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U.S. Marine Corps

COMPUTING CAPACITY MANAGEMENT

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1. PURPOSE. To provide an overview of the Capacity Management procedures and documentation standards which are required by reference (a)

2. AUTHORITY. This publication is published under the auspices of reference (b)

3. APPLICABILITY. The guidance contained in this publication is applicable to all contractors and Marine Corps personnel responsible for system development. The standards are applicable to the Marine Corps Reserve.

4. DISTRIBUTION. This technical publication will be distributed as indicated. Requests for changes in allowance should be submitted in accordance with reference (c).

5. SCOPE

a. Compliance. Compliance with the provisions of the standards provided under this program is required unless a specific waiver is authorized.

b. Waivers. Request for waivers to the provisions of this program will be forwarded to the CMC (MCCTA) for action, as indicated in reference (b).

6. RECOMMENDATIONS. Recommendations concerning the contents of this technical publication should be forwarded to CMC (MCCTA) via the appropriate chain of command. All recommended changes will be reviewed upon receipt and implemented as appropriate.

7. SPONSOR. The sponsor of the technical publication is CMC (MCCTA).

5233/04
CTAS-41

Subj: INFORMATION RESOURCES MANAGEMENT (IRM) COMPUTING CAPACITY MANAGEMENT

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Information Resources Management (IRM)
Standards and Guidelines Program

Computing Capacity Management
IRM-5233-04

Enclosure (1)

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Change Number	Date of Change	Date Received	Date Entered	Signature of Person Entering Change

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REPORTS REQUIRED

Report Title	Report Control Symbol	HQMC Code
ANNUAL COMPUTING CAPACITY MANAGEMENT PLAN	MC-5233-11	MCCTA

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Chapter 1

GENERAL

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Chapter 1

GENERAL

1.1. OVERVIEW. The purpose of this technical publication is to define how the Computing Capacity Management (CCM) program will be implemented and to describe the standard reporting requirements.

1.2. CAPACITY MANAGEMENT. CCM is the process by which an activity determines its computing capacity needs. It monitors and assures the cost-effective use of resources, and executes those performance improvement activities necessary to provide adequate computer service.

The basic principle of CCM is to ensure that adequate capacity exists, at the resource level, to process both existing and planned workloads. CCM also ensures that service goals are established, the system workload is classified and quantified, and hardware and software upgrades are cost-justified.

1.3. SCOPE. The standards, principles and functions described in this publication are applicable to mini and main-frame computers, local area networks (LANs) and the Marine Corps Data Network (MCDN), and deployed and developing AISs.

1.4. ORGANIZATIONAL ROLE. CCM is a decision support system with the purpose of providing automated data processing (ADP) management with both tactical and strategic planning information. In providing this information, the CCM program collects, analyzes, and reports historical and current statistical measurement data of the resource usage and capacity levels of computing systems.

1.5. INFORMATION FLOW. CCM resource utilization and capacity usage data is reported as depicted by figure 1-01. The subparagraphs below describe those pictured activities.

1.5.1. Reporting Field ADP Activity

a. The Marine Corps Computer and Telecommunications Activity, Central Design and Programming Division (MCCTA, CDPD), Quantico, VA, and the Information Resources Management Directorate (IRMD), Marine Corps Logistics Base, Albany, GA, unless otherwise noted, will be referred to as Central Design Activities (CDAs). The CDAs and the Regional Automated Service Centers (RASCs) collect, pre-process (i.e., characterize, correlate, analyze and reduce), and transmit measurement data to the central repository maintained by MCCTA. This is done using the MCDN and standardized CCM software tools. MCCTA will forward a Management Questionnaire to each site for input into the formal CCM plan.

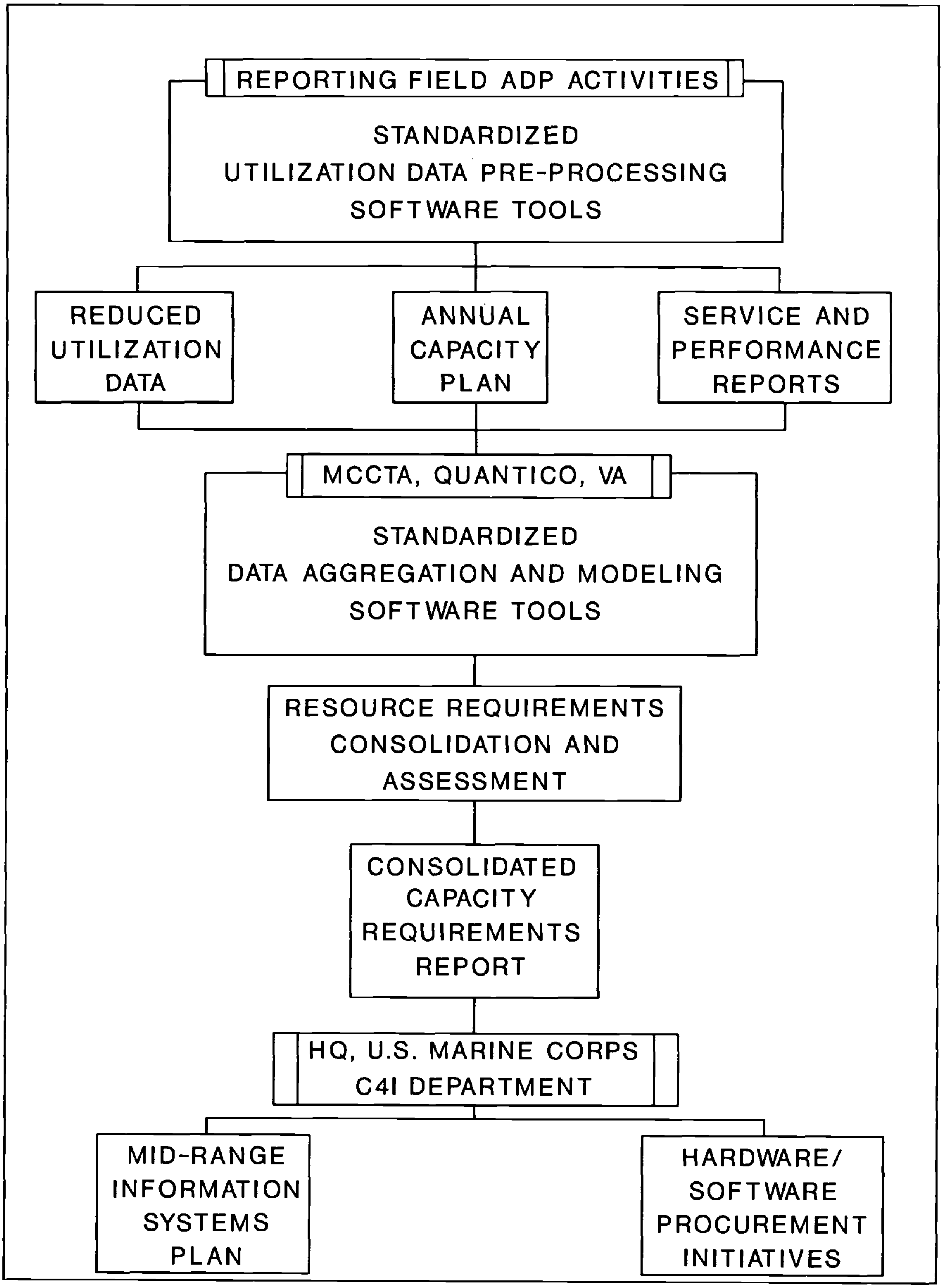

FIGURE 1-01
Information Flow

b. A formal CCM Plan is prepared and forwarded to higher headquarters annually. This plan identifies and quantifies the reporting activities' end-user service support and workload requirements, relative to the operational performance levels of their resources.

1.5.2. Central Repository

a. When data is received at the central repository site, it invokes a job to update the CCM On-line Database for each activity reporting. MCCTA will provide each site with a semiannual questionnaire to validate their IPS/ICS and reporting work groups.

b. After receiving and validating the annual CCM Plans, an analysis is conducted to determine Marine Corps-wide trends, growth patterns, forecasts, and operating capacity levels (present and projected).

c. The results of this analysis are consolidated, recommendations formulated, and the Marine Corps Consolidated CCM Report is prepared and forwarded to the Assistant Chief of Staff, Command, Control, Computer, and Intelligence (C4I) Department (Code MCCTA).

1.5.3. C4I Department. The Consolidated CCM Report provides input to the Mid-Range Information Systems Plan (MRISP) by identifying hardware and software resource requirement deficiencies (capacity shortfalls).

1.6. GLOSSARY. Appendix A contains a glossary of terms, abbreviations and acronyms that are useful in the understanding of this publication.

1.7. REFERENCES. Appendix B contains an alphabetic listing of the reference material used to prepare this publication.

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Chapter 2

CCM PROGRAM OVERVIEW

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Chapter 2

CCM PROGRAM OVERVIEW

2.1. OVERVIEW. This chapter defines the principle functions and activities of the CCM Program. The primary activities associated with performing the principle CCM functions are as follows:

a. Data collection and analysis.

b. Planning.

c. Reporting.

d. Management review and control.

2.2. FUNCTIONAL ACTIVITIES

2.2.1. Data Collection and Analysis Activity. Data collection and analysis involves collecting measurement data on the way the workload uses the resources. The three elements that comprise this function: instrumentation, workload usage, and performance control, are described below.

a. Data obtained by the instrumentation must be internally consistent, statistically valid, and represent both capacity usage and the time required to process the workload. The raw data collected by this system needs to be processed into more directly usable forms. This is accomplished by software measurement "tools" that reduce and analyze the data and with a CCM data base (CCM/DB). Current practice is to have separate measurement tools provided for each software service environment.

b. The role of workload usage, trend, and characterization is to determine the capacity requirements of the workloads processed and to detect trends in both usage and the characterizations themselves. The data collected in this effort will be used in the planning activity to develop formal workload forecast plans, establish hardware requirements, and identify performance improvements. This data is then used to compare actual usage against formally planned levels of usage. A difference between actuals and planned implies that there are discrepancies with the hardware configuration that need to be examined.

c. The ability to predict the capacity usage of a hardware configuration, either present or planned, constitutes effective performance control. Comparison between actual and planned levels of usage is of prime importance. A 5-10% variance between actuals and planned is considered acceptable for strategic planning purposes.

2.2.2. Planning Activity. Since all the planning activities of CCM are dependent on the workload characterization and forecast activities, the ability to develop accurate and reliable workload forecasts in a form requisite by the other functions is the key to successful planning. CCM software tools gain their functionality from the workload definitions and the IPS/ICS files for each reporting site. Any changes to these files must be coordinated with MCCTA in order to maintain data integrity in the CCM/DB.

a. Workload characterization consists of identifying and classifying the resource consumption of workload classes, at various levels of detail, to develop workload "profiles." Workload forecasting describes the expected workload over an interval. Hardware plans, performance plans, etc. are based on this description of expected workload.

b. A Workload Forecast Report will be prepared twice yearly and contained in Section III of the CCM Plan. Once prepared, a formal management review will occur with "sign-off" by the director of the installation and the designation of this forecast as the "standard forecast." All reports, capacity plans, rates, and other means of using this plan will use this report as its base.

c. The capacity planning activity must determine the most cost effective manner of providing the required resources, subject to a variety of constraints. This activity requires the capability to calculate the capacity of the system, to predict the elapsed time required to process the workload within service-time constraints, and to establish the unused capacity available for future growth.

2.2.3. Reporting Activity. The annual CCM Plan, report control symbol (RCS) MC-5233-11, will be prepared and sent to the Director, MARCORCOMTELACT, 3255 Myers Ave., Quantico, Virginia 22134-5048 (Code G9E) to satisfy the planning submission requirements of the MRISP. The report is due by 15 July, annually. This plan will be developed using the methodology, procedures, and software tools described in this publication. It consists of five sections that relate actual capacity levels to planned usage, in relation to end-user requirements. Appendix C contains the standard format of this plan.

2.2.4. Management Review and Control. Central to CCM is the management review and control activity. Capacity reports should be reviewed, on a monthly basis, by the activity director. Since these reports reflect the forecasted computing system growth relative to workload growth and requirements, a plus or minus ("+","-") variance in the forecast must be identified.

