

Forecasting the Future: Capacity Planning Best Practices Using CA MICS® Resource Management

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Executive Summary

Challenge

You've just been presented with a new challenge — the requirement to provide capacity planning for your organization. But what does that request mean? And what is the best way to accomplish it, on top of the many responsibilities you are already managing? CA MICS® Resource Management (CA MICS) is the solution to your concerns. Armed with the right data and the right tools, you can help your organization plan for the future, manage capacity changes and purchase hardware “just in time.”

Opportunity

The cost of hardware may have come down considerably, but the cost of the software is still a significant challenge, making it essential that accurate forecasts be available. CA MICS offers a time-proven approach to accurate capacity planning, enabling planners and those new to this activity to quickly assess future demands and help achieve the price-performance needed by the business.

Benefits

While ROI and TCO were once terms mostly understood in the boardroom, it is now a requirement for everyone to optimize costs, while providing the services required by the business. As such, capacity planning has never been more essential. CA MICS enables IT management to be assured that they are acquiring systems resources “just in time,” and with adequate foreknowledge necessary to achieve the best pricing from vendors.

The Whats and Whys of Capacity Planning

What is capacity planning? This function is a subset of the ITIL® Capacity Management process; it involves ensuring that adequate resources are available just when needed, at the least possible cost. Like many IT functions, knowing the technology (the hardware and applications) is only the beginning. Knowing how the business currently uses the applications and plans to use them in the future is as important as understanding the cost of each CICS transaction.

The need for capacity planning arises from the fact that nothing in your enterprise stays the same. Changes in functionality (implemented in application code) change the resource demands of given business transactions. Typically, almost any change in code will result in changes to the demand for CPU, memory and disk. In addition, changes to the hardware can result in changes to these costs. All this must be considered. More difficult to estimate and manage are the changes introduced by the business. These may be as basic as increases in the transaction rate introduced by new users of the system or by a business campaign, or as complex as a change in the way users interact with the system.

Some examples may be helpful. When a bank decides to increase the number of credit card customers by introducing a new card offering, they start with an advertising campaign. (You probably won't be told that this is happening, unless you develop a relationship with the business). The campaign itself may introduce more traffic to the corporate web site, as people look into the details. This puts stress on all resources. But the biggest "hit" will be to the application processing new card requests. Businesses have a reasonable estimate of response rates to these offerings (1-5% is typical), but the web has changed a lot of things, including the predictability of business growth. To give some actual numbers to this example, a bank set up a new web site for customers to manage their credit cards online; they didn't really anticipate what might happen. In the first week, they had 2000 new users, before the site was advertised or mentioned to customers. Capacity planning needs to take into account not just the growth the business expects, but the maximum throughput possible on the existing hardware; the difference between the two numbers indicates how much room for error exists.

The way a user interacts with an application may not be predictable either. In some cases, users unhappy with some aspect of the interface may use the application in unexpected ways, introducing possible bottlenecks or unexpected resource demands on the system. In one case, a user community who had formerly just used the telephone and a pad of paper to do their jobs was asked to start using a computer application which required typing and mouse skills. Immediately, performance analysts found that their use of the system caused major bottlenecks on the I/O subsystem because they only entered a few characters on every search screen presented, to minimize the amount of typing they had to do. So, when looking for the records of John Q. Smith, they only entered "SMI" on their search screen, bringing back hundreds of records and introducing batch-like characteristics to an otherwise online application.

Good capacity planners are system detectives. They have a support network that includes performance analysts, hardware specialists, network managers, application designers and the business users; they need to gather clues from all these areas. The best clues of all are found in the data, but given the amount of data any system produces, raw data is not enough. You don't have the time to sift through thousands of gigabytes (GBs) of SMF/RMF data; the capacity planner needs information — data presented in a way that helps him/her do the job.

