

## Auto-Plotting SSDs Provide Increased Plots at No Cost



### Plot Optimization Involves Balancing Storage and Compute

- **PLOTTING CHALLENGES:** The need for high-capacity solid-state drives (SSDs) to plot against the massive Netspace is important. Managing plots vs farming is becoming a significant challenge.
- **SYSTEM BOTTLENECK CHALLENGES:** Trying to optimize the CapEx and OpEx investments for this new type of Blockchain can be challenging at best. Migrating to a new model is key.
- **COMPUTATIONAL STORAGE SOLUTIONS:** Having compute resources on-board the SSDs allows local data processing to occur, which optimizes overall system TCO and allows [Auto-Plotting for free](#)

### Introduction

When discussing the new Crypto Currency that has hit the market by storm some new terms and uses are part of that process. Unlike previous Blockchain-based Currency, Chia uses storage, not compute to Farm for the coin. So, we step away from a focus on GPU and CPU and now take a look at the previously overlooked and most valuable part of the Computer Infrastructure, the Storage! So let's talk about a Solid State Drive (SSD) that can Auto-Plot (Plot itself) allowing for Plotting, Farming and Scale in ways never thought of before. Computational Storage Drives (CSD) can run plotting schema all within the drive, at no additional cost to the User.

With the concept of "Proof of Space (PoS)" as the driver for Chia, the need to have large volumes of storage available has created a market shift in buying and needs for local data stores. This comes in the form of both Hard Disk Drives (HDD) as well as Solid State Drives (SSD) but can also show even more promise for the new storage devices, Computational Storage Drives (CSD). Why is it that storage is so important?

To validate the PoS, a user has to own a farm. Today this farm is built around the concept of a plot file. Plots are stored areas on a drive that contain the user contributions to the Netspace of Chia (an estimate of space allocated to the network). The trick is that the Netspace comes at a cost to the local Farmer and Plotter. Each plot is relatively small, ~100GB, however, creating the plot requires up to 1.3TB of raw data writes. As each plot is created, read, modified, written, and repeated until it reaches a final plot. This creates a time/wear/speed issue for the initial setup of the farm. Once the plots are in place, farming becomes a 'stay online and available' process.

This is where Computational Storage Drives can add value, especially ones like those from NGD Systems that host a local OS per device. This means that each drive that is consumed for plotting can actually be set to “Auto-Plot” or use the local OS to simply run the plotting algorithm with no added support from the users’ systems. This can become even more interesting when you look at the CPU and Memory required for a user to plot without the feature. Basically the ‘faster and more threads’ a CPU has, the more it can plot. But each plot also consumes 4GB of Memory per plot, so this can create quite a system required to develop plot vs farm.

### Jonmichael Hands, the new VP of Storage Business Development at Chia,

“Many serious Chia farmers in this first wave of growth spent in the upwards of 50% of their total costs on plotting hardware to get a competitive advantage while the network is still growing exponentially. This included servers, CPUs, DRAM, and of course, data center or enterprise SSDs!”

No farming involved. With that, much of that cost is again focused on the storage, not the CPU and Memory. So, if you can get larger devices, that can hold more plots, offer auto-plotting, and reduce overall OpEx due to low power considerations, there is a new win-win for the farmers.

### How Auto-Plotting Works

The next step is to discuss what this means for the SSD consumer. There has been a lot of news lately about drives wearing out, new warranties against ‘mining’ and even some products that are ‘over-provisioned’ and sold as Chia specific. All of this is simply part of the goal to achieve more plots, faster, and more economically. So, in the following section we are going to discuss how Auto-Plotting and drive capacity can bring a more cost-effective TCO, even when CapEx seems high. Metrics include the idea of ‘Cost per Plot’, ‘Plots per Month’, and ‘Time to Plots’. While there is a lot about how to get the ‘fastest’ plot, the best scenario is to spend as little to get as much as you can. Duh! Right?

