

# NMMSS Upgrade Project Overview

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Pittsburgh, PA  
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SEO-SST-2006-00158

# Department of Energy

Peter Dessaulles, DOE SP 1.22  
Federal Project Manager

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Responsible Operations Office  
Division Director, SES&T

Washington Savannah River Company  
M&O Contract DE-AC09-96-SR-185000



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# WSRC NMMSS Upgrade Team

Program/Product Manager  
**Jerry O'Leary**

Gordon Meek, Project Advisor  
Tracy Webb, Project Controls

Design Authority Function

John Robichaux, Design Authority Engineer  
Marvin Moore

Quality Assurance

Tim Tate, WSRC Quality Services

Design Agency Function

John Thomas, IT Manager  
Dan Farmer, Project Engineer  
Rick Edwards  
Bob Alger  
Norma Camp  
Brent Krenz



# NMMSS Upgrade Work Scope

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The WSRC work scope is to execute the NMMSS Upgrade effort consistent with the DOE Systems Engineering Methodology Version 3 and in coordination with the NMMSS Operator. Develop and issue project plans and resource loaded schedules, coordinate and perform requirement validation and development with HS 1.22, other DOE elements and NRC; issue detailed and testable requirements specifications, perform design and validation activities, Implement selected components of the upgrade design for testing and evaluation.

# Project Structure

The NMMSS Upgrade Project has been decomposed into nine elements:

1. Program Support Activities – these span the entire project
2. System Description – High level requirements and design

Seven functional components were identified that implemented essential processing modules:

1. Authority Reference
2. Transactions Processing
3. Inventory Processing
4. Material Balance Processing
5. IAEA Reporting
6. Reports
7. SAMS

# NMMSS Functional Components

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## Authority Reference

The Authority Reference module provides the capability to input and maintain certain reference data to be used in validating data in other NMMSS functions. Reference information is to be entered only once unless relevant details change. In addition, the Authority Reference functions shall implement the business rules defined in Appendix A.

# NMMSS Functional Components

## Transaction Processing

The Transaction module permits the tracking of all controlled nuclear materials within the U.S. as well as U.S. material abroad in commonly defined reporting units. The transaction processing function involves the recording of the actual shipment/receipt or transfer of nuclear materials between facilities. Transactions may also record nonphysical transfer of material and other types of receipts and removals such as sales, decay, gains, losses and origin swaps.

One of the best safeguard features of the NMMSS is the comparison of shipper and receiver data on domestic shipments of nuclear material. The system serves as the impartial third party in highlighting differences and providing the DOE and NRC with the initial data necessary to investigate events and trends

# NMMSS Functional Components

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## Inventory Processing

The Inventory module provides a means determine the amount of nuclear material at a specific facility at a specific point in time. Reported inventory is used to update the nuclear material inventories for each facility in the U.S. The DOE relies on COEI reports for materials management activities. DOE contractors report inventory data at various cycles, some as frequently as monthly, but most report on a quarterly basis.

# NMMSS Functional Components

## Material Balance Processing

The Material Balance module provides the capability to determine a reporting entity's inventory status for a specified time period with inventory changes summarized by categories of increases and decreases. Final material balances are determined for each facility by summing the transaction data entries over a specified period of time and applying these to a previously reconciled period's ending inventory. The use of reported inventory data and transaction data enables the system to generate all other data comprising the material balance report.

# NMMSS Functional Components

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## IAEA Reporting

The IAEA module supports the interaction between the U.S. and IAEA. Under the U.S. – IAEA Safeguards Agreement, the U.S. is obligated to furnish data and reports to the IAEA for selected U.S. facilities and for all import and export activity. This module satisfies the IAEA Reporting function of the NMMSS.

# NMMSS Functional Components

## Reports

The Report module provides additional or miscellaneous reports that are not included in the Authority Reference, Transactions, Inventory, Material Balance, International Reporting and IAEA Reporting functions. It also provides the capability to generate reports in response to user requests, special studies and congressional inquiries. These reports may use one of the NMMSS standard report formats or may require a special query.

