Servers: are designed to have a server + cooling +backup/redundancy

Fiona Stanley data centre: run many of the information system used in the hospital

Redundancy/backup: Has two rooms with three racks + storage unit. Two computer rooms are redundant can run hospital on either but two just in case one has maintenance. Can loss of data in storage array and replicated in other real time to the other room so if we lose a room then we can recover other room.

Cooling: hot aisle and cold aisle Front rack facing each other. Vent pushes cold air under floor up to front of rack and the rack pulls air inside racks where it becomes hot air which is found back of aisle (think other side of the rack front) the hot air gets sucked up air condition and put back into floor as cold air.

Pawsey data centre owned ivec (research facaility): Joint venture of 4 university + csrio. Provides responsible services in supercomputing, data, storage, and visualization. Created as projected to provide supercomputing to scientist and in Australia.

Two major super computers. Taking data large and processing in real time (astronomy). Second larger machine for general science.

Supercomputing: contain many processing cores (cpu + gpu). They are meant to number crunching to complete complex task.

- **Water cooling**: ground water cooling solution. Cold water from aquafer (underground) pumped up surface → heat exchanges → extract heat from super computer → hot water and cool water is reinjected downstream to ground /aquafer to reduce its effect on upstream temperatures and saves water
    - Solar panels used to net electricity on water cooling
- **Redundancy/backup:** not that good
    - They have vps backs for data.
    - Redundant hardware
    - Two copies of data on tape cells archiving.
    - Takes a while
    - Not reliable since not enough funding by government
- The alternative option is cloud computing but they need supercomputing to crunch data sets fast so that is what super computer does

- Machines + cooling

Google: handles billions of searches and hosting YouTube servers

Cooling:

- Take server rack butt it to air condition unit
- We use cool water flowing through copper coils (above) so hot air from server is contained in the hot aisle.
- The hot air raise up
- Passes across **coils** where the heat air **transfers to water in coils** then warm water is brought out to data centre to cooling plant and comes back

Redundancy/backup:

- Data stored two servers.
- Important data on digital tapes.

Contain multi-layer security system

Equinix Data Centre: connects the worlds business and their customers, and employees.

Contains multi-layer security system

Backup generators: for unlimited power supply

Highly efficient indirect evaporate coolers

Hot aisle containment

So the four data centres: Fiona Stanley hospital, Pawsey, google, and equinx are different due to their mission. The mission of Fiona Stanley is quite small as it only serves for Fiona Stanley but pawsey serves for 6 different universities/organisation and equinix serves for many businesses

The Pawsey Data Centre: is a joint venture by the 4 universities providing responsible services in supercomputer, data, and virtualisation. It is funded by the government so the funds are low. It role is to be a research facility for scientist. It is designed to have two major computers one to allow processing of data in real time and the other is for general science data processing.

Fiona Stanely Data Centre: facilitates for all the information systems in the hospital. So it is critical to make sure everything is secure and runs smoothly in case of an emergency. Because if there was a issue that shut down the data centre a live could be loss. Therefore, the hospital have two computer/server rooms just incase one fails the other can server can

run the hospital. Also the data is replicated real time on the other room's server just incase one of data in a server is lost.

The Google/Equinix Centre: is large data centre that provides services to millions of people. Therefore, Google/Equinix data centre is designed to support millions of people. The data centre has many different measure to stop the loss of data and the shut down of their servers. One of them is providing backup generators to prevent power loss and also highly effective backup mechanism. Google backups their important data on three different servers- two servers + one digital tape

Powershell: A command shell (terminal) and configuration toolkit built in .net framework. But it supports the management of network devices and linux machines so it can be used on linux. Allows user to develop their own script and interact directly with operating system objects

Cloud computing: creating IT as a utility. IT delivered to you on demand.

Evolution of computing

- **Main frame computing:** Large structure, expensive to build, and built on site where data was location, designed for their original purpose can't be repurposed. +
- **Personal computing:** decentralised, everyone has their own computer and they pay someone to maintain computers. Evolved by better distributed computing and fibre optic (so technology that will enable us to transport computing power fast and at low cost
- **Cloud computing:** highly centralised, where the power to power is cheap, cooled and service and efficiently. Goal making it cheaper then own personal computers may be pay per use. So the goals provide computing cheaper compared to buying a computer. Sold as a utility.