NumaStore Preclinical™ FAQ

1. What is NumaStore Preclinical?
NumaStore Preclinical is an image storage and management solution designed to meet the specific needs of preclinical imaging departments. NumaStore Preclinical improves the workflow in the department by automatically backing up all image data created by all configurations of the Siemens Inveon™ PET/SPECT/CT scanners. NumaStore compresses the large image files using a lossless algorithm before storing them in local volumes or network shares, which saves costs by making efficient use of the storage hardware. Using NumaStore’s intuitive interface, studies can be quickly organized by file name, date, project name and many other attributes. Studies are easily exported to Inveon Acquisition Workplace (IAW) or Inveon Research Workplace (IRW) for reprocessing and display. NumaStore Preclinical also supports clinical DICOM formats and connectivity. This allows NumaStore to be the central archive and image management solution for all your research and imaging needs.

2. How does NumaStore Preclinical work with Inveon?
NumaStore Preclinical monitors the data folders on the IAW using a network connection and windows file sharing to automatically copy data files to NumaStore. The only modification required on the IAW is to grant NumaStore Preclinical read access to these folders. NumaStore can be configured to check for new data at time increments that can vary between once a minute to once a week or more. Once stored, the NumaStore data can be queried, sorted, filtered and exported back to the IAW. See the Inveon – NumaStore Workflow Drawing.
In addition, NumaStore Preclinical is able to store and manage DICOM data exported from the IRW. NumaStore can automatically copy data from any workstation that supports DICOM Query/Retrieve SCP. Users at systems, such as IRW, that support DICOM Query/Retrieve SCU can retrieve copies of studies that are stored in NumaStore in DICOM format. See the Inveon – NumaStore Workflow Drawing.

3. What data types does NumaStore Preclinical support?
NumaStore Preclinical supports all data types created by the Siemens Inveon® Preclinical platform including: raw projections, reconstructed, dynamic, gated, dynamic-gated, histogrammed, sinogram, list mode data, and calibration data. NumaStore Preclinical also supports DICOM images from IRW.

4. How much storage space do I need with NumaStore Preclinical?
There are many variables that determine the amount of storage that is required for a specific image, study or project. Some of the variables include the number of projections, matrix size and modality along with the amount of raw, reconstructed, histogrammed, list mode and calibration data acquired. For example a single typical PET/CT scan that includes raw CT, reconstructed CT, reconstructed PET, histogrammed PET, list mode and calibration data can range from 2.4 GB to 112 GB uncompressed or 971 MB to 44.8 GB compressed. Multiply this by the 100 scans and the amount of compressed data or the storage requirement becomes 95 GB to 4.4 TB. Contact Numa for more information on storage requirements.

5. How does NumaStore Preclinical file compression work?
NumaStore Preclinical employs 7-Zip to quickly and efficiently compress larger files, a lossless algorithm protects data integrity. The overall compression ratio for the different data types is roughly 40%. The chart below shows typical results for specific data types.

<table>
<thead>
<tr>
<th>Modality</th>
<th>Average Compression (%)</th>
<th>Raw Data Compression (%)</th>
<th>Sinogram Compression (%)</th>
<th>Image Compression (%)</th>
<th>Calibration Data Compression (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET</td>
<td>55</td>
<td>84</td>
<td>15</td>
<td>44</td>
<td>79</td>
</tr>
<tr>
<td>CT</td>
<td>49</td>
<td>59</td>
<td>N/A</td>
<td>39</td>
<td>59</td>
</tr>
<tr>
<td>SPECT</td>
<td>9</td>
<td>80</td>
<td>8</td>
<td>14</td>
<td>4</td>
</tr>
</tbody>
</table>

6. How do I purchase NumaStore Preclinical?
NumaStore Preclinical can be purchased from Numa Inc. Numa representatives will work with you to answer any questions and configure a NumaStore Preclinical system to meet the workflow and storage requirement of your department. Interested parties should contact Numa directly at:

   Telephone: 1.800.733.6862 (US and Canada only)
   1.603.883.1909
   Email: sales@numa-inc.com
   Web: www.numa-inc.com

7. What is the installation process for NumaStore Preclinical?
When an order is received, a Numa project manager will work with your department to coordinate the installation. A survey is completed to learn the specifics of the department’s equipment and network configuration. A requirements document is sent out to prepare for the installation. An installation date is scheduled and a Numa engineer performs the software installation, configuration and testing. A training session is scheduled to review the operation of NumaStore Preclinical with the end user(s).

