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S-AIS vs VMS vs LRIT
What are the differences?

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Overview of Talk

- Overview of S-AIS
- Overview of LRIT
- Overview of VMS
- Benefits of data correlation
- Benefits of data anomaly detection

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What is Automated Identification System?

Why AIS?

- Collision avoidance system mandated by the IMO in 1988
  - International voyaging vessels >= 300 tons
  - All passenger vessels
- Many other countries have mandated stricter AIS reporting requirements

What is AIS?

- Broadcasts encoded messages in the VHF spectrum with ship-specific information
- Broadcast multiple times per minute
- Transmission is automatic
- Can be collected by any receiver tuned to that VHF frequency
- This can be done by satellites and shore stations
- Contacts can be uniquely identified by MMSI and/or IMO
- Tracks can be uniquely identified by Timestamp and geolocation

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What is Long Range Identification and Tracking?

Why LRIT?

- Reporting system mandated by the IMO in 2006
  - International voyaging vessels >= 300 tons
  - All passenger vessels, including high speed craft
  - Mobile offshore drilling units

What is LRIT?

- Requires vessels to report their position to their flag administration
- Must be reported four times per day
- Transmission requires an active role by the participating vessels
- Typically transmitted via satellite communication channels
- Host nations can request LRIT information for all vessels destined for their ports

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What is Vessel Monitoring System?

Why VMS?

- Used by environmental and fishery regulatory organizations
  - ~500 vessels in Chile
- Used to monitor known fishing vessels in the territorial waters of a country

What is VMS?

- Main purpose is to monitor the movement of VMS equipped vessels
- Chile requires vessels to send information every 8 minutes
- Data typically transmitted via satellite communication channels

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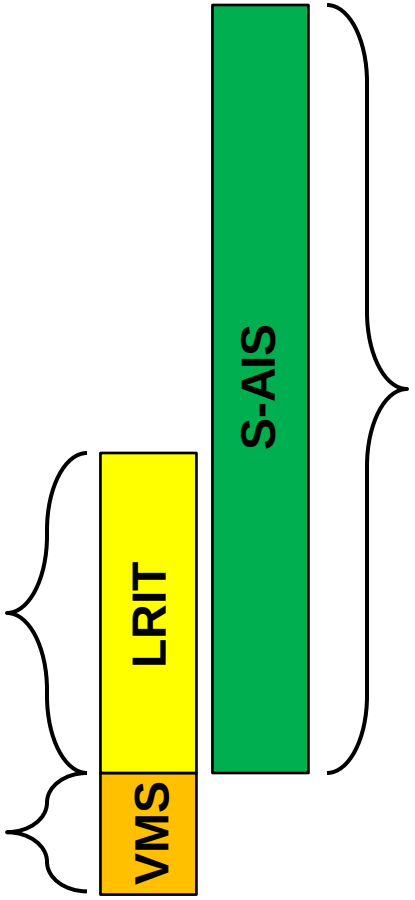
How do these compare to each other?

	S-AIS	LRIT	VMS
Who reports?	Everyone	Chilean vessels Chile-bound vessels	Chilean commercial fishing vessels
How often received?	~6 hours	4x per day	Every 8 mins
How transmitted?	VHF	Satellite	Satellite
Participation?	Automatic	Active	Active

How do these compare to each other?



All vessels 300 tons/passenger
***this will likely grow as the cost of AIS equipment decreases**