Chapter 3

SERVICE MANAGEMENT

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Chapter 3

SERVICE MANAGEMENT

3.1. OVERVIEW. This chapter defines both the scope and standards of the Service Management function.

3.2. SERVICE MANAGEMENT. Service Management is the process of defining and negotiating levels of end-user service. This process is formalized through a written agreement between end-users and CDA/RASC management. The formal written agreements are called Service Level Agreements (SLAs). They address the methods used to measure, control, report and manage resources to achieve agreed upon levels of service. The standard activities that Service Management involves are as follows:

a. Service Catalog.

b. Natural Forecast Unit (NFU) analysis.

c. Service level objectives.

d. Service level agreements.

e. Reporting.

3.3. METHODOLOGY. Service Management involves identifying, measuring, and reporting the service provided to end-users to meet their needs. This methodology includes classifying the service provided, identifying, validating and forecasting end-user requirements, negotiating service levels, establishing service-level objectives, and reporting service measurements.

3.4. SERVICE CLASSIFICATION. Service classification is the activity of defining and describing the logical categories of service provided in a way that eases measurement, control, and reporting. Without service classification it is impossible to identify the proportion of support provided by the CDA and/or RASC to end-users. The standard service classification categories are listed in the following subparagraphs.

3.4.1. Mission Essential Support. This classification describes those AISs that provide essential support for mission accomplishment (i.e., those AISs identified for contingency support).

3.4.2. Tactical Support. This classification describes those AISs that provide tactical support for mission accomplishment (e.g., the Marine Air/Ground Task Forces (MAGTF) lift Model, etc.).

3.4.3. Administrative Support. This classification describes those AISs that provide non-tactical administrative support for mission accomplishment (i.e., Distributed Office Support System (DISOSS), Electronic Mail System (ELMS), etc.).

3.4.4. Information Services Support. This classification describes those support services provided by the CPA/RASC (e.g., analysis and design, application programming, operating systems software support, etc.).

3.5. SERVICE CATALOG. The objective of the Service Catalog is to define and describe the services provided by the CDA and/or RASC, both systems software and AISs. This document must be tailored specifically to the CDA and/or RASC, reflecting only those services supported by that activity. It is then used as the basis for negotiating service levels. Once prepared, this document also serves as the data centers' software inventory schedule. At a minimum, the Service Catalog will contain the following items:

a. Service Function.

b. Service Name.

c. Description.

d. Machine Identification.

e. Deliverables.

f. Requirements.

g. Service Level Objectives.

h. Responsibilities.

Reference Appendix D for the standard format of the Service Catalog.

3.6. NATURAL FORECAST UNIT ANALYSIS. The purpose of NFU analysis is to identify and verify those "units of work" related to service classification that have a direct correlation to service (resource) demand. NFUs will be, whenever possible, used for forecasting computing system demand.

3.6.1. Natural Forecast Unit Identification. Based on the type of data processing (DP) service and application, the service analyst will select a list of "candidate" NFUs, e.g., those that accurately exhibit changes in the workloads' activity level(s). For example, the types of NFUs plausible for this purpose are: the number of personnel (military and/or civilian), the number of data terminals (e.g., access points), reports produced, input/output transactions, etc.

3.6.2. Natural Forecast Unit Validation. After selecting a "candidate" NFU, it must be validated to determine its exactness as a forecasting unit of work for any given set of resources.

This validation consists of analyzing the relationship between software work performed (a function of the NFU) and the CPU and I/O complexes, e.g., the effect that work has on resource consumption in terms of percent of utilization.

3.6.3. Natural Forecast Unit Forecasting. Forecasting service demand based on NFUs assumes that NFUs have a direct relationship with the level of the DP workload. Also, that this relationship is quantifiable and consistent for extended intervals. Mathematically, these assumptions state that, there exists an NFU to DP workload relationship as follows:

$$Y = F\ (X1, X2, X3 \ldots Xn)$$

Where:

Y is the DP workload.
X is the activity level of the NFU.
F is the functional relationship between these variables.

3.7. SERVICE LEVEL OBJECTIVES. The Service Level Objectives define "what" levels of service the CDA and/or RASC can support. Once determined, the service level objectives will be formally documented and published to the end-user community.

3.7.1. Quantitative Measures. The purpose of this activity is to determine the quantitative measures of productivity by which service can be evaluated. The measures selected must be statistically valid. The standard measures are as follows:

a. System availability, expressed in terms of mean-time-between-failure (MTBF).

b. System reliability, expressed in terms of mean-time-to-repair (MTTR).

c. Timeliness, expressed in terms or response time (RT), turnaround time, or delivery time.

d. Access points, expressed in terms of terminals or operators.

e. Volume, expressed in terms of I/Os, EXCPs, average blocksize, CPU seconds, etc.

f. Mix, expressed in terms of service workload.

3.7.2. Qualitative Measures. The purpose of this activity is to determine the qualitative measures of productivity by which service can be evaluated. To the maximum degree possible, these measures will be "quantified." The standard measures are as follows:

a. NFU expressed in terms of the amount of NFUs to be processed.

b. Security, expressed in terms of the degree to which automated information system assets are protected against threats and vulnerabilities as it equates to the Annual Loss Expectancy (ALE) (re. MCO P5510.14).

c. Accuracy, expressed in terms of how "up-to-date" (real time) data is, the completeness of the data that exists, the functionality (usability) of existing data.

d. Quality of service, expressed in terms of the number of reruns of production jobs, readability of output reports (re. paragraph 3.7.4).

e. User satisfaction, expressed in terms of a "scaled" rating.

3.7.3. Service Workloads. The purpose of identifying service workloads is to predict the capacity needed to meet a given service time. Service workload data will be grouped into one of the following four standard sub-classifications.

3.7.3.1. Response Time Workloads. Consists of those applications that have an on-line RT service requirement (e.g., TSO, DISOSS, ELMS, etc.).

3.7.3.2. Deadline Workloads. Consists of those applications that have a rigid scheduled time by which all processing must be completed (e.g., first-shift batch, 0900-1100 daily, etc.).

3.7.3.3. Turnaround Workloads. Consists of those applications that have a guaranteed throughput rate associated with them (e.g., CICS jobs).

3.7.3.4. Daily Completion Workloads. Consists of any remaining applications that do not fall into any of the previously listed classifications but must be completed prior to the beginning of the next work day (i.e., all other work).

3.7.4. Problem/Change Management. The primary objective of this activity is to monitor and report the actual levels of reliability, availability, accuracy, and quality of service provided by the CDA and/or RASC. This activity includes identifying perceived problems, initiating corrective action, and monitoring and reporting problem resolution. The following subparagraphs describe each of these processes.

3.7.4.1. Problem Management. Problem Management is the process of detecting, reporting, tracking, and correcting problems that impair any of the services provided by the CDA and/or RASC. A "problem" is un-planned interruption of, or deviation from, agreed-upon levels of service. Problem Management is concerned with reliability, expressed in terms of MTBF, and availability, expressed in terms of MTTR.

3.7.4.2. Change Management. Change Management is the process of modifying the production work environment. Change management differs from Problem Management in that the modification was both anticipated and planned for. This activity is concerned with the quality and accuracy of service provided by the CDA and/or RASC. A "change" can be applied to either the hardware or software system or to an application system. In all such cases, end-users will be notified far enough in advance to adjust their work schedules appropriately.

3.7.4.3. Service Evaluation. The perception that the end-user has about the quality of service provided is critical to the Service Management function. This perception will be quantified. The purpose of performing the end-user service evaluation is to quantify that perception. At a minimum, this activity will be conducted semi-annually and to coordinate with the negotiation of SLAs. The standard end-user quality Evaluation Survey, contained in Appendix E, will be used in accomplishment of this activity. The results of this survey will be reported to the Director of the CDA/RASC.

3.8. SERVICE LEVEL AGREEMENTS. SLAs are the basis of an effective service management function. The purpose of SLAs is to provide the CDA/RASC technical staff with a tool to manage their activities in a proactive instead of reactive manner. SLAs are agreements between end-users and the CDA and/or RASC that specify the volume and mix of end-user work to be processed in specified intervals, with given resources, for the duration of the agreement.

3.8.1. Content and Format. SLAs will contain the following standard items:

a. Identification of agreement parties.

b. A description of the work to be processed, including type, volume, mix, and time of arrival.

c. The service levels to be provided, including RT, turn-around time, deadlines, accuracy, and availability (for both normal periods and contingencies).

d. A performance reporting procedure specifying the frequency and types of reports to be provided to end-users and CDA/RASC management.

e. Provisions for modifying the agreement.

f. An expiration date.

The standard format for SLAs is contained in Appendix F.

3.9. REPORTING. The Service Level Report will be prepared as defined in this chapter. The standard format is depicted in Section II, Appendix C.

3.9. REPORTING. The Service Level Report will be prepared as defined in this chapter. The standard format is depicted in Section II, Appendix C.

Chapter 4

WORKLOAD MANAGEMENT

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Chapter 4

WORKLOAD MANAGEMENT

4.1. OVERVIEW. This chapter defines both the scope and standards of the Workload Management function.

4.2. WORKLOAD MANAGEMENT. Workload Management is the process of classifying, characterizing, and quantifying the existing and forecasted workload requirements of the computing system. The objective is to sub-divide the workload into groups, called a workload profile, that have common characteristics in a way that can be related to the planning objectives. Since this activity initiates the capacity management process, it has a fundamental role in determining the success of that effort. The standard functions of Workload Management are as follows:

a. Objectives.

b. Classification.

c. Characterization.

d. Impact analysis.

e. Administration

f. Forecasting.

g. Reporting.

4.3. METHODOLOGY. Workloads will be defined according to the planning purpose (objectives) for which they will be used. Figure 4-01, is an overview of this methodology. Systematically, Workload Management includes the following seven phases:

a. Objectives Phase. Consists of identifying and defining current and new workloads for planning purposes.

b. Classification Phase. Includes classifying workloads by subsystem, functional account, and service level requirements.

c. Characterization Phase. Involves characterization of workloads by CPU, I/O, memory, etc. requirements.

d. Impact Analysis Phase. Involves analyzing the workload to determine the average peak, workload growth patterns.

e. Administration Phase. Includes identifying, analyzing, and reporting on workload patterns and growth forecasts.

f. Forecasting Phase. Involves the quantitative and/or qualitative description of the workload, and the internal and external validation of the forecast.

