Space planning

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1 Equipment layout

IT equipment is mounted in racks within cabinets. Cabinets make up rows and pairs of rows make up aisles.

1.1 Cabinet

A cabinet contains front-and-back vertical rack rails, and is secured by a lockable door, usually perforated. Equipment is racked within the cabinet. Standard full-size cabinets are 42U in height, with each position numbered from the bottom upwards.

Most servers, like desktop computers, are air cooled. Air is drawn in at the front and ejected out the rear of the server. Servers are always racked front-to-back.

Cabling is normally done at the rear of the rack. Networking and power distribution equipment is often (but not always) mounted at the rear of a cabinet facing the rear.

1.2 Rack mounting

Racks have holes drilled in them for allowing equipment to be secured. These are normally unthreaded, and allow cage nuts and bolts to be inserted. The cage nut inserts into the rack, whilst the bolt is inserted through the holes drilled in the IT equipment's rack ears.

Heavier pieces of equipment such as servers normally are placed on horizontal rails inserted into the rack first. The rails are secured to the front and back racks.

1.3 Rack units

IT equipment in data centre environments is normally rack-mount form. Rack-mount equipment has a standard width of 48.3 cm or 19 inches, which includes the rack ears protruding from the side of each piece of equipment.

Equipment height is standardised in multiples of 44.5 mm or 1.752 inches. One rack unit (commonly called 1U) is equivalent to 44.5 mm. Conventionally we just use the number of units, such as 4U.

