



Plans for Monitoring TPS Control System Infrastructure using SNMP and EPICS

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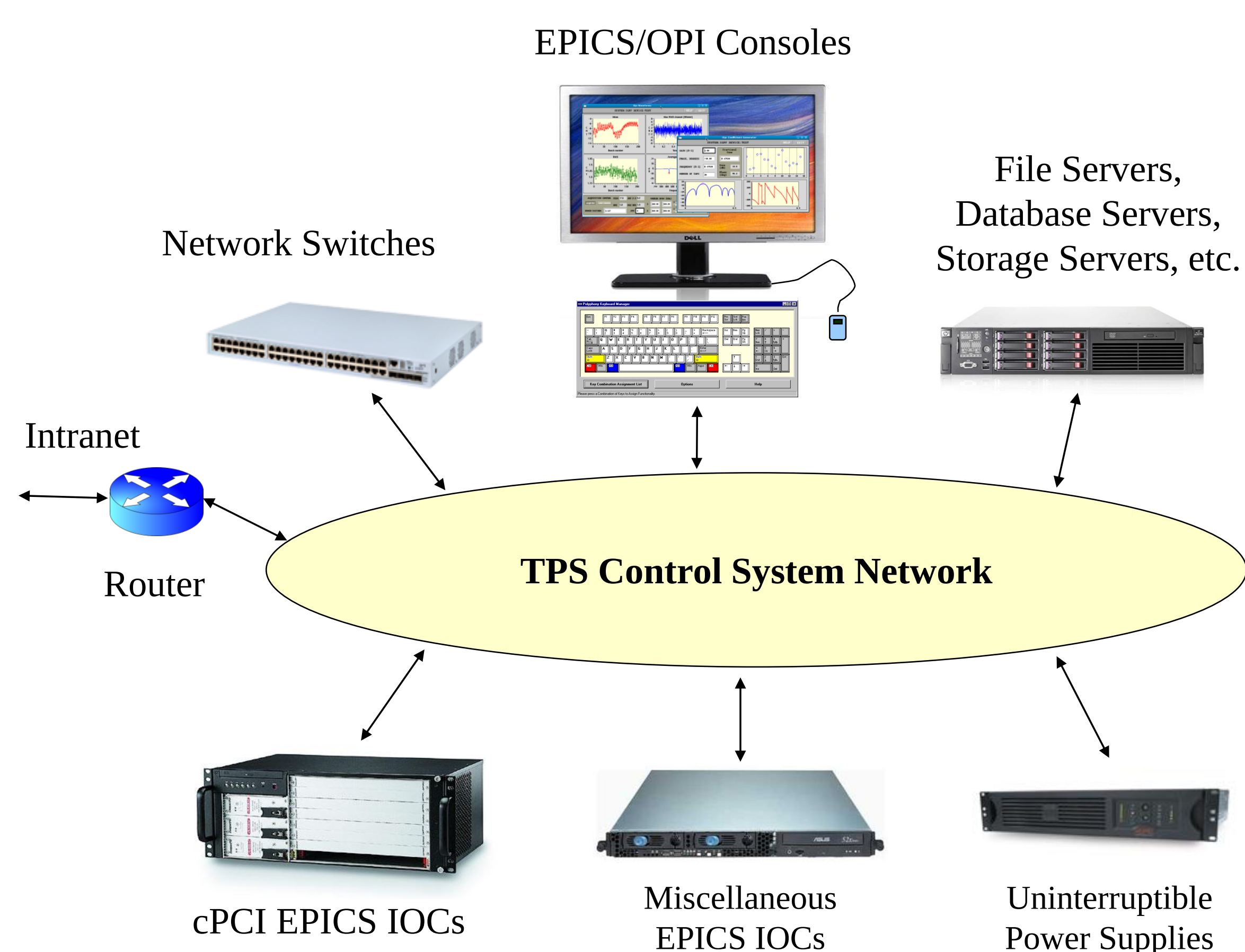