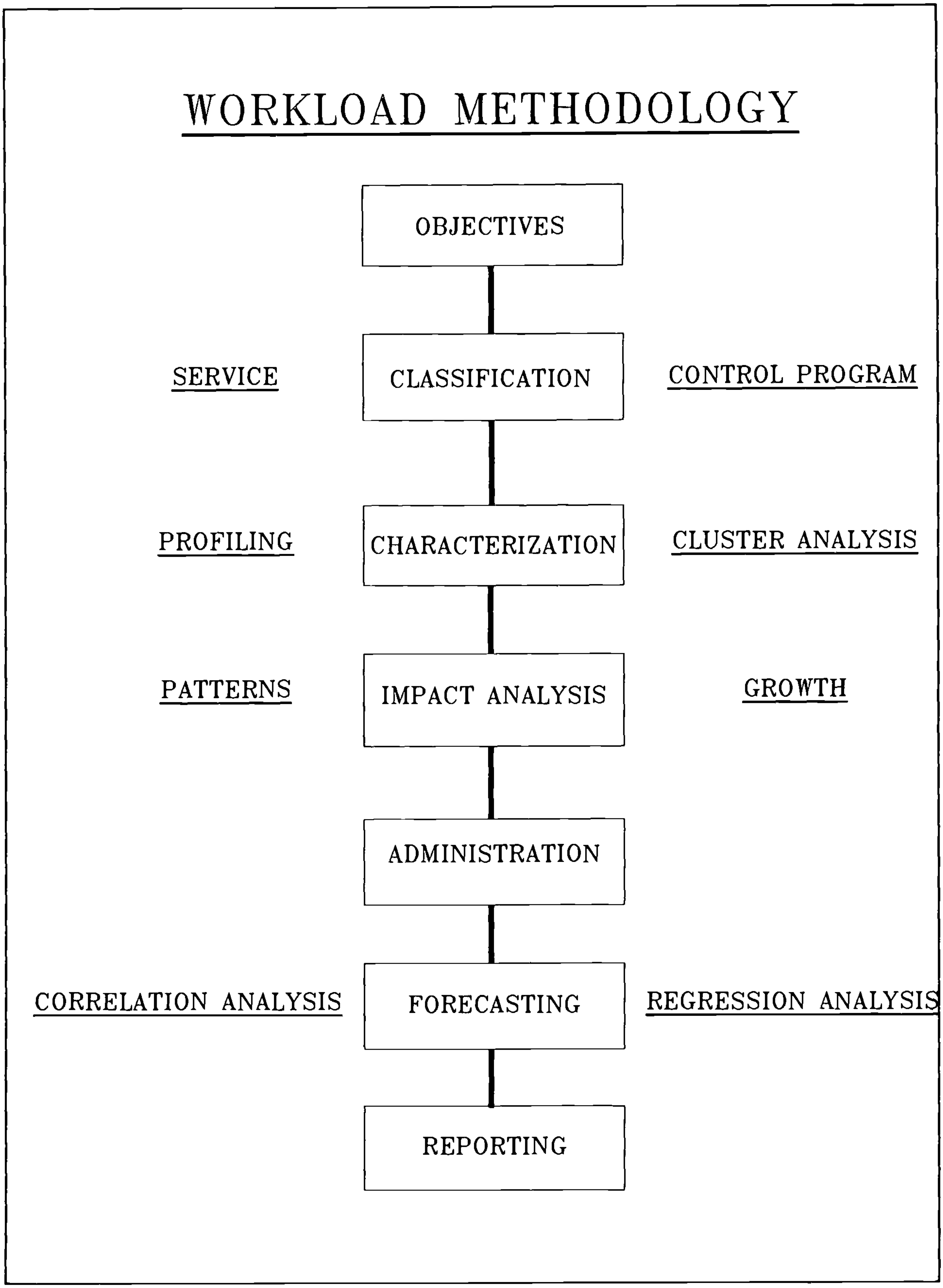

Figure 4-01
Workload Management Overview

g. Reporting Phase. Consists of development and acceptance of user, management, and technical reports.

4.4. WORKLOAD CLASSIFICATION. The purpose of workload classification is to predict the completion time or rate of the components of the service workload (equivalently, the capacity needed to meet a given service time). Workload classification is the first activity to be done when starting a capacity management project. This activity consists of creating groups of jobs or transactions according to their identifying information such as job name, class, accounting codes, etc. The objective is to create clusters of Information Systems (ISs) that have common traits; i.e., they belong to the same on-line application, their resource usage is affected by the same NFU, they run in the same system control-program environment, etc.

4.4.1. Workload Classification Perspectives. As with any planning effort, clear objectives in determining requirements is of maximum concern. Placing the workload into a proper planning perspective is the first step in defining the relationship of end-user support requirements and the corresponding computing system resource requirements. The critical point in workload classification, is to neither interfere with nor interrupt ongoing organizational planning. This activity must complement that effort.

4.4.2. Workload Classifications. To develop general concepts and techniques that will remain valid through a wide range of computer architectures, workload classifications must remain independent of equipment characteristics. Since a workload is classified for a specific purpose, it is necessary to identify the purposes that are of major concern. The standard types of workload classification groupings that will be used for planning purposes are defined below.

4.4.2.1. Service Workloads. The purpose of this type of workload is to predict the capacity needed to meet a given service time. Data will be grouped into one of the following four standard sub-classifications.

a. RT Service Workloads. Consists of those applications that require on-line RT service.

b. Deadline Service Workloads. Consists of those applications that have a rigid scheduled time by which all processing must be completed.

c. Turnaround Service Workloads. Consists of those applications that have a guaranteed throughput rate associated with them.

d. Daily Completion Workload. Consists of the remaining applications that do not fall into any of the previously listed classifications but must be completed prior to the beginning of the next work day.

4.4.2.2. Control Program (CP) Environment Workloads. The basic purpose of this type of workload is to predict the amount of load generated within the various control-program environments by the corresponding workload. For MVS systems, these workloads can be directly extracted from the SYS1.PARMLIB member, IEAIPSXX. The standard workloads will be defined as follows:

a. Batch.

b. TSO.

c. On-lines.

d. COMPLETE.

e. CICS.

f. Office Information Systems.

g. Information System Development.

h. Information System Maintenance,

i. System Security (CA-Top Secret).

j. Network (VTAM).

k. Operating System Overhead.

4.5. WORKLOAD CHARACTERIZATION. The Marine Corps adheres to a "cluster analysis" approach to characterize workloads. The benefit of this methodology is twofold: (1) minimal time is spent collecting, analyzing, forecasting, and modelling input, and (2) output from the modelling process parallels the headquarters-level IRM planning efforts. Workload characterization is defined as a statistically valid description of computing system workloads that is intelligible to the organization and can form the basis for forecasting. The objective of this activity is to gain an understanding of the resource usage for each system workload. Workload characterization is fundamental for performance tuning and service-level analysis. Finally, it is a vital element in creating workload forecasts that serve as input to predictive models.

4.5.1. Cluster Analysis. A workload characterization and forecasting methodology should facilitate the performance of any workload type of forecasts. Cluster analysis is a "pattern recognition" approach toward understanding workloads and their effect on the computing system. Clustering workloads is an attempt to gain understanding, through generalization, at the expense of detail. Clustering workloads uses techniques developed for pattern recognition, wherein large collections of data are reduced and represented by natural patterns. The natural patterns developed are called clusters. For the purposes of Marine Corps CCM studies, workloads will be clustered hierarchically, according to the following standard attributes:

a. Functional System category.

b. Control program workload.

c. Resource usage.

(1) CPU execution time (TCB and SRB).
(2) Memory allocated.
(3) Memory used.
(4) Channel requirements.
(5) Direct access device (DASD) requirements.
(6) Magnetic tape drives allocated.
(7) Number of disk I/O requests (EXCPs).
(8) Number of tape I/O requests (EXCPs).
(9) Lines printed.

d. Work period.

(1) First shift, 0800-1600.
(2) Second shift, 1600-2400.

4.5.2. Workload Profiling

a. The workload profile is a formal, comprehensive summary of the past and predicted future resource usage, service, and growth characteristics of organizationally related applications. It contains the result of technical data collection and analysis and serves as the basis for forecasting. Once clustering is completed, the workload statistics will be summed and placed into their respective application system category. When completed, the workload profile will serve as the workload inventory schedule.

b. The standard functional system workload categories that will be used are as follows:

(1) Aviation.

(2) Financial.

(3) Logistics.

(4) Manpower.

(5) Training.

(6) Command, Control, Communications, Computers, and Intelligence (C4I).

(7) Plans, Policies, and Operations.

4.6. IMPACT ANALYSIS. The objective of conducting an impact analysis is twofold: (1) to assess workload patterns, and (2) to assess workload growth. In accomplishing this activity the workload analyst gains insight into the effect the operational workload has on the system configuration. This process is simplified somewhat in the Marine Corps since only peak processing periods will be considered. The CCM On-line Database product will be used for determining CP-type service workloads. All other types of service workloads will use an appropriate CA-JARS report.

4.7. WORKLOAD ADMINISTRATION. The objective of workload administration is to develop workload acceptance criteria. To accomplish this objective, the workload analyst must perform the following tasks:

a. Identify, analyze, and report on workload patterns and growth.

b. Demonstrate the effects of these patterns on resource usage and service.

c. Recommend contingency planning actions for an "out of capacity" situation.

4.8. WORKLOAD FORECASTING. Forecasting is defined as "projecting the past into the future." The objective of workload forecasting is to provide the best possible estimates of future resource usage. The CCM software tools provide forecasting information utilizing the CCM/DB. The fundamental goals of workload forecasting in the Marine Corps are to gain a detailed understanding of the effect of workloads on system configurations and to provide input to model development. A Workload Forecast and End-user Survey will be conducted annually, to coordinate with submission of the CCM Plan. The results will be used as input to the forecasting process. To accomplish this goal, two standard methods have been selected to provide the basis for modelling:

a. Regression analysis.

b. Correlation analysis.

4.8.1. Regression Analysis. The least-squared, linear regression is a commonly used regression analysis method to find the best fitting line of a given set of data. It exacts a line that fits the data points with a minimum sum of the squares, of the error of estimation. The general equation for the least-square line approximating the set of points (X_1Y_1) . . . . (X_nY_n) is:

$$Y = a+bX$$

Where:

Y is a random dependent variable being compared to X
a is the slope of the line
b is a regression coefficient, and
X is a random independent variable being compared to Y

The general equation is also valid for forecasting both trend and seasonal data point movements.

The results produced through this analysis will be recorded into the Workload Profile Matrix (WPM).

4.8.2. Correlation Analysis. Although regression analysis techniques provide a solid foundation for building an accurate workload forecast, there are inherent shortcomings. Primarily, its inability to account for new applications or latent demand. To overcome these shortcomings, the Marine Corps adheres to the analysis and application of NFUs of work to describe growth in workload volumes. The concept of NFUs is to link end-user activities plans, with ADP activities plans. By using correlation analysis techniques, NFUs can be converted into resource units (i.e., CPU seconds, Execute Channel Programs (EXCPs), etc.).

This correlation is not always obvious and requires a two-step process as described below:

a. The NFUs need to be identified and forecasted.

b. The relationship between NFUs and resource usage must be examined by a mathematical equation to validate the relationship.

4.8.2.1. NFU Identification. (re: paragraph 3.6.3).

4.8.2.2. NFU Forecasting. Increases or decreases of NFUs have a direct correlation on the total amount of capacity necessary to provide the required service. Once the percentage of increase/decrease of NFUs is determined and recorded in the workload profile, the results may be directly used as input to the modelling process. The annual Workload Forecast, End-user Survey, Appendix G, will be used to ascertain these values.

4.9. REPORTING. The Workload Summary Report will be prepared as defined in this chapter. The standard format is depicted in Section III, Appendix C.

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Chapter 5

PERFORMANCE MANAGEMENT

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Chapter 5

PERFORMANCE MANAGEMENT

5.1. OVERVIEW. This chapter defines both the scope and standards of the Performance Management function.

5.2. PERFORMANCE MANAGEMENT

a. The Performance Management function is a control-oriented, problem-solving mechanism begun by a need to improve system performance or to optimize the use of available resources. For this function to be effective, service levels must be already established and the system workload profiled. This function will be completed prior to initiating a capacity study and uses the Workload Forecast Report to guide the performance and tuning, capacity planning, and modelling activities.

b. The objective of Performance Management is to determine if there is sufficient capacity at the resource level to satisfy both present and projected user processing demands in relation to established service level objectives. The standard activities of this function are as follows:

(1) Configuration design.
(2) Performance and tuning.
(3) Capacity planning.
(4) Modelling.
(5) Reporting.

5.3. METHODOLOGY. The Marine Corps employs an operational research approach for performance management activities. All pertinent data are collected and compared to provide management with factual, quantitative evaluations that are measured for the relative merits of possible courses of action. Confidence in decisions are based on the completeness of the model, the evaluation of the model, and analysis.

5.4. CONFIGURATION DESIGN. The objective of this activity is to identify performance capabilities, monitor performance, and maintain capacity according to engineering specifications. This activity includes maintaining an equipment inventory schedule and a current and accurate schematic drawing of the existing computing system configuration by sub-configuration. This schematic will be used in a variety of ways including: capacity analysis, modelling, facilities planning, and reporting.

5.5. PERFORMANCE AND TUNING. Generally, the Marine Corps adheres to the “Kreuter Methodology” for its performance and tuning (computer performance evaluation) activities. The performance and tuning activity includes analyzing and quantifying the data collected by the instrumentation system, determining the most effective way to allocate resource capacity, and adjusting the system performance tuning parameters. The objective of this activity is to allocate available capacity in the manner required to satisfy service level objectives. Accordingly, measurements must be made for each system sub-configuration at the resource component level.

