Real-Time Kinematics

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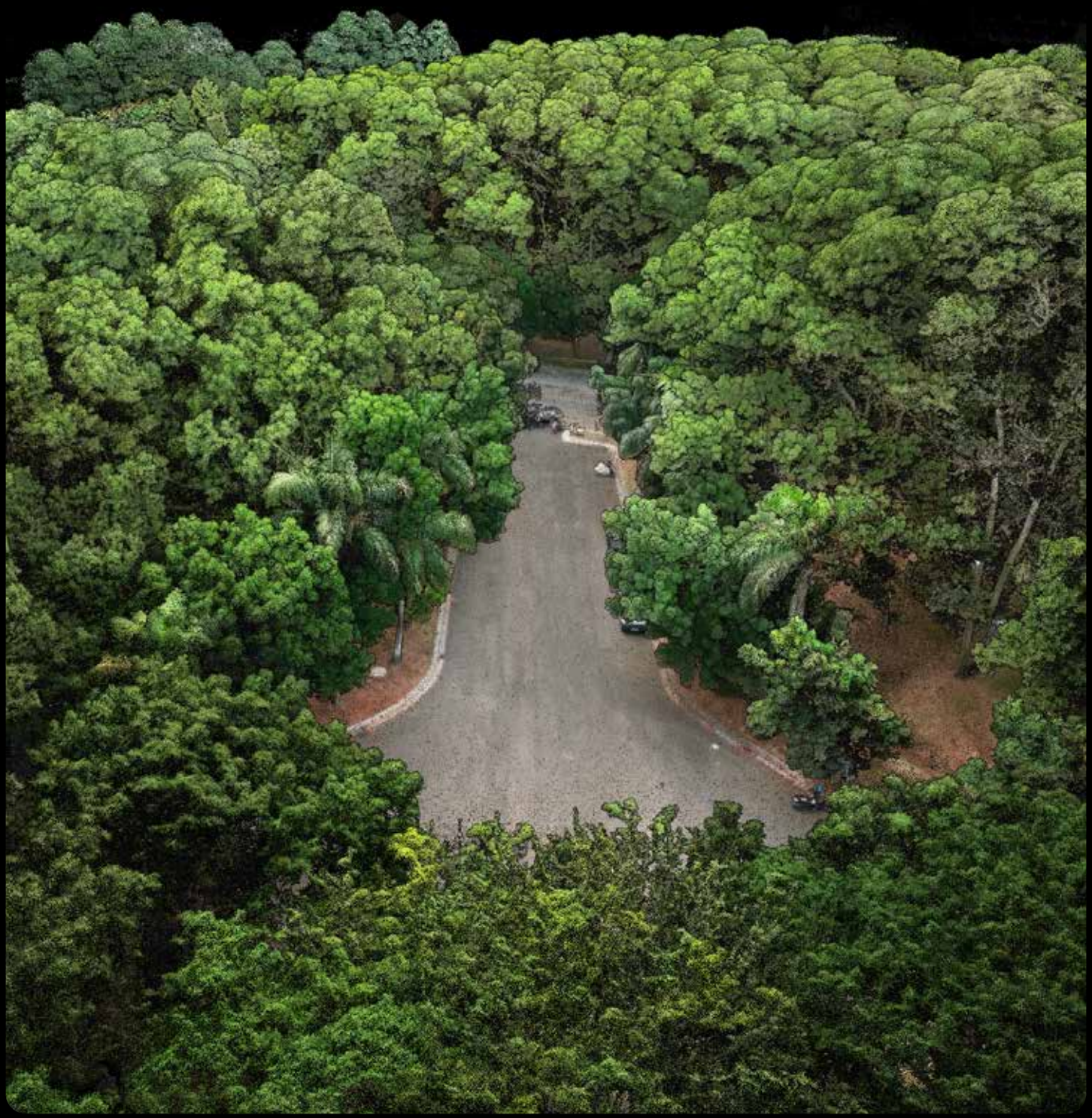
How does Real-Time Kinematics (RTK) Work?