Many SSDs can Plot, Many HDD can Farm. But what if you had a drive, say a CSD that can do both, while augmenting the overall system, and overcoming some CPU/Memory constraints by doing plots automatically and concurrently?

That is the idea around Auto-Plotting and can be done with a Linux-based OS on the SSD, and provide at least 20% more plots per system, as will be shown.

### The System for Auto-Plotting

Server Configuration: Per quote from provider - \$10,500

- 1x 2U AIC 24 2.5” Drives, Dual Socket, 1x LinuxOS – Ubuntu 20.04
- 2x Intel Xeon Gold CPUs
- 16x 16GB DDR4 Memory Modules
- 1x 40Gb NiC

Drive Configuration(s) – Drive costs based on eSSD market price for NAND (\$0.15/GB)

- 4x, 8x, 12x, 16x, 20x, 24x 8TB CSDs
- 32TB CSDs could be used to Farm instantly the Plots generated

With the above configuration(s) of servers + drives, we can work on providing the TCO and value of the drives acting as ‘stand-alone SSD’ and the value added by having the CSD ‘Auto-Plotting’ simultaneously. For this example,

the Auto-Plotting CSD is running 2 concurrent plots while the host is also concurrently plotting the drives at 12 plots per drive. As you can see, from the base math. 14 plots for the ‘price’ of 12 is a good start. Now let us get into the numbers. For the data below, we have used a ‘FIXED 48 plots per Host’ due to the thread count of the CPUs. The data below could be amplified if another fixed value was used.

### The Results

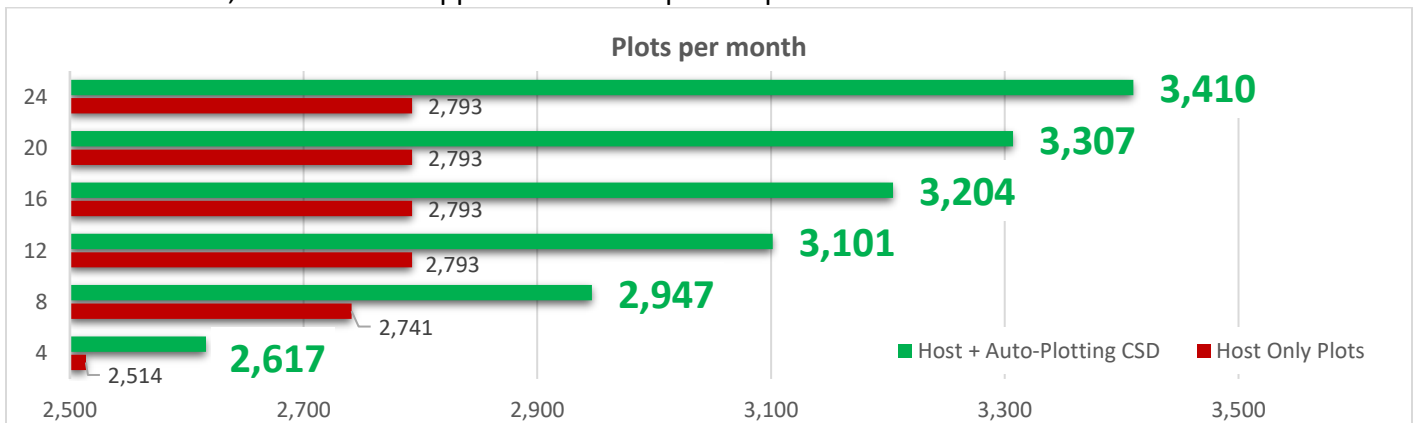
With 4 8TB Auto-Plotting CSDs and looking at a month of Plotting, you will see that for this configuration, the plot count increases by more than 100 plots, at NO Expense, Cost or Work, by the Host.

