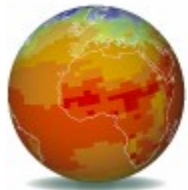# Current Progress of CPDN

Andy Bowery, University of Oxford

BOINC Workshop Budapest 2014
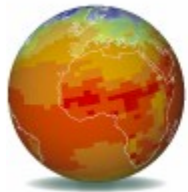
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Overview of talk

- Introduction to climate*prediction*.net

- Progress: virtualisation of CPDN backend

- Progress: new applications

- Progress: combining existing applications

- Study: UK Winter 2013/2014

- Upcoming study: Climate Central study
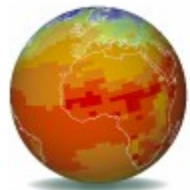
- Future plans

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Introduction to climate*prediction*.net

- climate*prediction*.net is the **world's largest climate modelling facility**, no other climate science group is able to run so many simulations in a study.

- A typical CPDN study size in the **range of thousands**, this is compared to other studies such as the UK Met Office's QUMP study where **128 simulations** have been run.

- Study the change in **risk of extreme weather** events due to human factors and how **climate may change in the future**.

- A number of concurrently running studies from 5 different groups.

- BOINC **allows large numbers** of simulations to be run, allowing a **better handle on uncertainity**.

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Virtualisation of CPDN backend

- Majority of backend servers have been moved to a virtual infrastucture using a GPFS filestore and VMware.

-> This has enabled scaling of the infrastructure as requirements of storage space and server load increase.

- Tape storage added for archiving historic results.

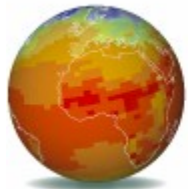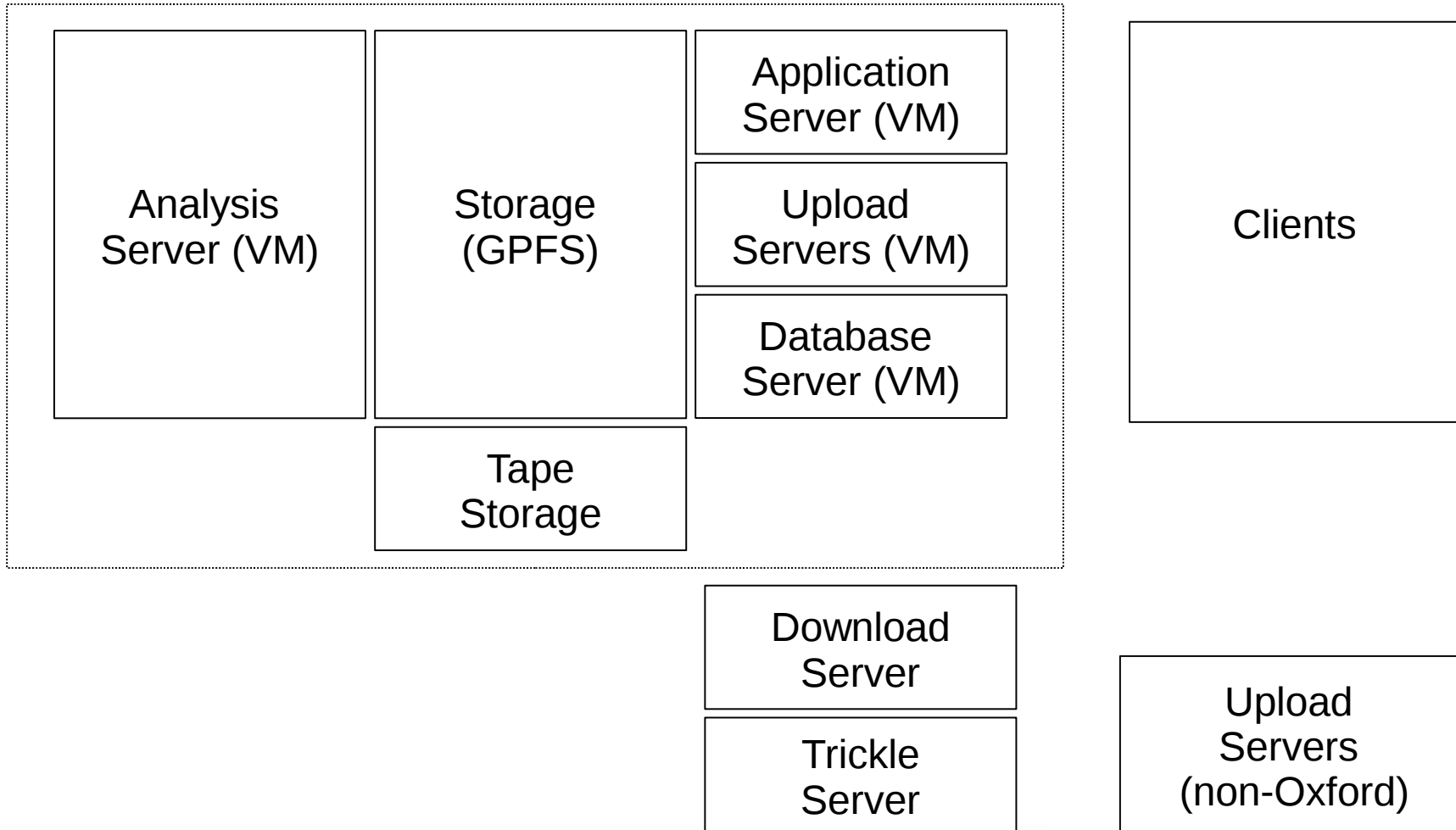- New analysis server linked to filestore to enable scientists to work directly on the data.
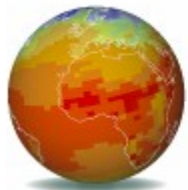
climate*prediction***.net**
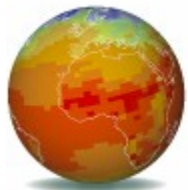the world's largest climate forecasting experiment for the 21st century