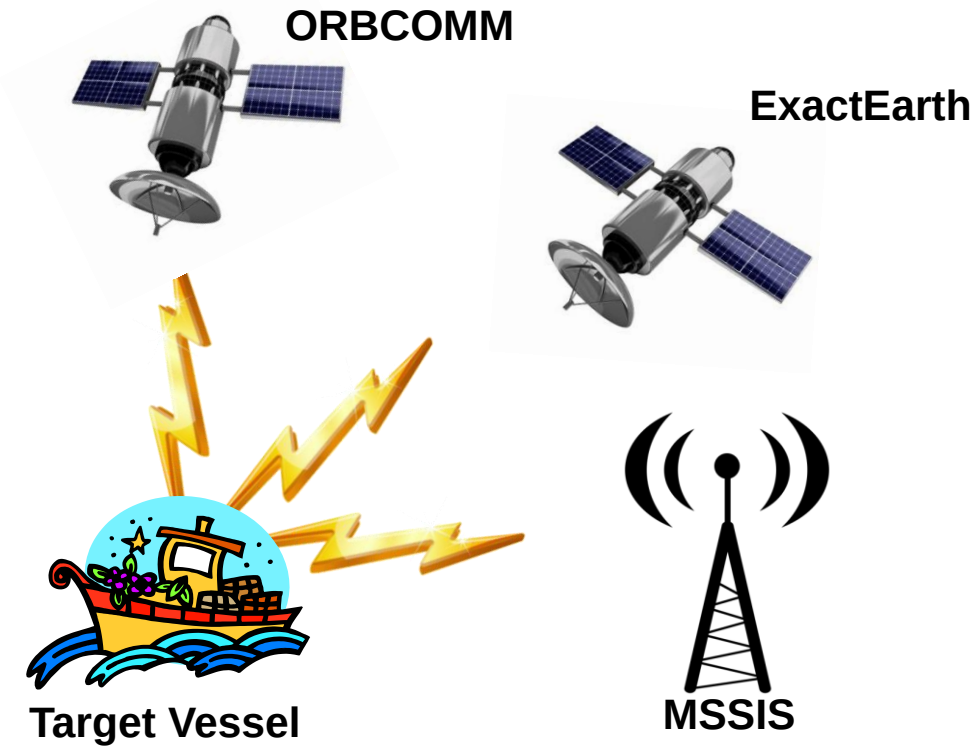
Chilean Vessels
300 tons/passenger

Chilean Flagged
Commercial Fishing
Vessels

Types of AIS correlation?

Duplicate AIS entry removal

- We only want to record information for unique track points
- Since the AIS message originates at the vessel, and can be received by more than one sensor, we want to limit the number of duplicate tracks in the database



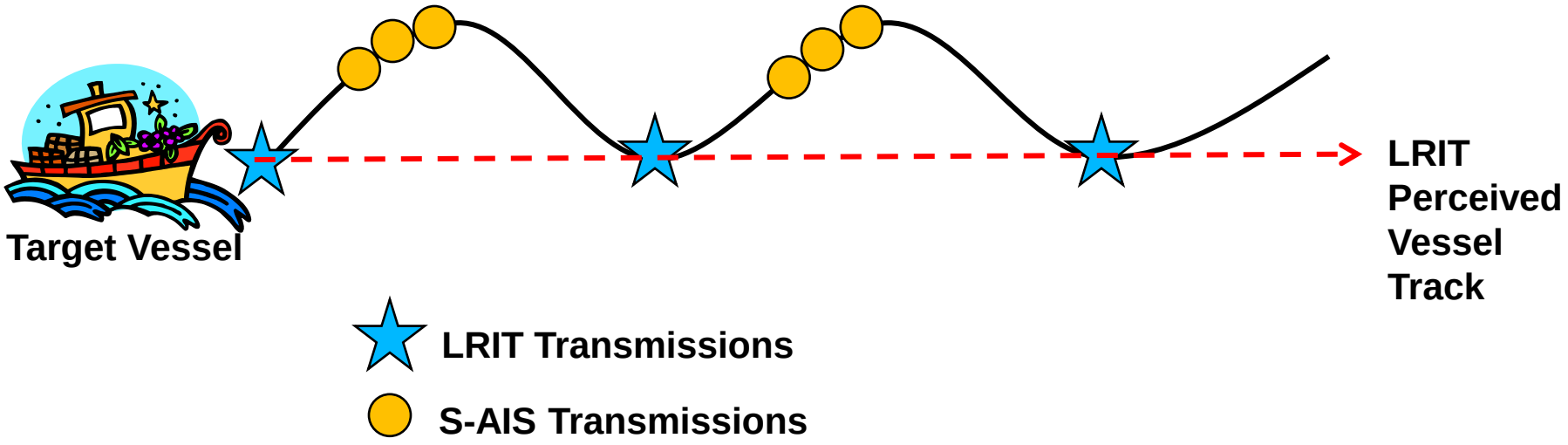
Duplicate messages will contain the same information, regardless of how they were received

It may still be useful, however, to capture that the contact was received by multiple sources

Types of AIS correlation?

AIS – LRIT Correlation

- Unlikely to have message duplicates, demonstrates an additive correlation or used for anomaly detection
- LRIT use requires an active role, some vessels may not use consistently
- Because AIS is more frequent, and automatic, it may display more behavioral information



Types of AIS correlation?