Abstract

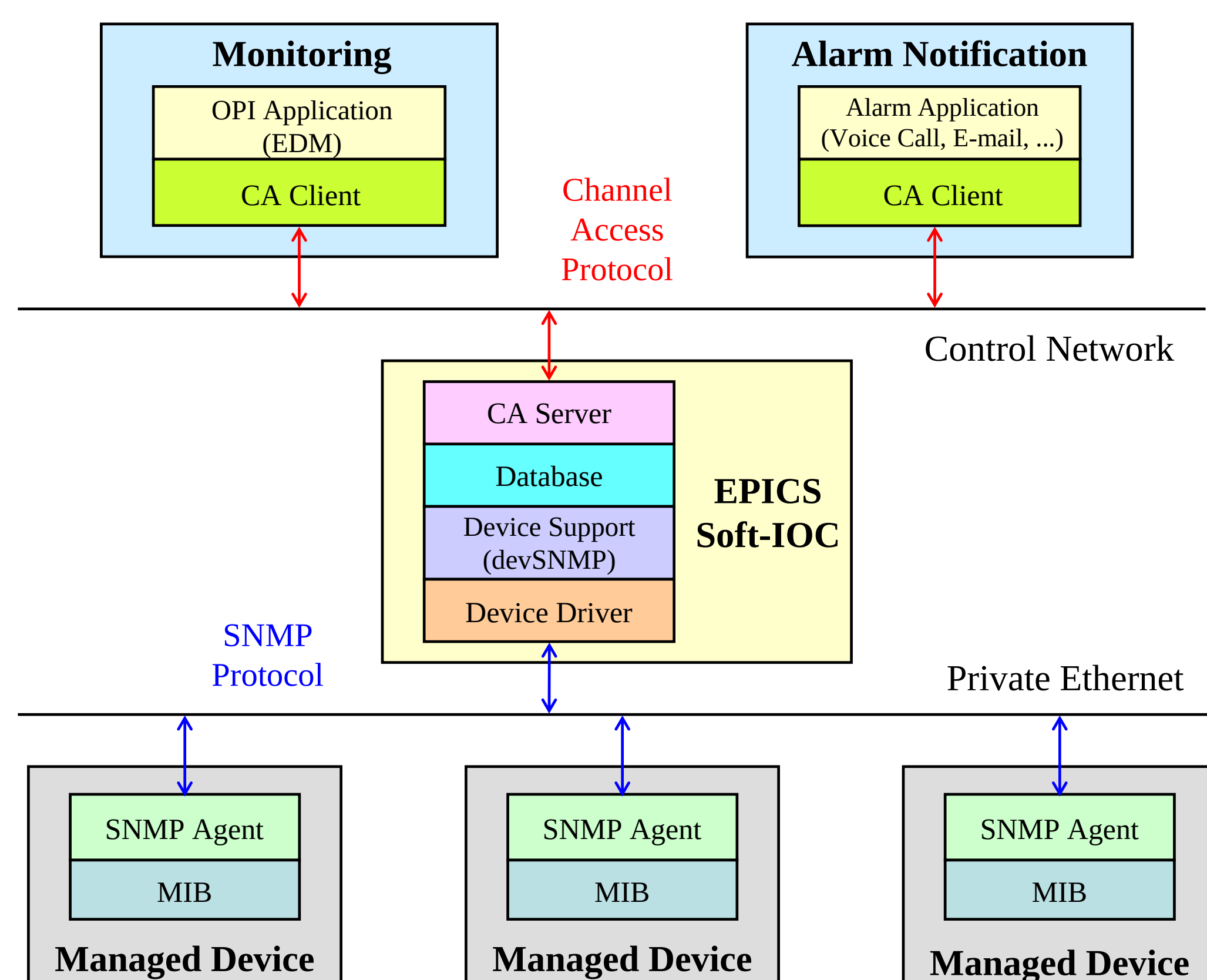
The Taiwan Photon Source (TPS) control system is one of the crucial systems for the accelerators and beamlines. It is necessary to monitor the status of the control system components such as housekeeping parameters of cPCI EPICS IOC crates, network traffic, connections between computers, etc. The equipment room environment including electric power, temperature, fire alarm, and water leak will also need to be watched. Using Simple Network Management Protocol (SNMP), the behaviour of network-attached devices can be monitored for administrative attention. Since the TPS control system is based upon the EPICS framework, the monitoring system is planned to adopt the EPICS support with SNMP. This paper will describe the system architecture of this monitoring system.

Introduction

- TPS control system will be implemented by using the Experimental Physics and Industrial Control System (EPICS) framework.
- An infrastructure monitoring system is planned to be implemented for gathering status information of control system components such as cPCI EPICS IOC crates, network switches, servers, UPSs, etc.
- The monitoring system will automatically display the warning messages on the OPI screen and send out the alarm notification by voice call and E-mail.



