

TPC Pricing Specification

Standard Specification
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Transaction Processing Performance Council (TPC)

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Document History

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April 13-June 27, 2005	1.0.1	minor text updates from 4/13/05 through 6/27/05 – updated index, improved clause references
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November, 2011	1.7.0 draft	Added wording to clarify between active and historical results and to include notion of SSDs and other storage devices instead of just rotating disk.

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CLAUSE 0 -- PREAMBLE

0.1 Introduction

0.1.1 Purpose

TPC Benchmarks™ are intended to provide a fair and honest comparison of various vendor implementations to accomplish an identical, controlled and repeatable task. The pricing for these implementations must also allow a fair and honest comparison for customers to review. The Transaction Processing Performance Council is providing this specification to guide the customer, the vendors implementing a benchmark, and the auditors on what is acceptable pricing for the purposes of publication. It is not attempting to dictate or exclude business practices in the marketplace. There may be some restrictions on pricing for publication (such as excluding sales and closeouts) that are different from some business transactions that actually take place in the marketplace, but those restrictions are intended to make publication both tractable and comparable during the lifetime of the publication for the majority of customers and vendors.

0.1.2 Definitions

Active Result. – A **Result** that is under review or has been **Accepted**, according to the TPC Policies and maintains current **Availability** and **Pricing**. **Withdrawn** and **Historical Results** are not **Active Results**.

Any customer. – No potential **Customer** will be excluded.

Archive Operation Requirement. The period of time for which data generated by the **Priced Configuration** as required by the benchmark specification must be maintained in on-line storage.

Available. A product is **Available** if it is **Orderable** and is shipping to **Customers**.

Availability Date. The date when the all **Components** of the system under test are **Generally Available**.

Benchmark Special Pricing. – A price that is submitted for publication that uses methods or values that would not likely be found in an actual **Purchase Agreement** with a **Customer**, as defined here in Clause 0.1.2.

Commercially Available Product. A product that:

1. Is **Orderable**,
2. Is maintained as defined in this specification,
3. Has a non-zero price for at least one of purchase, license or maintenance support, and

4. Is designed for customer uses other than running the benchmark.

Component. The term, “**Component**” is used often in this specification. It is used to designate an element of the system or subsystem being discussed without any specific relationship to whether it is a specific **Line Item**, a part of a bundled **Line Item** or a bundle of other elements of the configuration. For example, a power cord is a **Component** that may be separately priced as a **Line Item** with a **Part Number** or may be included in the price of a larger **Component**.

Continuous Operation Requirement. The period of time when the **Priced Configuration** must be able to support the full operation at the performance levels claimed in the benchmark.

Customer. An individual or business that could plausibly and legally purchase the products listed in the **FDR**.

Customer Replaceable Unit (CRU) – A **Component** of the **SUT** that can be removed and installed by the customer. CRUs may be serviced as if they are FRUs.

Defect. – A behavior of the system that prevents the normal operation of the customer’s application.

Discount. A reduction in price from the **List Price** of a **Line Item** or group of **Line Items**.

Failure. A condition that prevents the system under test from performing benchmark operations at the performance and functional levels required by the benchmark specification and claimed in the **FDR**.

FDR. See definition in official TPC Policies document.

Field Replaceable Unit (FRU) – A **Component** of the **SUT** that must be removed and/or installed by personnel of the maintenance provider.

Fix. Any resolution (including “workarounds”) that restores the application to normal operation.

Generally Available. A product is **Available** to **Any Customer**.

List Price. The price for which a vendor would sell one unit of an item to **Any Customer** without any other purchase (other than specific prerequisite or other required products that are documented in association with the product).

Line Item. A product, service, license, or bundle of any or all of these in an entity that is uniquely identified by a **Part Number**.

Orderable. A method exists for the specified **Sales Channel** and a **Customer** to establish a **Purchase Agreement** for the product at a specific price.

Part Number. An alphanumeric string used by a supplier to uniquely identify a priced **Component** of a **Priced Configuration**. The **Sales Channel** should be able to identify the **Component** by the **Part Number** when generating a price.

Priced Configuration. The **Components** to be priced defined in the benchmark specification, including all hardware, software and maintenance.

Pricing. The methods and documentation used to obtain a final price for the **Priced Configuration**, including all items specified in Clause 1.

Pricing Model. The algorithm or process used by a vendor to set or compute prices. There can be many **Pricing Models** within a single vendor pertaining to the same products or group of products. **Pricing Models** are often aimed at specific markets.

Pricing Source. A group or individual that would normally generate a price quotation for the **Sales Channel** specified in the **FDR**. For example, if the **Sales Channel** is a web-based tool that automatically generated a price quotation, then the **Pricing Source** is that tool.

Pricing Spreadsheet. The **Pricing Spreadsheet** is a table that lists the individually priced **Components** of the **Priced Configuration**, along with the source of the price, the computation of extended price including quantities and any applied **Discounts**, and the price totals (See Clause 1.4.1).

Purchase Agreement. A **Purchase Agreement** must be a document (electronic or paper) that would be interpreted in a court of law as a commitment to deliver product.

Real-World Pricing. The price that **Customers** would pay in a real sales situation.

Response Time For Problem Recognition. The period of time it takes from customer request until an active process is underway to classify the problem and, if it is at a level that would qualify as a **Failure** in this document, initiate the isolation and eventual resolution of the problem. There must be ownership of the problem. Simply having it in a queue is not sufficient. Direct interaction with the customer or their computer must be underway. The resumption of customer operations need not be guaranteed within the response period.

Comment: Companies use different terms for areas that a customer might consider a "problem". Service request, issue, **Defect** and bug are among these terms.

Result. See definition in official TPC Policies document.

Sales Channel. The organization or tool that enters into a **Purchase Agreement** with a **Customer**. For example, the **Sales Channel** could be a web-based tool, a particular sales organization, or a general sales organization.

Similar Configuration. A configuration is "similar" if the quantities of the **Components** in the configuration that are from a single **Pricing Source** are at least the quantities shown in the **FDR** of the result and no more than 10 percent more than those quantities. **Components** that are from different **Pricing Sources** do not need to be included when verifying the price from one particular **Pricing Source**.

Similar Discount. A **Discount** is "similar" if the value (in the priced currency) of the **Discount** for a **Similar Configuration** is at least as much as it is in the **FDR** of the **Result**.

Third Party (3rd Party). A company that provides a **Line Item** priced in the benchmark and that is neither the primary test sponsor (first party) nor the **Customer** (second party). In the situation where more than one company are sponsors of a benchmark, only one of these may be considered the primary test sponsor and the other(s) must be treated as 3rd parties.

Time for Defect Isolation. The period of time when the cause of a **Defect** is investigated and the probable solution is identified, coded, and tested, as appropriate. This time begins after the **Response Time For Problem Recognition** and precedes the **Time for Problem Resolution Availability**.

Time for Problem Resolution Availability. The period of time from when the probable **Defect** resolution is identified, coded and tested, to when the resolution is delivered to the customer for implementation on the system. The resumption of customer operations need not be guaranteed within the response period for this phase.

0.1.3 Basic Requirements

To meet the requirements of being fair, honest and comparable, while allowing for a variety of **Pricing** and business strategies, the following requirements exist for the **Pricing** information in all TPC Benchmark publications:

- 1) **Pricing** must be based upon some **Pricing Model** that the sponsoring company actually employs with **Customers**.
 - a) The published price must be a price that **Any Customer** would pay for the **Priced Configuration**.
 - b) The methodology used must generate a similar price for a **Similar Configuration** for **Any Customer**.

- 2) **Pricing** must be verifiable. In a competitive environment, aggressive discounting may occur in certain situations. The **Pricing Model** employed for TPC Benchmark publications might not represent the best or lowest price some **Customer** would pay. The **Pricing Model** must represent the **Pricing** that could be obtained by **Any Customer** in a request for bid to a single vendor. Situations that occur when requests for bids go out to multiple vendors and then those bids are used in multiple negotiations to get a better price are not being represented.

Benchmark sponsors are permitted several possible **Pricing Models** to construct a price for the **Priced Configuration**. The **Pricing Models** used must adhere to Clause 1 and the **Pricing Spreadsheet** must be formatted to adhere to the disclosure requirements in Clause 2 as illustrated in the appendix.

0.1.4 Binding Sections of the Specification

Every portion of this specification (including comments and appendices) must be satisfied by any **Pricing Model** used for publication, unless the portion is expressly identified as non-binding.

0.1.5 Specification Precedence

0.1.5.1 If there is a conflict between the benchmark specification and the pricing specification, the pricing specification is the controlling document. The benchmark maintenance subcommittee is required to bring any issues with the pricing specification to the pricing maintenance subcommittee for resolution. The benchmark maintenance and pricing maintenance subcommittees shall cooperate to resolve the conflict.

0.1.5.2 If there is a conflict that is not explicitly called out in the benchmark specification, the pricing specification wording prevails.

0.1.5.3 If there is language in the pricing specification and not in the benchmark specification, the pricing specification prevails.

0.1.5.4 If there is language in the benchmark specification and not in the pricing specification, the benchmark specification prevails.

0.2 General Pricing Guidelines

0.2.1 Pricing in the Marketplace

The purpose of TPC benchmarks is to provide relevant, objective information to industry users. To achieve that purpose, publication of a TPC benchmark requires **Pricing** that:

- 1) Is no lower than what would be quoted to **Any Customer** from the date of publication of the **FDR** until the **Result** ceases to be an **Active Result**.
- 2) Is actively used by the vendor in the market segment that the **Pricing Models** or represents (e.g., small business customers, or large corporations, depending on the type of system being priced).
- 3) A significant number of **Customers** in the market segment that the **Pricing Models** or represents would plausibly receive in a **Purchase Agreement**.

Comment: The same product may be priced differently through different **Sales Channels**. The price specified in the benchmark **Result** must be **Available** to **Any Customer** within the **Sales Channel** used for the **Result**.

0.2.2 Benchmark Specials

The use of innovative systems, products, technologies (hardware or software) and **Pricing** is encouraged as long as they meet the requirements above. Specifically prohibited is **Pricing** whose primary purpose is optimization of TPC benchmark **Results** without any corresponding applicability to real-world applications and environments. In other words, all "benchmark specials," that improve benchmark **Pricing** but are not **Real-World Pricing**, are prohibited.

