



BRYCK® Platform 2.0

User Guide



About

This document is a roadmap to establish successful business growth. It depicts the new journey you need to follow. We have tried to make the guide interesting and very easy to read. It is designed to provide efficient practices and key performance indicators.

It will clarify and strategize the business to achieve maximum profitability. We have categorized it in various segments for an easier and better understanding.

It consists of the market analysis for the product which will help the user to divide their market segments and focus on the prospects which have higher chances to convert into leads and hence achieve customer closure. It summarizes the complete sales process, strategies, resources, and messaging and is a complete guide for successfully closing the sales deal.

Author of Document

Tsecond Inc.

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1 System Overview

The second system is a high-performance enterprise portable data platform that enables customers to:

- Capture and store massive data at various types of edges including mobile edges
- Process the data at a very high speed over a standard network file system interface while capturing
- Physically transport the data securely and cost-effectively between two points

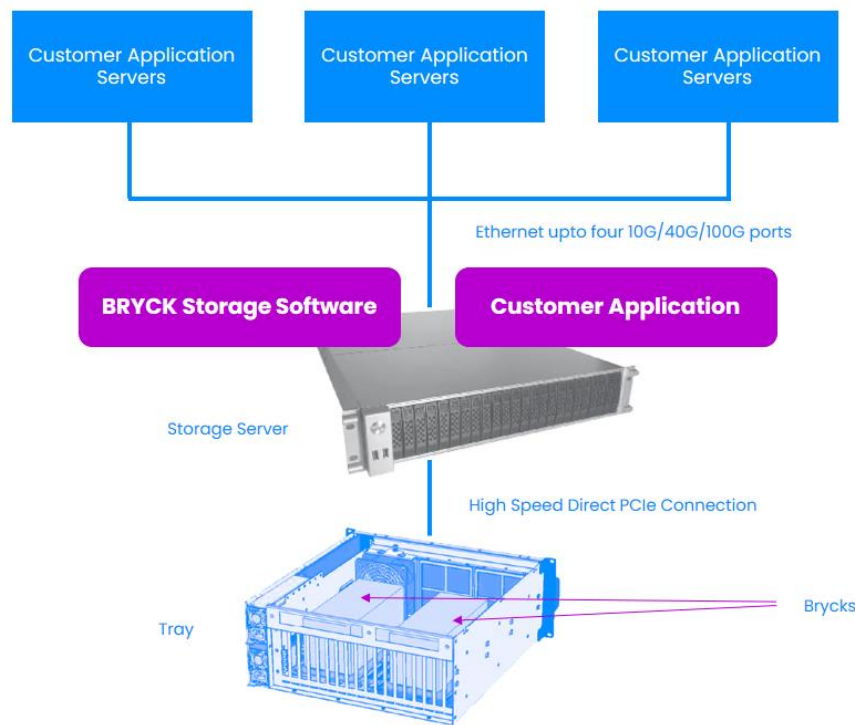


Figure 1: BRYCK platform

1.1 BRYCK

BRYCK is a rugged, small form factor (4" x 4" x 9.5"), high-density, and high throughput physically transportable hot-pluggable storage device. For the BRYCK to be operational, it is inserted into the Tray through high-speed connectors. BRYCK is the only transportable component in the system.

1.2 Tray

The tray is a 4U rack-mountable and airborne deployable rugged system. It is permanently fixed within the deployed infrastructure. Tray functions as an adaptor to the BRYCK that bridges BRYCK and the storage server over high-throughput connectivity.

The Tray contains a simple mechanism for easy insertion/removal of the BRYCK. The mechanism latches the BRYCK and makes sure that the BRYCK is operational in high vibration environments.

Tray connects to the storage server over two direct-attached high-speed PCIe 4.0 x 16 cables.

1.3 Storage server

The storage server is a standard size server optimized for data and compute-intensive applications. It runs Tsecond's BRYCK storage software stack along with customer applications. Customer applications running in the server access BRYCK directly at a very high speed over the BRYCK file system.

The storage server contains up to 4 100G Ethernet ports that enables remote applications to access the BRYCK storage over the network through network file system access protocols.

The storage server connects to the Tray over two direct-attached high-speed PCIe 4.0 x16 cables.

The storage server is an optional deliverable from Tsecond. Customers can use a server of their choice as a storage server.

1.4 BRYCK Storage Software

BRYCK is a self-healing and high-throughput storage software designed to enable various workloads ranging from traditional data access to advanced data analytics to run several times faster. It provides plug and play data portability on top of advanced storage functionalities. It guarantees end-to-end data consistency and data security while it is operational as well as during transport. It protects data from various types of failures and self corrects them at run time.

It provides high-speed storage access to external application servers through NFS over Ethernet and to local applications over the local file system

The storage stack software is a high-speed data upload/download application to transfer massive data to/from BRYCK in a very short time.

1.5 Customer Application Servers

These are the existing customer-owned application servers that are already operational in customer's infrastructure. Tsecond does not deliver them. The Application server accesses the BRYCK data over standard file system protocol SMB and NFS.

2 Typical BRYCK deployment

The figure 1.1 shows, typical BRYCK platform deployment. The BRYCK platform is deployed at Edge and at data centers. BRYCK enables customers to capture big data from their edge applications and process it high speed while capturing. Customers physically transport the BRYCK from Edge to datacenter for long term processing. At datacenter, they either process the data directly from BRYCK or upload the data from BRYCK to a datacenter storage and transport the BRYCK back to edge for further data collection.

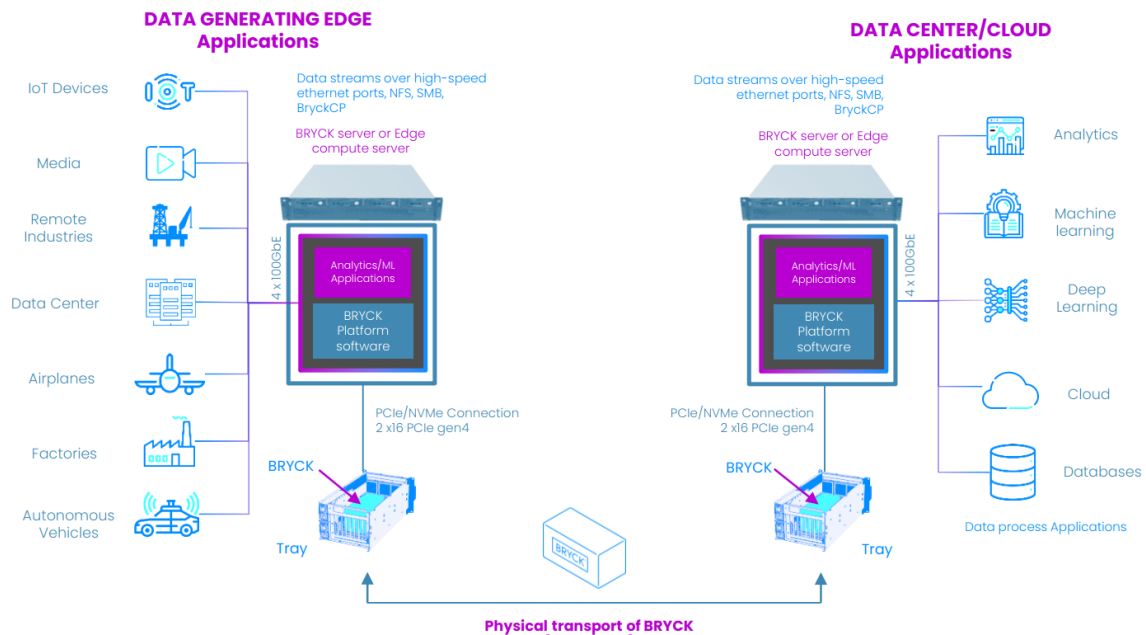


Figure 1.1: Typical BRYCK deployment

3 Product Features

This section describes the core features of the product

3.1 High performance and high-density storage:

BRYCK is a high-performance, low latency NVMe flash storage designed to run data-intensive applications such as analytics several times faster. A self-healing system automatically detects/corrects the error and provides end-to-end data consistency. The design philosophy behind the BRYCK storage is to create a storage architecture that can capture/store/process massive data with high-throughput, easy data transportability, simplicity and feature set of network-attached storage (NAS).

The raw capacity of the BRYCK ranges from 64TB to 1PB.

3.2 Transparent integration with applications:

Windows, MAC, and Linux applications servers transparently access the BRYCK storage over standard storage protocol NFS.

