Why CICS?
Why the Mainframe?
Why Now?

Steve Ware, UF

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http://nersp.cns.ufl.edu/~sfware/share106/s1057sfw.pdf (Updated: 06-08-2006)
Abstract

CICS is the leader in transaction processing, providing extremely fast response time, very high availability, and a feature-rich application processing environment.

CICS is strategically positioned for SOA and Web Services computing.

CICS TS for z/OS 3.1 became generally available in early 2005 and IBM has provided insights regarding future releases of CICS TS for z/OS. The recently announced IBM System z9 mainframe, and z/OS 1.7 operating system, provide one of the most modern, resilient, and capable computing platforms.
Abstract (cont.)

A CICS support person should be able to articulate the current capabilities of CICS and the mainframe, and make compelling arguments in favor of continuing to exploit and enhance the capabilities and features of CICS and the mainframe. This session will provide you with a one stop reference tool to win the computing platform debates.

The past, present, and future of CICS and the mainframe are bright - bring your sunglasses to this session as we shine a light on the best of breed - CICS and the mainframe!
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Agenda/Topics

• Introduction
• Why CICS?
• Why the Mainframe?
• What about Mainframe application development?
• What about IT staffing and training?
• Why CICS and the Mainframe - Now?
• Summary and Q&A
• Appendix and Additional Information
• Abbreviations (and a bit of Glossary)
Introduction

• **UF CNS**, University of Florida Computing & Networking Services (formerly known as **NERDC**), is the primary data center at the Gainesville, FL campus.

• Currently utilizing an IBM **zSeries** z800 2066-002 with 16GB, running **z/OS** 1.6, **CICS TS** 2.3, **DB2** 7.1, **RACF**, **JES2**, etc.

• 3 LPARs - 1 internal "sysprog sandbox", 1 test "alternate", and 1 production or "primary". **z/OS** 1.7 is being tested in the sandbox.

• We have 13 CICS regions configured, and run ~1M prod. transactions/weekday, and ~2M on peak load days.

• 2 internal/test sandbox, 2 development/test, 4 test/QA, and 5 production CICS regions currently configured.
Introduction (cont.)

• Founded in **1853**, became the **University of Florida** in **1905**.
  (East Florida Seminary -> Florida Agricultural College ->
  University of Florida)

• **UF** is a member of the **AAU**, the Association of American Universities.

• UF is one of the five largest universities in the U.S., public or private.

• **~50K enrolled** (initially 50,512, then 49,650 after drop/add) Fall 2005 semester, and **~250K alumni**.
Introduction (cont.)

• We're considered a "Classic" CICS site. ("Legacy = It Works!")

• Web access to CICS is via the CICS Socket Interface, in use at our site since ~1997.

• More than ~60% of local CICS tasks utilize sockets.

• All locally developed CICS applications are Assembler and/or COBOL. We have ~8K CICS application load modules, and ~32 have CICS sockets API (for file/data transfer, email, web enablement, etc.).

• Several internal CICS applications written in C/C++ and REXX. Java has been IVP tested, and a small Java CICS application is being developed (via Eclipse) and tested.
Why CICS?

- IBM's CICS is the planet's premier OLTP (On-Line Transaction Processing) system. CICS Rocks! Stick With CICS! Anyway...

- Enterprise caliber, high performance, fast response time, exceptional thruput and reliability, resilient, large installed base, capabilities continually enhanced, large variety of applications and tools, superior technical support from IBM, expansive API and feature-rich application processing environment, etc.

- Billions and billions of transactions processed daily - a true software "star" ;-)
Why CICS?

- Support for "heritage" technologies such as VTAM and SNA networking and 3270 devices. Some things are still better via a CHUI (CHaracter User Interface) than a GUI (Graphical User Interface). Data entry and scripting are examples where a CHUI shines.

- Support for "modern" technologies, including web services, SOA, SOAP, Java, JVMs, EJBs, C/C++, SSL, XML, and much more.

