z/OS

Planning for Sub-Capacity Pricing

Version 2 Release 1

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About this document

This document presents information about planning for and implementing sub-capacity pricing for IBM® products that run under the z/OS® operating system. It assists you in understanding your current software inventory, assessing your tactical and strategic software costs, making the decision to move to sub-capacity pricing, and using the Sub-Capacity Planning Tool (SCPT) and the Sub-Capacity Reporting Tool (SCRT) as aids in planning and managing your software costs.

For more information to help you understand how sub-capacity pricing applies to your particular configuration, you may need to refer to the resources listed under "Where to find more sub-capacity pricing information."

Who should use this document?

This document is intended for technical and administrative personnel involved in managing software products for an enterprise. There are three broad categories of users:

- Software asset managers, who must do any of the following:
  - Perform software acquisition and software license management
  - Maintain software inventories
  - Project future software needs
  - Manage software costs
  - Understand software licensing terms and conditions
- z/OS system architects, who must do any of the following:
  - Project software needs, based on current software utilization
  - Request or specify new and additional software licenses and products for the enterprise
  - Download and run planning tools
  - Review software costs
- Capacity planners, who must:
  - Create and maintain capacity and growth plans for z/OS systems

Where to find more sub-capacity pricing information

You can find more information about sub-capacity pricing and related topics at www.ibm.com/systems/z/swprice/.

You can find information about pricing-related announcement letters at www.ibm.com/systems/z/swprice/reference/announce.html.

Table 1 lists additional resources for information about sub-capacity pricing and related topics.

Table 1. Information resources for sub-capacity pricing and related topics

Resource title	Order number
Using the Sub-Capacity Reporting Tool, available from the SCRT web page	SG24-6522

Table 1. Information resources for sub-capacity pricing and related topics (continued)

Resource title	Order number
PR/SM Planning Guide, available from the IBM Systems Support web site for your hardware model	GA22-7236
z/OS MVS Planning: Workload Management	SC34-2662
z/OS RMF User's Guide	SC34-2664
z/OS MVS System Management Facilities (SMF)	SA38-0667
z/OS Intelligent Resource Director, available from the IBM Redbooks web site	SG24-5952
Hardware Management Console Operations Guide, available from the IBM Systems Support web site for your hardware model	SC28-6809
z/OS HCD User's Guide	SC34-2669

The z/OS Basic Skills Information Center

The z/OS Basic Skills Information Center is a Web-based information resource intended to help users learn the basic concepts of z/OS, the operating system that runs most of the IBM mainframe computers in use today. The Information Center is designed to introduce a new generation of Information Technology professionals to basic concepts and help them prepare for a career as a z/OS professional, such as a z/OS system programmer.

Specifically, the z/OS Basic Skills Information Center is intended to achieve the following objectives:

- Provide basic education and information about z/OS without charge
- Shorten the time it takes for people to become productive on the mainframe
- Make it easier for new people to learn z/OS.

To access the z/OS Basic Skills Information Center, open your Web browser to the following Web site, which is available to all users (no login required): z/OS Basic Skills Information Center home page (http://publib.boulder.ibm.com/infocenter/zos/basics/index.jsp)

z/OS information

This information explains how z/OS references information in other documents and on the web.

When possible, this information uses cross-document links that go directly to the topic in reference using shortened versions of the document title. For complete titles and order numbers of the documents for all products that are part of z/OS, see *z/OS Information Roadmap*.

To find the complete z/OS library, including the z/OS Information Center, see z/OS Internet Library (http://www.ibm.com/systems/z/os/zos/bkserv/).

How to send your comments to IBM

We appreciate your input on this publication. Feel free to comment on the clarity, accuracy, and completeness of the information or provide any other feedback that you have.

Use one of the following methods to send your comments:

1. Send an email to mhvrcfs@us.ibm.com.
2. Send an email from the "Contact us" web page for z/OS (http://www.ibm.com/systems/z/os/zos/webqs.html).
3. Mail the comments to the following address:
     IBM Corporation
     Attention: MHVRCFS Reader Comments
     Department H6MA, Building 707
     2455 South Road
     Poughkeepsie, NY 12601-5400
     US
4. Fax the comments to us, as follows:
     From the United States and Canada: 1+845+432-9405
     From all other countries: Your international access code +1+845+432-9405

Include the following information:
- Your name and address.
- Your email address.
- Your telephone or fax number.
- The publication title and order number:
     z/OS Planning for Sub-Capacity Pricing
     SA23-2301-00
- The topic and page number that is related to your comment.
- The text of your comment.

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute the comments in any way appropriate without incurring any obligation to you.

IBM or any other organizations use the personal information that you supply to contact you only about the issues that you submit.

If you have a technical problem

Do not use the feedback methods that are listed for sending comments. Instead, take one of the following actions:

- Contact your IBM service representative.
- Call IBM technical support.
- Visit the IBM Support Portal at z/OS support page (http://www.ibm.com/systems/z/support/).

z/OS Version 2 Release 1 summary of changes

See the following publications for all enhancements to z/OS Version 2 Release 1 (V2R1):

- *z/OS Migration*
- *z/OS Planning for Installation*
- *z/OS Summary of Message and Interface Changes*
- *z/OS Introduction and Release Guide*

Chapter 1. Introduction to sub-capacity pricing on z/OS

Sub-capacity pricing for z/OS systems offers pricing models that can provide more flexibility and improved cost of computing as you manage the volatility and growth of dynamic workloads on the IBM System z® platform and on IBM eServer™ zSeries® systems running in z/Architecture® (64-bit) mode. All IBM System z9® and later systems run in z/Architecture mode.

Sub-capacity pricing requires that you use the Sub-Capacity Reporting Tool (SCRT) to produce monthly sub-capacity reports and submit those reports to IBM for billing purposes. Detailed information about the monthly sub-capacity reporting process is available in *Using the Sub-Capacity Reporting Tool* at www.ibm.com/systems/z/swprice/subcap/scrt/.

In addition to z/OS systems, sub-capacity pricing is also available for z/TPF and z/VSE® systems and their associated products. For details, see *Using the Sub-Capacity Reporting Tool*.

Terms to understand

To understand sub-capacity pricing, you need to know a little bit about the processing units on which pricing is based, as described by the following terminology:

central processor (CP)
> The hardware unit that interprets and processes program instructions for the z/OS operating system and products that run under it.

central processor complex (CPC)
> A System z, zSeries, or S/390® server (or a plug-compatible manufacturer's server) that runs the S/390 or z/Architecture instruction set. A CPC contains one or more CPs.

logical partition (LPAR)
> A logical subdivision of a CPC. The System z Processor Resource/Systems Manager™ (PR/SM™) facility creates logical partitions and assigns processing capacity to them.

MSUs Millions of service units. In sub-capacity pricing documentation, MSUs refer to software pricing capacity units, not hardware capacity measurements.

processor unit (PU)
> The hardware unit that interprets and processes program instructions. System z processors can have different types of processor units, including:
>
> - **Central processor (CP)**, as defined earlier in this list
> - **Integrated Facility for Linux (IFL)**, which is a specialized processor dedicated to running Linux workloads
> - **IBM System z Application Assist Processor (zAAP)**, which is a specialized processor that provides a Java™ execution environment that enables Java-based web applications to be integrated with core z/OS business applications and backend database systems

- **IBM System z Integrated Information Processor (zIIP)**, which is a specialized processor that provides computing capacity for selected data and transaction processing workloads, and for selected network encryption workloads

sysplex

A collection of z/OS systems that cooperate, using certain hardware and software products, to process work. Just as a CPC contains one or more CPs, a sysplex contains one or more (usually more than one) CPCs.

What is the System z software pricing framework?

The System z software pricing framework refers to both the pricing and the licensing terms and conditions for IBM products that run in a mainframe environment. IBM mainframe software pricing is grouped into two categories:

- Monthly license charge (MLC) software
- International Product License Agreement (IPLA) software

Monthly license charge (MLC) software pricing

Monthly license charges apply to many System z software products, including z/OS, DB2®, CICS®, IMS™, MQSeries®, z/TPF, z/VSE and others. Pricing and terms and conditions for MLC products are based on the pricing metric you select. MLC pricing metrics can roughly be grouped into two categories: *full capacity based* pricing metrics and *sub-capacity capable* pricing metrics.

For complete descriptions of all System z software pricing metrics, go to www.ibm.com/systems/z/swprice/.

Full capacity based MLC pricing metrics

Under a full capacity based pricing metric, all software charges are determined by the full IBM-rated capacity (MSUs) of the CPC in which a product runs. Examples of full capacity based pricing metrics are Parallel Sysplex® License Charges (PSLC) and zSeries Entry License Charges (zELC). More information about these full capacity pricing metrics is available on the System z software pricing web site at www.ibm.com/systems/z/swprice/.

Sub-capacity capable MLC pricing metrics

Under a sub-capacity pricing metric, software charges for certain products are based on the utilization capacity of the logical partition (LPAR) or LPARs in which the products run. The following are examples of sub-capacity capable pricing metrics:

- Workload License Charges (WLC)
- Advanced Workload License Charges (AWLC), including Integrated Workload Pricing (IWP), when appropriate
- Entry Workload License Charges (EWLC)
- Advanced Entry Workload License Charges (AEWLC), including IWP, when appropriate
- System z New Application License Charges (zNALC)
- Midrange Workload License Charges (MWLC)

These MLC software pricing metrics can be implemented in either sub-capacity or full capacity mode. Sub-capacity pricing is available only on CPCs for which a sub-capacity report has been submitted and all other license terms and conditions have been met. If no sub-capacity report is submitted in a given month for a CPC

for which sub-capacity pricing has been established, any sub-capacity eligible products on that CPC are charged based on the full capacity of the CPC for that month.

Workload License Charges (WLC): When you elect WLC pricing for a particular operating system on a CPC, all of that operating system family's MLC products are licensed under WLC on that CPC. Sub-capacity eligible MLC products are called *Variable Workload License Charges (VWLC)* products. Non-sub-capacity eligible MLC products are called *Flat Workload License Charges (FWLC)* products and their pricing is a fixed monthly charge unrelated to the capacity of the CPC on which they run.

More information about WLC pricing is available at www.ibm.com/systems/z/swprice/mlc/wlc.html.

Advanced Workload License Charges (AWLC): When you elect AWLC for a particular operating system on a CPC, all of that operating system family's sub-capacity eligible MLC products are licensed under AWLC on that CPC. Non-sub-capacity eligible MLC products are considered FWLC products and their pricing is a fixed, monthly charge unrelated to the capacity of the CPC on which they run. Sub-capacity AWLC pricing applies to eligible z/OS and z/TPF software products and their associated middleware products when running on a zEnterprise® EC12 (zEC12) or zEnterprise 196 (z196) CPC. Sub-capacity AWLC pricing also applies when running on a zEnterprise BC12 (zBC12) or zEnterprise 114 (z114) CPC, but only if that CPC is in an actively coupled Parallel Sysplex that consists only of zEnterprise CPCs.

Integrated Workload Pricing (IWP) is an enhancement to AWLC that enables qualifying z/OS customers to add a selected set of workloads to an existing LPAR without increasing the sub-capacity value of other products already running in that LPAR.

More information about AWLC pricing is available at www.ibm.com/systems/z/swprice/mlc/awlc.html. For details about IWP, see the SCRT user's guide, *Using the Sub-Capacity Reporting Tool*.

Entry Workload License Charges (EWLC): When you elect EWLC pricing for a particular operating system on a CPC, all of that operating system family's MLC products that are sub-capacity eligible are licensed under EWLC on that CPC. The MLC products for that operating system on that CPC that are not sub-capacity eligible are charged a capacity-based price using the zELC pricing metric (for z800 CPCs) or the Tiered EWLC pricing metric (for z10™ BC, z9® BC, and z890 CPCs).

More information about EWLC pricing is available at www.ibm.com/systems/z/swprice/mlc/ewlc.html.

Advanced Entry Workload License Charges (AEWLC): When you elect AEWLC for a particular operating system on a CPC, all of that operating system family's sub-capacity eligible MLC products are licensed under AEWLC on that CPC. The MLC products for that operating system on that CPC that are not sub-capacity eligible are charged a capacity-based price using the Tiered EWLC pricing metric. Sub-capacity AEWLC pricing applies to eligible z/OS, z/TPF, and z/VSE software products and their associated middleware products when running on a zBC12 or z114 CPC.

Integrated Workload Pricing (IWP) is an enhancement to AEWLC that enables qualifying z/OS customers to add a selected set of workloads to an existing LPAR without increasing the sub-capacity value of other products already running in that LPAR.

More information about AEWLC pricing is available at www.ibm.com/systems/z/swprice/mlc/aewlc.htmlmlc/aewlc.html. For details about IWP, see the SCRT user's guide, *Using the Sub-Capacity Reporting Tool*.

Midrange Workload License Charges (MWLC): When you elect MWLC pricing for the z/VSE operating system on a CPC, those z/VSE MLC products that are sub-capacity eligible are licensed under MWLC on that CPC. MWLC pricing applies only to the z/VSE (Version 4 or higher) operating system and certain z/VSE middleware programs. On System z10® BC or System z9 BC CPCs, all other z/VSE programs will be priced according to Tiered Entry Workload License Charges (TWLC). On zEnterprise EC12, zEnterprise 196, System z10 EC, or System z9 EC CPCs, all other z/VSE programs will be priced according to either Flat Workload License Charges, Graduated Monthly License Charges, or Extended License Charges.

More information about MWLC pricing is available at www.ibm.com/systems/z/swprice/mlc/mwlc.html.

System z New Application License Charges (zNALC): zNALC is a monthly license charge pricing metric available on IBM z/Architecture servers running z/OS and offers a reduced price for z/OS on LPARs where qualified applications are running. zNALC pricing applies to the z/OS base feature and z/OS priced features (with the exception of HCM and HLASM Toolkit, which have flat pricing). zNALC is available for z/OS on LPARs dedicated to qualified applications, among other requirements. Similar to Workload License Charges and Entry Workload License Charges, customers may implement zNALC in either full capacity or sub-capacity mode.

Any logical partition (LPAR) that is designated as a zNALC LPAR must follow the naming convention ZNAL*xxxx* where *xxxx* is any letters or numbers. Alternatively, customers who prefer not to change LPAR names to qualify for zNALC pricing (and are running z/OS V1.6 or later) can specify the `LICENSE=ZNALC` IPL parameter in the active `IEASYSxx` PARMLIB member to indicate a zNALC system. The `LICENSE=ZNALC` IPL parameter will be available through APAR OA20314. However, the complete zNALC solution for the SMF data collected from a z/OS system initialized in this manner requires SCRT V14.1.0 or higher.

More information about zNALC pricing is available in "More about zNALC pricing" on page 57 and at www.ibm.com/systems/z/swprice/mlc/znalc.html.

Select Application License Charges (SALC): SALC pricing is available solely for WebSphere® MQ for System z and only on CPCs with one of the sub-capacity MLC pricing metrics. It is designed to allow customers to license MQ under product utilization rather than the sub-capacity MLC pricing metrics. SCRT still reports MSU values for these products but the reported values are not used to calculate the license charges.

More information about SALC pricing is available at www.ibm.com/systems/z/swprice/mlc/other.html.

International Product License Agreement (IPLA) software pricing

Some software products that run on the System z platform have an up-front license fee and an optional annual maintenance charge. These products are licensed under the International Program License Agreement (IPLA). System z IPLA products include some data management tools, CICS tools, IMS tools, application development tools, WebSphere products, and Tivoli® products.

Many IPLA products that run on z/OS can be licensed at a sub-capacity level. Sub-capacity charging for these products is available to customers who are already using sub-capacity pricing on that CPC for their MLC products using one of the existing sub-capacity pricing metrics.

This planning information helps you decide whether or not to use sub-capacity MLC pricing. Once you have decided to use sub-capacity MLC pricing, it is usually advantageous to also use sub-capacity IPLA pricing for those products that offer it.

System z IPLA software products that are sub-capacity eligible are licensed according to either *execution-based terms*, *reference-based terms*, or *z/OS-based terms*.

Execution-based licensing terms apply to z/Architecture IPLA products whose value is based on the processing power of the LPAR in which they run. These products are priced based on the utilization capacity of the LPARs in which they run. Execution-based IPLA products that are eligible for sub-capacity charging will appear on the sub-capacity report if those products execute on a CPC where you run SCRT. For a detailed example, see "Example of an execution-based sub-capacity eligible IPLA product" on page 55. Further, "Getting Started Sub-capacity Pricing for z/OS IPLA Software" describes a special case of execution-based licensing.

Reference-based licensing terms apply to z/Architecture IPLA products whose value is based on the value of another product, called the *parent product*. For example, a reference-based DB2 tool would be priced based on the license capacity of DB2. In this case, DB2 is the parent product of the DB2 tool. For a detailed example, see "Example of a reference-based sub-capacity eligible IPLA product" on page 56.

z/OS-based licensing terms apply to IPLA products that run under z/OS and provide value to the particular machine where the product is used. These products are priced based on the license capacity of z/OS on the CPC where the product is used. For a detailed example, see "Example of a z/OS-based sub-capacity eligible IPLA product" on page 56.

For a list of sub-capacity eligible IPLA products and how they are licensed, see www.ibm.com/systems/z/swprice/reference/exhibits/ipla.html.

Getting Started Sub-capacity Pricing for z/OS IPLA Software

Getting Started Sub-capacity Pricing for z/OS IPLA Software is a special case of execution-based licensing that applies to certain products subject to a specific set of qualifying conditions. These conditions apply on a per product, per operating system image, per hour basis. Products that qualify will be charged based upon a percentage of the size of the LPAR in which they run. For more information, including a detailed example, see *Using the Sub-Capacity Reporting Tool*.

How does sub-capacity pricing work?

Sub-capacity pricing is based on the concept of the highest observed four-hour rolling average utilization of the LPAR or LPARs where a sub-capacity product runs.

Note: While the examples are for a z/OS system, they also apply to z/TPF and z/VSE systems under the conditions specified in the examples.

Suppose a z/Architecture CPC has a specific VWLC, EWLC, or execution-based IPLA product running concurrently in three LPARs. The simultaneous combined utilization of these three LPARs is determined for each hour in the reporting period and the highest observed combined utilization is used as the basis for pricing the product. For certain sub-capacity eligible IPLA programs, the basis for sub-capacity is based on the MSUs reported for their parent programs or for the z/OS operating system.

LPAR utilization capacity

The *LPAR utilization capacity* is the highest sum of measured four-hour rolling average MSUs for the LPARs in the CPC in which a sub-capacity eligible product runs concurrently during a given month. If a z/Architecture CPC has a specific sub-capacity eligible product running concurrently in two LPARs, the utilization of these two LPARs over a month is used to determine your cost for the product on that CPC in that month.

