



Stratusphere™ Solutions

***Deployment
Best Practices Guide***

Introduction

This guide has been authored by experts at Liquidware to provide a baseline as well as recommendations for a best practices deployment of the Liquidware Stratusphere™ product, the leading product for desktop Assessment, Validation, Monitoring and Diagnostics. This paper is intended for IT infrastructure and operations audiences who want an optimal experience when using the Stratusphere solution.

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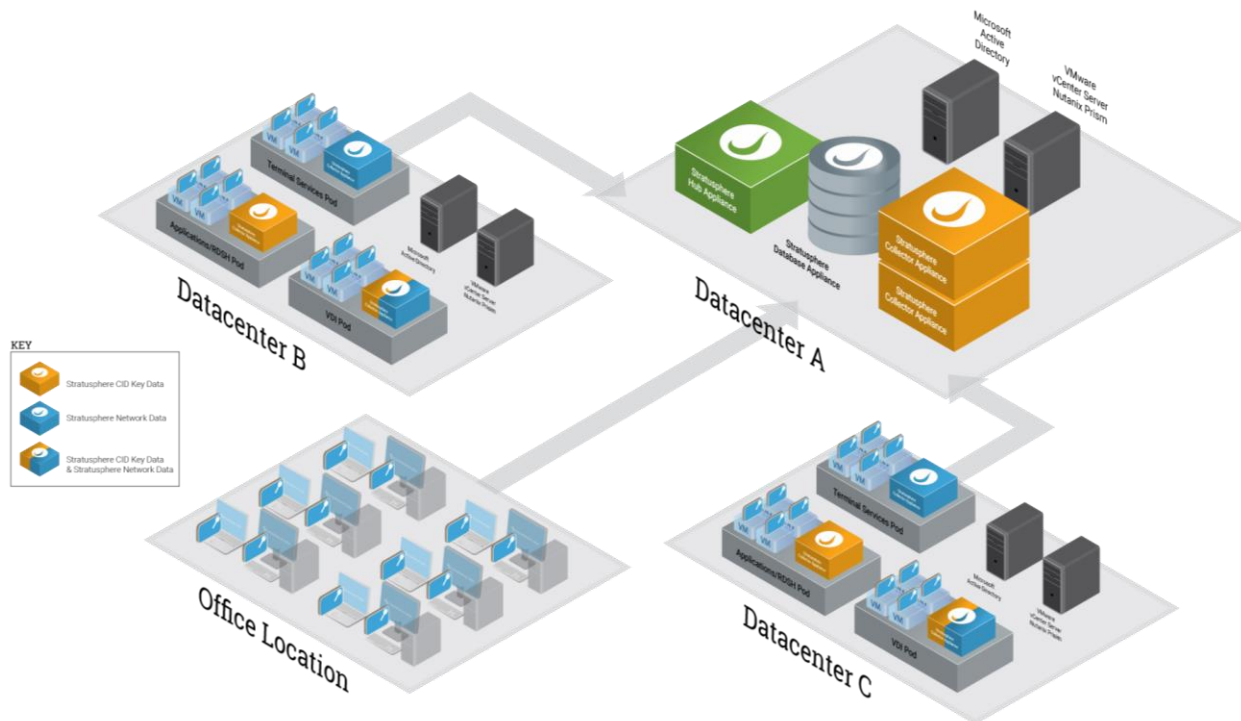
Product Component Overview

Stratusphere is certified for use with VMware, Amazon Web Services, Microsoft, Citrix, Nutanix, and KVM virtualization platforms, and is compatible with other desktop virtualization components such as third-party brokers. The product includes three virtual appliances (pre-packaged and self-contained VMs), the Stratusphere Hub, the Stratusphere Database and the Stratusphere Collector, and a software agent called the Connector ID Key that is delivered from the Stratusphere Hub.

