LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
-LIGO-
CALIFORNIA INSTITUTE OF TECHNOLOGY
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LLO VIDEO SERVER

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This is an internal working note
of the LIGO Project.

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1. ABSTRACT

This document describes the hardware, software and the procedures for installing the LLO Video Server at Livingston Site.

2. INTRODUCTION

The purpose of this document is to provide a detailed description of the LLO Video server system at LLO.

The Video server system at LLO provides for viewing of the LLO interferometer and site cameras on the web. This system is designed to use with the existing EPICS controlled video system and uses a web based camera selection GUI to select and display the image on the web. The web page is at http://london.ligo-la.caltech.edu/videoserver.html

3. HARDWARE

The hardware is the commercial off the shelf (COTS) AXIS 2401 video server manufactured by AXIS Communications (www.axis.com). This video server accepts a video input and has a built in server which broadcasts the image over the Ethernet network. Figure 1 shows the picture of AXIS 2401 video server.

Figure 1: AXIS 2401 Video Server – Front (Top) and Back (Bottom) View

This video server accepts one video input and also has one video output which is a loop through port for connecting the video server in series. The back panel has an Ethernet port to connect it to the network and two serial ports through which the video server can be configured. The video server comes with an external 12V 800mA AC power supply that needs to be plugged in at all times.

The video server is configured remotely through web-based tools. The video server's Ethernet Port is configured to have a General Computing (GC) Ethernet address to provide access to outside world.

The data sheet of the AXIS 2401 video server is at
http://london.ligo-la.caltech.edu/videoserver_manual/ds2400_2401.pdf

3.1. HARDWARE CONFIGURATION

Read the manual provided with the AXIS 2401 video server and set the IP address of the Ethernet port on the video server. Also change the root password from the default password.

The manual can be downloaded from the web site
http://london.ligo-la.caltech.edu/videoserver_manual/2400am.pdf

The video input to the AXIS 2401 video server is the one of the outputs of the Knox video switch. At LLO, output 17 of the video switch is connected to the video server. The software is appropriately configured for video server at output 17. This is the only addition to the existing video system

4. SOFTWARE

The software written is a simple PERL-CGI script that runs on the CDS web server (london at LLO). The perl-cgi script is written to emulate the EPICS' video medm screen seen in the control room and provides a similar graphical interface to the user to select the cameras. The perl-cgi script reads in the button pushed by the user and then sends a value using EPICS' caPut utility to the video system epics processor (at LLO: l0pemms – a mv162 processor running epics loaded on vxWorks). This helps to keep the existing video system without any changes except addition of the output monitor (monitor 17) to the software and adding a monitor button on the medm screen for the output of the video server.

Note: This button on the medm screen is only for debugging purposes and also helps to monitor from the control room if some one is accessing the video server. This may or may not be added to the medm screen.

A web page has been designed to display the cameras on the right frame with the video output of the video server on the left frame.

