



**INTEL<sup>®</sup>  
INNOVATION  
DAY**



The logo for Intel DC SSD, featuring the word "INTEL" in a bold, sans-serif font with a registered trademark symbol (®) to its upper right, followed by "DC SSD" in a similar bold, sans-serif font. The text is white and set against a dark blue background with a decorative pattern of thin, white, wavy lines that flow across the upper portion of the image.

**INTEL<sup>®</sup> DC SSD**

Сергей Лысокобылка

# ОТКАЗ ОТ ОТВЕТСТВЕННОСТИ

МАТЕРИАЛЫ ПРЕДОСТАВЛЯЮТСЯ ПО ПРИНЦИПУ "КАК ЕСТЬ", БЕЗ КАКИХ-ЛИБО ЯВНЫХ ИЛИ ПОДРАЗУМЕВАЕМЫХ ГАРАНТИЙ, ВКЛЮЧАЯ, В ЧИСЛЕ ПРОЧЕГО, ГАРАНТИЙ В ОТНОШЕНИИ ИХ РЫНОЧНЫХ КАЧЕСТВ, НЕНАРУШЕНИЯ ПРАВ НА ИНТЕЛЛЕКТУАЛЬНУЮ СОБСТВЕННОСТЬ ИЛИ ПРИГОДНОСТИ К ИСПОЛЬЗОВАНИЮ В ТЕХ ИЛИ ИНЫХ КОНКРЕТНЫХ ЦЕЛЯХ. НИ ПРИ КАКИХ ОБСТОЯТЕЛЬСТВАХ КОРПОРАЦИЯ INTEL ИЛИ ЕЕ ПОСТАВЩИКИ НЕ НЕСУТ КАКОЙ-ЛИБО ОТВЕТСТВЕННОСТИ ЗА УЩЕРБ (ВКЛЮЧАЯ, В ЧИСЛЕ ПРОЧЕГО, УПУЩЕННУЮ ВЫГОДУ, ПОСЛЕДСТВИЯ ПРИОСТАНОВКИ ПРЕДПРИНИМАТЕЛЬСКОЙ ДЕЯТЕЛЬНОСТИ ИЛИ ПОТЕРЮ ДАННЫХ), ВЫТЕКАЮЩИЙ ИЗ ФАКТА ИСПОЛЬЗОВАНИЯ МАТЕРИАЛОВ, ЛИБО НЕВОЗМОЖНОСТИ ИХ ИСПОЛЬЗОВАТЬ, ЧТО РАСПРОСТРАНЯЕТСЯ И НА ТЕ СЛУЧАИ, КОГДА КОРПОРАЦИЯ INTEL БЫЛА ПРЕДУПРЕЖДЕНА О ВОЗМОЖНОСТИ НАНЕСЕНИЯ ТАКОГО УЩЕРБА. УЧИТЫВАЯ, ЧТО ЗАКОНОДАТЕЛЬСТВО, ДЕЙСТВУЮЩЕЕ В РЯДЕ ЮРИСДИКЦИЙ, НЕ ДОПУСКАЕТ ОГРАНИЧЕНИЯ ИЛИ ОТКАЗА ОТ ОТВЕТСТВЕННОСТИ ЗА ПОБОЧНЫЙ ИЛИ КОСВЕННЫЙ УЩЕРБ, ИЗЛОЖЕННОЕ ВЫШЕ ПОЛОЖЕНИЕ МОЖЕТ К ВАМ НЕ ОТНОСИТЬСЯ.

