Dynamic Deployment and Scalability for the Cloud

Jerome Bernard
Director, EMEA Operations
Elastic Grid, LLC.

Speaker's qualifications

- Jerome Bernard is a committer on Rio, Typica, JiBX and co-founder of Elastic Grid, LLC.
- Jerome Bernard speaks frequently on Cloud Computing
  - Recently: QCon, Devoxx, JavaZone, JavaOne, and the Open World Forum
- Jerome Bernard is working with many clients using EC2, from TV channels to specialized media processing companies.

Agenda

Introduction to Cloud Computing
Introduction to Amazon EC2
Introduction to Elastic Grid

Introduction to Cloud Computing

- Why Cloud Computing?
  - Next logical step after virtualization
    - Better usage of your IT infrastructure
    - Cost Savings

Virtualization is used for consolidation.

Cloud Computing allow you to rent resources when they are needed.

- Can your traditional hosting scale to thousands of machines in a week?
- Can you afford spending huge amounts buying hardware if you only need it for a week?

Animoto Use Case
Company (US startup) creating cool videos based on a bunch of uploaded pictures. Really CPU intensive.
Went from dozen of servers up to 3500 servers in a few days when their application was released on Facebook. But went down to a few hundreds after another week.
How would you cope with that situation in a few days? Would you be able to raise money from VCs, buy the hardware, have the dealer send you the machine, install them and put them in a datacenter in just a few days?
What would do a week after with all the servers you don't need anymore?

Introduction to Cloud Computing

- Which Cloud Computing flavor?
  - Software as a Service (SaaS)
  - Platform as a Service (PaaS)
  - Infrastructure as a Service (IaaS)

IaaS: you rent some infrastructure -> some servers

PaaS: you rent access to a platform hosting your applications.

- References
  - SaaS: SalesForce, Facebook, LinkedIn
  - PaaS: SalesForce (EC2), Google App Engine, Microsoft Azure
  - IaaS: Amazon EC2, GoGrid, Flexiscale

Introduction to Cloud Computing

- Google App Engine
  - Make use of BigTable and Memcache
  - Integrate with Google Accounts
  - But in Python only...

- Microsoft Azure
  - Mostly for Windows and .Net solutions
  - Pricing model yet unclear

PaaS vs IaaS

- PaaS Pros
  - Usually easier to use than IaaS
  - Integrate with specific environments (Google, Microsoft Live, SalesForce, etc.)

- PaaS Cons
  - Less/No control over the Infrastructure
  - Languages/Services chosen by the provider
  - Vendor Lock-in

Introduction to Amazon EC2

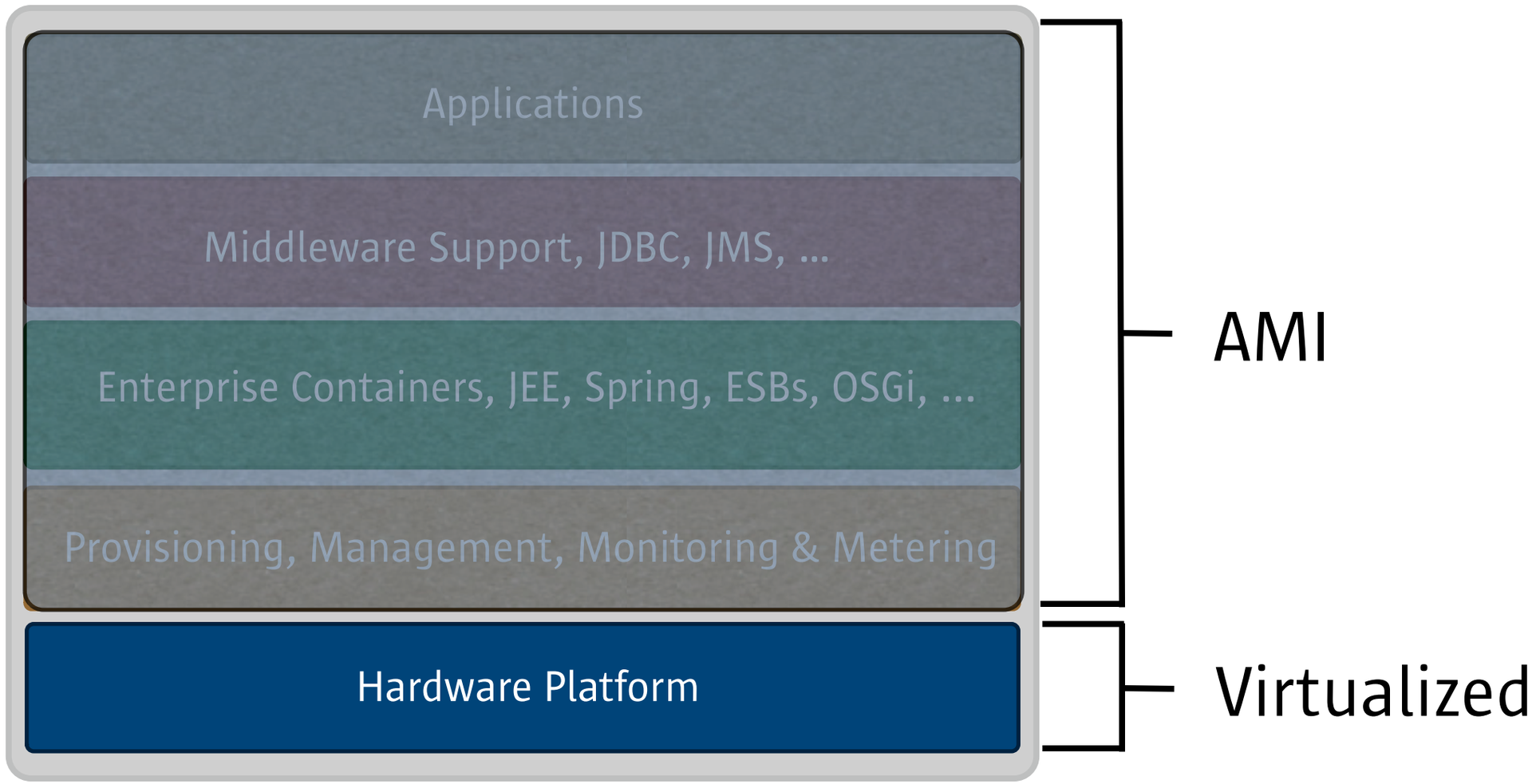
- Amazon EC2 is Infrastructure as a Service (IaaS)
  - Rent a server on a per hour base (from $.10 to $.80)
  - Many Operating Systems (Linux, Solaris, Windows)

- EC2 Amazon Machine Image (AMI)
  - Operating and system stack
  - Deployed to Amazon S3 (cheap storage)