Figure 2 shows the web page of the LLO Video Server. The html listing for this web page is in Appendix A.
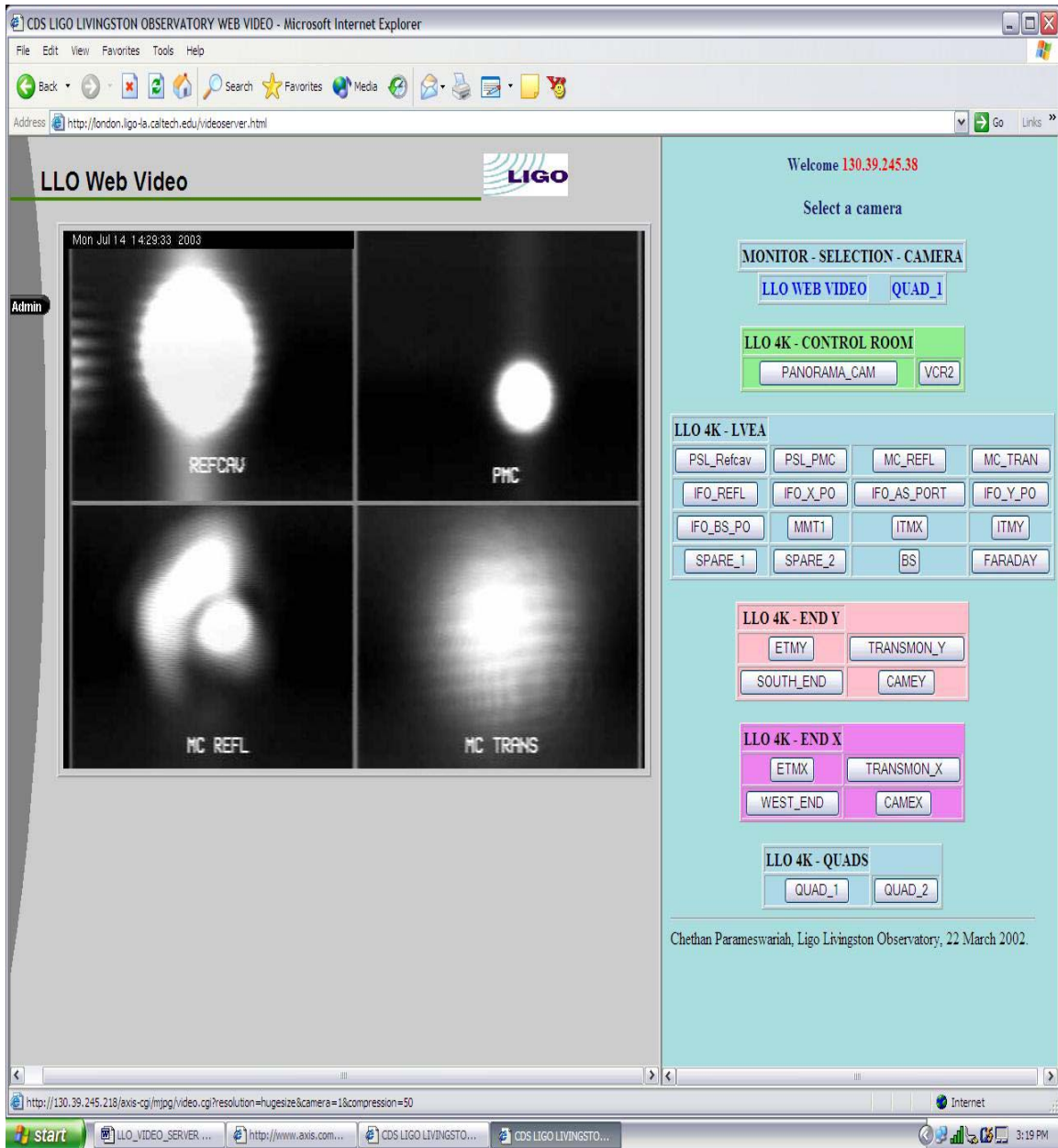
Figure 2: Web Page for the LLO Video Server

