Network Capacity Planning with PerfCap Products

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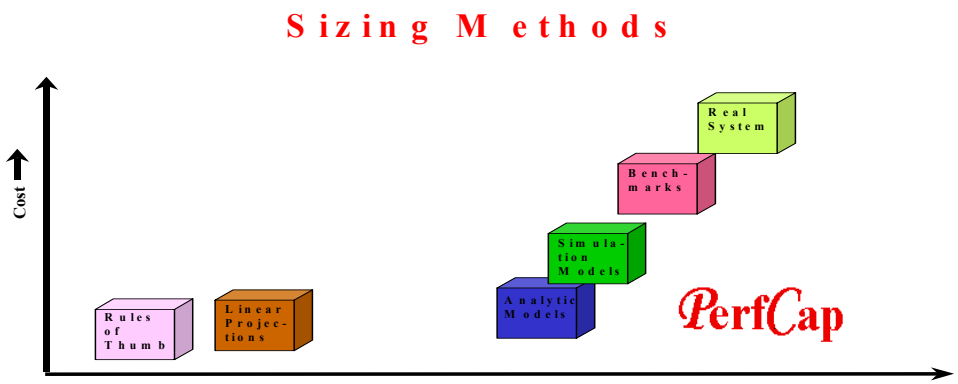


This document is a white-paper on achieving reliable network capacity planning using existing software and methodology designed by PerfCap Corporation products

Commissioned by: Digital Surplus, Ma, USA.

Introduction

This document is designed to explain the concept of Network Capacity Planning using software solutions provided by PerfCap Corporation. It is the first part of a response to growing customer requests for a guide in using of one of PerfCap's strongest product differentiators: the ability to process network utilization data for predicting network and workload changes.

Customer demand

CAPACITY PLANNING TOOLS

DigitalSurplus is a US-based reseller of network and server hardware and PerfCap performance analysis software. Though latent customer demand and enquiries on their dedicated PAWZ web-site (http://pawz.ws) it has become increasingly clear that the demand for PerfCap products comes from two main drivers:

- Server Capacity Planning
- Network Capacity Planning

PerfCap's existing performance infrastructure can co-exist with its own Capacity Planning tools, giving a 'current' and 'future view' of a customer environment

- Support for 7 platforms: Sun, NT,HP-UX, AIX,Tru64 and VMS
- Scalable performance management solution using 1 web-site for 100's of servers
- New technology: designed from ground-up as web-based
- Secure, authenticated solution.
- 18 year research and development into Capacity Planning/Performance Analysis tools and technologies.
- Existing customer list: chip-makers, telecommunications,. airlines, universities, defence, governments, utilities, and investment banks, from all over the world.

Through adroit marketing and web-site design, DigitalSurplus' own PAWZ web-site received a barrage of hits from sales leads all over the word. Companies, consultants and hardware vendors have submitted particular requests for information regarding one topic, and one topic only:

- Network Capacity Planning

It is an indicaton of the scarcity of the market in network capacity planning products, that major enterprises are willing to engage in a relatively new solution to answer traditional network capacity planning questions

- What is my headroom?
- Can I down-size my IT infrastructure and still get the same performance?
- Where are my 'hot segments' of my lan?
- How can I improve network and server performance?

PERFCAP'S NETWORK CP APPROACH

There are very many network monitoring tools on the market, which report basic network utilisation. Products such as NetScout, and NetHealth., are excellent enterprise monitoring tools, which can rapidly tell network infrastructure personnel what

are current and historical performance issues. Many customers will already have some kind of network monitoring product in place, but are unlikely to have any dedicated resources (people and software) to tell their IT organisation *how to capacity plan for future business requirements*.