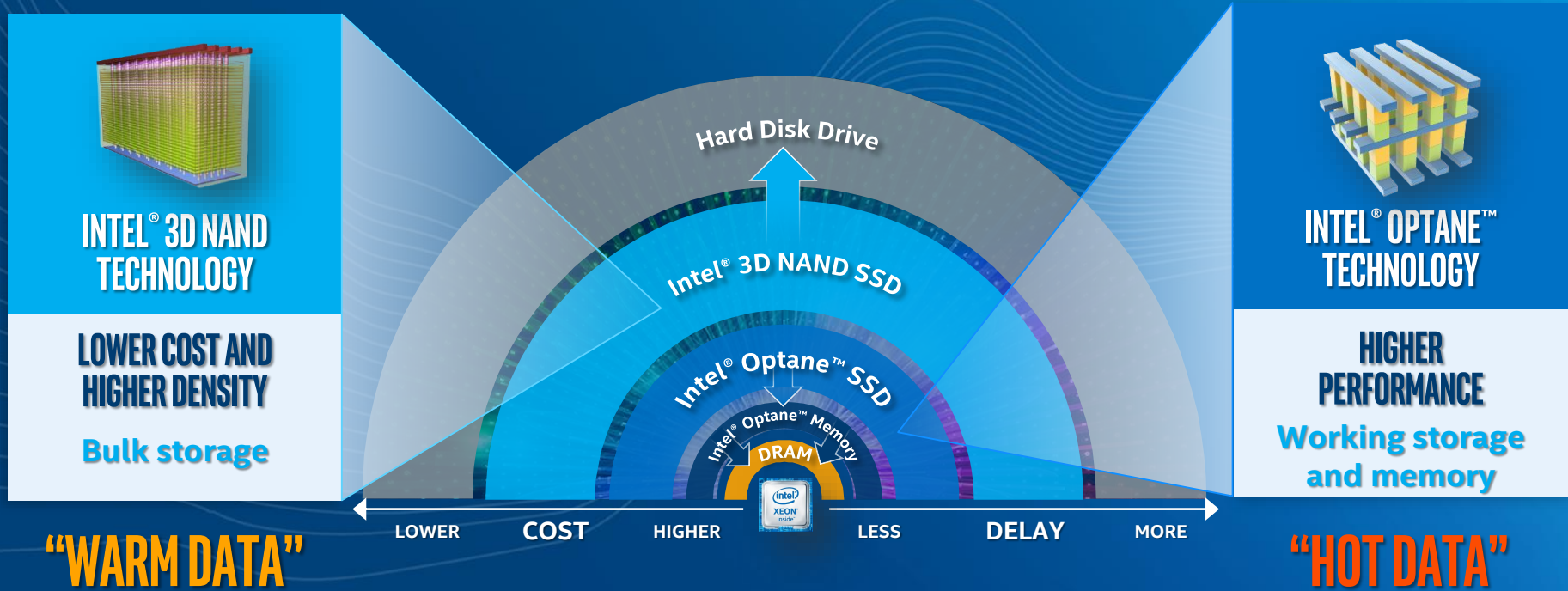
Корпорация Intel и ее поставщики не гарантируют точности или полноты текстовой или графической информации, ссылок и иного содержания материалов. Корпорация Intel вправе в любое время и без предварительного уведомления вносить любые изменения в указанные материалы, а равно и в продукцию, описанием которой они служат. Корпорация Intel не берет на себя каких-либо обязательств по обновлению материалов.

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Тесты производительности и рейтинги измерены на конкретных компьютерных системах и/или компонентах и отражают приблизительную производительность продуктов корпорации Intel в единицах данных тестов. Любое отличие в аппаратных или программных компонентах или конфигурации может повлиять на результаты измерений. Дополнительную информацию по тестам производительности и производительности продуктов корпорации Intel можно узнать по адресу:  
[http://www.intel.com/performance/resources/benchmark\\_limitations.htm](http://www.intel.com/performance/resources/benchmark_limitations.htm)

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# INTEL® IS INVESTING IN TWO TECHNOLOGIES



# INTEL® 3D NAND SSD



## PCIe\*

Intel® SSD DC  
P45xx/P46xx Series

up to

16TB

Capacity U.2, 4TB m.2

up to

6X

More IOPS/TB vs. SATA SSD

## SATA

Intel® SSD DC  
S45xx/S46xx Series

up to

8TB

Capacity 2.5", 2TB m.2

up to

10X

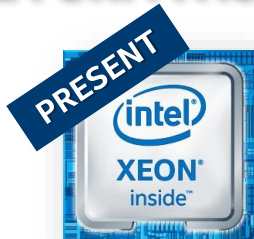
Better AFR than HDDs

\*Other names and brands may be claimed as the property of others

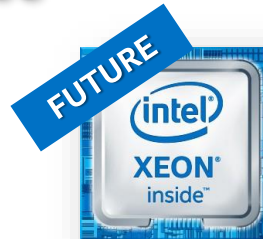
# PLATFORM STORAGE FORM FACTOR PROGRESS



**Grantley**  
(Haswell SP, Broadwell SP)



**Purley**  
(Skylake SP, Cascade Lake SP)



**Whitley**

	Grantley	Purley	Purley Refresh	Whitley
<b>Performance storage</b>	Up to 8x U.2 15mm on CPU	Up to 24x U.2 15mm through CPU, Intel® VMD	Up to 24x U.2 15mm through CPU, Intel® VMD	16x E1.S or U.2 15mm
<b>Caching</b>	AIC	AIC or U.2 15mm	AIC or U.2 15mm	U.2 15mm, E1.S
<b>Capacity Tier</b>	SATA 2.5in	SATA or U.2 15mm	U.2 15mm	E1.L or U.2 15mm
<b>Boot</b>	SATA M.2	SATA or NVMe* M.2	SATA or NVMe* M.2	NVMe* M.2 or E1.S



