

Maintaining Compliance on iCAP Systems



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Audience

This document impacts any customer who has iCAP.

Purpose

This purpose of this document is to:

1. Explain iCAP boot time compliance enforcement with respect to iCAP cores
2. Highlight a change in temporary capacity debiting that was made in the iCAP software (version 8.02 and later) and has been present in GiCAP since its inception
3. Document best practices for:
 - Ensuring an iCAP system is in compliance
 - Managing TiCAP balance
 - Creating nPars on an iCAP system

This document describes the design of the iCAP software in relation to boot time compliance, TiCAP debiting and nPar creation. The following sections describe the working of the iCAP software with respect to those issues and best practices to be followed to avoid unanticipated outcomes like cores being deactivated at boot time and decrementing TiCAP balance.

Overview

Please see the definitions of terms at the end of the document.

iCAP Boot Time Compliance Enforcement with Respect to iCAP Cores

- An iCAP system can be out of compliance when the total number of Inactive cores is fewer than the number of Cores without Usage Rights for that system (this can be verified from the "Instant Capacity Resource Summary" section of the `icapstatus` output or the Exception status returned by the same output). This could happen under conditions such as:
 - When a partition is at an EFI boot prompt on an Integrity server or BCH prompt on an HP 9000 server or at "vpmon" prompt (with no vPars booted) for both Integrity and HP 9000 servers
 - Shutdown (without using the `-R -H` option with the `shutdown` command) of a partition
 - `icapd` or `cimserver` daemons not running or responding correctly (for example, due to file system full condition under `/var`) on a partition
 - System experiences a hardware failure of the cell which has Inactive iCAP cores. A failed cell may not correctly report how many cores are present and as a result of this the iCAP software has to estimate the number of Inactive cores. Depending on the platform the minimum supported number of cores may be assumed inactive. If the cell actually had a larger number than the assumed inactive, the system could be reported out of compliance or temporary capacity may be debited
 - Removing hardware on a system with iCAP cores. If a cell is removed from a complex and that leaves insufficient Inactive cores the system will be out of compliance and could consume temporary capacity
 - No HP-UX or OpenVMS installed in a partition where the number of Intended Active cores is less than the total number of cores in that partition

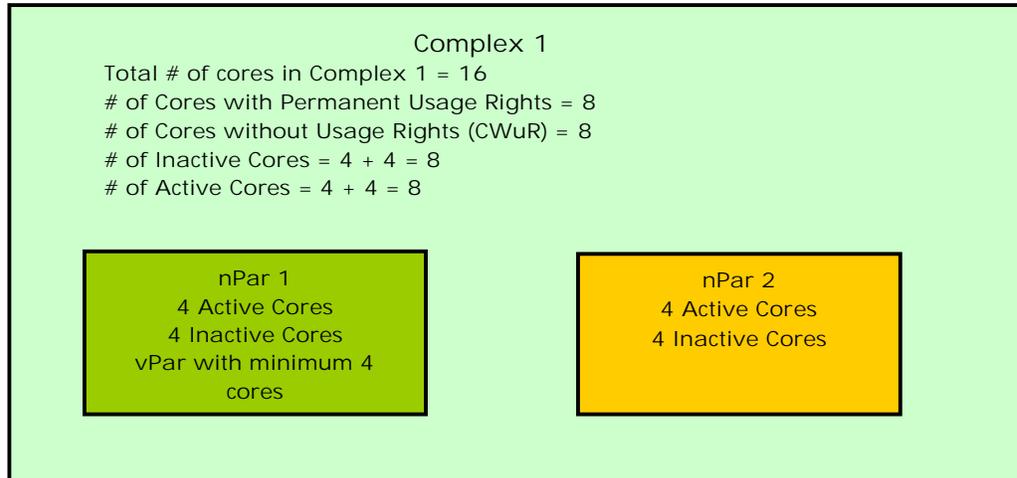
- As a result of an iCAP system being out of compliance, one or both of the following actions could occur:
 - TiCAP balance will be debited for that system. Please refer to the section titled "TiCAP debiting" for important details on TiCAP balance
 - During the reboot of an nPar (in nPar mode only) on that system, the iCAP software may enforce compliance by deactivating one or more cores on that partition so as to bring the system closer to a state of compliance (a minimum of one core will remain active on a partition). As a result of this, a subsequent reboot of the nPar into vPar mode may fail to boot up (locking the vPar database) because the count of Intended Active cores is less than the total assigned count for that vPar database. iCAP compliance enforcement (general and temporary capacity) does not occur within a vPar.
- The following are two important points with respect to nPars on an iCAP system. Please note that these operations will not cause iCAP compliance issues but are important while doing nPar related operations on an iCAP system
 - iCAP system which contains nPars that have not been ignited and booted with HP-UX. All physically configured components in such an nPar are assumed to have reserved usage rights (the creation of an nPar carries with it an implied intent to boot it). Such an inactive nPar cannot cause temporary capacity consumption, but components in that nPar are counted against the number of usage rights available for the system and could prevent activations on other active partitions
 - While creating a new nPar in an iCAP system there must be enough available usage rights on that system to cover all cores in that nPar.
If there are insufficient number of available usage rights on the active HP-UX partitions (or unassigned cells), the partition cannot be created