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Introduction

Emesent Aura's Real-Time Kinematics (RTK) allows scanning without the need to lay out or georeference ground control targets - accelerating time from scan to insight for Hovermap backpack, vehicle and above ground drone-based scans.

The simplified, fast tracked workflow automates the creation of accurate, georeferenced point clouds when scanning large areas, long linear assets or challenging environments where ground control targets are not feasible. Automatic drift correction delivers higher quality results for repeat scans over the same area and enables changes to be easily detected. During processing Aura intelligently leverages a combination of RTK and SLAM reference data depending on which has the best position quality to optimize results.

Scanning with RTK requires a base station and receiver.

What are some of the use cases for RTK?

1

Change detection and repeatability for mapping and surveying

→ RTK gives reduced time to survey and improved accuracy. As well as providing correction, the Georeferencing capability allows for repeat scans over the same area to be easily overlaid enabling insights into changes in the environment and sites.

2

Faster, easier scanning for forestry or topographic mapping

→ In large areas where there is challenging terrain it may not be feasible to set up numerous GCP targets, RTK eliminates this need.

3

More accurate solution for large, featureless environments such as fields, stadiums, and quarries

→ It enhances accuracy in large featureless environments which are traditionally challenging for SLAM.

4

Haul road compliance

→ Timely scanning over long distances to assess haul road degradation, where laying down GCPs is not feasible.

5

Safer scanning in high-risk or challenging areas

→ e.g. coastal areas, where it is not feasible to put down targets close to the edge of eroded areas

6

Rapid results for natural disasters

→ Responding to events such as landslides or coastal erosion, RTK facilitates swift and safe scanning, allowing for prompt analysis and response for first responders.

7

Areas where drone scanning is not feasible

→ use vehicle RTK in built up urban areas or drone restricted areas

8

Large project areas

→ e.g. for roadway projects, road condition inspection, urban planning and civil engineering

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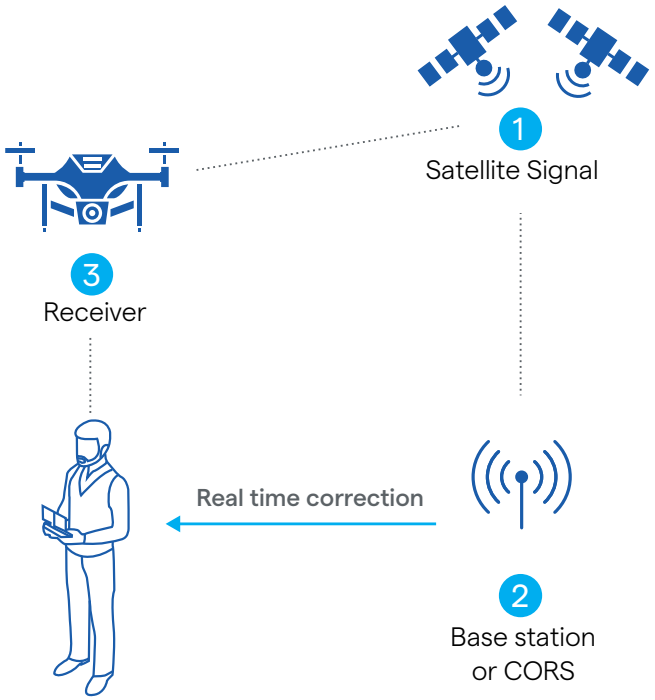
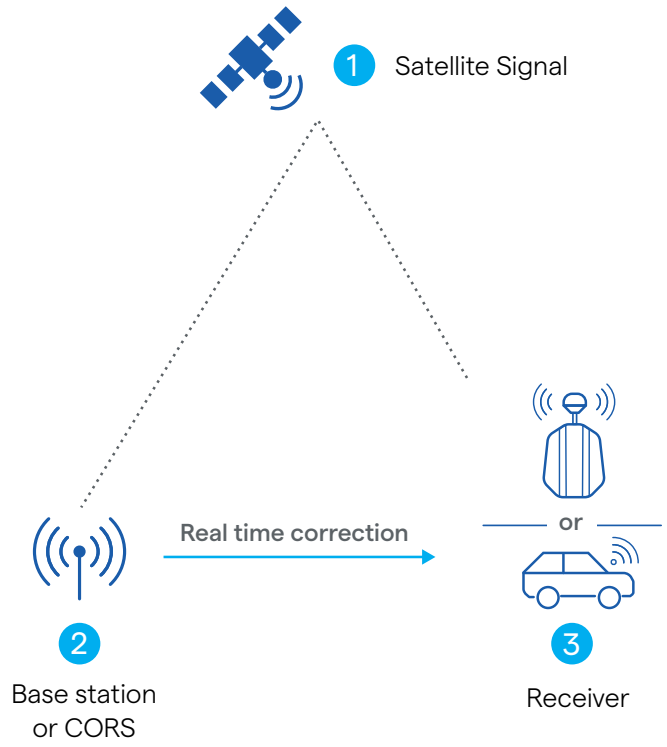
Standard drone-based RTK environment