**E1.S**

**E1.L**

EDSFF 1U Long updated to E1.L  
EDSFF 1U Short updated to E1.S

# EDSFF "RULER". INTEL IS LEADING A REVOLUTIONARY FORM FACTOR.

**1** A group of **15 companies** working together<sup>1</sup>

**2** Goal to **maximize storage efficiency** by defining revolutionary industry standard form factors

**3** Broad, dynamic range of solutions that **scales with new interface speeds**

## A HEALTHY ECOSYSTEM

### ODM/OEM solutions

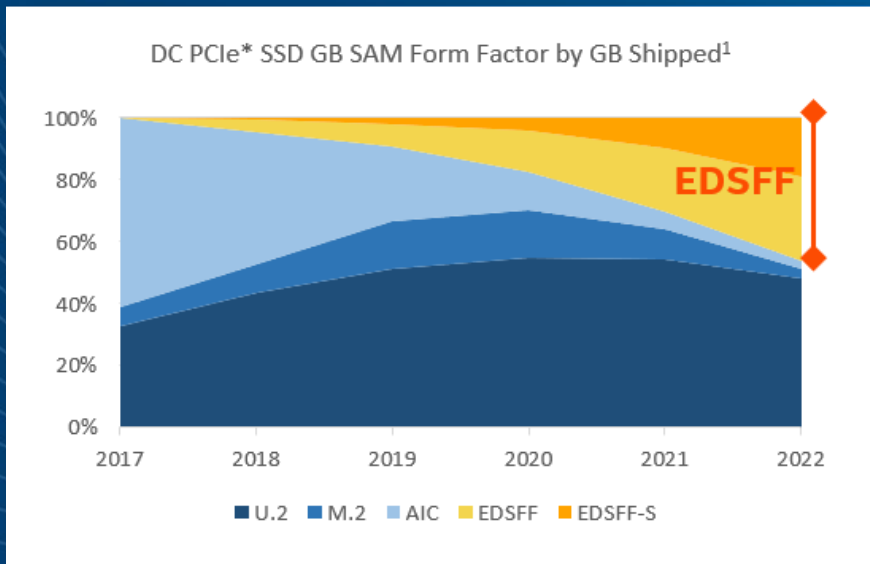


### SSD Suppliers



<sup>1</sup> List of EDSFF members provided at <https://edsffspec.org/>  
\* Other names and brands may be claimed as the property of others

# EDSFF: INTEL IS BUILDING THE MOST ROBUST “RULER” PORTFOLIO



**EDSFF 45%** of Data Center Serviceable Available Market (SAM) by 2022<sup>1</sup>



## Capacity Scaling.

- Up to 32 E1.L 9.5mm drives per 1U<sup>2</sup>
- Up to 48 E1.S drives per 1U<sup>2</sup>

## Thermal Efficiency.

- Up to 2x less airflow needed per E1.L 9.5mm SSD vs. U.2 15mm<sup>3</sup>
- Up to 3x less airflow needed per E1.S SSD vs. U.2 7mm<sup>3</sup>

## Enhanced Serviceability.

- Fully front serviceable with integrated pull latch
- Integrated, programmable LEDs
- Remote, drive specific power cycling

## Future Ready.

- x4, x8, x16 support, ready for PCIe\* 4.0 and 5.0<sup>4</sup>

<sup>1</sup> Source: Intel NSG Market Forecast, Q2'18

<sup>2</sup> Source – EDSFF form factor specifications shown at [edsffspec.org](https://edsffspec.org)

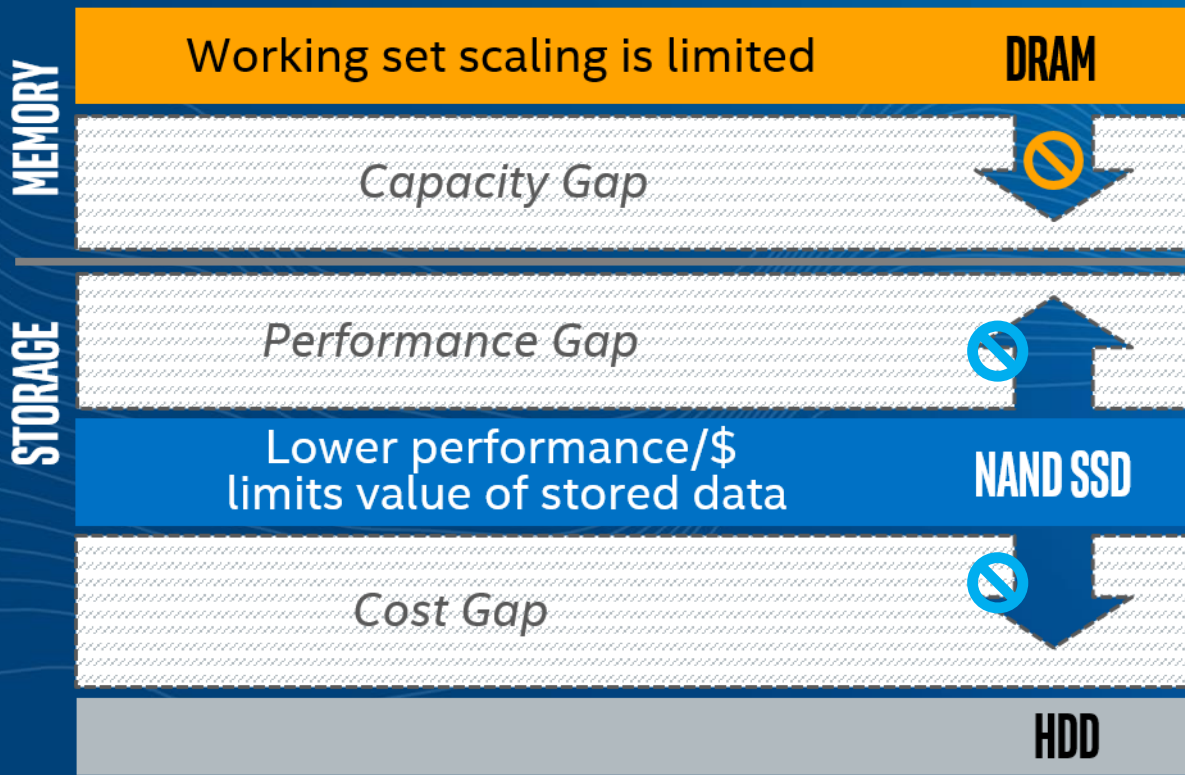
<sup>3</sup> Source – Intel. Results have been estimated or simulated using internal analysis or architecture simulation or modeling, and provided for informational purposes. Comparing airflow required to maintain equivalent temperature of a 4TB U.2 15mm Intel® SSD DC P4500 to a 4TB “Ruler” form factor for Intel® SSD DC P4500. Simulation involves three drives for each form factor in a sheet metal representation of a server, 12.5mm pitch for “Ruler” form factor, 1000m elevation, limiting SSD on case temp of 70C or thermal throttling performance, whichever comes first. 5C guard band. Results used as a proxy for airflow anticipated on EDSFF spec compliant “Ruler” form factor Intel® SSD P4510.

