Power Enterprise Pools on IBM Power Systems

Introducing new flexibility and responsiveness for activating capacity on demand

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Executive summary

In today's 24x7, always-on world, the IT organization must be able to respond quickly to dynamic business environments. A highly flexible IT infrastructure can be a key success factor to an organization's competitive advantage and can help deliver more value from IT investments. An IBM Power Systems™ IT infrastructure provides the foundation of shared IT capabilities upon which the entire business depends.

IBM Power® Enterprise Systems servers deliver flexibility that IT infrastructure demands by enabling IT staff to dynamically move processor and memory activations between servers within a defined pool of servers. This mobile feature of IBM Power Systems Capacity on Demand (CoD) is available using the new IBM Power Enterprise Pools offering.
It enables you to move processor power and memory configurations at your convenience and without having to purchase additional resources on other servers.

Power Systems Capacity on Demand was the first step in providing flexibility, enabling customers to activate dormant processor and memory resources within a single Power system without taking down the system or applications. The original Capacity on Demand allows you to quickly

purchase additional resources for a specific server to be used when required. However, if you are relocating workloads, these resources may be duplicates of those already purchased and enabled. Power Enterprise Pools is the latest evolution in providing both Power processor and memory resources when and where they are needed.

Introduction to Power Enterprise Pools

Power Enterprise Pools is an exciting multisystem Power Systems infrastructure offering designed to provide a highly resilient and flexible IT environment in support of your most demanding business applications. Power Enterprise Pools, a feature found only on Power Enterprise Systems, provides a new permanent activation type for processors and memory—Mobile Capacity On Demand (Mobile CoD)—which delivers unprecedented flexibility and the availability required to help meet resource needs both today and into the future.

Mobile processor core and memory activations are available to be re-allocated to any Power System within a defined pool which contains existing inactive resources. This capability allows IT infrastructure to more fully exploit the capabilities of Power servers and the enhanced features that Power Systems Capacity on Demand provide.

Power Systems pooling has advanced over the past several years, based on a vast amount of IBM experience working with customers around the world to understand their challenges and maximize the value they receive from IBM systems.

Power Enterprise Pools is the logical next step from IBM Systems Power Flex and IBM Power System Pools, providing new enhancements that:

- Put control of dynamically movable resources directly in the hands of IT staff.
  - Mobile activations can be moved within a Power Enterprise Pool at any time, without contacting IBM.
  - There is no limit to the number of times mobile activations can be moved.
- Provide instant response to change with new flexibility.
- Include the Power 770, 780 and 795 servers, as well as the newly released Power E870 and E880 servers.
- Enable high availability environments.
- Support your cloud environment and other dynamic workload management requirements.

Important note

For the purposes of this document, when Power 770 and 780 servers are mentioned, the applicable models being discussed are those that have IBM POWER7+™ processors (unless otherwise specified).

	CBU for DR*	Power Flex	Power System Pools	
Available for Power 795	X	X	X	
Available for Power 780			X	
Available for Power 770				
Available for Power E870/E880				
Enabled for processor activation	X	X	X	
Enabled for memory activation			X	
Supports workload balancing		X		
Immediate access to resource				
Pool size	Any	4	10	
Configuration restrictions	Specific and limited	Each system must be at 50% active	Pool must be 50% active	

Table 1. The evolution of Power Systems pooling

Power Enterprise Pool basics

Power Enterprise Pools with mobile and elastic CoD delivers both flexibility and economic efficiency to the Power infrastructure.

- The multi-system infrastructure provides a highly available, flexible IT environment to support customers' most demanding business resiliency objectives.
- Customers purchase the mobile capacity needed and may allocate and rebalance processor cores and memory resources within the specified enterprise pool.
- Elastic CoD (formerly named On/Off CoD) processor and memory enables customers to more easily address periodic spikes in demand.
- IBM PowerVM® Live Partition Mobility (LPM) enables customers to migrate running workloads between systems to help enable continuous availability.

New mobile activations are provided both for processor cores and memory on Power 770, 780 and 795 servers, as well as the POWER8 processor-based E870 and E880 servers. Activations may be re-located to any system within the same defined pool, and systems with different clock speeds can coexist in the same pool. What's more, to enhance investment protection, mobile activations can also move with their associated workloads when

upgrading from a server with POWER7+ processors to a new POWER8 technology-based server. There are two types of Power Enterprise Pools available today:

- A high-end pool for Power 780, 795 and Power E880 systems
  - This pool is designed for Power 780 (9179-MHD) and Power 795 (9119-FHB) class systems, along with the Power E870 and E880 servers. This pool supports different clock speeds and different machine types.
- A midrange pool for Power 770 and Power E870 systems
  - This pool is restricted to valid configurations of Power 770 (9117-MMD) systems along with the Power E870. This pool supports systems with different clock speeds.

