



SUPPORTING MEDIA & ENTERTAINMENT WORKFLOWS WITH TRUENAS®

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1 EXECUTIVE SUMMARY

Developing and delivering media content that reaches audiences whenever and wherever they are has increased in importance and complexity. In today's highly connected, entertainment-driven world, media and entertainment (M&E) companies need to stay competitive to succeed. These organizations need to produce information and entertainment in a variety of different formats to display on mobile devices, desktops, workstations, Blu-ray players, game consoles, set-top boxes, and TVs as well as in digital and analog movie theaters. Workflows grow in complexity daily and time-to-market windows continue to shrink. Where and how to store and archive all this content remains top-of-mind. M&E projects run on multiple heterogeneous environments, need an enterprise-grade storage array's features, and require multiple protocols.

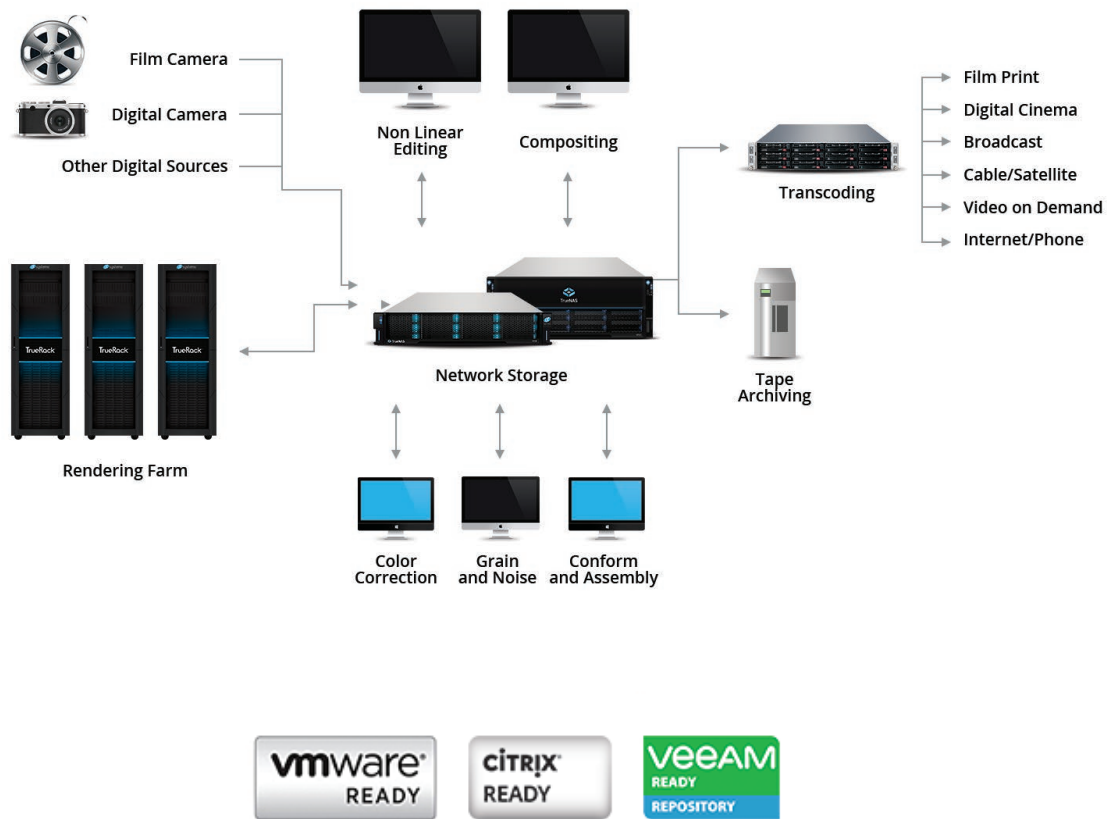
Most M&E production houses purchase data storage based on capacity and performance dictated by the needs of existing applications. As a result, businesses often end up with multiple classes of application-specific storage or storage silos including SAN, NAS, all-flash arrays, and many forms of direct attached storage (DAS) from a multitude of vendors.