<sup>4</sup> EDSFF Future Ready - <https://edsffspec.org/edsff-resources/>

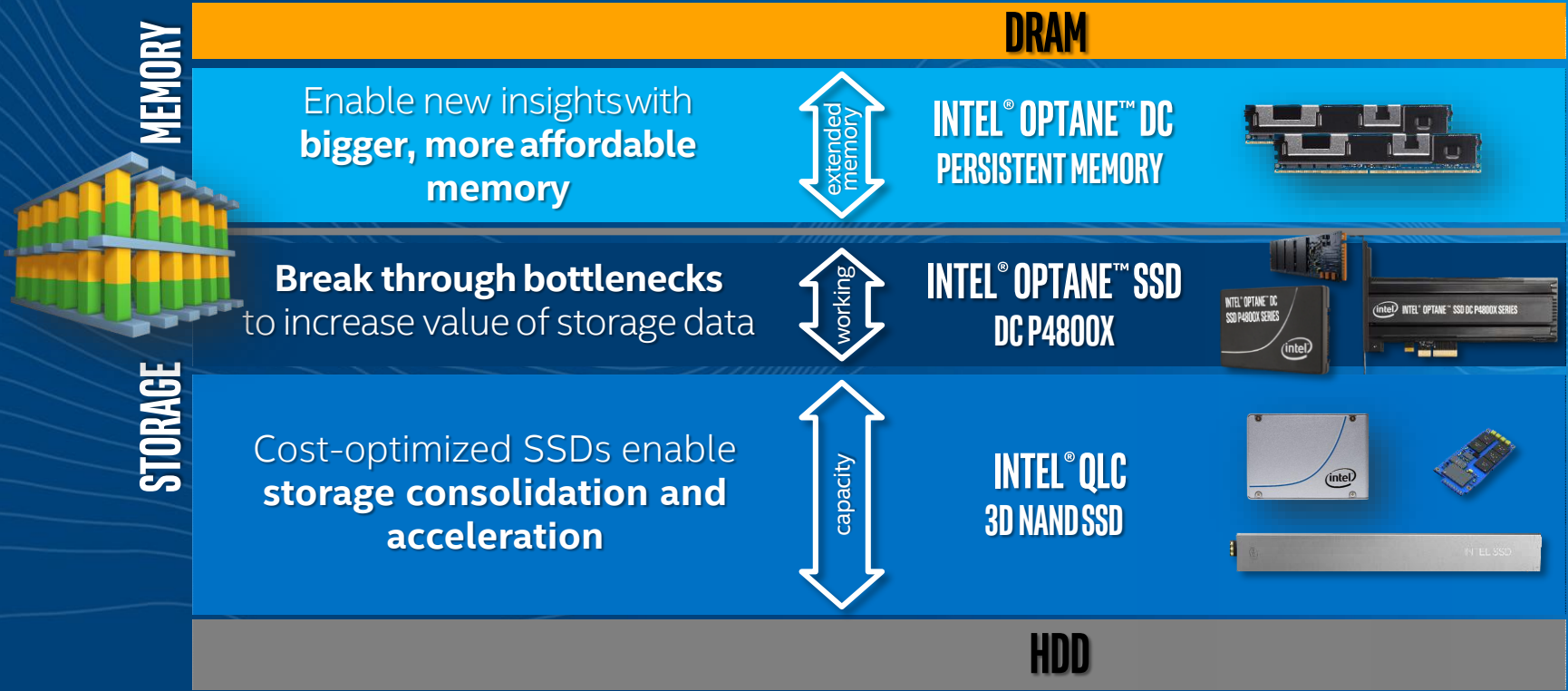
\*Other names and brands may be claimed as the property of others.