Figure 1 shows a configuration that is referred to throughout this documentation. For this first example, only CPC1 is described. CPC1 is a zSeries CPC rated at 184 MSUs and has two LPARs running concurrently. (For this example, we assume that all of the products are running in the hour where the peak utilization occurs.) The LPAR sizes (maximum potential capacities) are:

* 70 MSUs for LPAR1
* 100 MSUs for LPAR2
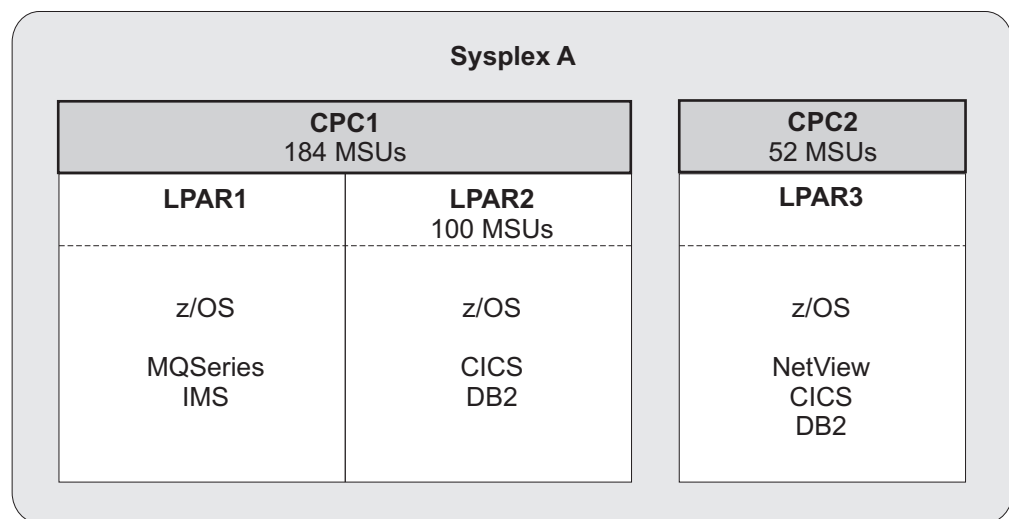
Figure 1. Sample configuration: Products and LPARS in CPC1 and CPC2 in Sysplex A

Using the configuration shown in Figure 1, suppose the combined peak four-hour rolling average utilizations of these LPARs over a given period are:

- LPAR1: 60 MSUs
- LPAR1 plus LPAR 2: 135 MSUs
- LPAR2: 80 MSUs

These LPAR combined peak four-hour rolling average utilization values would result in the sub-capacity eligible products running in these LPARs being priced based on these capacities:

- z/OS is priced based on 135 MSUs—the peak four-hour rolling average LPAR utilization of the LPARs where z/OS runs (LPAR1 plus LPAR2).
- MQSeries and IMS are priced based on 60 MSUs—the peak four-hour rolling average LPAR utilization of the LPAR where those products run (LPAR1).
- CICS and DB2 are priced based on 80 MSUs—the peak four-hour rolling average LPAR utilization of the LPAR where those products run (LPAR2).

Note that four-hour rolling average utilizations are calculated for each hour for each LPAR for a month—the billing period. (This example assumes the sub-capacity eligible products contained in these LPARs are running for the entire month.)

How the peak four-hour rolling average MSU value is determined

Table 2 shows an example of how the peak four-hour rolling average MSU value is calculated for the combination of products and LPARs shown in Figure 1 on page 6.

Table 2. Example of calculating the peak utilization based on the peak four-hour rolling average MSU value

Utilization	Hour 1	Hour 2	Hour 3	...	Hour 719	Hour 720
LPAR1: Four-hour rolling average utilization	60	55	50	...	50	45
LPAR2: Four-hour rolling average utilization	70	80	75	...	75	70
z/OS utilization (LPAR1 + LPAR2)	130	**135**	125	...	125	115
MQSeries and IMS utilization (in LPAR1 only)	**60**	55	50	...	50	45
CICS and DB2 utilization (in LPAR2 only)	70	**80**	75	...	75	70

The peak interval is the highest utilization determined from the sum of the utilization for all LPARs in which a particular product ran *in a given hour*. It is *not* the sum of highest utilization for individual LPARs in which a particular product ran *during different hours*.

In this example, the peak interval for z/OS is in hour 2. The z/OS utilization value for the month is the sum of the z/OS utilizations in both LPARs during hour 2, or 135.

The peak interval for MQ Series and IMS is in hour 1. Since those products only run in LPAR 1, their utilization value for the month is the value for LPAR 1 in hour 1, or 60.

The peak interval for CICS and DB2 is in hour 2. Since those products only run in LPAR 2, their utilization value for the month is the value for LPAR 2 in hour 2, or 80.

Advantages of sub-capacity pricing

Sub-capacity pricing is designed to offer several advantages over previous pricing methods:

- Your charges for products that use sub-capacity pricing are based on how much the LPARs in which the products run utilize system resources, rather than on the full capacity of the CPC. This means you can purchase hardware capacity for future needs without incurring an immediate increase in your software bill.
- If your utilization decreases when business is slow, your software bill decreases with it. If your utilization is seasonal, your monthly software bills decrease during periods of low utilization.
- You pay for capacity on a four-hour rolling average utilization, not on maximum capacity reached. Short utilization spikes will be averaged out in calculating your utilization. Longer spikes will affect the four-hour rolling average utilization in proportion to their duration and magnitude.
- For z/OS systems, you can sometimes aggregate MSUs associated with a sub-capacity eligible product across a Parallel Sysplex. Aggregation means when you run the sub-capacity eligible product in multiple LPARs on CPCs which are all part of the same Parallel Sysplex, you pay the base charge for the product only once. The values shown on the sub-capacity report are not affected by aggregation, but IBM adds up all the MSUs for aggregated products across each CPC in the sysplex when calculating your charges for those products. For aggregation, the Parallel Sysplex must meet the following requirements:
  - All CPCs in the Parallel Sysplex must be physically attached via coupling links to a common coupling facility and via timer links to a common external time reference (such as the Sysplex Timer®).
  - Images in the sysplex must account for 50 percent of the total MVS™ workload on each machine during prime business hours. In other words, MVS-based LPARs participating in the sysplex must represent at least half of the CPC's MVS-based processing capability.
  - All images in the sysplex must have at least one common systems enablement function activated to use the coupling facility. For a list of system enablement functions, see "z/OS systems enablement functions" on page 66.

Note: Sub-capacity pricing can, in some cases, decrease your overall software bill while increasing some components of your bill. For example, you might find that some of your software products have higher costs with sub-capacity pricing, but the overall software bill is lower. Or, if you have a seasonal utilization pattern, your bill in some months might be higher with sub-capacity pricing, but your total annual bill for all eligible products is lower.

Is sub-capacity pricing for everyone?

For System z10 BC and System z9 BC environments, and z890 servers, EWLC pricing is the default for z/OS systems, and sub-capacity pricing is always the best option.

For zEnterprise BC12 and zEnterprise 114, environments, AEWLC pricing is the default for z/OS, z/TPF, and z/VSE systems, and sub-capacity pricing is always the best option.

For zEnterprise EC12, zEnterprise 196, System z10 EC and System z9 EC environments, and other IBM zSeries servers, sub-capacity pricing is cost-effective for many, but not all, customers. You might even find that sub-capacity pricing is cost effective for some of your CPCs, but not others (although if you want pricing aggregation, you must always use the same pricing for all the CPCs in the same sysplex).

Once you decide to use sub-capacity pricing for a specific operating system family, you cannot return to the alternative pricing methods for that operating system family on that CPC. For example, once you select WLC you may not switch back to PSLC without prior IBM approval. (Sub-capacity IPLA pricing is usually the same as or preferable to full capacity IPLA pricing, but you can only use it when you have contracted to use sub-capacity MLC pricing.)

This documentation will help you determine whether or not sub-capacity pricing is appropriate for your enterprise.

Prerequisites for sub-capacity pricing

The prerequisites for sub-capacity pricing and for using SCRT are:
- For a z/OS Version 1 Release 1 operating system, or higher:
    - z/OS must be running with at least one LPAR configured on one or more of the following CPCs:
        - IBM zEnterprise EC12 (zEC12)
        - IBM zEnterprise BC12 (zBC12), *except* Model A01
        - IBM zEnterprise 196 (z196)
        - IBM zEnterprise 114 (z114), *except* Model A01
        - IBM System z10 Enterprise Class (z10 EC)
        - IBM System z10 Business Class (z10 BC), *except* Model A01
        - IBM System z9 Enterprise Class (z9 EC)
        - IBM System z9 Business Class (z9 BC), *except* Model A01
        - IBM zSeries (z990, z900, z890, or z800), *except* z890 Model 110
    - All instances of z/OS running on the CPC must be running in z/Architecture (64-bit) mode.
    - There cannot be any OS/390® or MVS operating systems licensed or executing on the CPC.
    - You must collect SMF type 70 and type 89 records from every LPAR on the machine that runs z/OS at any time.
- For a z/TPF Version 1 operating system, or higher:
    - z/TPF must be running with at least one LPAR configured on one or more of the following CPCs:
        - zEnterprise EC12 (zEC12)
        - zEnterprise BC12 (zBC12), *except* Model A01
        - zEnterprise 196 (z196)
        - zEnterprise 114 (z114), *except* Model A01
        - System z10 Enterprise Class (z10 EC)
        - System z10 Business Class (z10 BC), *except* Model A01
        - System z9 Enterprise Class (z9 EC)
        - System z9 Business Class (z9 BC), *except* Model A01
        - zSeries (z990, z900, z890, or z800), *except* z890 Model 110
    - You must collect SCRT89 records from every LPAR on the machine that runs z/TPF at any time.
- For a z/VSE Version 4 operating system, or higher:

- z/VSE must be running with at least one LPAR configured on one or more of the following CPCs:
  - zEnterprise EC12 (zEC12)
  - zEnterprise BC12 (zBC12), *except* Model A01
  - zEnterprise 196 (z196)
  - zEnterprise 114 (z114), *except* Model A01
  - System z10 Enterprise Class (z10 EC)
  - System z10 Business Class (z10 BC), *except* Model A01
  - System z9 Enterprise Class (z9 EC)
  - System z9 Business Class (z9 BC), *except* Model A01
- There cannot be any z/VSE Version 3 or lower operating systems licensed or executing on the CPC.
- You must collect SCRT89 records from every LPAR on the machine that runs z/VSE at any time.
- You must submit monthly sub-capacity reports from SCRT for each CPC that uses sub-capacity pricing.
- Transmit System Availability Data (TSAD) must be configured on all CPCs where sub-capacity pricing is to be used. For more information, see "Sending TSAD data" on page 36 and *Using the Sub-Capacity Reporting Tool*.

Detailed pricing information

For more information about pricing terms and conditions for specific products, see the following announcement letters:

- *IBM Announces Workload License Charges*
- *Availability of zSeries Software Charges at Less than Machine Capacity*
- *Clarification of Parallel Sysplex Pricing Terms and Conditions Including Changes to the Parallel Sysplex License Charge Exhibit*
- *Changes to Workload License Charges Gives Customers Additional Pricing Options*
- *New and Clarified Terms and Conditions for S/390 and zSeries Software*
- *Software Pricing for IBM eServer zSeries z990 and Enhancements to Variable Workload License Charges*.
- *Subcapacity Pricing for zSeries IPLA Products*.
- *Entry Workload License Charges (EWLC) for z800 Servers*
- *EWLC Tiered Price Structure and zELC Pricing for z890*
- *Midrange Workload License Charges (MWLC) for z/VSE V4*
- *System z New Application License Charges (zNALC) for z/OS*
- *Advanced Workload License Charges offers price/performance for the IBM zEnterprise 196*
- *IBM Integrated Workload Pricing for zEnterprise clients can significantly improve price/performance of collocated workloads on z/OS*
- *IBM Getting Started Sub-capacity Pricing for z/OS IPLA software provides an attractive pricing option for starting projects with select IBM WebSphere programs*
- *Getting Started Sub-capacity Pricing enhanced for select IBM WebSphere z/OS IPLA programs, making it easier than ever to start new projects on z/OS*
- *Advanced Entry Workload License Charges offers price/performance for the IBM zEnterprise 114*
- *Technology Update Pricing for AWLC offers price-performance advantages for IBM zEnterprise EC12 servers*
- *Additional Information: Technology Update Pricing for AWLC for z/TPF*

- *Technology Update Pricing for AEWLC offers price-performance advantages for IBM zEnterprise BC12 servers*

You can find these announcement letters and any others that have been issued since this information was last revised at www.ibm.com/systems/z/swprice/reference/announce.html.

Chapter 2. Overview of planning and implementation tasks for sub-capacity pricing

You will need to perform certain tasks to plan for and decide whether to use sub-capacity pricing and to implement it in your environment.

Sub-capacity pricing planning tasks

The following steps briefly describe the tasks you must perform to plan for sub-capacity pricing:

1. **Form a team.** Whether you are your organization's software asset manager, software architect, capacity planner, or all three in one person, you need organizational support to implement sub-capacity pricing. You will have to educate your management and your colleagues about what sub-capacity pricing is and what advantages it can have. It will take some time and effort to determine whether sub-capacity pricing is beneficial for the organization now or may become beneficial in the future.

2. **Understand the prerequisites.** For example, you can only use sub-capacity pricing on System z processors that run z/OS, z/TPF, or z/VSE in 64-bit mode. No OS/390 or MVS systems can be running on CPCs that use sub-capacity pricing. No TPF systems can be running on CPCs that use sub-capacity pricing for z/TPF. No z/VSE V3 or earlier systems can be running on CPCs that use sub-capacity pricing for z/VSE.

3. **Understand your timeline.** For instance, are you migrating from S/390 servers or zSeries servers to a later System z platform? Or from OS/390 to z/OS (or TPF to z/TPF, or VSE to z/VSE)? If so, then you need to know where you are in your hardware and software migration planning to decide at what point you qualify for sub-capacity pricing and when sub-capacity pricing is advantageous for you.

4. **Create a software inventory.** You may already have one; if not, see Chapter 3, "Inventorying your software," on page 17 to find out how to create a software inventory and what it should look like.

5. **Create a capacity and growth plan.** Sub-capacity pricing is not appropriate for every customer. However, even if it is not beneficial for your organization now, it might be in the future. You will need this plan to find out.

6. **Define a baseline.** Create a chart showing current capacity and utilization for each LPAR.

7. **Prepare to run a planning tool.** Start recording and saving SMF type 70 records to use as input to one of the sub-capacity tools.

   Note that you can only use the Sub-Capacity Planning Tool (SCPT) as part of the sub-capacity planning process for z/TPF and z/VSE systems when those systems are:

   - Running in LPARs with shared engines, *and*
   - Running on a CPC which contains at least one z/OS system from which the required SMF type 70 records can be collected

   If you meet the prerequisites for running the Sub-Capacity Reporting Tool (SCRT), as described in "Prerequisites for sub-capacity pricing" on page 9, then use that tool because the Sub-Capacity Planning Tool does not report on LPAR group capping, Getting Started Sub-Capacity Pricing products, nor Integrated Workload Pricing adjusted programs. If you do not meet the SCRT

prerequisites, then use the Sub-Capacity Planning Tool. For best results, you need to collect a month's worth of SMF data before running either tool.

8. **Download and run a planning tool.** The Sub-Capacity Planning Tool helps you analyze your processor and LPAR utilization in terms of the LPAR 4-hour rolling average that is used by SCRT to calculate utilization. It can be used on processors that are running OS/390 or z/OS to help in pre-migration software asset planning. SCRT can give you more specific information on your sub-capacity products, but has more stringent prerequisites.

9. **Create planning scenarios, as appropriate.** If your business conditions permit, IBM recommends creating three scenarios from the tool output: a current baseline, a scenario one year from now, and a scenario two years from now. If your system utilization is seasonal, you might create yearly or seasonal utilization plans.

10. **Get a cost analysis from IBM.** After you create your scenarios, you must contact your IBM sales representative or IBM business partner to get a pricing analysis for each one.

11. **Create a cost chart.** Use the pricing analysis and the information in Chapter 5, "Analyzing your software costs," on page 27 to create this chart.

12. **Determine whether sub-capacity pricing is cost-effective now or will be in the future.** The cost chart will help you do this.

13. **Review the contractual terms and conditions for the sub-capacity pricing options that apply to your environment.** If any sub-capacity pricing metrics are right for you, contact your IBM representative to obtain these documents:
    - *IBM Customer Agreement*
    - For AWLC:
      - *Attachment for IBM System z Advanced Workload License Charges*
    - For AEWLC:
      - *Attachment for IBM System z Advanced Entry Workload License Charges*
    - For sub-capacity WLC:
      - *Attachment for IBM System z Workload License Charges*
    - For sub-capacity EWLC:
      - *Attachment for EWLC, TWLC, zELC and z/OS.e License Charges*
    - For sub-capacity MWLC:
      - *Attachment for IBM System z Midrange Workload License Charges*
    - For sub-capacity IPLA software:
      - *Amendment for IBM System z Programs Sub-Capacity Pricing*

    Review IBM's terms and conditions, and sign the appropriate documents for your configuration. This is necessary to inform IBM that you are implementing sub-capacity pricing.

14. **Review and maintain plans.** The software inventory, capacity plan, baseline, and cost charts that you have created have many uses—schedule regular reviews and keep them up to date.

As a handy reference, you can use the abbreviated form of these planning steps in Appendix D, "Sub-capacity pricing planning checklist," on page 69.

Sub-capacity pricing implementation tasks

The following steps briefly describe the tasks you must perform to implement sub-capacity pricing:

1. **Schedule implementation of the Sub-Capacity Reporting Tool.** There are administrative and technical tasks that you must perform before you can run SCRT. Learn about them in *Using the Sub-Capacity Reporting Tool*.

2. **Run SCRT and analyze the sub-capacity report.** You should understand the sub-capacity report and add customer comments in those cases where comments are required. Again, *Using the Sub-Capacity Reporting Tool* fully explains how to do this.

3. **Submit the sub-capacity report to IBM.** Submit the sub-capacity report to IBM by the ninth day of the month following the month reflected in the reporting period.

4. **Review the bill from IBM.** When you receive the bill based on this submission of a sub-capacity report, review it to make sure you understand it.

5. **Fine-tune, as needed.** Review your software licenses and plan for changes to them. The sub-capacity report helps you do this.

As a handy reference, you can use the abbreviated form of these implementation steps in Appendix E, "Sub-capacity pricing implementation checklist," on page 71.

Chapter 3. Inventorying your software

The task to create a software inventory for your sub-capacity eligible products is usually performed by the software asset manager.

Creating software inventories

The first step in deciding whether or not to use sub-capacity pricing is to create inventories of your sub-capacity eligible software products. You need to know what products you are using and in which LPARs they run. When you have that information, you can download and run the Sub-Capacity Planning Tool. If you organize this information by CPC serial number, type, and model number, you will also have everything you need to run the Sub-Capacity Reporting Tool later.

You can ask IBM to send you a list of the products you are licensed for that are eligible for sub-capacity pricing, but to complete your inventory, you must document where in your configuration these products are currently running or where they will run in the future.

