Apple TV As The Game Changer Within Learning Institutions

Inside

Introduction

Apple TV was initially envisioned by Steve Jobs for streaming iTunes within the consumer market across multi-media entertainment centers, and is fast becoming educators' tool of choice for inexpensively converting classrooms into interactive multimedia distance learning centers. Apple TV links the classroom projector to mobile multi-media devices, and turns anyone with an Apple endpoint into a content generator. Within seconds professors can connect their mobile devices to projectors wirelessly, regardless of whether they are in the classroom or working remotely. Moreover, they can stream to student endpoints, and/or ask others to project from their mobile devices.

Many educators believe that Apple TV (and other equivalent form factors) is a true game changer. Classes become interactive, content is no longer coming solely from the professor, and students pay better attention because at any moment they can be asked to present from their desks. This is the direction of 21st century classrooms — virtual and interactive, with rich media content streaming.

IT Concerns

The open community design of Apple TV, while characteristic of Apple with a simple one-click client attachment via Airplay, has several downsides that require administrative control. Apple TV uses a broadcast protocol for advertising its presence to any client that can detect these advertisements (typically across a VLAN or SSID). Most educational institutions do not confine these types of broadcasts to within individual classrooms, so without central administration and control, these Apple TV broadcasts can be seen by others in the same building, and/or by others on both wireless and wired networks. Anyone who sees the broadcast can hijack the projector, or join as an unwanted student. And from a network traffic viewpoint, Apple TV streams are sent needlessly to other buildings, both wired and wireless. This is extremely poor use of network bandwidth.

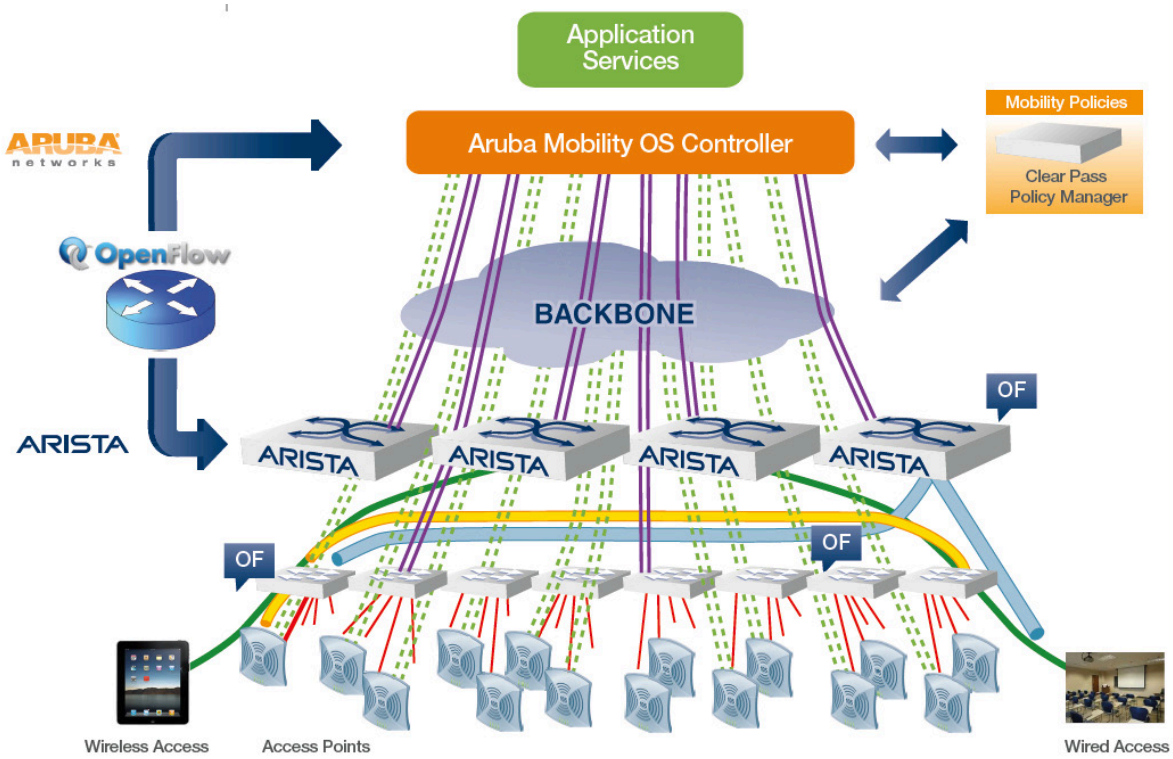
By no means should learning institutions discourage the adoption of Apple TV devices; discouraging their use has negative effects on the progressiveness of the institution's learning reputation (students typically do not care about protecting content, or about network security). What is required is way to centrally administer localized classroom access, insure that the traffic is optimized locally, and provide offer configuration procedures that non-technical educators can easily follow.