# CHANGING DATA NEEDS HAVE EXPOSED STORAGE & MEMORY GAPS



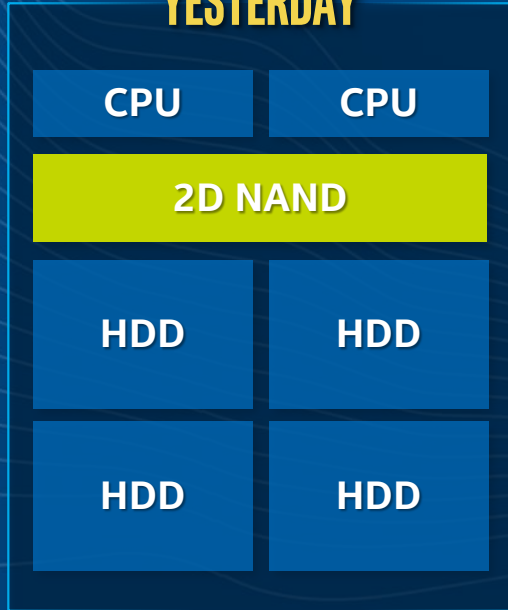
# INTEL® OPTANE™ TECHNOLOGY+ INTEL® QLC TECHNOLOGY FILL THE GAPS



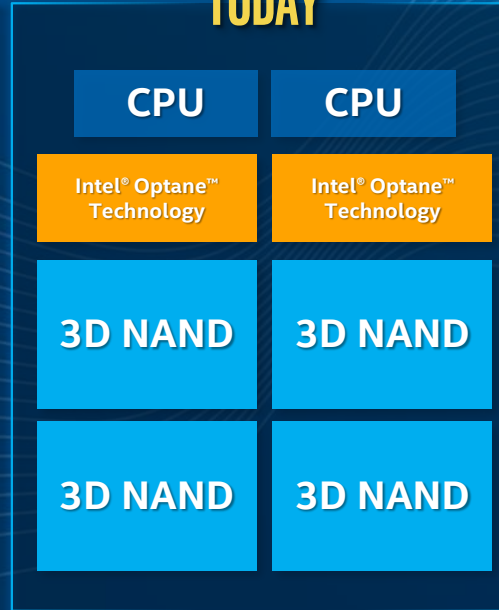
Products not shown to actual scale.

# A PORTFOLIO OF SOLUTION COMPONENTS

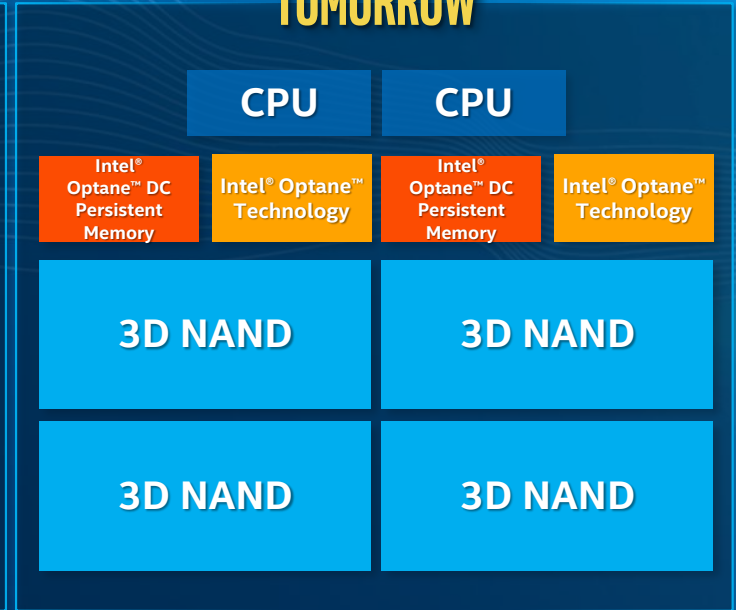
## YESTERDAY



## TODAY



## TOMORROW



# INTEL® SSD PORTFOLIO

## Intel® SSDs for Data Center

	Short Name
<b>Intel® Optane™ DC SSD Series</b> Optane PCIe (Performance)	<b>Intel® Optane™ DC SSD</b> (DC Series)
<b>Intel® SSD D7 Series</b> (Mixed workload and standard endurance NVMe/PCIe)	<b>Intel® SSD D7</b> (D7 Series)
<b>Intel® SSD D5 Series</b> QLC PCIe (Capacity Optimized)	<b>Intel® SSD D5</b> (D5 Series)
<b>Intel® SSD D3 Series</b> Legacy (SATA)	<b>Intel® SSD D3</b> (D3 Series)
<b>Intel® SSD D1 Series</b> Value Performance (DC Entry Level PCIe/SATA)	<b>Intel® SSD D1</b> (D1 Series)