Computer performance evaluation (CPE) is defined as the application of special tools, techniques, and analytical methods to improve the efficiency or productivity of existing or planned computing systems. CPE is concerned with the evaluation and rationale (analysis) of the system queues. The objective of CPE is to determine the most efficient manner to distribute the workload and to determine the capacity levels of system resources. For a detailed explanation of this activity, and its associated standards, refer to the IRM Technical Publication IRM-5233-05, COMPUTER PERFORMANCE EVALUATION.

5.6. CAPACITY PLANNING

5.6.1. System/Subsystem Configuration. The initial step is to generate a configuration schematic of the system/subsystem that is being analyzed. This schematic will be used as both a graphical depiction of the system/subsystem and to record utilization and usage values.

5.6.2. Peak Non-reschedulable. Next, determine the global resource active value during peak non-reschedulable periods. The following four steps will be performed (these apply to both on-line and batch).

a. Determine the processing period when on-line/batch processing dominate the system.

b. Develop the average resource utilization in 30-minute to 1-hour increments for on-line and batch during the defined processing period.

c. Select those intervals when resource usage is consistently high, and establish the peak period (Batch must be a result of viewing many time periods, and must not contain less than 16 hours of samples. The schedule “peak batch processing period” will not contain less than 4 contiguous hours of processing).

d. Compute the “average” resource utilization during the peak processing period.

5.6.3. Global Utilization. When both Peak On-line and Peak Batch average resource utilizations have been determined, the two must be compared to determine which one should be used for global CPU utilization.

a. High CPU usage during Peak On-line. Usually, this period will yield the greater CPU usage value. This will occur when on-line processing usage dominates the system during the processing period. This developed CPU value will be used as the global CPU use, during peak, non-reschedulable periods.

b. High CPU usage during Peak Batch. If this value is the greater of the two, further analysis is required to ensure that:

(1) sufficient measurement data and time periods were used in the computation of the global CPU active (CPU busy average) to ensure its validity as "global," and

(2) that the vast majority of the workload being executed cannot be rescheduled.

5.6.4. Determine Growth Potential. Finally, determine the growth potential. This is a computed value that defines the percentage that a workload can grow before the capacity limit is reached. Growth potential will be stated as follows.

$$\frac{\text{Capacity Limit}}{\text{Current Use}} - 1.0 = \text{Growth Potential}$$

5.6.5. CPU Analysis. CPU Analysis is the process of determining the amount of CPU resource that is available to the system for the performance of productive and quasi-productive (ie: systems maintenance) work. Viewed globally, the CPU is a serial resource that reaches exhaustion at approximately 85% utilization.

5.6.6. Disk Subsystem Analysis. The disk subsystem normally represents the most complex area of a computing system to analyze. It also can have the highest return-on-investment (ROI), for man-hours expended, while having the greatest impact on the system. Disk subsystems should be viewed as a set of resources independent of the CPU, i.e. a stand-alone system that begins at the external data controller (EXDC). Regardless of its complexity, only two problems need to be addressed, overload and contention.

5.6.7. Configuration. The system components that must be considered when determining overload and contention points in a disk sub-system analysis are as follows:

a. Channel. Channel-use (aka, CHPID) is a function of the performance level of the disk drives attached to the system.

b. Disk Control Unit (DCU). DCU activity is a function of the combined disk I/O requests originated and the disk performance level.

c. Disk Drive (Spindle). Spindle activity is a function of I/O requests to the disk, data sets resident on the disk, and contention for the path from the disk to memory. Analysis will include examination for the following conditions:

(1) Path Overload. The ramification of an overloaded or "blocked" path is an extended time to perform an

to a disk drive along that path. This may be validated through computation of I/O execution times for multiple busy disks along the path. A maximum of 25 to 30% use for the path (i.e., channel, DCU and string) is considered acceptable.

(2) Disk Overload. The ramification of an overloaded disk drive is both an expanded I/O execution time, due to increased rotational delay, and I/O service time. If drive overload is the only problem that effects the disk, I/O execution may be well within the standard. A maximum of 5% queuing is considered acceptable.

(3) Standard I/O Execution. The standard execution time is dependent upon the specifications of the drive. Too low an execution time may show poor blocking, a data set read in a serial fashion, or an index that should be considered for forced memory residency. The normal range is 22 to 30 milliseconds per I/O.

(4) Disk I/O Error Recovery. Excessive error recovery will cause the same problems as an overloaded disk, with an additional loss of CPU cycles. One percent (1%) should be considered unacceptable.

(5) Head Movement Time. On an active disk drive, at current specifications (3380-type technology), head movement time should be in the ranges indicated below.

	Single Density	Dual Density	Triple Density
Seek	8-10 ms	8-10 ms	12-20 ms
Latency	10-14 ms	10-12 ms	8-12 ms
Transfer	7-10 ms	5- 8 ms	5- 8 ms

Greater average time indicates head movement problems on a disk, with associated loss in throughput. A much greater average time may show poor blocking, and result in a loss of program throughput and CPU cycles due to additional I/O program executions.

5.6.8. Tape Subsystem Analysis. Magnetic tape subsystem analysis is similar to disk subsystem analysis in that the magnetic tape resource is connected to the computing system in a similar, but less complex, network structure. The reduced complexity is because of both reduced capabilities for concurrent operations and fewer programs in the workload mix requesting use of the tape subsystem.

5.6.9. Memory Analysis

a. Memory analysis (main memory) deals only with the quantitative characteristics of memory. The analyst needs to determine whether the system has sufficient memory to permit effective use of the system. The result can be a finding of the following:

(1) Undersubscribed memory.

(2) Optimal memory use.

(3) Oversubscribed or overloaded memory.

b. The paging subsystem of the operating system acts as a continual governor of memory usage and requirements by indicating, dynamically, the relationship between memory available and memory required. The analyst must determine the most efficient levels of paging for the system. To do this, compute the time required to perform an average I/O operation to the paging data set and compare it to the time required to perform an effective I/O to the paging device.

5.6.10. Reserve Capacity. The capacity limits stated in this chapter are conservative and generally understate the "actual" capacity limit of a resource by approximately ten percent (10%). Their use as a capacity limit will generally ensure effective fulfillment of both service-level commitments and requirements for the end-user community. It is better to provide the end-user with an agreed-upon level of service, even at a marginally inflated configuration, than to under-power and fail to meet commitments. This additional ten percent is held in reserve for out-of-capacity situations and to satisfy wartime essential processing requirements.

5.7. MODELLING. Modelling is the creation and exercise of mathematical descriptions, or models, of those portions of a computing system that estimate the operational characteristics of the system as it should operate if implemented. The Marine Corps standard is the BGS Systems, Inc., proprietary software products; CAPTURE/MVS to perform the analytical analysis of measurement data, INFO/BASE to store, retrieve, report and maintain the measurement data, and BEST/1-MVS to perform analytical modelling.

5.8. FORECASTING. Using the forecast values from the Workload Forecast Report, the "estimated life" (remaining) for the CPU resource will be determined as follows:

$$\frac{\text{Growth Potential}}{\text{Forecast}} \times 12 = \text{Estimated life remaining (in months)}$$

5.9. REPORTING. The Capacity Usage Report will be prepared as defined in this technical publication and IRM-5233-05. The standard format is depicted in Section IV, of Appendix C. A baseline model of the activities computing system will be generated via the CCM/DB (INFO/BASE) data base product using the procedures described in the BGS Systems MVS Product's User Guide. The standard format of this model is depicted in Section V, of Appendix C.

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Chapter 6

INSTRUMENTATION SYSTEM

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Chapter 6

INSTRUMENTATION SYSTEM

6.1. OVERVIEW. The purpose of this chapter is to describe the standardized instrumentation system used by the Marine Corps in direct support of the CCM Program.

6.2. SYSTEM MEASUREMENT DATA. The primary source of system measurement data for CCM, as implemented on MVS-XA systems throughout all CDAs and RASCs, are Resource Measurement Facility (RMF) and System Management Facilities (SMF) data. RMF generates system-wide performance data that represents device-oriented information. SMF collects and records a variety of job-step related or session-oriented performance data. SMF is transaction-specific and does not relate to the overall performance of the system. SMF records are created infrequently, at job-step or TSO session termination, and are frequently too detailed to see the impact of a single transaction on the system.

6.3. MEASUREMENT DATA COLLECTION. The standard system measurement data records that will be collected are described in the following subparagraphs.

6.3.1. Measurement Record Types. Those measurement data record types that will be collected are as follows.

a. RMF type: 70, 71, 72, 73, 74, 75, and 78's.

b. SMF type: 4, 30-2, 30-3, 30-4, 30-5, 34, and 40.

6.3.2. Measurement Interval. The standard measurement interval period for which data will be collected for subsequent analysis and reporting are described below.

a. RMF - These records will be collected at fifteen minute intervals (e.g., 0800, 0815. . . . 2145, etc.), from 0001 to 2400 hours daily, Sunday through Saturday.

b. SMF - These records will be collected continually from 0001 to 2400 hours daily, Sunday through Saturday.

6.4. DATA ANALYSIS. Data analysis will be accomplished using the CAPTURE/MVS and CAPTURE/MSNF products for the host mainframe computer and data communications network, respectively.

6.4.1. Host Mainframe. CAPTURE/MVS is designed to assist capacity analysis by understanding the existing environment through analysis of RMF and SMF measurement data, the Installation Performance Specification (IPS), and user-supplied data. It incorporates knowledge of internal MVS-XA characteristics to present structured, in-depth performance information about the workload processed by an installation.

6.4.2. Data Network. CAPTURE/MSNF is the data communications network "complement" of CAPTURE/MVS and is designed to assist capacity analysis by understanding the existing network boundary environment.

6.5. CAPACITY MANAGEMENT DATABASE. The central repository for the data collection and analysis functions for the host mainframe computer is the computing capacity management data base developed using INFO/BASE and SAS.

6.5.1. INFO/BASE. INFO/BASE is a capacity management data base system that is used to store, retrieve, and manipulate highly analyzed and reduced data about the capacity and performance of your system. INFO/BASE provides the following:

a. Maintain a single source for data collection of standard IBM system measurement facilities.

b. Maintain a measurement data base with a minimal amount of DASD space and personnel resources.

c. Provide summary data and statistics, such as the mean, for historical and trend analysis.

d. Interface with BEST/1-MVS through a SAS procedure and generate a baseline workload model.

6.5.2. Statistical Analysis System (SAS). SAS is a data retrieval, analysis, and reporting system with file management capabilities. SAS provides a set of tools to perform; data management and retrieval, statistical analysis, computer performance evaluation and capacity planning, report writing, graphics, and decision support.

6.6. JOB/RESOURCE ACCOUNTING

a. The Marine Corps standard, to perform the job/resource accounting and reporting function, is Computer Associates-Job Accounting and Reporting System (CA-JARS/OS). CA-JARS/OS is a comprehensive job accounting, performance measurement and reporting system.

b. CA-JARS/OS enables users to produce customized reports (System-Use Reports and Graphs) based on SMF measurement data to identify CPU, disk, tape, and peripheral resource utilization.

6.7. MODELLING. The Marine Corps standard, to perform the modelling function, is BEST/1. BEST/1 is used for analytical modelling, evaluating and predicting computer system and communication data network performance. Typically, BEST/1 is used to analyze various "what if" questions for capacity planning, performance tuning, and configuration design.

6.7.1. Host Mainframe. BEST/1-MVS was designed to use the model file created by either CAPTURE/MVS or INFO/BASE as its primary input, together with user commands, and produces various user selected reports.

6.7.2. Data Network. BEST/1-MSNF was designed to use the model file created by CAPTURE/MSNF as its primary input, together with user commands, and produces various user-selected reports.

6.8. REAL-TIME MONITORS. The standard real-time monitors currently in use throughout all CDAs and RASCs are described in the following subparagraphs.

