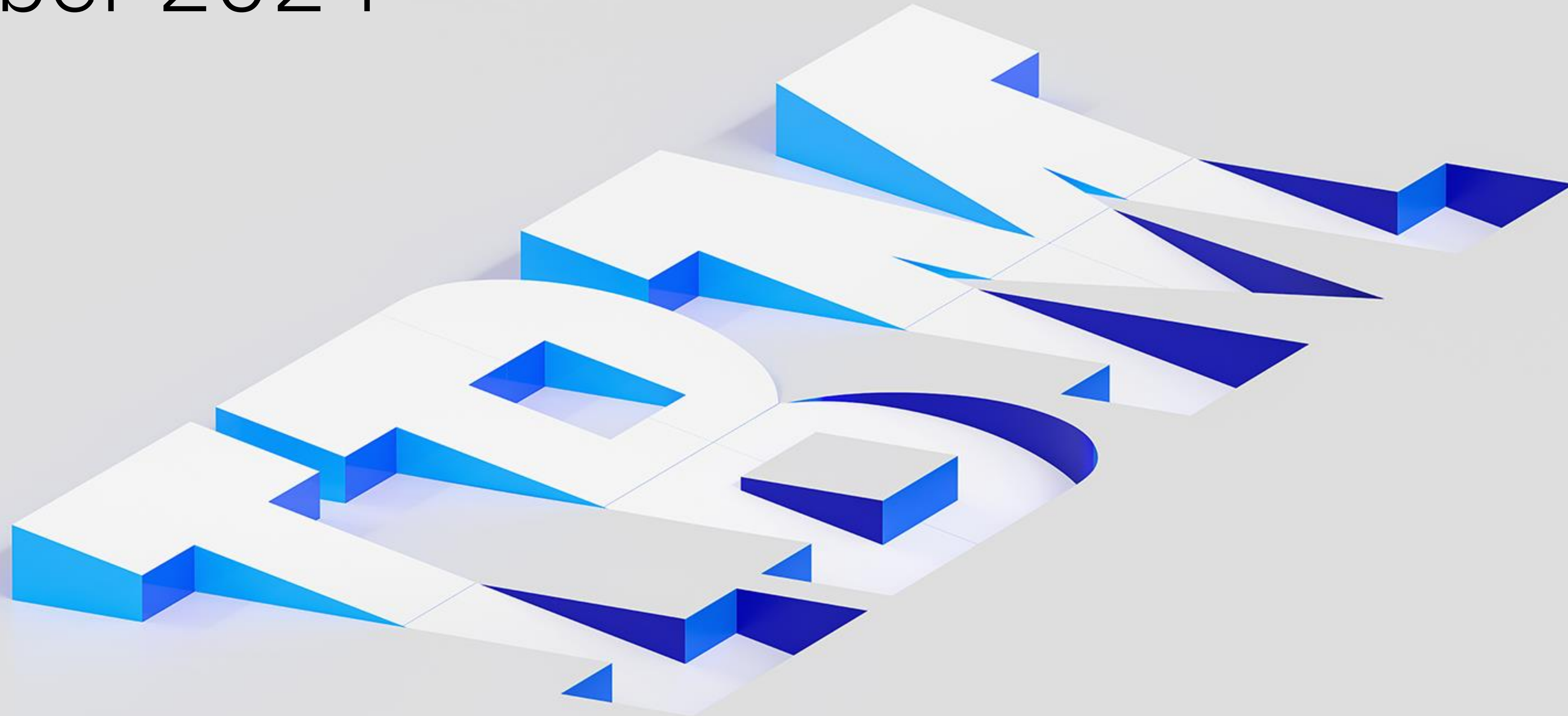


News & Hints

October 2024



Agenda

3	Statements of Direction / Hints
14	IBM z/OS Container Platform
18	IBM Z Capacity Portfolio
21	IBM Telum 2 Chip

Statements of Direction / Hints

IBM Open Enterprise SDK for Python 3.12 (11/14/24)

IBM announced adding Open Enterprise SDK for Python (Python), Z Open Automation Utilities (ZOAU), and Open Enterprise Foundation for z/OS (OEF) to z/OS 3.1 as bypassable requisites, effective on July 1st, 2024, see [z/OS 3.1 2Q 2024 Enhancement blog](#).

Many IBM Z clients have adopted these emerging technologies to accelerate their mainframe modernization strategies. Python and Open Enterprise Foundation are fundamental to accelerating IBM Z application modernization with open-source technologies. Z Open Automation Utilities adds powerful ways to interact with Multiple Virtual Storage (MVS) facilities and data sets directly from z/OS UNIX System Services and offers Python integration points.

New z/OS 3.1 orders in Shopz will include these bypassable requisite offerings so that they can be ordered to arrive in a deployable aggregated package to streamline the deployment experience. Existing z/OS installations can consider ordering these offerings as separate deployable packages as usual.

<https://community.ibm.com/community/user/ibmz-and-linuxone/blogs/chandni-dinani2/2024/06/26/zos-modernization-new-bypassable-products?communityKey=200b84ba-972f-4f79-8148-21a723194f7f>

Future required adoption of IBM Fibre Channel Endpoint Security on FICON-attached devices (04/23/24)

There is an increasing focus on the vital importance of cybersecurity from all sides, including regulatory groups and governments, and a particularly important area of cybersecurity is the protection of critical infrastructure. As many IBM Z® clients run the most mission critical applications, operate in highly regulated industries, and have an increasing amount of sensitive data, IBM must provide tools for securing client data and have a strong technology roadmap to continue to do so.

As data is being moved within and across data centers, authentication of the identities exchanging data and transparent encryption of the data in flight are required to strengthen security of the data. IBM Fibre Channel Endpoint Security (IFCES) is an end-to-end solution that is designed to provide a means to help ensure the integrity and confidentiality of all data flowing on Fibre Channel links between authorized server and storage devices, creating a trusted storage network that encrypts data in flight.

Given the increasing importance of providing the highest level of data protection to IBM Z clients, **IBM intends to require the use of IBM Fibre Channel Endpoint Security for all FICON connected devices starting with the release of IBM zNext+1**. This direction will require investment by IBM Infrastructure teams, FICON storage vendors and IBM Z clients as an important step towards continuing to secure the most mission critical workloads. In support of this direction, all new FICON-connected storage systems introduced after December 31, 2024, will be required to support IFCES to connect to zNext+1. IBM will continue its practice of licensing the FICON/IFCES specifications to vendors, and IBM will continue to actively support any vendor who chooses to implement these technologies into their products.

https://www.ibm.com/docs/en/announcements/z-linuxone-2q-2024-statement-direction#overview_title_1

IBM Test Accelerator for Z 1.0 (05/14/24)

IBM Test Accelerator for Z offers capabilities that enable software delivery teams to adopt agile, shift-left testing and continuous integration practices as part of an automated pipeline. This can help hasten the detection of defects, shorten delivery time, and reduce both cost and risk.

IBM Test Accelerator for Z brings z/OS developers and testers together, simplifying z/OS application testing so that organizations can accelerate quality goals. There are four capabilities that can be flexibly consumed based on business needs:

- Early Development Testing for z/OS enables creation and execution of reusable unit and early integration tests that can run without middleware. In addition, it helps teams accelerate test coverage for alternate or error paths.
- Integration Test Builder for z/OS accelerates automation of integration tests.
- Dynamic Test Engine for z/OS is required for both Early Development Testing for z/OS and Integration Test Builder for z/OS to create tests, and then run them without requiring middleware. It integrates with the IBM z/OS Debugger to enable code coverage collection and debugging while working with tests.
- On-demand Dev and Test environment for z/OS enables individuals or teams to quickly provision via GUI or APIs, z/OS instances for development and test from either a z/OS Dev and Test Stock image or custom image.

https://www.ibm.com/docs/en/announcements/test-accelerator-z-10-offers-platform-zos-developers-testers-generate-execute-automated-unit-integration-testing#planned_title_1

IBM watsonx Assistant for Z (05/20/2024)

IBM watsonx Assistant for Z v1 is a new generative AI assistant that infuses automation into conversational AI to help transform how system programmers, operators, and developers of all experience levels engage with and manage the mainframe. It is designed to enable users to quickly enhance their platform expertise, improve productivity, and accelerate efficiency through a trusted AI-powered conversational experience augmented with automation designed to simplify and optimize the execution of routine tasks.

IBM intends to release new capabilities to IBM watsonx Assistant for Z that enables clients to augment the assistant, accelerate automation and leverage co-location with the IBM Z environment. Features are intended to be included in 2024:

- A distribution that will run on IBM Linux on Z.
- The ability to add client's environment data to be used by IBM watsonx Assistant for Z to provide more curated answers.
- Capabilities that intend to simplify operations and development on IBM Z.
- IBM Z skill packs to enable clients to accelerate on automation.

https://www.ibm.com/docs/en/announcements/watsonx-assistant-z-transforms-simplifies-way-z-users-all-experience-levels-engage-interact-mainframe-be-more-productive#planned_title_1

Revised discontinuance of support: IBM Semeru Runtime Certified Edition for z/OS 11 (05/28/24)

Effective on the date of this announcement, the discontinuance of support date of IBM Semeru Runtime Certified Edition for z/OS 11, which was previously announced with a discontinuance of support date of 30 November 2024 in Software Announcement AD23-0579, has been extended to 30 November 2025.

https://www.ibm.com/docs/en/announcements/revised-discontinuance-support-semeru-runtime-certified-edition-zos-11#planned_title_1

IBM Open Enterprise SDK for Apache Kafka 1.1 (06/11/2024)

IBM Open Enterprise SDK for Apache Kafka 1.1 provides a straightforward connection to any Kafka cluster on the z/OS platform. z/OS application developers with COBOL and C/C++ applications can use Open Enterprise SDK for Apache Kafka to consume and publish Kafka events from their z/OS native applications directly to their Kafka broker. These direct calls do not need to go through any other layer, such as Java, MQ or CICS, allowing application developers to implement their solution independently from other teams.

z/OS COBOL application developers can transform between z/OS native COBOL copybooks and the JSON event format, that may be defined in schema registries. This allows the COBOL application programmer to easily include the copybook containing the event information into their applications.

