

Observability and Controllability for Hybrid, Multi-Cloud Environments

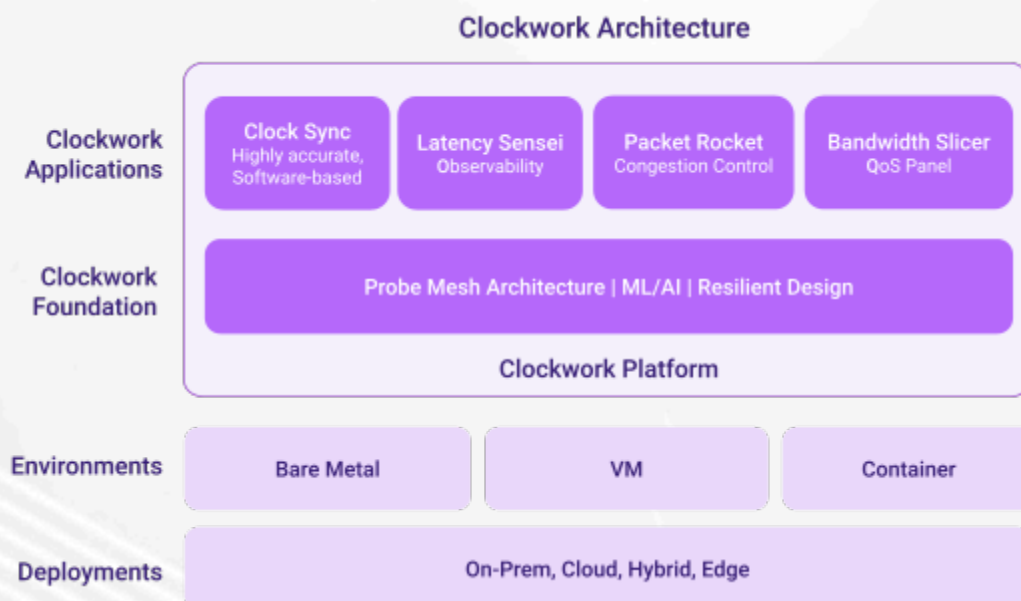
Gain fine-grained control and observability across on-prem data centers and multi-clouds

Delivering best-in-class user experience and performance to millions of users, while operating a complex hybrid, multi-cloud environment is no easy feat. Technical challenges impede performance, such as underperforming virtual machines (VMs), high latency and network jitter, as well as packet drops that can cause application-level delays and timeouts. Additionally, it's more difficult for infrastructure teams to monitor and remediate issues with disparate systems and inconsistent visibility across the various administrative domains.

Clockwork's Cloud Deluxe is a suite of software tools that provide a host-based network congestion control and monitoring system. It runs across on-prem data centers and multi-clouds to provide fine-grained control and observability. With Clockwork, reduce latency, eliminate almost all packet drops, and optimize network performance to lower costs and improve your user experience.

