Chapter 5

Design Proposed Town Data Centre for Small Industrial Area

5.1 Introduction

IT Data Centres are a huge investment and most midsize companies need to set up their own data centres to run their business operations. Building new data centres is a time-consuming effort needing millions of dollars and months of planning. Companies cannot afford to make a wrong decision when designing and setting up a new data centre as these need to build for a life of around 20 years.

The term data centre is a physical space, a facility that contains computer systems and related components. They can include power supply, backup services that provide redundancy, or communication equipment. All of these are kept in a controlled and secured environment. Today, the data centre is driving to a new model (Cloud Data Centre Services) based on subscription. Companies choose this model to reduce their costs. They don't need to purchase expensive hardware and constantly upgrade it. Instead, they use cloud services, where a third party is responsible for the hardware resources and often for the IT support as well.

GLIA Metoda Industries Units data centre survey on their members more than 1,200 registered, where more than 100 Units to directly contact and survey analyses in this report are based on information. Of these respondents 42% of them owned and operated their server facilities, 33% used a Data Centre, and 25% used a data centre solution managed solely by a CSP or third party.

Town Data Centre to Units Basic Connectivity is Optical Fibber Cable or Wireless Point to point (Air Fibber) Radio Connection, in case of primary failure then as per requests activate Cloud Connection for temporary basis or as per requirements. One Backup/Redundant Server is placed to industries, in case of failure of data centre connectivity then the Real-time sync redundant server is activated and users are connected to the server.

When data centre connectivity is activated at that time first redundant server synchronization to the data centre and all user connect to the data centre the same. Cloud data centre are many challenges like thousands of users and hundreds of different platform applications working in the data centre. But our town data centre is proposed

to local are data centre so users are limited and application is also limited so data centre architecture and maintenance it is easy.

Corporate data servers were typically located on-premises and every business that needed a server was forced to invest significant capital. Servers required their infrastructure, hardware, and maintenance solutions, for physical servers sitting in a dedicated room/area of the office. It was resource intensive and expensive, but innovations in TOWN Data Centre technology and the increasing availability of lightning-fast fibber/ wireless connectivity.

I am a projects coordinator and come across many types of Industries visits at GLIA Metoda and installations of IT servers and computer rooms. The task of turning the proposed town data centre into the GLIA Metoda is server rooms. These server rooms start with the industry's requirement services with equipment to support new services and growth within an Industries area. I proposed the Town Data centre to Services to the small industrial area.

Mostly Industrial Units require an On-Premise Data centre or Local Data centre with Security and Cost-effective as well as technical support. The town Data Centre site is nearest to an Industries Unit or organization. The users who wish to visit the centre or supervise the on-site staff from a Data centre are required. The data centre location in nears GIDC is Security is trusted. That allows the client to purchase new servers and storage on an as-needed basis. "Instead of buying a full rack of servers now, they can do financial engineering and buy servers just in time,".

5.2 Town Data Centre Design Considerations

Factors to Consider Design a Town Data Centre

There are numerous factors to consider when deciding to build or occupy space in a data centre. Proposed the planning of Town Data Centre in GLIA Metoda. Site Location Selection, available power grids, telecommunications infrastructure, networking services, transportation lines, and emergency services can affect costs, risk, security, and other factors that need to be taken into the data centre.

Data Centre Design & Physical Infrastructure

Another reason why we proposed the design of the town data centre is looking to GLIA Metoda. Data centre users especially Metoda are not trusted to cloud data centre for the physical security of their data. Many units deploy On-Premises Data centre and cannot provide the same level of security and resources that a top-tier facility can. When it

comes to mission-critical infrastructure, physical security should be a top factor to consider. Here are a couple of physical infrastructure factors to consider:

Employee Prospects

While there is currently a shortage of technology experts across Rajkot City, Ahmedabad city are educated employees with computer talent and expertise. With the influx of technology jobs appearing in Rajkot city smaller markets have seen an increase in the number of technical experts are increase. But not secure jobs are provided in Rajkot city the technical expert moves to Ahmedabad.

Sr. No	Name of Technical Expert Post	QTY	Salary	Monthly	Yearly
1	Manager	1	40000	40000	480000
2	Receptionist cum Admin	1	16000	16000	192000
3	Server/Network/Firewall Expert	3	30000	90000	1080000
4	Technical Support	2	20000	40000	480000
5	Technical Field Expert	4	20000	80000	960000
		Total	126000	266000	3192000

Table 5.1: Technical Employee

Always-Available Technical Expertise In the building's physical amenities, technical experts will be available around the clock. Having readily available support at any moment can be a major differentiator. When trained technical staff is available, a data centre location would become more than a facility. They would also become a trusted advisor, giving access to leverage their depth of expertise.

5.3 Town Data Centre Site Selection

Geographic Stability and Secure Location

A major obvious factor in locating a data centre is the stability of the actual site as regards weather, seismic activity, and the likelihood of weather events such as hurricanes, as well as fire or flooding. They say location is important. It is no different with data centre facilities. These facilities can hold millions and even billions of rupees in computer equipment, so it's imperative they are in a safe and secure location. For data centre location, providers need to consider geographic stability. That includes climate protection, seismic activity, terrain type, etc. To ensure the data environment is secure, a data centre colocation provider should be located in a risk-free environment.

Centre of Excellence Long Leased Site Selection

The Centre of Excellence is located at Metoda GIDC Gate 2 and also all centrally activities and meetings are arranged there. The centre of excellence is also displaying

the Units Manufacture Products. The excellence also provides industrial training and develop skilled employee for GIDC.

The excellence is also available space for developing a central data centre for all Metoda GIDC Units are attached and gathering Data centre services. The Centre of excellence is one of the Central paces to mage and handle by Metoda GIDC Union and committee members so Security and trust are there.

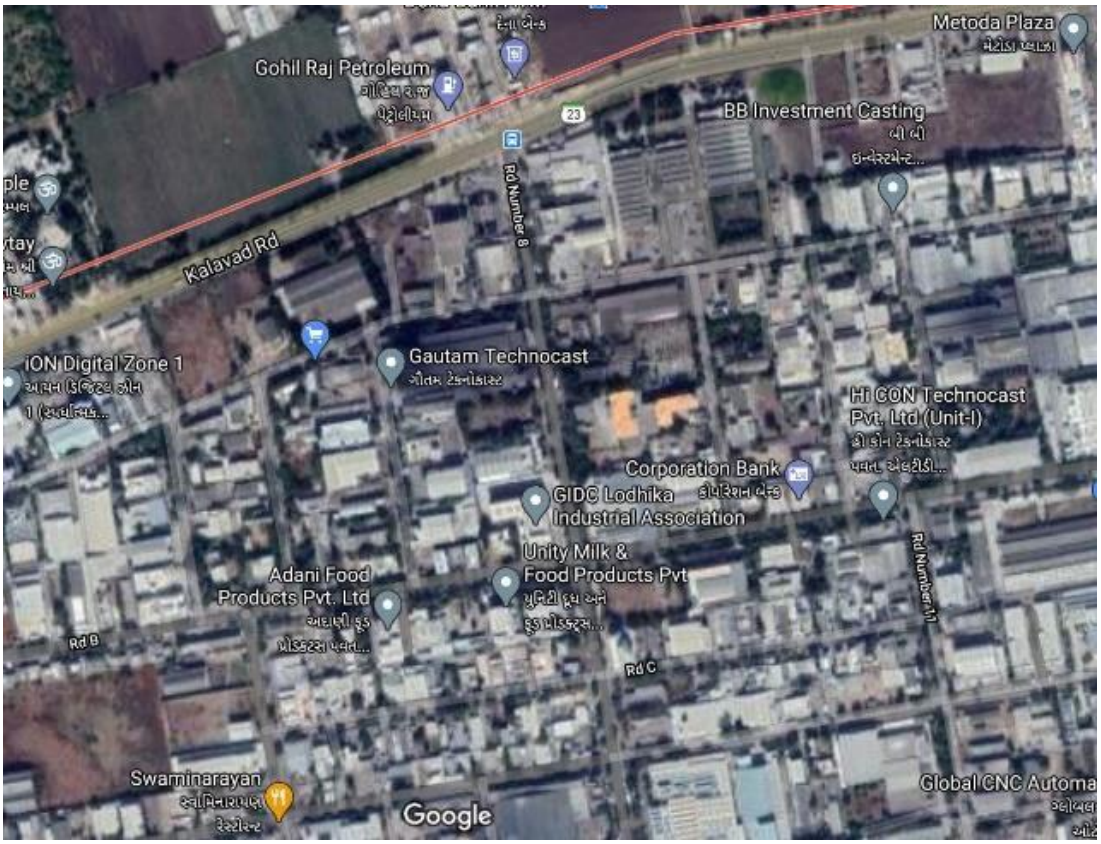

Figure 5.1: Centre of Excellence [1]

Sr. No.	Name	Centre of Excellence	
		Distance in Km	Direction
1	Human Habitation: Social Infrastructure school, hospital, Police Station residence, historic and cultural places, defence establishment, religious places, villages, Temple, etc.	3.8-khirasara, 1.2 vajadi, 4.5 vagudad	East- Vajdi, West - Khirasara, North GIDC Residential Area, South- Vagudad
2	Water supply: Nyari Dam	4.2 9 minutes	East
3	SH 120	10.12	East
4	Rajkot Airport	16.8 30 minutes	East
5	Rajkot-Bhaktinagar Railway line	15.6 28 minutes	East
6	Hotels and Banquet room	3.2 6 minutes	North East

Table 5.2: The Centre of Excellence Locating

Details of Alternate Sites considered and the Basis of Selecting the Proposed Site, particularly the environmental considerations gone into should be highlighted. The location map attached as Annexure 2 shows the location of the mine lease. An alternate site has been examined. I have two options for long leased infrastructure selection the one is Centre of excellence in a reliable trusted location another is and third-party commercial building I have long leased.

Data centre pre-requirement of infrastructure for physical security and stability for infrastructure, Here the purchase already constructed Commercial space who is provided the same Long Leased Rate per square feet Rs.35 to Rs.50, 50x1500=75000, Purchase per square fit 6500 prices, 1500x6500=9750000. If we plane to data centre space for rental on 10 years then purchase price and rental price are same.

Sr. No	Details	Capacity	Leased Charge		Purchase Charge
			Monthly	Yearly	
1	Space Leased rant	1500 square feet	75000	900000	0
2	Purchase Space	1500 square feet	0	0	9750000

Table 5.3: Long Leased Space for Data Centre

Vagudad Village Constructs Infrastructure

Why selection vagudad village location the hectors of free land space are available and as per data centre site selection criteria, all points are full filled.