Network performance monitoring tools are not c*apacity planning tools for networks*. Such software is designed for network engineers, not capacity planners. Existing network capacity planning tools (such as Comnet) do not take the server performance usage sufficiently into account as part of a capacity planning solution. PerfCap's solution for understanding network and server performance can be summarised thus:

PerfCap products already collects server performance information: CPU, IO Memory, and network card via its data collectors used for Performance Analysis Web Zone (PAWZ)

PerfCap has the analysis software to derive network capacity planning statistics from a combination of system data, capacity planning data and network utilisation

PerfCap's Product Set

To perform meaningful network capacity planning, it is essential that quality tools are in place to collect, and analyse server-based and network based data. The tools should be flexible enough to use imported data from other sources where required

TABLE 1. PerfCap product set - single system analysis

Name	Function	Supported Platforms
Performance Monitor	Collect server data	Windows NT, Sun Solaris, HP-UX, IBM AIX, Linux x86, Compaq Tru64, Compaq OpenVMS
Capacity Analyser	Analyse server data	Sun Solaris, HP-UX, IBM AIX, Compaq Tru64, Compaq OpenVMS
Capacity Reducer	Converts server data to planner use	Sun Solaris, HP-UX, IBM AIX, Compaq Tru64, Compaq OpenVMS
Capacity Planner	Capacity plans server and network data	Sun Solaris, HP-UX, IBM AIX, Compaq Tru64, Compaq OpenVMS

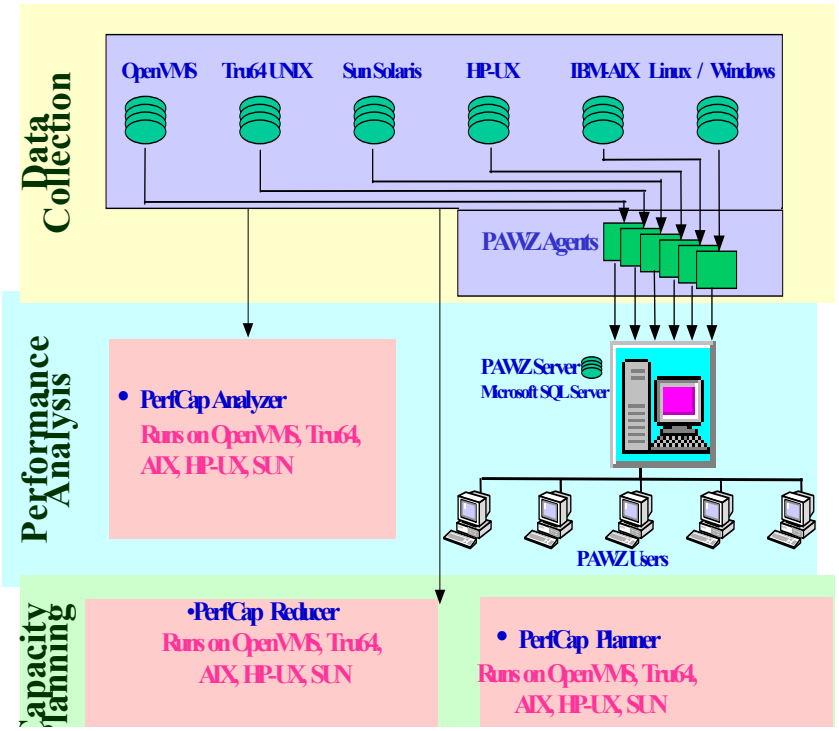
There is a complementary product set called PAWZ (Performance Analysis Web Zone) which collates performance data from multiple platforms into single database and a secure web-site. PAWZ itself does not offer a capacity planning facility today, but the data collectors used by PAWZ are totally compatible with the stand-alone products: Reducer, Analyser and Planner: there is therefore one common collector for both products.