# NMMSS Functional Components

## SAMS

The SAMS module provides the NMMSS data contributors a means of verifying, correcting, and entering transaction, inventory, and material balance data for electronic submission to NMMSS. It is a mini version of the NMMSS application for nuclear facilities to use at their site in support of their accountability systems in preparing data for submission to NMMSS.

# Spiral Development Model

- § Spiral development repeats the planning, requirements, and functional design stages in a succession of cycles or evolutions in which the project's objectives are clarified, alternatives are defined, risks and constraints are identified, and a provisional product or prototype is constructed.
- § The application product is evaluated after each evolution and the next cycle is planned.
- § The project objectives, alternatives, constraints, and risks are refined based on each evolution; then, an improved product is constructed with additional increments of functionality until the complete application product is completed and delivered.

# Spiral Development Model



Application of the Spiral Model to the NMMSS Upgrade will involve 7 iterations of development and deployment :

	<u>Description</u>	<u>Product</u>
All increments	User Interface requirements	
All increments	Security requirements	
All increments	System Performance requirements	
Spiral #1	Authority Reference component	NMMSS Upgrade Ver. 1.0
Spiral #2	Transaction processing component	NMMSS Upgrade Ver. 2.0
Spiral #3	Inventory component	NMMSS Upgrade Ver. 3.0
Spiral #4	Material Balance component	NMMSS Upgrade Ver. 4.0
Spiral #5	IAEA Reporting component	NMMSS Upgrade Ver. 5.0
Spiral #6	Reports component	NMMSS Upgrade Ver. 6.0
Spiral #7	Release of SAMS application	SAMS Upgrade Ver. 1.0

# NMMSS Upgrade Schedule – Critical Decision 2

WBS Element			Element Description	Product Version	Schedule Completion Date
04	01	01	NMMSS Project Support Activities		1/31/2008
04	02	00	NMMSS System Description		3/31/2004
			Spiral Evolutions		
04	02	01	NMMSS Authority Reference	Version 1.0	12/31/2004
04	02	02	NMMSS Transactions	Version 2.0	8/31/2005
04	02	03	NMMSS Inventory	Version 3.0	3/31/2006
04	02	04	NMMSS Material Balance	Version 4.0	9/30/2006
04	02	05	NMMSS IAEA Reporting	Version 5.0	3/21/2007
04	02	06	NMMSS Reports	Version 6.0	10/30/2007
04	02	07	NMMSS SAMS		12/31/2007



# NMMSS Upgrade Revised Schedule

WBS Element			Element Description	Product Version	Schedule Completion Date	Actual Completion Date
04	01	01	NMMSS Project Support Activities		1/31/2008	
04	02	00	NMMSS System Description		3/31/2004	2/19/2004
			Spiral Evolutions			
04	02	01	NMMSS Authority Reference	Version 1.0	12/31/2004	12/4/2004
04	02	02	NMMSS Transactions	Version 2.0	8/31/2005	8/29/2005
04	02	03	NMMSS Inventory	Version 3.0	3/31/2006	3/30/2006
04	02	04	NMMSS Material Balance	Version 4.0	9/30/2006	9/30/2006
04	02	07	NMMSS SAMS		11/30/2006	
04	02	05	NMMSS IAEA Reporting	Version 5.0	5/31/2007	
04	02	06	NMMSS Reports	Version 6.0	12/31/2007	



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## Project Performance Measures

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- § Maintain cumulative Schedule Performance Index (SPI) value • .9 and • 1.10
- § Maintain cumulative Cost Performance Index (CPI) value between • .9 and • 1.10•

# NMMSS Upgrade Project Performance to Date

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September 2006 Month End  
Cumulative Totals

## **Cost Performance Index**

**CPI            .99**

## **Schedule Performance Index**

**SPI            .97**

# NMMSS Upgrade Technical Description

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## § Commercially available

- Operating Systems
  - Windows 2003, Windows XP
- Software development tools
  - Microsoft Visual Basic 2005 (.NET)
- Database
  - Microsoft SQL Server 2000 (upgrading to 2005)
- Data interchange and reports
  - XML
  - Traditional flat file technology