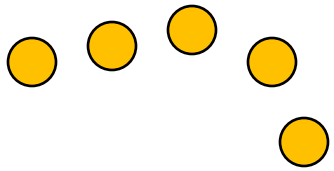
AIS – VMS Correlation

- VMS could be used to corroborate AIS data
- Any VMS identified vessel should be reported as a fishing vessel
- VMS outages are common, AIS could be used for additional monitoring

Open Fishing Zone

Target Vessel

Restricted Fishing Zone



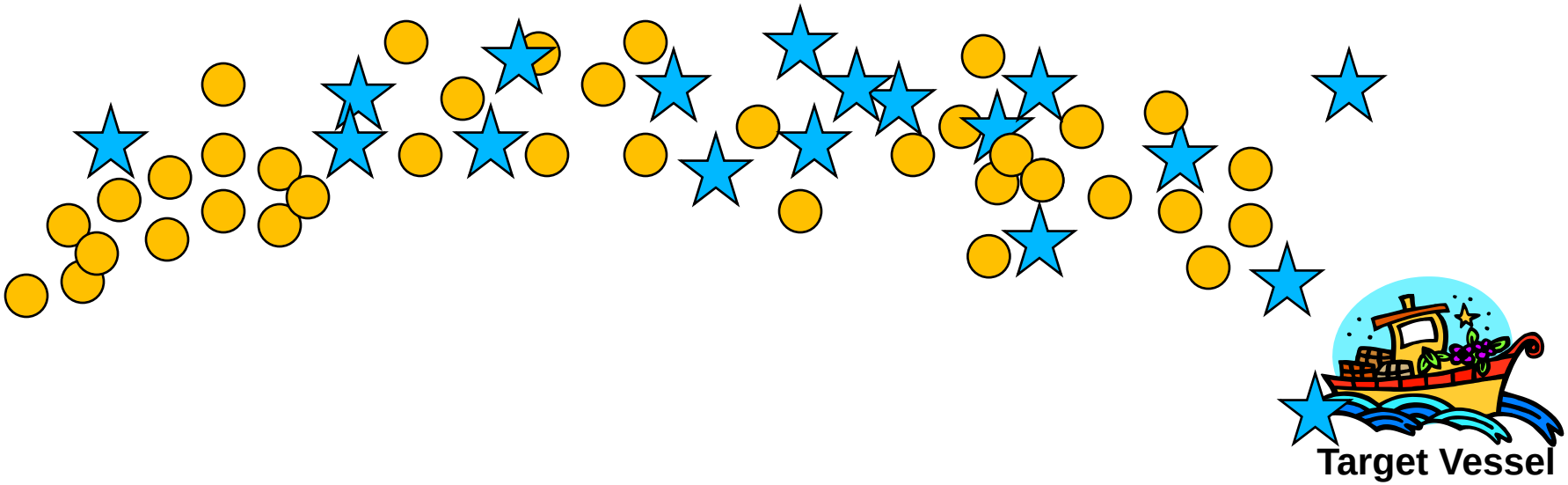
VMS/AIS reporting legal vessel location prior to VMS outage

Continued AIS monitoring shows possible illegal activity

How else do we use this correlation?