8. What is the support plan for NumaStore Preclinical?
NumaStore Preclinical’s warranty includes technical support, software updates, disaster recovery and remote status reviews. Numa also offers extended warranty and service agreements. Customers are instructed to contact Numa technical support for service on NumaStore Preclinical. Numa’s support can be reached by:

- Telephone: 1 (800) 733-6862 (US and Canada only)
  1 (603) 883-1909 Ext. 300
- Email: techsupport@numa-inc.com
- Web: www.numa-inc.com/support

9. Are extended service agreements available for NumaStore Preclinical?
Yes, Numa offers extended service agreements for NumaStore Preclinical that include technical support, software updates and options for disaster recovery support and remote status reviews. Contact Numa technical support for more information.

10. What are the hardware and software system requirements for NumaStore Preclinical?
For software-only installations the customer/site must supply the computer system or VMware environment for proper operation of the NumaStore software. Below are the minimum and recommended hardware and software requirements, however Numa recommends that customers consult with Numa for the specifications that meet the workload and workflow requirements for each application.

**Minimum Requirements:**
- Minimum Software Requirements for NumaStore Preclinical:
  - Microsoft Windows® XP or Windows 7
  - Microsoft MSDE SQL Server Express
  - RealVNC® remote control (for Numa technical support)
- Minimum Hardware Requirements:
  - Microsoft Windows® compatible computer system
  - Dual Core CPU, 2 GB RAM, 200GB hard drive, and a network card
  - Internet connectivity

**Recommended Requirements:**
- Recommended Software Requirements of NumaStore:
  - 64-bit Microsoft Windows® 7 Pro or higher
  - Microsoft MSDE SQL Server Express
  - RealVNC® remote control (for Numa technical support)
  - Antivirus software
  - OS, database, image backup and recovery software
- Recommended Hardware Requirements for NumaStore:
  - Windows® Compatible Computer System
    - <2.0GHz quad core CPU; 8GB RAM
    - 160 GB mirrored hard drive for the operating system
    - 160–500GB cache hard drive
    - 2 network cards
    - 2 TB or more of RAID storage
  - 17” monitor
  - Uninterruptible power supply (UPS)
  - Backup storage device
  - Internet connectivity

11. Does NumaStore Preclinical support clinical data?
Yes, NumaStore Preclinical is a customized version of the popular NumaStore Image Management system that supports many vendors’ imaging systems, multiple modalities and several versions of DICOM and non-DICOM image formats. Contact Numa for more information.

12. Are turnkey hardware and software solutions available from Numa for NumaStore Preclinical?
Yes, Numa can supply hardware, software and onsite installation support for customers in North America. For customers outside the United States, please contact Numa for information on configuration options and hardware support. Numa has several hardware configuration options and will work with you to match your budget and workflow requirements. Numa will build the system to your specifications and install it in your department. Contact Numa for more information.

13. Can NumaStore run in a VMware or Virtual Environment?
Yes. Please see the NumaStore Preclinical system requirements or contact Numa for more information.

14. Is NumaStore Preclinical expandable?
Yes, NumaStore Preclinical can be expanded in many ways, including:
- Support the full versions of Microsoft SQL (i.e., non Express)
- Connections to additional Inveon systems
- Connections to other DICOM compliant workstations and systems
- Additional hardware storage options
Contact Numa for more information.

15. What are the sizes of the PET/CT image studies created by the Inveon system?
The tables below list the sizes of the image/data files created using different PET/CT acquisition and reconstruction protocols of the Inveon system. This information can be used to calculate the amount of storage space required for NumaStore Preclinical. Multiply the size of types of images to be created by the number of images and compression percentage. Information about NumaStore’s image compression is available here.

**Raw CT Projection Data: 16-bit Unsigned Integer Data**
220 / 360 Projections

<table>
<thead>
<tr>
<th>512 X 768</th>
<th>1024 X 1024</th>
<th>1024 X 1536</th>
<th>2048 X 2048</th>
<th>2048 X 3072</th>
<th>4064 X 4096</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>167 MB</td>
<td>446 MB</td>
<td>669 MB</td>
<td>1.8 GB</td>
<td>2.7 GB</td>
</tr>
<tr>
<td>360</td>
<td>272 MB</td>
<td>726 MB</td>
<td>1.1 GB</td>
<td>2.9 GB</td>
<td>4.4 GB</td>
</tr>
</tbody>
</table>

**Reconstructed CT Image Data: 16-bit Signed Integer Data**

Note: The average reconstructed CT image size will be between 384–3,000 MB.

