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White Paper

Meraki Stacking

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This document describes the benefits of Meraki Stacking technology and how it can be used to manage a distributed network.
In addition, this document will cover how to architect a physical stack of Meraki MS Switches, to build out high availability networks.

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1 Introduction and Challenges

Network management at the access switch layer has become increasingly challenging over the past decade. With the explosive growth of Ethernet enabled clients in the enterprise, a commensurate rise in the number of ports allocated per user, and the rise of the distributed network, IT managers are dealing with managing large, distributed networks with tools better suited to managing the simple centralized networks of the past.

While stacking technology has been around for more than two decades, it's only within the past decade that mass commercialization has taken place. Stacking technology developed to address the challenges of scaling a network, simplfiying network management by providing the IT administrator with a single management IP address to manage a "stack" of switches and to improve network resiliency. Without stacking, each switch needs its own management IP address, and as ports and network size grows, this simply does not scale.

Meraki pioneered an innovative approach with its cloud-managed switches, enabling the one-stop convenience of stack management to be leveraged regardless of whether switches are physically interconnected with stacking cables, or thousands of miles apart. This approach is called Virtual Stacking.

Stacking can reduce management complexity for centrally managed networks, but today, the rise of the distributed enterprise means that stacking often is not enough to efficiently manage the network. Managing distributed networks now involves expensive overlay management software. Costs range from a few thousand dollars to tens of thousands of dollars, and the added complexity, training, and on-going maintenance of servers means that an IT team can quickly become over-burdened.

The answer to these challenges is Meraki's Virtual Stacking, an industry-first technology. Virtual Stacking meets the challenges of managing distributed networks by simplifying network management and reducing total cost of ownership.

For deployment scenarios demanding the highest performance between adjacent switches, or where building fiber limits the number of uplinks from the access to the distribution layer, virtual stack management of multiple ports can be combined with blazing fast stackable switches, providing up to 160Gbps of stack bandwidth.

Virtual Stacking

Meraki developed Virtual Stacking to allow administrators to manage and configure up to thousands of ports at once using Meraki's cloud management platform. Meraki's platform enables network-wide visibility and control, allowing administrators to monitor and configure switches, wireless access points, security appliances, and even mobile devices. Through a single pane-of-glass, IT administrators can manage their entire distributed network using an intuitive and secure web-based platform.

MS Series Switches can be treated as a virtual stack without requiring a physical connection, and regardless of their location. This means that switches can be in different physical locations (e.g., New York and California) and administrators still have unprecedented visibility and manageability into all the ports in the virtual stack, greatly simplifying management of large distributed networks. Switches that are in the same physical location can be physically stacked and managed using Virtual Stacking in the same way.

Meraki's corporate network is an example of a distributed network, with networks in San Francisco, London and Sydney, all managed using Virtual Stacking technology.