- Support for most operating systems - our focus will be z/OS.
Why CICS?

- What about CICS for Linux?
- IBM Statement of Direction:
  "IBM recognizes the significance and benefits of the Linux operating system to CICS customers who have chosen the TXSeries for their applications. It is IBM's intention to release a CICS offering on the Linux platform in 2005..."
- Disclaimer: "All statements regarding IBM's plans, directions, and intent, are subject to change and or withdrawal without notice."
- Note that CICS for zLinux is not mentioned - only TXSeries. Also note that it is now 2006...
Why CICS? (cont.)

- Programming language support includes Java, C/C++, Enterprise COBOL, Assembler, PL/1, REXX. Object oriented programming support, even in Assembler, with IBM's High Level Assembler. High speed XML parsers and CICS translator integration available with some compilers.
Why CICS? (cont.)

• Expansive API (Application Programming Interface), SPI (System Programming Interface), and XPI (eXit Programming Interface). You can truly "make CICS dance" anyway you'd like.

• The CICS **API** helps isolate the CICS application programmer from the operating system, allowing application programmers to focus on application development and business solutions.

• The CICS **SPI** allows the CICS system programmer to enhance the local CICS environment with SET and INQUIRE system capabilities.

• The CICS **XPI** allows the CICS system programmer to enhance and expand upon the delivered CICS capabilities in the many supplied CICS exit points.
Why CICS? (cont.)

- CICS ships with integrated debugging (CEDF/CEDX) and support tools (CEBR, CECI, CEDA, CEMT, CETR, CICSPlex SM, etc.), a large sample library, and sample applications with source code.

- IBM and other vendors also have very capable optional CICS testing, debugging, and monitoring tools.
Why CICS? (cont.)

• CICS offers flexible intercommunication facilities allowing it to be supported and configured across a variety of networks.

• CICS data management is comprehensive and includes support for major database management systems such as DB2 - this also includes a high performance CICS DB2-Attach facility. Data can be in databases, OS datasets, datatables, or even within CICS itself. Other database support includes Oracle, IMS, etc.

• CICS and VSAM continue to be enhanced, such as with the VSAM RLS function of DFSMS, and DFSMStvs (Transactional VSAM Services), for CICS and batch. Note that a coupling facility is required for these optional VSAM components.
Why CICS? (cont.)

- Many IBM CICS SupportPacs, vendor products, freely available source code, and helpful web sites and discussion lists. Speaking of SupportPacs, SOAP for CICS is a good example of how quickly IBM added this support to CICS:
  1. A free download was made available by IBM. The download included code, documentation, and samples. IBM also provided a good SOAP for CICS discussion list.
  2. An optional no-charge feature was added to CICS TS 2.2 and CICS TS 2.3, using a CALLable interface.
  3. It's fully integrated into CICS TS 3.1, via new and enhanced EXEC CICS WEB API commands, etc.
Why CICS? (cont.)

- CICS is designed and developed for high performance, availability, and capability. Examples include:
  1. CICS domain architecture.
  2. CICS storage protection and transaction isolation.
  3. CICS Language Environment (LE).
  4. CICS and the MVS Logger.
  5. CICS-DB2 Attach Facility.
  6. CICS JVMs - single use, resettable, and continuous.
  7. CICS Web Support.
Why CICS? (cont.)

• CICS TS 3.1, CICS Transaction Server for z/OS V3.1, is the latest release from IBM.

• The CICS TS 3.1 announcement letter even mentions a future release. Looks like there's lots more to come - the future looks bright for CICS!

• Our experience with CICS TS 2.3 includes near 100% scheduled availability. Exceptional reliability, with sub-second response time from the web! What's not to like?

• The latest CICS Information Centers for CICS TS 3.1 and 2.3 are (open standards) Eclipse based, with support for z/OS, Linux, AIX, and Windows. The Linux support has been thoroughly tested and utilized by the presenter.
Why CICS? (cont.)