Creative organizations are often forced to over-provision and over-purchase capacity or performance, or use an all-flash array to meet their production needs. This reactive purchasing drives up the cost of media production. As media files grow, it becomes complex to manage and inefficient to increase the capacity or performance of DAS or consumer-grade NAS, so many turn to cloud storage. The security risk and expense of cloud storage are a top priority of IT and Media Managers. These factors and others put intense pressure on your budget and data storage infrastructure to keep up with the demand.

A [TrueNAS](#) storage system from iXsystems brings an enterprise-grade storage solution supporting multiple protocols to M&E production houses that is capable and affordable for many M&E applications. It is designed to enable M&E customers to address media capacity and performance requirements while reducing TCO, consolidating digital assets, accelerating media workflows, and providing the features needed to protect all media assets. Read more to learn how TrueNAS addresses typical M&E production house concerns.

2 SUPPORTING M&E WORKFLOWS

The [award-winning](#) TrueNAS storage solution supports separate workspaces to hold media assets that can be accessed in the field or at a production house. TrueNAS delivers enterprise functionality, supports multiple physical and virtual applications, and has simultaneous block and file storage access. These features allow for backup and for repurposing videos, production assets, and more. Its scalability, high availability, and 24/7 white-glove support lower storage TCO for media workflows.



TrueNAS products are certified for Citrix XenServer, Veeam, and VMware vSphere. This adherence to the standards mandated by multiple vendor certifications guarantees compatibility with backup and hypervisor environments and decreases storage deployment risk for virtualized digital workflows. TrueNAS can also be used to get Avid-style bin-locking instead of using an AVID® Nexis®.

As the number of simultaneous videos grows, storage capacity or network performance needs increase, requiring additional storage arrays, storage infrastructure, the addition of high-performance short-stroked disk drives, or implementation of an all-flash configuration, increasing storage TCO. TrueNAS balances performance and capacity, enabling M&E production houses to invest in a hybrid or all-flash array for their application needs.

2.1 PRE- AND POST-PRODUCTION

Many M&E production houses have creative staff that work on different platforms, such as Apple, Linux, Unix, and Windows. DCIG, a storage industry analysis firm, found that fewer than half of enterprise-grade storage arrays provided unified support for both file and block I/O. iXsystems, in a recent customer survey, found that over 1/3 of their customer base used both block and file protocols.

¹ DCIG 2016-17 ISCSI SAN Utility Storage Array Buyer's Guide

The lack of unified support can impact the ability to use and share media, resulting in higher production costs. TrueNAS supports shared media using any file, block, and object protocol, supporting multiple editing, server, storage, archive, and playout systems.

Many M&E post-production houses require high-performance unified data storage to handle the production of media content and prepare final content for electronic distribution. There are four major properties of storage that affect digital workflows: IOPS (I/Os Per Second), throughput, location (private/hybrid or public cloud), and latency. TrueNAS provides high-speed, multi-protocol, on-premise data storage that is highly available, highly reliable, and has the power and throughput required for high resolution post-production workflows.

The growing amount of data combined with the shrinking timelines for content creation requires IT to increase storage capacity and bandwidth. During post-production, it is important that there are no pauses or dropped frames during operations. As video resolution increases there will be a dramatic increase in data transfer rates and capacity, so these processes require a high-bandwidth and high-capacity storage solution that is up to the task of handling many I/O intensive applications. These include metadata extraction, keyframe extraction for storyboarding, rendering, editing, compositing, and transcoding between formats.

2.2 SCALING/RENDERING/TRANSCODING

Professional nonlinear editing production video systems require a storage array that supports millions of digital files on a variety of workstations that can scale capacity without impacting performance. Slow scaling, rendering, or transcoding operations result in increased production costs. TrueNAS addresses each of these common reasons that would result in a production cost increase:

- Usage of file and block protocols
- Millions of small files
- Random I/O
- Multiple simultaneous projects
- 2K, 4K, or higher resolution rendering requirements
- Changing IOPS requirements

TrueNAS supports GbE, 10 GbE, 40 GbE, 100 GbE and up to 32 Gb Fibre Channel interfaces and scales to over 100 Gb/sec, allowing for network access to I/O intensive simultaneous projects. TrueNAS supports a variable block size so the I/O can be optimized for any file size used by an application.

A transcoding workload consists of many source files simultaneously transcoded into several different resolutions, bitrates, and formats. One popular choice is to transcode source material into the SMPTE H.264 video codec.