TiCAP Debiting

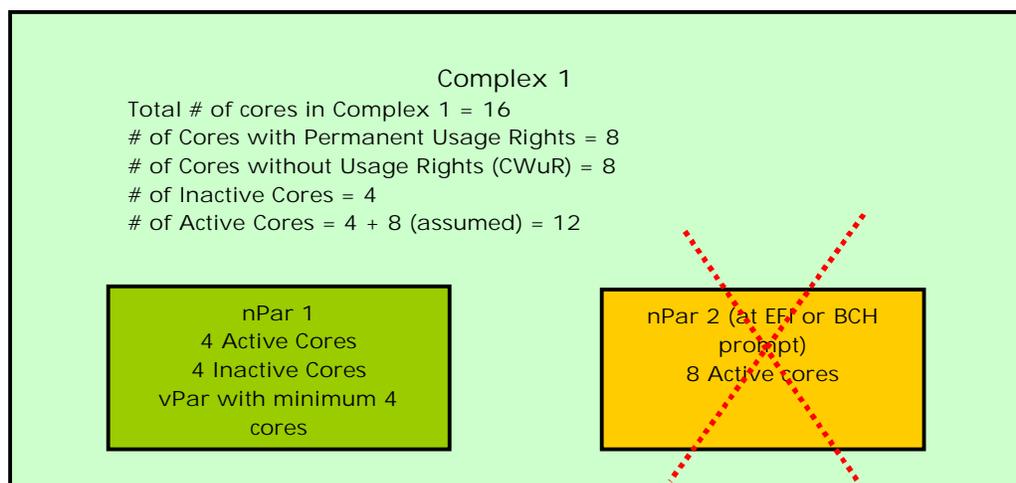
- In versions 8.02 and 8.03, the iCAP software was changed to allow debiting of the TiCAP balance which may cause it to go negative even when IAC or TiCAP is not applied to the system. Prior to this version the TiCAP balance would never go negative for a system unless TiCAP or IAC was applied or if the iCAP system was a member of a GiCAP group.
- As a result of this change and also where GiCAP is in use, the iCAP software will debit TiCAP balance if the number of Inactive Cores is fewer than the number of cores without usage rights, i.e. if the iCAP system is out of compliance (as described in the previous section).
- The following actions could occur as a result of having a negative TiCAP balance:
 - If there is a negative TiCAP balance but the number of Inactive cores is more than or equal to the number of Cores without Usage rights, the complex remains in an exception state without any enforcement action. However when additional temporary capacity is applied to the system the required amount of temporary capacity will be deducted to clear out the negative balance
 - If there is a negative TiCAP balance and the system is out of compliance (i.e. the number of Inactive cores is less than the number of Cores without Usage Rights) then boot time compliance enforcement may happen as described in the previous section
- For more details on the impact of negative TiCAP balance refer to the iCAP User's Guide at <http://docs.hp.com/en/B9073-90183/B9073-90183.pdf>. In particular, refer to Chapter 5: "Temporary Instant Capacity" and "Shutting down a partition with instant capacity cores" in the "Special Considerations" section.