3.3 Data transportability:

BRYCK is a rugged, small form factor and high throughput storage designed to be deployable in a variety of scenarios ranging from traditional data centers to airborne systems. The lightweight of the BRYCK enables the transport of petabytes of data at a fraction of the cost compared to the network transfer. The BRYCK platform guarantees end-to-end data consistency during physical data transport.

3.4 Upload/Download of large datasets in very short time:

Customers can upload/download 100s of TBS of data within a few hours. The product implements a high-speed data transfer application called BryckCP. Customer installs BryckCP in the application servers and uploads/downloads data at high-speed using it.

3.5 Automated error detection and correction:

BRYCK platform detects data errors at runtime and corrects them automatically at runtime without any manual interruptions. The error correction is done transparently to applications.

3.6 Data security:

The BRYCK platform encrypts data in transit at high speed. It uses hardware acceleration for fast encryption/decryption performance as well as optimal CPU utilization.

3.7 Simple Management:

The BRYCK platform supports simple WEB and REST-based configuration and management. The WEB interface is designed to enable users to perform any operation within few clicks.

3.8 BRYCK SDK:

The BRYCK platform provides simple python APIs for BRYCK management from customer applications. With the APIs, an application can detect/mount/eject/format/erase the BRYCK.

3.9 Flexible Storage BRYCK capacity:

The BRYCK is configurable based on the use case requirements. The raw capacities supported by BRYCK are 64TB, 128TB, 256TB, 512TB, 1PB

3.10 Operating systems:

BRYCK supports Oracle Linux 7.9 and Ubuntu 18.04

4 BRYCK platform Deployment

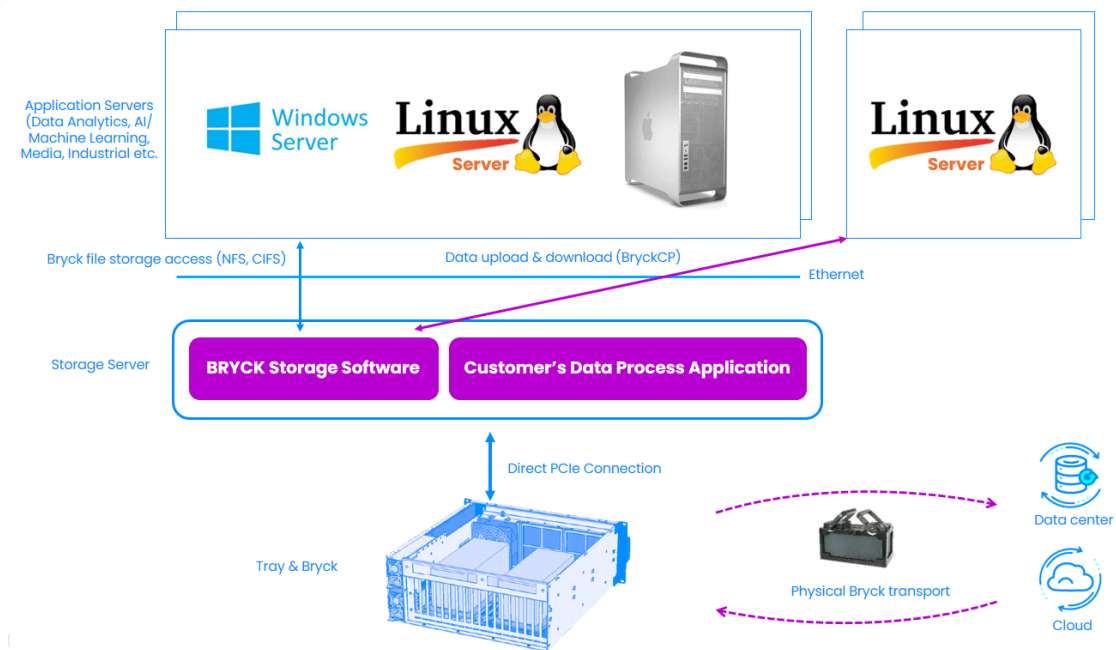


Figure 2: BRYCK platform deployment

The Figure 2 shows a typical deployment scenario for BRYCKs.

BRYCK and Tray are rugged and deployable in variety of use cases ranging from typical data center racks to autonomous vehicles and airborne systems.

The BRYCK storage software provides NFS file storage access to BRYCK over Ethernet. The BRYCK platform transparently integrates with Linux, Windows, and MAC applications. BRYCK storage's high throughput data access enables data-intensive applications to run several times faster than the existing solutions.

Customers can use BryckCP data to transfer large datasets to/from BRYCK at high speed. BryckCP is Tsecond's high-speed data transfer application to upload/download large data quickly.

The BRYCK is a hot-pluggable plug and play device. Customers can remove the BRYCK after data processing and transport it to the remote destination cost-effectively thanks to its small form factor and lightweight.

5 Installation

To successfully install the Tsecond BRYCK platform, one must follow the steps mentioned below:

1. Install the Tray (4U) into a datacenter rack or place it on a desk
2. Install the Storage server (2U) into a datacenter rack or place it on a desk
3. Connect PCIe ports of Tray and server as described in the quick start guide
4. Connect the management and data Ethernet ports to the network switch in your infrastructure
5. Connect the power cables of the server to 120V power outlet
6. Connect the Power cables of the Tray to 120V power outlet
7. Insert the BRYCK into the Tray
8. Turn ON the Tray
9. Turn ON the server
10. Power requirement: **Storage Server:** Max 1000 watts | **Tray with BRYCK:** Max 800 watts

5.1 BRYCK Insertion

The BRYCK is a hot-pluggable device. User needs to perform the following steps to insert a BRYCK into the Tray.

1. Open the top cover of the Tray
2. Insert the BRYCK into the chamber with orientation matching the arrow marks in the BRYCK to the Tray as shown in the Figure 2.
3. Close the top cover of the Tray
4. Login to the web UI
5. Navigate to "Bryck Storage" tab
6. Scan the Bryck to detect the inserted Bryck

5.2 BRYCK Ejection

User needs to perform the following steps to eject a BRYCK from the Tray.

1. Login to the web UI
2. Navigate to "Bryck Storage" tab
3. Eject the Bryck if the Bryck is not already ejected
4. Open the top cover of the Tray
5. Unfold the two handles of the BRYCK to unlatch it as shown in the Figure 3 and lift the BRYCK with both the hands
6. Close the top cover of the Tray

6 BRYCK platform Management

The Tsecond BRYCK platform provides a simple web-based management interface to configure and manage the BRYCK storage.

The BRYCK platform management consists of the following functional categories:

BRYCK storage configuration

BRYCK storage configuration consists of format, erase, eject and mount

Format

The format operation formats the BRYCK with BRYCK file system and with the specified data protection, data consistency, encryption settings and performance profile. The BRYCK contents are deleted during the formatting operation. After the formatting operation is completed, the BRYCK is accessible locally and over the network through NFS.

Eject

The eject operation logically ejects BRYCK from the usage. The user must complete the eject operation before physically removing the BRYCK from the Tray. The eject operation makes sure that in-flight data is flushed to the BRYCK. The BRYCK data is not accessible after it has been ejected.

Mount

The mount operation is performed to mount an ejected BRYCK for application's use. If the BRYCK is encrypted, the mount operation prompts for the key used during the format.

After the mount operation is completed, the BRYCK is accessible locally and over the network through NFS.

Erase

The erase operation securely erases the content of the BRYCK. The BRYCK data is not completely lost after an Erase operation.

Data transfer

The web interface allows users to initiate data transfers from BRYCK to an external NFS storage or vice versa. The User mounts one or more external NFS storage to the storage server first and initiates data transfers between the mount points and BRYCKs. The web interface shows the progress of the transfers. This method of data transfer to/from BRYCK is slow. For fast data transfer, Users can download BryckCP client packages to their systems and initiate the transfers using it.

System settings

The system settings allow users to view the system metrics, configure IP addresses and upgrade software and firmware.

Dashboard

The Dashboard shows the state of the BRYCK, server and the Tray, along with the current throughput of the system.

Messages

The BRYCK platform logs all the user-initiated actions and system events. Users can monitor and search for a specific event through a simple web interface.

Analysis

The BRYCK platform displays operational metrics of the system such as throughput, resource utilization, etc. in the form of charts.

