

(<http://benjr.tw/?q=node/81> thx?????)

Hypervisor Type 1 ?????????? ???

Ring

???? CPU ?????????????? Ring(?), ? Intel CPU ??????????
 ?? Ring 0,Ring 1,Ring 2 ? Ring 3.Ring 0 ??????,?????????
 ??? Ring0 ???,Ring 0 ?????????? IO,CPU,Memory ??????
 ??? Ring 1,?????? Kernel,driver ??? Ring 0.?? AP ??
 Ring 3,????????????? Ring 0 ? Ring3.????????????????????
 ??????????,?????? Window 3.1 ??????????,?????????????
 (Crash)?

VMM(Virtual Machine Monitor)

???????????????????????????????? OS ?????? Ring0.???????? VMM((Virtual Machine Monitor) ????? Hybervisor.???
 ??????????,????????????????????????(Guest OS).???????? VMM(Virtual Machine Monitor).

??? VMM ?????

- ?????????????????? Guest OS
- ?????????? Guest OS
- ??? Guest OS ?????????????????

1 - Full Virtualization ??? - Binary Translation

???? Intel CPU ?????,??? CPU ?????? Ring 0 ??,????????????????? Ring 0 ??????????.????????????????? X86???????
 ?? VMware ?????????????????? X86 ??????.????????? Binary Translation ?? direct execution ???,??? Binary
 translation ??????????????????(nonvirtualizable instructions)VMM ??????????,????? VMM ????.??? Guest OS ???
 ??????,????? Guest OS ??????????????????(partition)?????(Loop file),?? VMM ??????????????????????????.?????????
 ??????.?? direct execution ?????????????? Ring0 ??????????????????.

?????????????????,?????????????????(Guest OS)????? VMM ???,????????????????,?????????????(Guest OS)?????????????
 VMM.?? VMM ?????????????????? BIOS,devices ? memory???,.?????????????????(Guest OS)?????????????????????????
 ???(Guest OS)??.

??????????? **VMware's ??? virtualization products ? Microsoft Virtual Server.**

2 ????????????????? - Paravirtualization

????????????? x86 ??????????????,?????????????????(nonvirtualizable instructions)????? Ring 0 ???.?
 Paravirtualization ?????????,?????????(Guest OS)???,?????????(Guest OS)????????????????(nonvirtualizable
 instructions)????? VMM ?????????(hypercall),?? VMM ??????????.????(Windows 2000/XP)?????????(Microsoft ?
 ?????????????????),??????? Paravirtualization.???? hypercall ??? OS kernel ? syscall ??? hypercall ???

hypervisor(VMM)?.

Paravirtualization + Intel VT ?? AMD-V

??? VT ??? VMM ?????? Ring 0 ??,Dom0 ? kernel ?????? Ring1(Dom0 ?????? Xen ??????????).?????? DomU ?????? Ring1(?? Para-Virtualized,?? VT ??? Xen ??? full-Virtualized).????? AP ?????? Ring 3.??????? Para-Mode ? Guest OS ????? VMM ??? ?????? Full-Mode ?.???? VT ?????? VMM ?Guest OS(Para/Full-Mode)????????? Ring0 ? ?..?? VMM ????? Guest OS ??????.

Root Mode Privilege Levels.?????????(nonvirtualizable instructions)???? hypervisor ?????????? binary translation ? paravirtualization ??????.

??????????? **Xen,KVM,Hyper V,OpenVZ**