Figure 3 shows the diagram of the working of the LLO Video server. The existing setup controlled by the Video MEDM screen in the control room is shown enclosed. The video server with the web-epics interface is an addition to the existing system.
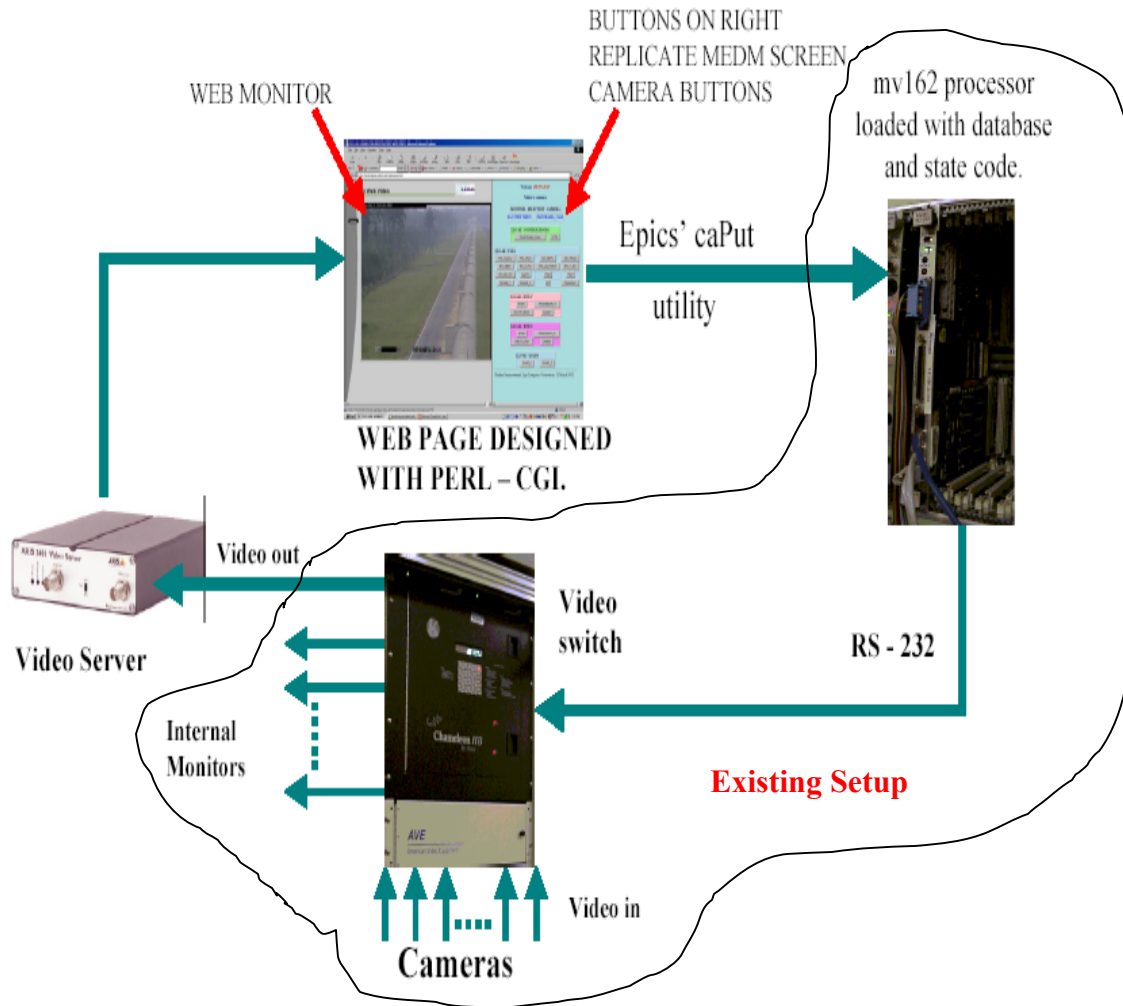
Figure 3: Diagram of the LLO Video server operation

The listing for the perl-cgi script is in Appendix B.

5. SECURITY

The epics' access security is configured to provide some amount of security to the processor. This is done to provide the operator in the control room control over the LLO Video server without having to turn off the processor. A security medm screen allows the operator to switch off access from outside world to the video server processor incase of problems. Turning off the video server shuts off the web server on london from writing PV values to the CDS network. With the changes to the security file mentioned below, any other services such as big brother interface, etc., that are running on london and writing PV values to the processor will continue to work without being blocked.

The security.acf file is changed to add the following:

```
User Access group definition
UAG(web) {nobody}

Host Access group definition
HAG(webgateway) {gateway}


ACCESS SECURITY GROUP DEFINITIONS

# web page interface gateway for LLO Video server permissions
      RULE(1, WRITE) {
        UAG(web)
       HAG(webgateway)
       CALC("C=1")
      }
```

and add the following line to the ASG(DEFAULT) definition

```
INPC(L0:CDS-SECURE_Pwebgateway)
```

The security medm screen available to the control room operators is shown in figure 4. The LLO video server has to be permitted by the control room operator for it to work. These buttons are restricted to be set only on the operator machines in the control room by the security file.

Figure 4: Epics access security screen at LLO

6. STATUS

The LLO Video server was implemented in March of 2002 and has been working ever since without any problems.

7. FURTHER WORK

The perl-cgi script at the moment is hard coded to replicate the camera buttons on the video medm screen. Any changes to the video medm screen have to be made manually in the perl-cgi script. A way to automate this process still needs to be done.

8. LOCATION OF FILES

The files at LLO are located at /cvs/cds/llo/web/videoserver directory.