# of Auto-Plotting CSDs	Host Only Plots	Host + Auto-Plotting CSD
4	2,514	2,617

So, the first question to ask, is does it scale? And believe it or not, it is linear... As you add more drives, you get added plots as well. Until of course you reach the limits of the CPU thread count, at which time adding more plots becomes even more visible since the drives can continue to plot themselves without Host interaction. So, when we have 24 drives, and the host is limited on thread count, you see a more effective improvement in plots, due solely to the Auto-Plotting CSDs. The drives continue to run 2 concurrent plots, but the Host is now limited to 2 concurrent plots per drive. This relates to over 700 more plots per month on this system.

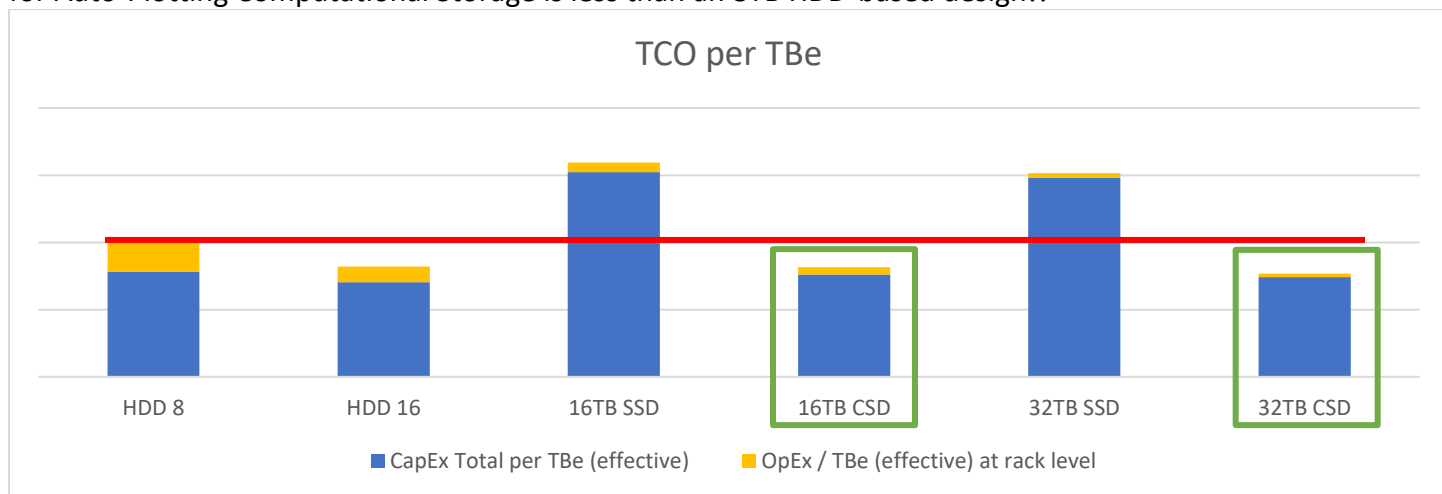
# of Auto-Plotting SSDs	Host Only Plots	Host + Auto-Plotting CSD
24	2,793	3,410

As you can see from the data. While adding more drives, to create space for plots is needed. The value they bring in actual plotting capability is muted due to the thread count of a pricey system. The value of having Auto-Plotting CSDs is visible in the fact that you can achieve more than 20% more plots per system, based on CPU limitations. If you had a ‘slower’ host, say a Xeon Silver, or a Ryzen Workstation, and had the same number of drives, the value can approach >40% improved plots.



## The Conclusion

Now that we have shown the outcome, the view should show the progression and the value brought by the Auto-Plotting CSDs. The graph below takes into the value of the system, including drive costs, and looks at the system based on the SNIA TCO and using a 40% performance per TB gain. As you can see. The effective TCO for Auto-Plotting Computational Storage is less than an 8TB HDD-based design!!



As you can see, even with a 'more costly' CapEx, the value for the TCO of Plotting is clearly evident in the use of Auto-Plotting CSDs. There is a mountain of data behind these data points provided and can be discussed as requested. For more information on these devices, reach out to [Info@NGDSystems.com](mailto:Info@NGDSystems.com)