

## Trapeze Competitive Advantages

### COMPETITIVE BRIEF

Trapeze NonStop Wireless LANs provide the highest levels of reliability, performance, security and management for today's always-on enterprises.



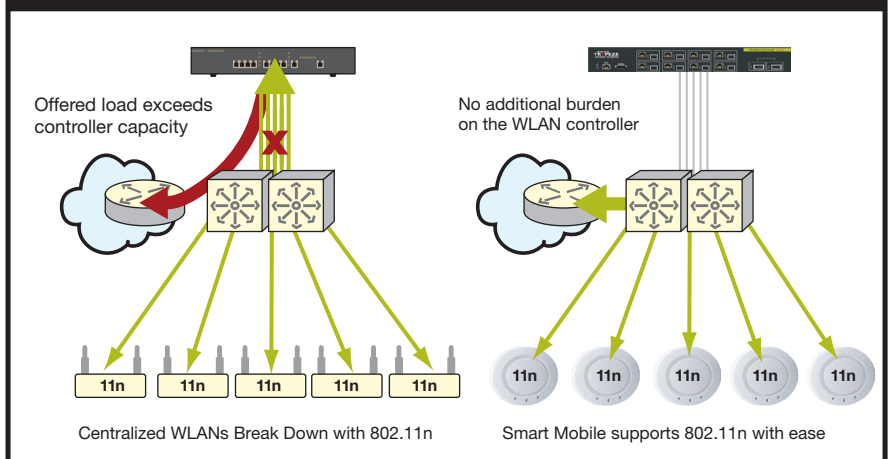
### Trapeze Provides Highest Reliability, Scalability and Investment Protection

The Trapeze Networks Smart Mobile architecture delivers unprecedented scalability. Smart Mobile intelligent switching overcomes the limitations of current solutions that depend exclusively upon centralized switching at the WLAN controller. Instead, Smart Mobile enables both centralized and distributed switching at the same time.

By allowing local switching at the access point, WLAN controllers are relieved of the packet forwarding overhead, and have more of their

processing capacity available for dealing with control-plane traffic and security policy administration. The result is fewer controllers are needed to support all the access points in the network. Bypassing the controllers for traffic forwarding, also results in more efficient traffic flows across the network core, because it eliminates backhauling traffic across the network to be switched by the WLAN controllers in the Data Center. Some vendors claim they can eliminate bandwidth waste by decentralizing the controllers themselves, and putting them in the wiring closets in each building – but at what cost? Doing this requires higher invest-

### Smart Mobile Scalability Advantage with 802.11n



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ment in controllers, consumes more power, more rack space, and more ports on distribution layer switches and inevitably requires more configuration and management. The Trapeze Smart Mobile architecture is future proof - unlike other vendors' solutions, all Trapeze controllers are 802.11n ready and require **no upgrades** to support 11n.

For customers that prefer centralized switching, and wish to implement 802.11n in this mode, Trapeze Networks flagship controller, the MX-2800 offers 28Gbps of line-rate switching performance - approximately four times the capacity of its nearest rival. As many as 32 Trapeze controllers can be grouped to form a single virtual controller cluster supporting over 16,000 access points.

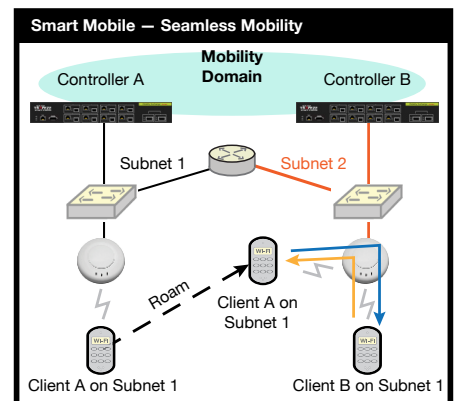
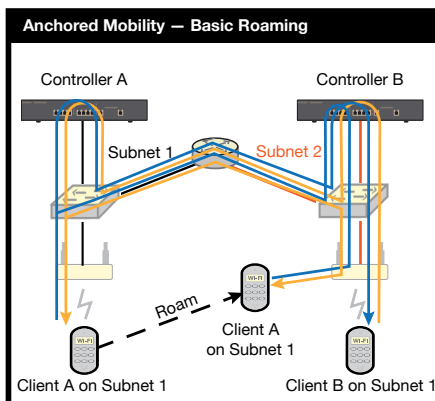
### Superior Load Balancing and Capacity Management

