VRPN Imager

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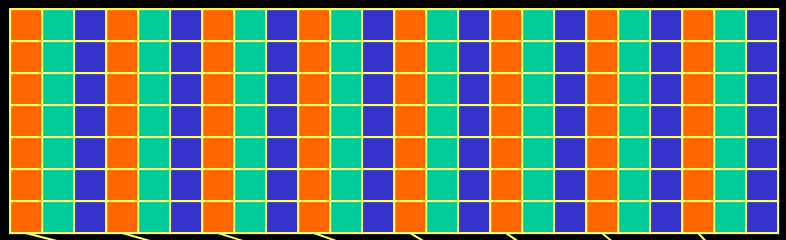
Examples

- Run testimager_client
  - Run testimager_server
    - Show throttling
    - Show discarded frames
  - Run DirectX Video Server
    - #define vrpn_USE_DIRECTSHOW

Server Data Flow Diagram



Imager(nx,ny)

AddChannel(red, units, min, max)

…

BeginFrame

Region(red)

Region(red)

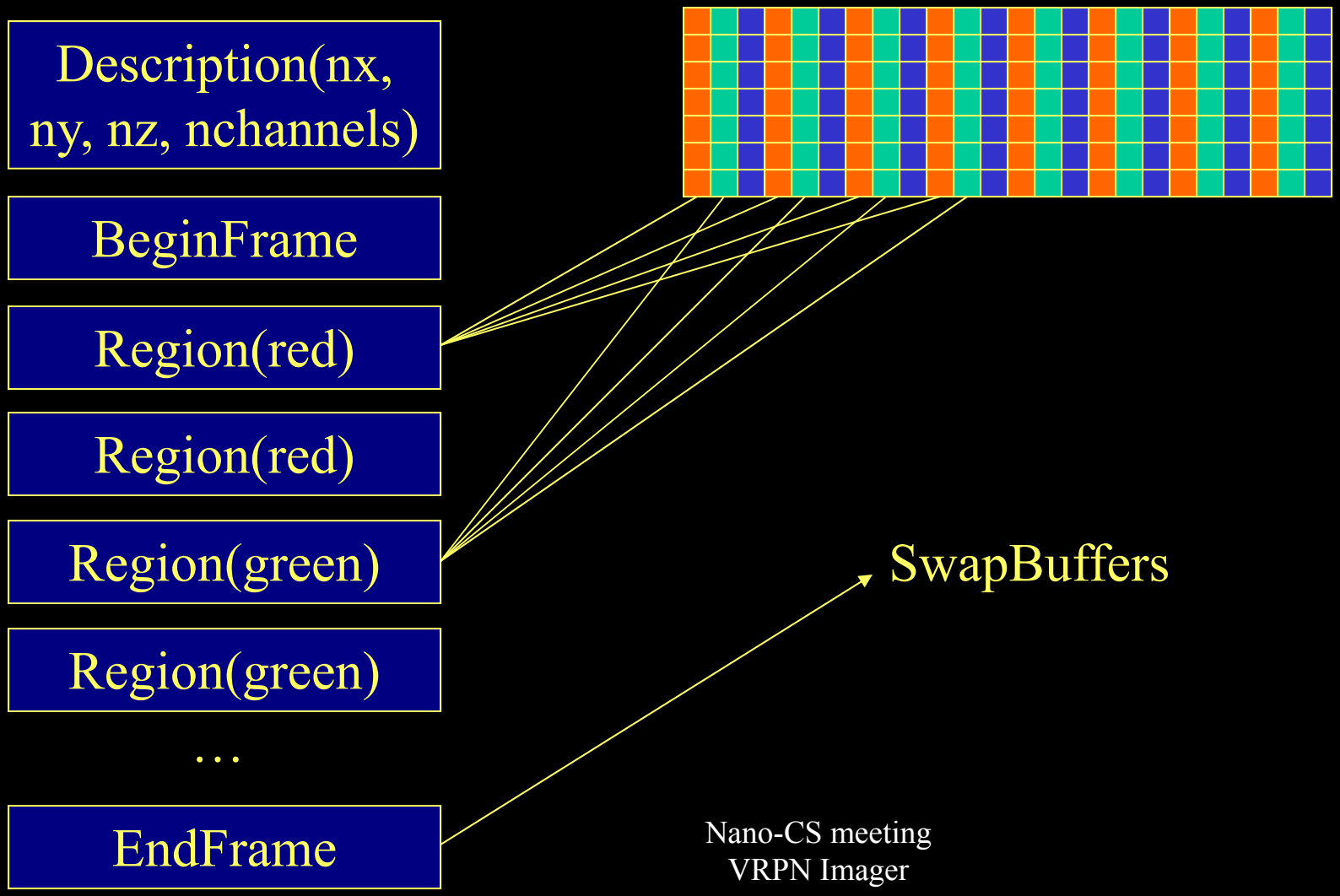
Region(green)

Region(green)

…

EndFrame

Client Data Flow Diagram



Example Client: Setup and Run

```
vrpn_Imager_Remote *g_imager;      //< Imager client object
g_imager = new vrpn_Imager_Remote(device_name);
g_imager->register_description_handler(NULL,
    handle_description_message);
g_imager->register_region_handler(g_imager,
    handle_region_change);
g_imager->register_discarded_frames_handler(NULL,
    handle_discarded_frames);
g_imager->register_end_frame_handler(g_imager,
    handle_end_of_frame);
while (1) g_imager->mainloop();
```