6.8.1. TMON/MVS. TMON/MVS is designed exclusively for the IBM/MVS operating system environment. TMON/MVS is a display-oriented, command-driven on-line monitor that uses a 327X or equivalent terminal to interact directly with the MVS operating system. TMON/MVS permits operators, systems, and performance analysis personnel to monitor system status (programs, jobs, CPU, MVS, etc.) in a real-time (foreground) mode. TMON/MVS can be used to modify SRM parameters without having to interrupt system operation.

6.8.2. TMON/CICS. TMON/CICS is an on-line performance monitor for the IBM Customer Information Control System (CICS) product. TMON/CICS permits both performance analysts and systems personnel to monitor CICS by providing four major facilities; exception analysis, degradation analysis, exploratory commands, and authorized commands facility. These facilities may be accessed in either external, director, or internal monitoring (of address space) modes.

6.9. OPERATIONAL CONSIDERATIONS. The standard operational considerations and procedures necessary to utilize the available CCM software "tools" are described below.

6.9.1. Access to Software Tools. Access control for BEST/1-MVS, BEST/1-MSNF, and INFO/BASE is the responsibility of MCCTA (Code G9E). G9E acts as both the INFO/BASE Database Administrator (DBA) and the Division Security Administrator (VCA) for all CCM Program software and data. Access control is applied using Top Secret (TSS) by restricting access of each reporting activity to the data set name level. As an overview, those procedures that must be followed by a CDA/RASC to gain access to these products are as follows:

a. Request your activity's VCA establish a TSS user profile and USER-ID at MCCTA.

b. Once the profile is established, the activity's capacity analyst must submit a problem change management (PCM) record or send a message to MCCTA (Code G9E), for action, requesting access to the software tools. The message's subject will be CCM Software Tools Access, and will request access to the CCM/DB data of the requesting activity only.

c. Once received, MCCTA (Code G9E) will grant "read-only" access to your activity's data base data, and "all" access for temporary data sets. MCCTA (Code G9E) will then respond to the requesting activity, acknowledging that access has been granted.

d. After receiving acknowledgement of access, the requesting activity should contact MCCTA (Code G9E) via telephone to coordinate importation of standardized batch procedures for subsequent execution of the software tools.

6.9.2. Operation of Software Tools. Figure 6-01, depicts the interaction of the BGS Systems, Inc. MVS products. To use BEST/1-MVS, BEST/1-MSNF, INFO/BASE, or SAS, the user need only: (1) be able to log-on to the Marine Corps Data Network, node MQG, (2) have TSS permission to access the software tools and data, and (3) have the training required to utilize the software tools.

6.9.3. Description of Software Tools. As a brief description, the BGS software tools interact as described below.

a. Raw RMF/SMF data are pre-processed through CAPTURE/MVS. CAPTURE/MVS is a three-step process, described as follows.

(1) EXTRACTOR. Execution of this program, extracts, from an input data set, SMF, RMF, and IPS data. Specifically, SMF-type 4, 30-2, 30-3, 30-4, 30-5, 34, and 40 records; and RMF-type 70-75 and 78 records. Additionally, the extractor accumulates data from these records in internal tables. Once all records are read and selected it produces an output file for further processing by the EXTRMULT and Analyzer.

(2) EXTRMULT. Execution of this program groups the extracted data according to the aggregation interval specified (re: paragraph 6.9.3.c.(4).(a)).

(3) ANALYZER. Using the output file created by the extractor as input, this program analyzes resource consumption, based upon user-supplied interval data, performs calculations on that data, and then prepares various user-selected reports. Additionally, the analyzer can create a Baseline Model File, used by BEST/1-MVS, and a Variables File, used to populate the CCM/DB (INFO/BASE). CA-7/11 automated job scheduling software is utilized to initiate the CCM/DB population process at MCCTA by the remote site. (re: paragraph 6.10)

b. BEST/1-MVS is a single program, capable of executing either in batch mode or interactively under TSO, that is used by the capacity analyst to forecast system performance and capacity requirements. Input to the modelling program is the Baseline Model File that is generated by either CAPTURE/MVS or INFO/BASE.

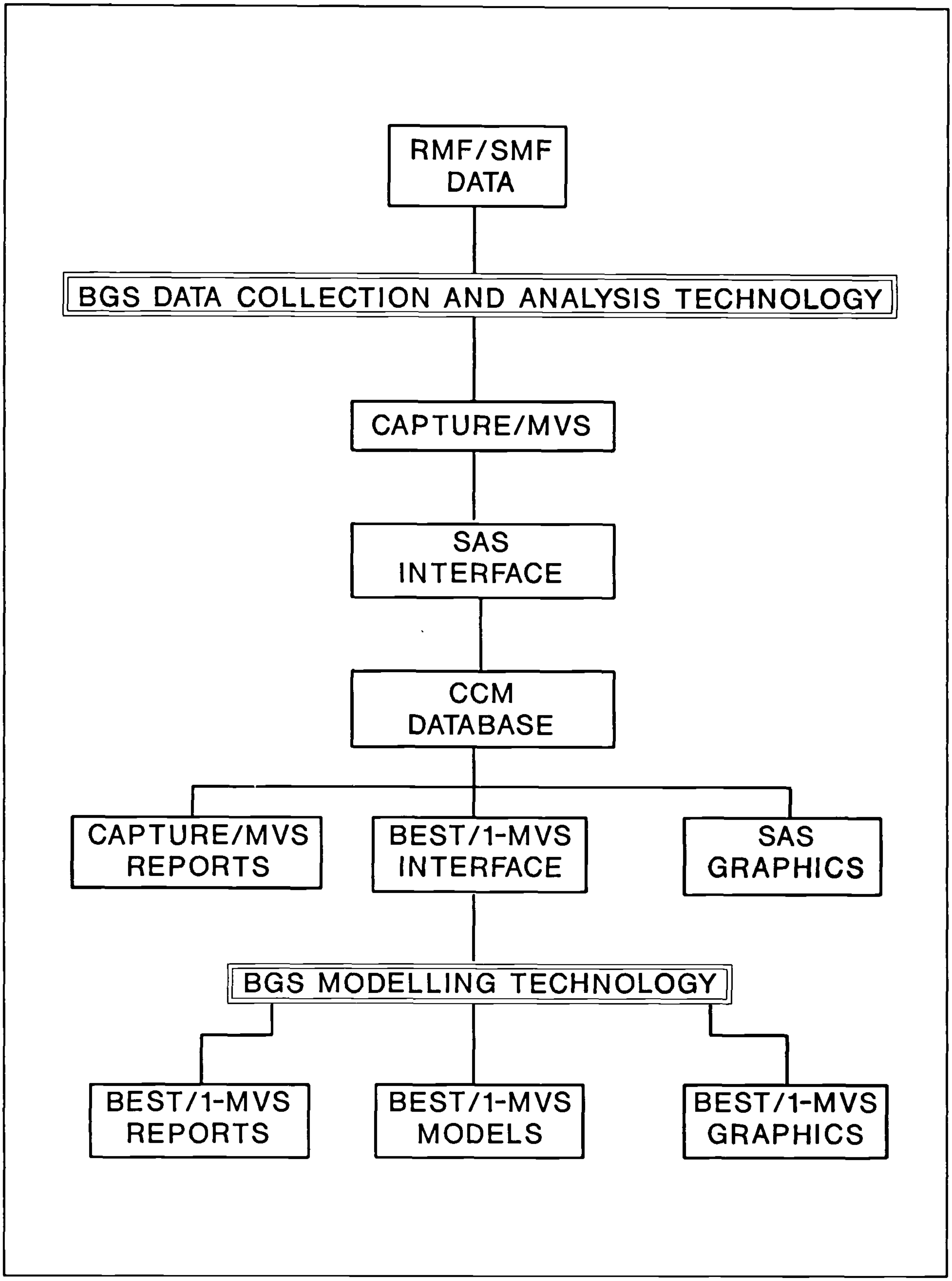

Figure 6-01
Instrumentation System Overview

c. INFO/BASE consists of the following four programs:

(1) INPUT PROCESSOR. The Variables File created by CAPTURE/MVS (re: 6.9.3.a(3)) serves as the source of system input. Execution of the input processor "populates" (i.e., adds data to) the CCM data base with detail-level data. This will occur on or about 0700 hours each day. The CCM/DB will contain the most current 60 days of detail-level data and previous months of summary-level data. The sole responsibility for database maintenance actions belongs to the CCM/DB DBA (MCCTA Code G9E).

(2) INFOMENU. This process is used to perform the Reporting and Graphics, Forecasting, Query, Modeling, User Reporting, Interactive (SAS) Processing, and Data Base Management functions. It interfaces with and extensively utilizes the capabilities of SAS, SAS/GRAPH and GDDM. INFOMENU is accessed via MCCTA "TSO APPLICATIONS MENU."

(3) MODEL GENERATOR. Although generating a baseline model is a menu item of INFOMENU, it is addressed separately because it may be executed from either CAPTURE/MVS or INFOMENU. Execution from INFOMENU is the recommended method since it does not interrupt the overall procedural/data flow.

(4) MAINTENANCE. INFO/BASE provides the following maintenance functions:

(a) AGGREGATION. A process wherein detail-level data is grouped according to a specified time span. The time span selected is 0800-1559 hours (first shift), 1600-2359 hours (second shift) and 2400-0759 hours (third shift) and is loaded in one hour intervals.

(b) ARCHIVING. A process wherein detail-level data is extracted from the data base and backed-up on magnetic tape media, according to a specified interval. When data is archived, summary-level statistics are created and stored for the period archived. Detail-level data will be archived monthly by the CCM/DB DBA.

(c) RESTORE. A process wherein detail-level data that has been archived for a specified date/time period, is extracted from an archive volume and restored to the data base.

(d) DELETION. A process wherein either detail-level or summary-level data for a specified date/time period, is permanently removed from the data base.

d. CAPTURE/MSNF is a single program, capable of executing in either batch mode or interactively under TSO, that is used by the network capacity analysts to forecast data communications network (boundary) performance. Input to this data reduction/analysis program includes: VTAM and NCP configuration source code, VTAM buffer contents trace, VTAM log, and network log data. Output consists of various reports and the network Baseline Model File.

e. BEST/1-MSNF is a single program, capable of executing in either batch mode or interactively under TSO, that is used by the network capacity analyst to forecast data communications network performance and capacity requirements. Input to this modelling program is the network Baseline Model File that is generated by CAPTURE/MSNF.

f. SAS/SASGRAPH. These products provide the user with additional statistical analysis and graphics capabilities and may be executed as a selected function from INFOMENU or as separate batch-mode procedures. While either is acceptable, execution via INFOMENU is strongly recommended.

g. The CA-JARS/OS and LANDMARK products can be found at each of the five major Marine Corps ADP sites. Utilization of these products is at the discretion of the Director of the CDAs and/or RASCs.

6.10. DATA AGGREGATION. As a standard, RMF/SMF data will be collected by the reporting ADP activity, processed using CAPTURE/MVS, and forwarded to MCCTA (ATTN: CODE G9E) daily. This data will be transmitted across the MCDN during non-critical work hours, 2400-0600 hours local time (0800 EST, 2300 ZULU). Once this data is received at MCCTA it will be aggregated into its respective database by the CCM/DBA thus completing the process-transmit-update cycle. Data set naming conventions for the transmitted data sets are as follows:

a. DSN=&HLVLQUAL.ANALYZER.&SYSID.VARFILE(+1), where:

HLVLQUAL = Your activities high-level data set name, qualifier valid under TSS, with “create” authority.

SYSID = The system identifier of the processing complex being reported.

b. Of significant importance to the processing requirements of CAPTURE/MVS are the installation control specification (IEAICSxx), and installation performance specification (IEAIPSxx), system parameter library (PARMLIB) members. This information is critical to the analysis of system measurement data and maintenance of the CCM/DB and must be kept current. Changes made to any of these members must be reflected in both the 'EXTRACTOR.CMDSLIB' and 'ANALYZER.CMDSLIB' user files.

6.11. DOCUMENTATION. Detailed descriptions of the execution of these products may be found in their respective user/reference guides. The BGS Systems MVS and BESTnet Products User's Guides and technical manuals should prove particularly useful in understanding the interaction of these products.

