MW4SOC 2010 Discussion Session

Middleware for Clouds vs.
Middleware for Other SOC:
What Is Different and What Is Not?

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Some Possible Discussion Points

- In which ways is cloud computing substantially different (or NOT) from other SOC initiatives?
- How do these differences (e.g. virtualization) affect (or NOT affect) middleware?
- Is cloud computing too diverse to speak about distinctive “cloud middleware”?
- What SOC middleware knowledge/experience can (or can NOT) be reused in cloud systems?
- What open research issues are specific for cloud middleware (or shared with other SOC middleware)?
- ...

Cloud Computing: What It Is / Is Not?

- Within the broad view of SOC (not only Web services)
- Earlier SOC initiatives similar to cloud computing: utility computing, on-demand-computing, ...
- Also related to: grid computing, virtualization, ...
- Different layers: IaaS (Infrastructure as a Service), PaaS (Platform), SaaS (Software), ...
- Private, hybrid, community, public clouds
- Different business models (not only pay-per-use)
- “Liberal use” of the term “cloud” by marketing

Middleware and Cloud Diversity

- Grid middleware + virtualization -> IaaS
- Distributed operating systems -> PaaS
- Web services middleware -> SaaS
- Middleware for private clouds vs. data centers
- Challenges in hybrid and community clouds
- “Inter-cloud” middleware
- What is the impact of different business models on middleware?

Middleware and Cloud Elasticity

- Middleware for achieving elasticity and for dealing with side-effects of elasticity
- The need for adapting to various changes
  - Quality of service (QoS) guarantees of using clouds
    - Past work on QoS middleware for SOC
  - Management when there is no full control over clouds (particularly non-private)
    - Orientation towards shared remote management

Example Discussion Points

Suggested by the Moderator

Some of these points are from: K.M. Glöckler, P. Brodmann, H. Waid, P. Barnerman
Some Insights and Opinions from the MW4SOC 2010 Workshop Participants

- There are very different opinions about how clouds relate to SOC, depending on used definitions of clouds, SOC, and SOA (the main SOC example)
  1. Cloud computing as a subset of “broader-view” SOC
     - in this view, SOA is another subset of SOC
  2. Cloud computing as a generalization of SOC
     - cloud computing is about providing various resources as services,
     - not only code execution as SOC (SOA) in this view does

Cloud Computing vs. SOC (Slide 2 of 2)

3. Cloud computing and SOC work on different layers
   - while SOC (SOA) provides coarse-grained functionality,
   - clouds (IaaS and PaaS) in this view provide lower-level computing capability
4. Cloud computing and SOC have different goals
   - while SOC (SOA) is about loose coupling as a paradigm for building applications,
   - cloud computing is about sharing resources and leveraging a set of resources to its fullest to amortize costs across users

Some Common Important Concerns

- There are many concerns in cloud computing common with SOC, where past SOC results could/should be leveraged, such as:
  - Formalization of various types of functional and extra-functional contracts between clouds and
  - QoS and SLA definition
  - Service and QoS negotiation
  - Monitoring
  - Real-time control
  - Scalability
  - Dependability functions

Some Specific Cloud Concerns (Slide 1/2)

- Virtualization
- Multi-tenancy is an important requirement for cloud infrastructure (and middleware)
  - Supports pay-per-use, but complicates other aspects
- There are additional security and privacy issues
- Scale is different (often much bigger) in the clouds
- Interoperability and portability between clouds
  - There is a need for open cloud standards, but this might not be in the interest of some market players
  - “Inter-cloud” middleware would be useful for users
Some Specific Cloud Concerns (Slide 2/2)

- Current speed/latency of Internet is prohibitive for some uses of clouds
- Monitoring (metering) and control are challenging
- Need to separate the communications aspects from the container aspects of middleware
  - The communications aspects of middleware are the same whether you are consuming computational capability vs. consuming software as a service
  - On the contrary, the containers that manage the server-side components are vastly different for software services vs. computational services