Example Client: Description

```
void  VRPN_CALLBACK handle_description_message(void *, const
    struct timeval)
{
  // This method is different from other VRPN callbacks because it simply
  // reports that values have been filled in on the Imager_Remote class.
  // It does not report what the new values are, only the time at which
  // they changed.

  // Record that the dimensions are filled in.  Fill in the globals needed
  // to store them.
  g_Xdim = g_imager->nCols();
  g_Ydim = g_imager->nRows();
}
```

Example Client: Region

```
void  VRPN_CALLBACK handle_region_change(void *userdata, const vrpn_IMAGERREGIONCB info)
{
   const vrpn_Imager_Region  *region=info.region;
   const vrpn_Imager_Remote  *imager = (const vrpn_Imager_Remote *)userdata;

   // Copy pixels into the image buffer.
   // Flip the image over in Y so that the image coordinates
   // display correctly in OpenGL.
   if (strcmp(imager->channel(region->d_chanIndex)->name, "red") == 0) {
     region->decode_unscaled_region_using_base_pointer(g_image+0, 3, 3*g_Xdim, 0, g_Ydim, true);
   } else if (strcmp(imager->channel(region->d_chanIndex)->name, "green") == 0) {
     region->decode_unscaled_region_using_base_pointer(g_image+1, 3, 3*g_Xdim, 0, g_Ydim, true);
   } else if (strcmp(imager->channel(region->d_chanIndex)->name, "blue") == 0) {
     region->decode_unscaled_region_using_base_pointer(g_image+2, 3, 3*g_Xdim, 0, g_Ydim, true);
   }
}
```

vrpn_Imager_Region:: decode_unscaled_region_using_base_pointer()

```
// Bulk read routines to copy the whole region right into user
// structures as efficiently as possible.
Bool decode_unscaled_region_using_base_pointer(
    vrpn_uint8 *data,              // Type and location of buffer
    vrpn_uint32 colStride,         // Values to skip (3 for rgb)
    vrpn_uint32 rowStride,         // Values to skip (3*width rgb)
    vrpn_uint32 depthStride = 0,         // 0 means overwrite
    vrpn_uint16 nRows = 0,               // Used to invert rows
    bool invert_rows = false,            // Invert rows?
    unsigned repeat = 1            // 3 for mono → RGB buffer
) const;
```

vrpn_Imager_Channel

- vrpn_Imager_Channel(void) {
  - name[0] = '\0';
  - units[0] = '\0';
  - minVal = maxVal = 0.0;
  - scale = 1;
  - offset = 0;
  - d_compression = NONE;
- };

Avoiding Crashing

- Wait for the description before allocating or drawing regions
  - Image size not defined until then
  - Channels not defined until then
  - is_description_valid() can be used, or callback
- Check for description changing
  - Need to re-allocate buffers if new size
  - New channels added, old ones modified

Avoiding Tearing

- Also Avoiding FunkyChrome
- Wait for the end of a frame before drawing
  - Region buffers are per channel (one per color)
  - Regions are less than the full screen

Avoiding Flooding

g_imager->throttle_sender(count);

- Send only *count* more images, then stop
- Accumulates (not what you want with multiple clients)

g_imager->connectionPtr()->Jane_stop_this_crazy_thing(50);

- Imager doesn't follow "The VRPN Way" and can flood
- Never return from the mainloop() call, data always ready when the handlers return
- Stops parsing after the packet with >= 50 total handled messages

Know What You're Missing

- Register discarded-frames handler
- Nonzero value is known # missed
- Zero value is unknown # missed
- No callback is none missed

vrpn_Imager_Stream_Buffer

- public vrpn_Auxiliary_Logger_Server
- public vrpn_Imager_Server
- Multi-threaded full-rate logger
- Forwards “preview” as fast as possible
  - Separate throttle/loss for this
  - Actual lost frame counts still stored in file
- Can run on different host (bass) from server

Reading from a File

- Standard VRPN
  - Open device@file://filename, not device@host
  - Acquire pointer to playback control if needed

Region Types

- uint8
- uint16
- u12in16 ?
- f32

vrpn_Imager_Pose

- get_origin(vrpn_float64 *xyz)
  - Pixel (0,0,0) goes from half-pixel below to half-pixel above
- get_dCol(vrpn_float64 *xyz)
  - Vector from pixel (0,0,0) to one past last in x.
  - This is the total image width
- get_dRow(…)
- get_dDepth(…)

Not Yet Implemented

- Client request a subset of the image
- Client request a frame rate
- Client set exposure time
- Binning (value and client set)
- Full transcoding
- Compression
- ImagerPose not yet tested

Parameters vs. Devices

	digital camera	digital video camera	analog scan converter	TEM	SEM	AFM	AFM Simulator	Scientific camera
# of dimensions	X	X	X	X	X	X	X	X
# of pixels in dimension 1	X	X	X	X	X	X	X	X
# of pixels in dimension 2	X	X	X	X	X	X	X	X
.....								
# of images/image planes	X	X	X	X	X	X	X	X
type of data (heigh, intensity)	X	X	X	X	X	X	X	X
native bit depth	X	X	X	X	X	X	X	X
pixel format/interleaving	X	X	X	X	X	X	X	X
physical scale (pixel size)				X	X	X	?	X
offset (and orientation) - read				X	X	X	?	X
offset (and orientation) - set				?	X	X	?	X
byte ordering	X	X	X	X	X	X	X	X
compression	X	X	X	X	X	X	X	X
pixel integration time/exposure	?	?		?	X	X		X
binning				?	?			X
inter-pixel delay				?	X			
scan rate				?		X	?	
frame rate		X	X	?				
focus control?				?	?			?