Forward Observer In-Flight Dual Copy System

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Overview

- Project Overview
- Workflow
- Requirements and Constraints
- Inflight
- Proposed Improvements
- Further Applications

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Project History: IU/CReSIS Partnership

- Airborne Synthetic Aperture Radar Systems
  - NSF Polar Grid Project
  - Operation Ice Bridge 2009
  - NSF Science & Technology Center grant for CReSIS
  - Operation Ice Bridge 2010-2012, 2012-2015
- MultiChannel Radar Depth Sounder
- Snow Band
- KU Band
- KU does radar well, IU does data well

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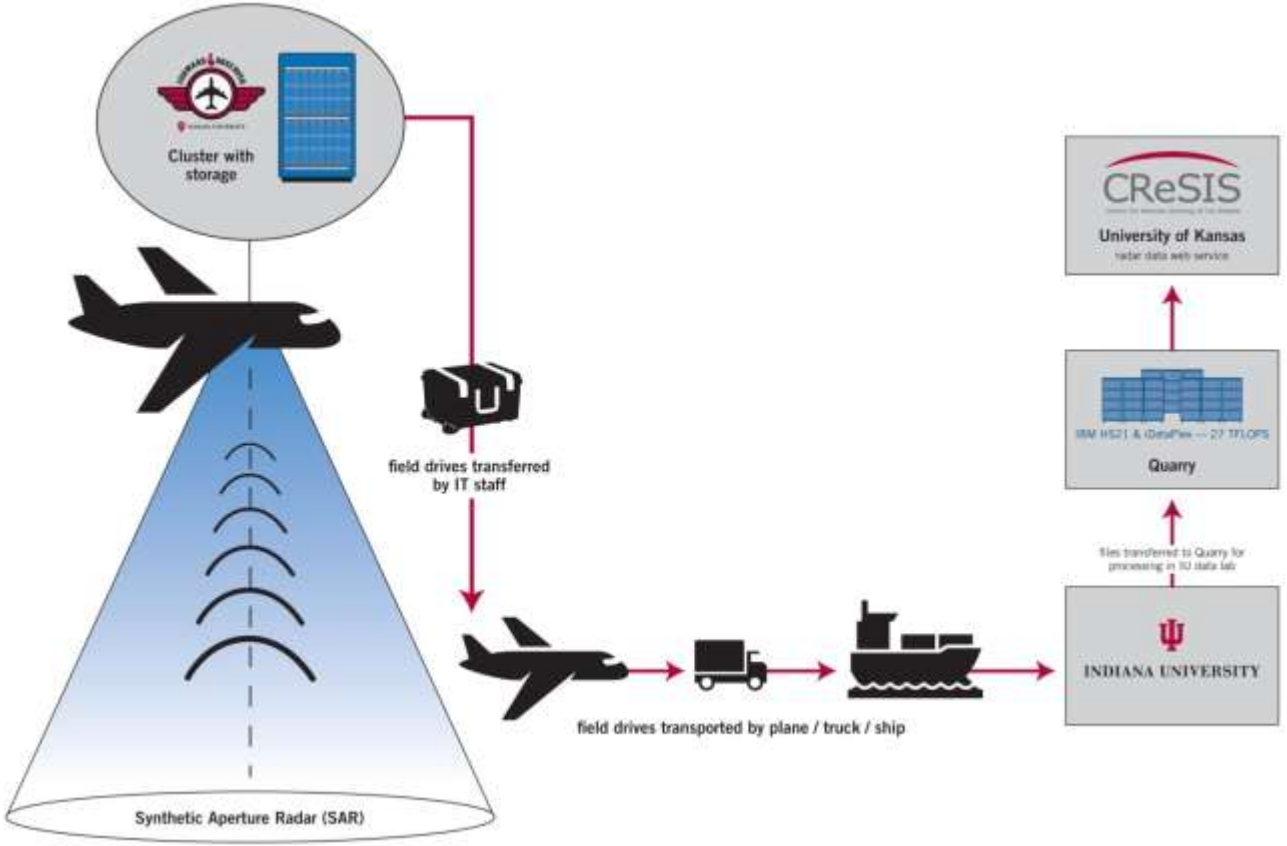

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Workflow (original)

- Radar systems on the aircraft connect to machine running LabView
- After flight, drives unloaded to Ground Lab
- Backup/Copy Operations
- Matlab Processing of Radar Data
- Final processing on IU's Quarry cluster
- Issues:
  - Delays returning results to data processing team
  - Overnight Turnaround
  - Physical Drive management

System Requirements / Constraints

- Intake of data at rates increasing every 6 months
  - Multiple sources – 3 or 4 instruments
  - File consistency and security throughout
  - Multiple copies
  - Ability to process data quickly
- Staffing issues – do we want to send an “IT Guy” to 2 or more missions a year?
- Ideal: archive and process data while in flight, simple enough to allow the radar/data processing team to use
  - FPGAs? SSDs? Vibration issues?

