# APPLICATION DEPLOYMENT IN FUTURE GLOBAL MULTI-CLOUD ENVIRONMENT[1]

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OpenADN is a next generation application deployment and delivery platform for easily creating, managing and controlling massively distributed and very dynamic application deployments that may span multiple datacenters. OpenADN automates the whole control and management stack of application deployment and delivery over a software defined infrastructure (SDI) and allows application architects to define logical workflows consisting of application servers, message-level middleboxes, packet-level middleboxes and network services (both, local and wide-area) composed over application-level routing policies. It also provides the abstraction of an application cloud that allows the application to dynamically (and automatically) expand and shrink its distributed footprint across multiple geographically distributed datacenters operated by different cloud providers.

The solution is also applicable to various application service providers (ASPs) and businesses, such as, banking, financial, and other sectors that need to use globally distributed multi-cloud resources. It has been estimated that 74% of the cloud customers use more than one cloud [2].

As shown in Fig. 1, on the north side, it offers three interfaces – for application developers, application architects, and application deployment administrators, respectively. On the south side it has many modules, one for each of the cloud/network management systems. In the figure, we have shown OpenStack, EC2, and OpenDaylight as examples of cloud/network management systems [1].

OpenADN by itself does not meddle with the resources inside the clouds; it simply requests the respective cloud manager to create those resources. The policies of when and where to create the resources are specified by the Application Deployment Manager.

All globally distributed applications will benefit from OpenADN. Three such examples are as follows:

1. **Internet of Things**:  This requires data collection and computing (data analysis/aggregation) facilities



Fig. 1: OpenADN Platform for Application Delivery in a WAN Multi-Cloud environment

located throughout the world. This is what Cisco calls "Fog Computing." Data could include that related to social networks, utility consumption, industrial monitoring, or any M2M application.

2. **Smart WANs**: By smart WANs, we mean wide area networks with differentiated transport that offer service chaining facility such that virtual links with specified QoS can be created on demand, application message level and packet level middle boxes can be created on demand along with the servers.

3. **Massively Distributed Apps**: Globally distributed on-line games can use OpenADN and the smart WANs.

**References**:

[1]  Paul, S., Jain, R. "OpenADN: Mobile Apps on Global Clouds Using OpenFlow and Software Defined Networking." ManSec-CC 2012, Dec 7, 2012, in conjunction with IEEE Global Communications Conference (Globecom) 2012, Anaheim, CA, December 3-7, 2012

[2]  Right Scale, "Cloudcomputing trends: 2014 State of the Cloud Survey." April 2, 2014, http://www.rightscale.com/blog/cloud-industry-insights/cloud-computing-trends-2014-state-cloud-survey [Online accessed July 20, 2014].
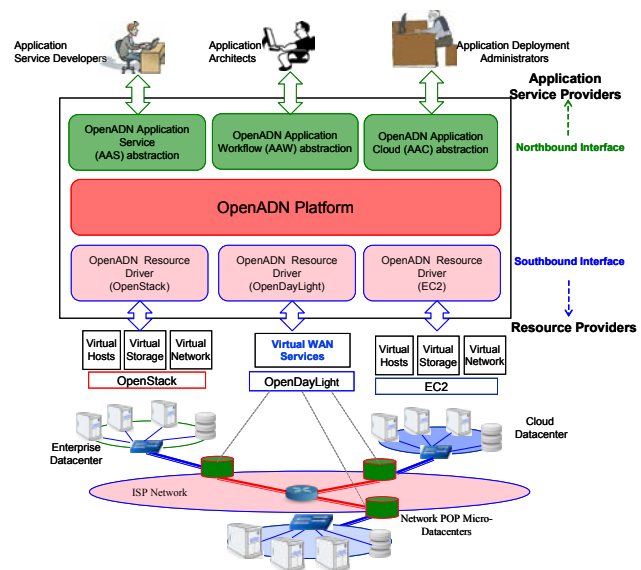
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