- EC2 instances
  - Virtual machines that run AMI

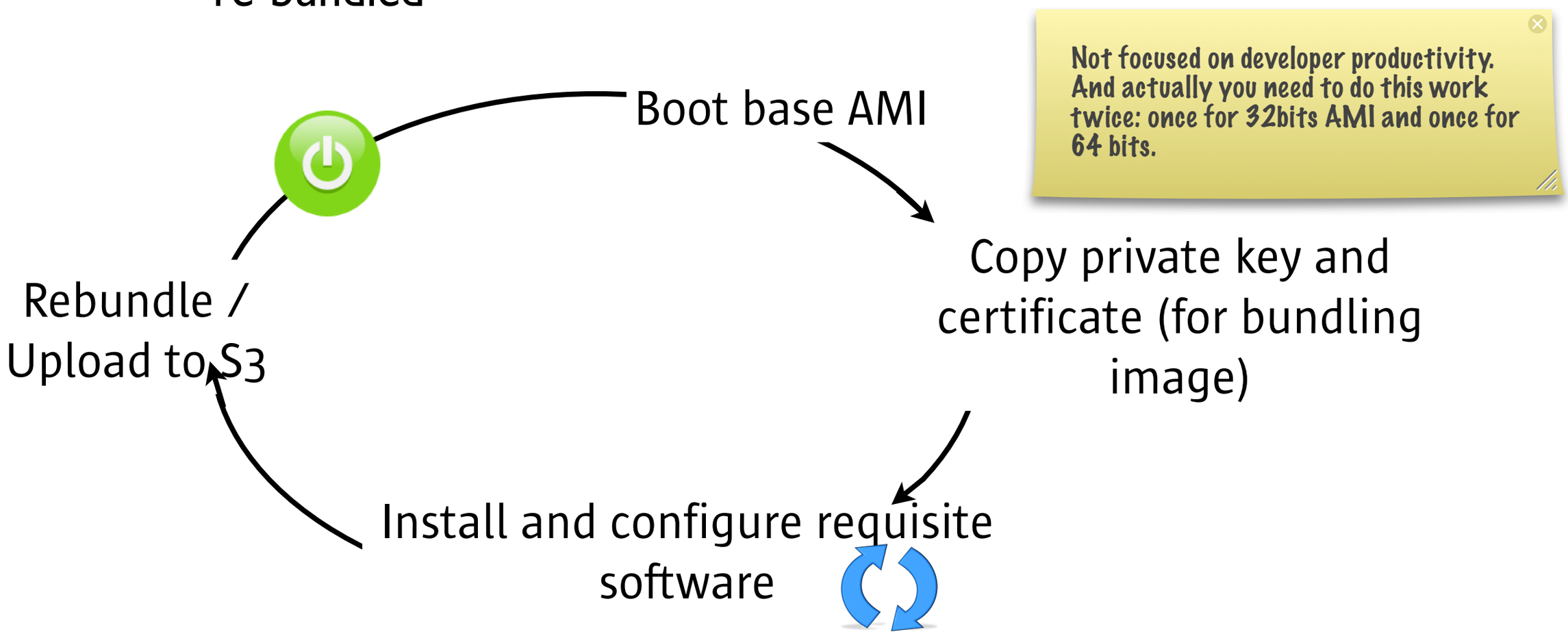
Introduction to Amazon EC2

- Typical Architecture Taxonomy



Amazon EC2 pitfalls

- EC2 AMI Challenges
  - The EC2 AMI is a boot image, requires substantial system administrator knowledge
  - As application code changes, AMIs typically need to change / be re-bundled



Amazon EC2 pitfalls (continued)

- Infrastructure challenges
  - Networking: no multicast but this is what most Java framework uses for clustering (JGroups, Shoal, etc.)
  - Backup: the local filesystem has no durability guarantee
  - Significant boot latencies of EC2 instances (can be several minutes)
  - Failures: you have to design your application to be resilient to EC2 instance failures. Anyway you should always do so :-)

Amazon EC2 Advice

I/O are way better and you benefit from durability, snapshot supports, etc.

- Some AWS Advice
  - I/O: prefer an Elastic Block Storage (EBS) volume to a local filesystem
  - Snapshot EBS volumes periodically (incremental backup) but export to S3 for complete backups
  - Choose the right instance type
    - Don't use Small for production!
    - Don't choose based on disk space (think EBS)
    - Choose based on available memory and CPU virtual cores

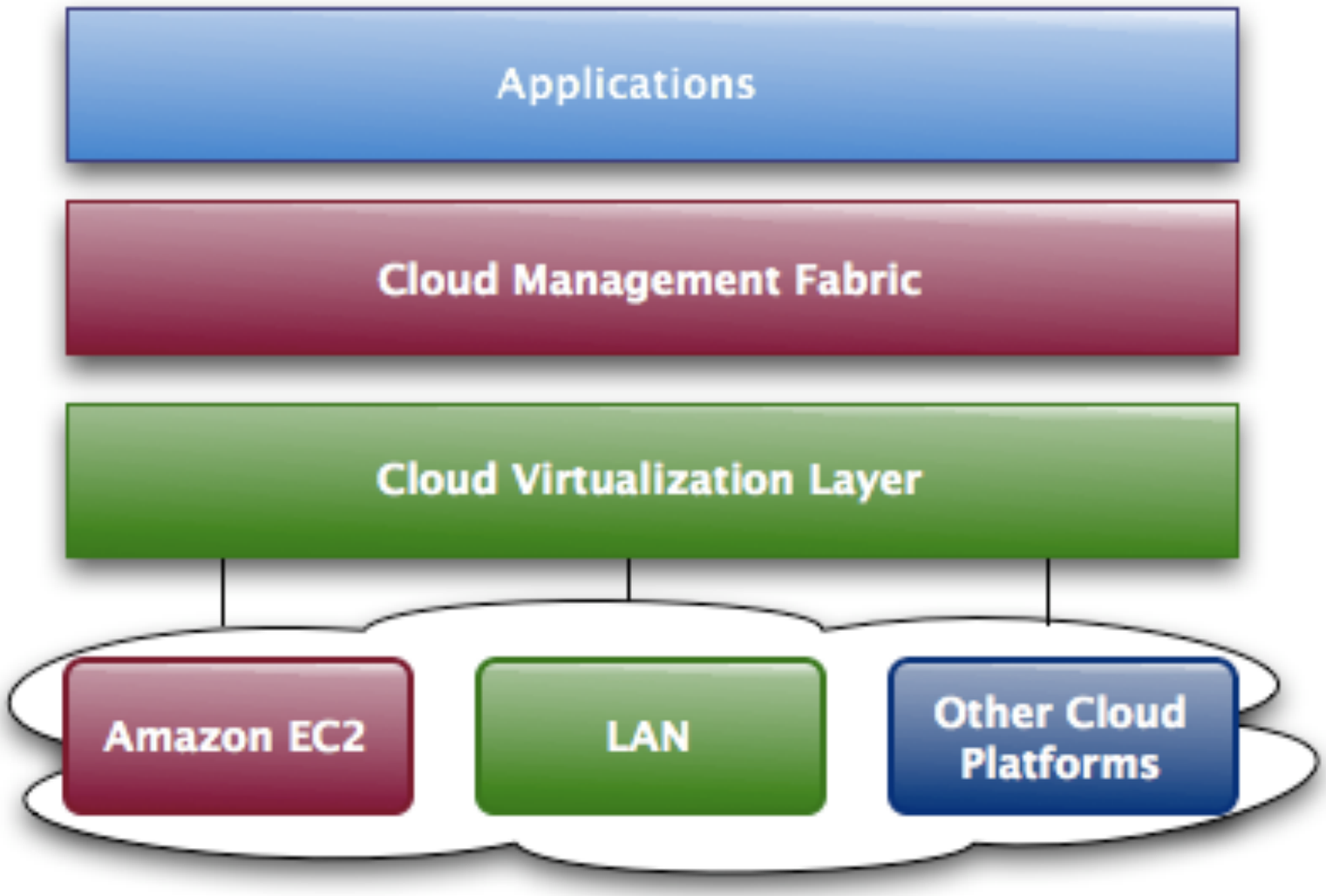
High CPU Medium is the best tradeoff usually unless you need a lot of memory.

