

Data Center in Myanmar

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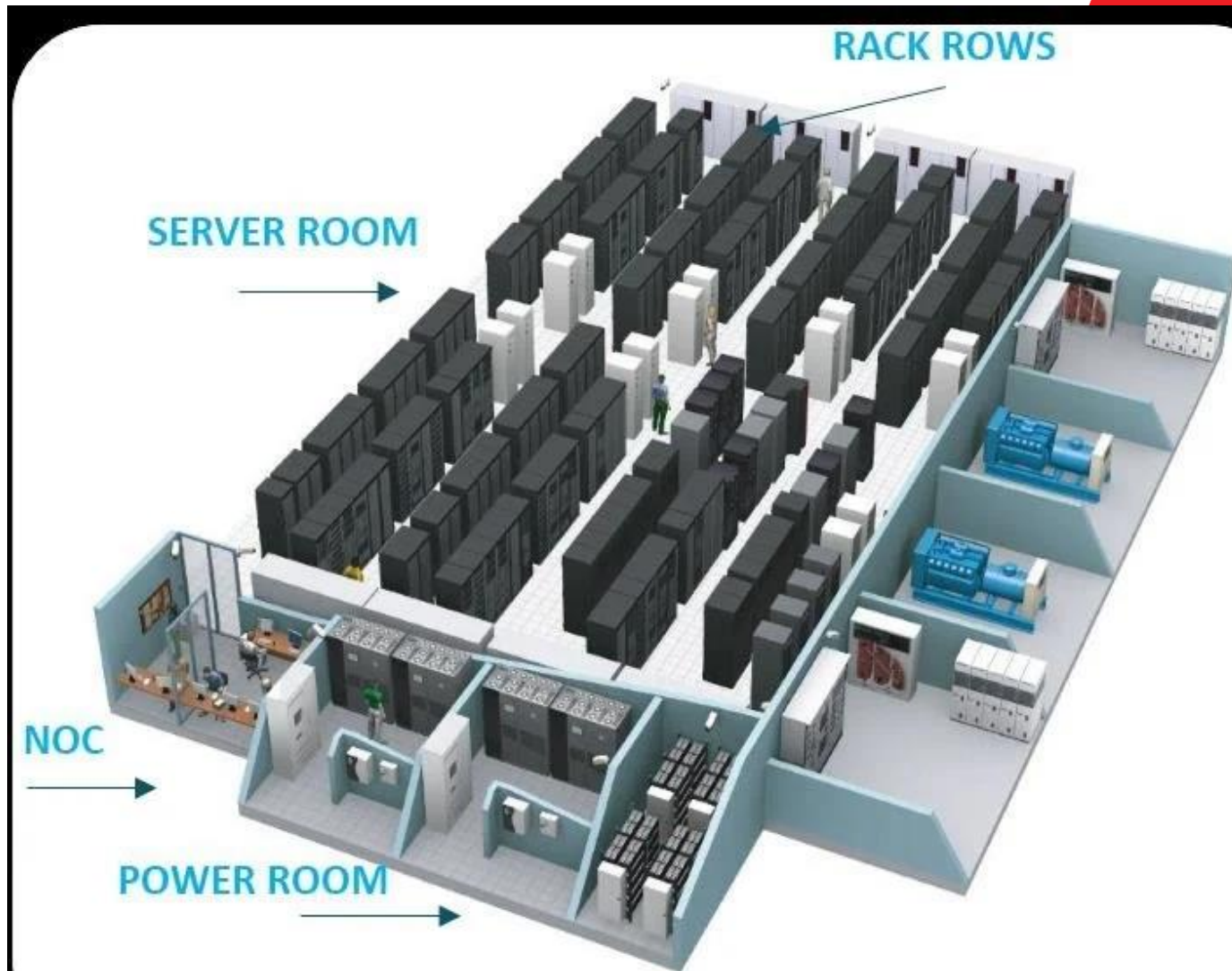
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MYANMAR NETWORK OPERATORS GROUP

Introduction to Data Center (DC)

- **Physical facility** = house applications and data
- **Brain** of Modern Industry
- **Computing facilities** for Social Networks, Cloud Services, Online Business
- Operated **24/7/365** constant uptime





Data Centers (DC) <https://youtu.be/FWpWU9tiKs4>

ICT Equipment in Data Center

Computing:

Form Factor = **Rack Servers** 19 inch **Blade Servers** modular
 Software Defined = **Web / Database / App / Virtual / GPU / File**

Networking:

Switches int: = **Access** ToR / **Core** HS
Routers ext: = **Edge** ISP/ **Core** HS / **Virtual** Cloud

Security(Firewall)

Deploy = **Hardware** / **Virtual** / **Cloud** FWaaS
 Inspection = **NGF** DPI (L3-L7) / **WAF** SQLinject / Bot

Storage:

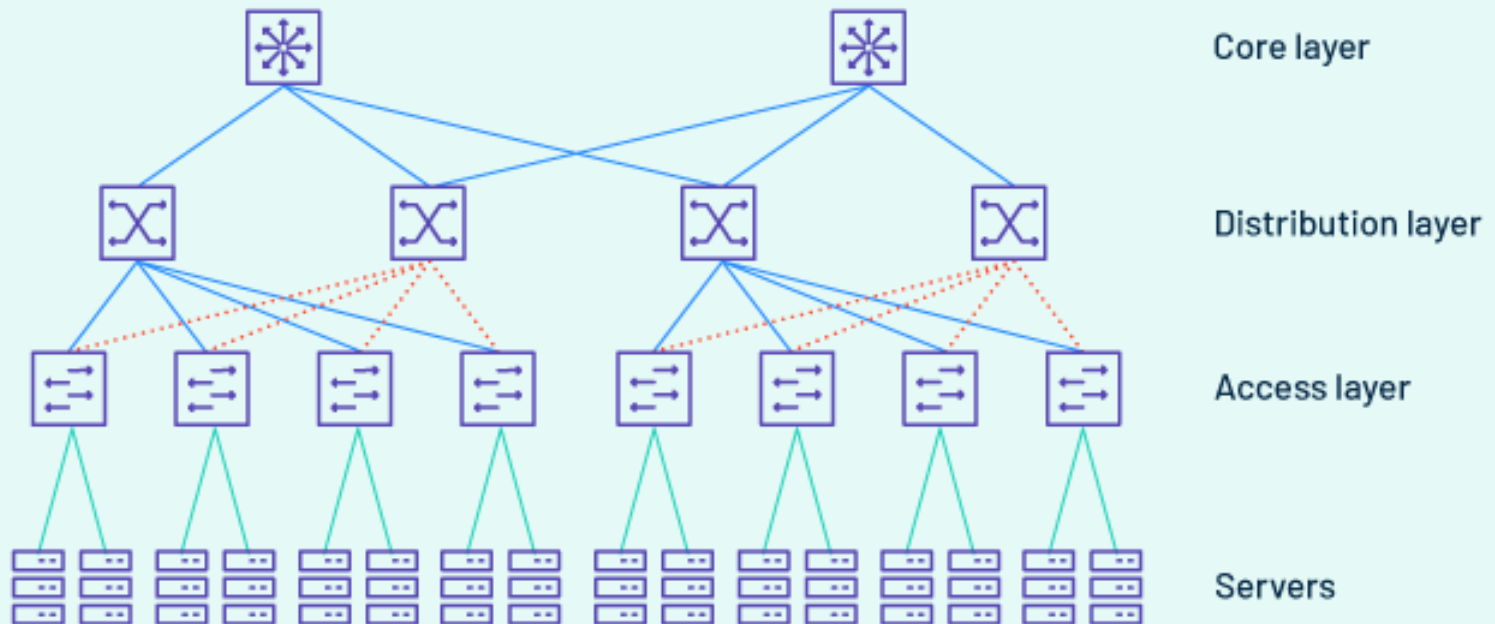
Class = 1st **SSD** HighSpeed 2nd **HDD** Low Speed 3rd **Tape** long
 Architecture = **DAS** Servers **SAN** Data Base **NAS** File Share **OS** cloud/AI

Optimization:

Application-Delivery Controllers (ADC)
Load Balance / Catch / Compress / SSL offload



Three-Tier Data Center Network



Architecture of Power/Energy

- **Step 1: Grid:** High-voltage input.
- **Step 2: Generation:** On-site backup (Diesel/Gas).
- **Step 3: Conditioning:** UPS (Uninterruptible Power Supply).
- **Step 4: Distribution:** PDU and Rack PDU