The following characteristics, while not exhaustive, should be used as a guide to judge whether a particular **Pricing** used is a benchmark special. It is not required that each point below be met, but that the cumulative weight of the evidence be considered to identify unacceptable pricing. Absolute certainty or certainty beyond a reasonable doubt is not required to make a judgment on this complex issue. The question that must be answered is this: based on the available evidence, does the clear preponderance (the greater share or weight) of evidence indicate that this **Pricing** is a benchmark special?

- 1) Is the **Pricing** not documented (publicly or privately) or are there restrictions that prevent **Any Customer** from obtaining the price?

- 2) Is the **Pricing Model** used inconsistently with **Customers** that purchase from the specified **Sales Channels**?
- 3) Is the price restricted to a customer set with volume-based negotiated prices, such as GSA, OEM, channel partner, or wholesale pricing?
- 4) Except for components whose combined impact on the price is less than 2%, is the **Priced Configuration** fully **Available** for less than 185 days? (e.g. Some components become unavailable within a few months of the **Availability Date** and no substitution is made, meaning that the likelihood of a customer being able to purchase the **Priced Configuration** is very limited.)
- 5) Does the **Pricing** have significant restrictions that limit its use or applicability beyond TPC benchmarks?
 - a) If the specific TPC **Priced Configuration** or a part of the **Priced Configuration** is priced as a bundle, are there no similar bundles **Available** for other configurations?
 - b) Is the **Discount** applied and the amount of the **Discount** unavailable for all similarly priced, similarly marketed, or other similar models.
- 6) Does the **Pricing** take special advantage of the limited nature of TPC benchmarks (e.g., software **Components** required, or limited use of maintenance) in a manner that would not be generally applicable to the real-world environment the benchmark represents?
- 7) Is the use of the **Pricing** discouraged by the vendor?
- 8) Does the **Pricing Model** require uncommon sophistication on the part of the **Customer**? For example, is a **Discount** only **Available** to customers who engage in extensive negotiations and who place competitor's bids against the **Pricing** agent? For example, is a **Customer** unable to receive a **Similar Discount** for a **Similar Configuration** when presenting the contact at the disclosed **Sales Channel** with all the price information for a particular **Pricing Source** in the **FDR**, but not necessarily that the information came from an **FDR**?
- 9) Is the **Pricing** unusual or non-customary for the vendor or unusual or non-customary to normal business practices? The following **Pricing** practices are suspect:
 - a) Availability of a **Discount** to a small subset of **Customers** who would normally purchase the kind of system being priced.
 - b) Unusual or non-customary restrictions on transferability of product, warranty or maintenance on **Discounted** items.

CLAUSE 1 -- PRICING

1.1 Pricing Methodology

The intent of this section is to define the methodology to be used to calculate the 3-year price and the price/performance of the benchmark. The **Pricing** methodology specified below must reflect the price for the purchase of the system under test, the licensing of software used in the benchmark, and the contracts for maintenance. **Pricing** may use packages and **Discounts** that are **Generally Available**. The prices must be disclosed in a **Line Item** fashion using **Pricing** in the currency of a country where the **Priced Configuration** is **Generally Available**.

The prices used in the benchmark must be for outright purchase of hardware and of licenses to use software. Lease agreements are not allowed.

All prices must be verifiable from the date of publication of the **FDR**.”

1.1.1 Priced Components

The **Components** to be priced are the **Priced Configuration** defined in the benchmark specification and the maintenance on those **Components** (see Clause 1.3).

1.1.2 Product Availability

The benchmarked system is the actual system that the **Customer** would purchase. However, it is realized that vendors may announce new products and disclose benchmark **Results** before the products have actually shipped to **Customers**. This is allowed, but any use of benchmark-special implementations is specifically disallowed (see Clause 0.2).

1.1.2.1 All hardware, software and support used in the calculations must be **Orderable** by **Any Customer** on the availability date.

1.1.2.2 For each of the **Components** that are not **Orderable** on the report date of the **FDR**, the following information must be included in the **FDR**:

- Name and **Part Number** of the item that is not **Orderable**
- The date when the **Component** can be ordered (on or before the Availability Date)
- The method to be used to order the **Component** (at or below the quoted price) when the order date arrives
- The method for verifying the price

1.1.2.3 For any **Component** that is not currently **Available**, **Any Customer** must be able to order some product from the same vendor that is **Generally Available** that is of the same type and has similar functionality as the product used in the **Result**. The means for ordering the existing product must be the same as the means disclosed by the sponsor for the product used in the **Result**.

Comment: A supplier with an existing product, such as a computer, server, storage, database, transaction monitor, or operating system, may price a newly announced product offering that is not currently **Available**. A supplier that has not offered a predecessor product in the past must make the product **Generally Available** prior to its inclusion in an **FDR**.

1.1.2.4 The **Availability Date** must be within 185 days of the full disclosure report (**FDR**) submittal date.

1.1.2.5 A Non-disclosure Agreement or other restriction that prevents **Any Customer** from ordering any priced **Line Item** disclosed in an **FDR** is not allowed.

Comment: The presence of an NDA does not mean that obtaining the **Pricing** is exclusionary. The actual NDA needs to be examined to determine exclusionary pricing. For instance, there are types of NDA's in an End-User Licensing Agreement (EULA) which prevent end users from disclosing certain things learned about a product.

1.1.3 Packages, Discounts

1.1.3.1 **Generally Available Discounts** for the **Priced Configuration** are allowed. The priced items over which a **Discount** applies must be specified (see Clause 2.1.2.2).

1.1.3.2 **Generally Available** packaged **Pricing** is allowed. (Packages must adhere to the requirements of Clause 0.2.)

Comment: The intent of the **Pricing** methodology is to allow packaging and **Pricing** that is **Generally Available** to **Customers** and to explicitly exclude closeouts, promotional **Pricing** and/or limited time offerings.

1.1.3.3 Assumptions of other purchases, other sites with similar systems, or any other assumption that relies on the principle that the **Customer** has made or will make any other purchase from the vendor are prohibited.

1.1.3.4 **Discounts** that are associated with only a subset of the **Components** of the **Priced Configuration** must be independent of the configuration and quantities of the other **Components** of the configuration. For example, a **Discount** applied specifically to storage must be **Generally Available** for the storage priced, regardless of what system or software is configured.

1.1.3.5 **Discounts** that are based on terms that require payment faster than 30 days after invoicing are prohibited.

1.1.3.6 Revenue **Discounts** based on total price are allowed. Any **Discount** must be only for the **Priced Configuration** being priced and cannot be based on past or future purchases. Individually negotiated **Discounts** are prohibited. Special customer **Discounts**, such as GSA (U.S. General Services Administration) schedule or an educational schedule, are prohibited.

1.1.3.7 Maintenance **Pricing** must cover a period of 3 years.

Comment 1: Maintenance **Pricing** indicates a purchase of future services. There are many ways that customers purchase maintenance. Among the valid combinations for **Pricing** of maintenance are: warranty coverage for 3 years, 3-year maintenance packaged pricing, warranty coverage for one year and monthly maintenance for an additional 24 months, warranty coverage for 2 years and an additional year of maintenance, or any of the above with a **Discount** for prepayment.

Comment 2: Any warranty coverage that is used to satisfy the maintenance requirement must meet the requirements for response time as defined in Clause 1.3.

1.1.3.8 Local **Pricing** and **Discount** structures must be **Available** in each country for which **Results** are published.

1.1.3.9 All hardware **Components** used in the priced system must be new (i.e., not reconditioned or previously owned).

Comment: While **Pricing** may not be based on past or future purchases, there is no restriction on whether the purchase of the **Priced Configuration** will affect the price of future purchases by the **Customer** (e. g. The purchase of a multimillion-dollar system could qualify a **Customer** for a greater **Discount** on future purchases.)

1.1.4 Suppliers and Sales Channels

1.1.4.1 The test sponsor must disclose the **Pricing Source** for all items. Any vendor providing **Components** that, in total, comprise 2% or more of the total system price after **Discounts** have been applied must list the **Sales Channel** that a **Customer** would use to obtain the price. If the **Sales Channel** requires the use of a separate **Pricing** organization to obtain the price, that organization must also be disclosed.

Comment 1: Sufficient information must be provided in the **FDR** to allow **Any Customer** to access the **Sales Channel**.

Comment 2: The disclosure requirement can be satisfied by providing a price quotation with a direct sales contact point, as is required for third-party providers (see Clause 1.1.4.4).

1.1.4.2 Each supplier's items and prices, including **Discounts**, must be listed separately. **Discounts** may not be dependent on purchases from any other suppliers.

1.1.4.3 All prices must be good at the time of publication. Price changes are subject to rules for revision as stated in Clause 2.2.

Comment: The intent of this clause is to allow price quotes that are not guaranteed through the availability date. However, the compliance of price can be challenged as long as the benchmark is listed as an active **Result**.

1.1.4.4 In the event that any hardware, software, or maintenance is provided by a **Third Party**, the **Pricing** must satisfy all requirements for availability, **Discounts**, and full disclosure. Prices must be guaranteed by the **Third Party** in a written price quotation. The quotation must include the **Part Number** corresponding to the **Line Item(s)** in the TPC pricing sheet and a total price for the items in the quotation, less any **Discount**. The quotation must also include the name of the **Third Party** vendor and the contact information so **Any Customer** could also request a similar quote. This written quotation must be included in the Full Disclosure Report. This requirement may be satisfied with a copy of a publicly **Available** price from a source such as a web-based tool or a hard-copy document. The test sponsor must ensure that all **Third Party Pricing** complies with this specification. For **Pricing** from a **Third Party** that has a total contribution of more than 2% of the price of the **Priced Configuration** after **Discounts**, the **Third Party** must be either an OEM (original equipment manufacturer) or an approved reseller/distributor of the priced **Component(s)**. The test sponsor must still comply with price changes as described in Clause 2.2.