Introduction to Elastic Grid

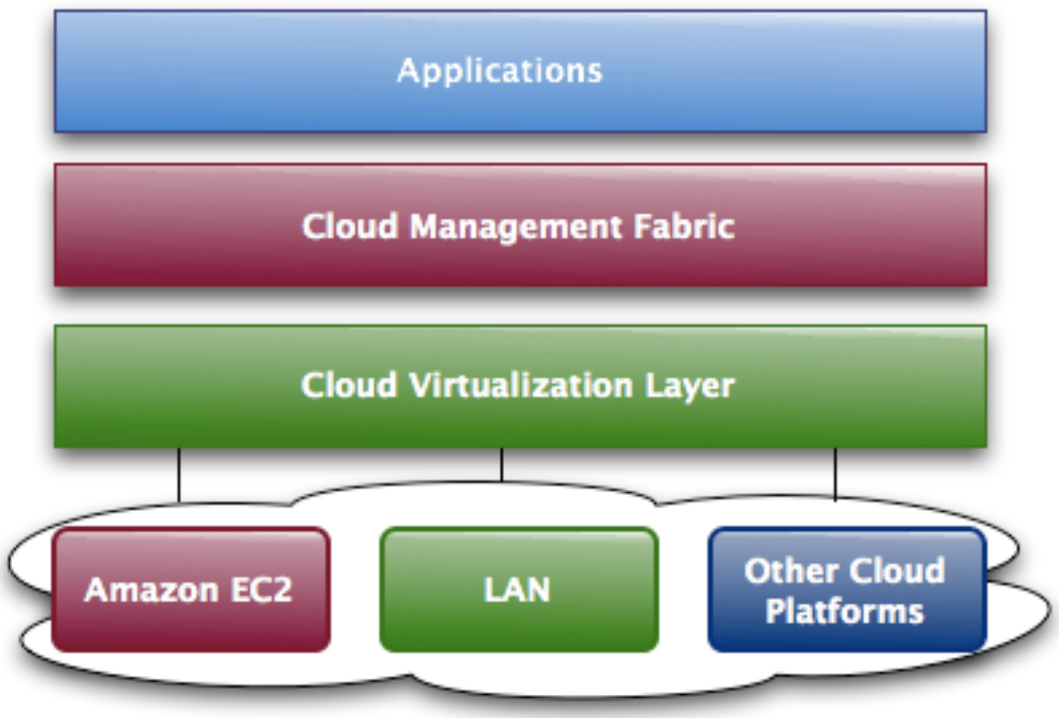
- Elastic Grid (abbreviated as EG)
  - Project initiated in early '08
  - AGPLv3 license
  - Part of the OW2 community

- Elastic Grid, LLC. founded in May '08
  - Team:
    - Dennis Reedy: Director US Operations
    - Jerome Bernard: we already went through this :-)

Introduction to Elastic Grid



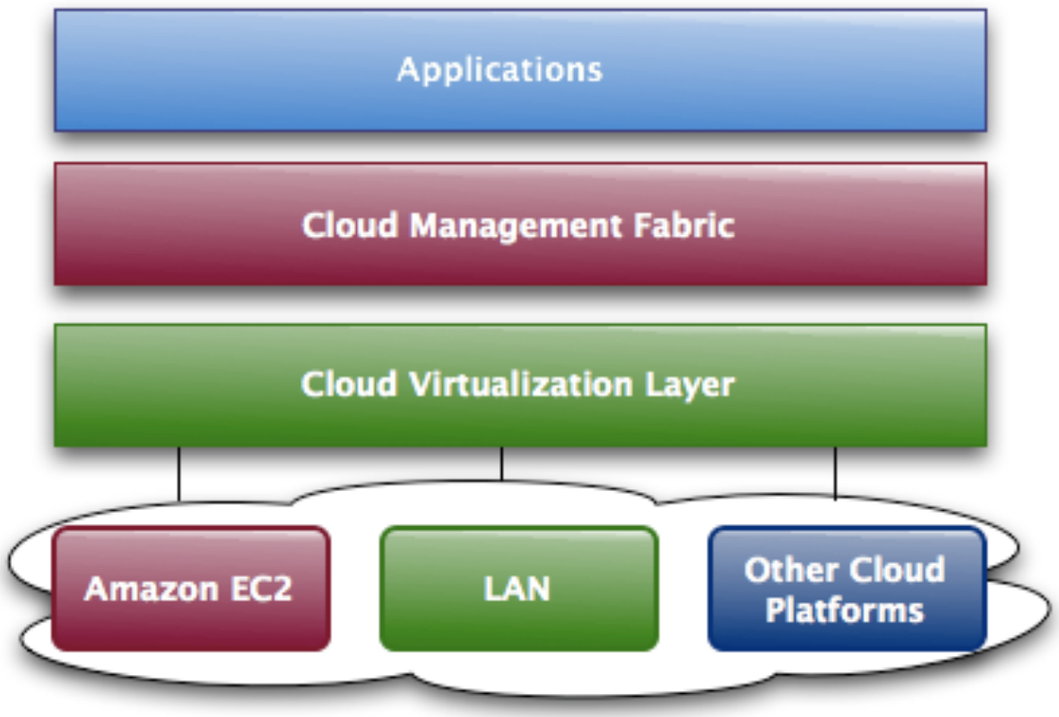
Introduction to Elastic Grid



Cloud Management Fabric

- Provides an adaptive capability to dynamically instantiate, monitor & manage application components
- The deployment provides context on service requirements, dependencies, associations and operational parameters
- Provisioning services additionally provides pluggable download distribution and resource

Introduction to Elastic Grid



Cloud Virtualization Layer

- Abstracts specific Cloud Computing provider technology
- Allows portability across specific implementations

- You can deploy on:
  - Private Cloud
  - Amazon EC2
  - More to come soon...

Sound Familiar?

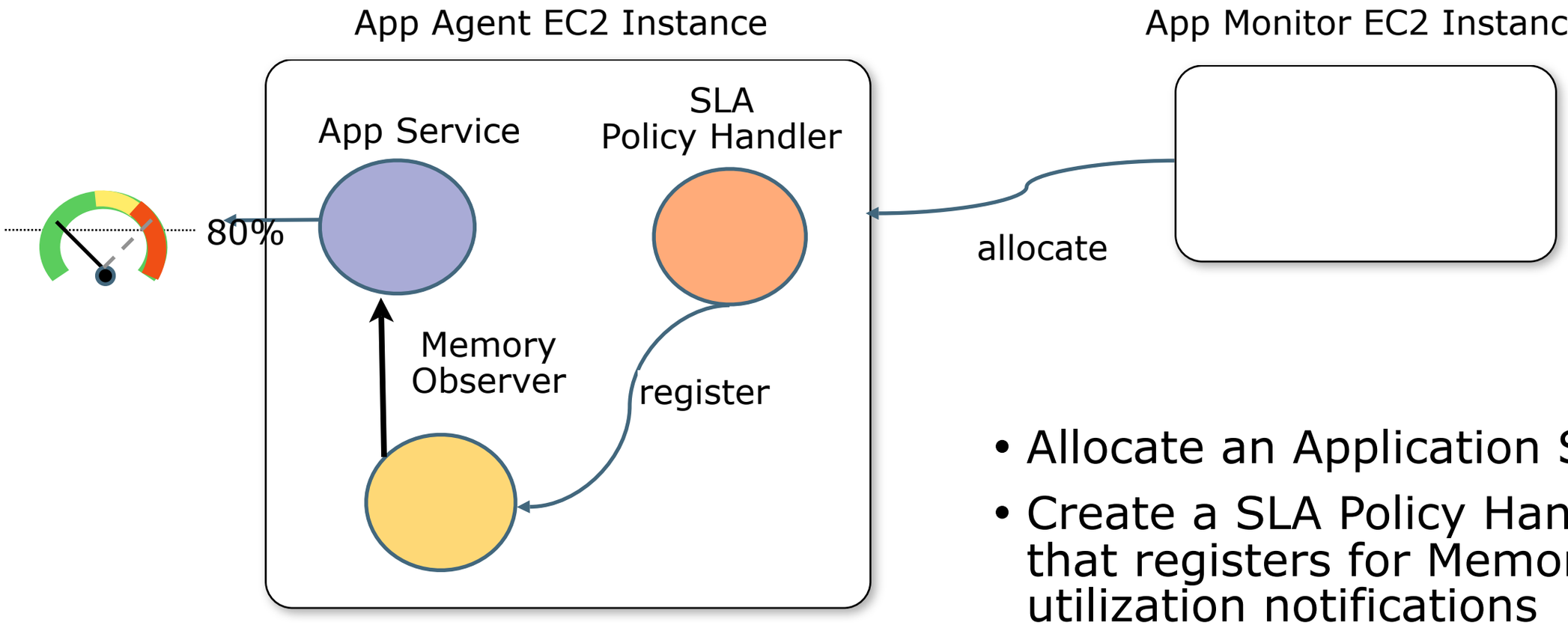
- The network is reliable
- Latency is zero
- Bandwidth is infinite
- The network is secure
- Topology doesn't change
- There is one competent administrator
- Transport costs are zero
- The network is homogenous

"*Essentially everyone, when they first build a distributed application, makes the following assumptions. All prove to be false in the long-run and all cause big trouble and painful learning experiences*".