- **Stratusphere Hub**—delivered as a virtual appliance (pre-configured VM), it provides the central policy management, policy distribution, data collection, reporting and alerting system for Stratusphere. The main interface is accessed through a standard web browser, and the virtual appliance also has a command line console for appliance setup and administration. Additionally, Stratusphere-collected metrics and information are also accessible via the Hub through a published API.
- **Stratusphere Database**—delivered as a preconfigured virtual appliance, it provides the central data storage option for the Stratusphere solution. This optional appliance is used for high performance architecture for larger number of desktop deployments. The Stratusphere Hub Appliance saves all the data it receives from other components into the database appliance.
- **Stratusphere Collector**—also delivered as a virtual appliance, serve two roles; to collect data from the software agent called the Connector ID Key and/or to sniff network connections for monitoring purposes. The CID Key Collectors are deployed in pairs for high availability and load balancing. They collect data uploaded by the CID Keys, validate it, and insert it directly into the database. Network Collectors are deployed as one per virtual host typically where virtual desktops reside. Connected to the virtual switch and configured for passive monitoring, it tracks network latency, response times and bandwidth consumption. Data collected by the Network Collector is enhanced by the user and machine information provided by the rarely used Advanced version of the Connector ID Keys. Network Collectors upload network monitoring data to the Stratusphere Hub which in turn inserts it into the database. Collector appliances are controlled and managed by the Stratusphere Hub.
- **Connector ID Key**—a small-footprint software agent that is employed to gather endpoint configuration and performance data from physical or virtual machines on which it is installed. Additionally, Advanced versions of the Connector ID Keys are also used to add tracking information to network connections, allowing detailed monitoring of network latency, response times and bandwidth consumption per machine and per user. Connector ID Keys are managed through the Stratusphere Hub. Versions are available for 32-bit and 64-bit Windows, Apple MAC OS X & macOS, as well as versions for RedHat, SUSE and Ubuntu Linux variants.

Architecture Performance

Here is a simple diagram of the Stratusphere Architecture:



The Stratusphere Hub Appliance serves as the starting point of the Stratusphere architecture. It acts as the front-end Web User Interface as well as the initial data collector for other Stratusphere sensors. The Hub Appliance works closely with the Database Appliance for storing and retrieving data for analysis, troubleshooting, alerting and reporting. When the number of machines being monitored goes above 500, Liquidware recommends using a Database appliance and if that number goes above 1000, a Database appliance is required. Liquidware also recommends that the Stratusphere Hub and Database appliances should be as close to each other as possible, preferably on the same virtual host for best performance.

When the number of machines being monitored by CID Keys go above 1,000 or if you want data being uploaded at a faster frequency, Liquidware also recommends using CID Key Collector appliances to reduce the load on the Stratusphere Hub appliance. Deploy the CID Key Collector Appliances in pairs for high availability and load balancing. Each CID Key Collector can handle around 5-10K CID Keys calling back every hour. The CID Key Collectors for performance reasons, insert data from CID Keys directly into the database bypassing the Hub thus freeing up the Hub to be the primary Web UI appliance. Stratusphere CID Key Collectors can theoretically be deployed anywhere within the infrastructure including the different remote data centers as displayed in the diagram above. But on an operational, performance basis, Liquidware recommends the CID Key Collectors to be deployed as close as possible to the Stratusphere Database appliance. The CID Key Collectors receive and validate CID Key uploads, then prepare it for database insertion with the necessary database identifiers for the machines, users, applications, etc. and thus need to lookup this information from the database. The closer they are to the database, the lesser the network latency they must deal with and the faster they can process incoming CID Key data. Also, depending on WAN/LAN bandwidth costs, the size of data uploaded by the CID Keys to the Collectors is smaller than the amount of data looked up and inserted into the database by the CID Key Collectors. Besides, the CID Keys communicate on a standard SSL port of TCP/443 that is almost universally available for communication through most firewalls. However, the CID

Key Collectors need to connect to the database on the Postgres port of TCP/5432 which is generally NOT open and accessible through the firewall in most organizations.

The Stratusphere architecture has two sensors - CID Keys and Network Collectors. CID Keys as mentioned above, upload their data to the Stratusphere Hub on a frequency configured within the Hub Web UI. If CID Key Collectors are deployed, the CID Keys are asked to upload their data to a list of CID Key Collectors instead of the Hub. The Hub is used as a fallback, in case the CID Keys cannot upload their data to any of the CID Key Collectors deployed in the list. Network Collectors as mentioned above, sniff network traffic based on policies from the Stratusphere Hub, collect network traffic stats, and unlike CID Key Collectors, upload their data to the Stratusphere Hub Appliance, which in turn then stored it the Database Appliance (if it has been installed).

It should be noted that the quantity of data collected by Stratusphere is variable, depending on factors such as CID Key call back frequency, number of machines being monitored, type of metrics being collected, and data retention policy. Similarly, the traffic captured by each Network Collector is also variable, depending on the type of monitoring policies specified and the number of connections observed within the environment. A “noisy” network environment will cause a significant increase in the amount of network traffic-related data to be captured by the Network Collector and stored by the Database Appliance.