Comment: Since prices may not be based on any assumptions of prior or future purchases, any new **Result** may use an existing **Third Party** price quote provided that the **Components** are applicable to the benchmark and the **Third Party Pricing** rules are satisfied

1.1.5 **Line Item Pricing**

Pricing shown in the Full Disclosure Report must reflect **Line Item Pricing** for hardware, software, and maintenance from the vendor's price books. If a **Component** of the **Priced Configuration** is identified with a unique **Part Number** and not as a part of a package that is also uniquely identified by a **Part Number**, it should be shown with a **List Price** (see exception in comment, below), quantity and an extended price as a separate **Line Item**.

Comment1: The intent of this clause is that the **Pricing** reflects the level of detail that an actual **Customer** would see on an itemized billing. If the source of multiple **Line Items** is a **Third Party**, the level of **Pricing** information available in the **Third Party** price quotation is sufficient. For example, a **Third Party** might provide only a total price line for a configuration.

Comment 2: In the case where the standard practice for a vendor is to price maintenance coverage as a single price covering a group of items, it is permissible to show this coverage as the maintenance price of the first item in the list.

1.1.6 **National Considerations**

For publishing in another country other than the country for which the **Results** are originally published, it is permitted to substitute local **Components** for those in the original report, providing the substituted products are sold to the same product description or specifications.

The pricing excludes domestic taxes and shipping charges that would be incurred in the country for which the **Results** are published. It must include tariffs, custom duties/fees and shipping to a domestic port of entry if the **Component** originates in another country.

Comment: The intent of this clause is to encourage local country **Pricing** by allowing substitution of equipment for country specific reasons such as voltage, product numbering, industrial/safety, keyboard differences, etc., which do not affect performance.

1.2 Priced System

1.2.1 Priced Configuration

The **Priced Configuration** is defined in the benchmark specification. The price of the entire **Priced Configuration** must be used, including all hardware (purchase price), software (license charges) and hardware/software maintenance charges over a period of 3 years (36 months).

Pricing must be for a one time, stand-alone purchase. The price listed must be the full price a **Customer** would pay for new equipment and new software licenses. There must be no assumptions of other purchases (past, present, or future), other customer locations with similar systems, or any other assumption that the **Customer** has made or will make any other purchase from the vendor.

Comment 1: Some licensing agreements are based on the number of users for the system on which the software is running. The number of users for TPC benchmarks is defined by the benchmark specification, if applicable. Any usage **Pricing** must be based on the **Pricing** policy of the company supplying the priced **Component**.

Comment 2: In cases where the number of emulated users is not defined by the benchmark specification, the **Pricing Model** cannot be based on a license that restricts the number of users.

1.2.2 Pricing of Supporting equipment

1.2.2.1 **Components** that may be needed for the benchmark test but are not included in the **Priced Configuration** are not priced. The price of the load generating system(s) (e.g. Remote Terminal Emulator or Remote Browser Emulator or Driver) is not included in the total cost calculation. In the case where the system used to generate load provides functionality in addition to the emulation described in benchmark specification, then the price of those hardware/software **Components** are to be included.

1.2.2.2 It is assumed that a **Customer** would purchase the SUT to provide services in a datacenter or remote site. The cost of connecting their users to that data center is not considered as part of the priced system. Network switches, cables, leased lines, or other connectivity costs are assumed to be the same for any possible implementation and are considered separately by a customer. Network **Components** that are required to interconnect **Components** of a SUT are to be priced. The defining requirement is the nature of the traffic supported by **Components**. If parts of the SUT have any communication amongst themselves (e.g. load balancing information, RPC traffic, etc.), then those communication **Components** must be priced.

1.2.2.3 Communication or network multiplexers and demultiplexers are not considered as part of the priced system if they do not use the contents of the data to make decisions on how to multiplex. For example, a multiplexer can be used without being included in the priced system if it simply allows multiple communication connections for users to be collected and delivered to the SUT. A multiplexer that also did load balancing and used the contents of the data coming from the user connections to decide how to deliver the user connection would have to be included in the priced **Components** of the SUT.

1.2.2.4 Standalone protocol converters (e.g. Ethernet to USB), modems, and other communication devices that are not used to interconnect parts of the SUT and do not draw resources (such as power, memory, or storage for startup) from the SUT are not considered as part of the **Priced Configuration**. If they do require SUT resources for startup or operation, they must be included in the priced **Components** of the SUT.

1.2.3 Database Storage and Recovery Log Pricing

Storage and recovery log equipment, if required to be priced, must be included in the **Priced Configuration**.

1.3 Maintenance

1.3.1 Minimum Maintenance Requirements

Hardware (see clause 1.3.2) and software (see clause 1.3.3) maintenance must be figured at a standard **Pricing** which provides 7 days/week, 24 hours/day coverage, either on-site, or if **Available** as a standard offering, via a central support facility. Maximum **Response Time For Problem Recognition** must not exceed 4 hours on any part whose replacement is necessary to correct a **Failure**. Software maintenance updates (see clause 1.3.4) must also be included in the pricing.

Once a probable problem resolution is determined, the **Time for Problem Resolution Availability** must not exceed 4 hours. For **Customer Replaceable Unit** s, this requirement can be satisfied by delivery of a **Component** to the customer location (by service personnel or by courier service or by other means), or through the use of on-site spares, as defined in Clause 1.3.2.2. For **Field Replaceable Units**, there must be a qualified maintenance person on site within this time.

Comment 1: The requirements for maintenance **Pricing** cannot be met by based on the cost to fix specific **Failures**, even if the **Failure** rate is calculated from Mean Time Between Failure (MTBF). The maintenance **Pricing** must be independent of actual failure rates over the 3-year period, no matter how many failures occur during that period.

Comment 2: Maintenance terms and conditions must be publicly available, or the terms and conditions must be provided to the auditor who is attesting to the validity of the **Result**. For maintenance terms and conditions that are not publicly available, it must be possible to share them with an auditor who is certified for any TPC benchmark and who is not affiliated with the auditor of the **Result**, to allow for processing of a compliance challenge.

Comment 3: To be commercially reasonable, standard maintenance contracts are not offered in all possible locations in a large country. The requirements for 4-hour **Response Time For Problem Recognition** and 4-hour **Time for Problem Resolution Availability** are met if the maintenance contract covers all areas within two hours travel time of an international airport in the country where the system is being priced. It is not assumed to cover all physical locations in a country.

Comment 4: Note that the 4-hour requirements do not restrict the duration of the **Time for Problem Resolution Availability** (problem analysis and isolation), nor do they establish requirements for the completion of the installation or the return to normal operations.

Examples (not inclusive):

Software: If a customer identifies a software **Defect** that is preventing normal operations, they can call the maintenance provider to report the problem, or submit an electronic maintenance request, depending on the terms of their maintenance contract. This point is the beginning of the **Response Time For Problem Recognition**. The maintenance provider may send an acknowledgement and may initiate a question & answer session between a first contact person and the customer, but these are insufficient to end the required response time. Eventually the problem is recognized as potentially real and a qualified service person or product developer are assigned to identify a resolution. This point is the end of the **Response Time For Problem Recognition**. The maintenance provider works with the software supplier to isolate the problem, propose a **Fix** and test the **Fix** to their satisfaction. None of this time is included in any TPC requirement. Once a proposed resolution is ready to release, it is posted to the web and the customer is instructed to download and apply the **Fix**. The **Time for Problem Resolution Availability**, is only the time between posting the **Fix** and notifying the customer. There are no requirements on when the customer downloads the **Fix** or when it is applied.

Hardware: A memory dimm shows that it is about to fail. Memory is considered to be a CRU for this configuration. The system automatically disables the memory pair, sends a message to the system operator and to the maintenance provider and the system continues to run in degraded mode. An automated response system registers that a problem has been identified, schedules a courier to deliver a new dimm, and sends a message to the customer. In this case, the **Response Time For Problem Recognition** is nearly instantaneous. This is also the beginning of the **Time for Problem Resolution Availability**. The courier picks up the part at a distribution center and delivers it to the customer location. This marks the end of the **Time for Problem Resolution Availability**. At a convenient time, the customer decides when to actually install the memory. There is no restriction on this time.

1.3.2 Hardware Maintenance Options

1.3.2.1 Central Support

If central support is claimed, then the appropriate connection device, such as an auto-dial modem, must be included in the hardware price. Also, any software required to run the connection to the central support, as well as any diagnostic software which the central support facility requires to be resident on the tested system, must not only be included in **Pricing**, but must also be installed during the benchmark runs.

1.3.2.2 On-site spares of **Customer Replaceable Unit s**

It is acceptable to incorporate, for pricing purposes, the use of spare, customer replaceable hardware items under the following conditions:

- 1) An additional 10% of the number of configured units of the replaceable items, with a minimum of 2, must be priced for spares.
- 2) The vendor must include a support service that guarantees replenishment on-site within 7 days throughout the 3-year maintenance period and covers every unit of the replaceable items (i.e. configured units and spare units).
- 3) The items must be **Generally Available** as spareable and must be replaceable for **Any Customer** installation.
- 4) The designation of the items as spareable and replaceable cannot depend on a threshold of purchased quantity.
- 5) The customer must be able to identify which part has failed within 4 hours of **Failure**.
- 6) The method for identification and replacement of the replaceable items must have customer documentation that is sufficient to accomplish the actions for item 5 above, without additional consultation.

Comment: The use of spares is intended to assist in complying with requirements for the four-hour **Response Time for Problem Recognition** requirement and the four-hour **Time for Problem Resolution Availability** requirement. The **Priced Configuration** must maintain the same quantities of **Components**, including spares, for three years. This requirement necessitates maintenance for the spares to ensure replenishment. Shipping costs need not be included in the replenishment support.

1.3.3 Software Maintenance for Defects

Software maintenance provides support to resolve **Defects** in the **Priced Configuration's** software. The highest priority **Defect** addressed by this support is a **Defect** that prevents normal operation of the application. This does not include defects in the application code. For those high priority **Defects**, software maintenance support must provide the following within four hours:

- 1) Acknowledgment of the **Defect** with an identifier that may be used for reference.

- 2) The start of a **Defect** resolution process that requires some direct interaction with the customer.
- 3) A commitment to fix **Defects**.