System Architecture



- A dedicated EPICS IOC will be used to retrieve information from the SNMP-compatible devices. The IOC can query the management data from managed devices via SNMP protocol. Then the data will be stored in the EPICS database for PVs channel access.
- The Extensible Display Manager (EDM) will be used as the operator interface (OPI) to show the monitored information via the Channel Access protocol.

Monitoring of SNMP-Compatible Devices

cPCI Crates :

- Each cPCI crate has an alarm board with SNMP support and it can provide the crate status parameters including voltage, temperature, fan speed, and status of power supply unit.
- Each column on EDM display page represents one cPCI IOC crate. If the parameters exceed normal range, the display value will turn into red for warning the operator.

cPCI IOC Crate Status

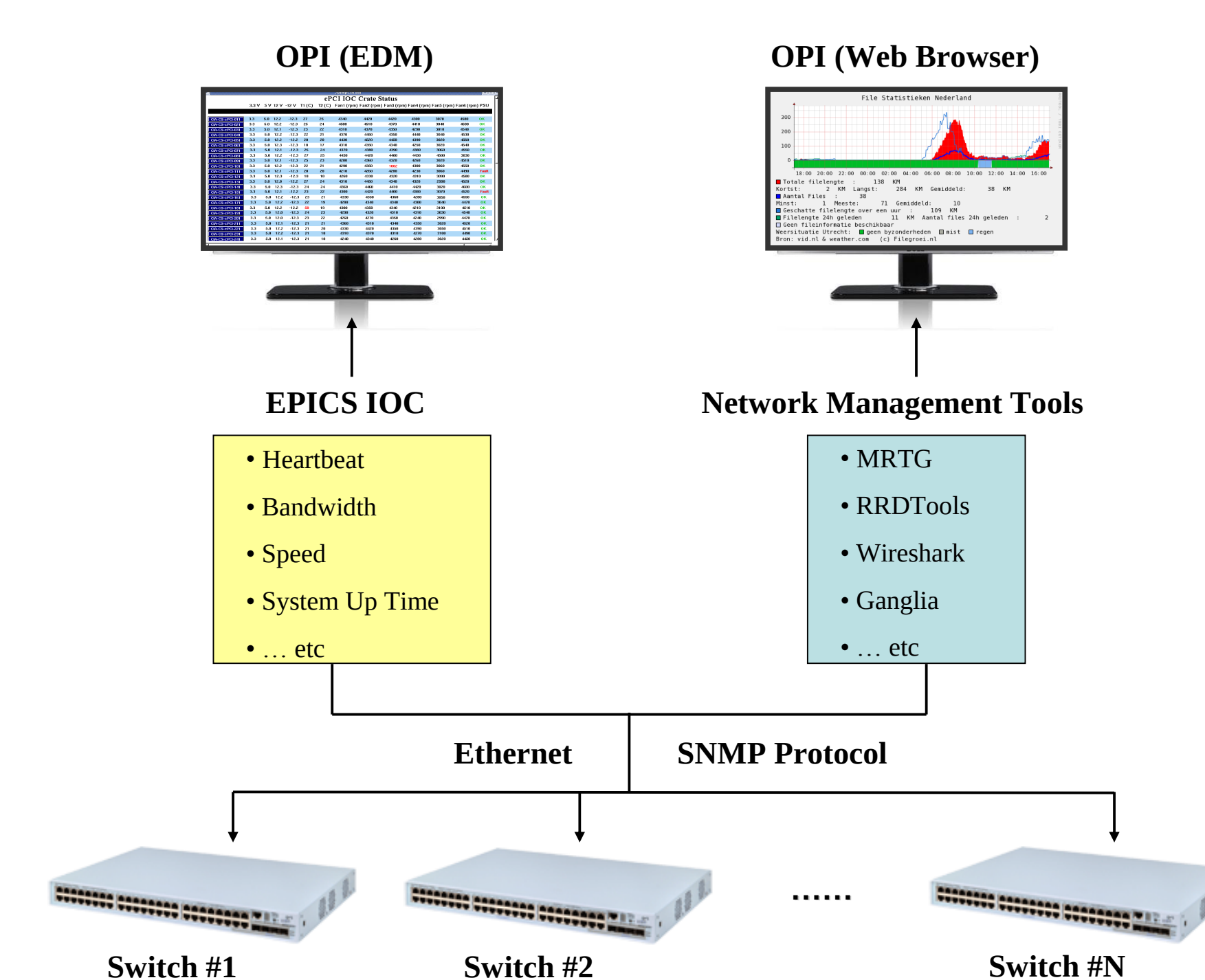
3.3V 5V 12V -12V T1(C) T2(C) Fan1(rpm) Fan2(rpm) Fan3(rpm) Fan4(rpm) Fan5(rpm) Fan6(rpm) PSU

