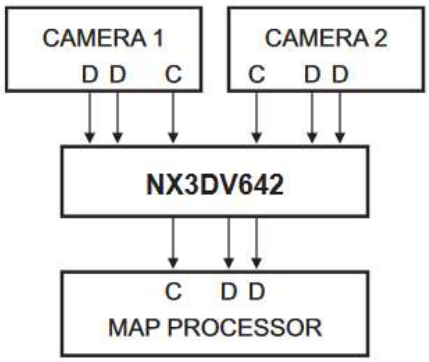
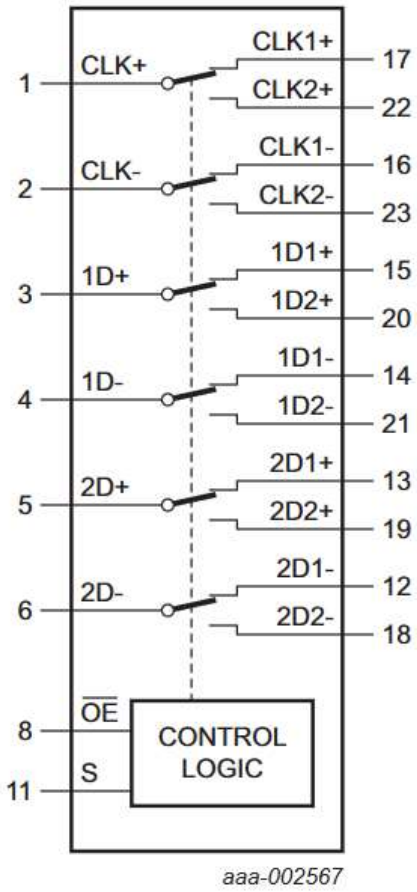
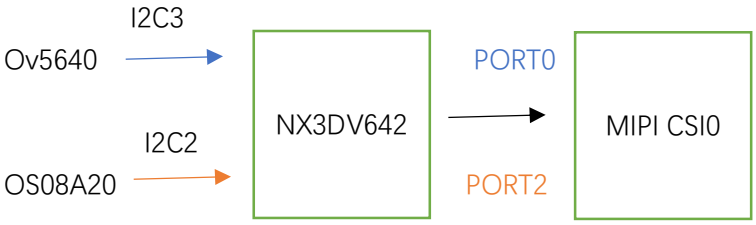
though i.mx8mp has two mipi csi port, but one mipi csi port only can support one camera, but maybe some customers want to connect two cameras with one mipi csi port, nxp has one switch(NX3DV642) to support this
the NX3DV642 data sheet is as below
https://www.nxp.com.cn/docs/en/data-sheet/NX3DV642.pdf





NX3DV642 uses S(select input pin) to choose different camera.



Because current imx8mp evk board doesn't connect this switch, and already prove port0 of mipi csi0 can be supported, so this document only shows os08a20 connect to the port2 of mipi csi, just for reference and record the debug steps, based on 6.1.22 bsp

These are simple steps for how to set the second port of mipi csi can be supported, based on imx8mp-evk-os08a20.dts

1) DTS (based on imx8mp-evk-os08a20.dts)

Current bsp mipi csi0 contains one 'port' child node with an 'endpoint' subnode.

```
&mipi_csi_0 {
	status = "okay";

	port@0 {
		endpoint {
			remote-endpoint = <&os08a20_mipi_0_ep>;
			data-lanes = <4>;
			csis-hs-settle = <16>;
		};
	};
};
```

After boot up we can see

```
root@imx8mpevk:~# media-ctl -p
Media controller API version 6.1.22

Media device information
------------------------
driver          mxc-md
model           FSL Capture Media Device
serial
bus info        platform:32c00000.bus:camera
hw revision     0x0
driver version  6.1.22

Device topology
- entity 1: mxc-mipi-csi2.0 (8 pads, 1 link)
            type Node subtype V4L flags 0
            device node name /dev/v4l-subdev0
        pad0: Sink
                <- "os08a20 1-0036":0 [ENABLED,IMMUTABLE]
        pad1: Sink
        pad2: Sink
        pad3: Sink
        pad4: Source
        pad5: Source
        pad6: Source
        pad7: Source

- entity 10: os08a20 1-0036 (1 pad, 1 link)
             type V4L2 subdev subtype Sensor flags 0
             device node name /dev/v4l-subdev1
        pad0: Source
                [fmt:SBGGR12_1X12/3840x2160 field:none]
                -> "mxc-mipi-csi2.0":0 [ENABLED,IMMUTABLE]
```