Capacity planning is both art and science. The skill involves synthesizing the information received from IT people, system data and the business into a plan which projects the need for resources. It requires the rigor of science in that you must test your hypotheses, and go back to compare projections to actuals, to refine your understanding of the system. The art is in knowing how to interpret the data and when to build in more or less “white space” (extra capacity) into your plan to accommodate unforeseen capacity demands. The more you understand the business, the better you know the cost of coming up short on capacity. The reality is that you cannot afford to have the capacity “white space” enjoyed by capacity planners in the 80’s; the challenge is to maximize what you have and buy only when absolutely needed.

But hardware has become cheaper! Software has not, and since it is pegged to floor capacity, in most cases, buying too much CPU will translate into a much bigger bill for DB2 and other products. Your work is an important component to financial management — keeping the cost per transaction low. When done well, capacity planners really contribute to the bottom line.

SECTION 2

The Terminology of Capacity Planning & Capacity Management

The ITIL library describes Capacity Management as a balancing act, where you try to balance cost against capacity and supply against demand. The first means making the most efficient use of the resources you have, then only buying what you need in terms of business demand. The second means knowing the demand and ensuring the supply is there when needed.

Capacity Management is divided into three sub-processes, of which the capacity planner typically manages the first two:

- **Business Capacity Management** obtaining business projections and forecasting the impact of the new demand on the existing resources
- **Resource Capacity Management** monitoring and analyzing the current resource demands
- **Service Capacity Management** managing the systems to the service level agreements established. Performance management (the day-to-day managing and monitoring of the system) is a subset of this process

All processes use a CDB — a Capacity Database. This federated database stores all system, performance, capacity, financial and business data needed to perform Capacity Management. Federated just means that in most cases, there isn’t a single physical database containing all this information; the data resides where it makes the most sense, but can be easily accessed, combined and correlated, as needed. The CA MICS database includes all the above information with the exception of the business metrics; these could be added or federated with some custom work.

Other useful terms follow:

MODELING A methodology for predicting the future impact of change. In IT, this usually means a tool that can map the existing environment and demands, then add to this the projected demand, resulting in a picture of the resource demands expected.

TRENDING A simpler way of looking at future growth, it assumes that growth rates in the past reflect growth rates in the future. It generates a straight line into the future to determine growth. This technique is generally used only when actual projections are not known.

LINEAR REGRESSION A method for determining the relation between two (or more) metrics. Assuming that they are related, an equation can be developed which explains this relationship, so you can figure out what the value of one would be from the value of the other. Most methods for calculating linear regression will develop an equation and a line, even if there is no relationship between the variables, so it is important to test the relationship (correlation) before putting too much weight on the result.

FORECAST The process of estimating the unknown. Take all the data you can find about the subject, hopefully leaving only one variable to estimate.

WORKLOAD CHARACTERIZATION This is the process of mapping IT processes and transactions to a business unit of work. In the past, a CICS transaction often was the same thing as a business transaction, but now, as many business applications span multiple platforms and IT applications, this exercise is necessary. The end user view is critical in performance reporting, availability management and even chargeback.

SECTION 3

CA MICS and Capacity Planning

What is CA MICS to a capacity planner? For many, it has only been the Capacity Database (CDB) used as input to a variety of standard SAS programs to understand current and past trends. In terms of making SMF and RMF data more usable, it has always been the best database. But CA MICS offers so much more. Like many software packages, many people never get past the most basic functionality, missing the chance to make their lives simpler and get more accurate forecasts and analysis, without writing code. CA MICS can do this for you, making your capacity plans more accurate, your projections more reliable and your hardware requests “just in time.” You don’t even need to know SAS to get started.

The CA MICS Capacity Planner Option (CPO) offers a wealth of tools to help you create your specialized capacity databases, characterize workloads and perform workload analysis and forecasting. To begin, the product offers utilities designed to help you create the custom capacity database you need. This database is derived from the standard CA MICS database, but is independent of it. CA MICS keeps data for many purposes aside from capacity planning, and as such, the data is frequently summarized and/or archived and bound by the data retention policies imposed on the CA MICS managed database; best practice in capacity planning means keeping the right metrics at the right granularity long enough to manage known business cycles. A separate database allows for that, without causing the CPU overhead or the disk space; this capacity planning database can be defined with its own data retention policies, which will often be very different from those of the base database. As an example, credit card authorization systems tend to see capacity demand peaking in December, only falling off somewhat by February. However, in July, normal growth typically leads to the same peak; the following December achieves yet a higher peak. Good capacity planning for this workload requires that one year’s worth of data is available to analyze trends, do forecasts and check results of these forecasts.

