A real situation of OpenStack based cloud computing

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Abstract

- *Cloud Computing - exemplified by OpenStack*
- *Introduction in Cloud Computing and OpenStack environment*
- *Virtual Machine consolidation in Cloud Computing*
- *Management of Cloud infrastructure*
- *Conclusions*

Introduction

- Cloud Computing it's a term used in the commercial field, below which promotes a range of applications and new services
- It offers a large-scale distributed system which offers:
- Software-as-a-Service (SaaS)
- Platform-as-a-Service (PaaS)
- Infrastructure-as-a-Service (IaaS)

Virtual Machine consolidation in Cloud Computing

- Complex management infrastructures because of the complexity introduced by modern data centers.
- Exploatation of virtualization technologies to support Virtual Machine consolidation.
- Introduce and implement proper placement functions in charge of detailing the real Virtual Machine-to-server mappings.

Management issues

- A placement function must face and address two main refinement directions:
- 1) an objective function, to rate how good a Virtual Machine placement solution is
- 2) resource constraints, to avoid too aggressive and impossible Virtual Machine consolidation solutions.

The objective function

- Functions capable of increasing their economic revenues:
- cut more of the operational costs of the data centers
- reducing power consumption
- increase the number of customers, by increasing the aggregate number of Virtual Machines in the data center.

- Reduce the number of powered-on servers, usually achieved by increasing Virtual Machine consolidation ratio

Resource constraints

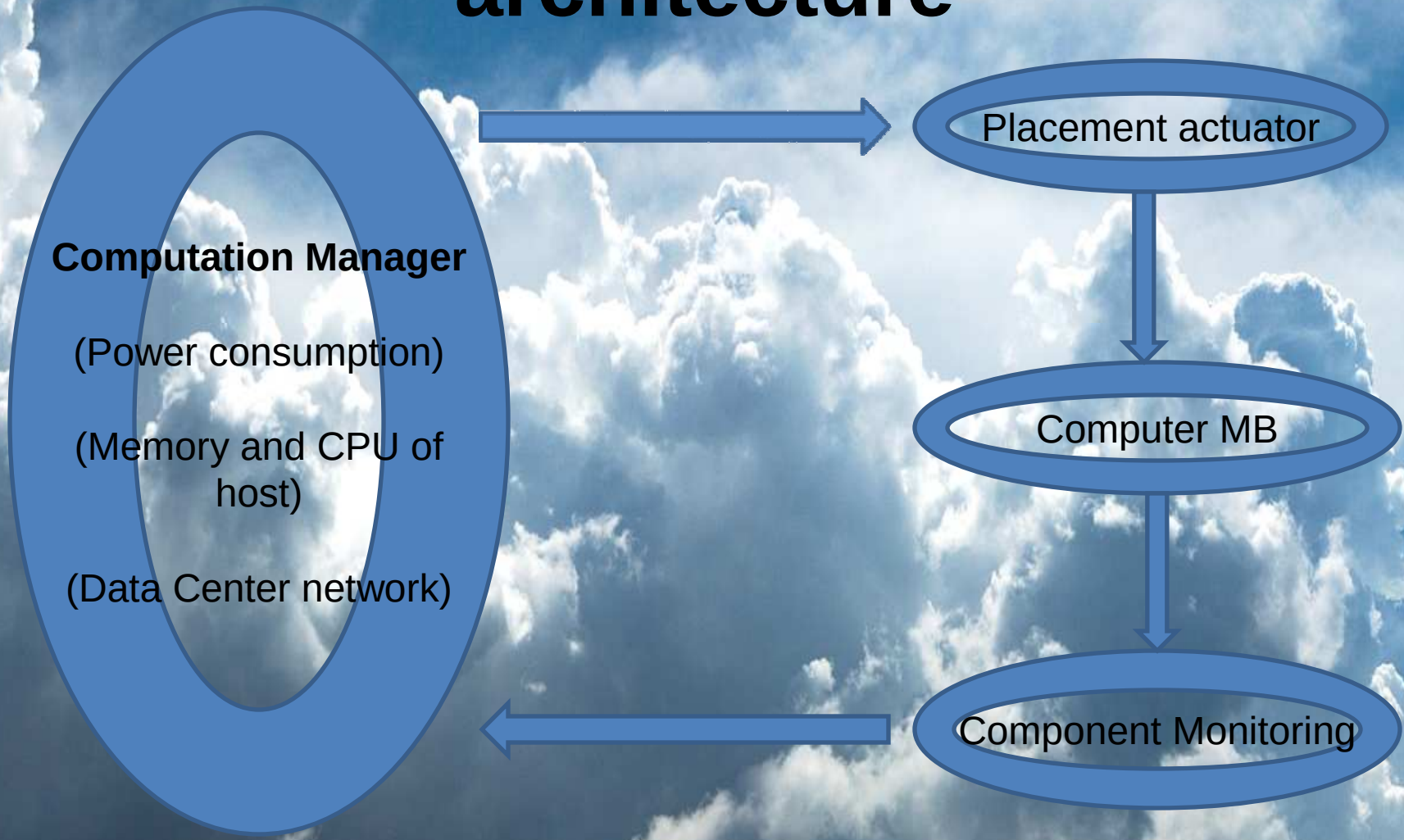
- Additional and more complex constraints associated with the data center as a whole may also be required. For instance, power consumption.
- The real bandwidth available between two physical hosts; this can lead to link saturations into the network.