# NMMSS Upgrade Technical Description

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## § Project Statistics

- 421 Functional Requirements
- 511 Business Rules

## § Application Statistics

- NMMSS Upgrade currently has a total of 98 menu options with 80 different screens

## § Software Statistics

- 394 different software files/component
- 150,000 lines of code

# Why we are here

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- § Present proposed design and functionality information for the SAMS application to be developed under the NMMSS Upgrade project; and,
- § Ensure that NMMSS operator, DOE, NRC, and contractors thereto, more fully understand the implications of the revised user interface and its potential impact upon the user community (the data contributors). The NMMSS Upgrade version of the SAMS application will appear and behave very differently than the current version of SAMS.

# Why we are here

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The SAMS application is essentially an extract of components of the NMMSS application and thus presents a user interface that is characteristic of the NMMSS application that the NMMSS Operator's system analysts experience.

The current NMMSS application is based upon a now obsolete FoxPro single record character oriented window-type user interface while the NMMSS Upgrade application uses a multi-record relational graphical user interface.

The technologies deployed by the NMMSS Upgrade that effect the user interface are Windows 2000/XP, SQL Server Express and Visual Studio.

# AGENDA

NMMSS Upgrade Project Overview

Jerry O'Leary, WSRC

Review of Current SAMS Application

Sam Brown, NAC International

Current Utilization of SAMS

DOE Site Representatives  
NRC Licensees  
NRC Software Vendors

Review SAMS Functional Requirements

John Robichaux, WSRC

Upgrade SAMS Conceptual Design

Daniel Farmer, WSRC

Standard User Interface Demonstration

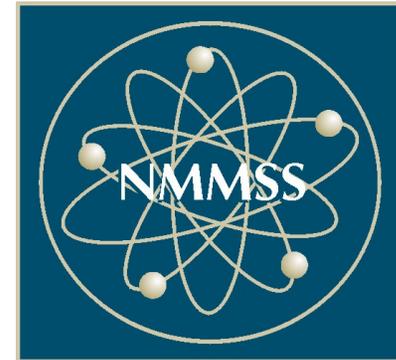
Daniel Farmer, WSRC

Open Discussion of Potential Affects Upon  
Data Submitters

Computer System Configuration  
User Interface Considerations  
User Training  
Beta Version

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# SAMS Functional Requirements

John Robichaux  
Safeguards & Security Integration  
Washington Savannah River Company

Pittsburgh, PA  
October 17, 2006

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# Overall SAMS Requirement

## System Requirement Specification (Rev. 4b Draft)

- The NMMSS-maintained software interface package, Safeguards Management Software (SAMS) will continue to be supported and upgraded to meet the new requirements of the upgraded NMMSS.
- SAMS will be supported on Microsoft Windows operating systems (2000 and NT) on Pentium processors with a minimum of 256 MB RAM of memory.

Note: Minimum hardware requirements will be upgraded.

# General SAMS User Interface

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- § Sign into application
- § Main menu structure
- § Consistent user interface
- § Provide pre-determined field data (drop-downs)
- § Ability to traverse / locate records
- § Perform field validation checks
- § Appropriate error messages upon validation
- § Provide system error message descriptions

# General User Interface Cont.

- § Migrate data from previous versions
- § Maintain NMMSS menu structure
- § Standardized report parameter screens
- § Standardized Report Formats
  - Cover Page
  - Internal Pages Header & Footer
  - No Data Page
  - Query Parameter Page
  - End of Report Page

# Authority Reference Requirements

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- § Manually enter, edit and search for address information
  
- § Assign shipping address information to a RIS
  - Usage in 741, 742, 742C forms
  
- § Preserve address information during updates

# Transaction Processing Requirements

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- § Import XML data
- § Import text (80 column) data
  - XML converter
- § Manually enter transactions
- § Perform on-line modifications
  - Current & future accounting periods
- § Clearly identify newly imported records
- § Distinguish between current & historical records
- § Convert asterisk values to zero (element & isotope wts.)