There are four types of file definition available in the CPO:

- Sample application files (to help you create your own CDB).
- Resource element files — the actual data files obtained by mining CA MICS data.
- Meta files — a place to put data selected from already-created capacity planning files and/or user-defined elements — an additional data repository created to manage new relationships you define.
- Business element files — these could be the number of business transactions or other natural forecast units. This is how you can use them as part of capacity planning and forecasting to obtain business-aware plans.

Once defined, the following files are available to the capacity planner:

- Historical observations
- Forecast files derived by running various statistical programs
- Worksheet facility files — these are files designed to help business users input data to a capacity plan

To get started, the best place to look is the Sample Applications. These are pre-defined views of the right CA MICS files to use, the right elements and the right way to summarize the data. These applications were defined as “best practice” views of the data, but they are only a start. As you learn more, you will find custom definitions will be best to answer the unique questions associated with your industry. The sample applications include, but are not limited to, the following:

- z/OS processor planning
- WLM Workload planning
- WLC (workload license charge) planning
- IRD planning
- CICS Resource planning
- TCP/IP Network Resource planning
- Distributed Systems planning

The second great resource is the list of functions built and provided for you. Each serves a different purpose depending on the challenge you are facing.

PPT - PROFILE AND TRENDING This facility will input compound growth rates for the elements you select. It is the most basic way of doing capacity planning and provides you with a “sense of direction” for future resource demand.

SMR - SIMPLE LINEAR REGRESSION It fits a “least-squares” line to the existing data, allowing you to project into the future with more accuracy.

UVM - UNIVARIATE MODEL FORECASTING With this, you can use linear, quadratic or cubic models to perform regression analysis. It includes various smoothing functions that help deal with non-linear data. This is a key approach to capacity planning and will be covered in more detail below.

MVR - MULTIVARIATE REGRESSION ANALYSIS Same as UVM, but you can input variables from a variety of capacity databases, creating different enterprise views. You can also predict the behavior of one variable based on growth in the other. This can be extremely valuable when you notice certain behaviors, such as the relationship of disk space growth to number of transactions within an application. This is a more sophisticated approach; it will come into play as you learn more about the kinds of questions relevant to capacity planning in your data center.

BEF - BUSINESS ELEMENT FORECASTING This capability allows you to perform a regression analysis between application utilization metrics (such as transaction counts) and business metrics. It is a form of MVR, allowing you to relate IT metrics to business metrics. More on this later.

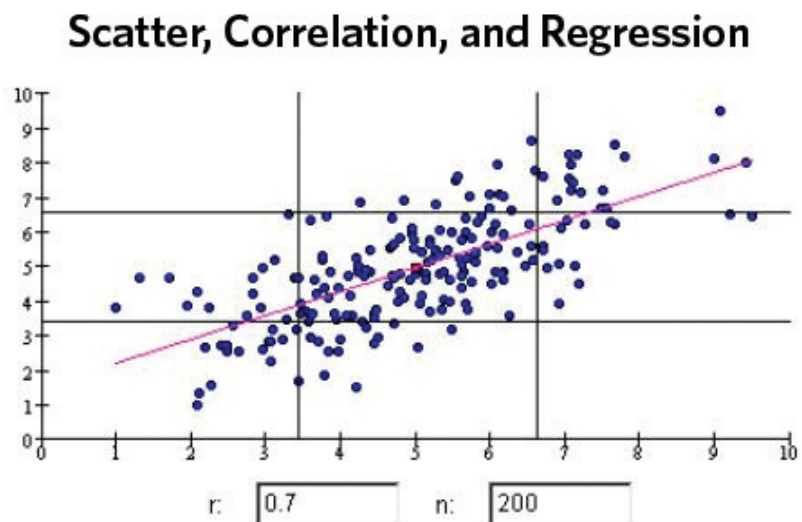
WORKLOAD CHARACTERIZATION An additional key capability is workload characterization, which helps you figure out which resource patterns relate to a given workload by using clustering. Aside from creating more useful categories for capacity planning, this exercise can be invaluable in grouping work for service classes, giving you a deeper understanding of the resource characteristics of each component.