1.3.4 **Software Maintenance Updates**

Software maintenance updates include **Fixes** and documentation for **Defects** that have been identified, resolved, and incorporated into patches, maintenance releases, update releases, etc. These software maintenance updates must be made available to **Customers** over the three-year period in a timely manner. The distribution of the software is flexible, but customers must receive either the software automatically or notification of the means by which to obtain the software. If the software maintenance is separately priced, the **Pricing** must include at least three distributions of maintenance updates over the three years. The total cost of the software maintenance must include both the cost of distributing the software maintenance update, as well as the cost of the actual update itself. The supplier must make clear to the customer when and how to obtain the updates. The maintenance update may include additional features and existing feature enhancements, in addition to the traditional bug **Fixes**.

1.3.4.1 The supplier must provide a defined mechanism for reporting **Defects**. Acceptable mechanisms include personal interaction, telephone or other electronic means.

1.3.4.2 The reporting mechanism must be available 7 days a week, 24 hours a day.

1.3.4.3 A maintenance update must include all **Defect Fixes** that are qualified for general use and are not limited in scope. Included are **Fixes** for problems found by other customers and by the product owner that are applicable to most or all installations of the software. This requirement precludes the use of a software maintenance contract that only provides **Fixes** to bugs that are found by a specific customer.

1.3.4.4 A maintenance update must not require a level of knowledge, sophistication, or effort to apply beyond that needed to install and administer the software product.

1.3.4.5 The TPC only requires the supplier to resolve issues arising from software **Defects**. It does not require service for operational problems, consultation or for errors in application code.

1.3.4.6 It is reasonable that a software product may be stable and mature enough that it would not require any bug **Fixes**; however, it should not be assumed at any time during the maintenance period that there will not be any bug **Fixes** available.

1.4 Required Reporting

1.4.1 Pricing Spreadsheet

1.4.1.1 The **Pricing Spreadsheet** details how the 3-year cost of ownership is computed. It contains the prices, **Discounts**, warranty information, and maintenance costs for all the hardware and software **Components** in the **Priced Configuration**. Price disclosure shall be presented in a structured fashion to enhance clarity and comparability between **Results**.

Comment 1: **Discounts**, warranty, and maintenance prices may apply to one or a group of **Line Item(s)** in the price spreadsheet. The spreadsheet must identify which **Line Items** are included in the group.

Comment 2: A representative **Pricing Spreadsheet** is included in each TPC Benchmark specification in the sample executive summaries.

1.4.1.2 The **Pricing Spreadsheet** must be included in the executive summary and must include the following items for each **Component** in the **Priced Configuration**:

- 1) Part name or brief description
- 2) **Part Number** (see definitions)
- 3) Source of the **Component**, whether from a benchmark sponsor or a **Third Party** (note: this can be an index into a list of **Component** sources, provided that the list is included in the **Pricing Spreadsheet**) For all **Components** that are not **Orderable** at the time of the publication of the **FDR**, the source must be appended with an “*”, pointing to the following footnote: “* These components are not immediately **Orderable**. See the **FDR** for more information.”
- 4) **List Price** of the **Component** (see definitions)
- 5) Quantity of the **Component** used in the **Priced Configuration**
- 6) The extended price of the **Component**, based on the **List Price** of the **Component**, the quantity included in the **Priced Configuration**, and any **Component**-level **Discounting**
- 7) Three-year maintenance price, or a notation that maintenance for the part is included in another maintenance charge.

1.4.1.3 For each different server type used in the **Priced Configuration** (e.g. Database Server, Client, Image Server, Web Server, etc.) or server configuration (e.g., 4-way Database Server and 8-way Database Server in same benchmark), pricing subtotals for **Components** and associated maintenance must be disclosed and grouped into the following categories:

- 1) General Hardware (e.g., processors, memory, controllers, packaged **Components**, etc.);
- 2) Storage devices, including interconnect hardware (if applicable). Storage that is included in the base price of a system need not be split into a separate category.

- 3) Software licenses (if applicable). Software that is included in the purchase price of the **Priced Configuration** need not be split into a separate category.

The total purchase price of the **Priced Configuration** and its associated 3-year maintenance price must be included in the **Pricing Spreadsheet**, along with the price/performance metric.

1.4.1.4 The percentage, amount, and basis (including type and justification) of all **Discounts** listed must be disclosed (see Clause 2.1.2.2). A tabular summary may be employed to simplify the presentation.

Comment: Thresholds for **Discounts** need not be disclosed.

1.4.1.5 The following advisory notice must be reproduced at the bottom of the spreadsheet, using a sans serif font no smaller than 8pt:

"Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing section of the TPC benchmark specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you."

1.4.2 Price Reporting

1.4.2.1 Two quantities will be reported with regard to **Pricing**. The first is the total 3-year price as described in Clause 2.1.2.2. The second is the Price/Performance metric as defined in the TPC Benchmark specification.

1.4.2.2 The country where the **Priced Configuration** is priced must be disclosed. All **Components** of the system must be **Generally Available** in the referenced country by the Availability Date. The currency used must be one that **Customers** commonly use in that country and must be identified by the 3-letter currency code (see ISO 4217). It is sufficient to include the ISO code with the final price and price/performance metrics. The ISO codes for each currency can be obtained from the Internet or the TPC-Administrator. The total price metric must be represented in the basic ISO monetary unit. The price/performance metric may be represented in basic ISO monetary units or 1/100th of the basic ISO monetary unit. If the price/performance metric is less than one monetary unit, it must be displayed with 2 significant digits. For example, in the United States, the system price must be reported in whole dollars and the price/performance may be reported in dollars and cents. Any fraction of a unit must be raised to the next highest unit (e. g., \$12.123 must be shown as \$12.13USD for price/performance and \$13,456.23 must be shown as \$13,457USD for the total system price).

CLAUSE 2 -- FULL DISCLOSURE

2.1 Full Disclosure Report Requirements

This section includes a list of requirements for the **Pricing**-related items in the Full Disclosure report.

2.1.1 General Items

2.1.1.1 The order and titles of sections in the Test Sponsor's Full Disclosure report must correspond with the order and titles of sections from the benchmark specification. Reference material for **Pricing** (such as price quotations) is to be included as the final appendix in the **FDR**. The intent is to make it as easy as possible for readers to compare and contrast material in different Full Disclosure reports.

2.1.1.2 The TPC Executive Summary must be included near the beginning of the Full Disclosure report. An example of the pricing page of the Executive Summary is presented in Appendix B.

Comment: The Executive Summary must include all **Pricing Sources** and **Sales Channels**, as required in clause 1.1.4.

2.1.1.3 Diagrams of both measured and **Priced Configuration** must be provided, accompanied by a description of the differences.

2.1.1.4 **Pricing** must be reported in the currency of the country where the system is priced.

2.1.1.5 All primary metrics of the benchmark must appear on the **Pricing Spreadsheet**.

2.1.2 Clause 1 Pricing Related Items

2.1.2.1 A detailed list of hardware and software used in the **Priced Configuration** must be reported. The listing for each separately **Orderable** item must have vendor **Part Number**, description and applicable release/revision level, price source, unit price, quantity, extended price, applicable **Discounted** price and 3-year maintenance price. If package-pricing is used, the vendor **Part Number** of the package and a description uniquely identifying each of the **Components** of the package must be disclosed to a sufficient level of detail to meet the requirements of 1.4.1.1.

2.1.2.2 The total 3-year price of the entire **Priced Configuration** must be reported, including: hardware, software, and maintenance charges. The justification of any **Discounts** applied must be disclosed in the price sheet. Sufficient detail of what items are being discounted and by how much they are being discounted must be provided so that the **Discount** amount used in the computation of the total system cost can be independently reproduced.

Comment 1: The purpose of this clause is to allow a reader to determine which **Components** are discounted and the aggregate **Discount** applied to them. **Line Item Discounts** are not necessary, but are sufficient. If only certain **Components** are discounted, they must be identified.

Comment 2: Given the price sheet, with the total system price, price/performance metric and **Discount** monetary amounts removed, a reader should be able to compute the **Discount** and total system price. The following examples satisfy this clause:

- 1) "All hardware components from manufacturer A are discounted x% based on total dollar volume of those components in this configuration".
- 2) "Single order amounts from Vendor A above \$y receive x% discounts."
- 3) "An x% discount was based on the overall value of the specific components from vendor A in this single quotation. Discounts for similarly sized configurations will be similar to those quoted here, but may vary based on the components in the configuration."
- 4) "All storage devices in this configuration are discounted by \$z per device, based on the number of devices purchased."

The following example does NOT satisfy this clause:

"A discount of \$y is applied." The discounted components are not identified and there is not an indication of what criteria were used to generate the **Discount**.

Comment 3: TPC disclosures are, by definition, showing **Generally Available** prices and **Discounts**. The intent of this section is to provide sufficient information for **Any Customer** to obtain a quote for a price on a **Line Item**, group, package, or configuration that is similar to one used in a benchmark disclosure:

- 1) For **Line Item** prices/**Discounts**, this rule applies to similar volumes of the item in the **FDR**.
- 2) For groups of **Line Items**, this rule applies to a similarly configured group in the **FDR**.
- 3) For revenue-based **Discounts**, this rule applies to configurations of similar total price for the same classes/families as the **Priced Configuration** in the **FDR**.
- 4) "Similar" is assumed to be 0 - 10% larger than the portion of the **Priced Configuration** used in the **FDR**.

2.1.2.3 The committed Availability Date of **Components** used in the price calculations must be reported. The Availability Date must be reported on the first page of the Executive Summary and with a precision of one day. When the priced system includes products with different availability dates, the reported Availability Date for the priced system must be a date at which all **Components** are committed to be **Generally Available**. Each **Component** used in the **Priced Configuration** is considered to be Available on the Availability Date unless an earlier date is specified.

2.1.2.4 A statement of the benchmark performance metric, as well as the respective calculations for 3-year pricing, price/performance, and the availability date must be included.

2.1.2.5 Additional Clause 1 related items may be included in the Full Disclosure Report for each country-specific **Priced Configuration**. Country-specific **Pricing** is subject to Clause 1.1.

2.1.2.6 For any usage **Pricing**, the sponsor must disclose:

- Usage level at which the **Component** was priced.
- A statement of the company policy allowing such **Pricing**.