Details And Example Scenario

- If a system is out of compliance (as described in the section “iCAP boot time compliance enforcement”), then the iCAP software will enforce compliance on the next reboot of any hard partition. This may have a significant impact on what the customer might be able to use in production as illustrated by the example below.
- Example scenario: Consider a complex with two nPars (nPar 1, nPar 2). In this example we assume that the complex has 8 Cores with Permanent Usage Rights and 8 Cores without Usage Rights. Both the nPars have 4 Active Cores and 4 Inactive Cores each. nPar 1 is running a vPar which is configured to use a minimum of 4 cores. Since the number of Inactive cores is equal to Cores without Usage Rights the complex is compliant and the TiCAP balance will not be decremented. This state is shown in the figure below.

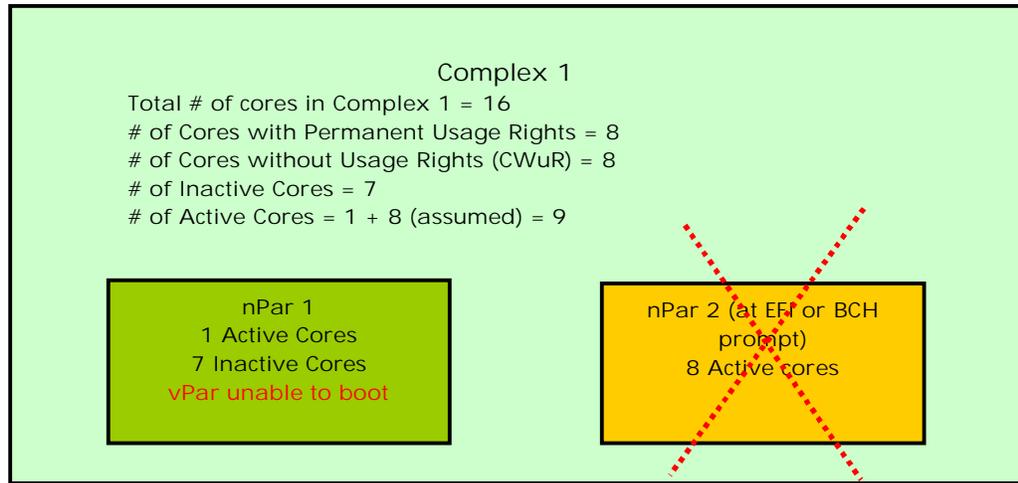


- Now consider the case where nPar 2 is at EFI (or BCH) boot prompt for more than 12 hours. The iCAP software in nPar 1 will assume that all cores in nPar 2 are active. In this state the number of active cores in the complex will be 12 (4 + 8). Since there are 8 cores without usage rights for the complex there should be 8 or more inactive cores. Currently there are only 4 inactive cores in the complex because of which the complex is out of compliance. If nPar 2 remains at EFI (or BCH) prompt for more than 12 hours TiCAP will be consumed for 4 cores every 30 minutes. This may lead to a negative TiCAP balance on Complex 1. The new state of cores in Complex 1 will be: # of Inactive Cores = 4; # of Active Cores = 4 + 8 (assumed) = 12. This state is shown in the figure below.



