VAX Solution for ANO Plant Process Computer

Station Info

ANO1 – B&W Two Loop PWR
Once Through Steam Generators
Power: 2568 MWt / 883 MWe
Heat Sink – Lake Dardanelle
Commercial Operation: 12/19/74

ANO2 – CE Two Loop PWR
U-Tube Steam Generators
Power: 3026 MWt / 1040 MWe
Heat Sink - Cooling Tower (Lake/Closed)
Commercial Operation: 03/26/80

Arkansas Nuclear One has been steadily improving Unit 1 and Unit 2 Simulators over the last several years with upgrades and improvements in:

Simulator Executive,

I/O Replacement,

Model Upgrades

…and having great success! Yet risk to PIs exist due to legacy systems…

…one being our early 1990s vintage Plant Monitoring Systems (PMS) on DEC VAX 4000 series hardware and legacy VMS 5.5 Operating System

legacy *adjective*

Definition of *legacy* (Entry 2 of 2)

1 : of, relating to, or being a previous or outdated computer system
// transfer the *legacy* data
// a *legacy* system

2 : of, relating to, associated with, or carried over from an earlier time, technology, business, etc.

Legacy System challenges:

Risk of simulator failure or availability delays due to service lifetime of components.

VAX spare parts availability and repair options limited and with much higher cost-to-value position than modern technology solutions.

Legacy System challenges:

Declining access to technical associates and vendors with deep knowledge of legacy hardware and software due to age of solutions

Plant PMS computer upgrades several years away, because…

Legacy System challenges:

…DEC and our PMS software vendors made a solid workhorse of a solution

Improvement Opportunity:

Identify options for rehosting PMS solution on virtual VAX technologies

Aware that industry, for over a decade, has had mature commercial offerings from a few vendors, and also open source emulators to preserve VAX investments.

What we were able to accomplish:

Successfully researched and tested SimH software as an open source option for rehosting our Unit 1 and Unit 2 Simulator PMS servers onto virtual VAXes running in a modern hardware and software environment.

Why SimH?

Robust software emulation of VAX hardware in SimH, with community of support around project.

Internet searching finds several successful conversion projects using SimH, along with many hobbyist installations using OpenVMS.

Why SimH?

SimH runs on many modern platforms and OS options - can easily rehost again when needed.

Initially a research effort, but SimH prototype worked better than expected.

How was it accomplished?

Worked in sandbox environment with physical backup tapes restored onto empty virtual machine environment.

Minimal changes needed reconfigure PMS software solution for virtual "hardware" differences in disk and network options.

How was it accomplished?

Tested as proof of concept with simulator maintenance testing during Unit 1 plant outage changes, and Unit 2 BOP model upgrades.

Performed final physical to virtual VAX conversion of both units PMS systems in around one week of time.

Benefits:

Improved risk position of Simulators PMS solutions impacting PIs

Greatly decreased time intervals for startup and routine maintenance on virtual VAX platform

Benefits:

Easy to backup and restore solution using modern tools, which also improved disaster recovery ability onto any compatible machine.

And…

Benefits:

(shiny new case … same destination for passengers of our Simulator PMS solution)

Questions?