The transcoding process can generate 1080p, 720p, and 480p versions, each with different bitrates. The studio determines the end result and studios commonly request multiple formats in order to accommodate premium deliverables to a wide audience.

| Definitions | Bandwidth | File size | Number of simultaneous files supported for read/write* | Number of files that can be held in a TrueNAS* |
|--|------------|-----------|--|--|
| 720p (1280×720) at 29.97 FPS | 4 MB/s | ~700 MB | 1,400 | 14 M |
| 1080p (1920×1080) at 29.97 FPS | 6 MB/s | ~1 GB | 1,000 | 10 M |
| 1440p (2560×1440) at 29.97 FPS | 13 MB/s | ~2 GB | 400 | 4 M |
| Standard Definition (SD) at 29.97 FPS in RGB at 10 bit depth | 42 MB/s | ~4 GB | 130 | 2 M |
| HD Definition (HD) video at 24 FPS in RGB at 10 bit depth | 199 MB/s | ~18 GB | 25 | 500 K |
| 2K film resolution | 306 MB/s | ~30 GB | 20 | 300 K |
| 4K film resolution | 1,233 MB/s | 100+ GB | 4-6 | 80 K |
| 8K film resolution | 4,975 MB/s | 300+ GB | 2-4 | 26 K |

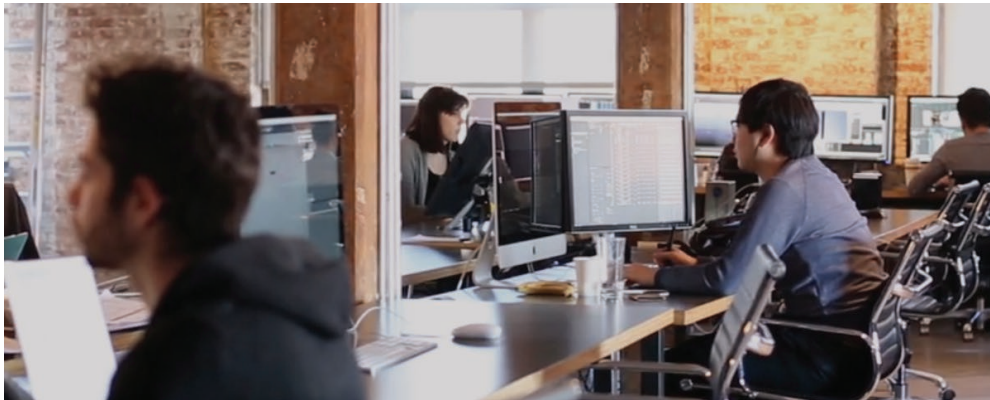
*Based on 10 PB of RAW storage with an approximation of how many multimedia files can be accessed and stored in a TrueNAS appliance. Consult with an iXsystems architect to configure a solution for your needs.

2.3 FAST MEDIA FILE PERFORMANCE

Slow rendering or transcoding affects the delivery time for a project and increases costs. TrueNAS delivers an optimal balance of price and performance that puts many all-flash arrays to shame while using lower-cost spinning media. TrueNAS uses read and write cache to speed up I/O and to mitigate changes in I/O patterns, such as those that occur when a media application changes from sequential to random I/O or changes the number of generated I/O operations.

TrueNAS includes storage optimization for file and block data. It will intelligently compress data when beneficial and skip over any data too inefficient to be worthwhile, like pre-compressed media files. Compression will reduce the size of IOPS that reach storage media, which actually increases performance for various media projects. This storage optimization gets the most out of every byte of TrueNAS storage by increasing capacity up to 10x without impacting I/O performance.

2.4 STORING AND DISTRIBUTING BILLIONS OF MULTIMEDIA FILES



M&E production houses face multiple storage challenges:

- The growth in Ultra-High Definition (UHD) content, frame rates, audio channels, and transcoded versions of digital assets increases storage consumption. Storage products must be flexible and expandable.
- I/O performance and latency of real-time videos and the need to produce content at a moment's notice increase pressure on storage performance.
- The use of global teams requires storage to support a variety of operating systems and to be manageable from halfway around the world.

A TrueNAS enterprise-grade unified storage array gives safe, secure, high-performance, economical, and scalable storage that can be used to create and distribute multiple multimedia files.

