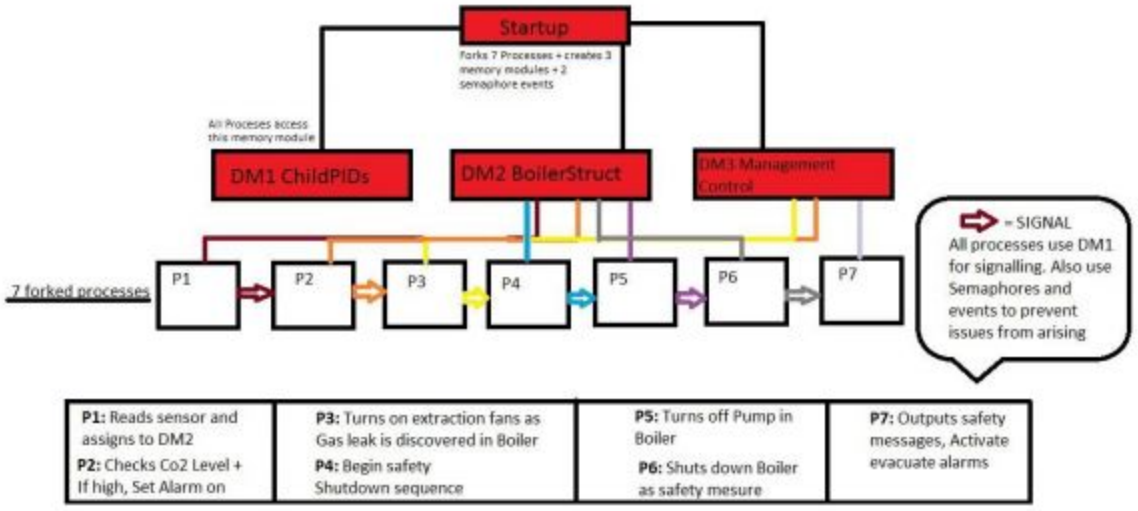
Description of problem:

A startup program first creates 3 memory modules. One for child processes and the two others are in relation to a water system. It then creates two events for the water system memory modules. The semaphores are important as it can prevent false readings. It forks 7 processes and stores there values in the child PID memory module. The 7 child processes each access the water system memory modules via semaphores.

Diagram:



Explanation:

- Startup forks 4 processes via the _os_exec & _os_fork commands.
- Startup then creates 3 data module via the _os_datmod.
- Startup the creates events based around the water system memory modules via _os_ev_create command.
- All processes then link to this child_PID memory module via the _os_link command.
- The processes use signal handlers in order to know when to send their signal to the next process.
- Whenever a process wishes to gain access to the water system memory modules they must use _os_ev_link & _os_ev_wait.
- Following completion of the critical section the processes must release the semaphore via _os_ev_signal & _os_ev_unlink.
- The program simulates a carbon monoxide leak from a boiler which can kill if not noticed.

Sample output from test side:

[1]$ Startup
P1: Gathering Sensor Information ...
Boiler On/Off: 1
Water temperature: 43
Water Level: Low
Pump On/Off: On
Heating Element On/Off: 0
Acidity Reading: 1
CO Levels: 76
P2: System Is Ready
P2: Auto-Check of CO Reading . . .
P2: CO level too high is at 76, starting Boiler CO leak protocol sequence
P3: Turning on extraction fan in boiler room as CO is dangerously high . . .
P3:Extraction Sub-system activated
P4: Gas Leak Detected!
P4: Begining Pump Safety Shutdown Squencene
P5: Pump begining to shutdown!
P6: Shutting off power to boiler!
P6: Gathering Sensor Information For safety, auto-logged to Database ...
Boiler On/Off: 0
Water temperature: 26
Water Level: Low
Pump On/Off: Off
Heating Element On/Off: 0
CO Levels: 68
Acidity Reading: 1
P7: WARNING
P7: GAS LEAK IN BOILER
P7: FOLLOW PROCEDURE AND EVACUATE BUILDING
P7: ALARM SYSTEM ACTIVATED
*Alarm Noises

Explanation of Output:

CO= Carbon Monoxide
Startup forks 7 processes & created 3 memory modules and two events. P1 assigns values to the boiler struct. P2 informs user that the system is ready for use. It automatically checks for CO readings as a lot of danger is associated with boilers leaking CO. It sees the CO is high and signals P3. P3 activates extraction fan and informs P4 via signal. P4 notices that there is a gas leak and begins the water pump safety shutdown. P5 shuts down the pump and informs P6 via a signal. P6 Gathers the latest inputs and logs and passes to P7 which begins the evacuation procedure, sounding alarms to notify workers.