The examples shown are for z/OS-based sub-capacity eligible MLC products. The inventory process is the same for all sub-capacity eligible products in other operating system families, as well as for sub-capacity eligible IPLA products.

The sub-capacity eligible MLC product inventory shown in Table 3 on page 18 is based on the configuration shown in Figure 2.

Sysplex A		
CPC1 184 MSUs		**CPC2** 52 MSUs
LPAR1	**LPAR2** 100 MSUs	**LPAR3**
z/OS	z/OS	z/OS
MQSeries IMS	CICS DB2	NetView CICS DB2
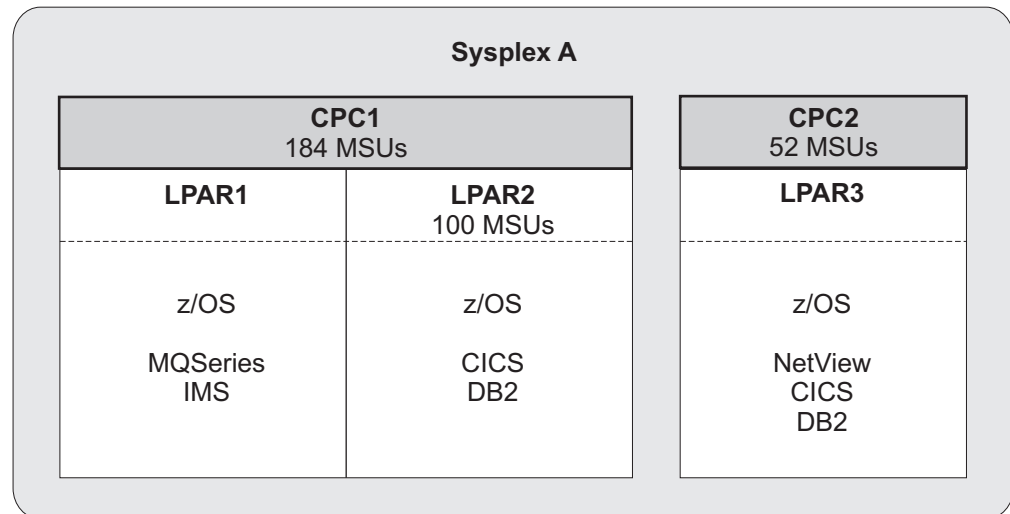
Figure 2. Sample configuration: Sub-capacity eligible products in Sysplex A

Sample software inventory for sub-capacity eligible MLC products

The products shown in this sample software inventory are the ones in the sample configuration shown in Figure 2.

Sub-capacity eligible product and location inventory

Table 3 shows a sub-capacity MLC product inventory. All the sub-capacity eligible MLC products are listed in this inventory, with the ones in use checked off. For the latest list of products that are eligible for sub-capacity pricing, be sure to check the list at www.ibm.com/systems/z/swprice/reference/exhibits/mlc.html.

Table 3. Example of a software inventory of sub-capacity eligible monthly license charge products

Customer survey							
Machine type-model and MSUs:		2064-2C4	2064-2C4	184	2064-2C1	52	236
Machine name and serial number:		CPC 1 12345	CPC 1 12345		CPC 2 67890		
LPARs:		LPAR1	LPAR2	MSUs	LPAR3	MSUs	**Sysplex MSUs**
z/OS V1	5694-A01	x	x	135	x	48	183
z/OS.e V1 (EWLC only)	5655-G52						
CICS TS for OS/390	5697-147		x	80	x	48	128
CICS TS for z/OS V2	5655-E93						
CICS/ESA V4	5655-018						
DB2 for MVS/ESA V4	5695-DB2						
DB2 for OS/390 V5	5655-DB2						
DB2 UDB for OS/390 V6	5645-DB2		x	80	x	48	128
DB2 UDB for OS/390 V7	5675-DB2						
DB2 UDB for z/OS V8	5625-DB2						
IMS/ESA® V5	5695-176						
IMS/ESA V6	5655-158	x		60			60
IMS V7	5655-B01						
IMS V8	5655-C56						
IMS V9	5655-J38						
MQSeries MVS/ESA	5695-137						
MQSeries for OS/390 V2	5655-A95	x		60			60
MQSeries for OS/390 V5	5655-F10						
COBOL for OS/390 & VM V2	5648-A25						
Enterprise COBOL for z/OS and OS/390 V3R1	5655-G53						
Enterprise PL/I for z/OS and OS/390 V3R1	5655-H31						
IBM Tivoli NetView® for z/OS	5697-ENV						
Lotus® Domino® for z/OS V6	5655-K36						
Lotus Domino for S/390 V5	5655-B86						
System Automation OS/390 V2	5645-006						
System Automation for OS/390	5645-005						
Tivoli Workload Scheduler for z/OS	5697-WSZ						
Tivoli NetView PM	5655-043						
Tivoli NetView for OS/390	5697-B82				x	48	48
Tivoli OPC	5697-OPC						
VisualAge® PL/I OS/390 V2	5655-B22						
Query Management Facility™ V3	5706-254						
Debug Tool for z/OS and OS/390	5655-H32						
Debug Tool for z/OS V4	5655-L24						
Airline Control System (ALCS) V2	5695-068						
z/TPF (see note)	5748-T15						
z/TPFDF (see note)	5748-F15						
z/VSE V4.1	5609-ZV4						

Note: z/TPF, z/VSE and associated products are supported for sub-capacity pricing. For details, see *Using the Sub-Capacity Reporting Tool*. The Sub-Capacity Planning Tool can be used as part of the sub-capacity planning process for z/TPF and z/VSE systems only when those systems are:

1. Running in LPARs with shared engines, *and*
2. Running on a CPC that contains at least one z/OS system from which the required SMF 70 records can be collected

Sub-capacity eligible IPLA products

Although sub-capacity IPLA pricing is usually less than full capacity IPLA pricing, you should also create an inventory of your sub-capacity-eligible IPLA products and understand the pricing differences for them. These differences might affect your decision to adopt sub-capacity MLC pricing.

The latest list of IPLA products that are eligible for sub-capacity pricing is available at www.ibm.com/systems/z/swprice/reference/exhibits/ipla.html.

If you are adding a new sub-capacity IPLA product to your configuration, check your sub-capacity reports to decide how many value units to purchase. You can find a complete description of value units at www.ibm.com/systems/z/swprice/zipla/.

Specifically, check:
- Maximum four-hour rolling average utilization, by LPAR, for execution-based sub-capacity IPLA products
- Parent product maximum four-hour rolling average utilization for reference-based sub-capacity IPLA products
- z/OS maximum four-hour rolling average utilization for z/OS-based sub-capacity IPLA products

Be sure to consider month-to-month variations in making the decision. You must purchase enough value units to accommodate your maximum utilization of the product. If you use less entitlement than you purchased, you will not get a refund. If you use more than you purchased, your utilization constitutes an order for the additional number of value units and you will be charged for them. For details and examples of how to choose an appropriate number of value units, see Appendix B, "Capacity planning for sub-capacity IPLA products," on page 55.

Products in other pricing categories

In addition to the products you use that are eligible for sub-capacity pricing, you may have products in other pricing categories, such as Flat Workload License Charges (FWLC), Tiered Entry Workload License Charges (TWLC), and non-sub-capacity eligible International Product License Agreement (IPLA) products. You can find out more about these license types at www.ibm.com/systems/z/swprice/.

Chapter 4. Understanding your configuration

You can create a capacity and growth plan to help you understand your current configuration and how that configuration is likely to change in the future. This task is usually performed by the whole planning team working together—the software asset manager, the z/OS system architect, and the capacity planner.

What is the capacity of your current configuration?

First, add up the capacity of all your z/Architecture and S/390 CPCs. You can find a list of the software pricing MSU ratings for all applicable CPCs and model numbers at www.ibm.com/systems/z/swprice/reference/exhibits/hardware.html.

How much of your capacity are you using?

This topic helps you determine the four-hour rolling average utilization for each LPAR and each CPC.

To find out how much of your total z/Architecture and S/390 capacity you are using and what its current cost is, download and run the Sub-Capacity Planning Tool (or, if you meet the prerequisites, the Sub-Capacity Reporting Tool) and send the output of the tool to IBM for a pricing estimate.

For more information about running the Sub-Capacity Reporting Tool and interpreting the output, see Chapter 6, "Preparing to use the Sub-Capacity Reporting Tool," on page 33 and Chapter 7, "Using SCRT to manage software costs," on page 39.

About the Sub-Capacity Planning Tool

The Sub-Capacity Planning Tool helps you analyze your CPC and LPAR utilization in terms of a four-hour rolling average utilization, in MSUs, which is the way your utilization is calculated for sub-capacity pricing, except for Getting Started Sub-Capacity Pricing eligible products and for products adjusted by Integrated Workload Pricing. The output from the tool helps you determine whether sub-capacity pricing is appropriate for your enterprise at your current utilization. You can also project whether sub-capacity pricing will become appropriate for you in the future, given your anticipated growth.

The Sub-Capacity Planning Tool can analyze:
- IBM or non-IBM mainframes
- Mainframes running z/OS, OS/390, or MVS
- Mainframes running in basic mode or LPAR mode
- Mainframes running z/TPF and z/VSE, provided that the z/TPF and z/VSE systems are:
  - Running in LPARs with shared engines, *and*
  - Running on a CPC which contains at least one z/OS system from which the required SMF type 70 records can be collected.
- LPARs with shared processors or dedicated processors.

This means that even if you are not yet on z/Architecture hardware or z/OS, you can assess whether sub-capacity pricing would be appropriate for you, given your

utilization, if you move to the appropriate hardware and software. The tool analyzes all the operating system images on a CPC. Its output can be used for all sub-capacity eligible products.

The Sub-Capacity Planning Tool takes data from SMF type 70 records, so you must be generating those records to run it. To get meaningful results, you should collect and analyze one month's worth of SMF type 70 records. For more information on SMF type 70 records, see *z/OS RMF User's Guide*.

You do not need to sort the SMF records or have them all in the same data set. The Sub-Capacity Planning Tool accepts multiple data sets as input.

Restrictions:
1. The Sub-Capacity Planning Tool cannot analyze utilization of z/OS, z/TPF, or z/VSE systems that are running as guests of z/VM®, except for the case where the z/OS, z/TPF, or z/VSE system is the only guest running in the LPAR.
2. The Sub-Capacity Planning Tool report is not acceptable for purposes of sub-capacity reporting; only an SCRT sub-capacity report can be used for that.

The Sub-Capacity Planning Tool is available as a self-extracting .zip file from www.ibm.com/systems/z/swprice/subcap/scpt, together with detailed instructions on how to use it.

Reviewing the output of the Sub-Capacity Planning Tool

The Sub-Capacity Planning Tool report describes the peak four-hour rolling average utilization of:
- Each individual LPAR
- All combinations of LPARs
- Combinations of LPARs and specific products in those LPARs that you specify
- The CPC as a whole

It also shows the date and time of each RMF™ interval, the LPAR utilization for each interval, and the four-hour rolling average utilization during that interval. These detailed fields are not shown in the samples in this documentation.

For example, our sample configuration has three LPARs in two CPCs. The Sub-Capacity Planning Tool must be run on each CPC and produces a separate report for each. The report for CPC 1 shows two individual LPAR values and one total CPC value. The report for CPC 2 lists one individual LPAR value which is also the CPC total. See Figure 3 on page 23 for a sample of the output.

```
===================== Sub-Capacity Planning Tool =================

Release Date                                        7/28/2005
Customer Name                                       Customer X
System Name                                         CPC1
Serial Number                                           123456
Machine Description                                 2064-2C4
CP Processors                                               4
Capacity (MSUs)                                          184

If you had a product only running in LPAR1, it would require 60 MSUs.
If you had a product only running in LPAR2, it would require 80 MSUs.
If you had a product running in ALL LPARs, it would require 135 MSUs.


===================== Sub-Capacity Planning Tool =================

Release Date                                        7/28/2005
Customer Name                                       Customer X
System Name                                         CPC2
Serial Number                                            67890
Machine Description                                 2064-2C1
CP Processors                                               1
Capacity (MSUs)                                           52

If you had a product only running in LPAR3, it would require 46 MSUs.
If you had a product running in ALL LPARs, it would require 46 MSUs.
```

Figure 3. Sample output from the Sub-Capacity Planning Tool

If there are more than 50 LPAR combinations, the tool lists only the first 50 by default, but you can use a parameter on the input JCL to have the tool list all combinations. You can also specify a string (a product name or number) and a list of LPARs (the LPARs where that product runs or a subset of the LPARs where that product runs) and see the values for products running in just those LPARs.

For example, if you had a configuration with 20 LPARs, but all products run in either all 20 or in three of the 20, you could specify only those combinations and get output like this:

```
===================== Sub-Capacity Planning Tool =================

Release Date                                        7/28/2005
Customer Name                                       Customer X
System Name                                         CPC1
Serial Number                                           123456
Machine Description                                 2064-2C4
CP Processors                                              10
Capacity (MSUs)                                          538

zos would require 110 MSUs (LA,LB,LC,LD,LE,LF,LG,LH,LI,LJ,LK,LL,LM,LN,LO,LP,LQ,LR,LS,LT,LU)
db2 would require 54 MSUs (LA,LO,LP)
```

Figure 4. Sample output from the Sub-Capacity Planning Tool showing LPAR combinations

What further growth do you anticipate?

Based on what workloads you have, the different LPARs on your CPCs, and your estimates of future needs, you can create a capacity growth plan that shows your future processing requirements in CPCs and MSUs.

In planning for the future, you need to think about changes in your business and changes in your technical configuration, some of which might result from business changes.

Business changes might include:
- Number of customers

- Number of employees
- Number of transactions
- Number of different products or services
- Kinds and amounts of data you need to track for accounting, regulatory, and tax purposes

Technical changes might include:
- Data storage and processing power required by improved applications
- Changes in your CPC machine type
- Changes to your operating system level
- Upgrades or additions of new software
- Upgrades or additions of new storage devices and other peripherals.

The baseline in your capacity growth plan needs to show:
- Your current number of CPCs
- How many LPARs each has
- What products are running in each LPAR
- What kind of utilization each LPAR has.

If your system utilization is seasonal, you might want to create a plan that shows the variations.

If you can, you should create plans at +1 year and +2 years that show:
- What LPARs will become fully utilized
- What CPCs will become fully utilized
- What capacity you may need to add
- How you will partition any additional CPCs
- What operating systems and software products will run in those new LPARs
- How fully utilized the new LPARs will be.

This plan will help you decide when to implement sub-capacity pricing.

Your plans should be on a CPC-by-CPC basis. If your CPCs participate in sysplexes that qualify for aggregation, you can determine this after the plans for each individual CPC have been created.

If you change machine types, your pricing will change, too. You will need to work with your IBM representative or IBM Business Partner representative to plan for this change. Your representative has access to a tool called CP2000 that can help you plan.

One important reason for creating plans at +1 and +2 year intervals is that the benefits of using sub-capacity pricing may change as your configuration changes. It is possible to see advantages for sub-capacity pricing over PSLC or zELC pricing with your current configuration and with some future configurations, while other future configurations would be priced more advantageously with PSLC or zELC. Since you cannot return to PSLC or zELC pricing once you have adopted sub-capacity pricing, it is important to understand these possibilities and be prepared for them.

Table 4 on page 25 shows a sample capacity growth plan.

Table 4. Example: Capacity and growth plan

Capacity and growth plan	current **changes +1 year** *changes +2 years*				2064-2C1 **2064-2C1** *2064-2C2*	**52** **52** *100*	**236** **236** *284*
Machine type-model and MSUs:		2064-2C4	2064-2C4	184			
Machine name and serial number:		CPC 1 12345	CPC 1 12345		CPC 2 67890		
LPARs:		LPAR1	LPAR2	MSUs	LPAR3	MSUs	**Sysplex MSUs**
z/OS V1	5694-A01	x	x	135 **150** *170*	x	46 **50** *75*	181 **200** *245*
z/OS.e Version 1	5655-G52						
CICS TS for OS/390	5655-147		x	80 **90** *100*	x	46 **50** *75*	126 **140** *175*
CICS TS for z/OS V2	5697-E93						
CICS/ESA V4	5655-018						
DB2 for MVS/ESA V4	5695-DB2						
DB2 for OS/390 V5	5655-DB2						
DB2 UDB for OS/390 V6	5645-DB2		x	80 **90** *100*	x	46 **50** *75*	126 **140** *175*
DB2 UDB for OS/390 V7	5675-DB2						
DB2 UDB for z/OS V8	5625-DB2						
IMS/ESA Version 5	5695-176						
IMS/ESA Version 6	5655-158	x		60 **70** *80*			60 **70** *80*
IMS V7	5655-B01						
IMS V8	5655-C56						
IMS V9	5655-J38						
MQSeries MVS/ESA	5695-137						
MQSeries for OS/390 V2	5655-A95	x		60 **70** *80*			60 **70** *80*
MQSeries for OS/390 V5	5655-F10						
COBOL for OS/390 & VM V2	5648-A25						
Enterprise COBOL for z/OS and OS/390	5655-G53						
Enterprise PL/I for z/OS and OS/390	5655-H31						
IBM Tivoli NetView for z/OS	5697-ENV						
Lotus Domino for z/OS V6	5655-K36						
Lotus Domino for S/390 V5	5655-B86						
System Automation OS/390 V2	5645-006						
System Automation for OS/390	5645-005						
Tivoli Workload Scheduler for z/OS	5697-WSZ				*x*	*75*	*75*
Tivoli NetView PM	5655-043						

Table 4. Example: Capacity and growth plan (continued)

Capacity and growth plan							
Machine type-model and MSUs:		**2064-2C4**	**2064-2C4**	**184**	**2064-2C1** **2064-2C1** *2064-2C2*	**52** **52** *100*	**236** **236** *284*
Machine name and serial number:		**CPC 1** **12345**	**CPC 1** **12345**		**CPC 2** **67890**		
LPARs:		**LPAR1**	**LPAR2**	**MSUs**	**LPAR3**	**MSUs**	**Sysplex** **MSUs**
Tivoli NetView for OS/390	5697-B82				x 	 46 **50** *75*	 46 **50** *75*
Tivoli OPC	5697-OPC						
Visual Age PL/I OS/390 V2	5655-B22						
Query Management Facility V3	5706-254						
Debug Tool for z/OS and OS/390	5655-H32						
Debug Tool for z/OS V4	5655-L24						
Airline Control System (ALCS) V2	5695-068						
Tivoli Workload Scheduler for z/OS	5697-WSZ				*x*	*75*	*75*
Tivoli NetView PM	5655-043						
Tivoli NetView for OS/390	5697-B82				x	46 **50** *75*	46 **50** *75*
Tivoli OPC	5697-OPC						
Visual Age PL/I OS/390 V2	5655-B22						
Query Management Facility V3	5706-254						
Debug Tool for z/OS and OS/390	5655-H32						
Debug Tool for z/OS V4	5655-L24						
Airline Control System (ALCS) V2	5695-068						

Chapter 5. Analyzing your software costs

After you run the Sub-Capacity Planning Tool, you send the output to IBM and receive a cost analysis in return. If you have used the Sub-Capacity Planning Tool to create outputs for several months because you have seasonal variations in your system utilization, or for +1 year and +2 year plans, send all the output spreadsheets to IBM for cost analysis. The cost analysis shows your present software costs and what they would be if you used sub-capacity pricing. The cost analysis shows you whether sub-capacity pricing will save you money now or in the future.

