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THE APPLICATION OF AUTOMATED OPERATIONS AT THE INSTITUTIONAL PROCESSING CENTER

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SUMMARY

The JPL Institutional and Mission Computing Division (37); Communications, Computing and Network Services Section (372); with its mission contractor, OAO Corporation, have for some time been applying automation to the operation of JPL's Information Processing Center (IPC). Automation does not come in one easy to use package. Automation for a data processing center is made up of many different software and hardware products supported by trained personnel. The IPC automation effort formally began with console automation, and has since spiraled out to include production scheduling, data entry, report distribution, online reporting, failure reporting and resolution, documentation, library storage, and operator and user education, while requiring the interaction of multi-vendor and locally developed software.

To begin the process, automation goals are determined. Then a team, including operations personnel, is formed to research and evaluate available options. By acquiring knowledge of current products and those in development, taking an active role in industry organizations, and learning of other data center's experiences, a forecast can be developed as to what direction technology is moving. With IPC management's approval, an implementation plan is developed and resources identified to test or implement new systems. As an example, IPC's new automated data entry system was researched by Data Entry, Production Control, and Advance Planning personnel. A proposal was then submitted to management for review. A determination to implement the new system was made and elements/personnel involved with the initial planning performed the implementation. The final steps of the implementation were educating data entry personnel in the areas effected and procedural changes necessary to the successful operation of the new system.

There is danger in today's market place of purchasing automation products that may become

antiquated within months, or purchasing products that may not be cost effective, or losing sight as to what future requirements our data center may be called upon to support. The IPC has chosen the commercially available and vendor supported software product, OPS/MVS by Legent, to serve as the corner stone to JPL's automation effort. Other vendors, such as, Computer Associates, Diversified Software, Unitech, and TSI also have provided software products that compliment JPL's automation effort. Hardware obtained from AGI, AST, HP, Symbols/MSI, and others have been used to support automated systems. Some systems have been developed in-house by IPC personnel to tailor automation to our specific needs.

Demands upon today's data centers are increasing: there is more processing to be done; the processing is more complex and demanding; user satisfaction and quality requirements must be achieved or exceeded; and there is an on-going demand for cost containment. The application of automated operations is the IPC's approach to achieving these demands.

A sample description of the IPC's automation activities and benefits realized is as follows:

- Automated Production Scheduling
An automated tool obtained from Computer Associates, CA-7, has replaced the manual submission of production job scheduling. This tool and associated processes/procedures ensures that "the right job is run at the right time". It also helps balance work loads. As a result, reruns have been reduced, schedules are met and processing time/resources are optimized. The IPC has accommodated a 60% growth in production scheduling requirements with no impact on resources, which was made possible by the application of automated scheduling.

Automated Operations at the IPC is essential in maintaining cost effectiveness, ensuring user satisfaction and quality and increasing production through-put.

Key words: Computer Operations, Automated Operations, Information Processing Center, mainframe processing, console automation.

1. INTRODUCTION

The Jet Propulsion Laboratory, Institutional and Mission Computing Division; Communications, Computing and Network Services Section; with its mission contractor, OAO Corporation, have for some time been applying automation to the operation of JPL's Information Processing Center (IPC). The IPC supports all JPL efforts requiring computing or communications. The IPC provides mainframe computing and user support for JPL's flight project efforts, as well as administrative computing requirements. All these support functions are engaged in some degree of automation. Automation does not come in one easy to use package. Automation for a data processing center is made up of many different software and hardware products supported by trained personnel.

The IPC automation effort formally began with master console automation, and has since spiraled out to include production scheduling, data entry, output delivery, report balancing, and documentation. Beside the interaction of multi-vendor systems, in-house systems have been developed for failure tracking and library storage.

1.1 Automation Implementation

The automation process began with operations management making the determination to move forward with the process. Next, a team, including operations personnel, was formed to research and evaluate available options. By acquiring knowledge of current products and those in development, taking an active role in industry organizations, and learning of other data center's experiences, a forecast can be developed as to what direction industry and technology are moving. With management's approval an implementation plan is developed and resources identified to test or implement new systems. As an example, a PC based, networked attached, data entry system was researched and evaluated by Data Entry, Production Control, and

Advance Planning personnel. A proposal was then submitted to management for review and approval. A determination to implement a new system was made and the same personnel involved with the initial research and planning took an active role in the implementation and training of personnel. That system is called KeyMaster, by TSI.

There is danger in today's market place of purchasing automation products that may become antiquated within months, or purchasing products that may not be cost effective, or losing sight as to what future requirements the data center may be called upon to support. It is very important to have an automation team to research and evaluate. And it is equally important to have management review and question the automation team's proposals.