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APPENDIX A

GLOSSARY

Actual Costing: The process of determining actual costs based on actual usage.

Analytical Modelling: A subset of simulation; a deterministic, mathematical representation of an information computing system whose independent variables (inputs) produce a single set of dependent variables (outputs). Analytic modelling is the use of numerical logic models of a computing system, concept, or operation used to examine its expected behavior. Analytic modelling is most useful during the operations phase of a computing system's life cycle for testing the effect of relatively small changes to various components of the hardware configuration and for estimating when bottlenecks will occur and which parts of the configuration will most likely cause these bottlenecks (contrast with simulation).

Baseline Model: A calibrated and validated statistical representation of the existing workload of the current information computing system configuration (see: Advanced model and Model).

Capacity: The theoretical power of an actual configuration, using standard installation parameters for block sizes, attainable multi-processing levels, instruction mixes, etc. to process the workload; a function of the combination of equipment speeds and configuration connections, and of the workload characteristics; the two basic forms of capacity are: 1) processor capacity, expressed in terms of software power, and 2) storage capacity, expressed in units of bytes-per-second or their equivalent on non-byte computer systems.

Capacity Limit: An absolute value, based upon engineering specifications and simulations, assigned as the upper productive limit and used to estimate when resource performance will be grossly degraded. (See Resource exhaustion and Resource saturation)

Computing Capacity Management: A planning-oriented process by which an installation determines its computing capacity needs, monitors and assures the cost-effective use of software and hardware, does performance improvement activities, and recovers the costs associated with providing information computing system services.

Chargeback: The process of setting and applying rates and computing total costs for the purpose of billing end-users for information computing system services.

Cluster Analysis: The process of grouping similar components whose elemental characteristics or measured performance closely approximate one another.

Computer Performance Evaluation: A control-oriented process which includes finding "bottlenecks" in the system/subsystem configuration and then balancing the workload across the system resources in order to make maximum efficient use of those resources. (See Performance Management)

Correlation Analysis: A mathematical analysis technique which determines the strength between two variables. This technique is used to examine either explicit or implicit relations of data, files, etc.

Estimated Life Remaining (ELR): A computed forecast value that estimates the time when a resource will achieve saturation (see: Resource saturation).

Forecasting: The process of calculating, through analysis and estimation, future requirements, events, or conditions.

Growth Potential: A computed value that represents the amount of additional productive work a resource is capable of accepting.

Information Resource Management: The management practice involving the integration of diverse disciplines, technologies, data bases and other information-handling resources. Conceptually, the IRM approach is a three dimensional integration consisting of: planning, people, and technology.

Model: A set of mathematical symbols, each precisely defined, that measure the relationships of the controlled and uncontrolled variables which are known and their values which are computed; a stripped-down replica of a real problem. Models are used in management science to identify, measure, and observe the characteristics of critical or sensitive components in order to predict the "real life" consequences of decisions.

Model Building: The process of creating a mathematical representation of a system for the purpose of analyzing and evaluating management decisions. The model-building effort must generalize and systemize, and through critical discrimination, to classify the elements under study.

Modelling: The creation and exercise of mathematical descriptions, or models, of those portions of the information computing system that estimate the operational characteristics of the system as it should operate if implemented.

Mid-Range Information Systems Plan (MRISP): A plan that provides information on the current status and future direction of the use of information resources and data communications technology within the Marine Corps. The MRISP provides a 7-year look ahead based on input from the functional managers and the C4I Department, HQMC.

Natural Forecasting Unit (NFU): A data item, either directly used or derivable, by the end-user that is used by her/his organization for the purpose of forecasting organizational needs and that relates to an AIS workload.

Peak Non-Reschedulable: That processing period of time in which a resource is consistently being utilized at a "high" rate and cannot be rescheduled to another time period.

Performance Management: The process of quantitatively establishing the user workload requirements in relation to the capacity of the hardware configuration (see: Computer Performance Evaluation).

Resource Exhaustion: A resource will be considered exhausted when, after either tuning is completed and/or forecasts applied, projections indicate the resource will be operating beyond the percentage levels of effective operation established through engineering specifications and evidenced in "rules-of-thumb."

Resource Measurement Facility (RMF): An IBM proprietary software monitor and measurement collection tool that is designed to measure selected areas of system activity. Essentially, RMF measures system-wide workload activity by copying various control blocks used by the System Resource Manager (SRM) component of the multiple-virtual storage (MVS) operating system. RMF is set, through system control parameters, to "awaken" and execute at predetermined intervals of time.

Resource Saturation: A resource will be considered saturated when, prior to tuning and application of forecasts, measurements indicate the resource is operating either at or beyond the established rules-of-thumb.

Response Time (RT): An implicit measurement which describes the time required to provide transactional service to a customer (user). When conducting studies where data terminals are involved, RT is defined as the time between when a customer presses the enter-key and is visually prompted again.

Service Level Agreement: A formal memorandum of agreement between end-users and the information computing system center that specifies the volume and mix of end-user AIS work to be processed, in stipulated periods of time, with given resources, for the duration of the agreement (see: Service Management).

Service Management: The process of defining and negotiating levels of end-user service (service levels) required of the information computing system center for AISs. Service management involves the identification, measurement, and reporting of service levels to end-users in order to meet service objectives (see: Service Level Agreement).

Service Rate: A computed value that reflects the number of requests processed by a server.

Service Time: A computed value that represents the amount of time required to service a request by a server; the sum of the time spent in the queue plus the time being processed by the serving facility.

Service Workload: An operational view of an information system workload which emphasizes the associated service requirements of that workload; a workload classification.

Simulation: A duplication of an environment, by a model, such that changes can be made at will to test particular outcomes of these specific actions on either the immediate problem or on the total effect (contrast with analytical modelling).

Software Monitor: Specialized sets of code that are usually (but not always) made a part of the computer's operating system and collect statistical information about distribution of activity caused by the execution of programs.

SPE: Software Performance Engineering; a set of techniques and procedures employed throughout the life cycle of an IS that are concerned with the performance aspects of software. A life cycle management function which ensures that software ISs are designed to meet certain performance criteria.

Storage Management: A major component of the operating system (OS) that consists of three modules which provide management of real, virtual, and auxiliary storage and performs allocation and deallocation of pages, page frames, and slots.

System Management Facility (SMF): An IBM proprietary software monitor and measurement collection tool that is designed to measure selected areas of system activity. SMF copies various control blocks when certain job-related events occur, e.g. configuration, paging activity, CPU time, SYSOUT activity, data set activity, etc. SMF formats this information into a number of different records.

System Resources Manager (SRM): A major component of the operating system (OS), in a broad sense SRM is concerned with the allocation of resources among address spaces. In a narrower sense the functions of SRM can be described as performance optimization within constraints set by the installation and performance monitoring in the dynamic environment of address space execution.

Throughput: A computed explicit measurement which describes the amount of work performed in a time period; the "flow" of requests into and out of a queue.

Utilization: A "dependent" mathematical variable which reflects the amount of time that a server facility is busy; actual usage.

Virtual Storage Manager (VSM): The Storage Management module concerned with allocation and deallocation of virtual storage.

Workload: The amount of work performed on an information computing system over a given period of time.

Workload Characterization: The analytical process of statistically validating and describing the system workloads in a manner that is intelligible to the organization for planning and projection purposes.

Workload Classification: The process of identifying and grouping the systems workloads in a manner independent of equipment characteristics and computer architectures for monitoring and planning purposes.

Workload Forecast: Projections of volume and mix of expected workloads (current, latent, new) over time in terms that can easily be translated into resource requirements (see: Natural Forecasting Units).

Workload Management: The process of classifying, characterizing, and quantifying the existing and forecasted workload requirements of the computing system.

ACRONYMS

ADP	- Automated Data Processing
AIS	- Automated Information System
ALE	- Annual Loss Expectancy
CCM	- Computing Capacity Management
CCM/DB	- Computing Capacity Management Data Base
CDPD	- Central Design and Programming Division
CP	- Control Program
CPE	- Computer Performance Evaluation
CPU	- Central Processing Unit
DCA	- Division Security Administration
DCU	- Disk Control Unit
DISOSS	- Distributed Office Support System
ELMS	- Electronic Mail System
ELR	- Estimated Life Remaining
IPS	- Installation Performance Specification
IRM	- Information Resources Management
LAN	- Local Area Network
MAGTF	- Marine Air/Ground Task Force
MCCTA	- Marine Corps Computer and Telecommunications Activity
MCDN	- Marine Corps Data Network
MRISP	- Mid-Range Information Systems Plan
MTBF	- Mean-Time-Between-Failure
MTTR	- Mean-Time-To-Repair
NFU	- Natural Forecast Unit
RCS	- Report Control Symbol
RMF	- Resource Management Facility
RT	- Response Time
SLA	- Service Level Agreement
SMF	- System Management Facility
WPM	- Workload Profile Matrix

APPENDIX B

REFERENCES

1. FIPS PUB 49 of 1977, Guideline on COMPUTER PERFORMANCE MANAGEMENT: AN INTRODUCTION.

2. FIPS PUB 57 of 1978, Guidelines for THE MEASUREMENT OF INTERACTIVE COMPUTER SERVICE RESPONSE TIME AND TURNAROUND TIME.

3. FIPS PUB 72 of 1980, Guidelines for THE MEASUREMENT OF REMOTE BATCH COMPUTER SERVICE.

4. FIPS PUB 75 of 1980, Guideline on CONSTRUCTING BENCHMARKS FOR ADP SYSTEM ACQUISITIONS.

5. FIPS PUB 96 of 1982, Guideline for Developing and Implementing a Charging System for Data Processing Services.

6. H. W. Merrill, Merrill's Expanded Guide to Computer Performance Evaluation Using the SAS System: 1984 (Cray, N.C.: SAS Institute Inc.)

7. L. Kreuter, The Kreuter Report: 1981 (Dumont, N.J.: L. Kreuter Assoc. Limited)

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APPENDIX C

COMPUTING CAPACITY MANAGEMENT PLAN

COVER LETTER

5233/04
TX1
25 Jan 1993

From: Director, Regional Automated Service Center, Camp Swampy, Texas, 78501
To: Director, MCCTA (Code G9E), Quantico, Virginia, 22134-5048

Subj: ANNUAL COMPUTING CAPACITY MANAGEMENT PLAN, RCS MC-5233-11

Ref: (a) MCO 5271.1
(b) IRM Technical Publication 5233-04
(c) IRM Technical Publication 5233-05
(d) IRM Technical Publication 5239-02
(e) IRM Technical Publication 5239-03

Encl: (1) Computing Capacity Management Plan

1. In accordance with the references, the subject report is submitted (Enclosure (1)).

2. It must be recognized that the study was hampered by the non-availability of on-line processing statistics due to the fact that Camp Swampy has only recently installed a Data Base Management System (DBMS). While M3S and the Prime Enhancement Program (PEP) are scheduled to be implemented, the RASC does not yet run any on-line applications. Also, this RASC has been operating under the MVS-XA Operating System for less that four months which limits the availability of historical data. Due to the aforementioned constraints, an updated Capacity Management Plan will be forwarded once significant changes have taken place.

Section I

MANAGEMENT SUMMARY

1. Introduction. Introductory statements regarding preparation of the plan.

2. Methodology. Remarks about the methodology used to prepare the plan, i.e., study criteria, date/time interval used, statistic used, etc.

3. Background. Remarks concerning any significant impact, i.e., implementation of hardware, software, AISs, etc.

4. Hardware Configuration. Description of the hardware configuration by system/subsystem, i.e., processor type, memory, channels, I/O configuration, data communications configuration, etc.

5. Software Configuration. Description of the software executing on the computing system, i.e., OS, ROSCOE, ISPF, etc. by environment (e.g., System Facilities, Program Development, Database, CICS, Proprietary Software, Data Communications, and Application Information Systems).