If sub-capacity pricing has no present or projected future advantages for you, you might still want to repeat the process a year or 18 months later. But, for now, you are done.

If sub-capacity pricing has current or future advantages for you, you will need to review the IBM terms and conditions for your current or planned configuration.

Whether or not you decide to use sub-capacity pricing for your current configuration, you need to establish a regular review of your software inventories, capacity growth plan, and software pricing analysis. Most of these tasks are usually performed by the software asset manager but the regular reviews of your inventories and plan should be done by the whole planning team.

Requesting a pricing analysis from IBM

To request a cost analysis from IBM, you need:
- The software inventories you created in Chapter 3, "Inventorying your software," on page 17
- The output of the Sub-Capacity Planning Tool, which you ran in Chapter 4, "Understanding your configuration," on page 21
- Any seasonal or capacity growth scenarios you created in Chapter 4, "Understanding your configuration," on page 21

Update your capacity growth plan with the MSUs from the Sub-Capacity Planning Tool. Estimate the MSUs for the +1 year and +2 year plan, if you were able to create the future plans, and add those to your spreadsheet, as shown in Table 4 on page 25. The current year's MSU values are from the Sub-Capacity Planning Tool output and the +1 year and +2 year values are estimates. Note that the planning team has added an additional software product to the configuration by the +2 year checkpoint.

Send your planning spreadsheet to your IBM sales representative or IBM business partner and ask that person to obtain a pricing analysis for you. Your sales representative or business partner can create this analysis using the Workload Pricer tool. This tool is only available to IBM employees and IBM business partners.

The results of your cost analysis will look something like Table 5 on page 28 and Table 6 on page 28. The example shows results for sub-capacity eligible MLC

products, but you can build similar worksheets for sub-capacity eligible IPLA products using the product lists at www.ibm.com/systems/z/swprice/reference/exhibits/ipla.html.

Note: The following examples are for illustrative purposes only. The pricing shown is an estimate, shown in US dollars, and does not reflect actual current pricing. Prices change over time and are subject to change without notice.

Table 5. Example of pricing analysis showing VWLC costs

Workload Pricer — Detailed Price									
This tool is for estimation only. These stated prices are for your information only and are subject to change. Applicable taxes are not shown. Licensed programs are available only under the IBM Customer Agreement or any equivalent agreement in effect between the customer and IBM.									
Customer:	Sample								
Location:									
Customer Number:									
Installation Type:	Uncoupled								
PID	**Program Name**		**Type**	**LIC**	**LVL**	**QTY**	**MSUs**	**Price**	
MTM:	**2064-2C4**	**PG:**	**Group:**		**MSUs:**	**184**			
Name:	**IBM zSeries 900**								
SN:	**System01**								
5675DB2	DB2 UDB for OS/390		VWLC	B			80	14618	
5655A95	MQSeries for OS/390 V2.1		VWLC	B			60	5689	
5655147	CICS TS for OS/390		VWLC	B			80	17076	
5655158	IMS V6 Transaction Manager		VWLC	B			60	14132	
5694A01	z/OS V1 Base		VWLC	B			140	46449	
			System Monthly Price						97964
PID	**Program Name**		**Type**	**LIC**	**LVL**	**QTY**	**MSUs**	**Price**	
MTM:	**2064-2C1**	**PG:**	**Group:**		**MSUs:**	**52**			
Name:	**IBM zSeries 900**								
SN:	**System02**								
5675DB2	DB2 UDB for OS/390		VWLC	B			46	11626	
5655147	CICS TS for OS/390		VWLC	B			46	13812	
5694A01	z/OS V1 Base		VWLC	B			46	18813	
5697B82	Tivoli NetView Ent		VWLC	B			46	4152	
			System Monthly Price						48403
			Total Monthly Price						146367

Table 6. Example of pricing analysis showing PSLC costs

Workload Pricer — Detailed Price									
This tool is for estimation only. These stated prices are for your information only and are subject to change. Applicable taxes are not shown. Licensed programs are available only under the IBM Customer Agreement or any equivalent agreement in effect between the customer and IBM.									
Customer:	Sample								
Location:									

Table 6. Example of pricing analysis showing PSLC costs (continued)

Workload Pricer — Detailed Price									
Customer Number:									
Installation Type:	Uncoupled/PSLC Alternative								
PID	**Program Name**		**Type**	**LIC**	**LVL**	**QTY**	**MSUs**	**Price**	
MTM:	**2064-2C4**	**PG:**	**Group:**		**MSUs:**	**184**			
Name:	**IBM zSeries 900**								
SN:	**System01**								
5675DB2	DB2 UDB for OS/390		PSLC	B			184	22478	
5655A95	MQSeries for OS/390 V2.1		PSLC	B			184	10375	
5655147	CICS TS for OS/390		PSLC	B			184	24306	
5655158	IMS V6 Transaction Manager		PSLC	B			184	22580	
5694A01	z/OS V1 Base		PSLC	B			184	72204	
				System Monthly Price					151943
PID	**Program Name**		**Type**	**LIC**	**LVL**	**QTY**	**MSUs**	**Price**	
MTM:	**2064-2C1**	**PG:**	**Group:**		**MSUs:**	**52**			
Name:	**IBM zSeries 900**								
SN:	**System02**								
5675DB2	DB2 UDB for OS/390		PSLC	B			52	12098	
5655147	CICS TS for OS/390		PSLC	B			52	13020	
5694A01	z/OS V1 Base		PSLC	B			52	39120	
5697B82	Tivoli NetView Ent		PSLC	B			52	4323	
				System Monthly Price					68561
				Total Monthly Price					220504

Determining whether sub-capacity pricing is right for you

Your pricing analysis shows you whether sub-capacity pricing is cost-effective for you now or might be in the future. In order to use sub-capacity pricing, there are technical and contractual requirements that you must fulfill.

Technical requirements for sub-capacity pricing

The technical requirements for sub-capacity pricing include:

- For a z/OS Version 1 Release 1 operating system, or higher:
  - z/OS must be running with at least one LPAR configured on one or more of the following CPCs:
    - IBM zEnterprise EC12 (zEC12)
    - IBM zEnterprise BC12 (zBC12), *except* Model A01
    - IBM zEnterprise 196 (z196)
    - IBM zEnterprise 114 (z114), *except* Model A01
    - IBM System z10 Enterprise Class (z10 EC)
    - IBM System z10 Business Class (z10 BC), *except* Model A01
    - IBM System z9 Enterprise Class (z9 EC)
    - IBM System z9 Business Class (z9 BC), *except* Model A01

- IBM zSeries (z990, z900, z890, or z800), *except* z890 Model 110
  - – All instances of z/OS running on the CPC must be running in z/Architecture (64-bit) mode.
  - – There cannot be any OS/390 or MVS operating systems licensed or executing on the CPC.
  - – You must collect SMF type 70 and type 89 records from every LPAR on the machine that runs z/OS at any time.
- For a z/TPF Version 1 operating system, or higher:
  - – z/TPF must be running with at least one LPAR configured on one or more of the following CPCs:
    - zEnterprise EC12 (zEC12)
    - zEnterprise BC12 (zBC12), *except* Model A01
    - zEnterprise 196 (z196)
    - zEnterprise 114 (z114), *except* Model A01
    - System z10 Enterprise Class (z10 EC)
    - System z10 Business Class (z10 BC), *except* Model A01
    - System z9 Enterprise Class (z9 EC)
    - System z9 Business Class (z9 BC), *except* Model A01
    - zSeries (z990, z900, z890, or z800), *except* z890 Model 110
  - – You must collect SCRT89 records from every LPAR on the machine that runs z/TPF at any time.
- For a z/VSE Version 4 operating system, or higher:
  - – z/VSE must be running with at least one LPAR configured on one or more of the following CPCs:
    - zEnterprise EC12 (zEC12)
    - zEnterprise BC12 (zBC12), *except* Model A01
    - zEnterprise 196 (z196)
    - zEnterprise 114 (z114), *except* Model A01
    - System z10 Enterprise Class (z10 EC)
    - System z10 Business Class (z10 BC), *except* Model A01
    - System z9 Enterprise Class (z9 EC)
    - System z9 Business Class (z9 BC), *except* Model A01
  - – There cannot be any z/VSE Version 3 or lower operating systems licensed or executing on the CPC.
  - – You must collect SCRT89 records from every LPAR on the machine that runs z/VSE at any time.
- You must submit monthly sub-capacity reports from SCRT for each CPC that uses sub-capacity pricing.
- Transmit System Availability Data (TSAD) must be configured on all CPCs where sub-capacity pricing is to be used. For more information, see "Sending TSAD data" on page 36 and *Using the Sub-Capacity Reporting Tool*.

Contractual requirements for sub-capacity pricing

The contractual requirements for sub-capacity pricing are:
- Signed contracts and agreements, as described in "Contracts for sub-capacity pricing" on page 31
- Submission of monthly Transmit System Availability Data (TSAD), as described in "Sending TSAD data" on page 36
- Use of the Sub-Capacity Reporting Tool, as fully described in *Using the Sub-Capacity Reporting Tool*

- Submission of sub-capacity reports from SCRT between the second and the ninth day of each month for the prior month's reporting period

IBM strongly recommends that you revert to monthly billing from quarterly billing prior to adopting sub-capacity pricing. This can be accomplished by emailing your written request for monthly billing to the appropriate address for your country (see the **Country** tab at www.ibm.com/systems/z/swprice/subcap/scrt/).

Contracts for sub-capacity pricing

To implement sub-capacity pricing for software products on any of your CPCs, you must sign the *Attachment for IBM System z Workload License Charges*, which attaches to the *IBM Customer Agreement* (ICA) contract.

- To implement AWLC pricing for software products on any of your CPCs, you must sign the *Attachment for IBM System z Advanced Workload License Charges*, which attaches to the ICA contract.
- To implement sub-capacity EWLC pricing for software products on any of your CPCs, you must sign the *Attachment for EWLC, TWLC, zELC and z/OS.e License Charges*, which attaches to the ICA contract.
- To implement AEWLC pricing for software products on any of your CPCs, you must sign the *Attachment for IBM System z Advanced Entry Workload License Charges*, which attaches to the ICA contract.
- To implement sub-capacity MWLC pricing for software products on any of your CPCs, you must sign the *Attachment for IBM System z Midrange Workload License Charges*, which attaches to the ICA contract.

To implement sub-capacity pricing for IPLA software products on any of your CPCs, use the *Amendment for IBM System z Programs Sub-Capacity Pricing*, which amends the *IBM International Program License Agreement* (IPLA) contract.

You can get these documents from your IBM sales representative or IBM business partner.

Scheduling monthly sub-capacity report reviews

Now that you are ready to implement sub-capacity pricing, plan to monitor and analyze your monthly sub-capacity reports, working with the whole team—software asset manager, z/OS system architect, and capacity planner. Modify the plans you have just created according to the sub-capacity report output so that you have a good record of what your utilization is and a sound basis for planning future expansion. Chapter 6, "Preparing to use the Sub-Capacity Reporting Tool," on page 33 has more information about what to look for in these reviews.

As you begin to see cost savings from sub-capacity pricing, remember to communicate these results to your company management.

Chapter 6. Preparing to use the Sub-Capacity Reporting Tool

Monthly sub-capacity reports from the Sub-Capacity Reporting Tool, or SCRT, are required for sub-capacity pricing. In addition, the sub-capacity reports that the tool produces can be a useful to you as cost management tools.

You may also wish to download and run SCRT as an additional planning tool before you sign up for sub-capacity pricing. You can do this at any time; IBM will not bill you according to sub-capacity pricing until you have signed the appropriate contract (see "Contracts for sub-capacity pricing" on page 31) and submitted your sub-capacity report.

The tasks related to using SCRT are generally performed by the z/OS architect.

About the Sub-Capacity Reporting Tool

SCRT is a no-charge IBM tool that reports required license capacity for sub-capacity eligible products that run on z/OS, z/OS.e, z/TPF, or z/VSE systems. SCRT analyzes a month's worth of utilization data for System z and zSeries CPCs and produces a *sub-capacity report*. The sub-capacity report indicates the required license capacity (in MSUs) of each sub-capacity eligible product running on the z/OS, z/OS.e, z/TPF, or z/VSE systems.

z/TPF and z/VSE support for sub-capacity differs from z/OS (and z/OS.e) support, for example, by using SCRT89 records instead of SMF records. Unless specifically noted, the same concepts described for z/OS (and z/OS.e) also apply to z/TPF and z/VSE.

For details about z/TPF support and its unique considerations, see www.ibm.com/systems/z/swprice/subcap/ztpf.html.

For details about z/VSE support and its unique considerations, see www.ibm.com/systems/z/swprice/subcap/zvse.html.

Traditional sub-capacity pricing is based on the four-hour rolling average utilization of the LPARs in which the sub-capacity products execute. For each hour in the reporting period, SCRT determines the required license capacity by examining:

- The four-hour rolling average utilization, by LPAR
- Which eligible products were active in each LPAR

SCRT then cross-references LPAR utilization and product execution by LPAR to determine the maximum concurrent LPAR four-hour rolling average utilization—the highest combined utilization of LPARs where each product executes during the reporting period.

Products whose capacity is adjusted by Integrated Workload Pricing and products eligible for Getting Started Sub-Capacity Pricing use capacity algorithms that differ from those for traditional sub-capacity pricing. See *Using the Sub-Capacity Reporting Tool* for a description of these algorithms.

SCRT processes the following data:

- In z/OS (and z/OS.e) environments: System Management Facilities (SMF) data, specifically, SMF type 70, subtype 1 (CPU Activity) records and SMF type 89, subtypes 1 and 2 (Product Use) records
- In z/TPF and z/VSE environments: SCRT89 records

SCRT uses the data sets specified in the JCL as input, and has a single data set as output. To comply with sub-capacity pricing terms and conditions, the input data sets must contain one reporting period of SMF type 70 and type 89 records for all the z/OS images and SCRT89 records for all z/TPF images on a zArchitecture CPC. (For more information about the reporting period, see "Analyzing the sub-capacity report" on page 39.) The output can be:

- A partitioned data set (PDS) with one member for each CPC found in the input data stream. Each member is one sub-capacity report. The report is a text file in comma-separated value (.csv) format, which can most easily be read by a spreadsheet program. For more information, see *Using the Sub-Capacity Reporting Tool*.
- A sequential data set that contains a single text file in comma-separated value (.csv) format. This file contains all the reports for the CPCs in the input stream to SCRT and can be used to submit reports to the license management support (LMS) application. For details on how to set this up, see the description of the OUTPUT DD statement in *Using the Sub-Capacity Reporting Tool*.

SCRT also does the following:

- Provides a simple, non-intrusive means for you to generate sub-capacity reports that show required license capacity for all eligible sub-capacity products that execute on a CPC
- Allows IBM to receive, view and store sub-capacity reports received from customers
- Allows IBM to generate customer bills according to the sub-capacity reports received from customers
- Provides information to IBM about z/OS.e, if z/OS.e is active in your environment.

Overview of the SCRT process

To enable sub-capacity pricing for a qualifying CPC that is running z/OS, you must do the following:

1. Prior to collecting any SMF records for SCRT to use in generating sub-capacity reports, you must apply all required service for z/OS systems, as indicated on the SCRT maintenance web site, including any service listed in the Preventive Service Planning (PSP) bucket and Solutions Assurance Product Review (SAPR) Guide for the CPCs on which these records will be collected. Failure to apply all of the required service may prevent SCRT from creating a sub-capacity report that will be acceptable to IBM for sub-capacity pricing.

   Check the SCRT maintenance web site at www.ibm.com/systems/z/swprice/ subcap/scrt/maint.html for any service updates to z/OS or other sub-capacity products that might be required for SCRT to work properly. For service updates to z/TPF and z/VSE sub-capacity products, click the appropriate link from the SCRT maintenance web site. Apply these service updates *before the start of the reporting period* for which you will be collecting data for SCRT.

2. Download the SCRT deliverable from the web site at www.ibm.com/systems/ z/swprice/subcap/scrt/. If you have already done this because you used SCRT for planning or because you have already been submitting sub-capacity reports for prior reporting periods, check the web site to make sure you have

the most current version of the tool and its documentation. You must use the most current version of SCRT to submit reports for billing.

3. Customize the JCL for the SCRT deliverable that you downloaded in step 2 to meet your needs and customize the SCRT control statements to supply the required customer-related information, software configuration information, and any other optional processing information, as necessary. See *Using the Sub-Capacity Reporting Tool* for details.

4. Collect one reporting period's worth of System Management Facility (SMF) data for z/OS systems and collect SCRT89 records for z/TPF and z/VSE systems running on your CPCs that use sub-capacity pricing. A reporting period is from midnight (the very beginning) of the second day of the month up to midnight (the very beginning) of the second day of the next month.

5. Move all of the SMF and SCRT89 data that you collected for each CPC to the z/OS system (or z/VSE system) on which you intend to run SCRT. See *Using the Sub-Capacity Reporting Tool* for details.

6. Review the SCRT control statements that you originally customized in step 3 and revise those control statements, as necessary, so that they contain appropriate values for the data that you are about to process in this execution of SCRT.

7. Run the SCRT program to create sub-capacity reports for those CPCs.

8. Review the return code from the SCRT job step.

   A return code of 0 means that SCRT successfully generated a sub-capacity report for every CPC that provided SMF and or SCRT89 records for processing by th at execution of SCRT. Return codes higher than 0 indicate that SCRT encountered one or more problems generating one or more sub-capacity reports.

   Look up any SCRTTOOL*xxx* messages that are listed by the SYSPRINT DD in the joblog from the SCRT step in Appendix A of *Using the Sub-Capacity Reporting Tool* for an explanation of the SCRT warnings or problems. Follow the actions indicated for each message to address each problem before attempting to rerun the SCRT job.

   If the actions do not correct the problem, send an email to scrt@us.ibm.com with a description of the problem, an attachment containing the job log for the SCRT job, and an attachment containing each of the sub-capacity reports that may have been generated. After these problems have been resolved, continue with the next stop in this process.

9. Review the sub-capacity report. You can choose any of the following methods to review the sub-capacity report:

   - Use one of the tools available on the z/OS system on which the report was generated (such as the ISPF browse or edit functions, under TSO/E).
   - Move the report to your workstation as a .csv (comma-separated values) text file and use a spreadsheet application available on your workstation.
   - If you have signed up for and have access to the license management system (LMS) web application, move the report to your workstation as a .csv file and use the LMS web application.