The data transformation utility included in Open Enterprise SDK for Apache Kafka, can be used to transform data between native copy book and JSON event formats. This utility generates COBOL copybook and code snippets for specific Kafka event schemas, and can be used to process Kafka event JSON objects in COBOL applications. The generated code snippets can be used to transform COBOL event data byte arrays into JSON objects for a Kafka producer, and JSON objects into COBOL event data byte arrays for a Kafka consumer.

https://www.ibm.com/docs/en/announcements/open-enterprise-sdk-apache-kafka-11-delivers-native-kafka-api-support-zos-platform#planned_title_1

IBM z/OS Container Platform (07/09/24)

IBM z/OS Container Platform (zOSCP), program number 5655-MC3, previously announced in Software Announcement AD24-0165 on 5 March 2024, has been enhanced and satisfies the statement of direction made in that announcement. Additional capabilities include container orchestration support for the management of containerized z/OS UNIX applications running natively on z/OS and is available with PTFs for the following APARs: OA66262, OA66266, OA66267, OA66268, OA66269, OA66270, OA66361, OA66362, OA66363, OA66364, OA66365, OA66366.

Container orchestration support is designed to address the challenges that arise as enterprises embrace modern application development, utilizing container technology as part of their digital transformation strategy. As the number of containers grows, container orchestration tooling becomes a necessity to manage the lifecycle of containers and to optimize the utilization of resources.

https://www.ibm.com/docs/en/announcements/zos-container-platform-delivers-industry-standard-orchestration-support-manage-containerized-zos-unix-applications-running-natively-zos#planned_title_1

IBM Db2 Analytics Accelerator for z/OS 8 (08/20/24)

IBM intends to deliver a new version of IBM Db2 Analytics Accelerator for z/OS (Accelerator) to provide clients with new and enhanced features to deliver real-time insights from the most current transactional data and to reduce mainframe resource consumption.

The Accelerator is an innovative technology that provides unprecedented analytic processing performance for real-time query results from IBM Z data-in-place. Providing high speed analysis of valuable enterprise data without expensive Extract-Transform-Load (ETL), the Accelerator helps organizations process real-time analytics from current transactional data without impacting transactional workloads. Critical data remains on IBM Z helping to reduce batch processing cycles, decision latency, security risk, complexity, and cost.

As part of this new version of the Accelerator, IBM intends to introduce several changes, new capabilities, and enhancements to existing features.

- New capabilities and enhancements planned to be included are:
- Large object (LOB) data will be accelerated in the same way as traditional structured data. Resource intensive queries with LOB data that are currently executed in Db2 for z/OS can be off-loaded to the Accelerator to free up z/OS-based resources and can enhance performance.
- Accelerator to Accelerator data copying will be possible enabling tables to be copied between Accelerators including Accelerator-only tables (AOTs), reducing duplicate processing across multiple Accelerators.
- AOTs will be used to store performance metrics to support the monitoring experience, improving user accessibility, automation, and the ability to make more proactive decisions.
- The Accelerator user experience will be provided through IBM Db2 Administration Foundation.

<https://www.ibm.com/docs/en/announcements/sod-db2-analytics-accelerator-idaa-zos-8#ariaid-title2>

IBM intends to remove the C/C++ Performance Analyzer host component from IBM z/OS (08/27/24)

IBM intends that z/OS 3.1 is the last release that contains the C/C++ Performance Analyzer host component (FMIDs H24P111/J24P112). The C/C++ Performance Analyzer host component is part of the optionally priced feature of XL C/C++. The C/C++ Performance Analyzer host component has been available within z/OS to support IBM C/C++ Productivity Tools for OS/390 (5655-B85), which was withdrawn from service on 30 May 2020.

The recommended replacements for IBM C/C++ Productivity Tools for OS/390 are:

- IBM Application Performance Analyzer for z/OS
- IBM Application Delivery Foundation for z/OS

<https://www.ibm.com/docs/en/announcements/statement-direction-intends-remove-cc-performance-analyzer-host-component-from-zos#ariaid-title2>

IBM Threat Detection for z/OS 1.1 (09/10/24)

IBM Threat Detection for z/OS 1.1 (5698-CA1) delivers the ability to detect various forms of anomalies in z/OS dataset accesses across a sysplex that could be indicative of a cyberattack. Its output is intended to facilitate notification, diagnosis, mitigation, and recovery for faster post-incident response times .

The IBM z/OS Workload Integration Correlator, a z/OS priced feature, is entitled with this offering to enable data collection.

The IBM z/OS Authorized Code Scanner (zACS), a z/OS priced feature, is entitled with this offering to provide the additional capability for integrity scanning of Authorized Program Facility (APF) z/OS programs.

For additional information, see the [IBM Threat Detection for z/OS](#) web page.

Product information, including system requirements, tech notes, training, support, and more, will be available on or before general availability in [IBM Documentation](#).

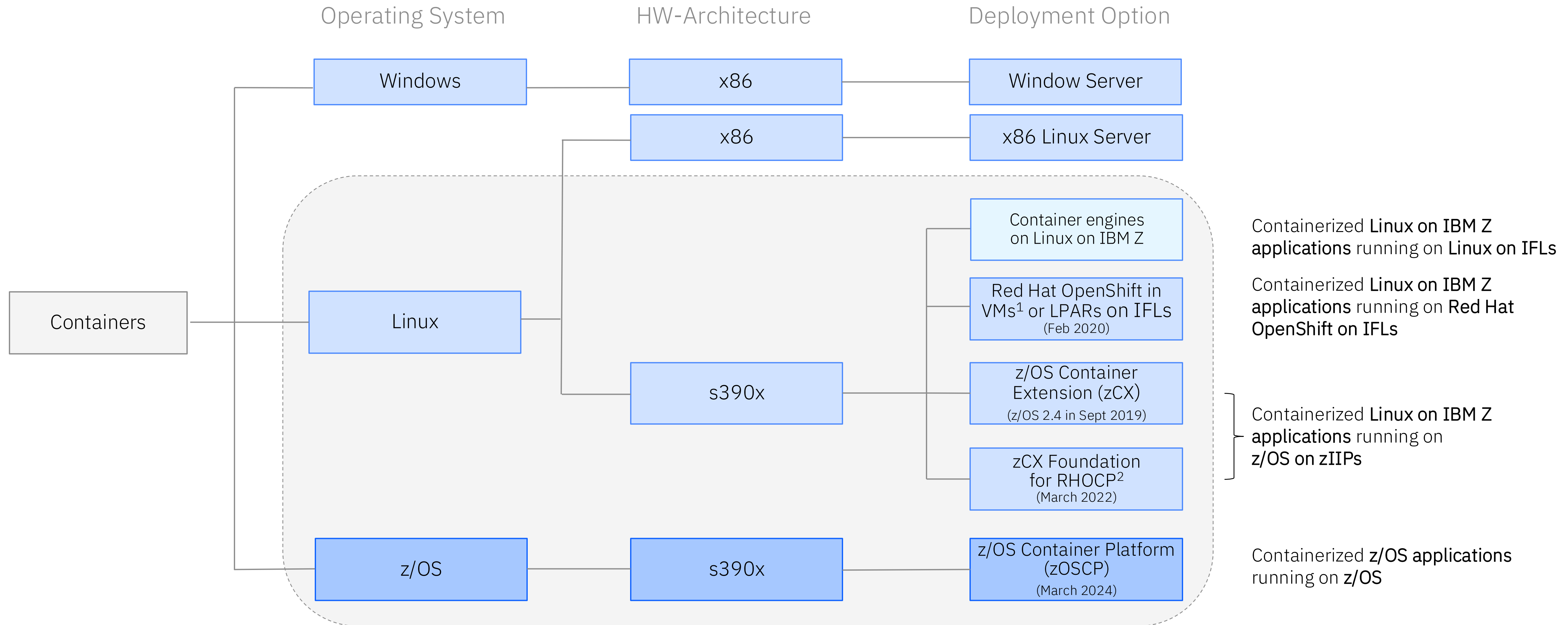
<https://www.ibm.com/docs/en/announcements/threat-detection-zos-11-delivers-ai-driven-discovery-anomalies-that-could-be-indicative-cyberattack#ariaid-title2>

IBM z/OS Container Platform (zOSCP)

*Enable cloud native development for new and existing
z/OS UNIX applications*

IBM Z container portfolio

IBM Z and containers on z/OS is designed to provide the agility and modern technologies to extend and build new UNIX applications on z/OS and to integrate z/OS data and transactions into an enterprise-wide hybrid cloud solution with... stronger security, better scaling and resiliency and close proximity to existing workloads



¹ Virtual machines based on IBM z/VM or Red Hat KVM

² Red Hat OpenShift Container Platform

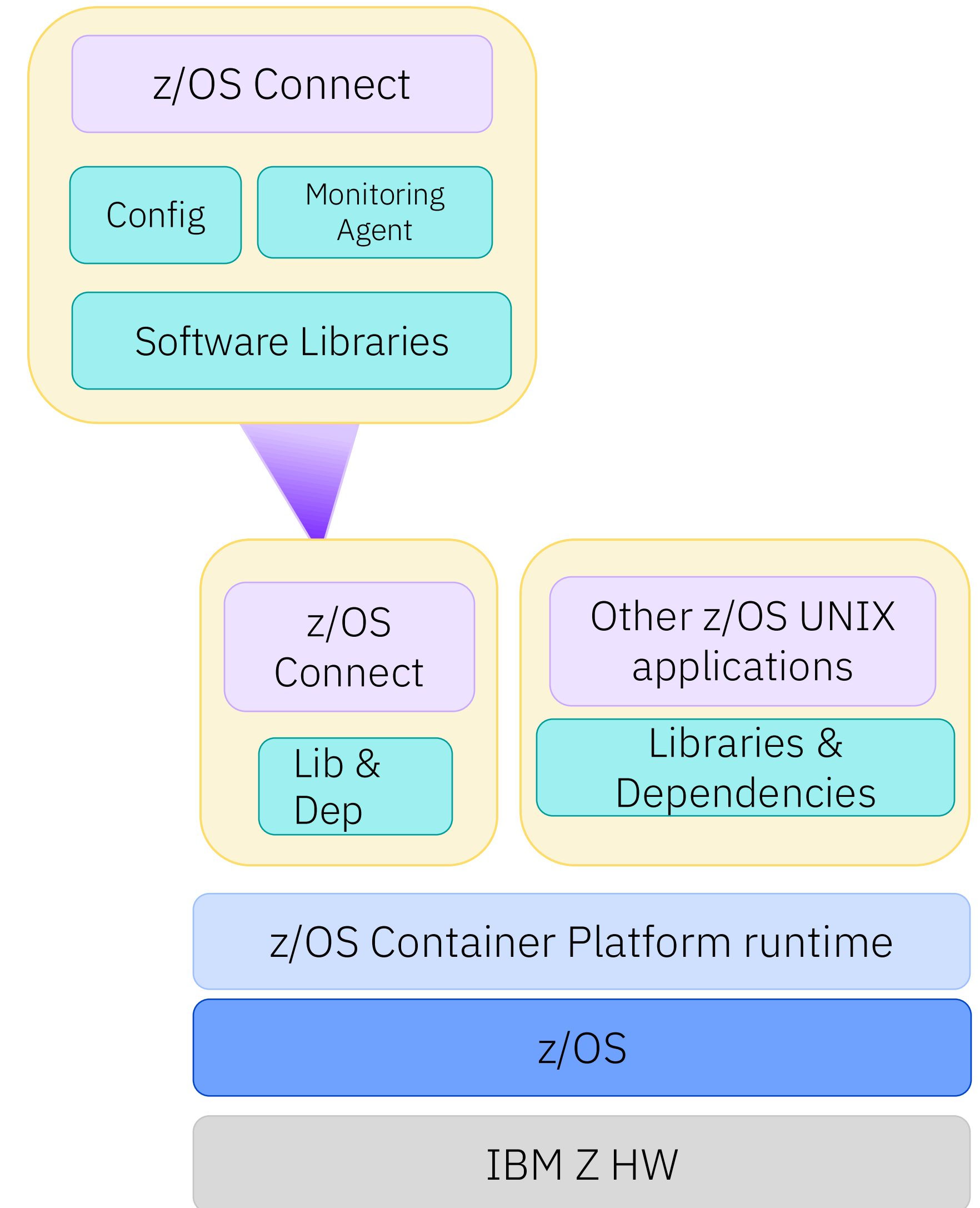
Containers on IBM z/OS Container Platform (zOSCP)

