VadaTech MCH Network Configuration

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This note presents the network configuration used for the VadaTech UTC002 MCH, located within each VadaTech MicroTCA VT892 chassis, deployed in the Muon $g-2$ experiment at Fermilab. An overview of the network addressing scheme is first presented, followed by configuration instructions for how to comply with the scheme.

Network Addressing Scheme

The IP address assignment scheme for each network interface of the VadaTech MCH is shown in Table 1. Each MicroTCA crate is assigned its own unique subnet, `[crate]`, which can range from 0 to 31. The configured module addresses for all crates are then grouped onto the same network with netmask `255.255.224.0`.

255.255.255.0 for 1 crate

	Network Interface	IP Address
MCH	GbE0/GbE1 Ethernet	`192.168.[crate].15`
	10/100 Ethernet	`-`
	μTCA Shelf	`192.168.[crate].17`
	μTCA Carrier	`192.168.[crate].18`
	MCH 1	`192.168.[crate].19`
	MCH 2	`192.168.[crate].20`
	Shelf Manager 0	`-`
	Shelf Manager 1	`-`

Table 1: IP address assignment scheme for each network interface, which is based on the MicroTCA crate's unique subnet, `[crate]`. An address of `-` denotes that it is not configured.

Network Configuration Instructions

Each MCH has a command-line interface (CLI), which provides access to its network configuration files. To connect to the CLI, plug an Ethernet cable into the `GbE0` port and, from a terminal, run

```
ssh root@192.168.[crate].15
```

Note that, if configuring a new MCH, you will need to use the `10/100` port and the MCH's default IP address, `192.168.1.252`, instead. After running this command, you may be prompted to enter the password `root`. You will then be in the MCH's CLI, which runs Linux.

It is important to note that, in order to change any files, you must remount the root directory with read/write permissions by running the following command

```
mount -o remount,rw /
```

The network configuration for the GbE0/GbE1 and 10/100 Ethernet ports are set in the configuration file /etc/rc.d/rc.conf in the CLI. You can modify this file's contents using vi, which comes pre-installed, as follows

```
vi /etc/rc.d/rc.conf
```

To conform to our network scheme, the "network interface" section at the bottom of rc.conf must be modified to that below, with [crate] replaced by the appropriate subnet reserved for the crate.

/etc/rc.d/rc.conf

```
# net interface 0
export SYSCFG_IFACE0=n
export INTERFACE0="eth0"
export IPADDR0="0.0.0.0"
export NETMASK0="0.0.0.0"
export BROADCAST0="0.0.0.0"
export GATEWAY0="0.0.0.0"
export NAMESERVER0="0.0.0.0"

# net interface 1
export SYSCFG_IFACE1=y
export INTERFACE1="eth1"
export IPADDR1="192.168.[crate].15"
export NETMASK1="255.255.224.0"
export BROADCAST1="192.168.31.255"
export GATEWAY1="192.168.1.1"
export NAMESERVER1="0.0.0.0"
```

255

set to IP address of your server, not this

The IP addresses for the μTCA Shelf, μTCA Carrier, MCH 1, and MCH 2 interfaces are set with the CLI-specific command, carrier set_ip_connection, as follows

```
carrier set_ip_connection -s 192.168.[crate].17 -c 192.168.[crate].18
carrier set_ip_connection -m 192.168.[crate].19 -M 192.168.[crate].20
```

also set gateway address 0 to match above. It's either -g or -G

The IP address set for the μTCA Shelf interface must also be changed in the Shelf Manager's FRU information file, /opt/vadatech/IPMI/UTCShelf/etc/fruUTCSH.xml, in the CLI. You can modify this file's contents using vi as follows

```
vi /opt/vadatech/IPMI/UTCShelf/etc/fruUTCSH.xml
```

The "IP Connection" block at the bottom of fruUTCSH.xml must be modified to match that below, with [crate] replaced by the appropriate subnet reserved for the crate. As the file is quite long, it is often convenient to search for "192" using the :/192 command while inside of vi to skip ahead to the relevant section.