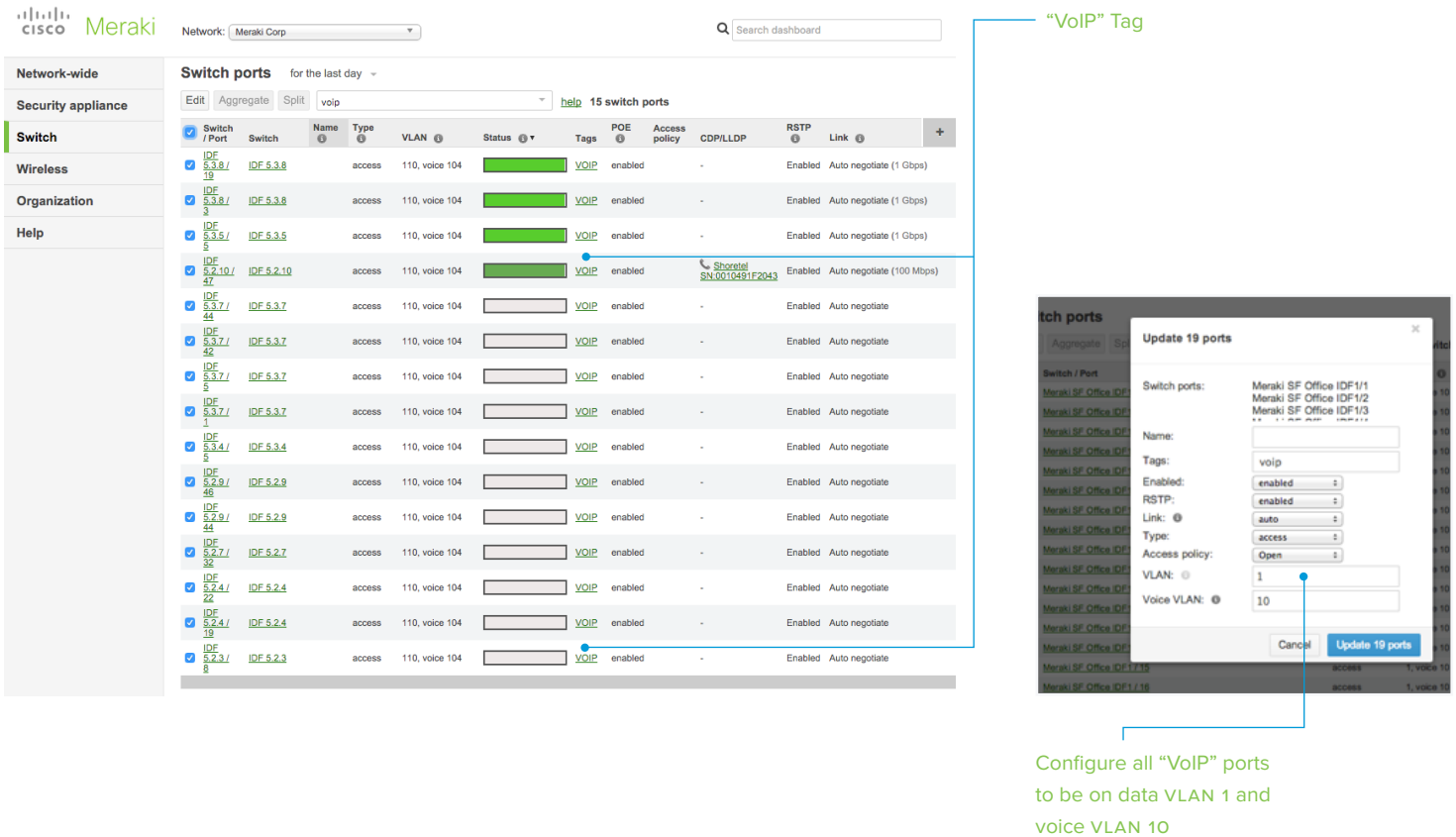
From the switching layer perspective, Virtual Stacking is used to manage this distributed enterprise network as groups of ports instead of individual switches. At each location, an intermediate distribution frame (IDF) on each floor serves clients located on that floor.

Virtual Stacking is not limited to four or eight switches per stack; in fact, thousands of ports can be members of a single virtual stack. This leads to a different challenge in network management, namely how to manage thousands of ports in a single pane-of-glass without overwhelming the administrator? Meraki solves this challenge by integrating switch names, tags, and a live, Google-like search. Administrators can name switches and even ports as required, for example, city location and floor assignment, or any other logical classification used by the organization. Tagging enables a second level of classification for even further logical grouping. For example, all VoIP ports can be tagged with "VoIP" and wireless access point ports with "WLAN," enabling easy searching and sorting through ports via the integrated live search. Finally, critical ports can be assigned tags such as "uplink," so administrators can receive per-port email or text message alerts of potential network issues. Admins can also see in real time the status of each switch and every single port in the virtual stack.

Configuring ports has never been easier with Virtual Stacking's ability to mass edit a group of ports. It takes just a few clicks to, for example, configure the first eight ports on all switches to be access ports on a specific VLAN, apply an 802.1X access policy, disable power-over-Ethernet (PoE), and run rapid spanning tree protocol (RSTP). Creating link aggregates on uplinks, for increased throughput and redundancy, also takes just a few clicks with no command line interface (CLI).

