Virt/RK: A Real-Time Virtualization Framework for Multi-Core Platforms

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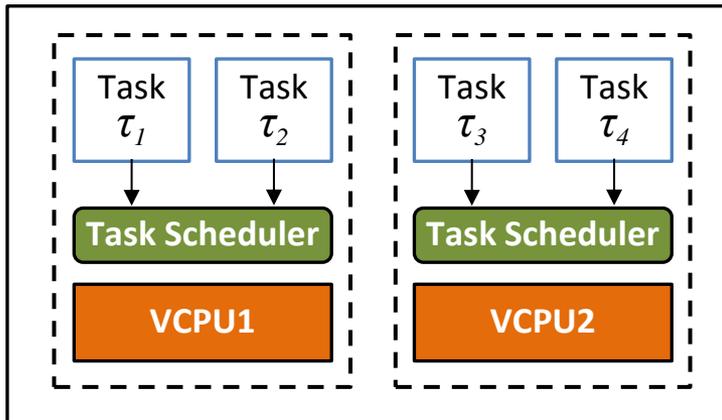Electrical & Computer
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Virt/RK

- Real-time virtualization with resource kernel approach
  - CPU reservation for VCPUs + Memory reservation for VMs

VM1


```
qemu-system-arm -cpu cortex-a15 -smp 2 -m 512
-virtrk cache,colors=0-7,ext_mem=256,ext_colors=8-15
-virtrk vcpu,id=vcpu0,vcpu=0,pcpu=0,c=5,t=10
-virtrk vcpu,id=vcpu1,vcpu=1,pcpu=1,c=5,t=10
```
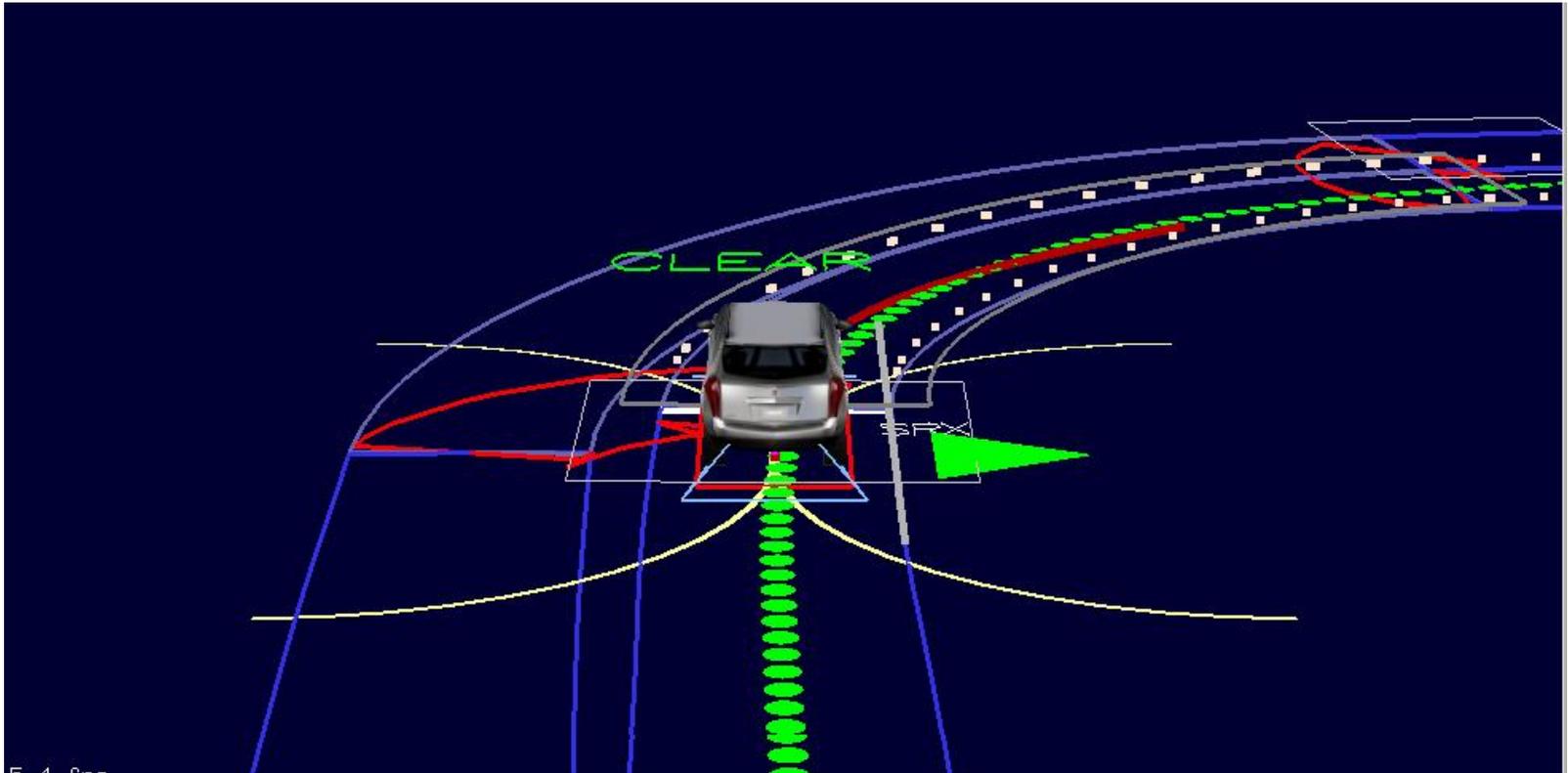
VM Resource Reservation

- VCPU1/2: 50% of physical CPU
- VM1: 25% of host memory with **cache & DRAM bank partitioning**

Prevents inter-VM interference

  - Current implementation: Virt/RK::KVM-x86, Virt/RK::KVM-ARM
  - Virt/RK::L4 under development

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Demonstration

- Virtualization of the driving context of an autonomous car*†

* C. Urmson et al., "Autonomous Driving in Urban Environments: Boss and the Urban Challenge", *Field and Robotics*, 2008.
† J. Wei et al., "Towards a Viable Autonomous Driving Research Platform", In *IEEE Intelligent Vehicles Symposium* (IV), 2013.

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