Comment: Usage **Pricing** may include, but is not limited to, the operating system and database management software.

2.1.2.7 System **Pricing** should include subtotals for **Components** as described in Clause 1.4.1.3.

2.1.2.8 Each **Line Item** in the **Pricing** sheet must indicate the **Pricing Source** for that item and indicate if it is not currently **Orderable**. See example in Appendix B.

Comment: By standardizing the **Pricing Spreadsheet** and adding subtotals, the value of the **FDR** and executive summary will be enhanced. This will allow the reader to more easily compare **Results** and determine pricing.

2.1.3 Clause 3 Audit Related Items

2.1.3.1 The auditor's attestation letter, which indicates the auditor's opinion of compliance, must be included in the Full Disclosure Report.

2.1.3.2 A review of the **Pricing Spreadsheet** is required to ensure that all required **Components** are priced (see Clause 3.2.1). The auditor is required to review pricing calculations prior to issuing the attestation letter.

2.2 Revisions to the Full Disclosure Report

Any modification to pricing or **Components** may require that the **Pricing Spreadsheet** and metrics be revised.

Revisions to the full disclosure documentation shall be handled as follows:

2.2.1 Required Revisions

Revisions to the full disclosure documentation are required to be published under the following circumstances:

2.2.1.1 When cumulative price changes have resulted in an increase of 2% or more from the reported price/performance, the test sponsor must submit revised price/performance **Results** to the TPC within 30 days of the effective date of the price change(s) to remain in compliance. The benchmark need not be re-run to remain compliant.

Comment 1: The intent of this clause is that the published price/performance reflects the actual current price/performance.

Comment 2: There may be instances where a **Component** increases in price by more than 2%. However, a revision is only required when the cumulative price change totals more than 2%.

2.2.1.2 A change in the committed availability date for the priced system that is later than the published availability date must be published in a revised Full Disclosure Report. If the revised availability date is greater than 185 days after the initial publication of the Full Disclosure Report, the benchmark must be withdrawn.

2.2.1.3 If Hardware or Software product substitutions within the **Priced Configuration** are allowed in the benchmark specification, such substitutions require that the **Pricing Spreadsheet** and metrics be revised.

2.2.1.4 A change in the committed orderability date for any **Components** of the priced system that is later than the published orderability date must be published in a revised Full Disclosure Report. No orderability date may be later than the availability date for the **Result**.

2.2.1.5 If a **Component** ceases to be **Available** and the **Result** is to be retained on the **Active Results** list, a valid substitution must be made and a revised **FDR** must be published.

2.2.2 Optional Revisions

2.2.2.1 Revisions to the full disclosure documentation are allowed to be published to reflect decreases in the price of one or more of the **Components** of the **Priced Configuration**, or to reflect an overall price/performance change that is less than 2% greater than the published price/performance.

2.2.2.2 A change in the committed availability date for the priced system that is earlier than the published availability date may be published in a revised Full Disclosure Report. The availability date cannot be moved earlier than the submission date of the revised **FDR**.

Comment: The implication of 2.2.2.2 and 2.2.1.4 is that the availability date for the priced system may be changed to any date that is at least the date of the change and at most 185 days from the original **FDR** publication date.

2.2.3 Audit requirements for FDR revisions

2.2.3.1 When the **Pricing Model** is changed in a revised **FDR**, it must be reviewed and approved by the auditor (see Clause 3.2.1.) The auditor's letter of attestation must be attached to the revised full disclosure report.

2.2.3.2 If Hardware or Software product substitutions within the **Priced Configuration** are made in a revision of an **FDR**, such substitutions require that the **Pricing Spreadsheet** and metrics be revised. Product substitutions must be reviewed and approved by the auditor. The auditor's letter of attestation must be attached to the revised full disclosure report.

2.2.3.3 Changes to the price of an existing **Component** of a **Priced Configuration** need not be audited.

2.2.3.4 Changes to the Availability Date or orderability date for **Components** or for the **Priced Configuration** do not need to be audited.

2.3 Rules for Substitution of Components in a Priced Configuration

2.3.1 Intent of Component substitution

The TPC recognizes the difficulties of conducting benchmarks that require large complex configurations. Sufficient quantities of **Components**, which sponsors want to showcase in the **FDR**, may not be available. After the **FDR** is published, some **Component** used in the original benchmark may become unavailable (e.g., end-of-life) or superseded by newer technology. As concessions for ease of benchmarking and business realities, the TPC allows **Component** substitution only as set forth in this section of the pricing specification.

Under no circumstance may a **Component** substitution degrade benchmark performance. Proof(s) of comparable performance must be cited in the **FDR** and auditor's attestation letter. Any substitution must comply with all other benchmark requirements. For some substitutions, sufficient proof may be satisfied by product documentation, published specifications or **Component** measurement (see Clause 2.3.3). All other substitutions require proof by measurement in the benchmark environment (see Clause 2.3.4).

Comment: When proving substitution without measurement in a full benchmark run, the intent is to demonstrate that the individual **Component** that is the substitute is equal or superior in performance to the measured **Component**. When proving substitution using a measurement in the benchmark environment, the intent is to prove that the Primary Metric(s) for performance will not degrade with the substitute **Components** in place.

2.3.2 Identification of Components that can be substituted

TPC benchmark specifications specify those **Components** that can be substituted. When a benchmark specification does not specify that certain **Components** can be substituted, they cannot be substituted.

2.3.3 Criteria for Component substitution when a measurement is not required.

There are some cases where **Component** substitution can be proven through product documentation or other **Component**-level evaluation. The intent is to show that there is no adverse effect on the performance of the SUT. The auditor has the option to require additional work beyond these rules.

2.3.3.1 Middle-tier **Component** substitution

When middle-tier **Component** substitution is allowed by the benchmark specification, it is permissible to substitute the hard drive(s), the CPU, the cache, or the storage controller of a middle-tier system without measurement, provided that

- 1) **Components** are substituted on a 1 for 1 basis.
- 2) When upgrading CPU speed, the bus speed does not decrease.
- 3) When upgrading CPU speed, the cache size is not reduced, at each cache level.
- 4) The disk I/O levels are negligible (less than 5 I/Os per second), or disk controller is the same and the rules for storage substitution apply.
- 5) When upgrading the cache, each cache size is not reduced.

- 6) When upgrading the cache, the cache architecture isn't changed.
- 7) When increasing the number of cores, the new cores must have equal or faster clock speed and the cache size per core is not reduced, at each cache level.
- 8) When upgrading the processor, the processor architecture isn't changed.

2.3.3.2 Storage device substitution (HDD, SSD, Optical, ...)

If the following criteria are completely satisfied, an allowed storage device substitution can be done without additional measurement.

- 1) The formatted capacity of the substitute device must be equal or greater than the substituted device
- 2) The substitute device must have the same interface type as the substituted device
- 3) Characteristics of the substitute devices, such as track to track seek time, average seek time, interface speed, on disk buffer size, rotational speed, media density and write performance characteristics must be the same or better than the substituted devices.
- 4) The number of substitute devices must be greater than or equal to the number of substituted devices in the published **Result**.
- 5) There must be sufficient physical connectivity to attach the new devices and the substitute devices must be supported in the priced enclosures within the SUT

2.3.3.3 Other **Component** substitutions (e.g. storage enclosures, external storage controllers, network adapters, routers, bridges, repeaters, switches and cables)

Components must be replaced on a 1-for-1 basis and must satisfy the same functions as those of the substituted **Components**.

In the case of proof for substitution without a full benchmark run, the test sponsor must show that the capacity, response time and throughput performance characteristics are equal to or better than the benchmarked **Components**. Proof(s) (e.g. detailed specification comparison or **Component**-level measurement) of comparable performance must be cited in the **FDR** and auditor's attestation letter. Any substitution must comply with all other benchmark requirements.

Comment: The purpose of any proof is to ensure that the substitute configuration will deliver a benchmark performance result that is at least as good as the measured configuration.

2.3.4 Criteria for Component substitution when a measurement in the benchmark environment is required to prove comparable performance characteristics

When a **Component** is allowed to be substituted and the performance impact cannot be proven from procedures detailed in Clause 2.3.3, the sponsor must provide proof through full benchmark measurement. The overall Primary Metric(s) for performance of the substitute configuration must be equal to or better than the original measured configuration. The auditor has the option to require additional work beyond these rules.

2.3.4.1 Middle-tier substitution on a one-to-one basis when a measurement is required

When a one-to-one middle-tier substitution is not covered under Clause 2.3.3.1, the following conditions must be met.

- 1) At least one of the priced middle-tier systems must be run along with the substituted middle-tier systems during the measurement interval.
- 2) The average benchmark throughput per user or job for all substituted work cannot exceed the average benchmark throughput per user or job of all priced middle-tier systems.
- 3) The benchmark throughput per user or job of each substituted middle-tier system cannot exceed the average benchmark throughput per user or job of the priced middle-tier systems by more than 2%.
- 4) Differences in the hardware and/or software between the substituted middle-tier systems and priced middle-tier systems are allowed as long as there is reasonable assurance that those differences do not enhance the performance characteristics of the datastreams to or from the database server and the substituted clients.
- 5) The type and number of connections, both physical and logical, to the database server(s) from the middle-tier systems must be the same in both the priced and benchmarked configurations.
- 6) Any ACID test that includes one or more middle-tier system must be proven with at least one of the priced systems.
- 7) The workload driver may dynamically add delays to the response time **Component** of the cycle time to ensure the above criteria are met.
- 8) The values reported in the Numerical Quantities Summary page are aggregate values, where appropriate, from all middle-tier systems.

2.3.4.2 Middle-tier substitution on an n-m basis

For ease of benchmarking, if middle-tier substitution is allowed, it is permissible to emulate one or more identically configured and loaded middle-tier systems (called the control set) using one or more non-priced middle-tier systems. Only priced systems in the control set are included in the substitution calculation/comparisons. Only one set of priced systems may be emulated (i.e. if there are multiple classes of priced middle-tier systems, only one of those classes may be emulated)

- 1) The actual benchmark runs must have at least 2 of the systems that are priced.
- 2) The average throughput per simulated user or job for all non- priced systems cannot exceed the average throughput per simulated user or job of all systems in the control set.
- 3) The ratio of throughput per simulated user or job of each non-priced system cannot exceed the average throughput per simulated user or job of the systems in the control set by more than 2%.