OA-CS-EPIC001	3.3	5.0	12.2	-12.3	27	25	4340	4420	4420	4300	3070	4580	OK
OA-CS-EPIC002	3.3	5.0	12.2	-12.3	25	24	4500	4510	4370	4410	3040	4600	OK
OA-CS-EPIC003	3.3	5.0	12.1	-12.3	23	22	4510	4570	4350	4250	3010	4540	OK
OA-CS-EPIC004	3.3	5.0	12.2	-12.3	22	21	4370	4450	4350	4440	3040	4530	OK
OA-CS-EPIC005	3.3	5.0	12.2	-12.2	20	20	4430	4520	4450	4390	3020	4560	OK
OA-CS-EPIC006	3.3	5.0	12.3	-12.3	18	17	4310	4350	4340	4250	3000	4540	OK
OA-CS-EPIC007	3.3	5.0	12.1	-12.3	25	24	4370	4380	4350	4380	3050	4550	OK
OA-CS-EPIC008	3.3	5.0	12.2	-12.3	27	25	4430	4420	4400	4430	3030	4580	OK
OA-CS-EPIC009	3.3	5.0	12.1	-12.3	25	23	4280	4360	4320	4260	3020	4510	OK
OA-CS-EPIC010	3.3	5.0	12.2	-12.3	22	21	4290	4350	4360	4300	3060	4530	OK
OA-CS-EPIC011	3.3	5.0	12.1	-12.3	20	20	4210	4250	4290	4230	3050	4480	Fail
OA-CS-EPIC012	3.3	5.0	12.3	-12.3	18	18	4260	4330	4320	4310	3090	4580	OK
OA-CS-EPIC013	3.3	5.0	12.0	-12.2	27	24	4310	4450	4340	4320	2990	4520	OK
OA-CS-EPIC014	3.3	5.0	12.3	-12.3	24	24	4360	4460	4410	4420	3020	4600	OK
OA-CS-EPIC015	3.3	5.0	12.1	-12.2	23	22	4360	4420	4400	4390	3070	4620	Fail
OA-CS-EPIC016	3.3	5.0	12.2	-12.3	23	21	4330	4350	4360	4290	3050	4550	OK
OA-CS-EPIC017	3.3	5.0	12.2	-12.3	22	19	4290	4340	4340	4300	3040	4470	OK
OA-CS-EPIC018	3.3	5.0	12.2	-12.2	20	19	4300	4350	4340	4210	3100	4510	OK
OA-CS-EPIC019	3.3	5.0	12.0	-12.3	24	23	4290	4320	4310	4310	3030	4540	OK
OA-CS-EPIC020	3.3	5.0	12.0	-12.3	23	22	4260	4270	4250	4240	2990	4470	OK
OA-CS-EPIC021	3.3	5.0	12.1	-12.3	21	21	4360	4310	4340	4350	3020	4520	OK
OA-CS-EPIC022	3.3	5.0	12.2	-12.3	21	20	4330	4420	4350	4290	3050	4510	OK
OA-CS-EPIC023	3.3	5.0	12.2	-12.3	21	18	4310	4370	4310	4270	3100	4490	OK
OA-CS-EPIC024	3.3	5.0	12.1	-12.3	21	18	4240	4340	4260	4200	3020	4450	OK

EDM display page for monitoring cPCI IOC crate status

Network Switches :

