

[Tech Note 732](#)

Wonderware Memory Manager Configuration Best Practices

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Introduction

This *Tech Note* describes configuring the Wonderware Memory Manager.

Configuring the Wonderware Memory manager is accomplished in different ways:

- If you are using InTouch 10.5 or later, go to the [Using InTouch Application Manager to Configure Memory Allocation](#) section. Memory Manager is configured in the InTouch Application Manager for these versions only. You can ignore the rest of the *Tech Note*.
- If you are using earlier InTouch versions, go to the [Non-Windows 2008](#) or [Windows 2008](#) sections.

Summary

The Wonderware Memory Manager provides a mechanism for one or more programs to share virtual memory. The shared virtual memory is located at the same virtual address within each program. The memory is shared by using memory mapped files which are forced to specific virtual memory addresses. This forced mapping can become a problem if one of the programs does not have the virtual memory address available that is already in use by some of the other programs for sharing the memory.

The Wonderware Memory Manager was previously hard coded to occupy a maximum memory range. For many years this memory range was 256 MB, but recently it was increased to as much as 2048 MB, because of the heavy memory consumption of certain applications. The default maximum memory range for the Wonderware Memory Manager remains at 256 MB.

You can configure the range of the Wonderware Memory Manager in 1 MB increments from 1 MB all the way up to 2048 MB. Any value less than 1 MB will be set to 1 MB and any amount larger than 2048 MB will be set to 2048 MB, except for the value of 0 MB, which will set the memory range to its default value of 256 MB.

It will be very obvious if you have set the memory range too low: The Wonderware Memory Manager will send messages to the ArchestraA logger indicating it has run out of memory.

Note: This procedure should only be done by someone who is familiar with modifying the Windows Registry.

Application Versions

Wonderware Application Server 3.1 SP2 Patch 1 and later (including 3.5)

- InTouch 10.1 SP2 Patch 1 and later (including 10.5).

Using InTouch Application Manager to Configure Memory Allocation (InTouch 10.5 and later)

1. Click Start/Programs/Wonderware/InTouch
2. Click **Tools/Node Properties**.
3. Click the **wwHeap Memory** tab (Figure 1 below).
4. Modify the wwHeap size and start location.