Below is an example of how Meraki uses tags within a network. For switches that serve VoIP clients, we tag these ports with "VoIP" and this allows us to quickly search for only ports that serve VoIP clients as well as configure these ports, regardless of where the switches are located.

FIGURE 1
Tagging & Configuring Ports



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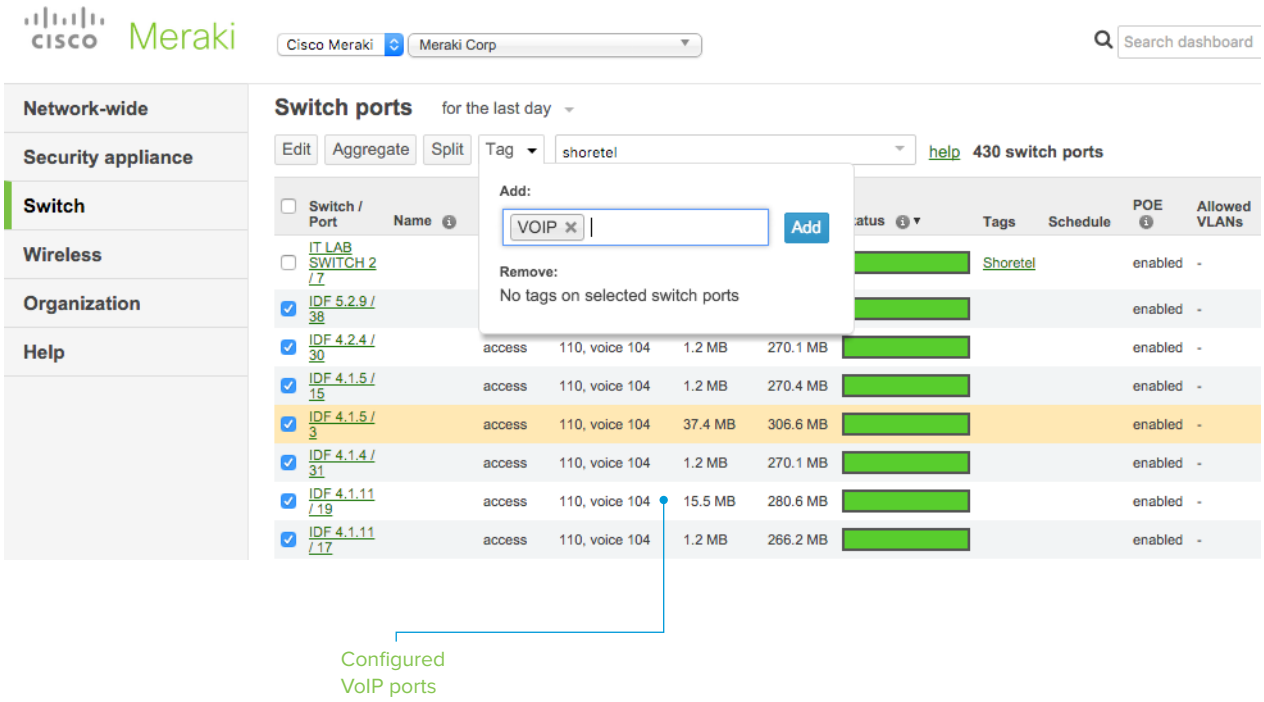

The ability to quickly search and apply configuration changes to distributed enterprise networks is extremely powerful. Ports are identified by specific tags, and administrators can configure specific ports across an entire distributed network. With Virtual Stacking, unprecedented scalability and location-independent deployments are a reality.

Scalability is as important as ease-of-management when it comes to Virtual Stacking. Switch networks can include up to 10,000 ports in a Virtual Stack while providing users with benefits such as being able to pre-configure a switch before it even arrives on-site using the “Add a Switch” feature or simply copy existing configuration settings to new or existing switches using the “Clone” tool. This allows IT administrators to quickly deploy new switches to branch locations without hiring expensive contractors. Replacing or adding new switches has never been easier.