- 4) Differences in the hardware and/or software between the substituted middle-tier systems and priced middle-tier systems are allowed as long as there is reasonable assurance that those differences do not enhance the performance characteristics of the datastreams to or from the database server and the substituted clients.
- 5) The number and type of connections, both physical and logical, to the database server(s) from the systems must be the same in both the priced and benchmarked configurations.
- 6) Any ACID test that includes one or more middle-tier system must be proven with both at least one of the priced systems.
- 7) The workload emulator/driver may dynamically add delays to the response time component of the cycle time to ensure the above criteria are met.
- 8) The values reported in the Numerical Quantities Summary page are aggregate values, where appropriate, from all benchmarked systems.
- 9) Additional documentation must be included in the **FDR**, consisting of a table for each measured middle-tier system and the aggregate of non-priced middle-tier systems and of priced middle-tier systems for numerical quantities that is required by the benchmark specification.

2.3.4.3 Storage device substitution when a measurement is required

Storage devices must be substituted on a one for one basis. To prove one-for-one storage device substitution of drive X for drive Y, the test sponsor:

- 1) Must collect device performance data while running the test under full measured configuration and at least 90% of the reported primary performance metric for the duration of the benchmark measurement
- 2) Must prove that drive X and Y are substantially doing the same work in terms of access patterns and I/O rates during the test.
- 3) Must put same mix of information (such as uniquely named tables, indexes, logs) on drive X and Y
- 4) Cannot mix drives in a monitored unit. A monitored unit is what the device performance monitor can uniquely measure. (Example: If a 7-drive RAID set is not monitored at the individual drive level, cannot have a mix of drive X and drive Y in the RAID set)
- 5) Can only substitute devices in terms of a monitored unit.

The logical and physical performance characteristics of the new drives must be at least as good as the old drives in terms of average service time and average queue depth or equivalent. The time measurement needs to be reported with 0.1 millisecond accuracy and the queue depth measurement needs to be reported in tenths.

Comment 1: There can be multiple instances of "X" and "Y" in each proof, depending on the functions performed by each substituted device.

Comment 2: All capacity requirements of the benchmark must be satisfied with the substitute configuration.

2.3.4.4 Storage Subsystem Substitution.

To qualify for one-to-one external storage subsystem substitution, the test sponsor must meet several conditions. For each substituted storage subsystem with a unique LUN configuration, there must be at least one corresponding priced storage subsystem in the measured configuration when the benchmark is re-run to which the following rules apply (Note: This applies only when a benchmark explicitly allows substitution of a storage subsystem as a **Component**. Otherwise, rules for storage devices, storage adapters, storage enclosures, etc. must be applied):

- 1) The storage subsystem must be external to the database server. This subsystem is externally powered and only connected to the database server through a host bus adaptor (HBA).
- 2) All RAID functions (duplication, parity, striping, etc.) on the originally measured configuration must be present and executed on the same **Component** as the newly **Priced Configuration**.
- 3) No software (e.g. driver) or host bus adaptor changes to the database server to which the storage subsystems are connected are allowed.
- 4) For each substituted storage subsystem, the same type and number of connections must be used in the corresponding priced storage subsystem.
- 5) The total number of LUNs must be the same on each priced storage subsystem as on each substituted storage subsystem.
- 6) Each priced and substituted LUN must contain the same mix of database records (e.g. both have new order records, both have history records).
- 7) Perform a test under full load and on the same configuration used for the performance run.
 - a) Must collect performance data while running at least 90% of the reported Primary Metric(s) for performance for a duration equal in length to the measurement interval.
 - b) The average response time (ms/io) per LUN over all priced storage subsystems cannot exceed the average response time per LUN over all substituted storage subsystems. All response times need to be reported with 0.1 millisecond accuracy.
 - c) The average throughput (ios/sec) per LUN over all substituted storage subsystems must be no more than 1% higher than the average throughput per LUN over all priced storage subsystems.
 - d) All performance data must be measured from the perspective of the database server.

The auditor must ensure that the priced storage subsystems conform to the benchmark durability requirements.

2.3.4.5 Substitution of other **Components** (e.g. storage enclosures, external storage controllers, network adapters, routers, bridges, repeaters, switches)

When substitution of other **Components** can not be proven under Clause 2.3.3.3, a full benchmark measurement is required. Sufficient performance information relating to the substitute and substituted **Components** must be provided to show that the Primary Metric for performance will not be degraded with the substitute configuration.

Components must be replaced on a 1-for-1 basis and must satisfy the same functions as those of the substituted **Components**.

2.3.5 Additional Substitution rules

2.3.5.1 Substituted **Components** must be clearly identified in the **FDR**.

2.3.5.2 Substitutions are not allowed on **Results** that have been withdrawn.

2.3.5.3 Any information and/or measurement results used to prove the validity of a **Component** substitution must be included in the section of the **FDR** that describes the differences between the measured and **Priced Configuration**. Original and substituted **Components** must be clearly identified. **Line Items** that contain substitutions must be designated with an 'S' suffix in the Price Source column of the price sheet of the Executive Summary and a note in the Notes section of the price sheet saying "One or more components of the measured configuration have been substituted in the **Priced Configuration**. See the **FDR** for details."

2.3.6 When Components can be substituted

Components can be substituted at initial publication of the **FDR** or whenever the **FDR** is revised.

2.3.7 Challenge of Component substitution

The **Component** substitution is open to challenge according to TPC policies.

2.4 Official Language

The official Full Disclosure Report must be written and submitted in English, but can be translated into additional languages.

CLAUSE 3 -- AUDIT

3.1 General Rules

3.1.1 General

An independent audit of the benchmark **Results** by an auditor certified by the TPC is required. An audit checklist for pricing-related items is provided as part of this specification. Other audit requirements are included in the individual benchmark specifications. Auditors may enhance this checklist. Please obtain the current audit checklist from one of the auditors. Please see the TPC Audit Policy for a detailed description of the auditor certification process.

3.1.2 Attestation Letter

The auditor's attestation letter must be made readily available to the public as part of the Full Disclosure Report, but a detailed report from the auditor is not required.

3.2 Auditor's Check List

3.2.1 Clause 1 Pricing Related Items

3.2.1.1 Verify that all required **Components** of the **Priced Configuration** are priced.

3.2.1.2 Verify that the **Pricing Spreadsheet** includes all the hardware and software licenses, warranty coverage, and additional maintenance costs as required in this specification.

3.2.1.3 Verify that price quotes for any items from **Third Party** sources are available for inclusion in the **FDR**, as defined in Clause 1.1.4.4.

Comment 1: The **Pricing Spreadsheet** is a spreadsheet detailing how the 3-year cost of ownership is computed (see Clauses 1.1., 2.1.2.1, and 2.1.2.2). It must contain the prices, **Discounts**, warranty information, and maintenance costs for all the hardware and software **Components** in the **Priced Configuration**.

Comment 2: Since final pricing for new products is typically set very close to the product announcement date, the auditors are not required to verify the final pricing of the tested system prior to issuing the attestation letter.

3.2.1.4 Obtain a written statement from the benchmark sponsor that the prices quoted are based on a single purchase, without requirements for past or future purchase, or any privileged relationship between buyer and seller.

3.2.1.5 Verify that the **Priced Configuration** has sufficient storage space for system software, database tables, and recovery logs as required by the benchmark specification.

3.2.1.6 Verify that storage and processing elements that are not included in the **Priced Configuration** are physically removed or made inaccessible during the performance test.

3.2.1.7 Verify that additional **Components** that are required by Clause 1.2.2.2 are included in the **Priced Configuration**.

3.2.1.8 Verify that all required maintenance is priced and that the terms and conditions of the priced maintenance satisfy this specification.

3.2.1.9 Verify that, when used, customer spareable **Components** are priced in sufficient quantity to meet the requirements in Clause 1.3.

3.2.1.10 If **Components** in the **Priced Configuration** are being supplied by a company other than the benchmark sponsor(s) (i.e., **Third Party** pricing), verify that valid price quotes have been received for all **Third Party Components** and satisfy the requirement of Clause 1.1.4.4.

APPENDIX A. REQUIREMENTS FOR BENCHMARK SPECIFICATIONS

Each benchmark specification of the TPC shall have an abbreviated pricing clause that delineates benchmark-specific pricing items and points to the TPC Pricing Specification. References to the Pricing Specification should be made, as appropriate, in other sections of the benchmark specification, such as full disclosure and audit clauses.

The following lists identify what information is expected to be in the benchmark specification and what is in the pricing specification:

What is in Pricing Specification:

- 1) how things are priced
- 2) availability and procedures associated with obtaining price
- 3) how substitutions can be priced
- 4) maintenance/support properties and terms that must be included in the **Priced Configuration**

What is in Benchmark Specification:

- 1) what is priced
- 2) functional requirements of what is priced
- 3) what substitutions are allowed

The following text must be included in the benchmark specifications:

In the Pricing-related Clause :

“Rules for pricing the **Priced Configuration** and associated software and maintenance are included in the current revision of the TPC Pricing Specification Version 1, located at www.tpc.org.”

In the Disclosure-related Clause:

“Rules for reporting Pricing information are included in the current revision of the TPC Pricing Specification Version 1, located at www.tpc.org.”

In the Audit-related Clause:

“Rules for auditing Pricing information are included in the current revision of the TPC Pricing Specification Version 1, located at www.tpc.org.”

In addition, the benchmark specification is required to identify precise specifications for what **Components** and functions must be included in the **Priced Configuration**. For example, in Pricing-related Clause (shown here as Clause 7), the following sections are required if it is the intent to include these **Components** in the **Priced Configuration**:

“The following requirements are intended to supplement the Pricing Specification:

“7.1 On-line Storage Requirements

“7.1.1 **Continuous Operation Requirement.**”

If it is to be included in the **Priced Configuration**, the benchmark specification must define what storage is needed to support the benchmark database, applications and any storage needed for continuous operation.

