BADU networks

10 REASONS YOUR NETWORK NEEDS *Warp*Engine™

A Totally New Approach to Network Optimization
For WAN, Wi-Fi, 4G LTE and 5G Mobile Networks

1 Only WarpEngine Eliminates Today's Leading Cause of Throughput Collapse on WAN, Wi-Fi and Mobile Networks

The leading cause of network throughput collapse is jitter, common with today's streaming applications that transmit huge volumes of data in bursts, compounded by virtualization jitter from clouds hosting them, and RF interference, fading and channel access conflict over "last-mile" mobile and Wi-Fi connections. Network protocols treat jitter as congestion, slowing traffic to prevent data loss until throughput collapses, even when plenty of bandwidth is available. Traditional optimization relies on compression, deduplication, caching and congestion window management techniques that have some impact on bandwidth usage, but do little to prevent jitter-induced throughput collapse. Only Badu Networks' patented *Warp*Engine filters out the impact of jitter, delivering up to 10x improvements in performance and throughput on existing WAN, Wi-Fi and mobile networks, and future-proofs them for 5G.

2 Only WarpEngine Overcomes 4G LTE Performance and Throughput Challenges and Prepares Your Network for 5G

RF interference, fading and channel access conflicts frequently cause retransmission timeouts (RTOs) leading to jitter-induced throughput collapse in today's 4G LTE mobile networks. In the busy high-speed, small cell, low round trip time (RTT) networks planned for 5G, the impact of RTOs will be devastating, resulting in more jitter-induced throughput collapse than ever. Traditional network optimization does little to address it in today's 4G environment, and will be even less effective with 5G. Only *Warp*Engine algorithmically filters out the impact of jitter to maximize 4G throughput and performance today, and 5G in the future.

3 Optimize Wi-Fi Today and 5G FWA Tomorrow

Actual user experience in a Wi-Fi network is almost always impacted by RF interference, fading and channel access conflict that create jitter across the entire network path from the origin server, causing throughput to collapse and applications to stall. Only *Warp*Gateway, built on the same core technology as *Warp*Engine, filters out the impact of external factors that create jitter in today's home, office or large public Wi-Fi networks to maximize performance and throughput, and will do the same for tomorrow's 5G FWA.

4 Only WarpEngine maximizes return from existing infrastructure, avoiding the time and cost of network upgrades to increase bandwidth

Jitter-induced throughput collapse has nothing to do with available bandwidth. In fact, adding bandwidth often leads to increased incidence of jitter-induced throughput collapse. Only *Warp*Engine analyzes bandwidth available to each network session and prevents congestion management from reducing throughput when the problem is really jitter. That's why *Warp*Engine delivers up to 10X improvements in throughput and performance without any changes to existing infrastructure.

5 WarpEngine is the Most Effective Solution for Encrypted Traffic

Now that over 80% of internet traffic is encrypted, *Warp*Engine's unique technology and transparent proxy architecture make it unbeatable. *Warp*Engine doesn't rely on deduping and compression algorithms used by competing solutions that require access to the payload. This means *Warp*Engine eliminates the performance overhead of encryption/decryption at each endpoint, as well as the risk of exposing sensitive encryption keys to third party solutions.

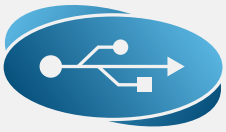
6 *Transparent Single Instance Plug-and-Play Deployment Delivers Maximum Flexibility at Minimum Cost*

Unlike WAN accelerators that require installation at each endpoint, significant configuration, and continuous monitoring, *Warp*Engine's technology is plug-and-play. It can be installed at a single location anywhere on the network as a hardware appliance, software module or VM, on-premises, in a cloud provider's environment, a cell tower base station, or between an access point and Wi-Fi router. No client application or server modifications are required and the overhead of supporting hardware and software at multiple locations is eliminated.

7 *Designed for Public, Private and Hybrid Cloud Deployments*

In the cloud, scheduling conflicts between VMs and hypervisor transfer delays create virtualization jitter that compounds jitter generated by the hosted applications. Only *Warp*VM, based on *Warp*Engine technology, prevents throughput collapse due to virtualization jitter in AWS, Microsoft Azure, Google Cloud, or any public, private, or hybrid cloud environment.

8 *WarpSDN Leverages WarpEngine's Patented Technology to Deliver SD-WAN that binds multiple links and optimizes them*



Most SD-WAN tools make decisions based on measurements at the edge to select the best performing link among broadband internet, dedicated MPLS, Wi-Fi, LTE, 5G or any other network transport - routing the highest priority traffic over the best performing connection at any point in time. While some SD-WAN solutions incorporate WAN optimization that reduces bandwidth usage for some types of traffic, they have little control over what happens after the link is selected. In contrast, *Warp*SDN takes the extra steps of binding multiple links to leverage their combined bandwidth, and optimizing each link's performance and throughput using patented *Warp*Engine technology.

9 *WarpEngine Is the Enabler for Mobile Edge and Fog Computing*

Emerging Mobile Edge and Fog Computing architectures are designed to support real-time applications with high speed wireless networks and locally cached content that distant cloud data centers can't effectively support, while filtering traffic between the edge and the cloud. This requires optimization that is both hierarchical and distributed to respond to ever-changing network conditions as traffic moves from one layer to the next, especially in short RTT, jitter-prone mobile edge networks used by IoT devices where the impact of RTOs can be devastating. *War*pEngine's transparent proxy architecture and ability to locally cache content, combined with *War*pSDN to respond to changing network conditions, and *War*pVM to address cloud virtualization jitter are required for this architecture to succeed

10 *WarpEngine is Required for a Complete, Future-Proof Network Optimization Strategy*

QoS tools are traditionally used to prioritize traffic and prevent packet loss. However, they can't guarantee performance and throughput in today's jitter-prone network environments where over 80% of the data is encrypted. The move to cloud, and the proliferation of IoT-enabled devices communicating over Wi-Fi, 4G LTE and small-cell 5G networks at the edge will intensify jitter's impact. To address this *War*pEngine tackles jitter head-on, algorithmically filtering out its impact to prevent throughput collapse for all types of traffic. With *War*pEngine, QoS settings can be relaxed as performance improves dramatically for all users, and you have a complete network optimization solution now and in the 5G future

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