IBM touts 3 "themes" in CICS TS 3.1.

1. Increased ease of integration.
   - This theme revolves around Web Services, SOA (Service Oriented Architecture), and enhanced SSL/TLS security. CICS can now easily be a web service provider, and/or or web service requestor.

For UF, use of the new and enhanced CICS WEB API commands should give us more capability for our CICS web based applications, as IBM has included a new sample application, and new development tools, including the new IBM CICS Web Services Assistant.
IBM touts 3 "themes" in CICS TS 3.1 (cont.).

2. **Enhanced application transformation.**
   - This theme revolves around enhanced XML support, with an addition to the product of "Channels and Containers", lifting the 32K COMMAREA limitation. Also, CICS C/C++ programs can use OTE (Open Transaction Environment) and XPLINK (Extra Performance Linkage) for performance improvements.

For UF, the use of CICS channels and containers should provide performance improvements for large web pages, reducing the number of subroutine calls, etc.
IBM touts 3 "themes" in CICS TS 3.1 (cont.).

3. Improved performance and system management.
   - This theme revolves around CPSM (CICSPlex System Manager) which we have not yet utilized, but is now a base component of CICS TS.

For UF, this release of CICS is where we need to start utilizing CPSM, as it can provide additional monitoring and automation, which is becoming more and more important, with the many components that now make up a CICS "unit of work".
Why the Mainframe?

• "Mainframe renaissance" (once again?) in recent years. "The legacy lives on!" "Big Iron Staying Power."

• Computing pioneer Seymour Cray once said, "What would you rather have to plow a field - two strong oxen or 1,024 chickens?"

• We have 2 processors with 16GB main memory in our z800, which has simultaneously run all of UF and UNF financial and student administration, all of the State of Florida universities LUIS (Library User Information System) and FACTS (Florida Academic Counseling and Tracking for Students). Compare this with the non-mainframe "solutions" with literally hundreds of processors, near terabytes of main memory, many times more DASD, power consumption, floor space, system administrators, etc. Add it up - which is less expensive? Which consistently provides better response time?

Session 1057, SHARE 106, Seattle, WA, Steve Ware, UF.
Why the Mainframe? (cont.)

• What is a mainframe?

• Rack server? Desktop? Laptop? All can now run z/OS, z/VM, z/VSE, and Linux, but...

• "Large" computing system, with lots of processing power, continually being enhanced, with very wide I/O bandwidth, comprehensive instruction set, efficient resource sharing, very capable resource management capabilities, 64-bit architecture, supporting many simultaneous processes/programs, all efficiently managed with an enterprise caliber OS.

• IBM eServer zSeries and System z9. The "zero downtime" and "a to z" enterprise servers, up to 60 LPARs, and 64-bit enabled (24-bit and 31-bit still supported).
Why the Mainframe? (cont.)

- MTBF in decades vs MTBF in years.
- OS choices include z/OS, z/OS.e, Linux, z/VM, TPF, and z/VSE. Focus here will be z/OS - the "zero downtime" and "a to z" Operating System.
- Processor capabilities include General CPs, ICFs, IFLs, zAAPs, and just announced earlier this year - zIIPs for z9. Also, special tamper-proof cryptographic coprocessor cards.
- Some of these new capabilities are an effort by IBM to make the mainframe be perceived as "more affordable" or "less expensive". There have been arguments for and against some of these changes...
Why the Mainframe? (cont.)

- World renowned security and cryptography, including RACF (or other z/OS ESM) and ICSF for z/OS key management facility and crypto API set.
- Think modern, innovative, scalable, resilient, comprehensive, flexible, secure, community (SHARE ;-), value, integration, very capable, etc.
- A very robust and viable component of today's IT infrastructure.
- Extremely high availability - "five nines", 99.999%, with Parallel Sysplex. Our S/390 and zSeries experience for over a decade has been 100% scheduled availability.
- Very fast, sub-second response time, high transaction volumes, even from the web!
Why the Mainframe? (cont.)