   Based on the results of your review, you might need to rerun SCRT using different SCRT control statement values to account for any unexpected changes to your hardware or software configuration, or to handle special conditions which might require you to use optional SCRT control statements, such as the **Exclude** control statement.

   While reviewing the sub-capacity report, add comments to the report, as required, before submitting it to IBM.

10. Contact your IBM representative or IBM Business Partner representative to obtain all of the IBM contracts and addenda that are required for sub-capacity pricing metrics, such as AWLC or EWLC, as well as any pricing options, such as IWP. Verify that all of the IBM contracts and addenda have been signed prior to submitting the sub-capacity reports that use those pricing options. Failure to have the required contracts or addenda signed or otherwise agreed to may cause IBM to reject the affected sub-capacity report.

11. Submit the sub-capacity report to IBM. If you have signed the appropriate Customer Agreement and the report is being used for billing, use the web site at www.ibm.com/systems/z/swprice/subcap/scrt/ to determine whether to use the LMS email process or the LMS web process to submit the sub-capacity report to IBM. Remember that LMS only accepts as input the comma-separated value format with a file extension of `.csv`.

12. The CPC must be configured to send weekly Transmit System Availability Data (TSAD, also known as Call Home). All of the sub-capacity pricing metrics supported by SCRT require CPCs to submit TSAD. This configuration is usually done when the CPC is installed. For more information, see "Sending TSAD data."

For example, if you begin to collect data for SCRT in the month of January, you must submit the sub-capacity report by 9 February. Your submitted data will be reflected in the software charges for March.

For detailed information about using SCRT, see *Using the Sub-Capacity Reporting Tool*, available at www.ibm.com/systems/z/swprice/subcap/scrt/.

Sending TSAD data

Sending weekly Transmit System Availability Data (TSAD) is part of the terms and conditions for sub-capacity pricing. The data is required for audit purposes. You can send TSAD by one of the following methods:

- Using IBM System z Remote Support Facility (RSF)
- Mailing a diskette, DVD, or USB flash memory drive to IBM
- Emailing the data to IBM

Typically, an IBM service representative enables RSF for you when your CPC is installed; most customers will find that their CPC is already set up for RSF. If RSF is not enabled, contact your IBM service representative.

If you are not going to be using RSF, see the procedure described in the "Transmit Service Data" task for the Support Element (SE) in *Hardware Management Console Operations Guide*. When you perform this task, select the **System Availability Data** button. This will create several files of data for this CPC on your chosen target device.

Submit the data to IBM in one of the following ways:

- If you intend to mail a diskette, DVD, or USB flash memory drive to IBM, copy all the files created by the SE to your chosen media. Label the media with the date, CPC type, model, and serial number, and mail it to the following address:

  IBM System z RAS Engineering
  B64A/707-2B86 (MS P317)

2455 South Road
Poughkeepsie, NY 12601

- If you intend to email the data to IBM, create a .zip file containing all the files created by the SE for the CPC. Name the .zip file SAD*sssss*.zip, where *sssss* is the five-digit serial number of the CPC. Send an email, including the date, CPC type, and model with the .zip file as an attachment to: **tsadmail@us.ibm.com**

Generating and collecting SMF type 70 and type 89 records

For z/OS systems your input to SCRT is one reporting period's worth of SMF type 70, subtype 1 (CPU activity) records and type 89 (product utilization) records.

To generate SMF type 70 records, you need a systems management product. You can use IBM's Resource Management Facility (RMF) or an equivalent product that produces these records. For more information about RMF, see *z/OS RMF User's Guide*.

Make sure that you are also collecting both SMF type 70, subtype 1 records and type 89, subtype 1 and 2 records. SMF record collecting is controlled by the SMFPRM*xx* member of PARMLIB. For general information about SMF, see *z/OS MVS System Management Facilities (SMF)*. For more information about collecting SMF type 89 records, see *z/OS MVS Product Management*.

Collecting SCRT89 records

z/TPF and z/VSE systems generate SCRT89 records instead of the SMF records generated by z/OS systems. The instructions for generating SCRT89 records on z/TPF systems z/VSE systems are provided in *Using the Sub-Capacity Reporting Tool*.

Chapter 7. Using SCRT to manage software costs

You can and should analyze the output from SCRT—the sub-capacity report—and use it, supplemented by the Sub-Capacity Planning Tool output, to manage your software costs. The analysis task will refer to specific portions of the sub-capacity report. For a complete description of the sub-capacity report and all its fields, see *Using the Sub-Capacity Reporting Tool*. Read the topic about viewing and submitting the sub-capacity report for billing purposes in that document before proceeding with the task of analyzing the sub-capacity report.

The tasks involved with using SCRT to manage software costs are usually performed by the whole planning team—the software asset manager, z/OS system architect, and capacity planner.

Analyzing the sub-capacity report

The sub-capacity report has two main sections, the billing-related section and the customer verification section.

- The billing-related section contains data that IBM needs to reconcile your company's sub-capacity bills.
- The customer verification section contains information that is useful to you when verifying the information in the sub-capacity report. The customer verification section starts after the Detail Data Sections - For Customer Analysis Purposes Only section.

Each sub-capacity report covers one month, beginning on the second day of one month and ending on the first day of the following month. (SCRT discards duplicate records and records outside this reporting period.) For the examples shown here, the report covers the period from 00:00:01 on 2 October to 24:00:00 on 1 November.

Your team—the software asset manager, z/OS architect, and capacity planner—should meet every month to conduct this review.

Viewing the billing-related report section

The following examples show the billing-related section of a sub-capacity report. The billing-related section displays customer information, tool information, special conditions, product summary information, and data collection details. You can find complete information about the report sections and fields in *Using the Sub-Capacity Reporting Tool*.

```
==B5=============== SCRT SUB-CAPACITY REPORT - IBM Corp =========================

Run Date/Time                           03 Nov 2012 - 09:17
Name of Person Submitting Report:       John Customer
E-mail Address of Report Submitter:     customer@abc.com
Phone Number of Report Submitter:       444-999-9999


Customer Name                           ABC Corporation
Customer Number                         8971234567
Machine Serial Number                   02-12345
Machine Type and Model                  2097-405
Machine Rated Capacity (MSUs)           118
Purchase Order Number                   (optional)
Customer Comments (255 chars max)       (optional)


For recurring charge (MLC) products, the data supplied in this report will be used to adjust
the billable MSUs in inventory for all MLC Products listed under the MLC Product Name
column on this report.  In accordance with our agreement, IBM will treat a change in product
licensed capacity as an order.  If the MSUs have changed since the last report, software billing
based on inventory MSUs will increase or decrease accordingly.

For One Time Charge (IPLA) products, the data supplied in this report will be used to
bill those IPLA products listed under the IPLA Product Name column in this report which
exceed your entitled capacity.  In accordance with our agreement, IBM will treat the use
of a product in excess of its entitled capacity as an order and you will be billed for
the amount in excess of your entitlement.

Note: This report is expected to provide a "% data  collected" > 95% and data reporting
period beginning on the 2nd of the previous month and ending on the 1st of the current month.


==C5===============================================================
TOOL INFORMATION

Tool Release            21.2.0

Reporting Period        2 Oct, 2012 - 1 Nov, 2012 inclusive (31 days)


                                        Justification for low data collection (255 chars max)
% Data Collected for z/OS           93%  (required)
```

Figure 5. Sample sub-capacity report: Customer information and tool information sections

```
==D5===============================================================
SPECIAL CONDITIONS

z/OS not eligible for subcapacity because z/OS running in ESA/390 Mode (31 bit)
```

Figure 6. Sample sub-capacity report: Optional Special Conditions section containing one of several error messages

```
==E5===============================================================
PRODUCT SUMMARY INFORMATION

MLC Product Name                          MLC Product ID   Tool MSUs  Customer MSUs  Customer Comments (255 chars max)

z/OS V1                                   5694-A01            98
DB2 UDB for z/OS V8                       5625-DB2            71
CICS TS for z/OS V3                       5655-M15            98
MQSeries for z/OS V6                      5655-L82            71
IMS V8                                    5655-C56            98
IBM Enterprise Cobol for z/OS and OS/390 V3  5655-G53         39      (optional)    (conditional)


IPLA Product Name                         IPLA Product ID  Tool MSUs  Customer MSUs  Customer Comments (255 chars max)

File Manager for z/OS V6                  5655-P17            60      (optional)    (conditional)
IBM WebSphere Application Server for z/OS V6  5655-N01        71
IBM WebSphere MQ Workflow for z/OS V3     5655-BPM            71
```

Figure 7. Sample sub-capacity report: Product Summary Information section

```
==H5===============================================================
DETAIL DATA COLLECTION

              SYSID  Input Data Start    Input Data End     Report Period % Data  Customer Comments (255 chars max)

LPAR1         SYS1   02 Oct 2012 - 00:00 02 Nov 2012 - 00:00          92.4%
LPAR3         SYS3   02 Oct 2012 - 00:00 02 Nov 2012 - 00:00          92.7%
LPAR2         SYS2   02 Oct 2012 - 00:00 30 Oct 2012 - 22:30          91.5%
LPARVM1       -      -                   -                             0.0%  This LPAR is only used for Linux
LPARVM2       -      -                   -                             0.0%  (required)

CPC                  02 Oct 2012 - 00:00 02 Nov 2012 - 00:00          93.1%
```

Figure 8. Sample sub-capacity report: Detail Data Collection section

Analyzing the customer verification report sections

The customer verification section of the sub-capacity report contains details that help you understand the billing-related section and can also help you understand your own configuration better and perhaps make your product utilization more efficient. The following figures show the customer verification sections of a sample sub-capacity report.

```
==L5===============================================================
DETAIL DATA SECTIONS - FOR CUSTOMER ANALYSIS PURPOSES ONLY
==M5===============================================================
SMF/SCRT89 INPUT DATA STATISTICS

                             SYSID     Input Data Start     Input Data End

LPAR1                        SYS1      01 Oct 2012 - 00:00  02 Nov 2012 - 22:00
LPAR3                        SYS3      01 Oct 2012 - 06:05  02 Nov 2012 - 23:45
LPAR2                        SYS2      01 Oct 2012 - 00:00  30 Oct 2012 - 22:30
LPARVM1                      -         -                    -
LPARVM2                      -         -                    -
LPARSP                       -         -                    -

CPC                                    01 Oct 2012 - 00:00  02 Nov 2012 - 23:45


==N5===============================================================
DETAIL LPAR DATA SECTION

               Highest  Hour Count  Date/Time          2nd Highest  Hour Count  Date/Time

LPAR1             32         1  03 Oct 2012 - 07:00         30           5  03 Oct 2012 - 06:00
LPAR3             35         6  03 Oct 2012 - 14:00         34          11  03 Oct 2012 - 13:00
LPAR2             41         4  04 Oct 2012 - 11:00         40           7  04 Oct 2012 - 10:00

CPC              107         5  03 Oct 2012 - 12:00        106          14  03 Oct 2012 - 11:00
```

Figure 9. Sample sub-capacity report: SMF / SCRT89 Input Data Statistics section and Detail LPAR Data section

```
==P5===============================================================
PRODUCT MAX CONTRIBUTORS

Product Name                                 Product ID  Highest  Date/Time            LPAR   LPAR   LPAR   GROUP
                                                                                       LPAR1  LPAR3  LPAR2  LGRPA

z/OS V1                                      5694-A01       98  06 Oct 2012 - 11:00     27     32     39
DB2 UDB for z/OS V8                          5625-DB2       71  03 Oct 2012 - 14:00      0     34     37
CICS TS for z/OS V3                          5655-M15       98  06 Oct 2012 - 11:00     27     32     39
MQSeries for z/OS V6                         5655-L82       71  03 Oct 2012 - 14:00      0     34     37
IMS V8                                       5655-C56       98  06 Oct 2012 - 11:00     27     32     39
IBM Enterprise Cobol for z/OS and OS/390 V3  5655-G53       39  04 Oct 2012 - 10:00      0      0     39
File Manager for z/OS V6                     5655-P17       60  09 Oct 2012 - 15:00     29     31      0
IBM WebSphere Application Server for z/OS V6  5655-N01       71  03 Oct 2012 - 14:00      0     34     37
IBM WebSphere MQ Workflow for z/OS V3        5655-BPM       71  03 Oct 2012 - 14:00      0     34     37
```

Figure 10. Sample sub-capacity report: Product Max Contributors section

```
==Q5=================================================================
PRODUCT GRID SNAPSHOT

Product Name                                Product ID           LPAR1     LPAR3     LPAR2

z/OS V1                                     5694-A01             92.4%     92.7%     91.5%
DB2 UDB for z/OS V8                         5625-DB2                       92.7%     91.5%
CICS TS for z/OS V3                         5655-M15             92.4%     92.7%     91.5%
MQSeries for z/OS V6                        5655-L82                       92.7%     91.5%
IMS V8                                      5655-C56             92.4%     92.7%     91.5%
IBM WebSphere Application Server for z/OS V6 5655-N01                      92.7%     91.5%
IBM WebSphere MQ Workflow for z/OS V3       5655-BPM                       92.7%     91.5%



==S5=================================================================
DEFINED CAPACITY VALUE USED - HOURS

Product Name                                Product ID         LPAR      LPAR      LPAR      GROUP
                                                               LPAR1     LPAR3     LPAR2     LGRPA

z/OS V1                                     5694-A01             4         8         7
DB2 UDB for z/OS V8                         5625-DB2                       8         7
CICS TS for z/OS V3                         5655-M15             4         8         7
MQSeries for z/OS V6                        5655-L82                       8         7
IMS V8                                      5655-C56             4         8         7
IBM Enterprise Cobol for z/OS and OS/390 V3 5655-G53                                7
File Manager for z/OS V6                    5655-P17             4         8         7
IBM WebSphere Application Server for z/OS V6 5655-N01                      8         7
IBM WebSphere MQ Workflow for z/OS V3       5655-BPM                       8         7



==U5=================================================================
GROUP CAPACITY LPARS

Group Name        LPARS

LGRPA             LPAR3(iii)(vii),LPAR2(iii)(vi)

(iii) LPAR was not a member of the group for the entire reporting interval
(vi) LPAR was hardcapped during a portion of the reporting period while it was defined to the group
(vii) LPAR was hardcapped during the entire reporting period while it was defined to the group



==W5=================================================================
This report is prepared by the IBM System z customer identified above ("Customer") or its authorized designee, and such
Customer is solely responsible for the completeness and accuracy of information and data used to create this report.
Specifically, IBM makes no representations or warranties regarding the contents or accuracy of this report.
Any questions regarding the contents of this report should be directed to the Customer.
```

Figure 11. Sample sub-capacity report: Product Grid Snapshot, Defined Capacity Value Used, and Group Capacity LPARs sections

Questions to consider about the sub-capacity report

Consider the following questions when you analyze your sub-capacity report. Your answers to these questions can help you decide whether you can optimize your configuration.

- Does the report match your expectations for product and LPAR utilization?
- Is this report consistent with reports from previous months or does it show unusual product or LPAR utilization?
- In the Product Grid Snapshot section, are any products shown as running for only a small percent of the time in some LPARs? If so, do you need that product to run in that LPAR?
- Do you have a low-utilization product running in a high-capacity LPAR? Could it run in a lower-capacity LPAR instead?
- How busy is each LPAR? Are some LPARs consistently at capacity and some consistently well under capacity?

Actions you can take to optimize your configuration

In some cases, it makes sense to modify your configuration to more efficiently use your sub-capacity eligible products. The following are some possible actions you can make to optimize your configuration:

- Move products between LPARs to better match product utilization with LPAR capacity.
- Isolate a single workload in an LPAR to control how much of the CPC capacity it can use.
- Use a WLM defined capacity to limit the amount of resource a workload gets. For more information, see *z/OS MVS Planning: Workload Management*.
- Add LPARs of different capacities to your CPC.

However, be aware that fine-tuning your configuration solely to minimize software costs can cause other problems. For example, a more complex configuration can make performance problems harder to resolve or cause you to spend more time on configuration maintenance than is reasonable.

Using the Sub-Capacity Planning Tool output along with the sub-capacity report

The Sub-Capacity Planning Tool report can help you understand the sub-capacity report. The Sub-Capacity Planning Tool gives you an hour-by-hour, LPAR-by-LPAR report on what each CPC in your configuration is doing during the month. Use the sub-capacity report to identify problems or areas you want to investigate, and then turn to the planning tool report for the details.

Billing for sub-capacity capable software products

Once you have signed up for sub-capacity pricing on your CPCs, in order to actually receive the sub-capacity pricing you must submit monthly sub-capacity reports for billing.

When you submit sub-capacity reports for billing, IBM bills you according to the information in those reports and you must pay the bill when it arrives. IBM does not retroactively adjust billing based on the month the sub-capacity data was collected; the sub-capacity pricing will appear on the invoice for the month that follows the submission of the sub-capacity report. For instance, you submit the sub-capacity report for your January utilization (billing period) by the ninth day of February and then receive the bill for that utilization in March.

If you observe extremely unusual utilization on a sub-capacity report (for instance, because of disaster recovery testing), there is a procedure for reporting the unusual condition and modifying the sub-capacity report so that it shows your intended product utilization. For details, see *Using the Sub-Capacity Reporting Tool*.

Appendix A. Sub-capacity pricing case studies

Case studies help illustrate how the planning process might look for two sample customers—one smaller and one large. The examples show two customers, Airweave, Inc. and AKZ Financials, who are considering moving to sub-capacity pricing for their sub-capacity eligible MLC products.

Case study 1: Airweave, Inc.

Airweave, Inc. is a Midwestern consumer air-conditioner manufacturer. The company has a single IBM eServer zSeries CPC, 2064-103, with a maximum capacity of 112 MSUs.

Their business is seasonal; the typical year at Airweave looks like this:

Table 7. Example: Airweave, Inc.'s seasonal business cycle

Time period	Activity
March through July	Planning cycle
August	Software upgrades and maintenance
September through February	Manufacturing cycle

Airweave configuration

The Airweave configuration consists of three LPARs—one for production, one for installing system and product upgrades and one for testing system and product upgrades, as shown in Figure 12. The test and installation LPARs are defined at 10 MSUs, although they are expected to use less capacity than that. All three LPARs have the same software inventory, as described in "Airweave software inventory."

CPC 1 112 MSUs		
zPROD	**zTEST** 10 MSUs	**zINSTL** 10 MSUs
z/OS	z/OS	z/OS

Figure 12. Sample configuration: Products and LPARS in CPC 1 for Airweave, Inc.

Airweave software inventory

- The following software runs on all three LPARs, zPROD, zTEST, and zINSTL, as shown in Table 8 on page 46:
    - z/OS V1, including RMF and Security Server
    - DB2 UDB for OS/390 V7
    - QMF MVS V3
    - CICS TS for OS/390 V2
    - MQ Series for OS/390 V5.2
    - IMS V7

– Enterprise PL/I for z/OS and OS/390 V3

Table 8. Product/location matrix for Airweave, Inc.