Peter Deutsch - "Deutsch's 8 Fallacies of Networking"

Elastic Grid Scalability on EC2

- Across existing EC2 instances



- Allocate an Application Service
- Create a SLA Policy Handler that registers for Memory utilization notifications
- SLA has upper limit set to 80%

Elastic Grid Scalability on EC2

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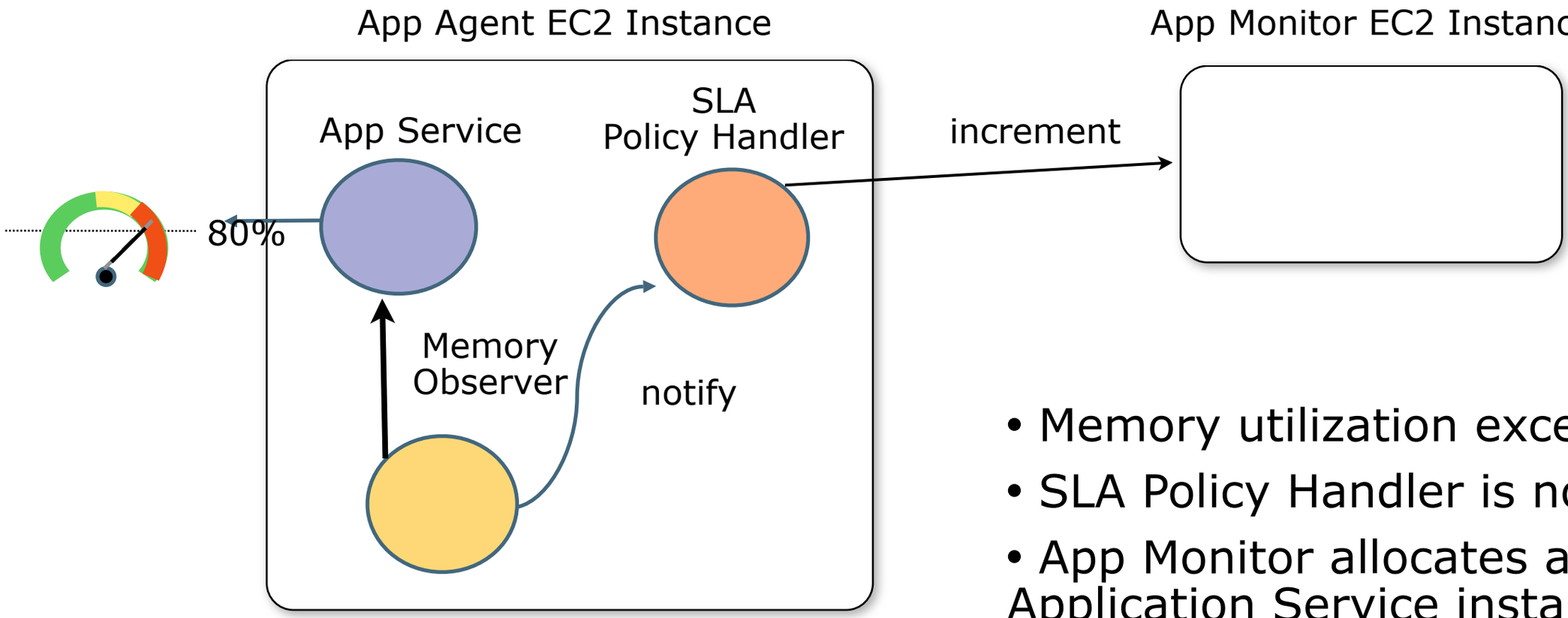

- Memory utilization exceeds 80%
- SLA Policy Handler is notified
- App Monitor allocates another Application Service instance to appropriate App Agent Instance

Elastic Grid Scalability on EC2

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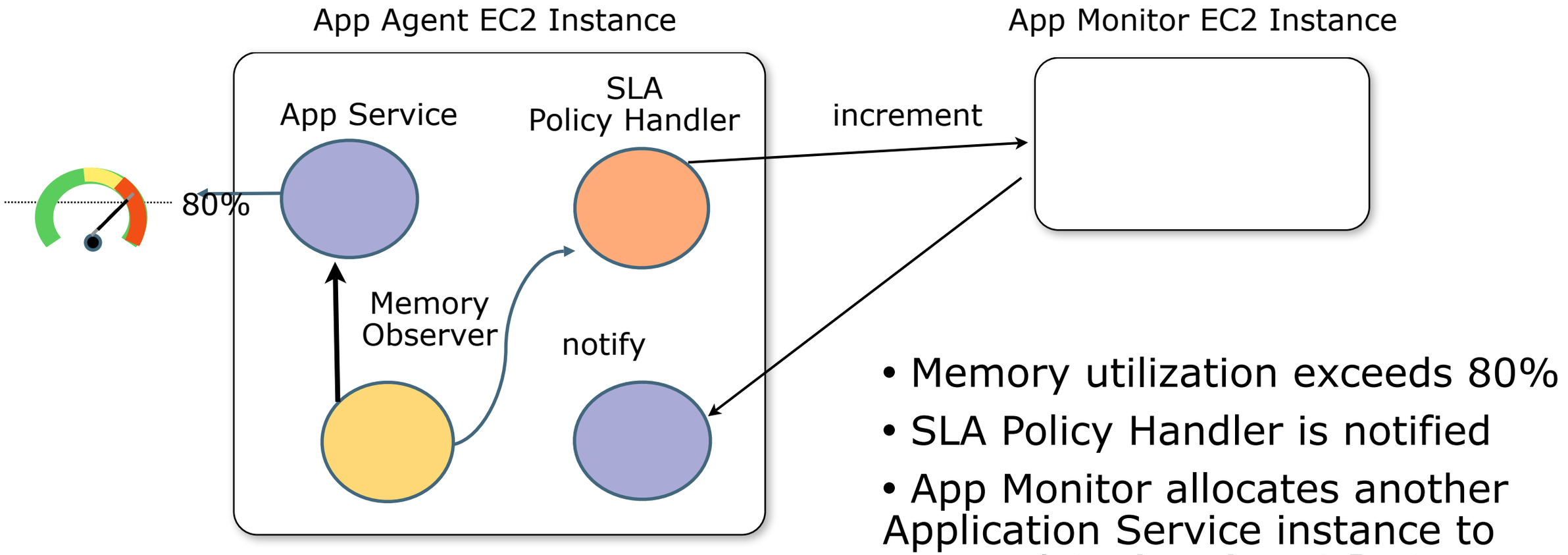

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Elastic Grid Scalability on EC2