Clock Sync: Providing Foundational Architecture

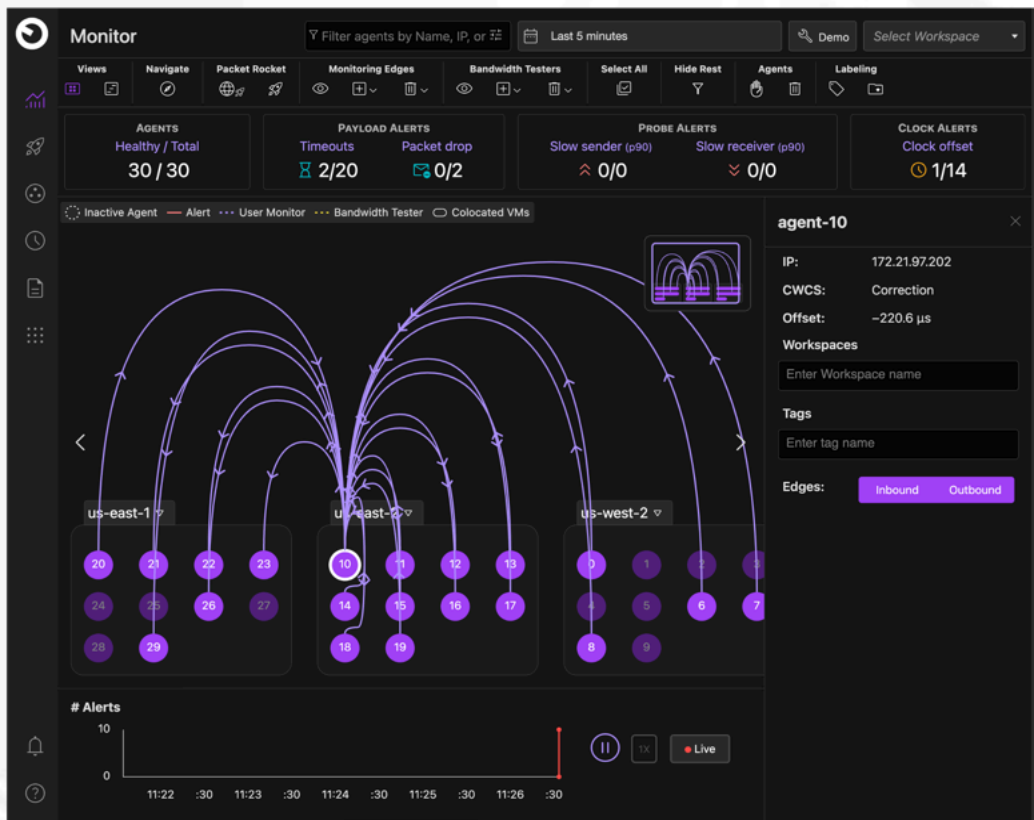
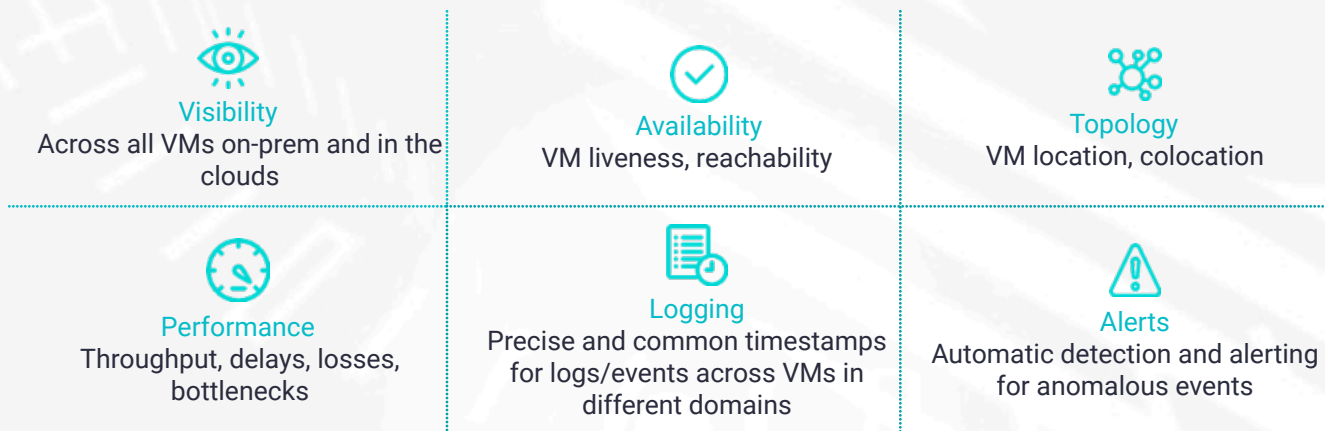
The key to Clockwork's innovative solution is highly accurate clock synchronization. By utilizing precisely synchronized system clocks, Clockwork's clock sync solution provides the technical foundation to enable a number of functions across your organization that rely on pristine common time, as well as underpinning Clockwork's own technology stack.



