Use of Databases for real-time data

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Background

- Previous real-time display used shared memory.
- Multiple copies of program X-displayed out.
- Difficult for other users/programs to have access.
Access to Data - onboard

- ASCII data feeds of scalar time-series
  - Network UDP broadcast
  - Serial feed; Digi SP-One (converts UDP to RS232)

- SQL Database/repository
  - Network readable and writeable by anyone
  - Permissions control
  - Easy to use and very common
  - Numerous language API's
PostgreSQL vs. MySQL

- PostgreSQL supports:
  - Arrays
  - Listen/notify mechanism
  - PostGIS extension.
## Table Layout

<table>
<thead>
<tr>
<th>global_attributes</th>
<th>low_rate_table</th>
</tr>
</thead>
<tbody>
<tr>
<td>variable_list and attributes</td>
<td>Spreadsheet style</td>
</tr>
<tr>
<td></td>
<td>Typically 300 columns/variables</td>
</tr>
<tr>
<td></td>
<td>Ten hour flight will have 36,000 rows</td>
</tr>
</tbody>
</table>
Display System Architecture

Onboard Server

Raw Data

Processor (time-series & 2d)

UDP Broadcast

SQL (LRT)

QC

Display(s)

Video titling

Onboard Display(s)

Imaging (e.g. AIMR)

“Smart” Instruments

SATCOM (on ground)
Using Unidata's LDM to transfer files.

- **Airplane**
  - DAQ
  - LDM
  - gzip sql statements
  - pqinsert
  - satcom
  - firewall

- **Ground**
  - my_script
  - pqexec
  - LDM
  - SQL (LRT)

- Options:
  - MPDS – pppoe – $0.057/Kbyte - ~$200/hour
  - or
  - Swift 64kbps – eth - $10/min
• Push/write 12,000-20,000 doubles per second.
• “ANALYZE” command needs to be run periodically.
  – Can cause a pause in database transactions
    • longer the bigger.
    • 2-30 seconds.
• Have not done image or non-standard data yet.
• Current databases are deleted per flight.
Pro's

- Network read/write
- FOTS Component
- Ubiquitous
- Really easy to use
  - “SELECT lat,lon,alt FROM raf_lrt where TAS > 20.0”
- Listen/Notify mechanism for real-time applications.
- Transfers in ASCII (platform independent).
Con's

- Can't “copy” a file and work offline.
- Transfers in ASCII (not compact).
Future

- We will continue to utilize and expand our database capabilities.
- User instruments writing directly into database
- Possible expansion:
  - Short and medium term storage and access of data.
  - Scan and Image data.