Customer survey						
Machine type-model and MSUs:			**2064-103**	**2064-103**	**2064-103**	**112**
Machine name and serial number:			**SYSPROD 12345**	**SYSPROD 12345**	**SYSPROD 12345**	
LPARs:			**zPROD**	**zTEST**	**zINSTL**	**MSUs**
z/OS V1	5694-A01		x	x	x	112
z/OS V1 RMF	5694-A01		x	x	x	112
z/OS V1 Security Server	5694-A01		x	x	x	112
DB2 UDB for OS/390 V7	5675-DB2		x	x	x	112
QMF MVS Version 3	5706-254		x	x	x	112
CICS TS for OS/390	5655-147		x	x	x	112
MQSeries for OS/390 V5.2	5655-F10		x	x	x	112
IMS V7	5655-B01		x	x	x	112
Enterprise PL/I for z/OS and OS/390 V3R1	5655-H31		x	x	x	112

Sub-Capacity Planning Tool output for Airweave

Figure 13 shows the output of the Sub-Capacity Planning Tool for one month during the manufacturing cycle of Airweave's CPC utilization.

Note that zINSTL and zTEST are rarely, if ever, active at the same time.

```
================== SUB-CAPACITY PLANNING TOOL============

Release Date                            7/28/2005
Customer Name                           Airweave, Inc.
System Name                             SYSPROD
Serial Number                           123456
Machine Description                     2064-103
CP Processors                                   3
Capacity (MSUs)                               112

If you had a product only running in zPROD, it would require 106 MSUs.
If you had a product only running in zTEST, it would require 2 MSUs.
If you had a product only running in zINSTL, it would require 2 MSUs.
If you had a product only running in zPROD & zTEST, it would require 108 MSUs.
If you had a product only running in zPROD & zINSTL, it would require 108 MSUs.
If you had a product only running in zTEST & zINSTL, it would require 2 MSUs.
If you had a product running in ALL LPARs, it would require 108 MSUs.
```

Figure 13. Sub-Capacity Planning Tool output for Airweave configuration

Airweave capacity plan

Based on the current state of the economy and the expected rate of new household formations, Airweave is projecting no major changes in the market for air-conditioners for the next year, so their current capacity plan is flat.

However, Airweave shows seasonal variation in utilization, so a projection of their seasonal utilization pattern is essential to estimating the company's software costs.

Table 9 on page 47 shows an example of the capacity and growth plan for Airweave.

Table 9. Example of capacity and growth plan for Airweave, Inc.

Capacity and growth plan									
Machine type-model and MSUs:			2064-103	2064-103	2064-103	112	112	112	112
Machine name and serial number:			SYSPROD 12345	SYSPROD 12345	SYSPROD 12345	November (current)	May (projected)	September (projected)	November (projected)
LPARs:			zPROD	zTEST	zINSTL	MSUs	MSUs	MSUs	zPROD MSUs
z/OS V1	5694-A01		x	x	x	108	75	82	110
z/OS V1 RMF	5694-A01		x	x	x	108	75	82	110
z/OS V1 Security Svr	5694-A01		x	x	x	108	75	82	110
DB2 UDB for OS/390 V7	5675-DB2		x	x	x	108	75	82	110
QMF MVS Version 3	5706-254		x	x	x	108	75	82	110
CICS TS for OS/390 V2	5697-E93		x	x	x	108	75	82	110
MQSeries for OS/390 V5.2	5655-F10		x	x	x	108	75	82	110
IMS V7	5655-B01		x	x	x	108	75	82	110
Enterprise PL/I for z/OS and OS/390 V3R1	5655-H31		x	x	x	108	75	82	110

Table 10 shows an example of the yearly utilization, in MSUs, for Airweave.

Table 10. Example of yearly utilization (in MSUs) for Airweave, Inc.

LPARs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
zPROD	106	110	90	65	67	69	69	75	80	90	95	95
zTEST	2	2	4	4	4	4	4	4	2	2	2	2
zINSTL	0	0	4	4	4	0	0	0	0	0	0	0
Total (CPC)	108	110	96	69	75	73	72	78	82	90	95	97

Airweave software costs

The following tables show the results of the Workload Pricer tool for Airweave using PSLC pricing, using full-capacity WLC pricing, and using sub-capacity WLC pricing at three points in the company's yearly cycle. Airweave's IBM representative used the tool to obtain this pricing analysis to help the Airweave team make the decision on using sub-capacity pricing.

Table 11. Example of PSLC cost for the Airweave configuration during the production cycle

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	2064-103	PG:	Group:		MSUs:	112			
Name:	IBM zSeries 900								
SN:	System01								
5655B01	IMS V7 Database Manager		PSLC	B			112	16456	
5655B01	IMS V7 Transaction Manager		PSLC	B			112	19491	
5655F10	MQSeries for OS/390		PSLC	B			112	9210	
5655H31	Full Function		PSLC	B			112	3961	
5675DB2	DB2 UDB for OS/390		PSLC	B			112	18592	
5694A01	z/OS V1 Base		PSLC	B			112	54420	
5694A01	z/OS V1 RMF		PSLC	B			112	2119	
5694A01	z/OS V1 Sec Svr		PSLC	B			112	3200	
5697E93	CICS TS for z/OS V2		PSLC	B			112	20954	
5706254	QMF MVS Version 3		PSLC	B			112	7532	
				System Monthly Price					155935

Table 11. Example of PSLC cost for the Airweave configuration during the production cycle (continued)

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	2064-103	PG:	Group:		MSUs:	112			
				Total Monthly Price					155935

Table 12. Example of full capacity WLC cost for the Airweave configuration during the production cycle

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	2064-103	PG:	Group:		MSUs:	112			
Name:	IBM zSeries 900								
SN:	System01								
5655B01	IMS V7 Database Manager		VWLC	B			112	18240	
5655B01	IMS V7 Transaction Manager		VWLC	B			112	21582	
5655F10	MQSeries for OS/390		VWLC	B			112	9536	
5655H31	Full Function		VWLC	B			112	3702	
5675DB2	DB2 UDB for OS/390		VWLC	B			112	19195	
5694A01	z/OS V1 Base		VWLC	B			112	38217	
5694A01	z/OS V1 RMF		VWLC	B			112	1623	
5694A01	z/OS V1 Sec Svr		VWLC	B			112	2368	
5697E93	CICS TS for z/OS V2		VWLC	B			112	23143	
5706254	QMF MVS Version 3		VWLC	B			112	7733	
				System Monthly Price					145339
				Total Monthly Price					145339

Table 13. Example of sub-capacity WLC cost for the Airweave configuration during the production cycle

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	2064-103	PG:	Group:		MSUs:	112			
Name:	IBM zSeries 900								
SN:	System01								
5655B01	IMS V7 Database Manager		VWLC	B			108	17896	
5655B01	IMS V7 Transaction Manager		VWLC	B			108	21174	
5655F10	MQSeries for OS/390		VWLC	B			108	9328	
5655H31	Full Function		VWLC	B			108	3654	
5675DB2	DB2 UDB for OS/390		VWLC	B			108	18807	
5694A01	z/OS V1 Base		VWLC	B			108	37041	
5694A01	z/OS V1 RMF		VWLC	B			108	1575	
5694A01	z/OS V1 Sec Svr		VWLC	B			108	2300	
5697E93	CICS TS for z/OS V2		VWLC	B			108	22703	
5706254	QMF MVS Version 3		VWLC	B			108	7585	
				System Monthly Price					142063
				Total Monthly Price					142063

Table 14. Example of sub-capacity WLC cost for the Airweave configuration during the planning cycle (summary, 75 MSUs)

								Price	

Table 14. Example of sub-capacity WLC cost for the Airweave configuration during the planning cycle (summary, 75 MSUs) (continued)

									Price	
				System Monthly Price						111760
				Total Monthly Price						111760

Table 15. Example of WLC cost for the Airweave configuration during the system maintenance cycle (summary, 82 MSUs)

									Price	
				System Monthly Price						120769
				Total Monthly Price						120769

Airweave cost analysis

Notice that not every product is more expensive with PSLC than with either full capacity or sub-capacity WLC pricing, but the total system cost is less with sub-capacity WLC at all points in the yearly cycle. Although using sub-capacity WLC pricing requires the IT staff to learn the SCRT and use it on a monthly basis, once you determine that full capacity WLC pricing is less expensive for you than PSLC, sub-capacity WLC can only reduce your software cost further.

Case study 2: AKZ Financials

AKZ Financials is a growing financial services company, providing mortgages and consumer loans.

AKZ configuration

AKZ Financials runs two IBM eServer zSeries CPCs: SYSTEM1 and SYSTEM2.

- SYSTEM1 is a z900, 2064-116, with a capacity of 441 MSUs. It has one LPAR: FC20.
- SYSTEM2 is also a z900, 2064-116, with a capacity of 441 MSUs. It has two LPARs: FC09 and TPOF.

Figure 14. Sample configuration: Products and LPARs in SYSTEM1 and SYSTEM2 CPCs for AKZ Financials

AKZ software inventory

Software on SYSTEM1:

- z/OS V1 with RMF
- DB2 UDB for OS/390 V7
- MQSeries for OS/390 V5
- MQSeries for OS/390 V2
- IMS/ESA V6
- NetView Perf Monitor V2
- Tivoli NetView for OS/390
- OPC V2

Software on SYSTEM2:

- z/OS V1 with RMF
- DB2 UDB for OS/390 V7
- MQSeries for OS/390 V2
- IMS/ESA V6
- Tivoli NetView for OS/390

AKZ product/location matrix

Table 16 on page 51 shows the sub-capacity eligible WLC software inventory for AKZ. In this chart, the MSUs shown are from the LPAR definitions. In Figure 15 on page 51 and Figure 16 on page 51, you see the MSUs from the four-hour rolling average utilization detected by the Sub-Capacity Planning Tool. The MSUs from the tool are the ones used in Table 17 on page 52.

Table 16. Product/location matrix for AKZ

Customer survey							
Machine type-model and MSUs:		**2064-116**	**441**	**2064-116**	**2064-116**	**441**	
Machine name and serial number:		**SYSTEM1 12345**		**SYSTEM2 67890**	**SYSTEM2 67890**		
LPARs:		**FC20**	**MSUs**	**FC09**	**TPOF**	**MSUs**	**Sysplex MSUs**
z/OS V1	5694-A01	x	441	x	x	441	882
DB2 UDB for OS/390 V7	5675-DB2	x	441	x	x	441	882
MQSeries for OS/390 V5.2	5655-F10	x	441				441
MQSeries for OS/390 V2.1	5655-A95	x	441	x	x	441	882
IMS/ESA V6	5655-158	x	441	x		441	882
Tivoli NetView Perf Mon	5655-043	x	441				441
Tivoli NetView for OS/390	5697-B82	x	441	x	x	441	882
Tivoli OPC	5697-OPC	x	441				441

Sub-Capacity Planning Tool output for AKZ

Figure 15 and Figure 16 show the output of the Sub-Capacity Planning Tool for one month of AKZ's SYSTEM1 and SYSTEM2 utilization.

```
================== SUB-CAPACITY PLANNING TOOL ============

Release Date                          7/28/2005
Customer Name                         AKZ Financials
System Name                           SYSTEM1
Serial Number                         123456
Machine Description                   2064-116
CP Processors                                  16
Capacity (MSUs)                               441


If you had a product only running in FC20, it would require 340 MSUs.
If you had a product running in ALL LPARs, it would require 340 MSUs.
```

Figure 15. Sub-Capacity Planning Tool output for AKZ Financials: SYSTEM1

```
================== SUB-CAPACITY PLANNING TOOL ============

Release Date                          7/28/2005
Customer Name                         AKZ Financials
System Name                           SYSTEM2
Serial Number                         67890
Machine Description                   2064-116
CP Processors                                  16
Capacity (MSUs)                               441


If you had a product only running in FC09, it would require 398 MSUs.
If you had a product only running in TPOF, it would require 19 MSUs.
If you had a product running in ALL LPARs, it would require 415 MSUs.
```

Figure 16. Sub-Capacity Planning Tool output for AKZ Financials: SYSTEM2

AKZ capacity and growth plan

Table 17 on page 52 shows AKZ Financials' capacity for the current year and their growth plan for +1 year and +2 years out.

Table 17. Example of capacity and growth plan for AKZ Financials

Capacity and growth plan	Current Changes +1 year *Changes +2 years*						
Machine type-model and MSUs:		**2064-116**	**340** **370** *400*	**2064-116**	**2064-116**	**415** **420** *430*	**755** **790** *830*
Machine name and serial number:		SYSTEM1 12345		SYSTEM2 67890	SYSTEM2 67890		
LPARs:		**FC20**	**MSUs**	**FC09**	**TPOF**	**MSUs**	**Sysplex MSUs**
z/OS V1	5694-A01	x	340 **370** *400*	x	x	415 **420** *430*	755 **790** *830*
z/OS V1 RMF	5694-A01	x		x		398 **405** *420*	738 **775** *820*
DB2 UDB for OS/390 V7	5675-DB2	x	340 **370** *400*	x	x	415 **420** *430*	755 **790** *830*
MQSeries for OS/390 V5.2	5655-F10	x	260 **300** *400*				260 **300** *400*
MQSeries for OS/390 V2.1	5655-A95	x	340 **370** *400*	x	x	415 **420** *430*	755 **790** *830*
IMS/ESA V6	5655-158	x	340 **370** *400*	x		398 **405** *420*	738 **775** *820*
Tivoli NetView Perf Mon	5655-043	x	340 **370** *400*				340 **370** *400*
Tivoli NetView for OS/390	5697-B82	x	340 **370** *400*	x	x	415 **420** *430*	755 **790** *830*
Tivoli OPC	5697-OPC	x	340 **370** *400*				340 **370** *400*

AKZ software costs

The following tables show the results of the Workload Pricer tool for AKZ Financials using PSLC pricing and using sub-capacity WLC pricing for the current year, one year from now, and two years from now. AKZ's IBM representative used the tool to obtain this pricing analysis to help the AKZ team make the decision on using sub-capacity pricing.

Table 18. PSLC cost for the current AKZ configuration

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	**2064-116**	**PG:**	**Group:**		**MSUs:**	**441**			
Name:	**IBM zSeries 900**								
SN:	**System1**								
5655158	IMS V6 Database Manager		PSLC	B			441	30491	
5655158	IMS V6 Transaction Manager		PSLC	B			441	36367	
5655F10	MQSeries for OS/390		PSLC	B			441	20347	
5655A95	MQSeries for OS/390 V2.1		PSLC	B			441	16946	
5655043	NetView Perf Mon		PSLC	B			441	3268	
5675DB2	DB2 UDB for OS/390		PSLC	B			441	39676	
5694A01	z/OS V1 Base		PSLC	B			441	115495	
5694A01	z/OS V1 RMF		PSLC	B			441	4625	
5697B82	Tivoli NetView Ent		PSLC	B			441	13112	
5697OPC	OPC 2.3 Tracker		PSLC	B			441	4524	
				System Monthly Price					284851
PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	2064-116	**PG:**	**Group:**		**MSUs:**	441			
Name:	IBM zSeries 900								
SN:	System2								
5655A95	MQSeries for OS/390 V2.1		PSLC	B			441	16946	
5655158	IMS V6 Transaction Manager		PSLC	B			441	36367	
5675DB2	DB2 UDB for OS/390		PSLC	B			441	39676	
5694A01	z/OS V1 Base		PSLC	B			441	115495	
5694A01	z/OS V1 RMF		PSLC	B			441	4625	
5697B82	Tivoli NetView Ent		PSLC	B			441	13112	
				System Monthly Price					226221
				Total Monthly Price					511072

Table 19. Sub-capacity WLC cost for the current AKZ configuration

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
PID	**Program Name**		**Type**	**LIC**	**LVL**	**QTY**	**MSUs**	**Price**	
MTM:	**2064-116**	**PG:**	**Group:**		**MSUs:**	**441**			
Name:	**IBM zSeries 900**								
SN:	**System1**								
5655158	IMS V6 Database Manager		VWLC	B			340	29451	
5655158	IMS V6 Transaction Manager		VWLC	B			340	35022	
5655F10	MQSeries for OS/390		VWLC	B			340	18882	
5655A95	MQSeries for OS/390 V2.1		VWLC	B			340	15739	
5655043	NetView Perf Mon		VWLC	B			340	3134	
5675DB2	DB2 UDB for OS/390		VWLC	B			340	36901	
5694A01	z/OS V1 Base		VWLC	B			340	88609	

Table 19. Sub-capacity WLC cost for the current AKZ configuration (continued)

PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	**2064-116**	PG:	Group:		MSUs:	**441**			
Name:	**IBM zSeries 900**								
SN:	**System1**								
5694A01	z/OS V1 RMF		VWLC	B			340	3929	
5697B82	Tivoli NetView Ent		VWLC	B			340	12115	
5697OPC	OPC 2.3 Tracker		VWLC	B			340	4213	
				System Monthly Price					247995
PID	Program Name		Type	LIC	LVL	QTY	MSUs	Price	
MTM:	2064-116	PG:	Group:		MSUs:	441			
Name:	IBM zSeries 900								
SN:	System2								
5655A95	MQSeries for OS/390 V2.1		VWLC	B			415	17614	
5655158	IMS V6 Transaction Manager		VWLC	B			398	37980	
5675DB2	DB2 UDB for OS/390		VWLC	B			415	41026	
5694A01	z/OS V1 Base		VWLC	B			415	96859	
5694A01	z/OS V1 RMF		VWLC	B			415	4379	
5697B82	Tivoli NetView Ent		VWLC	B			415	13540	
				System Monthly Price					211398
				Total Monthly Price					459393

Table 20. Sub-capacity WLC cost for the AKZ configuration one year from now

								Price	
				System1 Monthly Price					258465
				System2 Monthly Price					212626
				Total Monthly Price					471091

Table 21. Sub-capacity WLC cost for the AKZ configuration two years from now

								Price	
				System1 Monthly Price					268935
				System2 Monthly Price					215235
				Total Monthly Price					484170

AKZ cost analysis

Since the sub-capacity VWLC costs for the anticipated changes in the AKZ configuration one year and two years from now continue to be less than the PSLC cost for the current configuration, it clearly makes sense for AKZ to move to sub-capacity pricing now.

If AKZ qualifies for aggregation pricing on those products that run on both systems, the company would have total monthly software costs of $346 399 for the current configuration, for even more substantial savings.

Appendix B. Capacity planning for sub-capacity IPLA products

The following topics provide three examples of how to decide how much capacity to purchase for sub-capacity eligible IPLA products—for an execution-based sub-capacity IPLA product, a reference-based sub-capacity eligible IPLA product, and a z/OS-based sub-capacity eligible IPLA product.