The movement of Mobile CoD activations is instant, dynamic and non-disruptive, providing an ideal solution for both workload balancing and optimizing application availability, whether addressing planned maintenance outages or unplanned events. This gives your IT staff the ability to maintain control and provide flexibility at the same time using Mobile CoD that is available on demand.

The capability to freely move processor core and memory activations between servers in a pool provides a more flexible level of architectural capabilities. Some application areas where you might consider using Power Enterprise Pools include:

- PowerVM Live Partition Mobility (LPM): When using LPM for scheduled maintenance or partition relocation, mobile activations can be shifted from the LPM source server to the LPM target server.
- IBM PowerHA® SystemMirror® clusters: If the primary server fails, you can move mobile activations from the primary server to the backup server.
- Rebalancing server capacity: Mobile activations can be moved between servers to make the best use of CPU core and memory resources. Mobile activations can also be used to temporarily relocate resources for infrequent events such as end-of-month processing or full-scale performance testing.

NOTE: Re-located processor cores and memory provided by Power Enterprise Pools do not move application workload between resources. Pools provide the capacity to receive workload using your preferred high availability solution. PowerVM Live Partition Mobility and PowerHA SystemMirror are two excellent IBM options to simplify moving applications onto mobile resources.

Power Enterprise Pools can position your infrastructure for POWER8 and beyond

Power Enterprise Pools provide tremendous asset and investment protection for the future with POWER8 technology. The ability to mix processor generations within a pool can provide a key vehicle to simplify your move to the new POWER8 processor while reducing risk and preserving your current IT investment. IBM also provides upgrade paths from the current Power 770 and 780 servers to enterprise-class POWER8 processor-based servers. Customers with multiple systems can use PowerVM LPM to help maintain application availability during the upgrade process.

Many POWER7+ processor-based servers will have a direct upgrade path to systems built with POWER8 technology. For some older servers with IBM POWER7® processors, upgrading to POWER8 processor-based Power Systems will require a two-step upgrade process or, in some cases, a replacement server with a new serial number. Power Enterprise Pools Mobile Capacity on Demand can deliver a significant financial benefit by allowing POWER8 processor-based servers to interoperate and share mobile Capacity on Demand resources with POWER7+ processor-based servers within a single Power Enterprise Pool at no additional charge. IBM also provides customers an option to permanently transfer their mobile CoD processor and memory activation features from a Power 770, 780 or 795 to a designated POWER8 processor-based Power System within the same Power Enterprise Pool. Future enhancements are also being planned that will likely improve automation for high availability and disaster recovery environments by using the flexibility and performance of the Power Enterprise Pools offering.

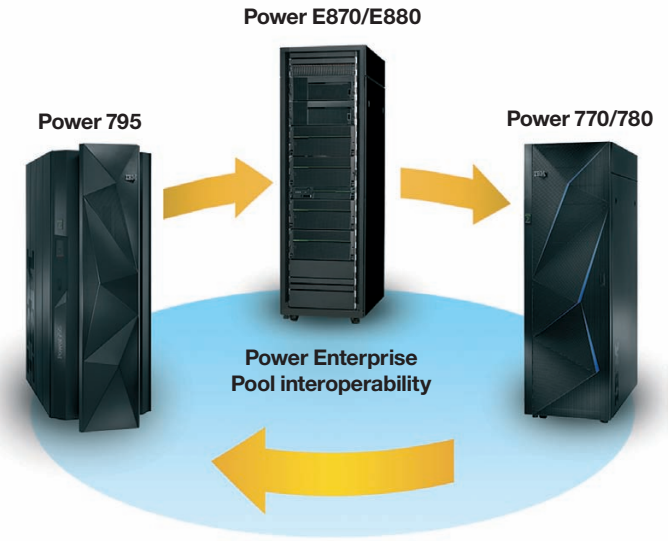

Figure 1. Aggregation of compute resources across multiple Power Systems generations

Power Enterprise Pools allows for the aggregation of compute resources, including processors and memory, across a number of Power 770, 780, 795, E870 and E880 servers, giving customers greater flexibility to respond to critical application workload requirements as well as the opportunity to enhance application availability.

