BUSINESS INTELLIGENCE IN CAPACITY MANAGEMENT

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This paper explores similarities in tools, techniques, and philosophies used in Business Intelligence practices and how they can be leveraged for improving Capacity Management processes. Specifically, it discusses leveraging additional data outside of component utilization and performance metrics to provide a complete picture of demand by including business demand and response time metrics to the capacity management information system.

INTRODUCTION

The ITIL version 3 framework defines the capacity management process as consisting of four sub-processes: business capacity management, service capacity management, component capacity management, and capacity management reporting [1]. The three capacity management sub-processes each rely on distinctively different types of metrics being warehoused in the Capacity Management Information System (CMIS) for analysis and the results included in reports as part of the reporting sub-process.

DATA COLLECTION AND WAREHOUSING

Component metrics used in component capacity management is often a primary focus of capacity management teams and tools. Resources and processes focus on collecting performance and utilization data on IT components. This data is sent to the CMIS for aggregation, summarization, analysis, and reporting. Component metrics are often the easiest to collect with the right toolset and support of IT infrastructure organizations.

The service and business capacity sub-processes use metrics about the performance, capacity, and demand for IT services. All three types of metrics are needed to fulfill the objective of capacity management to "to ensure that the capacity of IT services and the IT infrastructure is able to deliver the agreed service level targets in a cost effective and timely manner." [1]

Service metrics provide a measure of the performance of an IT service which means collecting information about the response time of transactions. A transaction defines a discrete unit of work performed by an IT service and may need to be defined by the service owner or stakeholders.

As an example, an IT service which provides authentication may define a transaction as the process to validate the user-provided credentials and return a response. A service metric for this transaction could be the elapsed time from when the user presses the submit button on a login form until the response page is rendered.

Similarly, the business capacity planning process revolves around the demand for IT services. Using the previous example, analyzing the number of user logins can provide insight into the demand for the login service. Business forecast and marketing analyses can provide insight into future peak demand for a service during an upcoming marketing campaign, for example.

1 The views expressed in this paper are those of the author along, and do not necessarily represent the views, opinions or endorsement of GM Financial or General Motors.

Once these general types of capacity data is being collected and stored in a capacity database of a CMIS, business intelligence tools and techniques can be used to augment traditional capacity planning techniques to enable the full capacity management process.

DATA VISUALIZATION AND REPORTING

It is difficult to obtain meaningful information from a matrix of numbers, especially when it spans multiple dimensions. Is there any meaningful correlation between the data dimensions? How are individual measurements trending over time – are they going up, staying steady, or doing down?

There have been tremendous improvements in the options available for taking large data sets and presenting them visually in a way that allows almost anyone to quickly gain insight into the meaning behind the data. The traditional time series bar and line charts are still widely used, but visualizations such as bubble charts, heatmaps, tree maps, scatterplots, and even including geographical data using maps can provide additional insights into relationships and correlations in capacity data.

Additionally, combining these visualizations into an interactive structured web interface allows multiple visualizations to be presented and linked together. The viewer can drive the discovery process from the high level executive view down into the most detailed detail if designed properly.

The design, scheduling, and generation of reports is a key feature of any Business Intelligence tool. Leveraging these tools by pointing them at the capacity database can not only jumpstart the adoption of the capacity reports, but it allows the capacity management team to leverage business intelligence data in the enterprise data warehouse.

DATA MINING

Data Mining is a set of practices designed to reveal previously undiscovered relationships between data dimensions. Data mining help to discover patterns or behaviors in application or resource usage was not readily apparent. The availability of business, service, and component capacity data makes data mining an extremely valuable tool in the capacity manager's arsenal.

ANALYSIS

There are number of analysis techniques used in Business Intelligence which can help to transform a large set of capacity data into meaningful insights. Statistical analysis can help quantify significance and reliability of observations to interpret the results of data mining efforts.

Time series analysis techniques are used to predict future behavior from past observations and can provide insights into future capacity demands from historical observations. For example, it can be used to gain insight into application behavior during high seasonal demand or a large marketing campaign.

Statistical modeling is a related discipline which uses mathematical assumptions about a system to create a model of the system in order to determine how it will behave when one or more of the inputs are changed. One such model useful for capacity management utilizes queueing theory to predict how a complex computer system with resource queues, such as a CPU, will behave under a theoretical or measured workload.

OLAP

OLAP (Online Analytical Processing) combines techniques in visualization and analysis to create a representation of multidimensional data. Typically represented as a cube, each “edge” represents a different data dimension. This allows the user to navigate the dimensions as you would a cube’s dimension – up, down, and across. Drilling up provides a courser view of the data, drilling down shows more details, and across is accomplished with slicing and dicing the data in different ways. Slicing takes a specific set of data from the cube and dicing allows viewing that data from different viewpoints.

For capacity data, OLAP cubes could be useful for analyzing and viewing any sort of multidimensional data such as process detail which includes multiple metrics about a list of processes. For example, an OLAP cube like this could be used to investigate high CPU utilization during peak times for a shared-use server.

Another advantage of OLAP cube is how the underlying data is represented. They use a multidimensional data model optimized for reads which allows for much more complex queries to be executed quicker than a data model optimized for frequent updates and inserts. Thus utilizing OLAP cubes takes additional planning to prepare the data into a data model that supports it.

SUMMARY

There are clear synergies between the tools and techniques used in Business Intelligence and, if employed, in capacity management. The purpose of Business Intelligence is to transform raw data into useful information that supports decision making which is very closely aligned with capacity management’s purpose to ensure there are enough IT resources to support the business at the expected service level. In order to fulfill capacity management’s purpose, a capacity manager must first analyze and understand the raw data being collected and turn it into information which can be used to make decisions about how to allocate or purchase IT resources.

REFERENCES

[1] IT Process Maps wiki, “Capacity Management”, Retrieved from https://wiki.en.it-processmaps.com/index.php/Capacity_Management