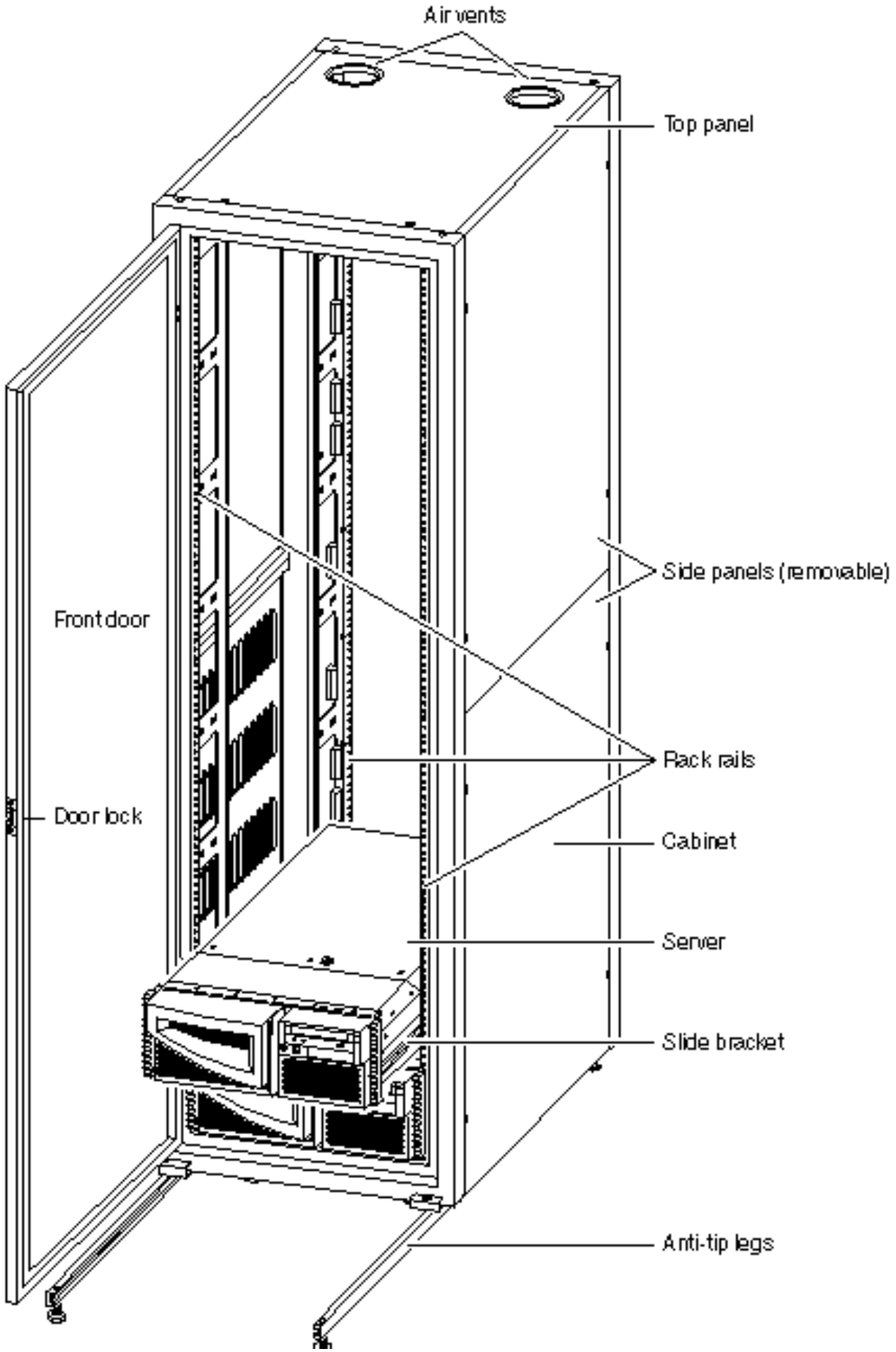

Figure 1: 19-inch cabinet schematic (Oracle)

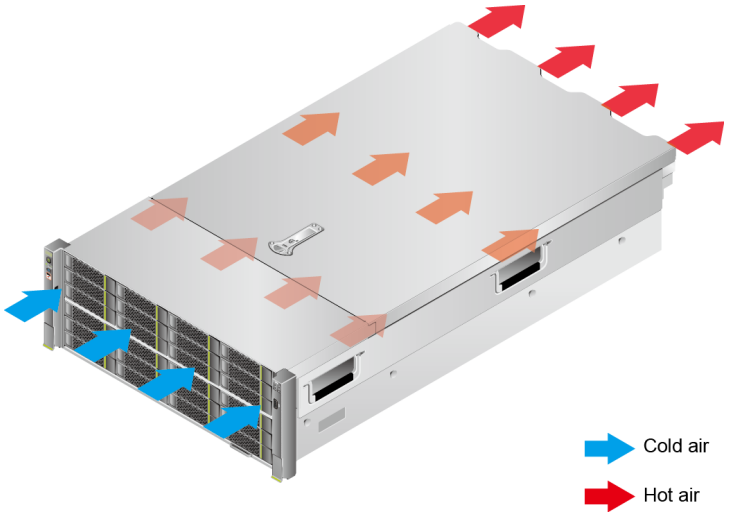

Figure 2: Conventional front-to-back server airflow

Figure 3: Cage nuts and bolt (wikipedia)

1.4 Non-rackmount equipment

Non-rackmount equipment such as tower-type server PCs should be discouraged in data centre environmen
Sometimes legacy equipment has to be accomodated.

2 Choice of space

1. Leave sufficient space surrounding racks to allow easy access to the front and the rear.
2. Sufficient space must be provided to allow easy insertion and removal of equipment.
3. Lighting must be adequate so that you can see front and back of the rack safely.
4. Availability of power and cooling (see later)

3 Cable management

- Need to consider **power and data** cabling.
- Data cabling may be both **copper and fibre**.
- Different physical layer protocols may appear on same cabling and connectors:
  - Most CAT5/6 will be ethernet.
  - Serial, HDMI video and other protocols may be carried on CAT5/6 also.
- Colour coding should be used to separate different cabling categories (depending on application)
- Cables (particularly those connected outside of the rack) should be labelled.
- Cables should be tied and routed using cabling routing guides within racks.
- Cables must not restrict airflow or physical access.

4 Suggested racking order

Heaviest items should be lower (in general). From the bottom up, a suggested order could be:

1. UPS units and batteries (next week)
2. Storage and SAN arrays
3. Servers

Networking equipment such as switches are often better placed at the rear of a rack.