Power Enterprise Pool activation details

The Power Enterprise Pool must first be defined to IBM using both a Power Enterprise Pool License Supplement and an Addendum, which describes the Pool and the Power servers (listed by serial number) within its scope. These documents are:

- IBM License Supplement for Power Enterprise Pools (Z126-6228)
  - The Supplement is required once per customer and must be combined with the Addendum in order to be valid.
- IBM License Supplement for Power Enterprise Pools Addendum (Z126-6229)
  - This Addendum to the Supplement is used to assign or remove systems to and from a pool.

With the announcement of Power Enterprise Pools, there are now four types of Capacity on Demand activations available both for processor cores and memory:

- Static CoD activations are permanent activations tied to a specific Power server and are not eligible to be relocated. Static activations must remain on the specific server they were originally activated on.
- Mobile activations are also permanent activations, but they are eligible to be moved to any server within a defined server pool.
- Elastic or On/Off CoD is a temporary static activation that is purchased by usage and billed quarterly. Customers can activate inactive processor cores or memory units dynamically without interrupting system or partition operations. The inactive processors or memory can be activated simply by purchasing an activation feature and entering the provided activation code. These apply only to a specific Power server identified by serial number.
- Power IFLs are permanent static activations for use in Linux partitions only.

Static	Mobile	Elastic or On/Off	Power IFL
Permanent activation	Permanent activation	Temporary activation	Permanent activation
IBM AIX®, IBM i, Linux	AIX, IBM i, Linux	AIX, IBM i, Linux	Linux only
PowerVM choice Standard or Enterprise across all servers	PowerVM choice Standard or Enterprise across all servers	PowerVM choice Standard or Enterprise across all servers	PowerVM Enterprise only, PowerVM for PowerLinux for Power IFL
Supported on all Power 770/780/795, E870/E880	Supported on Power 795; Power 770/780; Power E870/E880	Supported on all Power 770/780/795, E870/E880	Supported on all Power 770/780/795, E870/E880
Many firmware levels	HMC V7.8.0 or higher	Many firmware levels	Many firmware levels
Base cost	More value	Temporary	Lowest cost

Table 2. Comparison of four types of capacity on demand activations

NOTE: There are additional temporary Utility CoD and Trial CoD that are not shown in the chart above. Additional information on Power Systems Capacity on Demand can be found in the CoD Users Guide at: **ibm.com**/systems/power/hardware/cod/resources.html

Mobile processor and memory activations are ordered against a specific Power server, but are tracked and inventoried in the pool's hardware management console, not on the specific server where the resources reside. The server is unaware of mobile activations until the HMC assigns the activation to the target server.

Server partitions make no distinction between static, mobile or elastic CoD activations. At a given point in time, the hypervisor is simply aware of the total number of available activations and distributes the resources to partitions as directed or as needed.

Each server is required to have a minimum number of static processor core activations. Servers must be ordered with at least 50 percent of the memory active and a maximum of 75 percent of the memory activations can be mobile, depending on the model (see table below).

Static activations	Power 770/780	Power 795	Power E870/E880
Static core minimum	4	25% or 24 (whichever is larger)	8
Static memory minimum	25%	25%	25%

Table 3. Minimum processor and memory activations by model

A customer can choose to convert static activations to mobile activations on their existing Power servers, or can purchase new mobile activations. The conversion of existing static activations to mobile activations is chargeable via a Miscellaneous Equipment Specification (MES) conversion order. The conversion will ship a de-activation code for current static activations on a server and an XML configuration file with mobile activation information can then be downloaded and used by the pool's HMC.

When a new server is ordered with mobile-enabled processor cores or memory features or both, these resources will initially ship as static. Once the server has been added to the pool, the MES order for the no-charge Power Enterprise Pools enablement (feature code #EB35) and the no-charge conversion of mobile-enabled features from static to mobile features must be completed before the mobile activations can be used. To provide maximum flexibility, mobile and static activations can be mixed within the same partition.

Mobile CoD activations

There are new mobile activation feature codes both for processor cores and for memory. Mobile activations are priced slightly higher than static activations, as they provide greater flexibility and therefore a higher value to the customer.

Mobile processor activations are ordered in one core increments just like static core activations. For faster clock speed processors in each server model, mobile core activations are priced at approximately five percent more than static core activations. For slower processor clock speeds, mobile activations vary from 13 percent to 50 percent higher in price than static ones, depending on the server model. When planning your order for converting processor static activations to mobile, for greatest cost efficiency, you should consider specifying processors with the faster clock speed when you order the conversion.

Mobile memory activations are ordered in increments of 100 GB and are priced approximately 8 percent more than static memory activations. Memory activations within a Power Enterprise Pool are independent of physical memory DIMM sizes and are supported in blocks of 100 GB.