It can be helpful to understand what linear regression is all about. Simply stated, it is a way of understanding how you can predict the behavior of one or more related variables based on the behavior of a single variable. In capacity planning, the most common scenario is to ask — how much CPU will I use based on a known number of transactions? You start with what you know — the historical relationship between the two. The CPO takes this data in and produces a linear regression analysis of the data — CPU demand versus transaction volume. The regression draws the line that best fits the data, which typically will not appear to be completely linear to the eye. A sample of the output looks as follows in Figure A:

FIGURE A

Typical Plot of a Linear Regression showing the Best-Fit Line.

SAMPLE LINEAR REGRESSION



Once you are ready to begin, you have some choices to make. The first, an important one, is whether to normalize CPU utilization values to a base CPU. You can either pick one already in your shop (or one your company recognizes for this purpose) or create a dummy one with the characteristics you desire. The benefit is that when you move workloads around or add to workloads, the model automatically takes into account the actual cost of running that work based on the base CPU, rather than requiring that you do the conversion between one processor type and another.

Now load up your capacity database, initially, using the sample application files provided. You can then move right into a capacity planning exercise, once you have questions you need to answer. The most basic are — what will my resource utilization look like in 6 months? Do I need more processor capacity? Though you can use the profile and trending facility to get a general feel for this, more accuracy can be obtained using some form of regression analysis, either UVM or MVR.

Univariate Model Forecasting (UVM) uses linear, quadratic or cubic models of the data to perform regression analysis. The benefit of this function is that it offers smoothing functions that help to deal with non-linearity of the data. Although most statistics assume that there are linear relationships between two sets of metrics, this is not a completely valid assumption for many IT metrics. As an example, CPU busy goes non-linear at low transaction volumes; it also becomes non-linear at very high volumes, when the CPU busy is at or near 100%. The former is due to low-utilization effects — the fact that there is just some basic processing power needed to run a subsystem, like CICS, even if no productive work is being done. In the latter case, the impact of managing dispatching priorities when capacity is scarce and doing the switching between tasks takes up more processing. So, best results are achieved by smoothing.

In addition, UVM offers various statistical analyses designed to test your assumptions, such as two variables actually are related or to test the validity of your projections. You also can look at the confidence limits — how good is the fit of the data? All this helps you improve or at least gauge the validity and usability of the model you are testing. As an example, you might guess that CPU use and CICS transaction volume might have a linear relationship. But if you are assuming that your baseline data can just be increased by a certain percent to forecast the future, you may find that there are a large number of transactions that do not increase with business volume. As such, the correlation would be less optimal. This is only one example of why you need to test and verify your assumptions.

UVM also offers a feature called the LOG10 function, which is particularly good when you are trying to deal with exponential growth, as when you map transaction volume versus response time. The LOG10 function takes queuing more into account to help improve your accuracy, though it is not, per se, a queuing algorithm. When absolute accuracy is required, you might need to use a more sophisticated and thus, more complicated and costly modeling tool. But for most cases, these models will provide you with sufficient accuracy to minimize your risk.

Another useful capability is Business Element Forecasting (BEF). For many, this might be the most valuable tool you have. In many businesses, you will be presented not with the number of CICS or IMS transactions, but instead with the business metrics, such as the number of credit card authorizations. How do you translate this? You start with interviewing the application architects to understand how the application works, but then, you are left with a need to validate whether the metrics you think are right really will produce the forecasts you want. In this case, BEF is there to help you. The process is not difficult, but the amount of care you take in executing it will translate to the best results.