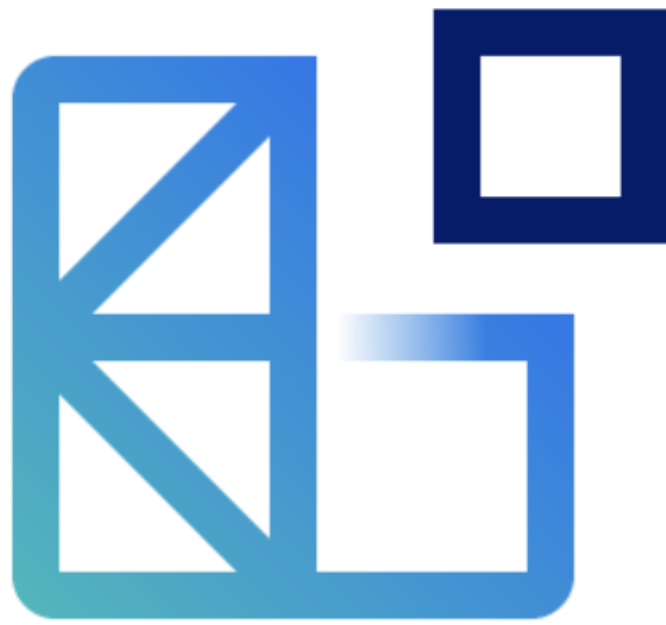
Supporting containers on z/OS requires that z/OS creates facilities to provide isolation for z/OS

Like all z/OS applications, zOSCP containers will run on z/OS

- zOSCP containers run in a z/OS address space

z/OS UNIX applications can be containerized and run natively on z/OS, some examples would include Go, Java and z/OS Connect





The value of z/OS Container Platform

targeted for workloads that



Desire to containerize z/OS UNIX applications, and run them natively on z/OS like any other z/OS application

zOSCP enables new and existing z/OS UNIX applications to be containerized and run in a z/OS address space like any other z/OS application



Have an affinity to the z/OS applications/data and/or want to co-locate with non-containerized applications and data on z/OS

zOSCP containers run natively on z/OS benefiting from running in close proximity to z/OS applications and data



Want to leverage traditional z/OS operations management

zOSCP supports traditional operations management for resource management, networking and security



Desire a consistent cloud native development process and seamless DevOps integration

zOSCP uses industry standard container technology and tools and supports DevOps practices enabling a cloud native development experience



Want a simplified “getting started” experience for Kubernetes cluster setup and configuration

zOSCP provides an embedded self-contained Control Plane Appliance (zCPA) facilitating the Kubernetes cluster setup experience



Desire a consistent and familiar recovery process

zOSCP provides an embedded load balancer, which integrates with the IBM z/OS Communications Server’s Sysplex Distributor technology, which eliminates the need for a SysAdmin to provide and manage an external load balancer when running a high availability Kubernetes cluster

IBM Z Capacity Portfolio

Replacement Capacity

	Capacity Backup (CBU)	Flexible Capacity for Cyber Resiliency EE	Flexible Capacity for Cyber Resiliency LiTe
Description	Allows the client to replace model capacity and specialty engines on a backup server in the event of an unforeseen loss of server capacity because of an emergency	Allows active capacity flexibility for all engine types between z16 servers to allow capacity swaps for an extended term	Allows active capacity flexibility for all engine types between z16 servers in different datacenters to allow capacity swaps for an extended term
Introduced	Sep '98	May '22	Sep '23
Use case	DR testing, Emergency DR		DR testing, Emergency DR, Compliance Testing, Facility Maintenance, Pro-active Avoidance
Engine type supported	Standard capacity, specialty engines		Standard capacity, specialty engines
Max. number of activations / activation period	10-day test per year (minimum of 72 hours in between tests); additional tests may be ordered 90-day disaster activation, replenishable on use	12 times per year / for maximum period of 12 months	4 times per year / for maximum period of 30 days and 90 days in case of real DR
Temp capacity limit	Defined at the time of purchase. CBU may back up <u>multiple</u> systems on a single system cannot exceed capacity lost	Equal or less than customer owned capacity can be activated after 24-hour migration overlap period	
Pricing	Pricing based on the number of CBU Engines, and duration of the contract	Tiered pricing based on defined customer scenarios. Perpetual and term license available TFP SW pre-req	Tiered pricing based on defined customer scenarios. Only term license available TFP SW pre-req

Temporary Capacity

	On/Off Capacity On Demand (On/Off CoD)	System Recovery Boost Upgrade	Tailored Fit Pricing for Hardware (TFP HW)	Test and Stress Test for Hardware (TST)	Z Business Resiliency Stress Test (zBuRST)
Description	Allows the client to temporarily add additional capacity or specialty engines due to seasonal activities, period-end requirements, peaks in workload, or application testing	Allows the client to make additional zIIPs temporarily available for a System Recovery zIIP Boost after planned or unplanned outages	Additional capacity corridor above client purchased capacity in whole engine increments, per CEC. Provides headroom capacity	Additional capacity corridor above client purchased capacity in whole engine increments, per CEC, limited to Test, Stress Test and development workloads	Allows the client to increase DevOps code quality by introducing massive quality assurance and/or stress tests
Introduced	Sep '03	Sep '20	May '21	May '23	Feb '21
Use case	Workload peaks, application testing	Planned or unplanned partition shutdowns or IPLs	Unpredictable workload spikes, workload efficiency and improved response times, capacity planning for growth	Continuous Test and Stress Testing to improve quality of development and improve resiliency	Volume / stress test of full production environment to address quality and scale
Engine type supported	Standard capacity, specialty engines	zIIP engines	Standard capacity	Standard capacity	Standard capacity, specialty engines
Max. number of activations / activation period	Used when needed, no limit on number of activations	30 activations (replenishable), 6 hours	Activated 365 / 7 / 24 During the term of the TFP HW contract	Test 365 days per year, Stress Test 20 days per year, increments of Stress Tests is optional	Activated for maximum of 15 business days
Temp capacity limit	Defined at the time of configuration (up to <u>double</u> of owned capacity)	20 zIIP engines	Corridor size defined at the time of contract	CEC Limits for Microcode activations	Min. of 10 000 MIPS, Min 50% of prod. MIPS
Pricing	Billed after usage, based on amount of capacity activated and duration of activation	1-to-5-year subscription	Cloud-like consumption pricing based on Subscription and Usage if measured above customer owned capacity per CEC TFP SW pre-req	Minimum 1-year Pre-paid subscription charge, TFP SW Dev/Test container is a pre-req.	Pre- paid On/Off CoD tokens. Tokens used for zBuRST are discounted off the cost of standard prepaid On/Off CoD capacity

