

Sikuliaq - Kepler LEO Store and Forward Beta Test Pilot

 KEPLER



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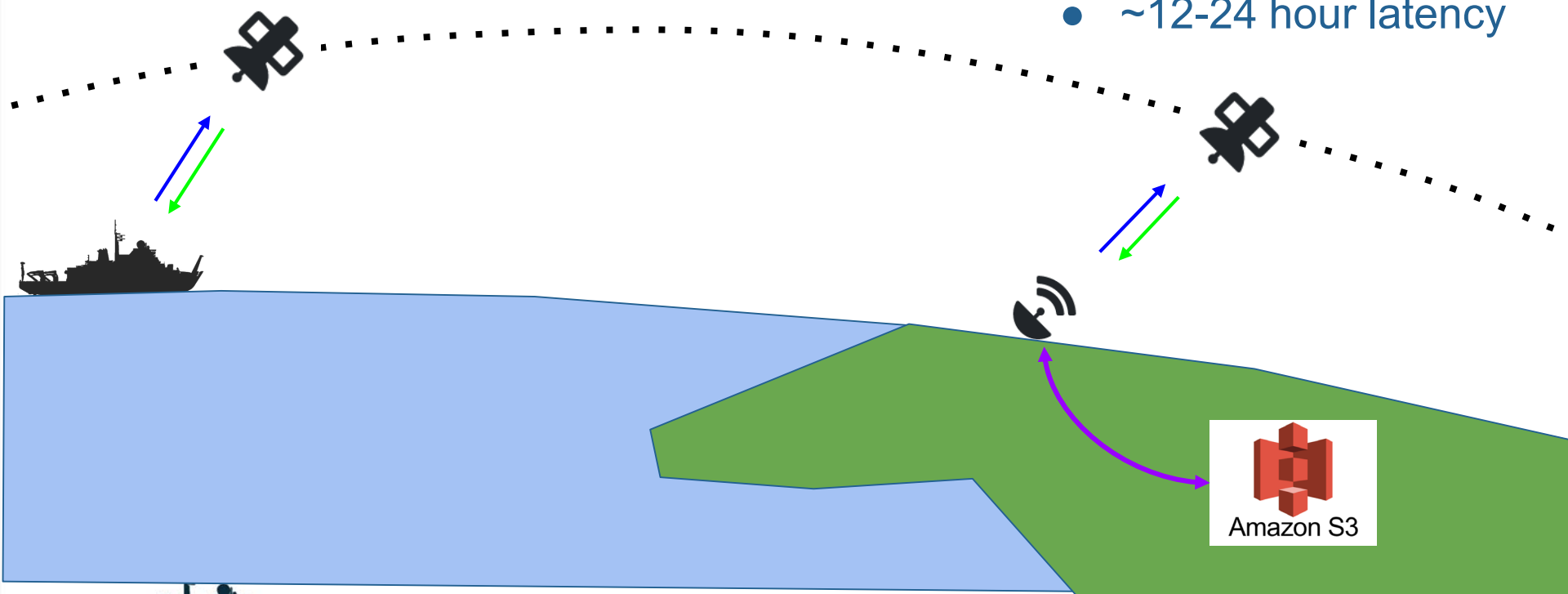
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Store and Forward

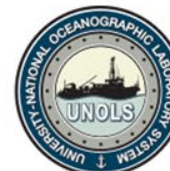
- ~100 Mbps
- ~10 minute passes
- ~14 passes per day
- ~ 1-8 GB per day
- ~\$15 per GB
- ~12-24 hour latency