Change to

```
&mipi_csi_0 {

    #address-cells = <1>;
    #size-cells = <0>;
    status = "okay";

     port@0 {
           reg = <0>;
           mipi_ep: endpoint {
           remote-endpoint = <&ov5640_mipi1_ep>;
           data-lanes = <2>;
           csis-hs-settle = <10>;
       };
};

      port@2 {
             reg = <2>;
            mipi_csi0_ep1: endpoint {
```

```
            remote-endpoint = <&os08a20_mipi_0_ep>;
            data-lanes = <4>;
            csis-hs-settle = <16>;
           csis-clk-settle = <2>;
            csis-wclk;
          };
        };
    };
```

```
root@imx8mpevk:~# media-ctl -p
Media controller API version 6.1.22

Media device information
------------------------
driver          vvcam-video
model           viv_media
serial
bus info        platform:vvcam-video.0
hw revision     0x0
driver version  6.1.22

Device topology
- entity 1: viv_v4l20 (1 pad, 1 link)
            type Node subtype V4L flags 0
            device node name /dev/video2
        pad0: Sink
                <- "vvcam-isp.0":0 [ENABLED]

- entity 5: vvcam-isp.0 (1 pad, 1 link)
            type Node subtype V4L flags 0
            device node name /dev/v4l-subdev0
        pad0: Source
                -> "viv_v4l20":0 [ENABLED]

- entity 7: vvcam-dwe.0 (2 pads, 0 link)
            type Node subtype V4L flags 0
            device node name /dev/v4l-subdev1
        pad0: Source
        pad1: Sink
```

2) MIPI CSI driver

https://github.com/nxp-imx/linux-imx/blob/lf-6.1.y/drivers/staging/media/imx/imx8-mipi-csi2-sam.c

refer to the function “mipi_csis_parse_dt”,

node = of_graph_get_next_endpoint(node, NULL);

**** of_graph_get_next_endpoint() - get next endpoint node***
**** @parent: pointer to the parent device node***
**** @prev: previous endpoint node, or NULL to get first***
struct device_node *of_graph_get_next_endpoint(const struct device_node *parent,

*struct device_node *prev)*

this function means only get first node of mipi csi port, but now we need the second port, so change the source code to

```
    struct device_node *node1;
// node = of_graph_get_next_endpoint(node, NULL);
    node1 = of_graph_get_next_endpoint(node, NULL);
    node = of_graph_get_next_endpoint(node, node1);
```

```
root@imx8mpevk:~# media-ctl -p
Media controller API version 6.1.22

Media device information
------------------------
driver          vvcam-video
model           viv_media
serial
bus info        platform:vvcam-video.0
hw revision     0x0
driver version  6.1.22

Device topology
- entity 1: viv_v4l20 (1 pad, 1 link)
            type Node subtype V4L flags 0
            device node name /dev/video2
        pad0: Sink
                <- "vvcam-isp.0":0 [ENABLED]

- entity 5: vvcam-isp.0 (1 pad, 1 link)
            type Node subtype V4L flags 0
            device node name /dev/v4l-subdev0
        pad0: Source
                -> "viv_v4l20":0 [ENABLED]

- entity 7: vvcam-dwe.0 (2 pads, 0 link)
            type Node subtype V4L flags 0
            device node name /dev/v4l-subdev1
        pad0: Source
        pad1: Sink
```

```
root@imx8mpevk:~# v4l2-ctl --list-device
[   99.105395] enter isp_mi_stop
 ():
        /dev/v4l-subdev0
        /dev/v4l-subdev1

VIV (platform:viv0):
        /dev/video2

vsi_v4l2dec (platform:vsi_v4l2dec):
        /dev/video1

vsi_v4l2enc (platform:vsi_v4l2enc):
        /dev/video0

viv_media (platform:vvcam-video.0):
        /dev/media0
```

3) imx8-media-dev driver

refer to the print log, It seems the internal links are created, but still desn't created link [os08a20 1-0036] => [mxc-mipi-csi2.0]

after debug, you can find driver "https://github.com/nxp-imx/linux-imx/blob/lf-6.1.y/drivers/staging/media/imx/imx8-media-dev.c"