# Transaction Processing Cont.

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- § Recall & traverse records
- § Create new records
- § Modify existing records
- § Save changes to records
  - with or without errors
- § Delete records
  - Current & historical
- § Copy data to new records
- § Move records to & from historical

# Transaction Processing Cont.

- § Run all edit checks for current and future accounting periods
- § Perform Process Runs
  - Includes all records not in historical
    - Will not use run numbers or work dates
  - Identify duplicate transactions
  - Identify transactions with errors
  - Identify error free transactions
- § Exempt field level errors

# Transaction Processing Cont.

## § Edit / Validation Checks

- Transaction Edits - General Rules
- Transactions Header Business Rules
- Transactions Detail Line Business Rules

## § Account for Project transfers

## § Account for Obligation information

## § Convert IAEA or facility codes to NMMSS codes

## § Convert IAEA, KMP & Measurement Basis codes to NMMSS Composition (COEI) codes

# Transaction Reports & Exports

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## § Generate the following reports

- Simulated 741 Report
- TJ-002 – Transaction Data Errors
- Run Edit checks prior to report generation

## § Generate a Transaction XML datasets

- Per D-23 & D-24 requirements

# Inventory Processing Requirements

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- § Import XML data
- § Import text (80 column) data
  - XML converter
- § Manually enter Inventory data
- § Perform on-line modifications
  - Current & future Inventory periods
- § Clearly identify newly imported records
- § Distinguish between current & historical records
- § Convert asterisk values to zero (element & isotope wts.)

# Inventory Processing Cont.

---

- § Recall & traverse records
- § Create new records
- § Modify existing records
- § Save changes to records
  - with or without errors
- § Delete records
  - Current & historical
- § Copy data to new records
- § Move records to & from historical

# Inventory Processing Cont.

- § Run all edit checks for all reported inventories
- § Perform Process Runs
  - Identify duplicate inventory records
  - Identify inventories with errors
  - Identify error free inventories
- § Exempt field level and compatibility errors
- § Edit / Validation Checks
  - Current Inventory Business Rules

# Inventory Processing Cont.

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- § Implement new Process codes
  - A, C and D
- § Convert IAEA or facility codes to NMMSS codes
- § Convert IAEA, KMP & Measurement Basis codes to NMMSS Composition (COEI) codes

# Inventory Reports & Exports

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- § Generate the following reports
  - Simulated 742C Report
  - I-010E – Inventory Data Listing
  - Run Edit checks prior to report generation
  
- § Generate a Inventory XML datasets
  - Per D-23 & D-24 requirements

# Material Balance Processing Requirements

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- § Import XML data
- § Import text (80 column) data
  - XML converter
- § Manually enter records / data
- § Perform on-line modifications
  - Current & future accounting periods
- § Clearly identify newly imported records
- § Distinguish between current & historical records
- § Convert asterisk values to zero (element & isotope wts.)

# Material Balance Processing Cont.

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- § Recall & traverse records
- § Create new records
- § Modify existing records
- § Save changes to records
  - with or without errors
- § Delete records
  - Current & historical
- § Copy data to new records
- § Move records to & from historical

# Material Balance Processing Cont.

- § Run all edit checks for all reported balances
- § Perform Process Runs
  - Identify duplicate Material Balance records
  - Identify Material Balance with errors
  - Identify error free Material Balance
- § Exempt edit check errors
- § Edit / Validation Checks
  - Current Material Balance Business Rules
- § Implement new Process codes
  - A, C and D