Appendix A

Listing for videoserver.html

```
<HTML>
<HEAD>
   <META HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=iso-
8859-1">
   <META NAME="GENERATOR" CONTENT="Mozilla/4.04 [en] (X11; I; SunOS 5.7
sun4u) [Netscape]">
   <META NAME="Author" CONTENT="Chethan Parameswariah">
   <TITLE>CDS LIGO LIVINGSTON OBSERVATORY WEB VIDEO</TITLE>
<!-- Background white, links blue (unvisited), navy (visited), red
(active) -->
<FRAMESET
        COLS="62%,38%"
        FRAMEBORDER="YES"
      BORDER="YES"
>
<FRAME
        NAME="Left"
        SRC=http://130.39.245.218/ <!-- Change this ip address ->
        FRAMEBORDER="YES"
        BORDER="YES"
        SCROLLING = "NO">
<FRAME
        NAME="Right"
        SRC="/perl/videoserver.pl" <!-- Change the path accordingly >
        FRAMEBORDER="YES"
        BORDER="YES"
        SCROLLING = "auto">
</FRAMESET>

</HEAD>
</HTML>
```

APPENDIX B

Listing for videoserver.pl

```perl
#!/opt/CDS/b/perl5.005_02/bin/perl

# This is the web - epics interface program for the LLO Video
# Server. It is site specific and is written for LLO.
#
# videoserver.pl First Release Chethan Parameswariah 22 Mar 2002
#
# use CGI ;
use CGI qw(:standard :html3);
use Apache::Util qw(escape_html);

$q = new CGI;
$q->use_named_parameters(1);

print $q->header(-style=>'H4 {color: blue}'),
      $q->start_html(-title=>'LLO WEB VIDEO SELECT',
                     -author=>'CHETHAN PARAMESWARIAH',
                     -base=>'true',
                     -dtd=>1,
                     -BGCOLOR=>'#aadddd',
                     -style=>'H1,H2,H3,H4 {color: midnightblue}',
                     -meta=>{'refresh'=>'10'},
                     );
#$videoselect = "/cvs/cds/llo/web/videoserver/videochange.sh";
$caPut =
"/opt/LLO/a/epics/release/r3.12.2/extensions/bin/solaris/caPut";
$videoserver = "/cvs/cds/llo/web/videoserver";
$remote_id = $ENV{REMOTE_HOST} || $ENV{REMOTE_ADDR};
if ( param('videocamera') eq "" ) {
  $value = 0;
}
elsif ( param('videocamera') eq "QUAD_1") {
  $value = 1;
}
elsif ( param('videocamera') eq "QUAD_2") {
  $value = 2;
}
elsif ( param('videocamera') eq "ETMX") {
  $value = 5;
}
elsif ( param('videocamera') eq "TRANSMON_X") {
  $value = 6;
}
elsif ( param('videocamera') eq "WEST_END") {
  $value = 7;
}
elsif ( param('videocamera') eq "CAMEX") {
  $value = 8;
}
elsif ( param('videocamera') eq "ETMY") {
  $value = 9;
}
elsif ( param('videocamera') eq "TRANSMON_Y") {
  $value = 10;
}
elsif ( param('videocamera') eq "SOUTH_END") {
  $value = 11;
}
```

```perl
elsif ( param('videocamera') eq "CAMEY") {
  $value = 12;
}
elsif ( param('videocamera') eq "PSL_Refcav") {
  $value = 13;
}
elsif ( param('videocamera') eq "PSL_PMC") {
  $value = 14;
}
elsif ( param('videocamera') eq "MC_REFL") {
  $value = 15;
}
elsif ( param('videocamera') eq "MC_TRAN") {
  $value = 16;
}
elsif ( param('videocamera') eq "IFO_REFL") {
  $value = 17;
}
elsif ( param('videocamera') eq "IFO_X_PO") {
  $value = 18;
}
elsif ( param('videocamera') eq "IFO_AS_PORT") {
  $value = 19;
}
elsif ( param('videocamera') eq "IFO_Y_PO") {
  $value = 20;
}
elsif ( param('videocamera') eq "IFO_BS_PO") {
  $value = 21;
}
elsif ( param('videocamera') eq "MMT1") {
  $value = 22;
}
elsif ( param('videocamera') eq "ITMX") {
  $value = 23;
}
elsif ( param('videocamera') eq "ITMY") {
  $value = 24;
}
elsif ( param('videocamera') eq "SPARE_1") {
  $value = 25;
}
elsif ( param('videocamera') eq "SPARE_2") {
  $value = 26;
}
elsif ( param('videocamera') eq "BS") {
  $value = 27;
}
elsif ( param('videocamera') eq "FARADAY") {
  $value = 28;
}
elsif ( param('videocamera') eq "VCR2") {
  $value = 29;
}
elsif ( param('videocamera') eq "PANORAMA_CAM") {
  $value = 30;
}
else {
  $value = 0;