• PR/SM (based upon VM), LPARs and LPAR clusters, etc.

• Virtualization, via z/VM and PR/SM, has about a 30 year head start over VMware and other virtualization technologies. Note that the speaker occasionally utilizes VMware for Linux.

• Even with a merging of technologies in servers, the capabilities that others are striving for are the capabilities already available today with the mainframe and in some cases, have been available for possibly decades.

• SMP/E, the IBM System Modification Program Extended component of z/OS, is a comprehensive tool to manage the installation and maintenance of z/OS software. Internet delivery of software maintenance is now standard and recommended.
Why the Mainframe? (cont.)

- Easily supports thousands of interactive users, and a large batch workload. You did consider both the interactive (foreground) and batch (background) workload when sizing those systems, right?

- Varying workloads are all very well managed via z/OS WLM.

- Very high data throughput and I/O are well known mainframe characteristics.

- z/OS has a very capable IP stack. SSL/TLS available with very good performance. Lots of enhancements in z/OS 1.7, including Application Transparent TLS. CICS Socket Interface enhancements in z/OS 1.7 include tracing improvements, and OTE support. Bottom line: z/OS and z/OS components and subsystems are continually being enhanced.
Why the Mainframe? (cont.)

- MVS Open Edition, z/OS Unix System Services, z/OS Unix - oh my!
- X/Open, POSIX compliant, etc.
- Auditability, accountability, and CMF/RMF/SMF, etc. Do you really know how much your non-mainframe servers cost? Can you accurately account for all system resource usage and access? Is there exceptional granularity in non-mainframe measurement facilities?
- Debugging and diagnosis - second to none. System dumps, stand-alone dumps, IPCS, GTF, CMF/RMF/SMF, etc.
- Why not a mainframe? Extremely CPU intensive tasks, such as hurricane prediction, might not be appropriate...
Why the Mainframe? (cont.)

• Are mainframes and mainframe software too expensive? (Remember, this session is only an hour! ;-)

• IBM "Capacity On Demand" capabilities for hardware, and "Sub-capacity Pricing" and "soft capping an LPAR" for software. These require specific RMF/SMF data, but the overhead might be justified, and IBM tools (SCRT) are provided to "run the numbers". Discuss with IBM and/or IBM business partner, and/or other software vendor(s).

• zSeries Software Asset Management: http://www-03.ibm.com/software/solutions/isvcosts/

• "For customers: ISVCOSTS is a no-vendors-allowed discussion list for open discussion by IBM customers of ISV cost issues."
Why the Mainframe? (cont.)

• Have you priced ERP software and other non-mainframe "enterprise" software costs recently? Do you have enough cooling, floor space, and power to attempt to run non-mainframe system hardware? Would you like to pay "per-seat" software license costs, when per-seat includes ~50K students and ~12K faculty and staff?

• Have you ever heard about "Re-boot Hill"? http://actscorp.com/reboothill.htm

• Some organizations gleefully talk about their non-mainframe initiatives, but tend to "clam up" when these initiatives go way over budget and/or can't deliver as promised and/or fail miserably. Let's call these "successful failures".
Why the Mainframe? (cont.)

- "Never trust a computer you can lift ;-)"
What about Mainframe application development?

• New: The CICS Service Flow Feature (See IBM 205-303 Announcement Letter, November 22, 2005.).

• Enables composition of CICS applications to create CICS business services.

• Optional no-charge feature of CICS TS 3.1.

• Delivers Service Flow runtime environment.

• Required by Service Flow Modeler function delivered in WebSphere developer for zSeries.

• Provides runtime components that extend CICS by providing adapters that exploit CICS interfaces, for fast reuse of existing CICS assets.
What about Mainframe application development?