Example of an execution-based sub-capacity eligible IPLA product

Customer A uses sub-capacity pricing and wants to acquire Fault Analyzer for z/OS. Customer A determines which category of sub-capacity eligible IPLA products Fault Analyzer belongs to by visiting the IBM Sub-Capacity System z IPLA web site at www.ibm.com/systems/z/swprice/reference/exhibits/ipla.html. The web site shows that Fault Analyzer is a sub-capacity eligible System z IPLA product with execution-based terms. This means that Customer A must designate the LPARs in which Fault Analyzer will execute. Customer A's IT staff decide that they will run Fault Analyzer only in LPAR SYSA on the System z CPC named CPC12.

Customer A's IT planning staff (consisting of the software asset manager, the IT architect, and the capacity planner) can look at the Detail LPAR Data section in last month's sub-capacity reports to figure out the current capacity of the designated LPARs. Since Customer One has designated only one LPAR, SYSA, they need only consider the sub-capacity report for CPC12, where LPAR SYSA exists. The Detail LPAR Data section of CPC12's sub-capacity report will indicate the highest four-hour rolling average of each active LPAR and active combination of LPARs on CPC12. The highest four-hour rolling average utilization of SYSA equals the software-pricing related capacity of SYSA.

Customer A must assess whether last month's sub-capacity report represents the expected capacity of the LPAR SYSA in the future. For example, if SYSA's capacity last month was 100 MSUs, the IT planning staff must consider whether that capacity is equal to or smaller than the expected future capacity of SYSA. If SYSA is expected to grow, Customer A's staff might decide to acquire a greater capacity of Fault Analyzer to ensure they have sufficient entitled license capacity in the future and avoid IBM-initiated billing for the product.

Other options Customer A's IT planning staff might want to consider include:

* Constraining LPAR SYSA to limit the required license capacity of Fault Analyzer. Some examples of available capping techniques are enforcing the logical weight (sometimes known as hard capping) or using defined capacity (soft capping). For more information about defined capacity, see "More about defined capacity" on page 59.
* Licensing Fault Analyzer based upon the maximum potential capacity of LPAR SYSA, to ensure that IBM-initiated billing does not occur. The simplest way to determine the maximum potential capacity of LPAR SYSA is by counting the number of logical engines assigned to it. If LPAR SYSA has four logical engines and CPC12 has 12 physical engines with an MSU rating of 372 MSUs, then LPAR SYSA's maximum potential capacity is approximately:

  $(4 / 12) \times 372$ MSUs = **124 MSUs**

Example of a reference-based sub-capacity eligible IPLA product

Customer B uses sub-capacity pricing and wants to acquire DB2 Administration Tool for z/OS. Customer B's IT planning staff determines which category of sub-capacity eligible IPLA products DB2 Administration Tool belongs to by visiting the IBM Sub-Capacity System z IPLA web site at www.ibm.com/systems/z/swprice/reference/exhibits/ipla.html. The web site shows that DB2 Administration Tool is a sub-capacity eligible System z IPLA product with reference-based terms.

Customer B's IT planning staff must now determine in which environments they want to use the DB2 Administration Tool to add value to the *parent* product, DB2 UDB for z/OS. Customer B's staff decides that they want to use the DB2 Administration Tool to add value to DB2 in their New York qualified Parallel Sysplex and to add value to DB2 in their standalone CPC, CPCTX, in Dallas. They will not yet be using the DB2 Administration Tool to add value to DB2 in their European qualified Parallel Sysplex.

Once they have identified the environments where DB2 Administration Tool will add value to DB2, Customer B's staff can look at the DB2 UDB for z/OS MSUs in the Product Summary Information section of last month's sub-capacity reports to determine the required license capacity of DB2 Administration Tool. Customer B's staff must look at the sub-capacity reports for all the CPCs running DB2 in the New York qualified parallel sysplex and the sub-capacity report for CPCTX in Dallas. The capacity of reference-based products is based on the capacity of the parent product across the entire environment; that is, for products that run in a sysplex, across the entire sysplex.

Customer B's staff must assess whether last month's sub-capacity reports represent the expected future DB2 MSUs. Last month's DB2 MSUs might be smaller than the expected future capacity of the New York sysplex, the standalone Dallas machine, or both. If the DB2 MSUs are expected to grow in the future, Customer B might want to acquire a greater capacity of DB2 Administration Tool to ensure they have sufficient entitled license capacity in the future and avoid IBM-initiated billing.

Example of a z/OS-based sub-capacity eligible IPLA product

Customer C uses sub-capacity pricing and wants to acquire Session Manager for z/OS. Customer C's IT planning staff determines which category of sub-capacity eligible IPLA products Session Manager belongs to by visiting the IBM Sub-Capacity System z IPLA web site at www.ibm.com/systems/z/swprice/reference/exhibits/ipla.html. The web site shows that Session Manager is a sub-capacity eligible System z IPLA product with z/OS-based terms. Customer C's staff must now decide which CPCs will use Session Manager. The staff decides that they will use Session Manager on three CPCs: CPCADM, CPCTST and CPCREG.

Customer C's staff now looks at the z/OS MSUs in the Product Summary Information section of last month's sub-capacity reports to determine the required license capacity of Session Manager. To make this calculation, the staff must look at the sub-capacity reports for CPCADM, CPCTST, and CPCREG.

Customer C's staff must decide whether last month's sub-capacity reports represent the expected future z/OS MSUs. Last month's z/OS MSUs might be larger or smaller than the expected future MSUs. If z/OS MSUs on the three CPCs are expected to grow, Customer C might want to acquire a greater capacity of Session Manager to ensure sufficient entitled license capacity in the future and avoid IBM-initiated billing.

Appendix C. Advanced topics in sub-capacity pricing

The following topics provide further discussion of some advanced topics such as zNALC pricing, defined capacity, group capacity, consolidating systems, and z/OS systems enablement functions.

More about zNALC pricing

System z New Application License Charges (zNALC) pricing applies to the z/OS base feature and z/OS priced features, with the exception of HCM and HLASM Toolkit. zNALC is available for z/OS on LPARs dedicated to qualified applications, among other requirements. See "System z New Application License Charges (zNALC)" on page 4 for more details.

Although the planning tool does not support zNALC, the planning tool can be used to report MSU estimates for LPARs that are running workloads that would qualify for zNALC. Such estimates can be generated by providing the planning tool with separate COMBIN DD control statements for z/OS, traditional z/OS and zNALC. The control statements would list the LPARs in which all z/OS systems are running, the LPARs in which z/OS is not running a zNALC workload (referred to as a traditional z/OS LPAR) and the LPARs in which z/OS is running a zNALC workload (referred to as a zNALC LPAR). For instance the following set of COMBIN control statements would be used to indicate that LPARs LPAR2 and LPAR3 were running zNALC workloads and LPARs LPAR5 and LPAR6 were running z/OS workloads which did not qualify for zNALC pricing.

```
z/OS=*ALL
zNALC=LPAR2,LPAR3
z/OS-Traditional=LPAR5,LPAR6
```

The resulting z/OS, zNALC, z/OS-Traditional values are described after the sample sub-capacity report fragment later in this topic.

Whenever SCRT encounters SMF data from zNALC LPARs (for example, LPARs whose names have the format ZNAL*xxxx*), SCRT reports the z/OS MSUs in one of two formats. These zNALC formats are shown in the following sections of the sub-capacity report:

- Product Summary Information
- Product Max Contributors
- Product Grid Snapshot
- Defined Capacity Value Used

When the SMF data is from a CPC where all of the z/OS LPARs are zNALC LPARs, SCRT reports all of the z/OS values as zNALC values and lists **z/OS (zNALC)** as the name in the **MLC Product Name** column of the sub-capacity report. In this case, IBM charges zNALC pricing for all of the z/OS use on the CPC. See Figure 17 on page 58.

```
 ==E5================================================================
 PRODUCT SUMMARY INFORMATION

 MLC Product Name                       MLC Product ID   Tool MSUs  Customer MSUs  Customer Comments (255 chars max)

 z/OS V1 (zNALC)                        5694-A01              98
 DB2 UDB for z/OS V8                    5625-DB2              71
 CICS TS for z/OS V3                    5655-M15              98
 MQSeries for z/OS V6                   5655-L82              71
 IMS V8                                 5655-C56              98
 Lotus Domino for z/OS V7              5655-B86              39


 IPLA Product Name                      IPLA Product ID  Tool MSUs  Customer MSUs  Customer Comments (255 chars max)

 File Manager for z/OS V6               5655-P17              60      (optional)   (conditional)
 IBM WebSphere Application Server for z/OS V6  5655-N01      71
 IBM WebSphere MQ Workflow for z/OS V3  5655-BPM              71
```

Figure 17. Sample sub-capacity report: product summary information for zNALC only

When the SMF data is from a CPC with both traditional z/OS LPARs (for example, LPARs whose names do not have the format ZNAL*xxxx*), and zNALC LPARs, SCRT reports three values for z/OS:

- **z/OS** – this value represents the MSU values for z/OS running in all LPARs on the CPC. This value is used when assigning capacity to the z/OS based IPLA sub-capacity products running on this CPC.
- **z/OS (Traditional)** – this value represents the MSU value charged against traditional z/OS use.
- **z/OS (zNALC)** – this value is used to determine what MSU value is charged against zNALC use. IBM uses the zNALC value reported on the SCRT, whenever the zNALC value is smaller than the difference between the z/OS value and the z/OS (Traditional) value.

When the difference between the z/OS value and the z/OS (Traditional) value is smaller than the zNALC value, then the difference is used, unless the difference is less than three MSUs. See www.ibm.com/systems/z/swprice/mlc/znalc.html for the rules that govern the case for when the resulting zNALC value is less than three MSUs.

Sample sub-capacity report for traditional z/OS and zNALC

Figure 18 on page 59 shows a sample Product Summary Information section for a CPC with both traditional z/OS and zNALC LPARs. The same zNALC formatting, as described in "More about zNALC pricing" on page 57, is also used in other sections of the sub-capacity report. Based on this sample report, IBM would use a value of 38 MSUs (the difference between the **z/OS** value (98) and the **z/OS (Traditional)** value (60)) when charging for zNALC on this CPC.

```
   ==E5=============================================================
   PRODUCT SUMMARY INFORMATION

   MLC Product Name                          MLC Product ID  Tool MSUs  Customer MSUs  Customer Comments (255 chars max)

   z/OS V1                                   5694-A01             98
   z/OS V1 (Traditional)                     5694-A01             60
   z/OS V1 (zNALC)                           5694-A01             41
   DB2 UDB for z/OS V8                       5625-DB2             71
   CICS TS for z/OS V3                       5655-M15             98
   MQSeries for z/OS V6                      5655-L82             71
   IMS V8                                    5655-C56             98
   Lotus Domino for z/OS V7                  5655-B86             39


   IPLA Product Name                         IPLA Product ID Tool MSUs  Customer MSUs  Customer Comments (255 chars max)

   File Manager for z/OS V6                  5655-P17             60      (optional)   (conditional)
   IBM WebSphere Application Server for z/OS V6 5655-N01          71
   IBM WebSphere MQ Workflow for z/OS V3     5655-BPM             71
```

Figure 18. Sample sub-capacity report: Product Summary Information section for a CPC with traditional z/OS and zNALC workloads

More about defined capacity

Defined capacity is the most sophisticated means of controlling an LPAR's four-hour rolling average utilization in a sub-capacity software pricing environment. If you have established a defined capacity but the four-hour rolling average utilization of the LPAR does not reach the defined capacity, then the software charges will be based upon the highest observed four-hour rolling average utilization.

Implications of a defined capacity

Defined capacity is an LPAR setting available to LPARs that:

- Are in a zEnterprise System, System z10, or System z9 environment or on zSeries hardware
- Are running native z/OS systems in 64-bit mode (Defined capacity is not supported for z/OS systems that are z/VM guests.)
- Use shared general purpose CPs
- Have relative weight *not* enforced (no PR/SM hard cap set)

Defined capacity is an optional setting that can be changed dynamically. Use the Hardware Management Console (HMC) to establish or change a defined capacity. You can also establish a defined capacity in the LPAR Image Profile, which ensures that the desired defined capacity is used if the system is re-IPLed. The defined capacity setting is in terms of MSUs. In cases where there are different values for hardware MSUs and software pricing MSUs for a given CPC, the defined capacity should be established in terms of software pricing MSUs. If you establish a defined capacity for an LPAR that has a PR/SM hard cap (enforced relative weight) or dedicated CPs, the defined capacity is ignored.

If you establish a defined capacity in an LPAR, z/OS workload management (WLM) monitors the four-hour rolling average utilization of that LPAR. If the four-hour rolling average utilization of the LPAR exceeds the defined capacity, the LPAR is temporarily capped (this is called *soft capping*) until the four-hour rolling average drops back below the defined capacity. The LPAR four-hour rolling average utilization *can* exceed the defined capacity. However, if the four-hour rolling average does exceed the defined capacity and soft capping is applied, it is possible (while being soft-capped) for the four-hour rolling average to continue to

rise and to exceed the defined capacity. In these cases, SCRT reports the defined capacity value and IBM charges customers at the defined capacity level rather than based upon the higher four-hour rolling average utilization.

More about group capacity

Group capacity allows soft capping across multiple LPARs defined in the same LPAR group. Group capacity is available to LPARs in a zEnterprise System, System z10, or System z9 environment that:

- Run native z/OS V1R8 (and higher) systems. z/OS guest systems running under z/VM do not support group capacity.
- Use z/OS workload management (WLM) to manage the four-hour rolling average utilization of all of the LPARs within the same group
- Do not enforce relative weight (no PR/SM hard cap set)
- Use the Hardware Management Console (HMC) to define the capacity group

Note:

1. The planning tool does not cap LPARs that are defined to an LPAR group. However, SCRT provides full capping support for the LPAR defined to a group, as explained in "How SCRT uses group capacity."

2. Although PR/SM and WLM will enforce the group capacity for this environment, SCRT has an additional requirement that needs to be met before it can perform the SCRT-specific group capping and group reporting described in "How SCRT uses group capacity." SCRT requires that the SMF type 70 records be generated by the RMF feature shipped with z/OS V1R8 (or higher) or that comparable SMF records be generated by a competitive ISV product. The SMF type 70 records for z/OS V1R8 (and higher) have additional fields which provide data for group capping.

How SCRT uses group capacity

For the first four hours after an IPL and for the hours immediately after adding LPARs to a group or changing the group's capacity, the capacities of those LPARs may exceed either the LPAR's defined capacity value (if set) or exceed the capacity of the LPAR group to which the LPAR has been defined (if part of a group), until WLM and PR/SM finally cap the LPARs to your provided capping values. Whenever SCRT finds SMF data that indicates that the LPARs within the same LPAR group have exceeded the capacity cap set for that group, SCRT assigns the capacity of the group to the products running in the LPARs in the group, instead of assigning the actual LPAR capacities. SCRT applies any defined capacity capping (when applicable) to individual LPARs before assessing group capping.

The Product Max Contributors section of the sub-capacity report has been extended to indicate when the peak hour for the product has been capped by SCRT at the MSU cap set for the LPAR group. The Defined Capacity Value Used section of the sub-capacity report has also been extended to indicate the number of hours that SCRT was required to set the MSU value to the cap value set for the LPAR group because PR/SM and WLM could not react fast enough to enforce the capped value. The hours reported in the Defined Capacity Value Used section do not include the number of hours that were successfully capped by PR/SM and WLM. The Group Capacity LPARs section lists the LPARs defined to each group during the reporting period.

Examples of MSU assessment by SCRT

Because group capping, with or without the capping of individual LPARs within a group, can be complicated, the following set of examples indicate how SCRT assesses the MSU value for the products in a sample configuration. In this sample configuration, LPAR2 has a defined capacity set to 28 MSUs, and LPAR2 and LPAR3 are part of an LPAR group that has been capped at 70 MSUs. The sample configuration also lists the MSU values for each LPAR for hours 51 and 73 of the sample reporting period.

Group capping on a traditional z/OS configuration

Table 22 illustrates a sample traditional z/OS configuration with group capping.

Table 22. Sample z/OS traditional configuration with group capping

CPC: 2096-S04 (serial = 02-12345)			
LPAR1	**LPAR2**	**LPAR3**	**LPAR4**
	Defined cap = 28 MSUs Group = GRPA Group cap = 70 MSUs	Group = GRPA Group cap = 70 MSUs	
z/OS V1R7 (SYS1) CICS TS V3 IMS V8 File Manager V6	z/OS V1R8 (SYS2) DB2 UDB V8 CICS TS V3 MQSeries V6 IMS V8 File Manager V6 WebSphere Application Server V6 WebSphere MQ Workflow V3	z/OS V1R8 (SYS3) DB2 UDBV8 CICS TS V3 MQSeries V6 IMS V8 Lotus Domino V7 WebSphere Application Server V6 WebSphere MQ Workflow V3	z/VSE
hour 51 = 27 MSUs hour 73 = 25 MSUs	hour 51 = 32 MSUs hour 73 = 30 MSUs	hour 51 = 39 MSUs hour 73 = 45 MSUs	

Table 23 shows the MSUs for hour 51 for the sample configuration shown in Table 22.

Table 23. MSUs for hour 51 in the sample z/OS traditional configuration

Product	MSUs contributed by each LPAR for hour 51 (actual values listed for each LPAR as shown in the configuration in Table 22)			Reported MSUs for hour 51
	LPAR1	**LPAR2**	**LPAR3**	
z/OS	27	28[1,2]	39[2]	94
DB2 UDB V8		28[1,2]	39[2]	67
CICS TS V3	27	28[1,2]	39[2]	94
MQSeries V6		28[1,2]	39[2]	67
IMS V8	27	28[1,2]	39[2]	94
Lotus Domino V7			39	39
File Manager V6	27	28[1]		55
IBM WebSphere Application Server for z/OS V6		28[1,2]	39[2]	67
IBM WebSphere MQ Workflow for z/OS V3		28[1,2]	39[2]	67

Table 23. MSUs for hour 51 in the sample z/OS traditional configuration (continued)

	MSUs contributed by each LPAR for hour 51 (actual values listed for each LPAR as shown in the configuration in Table 22 on page 61)			Reported MSUs for hour 51
Product	LPAR1	LPAR2	LPAR3	
Footnotes:				
1. This LPAR was capped to 28 MSUs by its Defined Capacity setting.				
2. The total MSUs for the LPARs in this group was 67 MSUs, which is less than the group cap of 70 MSUs so no group capping took place.				

Summary analysis for hour 51 shown in Table 23 on page 61:

- LPAR1 and LPAR4 can not participate in group capping, even if LPAR1 and LPAR4 were defined to be part of the LPAR group on the LPAR definition panel, because z/OS V1R7 (running in LPAR1), does not support group capping and z/VSE (running in LPAR4) does not support LPAR capping. Group capping support was introduced in z/OS V1R8.
- SCRT capped all products running in LPAR2 for hour 51, because LPAR2 exceeded its defined capacity.
- SCRT did not apply group capping to the LPARs in this group because the MSUs for the LPARs in this group totaled 67 MSUs, which is less than the group cap of 70 MSUs.