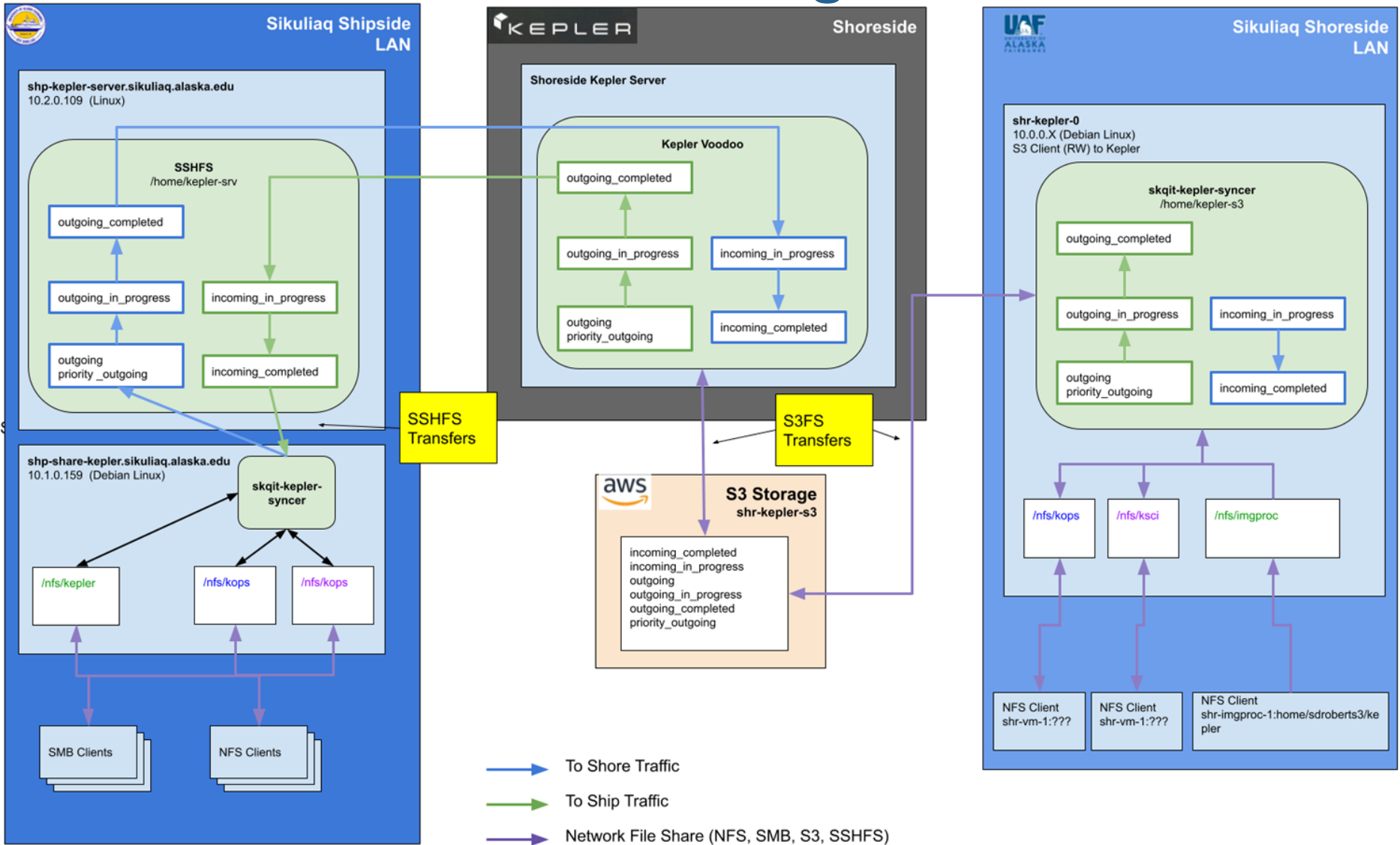
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Pilot Test Configuration



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Kepler Directory Structure

— **incoming_completed**
— incoming_in_progress
— outgoing
— priority_outgoing
— outgoing_in_progress
— **outgoing_completed**

- Same structure on ship and on shore (S3)
- Only files can be synced, not directory structures!
- 2x Uni-directional syncing. Not bi-directional syncing.
- Limited ability to prioritize traffic

Directory Roles are from the local perspective

- Shipside outgoing -> Shoreside incoming_completed
- Shoreside outgoing -> Shipside incoming_completed



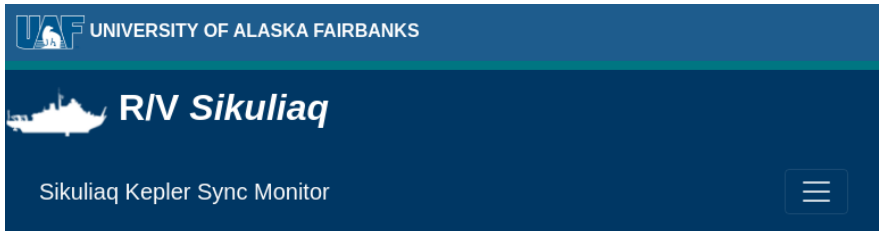
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Sikuliaq Kepler Syncer



↔ Pending File Transfers

Config Name: **SHORE2SHIP-PROD**

- 🕒 2021-10-20T18:33:32Z Current Time
- 🕒 2021-10-20T18:32:55Z Data Last Updated

Data Age

36 secs

Current Pending Kepler Files Transfers

Outgoing Pending Files

- KEPLER_OUTGOING_DIR: /home/kepler-s3/outgoing
- KEPLER_OUTGOING_PENDING_DIR: /home/kepler-s3/outgoing_in_progress
- OUTGOING_PENDING_FILE_TRANSFERS: 297
- OUTGOING_PENDING_FILE_TRANSFER_SIZE_BYTES: 1078.25 MB