- IBM developerWorks - IBM's resources for developers (almost all platforms, including Linux):
  http://www.ibm.com/developer

- IBM Application Developer CD - ADCD (z/OS specific):

- Fundamental Software, Inc. (FSI), FLEX-ES (x86 "mainframe"):
  http://www.funsoft.com/

- Cornerstone Systems, Inc.:
  http://www.csihome.com/

- T3 Technologies (tServer):
  http://www.t3t.com/
What about Mainframe application development?

- Locally written at UF: EAGLE
- Other "home grown" - a recommended option ;-) Owning the source code to your core business applications is priceless.
- Eclipse.
- IBM Rational Developer - Eclipse based.
- Sun NetBeans.
- WebSphere Developer for zSeries.
- Other?
What about IT staffing and training?

• From a CICS-L posting, "My experience is that us 'unafraid of change' Mainframers tend to think about infrastructure issues more clearly and have a rich history to draw upon when crafting solutions. I still find it amusing when someone thinks I'm a genius for proposing and mimicking an approach that has been in use on the mainframe for 20+ years."

• The IBM Mainframe Charter: "Fostering a vibrant zSeries community with the right skills and expertise available to our customers is an element of the IBM Mainframe Charter." Please see the session Appendix for a link to the IBM Mainframe Charter pdf.
What about IT staffing and training?

- "The IBM Academic Initiative (formerly called the IBM Scholars Program) offers open standards, open source and IBM technologies and educational resources to help faculty and students stay current with the IT industry." http://www.ibm.com/university/

- "The University of Florida is a participating member of the IBM Academic Initiative." See UF IT Connections newsletter story: http://nersp.cns.ufl.edu/~oitnews/2004_12/ibmat.html

What about IT staffing and training?

- Is managing "open systems" staff like "herding cats" ;-)?

- One concern about mainframe staffing is that lots of mainframe professionals are retiring or are about to retire. This same concern is being raised about teachers and nurses (but as far as I know, education and health care are not going to be abandoned, either ;-).

- Not enough IT professionals are being trained and/or majoring in CIS - this is not just a mainframe issue!
What about IT staffing and training?

- Some companies are outsourcing IT work overseas - this is not just a mainframe issue - it's happening with software development, call centers, manufacturing, accounting, health care administration, architecture, etc.

- Recent posting on IBM-MAIN: "I don't know of an outsourcing arrangement that ever really worked. It may work for a while, then comes the problems, the divorce, and back in house it comes. We should change the name to yo-yo sourcing."
What about IT staffing and training?

• Some attempts at IT staffing solutions have already been mentioned, including the IBM Academic Initiative and the zNextGen project.

• Internships and mentoring are other ideas worth considering.

• At UF, a senior CIS major approached me about doing a mainframe senior project. My only comment was "That's great! When can you start?" His project is in production in CICS at UF, and he's gainfully employed in IT.

• Sometimes, a little "maturity" and "institutional knowledge" can go a long way. When choosing a realtor, would you prefer the youngest realtor? What about a financial planner - is youngest the best? How about a brain or heart surgeon?
What about IT staffing and training?

- Is IT training for mainframes too expensive? Is IT training in general too expensive? Posted to IBM-MAIN: "Why are American companies so loathe to foot the bill for mainframe (and most other technology) training?"

- SHARE and other technical conferences are typically good investments.

- Consider book resources such as "Designing and Programming CICS Applications", by John Hornswill, and Members of the CICS Development Team at IBM Hursley: http://www.oreilly.com/catalog/cics/

- Discussion lists such as CICS-L and IBM-MAIN are other good resources.
What about IT staffing and training?

• Xephon CICS, DB2, MVS, MQ, RACF, and TCP/SNA Updates are good resources, with lots of source code, etc. "Founded in 1980, Xephon is a technical and market research organization specializing exclusively in information systems for large enterprises. The results of Xephon's research are made available in a variety of forms, including journals, reports, conferences, and seminars - and this Web site."
http://www.xephon.com/

• Cheryl Watson's Tuning Newsletters (and SHARE presentations), in addition to offering practical mainframe performance and measurement advice, offer good mainframe knowledge transfer. http://www.watsonwalker.com/
What about IT staffing and training?