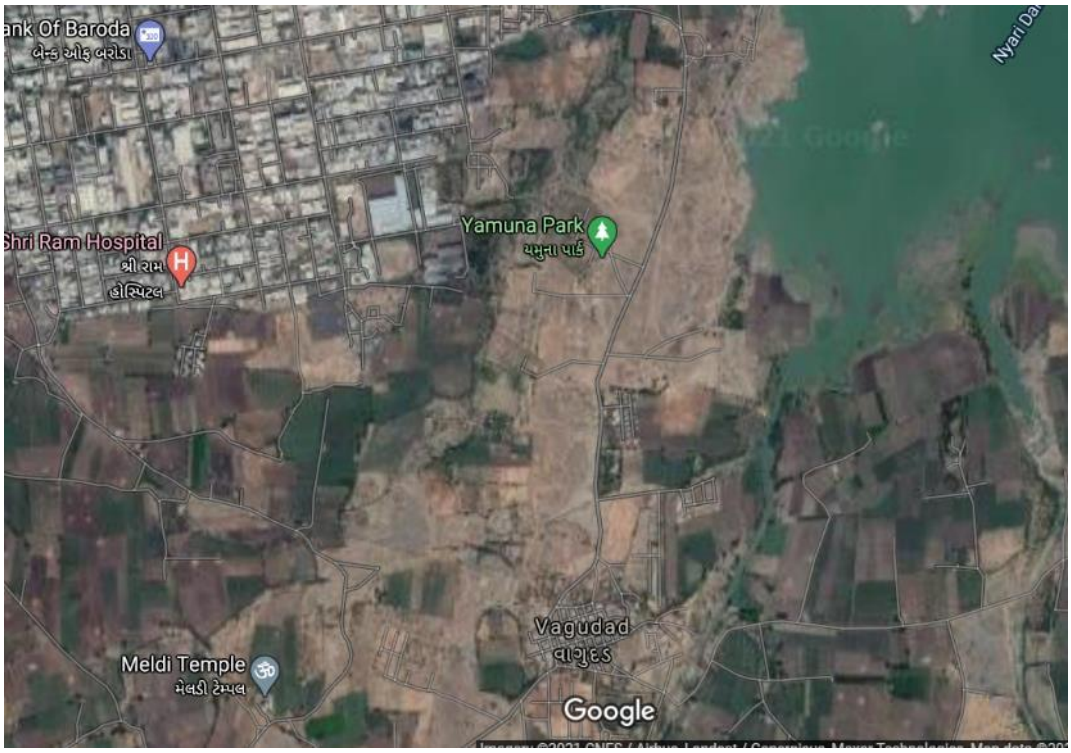

Figure 5.2: Vagudad Village Site [4]

This site is also recommended for the multi-story or vertical data centre design. because of its back side of Nyaridem in future if heavy rain that Dam cannot handle the water then Kalawad road and Front side of Nyaridem its dangerous situation than back side is safe for future disaster.

Sr. No.	Name	Vagudad Village	
		Distance in Km	Direction
1	Human Habitation: Social Infrastructure school, hospital, Police Station residence, historic and cultural places, defense establishment, religious places, villages, Temple, etc.	5.6 Vajadi, 7.6 Khirasara 4.5 GIDC	North
2	Water supply: Nyari Dam	1 3 minutes	North East
3	SH 120	10.12	East
4	Rajkot Airport	16.8 30 minutes	East
5	Rajkot-Bhaktinagar Railway line	15.6 28 minutes	East
6	Hotels and Banquet room	3.2 6 minutes	North East

Table 5.4: Vagudad Village Site Locating

The Town Data centres area unit capital-intensive construction comes, and geographic locations that have unduly high prices related to weather, resources, Laboured, and transportation can possible be less engaging compared to sites that do not. Measurement, of all risks against the higher side, is essential. Plane to Select Land on bit win METODA-GIDC and VAGUDAD Village and Nyaree-1 Riverfront. This location is near many Societies and Open areas and Farmer all facilities and transport use quickly. In addition, wind and an Eco-friendly environment are there.

Essential features of a well-meaning data centre are the site includes easy access and structures that accommodate future growth of the data centre and extension. The site selection is access is essential, especially once building on a building site. Property that is situated close to a serious main road is engaging.

Construction Cost

Vagudad village and GIDC both are nearest so no major difference in LAND cost. Discuss land and civil construction estimate cost in GIDC. Multi-Story data centre One Acre (one Acer=4046 square meters = 43559 square foot) Land select for a data centre. Out of 43559 square foot land construct 21776square feet of the data centre on land and the remaining 21776 square foot land were used for parking and future expansion. The total construction area is 21776 square Foot, and the data centre use space of approximately 20000 square Foot, and remind the 1776 space reserved for wall and weight space. However, we are developing a multi-story data centre ground floor And

each floor 20000 square foot space use. It means a multi-story data centre adds the same space on each floor. In required Area per Cabinet/Rack is 16 square feet. Per floor approximately 1250 Cabinets/Rack (1250/2=625), we store 625 racks per floor. Per Cabinet/Rack require 30 kW power consumes per Cabinet/Rack or 1000 Watt/feet2 (10764 Watt/meter2). It is the right way that such an overkill approach to power consumption. The whole one-acre land compound secures with RCC and Single Gate entry.

The land price in 2019 is 3.5 crore price per acre in VAGUDAD. In addition, the cost of construction depends on what quality of development we want [6].

C class: low-grade bricks and sand, cheapest cement and steel, most affordable fixtures, and fittings. Typically, C-class construction costs around 700 to 800 rupees per square foot of construction. Therefore, a thousand square measure house ought to value between 7 to 8 lakhs to build.

B class: medium grade bricks and sand, medium cost cement and steel, medium cost fixtures, and fittings. B category construction prices are around one thousand to 1100 per square measure. Therefore, a one thousand square measure house ought to price between ten to eleven lakhs.

A class: best-in-class resources. Usually, A class construction costs anywhere in Gujarat 1500 to 2500 per square foot. So, a 1000-square-foot house would cost between 15 to 25 lakhs.

5.4 Rajkot City Climate

The local climate is a major factor in data centre design because the climatic conditions dictate what cooling technologies should be deployed. In turn, this impacts uptime and the costs associated with cooling, which can total as much as 50% or more of a center's power costs. The topology and the cost of managing a data centre in a warm, humid climate will vary greatly from managing one in a cool, dry climate. Nevertheless, data centres are located in both extremely cold regions and extremely hot ones, with innovative approaches used in both extremes to maintain desired temperatures within the centre [5].

Rajkot is the fourth-largest city in the state of Gujarat, India, the centre of the Saurashtra region of Gujarat. Rajkot is located on the riverbanks of AJI and NYARI. It has an average elevation of 128 meters (420 ft.). Is spare in the area of 170.00 km². Avg. annual temperature-26 °C (79 °F), on METODA-GIDC Area and VAGUDAD Village,

in LODHIKA Taluka in Rajkot District of Gujarat State, India. It is located 14 KM towards the west of District headquarters Rajkot. 5 KM from LODHIKA. 269 KM from the State capital Gandhinagar. METODA-GIDC Pin code is 360021 and postal head office is Rajkot METODA-GIDC. KANKOT (3 KM), KANKOT (3 KM), RATAIYA (4 KM), RAMNAGAR (5 KM), BALSAR (5 KM) are the nearby Villages to METODA-GIDC. METODA-GIDC is surround by Rajkot Taluka towards East, PADADHARI Taluka towards North, KALAWAD Taluka towards west, KOTDA-SANGANI Taluka towards East. BHAKTI NAGAR Railway Station is 10Km from METODA-GIDC. New 150 Feet motamava Ring Road 9km 16Minut distance.

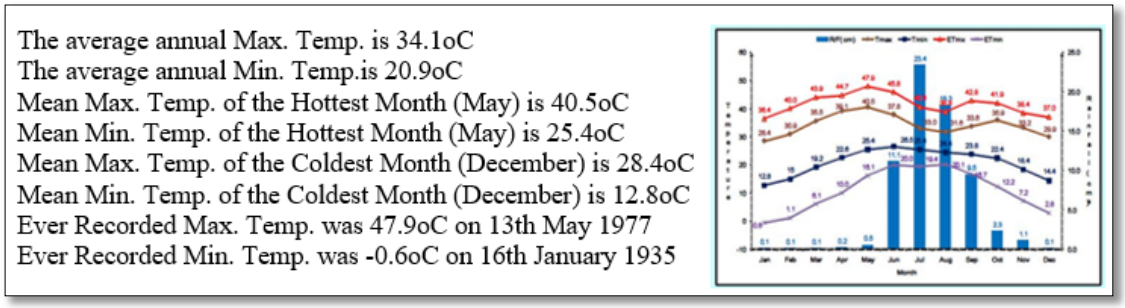

Figure 5.3: Rajkot City Climate [5]

Climatic Data from secondary sources, the climate in the region shows broadly four seasonal variations namely: Winter: December- February, summer: March – Mid June, **Monsoon**: Mid-June – September, Post- Monsoon: October – November

Temperature: Mean daily maximum temperature is recorded in May 32.50 C, Highest mean temperature is recorded 45.70 C in April. The mean daily minimum temperature is recorded 15.20 C in January and the lowest. The mean temperature recorded in the same month is 11.20 C.

Rainfall: Annual average rainfall of the last decade is 555mm. The distribution of rainfall by season is 2.2 mm in winter (December, January, February), 1.6 mm in summer (March, April, May), 520 mm in monsoon (June, July, August, September), and 31.2 mm in post monsoons (October-November).

Cloud Cover: The area remains cloudy between June-Septembers, which is the active period of the monsoon season. Generally cloud cover ranges from 6 to 7 OKTAS during this monsoon season.

Humidity: Most humid conditions are found in the monsoons, followed by summer, post-monsoons, and winter in that order. Mornings are more humid than evenings and

humidity ranges from a high of 77 to 85% in monsoon mornings to a low of 49 to 51% in winter evenings.

Wind: Long-term wind direction data is presented in the below table and indicates that the predominant wind direction is from West and South West and calm in the daytime and in evenings the prominent wind direction is from West, South West, and North East.

Earthquake: 1819 in Bhuj of a magnitude of 8.0, 1956 in Anjar of a magnitude of 7.0 2001 in Bhuj of a magnitude of 7.0, 2020 in kutch of a magnitude of 5.5

5.5 Raised Floor Plane

Serve rooms have a raised access floor or are fitted with a floor based on standard carpet tiles. The first step in designing a server room is to define the exact room dimensions, not all are square or rectangular use of server rack cabinets. Raised floor systems, also known as access floors, are elevated structural floor that is stabilized over a solid substrate, typically a concrete slab. A raised floor system creates a gap ideal for running electrical wiring and HVAC ducts.