6. Summary Findings. Summary remarks about the study; i.e., The summary findings of the Computing Capacity Management Study conducted during the period 1-15 July 1991 yielded the following results:

a. Service Management. SLAs have been negotiated with all major end-users. A copy of these agreements are on file at the RASC. The following service level objectives are established congruent with those SLAs:

	Response Time	Deadline	Turnaround	Daily Completion
AVIA	6-8 secs	2 hrs	7 hrs	4 hrs
FINL	2-4 secs	4 hrs	7.5 hrs	8 hrs
LOGS	4-6 secs	6 hrs	6 hrs	12 hrs
MANP	8-10 secs	6 hrs	7.5 hrs	10 hrs
TRNG	4-6 secs	2 hrs	2 hrs	4 hrs
COMM	2-4 secs	1 hr	1 hr	None
OPNS	6-8 secs	2 hrs	4 hrs	2 hrs

Section II of this Capacity Plan, clearly illustrates that this RASC is either meeting or exceeding its service level objectives. Considering the present capacity growth potential in relation to the forecasted growth, we should be capable of meeting these requirements for the remainder of this reporting period.

b. Workload Management. Although the majority of this RASCs workload during prime-shift is interactive, deadline workloads associated with the interactive work continues to be critical in order to satisfy both present and projected end-user requirements. The Capacity Usage Report, contained in Section IV of this plan, illustrates a total forecasted workload growth potential of 37%.

c. Performance Management. As indicated by the Capacity Usage Report, contained in Section IV of this plan, this RASC will exceed its present configuration capacity limits in eleven months. Our most critical resource is our channels, which will exceed their capacity limits in six months. Given an increase of two additional channels for our disk subsystem and one additional channel for our tape subsystem, our estimated life expectancy could be increased an additional three months; however, our present configuration would then be saturated.

d. Validated Baseline Model. The modelled results, contained in Section V of this plan, support the previously stated findings. A copy of the model, with the workload forecast applied, has been transmitted to MCCTA and cataloged as data set:

CSTX1.SYSMODL.TXOCCCMP.JUN0690

7. Conclusions. Concluding statements concerning the demonstrated results of the study.

8. Recommendations. Statements concerning any recommended actions that should be taken on behalf of the reporting activity.

Section II
Service Level Report

WORKLOAD	RESPONSE TIME (SEC)	RESIDENCY TIME (SEC)	RELATIVE RESPONSE	AVERAGE MPL	THROUGHPUT (TRANS/HR)	CPU UTIL
ADABAS	2.33K	2.33K	1.00	0.97	1.50	18.7%
BATADA	10.48	10.48	1.00	0.03	9.00	0.1%
BATCH	88.84	88.84	1.00	0.44	18.00	6.8%
BATCSS	8.46	8.46	1.00	0.08	36.00	0.8%
BATHOT	750.48	750.48	1.00	0.63	3.00	1.9%
BATNP	115.30	115.30	1.00	3.46	108.00	55.8%
BATPRO	114.75	114.75	1.00	0.24	7.50	2.1%
BATSAS	88.53	88.53	1.00	0.41	16.50	3.0%
CICSPR	413.59	413.59	1.00	0.17	1.50	5.3%
COMPCS	0.13	0.13	1.00	0.00	1.50	0.0%
COMPL	849.20	849.20	1.00	0.35	1.50	30.1%
JES	329.17	329.17	1.00	0.14	1.50	12.0%
OVRHD	448.02	448.02	1.00	0.19	1.50	13.9%
PHOENI	6.14	6.14	1.00	0.00	1.50	0.1%
PRODOV	193.15	193.15	1.00	0.08	1.50	1.4%
ROSCOE	3.98	3.98	1.00	1.66	1.50	21.4%
ROSCSS	12.47	12.47	1.00	0.01	1.50	0.1%
STASKS	638.90	638.90	1.00	1.60	9.00	53.7%
SYSTEM	0.80	0.80	1.00	0.00	4.50	0.0%
TSOG9ST1	0.34	0.34	1.00	0.36	3.89K	4.9%
TSOG9ST2	5.75	5.75	1.00	0.16	97.50	1.8%
TSOPROT1	0.07	0.07	1.00	0.26	13.15K	5.2%
TSOPROT2	15.71	15.71	1.00	0.18	40.50	2.0%
VTAM	233.22	233.22	1.00	0.10	1.50	9.6%
						250.8%
						(out of 400.0%)

Section III

Workload Summary Report

CPU TYPE: 3090-400E
PROCESSORS: 4
SYSTEM ID: GGOA

CPU UTILIZATION:
TOTAL 250.8%
PER PROCESSOR 62.7%

WORKLOAD	CPU UTIL	% OF TOTAL WKL RESPONSE TIME RESPONSE	SERVICE	WAIT	SERVICE DEGRAD.
BATNP	55.8%	25.1%	16.1%	9.0%	35.8%
STASKS	53.7%	38.0%	33.6%	4.3%	11.4%
COMPL	30.1%	92.1%	85.1%	7.0%	7.6%
ROSCOE	21.4%	13.4%	12.9%	0.5%	3.6%
ADABAS	18.7%	24.5%	19.3%	5.2%	21.4%
OVRHD	13.9%	77.3%	74.2%	3.1%	4.0%
JES	12.0%	92.5%	87.6%	5.0%	5.4%
VTAM	9.6%	100.0%	99.0%	1.0%	1.0%
BATCH	6.8%	22.7%	15.3%	7.3%	32.4%
CICSPR	5.3%	32.6%	30.6%	2.0%	6.2%
TSOPROT1	5.2%	20.2%	19.6%	0.5%	2.6%
TSOG9ST1	4.9%	13.7%	13.3%	0.3%	2.4%
BATSAS	3.0%	8.6%	7.3%	1.3%	14.9%
BATPRO	2.1%	12.5%	8.9%	3.6%	28.9%
TSOPROT2	2.0%	12.1%	11.0%	1.1%	8.9%
BATHOT	1.9%	3.5%	3.1%	0.4%	10.7%
TSOG9ST	1.8%	12.7%	11.8%	0.9%	7.3%
PRODOV	1.4%	20.4%	17.8%	2.6%	12.6%
BATCSS	0.8%	13.6%	10.0%	3.6%	26.2%
BATADA	0.1%	5.9%	4.5%	1.3%	22.8%
ROSCSS	0.1%	20.4%	19.8%	0.7%	3.3%
PHOENI	0.1%	34.7%	28.6%	6.1%	17.7%
SYSTEM	0.0%	24.2%	18.8%	5.4%	22.3%
COMPCS	0.0%	55.5%	38.6%	16.9%	30.4%

Section IV

Capacity Usage Report

1. Processor Analysis

RESOURCE	CURRENT USE	CAPACITY LIMIT	GROWTH POTENTIAL	FORECAST	ESTIMATED LIFE
3090-400E	62%	85%	37%	15%	30 mo.

2. Memory Subsystem Analysis. We have sufficient memory to satisfy our linear and projected demand. the conversion of Cobol-68 and Cobol-74 programs to Cobol-II is 65% completed. SABRS will replace 19% of the remaining programs, with the balance expected to be completed by the end of this fiscal year. The addition of extended memory coupled with this extensive conversion process has eliminated the memory contention problems of last year.

3. Channel Subsystem Analysis

RESOURCE	CURRENT USE	CAPACITY LIMIT	GROWTH POTENTIAL	FORECAST	ESTIMATED LIFE
CHPD-01	7.6%	40%	426%	15%	341 mo.
CHPD-02	7.3%	40%	448%	15%	358 mo.
CHPD-03	11.7%	40%	242%	15%	194 mo.
CHPD-04	8.8%	40%	354%	15%	284 mo.
CHPD-05	7.1%	40%	463%	15%	371 mo.
CHPD-06	13.4%	40%	198%	15%	159 mo.
CHPD-07	6.7%	40%	497%	15%	398 mo.
CHPD-08	9.3%	40%	330%	15%	264 mo.
CHPD-11	6.5%	40%	515%	15%	412 mo.
CHPD-12	4.9%	40%	716%	15%	573 mo.
CHPD-13	11.0%	40%	263%	15%	211 mo.
CHPD-14	8.6%	40%	365%	15%	292 mo.
CHPD-15	5.3%	40%	655%	15%	524 mo.
CHPD-16	12.3%	40%	225%	15%	180 mo.
CHPD-17	5.6%	40%	614%	15%	491 mo.
CHPD-18	7.4%	40%	440%	15%	352 mo.
CHPD-41	0.0%	40%	N/A	15%	N/A
CHPD-42	0.0%	40%	N/A	15%	N/A
CHPD-43	0.0%	40%	N/A	15%	N/A
CHPD-44	0.0%	40%	N/A	15%	N/A
CHPD-45	0.0%	40%	N/A	15%	N/A
CHPD-46	0.0%	40%	N/A	15%	N/A
CHPD-47	0.0%	40%	N/A	15%	N/A
CHPD-48	0.0%	40%	N/A	15%	N/A
CHPD-51	5.9%	40%	578%	15%	462 mo.
CHPD-52	6.7%	40%	497%	15%	398 mo.
CHPD-53	8.2%	40%	388%	15%	310 mo.
CHPD-54	6.8%	40%	488%	15%	390 mo.
CHPD-55	5.4%	40%	641%	15%	513 mo.
CHPD-56	7.8%	40%	413%	15%	330 mo.

3. Channel Subsystem Analysis (cont.)

RESOURCE	CURRENT USE	CAPACITY LIMIT	GROWTH POTENTIAL	FORECAST	ESTIMATED LIFE
CHPD-57	6.2%	40%	545%	15%	436 mo.
CHPD-58	8.0%	40%	400%	15%	320 mo.

4. Disk Subsystem Analysis

RESOURCE	PEAK USE	CAPACITY LIMIT	GROWTH POTENTIAL	FORECAST	ESTIMATED LIFE
DCU 010	20.0%	40%	100%	15%	80 mo.
DCU 020	18.9%	40%	112%	15%	89 mo.
DCU 030	30.9%	40%	29%	15%	24 mo.
DCU 040	24.3%	40%	65%	15%	52 mo.
DCU 050	17.7%	40%	126%	15%	101 mo.
DCU 060	33.5%	40%	19%	15%	16 mo.
DCU 070	18.6%	40%	115%	15%	92 mo.
DCU 080	24.7%	40%	62%	15%	50 mo.

5. Tape Subsystem Analysis. We have sufficient tape resources to accommodate more than 100 months of growth.

Section V

Validated Baseline Model

WORKLOAD	STATISTIC	MEASURED	CALCULATED
ADABAS	RESPONSE TIME	0.00	2.33K
STC	THROUGHPUT	1.50	1.50
BATADA	RESPONSE TIME	87.51	10.48
BATCH	THROUGHPUT	9.00	9.00
BATCH	RESPONSE TIME	230.48	88.84
BATCH	THROUGHPUT	18.00	18.00
BATCSS	RESPONSE TIME	14.88	8.46
BATCH	THROUGHPUT	36.00	36.00
BATHOT	RESPONSE TIME	212.47	750.48
BATCH	THROUGHPUT	3.00	3.00
BATNP	RESPONSE TIME	205.48	115.30
BATCH	THROUGHPUT	108.00	108.00
BATPRO	RESPONSE TIME	100.56	114.75
BATCH	THROUGHPUT	7.50	7.50
BATSAS	RESPONSE TIME	114.12	88.53
BATCH	THROUGHPUT	1.50	1.50
CICSPR	RESPONSE TIME	0.00	413.59
STC	THROUGHPUT	1.50	1.50
COMPCS	RESPONSE TIME	0.00	0.31
STC	THROUGHPUT	1.50	1.50
COMPL	RESPONSE TIME	0.00	849.20
STC	THROUGHPUT	1.50	1.50
JES	RESPONSE TIME	0.00	329.17
STC	THROUGHPUT	1.50	1.50
OVRHD	RESPONSE TIME	0.00	449.02
STC	THROUGHPUT	1.50	1.50
PHOENI	RESPONSE TIME	0.00	6.14
STC	THROUGHPUT	1.50	1.50
PRODOV	RESPONSE TIME	0.00	193.15
STC	THROUGHPUT	1.50	1.50
ROSCOE	RESPONSE TIME	0.00	3.98K
STC	THROUGHPUT	1.50	1.50

Validated Baseline Model (cont.)

