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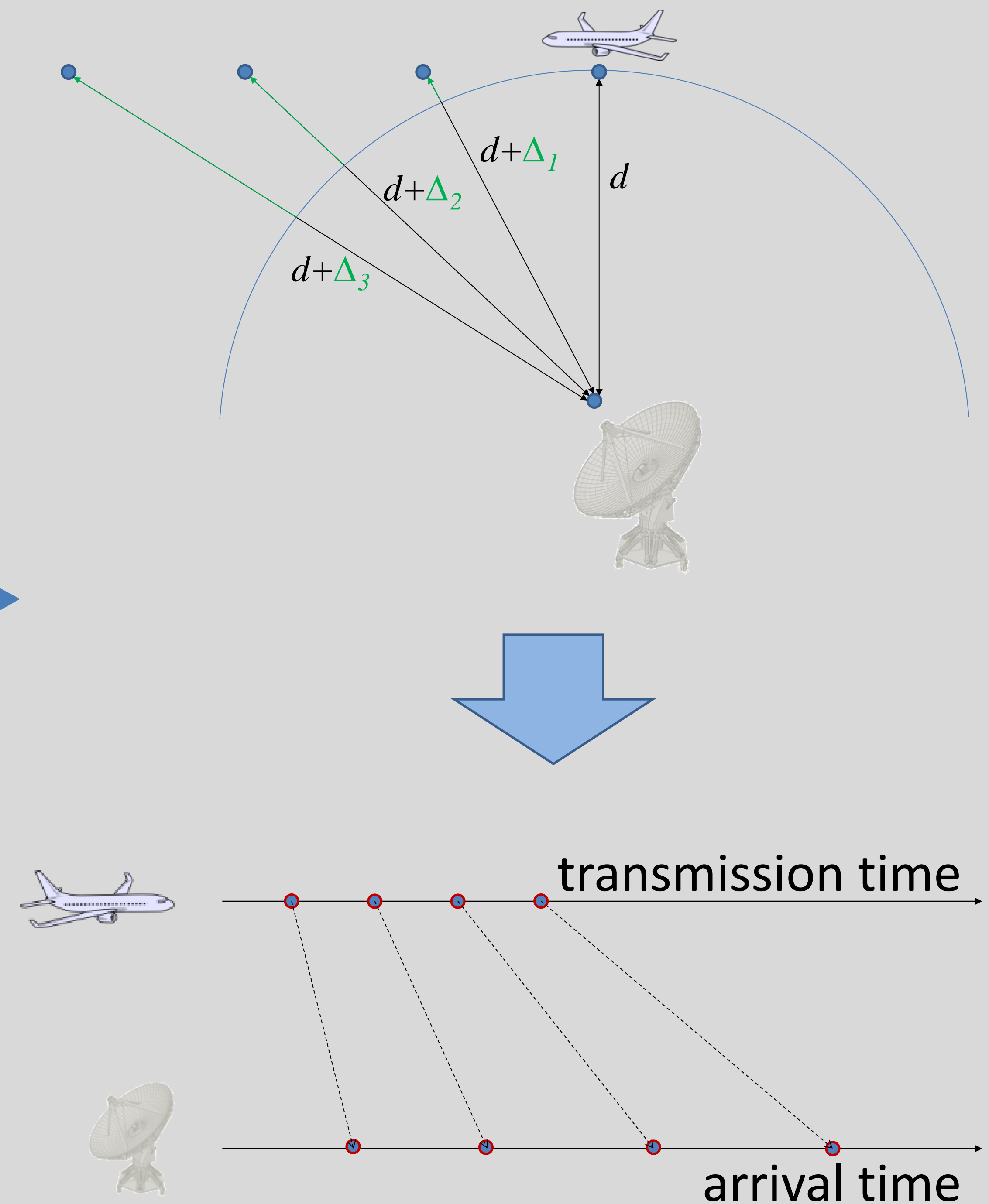
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Improving security with mobility

- **Existing location verification schemes** require specialized protocols, tight time synchronization, special-purpose hardware, or limited attacker knowledge ☹️
- **We demonstrated:** *Mobility can be exploited to get rid of these requirements!* [S&P15]
- **How it works:** Changes in distance between prover and verifier results in measurable distortion of transmission rate (mobility-differentiated ToA)
- **Security:** A single stationary attacker cannot adjust transmission times for multiple verifiers at the same time 😊
- **Data Source:** Real-world data for researchers from the *OpenSky Network* [OSKY]

Mobility-differentiated ToA



Open research problems

Mobility on the dark side:

Positioning requirements for mobile attackers?

Mobility on the light side:

Using mobile verifiers to improve track and location verification?

Mixing the old and the new:

Improvements by e.g. using loose time synchronization or clock drifts as a secret?

Collaborative schemes:

How could trusted nodes (e.g. other airplanes) help improving the verification?

More security by mobility?

- Secure track verification considers the **time** domain! But what about effects of mobility in the **space** and **frequency** domain?
- **Space domain:** Anomaly detection in air traffic movement patterns using graph bundling algorithms with data from OpenSky
- **Frequency domain:** Location, track, and velocity verification using the Doppler shift of acoustic or RF waves

References

[S&P15] Schäfer, Lenders, Schmitt: **Secure Track Verification**, *IEEE Symposium on Security and Privacy*, May 2015

[OSKY] <http://opensky-network.org>