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Retail Example

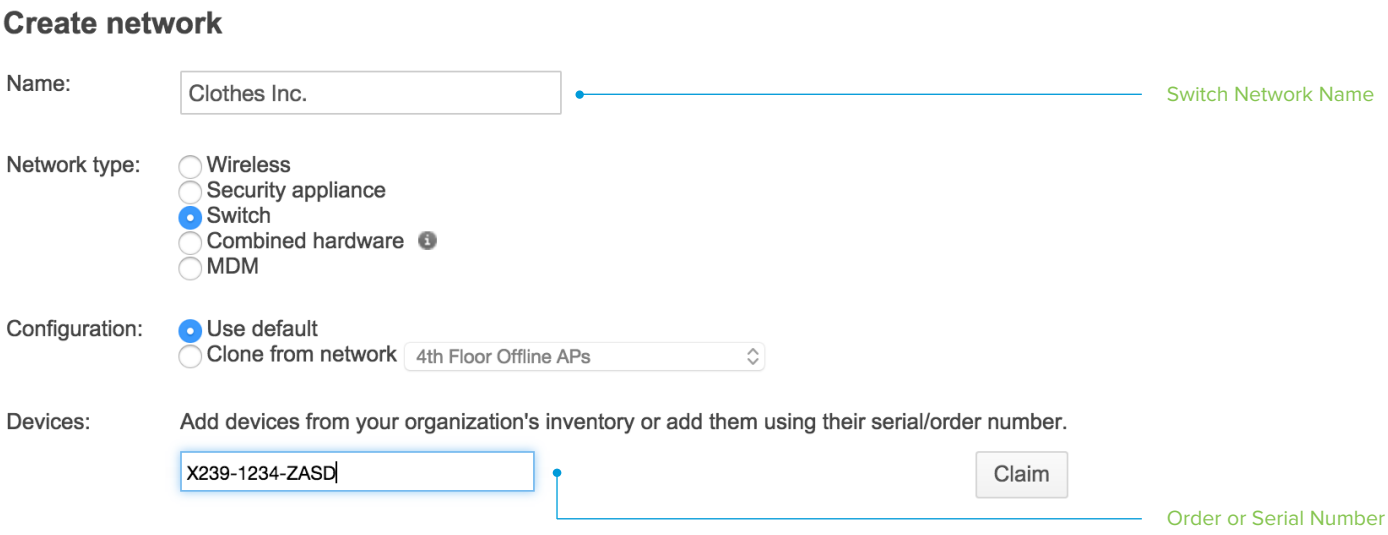
Consider a retail company with 50 stores across North America and is undergoing a network refresh. The IT team wants to deploy a common network infrastructure across all their stores. They plan on using 24 port PoE switches at these locations and want to assign ports 1-10 to VoIP phones and ports 11-15 to wireless access points. Ports 16-23 will be disabled and reserved for future use while port 24 is a trunk to upstream devices. The goal is to complete the upgrade in three months with a controlled rollout process.

The IT team will oversee installation and bring-up on-site at the company's flagship stores but will not be available at all locations. Instead, they plan to hire contractors to install equipment at the remaining locations, so they want a way to ensure the remaining deployments are as quick and error-free as possible.