6.1 First time network configuration

To configure the system management network for the first time, one must follow the steps mentioned below:

1. Connect a laptop directly to the RJ45 **service or mgmt** port of the server
2. Configure the network interface of the laptop with the static IP 172.16.1.10 and net mask 255.255.255.0
3. Start a web browser on the laptop
4. Set a web browser location to 172.16.1.2 This will load the Tsecond web page.
5. Login to the web interface (Username: admin, Password: password)

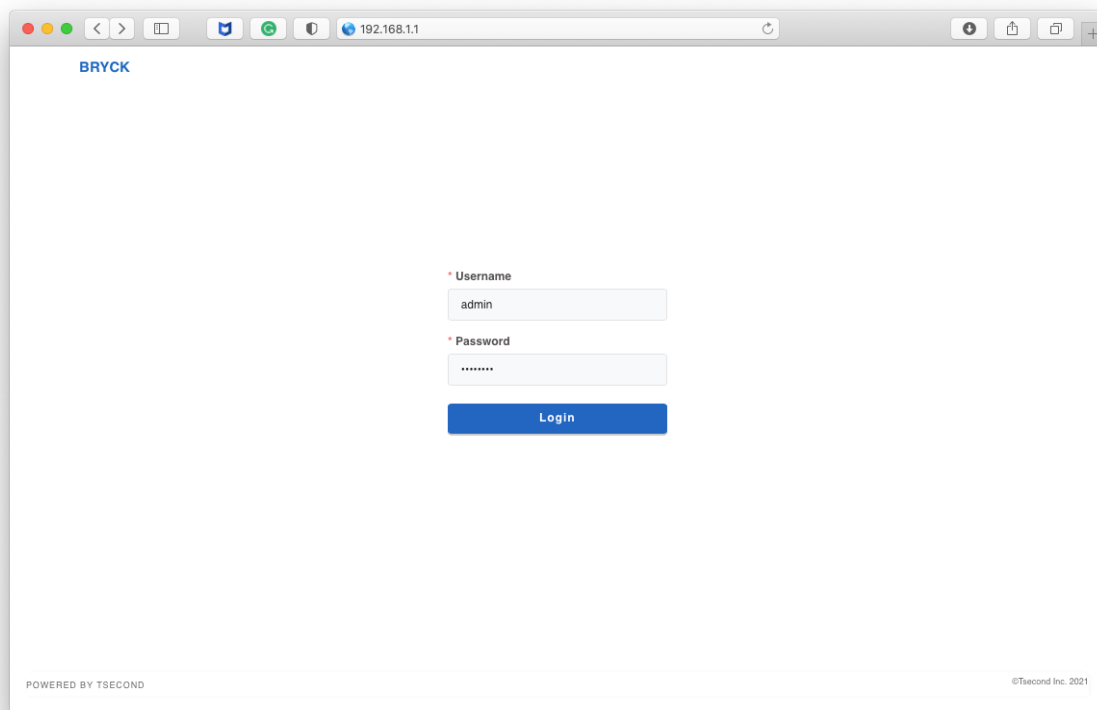


Figure 3: BRYCK web login

Upon successful login, BRYCK web displays the dashboard as shown in Figure 4. The dashboard shows the state of the BRYCK, Server, and Tray, along with throughput of the system as separate widgets. The state and throughput widgets are updated at run time.

The BRYCK widget shows the connectivity state of the BRYCK and the storage usage. The server and Tray widget shows the link status of the connectivity between Tray and the server.

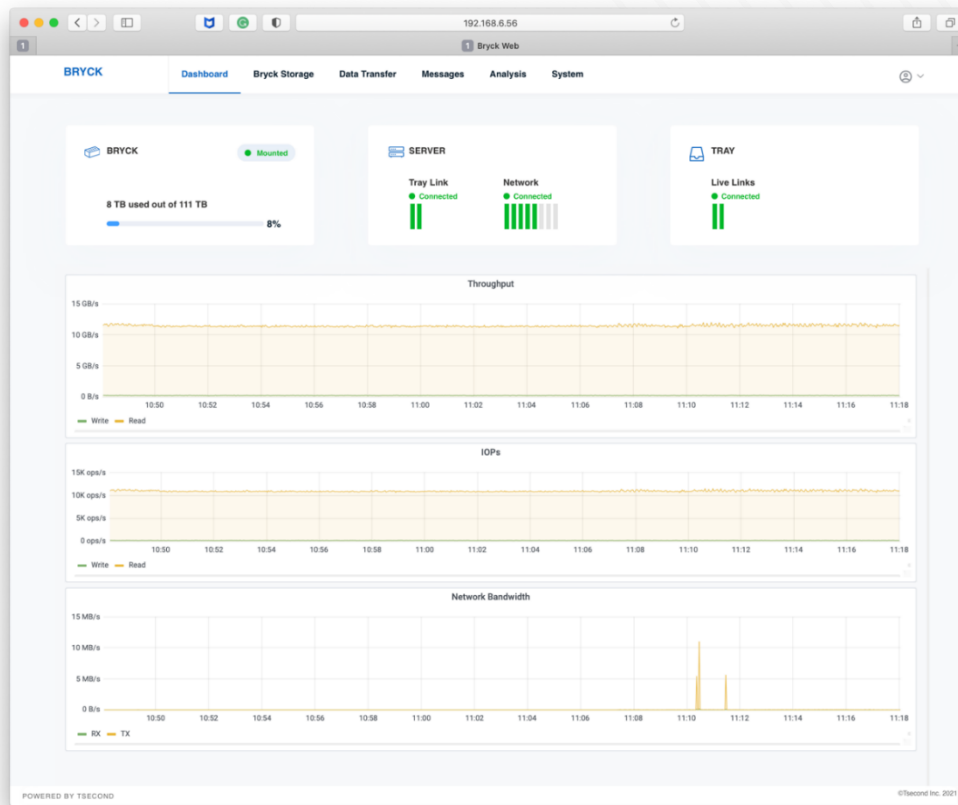


Figure 4: Dashboard

To configure the IP address of the management and data interfaces, navigate to the 'System' page, then click 'network', and select the interface "enp65s0f0" from the 'Interface' drop-down menu as shown in Figure 5.

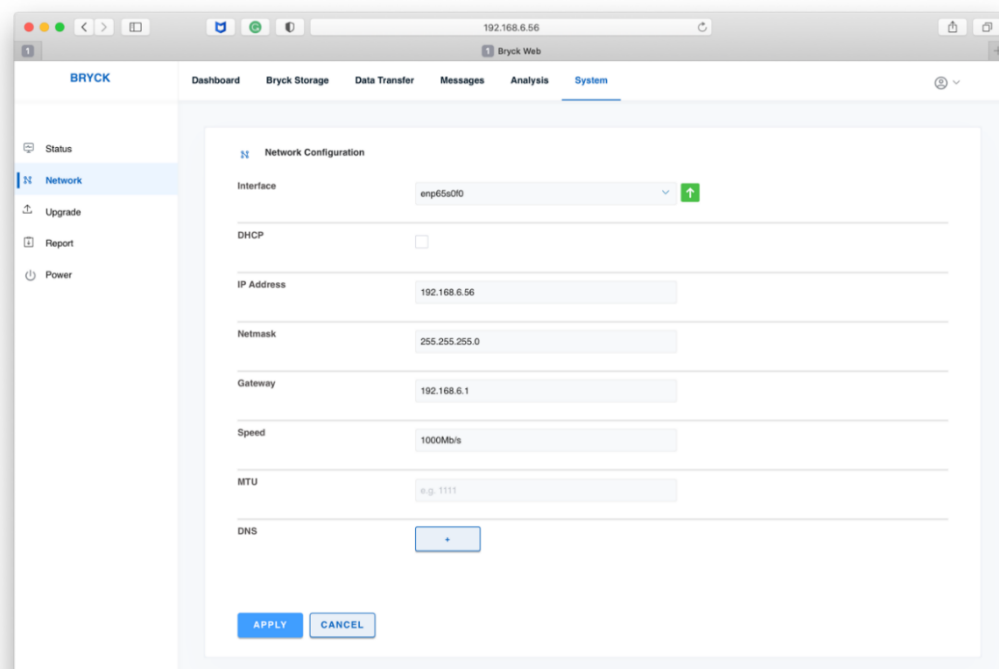


Figure 5: IP configuration

After the desired IP addresses are configured, disconnect the laptop from the service port and reset the IP address of the corresponding laptop interface back to your local network IP policy.

The BRYCK web interface is now accessible on the Management IP from your laptop.

6.2 100GbE network configuration

The storage server may consist multiple ethernet ports for high-speed data access. To configure the IP address for the ports, navigate to the 'System' page, then click 'network', and select the interface name the 'Interface' drop-down menu as shown in Figure 5.