WORKLOAD	STATISTIC	MEASURED	CALCULATED
ROSCSS	RESPONSE TIME	0.00	12.47
STC	THROUGHPUT	1.50	1.50
STASKS	RESPONSE TIME	0.00	638.90
STC	THROUGHPUT	9.00	9.00

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APPENDIX D

SERVICE CATALOG

SERVICE NAME: CAREER PLANNING MANAGEMENT SYSTEM (CPMS)

Date: August 19, 1987
Information Sources: CPMS Master File, FR File
Functional Manager: Manpower Division, Code MMEA-5
Data Center: "POC Billet Title"

DESCRIPTION

Service Type: On-line, batch initiated
Application: CUCP00
Summary: On-line update and inquiry system; backup contingency site is MCASC, KCMO; manual operation is possible

USER DEPARTMENT: MMEA-5; AV 224-4393

MACHINE ID

System: GG0C
Dataset: KCMO.CPMS.T1300U11.DRIF
KCMO.CPMS.T1300U11.DRRR
KCMO.CPMS.T1300U11.RATF
KCMO.CPMS.T1300U11.RMPF
Job Name: T1300R10
User: GMEA03, GMEA11 and all GOLD command USERID's

REQUIREMENTS

Input: Remote Terminal Access; 32 access points
Systems: ADABAS CPMS DATABASE
Time: 24 hours/7 days per week

DELIVERABLES

Critical Reports: CPMS RELM DOCUMENTS, MESSAGES
Tape: CPMS BACKUP
Disk: On-line database
Access: MCDN remote terminal connection
NFUs: Number of: reenlistments; extensions; lateral moves

SERVICE LEVEL VOLUMES

NFUs: Reenlistments - 18,750
Extensions - 5,000
Lateral moves - 1,250

Response Time: On-lines: 15-20 seconds per/transaction; Prime shift (0730-1630 hours)

Batch: Initiated after 1800 hours; deadline requirement is 0800 hours the following day

Reports:

a. By 0800 next day:
   (1) RELM Worksheet
   (2) Completed/Outstanding Actions
   (3) Completed Action
   (4) Unassigned School Seats

b. By 0800 each Monday:
   (1) School Wait List
   (2) School Seat Assignment

c. By 0800, 1st day of each month:
   (1) Retention Results
   (2) Reenlistments/Extensions
   (3) Estimated Reenlistment Bonus
   (4) Monthly Activity

Tapes: CPMS backup each night

Availability: 24 hours/7 days per week

Deadlines: Batch input must be submitted for processing prior to 1800 hours Central Standard Time

ASSUMPTIONS

(1) NFUs will not be exceeded by more than 10%
(2) System is available when needed by user
(3) RT are met

PRICING: Not applicable at this time

(1) On-lines: $0.00000 per/NFU
(2) Batch: $0.00 per/job
(3) Reports: $0.00000 per/line
(4) Tape: $0.00 per/mount
    $0.000 per/month storage
    $00.00 per/volume, mailing and handling
(5) DASD: $0.00000 per/track

REPORTING

Management Report ID:
  (1) Manpower On-line RT Analysis
  (2) Manpower Cost Recovery Report

Service Level Report IDs:
  (1) End-user Quality Evaluation Survey
  (2) CPMS On-line RT Report
  (3) CPMS Batch Activity Report

APPENDIX E

END-USER QUALITY EVALUATION SURVEY

END-USER SATISFACTION MEASUREMENT

END-USER DEPARTMENT: ______________________ DATE: __________

1. Service Level commitments were met: Circle one

* Service levels were met without exception	10 9
* Service levels were sometimes missed due to problems external to system	8 7 6
* Service levels were met inconsistently	5 4
* Service levels were rarely met	3 2
* Service levels were never met	1 0

2. Data integrity:

* All of the information provided by the system is accurate	10 9 8
* Most of the information provided by the system is accurate	7 6 5 4
* The information provided is partially correct and somewhat usable	3 2
* The information provided by the system is totally inaccurate	1 0

3. Problem/Change Management:

* No problems have occurred	10 9 8
* Problems have occurred at a low and manageable rate	7 6 5 4
* Problems occurred at an unacceptable rate initially but volumes are decreasing	3 2

* Problems are still occurring at an unacceptable rate — 1, 0

4. System Availability:

* Hours of availability are satisfactory — 10, 9, 8
* Hours of availability are mostly satisfactory — 7, 6, 5
* Hours of availability are rarely satisfactory — 4, 3, 2
* Hours of availability are unsatisfactory — 1, 0

5. System Reliability:

* Computer system is “up” most of the time — 10, 9, 8
* Computer system is “down” occasionally — 7, 6, 5
* Computer system is “down” often — 4, 3, 2
* Computer system is “down” too often — 1, 0

6. Application Availability:

* Application is available when needed — 10, 9, 8
* Application is available most of the time — 7, 6, 5
* Application is unavailable most of the time — 4, 3, 2
* Application is rarely available when needed — 1, 0

7. Application Output:

* Output provided satisfies requirements	10 9 8
* Output provided satisfies most requirements	7 6 5
* Output provided needs improvements in order to satisfy requirements	4 3 2
* Output provided does not satisfy requirements	1 0

8. RT (On-line applications):

* RT	10 9 8
* RT is satisfactory most of the time	7 6 5
* RT needs improvement	4 3 2
* RT is unsatisfactory	1 0

9. RT (Batch applications):

* Output is available when needed	10 9 8
* Output is available when needed most of the time	7 6 5
* Output is mostly unavailable when needed	4 3 2
* Output is always late being produced	1 0
* Not applicable	X

10. Data Center Quality

* Data center personnel/products either meet or exceed my needs/requirements	10 9 8
* Data center personnel/products are satisfactory	7 6 5
* Data center personnel/products are less than satisfactory	4 3 2
* Data center personnel/products are unsatisfactory	1 0

APPENDIX F

SERVICE LEVEL AGREEMENT

U.S. MARINE CORPS

SERVICE LEVEL AGREEMENT

This Service Level Agreement (SLA) is a memorandum of agreement (MOA) between the ______________________, hereinafter referred to as the End-user, and ___________________________, hereinafter referred to as the Data Center, that describes their rights and responsibilities associated with the processing of the End-users IS work at the Data Center.

The purpose of this agreement is to document the mutual agreement of service levels between the below signed parties.

The terms and conditions of this agreement contained herein shall remain in effect for a period of one (1) year, commencing with the first day of the new fiscal year.

Date ____________________

Date ____________________

____
Director
Data Center

____
OIC
End-user Department

I. PURPOSE

The purpose of this agreement is to provide the End-user department with consistent, reliable, and timely service for all AIS as provided by the Data Center and specified within this document.

II. AIS DELIVERABLES

This agreement is based upon the following deliverables:

A. Input. The End-user will submit a daily volume of {NFU related} input transactions which conform to AIS specifications.

B. Process. The Data Center will process the input transactions received from the End-user in accordance with AIS specifications.

C. Output. The Data Center will produce the below listed output in accordance with AIS specifications.

(1) Reports. ______________________________

____

(2) Disk datasets. ______________________________

____

(3) Tape datasets. ______________________________

____

(4) Backup datasets. Those listed in (2) and (3) above.

D. Access points. Remote terminal access will be provided to the End-user through nnnn(NN) on-line terminals located within the End-users department.

III. END-USER INPUT REQUIREMENTS

A. All End-user submitted {NFU related} transactions must be submitted for processing not later than 1700 hours on normally scheduled workdays.

B. All End-user database inquiries and remotely-printed extracts, reports, etc. must be completed not later than 1700 hours on normally scheduled workdays.

IV. SERVICE OBJECTIVES

A. The normal daily input requirement will range between nnnn-nnnn transactions.

B. Access point response-time shall not exceed a monthly average of eight (08) seconds, based upon the normal daily input requirement volume.

C. Access point availability will be provided as follows:

(1) Normal daily workdays/hours. Monday-Friday/0700-1700.

(2) Weekend workdays/hours. Saturday-Sunday/0700-1700.

(3) Additional access point availability will be considered on an individual basis upon request by the End-user departmental supervisor. This request must be made to the Data Center not later than 1430 hours.

D. Computer system reliability will be defined as follows:

(1) MTBF not to exceed more than two (2) planned outages per month.

(2) MTTR not to exceed twenty-four (24) hours.

(3) Data reliability to remain accurate to within twenty-four (24) hours of last file(s) backup. Backups are scheduled congruent with normal daily workdays. Two (2) backup copies will be maintained; one (1) copy will remain onsite at the CDA and/or RASC while the other will be maintained off-site in compliance with MCO P5271.1.

V. PRICING STRUCTURE

Pricing is not a consideration at this time.

VI. SECURITY

A. It is understood that data security (protection) will be provided to the End-user as defined by MCO P5510.14 and supporting publications.

B. In addition to data security, the Data Center will provide disaster recovery and backup procedures to the extent that total work interruption will not exceed forty-eight (48) hours.

VII. NOTIFICATION

A. The Data Center will provide the End-user notification of interruption of services in the following manner:

(1) Departmental managers will be informed not later than twenty-four (24) hours prior to any planned system outage.

(2) Every reasonable attempt will be made to notify departmental managers of causes behind unplanned system outages.

VIII. REPORTING

A. The End-user agrees to forward a monthly report to the Data Center, Customer Services Department assessing the quality and timeliness of services provided.

(1) Respective reports will include: days output was late, periods of unavailability of service, reason for non-performance of service as known by the customer, and any comments deemed appropriate.

B. The Data Center agrees to forward a copy of the ABC-XYZ Performance Report documenting the End-users input, process, and output activity and average response-times provided.

(1) Any discrepancies will be addressed and resolved through the process of arbitration as defined in Section IX of this agreement.

IX. ARBITRATION

A. It is understood that both parties agree to the following arbitration process:

(1) Every attempt will be made by the respective End-user and Data Center departments themselves to resolve any conflicts of agreement.

(2) If, after a period of two (2) normal workdays, the conflict remains unresolved, the under-signers of this agreement shall meet to mutually resolve the conflict. Their agreed upon conclusion to the conflict shall be final, and remain binding to both parties.

X. PENALTIES

A. Any penalties which may be assessed as a direct result of breech of this agreement shall be upon mutual agreement of the under-signed parties.

XI. RENEGOTIATION

A. Revisions to this agreement by mutual consent of the under-signed parties may be made in anticipation of, or subsequent to:

(1) A significant change in the capacity requirements, number of {NFU related} transactions processed, or volume of printed output (a "significant change" is defined as either an increase or decrease of 15% over average daily statistics at the time of the signing of this agreement).

(2) Introduction to production of a new process or AIS.

APPENDIX G

WORKLOAD FORECAST END-USER SURVEY

ANNUAL WORKLOAD FORECAST END-USER SURVEY

Computer Resource Utilization

Department ______________________ POC ____________________

Phone _______________

A. EXPECTED CHANGE TO EXISTING WORKLOAD

Please answer only one of the following three items.

All changes will be made with respect to the monthly average for the twelve month period beginning July, 1990-July, 1991.

1. No change.

If the monthly CPU Usage in FY90, 91 is expected to remain consistent with the average during FY89, then check here: _

2. Simple Percentage Change.

Indicate the percentage of change anticipated if it will apply across all components (Batch, On-line, TSO, ADABAS, etc.) and across all time periods (First/second shift, weekends, etc.) and for the full six month period.

Resource utilization is expected to: increase by ______%
: decrease by ______%

3. Complex Change.

If this major system is expected to change significantly in some way other than a simple flat percentage as indicated in item 2 above, then check here: (you will be contacted for details). _______

B. NEW WORKLOAD ADDITIONS

Project Title	Development Start Date	Production Start Date

COMMENTS/REVISIONS

Technical publications under the Information Resources Management (IRM) Standards and Guidelines Program (MCO 5271.1) are reviewed annually. Your comments and/or recommendations are strongly encouraged.

IRM Tech Pub
Name: ____

IRM-______-___ (Number) Date of Tech Pub: ______________________

COMMENTS/RECOMMENDATIONS:

Name/Rank:
____(optional)

Unit:
____(optional)

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