Endpoint data collected by the CID Keys typically averages less than 100KB for each period of data collection. This data includes machine, user, application process, resource utilization, performance statistics, and other user experience-based metrics. In total, the information provides enough detail to offer visibility into past events, inclusive of the corresponding infrastructure that supports the environment.

Testing for Required Attributes

The Endpoint data & metrics mentioned above, are captured continuously and require an appropriate allocation of resources to ensure all Stratusphere components perform and meet reliability requirements. Liquidware conducts performance, reliability and scalability tests on the Stratusphere architecture at each major release of the product. These tests include the use of automated software tools to simulate sustained CID Key, CID Key Collectors and Network Collectors uploads to the Stratusphere Hub and Database Appliances. The health of the Hub Appliance, Database Appliance, and Collectors are monitored throughout testing to ensure all processes function as designed.

In addition, this testing also validates that all background maintenance tasks complete as designed and that all data is uploaded, extracted, and stored in the database in the most reliable and effective manner. For each of these tests, Liquidware closely monitors the CPU, RAM, Disk and IOPs utilization of each appliance and component to understand all requirements for production customer deployments. Liquidware has collected this data over time, based on internal performance testing and production deployments, to provide these deployment best practices and guidelines for large enterprise deployments.

In Stratusphere 6.0, Liquidware introduces Summarized, Rolled Up data tables for faster data querying performance and enabling longer data retention. This setting can be configured under the Administration section, by navigating to Hub Administration > Data Retention > Settings tab. The status and progress of each summarization, is displayed within the Event Log tab after each summarization is complete. In earlier versions of Stratusphere, all data was stored in detail format for the entire duration of the data retention setting. Thus, any time a user would query for data over a couple of days or week or more, the database query would have to process Gigabytes of information for each user or machine or applications. Obviously, this is a slow, time consuming, expensive querying mechanism. For 6.0, Liquidware introduces summarized rolled up data tables, that are created on a scheduled basis and populated

as data comes in from the sensors. Querying performance while looking for data over a couple of days or weeks or month or more now uses these summarized, rolled up data tables with drastically reduced record counts and much smaller sized datasets, thus providing much faster data query performance.

A very large percentage of our customers, use the default CID Key callback frequency of 60 minutes. If this is the setting in use, Liquidware does NOT recommend enabling the Hourly Summarized Rollup table because most of the data is already at an hourly resolution.

Resource Guidelines and Recommend Best Practices

The following represent deployment guidelines for the Stratusphere Architecture. Please note that these guidelines are broad and should be adjusted as resource utilization can vary depending on many factors such as number of machines being monitored, their callback frequencies, number of applications employed, network protocols monitored, etc. Liquidware strongly recommends using the its Online Sizing Guide to properly size the Stratusphere components for optimal operations.

In this example, we propose an architecture and supporting Stratusphere Architecture based upon an example environment comprised of two data centers, each with a single virtual desktop infrastructure cluster. Each cluster will be made up of 16 hosts, supporting 3,000 VMs per cluster. Overall, each data center will support 3,000 users, or 6,000 total global users. Data retention period for Stratusphere CID Key Detail data will be 30 days. Liquidware recommends enabling Stratusphere Summarized Roll-up Data for Daily, Weekly, Monthly, and Yearly time frames for enhanced performance and much longer data retention. Liquidware recommends about 60 days for Daily, 13 weeks for Weekly, 12 months for Monthly, and 2 years for Yearly Summarized, rolled up data.

To that end, the Stratusphere Architecture will include one Hub and Database pair. Liquidware recommends using 2 CID Key Collectors deployed as close to the Database appliance as possible. Although, a single CID Key Collector can handle up to 8,000 CID Key callbacks per hour, for high availability and load balancing, 2 CID Key Collectors are recommended. Additionally, 32 Network Collectors will be deployed, one for each host server.