If hour 51 was the earliest peak hour for all of the products in this sample configuration for the reporting period, Figure 19 shows what the corresponding Product Max Contributors section of the sub-capacity report would look like.

```
==P5==============================================================
PRODUCT MAX CONTRIBUTORS

Product Name                                Product ID  Highest  Date/Time            LPAR   LPAR   LPAR   LPAR   GROUP
                                                                                      LPAR1  LPAR3  LPAR2  LPAR4  LGRPA


z/OS V1                                     5694-A01        94   04 Oct 2012 - 03:00    27     28     39      0      0
DB2 UDB for z/OS V8                         5625-DB2        67   04 Oct 2012 - 03:00     0     28     39      0      0
CICS TS for z/OS V3                         5655-M15        94   04 Oct 2012 - 03:00    27     28     39      0      0
MQSeries for z/OS V6                        5655-L82        67   04 Oct 2012 - 03:00     0     28     39      0      0
IMS V8                                      5655-C56        94   04 Oct 2012 - 03:00    27     28     39      0      0
Lotus Domino for z/OS V7                    5655-N14        39   04 Oct 2012 - 03:00     0      0     39      0      0
File Manager for z/OS V6                    5655-P17        55   04 Oct 2012 - 03:00    27     28      0      0      0
IBM WebSphere Application Server for z/OS V6 5655-N01       67   04 Oct 2012 - 03:00     0     28     39      0      0
IBM WebSphere MQ Workflow for z/OS V3       5655-BPM        67   04 Oct 2012 - 03:00     0     28     39      0      0


VSE Central Functions                       5686-CF8        11   04 Oct 2012 - 03:00     0      0      0     11      0
```

Figure 19. Sample Product Max Contributors section for hour 51 in the sample z/OS traditional configuration

Table 24 shows the MSUs for hour 73 for the sample configuration shown in Table 22 on page 61.

Table 24. MSUs for hour 73 in the sample z/OS traditional configuration

	MSUs contributed by each LPAR for hour 73 (actual values listed for each LPAR as shown in the configuration in Table 22 on page 61)			Reported MSUs for hour 73
Product	LPAR1	LPAR2	LPAR3	
z/OS	25	28[1,2]	45[2]	95
DB2 UDB V8		28[1,2]	45[2]	70
CICS TS V3	25	28[1,2]	45[2]	95

Table 24. MSUs for hour 73 in the sample z/OS traditional configuration (continued)

Product	MSUs contributed by each LPAR for hour 73 (actual values listed for each LPAR as shown in the configuration in Table 22 on page 61)			Reported MSUs for hour 73
	LPAR1	LPAR2	LPAR3	
MQSeries V6		28[1,2]	45[2]	70
IMS V8	25	28[1,2]	45[2]	95
Lotus Domino V7			45[3]	45
File Manager V6	25	28[1]		53
IBM WebSphere Application Server for z/OS V6		28[1,2]	45[2]	70
IBM WebSphere MQ Workflow for z/OS V3		28[1,2]	45[2]	70

Footnotes:

1. This LPAR was capped to 28 MSUs by its Defined Capacity setting.

2. The total MSUs for the LPARs in this group was 73 MSUs, which is more than the group cap of 70 MSUs so group capping took place.

3. Group capping did not apply to the product running in this LPAR because the LPAR did not exceed the group capacity.

Summary analysis for hour 73 shown in Table 24 on page 62:

- LPAR1 cannot participate in group capping, even if LPAR1 was defined to be part of the LPAR group on the LPAR definition panel, because z/OS 1.7, which is running in LPAR1 does not support group capping. Group capping support was introduced by z/OS 1.8.

- SCRT capped all products running in LPAR2 for hour 73, because LPAR2 exceeded its defined capacity.

- SCRT set the group cap for all products that were running in both of the LPARs in the group (LPAR2 and LPAR3) during hour 73, because the capacities of both LPARs in the group (73 MSUs) exceed the group cap.

- SCRT was not required to cap any product that ran in only one of the LPARs in the group because neither LPAR alone exceeded the capacity of the group.

If hour 73 was the earliest peak hour for all of the products in this sample configuration for the reporting period, Figure 20 shows what the corresponding Product Max Contributors section of the sub-capacity report would look like.

```
==P5==============================================================
PRODUCT MAX CONTRIBUTORS

Product Name                              Product ID  Highest  Date/Time               LPAR   LPAR   LPAR   LPAR   GROUP
                                                                                       LPAR1  LPAR3  LPAR2  LPAR4  LGRPA

z/OS V1                                   5694-A01      95  05 Oct 2012 - 01:00         25      0      0      0     70
DB2 UDB for z/OS V8                       5625-DB2      70  05 Oct 2012 - 01:00          0      0      0      0     70
CICS TS for z/OS V3                       5655-M15      95  05 Oct 2012 - 01:00         25      0      0      0     70
MQSeries for z/OS V6                      5655-L82      70  05 Oct 2012 - 01:00          0      0      0      0     70
IMS V8                                    5655-C56      95  05 Oct 2012 - 01:00         25      0      0      0     70
Lotus Domino for z/OS V7                  5655-N14      45  05 Oct 2012 - 01:00          0      0     45      0      0
File Manager for z/OS V6                  5655-P17      53  05 Oct 2012 - 01:00         25     28      0      0      0
IBM WebSphere Application Server for z/OS V6  5655-N01  70  05 Oct 2012 - 01:00          0      0      0      0     70
IBM WebSphere MQ Workflow for z/OS V3     5655-BPM      70  05 Oct 2012 - 01:00          0      0      0      0     70

VSE Central Functions                     5686-CF8      13  05 Oct 2012 - 01:00          0      0      0     13      0
```

Figure 20. Sample Product Max Contributors section for hour 73 in the sample z/OS traditional configuration

Group capping on a z/OS traditional and z/OS zNALC configuration

z/OS zNALC and z/OS traditional are treated the same way as any other product for group capping. This can be demonstrated by changing the configuration to contain a zNALC LPAR. LPAR3 was replaced by ZNAL3, which is a zNALC LPAR. Note that some of the products were dropped from the zNALC LPAR because zNALC LPARs must be dedicated to zNALC workloads and the applications which support those zNALC workloads. See "More about zNALC pricing" on page 57 for a description of how SCRT reports on configurations with zNALC LPARs.

Table 25 shows a sample z/OS traditional and z/OS zNALC configuration with group capping.

Table 25. Sample z/OS traditional and z/OS zNALC configuration with group capping

CPC: 2096-S04 (serial = 02-12345)			
LPAR1	**LPAR2** Defined cap = 28 MSUs Group = GRPA Group cap = 70 MSUs	**ZNAL3** Group = GRPA Group cap = 70 MSUs	**LPAR4**
z/OS V1R7 (SYS1) CICS TS V3 IMS V8 File Manager V6	z/OS V1R8 (SYS2) DB2 UDB V8 CICS TS V3 MQSeries V6 IMS V8 File Manager V6 WebSphere Application Server V6 WebSphere MQ Workflow V3	z/OS V1R8 (SYS3) DB2 UDB V8 Lotus Domino V7	z/VSE
(hour 73 = 25 MSUs)	(hour 73 = 30 MSUs)	(hour 73 = 45 MSUs)	

Table 26 shows the MSUs for hour 73 for the sample configuration shown in Table 25.

Table 26. MSUs for hour 73 in the sample z/OS traditional and z/OS zNALC configuration

Product	MSUs contributed by each LPAR for hour 73 (actual values listed for each LPAR as shown in the configuration in Table 25)			Reported MSUs for hour 73
	LPAR1	**LPAR2**	**ZNAL3**	
z/OS	25	28[1,2]	45[2]	95
z/OS (Traditional)	25	28[1]		53
z/OS (zNALC)			45[3]	45
DB2 UDB V8		28[1,2]	45[2]	70
CICS TS V3	25	28[1]		53
MQSeries V6		28[1]		28
IMS V8	25	28[1]		53
Lotus Domino V7			45[3]	45
File Manager V6	25	28[1]		53
IBM WebSphere Application Server for z/OS V6		28[1]		28
IBM WebSphere MQ Workflow for z/OS V3		28[1,2]	45[2]	70

	MSUs contributed by each LPAR for hour 73 (actual values listed for each LPAR as shown in the configuration in Table 25 on page 64)			Reported MSUs for
Product	LPAR1	LPAR2	ZNAL3	hour 73
Footnotes:				
1. This LPAR was capped to 28 MSUs by its Defined Capacity setting.				
2. The total MSUs for the LPARs in this group was 73 MSUs, which is more than the group cap of 70 MSUs, so group capping took place.				
3. Group capping did not apply to the product running in this LPAR because LPAR did not exceed the group capacity.				

If hour 73 was the earliest peak hour for all of the products in this sample mixed z/OS traditional and zNALC configuration for the reporting period, Figure 21 shows what the corresponding Product Max Contributors section of the sub-capacity report would look like.

```
==P5===============================================================
PRODUCT MAX CONTRIBUTORS

Product Name                              Product ID  Highest  Date/Time            LPAR   LPAR   LPAR   LPAR   GROUP
                                                                                    LPAR1  LPAR3  LPAR2  LPAR4  LGRPA

z/OS V1                                   5694-A01       95  05 Oct 2012 - 01:00      25      0      0      0     70
z/OS V1 (Traditional)                     5694-A01       53  05 Oct 2012 - 01:00      25     28      0      0      0
z/OS V1 (zNALC)                           5694-A01       45  05 Oct 2012 - 01:00       0      0     45      0      0
DB2 UDB for z/OS V8                       5625-DB2       70  05 Oct 2012 - 01:00       0      0      0      0     70
CICS TS for z/OS V3                       5655-M15       53  05 Oct 2012 - 01:00      25     28      0      0      0
MQSeries for z/OS V6                      5655-L82       28  05 Oct 2012 - 01:00       0     28      0      0      0
IMS V8                                    5655-C56       53  05 Oct 2012 - 01:00      25     28      0      0      0
Lotus Domino for z/OS V7                  5655-N14       45  05 Oct 2012 - 01:00       0      0     45      0      0
File Manager for z/OS V6                  5655-P17       53  05 Oct 2012 - 01:00      25     28      0      0      0
IBM WebSphere Application Server for z/OS V6  5655-N01   28  05 Oct 2012 - 01:00       0     28      0      0      0
IBM WebSphere MQ Workflow for z/OS V3     5655-BPM       70  05 Oct 2012 - 01:00       0      0      0      0     70

VSE Central Functions                     5686-CF8       12  05 Oct 2012 - 01:00       0      0      0     12      0
```

Figure 21. Sample Product Max Contributors section for hour 73 in the sample z/OS traditional and z/OS zNALC configuration

For more information, see the topics on:
- Defining group capacity in the chapter on "Workload Management Participants of WLM Planning" in *z/OS MVS Planning: Workload Management*.
- "Workload Charging by Soft-Capping to a Defined Capacity" in *PR/SM Planning Guide*, available from the IBM Systems Support web site for your hardware model.

Consolidating systems

With sub-capacity workload license charges, it can be beneficial to consolidate workloads from two smaller CPCs onto one larger CPC. For example, if you had two separate 78 MSU CPCs running z/OS and one had a peak four-hour rolling average utilization for the month of 75 MSUs while the other had a peak of 65 MSUs, your z/OS bill for the two systems would be based on 140 MSUs for that month, as illustrated in Table 27 on page 66.

Table 27. Peak utilization for separate systems (CPC 1 and CPC 2) before consolidation

Hour:	11	12	13	14	15	...	36	37	38	39	MSUs billed
CPC 1 peak value	64	66	70	73	72	...	66	69	72	**75**	75
CPC 2 peak value	**65**	62	60	59	58	...	65	64	63	60	65
Total for CPC 1 and CPC 2											**140**

If you consolidated those workloads onto two LPARs of a 143 MSU processor, then only if those two peaks occurred in the same hour would your z/OS bill be based on the sum of the two highest values. A more likely scenario is that the peaks would occur in different hours and your highest combined utilization would be less than 140 MSUs, such as the 135 MSUs illustrated in Table 28.

Table 28. Peak utilization for equivalent LPARs (LPAR A and LPAR B) on a single system (CPC 3) after consolidation

Hour:	11	12	13	14	15	...	36	37	38	39	MSUs billed
LPAR A *(formerly CPC 1)* peak value	64	66	70	73	72	...	66	69	72	**75**	–
LPAR B *(formerly CPC 2)* peak value	**65**	62	60	59	58	...	65	64	63	60	–
Total for CPC 3	129	128	130	132	120	...	131	133	**135**	**135**	**135**

Consolidating onto a different machine type

The example in "Consolidating systems" on page 65 shows consolidation within the same machine type (for example, two smaller z900 CPCs, machine type 2064, consolidating onto a larger z900 CPC). When the consolidation is to a different machine type (for example, from two z900 2064 CPCs to a z990 2084 CPC or to a zEnterprise 196, System z10, or System z9 environment), special planning is necessary. You should work with your IBM representative or IBM Business Partner representative to plan for this kind of change. Your representative has access to a tool called CP2000 that can help you plan.

z/OS systems enablement functions

At least one of these common systems enablement functions must be activated on all images in a sysplex for the software on that sysplex to participate in a pricing aggregation.

- Application Data Sharing
- GRS Star Implementation
- JES2 Checkpoint in the Coupling Facility
- RACF® database caching
- SmartBatch multisystem processing
- VTAM® Generic Resources

- VTAM MULTINODE Persistent Sessions
- Automated tape sharing and switching
- System logger SYSLOG (OPERLOG)
- System logger LOGREC
- System logger Resource Recovery Services

Appendix D. Sub-capacity pricing planning checklist

Use the checklist in Table 29 to help you track your progress in planning for workload license charges. You can find more information about these tasks in "Sub-capacity pricing planning tasks" on page 13.

Table 29. Sub-capacity planning checklist and role responsibilities

Task	Software asset manager	z/OS system architect	Capacity planner	Complete ✔
Form team	●			
Create inventories of your sub-capacity eligible software	●			
Create a capacity and growth plan		●	●	
Build product/location matrices	●			
Define a baseline		●		
Download and run the Sub-Capacity Planning Tool		●		
Review the Sub-Capacity Planning Tool output	●	●	●	
Create three scenarios: now, + 1 year, + 2 years	●	●	●	
Get cost analysis from IBM for the scenarios	●			
Create three-year cost chart	●	●		
Determine whether company saves now or will save in future with sub-capacity pricing	●			
Review IBM Terms and Conditions	●			
Put contracts in place (or plan them for future)	●			
Maintain software inventories and product/location matrices	●			
Maintain capacity and growth plan		●	●	
Schedule regular reviews of cost charts	●			
Participate in reviews of cost charts		●	●	

Appendix E. Sub-capacity pricing implementation checklist

Use the checklist in Table 30 to help you track your progress in implementing workload license charges. You can find more information about these tasks in "Sub-capacity pricing implementation tasks" on page 14.

Table 30. Sub-capacity implementation checklist and role responsibilities

Task	Software asset manager	z/OS system architect	Capacity planner	Complete ✔
Schedule sub-capacity reporting tool implementation	●	●		
Discontinue any OS/390 or MVS licenses on CPCs to use sub-capacity pricing	●			
Install any prerequisites for running the SCRT		●		
Install SCRT		●		
Test SCRT execution		●		
Sign terms and conditions for sub-capacity pricing	●			
Run SCRT		●		
Analyze sub-capacity report	●	●		
Modify sub-capacity report, if required	●			
Submit sub-capacity report to IBM	●			
Receive bill from IBM (the month after sub-capacity report submission)	●			
Review bill	●	●		
Schedule monthly software license plan reviews	●			
Use sub-capacity report to modify configuration and cost structure quarterly	●	●	●	

Appendix F. System z software pricing information

Table 31 lists some useful web pages that contain information about IBM System z software pricing.

Table 31. IBM System z software pricing web pages

Information about this topic...	Is available here...
System z software pricing information	www.ibm.com/systems/z/swprice/
System z software pricing announcements	www.ibm.com/systems/z/swprice/reference/announce.html
Sub-Capacity Corner web page	www.ibm.com/systems/z/swprice/subcap/
SCRT (download)	www.ibm.com/systems/z/swprice/subcap/scrt/scrt/
SCRT and related FAQs	www.ibm.com/systems/z/swprice/subcap/scrt/faq.html
IBM System z, zSeries, and S/390 hardware models and their capacity ratings	www.ibm.com/systems/z/swprice/reference/exhibits/hardware.html
Using the Sub-Capacity Reporting Tool	www.ibm.com/systems/z/swprice/subcap/scrt/
IBM System z Software Pricing Reference Guide	www.ibm.com/systems/z/swprice/reference/
Sub-Capacity Planning Tool	www.ibm.com/systems/z/swprice/subcap/scpt/
Products that do and do not produce SMF 89 records (see the various sub-capacity eligible MLC and IPLA product lists at this site)	www.ibm.com/systems/z/swprice/reference/exhibits/
Value Unit Converter Tool	www.ibm.com/systems/z/swprice/zipla/vuc/

Appendix G. Accessibility

Accessible publications for this product are offered through the z/OS Information Center, which is available at www.ibm.com/systems/z/os/zos/bkserv/.

If you experience difficulty with the accessibility of any z/OS information, please send a detailed message to mhvrcfs@us.ibm.com or to the following mailing address:

IBM Corporation
Attention: MHVRCFS Reader Comments
Department H6MA, Building 707
2455 South Road
Poughkeepsie, NY 12601-5400
USA

Accessibility features

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size.

Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. Refer to *z/OS TSO/E Primer*, *z/OS TSO/E User's Guide*, and *z/OS ISPF User's Guide Vol I* for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users accessing the z/OS Information Center using a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line, because they can be considered as a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that your screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually

exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, you know that your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol can be used next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 * FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* * FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol giving information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, this indicates a reference that is defined elsewhere. The string following the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you should refer to separate syntax fragment OP1.

The following words and symbols are used next to the dotted decimal numbers:
- ? means an optional syntax element. A dotted decimal number followed by the ? symbol indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that syntax elements NOTIFY and UPDATE are optional; that is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.
- ! means a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicates that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the same dotted decimal number can specify a ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In this example, if you include the FILE keyword but do not specify an option, default option KEEP will be applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1!

(KEEP), and 2.1.1 (DELETE), the default option KEEP only applies to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

- * means a syntax element that can be repeated 0 or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3*, 3 HOST, and 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

  Note:
  1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
  2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you could write HOST STATE, but you could not write HOST HOST.
  3. The * symbol is equivalent to a loop-back line in a railroad syntax diagram.

- \+ means a syntax element that must be included one or more times. A dotted decimal number followed by the \+ symbol indicates that this syntax element must be included one or more times; that is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the \+ symbol can only repeat a particular item if it is the only item with that dotted decimal number. The \+ symbol, like the * symbol, is equivalent to a loop-back line in a railroad syntax diagram.

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for service, and current service activity will cease if a problem is determined to be associated with out-of-support devices. In such cases, fixes will not be issued.

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- For information about software support lifecycle, see: IBM Lifecycle Support for z/OS (http://www.ibm.com/software/support/systemsz/lifecycle/)
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