6.3 Bonding setup

Oracle Linux command line interface shall be used to configure advanced settings for storage server such as bonding, security, firewall and so on. To configure bonding, login to storage server as admin user through a KVM console or SSH and run the following commands in the Linux prompt

```
$ sudo ifdown ens22f0
$ sudo ifdown ens22f1
$ sudo ifdown ens23f0
$ sudo ifdown ens23f1
$ sudo nmcli con add type bond ifname bond0 bond.options "downdelay=5,miimon=100,mode=balance-rr,updelay=10"
$ sudo nmcli con add type ethernet ifname ens22f0 master bond0
$ sudo nmcli con add type ethernet ifname ens22f1 master bond0
$ sudo nmcli con add type ethernet ifname ens23f0 master bond0
$ sudo nmcli con add type ethernet ifname ens23f1 master bond0
$ sudo ifup bond-slave-ens22f0
$ sudo ifup bond-slave-ens22f1
$ sudo ifup bond-slave-ens23f0
$ sudo ifup bond-slave-ens23f1
$ sudo nmcli con mod bond-bond0 ipv4.method manual ipv4.address {IP address}/{subnetmask} gateway {gateway IP}
Example: IP without gateway
sudo nmcli con mod bond-bond0 ipv4.method manual ipv4.address 172.16.10.1/24
Example: IP with gateway
sudo nmcli con mod bond-bond0 ipv4.method manual ipv4.address 172.16.10.1/24 gateway 172.16.10.254
$ sudo nmcli con up bond-bond0
```

6.4 Format BRYCK

The format operation is the first operation to be performed on a Tsecond BRYCK platform during installation. Format operations set up a BRYCK file system with desired data protection, encryption and performance profiles.

To format a BRYCK, navigate to 'BRYCK Storage' and click 'Format', enter the desired formatting settings, and then click 'Save'.

The following settings are used during the formatting process

- Description: Optional user-defined string to describe the use of the BRYCK
- Encryption: Enable/disable data encryption
- Encryption Key: A file containing 256bit key for AES encryption
- Protection Mode – Settings for flash storage failure tolerance.

- None
All BRYCK storage modules are used for data. Data is not protected from one or more BRYCK storage drive failure
- Raid5
Data is protected from up to one BRYCK storage module failure
- Raid6
Data is protected from up to two BRYCK storage modules failure
- Average IO size
 - Average read/write block size of the application that reads/writes data from/to BRYCK in Kilo bytes The BRYCK platform automatically tunes the BRYCK file system based on this setting
- Deduplication
 - Enable this option if the dataset contains duplicate data. The deduplication algorithm stores the duplicate data efficiently and allows storing data more than the raw capacity of the Bryck
- Compression
 - Enable this option if the data is compressible
- Data sync: Configures the data synchronization settings
 - Periodic
Data is persisted to BRYCK when application issues sync or periodically in ~5 secs or when the unflushed data hits a threshold whichever comes first. This is the default option.
 - Application Sync
Data is persisted to BRYCK only when the application issues a sync request. Most of the applications typically issue sync requests to persist data.
 - Always
Every write is persisted to BRYCK automatically. Applications do not need to issue explicit sync.
- Auto mount on Reboot: This setting mounts the BRYCK automatically when the BRYCK server is rebooted while the BRYCK is mounted. When the BRYCK is encrypted, the BRYCK software stores the encryption key in the server.

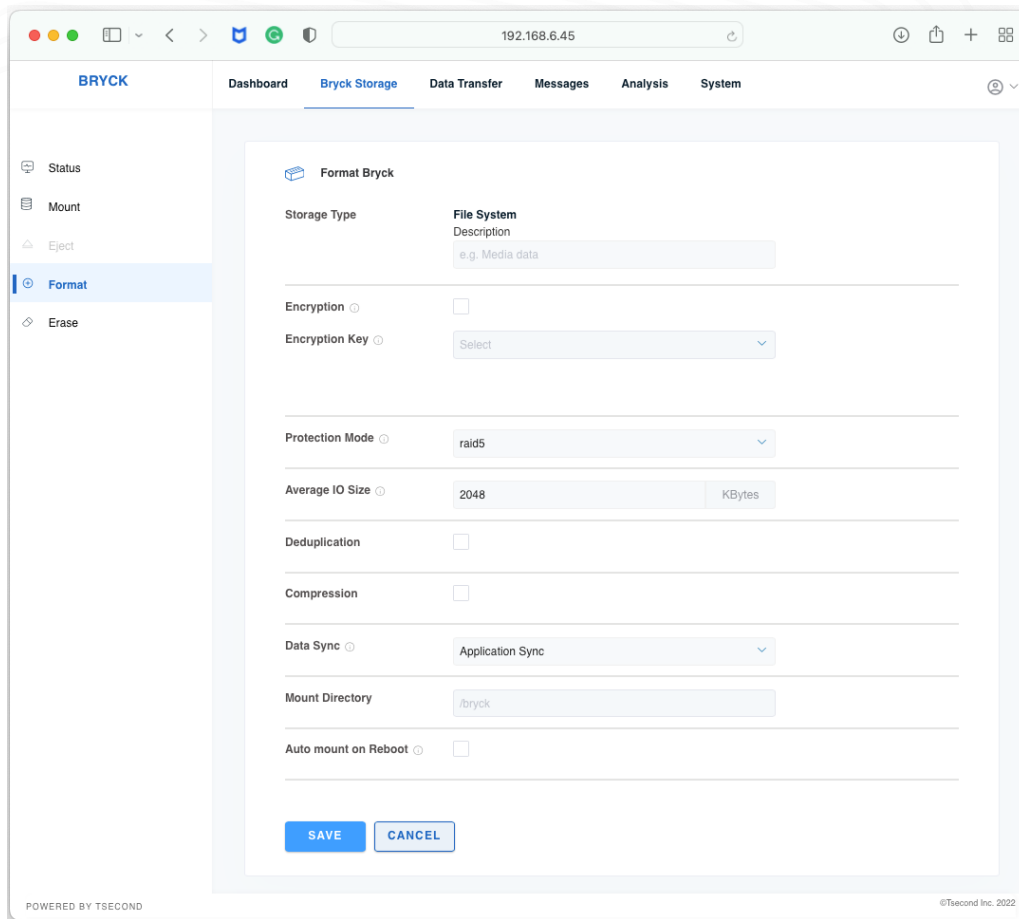


Figure 6: BRYCK Format Settings

Once the formatting is successfully completed, the BRYCK goes to Mounted state and is ready for use. The status option on the BRYCK Storage page shows the status of the installed BRYCK that includes state, Encryption state, data protection configured, Usable storage capacity, and the directory where BRYCK is mounted. Figure 7 shows the status of the Mounted BRYCK