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Virtualisation of CPDN backend

Analysis Server (VM)	Storage (GPFS)	Application Server (VM)	Clients
		Upload Servers (VM)	
		Database Server (VM)	
	Tape Storage		

Download Server
Trickle Server

Upload Servers (non-Oxford)

New Applications

- New applications:

    - hadam3pm2 application

    - hadam3prm3pm2t applications - new regions of Africa and East Asia

    - hadcm3s – shortened version of hadcm3n, runs only for 1 year

Combining Existing Applications

- climate*prediction*.net is one BOINC project with a number of application currently running and in development:

    - Five applications for Weather At Home (MOSES 1): Europe, Pacific North West, Africa, Australia New Zealand and South Asia applications,

    - One hadam3pm2 application (global only model),

    - One hadcm3n application and one hadcm3s application,

    - Three applications for hadam3prm3pm2t (MOSES 2): Pacific North West, East Africa, and Europe.

- In total ten different applications -> headache managing all these applications across three operating systems.

- Work has started to combine these into two or even one application.

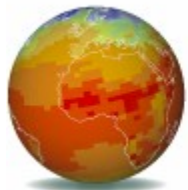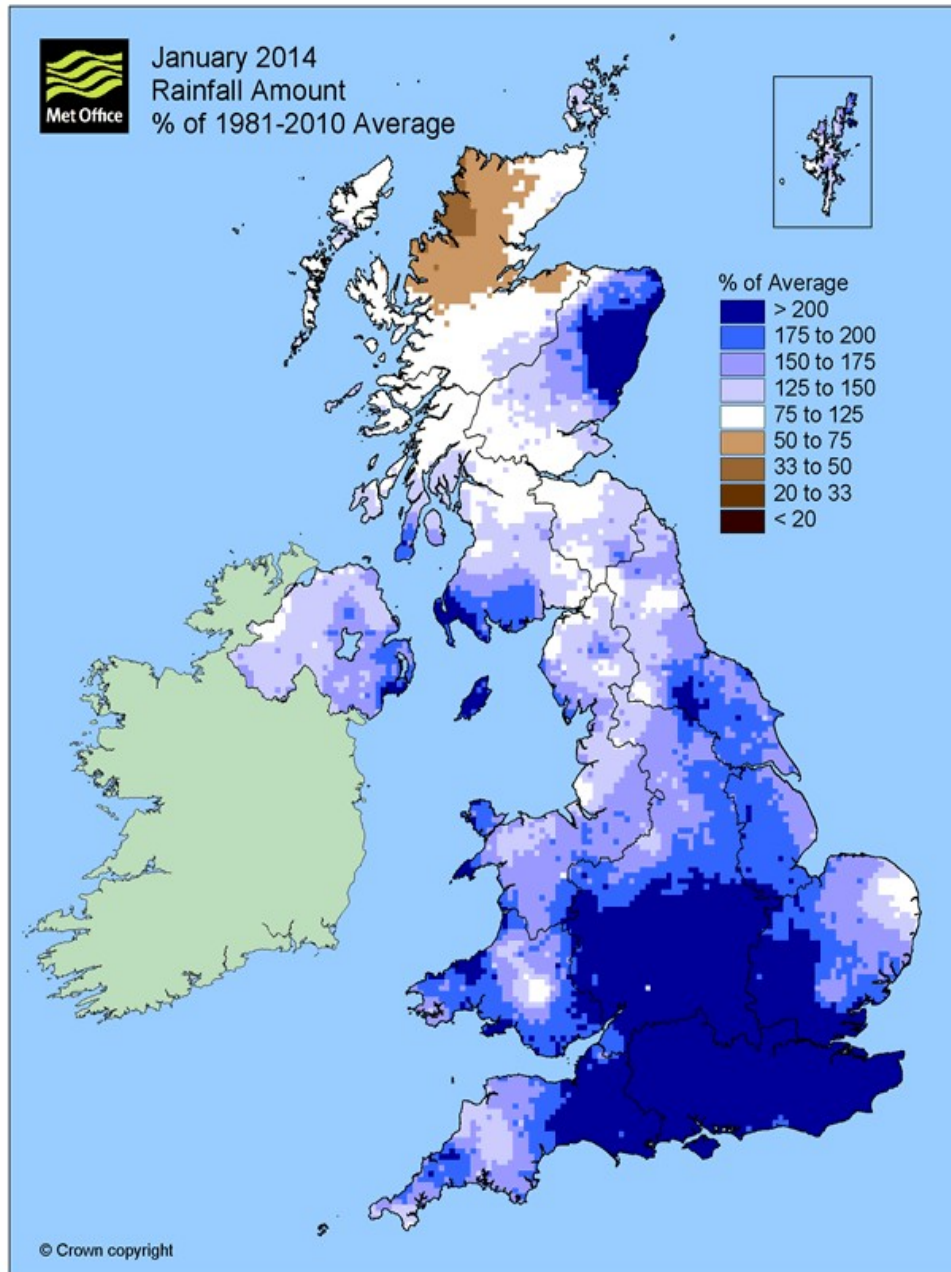- Would like to distribute these applications in VirtualBox