- IBM and other vendor Webcasts, etc.
- IBM Redbooks (most are very good):
  http://www.redbooks.ibm.com/
- IBM's Redbook series "ABC's of OS/390 System Programming" (5 volumes) and "ABCs of z/OS System Programming" (8 of 11 volumes available as of 01-27-2006).
- IBM's "Introduction to the New Mainframe: z/OS Basics":
Why CICS and the Mainframe - Now?

- The newest capabilities and enhancements to both CICS and the mainframe can be utilized, while more "mature" programs and applications continue to run. For example, newer 64-bit features can be utilized, while older 24-bit and 31-bit programs continue running along fine. Assembler, COBOL, C/C++, and PL/1 CICS applications can be utilized or enhanced, and/or Java can be added to the application mix. Lots of choices and flexibility.

- Multiple releases of CICS can be run simultaneously, making for smooth and phased release migration (see the IBM CICS Installation Guide for additional details).
Why CICS and the Mainframe - Now?

• CICS has provided downward compatibility for most system and application code for many years.

• Note, however, that CICS TS 2.3 is the last release to support OS/VS COBOL run-time. Since the IBM OS/VS COBOL compiler has not been supported by IBM for over 10 years, this should not be an issue for most sites that are migrating to CICS TS 3.1. Also note that a CICS software vendor is marketing a product to allow OS/VS COBOL run-time in CICS TS 3.1.
Why CICS and the Mainframe - Now?

• z/OS and mainframe downward compatibility is also remarkable. We have code from the 70's still running in the latest releases of z/OS. This is not always recommended, but sure is handy in many cases.

• CICS and z/OS migration is made much easier, because backing off an upgrade (or other system level change) is much easier when compared to other computing environments. z/OS can easily be re-IPLed off of the prior SYSRES, or CICS can easily be reloaded with prior run datasets. We haven't had to back off of a CICS or z/OS migration for many many years, btw.
Why CICS and the Mainframe - Now?

• Recently, in our CICS test environment, a system change was made, but was easily backed off in minutes, to assist a CICS application developer resolve the problem. She was amazed that it only took minutes - it turned out to be an application issue, but the resolution was much quicker and easier due to the speed and agility of CICS and z/OS.
Why CICS and the Mainframe - Now?

• IBM has reported CICS and mainframe revenue growth. Both CICS and mainframe capabilities and features continue to be enhanced, seemingly faster than some customers can keep up! In my opinion, this is all good news.

• Almost any good IT professional can be taught about almost any platform. Why not teach them about the best of breed - CICS and the mainframe?

• Why not invest in CICS and the mainframe? Remember, it's not an expense, it's an investment! And when choosing, be sure to "choose wisely"!

• Why not now?
Summary

• UF continues to exploit the many inherent advantages of CICS, z/OS, and the mainframe.

• Students especially like the sub-second response time, even from the web! Faculty and staff also appreciate this good response time, but they might be a bit more patient than the students ;-).

• Do all the math when making computing decisions - you just might calculate that the mainframe costs are very competitive, and that the capabilities of the mainframe are much better than other platforms. TCO and TCU are both important.

• Personally, some business relationships are based upon whether or not the business utilizes a mainframe. Ask, and let the business know what your preferences are!
Summary (cont.)

• I really like things that work, and **work well** - like CICS and the **mainframe** (ok, **Linux**, too ;-).

• IT work should be productive, enjoyable, and **fun**. Ok, it doesn't always work out that way! My experience is that working with CICS and the mainframe, from a **Linux** workstation, is productive, enjoyable, and yes, even fun (most of the time ;-)).

• The **future** looks very **bright** for CICS and the mainframe! (Sunglasses are optional ;-)

• **Thanks!** Have a great time for the remainder of the conference, and have a safe trip home.