<table>
<thead>
<tr>
<th>512 X 512</th>
<th>768</th>
<th>1024</th>
<th>2048</th>
<th>3072</th>
<th>4096</th>
</tr>
</thead>
<tbody>
<tr>
<td>512</td>
<td>250 MB</td>
<td>375 MB</td>
<td>500 MB</td>
<td>1 GB</td>
<td>1.5 GB</td>
</tr>
<tr>
<td>1024 X 1024</td>
<td>1 GB</td>
<td>1.5 GB</td>
<td>2 GB</td>
<td>4 GB</td>
<td>6 GB</td>
</tr>
<tr>
<td>2048 X 2048</td>
<td>4 GB</td>
<td>6 GB</td>
<td>8 GB</td>
<td>16 GB</td>
<td>24 GB</td>
</tr>
<tr>
<td>4064 X 4096</td>
<td>16 GB</td>
<td>24 GB</td>
<td>32 GB</td>
<td>64 GB</td>
<td>96 GB</td>
</tr>
</tbody>
</table>

**Histogrammed PET Data: 16-bit Integer**

Note: The average sinogram size will be from 168–5,000 MB.
<table>
<thead>
<tr>
<th>Static Data w/ 27 segments</th>
<th>Dynamic Data w/30 frames</th>
<th>Gated Data w/4 Gate Bins</th>
<th>Gated Data w/8 Gate Bins</th>
<th>Dynamic-Gated Data w/30 Frames and 4 Gate Bins</th>
<th>Dynamic-Gated Data w/30 Frames and 8 Gate Bins</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 X 160 X 159</td>
<td>168 MB</td>
<td>X27 X30 = 5 GB</td>
<td>X27 X4 = 670 MB</td>
<td>X27 X8 = 1.3 GB</td>
<td>X30 X4 = 20.1 GB</td>
</tr>
</tbody>
</table>

**Reconstructed PET Data: 32-bit float data**

*Note: Typical reconstructed PET image sizes will range from 10–300 MB.*

<table>
<thead>
<tr>
<th>Static PET Data</th>
<th>Dynamic PET Data w/30 frames</th>
<th>Gated PET Data w/4 Gate Bins</th>
<th>Gated PET Data w/8 Gate Bins</th>
<th>Dynamic-Gated PET Data w/30 Frames and 4 Gate Bins</th>
<th>Dynamic-Gated PET Data w/30 Frames and 8 Gate Bins</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 X 128 X 159</td>
<td>10 MB</td>
<td>298 MB</td>
<td>40 MB</td>
<td>80 MB</td>
<td>1.2 GB</td>
</tr>
<tr>
<td>256 X 256 X 159</td>
<td>40 MB</td>
<td>1.2 GB</td>
<td>159 MB</td>
<td>318 MB</td>
<td>4.8 GB</td>
</tr>
</tbody>
</table>

**Listmode Data:**

Raw scanner acquired data will typically range from 1–100 GB. It is difficult to estimate this as it will depend heavily upon how long the acquisition is and how much activity is injected into the subject. Average PET listmode size will be on the order of 1 GB for a 15–20 minute acquisition at normal mouse doses of 150-200 µCi. SPECT listmode sizes will typically be smaller with 45 minute acquisitions resulting in listmode sizes on the order of 700 MB.

**Calibration Data:**

PET Normalization Data ≈ 340 MB  
Attenuation and Blank Data ≈ 340 MB  
SPECT Normalization Data ≈ 40 kB  
SPECT Energy Lookup Data = 80 kB  
SPECT Crystal Lookup Data = 10 MB

16. **What is the relationship between NumaStore Preclinical and Siemens Inveon® IAW/IRW software packages?**
NumaStore workflow with IAW and IRW

- IAW creates the standard data types
- NumaStore Preclinical software monitors IAW folder locations for any new data
- NumaStore Preclinical software transfers all raw and image data to the storage location
- Data is added to the NumaStore queryable database using information in data headers
- Stored data is searched for and retrieved to post-process the data using IRW
- Data processed using IRW software can be "pushed" to the Numastore storage location using DICOM SCP/SCU communication protocols.