  }
$outputcamera = param('videocamera');
$monvalue = 17;
$status = system("rm $videoserver/cacamfile");
#$status = system("rm $videoserver/cacamoutput");
```

```perl
$status = system("echo L0:VIDEO_monitor $monvalue >
$videoserver/cacamfile");
$status = system("echo L0:VIDEO_camera $value >>
$videoserver/cacamfile");
#$status = system("echo $status > $videoserver/cacamoutput");
$status = system("$caPut $videoserver/cacamfile");
#$status = system("echo $status >> $videoserver/cacamoutput");
print h4({-align=>CENTER},"Welcome <font color = red>
$remote_id</font>");
print h3({-align=>CENTER} ,'Select a camera'),
start_form,
"<table width = 40% align=\"center\" bgcolor=\"lightblue\"
border=\"1\">",
  "<tr><td align = \"center\" nowrap><b>MONITOR     - SELECTION      -
CAMERA</b></td></tr>",
 "</table>",
"<table width = 40% align=\"center\" bgcolor=\"lightblue\"
border=\"1\">",
  "<tr><th nowrap><font color=\"blue\" >LLO WEB
VIDEO</th><th></th><th></th><th></th><th></th><th nowrap>",
  "<font color=\"blue\">$outputcamera</font>",
  "</th></tr>",
 "</table>",
"<P><table width = 40% align=\"center\" bgcolor=\"lightgreen\"
border=\"1\">",
  "<tr><th nowrap>LLO 4K - CONTROL ROOM </th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-
value=>'PANORAMA_CAM'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'VCR2'),"</th></tr>",
 "</table>",
"<P><table width = 40% align=\"center\" bgcolor=\"lightblue\"
border=\"1\">",
  "<tr><th>LLO 4K - LVEA </th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'PSL_Refcav'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'PSL_PMC'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'MC_REFL'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'MC_TRAN'),"</th>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'IFO_REFL'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'IFO_X_PO'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'IFO_AS_PORT'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'IFO_Y_PO'),"</th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'IFO_BS_PO'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'MMT1'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'ITMX'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'ITMY'),"</th>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'SPARE_1'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'SPARE_2'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'BS'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'FARADAY'),"</th></tr>",
 "</table>",
"<P><table width = 40% align=\"center\" bgcolor=\"pink\" border=\"1\">",
  "<tr><th nowrap>LLO 4K - END Y </th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'ETMY'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'TRANSMON_Y'),"</th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'SOUTH_END'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'CAMEY'),"</th></tr>",
 "</table>",
"<P><table width = 40% align=\"center\" bgcolor=\"violet\"
border=\"1\">",
  "<tr><th nowrap>LLO 4K - END X </th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'ETMX'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'TRANSMON_X'),"</th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'WEST_END'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'CAMEX'),"</th></tr>",
```

```
 "</table>",
"<P><table width = 40% align=\"center\" bgcolor=\"lightblue\"
border=\"1\">",
  "<tr><th nowrap>LLO 4K - QUADS </th></tr>",
  "<tr><th>",submit(-name=>'videocamera',-value=>'QUAD_1'),"</th>",
  "<th>",submit(-name=>'videocamera',-value=>'QUAD_2'),"</th></tr>",
 "</table>",
  hr,
"Chethan Parameswariah, Ligo Livingston Observatory, 22 March 2002.",
end_form;
# complete html page.
print
      $q->end_html();
```