PAWZ

PAWZ can also automate the process of performance analysis for many hundreds of servers, and can provide performance reports and exceptions across all platforms. Separate white-papers are available on PAWZ giving customer benefits. Primarily, PAWZ saves staff time and resources collating performance data manually. In one example, a department of 10 people dedicated to writing and producing reports on 100 systems was reduced to 1 person producing automated reports on 400 systems. PAWZ fills in the gaps which enterprise management products miss: PAWZ provides the enterprise with a diagnosis of system performance, enterprise management software merely shows you the symptoms of system performance. Both are important, one is more useful.

The following diagram gives an graphical representation of PerfCap's products.

FIGURE 1. PerfCap's product set 2002



PERFORMANCE MONITOR

The *Performance Monitor* is the corner-stone of PerfCap's product set. Regardless of platform, the version 4.0 of the performance monitor will collect the following types of information regarding each server

- CPU, Memory, process, and Disk, usage
- Process-level information: cpu, memory, paging
- Network level: TCP/IP, UDP utilisation, re-transmits, delays etc.

Version 4.0 (August 2002) of the performance monitor makes PerfCap Corporation the *only performance analysis software in the world* to offer TCP/IP statistics from all popular platforms *including for Compaq OpenVMS.* The latter feature has opened up new fields for analysis for the Open VMS market. Although small, and declining, the VMS installed base is a good market to attack: OpenVMS servers are communicating through IP these days rather than the proprietary DECnet protocols of the

1980's and 1990's. From a consultancy level, not to ignore the DEC VAX/Alpha market is an error. Now PerfCap offers the capability to bring OpenVMS network metrics into the managed resource category

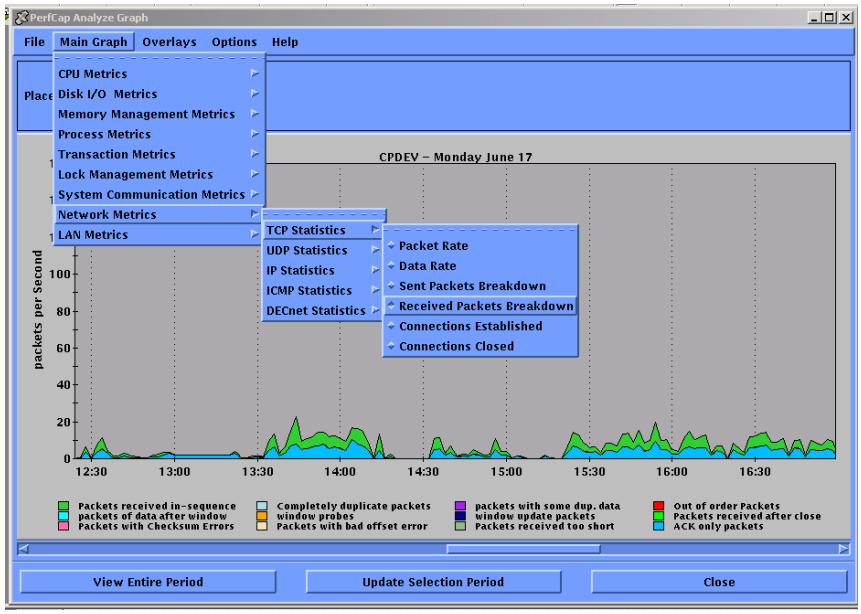
CAPACITY ANALYZER

The *Capacity Analyser* offers the customer the software to analyse one or more platform in detail, manually, from a VMS or UNIX server or workstation. The analyzer will give a breakdown of TC/IP traffic, by throughput, rate and full packet breakdown. This is the first analysis step a customer or consultant will perform having collected the data on the customer's site.

Capacity Analyzer can display graphs on top 10 or specific drives, processes, cpu's and network protocol. The VMS Analyzer can also display response time and transaction rate per command, and can read PerfCap data from UNIX sources. Graphs can be saved to csv or printed to a postscript printer as required.