“7.1.2 Archive Operation Requirement”

“If there is a requirement for additional storage in the **Priced Configuration**, such as storage needed to contain the data that would be generated at the benchmark rate for a period of time defined in the benchmark specification, this requirement must be included in the benchmark specification.

“7.1.3 Back-up Storage Requirements”

If on-line back-up data is required by the benchmark, it must be included in the **Priced Configuration**.

“7.2 Other pricing requirements not included in the TPC Pricing Specification”

If there are additional pricing requirements, they should be included here.

In the Disclosure-related Clause, the benchmark specification must define the major categories that will be used on the Price Spreadsheet. For example, one benchmark may define a “Client” system, while another may define an “Application Server” system.

APPENDIX B. EXECUTIVE SUMMARY

The tables on the following page illustrate the format of the Pricing Sheet for the TPC Executive Summary and Full Disclosure Report. If all information will not fit on a single page with this format, the Pricing Sheet should be extended to a second page instead of reducing font size. The major headings (e.g. "Server Hardware" in this example) are defined by the individual benchmark specifications.

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<table border="1"> <thead> <tr> <th style="text-align: left;">Description [10 point font sans serif bold (across this row and for main titles, below) 8 point font sans serif for other text in this section]</th> <th style="text-align: center;">Part Number</th> <th style="text-align: center;">Price Source</th> <th style="text-align: center;">Unit Price</th> <th style="text-align: center;">Qty</th> <th style="text-align: center;">Extended Price</th> <th style="text-align: center;">Discounted Price * [if line item discounts are used; else not needed]</th> <th style="text-align: center;">3 yr. Maint. Price</th> </tr> </thead> <tbody> <tr> <td colspan="9">Server Hardware</td> </tr> <tr> <td>RO90214,32MB,CDROM,NO HDD, MOUSE</td> <td>201-A</td> <td>1</td> <td>15,995</td> <td>1</td> <td>15,995</td> <td>15,995</td> <td>3,839</td> </tr> <tr> <td>RO90214 DUAL CPU UPGR CARD,1MB CACHE</td> <td>25657</td> <td>1</td> <td>17,000</td> <td>1</td> <td>17,000</td> <td>17,000</td> <td>2,380</td> </tr> <tr> <td>128MB SIMMS (4X32MB) FOR ECC MEM BD</td> <td>82038</td> <td>1 *</td> <td>11,495</td> <td>3</td> <td>34,485</td> <td>34,485</td> <td>0</td> </tr> <tr> <td>PCI LAN CONTROLLER/10</td> <td>654</td> <td>1</td> <td>595</td> <td>1</td> <td>595</td> <td>595</td> <td>143</td> </tr> <tr> <td>14" EPA SVGA MONITOR</td> <td>26019</td> <td>1</td> <td>480</td> <td>1</td> <td>480</td> <td>480</td> <td>116</td> </tr> <tr> <td>101-KEYBOARD, PWR CORD</td> <td>G6001A-A</td> <td>1</td> <td>85</td> <td>1</td> <td>85</td> <td>85</td> <td>0</td> </tr> <tr> <td>DIFF PCI TO SCSI HOST BUS ADAPTER</td> <td>1111</td> <td>1</td> <td>995</td> <td>2</td> <td>1,990</td> <td>1,990</td> <td>478</td> </tr> <tr> <td>ECC MEMORY BOARD FOR PC TOWER SYSTEMS</td> <td>77016</td> <td>1</td> <td>695</td> <td>1</td> <td>695</td> <td>695</td> <td>0</td> </tr> <tr> <td>SCSI CABLE,68P HD -68P HD, 10FT</td> <td>1EZ10</td> <td>2</td> <td>130</td> <td>4</td> <td>520</td> <td>520</td> <td>0</td> </tr> <tr> <td>ED FIE, 256-PORT AUI LIGHTER 10 BASE-T XCVR AUI TO RJ45</td> <td>499578T256</td> <td>1</td> <td>7,000</td> <td>5</td> <td>35,000</td> <td>35,000</td> <td>0</td> </tr> <tr> <td></td> <td>40064</td> <td>1</td> <td>109</td> <td>2</td> <td>218</td> <td>218</td> <td>72</td> </tr> <tr> <td>ED IEEE802.3 TRANCEIVER</td> <td>4540-B</td> <td>1</td> <td>289</td> <td>2</td> <td>578</td> <td>578</td> <td>219</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>Sub-total</td> <td>107,641</td> <td>107,641</td> <td>7,247</td> </tr> <tr> <td colspan="9">Server Storage</td> </tr> <tr> <td>2GB 7200 RPM DISK MODULE</td> <td>12009-HB</td> <td>1</td> <td>1,099</td> <td>80</td> <td>87,920</td> <td>65,940</td> <td>38,685</td> </tr> <tr> <td>DESKSIDE CHASSIS</td> <td>78900D</td> <td>1</td> <td>2,935</td> <td>3</td> <td>8,805</td> <td>6,604</td> <td>3,875</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>Sub-total</td> <td>96,725</td> <td>72,544</td> <td>42,560</td> </tr> </tbody> </table>									Description [10 point font sans serif bold (across this row and for main titles, below) 8 point font sans serif for other text in this section]	Part Number	Price Source	Unit Price	Qty	Extended Price	Discounted Price * [if line item discounts are used; else not needed]	3 yr. Maint. Price	Server Hardware									RO90214,32MB,CDROM,NO HDD, MOUSE	201-A	1	15,995	1	15,995	15,995	3,839	RO90214 DUAL CPU UPGR CARD,1MB CACHE	25657	1	17,000	1	17,000	17,000	2,380	128MB SIMMS (4X32MB) FOR ECC MEM BD	82038	1 *	11,495	3	34,485	34,485	0	PCI LAN CONTROLLER/10	654	1	595	1	595	595	143	14" EPA SVGA MONITOR	26019	1	480	1	480	480	116	101-KEYBOARD, PWR CORD	G6001A-A	1	85	1	85	85	0	DIFF PCI TO SCSI HOST BUS ADAPTER	1111	1	995	2	1,990	1,990	478	ECC MEMORY BOARD FOR PC TOWER SYSTEMS	77016	1	695	1	695	695	0	SCSI CABLE,68P HD -68P HD, 10FT	1EZ10	2	130	4	520	520	0	ED FIE, 256-PORT AUI LIGHTER 10 BASE-T XCVR AUI TO RJ45	499578T256	1	7,000	5	35,000	35,000	0		40064	1	109	2	218	218	72	ED IEEE802.3 TRANCEIVER	4540-B	1	289	2	578	578	219					Sub-total	107,641	107,641	7,247	Server Storage									2GB 7200 RPM DISK MODULE	12009-HB	1	1,099	80	87,920	65,940	38,685	DESKSIDE CHASSIS	78900D	1	2,935	3	8,805	6,604	3,875					Sub-total	96,725	72,544	42,560
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Server Software								
ACME UNIX	K985	1	9,800	1	9,800	9,800	0	
ACME SERVICEPLUS FOR UNIX RDBMS & SQL (WITH 45% DISCOUNT)	K467	1	0	1	0	0	6,960	
	123456789	3 *	58,000	1	58,000	58,000	46,400	
TX MON: 8 USER	QQSQ123	4	12,000	1	12,000	12,000	0	
TX MON: SERVICEPLUS	QQSQ432SA	4	0	1	0	0	3,000	
	QV318ASC9X							
TXMON: UPG TO UNLMTD USERS	N	4	23,000	1	23,000	23,000	0	
Sub-total						102,800	102,800	56,360
Client Hardware								
RO90200,32MB,CDROM,NO HDD,MOUSE	200-A	1	12,995	1	12,995	12,995	4,622	
128MB SIMMS (4X32MB) FOR ECC MEM BD	82038	1	11,495	2	22,990	22,990	0	
PCI LAN CONTROLLER/10	7422	1	595	1	595	595	130	
Sub-total						36,580	36,580	4,752
Client Software								
ACME UNIX	K980		2,250	1	2,250	2,250	0	
ACME UNIX SERVICEPLUS: UNLMTD USRS	K466		0	1	0	0	24,000	
ACME UNIX UPGRADE TO UNLMTD USR	P001ASA9FN		24,000	1	24,000	24,000	0	
Sub-total						26,250	26,250	24,000
Other Discounts*							(\$7,584)	(\$2,566)
Total						\$362,412	\$338,230	\$132,353
Notes: [8 font sans serif bold]								
* Basis for discounts: Server storage discounted 25% by dollar volume; All Acme-sourced products and services discounted by 3% for good-guy discount				Three-Year Cost of Ownership: \$470,584USD				
Price Source: 1=Acme, 2=Allison Corp., 3=Lena RDBMS, 4=MonMon, Ltd.				Benchmark Rating: 4229.11				
* These components are not immediately orderable. See the FDR for more information				Price/Performance: \$111.28USD				
Audited by Benchmarks R' US								
Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing sections of the TPC benchmark specifications. If you find that stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org . Thank you.								

APPENDIX C. EXAMPLE OF INTEGRATING PRICING SPECIFICATION IN BENCHMARK SPECIFICATIONS

The information contained in this appendix is intended as non-binding sample/example text that might be implemented in a benchmark specification, where it would then become binding.

(7.0) PRICING

Rules for pricing the **Priced Configuration** and associated software and maintenance are included in the latest level of the TPC Pricing Specification, located at www.tpc.org. The following requirements are intended to supplement the Pricing Specification:

(7.1) **Priced Configuration**

The system to be priced shall include the hardware and software **Components** present in the System Under Test (SUT), a communication interface that can support user interface devices, additional operational **Components** configured on the test system, and maintenance on all of the above.

(7.1.1) The driver is not required to be priced.

(7.1.2) System Under Test

(7.1.2.1) Calculation of the **Priced Configuration** consists of:

1. Price of the SUT as tested and defined in Clause X;
2. Price of a communication interface capable of supporting the required number of user interface devices defined in Clause X;
3. Price of on-line storage for the database as described in Clause X and storage for all software included in the **Priced Configuration**;
4. Price of additional products (software or hardware) required for customary operation, administration and maintenance of the SUT for a period of 3 years
5. Price of all products required to create, execute, administer, and maintain the executable query texts or necessary to create and populate the test database.