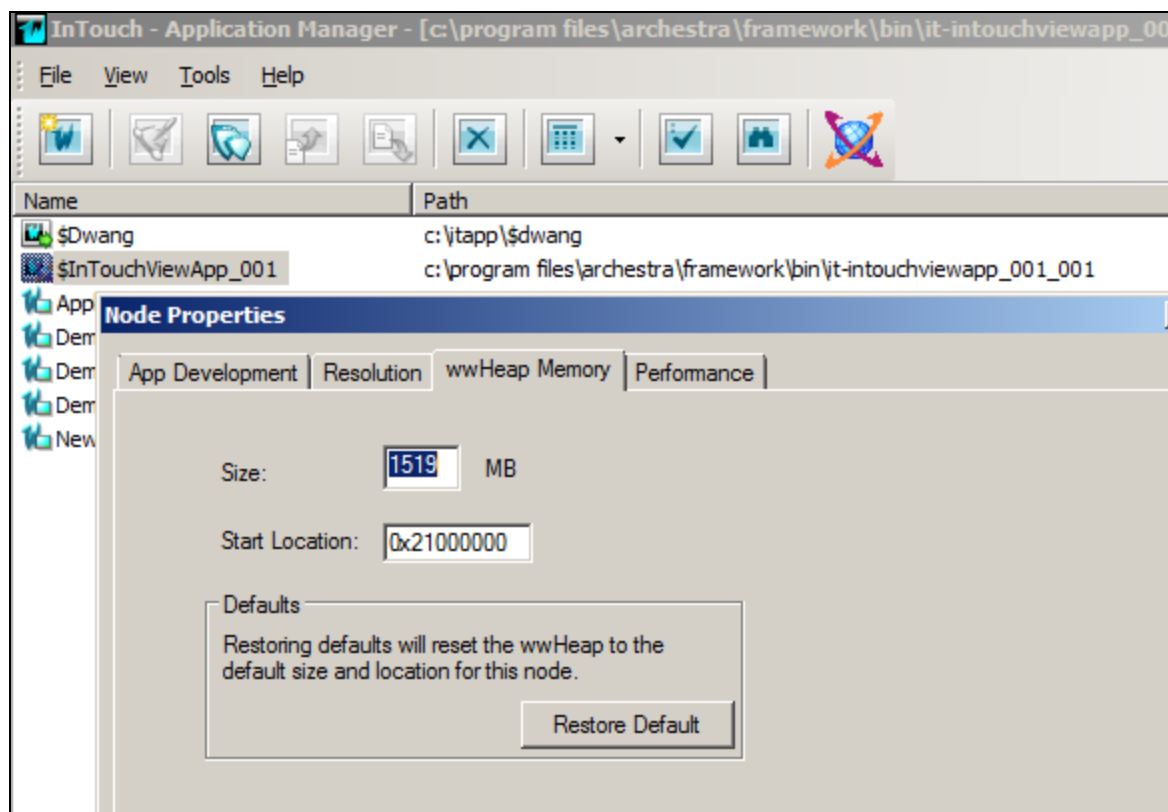


FIGURE 1: CONFIGURING WWHEAP MEMORY FROM INTOUCH APPLICATION MANAGER

Note: See the [Configure Memory Start Address](#) section for more information.

Configuring Memory Range in Non-Windows 2008 Systems (InTouch 10.1 and earlier)

Create a DWORD registry entry with the value **MemoryRange** under the following key and set it to the maximum number of megabytes (MB) you want the Wonderware Memory Manager to allow:

```
HKEY_LOCAL_MACHINE\Software\Wonderware\wwHeap
```

The default value of 256 will be used if no registry value is present, or when the registry value is set to **0**.

Example

- **"MemoryRange"=dword:00000200** sets the memory range to 200 Hex = 512 MB (megabytes)
- **"MemoryRange"=dword:00000400** sets the memory range to 400 Hex = 1 Gig (Gigabytes) = 1024 MB
- **"MemoryRange"=dword:00000800** sets the memory range to 800 Hex = 2 Gig (Gigabytes) = 2048 MB

The sample registry file for **512 MB** can look like the following:

```
Windows Registry Editor Version 5.00

[HKEY_LOCAL_MACHINE\SOFTWARE\Wonderware\wwHeap]
"MemoryRange"=dword:00000200
"BaseOffset"=dword:21000000
"ConserveMemory"=dword:00000001
```

The memory range will be written to the ArchestrA logger. You will see a line similar to below in the logger:

WWHEAP Memory Range 2048 MB (32768 Maps) Conserve Memory 1

You can [download the Sample Registry files](#) and rename them to *.reg after the file is unzipped, or you can add it manually to the registry.

Configuring the Memory Range in Windows 2008 Systems (InTouch 10.1 and earlier)

Create a DWORD registry entry with the value **MemoryRange** under the following key and set it to the maximum number of megabytes (MB) you want the Wonderware Memory Manager to allow:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Wonderware\wwHeap
```

The default value of **256** will be used if no registry value is present or the registry value is set to **0**.

Example

- **"MemoryRange"=dword:00000200** will set the memory range to 200 Hex = 512 MB (megabytes)
- **"MemoryRange"=dword:00000400** will set the memory range to 400 Hex = 1 Gig (Gigabytes) = 1024 MB
- **"MemoryRange"=dword:00000800** will set the memory range to 800 Hex = 2 Gig (Gigabytes) = 2048 MB

The sample of registry file for 1024 MB can look like below:

```
Windows Registry Editor Version 5.00
```

```
[HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Wonderware\wwHeap]
"MemoryRange"=dword:00000400
"BaseOffset"=dword:21000000
"ConserveMemory"=dword:00000001
```

The memory range will be written to the ArcestrA logger. You will see a line similar to below in the logger:

WWHEAP Memory Range 2048 MB (32768 Maps) Conserve Memory 1

You can [download the Sample of Registry files](#) and rename them to *.reg after the file is unzipped from link or add it manually to the registry.

Configure Memory Start Address

The Wonderware Memory Manager's memory start address affects where in virtual memory the beginning of the virtual memory will be allocated. The memory is allocated in successive 64K blocks starting from this address, barring any obstructions, such as DLL, regular memory allocations, or other memory uses.

The default starting address is **0x21000000**. The starting address will be forced lower than the user-specified address if the range of the Wonderware Memory Manager's memory would be pushed past the end of the permitted application virtual address space, which is typically about **0x7FFF0000**.

Previous versions of the Wonderware Memory Manager had a start address at 0x50000000, but experience has shown that many Microsoft dynamic link libraries and Visual Basic runtime components are now located at this address, so the decision was made to lower the address to its new default of 0x21000000. The start and end memory addresses will be written to the ArcestrA logger.

Create a DWORD registry entry with the value **BaseOffset** under the following key and set it to the desired memory base offset:

```
HKEY_LOCAL_MACHINE:Software\Wonderware\wwHeap
```

The default value is **0x21000000** if no value is present or if the registry value is set to **0**.

Windows /3GB Switch

How to set the /3GB switch in Windows:

[http://technet.microsoft.com/en-us/library/bb124810\(EXCHG.65\).aspx](http://technet.microsoft.com/en-us/library/bb124810(EXCHG.65).aspx)

On Windows without the /3GB switch:

- Max application address = 0x7FFEFFFF
- Min application address = 0x00010000
- 2GB heap is allowed 32765 maps, slightly less than 2GB (192 KB less).
- For full wwHeap range, the starting address is forced down to the minimum application starting address.

On Windows with the /3GB switch enabled:

- Max application address = 0xBFFFEFFFF
- Min application address = 0x00010000
- 2GB heap is allowed 32768 maps, which is a full 2GB
- For full wwHeap range, the starting address is forced down to 0x407E0000, if specified to be larger.

Configuring Memory Conservation

The Wonderware Memory Manager's memory allocation algorithm, by default, will search for free memory starting at the beginning of the memory range. As memory is released, the 'lower' memory addresses will be recycled. As a result, even if the Wonderware Memory Manager's memory range is set to 256 MB, perhaps only the lowest 128 MB will ever be accessed if the InTouch application's memory requirements do not exceed 128 MB.

In the case where the InTouch application is using a lot of memory and the Wonderware Memory Manager's memory range is set to a larger value, such as 512 MB or more, it can be very inefficient to have the free memory search algorithm start at the beginning memory address each time it searches for an available memory block. As a result, a registry entry can be created that causes the memory manager to start searching for a free memory block at an index AFTER the most recently located free memory block

In either case, if the memory manager cycles through this list twice without locating a suitable range of free memory, then the Wonderware Memory Manager will generate an out of memory message.

The disadvantage to cycling through all of the memory is that ALL of the Wonderware Memory Manager's memory range will eventually be used, if even for a brief while. This can have a negative effect if some DLL are transient within the Wonderware Memory Manager's memory range. This has been observed most often with InTouch applications that exhibit heavy window cycling or recipe usage.

By default, the Wonderware Memory Manager will recycle' lower memory blocks and search for free memory from the base offset for each memory request. To enable the efficient free-memory search algorithm create a DWORD registry entry with the value ConserveMemory under the following key And set the value to 0 to cycle through the list or set it to 1 to always start the search at the beginning of the list:

```
HKEY_LOCAL_MACHINE:Software\Wonderware\wwHeap
```

The default value is 1 if no value is present or if the value is not 0. The status of the memory conservation will be written to the Archestra logger.

Reserve Memory Ranges

In certain circumstances, it is necessary to reserve a block of memory ranges within the overall memory range of the Wonderware Memory Manager's accessible addressing space. This might be required if a large memory range is accessed by the InTouch application, but the Wonderware Memory Manager constantly detects that certain DLL for one or more processes are located within the accessible memory range.

In this particular case, you can specify that a configuration file be read during the start sequence of the Wonderware Memory Manager. This file will contain entries which describe the memory ranges which the Wonderware Memory Manager is to avoid.

The memory reservation file is a text file in the simple INI file format. This makes it very easy to read by humans and to edit with a simple text processing tool such as Notepad.Exe.

Two types of entries are possible: One to exclude a range of memory, and the other to exclude a certain number of 64K memory blocks starting at a specific memory address.

To enable the memory reservation

1. Create a REG_SZ (string) registry entry with the value **ReserveFilePath** under the following key:

```
HKEY_LOCAL_MACHINE:Software\Wonderware\wwHeap
```

2. Set the value to the full file path of the **.ini** file containing the desired memory reservation entries. The default is to not process any file if the value is absent.

A warning is not generated if the file is missing or can not be processed. If the reservation file path is detected in the registry, then its file path is written to the ArchestrA logger – whether the file is valid, exists or not, or was actually processed or not.

A memory range is reserved by specifying

- A start address
- Followed by a dash
- Followed by the ending memory address.

Control characters and spaces are stripped from the input string. The memory addresses must end on 64K boundaries – meaning the lower 4 bytes of the address are zero.

For example:

```
MEM00002=0x25000000-0x33450000
```

Would exclude the memory addresses from 0x25000000 up to 0x33450000.

Reserving Memory Blocks

A sequential set of memory blocks, each representing a 64K section of virtual memory, can be reserved by specifying a start address, followed by a semicolon (;) followed by the number of memory blocks to reserve. Control characters and spaces are stripped from the input string.

For example:

```
MEM00004=0x25000000;16
```

Would exclude 16 X 64K of memory starting at the memory address 0x25000000.

File Format

The file is in **.ini** file format, with the section **ReserveMemory** receiving the processing. The processor will search for memory entries **MEM00000** through a maximum of **MEM16384**, where the numbers are in decimal.

The maximum number of entries processed depends upon the Wonderware Memory Manager's current memory range. The maximum number processed is equal to the range of the memory in MB times 16. So, a 256 MB memory range would process entries MEM00000 through MEM04096.

Each entry is checked, so when you make the file, they do not have to be sequential in order, merely unique. If you want the processing to finish more quickly, then create a 'DONE' entry as follows "MEM00005=DONE" and the processing will stop as soon as that entry is observed.

Any entries lower than the memory range or greater than the memory range are ignored. No warning messages are generated for entries which are not processed or contain syntactical errors.

Example File

```
[ReserveMemory]
MEM00000=0x25000000-0x33450000
MEM00001=0x45000000;8
MEM00002=0x50000000;16
MEM00003=DONE
```

Memory Full Diagnostics

It can be useful to observe the state of each of the memory maps and some other memory manager state information in systems that are experiencing difficulties. A diagnostic text file can be dumped automatically if the system is out of memory.

To enable the diagnostic file generation

1. Create a REG_DWORD registry entry with the value **DumpSharedMapWhenFull** under the following key.
2. Set it to a non-zero value to enable the file dumping:

```
HKEY_LOCAL_MACHINE:Software\Wonderware\wwHeap
```

The file will be written to the current user's temporary folder, and it will have the file name **WWHeapShareDump.txt** unless a registry entry is created to generate a new file name each time.

To enable the diagnostic file generation to create a new file each time

1. Create a REG_DWORD registry entry with the value **DumpSharedMapToNewFile** under the following key.
2. Set it to a non-zero value to enable the file dumping to a different file name each time.

```
HKEY_LOCAL_MACHINE:Software\Wonderware\wwHeap
```

The files will have the name **WWHeapShareDumpXXXXXXXX.txt** where the XXXXXXXX is replaced with a number, such as 00000000, 00000001, 00000002, etc.

Attached Process Diagnostics

It can be useful to observe the state of each of processes and some other state information in systems which are experiencing

difficulties. A diagnostic text file can be dumped automatically if the system is out of memory.

To enable the diagnostic file generation to create a new process data file each time

1. Create a REG_DWORD registry entry with the value **DumpSharedProcessDataToNewFile** under the following key.
2. Set it to a non-zero value to enable the file dumping to a different file name each time:

```
HKEY_LOCAL_MACHINE\Software\Wonderware\wwHeap
```

The files will have the name WWHeapSharedProcessDumpXXXXXXXXX.Txt where the XXXXXXXX is replaced with a number, such as 00000000, 00000001, 00000002, etc.

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 [Back to top](#)

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