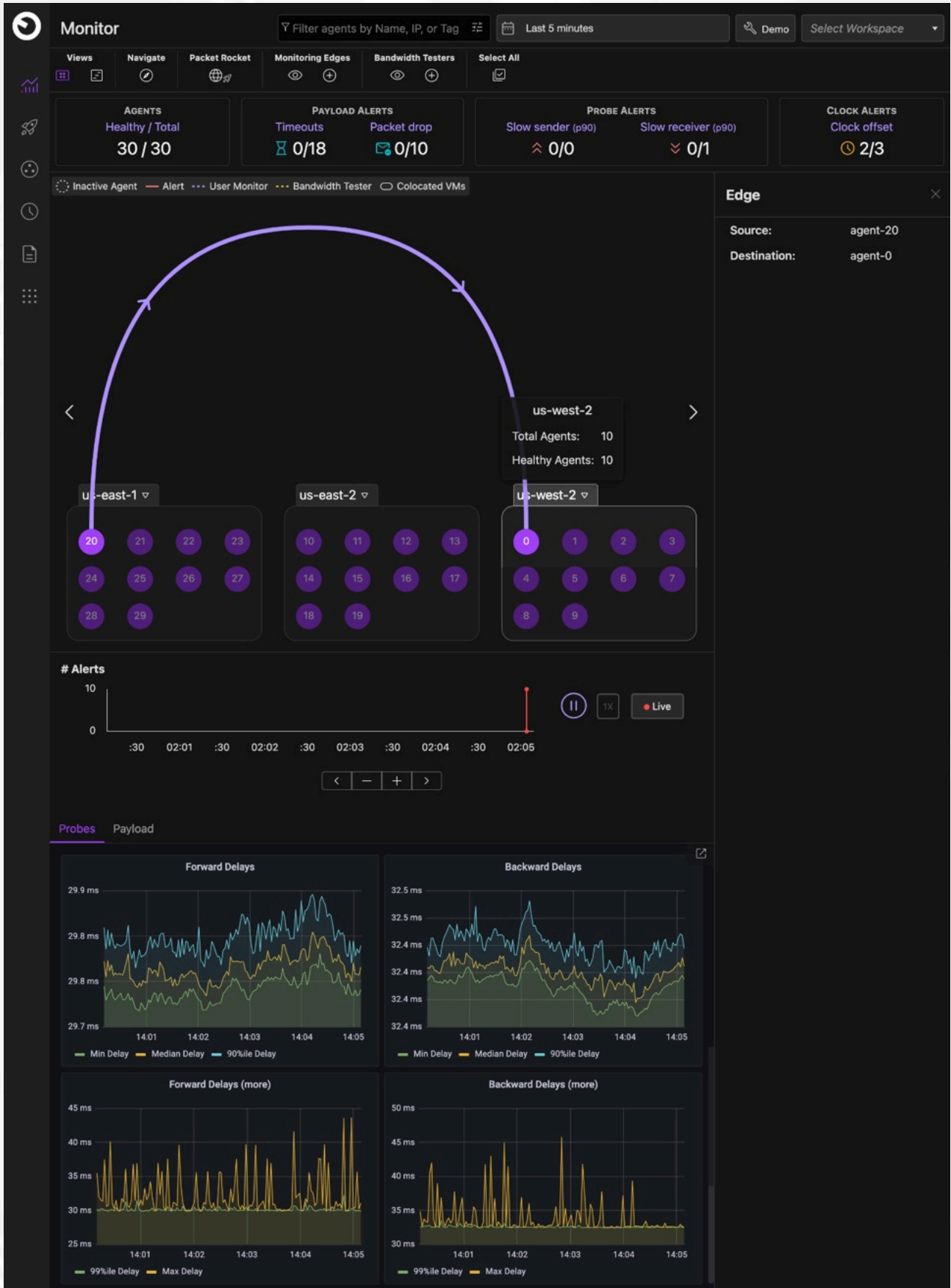
Latency Sensei: Network Observability without Network Support

Virtual computing offers many benefits to tenants who need to scale rapidly without the hardware overhead. However, outsourcing the network means the underlying infrastructure has become opaque: users cannot access the network elements connecting their virtual machines or computing resources and must simply trust their provider.