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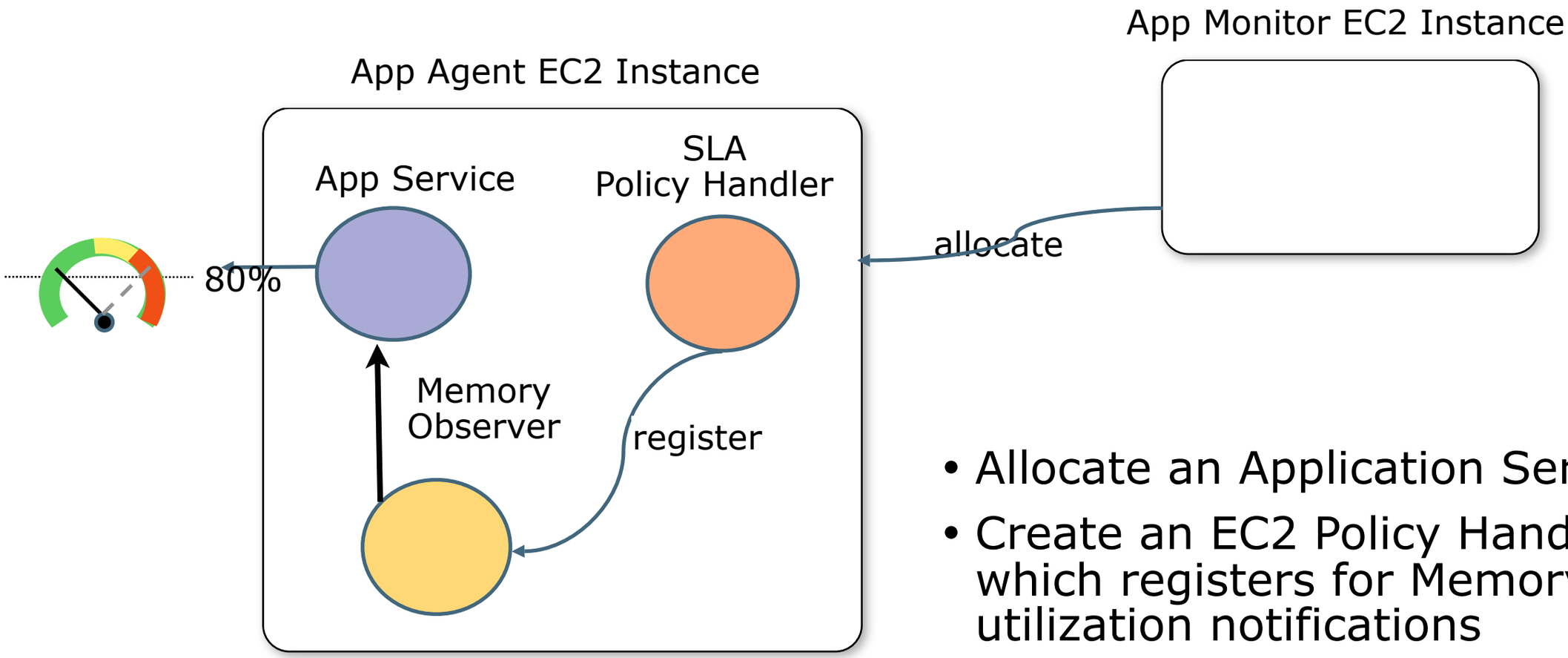

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Elastic Grid Scalability on EC2

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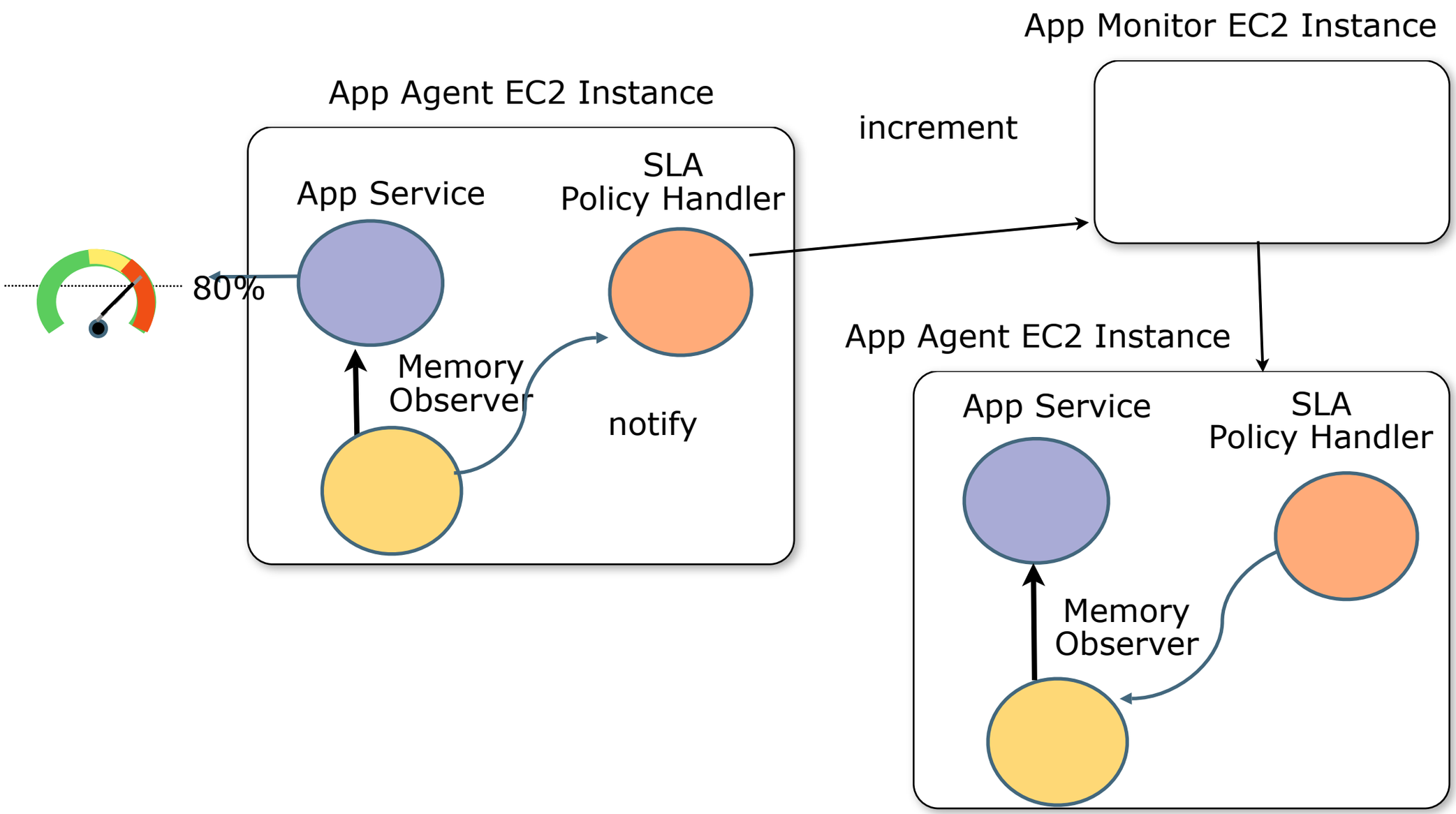
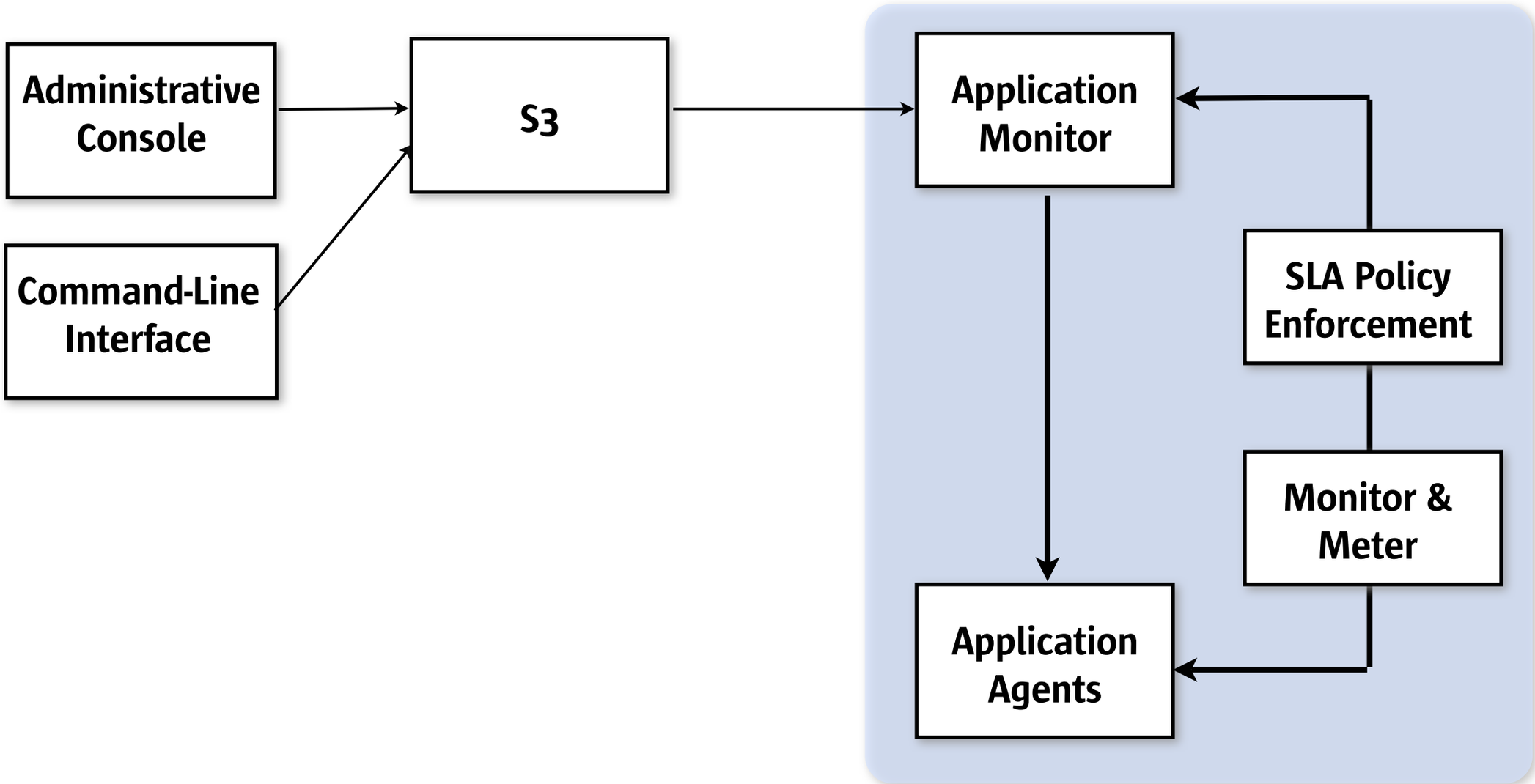