IBM Telum 2 Chip

IBM Telum 2

IBM Telum® II
processor and
IBM Spyre™ Accelerator chip
for AI



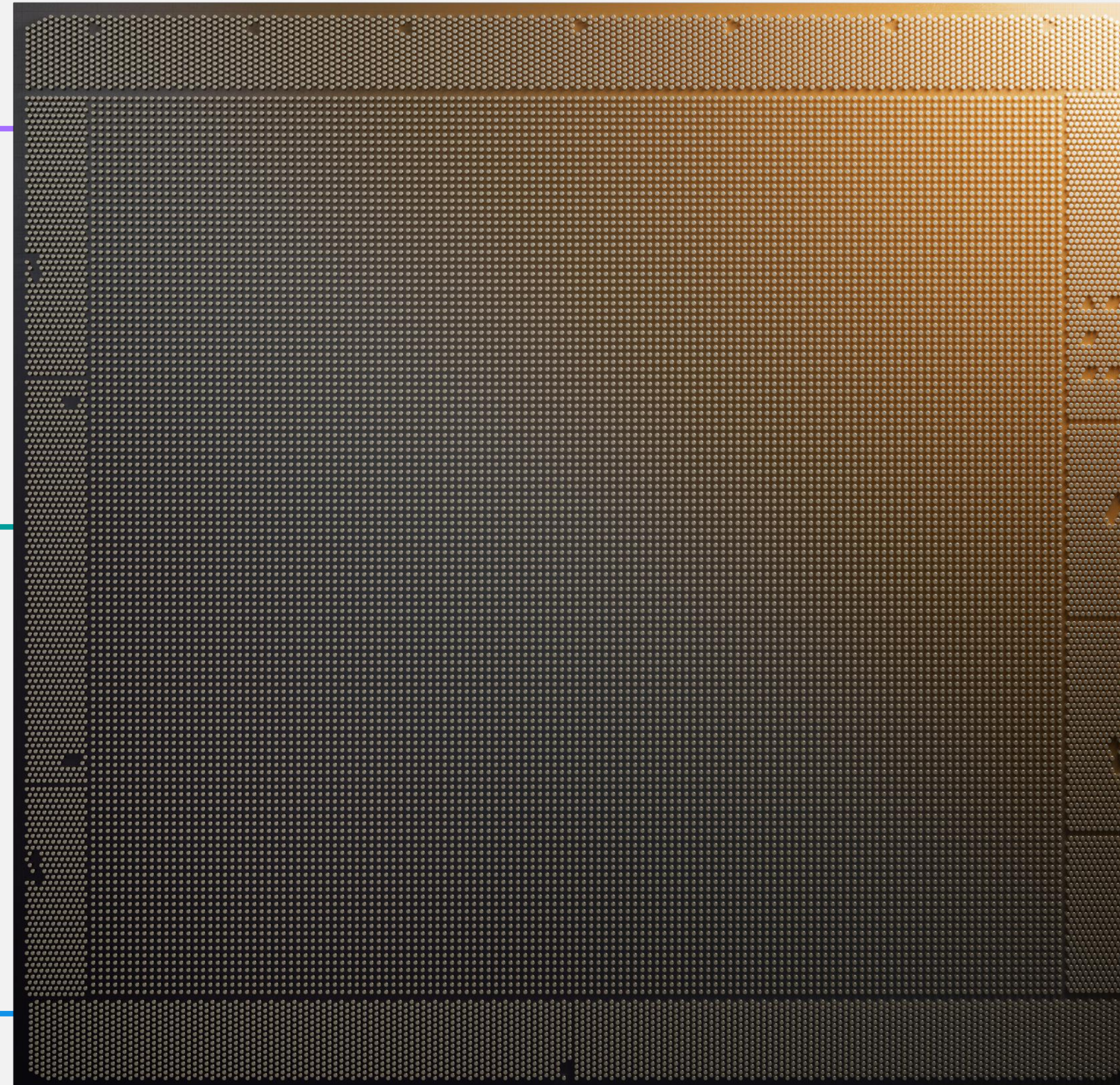
10 - 36MB L2s

DPU

For I/O acceleration

AI accelerator

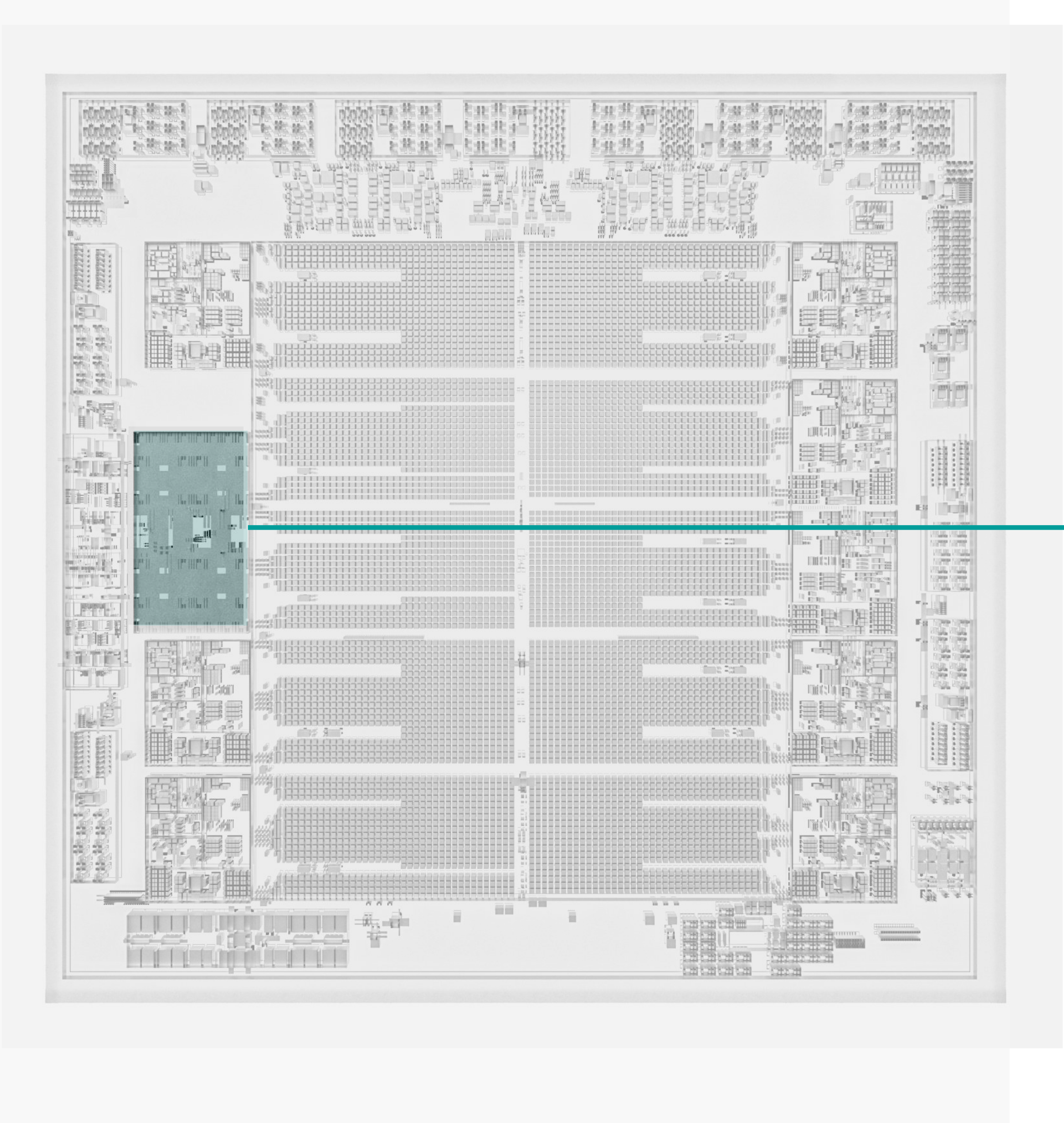
24 TOPS



8 - 5.5GHz cores

On-chip Data Processing Unit implements complex I/O protocols and reduces latency

Reduced power for IO management by 70%



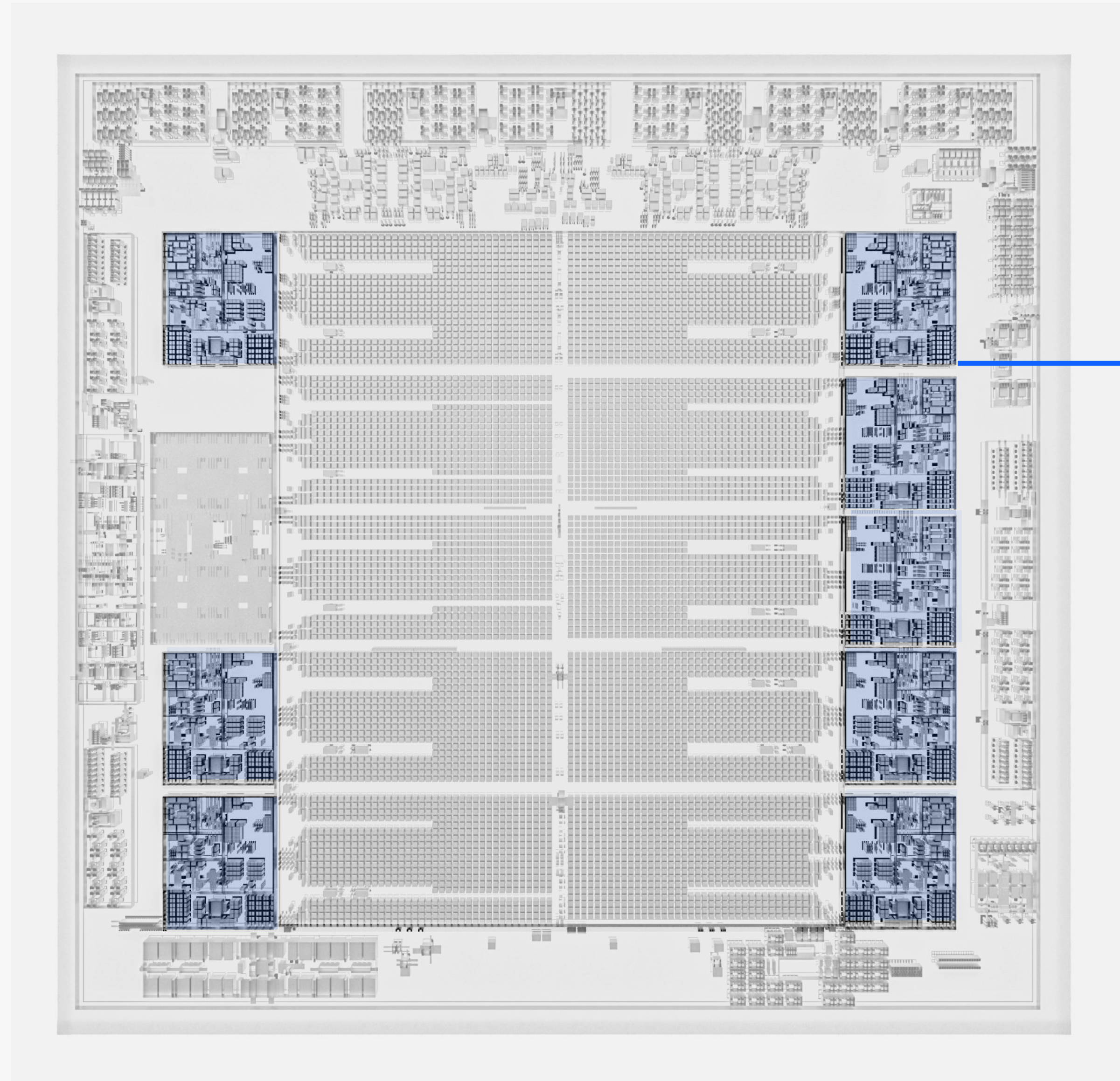
DPU

Enhanced Central Compute Complex

Optimized cores

- Branch prediction improvements
- Rename register growth 128 to 160
- Improved store writeback and address translation