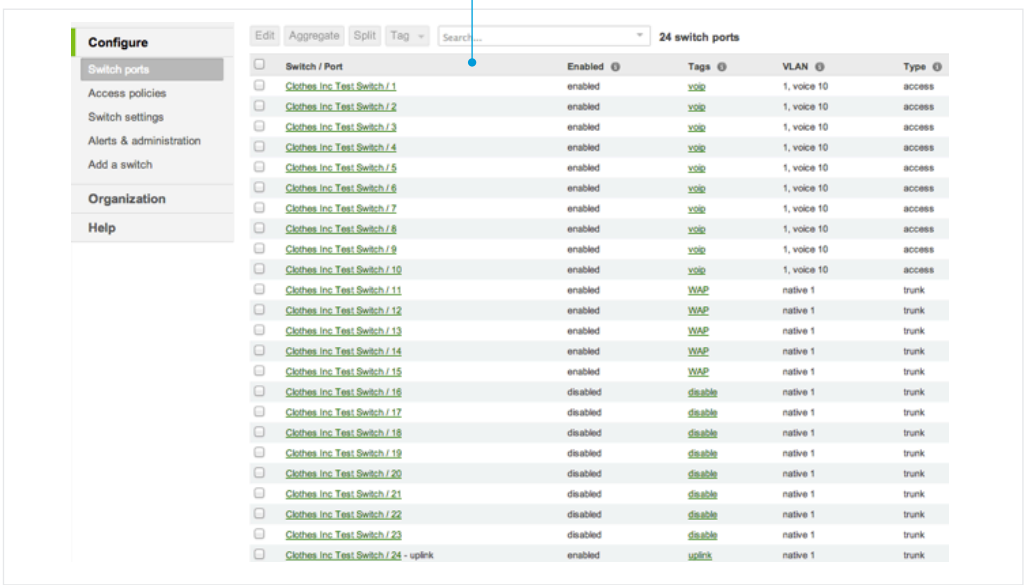
Meraki's Virtual Stacking technology makes this type of deployment simple. IT can configure a test store network, verify configuration settings, and then use Meraki's "add a switch" and "clone" features to add new switches with predefined configurations to the network.

EXAMPLE DEPLOYMENT/SWITCH CONFIGURATION STEPS

1 Create switch network



2 Configure switch ports



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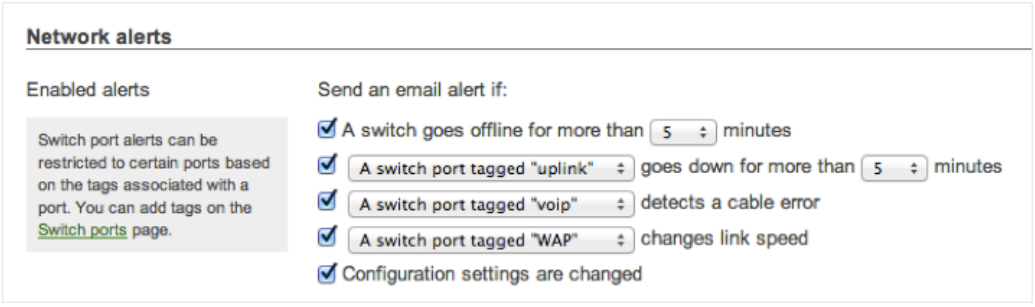
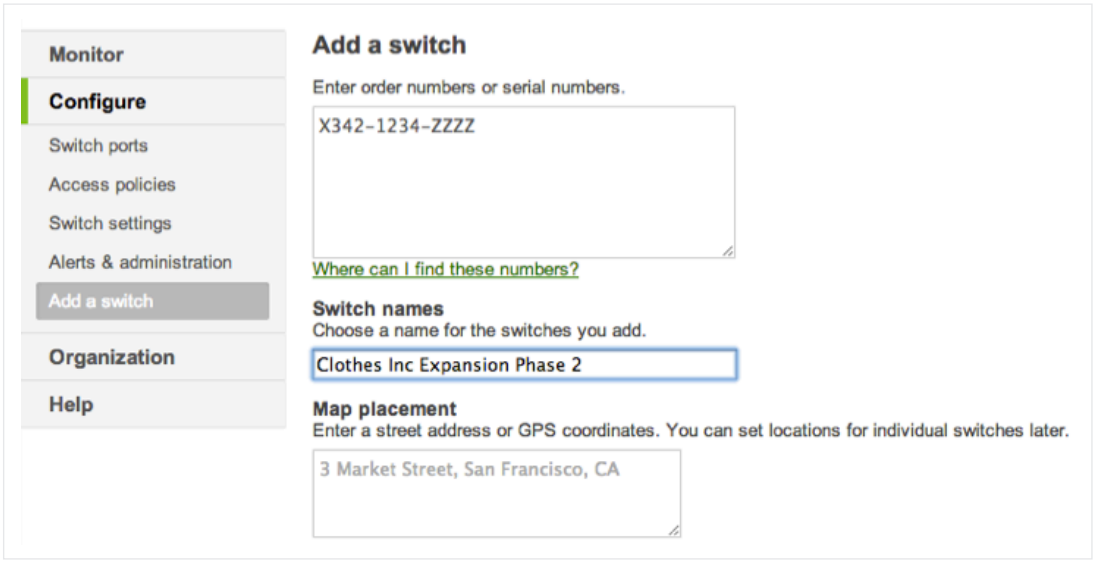
3 Define per port alerts for critical ports such as “uplink”