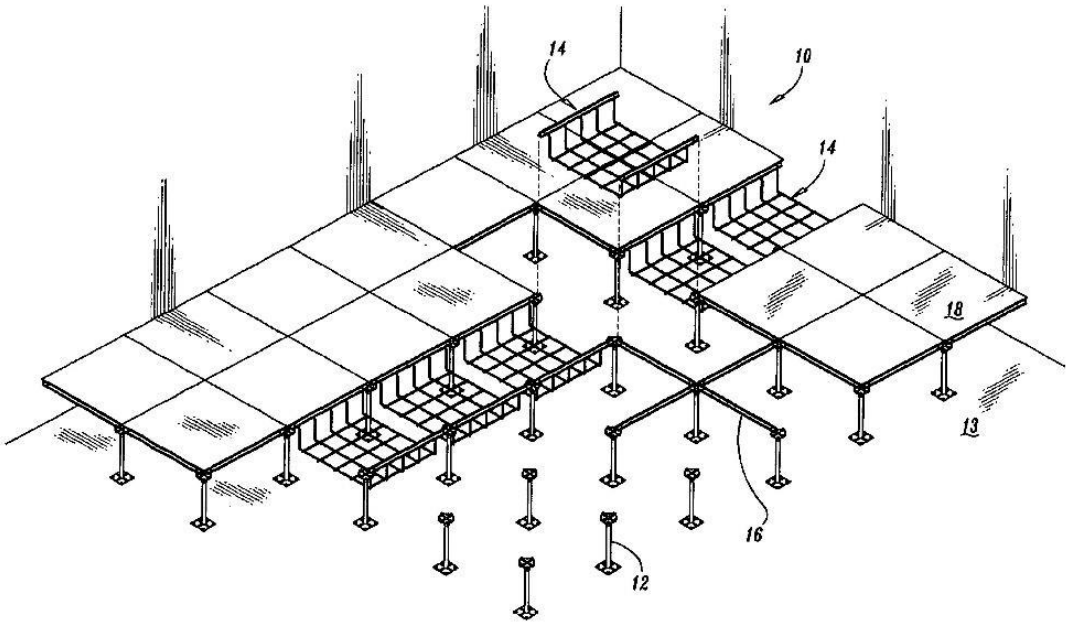

Figure 5.4: Raised Floor with Tray [8]

Cabling Architecture

Data centres usually use three main kinds of network cabling: AC/DC power, ground, copper, and fibre optic. With a raised access floor it is possible to use the underfloor plenum for routing power and data cables. These can be connected to the server cabinets

via bottom entry compartments. Where underfloor is not an option, overhead trunking can be used.

Each power and data cable connection should be mapped and identified (tagged) within the installation. This allows for easy fault finding, equipment disconnection, and capacity increases in the future. Proper installed and tagged cable arrangements also prevent errors when decommissioning or removing systems, especially in an emergency.

5.6 Local Government Permission

Recognizing the short and long-term benefits of data centres to industries, many state and local governments have devoted resources to attracting these centres to their areas. Local policymakers have introduced business-friendly policy measures such as sales tax exemption for computing equipment and software, machinery equipment, and computers; infrastructure grants; and property tax abatements or exemptions. These incentives drive companies to build data centres and invest in the surrounding areas, creating significant economic and social benefits to local communities.

Goods and Service Tax: Data Centre has required Government permeation to Architect a data centre with some security-related low. Also, require tax for local Government lobby.

5.7 Infrastructure Design and Planning

The Centre of Excellence in GIDC Lodhica industrial association Metoda, all Industrial are using this facility and it's a trust symbol in the industry. The excellence is more than 43 thousand square feet construction and also Offices, Seminar Hall, conference office, rest room, etc. facility is already there and used by industrial users. Approx. 30 thousand square feet of space is free.

Figure 5.5: Centre of Excellence front View

Ground floor left side free space is 40x30(1200) square feet are area free to using data centre rack deployment. And nears 20x15(300) square feet for IT Admin and technical staff are useful and also some utility is placed.

Figure 5.6: Rack Deployment Space

Figure 5.7: IT Admin Space Utility

The server room north side admin office for centre of excellence, south side marginal space, east side lobby and toilet for common use, west side it admin office and after marginal space and also access to centre of excellence lift and backside door. Data centre Building space allocation

Dara Centre Building (Boundary line of land)	Building	Inside IT Room	Workspace	
		Outside IT Room	Telecommunication	
			Computer Room	
			Support Space	Administrative area
				Waiting Area
				Reception Area

Table 5.5: Data Centre Building Space Allocation

Data center Information Technology setups require passive work to administration staff work smoothly and data center monitoring and troubleshooting purpose. In this below table basic passive setups are required.

Sr. No	IT Materials	QTY	Unit	Unit Price	Amount
1	CAT6a LAN Cable Laying with Casing Capping	500	meter	60	30000
2	IO with Plate (LAN and Intercom)	20	nos	150	3000
3	9U Rack	1	nos	4700	4700
4	IP Dome 2MP Camera inbuilt Audio	8	nos	3500	28000
5	IP Bullet 2MP Camera inbuilt Audio	2	nos	3750	7500

6	Antivirus	10	nos	1600	16000
7	Tile Floor 2X2 Server room	1200	sq. ft.	245	294000
8	POP 2X2 Server room	1200	sq. ft.	67	80400
			Total	14072	463600

Table 5.6: IT Infra Office Cabling and Floor Charges

5.8 Town Data Centre Rack Deployment Design

There is no perfect way to gauge how many servers are in a typical data centre, but there are a few ways to go about estimating it. If we judge by how many servers can fit in an eight tiles pitch configuration within a certain amount of square feet. As per industry standards requires a total space of 65% space for rack usage, one 42U Rack requires 8 tiles (the size of each tile is 4 square feet,) 8tiles x 4 square feet = 32 square feet total require for each rack.

Figure 5.8: Rack Tiles Size

Each 42U rack Layer switch used 1U space, Power redundancy switch used 1U space and 15 kva Online UPS use 6U space so, 8U rack size reserved for Network and Power

equipment's, remind 34U Rack size used to Server or related equipment's. If we are used a 34U rack size for a 2U server so we are installed a total of 17 servers and each server power consumes 600watt then the total power consumption is 10220 watts, which means 10.22 KVA or installing 1U server 34 and each server 350watt power require then total power consumption is 11900 watt, 11.9 KVA power capacity requirements. In some cases power rarely fluctuates or adds any more power consumption hardware than load increase, this calculation is a full load and uninterested power supply-UPS smoothly works on 80% load, so we are designing the 15KVA Approx. Power capacity to each rack.

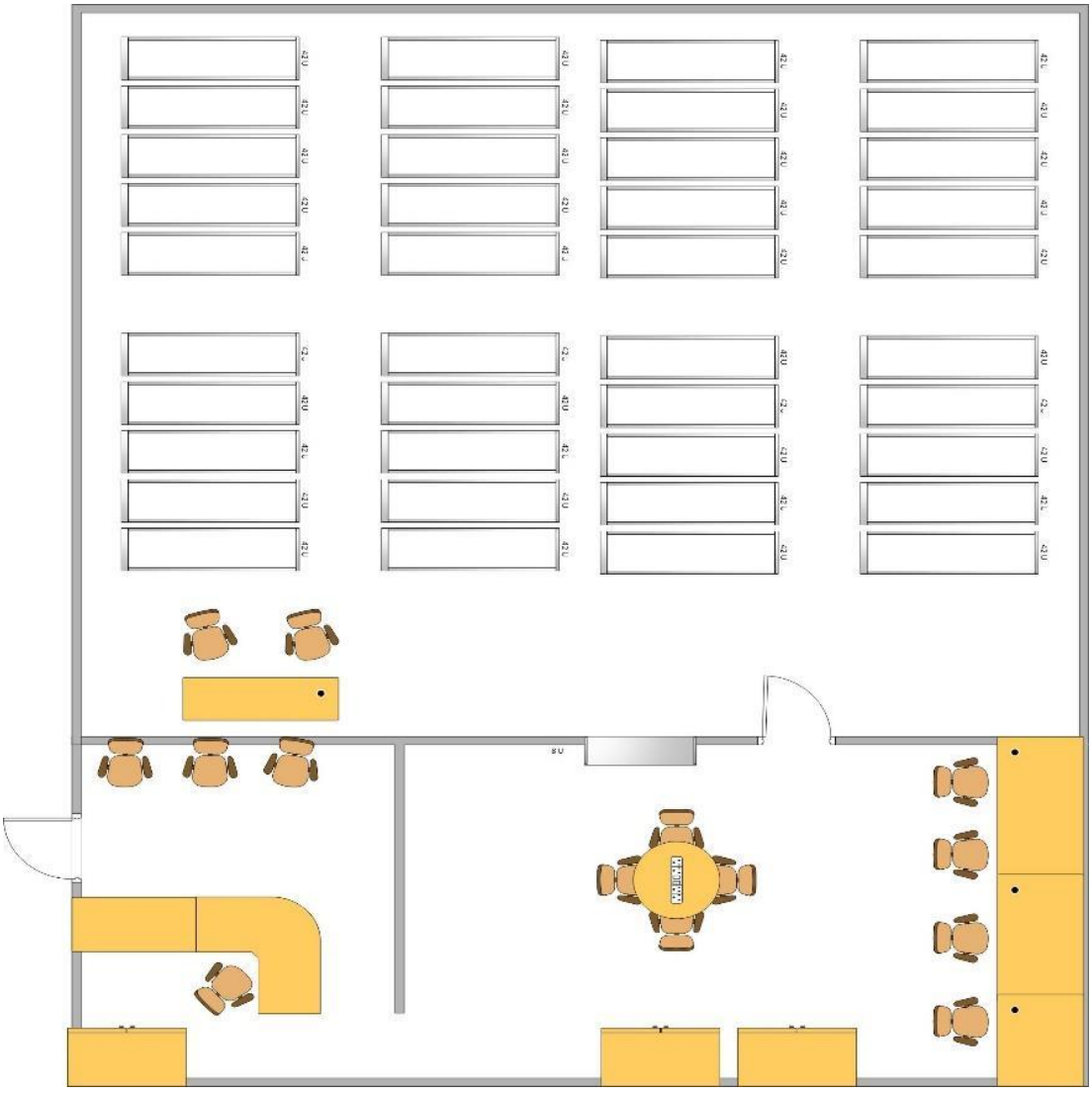

Figure 5.9: Rack Sizing

This design for 40 server racks and its admin total power load is 600KVA Server rooms have a limited floor space ceiling height. Using server rack cabinets, which are designed to sit into the space provided by one or more standard floor tiles allows an installation

to use the least amount of floor space whilst scaling vertically. A typical server rack cabinet will have a Maximum External Height of 78.74 in. (2000 mm), an External Width of 23.62 in. (600 mm) 27.56 in. (700 mm) 31.50 in. (800 mm), and a Static Weight Capacity of 3200 lbs (1451 kg). Server cabinets are typically installed with side panels and may have a front and rear door. The front of the rack provides access to the front of the installed equipment with the rear used for power and network connections and exhaust airflow. When two or more server cabinets are installed within a server room, they can be placed side by side and this helps both cabling and cooling.

Town Data Center 40 rack Design Cost and Hardware

In this table, the other passive equipment's required for rack set up in this table 40 rack setup basic active and passive equipment's are required.