The following example screen shot from 4.0 analyser shows the network analysis feature for an OpenVMS system. the graph is one of the 100's of graphs available within the product

FIGURE 2. OpenVMS TCP/IP metrics collected from PerfCap and viewed with PerfCap analyser



CAPACITY REDUCER

The Capacity Reducer's sole function is to convert PerfCap Performance Monitor data into capacity planner data format. It is a mandatory step in performing a capacity plan. One Reducer will convert data from any PerfCap Performance Monitor and produce multiple MERG format files. The reducer will also issue a report giving process breakdown and system configuration (as far as the running OS will allow). These reports can give useful tcpip summary of activity.

Like the Analyzer, the VMS version of the reducer will read files from all PerfCap data sources, but report on VMS files only. The UNIX variant will read and report on UJNIX and NT files only - VMS is not currently supported.

CAPACITY PLANNER

The *Capacity Planner* is the analytical model engine that takes the MERG data from the Reducer and produces response times and workload utilisation figures for use in a capacity planning analysis study. This tool can also read the ecp_network.dat file and combine server and network utilisation to produce an overall performance model of the computer system under review.

Using the Planner is not a trivial exercise. Customers wishing to use (buy or rent) the products are strongly recommended to attend PerfCap-approved training courses in Capacity Planning Methodology (001 603 594 0222 for details)

How to capacity plan a network and server infrastructure using PerfCap Products

This section lists the pre-requisites for network capacity planning. The detail is general, giving methodology rather than a precise walk-through of specifics tasks and tool usage.

Operations summarised below give the steps necessary to perform network capacity planning.

- Data Collection
  Collect server data using PerfCap Performance Monitor
  Collect server configuration data from customer site
  Collect network data from external sources
- Characterise workload
  Understand type and function of core processes
  Find peak usage of workloads to build model using Capacity Reducer
  Analyse system performance in peak period using Capacity Analyser
  Build a network configuration file (ecp_network.dat)
- Capacity Plan
  Save network and system configuration files
  Validate model
  Perform what-if scenarios

DATA COLLECTION

Using the PerfCap Performance Monitor collect system performance data on the systems of interest. Obviously more than one node or machine will be instrumented, according to the nature of the application: client-server (2 or 3 tier), web-based, etc. etc.

Using network probe analysis software[1], instrument the network surrounding the servers of interest. Network instrumentation can be taken from either physical probes such as packet sniffers or traffic analysers or from smtp MIB data from most modern bridges, routers or switches.

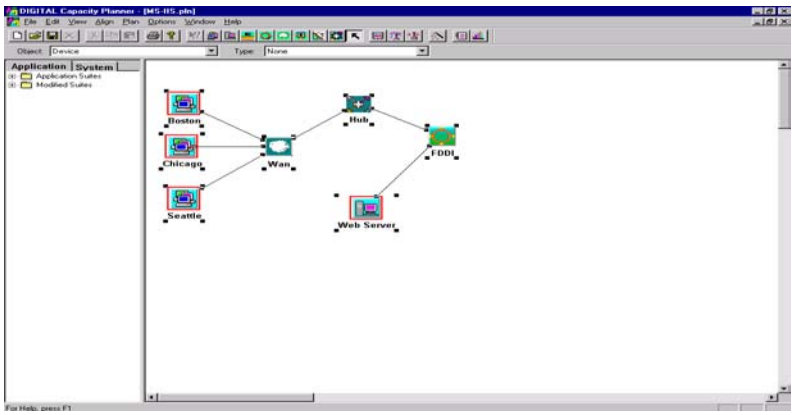
1. Not currently available from PerfCap Corporation

Ensure that system and network data collection times overlap. *Collect data for periods of time which reflect high business activity*, and be aware that high business usage may coincide with a weekly, monthly or even quarterly event. For example, stock exchanges and investment banks have heavy settlement trading days: typically, the first Thursday of a month. Not capturing data for this prime interval can lead to serious errors in the subsequent capacity planning report. Analyse the data using the Capacity Analyser or PAWZ to see if the data 'looks' correct. What may be unusually high system and network utilisation could possibly be a network backup scheduled at an unusual time. One would not base a capacity plan around those periods.