/* csi2 node have only port */

```
Function register_sensor_entities
    /* csi2 node have only port */
        //port = of_get_next_child(node, NULL);//joan
                port1 = of_get_next_child(node, NULL);//joan
                port = of_get_next_child(node, port1);//joan

                v4l2_info(&mxc_md->v4l2_dev, "port full name is %s\n", port->full_name);//joan
            v4l2_info(&mxc_md->v4l2_dev, "port name is %s\n", port->name);//joan

v4l2_info(&mxc_md->v4l2_dev, "ep full name is %s and ep name is %s\n", ep->full_name, ep->name);//joan
```

after that you can find the print information

```
[   10.053085] mx8-img-md: port full name is port@2
[   10.057710] mx8-img-md: port name is port
[   10.061726] mx8-img-md: ep full name is endpoint and ep name is endpoint
```

also need to add this code

```
if (endpoint.base.port ==2)//joan
                endpoint.base.port=0;     //joan
 mxc_md->sensor[index].id = endpoint.base.port;
```

for further debug, you should find function *mxc_md_create_links*

```
else if (mxc_md->mipi_csi2[sensor->id].sd) {
        mipi_csi2 = &mxc_md->mipi_csi2[sensor->id];
```

sensor->id = endpoint.base.port, endpont.base.port is from reg<?> in the dtsfile under port@? of mipi csi, which means that endpoint.base.port=0 is for mipi csi0, if endpoint.base.port=1 which is for mipi csi1 , that's why I add port@2 under mipi csi0, not port@1 under mipi csi0, I redefind port@2 to mipi csi0 by the code

```
if (endpoint.base.port ==2)
            endpoint.base.port=0;
```

I also add print information to improve this

```
v4l2_info(&mxc_md->v4l2_dev, "sensor->id is (%d)\n", sensor->id);//joan
```

```
[   10.075149] mx8-img-md: sensor->id is (0)
```

Which means attach os08a20 to mipi csi0

After compiling and building, don't forget use the new imx8-media-dev.ko

After reboot, we can see the new link

```
[   10.079182] mx8-img-md: created link [os08a20 1-0036] => [mxc-mipi-csi2.0]
[   10.086074] mxc-md 32c00000.bus:camera: mxc_md_create_links
```

```
root@imx8mpevk:~# media-ctl -p
Media controller API version 6.1.22

Media device information
------------------------
driver          mxc-md
model           FSL Capture Media Device
serial
bus info        platform:32c00000.bus:camera
hw revision     0x0
driver version  6.1.22

Device topology
- entity 1: mxc-mipi-csi2.0 (8 pads, 1 link)
            type Node subtype V4L flags 0
            device node name /dev/v4l-subdev0
        pad0: Sink
                <- "os08a20 1-0036":0 [ENABLED,IMMUTABLE]
        pad1: Sink
        pad2: Sink
        pad3: Sink
        pad4: Source
        pad5: Source
        pad6: Source
        pad7: Source

- entity 10: os08a20 1-0036 (1 pad, 1 link)
             type V4L2 subdev subtype Sensor flags 0
             device node name /dev/v4l-subdev1
        pad0: Source
                [fmt:SBGGR10_1X10/1920x1080 field:none]
                -> "mxc-mipi-csi2.0":0 [ENABLED,IMMUTABLE]
```

```
root@imx8mpevk:~# v4l2-ctl --list-device
[  108.231145] enter isp_mi_stop
 ():
        /dev/v4l-subdev0
        /dev/v4l-subdev2
        /dev/v4l-subdev3

 (csi0):
        /dev/v4l-subdev1

FSL Capture Media Device (platform:32c00000.bus:camera):
        /dev/media0

VIV (platform:viv0):
        /dev/video2

vsi_v4l2dec (platform:vsi_v4l2dec):
        /dev/video1

vsi_v4l2enc (platform:vsi_v4l2enc):
        /dev/video0

viv_media (platform:vvcam-video.0):
        /dev/media1
```

```
root@imx8mpevk:~# gst-launch-1.0 v4l2src device=/dev/video2 ! video/x-raw,width=640,height=480 ! wayl
andsink
[   78.847949] enter isp_mi_stop
Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
[   79.296940] enter isp_mi_stop
[   79.418932] enter isp_s_comp
[   79.421854] enter isp_s_comp
[   79.424762] enter isp_s_comp
[   79.450320] enter wdr3_hw_init
[   79.453410] wdr3 res: 1920 1080
[   79.510973] enter isp_set_stream 1
[   79.526372] enter isp_mi_start
```

In the end

firstly, I used port@1 under mipi csi0, refer to the logfile, and don't change any ***endpoint.base.port***

```
v4l2_info(&mxc_md->v4l2_dev,
"port name is %s\n", port->full_name);
```

I add print information, can find the name from logfile as below

```
6.631759] mx8-img-md: port name is port@1
```

Then the driver would create link with mipi csi1, then change the port@1 to port@2, and add code

```
if (endpoint.base.port ==2)
        endpoint.base.port=0;
```

to attach port@0 and port@2 to mipi csi0, port@1 to mipi csi1, then customer can use mipi csi1 and mipi csi0 in the same time