Link https://youtu.be/Y_8P3wzxsqY

Grid Power Requirement on Data Center

Data Center Type	Typical Power Capacity	Energy Density per Rack
Small / Edge	1 MW – 10 MW	5 – 15 kW
Enterprise / Colocation	10 MW – 100 MW	15 – 40 kW
Hyperscale (AI-focused)	100 MW – 1,000+ MW	60 – 100+ kW

Grid Interconnection

- **Technical Requirements:**
 - **High Voltage Entry:** Direct to Power grids (MV , HV)
 - **Redundancy :** Two independent feeds from different substations
 - **Power Quality:** UPS Array (to "clean" electricity / handle micro-fluctuations).
- *Grid → Substation → Transformers → UPS → PDU → Servers.*
- Power Usage Effectiveness (PUE) = Total Power / IT power = 1.1

Tier Level	Redundancy	Generator Requirement	Downtime/Year	
Tier I	N	1 Generator Array	28.8 hours	
Tier II	N+1	1+1 Generator Arrays	22.7 hours	
Tier III	N+1	1+1 Generator Arrays (Component can be removed for repair without downtime.)	1.6 hours	
Tier IV	2N	2 Generator Arrays (Fault Tolerant)	26.3 minutes	72 hrs Fuel Storage Double Cost 99.995%

Power Generation

Role

"Last Line of Defense" between **Grid failure** and UPS **battery depletion**.

- **Transition** : start load within 15 Sec.
- **Integration**: ATS + UPS

ISO 8528-1 Standards

- **Emergency Standby (ESP)**: Max power for variable loads; <200 hrs/yr).
- **Prime Power (PRP)**: Unlimited hours; variable load; 10% overload
- **Data Center Continuous (DCC)**: Unlimited hours

Power Generation

$$P_{\text{total}} = (P_{ITx} \times 1.1) + P_{\text{Cooling}} + P_{\text{BatteryCharge}}$$

Redundancy

- **N+1 (Common):** Total Genset + 1 spare. (Cost-effective reliability.)
- **2N (Premium):** Two Total Genset (concurrent maintainability.)

Fuel Storage

- 72 hours of fuel on-site at full load.

Maintenance

- **Weekly No-Load Run:** (starter battery and engine are functional ?)
- **Annual Load Run:** (100% capacity with dummy load)
- **Fuel Polishing:** (Filtering stored diesel (prevent microbial growth))

UPS (Uninterruptible Power Supply)

Role

Bridge: Grid power outage and generator about 30 Sec
Conditioning: filter against grid "pollution" (surges, drop, noise).
Goal: 0ms transfer time. Servers must never "see" a change

Voltage and Frequency Independent (VFI)

Rectifier: Converts *Incoming AC* to *DC* (+ charge batteries).
Inverter: Converts *DC* back to *Pure AC*

Battery Runtime

<15 minutes at full load.

Battery Technology

Lead Acid : Low cost / Heavy footprint / < 5 year lifespan / Slow charge
Lithium-Ion : High cost / Small footprint / >10 year lifespan / Fast charge

PDU (Power Distribution Unit) and Rack PDU (rPDU)

Power Distribution Unit (Floor PDU)

- Transition Point:** Hub between the UPS and the server rows.
- Voltage Transformation:** Stepdown 480V 3 Phases to 230V Single Phase.
- Circuit Protection:** Primary circuit breakers that protect an entire row
- Monitoring:** Tracks power usage to prevent overloads.

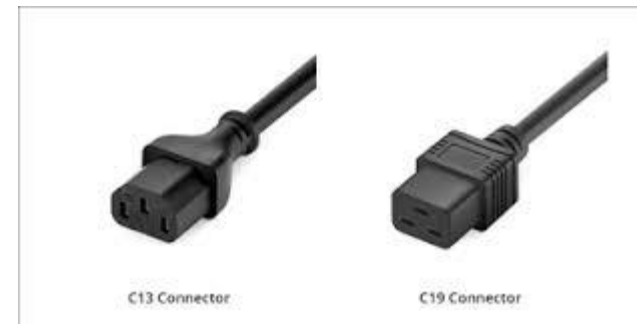
PDU (Power Distribution Unit) and Rack PDU (rPDU)

Rack PDUs (rPDUs)

Last point : Power strip that distributes to IT equipment.