Regardless of how your environment evolves – single cloud, multi-cloud, hybrid, on-prem – Latency Sensei provides visibility and insight into your deployments so you can measure network latency and optimize application performance. Its low-overhead, always-on “probe mesh” provides 24/7 monitoring to provide real-time information on:



Derive insights and explore a digital replica of your cluster with a unique dynamic visualization.



Monitor cross-region (or cross-cloud) connections and measure one-way latency

Once you can infer and see the quality of your full network, the next step is to actually manage it. Clockwork goes beyond network **observability**, our solutions also provide **controllability**.

Packet Rocket: “Zero-drop” Congestion Control

Packet Rocket automatically reduces delays and jitter at the network edges, eliminating virtually all packet drops, and features dynamic configuration of bandwidth slices for apps/flows – without any network support or hardware upgrades.



High-impact

- ✓ Reduce request completion time
- ✓ Reduce network latency
- ✓ Reduce packet loss and retransmission



High-performance

- ✓ Scale up to 10s of 1,000s of nodes in a single installation
- ✓ 2-3x improvement in network performance tests (depending on traffic shape and network configuration)



High-flexibility

- ✓ Software-based solution that runs anywhere—from on-prem data centers to public clouds
- ✓ Requires no direct control of the network, like public cloud environments.

Results: Improve performance while reducing overhead


Low-latency applications and high-bandwidth applications can create tension in network infrastructure. For example, say an e-commerce website using a Kubernetes cluster needs low latency to ensure user happiness with quick transaction completion times.

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	Sunglasses SKU #OLJCESPC7Z	
Quantity: 1		\$19.99
Shipping		\$8.99
Total		\$28.98