- 20% area reduction
- 15% power reduction



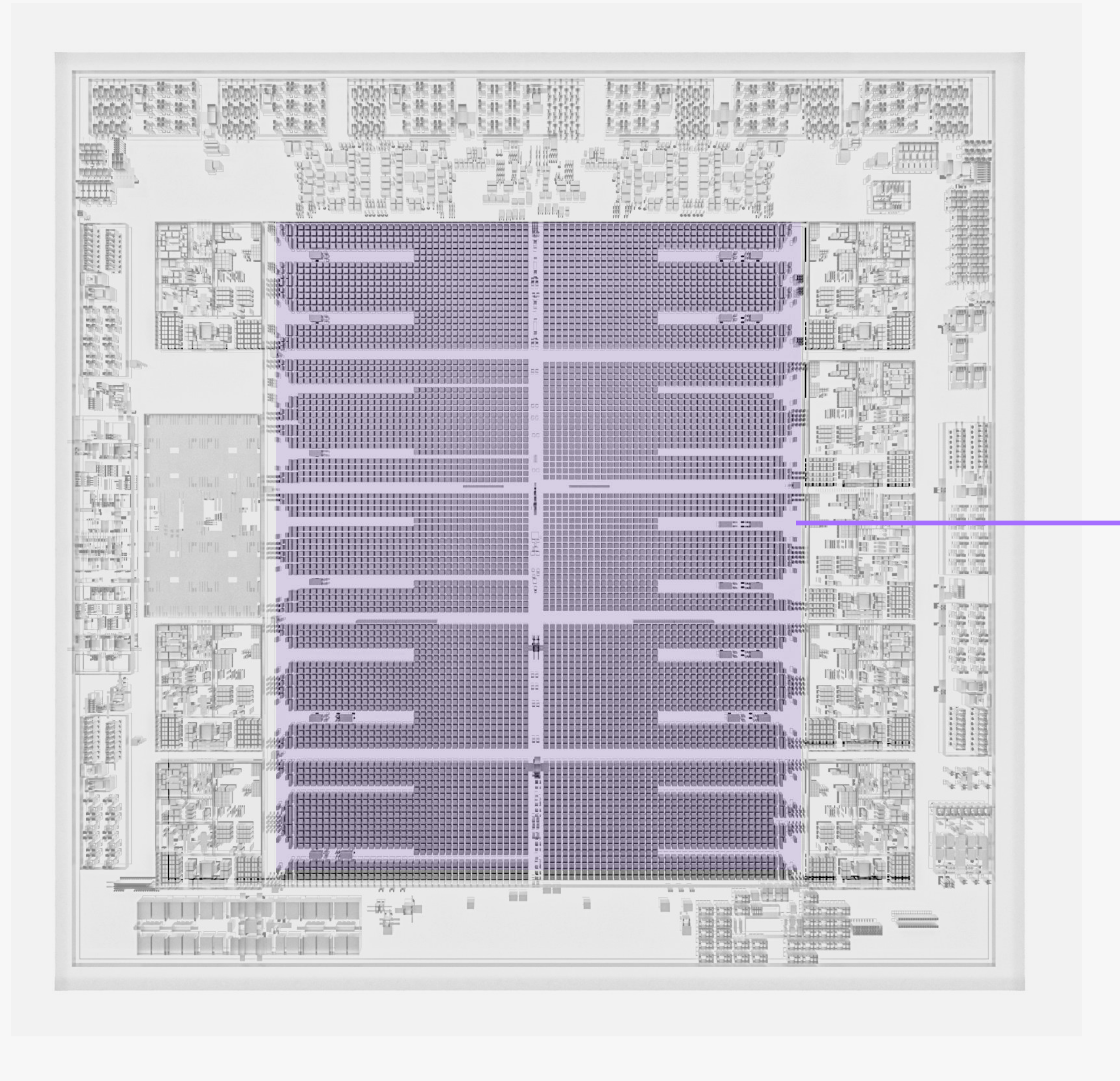
8 cores

40% cache growth

Improved caches

- 36MB L2—3.6ns
- 360MB virtual L3—11.5ns
- 2.8 GB virtual L4—48.5ns

- Improved horizontal persistence
- 30% improvement off-chip bandwidth
- Drawer-to-drawer encryption

