

# Conversion from QNX4 to MSI Control Software

Kevin Sterne, 3/19/2012

Below is a compilation of notes on the parts and pieces needed to convert an older style SuperDARN radar using QNX 4 computers to the newer MSI style radars using QNX 6. Note that there is a bit of ambiguity here as each radar will have different interfacing with the radar's current transmitters and phasing matrices.

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The costs were as follows two years ago. I would imagine that they are close though SIL might want a bit more now as I'm sure their costs have increased:

Phasing chassis: ~\$1100  
Phasing cards: ~\$500 each

BAS box: ~\$2600  
Power Divider: ~\$2200  
RxFront End: ~\$5000

I don't know about the power supply. If I remember correctly, we switched to having individual supplies in each device when we went to SIL, which got rid of the need for the separate box. I'll check on that and get back to you.

Bill

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Mike,

Converting to the new OS could be done in one of a few ways. The costs depend on what is done. To convert without any new code development means purchasing hardware (computers, DIO, timing, receiver, DDS). Converting without purchasing all of the hardware means code development (drivers for whatever doesn't exist in the new OS). There would still be some hardware cost as the old stuff just isn't supported in new computers (ISA bus for example).

I'll forward to you Jef's write up of costs based upon the changes we made to King Salmon

Bill

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Jef Spaleta wrote:

What it will take to transition an existing radar from qnx4 to use the new system.

This is based entirely with my experience transitioning KSR...which you and Todd already did a transition of to digital reception.

Important notes:

0) The old qnx4 based system uses an ISA bus based DIO card as part of its critical timing functionality. This is no longer available as an option. Any new control system must move to at least PCI 3.3 volt (advertised as universal pci) or pci-e. 5 volt PCI and ISA hardware must be avoided to reduce the difficulty of long term support.

1) The existing phasing matrix in the KSR design uses inverted TR logic and differential line driver logic. The current MSI electronics stack only provides TTL logic for timing and DIO signals. This difference may necessitate modifications to the existing BAS and or phasing matrix wiring to use the provided TTL logic in the new electronics stack. This is the one complication I ran into at KSR that I had to rely on Mick's institutional knowledge to help sort out.

2) The British transmitters also require additional computer hardware and software for RS-485 based control of the onboard microcontrollers. It is possible to turn off the remote control of the microcontrollers off completely via a jumper in the transmitter electronics. KSR has a minimal replacement for the transmitter control, but it really needs to be made more robust. Site operators with microcontroller based transmitters will have to make a decision on whether to disable the remote control capability or invest in the new control software that runs on linux using what I have written as a starting point.

3) Total cost is difficult to estimate as there will be additional electronics that must be deployed to interface with the existing phasing matrix and transmitters. I've broken out estimates for each components. Without counting the custom interface boxes its ~\$35,000 investment in control electronics assuming that a DDS upconverter card and a digital receiver much be purchased. If these items are not purchased the estimated cost drops by half. Anyone looking to avoid using the DDS upconverter card will have to do significant work to provide appropriate timing and DIO logic (software driver and associated interface hardware) to control an alternative tx driver signal. And of course moving to an MSI styled phasing matrix would incur more costs up front, but would allow a site to make use of the existing operational software and hardware with less design modifications.

Computers.

ROS computer: ~\$5000

RST computer: ~\$1000

ROS computer running QNX6 preferable a quad core or better with enough pci and pci-e slots to house all the computer cards. The new ROS is highly threaded makes use of the multiprocessing capabilities of standard multicore hardware now. The Trenton Systems backplane computers has been more than adequate for all current ROS installs.

RST computer running any current linux operating system. We are currently using CentOS 5 as the operating system at all ROS deployments.

Dual gigabit networking on both computers would be advisable to separate out operational communication traffic from external data archive traffic onto separate interfaces.

Network switch : ~ \$300

Computer Cards:

Timing Card (pcie): ADLink PCIe-7300A : ~\$1000

DIO card (universal pci) : Acces pci-DIO-120: ~\$400

GPS card (universal pci) : The card we are using has been discontinued and we'll need to look at quotes for new cards : Cost guess ~\$5k

Digital Reciever Card (pci) : ~\$8000

DDS Upconverter Card (pci) : ~\$10000

Additional Electronics.

100 MHz capable clock source (existing clock source on site may be reusable for this): Cost N/A

DIO controllable RXFE electronics (can reuse the MSI design) : Cost from SLI

Signal distribution electronics (can reuse the MSI design) : Cost from SLI

Interface box from DIO and Timing Card to existing phasing matrix : < \$500 in material to fabricate by hand

Interface box from DIO to Transmitters to obtain status information:  
Not in the MSI design, but also not critical for operation: Cost for McM txstatus interface box?

-jef