/25/2021)
 - Web site is now: <https://svlsimulator.com>
 - **NOTE:** svlsimulator.com documents the **new 2021.1 release**
 - *(...which is used for Challenge Phase 2!)*
- SVL Simulator Documentation
 - All new 2021.1 docs: <https://svlsimulator.com/docs/> (new cloud-based UI)
 - Use 2020.06 archive for Challenge Phase 1: <https://svlsimulator.com/docs/archive/2020.06/>





More Training Materials

- **Video for new web UI in SVL Simulator 2021.1**
 - Creating new random simulation: <https://youtu.be/C-Z9DXFbIhY>
- 2020 LGSVL+Apollo hands-on video
 - How to build Apollo and use Python API scripts (with older LGSVL 2020.06)
 - YouTube walk-through: https://youtu.be/Ucr0aM334_k
- Online AD Course from ExactPro Systems using LGSVL:
 - https://www.youtube.com/playlist?list=PL8QI2_5rYPjgEygg5rDm7DSHWbGmVqYF5
 - <https://exactpro.com/events/external/software-testing-complex-intelligent-systems-and-autonomous-vehicles>



Installing SVL Simulator

- Download **SVL Simulator 2021.1** release
 - Use “**Download**” button at <https://svlsimulator.com/>
 - Full release notes and latest binaries: <https://github.com/lqsvl/simulator/releases>
- SVL Simulator Documentation
 - Main: <https://svlsimulator.com/docs/>
 - Installing: <https://svlsimulator.com/docs/installation-guide/installing-simulator/>
 - Getting Started: <https://svlsimulator.com/docs/getting-started/getting-started/>



Installing Apollo

- Installing Apollo
 - **Recommended: Apollo r6.0.0 branch:** <https://github.com/ApolloAuto/apollo/tree/r6.0.0>
 - Supports SVL Simulator and Nvidia 10x0 and 20x0 series GPUs
 - **Latest: Apollo (master):** <https://github.com/ApolloAuto/apollo>
 - Supports SVL Simulator and Nvidia 10x0, 20x0, and 30x0 series GPUs
 - Build may be unstable; mind the prerequisites: <https://github.com/ApolloAuto/apollo#prerequisites>
 - Note: With Apollo 6.0+ perception may not work; best to use SVL “modular testing” (aka ground truth sensors)
- SVL Simulator + Apollo Documentation
 - <https://svlsimulator.com/docs/system-under-test/apollo-master-instructions/>
 - See Apollo notes re: Nvidia drivers/Docker <https://github.com/ApolloAuto/apollo#prerequisites>
 - Nvidia Container Toolkit:
 - <https://docs.nvidia.com/datacenter/cloud-native/container-toolkit/install-guide.html>
 - Lots of Apollo docs here: <https://github.com/ApolloAuto/apollo/tree/master/docs>



Choosing Maps, Vehicles, and Sensors

- Should not need to install Unity or re-build simulator from source
 - SVL Simulator is open source and contributions are always welcome but that's not the point of this Challenge!
- **Use provided maps and vehicles**
 - Many maps (3D environments for simulation) are available: <https://wise.svlsimulator.com/maps/public>
 - May need to add **apollo50** HD map ("**base_map.bin**") into Apollo container: ("**/apollo/modules/map/data/<mapname>**")
 - Vehicles with Apollo sensor configurations: **Lincoln2017MKZ**, Lexus2016RXHybrid, and Jaguar2015XE
- **Use provided Sensor Configurations**
 - Use "**Apollo 6.0 (modular testing)**" sensor configuration
 - Should not need to modify provided Apollo-ready sensor configurations
 - Camera and LiDAR sensors are not needed when using modular testing (ground truth) sensor configurations
- SVL Simulator Documentation
 - Library: <https://svlsimulator.com/docs/user-interface/web/library/>
 - Modular Testing: <https://svlsimulator.com/docs/tutorials/modular-testing/>