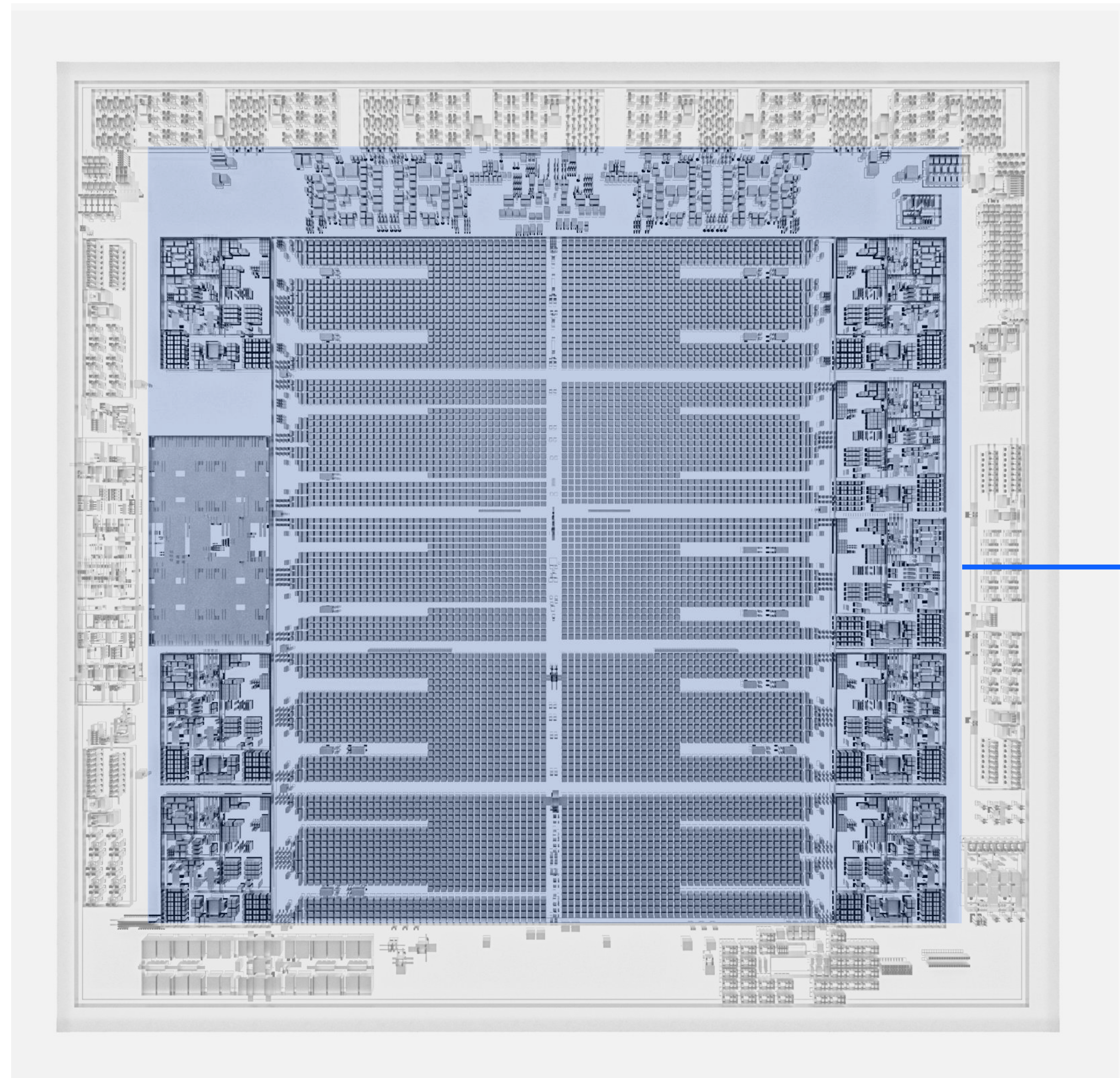


10 L2s

5nm
technology

↑ 5.5 GHz
per core

↑ 20%
socket
performance

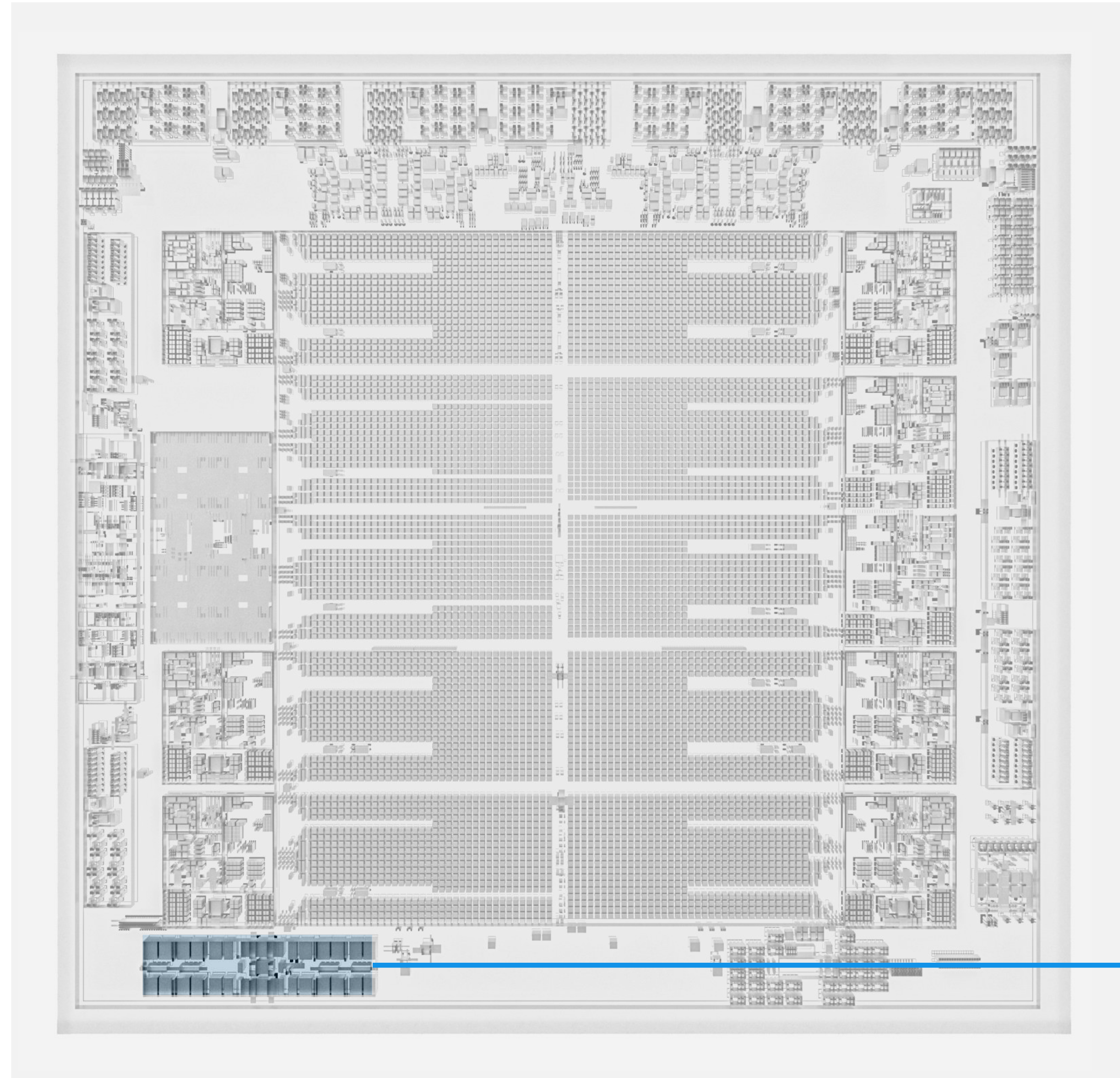


Voltage
control loop

Improved On-processor AI Acceleration

- 24 TOPS per chip
- 192 TOPS per drawer
- 768 TOPS per system

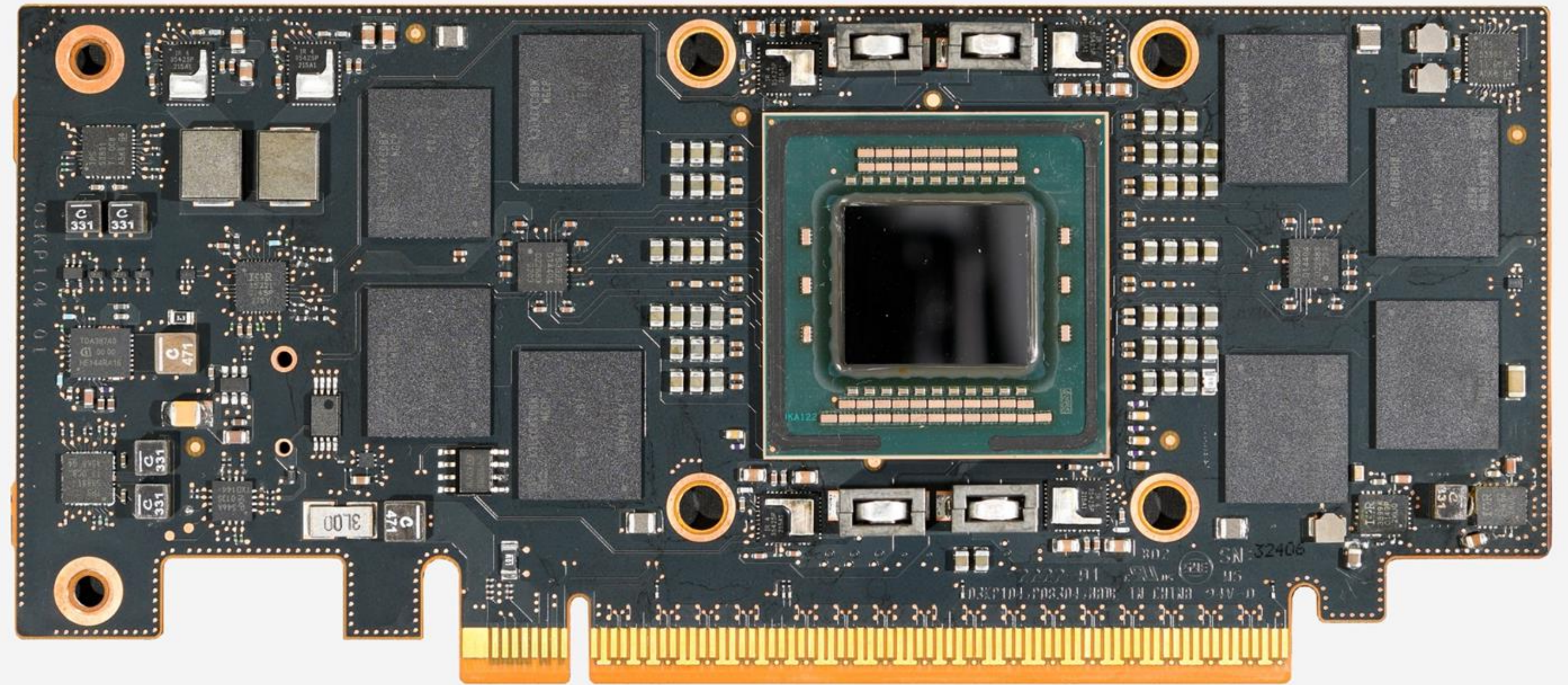
- Integrated as a CISC instruction
- Remote AI accelerator
- Support for LLM compute primitives
- Int8, FP16 datatypes



AI accelerator

IBM Spyre™ Accelerator PCIe attached card

- 300+ TOPS
- 75W PCIe gen5 x16 adapter
- 128GB of LPDDR5 memory

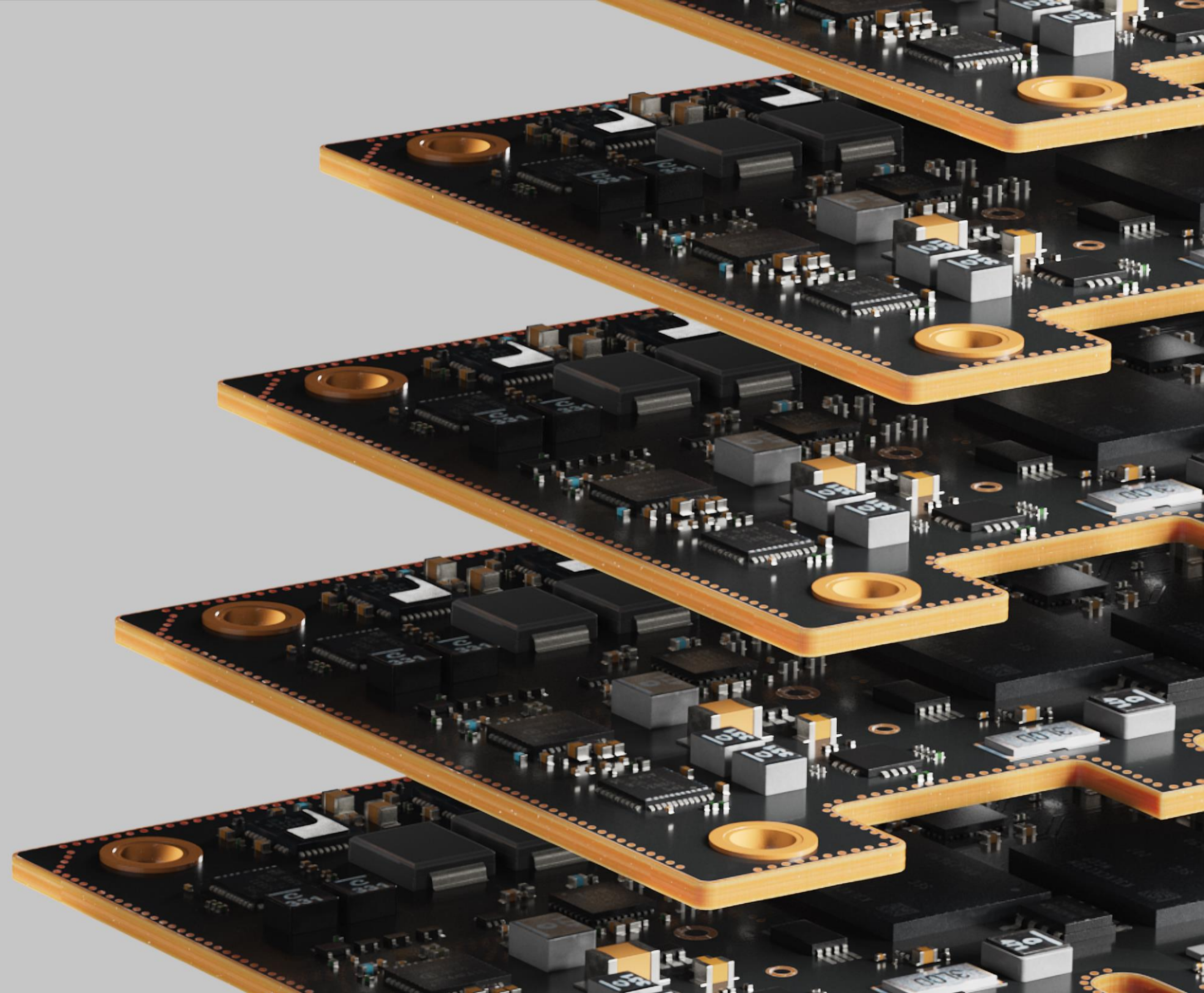


Designed to handle
generative AI use cases

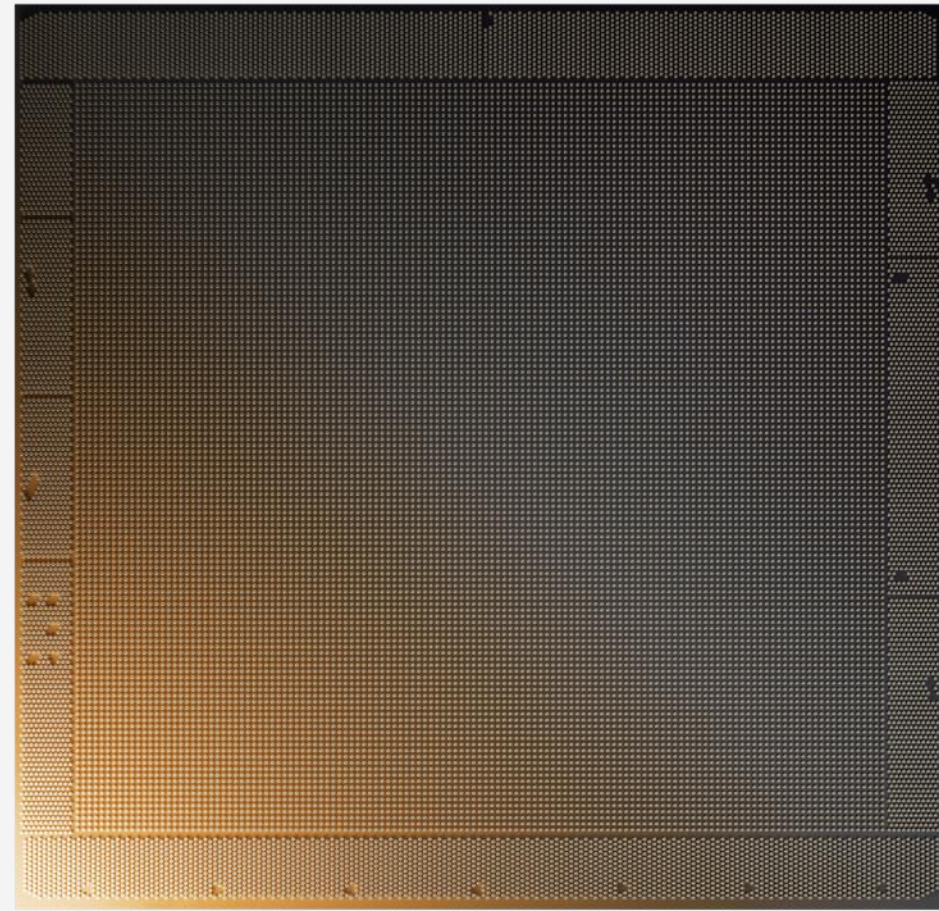
8 cards in I/O drawer
form a logical cluster