• **Questions?** Comments? **Random thoughts?**
Appendix and Additional Information

- IBM CICS (Customer Information Control System):  
  http://www.ibm.com/cics (which recently resolved to)  

- IBM CICS Transaction Server - Features and benefits:  

- IBM CICS Portfolio Brochure (G224-7571-00):  

- IBM Family - News:  

- IBM CICS SupportPacs:  
Appendix (cont.)


• IBM zSeries FAQs: http://www-03.ibm.com/servers/eserver/zseries/faq/

Appendix (cont.)

- IBM Academic Initiative:

- IBM Redbooks:
Appendix (cont.)

- SHARE ("It's not an acronym, it's what we do.")
  http://www.share.org/

- SHARE CICS Project:
  http://www.share.org/cics
Appendix (cont.)

• The University of Florida (UF):  
  http://www.ufl.edu/

• UF Computing & Networking Services (CNS):  
  http://www.cns.ufl.edu/

• CICS at UF:  
  http://cics.ufl.edu/

• EAGLE at UF:  
  http://eagle.ufl.edu/
Appendix (cont.)

• Cheryl Watson, Watson & Walter, Inc.: http://www.watsonwalker.com/

• VMware, Inc. (Virtualization Software): http://www.vmware.com/

• Xephon ("Update" publications): http://www.xephon.com/
Abbreviations

- ADCD: Application Developer Compact Disk (CD)
- CICS: Customer Information Control System
- CIS: Computer and Information Sciences
- CISE: Computer and Information Science and Engineering
- CMF: CICS Measurement Facility (via SMF)
- CNS: Computing & Networking Services (formerly NERDC)
- CP: Central Processor - see CPU
- CPU: Central Processing Unit
- DFSMS: Data Facility Storage Management Subsystem
Abbreviations (cont.)

- **EAGLE**: UF Enhanced Application Generation Language for the Enterprise
- **EGL**: IBM Enterprise Generation Language
- **ESM**: External Security Manager
- **FACTS**: Florida Academic Counseling and Tracking for Students
- **Heritage**: See Legacy
Abbreviations (cont.)

- IBM: International Business Machines, Inc.
- I/O: Input/Output
- ICF: Integrated Coupling Facility
- ICSF: Integrated Cryptographic Service Facility
- IFL: Integrated Facility for Linux
- IT: Information Technology
- LE: Language Environment
- Legacy: It Works!
- LPAR: Logical Partition
Abbreviations (cont.)

- MTBF: Mean Time Between Failures
- MVS: Multiple Virtual Storage
- NERDC: Northeast Regional Data Center (now CNS)
- OS: Operating System
- OTE: Open Transaction Environment
- PDF: Portable Document Format
- PR/SM: IBM Processor Resource/Systems Manager
- RMF: Resource Monitoring Facility
- RLS: Record Level Sharing
Abbreviations (cont.)

• SCRT: Sub-Capacity Reporting Tool
• SMF: System Monitoring Facility
• SNA: Systems Network Architecture
• SOA: Service Oriented Architecture
• SOAP: Simple Object Access Protocol (a component of web services)
Abbreviations (cont.)

- TCO: Total Cost of Ownership
- TCU: Total Cost per User
- TS: Transaction Server
- UF: University of Florida
- UNF: University of North Florida
- VSAM: Virtual Storage Access Method
- VTAM: Virtual Telecommunications Access Method
- VM: Virtual Machine
- WLM: Workload Manager
Abbreviations (cont.)

• z/OS: The "zero downtime" and "a to z" Operating System
• zSeries: The "zero downtime" and "a to z" Enterprise Servers
• zAAP: zSeries Application Assist Processor (for Java)
• zIIP: zSeries Integrated Information Processor (for DB2)
Presentation Information

• The **Slackware Linux** Project:  
  http://www.slackware.com/

• **OpenOffice.org** 2.0.1 "Impress":  
  http://www.openoffice.org/  
  (File -> Export as PDF)  
  (Used SHARE supplied PowerPoint template.)

• IBM (Lenovo) **ThinkPad** T40 2379-D5U:  