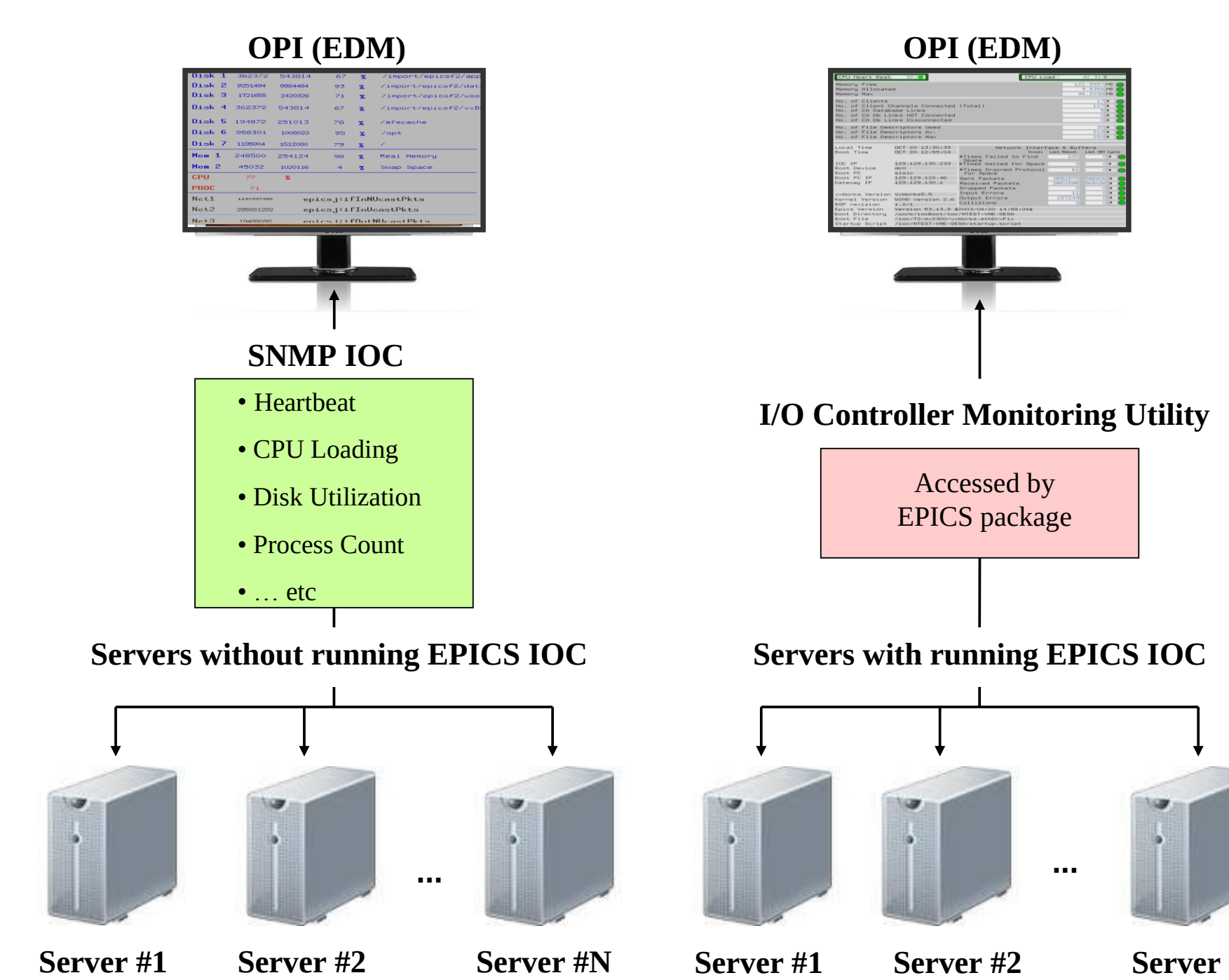
- The network management tools usually have many complicated functions which are suitable for network administrators to monitor the detail information of network equipments.
- Maintainers only want to know some ordinary data such as heartbeat, bandwidth and housekeeping parameters.
- It is more convenient and efficient to centralize variety of data into EPICS IOC that we can manage and present the received data via a customized control interface which could integrate into the TPS control system.



EPICS IOC vs. Network Management Tools

Servers :

- For servers without running EPICS IOC, a dedicated EPICS IOC will be used to gather host information such as heartbeat, CPU load, disk usage, number of processes, and network traffic via SNMP daemon which is running on the servers.
- For servers with running EPICS IOC, there is the IOC monitoring utility that can run at IOC and monitor the available resources. The OPI can get data directly through the utility without involving SNMP and other dedicated EPICS IOC.



Monitoring schema for servers

Others :

- UPSs are also planned to be added into the monitoring system. Status information such as current, load rate and battery will be monitored.
- Instead of using the inefficient SNMP, detection devices supported by EPICS will be used to collect the equipment room environment parameters.

Summary

- Since there are many control system components distributed at numerous locations in the TPS buildings, it is necessary to have an infrastructure monitoring system to supervise the status of these components.
- To be consistent with TPS control system which is based on EPICS framework, the monitoring system is developed by using the EPICS device support with SNMP.
- This system can display warning messages which contain the location and status information for easily targeting the failed device.