Centralized Controller Approach

The ideal solution for using Apple TV within classrooms is a centralized mobility controller with Software Defined Network (SDN) control capabilities. The controller provides access and credential enforcement, and programs the underlying campus switch topology for both wired and wireless communication in the shortest path manner, often eliminating unnecessary switch hops between wired and wireless endpoint devices. Further, the mobility controller provides the middleware glue logic between the underlying network and directory and application services. It programs access to and through Apple TV based on a) a list of projectors that only authenticated professors can see, b) student, classroom, and projector adjacency, and c) providing streaming to remote students or those who need to share content. The only realistic way to scale the use of Apple TV within the classroom, yet maintain administrative control, is via a central mobility controller.

A Topological View

The diagram below provides an architectural view of how to deploy Apple TV, with a centralized mobility controller, and with SDN enabled switches. The tunneling of the set-up services (control) is shown in purple, the determination of the forwarding path is shown in dotted green lines, and the actual forwarding path is shown in solid green lines.



The beauty of this approach is that Apple TV broadcasts can be controlled as an overlay to an existing network, without having to rip out the existing network. The wireless controller is easily centralized, and can be placed almost anywhere logically, as long as tunneling of the bonjour protocol (specifi cally Multicast DNS) is forwarded to the controller. Adding an SDN-enabled aggregation switch layer for controlling the "wired" forwarding path with those on the "wireless" network is also recommended. These aggregation switches not only provide a more seamless Apple TV "network" between wired and wireless networks, but they also address the need for increased bandwidth within each building, as driven by a growing number of peer-to-peer rich media applications as well as increased data rates due to the recent ratifi cation of 802.11 AC access points (see Aruba white paper).

Aruba And Arista: Software Defined Networking Integration

Aruba Networks, a leader in network access for mobile enterprises, and Arista Networks, a leader in high performance 10/40Gbps aggregation switching, have collaborated to provide a combined SDN offering that allows educators to broadly deploy Apple TV devices throughout their buildings, while insuring that content is controlled within the classroom. This combined offering is based on Aruba's Software Defined Mobility Controller and the integration of this controller — for both tunneling and data path programming — with Arista's low latency data-center-class Software Defined extended switches.

Aruba and Arista use OpenFlow (Floodlight) as the open programmatic interface between the Aruba controller and the Arista switches. Aruba is able to easily modify the Arista switching tables via Arista Extensible Operating System (EOS) (see Arista's SDCN white paper).

Airheads Demonstration

Aruba and Arista are demonstrating how Apple TV can be controlled at the Aruba Airheads Annual Conference 2013 in Las Vegas. The demonstration specifically shows how IT can configure the Apple TV devices, connected on wired Ethernet to the Aruba mobility controller, and permit access only by credentialed log in (typically the professor community). Upon login the professor can pick their desired projector from a descriptive list of projectors, and once selected they can begin projecting through their Apple mobility device of choice. The professor can then enable distance learning through higher layer multi-media streaming services, as well as set up a community of interest in which the students can project.

Apple TV broadcasts are tunneled through Arista's 7050S switch to Aruba's mobility controller, thus insuring containment of the Multicast DNS protocol. Once the user community (of Apple TV, professor, and student) is authenticated and authorized, the Aruba mobility controller programs the forwarding of the peer-to-peer client traffic locally between the Aruba switches in the access layer and Arista switches in the aggregation layer.

This SDN-based programming offloads the forwarding from the mobility controller and reduces the number of switch hops by typically 30 to 50 percent. Reducing the number of switch hops between endpoints (professor/Apple TV) offers significant improvements in the client experience, given the latency-sensitive nature of voice, video, and virtual desktop applications. Moreover, this demo shows how customers can more easily scale Aruba's centralized mobility controller, since offloading the data path (session traffic) from the controller and onto Arista's aggregation switches minimizes the potential chokepoints within the network by an order of magnitude.

For more information regarding Aruba Network mobility and access switching products please go to www.arubanetworks.com. For more information on Arista Networks data center and aggregation networking products please go to www.aristanetworks.com.

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