

# ALTITUDE

## Elevate Your Data



## THE ALT SYSTEMS APPROACH TO MEDIA WORKFLOW ACCELERATION

**How the ALT Systems Altitude appliance automates and accelerates media movement to, from, and within the cloud**

### Abstract

The explosive growth of digital media and emphasis on remote content creation workflows presents two critical challenges: ensuring content is both remotely available and cost-effectively stored. Balancing these imperatives involves trade-offs that can cost valuable staff time, delay content access, and create lasting media management headaches.

To address these challenges, ALT Systems and Pixspan created Altitude, a preconfigured server designed to quickly and easily move media between:

- ▶ On-premise NAS and SAN storage systems
- ▶ AWS
- ▶ Azure Blob
- ▶ Wasabi
- ▶ Other S3 compatible cloud storage providers

Altitude is powered by PixMover™ software from Pixspan. PixMover's drag & drop web interface makes media movement easy and intuitive.

This white paper explains the Altitude solution, presents test metrics that clearly show PixMover is able to move data much faster than other solutions, and outlines the cost savings and value proposition provided by this breakthrough workflow acceleration technology.

### Solution Design

ALT Systems designed Altitude as a preconfigured appliance to automate and accelerate media workflows. Each Altitude server comes with the latest Pixspan PixMover software and is already configured according to the customer's unique network environment.

The PixMover application provides:

- ▶ Massive parallelization technology that maximizes bandwidth utilization of any Fibre Channel, Ethernet, or Internet connection
- ▶ Bandwidth scheduling and throttling to protect impacting shared network traffic
- ▶ An easy to use web GUI for customers who don't want to deal with the complexities of a store-and-forward appliance like AWS Snowball
- ▶ The ability to limit access to sensitive parts of the customer's file system

PixMover offers several key advantages when compared to other data movement solutions:

- ▶ Speed - fast transfers of any file type, including image sequences
- ▶ Ease of Use - does not require highly specialized training

- ▶ Storage Compatibility - flexible enough to be used with leading Media & Entertainment storage architectures, including:
  - Network-Attached Storage (NAS)
  - Storage Area Network (SAN)
  - S3 compatible object storage
- ▶ Supportability - a responsive and knowledgeable remote support team
- ▶ Cost-Effective Licensing - a reasonable business model able to accommodate rental, lease, or purchase preferences

The preconfigured Altitude server is a 2RU chassis with a high speed CPU, GPU, memory, minimal internal HDD storage, and redundant power supplies.

To tailor each Altitude server to each customer's site needs, ALT Systems adds appropriate network interface cards to support 1Gb to 100Gb Ethernet and 16 to 32Gb Fibre Channel connections.

The server runs the latest version of CentOS 7 with up-to-date security patches critical to any computer exposed to the Internet. Older kernels required for StorNext compatibility or other reasons can be installed as needed.

Altitude supports all major file systems to mount on-premises storage using Samba, NFS, StorNext, or any storage architecture recognized by Linux.

## Deployment

ALT Systems preconfigured each Altitude server according to the customer's network topology and storage architecture.

To reduce the burden on the customer's staff, on site integration and power-up is typically handled by ALT Systems technical personnel as part of a Managed Services engagement.

Once connected to the customer's production network, the PixMover daemon is launched and storage mounts are established. PixMover thereafter automatically sees all volumes mounted by the Linux OS.

The customer is asked to enter their private S3 access keys. The system securely stores those credentials.