Tiered by segment, interface, endurance and performance

## Intel® SSDs for Client

	Short Name
<b>Intel® Optane™ SSD 9 Series</b> High performance Optane	<b>Intel® Optane™ SSD 9</b>
<b>Intel® Optane™ SSD 8 Series</b> Smaller FF, low power	<b>Intel® Optane™ SSD 8</b>
<b>Intel® SSD 7 Series</b> Performance PCIe 3D NAND	<b>Intel® SSD 7</b>
<b>Intel® SSD 6 Series</b> Mainstream PCIe	<b>Intel® SSD 6</b>
<b>Intel® SSD 5 Series</b> SATA	<b>Intel® SSD 5</b>

Tiered by Performance

This change impacts all products launching after **June 2018**. We will not change products that launched before that timeframe.

\*Other names and brands may be claimed as the property of others.

# INTEL® SSD PORTFOLIO

## Intel® SSDs for Data Center

Short Name

<b>Intel® Optane™ DC SSD Series</b> Optane PCIe (Performance)	<b>Intel® Optane™ DC SSD</b> (DC Series)
<b>Intel® SSD D7 Series</b> (Mixed workload and standard endurance NVMe/PCIe)	<b>Intel® SSD D7</b> (D7 Series)
<b>Intel® SSD D5 Series</b> QLC PCIe (Capacity Optimized)	<b>Intel® SSD D5</b> (D5 Series)
<b>Intel® SSD D3 Series</b> Legacy (SATA)	<b>Intel® SSD D3</b> (D3 Series)
<b>Intel® SSD D1 Series</b> Value Performance (DC Entry Level PCIe/SATA)	<b>Intel® SSD D1</b> (D1 Series)

Tiered by segment, interface, endurance and performance

This change impacts all products launching after **June 2018**. We will not change products that launched before that timeframe.

\*Other names and brands may be claimed as the property of others.

# NAMING GUIDANCE: INTEL® OPTANE™ DATA CENTER SSD

## INTEL® OPTANE™ DC SSD XXXXX SERIES

Product Series	Interface	Endurance	Controller Generation	Media Stepping	Special (customer / product)	Unique Technology
DC = Intel® Optane™ Technology	P = PCIe* / NVMe*	7 = High Endurance (30 DWPD)	3 = 3 <sup>rd</sup> Gen Controllers	0 = 1 <sup>st</sup> media on controller	0 = Normal	X = Intel® Optane™ technology
	D = Dual Port NVMe	8 = Very High Endurance (60 DWPD)	4 = 4 <sup>th</sup> Gen Controllers	1 = 1 <sup>st</sup> refresh or 2 <sup>nd</sup> media on same controller	1 = Low Power	
			5 = 5 <sup>th</sup> Gen Controller	2 = 2 <sup>nd</sup> refresh or 3 <sup>rd</sup> media on same controller	2 = Performance Optimized	

\*Other names and brands may be claimed as the property of others.

# NAMING GUIDANCE: INTEL® SSD DATA CENTER

## INTEL® SSD DX-XXXXX SERIES

Product Series	Interface	Controller Generation	Endurance and Performance	Media Stepping	Special (customer / product)	Unique Technology
<b>DC</b> = Intel® Optane™ Technology	<b>S</b> = SATA	<b>3</b> = 3 <sup>rd</sup> Gen Controllers	<b>1</b> = Entry DC, Boot	<b>0</b> = 1 <sup>st</sup> media on controller	<b>0</b> = Normal	<b>X</b> = Intel® Optane™ technology
<b>D7</b> = Mixed workload / standard endurance	<b>P</b> = PCIe* / NVMe*	<b>4</b> = 4 <sup>th</sup> Gen Controllers	<b>3</b> = Value Endurance	<b>1</b> = 1 <sup>st</sup> refresh or 2 <sup>nd</sup> media on same controller	<b>1</b> = Low Power	
<b>D5</b> = Capacity Optimized	<b>D</b> = Dual Port NVMe	<b>5</b> = 5 <sup>th</sup> Gen Controller	<b>5</b> = Standard Endurance <1/<2 DWPD (P/S)	<b>2</b> = 2 <sup>nd</sup> refresh or 3 <sup>rd</sup> media on same controller	<b>2</b> = Performance Optimized	
<b>D3</b> = Legacy			<b>6</b> = Medium Endurance / Mixed Workload 3 DWPD		<b>6</b> = large Size Coarse IU (16K or 64K) See <a href="#">Product News</a>	
<b>D1</b> = Value Performance / boot			<b>7</b> = High Endurance ~10 DWPD		<b>8</b> = PCIe x8 AIC	
			<b>8</b> = Very High Endurance			

\*Other names and brands may be claimed as the property of others.

