

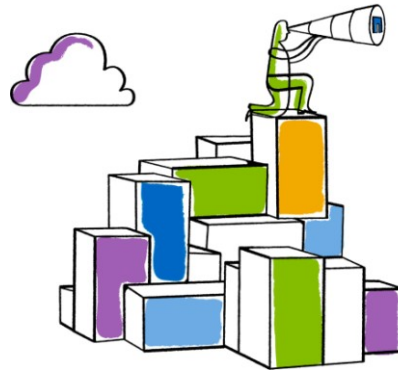


Go further, faster®



# Green Data Center and New Technologies

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# Culture at NetApp

Simplicity  
ABC



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# Design Philosophy

- Infrastructure                      Raised Floor                      Vs. [REDACTED]
- Humidity Control                      Control                      Vs. [REDACTED]
- Containment                      Hot Aisle                      Vs. [REDACTED]
- Operating Temperature                      18-21 Deg C                      Vs. [REDACTED]
- Cooling Control                      Temperature                      Vs. [REDACTED]

**FREE COOLING**



# Evolution of Datacenters @ NetApp

## Generation-1

- Rack Power Capacity - 4KW
- PUE - 2.0
- Lessons Learnt
  - Hot wraps
  - Short Cycling
  - No control

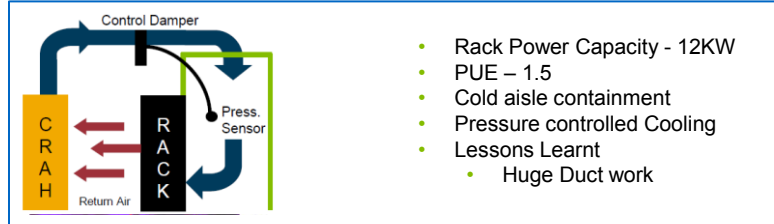
## Generation-2

- Rack Power Capacity - 4 to 6KW
- PUE - 2.0
- Variable Air flow
- Temperature control
- Lessons Learnt
  - Hot wraps
  - Short Cycling
  - Temperature controlled



# Evolution of Datacenters @ NetApp

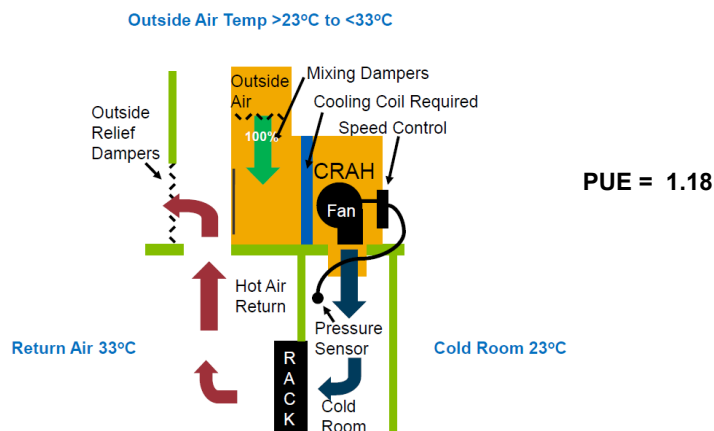
## Generation-3



## Generation-4

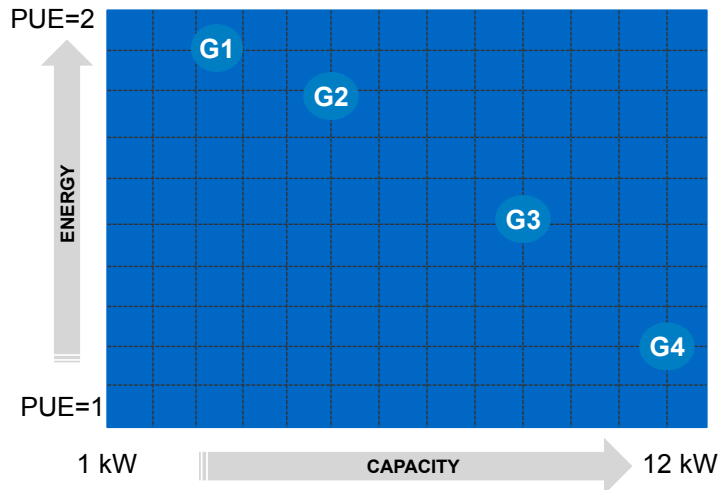


# Generation-4 Datacenters/Lab with Airside Economizer





## Performance of Datacenters



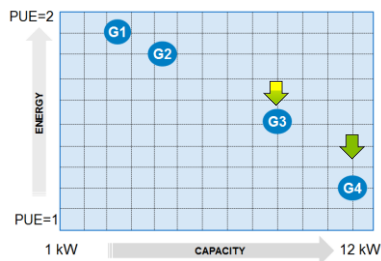
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## Datacenters/Lab in NetApp India