Elastic Grid Architecture



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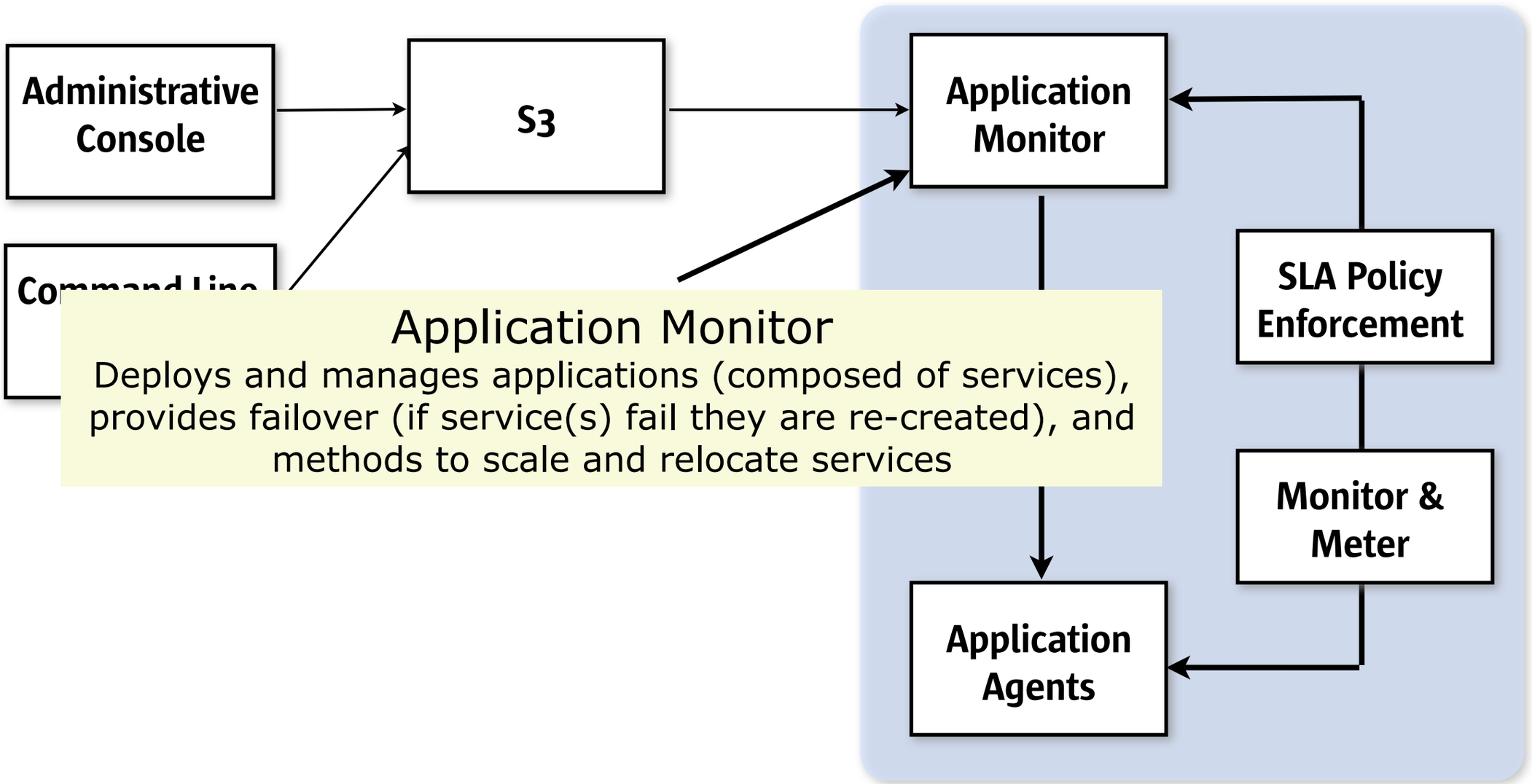
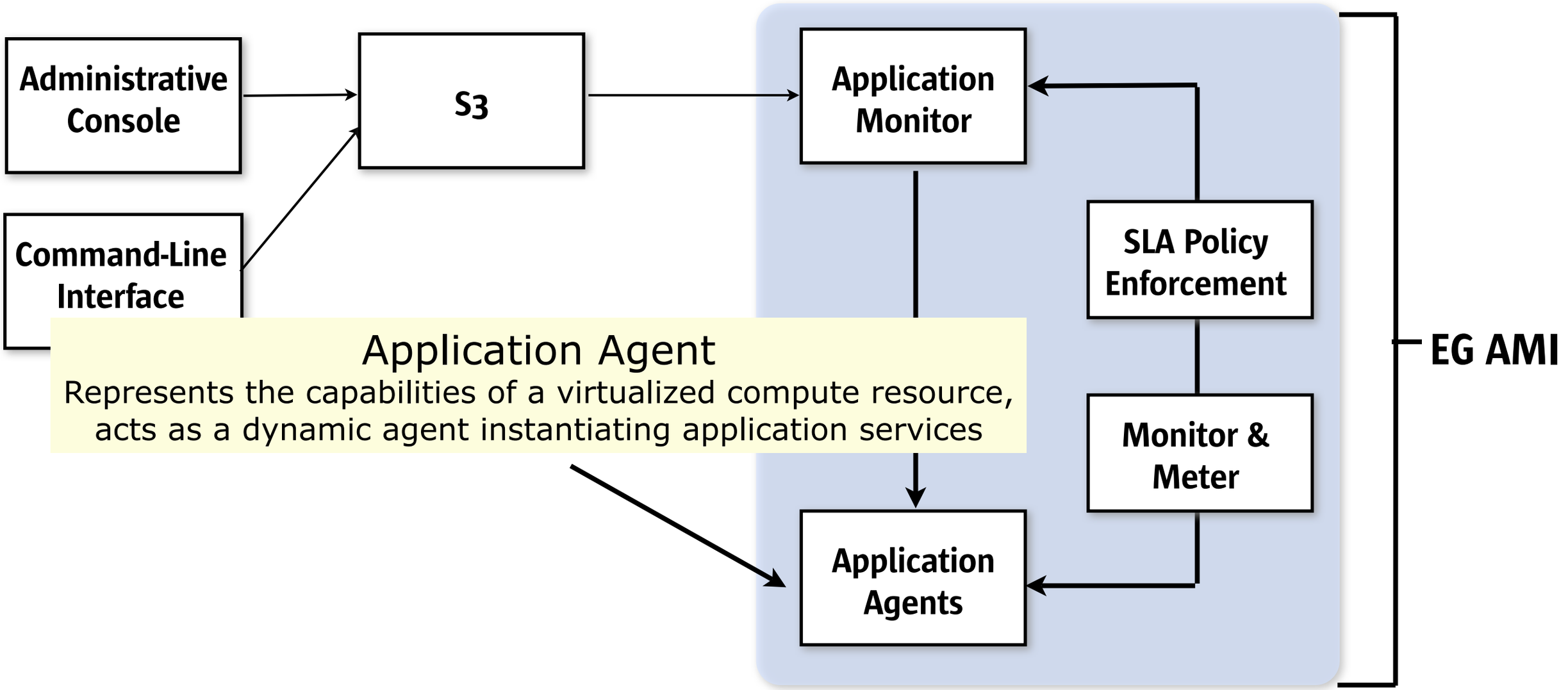


