Computer Specifications for NAME

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NAME can be run in a wide variety of configurations that alter the load that the model places on the host computer. This document attempts to a act as a rough guide to what might be considered as typical computational demands. Example computer specifications where given are only provided as an indication and are obviously very time specific given the rapidly changing nature if IT hardware. Fast is always going to be better after all.

Operating Systems

The Met Office run NAME under RedHat linux and Microsft Windows operating systems. The model has also been run under the Mac operating system.

Compiler

The Met Office use the Intel Fortran compiler on both linux and Microsoft Windows.

Run Times

Run time while dependent on CPU speed are actually determined by the type of simulation. NAME run times can be as short as a few 10's of seconds but can extend to months of computer time. This varies due to:

- Number of particles being released.
- Simulation length i.e., hours of meteorology or years.
- Size of geographical domain.
- Additional processes such as chemical reactions.

RAM usage

The table below lists three types of run and a typical range of RAM usage. However, in practice the upper limit is only set by how long you are willing the run to take and the 32bit/64buit issue as explained below.

Type of NAME run	Typical RAM (Gb)	
Short range (10km – 1000km) single source	0.3 - 1.0	Using local observations or UK NWP
Long range (100's – 1000's km) single source	0.7 -2.0	Using Global NWP
Air Quality Run using Chemistry	2.0 - 3.0	Using EU regional NWP

Model RAM usage is highly dependent upon:

- Met data
  At any one time Name loads three dimensional numerical weather prediction (NWP) data for two time instances. This is then used to advect, etc. the pollutant. NWP data files can vary considerably in size as outlined in a latter part of this document. NAME can also used observed meteorological data for short range dispersion. In this case the data volume is very small and therefore the memory usage will be at the lower end of the above requirements.
- Number of model particles
  NAME is a Lagrangian particle model. This means that it release model particles to represent the pollutant that it is simulating. Many thousands to millions of these particles must be released to suitable represent any cloud/plume or multiple clouds/plumes of pollutant.

- Chemistry
  Enabling the calculation of chemical reactions within NAME adds a significant amount to the memory requirement.
- Output requests
  It is possible to ask for a considerable amount of output that can be either averaged or integrated in time. Each request requires only a small amount of RAM. However, the ability to ask for hundreds of outputs can still add significantly to the RAM requirements.

32Bit/64Bit issues

32 bit operating systems (the majority of desktop computers) are limited to the amount of RAM that a single application can utilise. This is in theory 3 Gb. However, in practice we have found the limit to be just under 2 Gb on linux Mirosoft Windows. 32 bit operating system are also limited in the total amount of RAM that can be installed. This is typically higher than 4 Gb but varies considerably from operating system to operating system.

Met Data Volumes

NAME needs meteorological data as an input in order to run. This data takes the form of numerical weather prediction data or observed data.

Numerical Weather Prediction (NWP) data
The table below lists the individual files size for three of the Met Offce's current NWP models. Files size are given in Mb for uncompressed and also for zipped files. It is possible to run NAME on the zipped data as an associated utility will unzip just the file needed i.e., one extra unzipped file is created and overwritten as NAME progresses through the run.

Data	Horizontal resolution	Grid[1] nx, ny, nz	Data frequency	File Size Uncompressed (zipped)
Global	0.5625° x 0.375° (approx 40 km over UK)	640 x 480 x 31	3 hourly	330 Mb (88 Mb)
Europe	0.11° x 0.11° (approx 12 km over UK)	380 x 300 x 31	1 hourly	87 Mb (28 Mb)
UK 4km	0.036° x 0.036° (approx 4 km over UK)	288 x 260 x 50	1 hourly	175 Mb (52 Mb)
Per grid point		1 x 1 x 1		4.0×10^{-5} Mb per grid point

Historical data sets also exist. As these are stored at the resolution of the models that were run at that time then the file sizes are general smaller than the current files. The table below lists the available data by data and indicates the entire size for each period. The EU at 12 km and UK at 4km data sets are much shorter in time (2 years) and have not been listed below.

[1] Grid sizes are those stored for NAME and are not necessarily the entire UM grid.

Met data type	Actual start	Actual stop	Data Size - Zipped (Gb)
Global	1/1/1999	2/9/2001	66
	1/1/2001	8/7/2002	144
	7/24/2002	12/6/2005	444
	11/1/2005	current met	743 (25/09/08)
European area at global resolution	1/1/1995	1/1/1999	44
	1/1/1999	8/6/2002	27
	1/1/2001	8/7/2002	12
	7/24/2002	12/19/2005	67
	11/1/2005	current met	113 (25/09/08)
UK at 12km	1/1/1999	2/9/2001	50
	1/1/2001	8/7/2002	105
	8/7/2002	current met	412 (25/09/08)

Single site observed data (only applicable for short range problems)
This typically consists of 5 to 8 numbers for each hour (or what ever the recording interval is). A file containing 1 years worth of hourly data will only be approximately 1 Mb in size.

Computer CPU

NAME is currently not able to utilise multiple CPU's even if they exist. The Met Office have a project under way that involves modifications to the code to enable parallelisation. This project will deliver by 01/04/09. Provided that there is enough RAM available then it is perfectly acceptable to manually run multiple NAME runs on the same computer. If this computer has multiple CPU's then each NAME run will use one of those CPU's with very little impact on the other runs.

NAME is a computational intensive model and therefore in general it is better to have the fastest CPU possible. However, CPU speed only affects the length of time a run takes and not the computers ability to perform the run which is set by the RAM. There is therefore no lower limit to the.

Example Computers

The following two example are taken from the current computers used at the Met Office to run NAME.

Desktop

Operating system: 32 bit Linux
CPU: Intel dual core 2.13 GHz
RAM: 4Gb
Hard drive: 500 Gb (At the Met Office met data is generally stored on a network server and so this hard drive does not need to be large)

Server (multiple users running NAME)

Operating system: 64 bit Linux
CPU: Two Intel quad cores at 3.0 GHz
RAM: 16 Gb
Hard drive: 1Tb RAID 5 (At the Met Office met data is generally stored on a network server and so this hard drive does not need to be large. However, local RAID 5 storage does offer a speed improvement for IO intensive runs.)