# Material Balance Reports & Exports

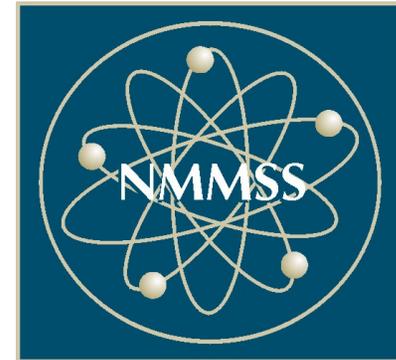
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## § Generate the following reports

- Simulated 742 Report
- MB-001-ED – Material Balance Data
- Run Edit checks prior to report generation

## § Generate a Material Balance XML datasets

- Per D-23 & D-24 requirements



# Upgrade SAMS Conceptual Design

Dan Farmer  
Technical Manager NMMSS Upgrade  
WSRC

October 17-18, 2006

SEO-SST-2006-00158

# Outline

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- § Project Information
- § Product Environment
- § SAMS Upgrade Approach
- § System Requirements
- § Computer Security Issues

# Project Organization

## § Project Sponsors

- Peter “the Sponsor” Dessaulles (DOE) and Brian Horn (NRC)

## § Local Oversight

- Tom Williams and Scott Boeke (DOE-SR)

## § Washington Savannah River Company

- Jerry O’Leary (Project Manager), John Robichaux (Design Authority)
- Dan Farmer (Technical Manager), Rick Edwards (Team Lead)
  - Team – Norma Camp, Brent Krenz and Bob Alger

## § NAC International

- Dan Collier (Point of Contact), Tina Barnett (Technical Liaison), Sam Brown (Technical Liaison) , and Mitch Hembree (Testing Lead)

# Project Methodology

## § Spiral / Iterative Development

- Each major function of the NMMSS is divided into segments.
  - Authority Reference
  - Transactions
  - Inventory
  - Material Balance
  - SAMS
  - IAEA Reports
  - Reports
- Each segmented function (or turn of the spiral) will be completed sequentially and tested at NAC for use after completion.

# Project Methodology

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- § Rigorous Project Management and Software Engineering Practices are followed.
- DOE O 413.3 Project Management Order
  - DOE M 413.3-1 Chapter 12 Earned Value Management
  - DOE M 200.1-1A Systems Engineering Methodology

# Current Status of Software Development

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## § Spirals Completed to Date

- Authority Reference (Software 12/15/04, Parallel Testing 03/16/05)
- Transactions (Software 8/31/05, Parallel Testing 01/31/06)
- Inventory (Software 3/31/06, Parallel Testing 06/30/06)
- Material Balance (Software 9/30/06, Parallel Testing 12/31/06)

## § Current Efforts are in the planning and design of SAMS

## § Resolved issues of Microsoft Upgrades to SQL Server and the Software Development tools

# Product Environment

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## § Anticipated components of the Upgraded SAMS

- Microsoft Windows Operating System (see below) but preferably a flavor of Windows XP
- Microsoft .NET 2.0
- Microsoft SQL Server Express (free version of SQL Server)
- Microsoft Internet Explorer 6.0 SP1 or later
- XML and XSL for Reports

## § Anticipated components to build SAMS

- All the above
- Visual Studio 2005

# SAMS Upgrade Approach

## § Comparison of Safeguards Management System (SAMS) Development Approach

### – Classic

- Software built in FoxPro
- Derived from existing NMMSS FoxPro component
- FoxPro components are used to create SAMS from NMMSS

### – Upgrade

- Software built in Visual Basic .NET
- Derived from upgrade NMMSS Visual Basic/SQL Server component
- Visual Basic/SQL Server components are used to create Upgrade SAMS from Upgrade NMMSS

# SAMS Upgrade Approach

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## § Edit checking

- Classic
  - Limited set of edit checks due to original distribution media
- Upgrade
  - Expanded set of edit checks
    - All of Authority Reference Data can be distributed on a CD

# SAMS Upgrade Approach

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## § Example of Edit Checks currently not run in Classic SAMS

- The NMMSS Classic system does not currently check to see if the transfer authority number is in the INMITS Table. The New system will.