Sr. No	Device Name	Description	QTY	Unit	Unit Price	Amount
1	L3 PoE 24 port Switch for P to P Device	L3 PoE 24 port Switch for P to P Device	1	nos	160980	160980
2	Firewall SOPHOS XG 750	Firewall SOPHOS XG 750	1	nos	1890000	1890000
3	42U Network and Firewall Rack	42U RACK with PDU	1	nos	33950	33950
4	42U Server RACK	42U RACK with PDU	40	nos	33950	1358000
5	L3 24 port Switch	Network	40	nos	103386	4135440
6	15 KVA Online UPS	Online Rack UPS 30 minutes backup	40	nos	294600	11784000
	Power Redundancy switch		40	nos	65800	2632000
				Total	2516866	21994370

Table 5.7: Data Center 40 Rack Setup Cost

Basic Furniture requires IT Admin Office and back end for data centre functions.

Sr. No	Office Furniture	Details	Technical Specification	QTY	Price	Amount
1	Computer Table	standard	Oslo Table for Staff 4 feet (L) X 2 Feet (Width) without drawer unit	4	7973	31892
2	Computer Table	standard	Computer desk	3	6699	20097
3	Storage Cabot	standard	Cabin Storage (Back Unit) – 6 Feet long , 1 Feet 6 Inches (Depth(& 2 Feet 6 Inches (Height)	2	18433	36866

4	Storage Cabot	standard	Cabin Storage (Side Unit) – 3 Feet long, 1 Feet 6 Inches (Depth) & 2 Feet 6 Inches (Height)	1	11071	11071
5	Admin Cabot	standard	Storage with Shutter. Size :3 Feet (L) X 1 Feet 6 Inches (Depth) X 4 Feet (Height)	1	14954	14954
6	Meeting Room	7 seating	Alchemy Meeting table for 4 Persons. Table top size of 4 feet X 2 feet	1	16950	16950
7	Revolving Chair	standard	Regent office chair	7	5636	39452
8	Visiting Chair	standard	Folding chair	4	1709	6836
			TOTAL		**83425**	**178118**

Table 5.8: IT Admin Office Furniture

5.9 Town Data Centre Power Supply Design

The IT power infrastructure setup depends on the IT workload, that is, the power factor consisting of IT servers, storage, and networking equipment. Well-designed facilities put significant thought into power distribution to make sure that they're not letting much electricity go to waste. They also implement sophisticated automated systems that manage power-intensive operations more efficiently to keep energy usage growth in check even as facilities grow larger and more powerful. Many facilities also embrace additional green data centre design standards to ensure that they’re promoting sustainability alongside performance.

Part of the reason why data centre infrastructure is consuming so much energy is that companies are deploying far more powerful servers than they did in the past. These servers have higher wattage requirements, which means data centres need to provide higher-density racks to accommodate them. While a typical server rack once required between 3 and 5 kW the average density for today is between 7 and 10 kW, with many hyper-scale facilities deploying racks in the 16 to 20kW range.

Sr. No	Device Name	Description	Status	Size in Unit	Power Rating	Power Supply	Total Power in Watt
1	PowerEdge C6515	RACK Server	Online	2	550	2	1100
2	PowerEdge R340	RACK Server	Online	1	350	2	700
3	PowerEdge R550	RACK Server	Online	2	600	2	1200

4	PowerEdge 750xs	RACK Server	Online	2	600	2	1200
5	PowerEdge C6515	RACK Server	Online	2	550	2	1100
6	PowerEdge R340	RACK Server	Online	1	350	2	700
7	PowerEdge R550	RACK Server	Online	2	600	2	1200
8	PowerEdge 750xs	RACK Server	Online	2	600	2	1200
9	PowerEdge C6515	RACK Server	Online	2	550	2	1100
10	PowerEdge R340	RACK Server	Online	1	350	2	700
11	PowerEdge R550	RACK Server	Online	2	600	2	1200
12	PowerEdge 750xs	RACK Server	Online	2	600	2	1200
13	PowerEdge C6515	RACK Server	Online	2	550	2	1100
14	PowerEdge R340	RACK Server	Online	1	350	2	700
15	PowerEdge R550	RACK Server	Online	2	600	2	1200
16	PowerEdge 750xs	RACK Server	Online	2	600	2	1200
17	PowerEdge R550	RACK Server	Online	2	600	2	1200
18	PowerEdge 750xs	RACK Server	Online	2	600	2	1200
19	Power Vault ME4024 Storage Array	RACK Storage	Online	2	580	2	1160
20	L3 24 port Switch	Network	Online	1	20	1	20
21	PRS	Rack power redundancy switch	Online	1	0	1	0
22	15 KVA Online UPS	Rack UPS	Online	6	0	1	0
			Total	42	10200	41	20380

Table 5.9: One Rack Power Consumption

This shift has put pressure on data centres that lack the cooling infrastructure to accommodate this higher-performance equipment. High-density server racks also tend to be larger than their predecessors, forcing many facilities to rethink how they deploy assets on the data floor. If a data room wasn't designed with modern, high-density racks

in mind, it may be forced to use inefficient workarounds that limit flexibility and potentially compromise performance.

IT Admin Power Consumption and Hardware Cost.

Sr. No	IT Equipment's	QTY	Unit	Unit Price	Amount	Power Watt	Total Power Watt
1	All In One PC (8GB RAM, 512SSD, i3 Processor, 4core)	3	nos	47800	143400	180	540
2	LED Monitor (8GB RAM, 512SSD, i3 Processor, 4core)	5	nos	9000	45000	25	125
3	Desktop (16GB RAM, 512SSD, i3 Processor, 4core)	4	nos	45000	180000	200	800
4	Laptop (8GB RAM, 512SSD, i3 Processor, 4core)	3	nos	62400	187200	100	300
5	L2 Manage Switch	1	nos	18500	18500	195	195
6	Wi-Fi Access Point	2	nos	6600	13200	13	23
7	Biometric Door Lock	1	nos	9900	9900	8	8
8	Biometric Attendance Machine up to 20 User	1	nos	13000	13000	7	7
9	NVR 16 Channel with 30 Days Backup (Including 4TB -2 nos. HDD)	1	nos	28500	28500	15	15
10	EPBX	1	nos	35750	35750	12	12
11	Phone	10	nos	1280	12800	7	70
12	55" TV	2	nos	50700	101400	80	160
13	Video Conferencing Systems	1	nos	72600	72600	12	12
14	D Link Router for Office Internet	1	nos	1800	1800	7	7
15	Multifunction Printer	1	nos	21300	21300	490	490
16	LED Light	24	nos	2120	50880	36	864
17	5 KVA Online UPS	1	nos	100000	100000	0	0
		Total		**526250**	**1035230**	**1387**	**3628**

Table 5.10: IT Admin Power Consumption and Hardware Cost

5.10 PGVCL Power Supply

All data centres consume power for two purposes: first to power the servers and other IT equipment and, second, to power the air conditioning to cool the equipment. Non-IT equipment requirements office cooling, lights, etc.

Enterprises can determine IT power requirements by summing up the consumption of the equipment. This can be found in equipment specifications and is generally a range depending on processing loads. If total consumption is 600kW, then enterprise customers may consider buying actual power consumption. Otherwise, they will pay a fixed fee for the power available to the equipment.

Optimizing the power factor of data centres connected to the smart grid, The Data Centre (DC) services business is blooming increasing their energy demand and making them important players in the safe operation of the smart grid. The DC IT servers have a dynamic power factor varying from 0.98 for high-density workloads and 0.8 for 20% server usage. Watts to the kVA calculation formula. The apparent power S in kilovolt-amps (KVA) is equal to the real power P in watts (W), divided by 1000 times the power factor PF: S (KVA) = P (W) / (1000 × PF), so kilovolt-amps are equal to watts divided by 1000 times the power factor. Kilovolt-amps = watts / (1000 × PF), what is the apparent power in kilovolt-amps when the real power is 3000W and the power factor is 0.8. Solution: S = 444797W / (1000 × 0.8) = 556 KVA [10].

Sr. No	Name of Facility	WATT	KVA	QTY	WATT	KVA
1	42U RACK with Full Load Power Consumption	10200	12.75	40	408000	510
2	IT Equipment (Admin and Technical)	3628	45.99	1	36797	46
3	Heating, Ventilation, and Air Conditioning. HVAC	32237				
4	Network Rack	932				
	TOTAL LOAD	**46997**	**58.74**		**444797**	**556**

Table 5.11: Data Centre Power Consumption

Power typically represents the largest cost in a data centre. Therefore, choosing a provider with lower power costs will ultimately lower overall costs. Third-party providers' power costs are typically locked in, whereas in-house operations are subject to fluctuating power costs.

The cost a service provider pays for power will be affected by the source of the power, the regulatory environment, the facility size, and the rate concessions, if any, offered by the utility. At a higher level, tires, batteries, generators, and redundant power grids are a required part of the picture.

Utility Supply, Generators, Transfer Switches, Distribution Panels, Uninterruptible Power Supplies (UPS), PDU, the power that comes from one or more utility grids. While most of us consider the grid to be our primary power supply, politics, economics,

and distribution make utility supply power susceptible to outages, which is why data centres must have autonomous power available to maintain availability. Fuel consumption (at 100% load) 133.5 litters per hour

Sr. No	Details	Capacity	Recurring Charge		One-time Purchase or Installation Charge
			Monthly	Yearly	
1	PGVCL Supply	600 kva	79475	953700	1080000
2	Solar Setup	50 kva	0	0	2050000
3	Diesel Generator	600 kva	11867	142402	3600000
		TOTAL	**91342**	**1096102**	**6730000**

Table 5.12: Data Centre 600 KVA Power Supply Setup Cost

Hybrid Solar Green System

A Solar Panel is a Green electricity-generating system Solar System, this panel is deployed in an open area to direct solar light to get to or on top of a house or building. There are three main types of solar power systems that are available On-grid solar systems it's a direct used solar electricity, and Off-Grid Solar Systems are stored over electricity in Batters when ewer we use this. Hybrid Green Solar System connected to the PGVCL power supply grid and similarly with battery for the power backup. There are three types of solar panel systems that are given below in table 5.13 [11][12].

Types	Price	Price Per Watt
On-grid Solar	Rs. 2050000/-	Rs. 41/-
Off-grid Solar	Rs. 3000000/-	Rs. 60/-
Hybrid Solar	Rs. 3750000/-	Rs. 75/-

Table 5.13: Solar Systems Price Break Down

The battery backup assists the electric load after the PGVCL grid is not available. When solar power electricity production requirements are increasing, the additional power green can charge the batteries, which store the electricity, and when the structure produces less electricity than the batteries can brand up the shortage. These systems are extra difficult to design and install and expensive.