Shipping Address

E-mail Address
someone@example.com

Street Address
1600 Amphitheatre Parkway

Zip Code
94043

City
Mountain View

State
CA

Country
United States

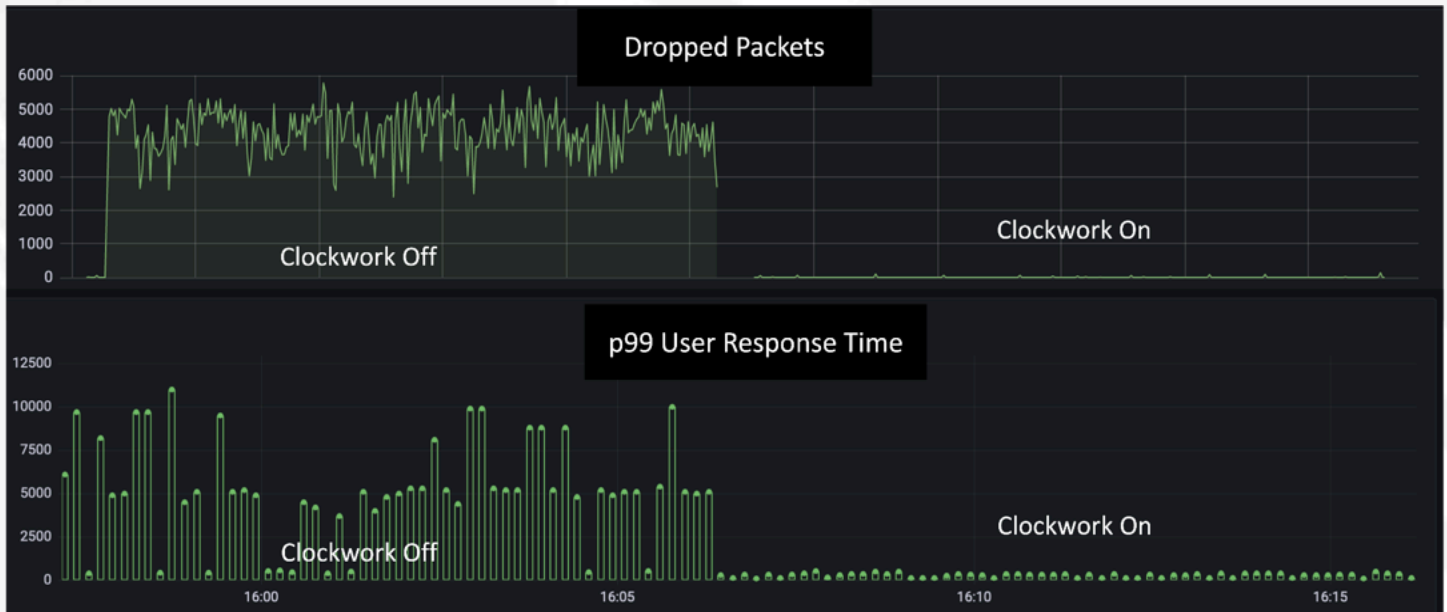
Payment Method

Credit Card Number
4432-8015-6152-0454

Sample e-commerce application

On the same network, large file transfers are taking place, requiring high bandwidth. This scenario is generally addressed by putting them on separate networks/links or requiring "autoscaling" of VMs/pods, both costly solutions in resources and operational overhead.

With Clockwork, both applications can coexist and remain responsive. In tests, network performance can improve by 2-3X (results vary depending on traffic shape and network configuration). Clockwork enables fast transaction completion time on the e-commerce application while ensuring fast and efficient file transfers.



Packet Rocket's results are beneficial for any user-facing application, such as ride hailing or delivery services, marketplaces, social networks, AI bots, etc. Provide best-in-class user experience, maintain critical workloads, and reduce costs.

Bandwidth Slicer: QoS Panel to allocate bandwidth

Part of Packet Rocket is Bandwidth Slicer, a QoS panel for dynamically slicing bandwidth across applications and traffic types. Easily create bandwidth slices with an intuitive software interface or via API where you can prioritize traffic and ensure critical applications have the necessary bandwidth for ever-changing workloads. No hardware configuration is required.