Standard backpack or vehicle-based RTK environment



Real-Time Kinematics is a high-precision satellite-based positioning technique used in surveying applications.

Employing a combination of satellite signals from the Global Navigation Satellite System (GNSS) and ground base stations it provides centimeter-level positioning accuracy in real-time.

1 Satellite Signals

RTK relies on satellite signals from a GNSS (Global Navigation Satellite System). These satellite signals are transmitted from multiple satellites in space and received by the RTK base station on the ground.

2 Base Station or CORS

A base station, also known as a reference station, is set up at a known location with a precisely known position. The base station has a high-accuracy GNSS receiver that continuously tracks the satellite signals and sends detailed satellite information to the drone or vehicle receiver.

A Continuously Operating Reference Station (CORS) network is a network of RTK base stations that broadcast corrections, usually over an Internet connection.

3 Receiver

The drone, backpack or vehicle receiver will also receive the same satellite signals as the base station and calculate the distance between the base station and the receiver.

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When to use RTK or Ground Control Points (GCP)

Both RTK and GCP are designed to provide a precisely known position. Depending on the environment we recommend using RTK whenever it is possible. When using RTK we recommend that you use checkpoints to verify accuracy and check that your outputs have the correct co-ordinate system.

	GCP	RTK
Type of scan	Drone, vehicle, walking	Drone, vehicle or backpack
Location	Above and below ground	Above ground only
GPS	Optional depending on surveying technique	Required
Ground targets	Required	Not Required
Georeferencing	Georeferencing in post-processing	Georeferencing in post-processing
Drift correction	Automatic drift correction in post-processing. Manual correction available if targets not auto-detected	Automatic drift correction in post-processing
Set up	Lay out targets and walk or drive to locate targets prior to scanning	Once RTK connection established, scam can take place. No need to survey targets
Line of sight required	Of targets	Connection with base station