Incoming Pending Files

- KEPLER_INCOMING_DIR: /home/kepler-s3/incoming_completed
- KEPLER_INCOMING_PENDING_DIR: /home/kepler-s3/incoming_in_progress
- INCOMING_PENDING_FILE_TRANSFERS: 0
- INCOMING_PENDING_FILE_TRANSFER_SIZE_BYTES: 0.00 MB

- Encodes and Reproduces directory structures between ship and shore via Files.
- Translates directory structures to files and files to directory structures.
- Monitors File Transfer Statistics



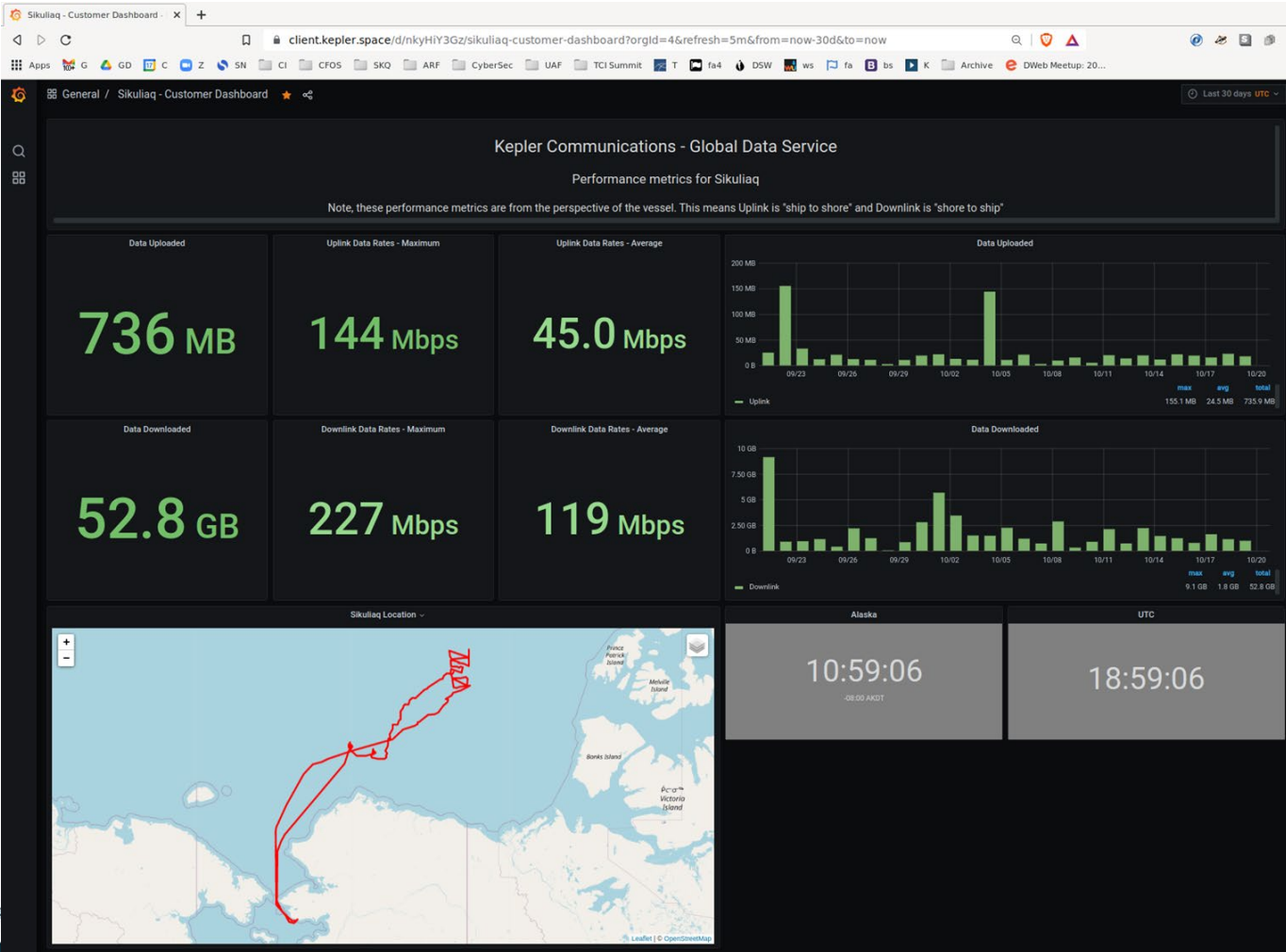
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Kepler Dashboard



