G2M Research NVMe Market Forecast & Vendor Report Abstract

Report Purpose

The purpose of the G2M Research NVMe Market Forecast and Vendor Report is to provide those who participate in the marketplace NVM Express® (NVMe™) devices, software, and systems with a guide to the size of the market, and its expected growth over the next five years. This report is focused on providing usable market data for the following portions of the NVMe ecosystem:

- NVMe enabled servers for applications, storage, appliances
- Server based NVMe storage drive bays (also called "NVMe bays")
- Server based NVMe ASIC controllers and adapters
- Server based NVMe over Fabric adapters using Fibre Channel (FC) or Ethernet
- I/O and Co-Processor adapter cards deployed in NVMe bays (Ethernet, ARM, GPU)

The target audience for this report includes: data center architects and managers; NVMe product and ecosystem vendors; NVMe OEMs, NEPs and ODMs; business unit/executive management; venture capitalists (VCs), angel investors, and financial analyst and private equity (PE) investors.

G2M Research NVMe Market Report Overview

The current footprint for NVMe-enabled systems and devices can be expected grow exponentially by 2020 to be a multi-billion dollar market, as data centers, service providers and telecom equipment providers and carriers start to utilize NVMe-capable enabled infrastructure platforms. The G2M Research™ NVMe Market Forecast, Ecosystem Taxonomy and Vendor Share Report captures relevant data from this new market, as shown in sample tables on the right. This report will analyze the various components. The report is made up of following sections:

- NVMe Market Total Available Market (TAM)
- 5 year NVMe market forecast assumptions
- NVMe Products: ASICs, NVMe Controllers, NVMe Bays, NVMe Adapters (I/O, ARM)
- Go-to-Market Splits (Direct, Channel, OEM/ODM)
- Forward-looking uses case and industry road map analysis for NVMe technology

NVMe Storage Devices

Manufacturer	Product Type	Capacity (GB)	R/W Perf: Seq (MB/s); Random (KIOPS)	Website
Kingston Technology HyperX Predator M.2 SSD	NVMe M.2 SSD	240-960	1400/1000; 160/119	http://www.kingston.com/us/ssd/consumer/shpm2280p2
Toshiba OCZ R400/400A PCIe M.2 SSD	NVMe M.2 SSD	128-2014	2600/1600; 210/140	https://ocz.com/us/ssd/rd400-ssd
FADU FREE EC800F	NVMe PCIe SSD	3200	5000/5000; 1000/400	www.fadutec.com
Greenliant G-Card G7100 Series	NVMe PCIe SSD	900-1800	875/850; 130/60	http://www.greenliant.com/products/solid_state_storage.dot#gcard
Western Digital UltraStar SN150PCIe	NVMe PCIe SSD	1600-3200	3000/1600; 743/140	https://www.hgst.com/sites/default/files/resources/Ultrastar-SN100-Series-NVMe-PCIe-SSD-DS.pdf
Huawei ES2500P SFF/ES3600P	NVMe SSD	1200-3200	3100/1950; 770/175	http://support.huawei.com/enterprise/docinforeader.action?contentId=DOC1000101091&idPath=
Intel SSD DC D3600 Series	NVMe SSD	800-1600	2100/1500; 470/95	https://www-ssl.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-dc-d3700-series.html
Lenovo P3700 G3HS	NVMe SSD	400-2000	2800/2000; 460/175	http://www.lenovo.com/images/products/system-x/pdfs/datasheets/ent_p3700_ssd_ds.pdf

**Worldwide Enterprise NVMe-Enabled Server Bays by Calendar Year**

	2015	2016	2017
Worldwide Enterprise Servers With NVMe Bays (units)	168,950	344,833	710,109
Worldwide Enterprise Server NVMe Bays Shipped (units)	675,802	1,655,199	3,621,556

