Mark5 OS & Software Development

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Objective

• State of Mark5’s OS
• Mark5A/B Application Software
  – SDK9
  – Version Info
• Maintenance
• Mark5C Software / Status
State of Mark5’s OS

• Debian Lenny and Squeeze (under test)
  – Latest OS distribution supported
  – Linux kernel 2.6.26 (lenny) 2.6.32 (squeeze)
  – Requires Conduant SDK9.X

• Debian Etch
  – Latest OS distribution no longer supported
  – Last patch available on Jan 2011
  – Required for real-time e-VLBI
    • More on this in a few slides
State of Mark5’s OS

• Why have sites upgraded their OS’s
  – Security concerns / maintainability
    • Mark5 is connected to a network
  – Performance improvements
    • Linux kernel network stack improvements
      – Network interface cards (NICs) support
        » 1 Gbps / 10 Gbps NIC
    • Other subsystems
      – Disk
      – Raid, etc
  – New motherboard support
    • Old distributions do not support chipsets
  – Bug fixes / capabilities Streamstor controller card
    • Large Module SATA support
Mark5 Application Software

• Mark5A application
  – Converted to support SDK9.2
  – Testing on Mark5A / 5B / 5B+
  – Notes
    • Mark5B and Mark5B+ application
      – DIMinio (case sensitive)
        » dimino will point to old software if installed
      – Match the latest command set supported
Mark5 Application Software

• Mark5A (cont)
  – e-VLBI bug
    • Disk2net no longer works
      – Under investigation
      – New version expected shortly
  – Mark5B+
    • errors with configuration of IO board
Mark5 Application Software

• What it is:
  – One debian package (NEW)
    • Mark5A/5B/5B+ application
      – mark5_2.3.1-i386.deb
      – Same code, post install script creates proper command to start application
    • streamstor_9.2.1-i386.deb
  – Installed / maintained through a standard package manager
    • synaptic (apt-get) / aptitude
    • dpkg
Upgrade Approach

• Debian mirror at Haystack
  – Crashed / replaced
  – Unavailable at this time

• For Mark5 systems
  – Download deb package from Haystack website
    • Note the distribution you are installing on
  – Perform following commands:
    • dpkg -i streamstor_9.2.1-i386.deb
    • dpkg -i mark5_2.3.1-i386.deb
Upgrade Approach (cont)

• For Mark 5B/5B+ systems
  – Perform following commands:
    • dpkg -i streamstor_9.2.1-i386.deb
    • dpkg -i mk5bio_1.0.6-i386.deb
    • dpkg -i mark5_2.3.1-i386.deb
SDK 9.2 Upgrade

• New method to updated firmware for newer controller cards
  – ssflash -u sdk9.2.ssf
  – For new controller cards Amazon
    • Mark5B+ systems
  – Handout in class for how after installing deb package to perform firmware upgrade
What’s Next

• Presently 1 stable Debian OS distro’s - Squeeze
• Support for Squeeze
  – thru May 2014
  – Debian supports second distribution for 1 year
    • After release of new distribution - Wheezy
      – Expected Weekend of May 4th / 5th
• Linux kernel 2.6.32 (Squeeze)
  – Not Mark5 Application dependent
  – Conduant / Jungo driver dependent
• 64 bit kernel support
  – Jungo / SDK dependent
  – Available with SDK9.3
    • Under test
# SDK Information

<table>
<thead>
<tr>
<th>SDK Version</th>
<th>Shared Library version number</th>
<th>cc5A/cc5B linked library</th>
<th>Debian Package version</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.3</td>
<td>libwdapi1110</td>
<td>-lwdapi1110</td>
<td>streamstor_9.3.1-i386.deb</td>
</tr>
<tr>
<td>9.2</td>
<td>libwdapi1031</td>
<td>-lwdapi1031</td>
<td>streamstor_9.2.1-i386.deb</td>
</tr>
<tr>
<td>9.1</td>
<td>libwdapi1021</td>
<td>-lwdapi1021</td>
<td>streamstor_9.1.0-i386 .deb</td>
</tr>
<tr>
<td>9.0</td>
<td>libwdapi1011</td>
<td>-lwdapi1011</td>
<td>streamstor_9.0.0-i386 (5c)</td>
</tr>
<tr>
<td>8.3beta</td>
<td>libwdapi1001</td>
<td>-lwdapi1001</td>
<td>streamstor_1.2.2-i386 .deb</td>
</tr>
<tr>
<td>8.3</td>
<td>libwdapi1001</td>
<td>-lwdapi1001</td>
<td>streamstor_1.2.1-i386.deb</td>
</tr>
<tr>
<td>8.2</td>
<td>libwdapi921</td>
<td>-lwdapi921</td>
<td>streamstor_1.1.4-i386.deb</td>
</tr>
<tr>
<td>8.1</td>
<td>libwdapi910</td>
<td>-lwdapi910</td>
<td>NA</td>
</tr>
<tr>
<td>7.6</td>
<td>libwdapi801</td>
<td>-lwdapi801</td>
<td>NA</td>
</tr>
<tr>
<td>6.X</td>
<td>libwdapi521</td>
<td>-lwdapi623</td>
<td>NA</td>
</tr>
</tbody>
</table>
Maintenance

• Recommend signing up for
  – debian-security-announce mailing list
    • http://lists.debian.org/debian-security-announce/
    – Informs the users about security problems by posting security advisories about “all” Debian packages on this list.