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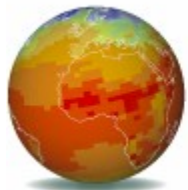UNIVERSITY OF OXFORD

Study: UK Winter 2013/2014

Study: UK Winter 2013/2014

- Wettest January and wettest Winter in the world's longest daily weather record: 1767 – present day

- Public expects: "it was climate change" or "it was not climate change" -> we cannot say this

Study: UK Winter 2013/2014

- Studied the period: December 2013 -> February 2014

- 146,000 simulations run.

- Study compared two ensembles of simulations: with and without human-contributed gases.

- A new type study: the study was conducted soon after the winter, and pre-publicised by the Guardian newspaper.

- The results were updated once/twice a week on the CPDN website as the simulations were completed by the CPDN BOINC volunteers -> this enabled the public to follow the progress.

- The result: human-caused climate change has increased the risk of such events occurring by 40%, with a larger uncertainty.
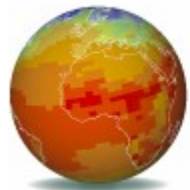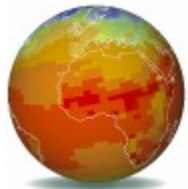
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Climate Central funded study

- *Climate Central* are an independent US based group of scientists funded by a number of donors.

- *Climate Central* have a network of US local TV Weathercasters to which they feed information through their *Climate Watch* network.

- Study to run 10,000 workunits every month from October 2014 until June 2016. Simulations cover 3 months of simulation time.

- Data analysed and retained if interesting events, if not removed.

- Will allow *Climate Central* to supply real-time data on the extent that human-caused climate change has changed the frequency of the occurence of particular events to US local TV Weathercasters.
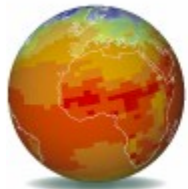
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Future plans: 'Best Practice'

- **Better issue tracking system**: linked to git repository

- **Release plans** linked to tickets

- **Continuous Integration**: change CPDN code to enable small applications that test different aspects of applications to enable applications to be run nightly, linked to repository, and providing accessible executables to the scientists of the project.
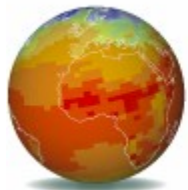
Future plans

- Major new study: Climate Central funded study

- Combining applications to reduce the number of applications and ensure upcoming applications are included.

- Using VirtualBox for the applications.

- Re-write the CPDN code incorporating TDD.
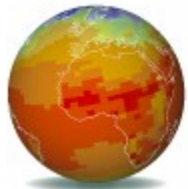
- 'Best practice' – add continuous integration

Thanks!

And lastly...

The work of climate*prediction*.net is not possible without the participation of volunteers, thank you to all our volunteers!