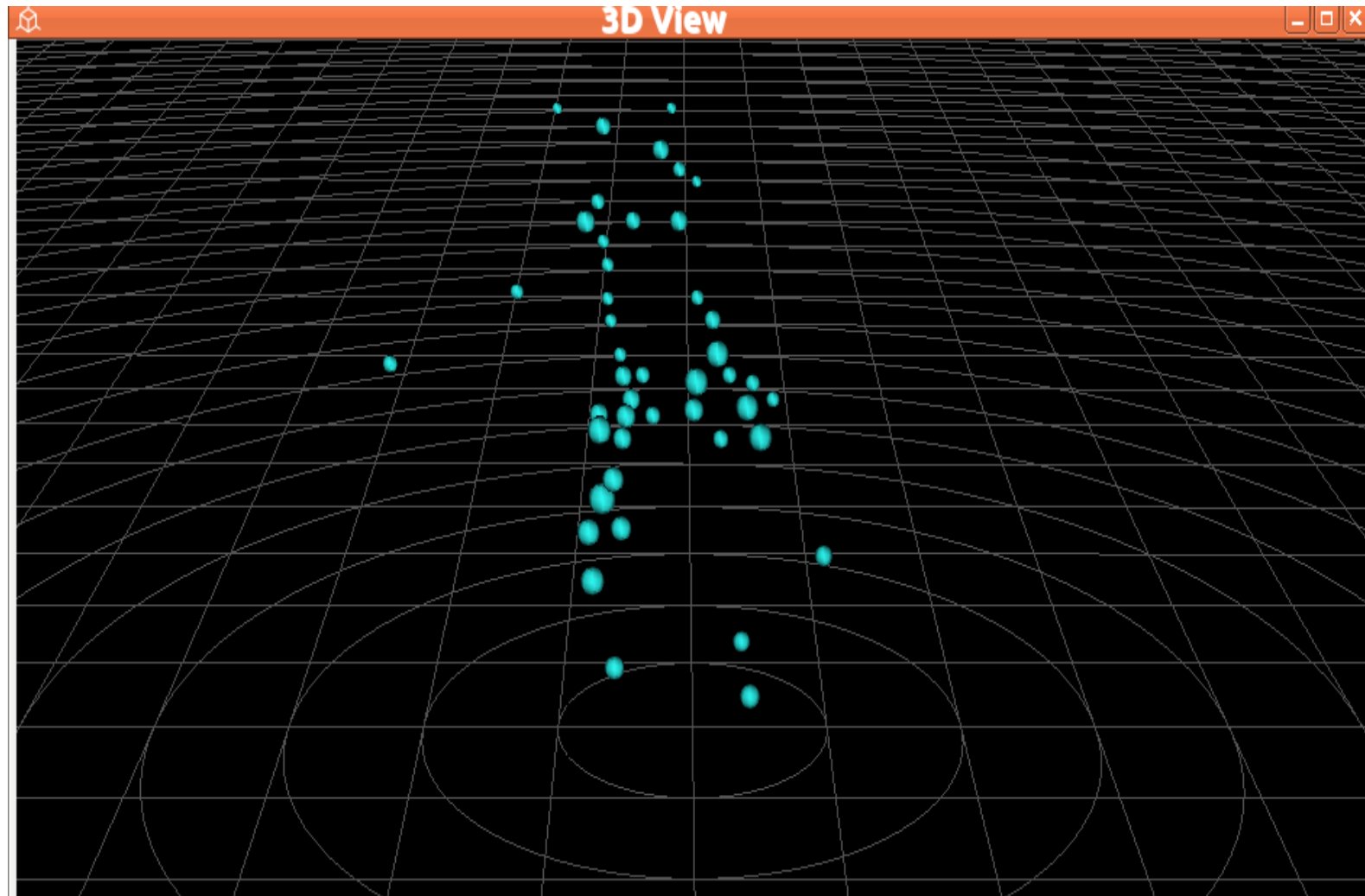


# Perception System using Stereo Vision and Radar

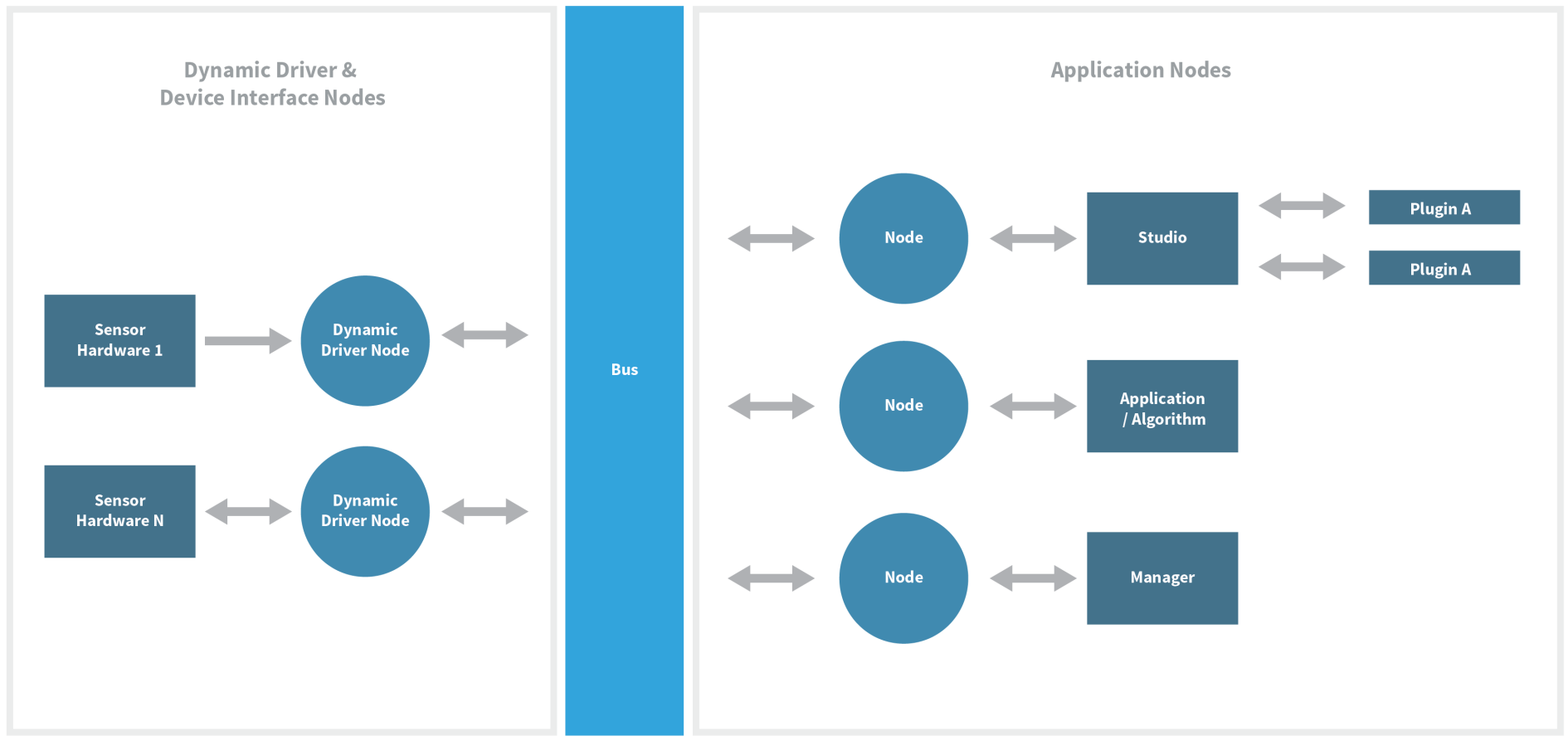
## **Progress Review 7**

Team A  
02/ 01/ 2017

# Radar data visualization in PolySync Studio

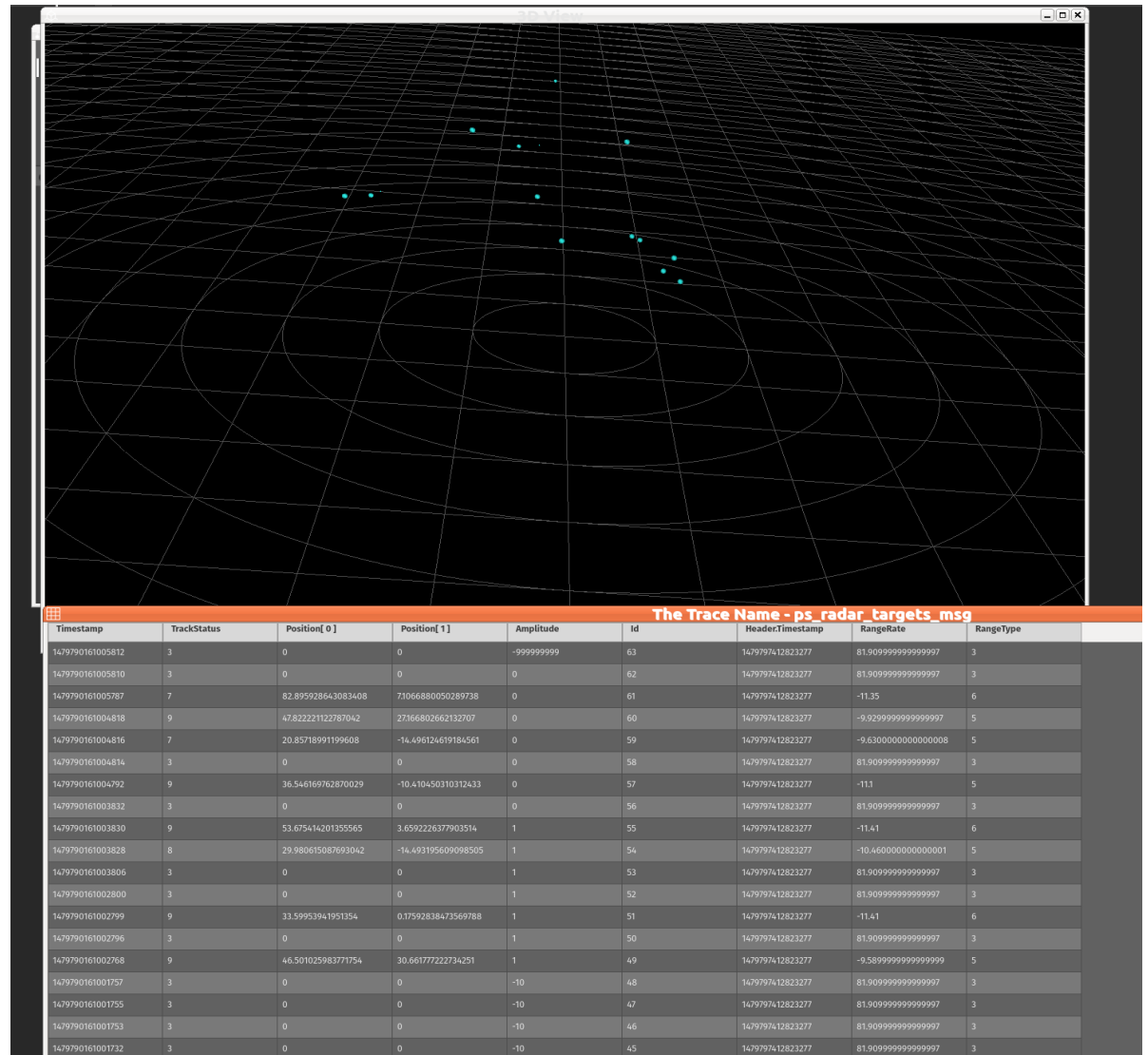


# Full System Architecture



# Information Identification

- Target ID
- Time Stamp
- Position
- Velocity
- Range Rate
- Track Status
- Range Type
- Zone Type
- Amplitude
- Magnitude
- Cross Section



# Information Extraction

- Filtered by *track status*
- Filtered by *range type*

- *Get track IDs*
- *Get positions*
- *Get velocities*

```
zihao@zihao-ThinkPad-W550s: /usr/local/polysync/examples/cpp/RadarSubscriber/build
zihao@zihao-ThinkPad-W550s: /usr/local/pol... x zihao@zihao-ThinkPad-W550s: /usr/local/pol... x zihao@zihao-
