RIEGL-VZi ROS 2 Driver API

1. Coordinate Systems

RIEGL uses hierarchically structured coordinate systems:

SOCS (Scanner's Own Coordinate System): Angle data and range data are the base for calculation of the data in the Scanner's Own Coordinate System (SOCS).
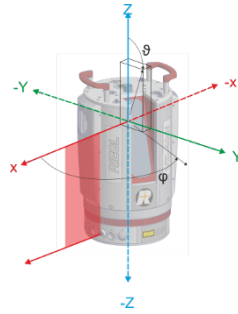

Figure 1: SOCS

PRCS (Project Coordinate System): A number of scan positions and the data acquired therein make up a scan project.The center of the project's coordinate system (PRCS) usually coincides horizontally with the center of the first scan position. The axes of PRCS are strictly pointing to east (x-axis, red), north (y-axis, green) and up (z-axis, blue), respectively.
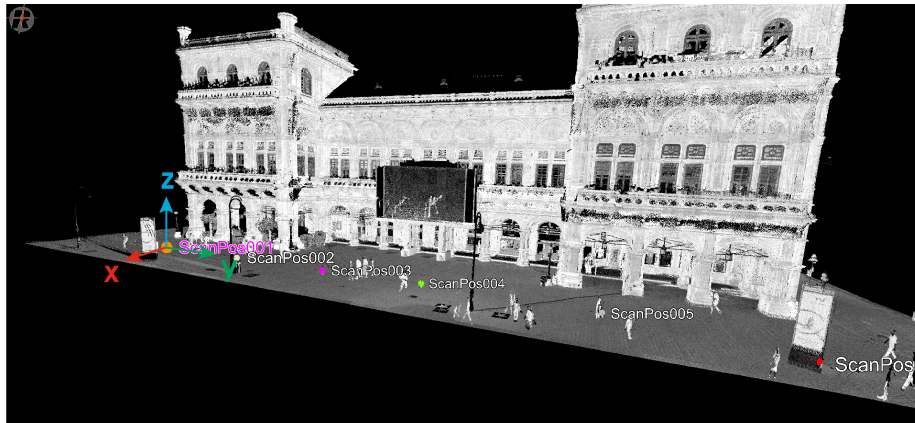

Figure 2: PRCS

VOCS (Voxel Coordinate System): This is an intermediate coordinate system.

Origin and orientation are identical to PRCS at the first scan position. Each scan will be registered in the VOCS coordinate system. * Every scan position is described by SOPV (Scan Orienqtation and Position in VOCS). * The position of the VOCS is described by VOP (VOCS Orientation and Position in PRCS). * With every scan the VOP, especially the orientation, will be readjusted. * The SOP (Scan Position and Orientation in PRCS) has to be recalculated after each newly registered scan from SOPV and updated VOP.

```
SOCS ---
 |       |
sopv    |
 |       |
VOCS    sop
 |       |
vop     |
 |       |
PRCS ---
```
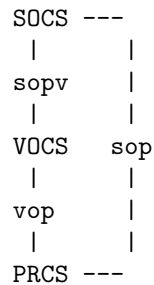
2. RIEGL Interfaces

2.1 Messages

riegl_vzi_interfaces/Status:

```
uint8 errors
uint8 warnings
uint8 scan_progress
uint8 memory_usage
```

tbd...

2.2 Services

riegl_vzi_interfaces/GetPointcloud:

```
uint32 n
---
PointCloud2 pointcloud
```

See PointCoud2 definition: sensor_msgs/PointCloud2

riegl_vzi_interfaces/GetPose:

```
int32 first
int32 last
---
PoseStamped vop
```

```
PoseStamped sopv[]
PoseStamped sop[]
```

A negative value of n/first/last points to the last scan position. 0 ist the first scan position.

See PoseStamped definition: sensor_msgs/PoseStamped[]

3. Nodes

3.1 riegl_vz

3.1.1 Parameters

~**hostname** (string, default: "") :

The scanners hostname or IP address.

~**ssh_user** (string, default: "user") :

The linux user name for SSH login on the scanner.

~**ssh_password** (string, default: "user") :

The linux user password for SSH login on the scanner.

~**scan_pattern** (string, default: "Overview") :

The scan pattern for laser scanning, specifying the field of view (FOV) and the delta angles between laser shots on line and frame angle.

~**meas_prog** (integer, default: 0) :

The laser scanners measurement program, defining the laser pulse repetition rate (PRR).

~**stor_media** (integer, default: 2) :

Automatically increment scan position before every data acquisition start.

~**coarse_registration** (bool, default: False) :

Enable coarse registration. If coarse registration fails, the standard registration method will be applied.

~**pointcloud_msm** (integer[], default: {1,1}) :

The point cloud MSM (monitor step multiplier) configuration, used for scan data reduction, default disabled ([0]: lines, [1]: shots).

3.1.2 Published Topics

pointcloud (sensor_msgs/PointCloud2) :

Point cloud with scan data from the laser scanner in SOCS.

status (riegl_vzi_interfaces/Status) :

Riegl VZ scanner status, provided once per second.

3.1.3 Services

create_project (std_srvs/Trigger) :

Create a new or load an existing project on the scanner with name composed from current local time (date and time).

Returns:
success = True -> message: Project Name
success = False -> message: Error Message

scan (std_srvs/Trigger) :

Acquire laser scan data. Start scan and wait until finished. When the scan has finished data is published on 'pointcloud' topic.

Returns:
success = True -> message: Measurement Identifier
success = False -> message: Error Message

get_pointcloud (riegl_vzi_interfaces/GetPointcloud) :

Get point cloud data of a previously acquired scan position.

scan_register (std_srvs/Trigger) :

Start laser scan registration in actual project and wait until finished. Provide estimated position on 'pose' topic.

Returns:
success = True -> message: SUCCESS
success = False -> message: Error Message

get_pose (riegl_vzi_interfaces/GetPose) :

Request VOP, SOPV and SOP for scan position(s).

shutdown (std_srvs/Trigger) :

Shutdown the laser scanner.

Returns:
success = True -> message: SUCCESS
success = False -> message: Error Message