For both sets of data, o*btain and validate the physical server and network infrastructure*: product specification, type, model, speed, settings etc. This is vital in the capacity plan: the PerfCap product set and the customer/consultant needs to know configuration information that may not be available to the data collectors used. For example, the PerfCap Performance Monitor will mainly see what the OS sees: for disk IO, it will understand the layout from the logical disk level, rather than the physical disk level: for example, the OS will not see intervening controllers, hostbus adapters, and physical disk sets as separate from logical disk sets. The physical disk infrastructure has to be added later to the capacity planning model.

Similarly, a network sniffer may not accurately get the model type and speed of a switch or router infrastructure.

FIGURE 3. Network infrastructure breakdown -



Whatever configuration data is collected, the data relevant to the systems under review can be stored for future usage: server information in the *.cfg file and network information in the ecp_network.net file per study. Once entered and validated this data can be re-used for all subsequent capacity planning studies without manual re-calibration.

WORKLOAD ANALYSIS

The next stage is the most complex and time-consuming: taking valid data and forming it into a mathematical model for the Capacity Planner.

Having gathered a representative sample of data, ask the customer about the application itself

- How does it work?
- Which processes talk to each other in a client-server relationship?

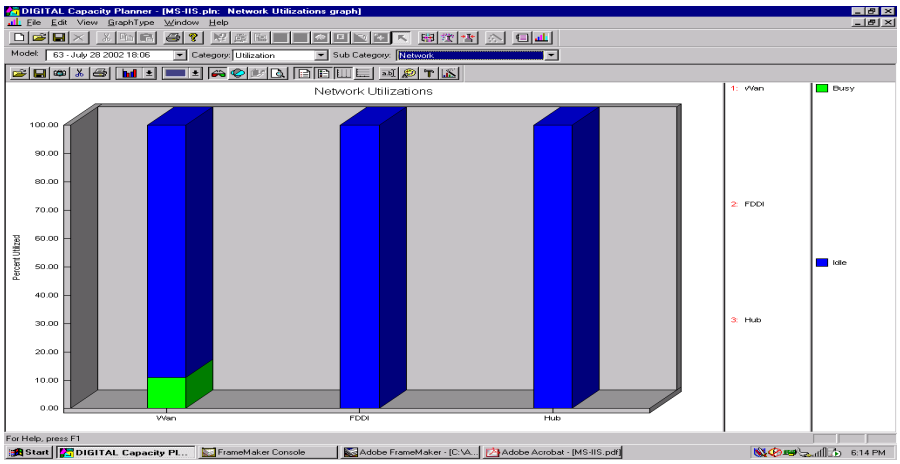
- Are the server processes single or multi threaded?

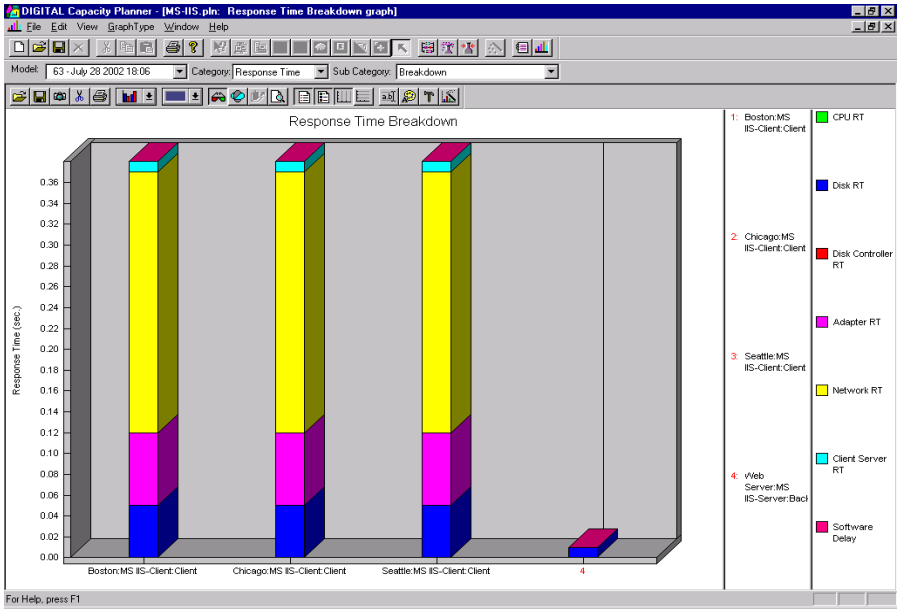
For the period of interest for your capacity plan:

- How many end users?
- How many application transactions?
- What protocols are used, and average packet size transmitted?
- Are client-server transactions synchronous or asynchronous?

The end result of such analysis is that you will group like processes together, and for each of the key application processes, you will have an understanding of the application transaction rate. ‘Transaction’ can mean whatever the application defines as a successful operation. It is not usually some system transaction (such as a CPU ms) or a database transaction (such as an update, a delete or an add).

FIGURE 4. Client-Server model from Capacity Planner





Performance data initially captured by the server can be 'reduced' using the Capacity Reducer to provide an input file into the Capacity Planner: a.MERG file. The.MERG file is complemented by the ECP network.dat file, which contains all the relevant network configuration data.

CAPACITY PLAN

Having formed a base model, with data validated and 'good', the matter of performing what-if scenarios, saturation analysis and system sizing is handled entirely within the PerfCap Capacity Planner. In many ways, this is the quickest task to accomplish out of the entire exercise, and also the most interesting to the end customer.

Using the Capacity Planner, one can present the customer with a variety of options, according to the defining need for the study. Common question asked include:

- What is my network usage?
- What are the current system or network bottlenecks?
- How can these bottlenecks can be fixed now?
- How can future system bottlenecks be solved if workload increases?

The economic advantage of such a tool is that the customer can 'try' different system processors or network infrastructure without having to install or change any of the current physical infrastructure. All the 'what-if' scenarios can be answered within the model.

For example, the customer may be thinking of upgrading from ATM to GbEthernet, but may be unsure of the best way to route traffic through his existing topology. The power of the tool, is that new (or even future) network technologies can be implemented within the Capacity Plan itself, to offer the customer choice. In practise, the analysis stage of the capacity plan can discover so many system and network performance issues, that the purpose of the study may change dramatically during the lifetime of the engagement.

Some of the benefits of such studies to the customer are outlined below:

TABLE 2. Side-effects of Capacity Planning

Purpose of study	Finding	Result
Imminent workload increase	server bottleneck, no network issues	Server upgrade recommended
Server Performance issues	No performance issues of sorcery	Software issues
Network Performance issues	Server network card mis-configured	Server issues
Health check	Server over-specified	Downgrade to save maintenance costs

Purpose of study	Finding	Result
Network Performance Issues	Slow switch	Replace switch
Server Consolidation	Propose down-sizing	Cost savings

Conclusions

With the right mix of information from customer and from the tool-set, effective network capacity planning cab be achieved using PerfCap software products. The consultant can give the customer confidence that proposed upgrades (if necessary) will give the expected business benefit. Even when the proposed network or system upgrades are found by the tools to be inadequate, alternative solutions can be suggested with confidence.

Careful use of the tools will give the customer confidence in assessing the following:

- *Can I down-size my servers and network infrastructure and still deliver business requirements.*
- *Is the hardware upgrade suggested by the hardware vendor fair value for money? Can it deliver what is claimed?*
- *Can I perform server consolidation so that it actually works, rather than as a paper exercise*

All PerfCap Products are available to rent or purchase from www.pawz.ws 001 781 990 1141.