# INTEL® SSDS FOR DATA CENTER FAMILY

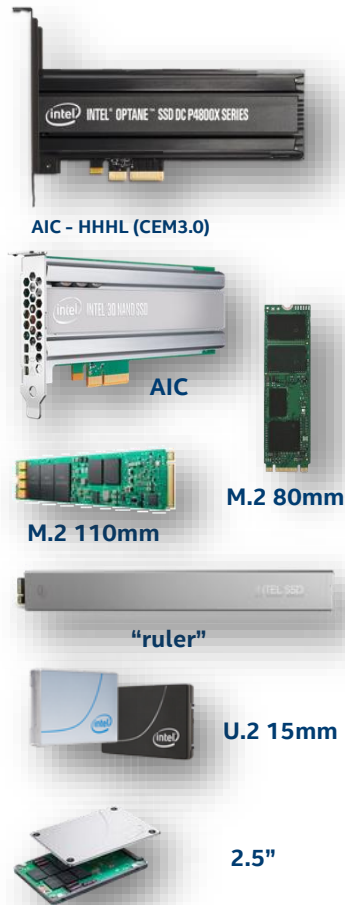
Series	Use Case	Endurance	Interface	November 2018
DC	Intel® Optane™ Technology	Very High Endurance	PCIe* Gen3	Intel® Optane™ DC SSD P4800X: U.2 15mm: 375GB, 750GB, 1.5TB AIC: 375GB, 750GB, 1.5TB
				Intel® Optane™ DC SSD P4800X with IMDT: U.2 15mm: 375GB, 750GB, 1.5TB AIC: 375GB, 750GB, 1.5TB
	Low Power	Very High Endurance	PCIe* Gen3	Intel® Optane™ DC SSD P4801X: U.2 15mm: 100GB Intel® Optane™ DC SSD P4801X with IMDT: U.2 15mm: 100GB
D7	Server Performance	Mid	PCIe* Gen3	DC P4610: U.2 15mm: 1.6TB, 3.2TB, 6.4TB, 7.68TB
				DC P4608: AIC x8: 6.4TB
				DC P4600: U.2 15mm: 1.6TB, 3.2TB, 6.4TB AIC: 2TB, 4TB
				DC P4510: U.2 15mm: 1TB, 2TB, 4TB, 8TB
	Standard	PCIe* Gen3	DC P4500: Ruler: 4TB, 8TB	
			DC P4500: AIC: 4TB, 8TB	
			DC P4511: M.2 110mm: 1TB, 2TB	
Low Power	Standard	PCIe* Gen3	DC P4501: 2.5": 500GB, 1TB, 2TB, 4TB	
D3	Server Performance	Mid	SATA III	D3-S4610: 2.5": 240GB, 480GB, 960GB, 1.92TB, 3.84TB
				DC-S4600: 2.5": 240GB, 480GB, 960GB, 1.92TB, 3.84TB
				D3-S4510: 2.5": 240GB, 480GB, 960GB, 1.92TB, 3.84TB
	Standard	SATA III	DC-S4500: 2.5": 240GB, 480GB, 960GB, 1.92TB, 3.84TB	
			DC S3520: M.2 80mm: 150GB, 240GB, 480GB, 760GB, 960GB	
D1	Value Performance	Value	PCIe* Gen3	DC-P3100: M.2 80mm: 128GB, 256GB, 512GB, 1TB
			SATA III	DC S3110: 2.5": 128GB, 256GB, 512GB M.2 80mm: 128GB, 256GB, 512GB
E7	Commercial (0°C to 70°C)	Standard	SATA III	E 7000s: 2.5": 150GB, 240GB, 480GB, 960GB M.2 80mm: 150GB, 240GB, 480GB, 960GB

■ 32-Layer, MLC, 3D NAND

■ 32-Layer, TLC, 3D NAND

■ 64-Layer, TLC, 3D NAND

■ Intel® Optane™ Technology



\*Other names and brands may be claimed as the property of others.