Combining several features that are completely unique to Trapeze, it is possible to gain 30-40% more usable capacity over any other vendor with the exact same number of access points and requiring fewer controllers. Wireless clients exhibit two common problems: The front door problem - they tend to aggregate on the same access point even though other access points are in range and could provide equivalent service levels per the bandwidth requirements defined in a user's security profile; Defaulting to 2.4Ghz - Most wireless clients default to 802.11b or 802.11g, often times resulting in congestion on the 2.4Ghz band while the 5Ghz band remains virtually unused.

Trapeze solves these and other problems as follows: Trapeze offers dynamic radio power management, and client load balancing across access points, as do many other vendors. But only Trapeze has patent-pending Band Steering that forces 5Ghz capable clients to use that band whenever possible. This not only increases usable capacity up to 40%, but it also improves the experience for all users connected on 2.4Ghz. In addition, clustering capabilities let lightly loaded controllers dynamically take over control of access points, when other controllers get overloaded - this results in more even distribution of access point management and switching (if local switching mode is not enabled) across available controllers. Trapeze also offers granular QoS and bandwidth management on a per-user, per SSID and per application basis to enable minimum service level guarantees.

### Faster, More Reliable Roaming with Full Security

Wireless LANs are becoming essential in mission-critical environments such as healthcare, retail and manufacturing. But they have limited value if users keep losing connections as they move around the building or between buildings. Uninterrupted connectivity while on-the-move is a pre-requisite for successful wireless deployment. Unfortunately wireless and mobility are not the same thing... just like cell phones... the real value comes from being mobile, in your car, at the store, or wherever... not from being untethered - you know how frustrating it is when your cell phone loses signal and drops the call!





Trapeze Networks has taken a scaleable, distributed approach to the roaming / authentication challenge.

Achieving total mobility is complicated, since it is not just about roaming from one access point to another, it is about roaming from floor-to-floor, building-to-building – across access points and across controllers – all while enforcing stringent security and preserving consistent, user-centric security, bandwidth and QoS policies at every step along the way. This begs the question: How is Mobility governed by different vendors' wireless systems.

Other vendors' systems depend on a "home controller" for the duration of an active session – this controller (Cisco calls it a mobility anchor!), is the custodian of security keys for that client session. Thus whenever a client roams to a different controller, the new controller has no prior awareness of the client, and must query the other controllers in the network to determine if one of them has the security keys required to allow the client to roam without forcing re-authentication. Once a "home controller" is found, user traffic needs to be tunneled back to it. With a limited 100ms time budget to resolve this, its easy to imagine how a long round-trip delay, or a few lost packets on a congested controller can cause client sessions or voice calls to drop.

In contrast, only Trapeze has a distributed security/authentication model. There is no dependence on a "home controller". Once a client is authenticated, the security keys are propagated to all other controllers in a Mobility Domain™, such that whenever a client roams to a new controller, the new controller is already aware of the client and already has the required security keys, without needing to query the network. The result is faster, more reliable roaming, indoor and outdoor.

Inevitably, because of the complexity of roaming across WLAN controllers, vendors that rely on a "home controller" model, encourage deploying large controllers, each supporting as many access points as possible. This reduces the incidence of cross-controller roams, but at the expense of inefficient traffic flows, increased congestion and higher exposure to single point of failure.