Other connections

- Cloud power efficiency is an important topic

  for both environmental and economic issues.
- Reduce the number of powered on servers for the sake of power consumption reduction.
- Optimize runtime performance for CPU.
- Optimize memory demands

Cloud management infrastructure - Logical architecture



Power consumption

- Power efficiency in modern data centers is important for two main reasons: environmental and economic perspectives.
- Cloud management infrastructure needs access to both load and power consumption indicators.
- Cloud management infrastructures use dynamically scaling CPU frequency.

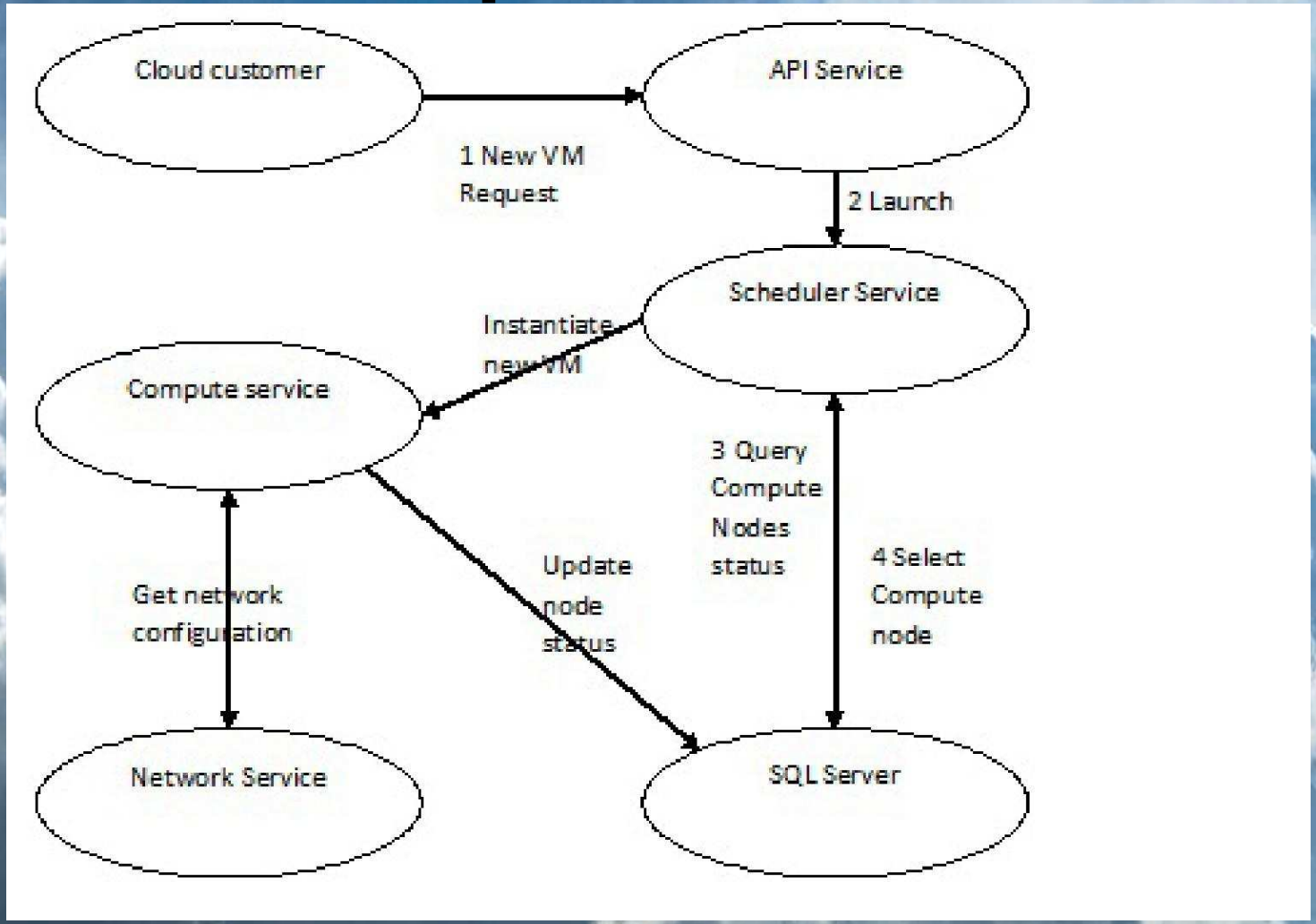
CPU and memory of the host

- Virtual Machines collocated on the same physical host share both CPU and memory resources.
- Cloud management infrastructure is in charge of reconfiguring hypervisors, mainly to avoid Virtual Machines proposing more computational load than allowed.
- Pack as many Virtual Machines as possible on the same physical host, while avoiding resource shortage.

Data center network

- Virtual LANs (VLANs) are usually adopted for security reasons, network paths and switching elements are the same and traffic demands belonging to different Cloud customers interfere among them, thus possibly resulting in reduced service performance.
- Bandwidth and latency are two fundamental attributes, with extremely different weights depending on the actual service provisioned.

