

Operating systems à la carte: applying composable image configurations for scalable OS research

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Research into operating system is an inherently cumbersome task due to the low level and absolute nature of operating systems. Testing them requires either the use of virtualization software which imposes artificial constraints, expensive extraneous hardware that drives up cost of research or wiping the host machine risking loss of data.

This work presents Ron: a distributed system which makes use of inexpensive nodes that deploy and run image configurations. Each configuration contains images of various semantic types like user, machine, temporary or system. For all these types, external and internal contracts may be defined. External contracts are enforced by the control server; An example of such a contract is the inclusion of a machine persistent storage image at each booth. Internal contracts can be optionally supported by the target image and contain features which may be helpful to researchers. An example of this is the lazily mounting of other image types at boot by the system image.

By utilizing such a composed and distributed design, the disk space required to host research is minimized while the hardware utilization is maximized. The weakly typed and optional nature of the disk images allows for the support of a plethora of useful features on popular images while small, specialized systems can mix ‘n’ match which contracts they can or want to support. In conclusion, the utilization of the system allows for real-world baremetal performance while minimizing cost and avoiding the risk of manually executing dangerous operations.