1.2 Console Automation

The IPC chose the commercially available and vendor supported product, OPS/MVS by Legent (formally Goal Systems) to serve as the console automation tool.

Console automation was the first step taken by the IPC to automate some of the functions carried out by Operations. Several thousand messages and repetitive reply situations made the master console an obvious beginning. The automation package was installed, operator training was given, and results were very slow. We learned that the operators were not too happy with the idea of automating what they had been doing manually. Performing a quiesce in 8 minutes or an IPL in 4 minutes did not impress the operations staff. And they were right, it was not impressive. We had failed to show the operations staff that automation was not replacing them. Rather it is changing their job descriptions. The computer operations profession is under going a change. Today some computer operators do not operate equipment, but monitor software that operates equipment, operators do not run to mount a tape but sit at a desk analyzing an operations anomaly. Soon operators will not load paper into large printers but will answer user requests for specific operations support. Operations is changing and the staff must change too. Operators must develop into operation analysts, help desk personnel, production control analysts, and operations managers. The process may be slow and aggravating at times, but it should not be stopped.

1.3 Automated Scheduling

Two years ago the IPC submitted scheduled production jobs manually. An operator manually started each job and ran most of the schedule single thread. Management realized that this situation was not efficient, nor farsighted. An automated scheduling package, CA-7 by Computer Associates, was chosen, purchased, and implemented. Operations staff received training, one operator became a scheduler, a support person also became a scheduler. Two members of the operations staff had made the change to using automated software to carry out what had been a manual function. After two years, our production schedule has grown by 60% and is continuing to grow, but staffing has remained at the same level and processing is being completed within the same processing window.

1.4 Balancing

If we were to automate scheduling then why not balancing. These two functions interface. IPC supported the purchase and use of U/ACR by Unitech. This automation package is largely used by the applications groups, with very little manual interfacing with operations. U/ACR is an automated balancing tool that interfaces with CA-7. If a job is out of balance then the scheduling software is made aware and the job is stopped, as well as, any succeeding jobs that use output from the out-of-balance job. A failure is recorded and at that point a problem analyst takes over.

1.5 Documentation

The next area of concern was documentation. Everyone knows, documentation is the last thing done, and very often never done. The problem was how to continually update documentation that must be made available to operations staff, applications staff, and management. The IPC chose DOCU/TEXT, by Diversified Software, to help solve this problem. We felt by using an on-line documentation system that updates could be made faster and more easily, and that up-to-date documentation would be available to everyone who needed it. The documentation is available to everyone who needs it. But it was necessary to assign operations personnel to monitor the system for incomplete documentation. Some of our documentation problem has been solved, but not all. We are still researching and discussing options to improve upon documentation maintenance.

1.6 Output Delivery

Express Delivery has been in use at the IPC for years, but is now being teamed up with SAR (Sysout Archive and Retrieval). Express Delivery is a software package that automatically addresses reports to the proper person or place. Its primary usage is with hard copy output. SAR, is a on-line mainframe storage tool for retrieval and analysis of output. By interfacing Express Delivery and SAR we hope to eliminate hard copy generation, provide immediate access to output, provide electronic archiving of sensitive and legal information, and reduce overall costs of report generation and delivery. This is IPC's effort to bring about on-line report viewing.

1.7 BLITS

BLITS, is Barcoded Library Inventory and Tracking System. It is a PC based system for JPL's Archive Tape Library, written in-house by one of our planning analysts. The IPC's Archive Library has over 120,000 magnetic tapes. The library services 25 different JPL tape libraries. The Archive Library is maintained by one person, using BLITS. BLITS uses a Portable Data Terminal (PDT), programmed in UBASIC, to read bar code labels attached to each tape. The information is downloaded to the PC in ASCII text format. The ASCII is then converted to a data base file (.DBF), which is used by several dbFast Windows programs. With these programs, inventory is tracked and reports are generated.

1.8 Failure Reporting

The semi-automated failure system was developed by Production Control and Systems personnel, and coordinated by Advance Planning. The failure system uses the automated scheduling tool, CA-7, to submit a job that identifies a failure and captures system data concerning the failure. The data is loaded to a data base, then accessed by an analyst, who records actions taken to resolve the failure. The failure information is then printed at a distributed printer, and after review, fax'ed to Configuration Management for distribution to the responsible areas. Resolution data is then entered into the failure data base. Management and statistical reports are generated, by programs written in DYL280. We call this system semi-automated because we have not yet finished implementing the on-line viewing portion of the system. When

finished the system will not use paper, but instead failure data, statistical report data, and historical data will be available on-line.