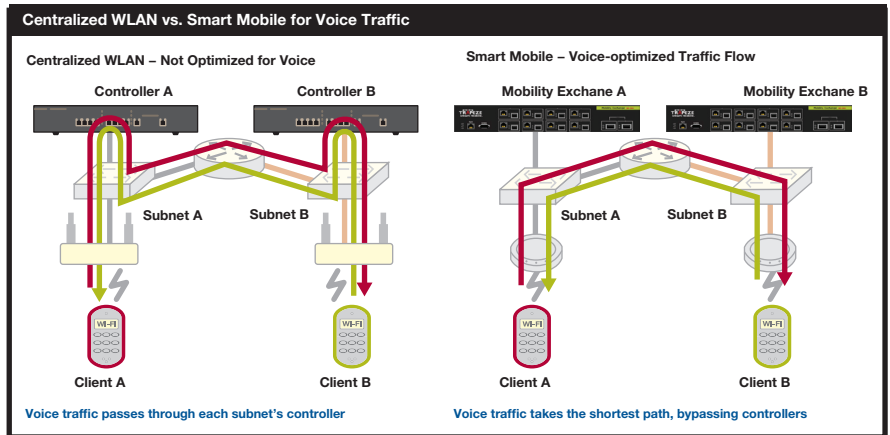
Instead, Trapeze Networks has taken a scaleable, distributed approach to the roaming / authentication challenge. Every bit as secure as a centralized model, this approach benefits from the security credentials of clients being distributed to all controllers in advance of the client roaming to them. This is how it works: When a client (a PDA, laptop, or Wi-Fi phone) first joins the wireless network, the controller that authenticates the client, propagates the client's service profile and credentials across the Mobility Domain™ – a cluster of up to 32 controllers – over secure controller-to-controller tunnels. Thus, when a client roams to an access point on a new controller, it is recognized immediately, without needing to query other controllers to get security credentials, because it already has them. The result is fast, reliable, identity-based mobility across controllers, with a lower probability of time-outs or dropped sessions for voice and data applications.

### **Best Architecture for Reliable Toll-Quality Voice**

Voice is the killer application for Wireless LANs. Just as voice over IP has become widespread in large enterprises, its destiny on wireless LANs is a certainty as well, with over 40% of large enterprises indicating adoption plans by 2010. But above all other applications voice is the most latency and jitter sensitive. Thanks to Smart Mobile local switching, voice traffic flows directly from handset to handset, taking the shortest path, without needing to go through intermediate WLAN controllers. This approach mirrors the architecture of the SIP protocol. Consequently Trapeze WLANs have the lowest end-to-end latency for voice calls. Independent tests show that under high loads, other vendors have up to 6 times the latency and 15 times the jitter of Trapeze for voice traffic.

Going beyond superior voice quality, the combination of Trapeze's distributed Mobility Domain and "clustered switching" capabilities provides a level of network resiliency that is unprecedented in the industry. Trapeze's "clustered switching" enables hit-less failover of voice calls if an access point or a controller, or even a portion of the wired network fails while a call is in progress.

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Any other vendor would drop the call, but the Trapeze WLAN infrastructure can dynamically re-route the call and keep it alive, without missing a beat. Trapeze voice support goes hand in hand with its distributed security model and Mobility Domains, ensuring that both voice and data are subject to the highest security measures embodied in the WPA/WPA2 standards.

**Same Deployment Model Indoor and Outdoor**

The requirements for outdoor access points and indoor access points are different. In addition, to providing network access for wireless clients, outdoor access points are also used for wireless bridging and mesh as an alternative to utilizing a fiber or copper backbone to connect buildings, or traverse large open spaces. However, outdoor wireless backbones do not have the luxury of high bandwidth, so they must be very efficient at routing traffic and avoid unnecessary traffic forwarding or double round trips. Consequently, most outdoor wireless networks were born from different stables than indoor WLAN equipment, and from different vendors. In fact, to perform well, they must have many of the intelligent switching characteristics embodied in Smart Mobile.

Only Trapeze has a uniform architecture, deployment model, RF planning and management system for both indoor and outdoor. Other vendors have a variety of constraints when deploying outdoor wireless networks, for example:

All outdoor access points must be managed separately from indoor access points by a dedicated controller; wireless bridging requires a completely different management platform; all client traffic must be switched by a centralized controller, and may therefore need to traverse the mesh twice. These constraints waste money and resources.