(7.1.2.2) Specifically excluded from the priced system calculation are:

1. End-user communication devices and related cables, connectors, and concentrators;
2. Equipment and tools used exclusively in the production of the full disclosure report;
3. Equipment and tools used exclusively for the execution of the DBGEN or QGEN (see Clause X) programs.

(7.1.3) User Interface Devices and Communications

(7.1.3.1) The priced system must include the hardware and software **Components** of a communication interface capable of supporting a number of user interface devices (e.g., terminals, workstations, PCs, etc.) at least equal to 10 times the number of sessions used for the query test.

Comment: Test sponsors are encouraged to configure the SUT with a general-purpose communication interface capable of supporting a large number of user interface devices.

(7.1.3.2) Only the interface is to be priced. Not to be included in the priced system are the user interface devices themselves and the cables, connectors and concentrators used to connect the user interface devices to the SUT. For example, in a configuration that includes an Ethernet interface to communicate with PCs, the Ethernet card and supporting software must be priced, but not the Ethernet cables and the PCs.

Comment: Active **Components** (e.g., workstations, PCs, concentrators, etc.) can only be excluded from the priced system under the assumption that their role is strictly limited to submitting executable query text and receiving output data and that they do not participate in the query execution. All query processing performed by the tested configuration is considered part of the performance test and can only be done by **Components** that are included in the priced system.

(7.1.3.3) The communication interface used must be an industry standard interface, such as Ethernet, Token Ring, or RS232.

(7.1.3.4) The following diagram illustrates the boundary between what is priced (on the right) and what is not (on the left):

Figure 1: The Pricing Boundary

(7.1.4) Database Storage and Recovery Log

(7.1.4.1) Recovery data must be maintained for at least the duration of the run used to compute the published performance metric.(see Clause X).

Roll-back recovery data must be either in memory or in on-line storage at least until all transactions dependent on it are committed. Roll-forward recovery data may be stored on an off-line device provided that:

1. The process that stores the roll-forward data is active during the measurement interval;
2. The roll-forward data that is stored off-line during the measurement interval must be at least as great as the roll-forward recovery data that is generated during the period (i.e., the data may be first created in on-line storage and then moved to off-line storage, but the creation and the movement of the data must be in steady state);
3. All ACID properties must be retained.

Comment: Storage is considered on-line if any record can be accessed randomly and updated within 1 second even if this access time requires the creation of a logical access path not present in the tested database. For example, a disk-based sequential file might require the creation of an index to satisfy the access time requirement. On-line storage may include magnetic disks, optical disks, or any combination of these, provided that the above mentioned access criteria are met.

(7.1.4.2) While the benchmark requires the configuration of storage sufficient to hold the requisite recovery data as specified in Clause X, it does not explicitly require the demonstration of roll forward recovery except as required by the ACID tests (See Clause X).

(7.1.4.3) The requirement to support at least eight hours of recovery log data can be met with storage on any durable media if all data required for recovery from failures listed in Clause 4 are on-line.

(7.1.4.4) The storage that is required to be priced includes:

1. storage required to execute the benchmark;
2. storage to hold recovery data (see Clause 0);
3. storage and media needed to assure that the test database meets the ACID requirements defined in Clause 4

(7.1.4.5) All storage required for the priced system must be present on the tested system.

(7.1.5) **Additional Operational Components**

(7.1.5.1) Additional products that might be included on a customer installed configuration, such as operator consoles and magnetic tape drives, are also to be included in the priced system if explicitly required for the operation, administration, or maintenance, of the priced system.

(7.1.5.2) Copies of the software, on appropriate media, and a software load device, if required for initial load or maintenance updates, must be included.

(7.1.5.3) The price of an Uninterruptible Power Supply, if specifically contributing to a durability solution, must be included.

(7.1.5.4) The price of all cables used to connect **Components** of the system (except as noted in Clause 0) must be included.

(7.1.6) **Component Substitution**

Hardware or Software product substitutions within the SUT, with the exceptions noted below require the benchmark to be re-run with the new **Components** in order to re-establish compliance. The exceptions are:

1. For any substitution of equipment emulated during the benchmark, (as allowed under Clause 6) a new test according to Clause 6.6.3.4 must be provided.
2. Secondary **Components** such as front-end systems, storage devices, terminal servers, network adapters, routers, bridges, repeaters and the like may be substituted.
3. Substitution of the Server or Back-end system or the Host system, OS, DBMS or TP Monitor is not allowed under any circumstances.

Comment: The **Component** substitution will be open to challenge for a 60-day period.

(8.0) FULL DISCLOSURE

(8.x.y) Pricing Related Items

Rules for reporting Pricing information are included in the current revision of the TPC Pricing Specification Version 1, located at www.tpc.org.

(8.x.y.1) Price Spreadsheet Categories: The major categories for division in the Price Spreadsheet will be:

Server Hardware

Server Storage

Server Software

Client Hardware

Client Storage

Client Software

Infrastructure (networking, UPS, consoles, other **Components** that do fit into the above categories)

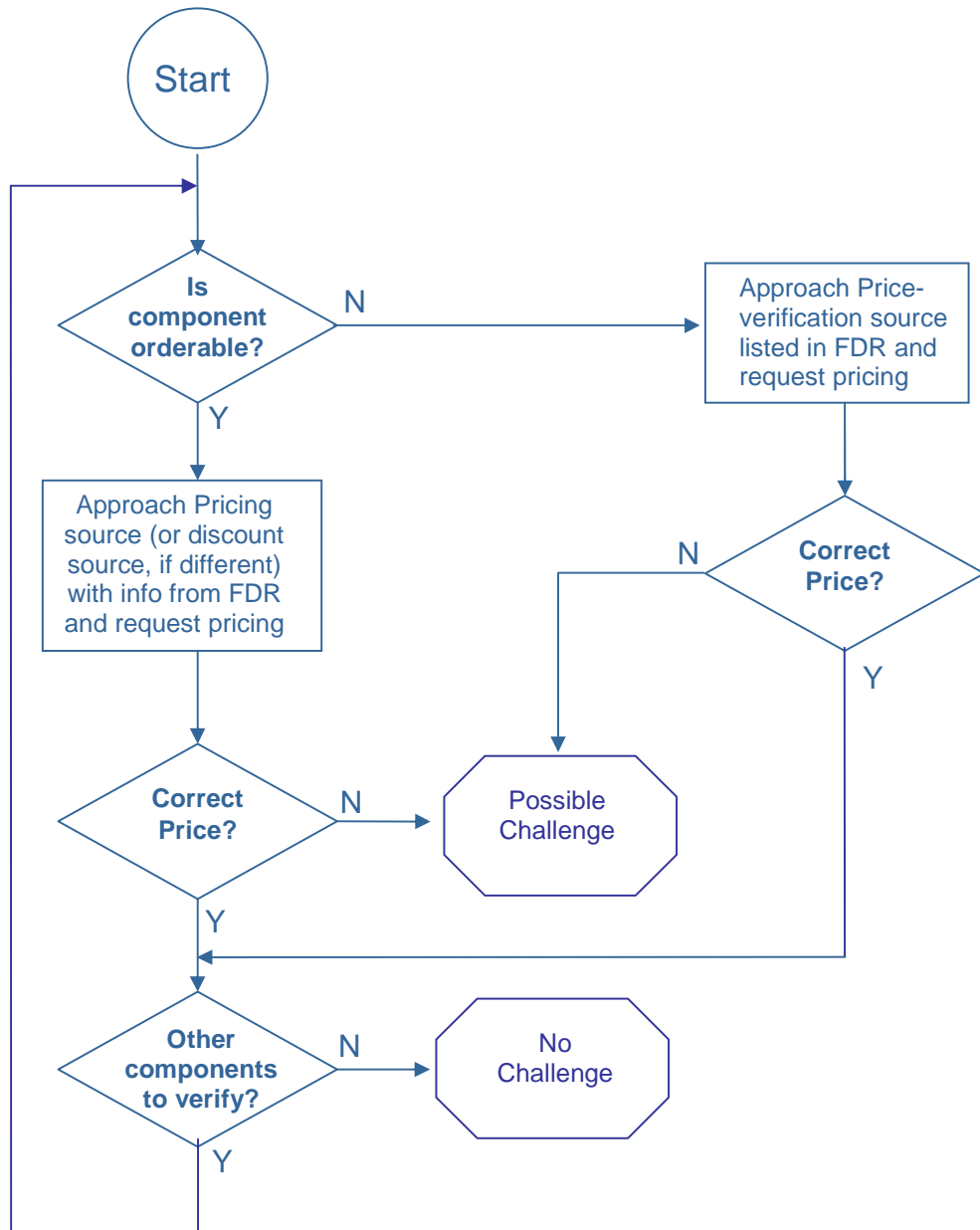
APPENDIX D. PRICE VERIFICATION FLOWS

The following flows can be used as guidelines for the verification of prices and **Discounts** in preparation for a possible challenge. These flows only cover a fraction of the requirements in the specification and the main text of the specification takes precedence when there is a perceived conflict between the two or when there is an area that is not covered by the flows. The pricing specification requires that sufficient information be disclosed that the prices and **Discounts** can be verified solely by contacting groups that would normally be involved in setting prices for consumers.

Notes:

- * If the source for verification of prices of non-**Orderable** items is not specified as being different from the source for currently **Orderable** items, the assumption is that the same source can be used for both **Orderable** and non-**Orderable** items.
- * The flows provide a process that a potential challenger can follow to collect substantive evidence regarding the prices of a benchmark configuration – prior to contacting the test sponsor, if he/she so chooses.
- * Contacts with a sales organization must reference the quotation in the **FDR** and the name of the sales contact point who issued the quotation, if available
- * The challenger is permitted and encouraged, but not required to perform background research prior to involving an auditor
- * Auditor involvement is recommended to provide an independent view that a good faith effort was made in pursuing the investigation. However, if sufficient evidence is available to proceed with a challenge, auditor involvement is not specifically required (i.e. Auditor involvement can improve the strength of a challenge, but is at the discretion of the challenger.)
- * The Challenger is responsible for any necessary contracts with the Auditor.

Line Item Price Verification



Discount Verification