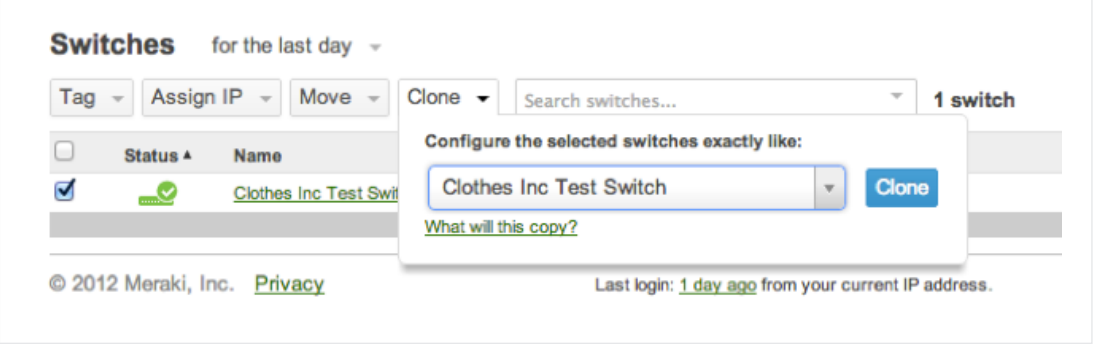


4 Verify configuration and settings in test network and deploy to flagship stores

5 Add new switches to network by order number or serial number



6 Clone switch settings using “clone” tool to clone newly added switch to be exactly like existing “Clothes Inc Test Switch.”



7 Ship switches to retail sites for contractors to install (no additional configuration required)

If any configuration changes need to be made, the IT staff can search by names or tags and edit all the VoIP ports across all 50 sites or all the WLAN ports with just a few clicks.