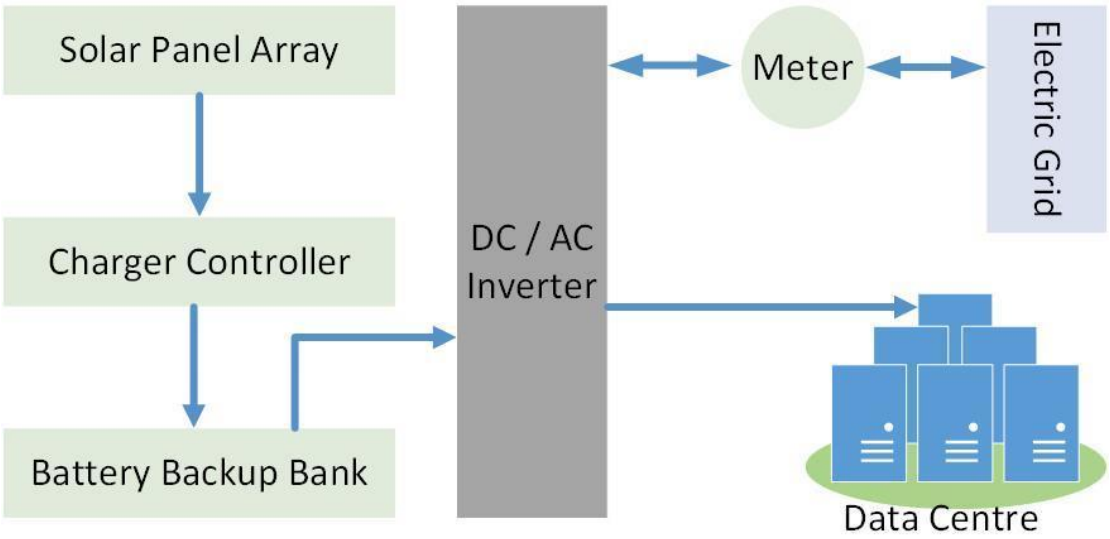

Figure 5.10: Hybrid Solar System

This hybrid solar system generates an average of six thousand units per month. 50kW solar system requires a 150 square meter area approx. for fitting. It's sufficient to install in schools, factories, companies, hotels, farms, etc. can design the 50kW hybrid Solar system as per requirement. The charge of procurement of 50kW solar systems confides on the type of solar system.

Diesel Generator

Generators are used to supply power when the utility supply is unavailable. They convert mechanical energy, usually from motors, to electrical energy. Transfer Switches are used to transfer electric load from one source or electrical device to another, such as from one utility line to another, from a generator to a utility, or between generators. The transfer could be manually activated or automatic to ensure continuous electrical power. Distribution Panels get the power where it needs to go, taking a power feed and dividing it into separate circuits to supply multiple loads.

Online UPS (Uninterrupted Power Supply)

UPS, as we touched on earlier, ensures that continuous power is available even when the main power source isn't. It often consists of batteries that can come online almost instantaneously when the current power ceases. The power from a UPS does not have to last a long time as it is considered an emergency measure until the main power source can be restored. Another function of the UPS is to filter and stabilize the power from the core power supply.

An online Uninterrupted Power Supply procedures a dual alteration way of tolerant Alternating Current input, rectifying to Direct Current for transient through the

rechargeable battery then reversing back to 230 Volt Alternating Current for running the protected equipment.

Advantage	Drawback
Enhanced voltage parameter. Alteration time from DC to AC is insignificant with no breaks in voltage. No fluctuations in the electrical power, indicating steady voltage quality. The quality of the capacity is free from distortion. Immediate ideal electrical output, highest defence against all power fluctuation.	Difficult designs demand a huge heat descent. Advanced power dissipation complete efficiency of UPS has concentrated The inverter is always on and wattage of the rectifier is increased. It has to supply power to the inverter as well as responsibility for the battery Inflated than UPS classifications.

Table 5.14: Online UPS Benefits and Limitations

Uninterrupted Power Supply input AC is charging the dray battery backup which provides power backup to the output inverter, the failure of the main input AC then transfer switch activation. That is a power loss ensues, the rectifier will drop out of the circuit and the batteries will keep the power balanced and unchanged. No transfer time during the failure. When power is restored, the rectifier will recommence carrying the greatest of the load and begin charging the batteries, though the charging current may be limited to prevent the high-power rectifier from overheating the batteries and blistering off the electrolyte [13].

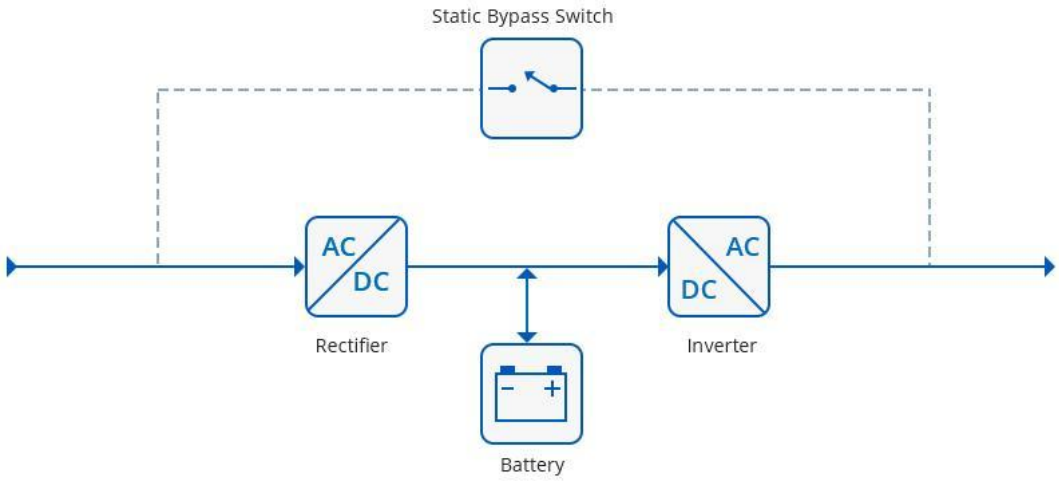

Figure 5.11: Uninterrupted Power Supply Diagram [13].

The online UPS system protects the unstable power supply of the dual transformation process that isolates the kit from harm on the AC line types of equipment. The online Uninterrupted Power Supply system fixes not need a transmission time because the inverter is at present providing the related equipment load when an outage happens. Online UPS systems accept an additional precise method of power parameter:

continuous dual adaptation operation, separating connected equipment from harms on the AC line, including blackouts, brownouts, overvoltage's, harmonic distortion, electrical impulses, and regularity differences.

Once not working from the battery, online UPS systems typically regulate voltage within ±2 to 3%. Size characteristically minor and smooth, Useful Power Range 5 to 5000 KVA, High Voltage Preparing, Average Price per VA, Effectiveness Low-Medium Classically 80 to 90%, High price,

Power Distribution Unit

Data Centre PDU stands for the Power Distribution Unit and is the device that distributes power to individual pieces of equipment. The UPS and PDUs should be connected to the IP network for SNMP and data centre infrastructure management (DCIM) style monitoring and alarm reporting. It is good practice to install uninterruptible power protection and to use smart or intelligent PDUs with metered and switched outlet sockets.

Power Redundancy Switch:

A redundant power supply is when a single piece of networking equipment operates using two or more physical power supplies. Each of the power supplies will have the capacity to run the device on its own. This makes sure that the device could operate normally even if one power supply fails. For additional security, the UPS system should be installed with an external UPS maintenance bypass switch. This allows the UPS to be completely isolated for preventative maintenance or swapped out should a fault occur, both without interruption to the connected loads balancer PDU.

5.11 Town Data Centre AIR Cooling Design

The air around servers needs to be maintained in the range of 68° to 72°F (20° to 24°C) for optimal reliability. Data centre, relative humidity (RH) levels should be between 45% and 55%. If RH levels become too high, water condensation will cause corrosion, rust, and short-circuiting within the equipment [14].

The server cabinet is the starting point for an energy-efficient cooling system. Each generation of servers provides more powerful processing and digital capacity than the next. For each 1Watt of power consumed 1Watt of heat is generated. A typical server rack even in a small server room can see 5 to 10kW of power draw and heat generation. Within a data centre high power density racks can see heat loads of 15 to 30kW or more.

From innovations in traditional air handlers to innovative strategies that incorporate natural cooling with outside air and water sources, cooling infrastructure is one of the primary design standards to consider for any data centre. The server room inside heat is unique of the maximum significant metrics in server room environment as per METODA environment the server room cooling 22 to 27°C require. Protection server equipment at a reliable temperature and moisture point is a critical portion of a capacity.

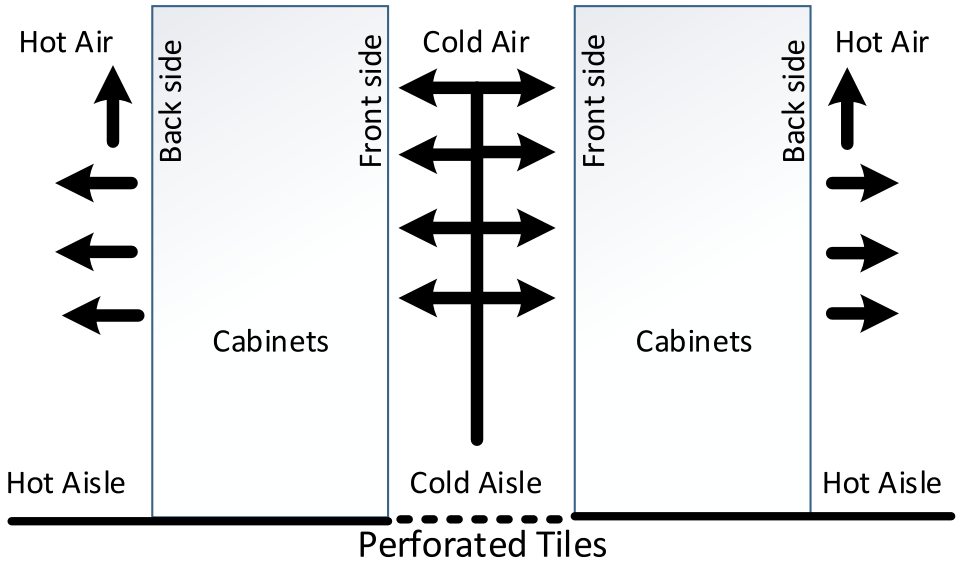

Figure 5.12: AIR Cooling Ventilation

We proposed a design for smart rack architecture its 42U rack have HVA Air conditioner systems with sensor, and also deploy enterprise air conditioning on the wall for room temperature management. Boos its price is very cheap and also maintenance and very easy and low price.

