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White Paper – Watchdog in Computer Systems

Concept

A watchdog timer (or simply a watchdog) is an electronic timer that is used to detect and recover from computer malfunctions and failures. During normal operation, the computer regularly restarts the watchdog timer to prevent it from elapsing, or "timing out". If due to a hardware fault or software/program error, the computer fails to restart the watchdog, the timer will elapse and generate a timeout signal. The timeout signal is used to initiate corrective action or actions. The corrective actions typically resets/restarts the computer system and restores normal system operation.

Watchdog in Compulab PC

Compulab x86 industrial systems inherently incorporates set of industrial features out-of-the-box, when watchdog is one of the most popular and useful of them. Compulab watchdog functionality can be divided into 3 main parts:

Phase 1 timer – watching and recovering the system from failures during an initial boot/BIOS phase. The timer starts the countdown as system powers on and elapse/reaching timeout after some preconfigured period of time, between 20-240 seconds in order to make sure operating system has enough time to load and start phase 2 timer service. At normal operation OS loads the kernel and relevant service, and prevents the timer from timing out (i.e. timeout of phase 1 timer will initiate system reset). Phase 1 timer is enabled/disabled and configured in BIOS.

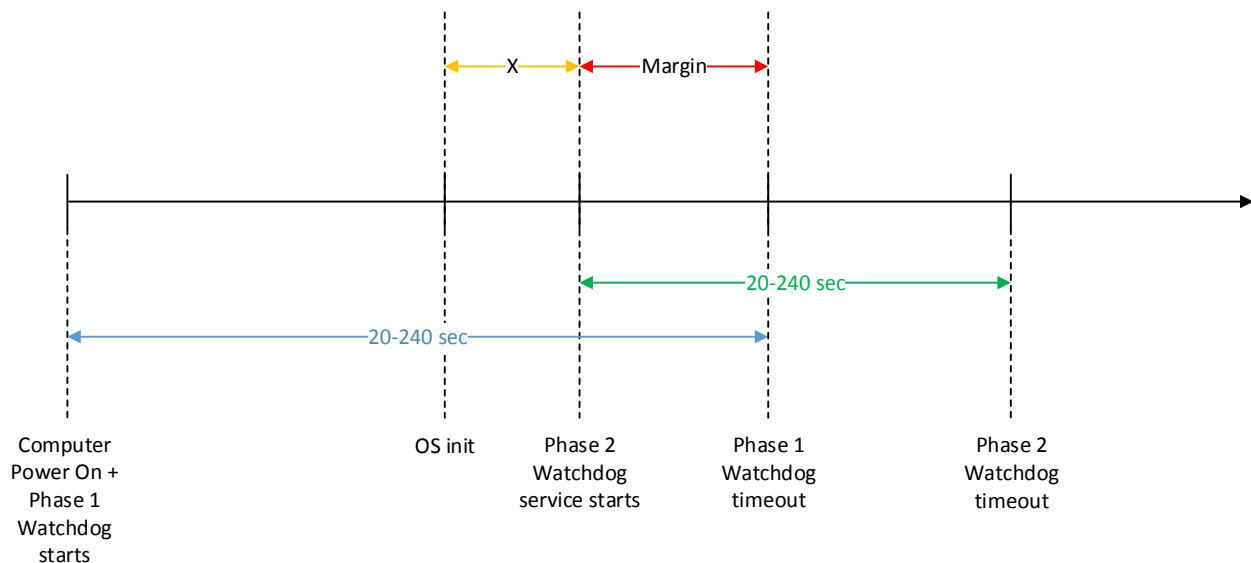
Phase 2 timer – watching and recovering the system from failures during OS phase. The timer starts the countdown once OS has successfully loaded the kernel and all relative services, including the service responsible for launching phase 2 watchdog timer. Service operation and management takes place by installing the relevant driver. At normal system operation countdown counter will elapse and relaunch itself, and the procedure continues infinitely (i.e. timeout of phase 2 timer will lead to a new countdown).

Interface – A set of commands the user can access, set and configure watchdog operation. The interface may vary between systems.

Timing Diagram

X – An unknown duration which depends on general system load and amount of services startup programs and applications to launch. It is strongly recommended to minimize this duration as much as possible.

Margin – The amount of time between phase 2 timer starts and phase 1 timer timeout. For reasonable system operation we would like to make this duration long enough to prevent system races but not too long to make system boot fast enough.



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