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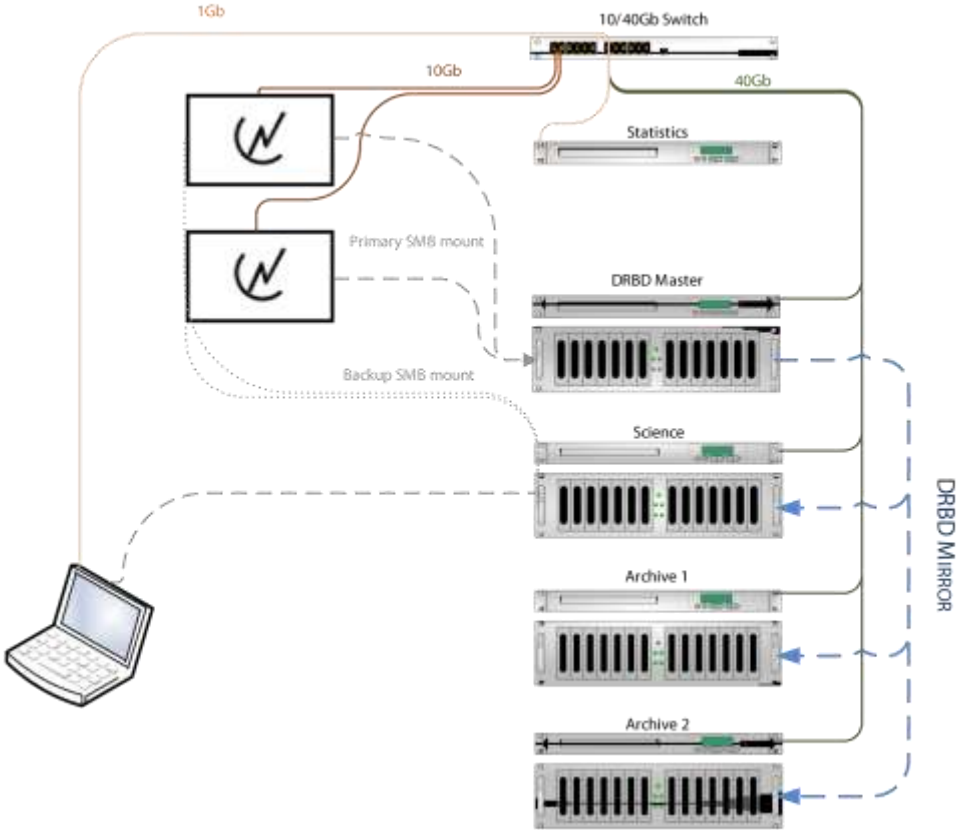
Forward Observer System

Replace the radar storage array with network: 40Gb Infiniband transport infrastructure

- 3 Servers with 24 SSD drives each
    - Head – Windows Share to Radar
    - Science – Matlab Processing
    - Archive – Checksum and copy to:
- Vibration-mounted mechanical drives for cycling out data to ground processing
- Monitoring/management server

Iteration 2:

- No mechanical drives
- Process management allows processing during collection



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Benefits from a computational science system in the plane

- Better data assurance across multiple copies
- Possible to monitor data rates from the radar computers more closely
- Possible to process in flight
- Sync of data processing teams and radar teams
- Significant improvement in usability
- Faster storage and processing (for some tasks) than the systems at IU and KU

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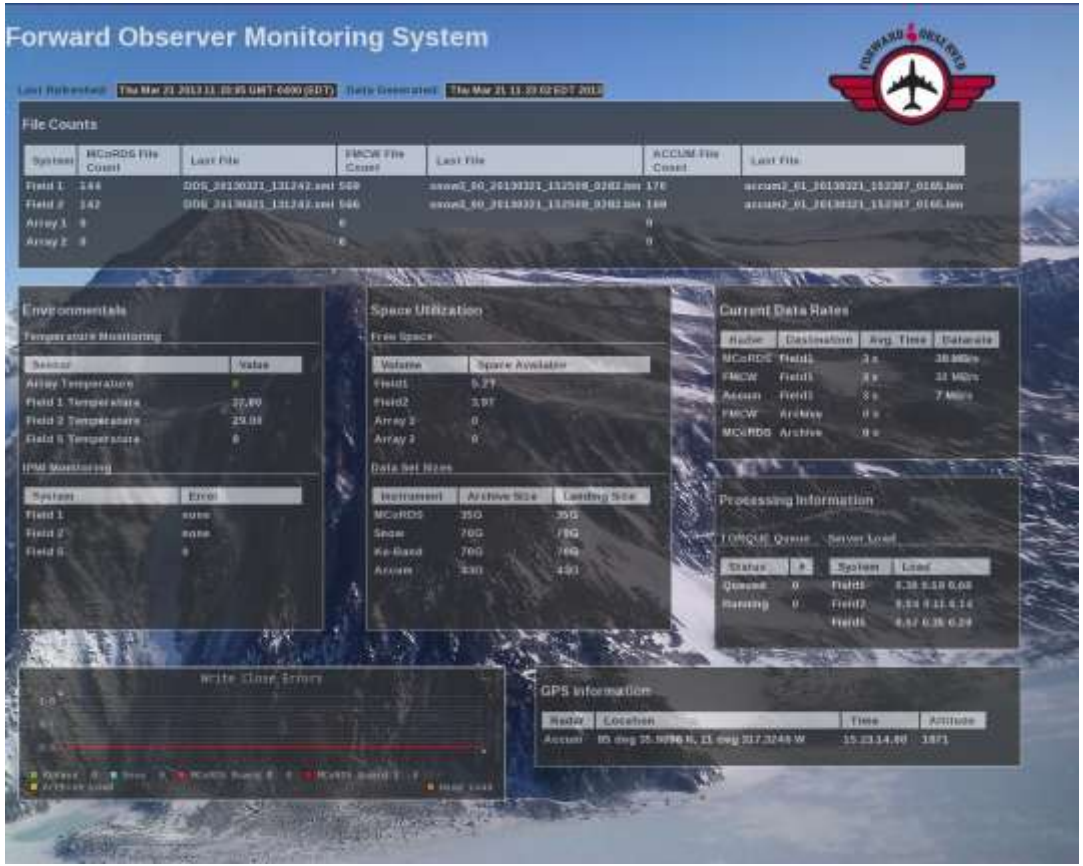
- Storage utilization
- File counts
- Current reads/writes
- Status of processing queues
- Environmental status of servers
- Error tracking