Sr. No	Air Cooling Equipment's	Make and Model	QTY	Unit	Unit Price	Amount	Power Watt	Total Power Watt
1	Split AC 2 ton	Voltas 2 Ton 5 Star Split AC	1	nos	45500	45500	1741	1741
2	Exos fane	Havells	2	nos	1280	2560	32	64
3	Pedestal FAN	standard	2	nos	2599	5198	100	200
4	Voltas 2 ton Duct AC	Voltas 2 Ton 5 Star duct AC 160 sq ft (160 x8=1280 sqft, DC size 1200 sq ft)	8	nos	68990	551920	2600	20800

5	Voltas 2 ton Tower AC	Voltas 2 ton Tower AC 5 star 240 sq ft	2	nos	62890	125780	2358	4716
6	Blue star 4 ton Tower AC	Blue star 4 ton Tower AC 5 star 400 sq ft	2	nos	114990	229980	2358	4716
			Total		**296249**	**960938**	**9189**	**32237**

Table 5.15: AIR Cooling Equipment's Cost and Power Consumption

The equipment within a server rack is arranged so that cool air can be presented using precision cooling to the front of the rack. Hot air is exhausted via the rear of the cabinet. A single server rack may be cooled with a wall-mounted or ceiling-suspended air conditioner. This is typical for a small server room. Larger installations with multiple racks may use a larger air conditioner or consider some form of containment, hot or cold aisle.

From innovations in traditional air handlers to innovative strategies that incorporate natural cooling with outside air and water sources, cooling infrastructure is one of the primary design standards to consider for any data centre. While many facilities still rely on relatively inefficient computer room air conditioners (CRACs), the increased power demands of modern servers have spurred the rapid development and adoption of new solutions like direct-to-chip liquid cooling and calibrated vector cooling (CVC).

Rack Cooling tackles cooling on a rack-by-rack basis. Air-conditioning units are dedicated to specific racks. This approach allows for maximum densities to be deployed per rack. This works best in data centres with fully loaded racks, otherwise, there would be too much cooling capacity, and the air-conditioning losses alone could exceed the total IT load.

We proposed a design for smart rack architecture its 42U rack have inbuilt Air conditioner systems with sensor, and also deploy enterprise air conditioning on the wall for room temperature management. Because its price is very cheap and also maintenance and very easy and low price.

5.12 Town Data Centre Server Design

Server sizing and Storage Capacity Planning

A rack server, or rack-mounted server, is any server that is built specifically to be mounted within a server rack. Rack servers are general-purpose machines that can be configured to support a wide range of requirements. They are most commonly found in data centre environments but can also be used in smaller computer closets. So it can be

secured into the rack using mounting screws or rails, depending on the design. If you only require a small number of servers, they are the preeminent choice economically due to the lower upfront costs.

Benefits of a Rack Server

While which type of server is used largely depends on the scenario, there are several advantages of using a smaller rack server over a blade server: Power Rack servers are typically built with all the needed components to operate as a stand-alone system. They can be very powerful and are used to run high-end applications. Convenience having the ability to easily mount a server within a rack is convenient and saves a lot of space, especially when compared to a traditional tower-style server.

Cooling a rack server is easier than most others. They are usually equipped with internal fans and placing them in a rack increases airflow. Ideal for Lower Quantity Rack servers is best suited when need more than one server (but less than about 10) because they don't require a massive chassis. Installation of blade servers in an enterprise data centre. Racks with servers and backup drives.

A blade server is a modular server that allows multiple servers to be housed in a smaller area. These servers are physically thin and typically only have CPUs, memory, integrated network controllers, and sometimes storage drives built in. Any video cards or other components that are needed will be facilitated by the server chassis. Which is where the blades slide into. Blade servers are often seen in large data centres. Due to their ability to fit so many servers into one single rack and their ability to provide high processing power.

Blade servers are generally used when there is a high computing requirement with some type of Enterprise Storage System: Network Attached Storage (NAS) or a Storage Area Network (SAN). They maximize available space by providing the highest processor per RU availability. Blade Servers also provide rapid serviceability by allowing components to be swapped out without taking the machine offline. Will be able to scale to a much higher processor density using the Blade architecture. The facility will need to support a much higher thermal and electrical load per square foot.

Power Consumption In many cases the chassis for the Blade Server will supply the power to multiple servers, reducing total consumption.

Hot Swappable Blade servers can be configured to be hot swappable so if one blade has a problem, it can be pulled and replaced much more easily. This helps to facilitate redundancy. Less Need for Cables Rather than having to run individual cables for each

server, blade servers can have one cable (often fibre) run to the chassis, thus reducing the total cable requirements. Processing Power Blade Servers can provide an extremely high processing power while taking up minimal space

When to use a rack server or a blade server depends entirely on each scenario. Ultimately, both a Blade Server and a Rack server can be configured to do the same work. It all boils down to which one can do the work most economically. Based on processing needs and the layout of space. Be sure to take into consideration the thermal and electrical requirements of the machine, computing requirements of the work (CPU/hr.), and the carrying capacity of the facility (Watts/sq. ft.) when trying to find the optimal server for your needs.

Data Centre Server Storage Capacity Sizing

Basic Server storage capacity Requirement VMWare Require Hardware for Workspace ONE Assist Server CPU 2.4 GHz Processors, 4 Logical Processors, 2 CPUs, 2 Core 2x2, RAM 16 GB, Hard Drive Space 100 GB for OS drive, Bandwidth 1 MB/per minute. Windows Server Essentials 2012/16/19 64-bit server software operating system requirements CPU socket 3 GHz (64-bit processor) RAM 4 GB, Hard disk 60 GB. SAP HANA requirements hardware CPU core 8 cores, RAM 128 GB, Hard disk for storage 20 GB, Network 10 GB/ second backbone connectivity, Bandwidth 1MB/ per minute. CRM Standard ERP Recommended Server Hardware CPU Core 2.5 GHz 4core, Memory RAM 16 GB, Hard Disk 20 GB, internet 1Gb/s. SQL Database minimum hardware configuration requirements to installation. CPU 2 GHz speed, 2 Core processors, RAM 2 GB, Hard Disk space 6 GB. This is a minimum recommended Hardware for an ERP system. CPU core and RAM are not a major change for up gradation, HDD based on OS and ERP Calculate actual Storage depend on Database. In addition, the configuration RAID server then requires plus storage.

Software details	CPU	RAM	Storage
VMWare + Windows Server + ERP SAP HANA + SQL DB Server	16 Core	152 Gb	186 Gb
VMWare + Windows Server + Standard ERP + SQL DB Server	12 Core	40 Gb	186 Gb
Windows Server + ERP SAP HANA + SQL DB Server	12 Core	136 Gb	86 Gb
Windows Server + Standard ERP + SQL DB Server	8 Core	24 Gb	86 Gb
	12	88	136

Table 5.16. Minimum Hardware Requirement for each Complete Server Solution.

As per the above table and our statistical online survey based we proposed server capacity calculation for the Town data centre to require. A total of 1200 industrial units are present and out of 1200 the 1000 small and medium industries are using small ERP software and his need of server configuration like (12core CPU) x (1000 industries unit) = total of 12000 core CPU are required, (88 GB RAM) x (1000 industries unit) = total 88000 GB RAM, (136 GB Storage) x (1000 industries unit) = total136000GB (133TB) Storage Capacity Require.

Virtualization Server Facility

Virtualization is a technique, which allows sharing of a single physical instance of a resource or an application among multiple customers and organizations. It does this by assigning a logical name to physical storage and providing a pointer to that physical resource when demanded. The main usage of Virtualization Technology is to provide the applications with the standard versions to their cloud users, suppose if the next version of that application is released, then cloud provider has to provide the latest version to their cloud users, and practically it is possible because it is more expensive. To overcome this problem we use virtualization technology, By using virtualization, all severs and software application which is required by other cloud providers are maintained by third-party people, and the cloud providers have to pay the money on a monthly or annual basis.

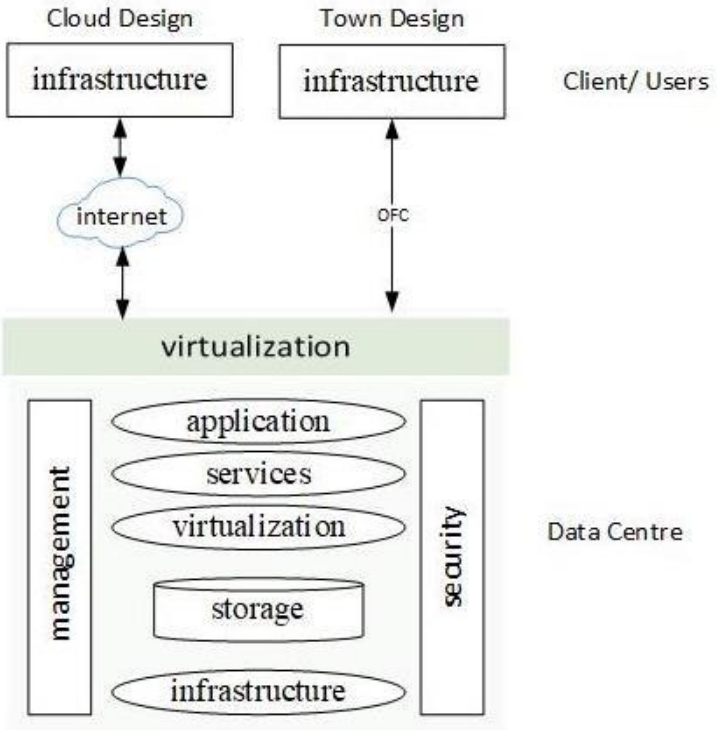

Figure 5.13: Virtualization Hardware

5.13 Town Data Centre Network Design

Data Centre Secure Network Connection Architecture

In addition to a secure location and infrastructure, a secure network connection is of prime importance. Businesses are starting to require more and more bandwidth and greater network speeds to keep up with their competitors. As a result, these growing needs have made connectivity a major factor when considering data centre facilities. Carrier-neutral facilities can deliver high bandwidth and high reliability with low latency service. Generally, latency will be the main factor in transferring data to and from a data centre. Latency is the delay before a transfer of data begins following the instruction for its transfer.

Diagram for Wireless Network Connection to Units.