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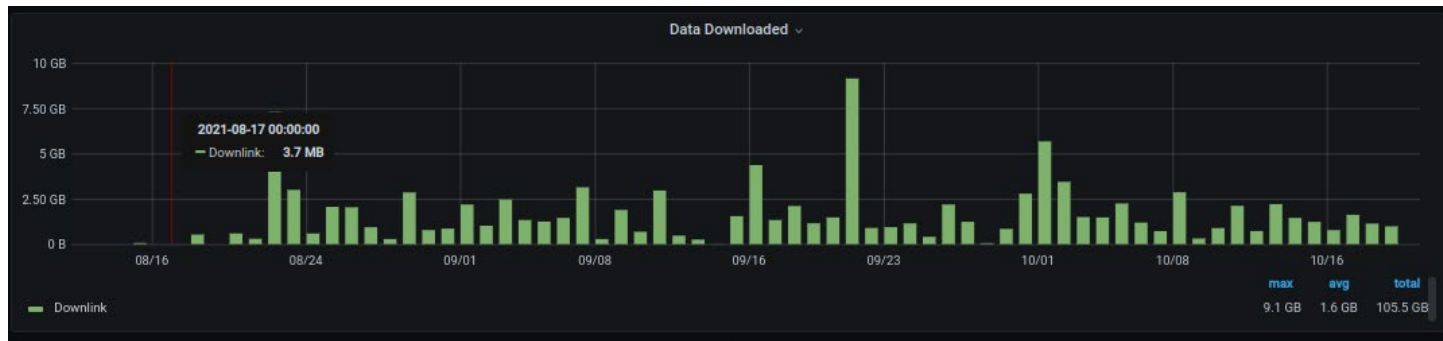
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Capacity Performance