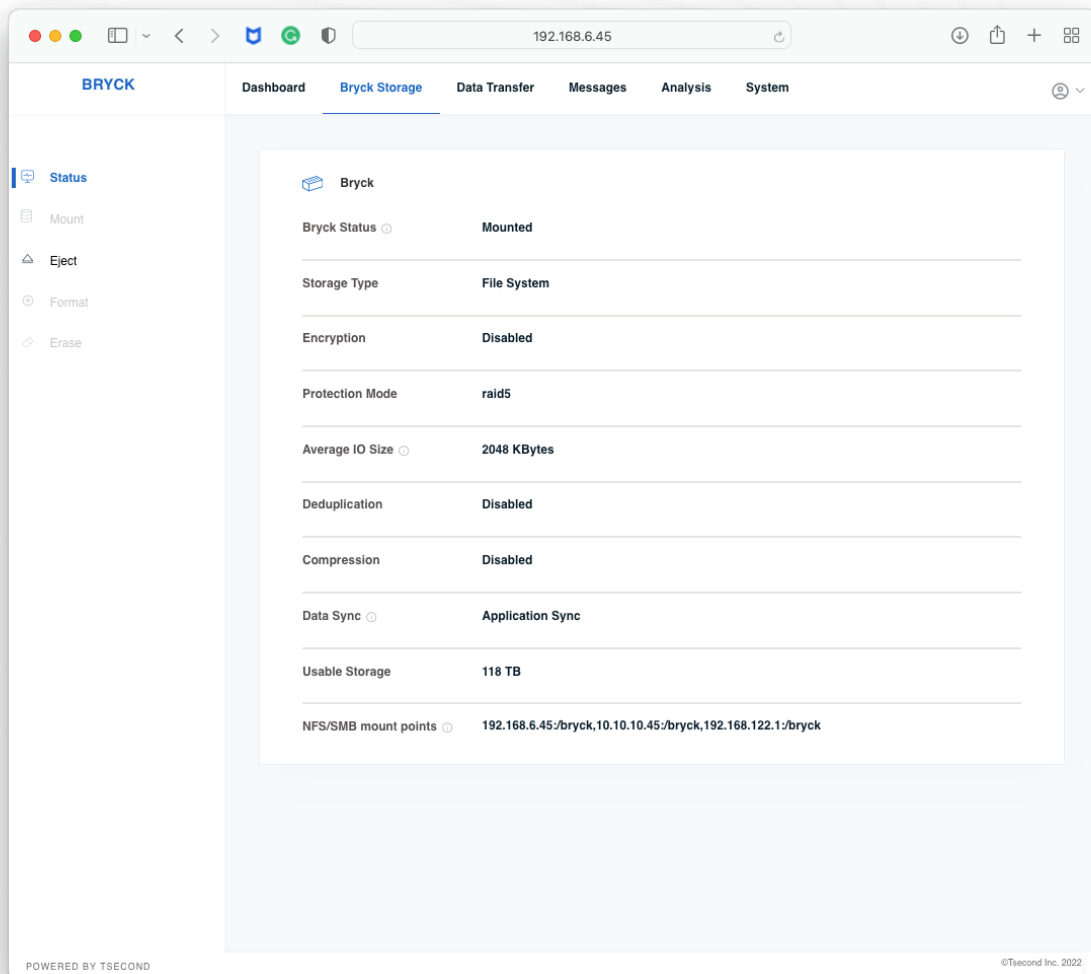


Figure 7: BRYCK mounted

The BRYCK storage is accessible in the following ways after a format/mount operation is completed

- Customer applications running in the storage server access the BRYCK at the directory '/bryck'
- Customer Applications running remotely access BRYCK over NFS through the IP address of the data interfaces
- Customer Applications running remotely access BRYCK over SMB through the IP address of the data interfaces with username 'bryck' and password 'smbpass'
- Transferring data to/from BRYCK is done using NFS or using Tsecond's data transfer application "BryckCP"

6.5 Application server connectivity

6.5.1 Map Bryck storage to windows system

The following steps shall be used to mount Bryck in a Windows machine over network using SMB protocol

1. Start file explorer
2. Right-click "This PC" in the left pane of the file explorer
3. Click "Map network drive" as shown in the Figure 7.1
4. Select a drive where you want to map the Bryck. For example, drive Z:
5. Enter `\\<Server IP>\bryck` in the Folder field
6. Click Finish as shown in the Figure 7.2
7. Enter "bryck" in the username field
8. Enter "smbpass" in the password field
9. Click "OK"
10. Bryck will be mounted at the selected drive
11. The Bryck storage can be accessed as a local disk drive by any windows application

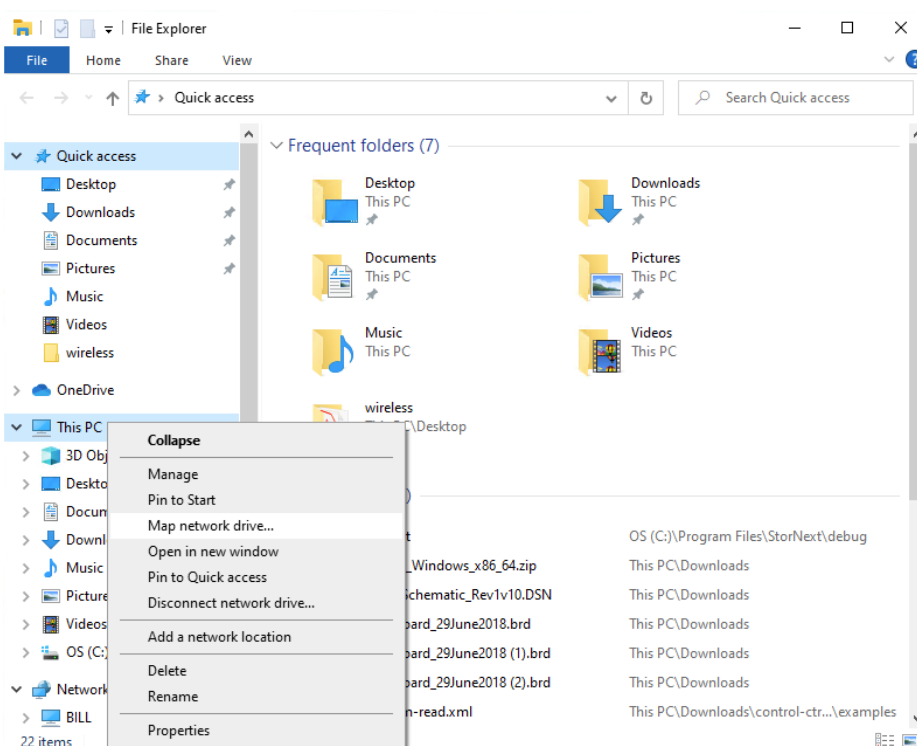


Figure 7.1 Map Bryck storage

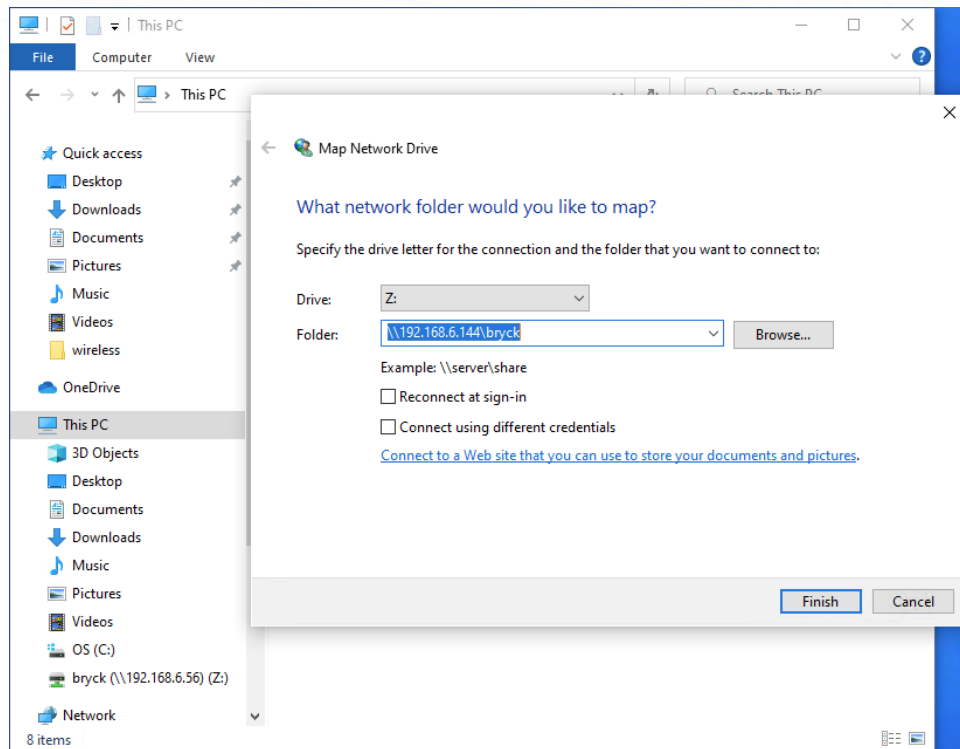


Figure 7.2 Map Bryck storage as drive

6.5.2 Disconnect Bryck storage from Windows system

The following steps shall be used to disconnect Bryck from the Windows machine

1. Start file explorer
2. Right-click the drive where the bryck is mounted in the left pane of the file explorer
3. Click "Disconnect"
4. Bryck will be disconnected from the windows machine

6.5.3 Map Bryck storage to Mac system

The following steps shall be used to mount Bryck in a Mac machine over network using SMB protocol

1. Start finder application
2. Select "Go" option in the top menu bar and then select "connect to server" as shown in Figure 7.3
3. Enter smb //<server IP>/bryck in the "Server Address" field
4. Click Connect as shown in the Figure 7.4
5. Enter "bryck" in the username field
6. Enter "smbpass" in the password field
7. Click "OK"
8. Bryck will be mounted locally as "server IP"
9. The Bryck storage can be accessed as a local disk drive by any Mac application