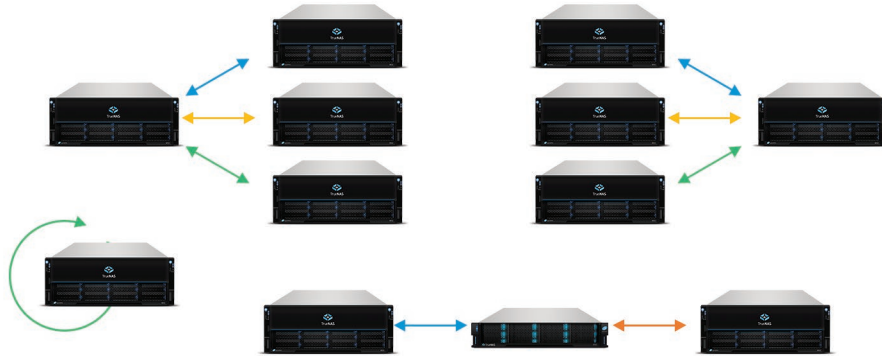
2.5 SAFEGUARDING MEDIA FILES

Studios need to safeguard their work. Every week, producers, editors, artists, and executives generate large multimedia files that must be stored and backed up as well as sent to a variety of distribution channels. Traditional channels include cable and satellite broadcast, digital cinema, video on demand (VOD), and smart mobile devices. SMB or NFS protocols are often used to share the final content for this distribution.

Much of earlier film/cellular stock is rotting away, so many production houses now keep their work on a storage array. TrueNAS provides unrivaled data integrity protection for storing and protecting multimedia files by using the OpenZFS enterprise-grade file system. OpenZFS is a next-generation file system in every regard, from its self-healing bit rot mitigation to its flexible snapshotting and replication mechanisms.

Once final content has been transcoded, it must be protected as well. Transcoding of finished source content into each of the distribution channel formats is crucial to the delivery of content and the realization of a return on investment for the previous production steps. Depending on the transcoding infrastructure, the capacity of transcoded content is measured in terabytes. A lack of a centralized backup and archive solution can lead to multiple copies being kept on different servers or storage arrays, increasing production storage costs. The last thing an M&E production house wants is to lose content, so many implement a backup product, like Veeam, to backup the footage to tape.

If a studio backs up multimedia files to tape, they will encounter shortcomings due to a tape's speed being orders of magnitude slower than TrueNAS. Moreover, restoring files from tape is arduous, taking several seconds or minutes for each file. Since TrueNAS can directly access any file, data is available faster than tape.



Every TrueNAS system includes ZFS replication to replicate vital content to a remote location, like a disaster recovery data center. Other vendors charge extra for this service, increasing TCO for data storage. This and other features of TrueNAS are important to production houses:

- **Self healing.**

Every production asset and media file is checked for consistency and repaired if necessary. TrueNAS protects media assets from disk failure and repairs the data from errors such as bit rot.

- **Local replication**, usually written as $A \rightarrow A$ or $A \rightarrow B$.

A and B are at the same location and can be on the same TrueNAS storage array, usually written as $A \rightarrow A$, or on two different TrueNAS storage arrays, usually written as $A \rightarrow B$. Having A and B on two TrueNAS storage arrays provides protection from a storage array outage of either A or B. However, local replication does not protect from a site-wide outage.

- **Bidirectional remote replication**, usually written as $A \rightarrow B$, $B \leftarrow A$.

Protects data from a site-wide outage. It allows a user to perform production changes using the data on the target site and then replicate those changes to the original site. It also allows production on A and B. B is the DR (Disaster Recovery) target for the production on A, and A is DR target for B's production. In the event of an outage at A or B, all of the production is done at the other site, and when it is online again, all of the changes at the DR target are sent to the other site.

- **Multi-node remote replication**, usually written as $A \rightarrow B$, $A \rightarrow C$.

An example is when system B is in the same general location as A, say on the same campus, and C is off-site at a remote location. The data is simultaneously replicated to B and C. During a physical outage of A, B can be used. If there is a site-wide outage that disrupts A and B, C can be used.

- **Multi-Hop remote replication**, usually written as $A \rightarrow B \rightarrow C$.