Bandwidth Slicer Configuration Panel

Configure Packet Rocket For Agent

Reporting: Detailed
This can only be modified through global settings

Platform: AWS
 Apply to global settings

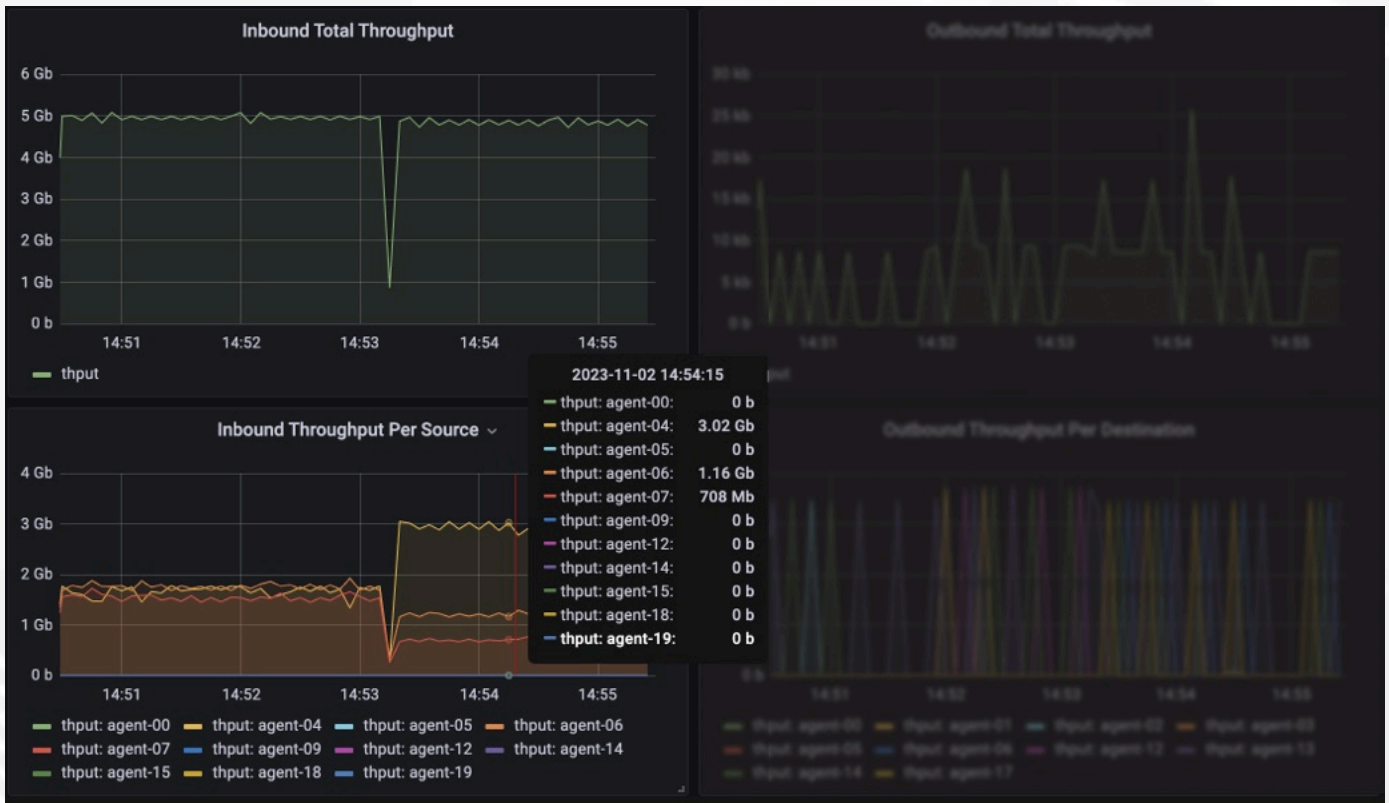
Bandwidth Slicing: On

Sender VMs	Target Bandwidth	Expiration Time
Ghost Buffer for all VMs (*excluding those set below)	4900 Mbps	mm/dd/yyyy, --:-- --
agent-04 x <small>IPs: 172.20.167.121</small>	3000 Mbps	11/02/2023, 10:30:40 PM
agent-06 x <small>IPs: 172.20.66.31</small>	1200 Mbps	11/02/2023, 10:30:48 PM
agent-07 x <small>IPs: 172.20.144.235</small>	700 Mbps	11/02/2023, 10:30:57 PM

Buttons: Cancel, Clear Agent Config, Apply

Dynamically configure bandwidth slices to prioritize competing workloads with a graphical user interface or via API

Bandwidth Slicer Results



Attain full bandwidth utilization with near-zero packet drops and consistent throughput

System Requirements

Clockwork software can be deployed in on-premises, cloud, edge or hybrid networks in minutes and across a broad range of computing environments, including bare metal, virtual machines, and containers. Get up and running quickly for all major cloud providers with just a few lines of code – no access needed to the underlying cloud infrastructure.

Operating Systems

- Ubuntu (18.04 and later), RHEL/CentOS (7 and later) and Debian(9 and later) with x86 64 Intel CPUs.
- Windows versions (please contact us for more details for Windows implementations)

Firewall Requirements

- Agents probe each other on inbound port 3190 using UDP
- Agents communicate with each other on inbound port 6171 using TCP
- Agents communicate with the Coordinator on port 6176 of the Coordinator using TCP.

Congestion Control Requirements

- Kernel module or eBPF support



To request a demo,
Contact us at **hello@clockwork.io**



About Clockwork.io

Founded by a team from Stanford University, Clockwork's technology enables time-sensitive applications in areas such as financial trading, high-tech, and online gaming. Being software-based, its solutions can run anywhere: in on-premises data centers, public clouds, or hybrid environments. Taking aim at the "clockless architecture" prevalent in distributed systems and networks, Clockwork aims to redefine a large part of the way these technologies (which underlie the cloud) are currently practiced. Learn more at clockwork.io.