ID: 26  Pos_x: 28.6045  Pos_y: 4.12198  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 37  Pos_x: 33.2829  Pos_y: -2.79484  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 39  Pos_x: 6.89992  Pos_y: -2.05696  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 48  Pos_x: 32.4982  Pos_y: 0.340333  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 52  Pos_x: 4.67515  Pos_y: 3.08269  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 63  Pos_x: 50.831  Pos_y: 9.97264  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
-----
ID: 1  Pos_x: 35.898  Pos_y: -0.375937  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 3  Pos_x: 12.3137  Pos_y: 4.16797  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 4  Pos_x: 14.7936  Pos_y: -5.82737  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 5  Pos_x: 37.0141  Pos_y: 2.52337  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 6  Pos_x: 17.0317  Pos_y: 4.43642  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 18  Pos_x: 38.4485  Pos_y: 16.3997  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 37  Pos_x: 33.2829  Pos_y: -2.79484  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 39  Pos_x: 6.89992  Pos_y: -2.05696  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 48  Pos_x: 32.2982  Pos_y: 0.338239  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 52  Pos_x: 4.66436  Pos_y: 3.09899  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
ID: 63  Pos_x: 50.831  Pos_y: 9.97264  Vel_x: -1e+09  Vel_y: -1e+09
Tracking status: 9
-----
```