Required resources for the Stratusphere Hub Appliance will be:

Estimated Resources for each Hub Appliance	
Central Processing Units	4-6 vCPUs
Memory	24-32 GB vRAM
Storage HDD1 (OS)	Default (20 GB)
Storage HDD2 (Swap)	24 GB
Storage HDD3 (DBMS)	20 GB
Storage HDD4 (Upgrades)	Default (10 GB)

The Stratusphere Database Appliance will require:

Estimated Resources for each Database Appliance	
Central Processing Units	6 vCPUs
Memory	32-64 GB vRAM
Storage HDD1 (OS)	Default (10 GB)
Storage HDD2 (Swap)	Default (8 GB)
Storage HDD3 (DB)	2817 GB
Storage HDD4 (DB Temp)	2817 GB
Storage HDD5 (DBX Log)	8 GB

The two (2) Stratusphere CID Key Collector Appliances will each require:

Estimated Resources for each Network Station	
Central Processing Units	2 vCPUs
Memory	4 GB vRAM
Storage	Default (5 GB)

The thirty-two (32) estimated Stratusphere Network Collector Appliances will each require:

Estimated Resources for each Network Station	
Central Processing Units	1 vCPUs
Memory	768 MB vRAM
Storage	Default (5 GB)

Recommended Stratusphere Architecture Settings

To support the above reference design, there are many considerations and settings that should be closely monitored to ensure adequate performance and availability of related resources. Please note, the above Stratusphere components have been sized with the following are recommended settings in mind.

Hub Administration > Configuration tab:

- Liquidware recommends using SMTP Mail Relay servers to receive scheduled Administration Reports that would provide warnings or status updates of all Stratusphere Components. Please enter relevant SMTP Mail Relay Server information along with a default From & To address under the Hub Administration > Configuration tab within the Administration section of the Web UI.
- Please select the correct Time Zone of the Hub at the very beginning of the installation. When Summarized Roll-up information tables are enabled, these tables are created in the Hub's time zone to provide the fastest query performance. Changing the time zone on the Hub, would cause the summarized, roll-up tables to not match the new time zone, and it would trigger creation of new summarized, roll-up data based on the new time zone. Summarized, roll-up tables are created based on detail CID Key callback data when it is received. If this detail data is purged due to age or disk space thresholds, this information can no longer be rebuilt from detail if the time zone of the Hub is changed later. This would result in a loss of longer term summarized, roll-up information already generated until that point in time.
- Liquidware recommends using the Stratusphere Online Sizing Guide to determine appliance configuration for vCPUs, RAM, and disk space. The sizing guide provides information on space requirements for storing detail and rollup information for the number of days this information needs to be stored.

Hub Administration > Data Retention tab:

- By default, Stratusphere does NOT have an age threshold set for data retention.
- The disk space threshold will determine when the database will need to purge the oldest data.
- On new installations, Stratusphere does have some defaults for enabling summarized, rolled up information. Please use the sizing guide to determine how to configure the retention thresholds for summarized information as they do take some disk space, albeit smaller than the detail callback level data.

- The disk space threshold is the fail-safe mechanism to keep the collection of data going. Since the Database appliance has a separate temporary space for running queries, the default space threshold can now be set to 80%.

Hub Administration > Connector ID Keys > Connector ID Key Properties tab:

- For most users, the default settings for the Connector ID Keys to call back at 1-hour callback frequency with a 5-minute inspection sample interval will work optimally. Liquidware recommends using the Stratusphere Online Sizing Guide to determine the space requirements that can change based on callback frequencies. Changing the sampling frequency down from 5 minutes, will not cause a significant uptick to the space requirements.
- Liquidware recommends collecting data from a machine all the times instead of only when a user is logged in. In most operating systems, there are automated and scheduled tasks that take up resources regardless of whether a user is logged in or not. If these tasks take up significant resources at the same time, when no users are logged in, on a shared virtual platform, visibility of what was going on would be lost if CID Keys were only configured to collect data only when users are logged in.
- CID Key process inspection will be limited to top 20 percent of all processes by usage. Usage will be determined in the categories of CPU, Memory, Disk IO and application load times. When troubleshooting or performing diagnostics on a targeted group or users/machines, this value can be temporarily set to 100 percent, as needed by machine groups.
- Collecting file and folder count and size information is recommended only for Physical Desktop machines prior to any kind of data and profile migration to virtual desktops.
- If using remote sessions to virtual desktops or similar, only then consider enabling the Trace Route metric collection. Additional, enable these metrics only if there is a need to identify and trend the latency on each hop, IP Address of each hop, DNS name of each hop, ping, and jitter of the remote session over time.
- Enable Login Process Breakdown to get detailed timeline of the steps, events and processes that take place during a login. It will help make sure the machines have the right domain controllers, policies, settings, and detail how much each step within the login takes.
- If you require browser metrics, only then Enable Browser metrics to understand each tab, URL, domain, and host accessed by the user on Microsoft Internet Explorer and Google Chrome (extension required).