2.0 BENEFITS

Each of these tools is part of an integrated automation effort. Our goal is to not eliminate personnel but to allow increased workloads to be carried out at current labor levels. Personnel receive training for each automation tool as it is added. Soon our personnel will no longer be just tape hangers, but also help desk persons, problem analysts, automation analysts, and trainers.

The benefits we hope to achieve for automated operations are:

- less operational costs
- fewer system outages
- improved problem recognition
- faster response time
- elimination of labor intensive tasks
- improved accuracy
- reliable handling of time-dependent tasks
- reduced system outages

2.1 Current and Future Development

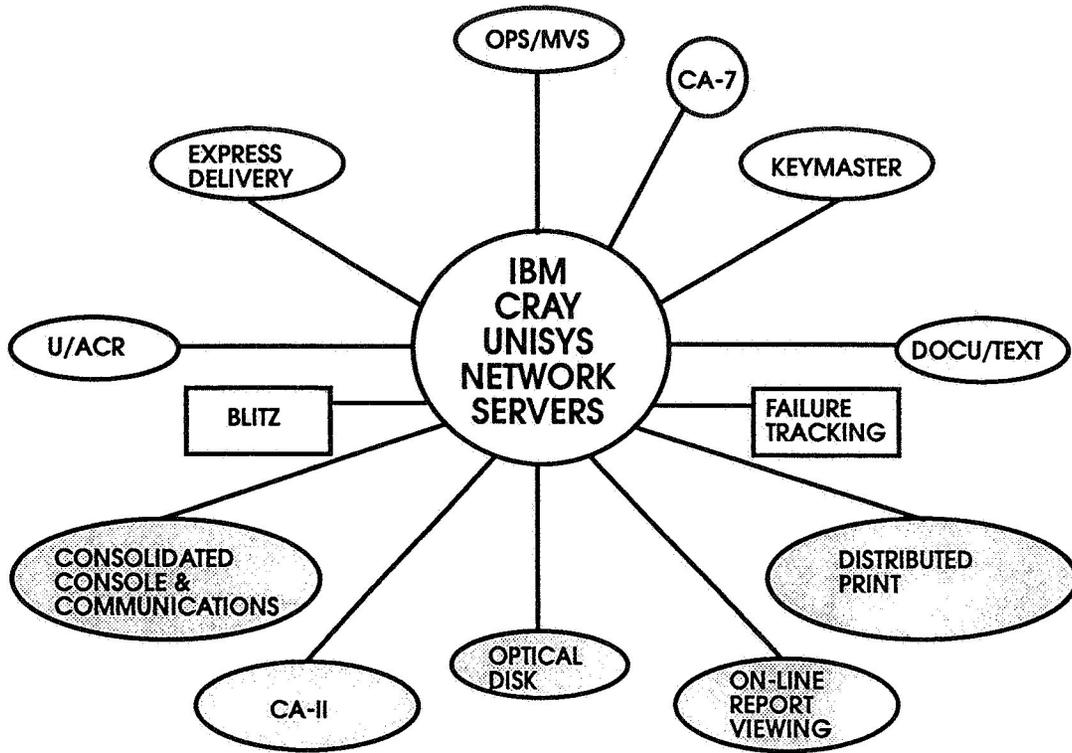
Automation is an on-going process. Currently we are developing user training classes to support the implementation and use of on-line report viewing. Development of a distributed print plan is underway. Distributed print will allow users to print output at their locations, thus reducing distribution labor and transportation time and costs. A PC based system called ELIXIR, which is used to tailor and create forms in-house, is now in use. Magneto-optical disk storage is being researched and evaluated for possible use in supporting on-line report viewing and archive storage. CA-11, a restart and rerun tool is currently being implemented. Two automated tape libraries (Silos) have been installed and are in use.

There is a plan in development to consolidate voice communications and console operations for an IBM 3090/200, Cray YMP, 2 Unisys 1100/90's, and network and client/server monitoring. Some of the development input was obtained by going outside operations to enlist the help of skilled personnel in other areas within JPL, to help us better communicate our plans and proposals. This plan is currently being reviewed by IPC management.

3.0 CONCLUSION

Demands upon today's data centers are increasing: there is more processing to be done; the processing is more complex and demanding; user satisfaction and quality requirements must be achieved or exceeded; and there is an on-going demand for cost containment. The application of automated operations is the IPC's approach to achieving these demands. Automated operations at the IPC is essential in maintaining cost effectiveness, ensuring user satisfaction and quality, and increasing production through-put.

VENDOR, IN-HOUSE, AND SYSTEMS UNDER DEVELOPMENT



BLITS

BARCODED LIBRARY INVENTORY AND TRACKING SYSTEM

120,000 TAPE ARCHIVE LIBRARY