1TB of memory

1.6TB per second
aggregate memory
bandwidth

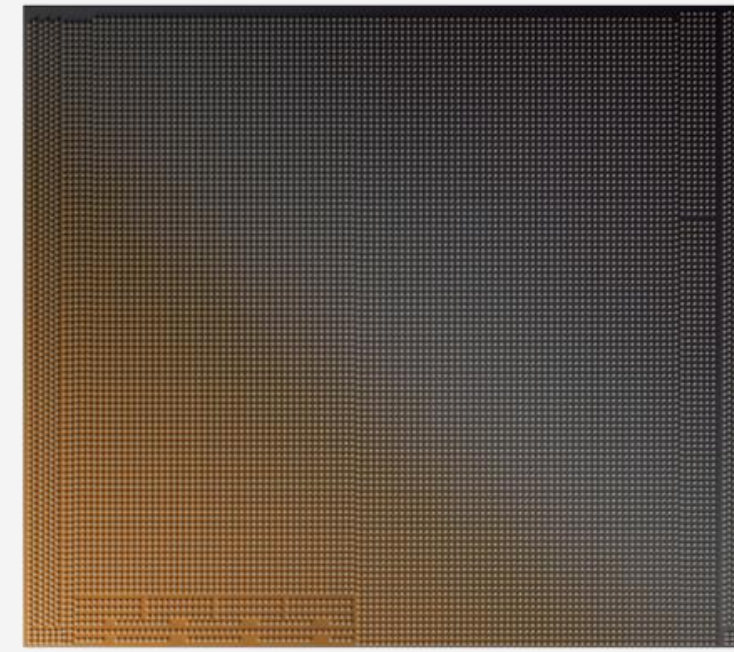


Telum[®] II



Samsung 5HPP technology
43 billion transistors
600 sqmm
24 miles of wire

Spyre[™]



Samsung 5LPE technology
26 billion transistors
330 sqmm
14 miles of wire



Thank you

References

1 - DISCLAIMER: Performance result is extrapolated from IBM internal tests running local inference operations in an IBM z16 LPAR with 48 IFLs and 128 GB memory on Ubuntu 20.04 (SMT mode) using a synthetic credit card fraud detection model (<https://github.com/IBM/ai-on-z-fraud-detection>) exploiting the IBM Integrated Accelerator for AI. The benchmark was running with 8 parallel threads each pinned to the first core of a different chip. The `lscpu` command was used to identify the core-chip topology. A batch size of 128 inference operations was used. Results were also reproduced using a z/OS V2R4 LPAR with 24 CPs and 256GB memory on IBM z16. The same credit card fraud detection model was used. The benchmark was executed with a single thread performing inference operations. A batch size of 128 inference operations was used. Results may vary.

IBM Spyre™ Accelerator is currently in tech preview

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Client examples are presented as illustrations of how those clients have used IBM products and the results they may have achieved. Actual performance, cost, savings or other results in other operating environments may vary.

Not all offerings are available in every country in which IBM operates.

Any statements regarding IBM’s future direction, intent or product plans are subject to change or withdrawal without notice.

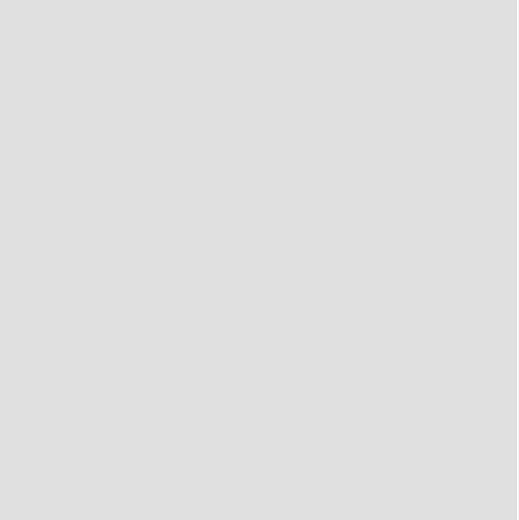
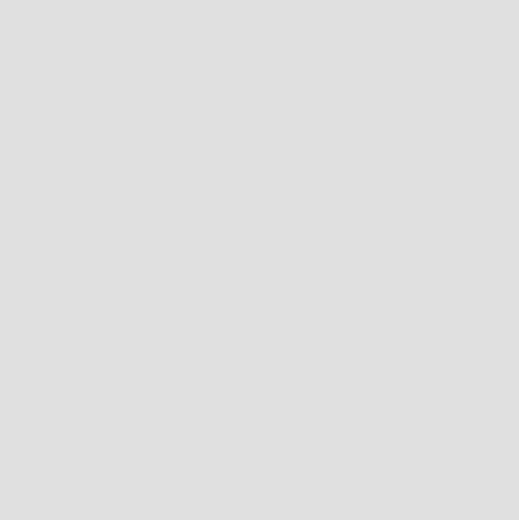
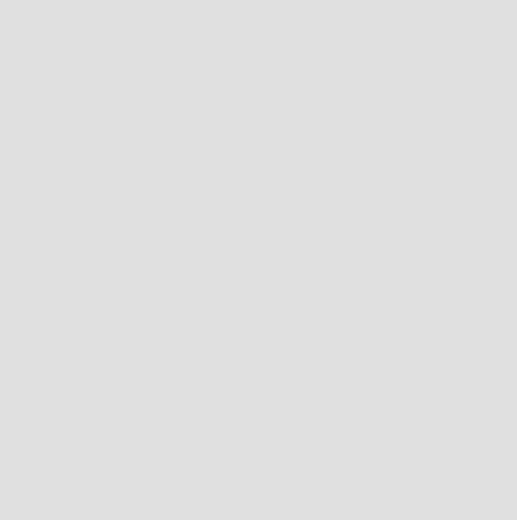
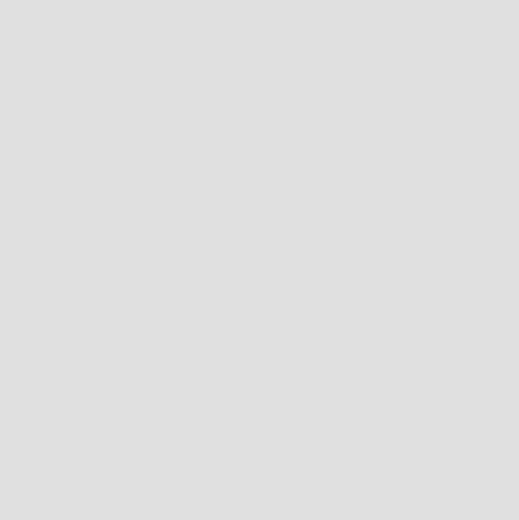
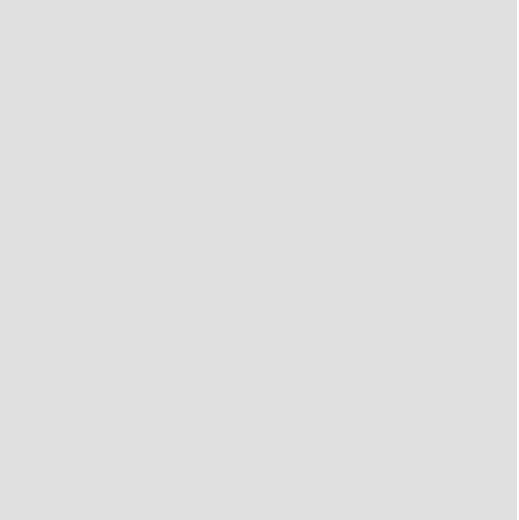
Presenters



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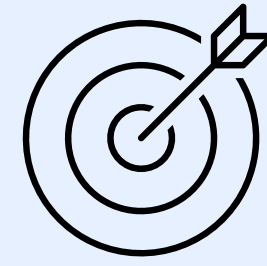
Replacement Capacity

Temporary Capacity

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Introduced	Sep '98	May '22	Sep '23	Sep '03	Sep '20	May '21	May '23	Feb '21
Use case	DR testing, Emergency DR	DR testing, Emergency DR, Compliance Testing, Facility Maintenance, Pro-active Avoidance		Workload peaks, application testing	Planned or unplanned partition shutdowns or IPLs	Unpredictable workload spikes, workload efficiency and improved response times, capacity planning for growth	Continuous Test and Stress Testing to improve quality of development and improve resiliency	Volume / stress test of full production environment to address quality and scale
Engine type supported	Standard capacity, specialty engines	Standard capacity, specialty engines		Standard capacity, specialty engines	zIIP engines	Standard capacity	Standard capacity	Standard capacity, specialty engines
Max. number of activations / activation period	10-day test per year (minimum of 72 hours in between tests); additional tests may be ordered 90-day disaster activation, replenishable on use	12 times per year / for maximum period of 12 months	4 times per year / for maximum period of 30 days and 90 days in case of real DR	Used when needed, no limit on number of activations	30 activations (replenishable), 6 hours	Activated 365 / 7 / 24 During the term of the TFP HW contract	Test 365 days per year, Stress Test 20 days per year, increments of Stress Tests is optional	Activated for maximum of 15 business days
Temp capacity limit	Defined at the time of purchase. CBU may back up <u>multiple</u> systems on a single system cannot exceed capacity lost	Equal or less than customer owned capacity can be activated after 24-hour migration overlap period		Defined at the time of configuration (up to <u>double</u> of owned capacity)	20 zIIP engines	Corridor size defined at the time of contract	CEC Limits for Microcode activations	Min. of 10 000 MIPS, Min 50% of prod. MIPS
Pricing	Pricing based on the number of CBU Engines, and duration of the contract	Tiered pricing based on defined customer scenarios. Perpetual and term license available TFP SW pre-req	Tiered pricing based on defined customer scenarios. Only term license available TFP SW pre-req	Billed after usage, based on amount of capacity activated and duration of activation	1-to-5-year subscription	Cloud-like consumption pricing based on Subscription and Usage if measured above customer owned capacity per CEC TFP SW pre-req	Minimum 1-year Pre-paid subscription charge, TFP SW Dev/Test container is a pre-req.	Pre- paid On/Off CoD tokens. Tokens used for zBuRST are discounted off the cost of standard prepaid On/Off CoD capacity

Test and Stress Test capacity

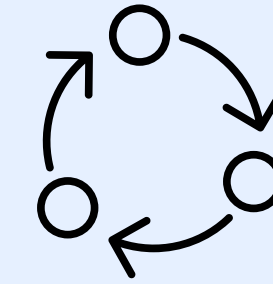
Delivers the ability to increase Test and Development capacity 24/7/365 and doing Stress Testing for 20 Days per year or more



GOAL

Become more responsive to Business Demand by continuous delivery of new application features and functions via constant delivery.