For more information please visit: <https://www.intel.com/content/www/us/en/products/memory-storage/solid-state-drives.html>



# INTEL® SSD DATA CENTER DESIGN-IN ROADMAP - PCIe\* (1/2)

Series	Use Case	Endurance	Oct	Nov	Dec	Q1 '19	Q2 '19	Q3 '19	Q4 '19
			DC	Intel® Optane™ Technology	Very High Endurance	<p><u>Intel® Optane™ DC SSD P4800X</u>: U.2 15mm: 375GB, 750GB, 1.5TB  <u>Intel® Optane™ DC SSD P4800X w/ Intel® Memory Drive Technology</u>: U.2 15mm: 375GB, 750GB, 1.5TB</p> <p><u>Intel® Optane™ DC SSD P4800X</u>: AIC: 375GB, 750GB, 1.5TB  <u>Intel® Optane™ DC SSD P4800X w/ Intel® Memory Drive Technology</u>: AIC: 375GB, 750GB, 1.5TB</p>			
D7	Server Performance	Mid	<u>DC P4610</u> : U.2 15mm: 1.6TB, 3.2TB, 6.4TB, 7.68TB						
		Standard	<p><u>DC P4510</u>: U.2 15mm: 1TB, 2TB, 4TB, 8TB</p> <p>(In Planning) <u>DC P4510</u>: E1.L 9.5mm: TBD</p>						

■ 64-Layer, TLC, 3D NAND
 ■ Intel® Optane™ Technology
 ■ QS

# INTEL® SSD DATA CENTER DESIGN-IN ROADMAP – PCIe\* (2/2)

Series	Use Case	Endurance	Timeline														
			Oct	Nov	Dec	Q1 '19			Q2 '19			Q3 '19			Q4 '19		
DC	Low Power Intel® Optane™ Technology	Very High Endurance	QS			Intel® Optane™ DC SSD P7401X: M.2 80mm: 58GB											
			QS			Intel® Optane™ DC SSD P4801X: M.2 110mm: 100GB, 200GB, 375GB											
			Intel® Optane™ DC SSD P4801X: U.2 15mm: 100GB Intel® Optane™ DC SSD P4801X w/ Intel® Memory Drive Technology: U.2 15mm: 100GB														
D7	Low Power	Standard	DC P4511: M.2 110mm: 1TB, 2TB														
												(In Planning) DC P4511: E1.S 5.9mm: TBD					
D5	Value Performance	Value	QS			D5-P4326: U.2 15mm: 15.36TB E1.L - 18mm: 15.36TB, E1.L - 9.5mm: 15.36TB											
			QS			D5-P4320: U.2 15mm: 7.68TB											
D1	Value Performance	Value	DC P4101: M.2 80mm: 128GB, 256GB, 512GB, 1TB, 2TB														

■ 64-Layer, QLC, 3D NAND   ■ 64-Layer, TLC, 3D NAND   ■ Intel® Optane™ Technology   ■ QS

# INTEL® SSD DATA CENTER DESIGN-IN ROADMAP - SATA

Series	Use Case	Endurance	Oct	Nov	Dec	Q1 '19	Q2 '19	Q3 '19	Q4 '19
			D3	Server Performance	Mid				<u>D3-S4610</u> : 2.5": 240GB, 480GB, 960GB, 1.92TB, 3.84TB, 7.68TB <sup>1</sup>
Standard					<u>D3-S4510</u> : 2.5": 240GB, 480GB, 960GB, 1.92TB, 3.84TB, 7.68TB <sup>1</sup>				
						<u>D3-S4510</u> : M.2 80mm: 240GB, 480GB, 960GB, 1.92TB <sup>1</sup>			

■ 64-Layer, TLC, 3D NAND    ■ QS

# ПРЕИМУЩЕСТВА ПРОДУКЦИИ INTEL® PCSD



Web Self-Help				
<a href="#">FAQ</a>	<a href="#">Downloads</a>	Guides	Videos	<a href="#">ARK</a>
✓	✓	✓	✓	✓
<b>Languages:</b> English, French, Italian, German, Spanish, Portuguese, <b>Russian</b> , Chinese, Korean, Japanese				



Interactive Support Channels				
Phone	<a href="#">Email</a>	Chat	<a href="#">Community</a>	<a href="#">Social</a>
✓	✓	✓	✓	✓
<b>Languages:</b> English, French, Italian, German, Spanish, Arabic, Portuguese, Turkish, <b>Russian</b> , Mandarin, Cantonese, Thai, Korean, Vietnamese, Japanese, Bahasa, English, Hindi, Telugu, Bengali, Malayalam, Tamil, Sinhalese				
Hours of Operation: 8x5 Local Language, 24x7 English				



Warranty (1-3 Years)	
Advanced Warranty Replacement ( <b>AWR</b> )	✓
Standard Warranty Replacement ( <b>SWR</b> )	✓



## Обеспечение высочайшего уровня поддержки, сфокусированной на реализации возможностей заказчиков

- **Тренинги** Boot camp (TST) и online информация
- Intel Application Design & Support Center (**ADSC**): возможности работы с новыми платформами, глубокие технические тренинги, технические демонстрации продукции

## Глобальная техническая поддержка

- Еженедельное обновление информации, специальные тематические встречи и круглые столы

## Гарантия

- 3 года Standard Warranty
- Сервис расширенной замены компонентов (Advanced Replacement Services)
- Локальный склад компонентов для AWR/SWR

# ПОИСК ИНФОРМАЦИИ О ПРОДУКЦИИ

Intel's **A**utomated **R**elational **K**nowledge-base (**ARK**) – открытый ресурс продукции Intel

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