- Interview developers to figure out which elements are the biggest factors in resource demand for this business case
- Interview business users to gather the kinds of metrics they look at
- Get historical information on business volumes, to create a business element history file
- Using the information from the first step, create an element history file of the resources to track
- Now, use business element forecasting to determine which business elements correlate well with the resources, based on the history
- You can then use these elements to forecast resource demand into the future
- Last, track results, verify and correct, as needed

The documentation for the CPO clearly walks you through the exercise of building your first model — the tutorial in Appendix B is the best place to start. Throughout the manual, you will find screen shots showing you exactly how to input parameters and data selection criteria. Once you have worked through a few models, you will find it easy to proceed on your own. You'll also likely find a wealth of questions waiting to be answered, once you understand the power at your fingertips.

SECTION 4

Real-World Challenges

When beginning a career in capacity planning, it can be difficult to know where to start. Where can you get the most “bang for the buck” from your work? As with most areas of systems management, you should begin with identifying business value. For capacity planning, this means always having just enough resource capacity to support business volumes, and also having a well-thought-out plan for disaster recovery. And given the cost-consciousness of most businesses (“I know how much I make per transaction; how much is it costing me?”), the job includes getting rapid return on any investment (ROI) and reducing the total cost of ownership (TCO). Buy just enough and fully exploit what you have, remembering the total cost of resources also includes the cost of software (typically an increasing cost with increasing capacity) and the cost of the people to manage the systems.

A few typical capacity planning challenges will be outlined here, with the best way to find the answer through CA MICS. Some questions will be posed by the business, others by your management, but in the end, as you build your skills and knowledge, the best questions will be the ones you anticipate and answer.

Business Growth Projections

All capacity planning starts here — the business forecasts changes in the volume of work they will be doing, whether it is an increase (or decrease) in real estate loan requests, stock trades, orders on a web site, etc. You can exploit a simple approach to forecasting future resource demands by assuming that growth will continue as it has in the past, or, with information from the lines of business, forecast the growth more precisely. CA MICS will help you with both approaches.

You may have a CICS application that processes invoices, logs credit updates and makes online inquiries against open items. The CPU used by this application is dependent on the growth of the invoices, credits and inquiries. The Business Element (BE) feature in the CPO uses these metrics from the business (historical and future projections) to determine the growth in CPU. The process can be summarized in eight (8) steps.

1. Build the CICS CPU history Resource Element File (REF) from the CA MICS database. A resource element file is a user defined extract where the user selects the CA MICS file, elements and time-span. Optionally, use the CICS Sample Application to build the capacity file. The sample application has the file and elements pre-selected.
2. Build the Business Element File (BEF) from the business metrics. This data will include history and forecast for invoices, credits and inquiries. The time detail (DAYS, WEEKS, MONTHS) will be the same as the REF. Data may be entered with a batch job that includes user defined input information to read the business element information or using the SAS full screen editor option.
3. Execute the CPO Stepwise Multiple Regression (SMR) task to determine the best model for the CPU used per transaction/task. CPO provides a panel to enter the information on the files and elements to include in the analysis along with parameters. The dependent element is from the REF and the independent elements are from the BEF. Confidence limits of 70, 90 or 95 may be selected.
4. Analyze the Model Analysis Report to determine if the data is a good fit. Sometimes it is necessary to reject the data because of anomalies. Sometimes different business elements or resource elements may be required. CPO allows data to be excluded for holidays, weekends, abnormal processing, etc. Steps 3 and 4 should be repeated until satisfactory results are obtained.
5. Accept the forecast. Since the BEF contains history and forecast data, the results of the SMR include a report and a forecast of CPU required for the future. This forecast is saved in the CDB.
6. Set up a process to update the actuals for the business elements capacity database using either batch or online edit. The capacity database's CPU resource consumption data can be updated from the CA MICS repository by using the MICS production reporting interface of CPO. This update can be performed on a regular basis by scheduling the production reporting job stream.
7. Use any or all of the forecasting functions available in the CPO to produce reports for your review. All forecasting functions can also be grouped together for execution using the MICS Production Reporting feature. This analysis and reporting can be performed on a regular basis by scheduling the product reporting job stream.
8. Repeat the forecast exercise based on business needs.