Hub Administration > VM Directories tab:

- Liquidware recommends adding any VMware vSphere or Nutanix Prism VM Directories to Stratusphere to import and sync the inventory of machines & groups along with metrics from these repositories as well.
- Use default statistic import interval along with the sampling interval for most cases.
- Liquidware recommends using the IMPORT STATISTICS FOR ALL VIRTUAL MACHINES to get detailed, trendable, metrics for all virtual machines regardless of whether they have the CID Key installed or not.

Hub Administration > Directories tab:

- Liquidware recommends adding all users detected by the CID Key to the Local Directory within Stratusphere.
- While User Groups and Machine Groups can also be created within Stratusphere, any existing LDAP compliant Directory such as Microsoft Active Directory can be synced to Stratusphere as well.

However, it is very important to only import groups that would be useful from a reporting perspective, because there may be thousands of groups that exist within AD which if imported would defeat the purpose as there would be lots of groups to pick from while filtering for reporting.

Recommended Best Practices

In addition to the above noted Stratusphere resources, the following infrastructure best practices should be considered to maximize scalability and performance:

- Disable VMware vMotion and Distributed Resource Scheduler (DRS) features for the Stratusphere Hub and Database Appliances.
- Set resource affinity rules to ensure that the Stratusphere Hub and Database Appliances are always on the same virtual host always.
- If Network Collectors are deployed, disable VMware vMotion and DRS for the Network Collectors appliances. Also, set resource affinity rules to ensure that the Network Collector is always on the same virtual host that it is supposed to monitor and is not being moved around automatically or by an Administrator that does NOT know about the Network Collector's function and usage.
- The Stratusphere Database Appliance requires significantly higher sustained IOPs and should be deployed on a high-end data store with low IOPs contention.
- If the number of CID Key callbacks is above 5,000/hour, Liquidware recommends using SSD storage on the Database HDD#3 and HDD#5 for performance reasons.
- The Stratusphere Hub and Database Appliances are major server-class virtual appliances. In production environments, they should be deployed in your server host cluster, and NOT within the desktop host cluster.
- If CID Key Collectors are deployed, Liquidware recommends using them in pairs to start with and add to them as the callbacks per hour grow. So even if there less than 8,000 callbacks/hour, Liquidware recommends using 2 CID Key Collectors for high availability and load balancing among the Collectors. These two CID Key Collectors will work until the callbacks/hour are below 16,000. If the callbacks/hour are over 16,000, use 3 CID Key Collectors.
- Liquidware recommends deploying CID Key Collectors as close to the Database Appliance as possible. The CID Key Collectors receive data from the CID Key, validate the integrity of the data, and then need to process it by adding identifiers for machines, users, applications, etc. These identifiers are looked up within the database, then assigned to the data before it is inserted into the data in the most efficient copy-in format for performance and efficiency. If the CID Key Collector is closer to the Database, it will reduce the latency of looking up for information. Also, from a bandwidth usage perspective, the CID Keys calling back to a Collector on TCP/443 use approximately about 100KB of data. The Collector when storing this information, after converting it into the database format and adding identifiers for every element, uses double the bandwidth to save this information. Additionally, from a security perspective, the CID Keys use a standard SSL port (TCP/443) which is available in most organizations for communication purposes. However, the CID Key Collector uses TCP/5432 to connect to the Database and store/retrieve data. This port, in most organizations, will not be available and open through most firewalls.

Getting Help with Stratusphere

If you have questions or run into issues while using Stratusphere, Liquidware is here to help. Our goal is to provide you with the knowledge, tools, and support you need to be productive.

Using Online Resources

Liquidware maintains various kinds of helpful resources on our [Customer Support Portal](#). If you have questions about your product, please use these online resources to your full advantage. The Support Portal includes product forums, a searchable Knowledge Base, documentation, and best practices among other items. You can visit our website at <http://www.liquidware.com>.

Contacting Support

If you wish to contact our Support staff for technical assistance, please either log a request on the [Liquidware Customer Support Portal](#) or give us a call. Prior to Logging a Case you may want to review these helpful tips:

- Check the Product Documentation included with your Liquidware Product.
- Try to see if the problem is reproducible.
- Check to see if the problem is isolated to one machine or more.
- Note any recent changes to your system and environment.
- Note the version of your Liquidware product and environment details such as operating system, virtualization platform version, etc.

To speak directly with Support, please use the following numbers:

Toll Free in USA & Canada:	1-866-914-9665
International:	+ 1-678-397-0460