• Alternative
  – Update the package list weekly
  – Upgrade the required packages if any
Mark5 OS and e-VLBI

• Real-time eVLBI issues related to Mark5’s
  – Jive5A
  – Discovered by JIVE (Harro Verkouter)
  – At issue CPU usage over PCI bus transfers with small block size
    • Inhibits corner turning feature to maximize channel bandwidth
  – OS (kernel) / SDK9 dependent
    • Good OS: Debian Etch / Lenny
    • Bad OS: Debian Squeeze
Mark5C
Software

• DRS Version 0.9.9 official released
  – 2Gbps in 1 bank mode / 4Gbps in 2 bank mode
  – Mark5B / VDIF data support
  – Support hardware / software correlation

• DRS Version 0.9.14 under test
  • Address full disk bug
    • Presently requires drs restart
  • Other minor bugs in command set
  • Start up with out disk in system
Mark5C Software Utilities

• SDK 9.3 officially released
  – Verifying operations with DRS 1.0 release
• FuseMk5a has incorporated Mark5C functionality
• SSErase
  – 2 bank mode support?
  – Powers that be recommended against in case of error during conditioning
  – Added capability for write only test
• Difx support
  – Direct reading of disk modules in 2 bank mode??
  – With FuseMk5 initial path
Mark5C Features (cont)

• There is no 1pps
  – No timing or synchronization

• Recording starts immediately after command is issued
  – 2 Gbps there is not problem gating using the 5C
    • Note :
      – 50% probability to start on non-Mark5B header
      – scan_check problems
  – 4Gbps delayed response to record=off command
    • Daughter board is at max clocking capacity
packet – Set/get packet acceptance criteria

Command syntax:  \texttt{packet = <DPOFST> : <DFOFST> : <length> : <PSN Mode> : <PSNOFST> ;}
Command response: \texttt{!packet = <return code> ;}
Query syntax: \texttt{packet? ;}

Purpose: Set / get the packet acceptance criteria.

Settable parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Allowed values</th>
<th>Default</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;DPOFST&gt;</td>
<td>int</td>
<td>$\geq 0$</td>
<td>0</td>
<td>payload byte offset from beginning of payload to first recorded data</td>
</tr>
<tr>
<td>&lt;DFOFST&gt;</td>
<td>int</td>
<td>$\geq 0$</td>
<td>0</td>
<td>payload byte offset to beginning of recording</td>
</tr>
<tr>
<td>&lt;length&gt;</td>
<td>int</td>
<td>$&gt; 0$</td>
<td>5008</td>
<td>number of bytes to record per packet (see Note 1)</td>
</tr>
<tr>
<td>&lt;PSN Mode&gt;</td>
<td>int</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>&lt;PSNOFST&gt;</td>
<td>int</td>
<td>$\geq 0$</td>
<td>0</td>
<td>payload byte offset from beginning of payload to PSN (for PSN monitor mode 1 or 2)</td>
</tr>
</tbody>
</table>

Monitor-only parameters:

<table>
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</tr>
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<tr>
<td>&lt;DPOFST&gt;</td>
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<td>&lt;DFOFST&gt;</td>
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<td>$\geq 0$</td>
<td>payload byte offset to beginning of recording</td>
</tr>
<tr>
<td>&lt;length&gt;</td>
<td>int</td>
<td>$&gt; 0$</td>
<td>number of bytes to record per packet (see Note 1)</td>
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<tr>
<td>&lt;PSN Mode&gt;</td>
<td>int</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>&lt;PSNOFST&gt;</td>
<td>int</td>
<td>$\geq 0$</td>
<td>payload byte offset from beginning of payload to PSN (for PSN monitor mode 1 or 2)</td>
</tr>
</tbody>
</table>

Notes:

1. The length of data to be recorded must be a multiple of 8 bytes.
2. PSN-monitor 0 mode will disable packet serial number checking and record all data in the order received. PSN-monitor mode 1 will replace invalid packets with the specified fill pattern and guarantee order. PSN-monitor mode 2 will prevent packets from being written to disk if the most significant bit is set.
Mark5C Data Payload Definition and Parsing

Received 10G Daughter Board

- Ethernet Header
- Network Layer Payload
- FCS

Strips off the ethernet and FCS bytes

IP  UDP  VLBI Payload

PSN Mode 1 or 2

PSN Mode 0

IP  UDP  VLBI Payload

DPOFST  VLBI Data Frame  Recorded payload

- The “packet” command from the Mark5C command set specifies how to treat the incoming data:

\[
\text{packet} = \langle DPOFST \rangle : \langle DPOFST \rangle : \langle \text{length} \rangle : \langle \text{PSN Mode} \rangle : \langle \text{PSNOFST} \rangle;
\]

- DPOFST – Data payload offset – number of bytes into the received packet to find the start of the VLBI Data Frame.
- DPOFST – VLBI Data Frame offset – number of bytes to add to DPOFST to find the start of the data to be recorded.
- Length – VLBI Data Frame length in bytes
- PSN Mode –
  0 - “Does not” guarantee order or correct for missing packets, it simply records what is received in the order it is received.
  1 - Guarantees order and corrects for missing packets by inserting fill pattern by verifying the 32 bit PSN number
  2 - Guarantees order and corrects for missing packets by inserting fill pattern, but discards packets with the most significant bit of PSN being set to 1.
- PSNOFST – Packet Serial Offset – Since the PSN can be the first word in the VLBI Data Frame or embedded in a VLBI header (e.g. word 5 of the vdif header) specifies the number of bytes from DPOFST to locate the PSN.
Mark5C User Directory

• Is not backward compatible with 5A/5B

• Has support for
  – 5B data (0.9.9)
  – VDIF Data (0.9.9)
    • If there is a need for bank mode with VDIF support
      – an early version can be released

• New data structure
  – Describing the meta data of the scans recorded

• Impact is to hardware correlators
Field System Support

• When will the mark5C be integrated into the field system?
  – Under development / test
  – Normal operations expected June 2013
    • Mark5C commands
    • RDBE commands
  – Release for standard operations
  – After testing with broadband development system
Questions ?