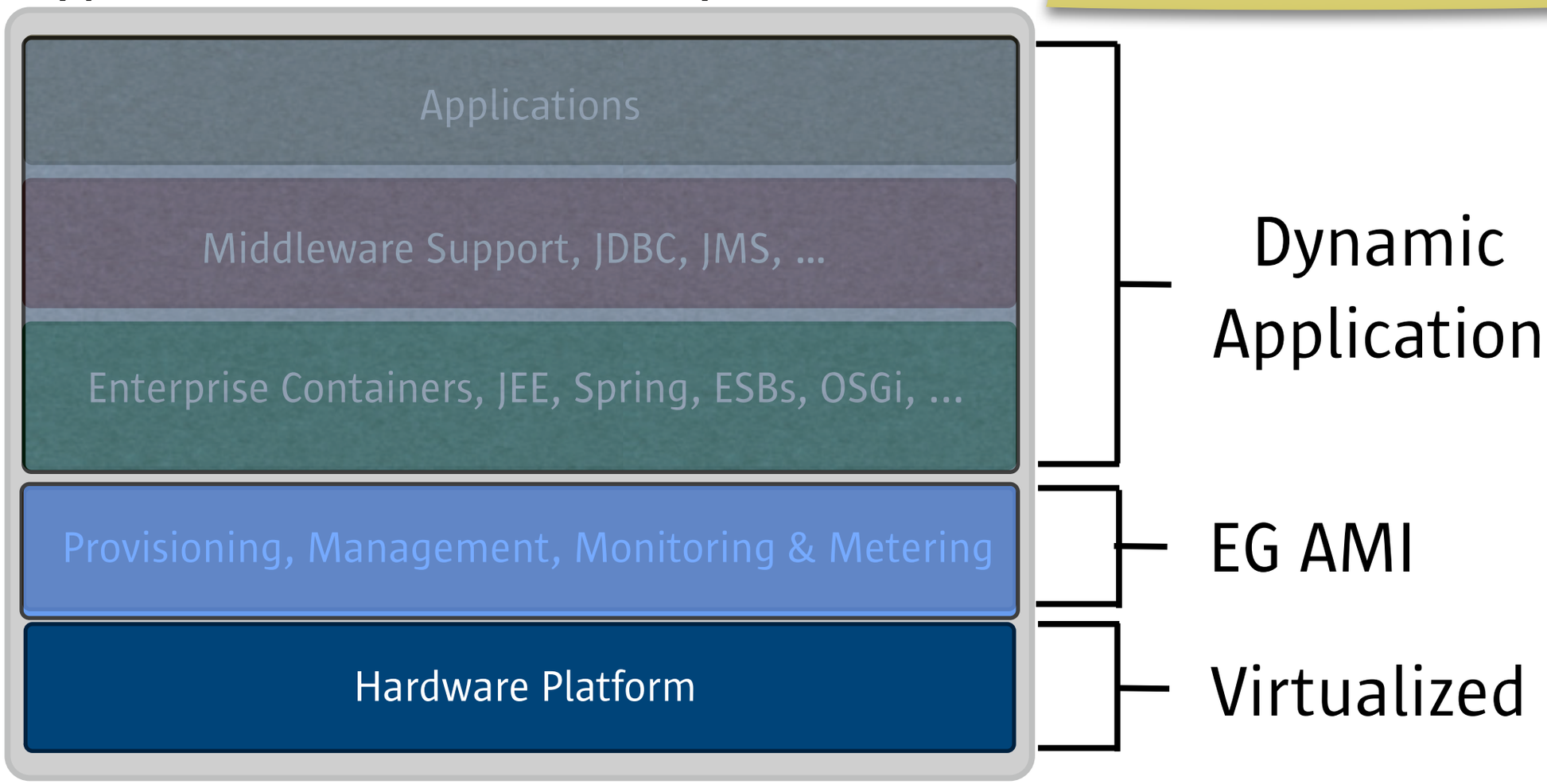
Elastic Grid Architecture



elasticgrid

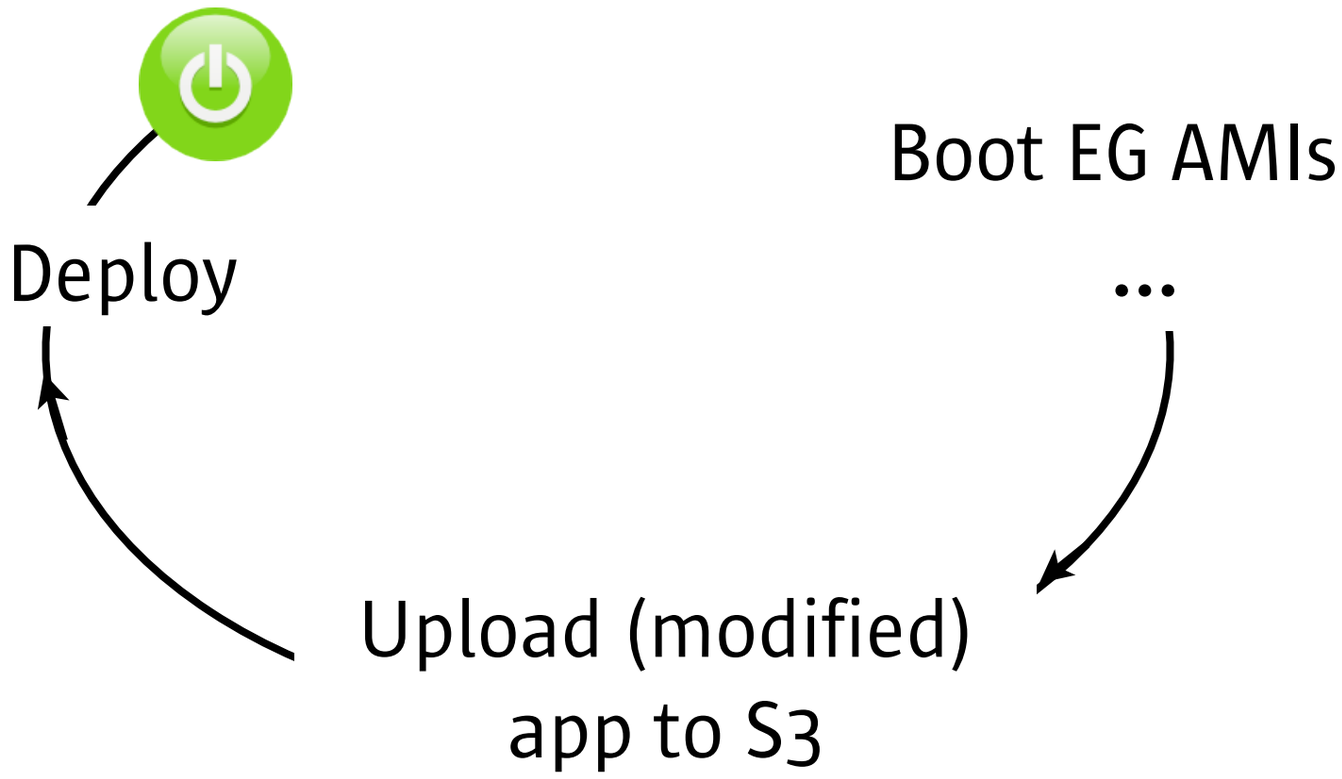
You won't have to create AMIs anymore and of course, you won't have to update an AMI when your application code changes!