Planning for zIIPs and zAAPs

You haven't bought them yet, but you are seriously considering adding the low cost engines to your complex. Before doing it, you'd love to have some idea of how much processing you can offload, and how much capacity would be left. This exercise, done in concert with business growth projections can also be used to measure how long you might delay upgrades by purchasing these processors. After all, the reason you would even consider these is the lower TCO (total cost of ownership) both from a hardware and software perspective. But you need to be able to offload enough work to make it worth your while. How much Java processing do you have? How much zIIP-eligible DB2 processing do you have in-house?

CPO provides a sample application that includes the information you need for a quick-start of capacity planning of zAAP and zIIP processors. CA MICS records metrics on work that is eligible to run on zAAP and zIIP processors in the workload manager files. These files are used to populate the CPO workload manager sample application.

1. Select the CPO workload manger sample application. Complete the panel with information on the time-span (DAYS, WEEKS, MONTHS), the systems (LPARS), CA MICS units where the WLM data is stored. Optionally, you may filter the data by shift or system; combine service classes into groups that are called CAPAPUs in CPO; or enter a normalization value for CPU time. If you are already processing on these special processors, the CPO z/OS planning sample application provides metrics on the actual usage of these processors.
2. Execute the database update process in foreground or batch to populate the capacity database with this data. For data at the weeks or months time-span, archive data may be available off tape. If so, with one execution of the update you will have populated a database with 52 weeks or 24 months of historical data.
3. Review the report from the database update to determine how much zIIP and zAAP processing is used or eligible. CA MICS tools like MICF and Query and Reporting may be used to generate reports from the CPO file.
4. When satisfied with the extract, move the definition to the production capacity database and implement a production update and report process.

SECTION 5

Capacity Planning Best Practices

When beginning your first capacity plan, it can be helpful to learn from the experience of others. There are some "best practices" which can help you produce the best results more quickly, with fewer assumptions and lower risk.

Run Multiple Models

The business gives you projections of growth, but you should assume that these are best estimates, not completely reliable. Particularly with internet marketing, it can be almost impossible to gauge the impact of a campaign. Some numbers, based on historical principles can be more reliable, but as an example, the long-understood historical behavior of credit card processing was turned on its head when people began doing much of their holiday shopping online. So you always want to be more conservative in assessing the data.

The best way to do this is with “worst case” analysis. Run the numbers as the business forecasts, and if all is well, continue to increase the volume by increments (10% is a good place to start), until some resource is exhausted. This tells you the outside limits of your ability to service requests. Prepare a capacity plan that shows these limits for the business and ask them if the “worst case” is reasonably possible. Although it is always best to hold off on capacity upgrades, this exercise will help you to know if a contingency plan is needed. Do you need to be sure that your CPU has extra CECs available to provision? Some DASD available, if needed?

Multiple models may also be valuable when dealing with a large number of variables. If you have to input capacity projections for many lines of business, it can be difficult to know if the peaks will occur concurrently or not. You may have to plan for various scenarios, including the case where all the peaks coincide, making maximum demand on systems resources. Another case might be when different days of the week (or hours of the day) show widely divergent behavior in terms of resource utilization. Modeling each of these separately can help to assure that capacity will be sufficient.

Additionally, one area that is often forgotten is batch. If dealing with web applications, it would be useful to determine that there is going to be enough capacity to run batch during off hours, given that the most batch work is assigned a lower dispatch priority than online, and thus, would be sacrificed or slowed if online demands increase.

Pick the Right Data

CA MICS keeps a lot of historical data. When building your capacity database, be sure you understand the underlying changes that may have occurred during the period you select. More data is better than less, but if you have had a CPU upgrade, major changes in configuration, changes to applications that affect resource demand or other important changes, you need to select a period that is more consistent. When data is consistent, you can select from 1/3-1/2 of the number of historical intervals to look at trends in growth rate. Sometimes, in a volatile environment, you will only be looking at very recent data, but this will not give you much in the way of trending data.