S3 permissions are enabled as shown in Figure 1. Minimal required permissions are GetObject and PutObject.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "AllowAccessToSpecificBuckets",
      "Effect": "Allow",
      "Action": [
        "s3:Get*",
        "s3:List*",
        "s3:DeleteObject",
        "s3:PutObject"
      ],
      "Resource": [
        "arn:aws:s3:::yourbucketname",
        "arn:aws:s3:::yourbucketname/*"
      ]
    }
  ]
}
```

Figure 1 - S3 IAM Role Example

Optionally, the customer may enter their private SMTP credentials for email notifications on job completion or failure.

Altitude is then ready to begin accelerating media workflows. ALT Systems managed services personnel can monitor the media migration progress. Routine status reports are provided to the customer as migration progresses.

## Security

Using the web GUI, users can easily create multiple user accounts with different privileges to limit access to specific folders as needed. Users can also be assigned read-only permission if required.

PixMover's web interface and REST API run on TCP port 9090. Typically the operator will login with password from inside the facility or through a VPN, so there is no need to open any inbound ports to the Internet.

All traffic is encrypted in transit using TLS 1.2, and can be encrypted at rest if desired and supported by the individual cloud provider. If staff needs to login remotely, the control plane can be tunneled through an AutoSSH relay server using RSA private key authentication.

PixMover communicates with your cloud storage provider using access keys or tokens which are stored in encrypted form. There is no need to share these keys with ALT Systems or even with the operator.

For maximum security, it's recommended to use an IAM role with access to only the specific buckets in use. It is possible

to use multiple IAM roles if different users need access to different buckets.

### Bandwidth Throttling

When multiple departments share the Internet connection or local storage, there may be circumstances when the infrastructure is overburdened, so PixMover provides a tool for job scheduling and bandwidth throttling. You can define hour-by-hour bandwidth constraints for each file system, and monitor usage in the web interface. Jobs can also be assigned a priority from 1-10 to organize when you have multiple jobs in the queue. PixMover always runs a single job at a time, but large files are automatically split into chunks for best performance. Jobs can be paused and resumed if needed. Pausing a job does not happen immediately, because it finishes the current file in progress.

### Image Sequences

Image sequences such as TIFF or EXR are notoriously unwieldy because they can contain 100,000+ files in a single directory. PixMover automatically detects sequentially numbered sequences and displays them as a single clip with total file size for ease of use.

When submitting a job, users can choose the whole sequence or any subset of frames. A bonus is this makes it easy to see when there is a missing frame because such sequences will appear as two clips.

### Compression

Storage Management products are often configured to identify content that hasn't been accessed in a long time so that it can be moved to a lower tier of storage. PixMover can be incorporated into that workflow using the REST API and scripting to either have that content compressed in place, or to compress the content as it is being moved to the lower storage tier.

This has the ability to generate substantial savings in storage, and potentially reduce the restore time as the files being restored will require less bandwidth to the slower storage tier.

Pixspan's proprietary compression algorithm is extremely efficient for uncompressed images (DPX, TIFF, EXR, etc.) and raw Bayer pattern camera negatives such as ARRIRAW, Varicam, and Canon.

The compression is mathematically lossless, meaning the MD5 checksums or PSNR analysis will be a 100% match on the other end. Compression ratio varies based on content, averaging about 50%.

Enabling this optional feature can save time on the transfer, reduce storage costs at rest, and reduce egress costs when retrieved.

Users may want to compress only for transit and decompress on the other end, or choose to leave the files compressed for the long term because these PXZ compressed files can be read natively by software including Autodesk Flame, Colorfront, and Baselight.

Compression happens in real-time, which effectively doubles the speed of your upload to the cloud. Filenames and extensions will be preserved and appended by .pxz extension.

PixMover can also generate a thumbnail image for each frame. The thumbnail is embedded into each file, and it will appear in macOS Finder or Windows Explorer, which is helpful for visually identifying files without launching any special software.

### Automation

All features of PixMover are also available via REST API for automation. This could be used to integrate with various other systems, or craft transfer jobs using an external manifest file. Webhooks can be used to send job activity notifications to external services including Slack.

### Additional Benefits

PixMover can preserve file attributes including standard POSIX permissions, atime, ctime, and mtime.

PixMover can also be used to migrate objects from one cloud provider to another. In this case, customers can choose to preserve object tags if desired.

## Altitude Performance Test Results

ALT Systems tested PixMover transfer performance for a range of file types across various transfer topologies.

### TIFF Image Sequence Transfer Test

A 177GB TIFF image sequence was uploaded to AWS S3 from two different points of origin.

The Los Angeles test used a Sohonet 2.5Gbps connection in Santa Monica. The New York test used Fios 1Gb residential connection in Manhattan. Transfer speed metrics were obtained with and without use of compression.

Results were compared to use of the AWS CLI tool. For compression testing, both CPU and GPU were utilized.



Origin / Destination	AWS CLI	PixMover	PixMover with Compression
LA / S3-west-1	14 min 1.69 Gbps	10 min 8s 2.33 Gbps	4 min 24s 5.36 Gbps
LA / S3-east-1	49 min 42s 0.47 Gbps	32 min 52s 0.72 Gbps	14 min 18s 1.65 Gbps
NY / S3-west-1	91 min 44s 0.26 Gbps	73 min 17s 0.32 Gbps	31 min 53s 0.74 Gbps