3 Building Resilient Networks

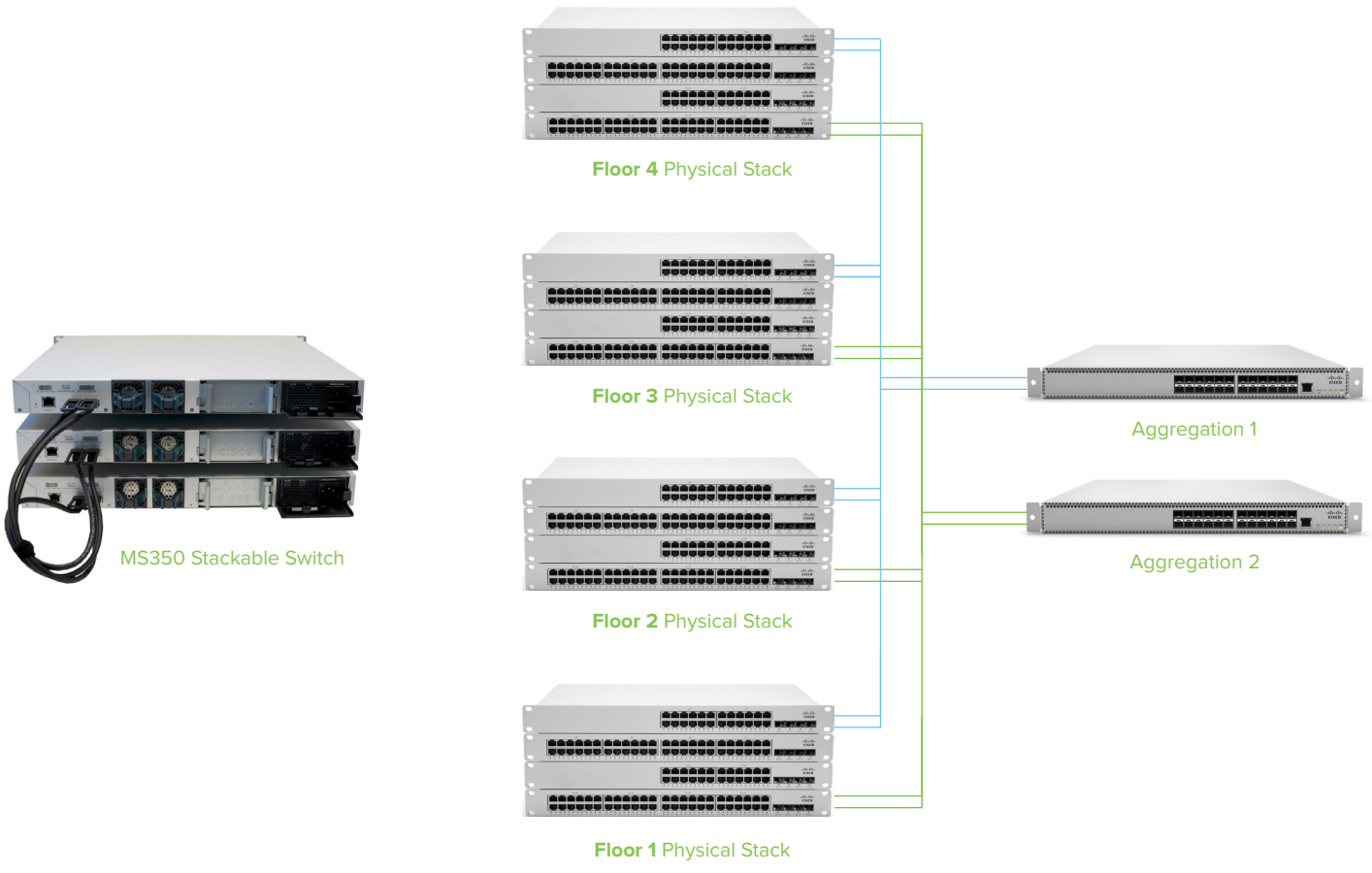
Traditional physical stacking is used to provide resilience, high performance and to simplify switch management. Many IT administrators require resilient networks with redundancy and high availability to support business continuity. This can be achieved by stacking switches with a pair of stack connections, and linking to the core/aggregation layer using cross-stack link aggregation, thus providing alternate paths so that losing one switch or uplink does not sever connectivity to the rest of the network.

Meraki's MS Series Switches support redundant architectures using standards-based modules and protocols, such as QSFP, LACP and RSTP. The end result is a network that has all the benefits of Virtual Stacking with no single point of failure and no blocked connections on uplinks to the core/aggregation layer.

Below is an example of a resilient switch network at Meraki's headquarters. Each floor has an IDF, with four stacked switches per wiring closet, all of which are managed through a single pane-of-glass, the Meraki dashboard. The dedicated stacking cables between switches in the stack provide up to 160Gbps of stack bandwidth, with spatial reuse, and link up to the core/distribution layer. By using cross-stack LACP, throughput between network layers is maximized, and all links are forwarding.

To assist with building stacks up to 8 units high, Meraki offers 1m and 3m stacking cables, in addition to the 0.5m cable included with each MS350 switch.

FIGURE 4
Network Resiliency



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4 Virtual and Physical Stacking