Hardware Requirements

To use RTK with your Hovermap, additional hardware is required

Backpack Scan

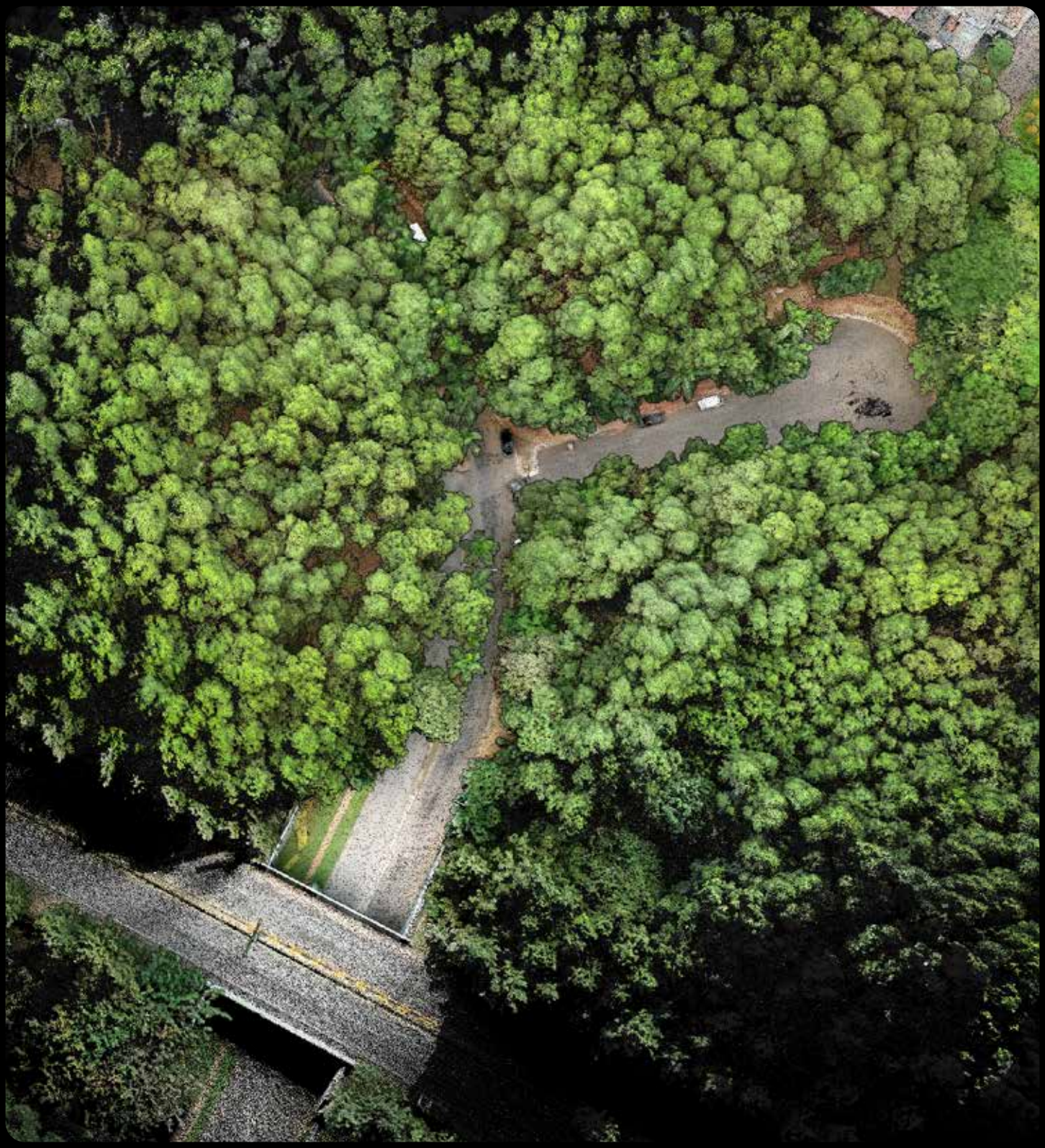
- → Emlid RS2/RS2+/RS3, Trimble R10/R12/R12i or Leica GS18/GS18T/GS18I GNSS receiver
- → Compatible base station or subscription to a local CORS network
- → Hovermap Backpack RTK Kit

Drone Scan

- → Supported drone (eg. DJI M300 or M350)
- → Base station with tripod or subscription to a local CORS network

Vehicle scan

- → Emlid RS2/RS2+/RS3, Trimble R10/R12/R12i or Leica GS18/GS18T/GS18I GNSS receiver
- → Compatible base station or subscription to a local CORS network
- → Hovermap vehicle mount with magnetic or vacuum feet



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About Emesent

Building on a decade of pioneering research at the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Emesent offers state-of-the-art autonomous SLAM-based LiDAR mapping and data analytics solutions specifically designed for challenging and GPS-denied environments.

Providing fast, accurate and long-range scanning, Emesent Hovermap helps businesses map the unknown, minimizing operational downtime while improving worker safety.

For more information visit: emesent.com or contact licensing@emesent.io to enable RTK on your Hovermap.

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