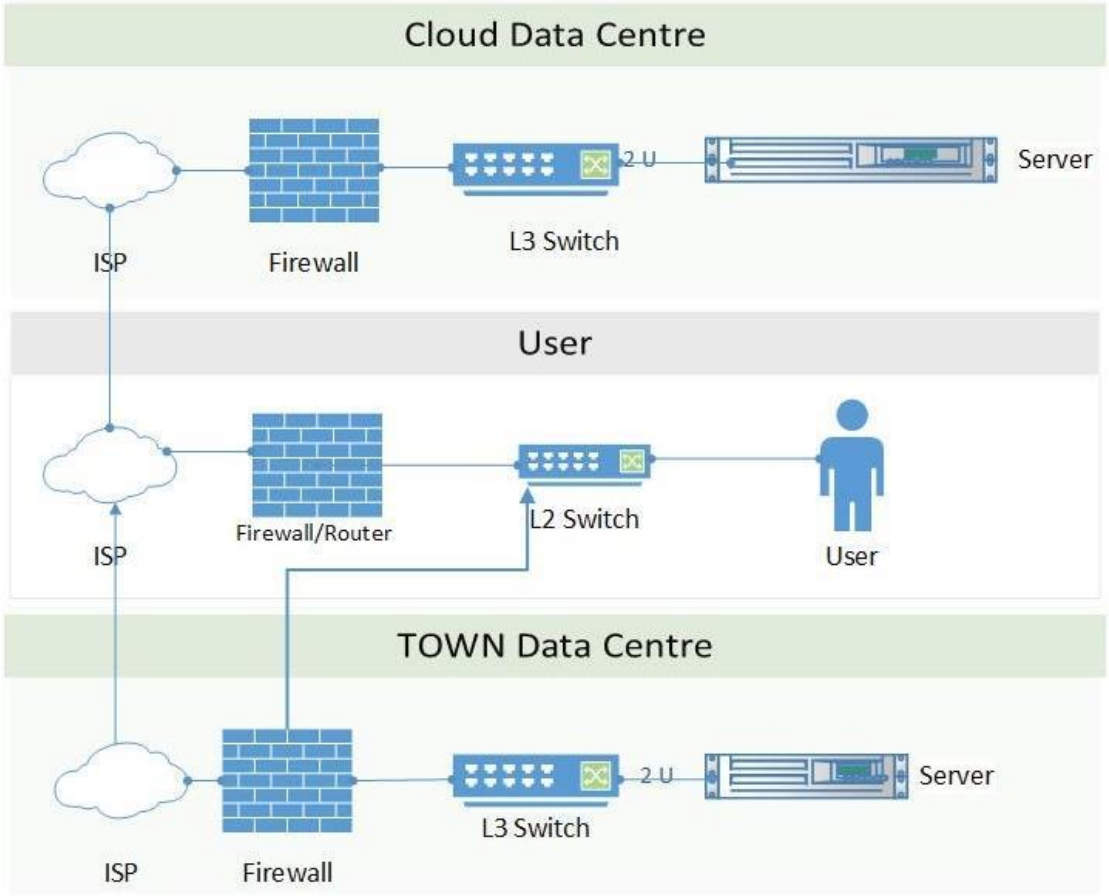

Figure 5.14: Network Diagram

All units End users and other connections are Optical Fibre or Wireless connections, today, wireless technology cost-effective and low-maintenance solution. I also observed when I travel in Ahmedabad city and expert friend and also discuss with ISP

Provider to all are wireless solution provides it's cost-effective and maintenance free to compare fibre.

Data Centre Rack Networking

A Town data centre uses a secure server room for storing equipment. This facility set local rack network access based on Private IP access is fixed with MAC binding.

The server to layer 3 switch connection establishes a 10Gbps Optical fibre cable. The data centre backbone Intranet (LAN) network is 10Gbps (Server, Layer3 switch, Firewall, Storage, etc.) and also firewall to outbound end Distribution layer 3 switch connection 10Gbps Optical fibre and then distribution layer 3 switch to end-user access switch connection also 10gbps fibre connection. Access switch to end user connection also 1Gbps accessible connection.

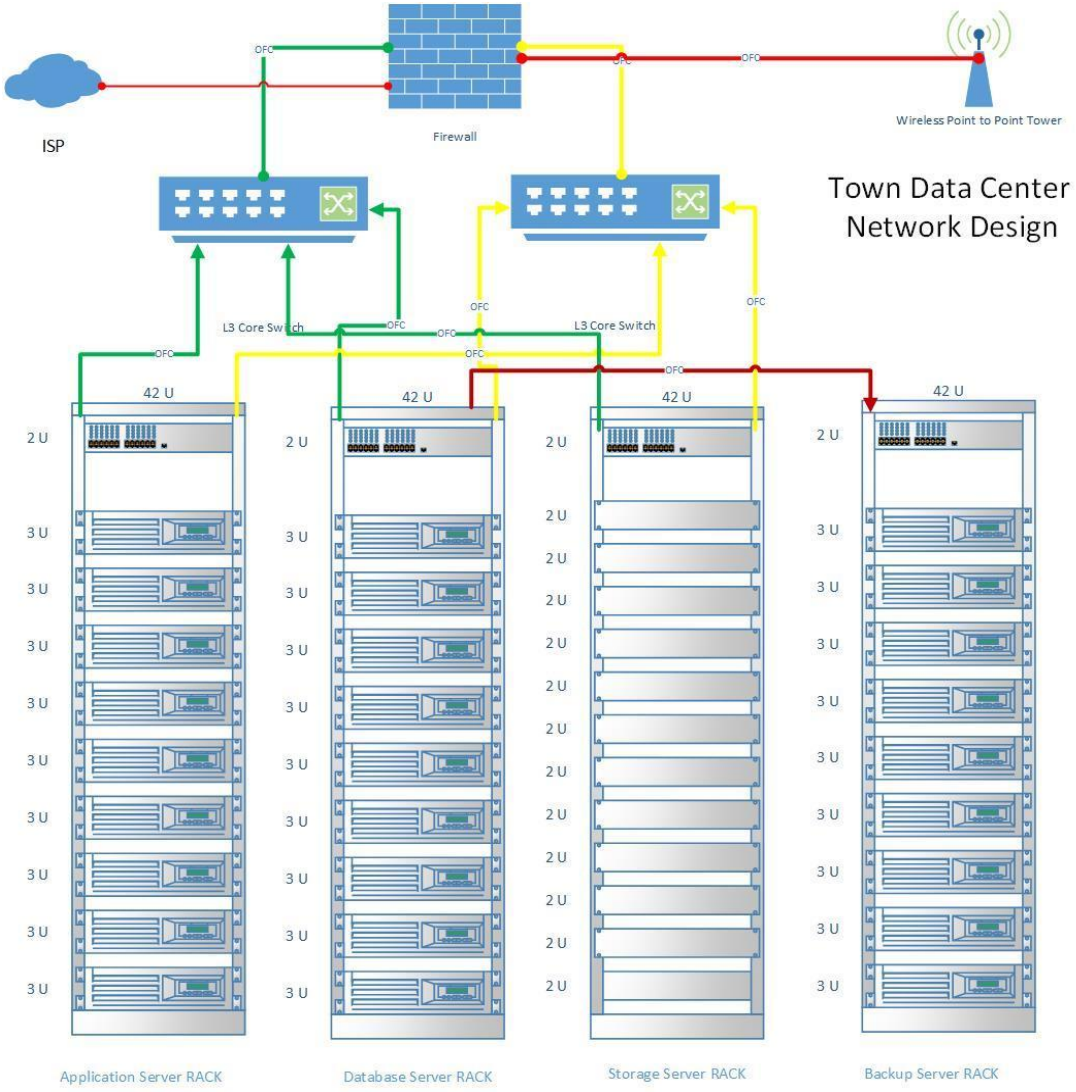

Figure 5.15: Server Room Rack Network Design

Wireless Point-to-point Connection is a second connection or redundancy whenever fibre connection is a failure then this wireless connection is established or active. And some location is far distant and fibre optical is not possible then and then the wireless point-to-point connection is established. The wireless radio range is up to 100 kilometres and also the speed is up to 2 Gbps throughput capable radios are available in the market.

Core layer connected to Firewall with 40Gbps x 2 = 80Gbps Optical Fibre cable, Inbound and outbound Core Layer Connected to Distribution Layer switches 40Gbps x 2 = 80Gbps Optical Fibre cable, Distribution Layer connects to Access Layers 40Gbps x 2 = 80Gbps Optical Fibre cable and Access layer to server connection 10Gbps x 2 = 20Gbps Optical Fibre cable. And also access layer to end user connection 1Gbps Optical fibre to Copper or Wireless connection.

Virtual LAN

A VLAN (virtual LAN) is a sub-network that can group collections of devices on separate physical local area networks (LANs). A LAN is a group of computers and devices that share a communications line or wireless link to a server within the same geographical area. Within the address space, certain networks are reserved for private networks. Packets from these networks are not routed across the public internet. This provides a way for private networks to use internal IP addresses without interfering with other networks. The private networks are

Class A Private IP Address 10.0.0.1, Subnet mask 255.255.0, First 10 are fix in our network and second 1 to 254 represents Zone defined by data centre expert, the third one in 1 to 254 represents Unit and the last one is a host using by the user at that place as per requirement. VLAN is a defined combination of zone name and unites name and each unit is different from VLAN.

10 (FIX)	1 (East Zone)	1 (Unit Name)	1 (User)	VLAN (1 1 to 254)
10	1	2	1	12
10	1	3	1	13
10	1	4	1	14

Table 5.17: VLAN Distribution Table

I have to configure Cisco Layer switch for the Data Center core configuration for the Internet Protocol vised Virtual LAN. This is a distribution for each Unites are separate IP Pool for Secure Local Connection to the data center.

---------- Show clock ----------

*20:02:24.904 UTC Sun Oct 17, 2021

---------- Show version ----------

Cisco IOS Software, IOS-XE Software, Catalyst 4500 L3 Switch Software (cat4500e-UNIVERSALK9-M), Version 03.07.01.E RELEASE SOFTWARE (fc3)

Technical Support: http://www.cisco.com/techsupport

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Compiled Tue 28-Apr-15 12:27 by prod_rel_team

License Information for 'WS-C4500X-16'

License Level: ipbase Type: Permanent

Next reboot license Level: ipbase

cisco WS-C4500X-16 (MPC8572) processor (revision 9) with 4194304K bytes of physical memory.

Processor board ID JAE191802QQ

MPC8572 CPU at 1.5GHz, Cisco Catalyst 4500X

Last reset from Power Up

20 Virtual Ethernet interfaces

24 Ten Gigabit Ethernet interfaces

511K bytes of the non-volatile configuration memory.

Configuration register is 0x2101

---------- show running-config ----------

Building configuration...