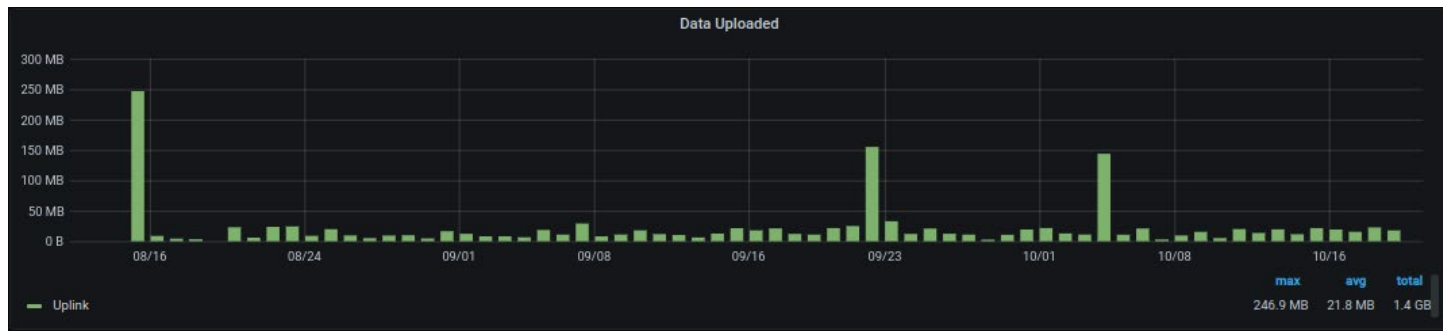
To Ship

70 Days
105 GB
119 Mbps Avg
226 Mbps Max



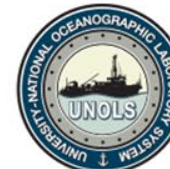
To Shore

70 Days
1.42 GB
45 Mbps Avg
144 Mbps Max



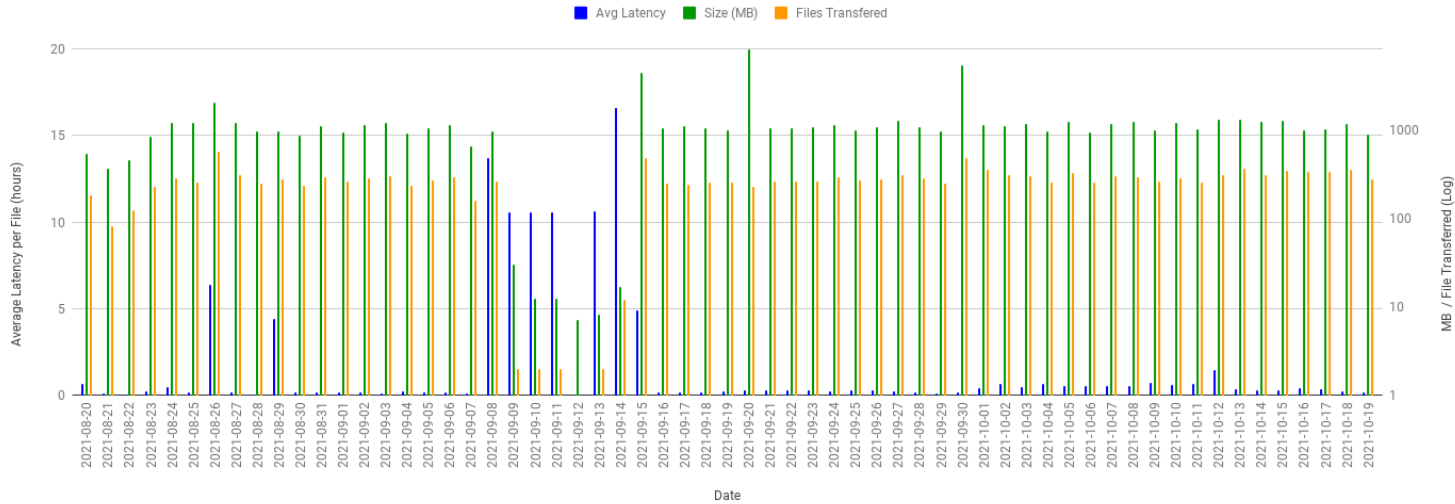
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Latency Performance

Shore to Ship Daily Transfers



To Ship

Latency

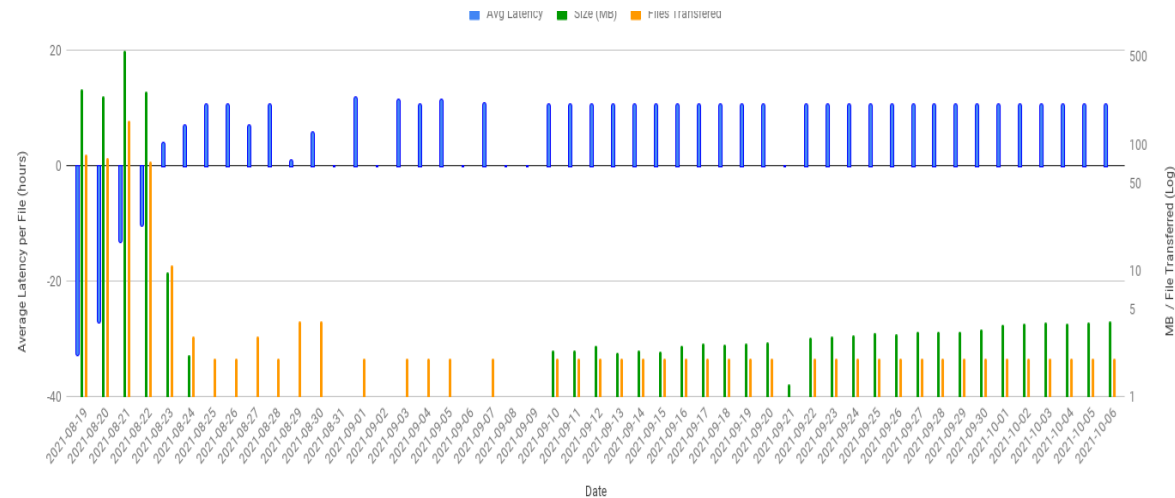
- ~1-2 hours
- Seems Low!

Size per day

- ~1 GB
- Max: ~8+ GB

Files

- ~250



To Shore

Latency

- ~10 hours

Size per day

- ~30 MB

Files

- ~2



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Summary

Pros

- \$15 per GB
- Global Coverage
- 100+ Mbps
- ~12 Hour Latency
- Can move large payloads

Cons

- Single Directory Structure
- Single Directional Sync
- Integration / Automation
- End User Access
- \$20k Antenna Lease

Issues

- Latency is high for Near Real Time Data
- Performance is variable
- Vessel Tracking / Location Prediction
 - ~100 miles
- Stability Improved over time
- Visibility of Status

Potential Use Case

- Continuous Data Sync to Shore
- Moving data in Remote Locations
- Syncing IT Updates to Ship
- Moving Videos or other Large Files



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