NY / S3-east-1	29 min 0.81 Gbps	26 min 8s 0.90 Gbps	11 min 22s 2.08 Gbps

Figure 2 - TIFF Image Sequence Transfer Test Results

The table below shows the percentage speed improvement obtained by PixMover when compared to AWS CLI use.

Origin / Destination	PixMover	PixMover with Compression
LA / S3-west-1	38% improvement	217% improvement
LA / S3-east-1	53% improvement	251% improvement
NY / S3-west-1	23% improvement	185% improvement
NY / S3-east-1	11% improvement	157% improvement

Figure 3 - TIFF Image Sequence Speed Improvements

## Large MXF IMF File Transfer Test

A 769GB MXF IMF package was uploaded to S3 from an EC2 compute instance in the same region.

Figure 3 below shows the PixMover uncompressed transfer compared to three benchmarks: AWS CLI, Minio MC, and an S3 Browser. PixMover significantly reduced transfer times compared to each benchmark.

Origin / Destination	AWS CLI	Minio MC	S3 Browser	PixMover
EC2 / NorCal S3-west-1	3 hours .56 Gbps	39 min 2.68Gbps	19 min 5.45 Gbps	6 min 16.2Gbps

Figure 3 - Large MXF IMF Transfer Test Results

Hardware and software used for the MXF IMF transfer test included:

- ▶ An m5ad.24xlarge instance running in NorCal us-west-1
- ▶ 96 vCPU with 384GB RAM
- ▶ 4x NVMe drives in RAID 0 formatted with XFS
- ▶ 20Gbps network connection
- ▶ Amazon Linux 2

- ▶ PixMover 4.6.3
- ▶ AWS CLI 2.1.30
- ▶ Minio mc 2021-03-12
- ▶ S3 Browser 9.5.5 Pro (on Windows 2019 with NTFS)

## Conclusions

Altitude powered by PixMover software provides an easy, fast way to migrate media between on-premise NAS and SAN storage systems, and to, from and within public and private cloud storage locations.

Customer time required is kept to an absolute minimum. ALT Systems Managed Services personnel preconfigure each Altitude server, and install and configure the on-board PixMover software so the system arrives ready to be racked and powered-up.

Once media begins to move, uploads will be up to 28 times faster than manual transfers using the AWS CLI tool. High-resolution images are migrated with 100% validation that every bit is delivered, while saving 50-80% on storage and networking costs.

Shorter media migration times and faster content mean greater worker productivity, higher partner/customer satisfaction, and more time spent on the work, not waiting for it to arrive.

Altitude is fast, easy, secure and reliable, and available now from ALT Systems in Los Angeles, California.

## Case Study: Blu Digital

# Blu.™

Blu Digital Group based in Burbank, CA, is a major player in digital media distribution and entertainment supply chain that processes, delivers and qualifies film, TV and entertainment content to look, sound and be experienced as best as possible over an array of home entertainment devices. ALT Systems and Pixspan provided Blu Digital with a more effective, efficient, and economical way of migrating their data to the cloud.

Blu Digital uploads an average of 2TB of data to the cloud on a daily basis. Occasional projects requiring migration from LTO tape to the cloud can be as large as 150TBs. Manual transfers were taking months to complete and costs were unacceptably high. In short: Blu Digital faced the two most common limitations of uploading data to the cloud – it was slow and expensive.

According to Michael Thexton, Blu Digital's Executive Director of Technology, it didn't make sense to increase the company's existing 5Gb Internet circuit speed because the path was not fully saturated. Thexton also considered network optimization software such as Aspera, but found that the per-GB cost model was prohibitive.

Blu Digital wanted a solution that was simple to use and economical. Thexton leveraged the power of Altitude's PixMover software to accelerate Blu Digital's daily media movement workflow. In running its own comparison tests, Blu Digital found that PixMover was significantly faster than other solutions.

"Our Cloud uploads are three times faster, our circuit is much better utilized, and nontechnical staff can easily manage the uploads," Thexton observed. "Not only are the monthly cost savings significant, but because of PixMover's reliability we can focus our saved time on customer priorities versus checking on file transfers."

Blu Digital compared the cost of PixMover against the cost of network optimization software provider Aspera. PixMover is licensed with an all inclusive flat subscription price, costing less than \$100 per week. At 2TB of uploads per day, it saves about 20 hours per week. Compared to the Aspera per-GB price model, based on its daily volume of 2TB, PixMover would save more than \$10,000 per month.



*"Amazingly there weren't any other options that allowed us to continually fill a bucket with assets how PixMover allowed us to. We didn't have issues with terabytes hanging, nor were we concerned that it would take ages to get that volume of data up to the Cloud. We were confident when we came in the next morning PixMover would have the job done."*

**Michael Thexton**  
Blu Digital Executive Director of Technology

### About ALT Systems



ALT Systems ([www.altsystems.com](http://www.altsystems.com)) is a premier systems provider, integrating superior compositing, DI, networking, and storage solutions for the Media and Entertainment Industry. Founded in 1995, ALT Systems delivers products and solutions for compositing, editing, dailies, color correction, data storage, networking, rendering, and archiving.

In 2019 ALT Systems acquired Cutting Edge, a file-based media workflow company based in San Francisco. Together, we provide each customer a unique solution customized to meet their specific needs by offering extensive demonstrations and evaluations, straightforward pricing, and flexible financing. For more information, email [sales@altsystems.com](mailto:sales@altsystems.com) or phone (818) 504-6800.

### About Pixspan



Pixspan ([www.pixspan.com](http://www.pixspan.com)) provides the fastest and easiest data acceleration for moving large data files of any type and size on-premise and to, from, and within the Cloud, globally and on demand. Pixspan's software products accelerate and enhance Cloud and On-Premise workflows, offering unprecedented savings in time, storage and infrastructure costs. For more information, email [sales@pixspan.com](mailto:sales@pixspan.com) or phone (202) 320-0878.