Data Center Components Overview
Power
Outside Transformer
Takes grid power and transforms it from 113KV to 480V

Utility (grid) power
Supply of high voltage power to the Data Center
Electrical Room
Provides protection from outside power events (surges, lightning strikes), as well as distributing power throughout the Data Center
Generator
Provides power to the Data Center in the event of power failure

Diesel Supply
On-site storage provides fuel to support the generator
**UPS and in room PDU**

**UPS** - Supplies temporary power in the event of a loss of utility power.

**PDU** - Standalone unit that steps down (480V to 208V) and distributes power to the IT equipment.

Installed in separate room or on the Data Center floor.
**Busway**
Installed in the Data Center, distributes power to the server racks
Cooling
**Chiller Plant**
Large scale cooling plant that provides cooling directly to the Data Center or through smaller pieces of IT cooling equipment.
**CRAC/CRAH unit**

CRAH – (Computer Room Air Handler) Uses chilled water or compressed refrigerant from the chiller plant or compressor and exchanges heat from the Data Center.  

CRAC – (Computer Room Air Conditioner) Fully enclosed air conditioning system (compressor, radiator, etc.) providing cooling to the Data Center.
Heat Exchanger
Takes heat from chiller plant and ejects it to the outside air

Water Supply
On-site storage provides water to support chiller system
Infrastructure
Infrastructure

Enclosures
Housing for IT equipment
Ladder Rack
Used to distribute network or power systems overhead
CFD Model of Cooling Solutions

• Physical Space
  – Dimensions: 40’ Wide by 60’ Long
• Raised floor height: 24”.
  – Ceiling height from raised floor: 14’
  – 2403 sq. ft. traditional raised floor Data Center

• IT Specifications
  – 7.2 kW per Rack
  – Total IT Load = 459kW
  – 64 Racks at 44 RMU (1408 servers @ 2U) 2240 Ports (servers x 2 ports)

• Room Conditions
  – CRAC unit exhaust 75°F
  – False ceiling used with chimneys
  – Aisle contains 16 x 40% perforated floor grilles
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)

**Configuration**
GL840ES-2448
Solid Top
Front door: Mesh
Rear Door: Mesh
GL-AMES air manager
GL-EC-48-3246 Chimney
5 floor tiles per cold aisle

**Performance**
Air Handler Supply: 75
Air Handler Return: 98.2
Room Temp. Change: 6.7
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)
Temperature, cabinet bottom height

Cold aisle temperatures are very consistent with no air re-circulation.
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)

Temperature, halfway cabinet height

Usage of chimneys eliminates the hot aisle maintaining a consistent temp. throughout the Data Center.
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)

Temperatures in the cold aisle at the tops of the enclosures are within range of the air handler set-points due to the elimination of the hot aisle. The overall temp in the Data Center is very consistent.
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)
Temperature, 12” above cabinet

Exhaust air from the chimneys is directed into the drop ceiling where the air handlers with baffles installed into the ceiling draw the hot air in to be conditioned.
Enclosure Level Containment
With Air Manager and Chimneys
(5 floor tiles per aisle)
cross section

Equipment intake temperatures are consistent from top to bottom
Standard Cold Aisle Containment
With Horizontal Polargy Panels
Standard Cold Aisle Containment With Horizontal Polargy Panels

**Configuration**
- GL840ES-2448
- Solid Top
- Front door: Mesh
- Rear Door: Mesh
- Aisle Containment: ACD840ES
- Polargy Polar Plex Horiz. Panel

**Performance**
- Air Handler Supply: 75
- Air Handler Return: 98.2
- Room Temp. Change: 19.2
Standard Cold Aisle Containment
With Horizontal Polargy Panels

Temperature, cabinet bottom height

End of row containment creates a consistent cold aisle temperature
Standard Cold Aisle Containment
With Horizontal Polargy Panels

Temperature, halfway cabinet height
Standard Cold Aisle Containment
With Horizontal Polargy Panels

Temperature, cabinet top height

Overhead containment panels reduce re-circulation in the top of enclosures creating very consistent temps in the aisles in the Data Center.
Standard Cold Aisle Containment
With Horizontal Polargy Panels

cross section view

Equipment intake temperatures are consistent from top to bottom
Standard Cold Aisle Containment
Standard Cold Aisle Containment

**Configuration**
- GL840ES-2448
- Solid Top
- Front door: Mesh
- Rear Door: Mesh
- Aisle Containment: ACD840ES

**Performance**
- Air Handler Supply: 75
- Air Handler Return: 98.1
- Room Temp. Change: 22.1
Standard Cold Aisle Containment

Temperature, cabinet bottom height

Cold Aisle containment reduces re-circulation creating more consistent temperatures in the hot and cold aisles.
Standard Cold Aisle Containment
Temperature, halfway cabinet height
Standard Cold Aisle Containment

Temperature, cabinet top height

Re-circulation still occurs at the tops of the enclosures creating higher exhaust temps and less even temperatures in the Data Center.
Standard Cold Aisle Containment

cross section view

Equipment intake temperatures fluctuate at the ends of rows and tops of enclosures due to re-circulation.
Standard (Hot Aisle/Cold Aisle)
Standard (Hot Aisle/Cold Aisle)

Configuration
GL840ES-2448
Solid Top
Front door: Mesh
Rear Door: Mesh

Performance
Air Handler Supply: 75
Air Handler Return: 98.6
Room Temp. Change: 21.5
Standard (Hot Aisle/Cold Aisle)

Temperature, cabinet bottom height

Re-circulation in the cold aisle raises equipment inlet temperature
Standard (Hot Aisle/Cold Aisle)

Temperature, halfway cabinet height
Standard (Hot Aisle/Cold Aisle)

Temperature, cabinet top height

Re-circulation in the cold aisle raises equipment inlet temperature which creates a higher exhaust temperature.
Standard (Hot Aisle/Cold Aisle) cross section view

Re-circulation from around the aisle and over the top of the enclosures creates high equipment intakes in the cold aisle.