Creating Simulations

- **Random Traffic Simulation**
 - Good for interactively testing simulator and Apollo
- **API-Only Simulation**
 - Similar to 2020.06 API-Only mode: Used for running local Python scripts
- **Python API Simulation**
 - Linux-only (for Apollo integration): Used for Python script simulations
- **SVL Simulator Documentation**
 - Runtime Templates: <https://svlsimulator.com/docs/running-simulations/runtime-templates/>
 - Creating Simulations: <https://svlsimulator.com/docs/running-simulations/running-simulator/>

Python API



- Get latest Python API (updated for SVL 2021.1)
 - <https://github.com/lgsvl/PythonAPI/> - use this for SVL 2021.1
 - --> `git clone git@github.com:lgsvl/PythonAPI.git`
 - Update existing clones to “master” branch for SVL 2021.1: `git checkout master`
- Python API Quickstart (Example) Scripts
 - <https://github.com/lgsvl/PythonAPI/tree/master/quickstart>
- Controlling Apollo (Dreamview) with `lgsvl.dreamview` API
 - Example: https://github.com/lgsvl/PythonAPI/blob/master/examples/NHTSA/Encroaching-Oncoming-Vehicles/EOV_S_25_20.py
- SVL Simulator – Python API Documentation
 - Python API: <https://svlsimulator.com/docs/python-api/python-api/>
 - Dreamview API: <https://svlsimulator.com/docs/python-api/dreamview-api/>
 - Quickstart Scripts: <https://svlsimulator.com/docs/python-api/api-quickstart-descriptions/>

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Demo





Getting Help

- Troubleshooting SVL Simulator
 - <https://svlsimulator.com/docs/support/troubleshooting/>
 - <https://svlsimulator.com/docs/support/faq/>
- Apollo Dreamview help:
 - https://github.com/ApolloAuto/apollo/blob/master/docs/specs/dreamview_usage_table.md
 - https://github.com/ApolloAuto/apollo/blob/master/docs/FAQs/Dreamview_FAQs.md
- Technical questions? See Github issues: search before posting
 - **SVL Simulator:** <https://github.com/lgsvl/simulator/issues>
 - **Apollo:** <https://github.com/apolloauto/apollo/issues>



Troubleshooting Apollo + SVL Simulator

- Review the doc: <https://svlsimulator.com/docs/system-under-test/apollo-master-instructions/>
- Note: Nvidia driver 460 (CUDA 11.1) is required after `ca4776a7` in Apollo master
- Dreamview: “Mkz **Lgsvl**” and “Lincoln2017MKZ **LGSVL**” and correct map?
- Check `cyber_monitor` (after: `docker/scripts/dev_into.sh`)
- In Simulator: Press “Play” (if interactive mode; else use API-Only mode for Python control)
 - Should make several channels green: canbus, 5 x gnss, camera/lidar perception, clock (if enabled)
 - Is bridge IP address and port set correctly in Vehicle settings (e.g. localhost:9090 or IP:9090)?
- “Please send car initial position”?
 - Enable **Transform** and **Localization** modules in **Module Controller**?
 - Confirm sensor configuration
- Map rotated or missing in Dreamview?
 - Apollo 5.0: Get latest maps from LGSVL fork
 - Apollo master: `git checkout 7762c918` (Jan 5, 2021 or later has latest Borregas map as does r6.0.0 branch)



Troubleshooting Apollo + SVL Simulator

- Use Modular Testing (ground truth) sensors instead of Apollo 6.x perception
 - Perception not working in Apollo master; won't run on single CPU/GPU with Simulator
- No **routing** or **planning** path? Ego vehicle won't drive?
 - Enable **Prediction**, **Planning**, **Routing**, and **Control** modules in **Module Controller**?
 - Must cycle **Planning** off and back on after driving away from initial location
 - Modules don't instantly turn off or on (Dreamview switches "bounce")
 - Restart container: **dev_start.sh stop**, and **dev_start.sh** then **dev_into.sh**
- Apollo latency issues?
 - CPU may be too slow to run Apollo and SVL Simulator on same machine
 - Use Clock sensor: Set **clock_mode** to **MODE MOCK** in (Apollo) cyber.pb.conf
 - <https://svlsimulator.com/docs/system-under-test/apollo-master-instructions/#setting-clock-mode>

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Q & A



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Thanks!