This allows a company to have a DR site for their DR site, here called C. The data is first replicated to B and then replicated to C. With TrueNAS, different schedules can be used for $B \rightarrow C$ and for $A \rightarrow B$. This allows for frequent replication from A to B, say once an hour, and less frequent replication, say once per day, to site C.

- **Multi-Site remote replication**, usually written as $A \rightarrow B$, $C \rightarrow B$.

This allows for a DR site that is used by sites A and C. If A has an outage, site B is used for data. If site C fails, site B is also used. If both A and C have an outage, site B can be used for both.

2.6 ASSET MANAGEMENT AND HYBRID CLOUD WORKFLOWS

Designers, creatives, and digital artists often need more than folders and directories for managing the hundreds or thousands of files and versions needed for a project. Especially on teams consisting of multiple specialists collaborating together to produce a major project, hunting for files or poor communication can cause frustration and eat up valuable time. Digital asset managers (DAM), media asset managers (MAM), and production asset managers (PAM) are tools to help expedite content search, workflows, and publishing/broadcasts with rich features for team collaboration. TrueNAS robust protocol (SMB,NFS,AFP,iSCSI,FC,FTP,WebDAV,S3) and multi-pool support offers the perfect base for securely integrating with workflows from MAMs such as Dalet, Adobe, Cantemo and more.

TrueNAS features direct integration with the iconik smart media management platform. iconik streamlines asset management with local and cloud-based assets being discoverable in a single, web-based interface. iconik makes sharing and collaborating on media effortless, regardless of geographic location. Users can enjoy easy searching, universal availability, and intuitive workflow management that allows multiple editors and professionals to jointly review and work together. The hybrid cloud allows content to be managed locally or in your cloud provider of choice, with users deciding what content should be stored where. Users can also leverage advanced Artificial Intelligence, making it easier than ever to find the content you need when you need it.

The iconik storage gateway is available as a plugin on TrueNAS and users can contact iconik about setting up a management account at iconik.io.



3 CONCLUSION

TrueNAS is designed for M&E and can be used when an M&E production house creates and distributes thousands of multimedia files. View our webinar to learn why storage industry analysts DCIG ranked TrueNAS #1, said that it had “Best-in-Class” hardware, and why press and industry analysts awarded iXsystems Gold in 2016 Best in Biz Awards International competition. TrueNAS includes enterprise features like compression, replication, encryption, thin provisioning, caching, and multiple file and block protocols, without playing unlock fees. There’s no question that TrueNAS is the best value in enterprise data storage.

To consult with one of our Solutions Architects regarding your M&E needs, contact info@iXsystems.com, call 1.855.GREP.4.IX, or visit iXsystems.com.

4 APPENDIX

4.1 REFERENCES

Additional information on using TrueNAS for media and entertainment:

- [Introduction to TrueNAS White Paper](#)
- [TrueNAS Hybrid & Flash Data Sheet](#)
- 1st Ave Machine Case Study ([Video](#), [PDF](#))
- Children's Hospital & Clinics of Minnesota Case Study ([Video](#), [PDF](#))
- [Creative Integrations Case Study](#)
- [Hornet Inc. Case Study](#)
- [Iostudio Case Study](#)
- [Media & Entertainment Solution Page](#)

4.2 HISTORY OF IXSYSTEMS

Located in the heart of Silicon Valley, we have been committed to serving technology needs with a focus on Open Source and enterprise hardware since 1996. From our inception onward, we've been perfecting our craft of making quality storage solutions and custom-built servers backed by a passion for superior customer experience. See what our customers say [about us](#).

4.2.1 OPEN SOURCE BACKGROUND

Every modern company uses Open Source technology in some way and some leverage it aggressively. If your company leverages Open Source technology, you know you have a distinct advantage working with a company that speaks your language. Nearly everything we do at iXsystems involves and benefits Open Source technology. We incorporate Open Source solutions into our storage and server product lines and use Open Source extensively ourselves.

We are the main developers of FreeNAS®, TrueNAS CORE, and SCALE and also contribute to FreeBSD, OpenZFS, and SAMBA. We spread the Open Source message through our participation in many industry events around the globe. We employ a long list of FreeBSD and Open Source project committers, all of whom came to iXsystems because of their passion for Open Source. This strategy has allowed us to succeed commercially and in turn, allows us to help our clients do the same.

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