Be able to do frequent Stress Testing and become more resilient



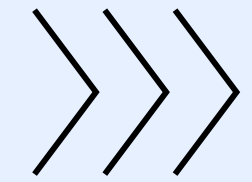
METHOD

Restricted capacity to be used for Development and Stress Test LPARs only (no Production)

Minimum of 1 engine for Test Development per involved CEC

Stress Test Capacity based on customer requirement /demand

MIPS and Microcode only



CHARGES

Prepaid Subscription charges for the contract term, and ability for optional Stress Test above the standard 20 per year.

No usage charges

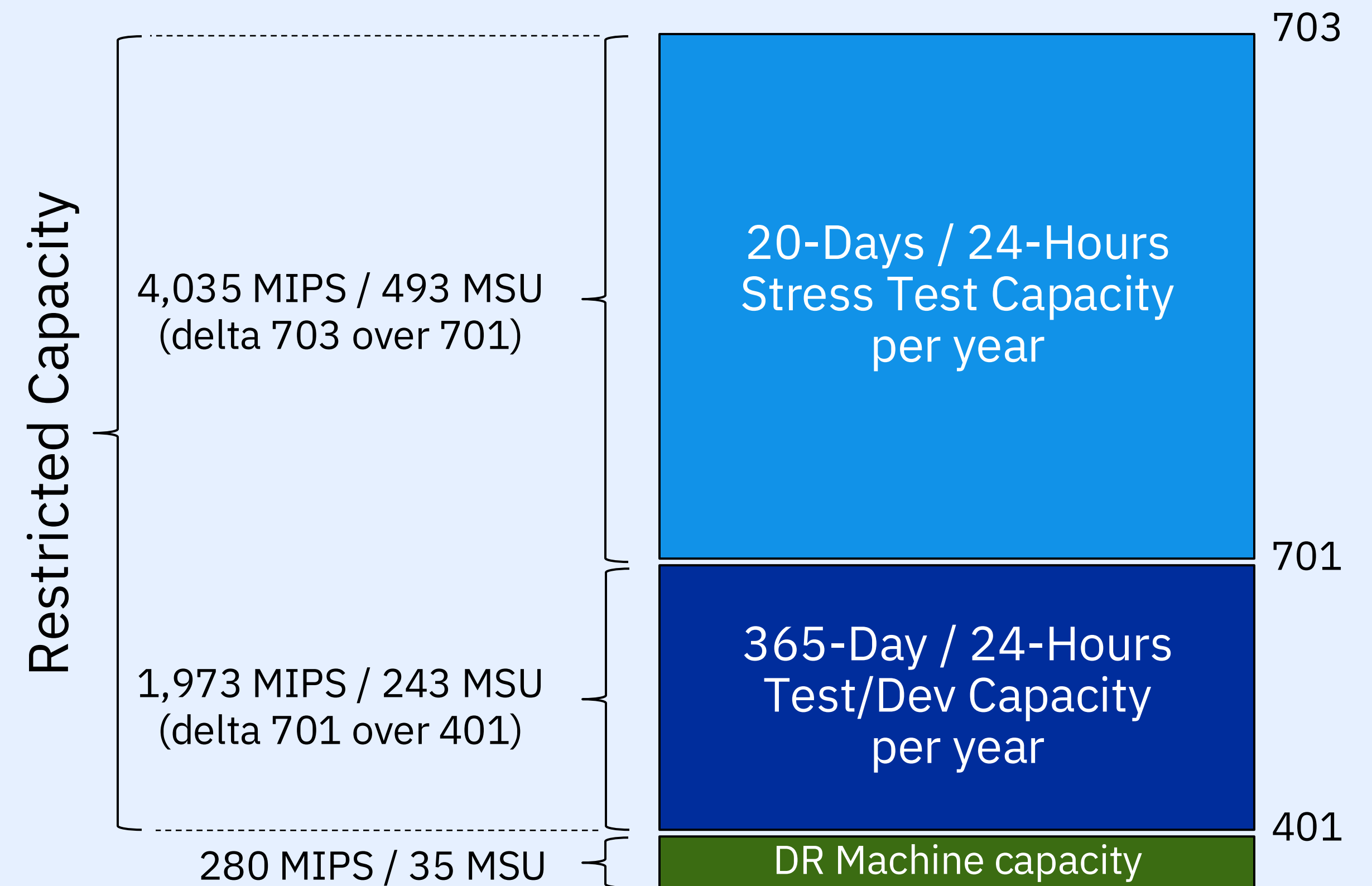
Test and Stress Test capacity on dedicated machine(s)

Test and Stress Test capacity:

- Two levels of restricted capacity per machine:
 - Test/Development capacity
 - Stress Test capacity
- Minimum 1-year prepaid contract
 - Contracted per year
 - Pricing is based on the Development and Test purchase price for both capacity levels
 - Capacity ownership stays with IBM
 - Flat rental fee based on LSPR* capacity levels
 - Additional Stress Test Capacity can be acquired
 - Increases can be done during contract term
- Dedicated engines not shared with any other workload
 - No limit on size of the Test/Dev Capacity or Stress Test Capacity (microcode only)
 - Standard is 2:1 ratio

*LSPR = Large Systems Performance Reference for IBM zSystems
<https://www-40.ibm.com/servers/resourceink/lib03060.nsf/pages/lspindex?OpenDocument>

IBM z16 Dev/Test System



Example:

365 days / 24 hours Delta between IBM z16-401 and IBM z16-701 = 243 MSU / 704.6% Test/Development Capacity

20 days / 24 hours Delta between IBM z16-701 and IBM z16-703 = 493 MSU / 204.5% Stress Test Capacity

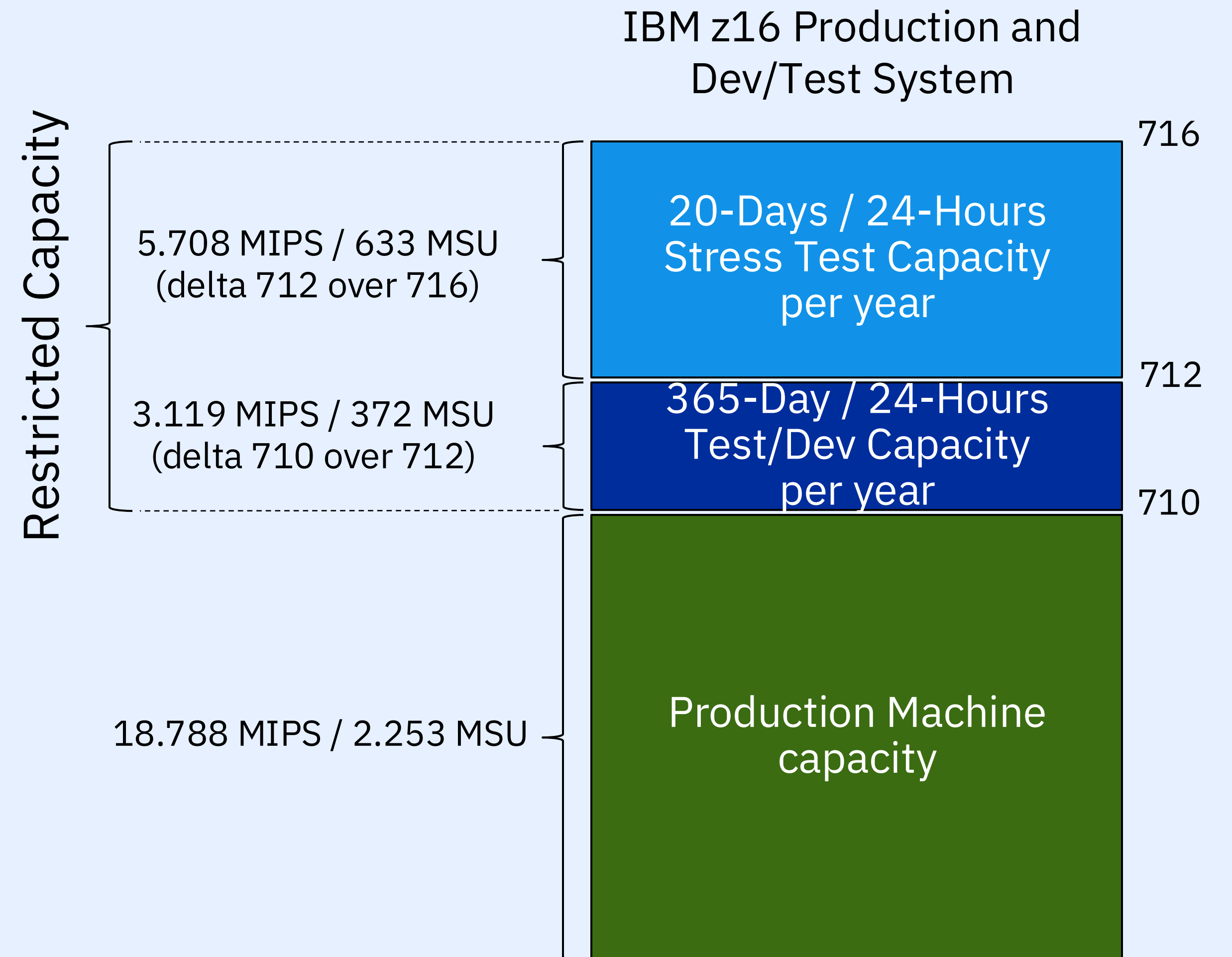
Test and Stress Test capacity on shared machine(s)

Test and Stress Test capacity:

- Two levels of restricted capacity per machine:
 - Test/Development capacity
 - Stress Test capacity
- Minimum 1-year prepaid contract
 - Contracted per year
 - Pricing is based on the Development and Test purchase price for both capacity levels
 - Capacity ownership stays with IBM
 - Flat rental fee based on LSPR* capacity levels
 - Additional Stress Test Capacity can be acquired
 - Increases can be done during contract term
- Dedicated engines not shared with any other workload
 - No limit on size of the Test/Dev Capacity or Stress Test Capacity (microcode only)
 - Standard is 2:1 ratio

*LSPR = Large Systems Performance Reference for IBM zSystems

<https://www-40.ibm.com/servers/resourceink/lib03060.nsf/pages/lspindex?OpenDocument>



Example:

365 days / 24 hours Delta between IBM z16-710 and IBM z16-712 = 372 MSU / 16.6% Test/Development Capacity

20 days / 24 hours Delta between IBM z16-712 and IBM z16-716 = 633 MSU / 183% Stress Test Capacity