- Typical Architecture Taxonomy



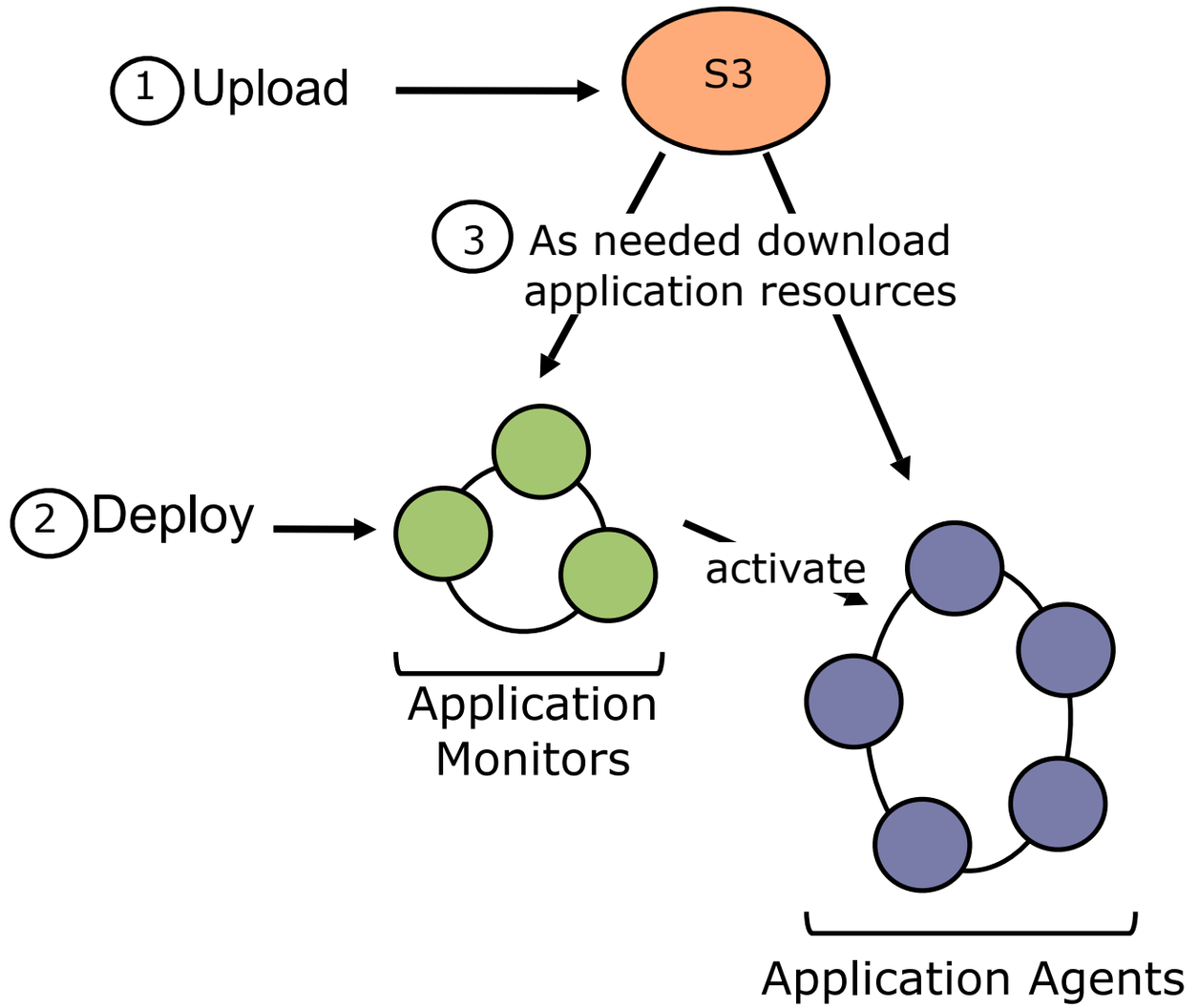
Deployments with Elastic Grid

- EG AMIs are pre-set, no need to (re-)bundle
- As application code changes, upload to S3 and deploy
- Focuses on developer productivity



Elastic Grid Deployments

- Deploy application code to S3
- Run the deploy command
- All code is dynamically served and instantiated
- Application is monitored and managed across EC2 instances



Sample Deployments

Sample: Calculator

- Calculator
  - Made of 4 core services (add, subtract, divide, multiply)
  - Consumed by a Calculator, with the help of dynamic associations

```
deployment(name:'Calculator') {
    groups 'rio'

    resources id:'impl.jars', 'calculator/lib/calculator.jar'
    resources id:'client.jars', 'calculator/lib/calculator-dl.jar'

    service(name: 'Calculator') {
        interfaces {
            classes 'calculator.Calculator'
            resources ref:'client.jars'
        }
        implementation(class:'calculator.service.CalculatorImpl') {
            resources ref:'impl.jars'
        }
        associations {
            association name:'Add', type:'requires', property:'add'
            association name:'Subtract', type:'requires', property:'subtract'
            association name:'Multiply', type:'requires', property:'multiply'
            association name:'Divide', type:'requires', property:'divide'
        }
        maintain 1
    }

    ['Add', 'Subtract', 'Multiply', 'Divide'].each { s ->
        service(name: s) {
            interfaces {
                classes "calculator.$s"
                resources ref:'client.jars'
            }
            implementation(class: "calculator.service.${s}Impl") {
                resources ref:'impl.jars'
            }
            maintain 1
        }
    }
}
```

Sample: Spring dm Server

- Indiquate where Spring dm Server distribution is located
- Indicate where are located the sample applications

```
software(name: 'Spring DM Server', version: '1.0.1', removeOnDestroy: true) {
  install source: 'http://elastic-grid-examples.s3.amazonaws.com/spring-dm/springsource-dm-server-1.0.1.RELEASE.zip',
          target: 'springsource-dm-server',
          unarchive: true
}

// deploy Spring Travel Sample
data source: 'http://elastic-grid-examples.s3.amazonaws.com/spring-dm/spring-travel-1.2.0.zip', unarchive: true,
     target: 'springsource-dm-server/springsource-dm-server-1.0.1.RELEASE'

// deploy Form Tags Sample
data source: 'http://elastic-grid-examples.s3.amazonaws.com/spring-dm/formtags-1.4.0.zip', unarchive: true,
     target: 'springsource-dm-server/springsource-dm-server-1.0.1.RELEASE'
```

Sample: Spring dm Server

- Hook into JMX Gauges in order to get the metrics
- Indicate how you'd like to automatically scale

```
// monitor number of threads and scale Spring dm Server instances
sla(id: 'thread-count', low: 80, high: 200) {
  policy type: 'scaling', max: 3
  monitor name: 'Thread Count',
          objectName: ManagementFactory.THREAD_MXBEAN_NAME,
          attribute: 'ThreadCount', period: 5000
}

// monitor maximum time spent on a HTTP call
sla(id: 'http-max-time', high: 5000) {
  policy type: 'notify'
  monitor name: 'HTTP Max Time',
          objectName: 'springsource.server.catalina:type=GlobalRequestProcessor,name=http-8080',
          attribute: 'maxTime', period: 1000
}

execute command: 'bin/startup.sh'
maintain 1                          // we want at least 1 instance to be running in our cluster
maxPerMachine 1                     // we don't want to host more than 1 instance per machine
```

Summary

- So what does Elastic Grid do for the app?
  - Ease development and deployment of Java applications using Amazon services
  - Provides automated management, fault detection and scalability for the application
  - To be available soon: Cloud Bursting!

- Why you should use Elastic Grid?
  - Avoid Cloud Computing platforms pitfalls
  - Focus on development, not infrastructure

Q&A

Thanks for your attention!

Register for the private Beta on Elastic Grid Website

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Elastic Grid Blog: http://blog.elastic-grid.com
Elastic Grid Wiki: http://wiki.elastic-grid.com