/opt/vadatech/IPMI/UTCShelf/etc/fruUTCSH.xml

```
<IP_Connection>
    <in_band>eth0,eth1</in_band>
    <failover>eth1,eth0</failover>
    <IP>
        <ip_address>192.168.[crate].17</ip_address>
        <gw_address>192.168.1.1</gw_address>
        <net_mask>255.255.255.0</net_mask>
    </IP>
</IP_Connection>
```

Any change to the `fruUTCSH.xml` file requires that the FRU repository be recreated. This is done, in the CLI, with the following two commands, in order, as given by

```
vtipmi stop
createFruRepositories
```

The MicroTCA crate must then be *power-cycled*, and you must wait until *all* of the blue hot-swap lights have turned off. The IP address set for the μ`TCA Shelf` interface finally needs to set with the CLI-specific command, `set_shelf_address_info`, as follows

```
set_shelf_address_info -a 192.168.[crate].17
```

The MicroTCA crate must then be again *power-cycled*. After *all* of the blue hot-swap lights have turned off, the MCH will have the proper network configuration, as given in Table 1.

Network Configuration Settings

The MCH's network configuration can be verified from within its CLI, with five commands. First, the IP addresses for the μ`TCA Shelf`, μ`TCA Carrier`, `MCH 1`, and `MCH 2` interfaces can be verified using the CLI-specific command, `carrier get_ip_connection`, as follows

```
# carrier get_ip_connection

MicroTCA Shelf IP Address   : 192.168.[crate].17
MicroTCA Carrier IP Address : 192.168.[crate].18
MCH 1 IP Address            : 192.168.[crate].19
MCH 2 IP Address            : 192.168.[crate].20
Subnet Mask                 : 255.255.255.0
Gateway Address 0           : 192.168.1.1
Gateway Address 1           : 0.0.0.0
Username                    : shelf
Password                    : ********
```

The `Shelf Manager 0` and `Shelf Manager 1` can then be confirmed to be not configured with the CLI-specific command, `get_ip_connection`, as follows

```
# get_ip_connection
```

```
Shelf Manager IP Address 0        : 0.0.0.0
Shelf Manager Gateway Address 0   : 0.0.0.0
Shelf Manager Netmask 0           : 0.0.0.0
Shelf Manager IP Address 1        : 0.0.0.0
Shelf Manager Gateway Address 1   : 0.0.0.0
Shelf Manager Netmask 1           : 0.0.0.0
```

The IP address set for the μTCA `Shelf` interface, however, must also be confirmed using the CLI-specific command, `get_shelf_address_info`, as follows

```
# get_shelf_address_info

Shelf Address: "192.168.[crate].17"
```

The μTCA `Shelf` interface is exclusively used for the Shelf–Carrier communication. With our MCH network configuration, each crate is set up as a shelf manager, with only its own carrier connected to it. The CLI-specific command, `list_carriers_present`, can then be used to verify that only one carrier is present as follows

```
# list_carriers_present

Carrier   IPMB      Physical Location      Device Name          Hotswap State
          Address
#01       0x82      (Slot #00, Tier #00)   UTCA CARRIER         M4 (Active)
```

A summary of the interface configurations can be given with the standard `ifconfig` command, as shown below. Here the netmask `255.255.224.0` should be verified for the `eth1` interface.

```
# ifconfig

eth1    Link encap:Ethernet  HWaddr 00:13:3A:07:59:91
        inet addr:192.168.[crate].15  Bcast:192.168.31.255  Mask:255.255.224.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:449361 errors:0 dropped:0 overruns:0 frame:0
        TX packets:256872 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:25275073 (24.1 Mb)  TX bytes:13392000 (12.7 Mb)

eth1:1  Link encap:Ethernet  HWaddr 00:13:3A:07:59:91
        inet addr:192.168.[crate].18  Bcast:192.168.0.255  Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

eth1:8  Link encap:Ethernet  HWaddr 00:13:3A:07:59:91
        inet addr:192.168.[crate].19  Bcast:192.168.0.255  Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

eth1:9  Link encap:Ethernet  HWaddr 00:13:3A:07:59:91
        inet addr:192.168.[crate].17  Bcast:192.168.0.255  Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
```

```
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:11260071 errors:0 dropped:0 overruns:0 frame:0
          TX packets:11260071 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1192254002 (1137.0 Mb)  TX bytes:1192254002 (1137.0 Mb)
```