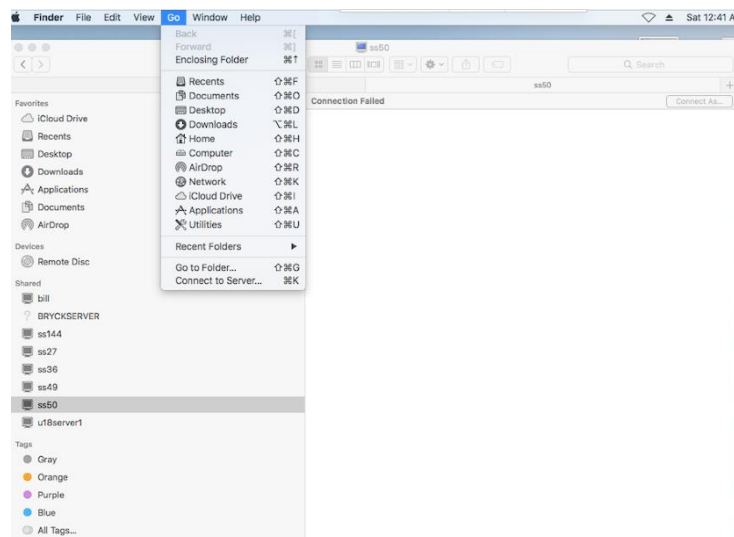


Figure 7.3 connect to server

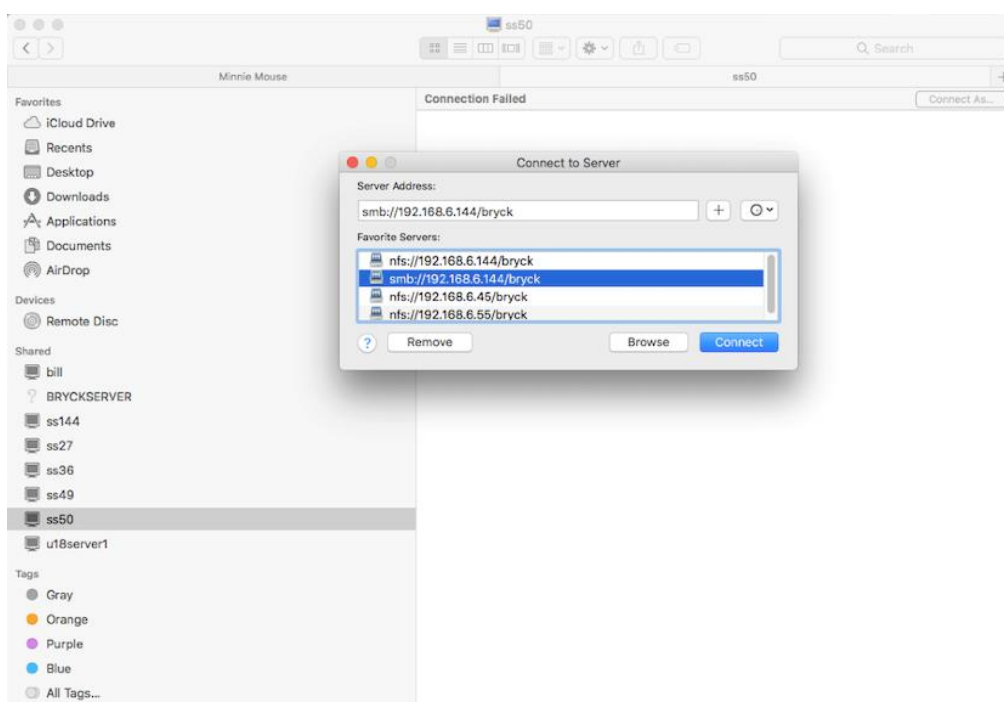


Figure 7.4 server address

6.5.4 Disconnect Bryck storage from Mac system

The following steps shall be used to disconnect Bryck from the Mac machine

1. Start finder application
2. Click the eject icon in the "server ip" as shown in Figure 7.5
3. Bryck will be disconnected from the Mac system

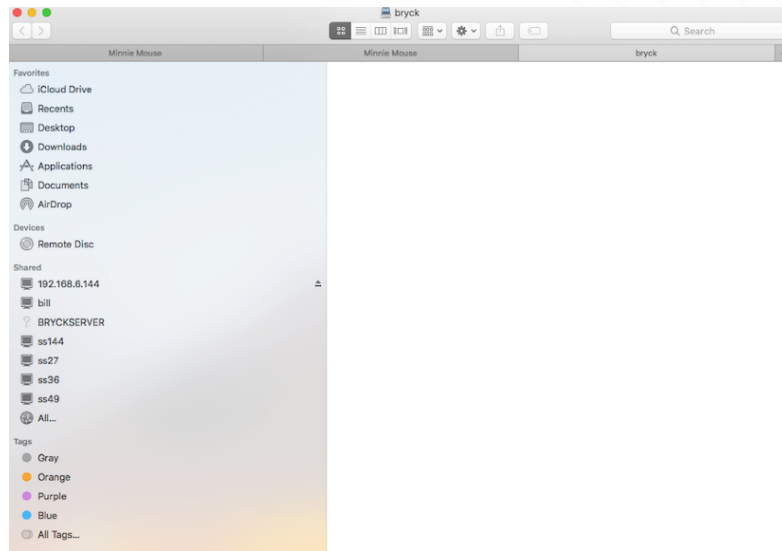


Figure 7.5 Eject Bryck

6.5.5 Map Bryck storage to Linux system

The following steps shall be used to mount Bryck in a Linux machine over network using SMB protocol

1. Start the terminal application
2. `mkdir /mnt/bryck`
3. `chmod -R 777 /mnt/bryck`
4. Execute the following command:
`sudo mount -t cifs //<SERVER IP>/bryck /mnt/bryck/ -o user=bryck,pass=smbpass,domain=WORKGROUP,sec=ntlmssp,gid=bryck,uid=bryck`
5. Bryck storage will be mounted at `/mnt/bryck/`
6. Linux applications can use `/mnt/bryck/` to access bryck storage as a local drive

6.5.6 Disconnect Bryck storage from Linux system

The following steps shall be used to disconnect Bryck from a Linux machine

1. Start the terminal application
2. `sudo umount /mnt/bryck`
3. Bryck will be disconnected from the Linux system

6.6 Data Transfer

In some use cases, users need to first upload large data to BRYCK before processing it with applications or users need to download large data from BRYCK to their storage infrastructure.

Users can upload/download large data fast using one of the following methods:

Data transfer using BryckCP client

The BRYCK platform provides a high-performance data transfer application called “BryckCP”. BryckCP is a Linux command-line utility that can be installed on the application servers. Users can use this utility to transfer data at high speed from the application server to BRYCK or vice versa. The BryckCP is downloadable from the BRYCK web.

Data transfer from/to external NFS storage

The BRYCK platform provides web interface to mount external storage systems at the storage server and transfer data between BRYCK and external storage.

6.7 Data transfer from/to external NFS storage

The external storage must be mounted first before initiating the transfers.

To mount external storage through NFS at the storage server, navigate to ‘Data transfer’ and then click ‘Add’ as shown in figure 8. Enter the required parameters and click ‘Mount’ to mount the external storage. This process can be repeated to mount multiple external storage.

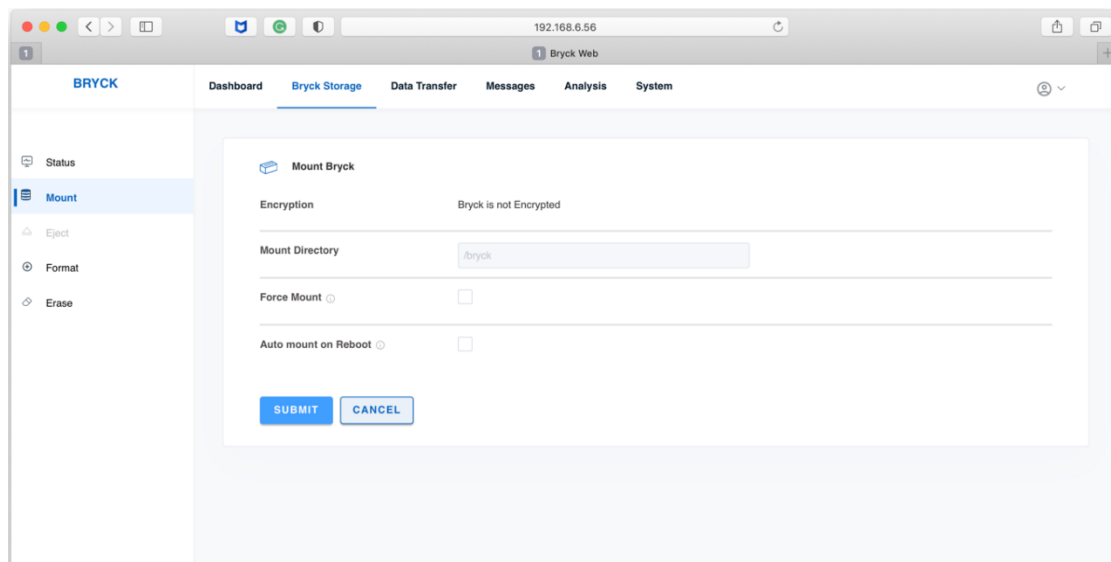


Figure 8: NFS Mount

To initiate a data transfer, click “Create”, enter the required fields, and then click “Transfer” as shown in Figure 9. This initiates the transfer of data from/to external storage to/from BRYCK. The “Status” page shows the status and progress of all transfers.