Worldwide NVMe Storage Device Unit Shipments by Calendar Year

	2015	2016	2017
Worldwide NVMe Enterprise 2.5" SSD Shipments (units)	216,115	968,751	2,419,382
Worldwide NVMe Enterprise PCIe SSD Shipments (units)	106,785	115,270	133,865
Worldwide NVMe Enterprise M.2 SSD Shipments (units)	962,110	1,381,182	1,951,030

NVMe Market Forecast & Vendor Report Methodology

One of the most frustrating aspects of utilizing market forecast data are the disconnects, hidden assumptions, and "less than transparent" taxonomies utilized by different market analysts. These place the user of the data (whether they are product managers in a large company, executives in a startup, or investors) with the unenviable task of having to reconcile the different forecasts and methodologies (difficult at best), or "bracketing" the forecast by choosing the lowest and highest as the brackets, without understanding their differences. The goal of G2M Research is to provide forecasts that are both internally consistent,
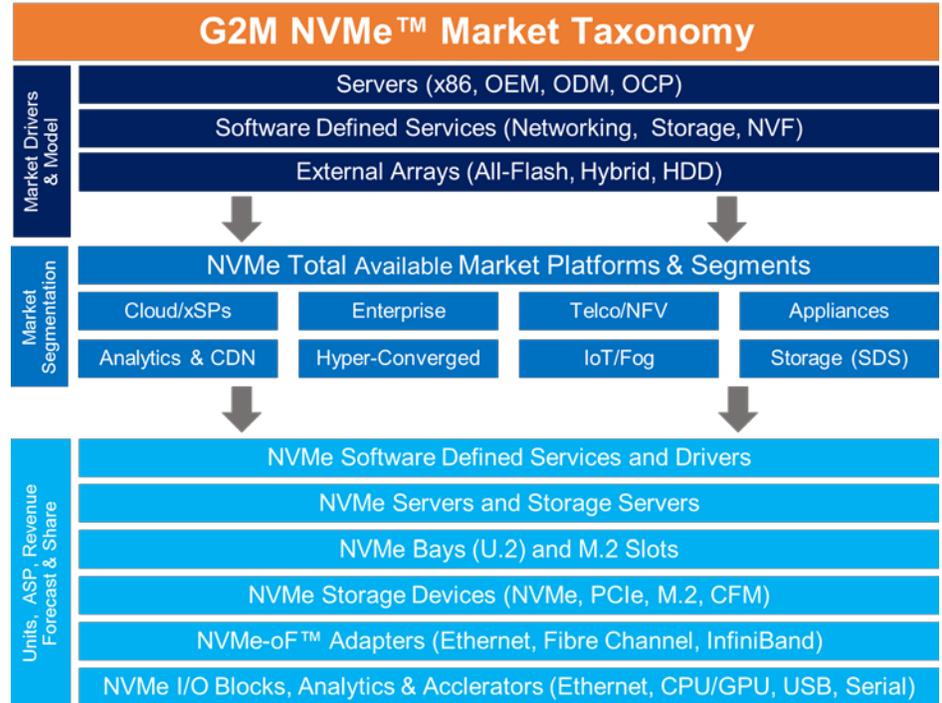
and which provide rationale for their divergence from (or convergence with) the results provided by other market research firms. Additionally, G2M Research approaches forecasting from an "ecosystem" standpoint so that the forecast for the entire ecosystem is as consistent as possible.

The G2M Research methodology utilizes multiple publicly available data sources to form a market size baseline for the enterprise markets for these systems and devices. This foundational data is then combined with the results of interviews of a sample of vendors from across the ecosystem and with a market taxonomy with specific "cause and effect" relationships between various ecosystem components. We also utilize historical adoption rates for similar technologies to act as a figure of merit with which to judge the forecasts. Where divergent forecast data or labels are found, G2M Research relies on the majority consensus of the vendor interviews to "judge" the differences. For the NVMe Market Report, our approach was as follows (all of the data from these intermediate steps are provided in the G2M Research NVMe Market Report):

1. <u>Size the current market for platforms that can be "hosts" for NVMe devices</u>. This included three types of systems: servers; storage appliances (i.e., servers that are dedicated to running software-defined storage packages); and all-flash storage arrays. We utilized publicly available data from Gartner and IDC. We also interview vendors in this market to "shape" the combination of this data into a baseline, and to forecast market growth. For this report, we specifically did not include servers, storage appliances, or arrays utilized by "hyperscale/cloud" providers because of the secretiveness of their architectures.