Mounting: **Horizontal**(front of rack (2U). (or) **Vertical** : rear of the rack;

Outlets: **C13** (low power 10A) (and) **C19** (high power 15A) outlets (prevent disconnect)



Advanced Cooling System in Data Center

Heat Problem

servers are essentially heaters.

100% of electrical convert to heat.

Without cooling, chips slow down or melt.

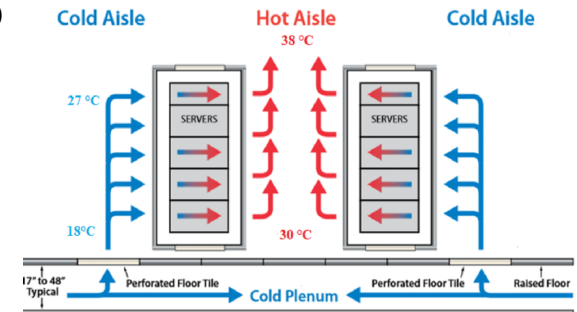
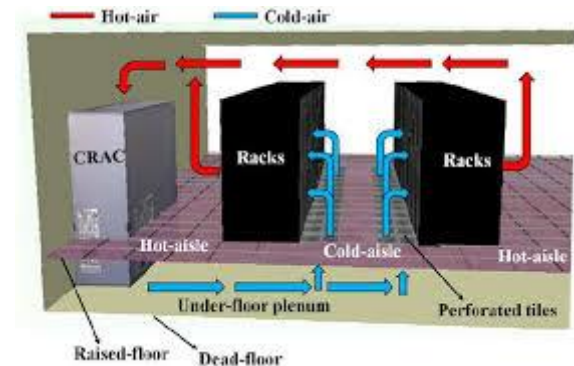
Traditional Air Cooling (The Standard)

- Core Concept:** Moving large volumes of chilled air.
- Raised Floors:** space below the floor as a pressurized air flow
- Units:** Computer Room Air Conditioners that cycle the air.

Airflow

Cold Aisle Containment (CAC): cold air goes through the Servers.

Hot Aisle Containment (HAC): hot exhaust and sends back to Aircons



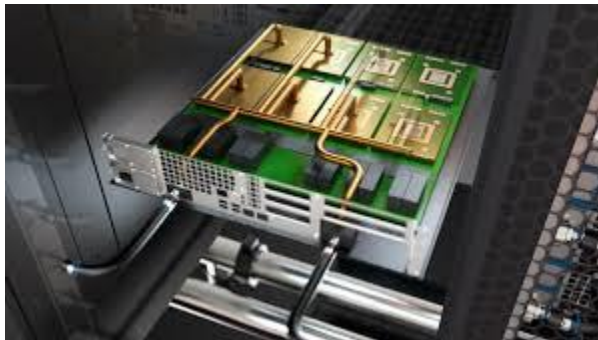
Advanced Cooling Systems in Data Center

Shift to Liquid Cooling

Water is **4times** more heat-absorbent and **24 times** more heat-conductive than air.

Direct-to-Chip (Cold Plates): Liquid flows through plates attached to CPUs.

Immersion Cooling: Servers are dunk into non-conductive fluid



<https://youtu.be/iRLCUWbi0o4>

Data Center Certification Organizations

- **Design**

- **Uptime Institute** Tier Standard: (1-4)
- **TIA-942** Telecommunications Industry Association Electrical, Mechanical (1-4)
- **BICSI** Building Industry Consulting Service International **002** Design (0-4)

- **Security**

- **IEC 27001:** Information Security (ISMS).
- **AICPA SOC 1 & 2 :** Privacy
- **PCI DSS:** Credit card .

- **Energy**

- **ISO 50001:** Energy Management
- **WUE Water Usage Effectiveness :** Waterless

The Giants – World's Largest Data Center

Rank	Company	Location	Area (Sq. Ft.)
1	Range	China	6,300,000
2	Switch Super	Nevada, USA	3,500,000
3	DuPont	Virginia, USA	1,600,000
4	Utah	Utah, USA	1,500,000
5	Microsoft	Iowa, USA	1,200,000

Myanmar Datacenter

	Company	Location	
1	<u>True IDC</u> :	Yangon	Tier 3
2	Myint & Associates	Yangon	Tier 3
3	Burst Myanmar	Thilawa SEZ	Tier 4 ?
4	MPT	Yangon	Tier 3
5	GTMH	Yangon	Tier 3

That is FUTURE we can create today

Thank you for your time