Virtual Machine instantiation in OpenStack



Conclusions

- Virtual Machine consolidation introduces novel challenges that have to be considered by the Cloud management infrastructure.
- Colocating Virtual Machines on the same physical server is always convenient in terms of power savings, it can lead to performance side-effects that, as presented above, strictly depend on the type of run services.

References

- L.M. Vaquero, L. Rodero-Merino, J. Caceres, M. Lindner, *A break in the clouds: towards a cloud definition* ,ACM SIGCOMM Computer Com-munication Review,39 50-55 (2009).
- T. Grandison, E.M. Maximilien, S. Thorpe, A. Alba, *Towards a Formal Definition of a Computing Cloud, in: Services (SERVICES-1)* ,2010 6th World Congress on, pp.191-192,(2010).
- B.P. Rimal, E. Choi, *A service-oriented taxonomical spectrum, cloudy challenges and opportunities of cloud computing* ,International Journal of Communication Systems, 25 796-816 (2012).
- X. Meng, V. Pappas, L. Zhang, *Improving the scalability of data center networks with traffic-aware virtual machine placemen* ,in: Proc. of the 29thConference on Information Communications (INFOCOM10),(2010).
- *Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions,* http://www.gartner.com/it/page.jsp?id=503867 ,(2011).
- *Gartner Says Energy-Related Costs Account for Approximately 12 Percent of Overall Data Center Expenditures* , http://www.gartner.com/it/page.jsp?id=1442113, (2011).