When using regression analysis, CA MICS will provide you with the coefficient of determination between one or more metrics. It is critical that this correlation value be at least 0.70 (70% correlated) to ensure accuracy of your forecast. Higher is better. On some occasions, you may find you have a negative R^2 ; this means that two variables are inversely correlated. One will increase while the other decreases. This is perfectly valid. Again, you would look for at least a -0.70 correlation.

CA MICS will also provide confidence limit information. When you select 99%, this means that all your values will fit between the standard error above and below the data line. However, if the standard error is very large, this means that the data fit is not very good. Though CA MICS will provide forecasts even in this case, they will not be as reliable as those where the data fits the line better.

The Limits of Linear Regression

Linear regression is a statistical method for understanding a relationship between metrics. However, it can draw a line from any scatter plot of data, even if there is actually no relationship at all between the metrics. Use the expert help in the CA MICS Capacity Planning Option manuals to help you select appropriate metrics and look at the plots themselves. If there are a great number of outliers, or if the line appears to be drawn at random, this might not be the best choice of metrics for capacity planning.

Additionally, this technique is primarily designed to look for data points within the limits of the actual data. As you project out further beyond the limits of the points, the accuracy will tend to decrease, especially if the relationship becomes non-linear. In this case, or when you know that queuing may be an issue with your data (that it will not draw a straight line), consider using the LOG10 function, which understands exponential rather than linear growth.

Documenting Assumptions

Capacity planning is all about making careful assumptions, but too often these assumptions are not well understood. As you go along, make note of any assumptions that you are making, so if there are problems with your forecasts, you can go back and assess their validity. This also helps when working with the business or procurement, when more hardware may be needed. Some typical assumptions that you might be making are as follows:

- The business forecasts are accurate
- The baseline data accurately reflects transaction mix for this application
- Combining historical data from multiple days and hours gives a representative picture of resource use
- CPU demand is linear with relationship to transaction volume (an assumption known not to be valid at very low or very high demand)
- There will be no need to move additional work into this LPAR as a result of a failover or disaster

Keep an ongoing list of these assumptions, and in fact, if publishing a capacity plan, include the important ones. This lets additional eyes scan the assumptions and allows that others may have additional valuable information to help improve the accuracy of your forecast.

Verifying Results

Too often, capacity plans are created, disseminated, but never looked at after the projected periods arrive. Some of the most valuable data comes from understanding the variances from your projected results. These may be the result of inaccurate forecasts from the business, changes in application usage or design or other anomalies. The only way to continue to improve your plan is to do a careful analysis of the forecast accuracy.

CA MICS offers graphical analysis tools to help you compare actuals to forecasts, and then, you can investigate any significant outliers. Each time you do this, you learn more about the applications, the way the business uses them and the relation between business values and IT metrics. So you can actually improve the accuracy of your capacity plans with every iteration.

Conclusions

Capacity planning is all about becoming proactive. With CA MICS, you can minimize risk for the business as well as ensure that you are “ahead of the curve” in managing systems resources. You can’t get a good deal on hardware when you need to buy it today. By planning carefully, hardware acquisitions can be made “just in time,” at optimal cost. CA MICS helps make capacity planning much easier, and much more accurate, without the need for you to become an expert statistician. These tools provide you everything you need to understand your system and how the business uses it, to assess historical trends, and accurately plan for the future.

If you are:

- Charged with reducing the cost of systems resources
- Challenged with figuring out capacity demands based on business volumes
- Searching for automation that will help you reduce the time and complexity of this process

CA MICS Resource Management can make you a capacity planning wizard, saving your company time and money, while providing the business the capacity they need.

To learn more about the CA MICS Resource Management architecture and technical approach, visit ca.com/mainframe/resourcemanagement.

About the Authors

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CA, one of the world's largest information technology (IT) management software companies, unifies and simplifies complex IT management across the enterprise for greater business results. With our Enterprise IT Management vision, solutions and expertise, we help customers effectively govern, manage and secure IT.

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