2. <u>Size the availability of NVMe "sockets" in host platforms</u>. To turn the number of hosts into something related to NVMe devices, G2M Research performed an in-depth analysis of the host platforms to see which ones actually provide "sockets" for NVMe devices. These are broken down into either "NVMe Bays" (2.5" or 3.5" bays with U.2 connectors), or M.2 sockets.

While this leaves out PCIe card form factor "sockets", their inclusion would result in the inclusion of **all** servers, since all servers have PCIe slots. Once we determined the number of platforms with NVMe "slots", we looked at the number of NVMe bays and M.2 sockets per host platform to come up with a total number of sockets today. Finally, we examined the historical adoption trend rates for similar technologies such as PCI Express (PCIe), plus vendor interviews, to determine the likely growth rate in the number of sockets per platform, and the growth in adoption rate for platforms with NVMe bays or U.2 sockets.

3. <u>Size the market for various NVMe devices</u>. In a similar manner to which we sized the number of available NVMe platforms, we sized the market for SSDs utilizing publicly-available data from Gartner, IDC, and TrendFocus. We then examined the specific product offerings from the device vendors to determine what the likely percentage NVMe SSDs were in the overall SSD market, again augmented by interviews with NVMe device vendors. Finally, we modulated the predicted growth rates from the publicly available sources with the vendor interview data to derive our growth rates. These were applied to the previous data to determine final forecasts for NVMe SSDs (2.5" U.2 SSD devices), M.2 SSDs, and PCIe SSDs. Since the hyperscale/cloud market is a significant consumer of enterprise-grade M.2 SSDs, we included usage of these devices by this market in our forecasts; they are broken out separately from the enterprise market forecasts.

4. <u>Ecosystem Resolution Process</u>. While it may seem intuitive that the number of NVMe "host slots" should be related to the number of NVMe devices, there is no inherent connection between these two factors. This is where the G2M Research Market Taxonomy and its "cause and effect" mechanisms come in. For the NVMe Market Sizing Report, we compared the ratio of NVMe device market size to host socket market size (#3 above divided by #2 above), and compared these to the ratios seen for other similar technologies, (in particular, SAS/SATA flash drives and hard disk drives) to help us resolve any disconnects. The result is a set of forecasts that are (reasonably) internally consistent.

5. <u>Top Takeaways and Final Vendor Validation</u>. While forecast data in and of itself is useful, G2M Research also compiles a list of key takeaways that we highlight in our reports. We then take these back to our interview vendors to validate them (and hence the data that they are based on). The result is a report that provides detailed data, but doesn't make report customers become analysts.

G2M Research – Analysts with "Real-World" Experience

G2M research is staffed by industry professionals who been on every side of this business: vendors, industry analysts, OEMs, and channel/IT end user. Our goal is to leverage best in class industry data, vendor expertise, OEM perspectives and real world customer experiences to build a "multi-sourced" market analysis model. We will do this through our "G2M Top Down Model," reference points from partner analyst, direct briefings/interviews with vendors, OEMs, channel partner. Additionally, we will conduct primary market research and surveys with end users in key segments. Please contact us at +1-858-610-9708 or at info@g2mcommunications.com to subscribe and/or schedule a briefing.

www.g2minc.com
sales@g2minc.com
info@g2minc.com

Report Table of Contents and Table of Tables
March 2017 Update to 2016 Market Sizing Report

Contents

Table of Tables