- If nPar 2 were to remain at the EFI (or BCH) prompt and nPar 1 were to be rebooted in nPar mode then the iCAP software will enforce compliance and activate only as many cores as

required on nPar 1 to bring Complex 1 as close to compliance as possible (minimum of 1 core per cell). In this case only 1 core will be activated in nPar 1 (the minimum required for a single cell nPar). In this condition the vPar on nPar 1 will not be able to boot up as the minimum required 4 cores are not available. Note that TiCAP will continue to be consumed for 1 core as the number of Inactive Cores in the complex is 7 which is one less than the number of Cores without Usage Rights of 8. This state is shown in the figure below



Best Practices To Ensure Compliance, Manage TiCAP Balance, and Create nPARS on an iCAP System

- If there are any iCAP cores on the complex, make sure that the number of Inactive Cores in the HP-UX/OpenVMS partitions is greater than or equal to the number of iCAP cores in the complex.
- Ensure that partitions in an iCAP system are shutdown correctly by using the **-R -H** option.
- For the first 12 hours that a partition is at any of the conditions (as defined in the section titled "iCAP boot time compliance enforcement with respect to iCAP cores") where all cores can be counted as active there is no decrementing of TiCAP balance. As soon as the 12 hours are over and if the partition is still in any of the conditions above, TiCAP balance may subsequently be deducted while the situation remains unresolved. Make sure that the situation is rectified within 12 hours.
- Ensure that `cimserver` and `icapd` daemons are running on all nPars and vPars in an iCAP system.
- By default the iCAP software will send expiration reminder when the temporary capacity balance is projected to expire within 15 days or less. The `icapmodify` command with the `-w` option can be used to adjust the warning period for more advance notice of TiCAP consumption.
- Hardware failures are uncommon. In the event of a cell board hardware failure the best option is to replace the failed cell board as soon as possible and return the system to a compliant state.
- When removing hardware from an iCAP system, ensure that there are enough Inactive cores on the remaining hardware to cover the expected iCAP inventory for the system. Replace the removed hardware as soon as possible.
- In the event of vPar database lock, boot into nPar mode and use `vparmodify/vpardelete` as appropriate to repair the vPar database so that the total assigned core count "fits" within

Intended Active count OR use "icapmodify" ("parmodify", etc.) to increase Intended Active count if that is possible.

- Best practices related to nPars on an iCAP system:
 - It is recommended that all nPars that are created are ignited and booted with HP-UX. Otherwise as described in the "Overview" section components in that partition will be counted against the number of usage rights and could prevent activations on other partitions. The inactive nPar can be removed to free consumed usage rights or the partition can be booted and the "icapmodify" command can be used to change the number of intended active cores for that partition
 - While creating a new nPar in an iCAP system, ensure that there are enough usage rights on the system to cover all cores in the new nPar. If possible free up enough cores in the system to free up sufficient usage rights. If this is not possible, HP support should be contacted to have code words created to temporarily give the system enough usage rights to create the nPar.
- For more details on this refer to the iCAP User's Guide available at <http://docs.hp.com/en/B9073-90183/B9073-90183.pdf>.

Note: From iCAP version 8.02 or later a negative TiCAP balance is no longer cleared when applying an RTU codeword.

GiCAP

The same principles apply to a GiCAP group but the calculations are done at the group level rather than at the complex level.

Definitions of Terms Used in this Document

- Cores without Usage Rights
Cores purchased under the iCAP program are initially defined to be Cores without Usage Rights. We also call these iCAP cores. (It's important to keep in mind however that the iCAP software and program do not at any time care about the identity or location of cores, only the total counts.)
- Core with Permanent Usage Rights
Once a customer purchases a Right to Use (RTU) and applies it to a core the core is then defined to be a Core with Permanent Usage Rights. Any other core that is purchased and not an iCAP core is also a Core with Permanent Usage Rights.
- Active Core
Typically a core that is running an operating system but also includes cores that the iCAP program counts as being active as described in the Overview section.
- Inactive Core
Any core that is not an Active Core.
- The Intended Active number
The number of cores that the Instant Capacity software attempts to activate at system boot time. It is adjusted by the use of the `icapmodify` command with the `-a`, `-d` and `-s` options. The number of Intended Active cores for each partition is displayed in the output of the `icapstatus` command.

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