**Highest Availability, NonStop Infrastructure**

As wireless LANs become the new access-layer to the corporate network, mission-critical availability becomes paramount. While many vendors have implemented component-level reliability features such as dual homing from the access point, link aggregation, or redundant power and so on (all standard on Trapeze), none other than Trapeze, have tackled system-level resilience to match that of the most advanced wired networks.

In most networks it is typical to implement a many-to-one redundancy configuration. However, one of the major drawbacks of this approach is that it is difficult to keep the backup controller configuration in step with the controllers it is intended to back up. Furthermore, since few IT departments have the discipline or the time, to regularly test their disaster recovery plan, the backup controllers rarely get tested, and lay idle 99% of their life – until when they are needed, it is often discovered they are not properly configured!



Trapeze solves this problem with "Cluster Configuration" by enabling a many-to-many redundancy capability, in which all controllers act as backups for one another, and at all times carry a copy of the configuration of all other controllers. With this "active redundancy" approach, all controllers are in operation at all times, and in the event of any one of them failing, the others can instantaneously assume management responsibility for all the Access Points previously managed by the failed controller, without any calls being dropped or data sessions being broken. This feature also enables in-service upgrades with absolutely zero downtime. As one controller is brought off-line, the others dynamically and immediately absorb the extra load. After the controller is upgraded or reconfigured, it automatically resumes operation and takes back the load from the other controllers in the cluster.

Trapeze's indoor and outdoor mesh technology is also designed for nonstop operation. It provides rapid recovery from mesh link failure or disruption, with automatic load-balancing, self-optimization and path re-convergence while also implementing advanced flood control and traffic filtering to maximize bandwidth efficiency.

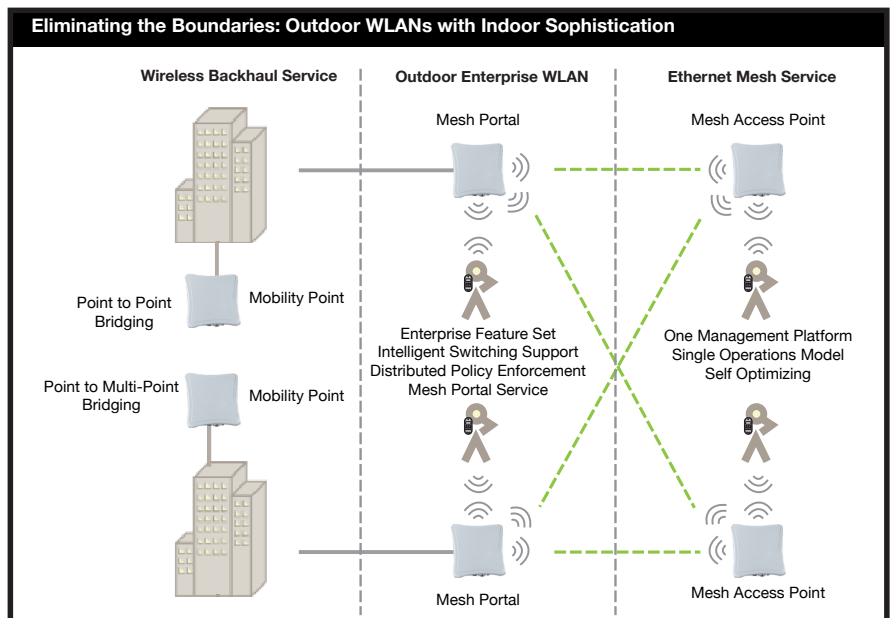
### Superior Intrusion Protection with Location Based Access Control

Trapeze adheres strictly to the highest security protocols and industry standards adopted by all serious Enterprise WLAN vendors, including:

- 802.1X based authentication
- AES-CCMP encryption
- WPA/WPA2 (Wi-Fi Protected Access)
- 802.11i and all WMM subsets
- All common EAP types

For Federal Government applications, Trapeze is also fully compliant with DODD 8100.2 and is one of very few Wireless LAN vendors that has a validated FIPS 140-2 certified solution.