[The following are all contained in the transaction business rules.doc](#)

# SAMS Upgrade Approach

## § Data entry model

– Classic

- Screens are row or record oriented



– Upgrade

- Screens are data set oriented

AddressKey	StreetAddress	City	StateCode	Zip	OuterEnvelope
1	9800 SOUTH CASS AVENUE	ARGONNE	IL	60439	
2	505 KING AVENUE	COLUMBUS	OH	43201	ATTN: DOCUMENT CUSTODIAN
3	115 SPEDDING HALL ISU	AMES	IA	50011	
4	115 SPEDDING HALL ISU	AMES	IA	50011	SHIPPING AND RECEIVING
5	9800 S. CASS AVENUE	ARGONNE	IL	604394899	ATTN: DOCUMENT CUSTODIAN
6	P. O. BOX 451	PRINCETON	NJ	08543	SAFETY, JAMES FORRESTAL CAMPUS
7		PRINCETON	NJ	08543	RT. 1, JAMES FORRESTAL CAMPUS
9	376 HUDSON STREET	NEW YORK	NY	100143621	RADIATION PHYSICS DIVISION

# SAMS Upgrade Approach

## § Reports

- Classic
  - Paper reports
    - Text based formats created in the Mainframe “era”
  - Electronic Reports
    - Text file format or an Excel extraction
- Upgrade
  - Paper reports
    - True formatted reports
      - » <D:\Demo\open.html>
  - Electronic Reports
    - XML / XSL style sheets or an Excel extraction
      - » <..\..\..\Program Files\WSRC\NMMSS Application\D-002.xml>

# SAMS Upgrade Approach

## § Data Imports and Exports

- Classic
  - Handles 80 column format as well as XML formats
- Upgrade
  - Only will input and output XML formats
  - A Utility Program will convert any 80 column format to XML format
  - There are no plans on creating any method of creating 80 column formatted files
  - Library

# SAMS Upgrade Approach

## § Underlying Database Structure

### – Classic

- FoxPro files were not fully relational. Tables held some duplicate data
- Overall data structure is based on a Material Type view

### – Upgrade

- Database upgrade normalized the data structure (ie. Got rid of duplicate data)
- Overall data structure is based more on a periodic table view which can model the Material Type View

[Docs\NMMSS Software Design Description .doc](#)

# System Requirements

## § System Requirements\*

- Prerequisite hardware
  - RAM Minimum: 192 MB
    - Recommended: 512 MB or higher
  - Hard Disk space 600 MB free space
  - Processor Pentium III Compatible or higher
    - Minimum: 500 MHz
    - Recommended: 1 GHz or higher

\*Note: (as identified by Microsoft in SQL Server 2005 Books Online Hardware and Software Requirements (SQL Server Express) Updated: 17 July 2006 )

# System Requirements

## § System Requirements (cont.)

### – Prerequisite software

- [Microsoft .NET Framework 2.0](#)
- SQL Server Setup requires Microsoft Data Access Components (MDAC) 2.8 SP1 or later. You can download MDAC 2.8 SP1 from this [Microsoft Web site](#).
- Internet Requirements Microsoft Internet Explorer 6.0 SP1 or later (prerequisite for .NET Framework)
- Operating System
  - Windows Server 2003 SP1, Windows Server 2003 Enterprise Edition SP1, Windows Server 2003 Datacenter Edition SP1, Windows Small Business Server 2003 Standard Edition SP1, Windows Small Business Server 2003 Premium Edition SP1, Windows XP Professional SP2, Windows XP Home Edition SP2, Windows XP Tablet Edition SP2, Windows XP Media Edition SP2, Windows 2000 Professional Edition SP4, Windows 2000 Server Edition SP4, Windows 2000 Advanced Edition SP4, Windows 2000 Datacenter Server Edition SP4

# System Requirements

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- § Hardware needed specifically by the Upgrade SAMS
  - Video and Screen capable of displaying 1280 by 1024

# Computer Security Issues

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## § Potential Issues

- SQL Server Express
- Windows patches
- .NET 2.0 Framework