



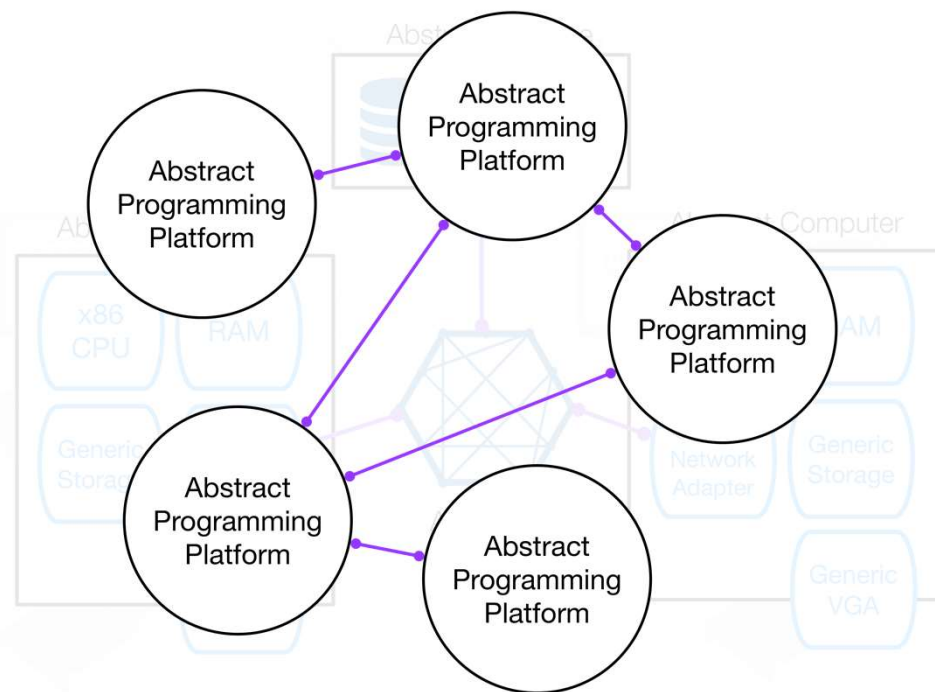
CLOUD COMPUTING APPLICATIONS

Virtualization
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Sharing Resources

- Economics of Clouds requires sharing resources
- How do we share a physical computer among multiple users?
- Answer: Abstraction
 - Introduce an abstract model of what a generic computing resource should look like
 - The physical computer resource then provides this abstract model to many users

Layers of Abstraction

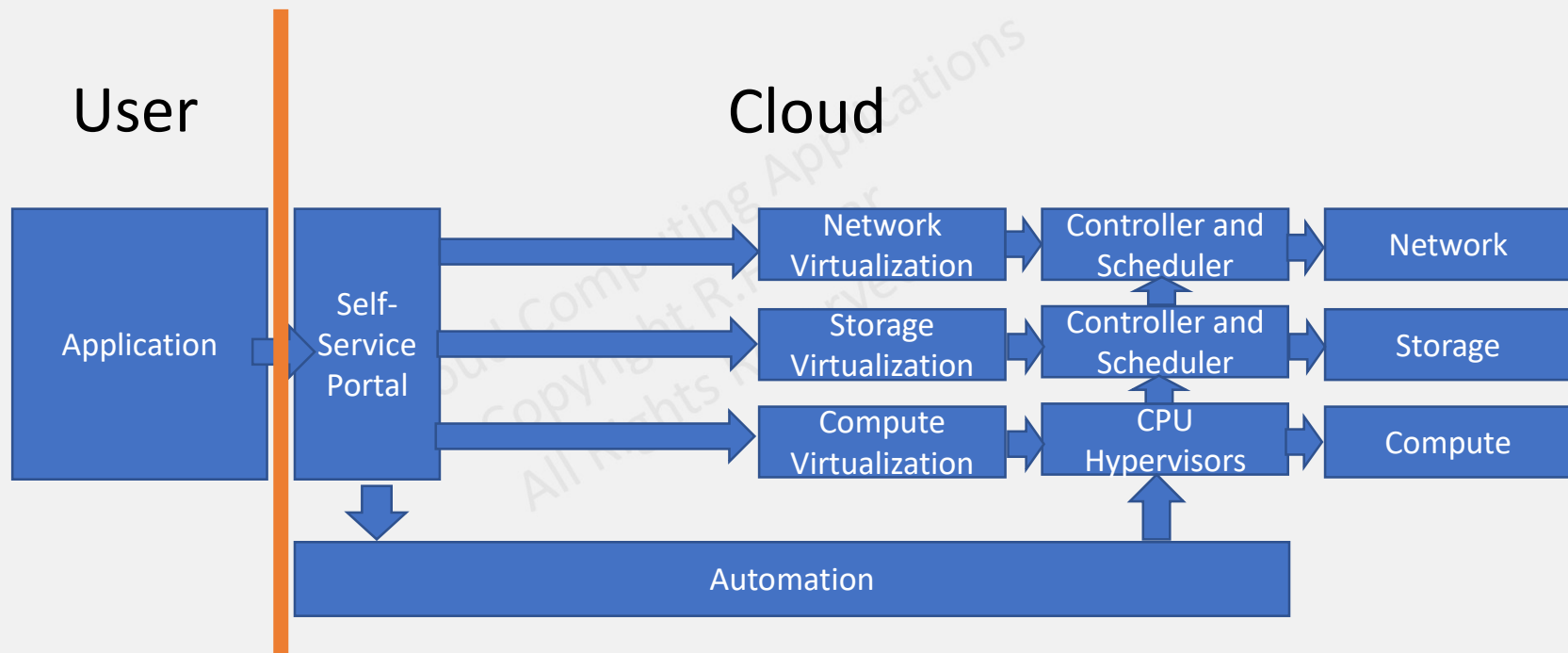


- Introduce an abstract model of what a generic computing resource should look like
- The physical computer resource then provides this abstract model to many users
- Virtualization avoids creating dependencies on physical resources

Virtualization: Foundation of Cloud Computing

- Virtualization allows distributed computing models without creating dependencies on physical resources
- Clouds are based on virtualization
 - Offer services based mainly on virtual machines, remote procedure calls, and client/servers
 - Provide lots of servers to lots of clients (e.g., phones)
- Simplicity of use and ease of programming require allowing client server paradigms to be used to construct services from lots of resources

Software-Defined Data Center



Types of Virtualization

- Emulation
- Full
 - Software
 - Binary Translation
 - Paravirtualization
 - Hardware assisted
- MicroVMs
- OS level
 - Containers