

doing one thing at a time. This switching can happen so fast as to give the illusion of simultaneity to an end user. For instance, a typical computing device may contain only one processor, but multiple programs can be run at once, such as an ECI for player tracking alongside an a game program; though the user experiences these things as simultaneous, in truth, the processor may be quickly switching back and forth between these separate threads. On a multiprocessor system, threading can be achieved via multiprocessing, wherein different threads can run literally simultaneously on different processors.

**[0184]** In embodiments of the present invention, multiprocessor systems with multiple CPUs may be used in conjunction with multiprocessing. For example, an ECI process or ECI thread may be executed on one or more CPUs while a game is executed on one or more different CPUs. In a particular embodiment, in a multiprocessor system, CPU accessibility may be limited according to the application. For instance, ECIs may be only executed on certain processors and games on other processors. The ECIs may be prevented from utilizing processors dedicated to executing games or other applications.

**[0185]** Threads are distinguished from traditional multi-tasking operating system processes in that processes are typically independent, carry considerable state information, have separate address spaces, and interact only through system-provided inter-process communication mechanisms. Multiple threads, on the other hand, typically share the state information of a single process, and share memory and other resources directly. Although, as noted above, threads of the same process may be assigned to different resource partitions. Context switching between threads in the same process may be typically faster than context switching between processes.

**[0186]** In general, the term, “process” refers to a manipulation of data on a device, such as a computer. The data may be “processed” in a number of manners, such as by using logical instructions instantiated in hardware, by executing programming logic using a processor, or combinations thereof. Thus, a “process” for the purposes of this specification may describe one or more logical components instantiated as hardware, software or combinations thereof that may be utilized to allow data to be manipulated in some manner. Therefore, the terms “process” and “process thread” as described are provided for the purposes of clarity only and are not meant to be limiting.

**[0187]** Four resource partitions, **360**, **366**, **368** and **370** are illustrated in FIG. 8. An operating system resource partition **360** that includes processes (or process threads) executed by the operating system. A game resource partition **366** from which game processes (or process threads) are executed. An ECI resource partition **382** from which a first ECI process **382** (or ECI process thread) may be executed and an ECI resource partition **368** from which a second ECI process **380** (or ECI process thread) may be executed. As noted above, resource partitioning may be performed at the process level, the process thread level or combinations thereof.

**[0188]** In one embodiment, resource partition definitions **308**, such as resources allocated to each resource partition and processes that are enabled to execute in each partition (e.g. partition assignments **310**) may be stored in the secure memory **326**. Data stored in the secure memory may have been authenticated using the authentication components **304** stored on the Boot ROM **302**. When a process is launched by the operating system, it may check to see which resource

partition to assign the process using the partition assignments **310**, which may include a list of processes that may be executed in each partition. In one embodiment, some processes may be assigned to more than one resource partition. Thus, when the resources associated with a first resource partition are being fully utilized, the process may be executed from a second resource partition with available resources.

**[0189]** In another embodiment, the partition assignment information may be stored with each executable image, such as images, **316**, **318** and **320**. When a process or process thread is launched, the operating system may determine which partition to assign the process or the process thread (In general, each process will have at least one process thread). With this method, new executable images may be downloaded to the gaming machine from a remote device that are not listed in the partition assignments **310** and still be assigned to a resource partition.

**[0190]** In a particular embodiment, the operating system may only allow one ECI process or ECI process thread to execute in a partition at one time. In other embodiments, a plurality of ECI processes may be executed from a single partition at one time. When only a single ECI process is allowed to execute from a partition at one time, the amount of resources available to the ECI process occupying the partition may be more predictable. This type of architecture may be valuable when ECIs are provided from two or more different hosts simultaneously where each remote host doesn't necessarily know the resource requirements utilized by an ECI from another remote host. When two or more ECIs are allowed to occupy a single partition and execute simultaneously, the resources provide to each ECI, respectively, may be more vary more if each respective ECI is competing for a limited amount of resources.

**[0191]** The resource competition may be become more acute when the resources needed by two or more ECIs are near or greater than one or more resources (e.g., CPU cycles or memory) provided in a partition. In some embodiments, the gaming machine may prioritize resource utilization by each ECI process. For instance, an execution priority may be assigned to each ECI process executing in a resource partition such that based on the priority one ECI process is favored over another ECI process when they are both competing for resources.

**[0192]** The priority assigned to each ECI process may be based on other factors. A priority to resources may be assigned to an ECI process based upon its function. For instance, an ECI for providing a bonus interface may be given a higher priority to resources than an ECI for providing advertising. In another embodiment, a priority may be assigned to an ECI process in accordance with a price paid to allow the ECI process and its content to be presented on the gaming device. In general, prioritization for utilizing resources is another way of providing virtualization on a gaming device.

**[0193]** Resources that may be monitored and limited for each partition include but are not limited CPU usage, memory usage, such as RAM usage, NV-RAM usage, disk memory usage, etc., GPU (graphics processing usage), network bandwidth, sound card usage and access to gaming devices, such as displays, audio devices, card readers, bill validators (e.g., as described with respect to FIG. 7, for some resource partitions, for security purposes, access to certain devices, such as bill validators and cashless devices, or device features may not be available). Resources that may be monitored on the gaming machine **300** include the executable space **338**, the