In addition, Trapeze offers intrusion protection that is second to none. Wireless LAN controllers generally provide support for detecting and preventing approximately 40 common intrusion methods or malicious attacks – this support comes almost for free, because it is included in the Wi-Fi chipset that almost every vendor is using. For additional WIPS/WIDS protection, Trapeze can prevent 230+ known attacks, with full support for overlay intrusion protection systems from vendors such as Air Tight, Air Magnet and Air Defense. Only Trapeze offers unique integration between RingMaster and the Air



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Defense server, to dramatically reduce the cost of managing both systems and save up to 50% on sensor costs.

Further, Trapeze has pioneered completely new capabilities for locking down wireless network access based on their physical location. No other WLAN vendor has integrated location tracking with Access Control. By doing so, Trapeze provides network administrators new levels of flexibility to restrict network access, based on a person's location. This enables much tighter control of all types of users, including guests as they move in and out of meeting rooms and around the campus. Trapeze's SmartPass augments traditional endpoint security with location awareness, in order to prevent parking-lot hackers who may have stolen a laptop or PDA, or dynamically change a users access privileges, based on their location and behavior.

### Industry's Most Advanced RF Planning and WLAN Management

Unlike other vendors who added network management as an after-thought, Trapeze Networks set out to have the most sophisticated WLAN management capabilities from day one. Now in its 7<sup>th</sup> generation, RingMaster is a world class, award-winning management platform that dramatically simplifies the planning, configuration, deployment and monitoring of large enterprise wireless LANs. You can manage multi-site networks from a single management console with ease. For example, take Kaisers Tengelmann, one of the largest retailers in Europe, they drop ship a WLAN Controller and Access Points to a new store, and bring them online, completely remotely with no truck roll involved. They manage over 700 stores from one location.

Feature comparison	Trapeze	Cisco
Management Interface	Single Console	Multiple Components
Software Generation	7 <sup>th</sup> Generation	Many Generations, Many Products
Outdoor/Indoor Operational Model	Single Integrated Model	Different for Outdoor and Indoor
Controllers/switches per Server	500	25
Integrated 3D Planner	Yes	—
Network Wide Service and Change Management	Yes	Limited
Network Wide Fault Location and Correction	Yes	Limited
Drill Down to Real Time Historical Data	Yes	—
Comprehensive one-hour to 30-day Reporting	Yes	—

Trapeze networks is the only wireless LAN vendor with 3D predictive modeling software that lets you perform accurate RF planning without the delay and expense of manual site surveys. Using existing blueprints of your building, and taking a few RF attenuation readings for common building properties, to calibrate the model, RingMaster planning, lets you model the optimum placement, channel assignments and radio power settings of Access Points to achieve best performance and mobility throughout your facility - both indoors and outdoors. What's more, this is all done in a three dimensional space, taking account of channel assignments on adjacent floors, so you eliminate co-channel interference problems that reduce performance and prevent seamless roaming.

You can define the coverage area you want, and specify capacity requirements in terms of active users, minimum bandwidth requirements, number of concurrent voice calls and so on, that you expect to support... and RingMaster does the rest, giving you a complete work order showing precisely where to place access points and how they should be configured for optimum results - A technician can literally use the work order as the instructions for physically installing all the Access Points.

This deployment plan becomes the basis for configurations and service profiles that are downloaded to Controllers and Access Points in clusters - not one at a time, reducing deployment and configuration time to a fraction of what it takes to set up other vendors' equipment. For the most granular control of bandwidth, you can even create bandwidth and QoS profiles at a per SSID or per user level. Once your network is operational, Trapeze provides the most comprehensive security alarms, and activity reports with extensive history so you can analyze roaming and utilization patterns. With Trapeze's powerful monitoring you have the information to troubleshoot connectivity problems quickly, and plan growth before it becomes urgent, while at the same time getting immediate visibility of rogue access points or other attempts to breach network security.