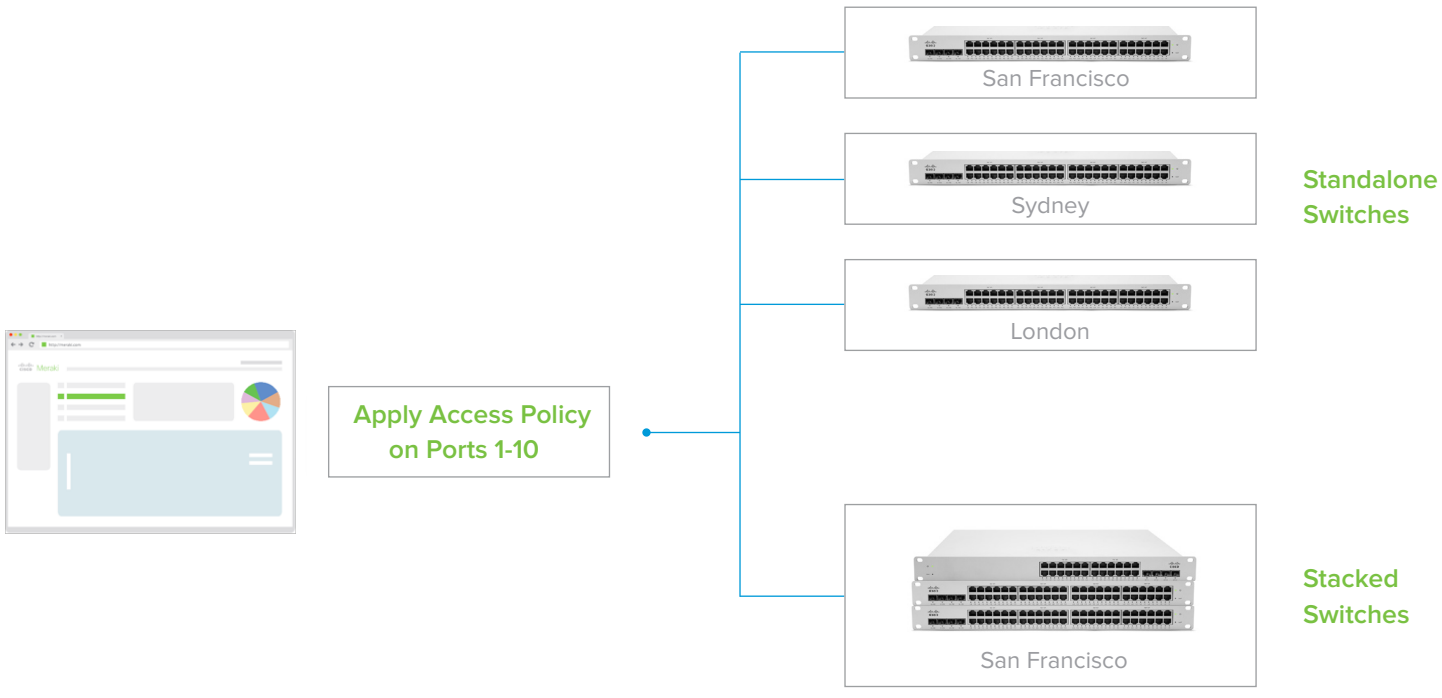
Following the introduction of Virtual Stacking with the launch of the Meraki switch line back in 2012, network engineers have been benefiting from this much simpler way to configure multiple ports across multiple switches, regardless of their location.

When deploying switches to multiple floors, buildings or locations, it is common to standardize on select ports being used for select purposes. For example, ports 1-10 may be dedicated to VoIP ports. With Meraki, it would make sense to tag each of these ports with something like 'VoIP' so they can be easily searched for. When a change is required to all VoIP ports, the engineer could simply do a search for 'VoIP', and then edit all resulting ports simultaneously.

This highly scalable management tool can save significant effort for network engineers responsible for managing multiple dispersed switches and the technique works identically, whether configuring ports on standalone switches, or on physically stacked switches.

Figure 4 illustrates the ability to configure multiple ports across both standalone and physically stacked switches using Meraki Virtual Stacking.

FIGURE 4
Virtual and Physical Stacking



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Conclusion

Virtual Stacking is the innovation that has been missing in enterprise networking at the access layer. Meraki's MS Series switches with Virtual Stacking simplify network management so that distributed enterprise networks can easily be managed through an intuitive single pane-of-glass. IT administrators can now monitor and configure anything from a single port to thousands of ports with a solution that is scalable, resilient, and cost effective without the need for expensive network management overlays. In addition, building resilient networks is simple with standards-based hardware and protocols and physical stacking of switches.

Contact your Meraki representative to learn more and set up a trial.

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