Value	Description
TRACK_STATUS_INVALID	Track status information is invalid.
TRACK_STATUS_UNKNOWN	Track status information is unknown.
TRACK_STATUS_NOT_AVAILABLE	Status information on the track is not available.
TRACK_STATUS_NO_TRACK	Track is not valid and should not be considered usable.
TRACK_STATUS_RAW_TARGET	Track is a raw target measurement and is not tracked.
TRACK_STATUS_ACTIVE	Track is active/valid.
TRACK_STATUS_CIPV	Track is flagged as the closest in path vehicle.
TRACK_STATUS_NEW	Track is new to the tracker, i.e. the start of a track.
TRACK_STATUS_NEW_UPDATED	Track is new and was updated.
TRACK_STATUS_UPDATED	Track was updated.
TRACK_STATUS_COASTED	Track was coasted.
TRACK_STATUS_MERGED	Track was merged.
TRACK_STATUS_INVALID_COASTED	Track is invalid and was coasted.
TRACK_STATUS_NEW_COASTED	Track is new and was coasted.
TRACK_STATUS_KIND_COUNT	Number of <u>ps_track_status_kind</u> values.

Value	Description
RANGE_INVALID	Range information is invalid.
RANGE_UNKNOWN	Range information is unknown.
RANGE_NOT_AVAILABLE	Range information is not available.
RANGE_NONE	Not in-range.
RANGE_NEAR	Near range.
RANGE_MEDIUM	Medium range.
RANGE_LONG	Long range.
RANGE_KIND_COUNT	Number of <u>ps_range_kind</u> values.



# Comparison

The image displays a PolySync Studio interface with a radar visualization and a terminal window. The radar shows a grid with several bright blue spots representing tracked objects. The terminal window shows the output of a RadarSubscriber, displaying tracking data for various objects.

**Terminal Output:**

```
zihao@zihao-ThinkPad-W550s: /usr/local/polysync/examples/cpp/RadarSubscriber/build
ID: 48 Pos_x: 32.4538 Pos_y: 0 Vel_x: -1e+09 Vel_y: 1e+09 Vel_z: -1e+09
Tracking status: 9
ID: 52 Pos_x: 4.58637 Pos_y: 0.03703565 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 63 Pos_x: 50.8135 Pos_y: 10.0613 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 63 Pos_x: 50.8135 Pos_y: 10.0613 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 3 Pos_x: 23.1369 Pos_y: 3.49913 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 3 Pos_x: 12.3137 Pos_y: 4.16797 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 4 Pos_x: 14.7936 Pos_y: 45.82737 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 5 Pos_x: 37.5216 Pos_y: 25.426417 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 6 Pos_x: 17.0471 Pos_y: 4.37694 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 18 Pos_x: 138.4199 Pos_y: 416.74668 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 24 Pos_x: 32.2667 Pos_y: 2.93658 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 33 Pos_x: 35.9983 Pos_y: -0.376984 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 37 Pos_x: 33.3674 Pos_y: -0.2397796 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 39 Pos_x: 6.98706 Pos_y: -2.03286 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 42 Pos_x: 81.9558 Pos_y: 12.788896 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 48 Pos_x: 32.7998 Pos_y: 0.057072297 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 52 Pos_x: 4.59166 Pos_y: 3.02764 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
ID: 63 Pos_x: 50.8135 Pos_y: 10.0613 Vel_x: -1e+09 Vel_y: -1e+09
Tracking status: 9
```

**Code Snippets:**

```
// Register as a listener for the message type that the publisher
// is going to send. Message types are defined in later tutorials.
registerListener( _messageType );
```

```
120
121 create an instance of the HelloWorldNode and connect it to PolySync
122 rSubscriberNode subscriberNode;
123
124 when the node has been created, it will cause an initStateEvent to
125 be sent.
126 subscriberNode.connectPolySync();
```

# Stereo Vision

- Camera calibration using OpenCV
- Result: Errors exist



# Future Work Plan

- Cameras
  - Calibrated stereo vision
  - Object depth estimation
- Radar
  - Write data to file
  - More research on filtering techniques