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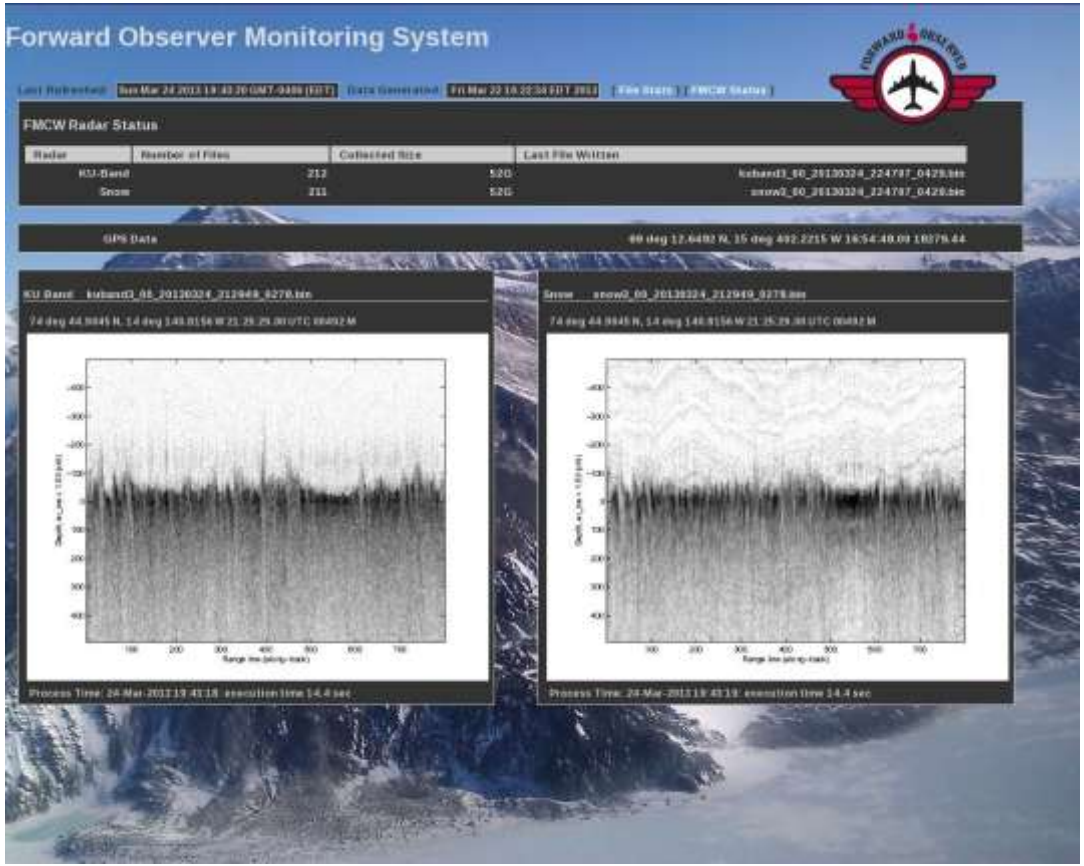
- Radar status
- GPS info
- Results of “Quick-Look” Matlab processing to show the ice bed



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Future Improvements

- Improved drive management – handling 24 SSD's at a time for sync/backup
- Better management of Matlab processing
- Workflow documentation and automation
- End goal: remove the "IT guy" and make the system more manageable
- Apply to new instruments and new platforms, provide data and computational capability in about 10RU of space on a single 7500KVA UPS

Thanks!

- Questions: rich@iu.edu
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