Static core and memory activations that a customer has already purchased or may purchase in the future can be converted to mobile activations through a standard IBM upgrade order at any time.

Feature #EP22	1 core mobile activation	For Power 770
Feature #EP23	1 core mobile activation	For Power 780/795
Feature #EMA4	100 GB mobile memory activation	For Power 770/780/795
Feature #EP2S	1 core mobile activation	For Power E870
Feature #EP2T	1 core mobile activation	For Power E880
Feature #EMA7	100 GB mobile memory activation	For Power E870/E880

Table 4. Mobile CoD activation feature codes for processors and memory by model

Power Enterprise Pool details

After your Power Enterprise Pool has been defined to IBM using the License Supplement and Addendum contracts mentioned earlier, your IBM Business Partner will order the IBM MES no-charge Mobile Enablement feature code #EB35 for each server that is to be included in the pool. Ordering feature code #EB35 will automatically notify IBM to create a customer-specific XML configuration file to be downloaded and installed on the master HMC for the pool. The XML file will be used by the master HMC to identify the group of servers enrolled in each pool and designate the mobile processor and memory resources that are available for assignment within the defined pool.

When you order the Mobile Enablement feature code #EB35 or when you order any mobile activations or static-to-mobile conversions, the IBM fulfillment team will first check to see if valid contracts are in place for that specific server (specified by serial number). The entire order will not be processed until the contract is verified. Pool requirements and limitations are included in the following table:

If a customer wants to add a server or servers to an existing Power Enterprise Pool, IBM must be notified by submitting a new Addendum to the existing License Supplement identifying which server or servers will be added to a specific high end or midrange pool. A separate mobile enablement feature code #EB35 must be ordered from IBM for each new server that will be added to the pool.

Removing a server from a pool is a very similar process to adding a server. IBM must be notified by submitting the Addendum to the existing License Supplement specifying which server will be deleted from a specific pool. Systems removed from a pool can join another pool and contribute their mobile activation resources to the new pool and use another system's mobile activation resources within the pool by following the same process used when first adding a server.

Before removing a server from an existing pool, all assets (including mobile resources) that were originally purchased with the system must be returned to the original owning system identified by serial number. Mobile assets belonging to a system may qualify for transfer to another system serial number depending on normal qualifying guidelines and, if the assets are available for transfer, additional contractual documentation will be required.

Power Enterprise Pool Requirements and Limits	
Midrange Pool - Power 770/E870	**High End Pool - Power 780/795/E880**
Maximum 10 servers per pool	Maximum 10 servers per pool
Maximum 1,000 partitions	Maximum 1,000 partitions
All servers in same country (except EU)	All servers in same country (except EU)
HMC running V7.8.0 or higher firmware	HMC running V7.8.0 or higher firmware
Running any supported OS (AIX, i, Linux)	Running any supported OS (AIX, i, Linux)

Table 5. Power Enterprise Pool requirements and limits by model

When adding or removing a server from an established Power Enterprise Pool, the Addendum will be submitted directly to the Power Systems CoD Project Office by email to: pcod@us.ibm.com. Once the update is processed, a new customer-specific XML pool configuration file will be posted on the CoD website (URL below) and must be downloaded to the controlling master hardware management console. The new XML file will contain the new configuration of the pool and identify the available mobile processor and memory resources.

NOTE: The Capacity on Demand website for retrieving the Power Enterprise Pools HMC configuration file is located at: http://www-912.ibm.com/pod/pod

The customer-specific XML pool configuration file will be loaded onto the master HMC that controls the Power Enterprise Pool using the new GUI interface provided in HMC code level V7.8.0 and higher.

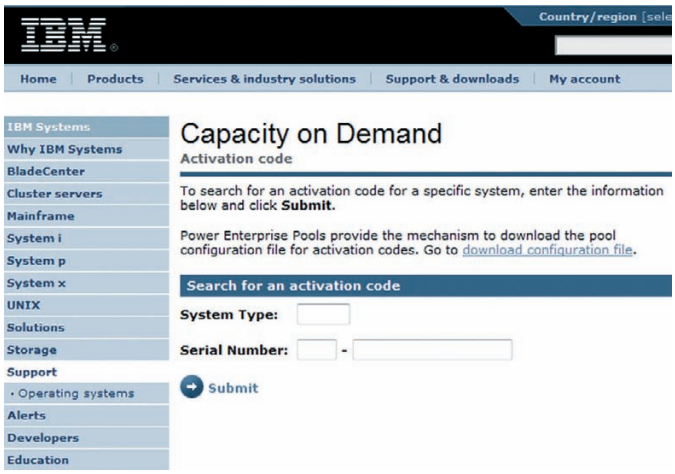

Figure 2. Capacity on demand login screen at www-912.ibm.com/pod/pod

Understanding configuration requirements

When planning your Power Enterprise Pool, you must consider and comply with the following configuration requirements:

1. A single server can be a member of only one Power Enterprise Pool at a time.
2. Customers must complete both Power Enterprise Pool agreements:
   - IBM License Supplement for Power Enterprise Pools (Z126-6228)
   - IBM License Supplement for Power Enterprise Pools Addendum (Z126-6229)
3. A server must join a Power Enterprise Pool type based on its processor class of system.
4. A Power Enterprise Pool may have only one master HMC that manages all its resources.
5. Hardware maintenance and software maintenance coverage must be consistent across the pool:
   - Either all resources are included in an IBM Hardware Maintenance Agreement (HWMA) or all are not included in such an agreement.
     – Servers under warranty are considered as being under an HWMA.
     – Warranty coverage may include both 9x5 and 24x7 coverage.
   - A minimum of one IBM Software Maintenance Agreement (SWMA) is required on each server.
6. Customers must license at least one processor core on each system for each Licensed Program for which they have an SWMA.

The master HMC holds the key

Power Enterprise Pools are created and managed using a master HMC. Each pool created is required to have one master HMC that manages all servers and mobile resources within the pool. However, the master HMC may also create and manage multiple pools.

The master HMC stores the data included in the customer-specific XML CoD configuration file, which defines the servers and mobile activations that are included in the pool. The master HMC controls where the activations are assigned, performs resource movement and is also aware of each server's static resources. A second, redundant backup HMC for the pool is optional, but strongly recommended for availability. However, there can only be one primary master HMC; the backup non-master HMC can only perform view operations.

Should the pool's master HMC become unavailable, the running of servers will not be impacted. However, until the master HMC is active again, mobile resources cannot be moved within a pool. That is because the master HMC is the only tool that can re-allocate mobile resources and is also required to be running to assign mobile resources whenever a server is powered on or restarted.

The master HMC requires code level V7.8 or later. HMC Version 7 Release 7.8.0 was updated to support Power Enterprise Pool management and provides the GUI interface required for managing the mobile resources. This release requires at least 2 GB of physical memory available to the HMC in order to manage a Power Enterprise Pool and its CoD activations.

NOTE: Older versions of the HMC not supported include 7042-CR4, 7310-CR3/CR4/C05/C06, 7042-C06/C07 and 7315-CR3.

The HMC GUI available in HMC V7.8 and higher helps simplify management of Power Enterprise Pools. The master HMC console can manage any pool where it already manages all of the servers included in the pool. From the new Power Enterprise Pool Management panels, functions are available to create and delete pools, provide details of CoD mobile processor and memory availability and their allocation status, display compliance information and record the pool's history log.

Conclusion

Organizations rely on around-the-clock availability of their mission-critical Power Enterprise Systems to help provide business continuity, data integrity and help deliver ongoing customer satisfaction. IT infrastructure flexibility should be viewed as an organizational core competency and is necessary to provide the service availability to meet today's business resiliency demands.

As organizations grow and expand, their workloads are increasing exponentially. Managing these new IT demands efficiently, while maintaining optimum capacity performance, requires new workload management strategies that focus on reducing costs, mitigating risk and improving business agility. Organizations need a way to manage workloads across the entire infrastructure—and do it with minimal overhead while responding quickly. The Power Enterprise Pools offering provides the dynamic workload management capabilities to intelligently place and dynamically re-allocate processor and memory resources across a pool of Power Systems.

IBM now delivers IT infrastructure that can provide tangible benefits to the business by deploying the industry-leading mobile capacity on demand made possible with the Power Enterprise Pools offering. The flexibility that mobile resources provide will require a change in mindset to help create a Power infrastructure where the inactive processor cores and memory capacity within a Power Enterprise Pool can be available for mobile activations. Providing the capacity to promote high availability is an essential ingredient to reducing or preventing downtime.

Give your enterprise the power of on-demand IT resource flexibility and availability that are needed today. Deploying Power Enterprise Pools now can also help simplify your adoption of the next-generation POWER8 infrastructure when your future IT infrastructure needs demand it.

For more information

To learn more about the Power Enterprise Pools on IBM Power Systems offering, please contact your IBM representative or IBM Business Partner, or visit the following website: **ibm.com**/systems/power/hardware/systempools

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