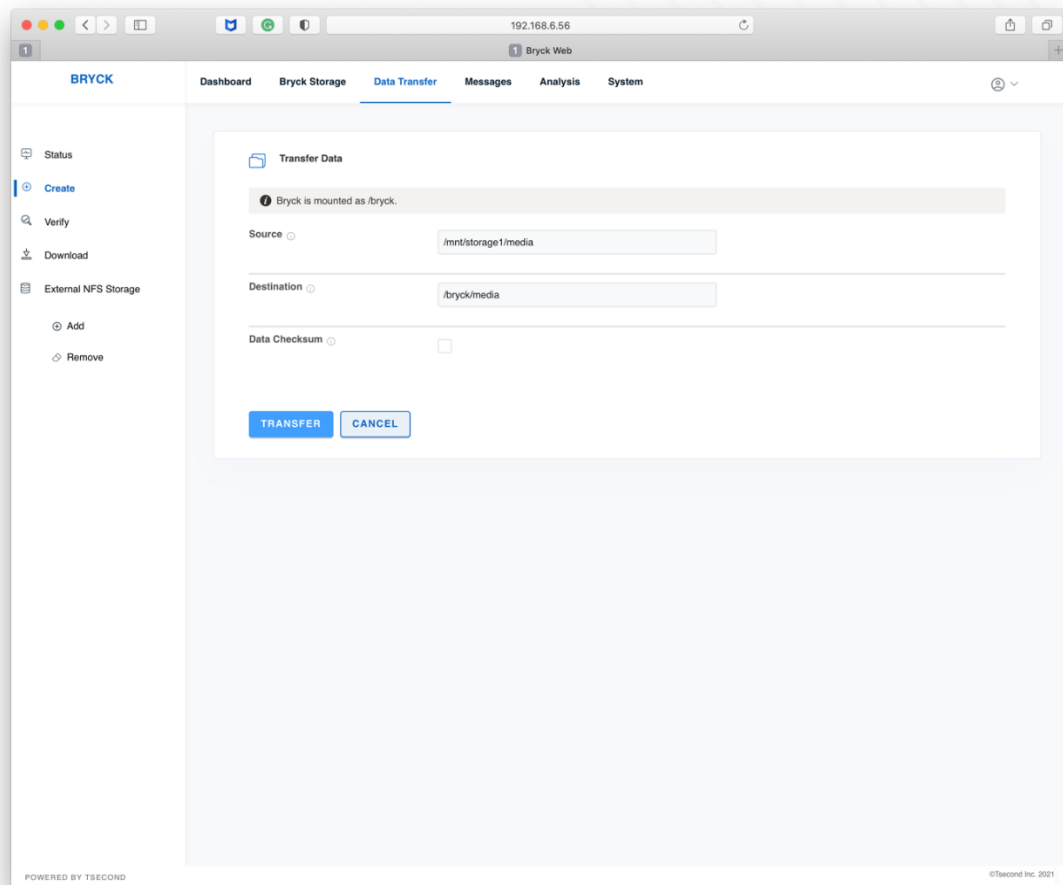


Figure 9: NFS data transfer

The throughput of data transfer from/to external storage would be limited by the external storage capacity. Typically, it is limited to a few GB/sec.

To transfer the data at 30+ GB/sec, users can use the BryckCP data transfer application. The following section describes this method of data transfer.

6.8 Data transfer using BryckCP

To transfer data using BryckCP, navigate to 'Data transfer' in the web GUI, click Download and then download the BryckCP client package for your server operating system as shown in Figure 10.

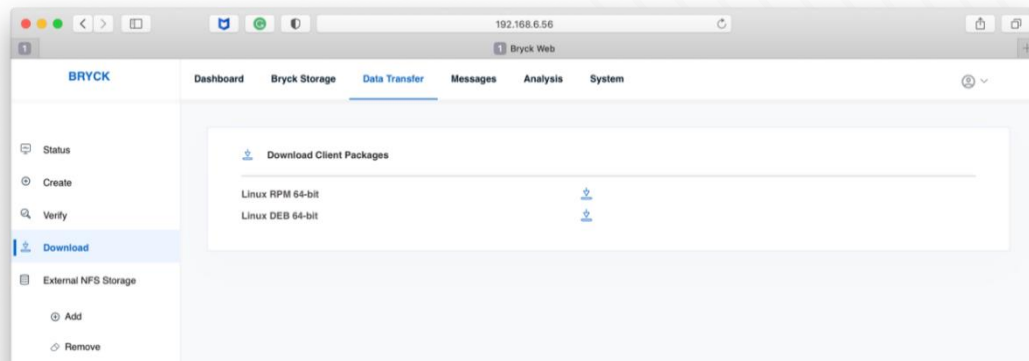


Figure 10: BryckCP clients

BryckCP is a command line utility. It runs on the app server terminal where data is copied from/to BRYCK

```
Usage: bryckcp [OPTIONS]... SOURCE DEST

Options:
-h [ --help ]                Show this help description
-b [ --buffer_size ] arg (=1572864)  Buffer size for data transfer in bytes
-c [ --chunk_size ] arg (=268435456) Multi-parts copy size
-r [ --nb_readers ] arg (=5)        Number of readers
-w [ --nb_writers ] arg (=1)       Number of writers
-l [ --log_file ] arg (=stdout)    Directory to store log files
-d [ --direct_io ] arg (=1)        Indicate whether or not files should be
                                     opened for direct IO. Enabled by default
--purge arg (=1)                Remove destination file/directory before copying data

Example:
1. Copy data from /mediadata to BRYCK
   BryckCP /mediadata <storage_server IP>:/BRYCK/mediadata
2. Copy data from BRYCK /BRYCK/mediadata to local directory /mediadata
   BryckCP <storage_server IP>:/BRYCK/mediadata > /mediadata
```

6.9 BRYCK Ejection and Removal

To remove BRYCK from the Tray, one must follow the steps mentioned below:

1. Login to the BRYCK web
2. Navigate to 'BRYCK storage'
3. Click 'Eject' and "Submit" as shown in figure 11 (BRYCK is unmounted from the storage server. All the inflight data is flushed to the BRYCK).
4. Wait until state of the Bryck goes to "Removed"
5. Open the top cover of the Tray. (The Tray has a piano-hinge cover and does not require tools to open it).
6. Unfold the BRYCK handle to unlatch the BRYCK from the Tray
7. Remove the BRYCK
8. The Dashboard in the BRYCK web shows "BRYCK is removed"

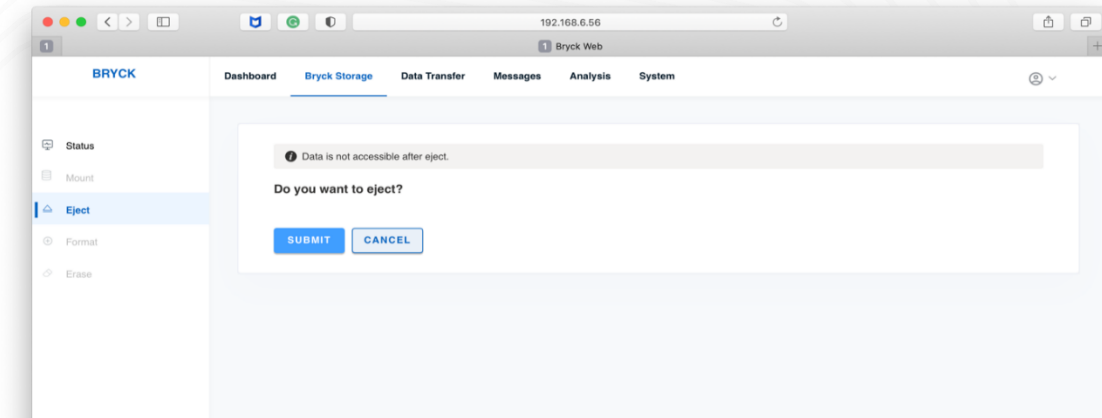


Figure 11: BRYCK Eject

6.10 BRYCK Insertion and Mounting

The BRYCK is a hot-pluggable device. User needs to perform the following steps to insert a BRYCK into the Tray:

1. Open the top cover of the Tray. (The Tray has a piano-hinge cover and does not require tools to open it).
2. Insert the BRYCK in the BRYCK chamber
3. Fold the BRYCK handle to latch the BRYCK
4. Login to the BRYCK web
5. Navigate to 'Bryck storage'
6. Click 'Scan'
7. Wait until the Bryck state goes to "Ejected"
8. Click 'Mount' and "Submit" as shown in figure 12
9. Enter the required parameters and click 'Submit'
10. BRYCK is mounted
11. The dashboard page in the BRYCK web shows that BRYCK is mounted
12. BRYCK data is accessible over NFS, BryckCP

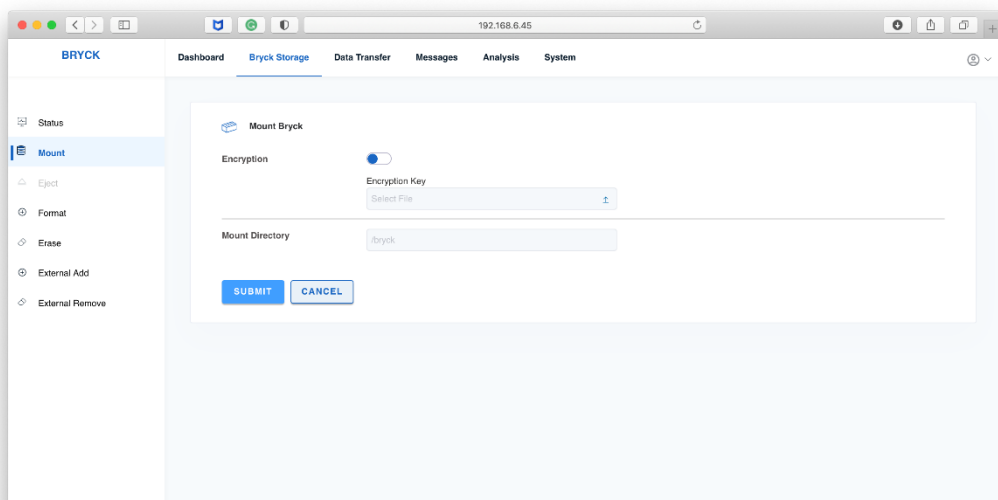


Figure 12: BRYCK Mount

7 Messages

The Messages page on the BRYCK web shows the logged system events. It keeps the history of logs for a configured period and provides an advanced search interface for searching logs through the history. Figure 13 shows the messages page

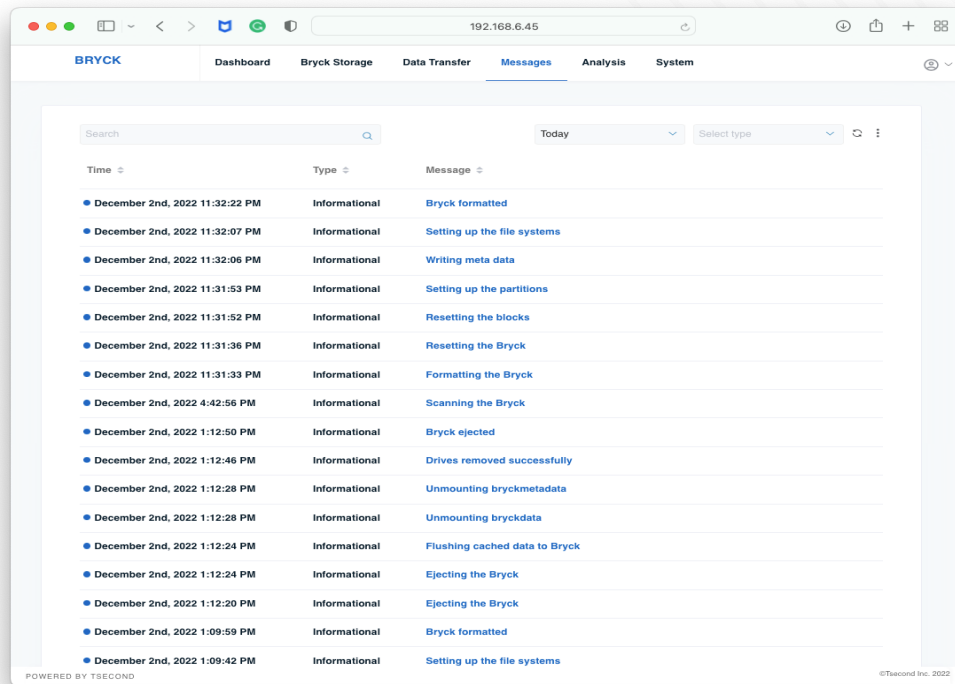


Figure 13: Messages

8 Analysis

The analysis page in the BRYCK web uses the following system metrics in chart form as shown in figure 14.

- Throughput
- BRYCK temperature
- Storage utilization
- Storage server CPU/Memory/IO/Network utilization

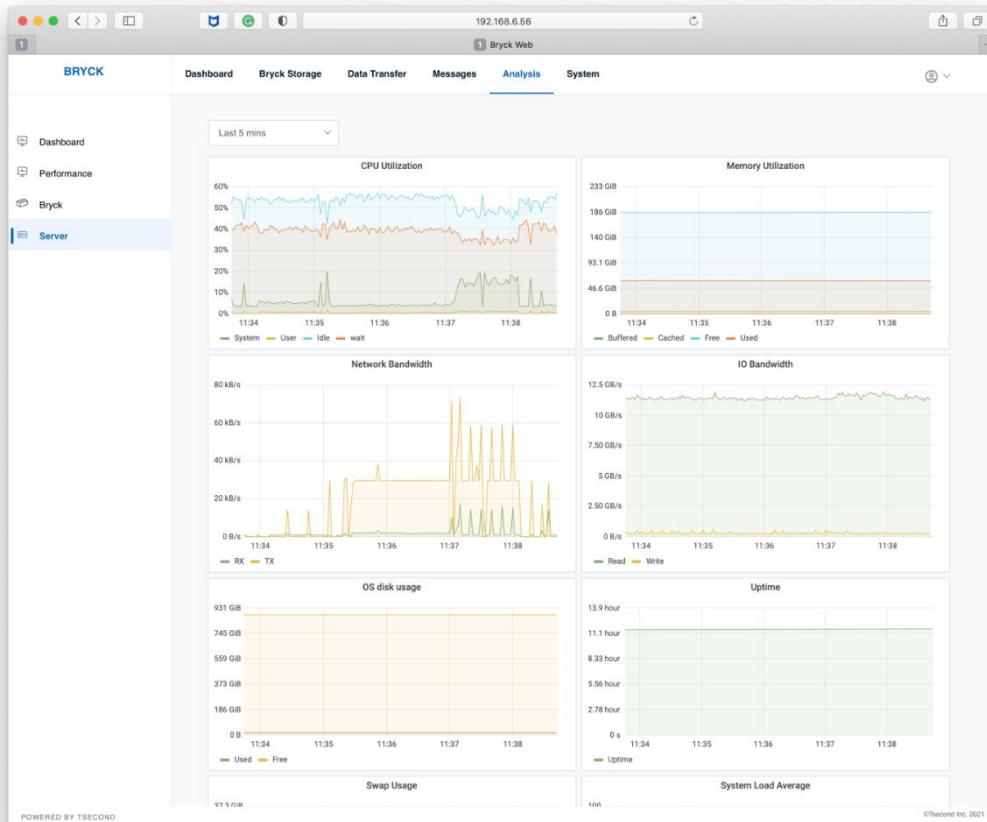


Figure 14: Analysis

9 Supportability

When the user needs to report an issue regarding the product, then the user should navigate to 'system' page on the BRYCK web, click 'Report' and select 'Generate Report'. The BRYCK web will generate a report file that can be sent to Tsecond support for debugging purpose.