### Current Lab

- 200 Racks in 5060 SF area
- 2400 KW Power and 800TR of Cooling
- Power Density of 12KW/Rack
- Extreme Density Cooling system
- Modular, Scalable UPS system
- 3000 Servers including 50 Blade Servers

### New Bangalore Site Lab

- Targeted PUE of 1.2 to 1.3
- Cold Aisle Containment
- Airside Economizers – Free Cooling 10-25 Deg C 47%
- Efficient Water Cooled Chillers of COP 7
- Efficient UPS Power – 96% Efficient DRUPS

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## Green Performance

UPS Power



- Achieve 96% of Efficiency
- Buy Green Power from Individual Power Producers
- No Batteries

Cooling Power



- Achieve COP of 7
- Buy Green Power from Individual Power Producers
- Utilize 47% of Free Cooling

Water

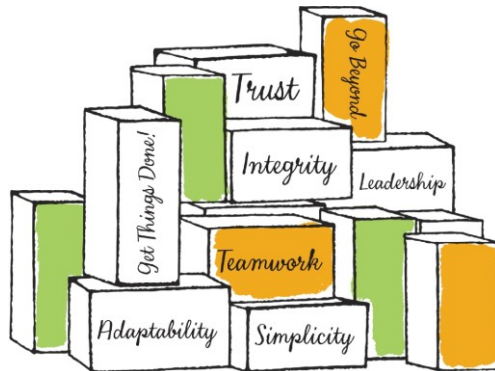


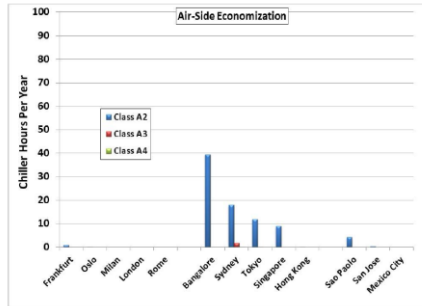
- Reuse/Recycle Water
- Zero Discharge Site
- Efficient Cooling tower

**Targeted PUE of 1.2 to 1.3**



*Thank you*



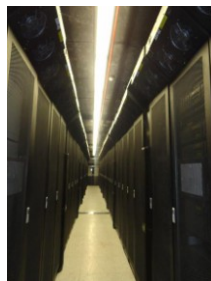
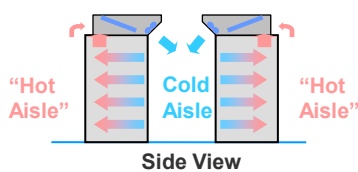


Location	15-20C % of Hours	15-20C x-factor	20-25C % of Hours	20-25C x-factor	25-30C % of Hours	25-30C x-factor	30-35C % of Hours	30-35C x-factor	Net x-factor
Doha	93.0%	0.865	5.0%	1.13	1.7%	1.855	0.1%	1.462	0.88
London	91.1%	0.865	7.1%	1.13	1.7%	1.855	0.1%	1.462	0.89
Frankfurt	85.0%	0.865	10.0%	1.13	3.0%	1.855	0.0%	1.462	0.92
Mexico City	79.7%	0.865	22.2%	1.13	6.7%	1.855	0.3%	1.462	0.96
Milan	75.4%	0.865	15.0%	1.13	9.2%	1.855	1.5%	1.462	0.96
Sydney	62.0%	0.865	29.4%	1.13	7.2%	1.855	1.8%	1.462	0.98
Rome	61.4%	0.865	29.6%	1.13	14.0%	1.855	1.8%	1.462	1.00
Tokyo	62.7%	0.865	19.4%	1.13	14.0%	1.855	4.0%	1.462	1.01
San Paulo	48.2%	0.865	36.4%	1.13	11.7%	1.855	2.0%	1.462	1.04
San Jose, Costa R	22.1%	0.865	51.0%	1.13	23.0%	1.855	2.4%	1.462	1.13
Hong Kong	30.9%	0.865	24.1%	1.13	31.7%	1.855	9.3%	1.462	1.15
Bangalore	16.0%	0.865	47.0%	1.13	20.7%	1.855	8.3%	1.462	1.28
Singapore	0.0%	0.865	14.4%	1.13	64.0%	1.855	20.8%	1.462	1.38

Table C-4. Time weighted failure rate x-factor calculations for Class A2 for air side economization for selected major world-wide cities. The data assumes a 1.5°C temperature rise between the outdoor air temperature and the equipment inlet air temperature.



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