Useful for track building

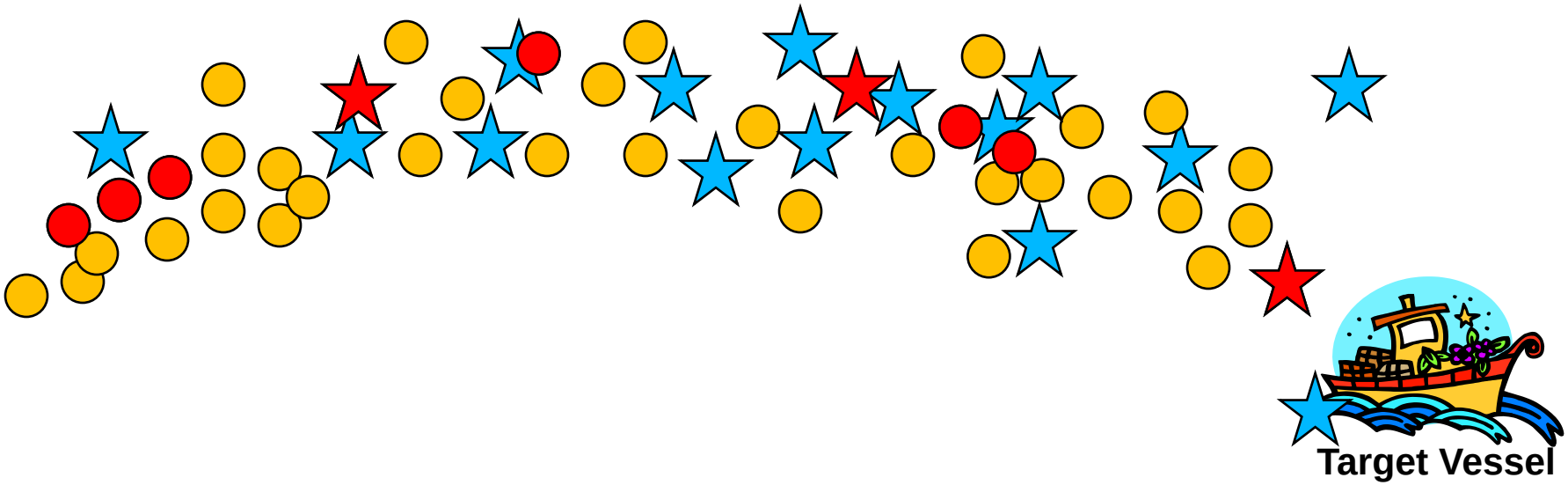
- A snapshot of a shipping channel as a lot of information in it
- A series of snapshots over time has even more data



How else do we use this correlation?

Useful for track building

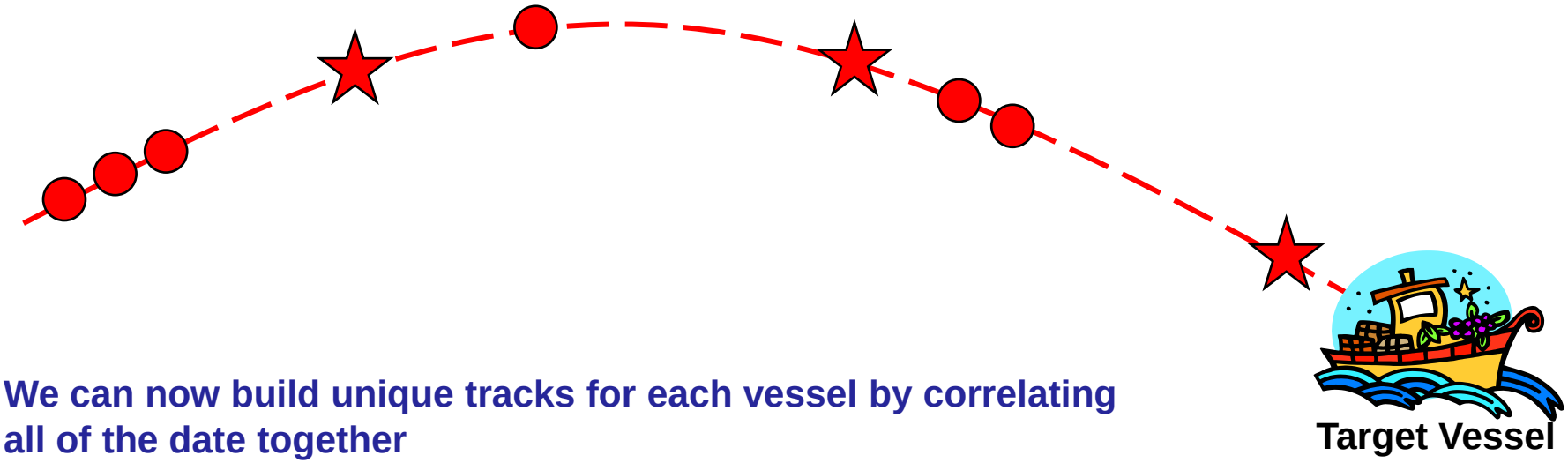
- Do not want duplicate information
- Do want as much unique data as possible
- Correlating different data sources together will help us identify data that is unique to each vessel



How else do we use this correlation?

Useful for track building

- Create track information based upon multiple data sources



We can now build unique tracks for each vessel by correlating all of the date together

How else do we use this correlation?

Useful for track building

- Being able to observe historical track data leads us to the beginning of detecting abnormal behavior based on location

Six months of track data

Why are they now out here?