Current configuration: 13048 bytes

Last configuration change at 20:02:04 UTC Sun Oct 17 2021 by director

Current Firmware Version 15.2

service compress-configuration

service sequence-numbers

service unsupported-transceiver

hostname TOWN_DC_VLAN_L3_01

boot-start-marker

boot system flash bootflash:cat4500e-universalk9.SPA.03.07.01.E.152-3.E1.bin

boot-end-marker

enable secret password 5 <removed>

enable password <removed>

username admin privilege 15 secret 5 <removed>

username TDC privilege 15 password 0 <removed>

username it help privilege 15 password 0 <removed>
no aaa new-model
ip vrf Liin-vrf
ip dhcp excluded-address 10.57.0.41 10.57.0.252
ip dhcp pool Staff
 network 10.254.0.0 255.255.0.0
 default-router 10.254.254.254
 dns-server 8.8.8.8
 vtp mode transparent
power redundancy-mode redundant
spanning-tree mode pvst
spanning-tree extend system-id
spanning-tree vlan 1 priority 24576
vlan internal allocation policy ascending
vlan 2, name (Name of unit)
vlan 3, name (Name of unit)
vlan 4, name (Name of unit)
vlan 5, name (Name of unit)
interface FastEthernet1
 vrf forwarding mgmtVrf
 no ip address
 speed auto
 duplex auto
interface TenGigabitEthernet1/1
 switchport mode trunk
interface TenGigabitEthernet1/2
 switchport mode Access
interface TenGigabitEthernet1/3
 switchport mode Access
interface TenGigabitEthernet1/4
 switchport mode Access
interface TenGigabitEthernet1/5
 switchport mode Access
interface Vlan1, ip address 10.1.1.254 255.255.255.0

interface Vlan2, ip address 10.1.1.254 255.255.255.0

interface Vlan3, ip address 10.1.1.254 255.255.255.0

interface Vlan4, ip address 10.1.1.254 255.255.255.0

interface Vlan5, ip address 10.1.1.254 255.255.255.0

ip default-gateway 10.0.0.254

ip forward-protocol nd

ip http server

ip http authentication local

no ip http secure-server

ip route 0.0.0.0 0.0.0.0 10.0.0.254

access-list 101 permit ip 10.1.1.254 0.0.0.255 10.1.1.254 0.0.0.255

access-list 101 permit ip 10.1.2.254 0.0.0.255 10.1.2.254 0.0.0.255

access-list 101 permit ip 10.1.3.254 0.0.0.255 10.1.3.254 0.0.0.255

access-list 101 permit ip 10.1.4.254 0.0.0.255 10.1.4.254 0.0.0.255

access-list 106 deny ip 10.0.0.254 0.0.0.255 10.0.0.254 0.0.0.255

snmp-server community <removed> RW

snmp-server community <removed> RO

snmp-server location Town Data Centre

snmp-server contact IT Admin

snmp-server enable traps snmp authentication linkdown linkup coldstart warmstart

snmp-server enable traps transceiver all

snmp-server enable traps tty

snmp-server enable traps cpu threshold

snmp-server enable traps auth-framework sec-violation

snmp-server enable traps fru-ctrl

snmp-server enable traps entity

snmp-server enable traps flash insertion removal

snmp-server enable traps power-ethernet police

snmp-server enable traps rep

snmp-server enable traps vtp

snmp-server enable traps vlancreate

snmp-server enable traps vlandelete

snmp-server enable traps envmon fan shutdown supply temperature status

snmp-server enable traps port-security

```
snmp-server enable traps energywise
snmp-server enable traps ipsla
snmp-server enable traps config-copy
snmp-server enable traps config
snmp-server enable traps config-ctid
snmp-server enable traps bridge newroot topologychange
snmp-server enable traps stpx inconsistency root-inconsistency loop-inconsistency
snmp-server enable traps syslog
snmp-server enable traps errdisable
snmp-server enable traps vlan-membership
snmp-server enable traps mac-notification change move threshold
line con 0
 password <removed>
 login
 stopbits 1
line vty 0 4
 password <removed>
 login local
line vty 5 15
 password <removed>
 login local
end
```

The entire data centre is accessible Class B IP address 172.16.0.0 subnet mask 172.31.255.0 this IP is used for internal IT Equipment and troubleshooting or maintenance purposes of the data centre. This local area is connected to Optical fibre cable and Wireless Point to Point Connection to using distribution point Ring Topology and Access Point is Star Topology. Also, Cloud Based connections are available.

5.14 Town Data Centre Security Design

Physical: Systems such as secure check-in, multi-factor authentication through mantraps, key card access, retinal scanners, and more are in place to limit access to authorized personnel only. Two-factor authentication adds another layer of physical security. Using a key card in addition to biometric access requires each user to match the card to their fingerprint or retinal recognition. Adding a code to the mix would be

another example of layered security. Once inside the physical data centre room, additional security should be available. Examples may include video surveillance of each rack row and combo locks on each cage.

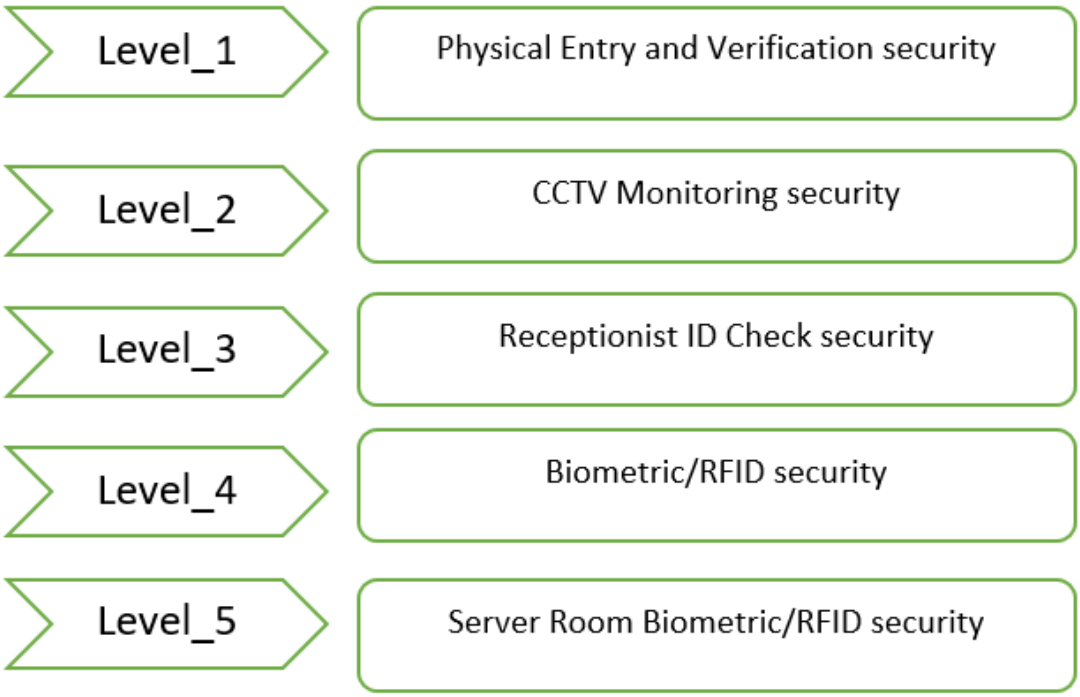

Figure 5.16: Security Level

Logical: Data encryption, SSL certificates, firewalls and also virtual firewalls (for VMs), Protected and tested data backup and disaster recovery procedures, Reliable and complete data destruction procedures (old hard drives, contract terminations). Including user identification and password access, authenticating, access rights, and authority levels.

Layered Data Centre Security: Layered Security Zones. Systems and processes are deployed to allow only authorized personnel in certain areas of the data centre. Examples include key card access, alarm systems, mantraps, secure doors, and staffed checkpoints.

Security threats are a real challenging tack in its security whether physical or Logical based. Both aspects need to be in the form of access control to the room itself and server cabinets and in terms of IT firewalls and software protection.

5.15 Town Data Centre Software and Certificate

License Requirements

Data Centres currently need another service provider (OSP) License from the government. OSP needs to mandatorily register for every data centre at every location,

even if the data centre is a part of the same single network or offering. OSP are required to provide the call data records of all the specified calls handled by the system at a specified periodicity, as and when required by the security agencies. The term security agencies have not been defined, leaving it open to interpretation, which impedes a data centre operation.

Department of Telecommunication-DOT and the local term cell granting the registration, reserve the right to modify at any time the terms and conditions of the registration if, in its opinion, it is necessary or expedient to do so in the public interest or the interest of the security of the state or for the proper conduct of the telegraphs.

Data centres also need access to broadband through ISP to link up data centre interests or to the outside world. Currently, there appears to be a lack of clarity on the data centre being able to receive broadband connectivity without an ISP license or some other telecom license apart from the OSP Registration.

Compliance Certificates

Every organization may have different standards and attest to their compliance differently. But GLIA Metoda industrial areas are production units in different categories so we are only basic security standards are required. The International Organization for Standardization is an international standard-setting body composed of representatives from various national standards organizations. Founded on 23 February 1947, the organization develops and publishes worldwide technical, industrial, and commercial standards. It is headquartered in Geneva, Switzerland, and works in 165 countries. ISO certification is proof from a third party that complies with an ISO management standard.

Sr. No	ISO Name	Fees	Details
1	ISO 27001:2013	5000	Describes a best practice of a company involves in the information security management system (ISMS).
2	ISO 9001:2015	2000	Ensure company product & services meets customer expectations and enhance customer satisfaction.
3	ISO 14001:2015	3500	Maps out a framework that an organization can follow to set up an effective environmental management system.
4	ISO 20000:2018	7000	Allows demonstrating excellence and proving best practices in IT & improvement in the delivery of IT services.
5	ISO 50001:2018	11000	describes best energy management practices which outline using energy efficiently helps organizations

			save money as well as helping to conserve resources and tackle climate change.

Table 5.18: ISO Detailed

Architectures for software-defined data centres can address the need for flexibility and agility, but by implementing them Local data centre provide facilities via cable or traditional server room type then no need for expansive software require. But some basic software requirements like server operating systems, Virtualization, etc.

With the virtualization features available in the free hypervisor versions, Hyper-V provides more functionality than ESXi. VMware offers various paid versions of ESXi, but also provides a free version available for anyone to use. ESXi is a world-leading bare-metal hypervisor created and provided by VMware. A hypervisor is an operating system that lets run many servers, known as virtual machines, on one physical server. We use the term bare-metal because ESXi is installed directly onto physical hardware, rather than an application on top of an existing operating system.

Details	**Free vSphere Hypervisor**	**Paid vSphere Hypervisor**
Expiration	No time limits on the free version	Not applicable
Evaluation time	Sixty day trial of Enterprise Plus features	Not applicable
Community Support	VMTN Forums	VMTN Forums
Maximum physical CPUs	2	768 (logical)
Maximum physical memory	16TB	16TB
Maximum vCPUs per VM	8 vCPUs	256 vCPUs
Maximum vRAM per VM	6TB	6TB
Official Support	No	Various SLAs available
Central Management (vCentre)	No	Supported
High Availability (HA)	No	Supported
Storage/Backup API usage (VADP)	No	Yes
Live migration of VMs (vMotion)	No	Supported
Load balancing of VMs (DRS)	No	Supported
Cost	Free	$1,323
Maximum of Cores	2 processors with a maximum of 8 cores/processor	16
OSE Management Licenses	No OSE Management licenses required	2 OSE Management licenses

Table 5.19: VMWare Technical Detail

5.16 Town Data Centre Technology Architect

The Tire/Rated-I Data Centre Architect

Data centre tiers are a standardized ranking system that indicates the reliability of data centre infrastructure. This classification ranks facilities from 1 to 4, with 1 being the worst and 4 the best-performing level. A data centre receives this international ranking from the Uptime Institute, an independent organization that determines the facility level primarily based on: Uptime guarantees, Fault tolerance (the ability to handle both planned and unplanned disruptions), and Service cost. Multi-users are connected to the data centre is reliable for tier 1 data centre and nationally multiuser are connected so require tier 2 architect and multi-users are connected to internationally then and then used tier 3 or 4 architects.

This unbiased tier system gives an objective understanding of how a specific data centre operates. However, having a rating is optional, so not all data centres have an assigned tier. Most major facilities choose to request an evaluation from the Uptime Institute, though, as an official rating helps: Build service credibility, Market the facility's capabilities, Build trust and attract potential clients, and Plan for future upgrades and facility expansions.

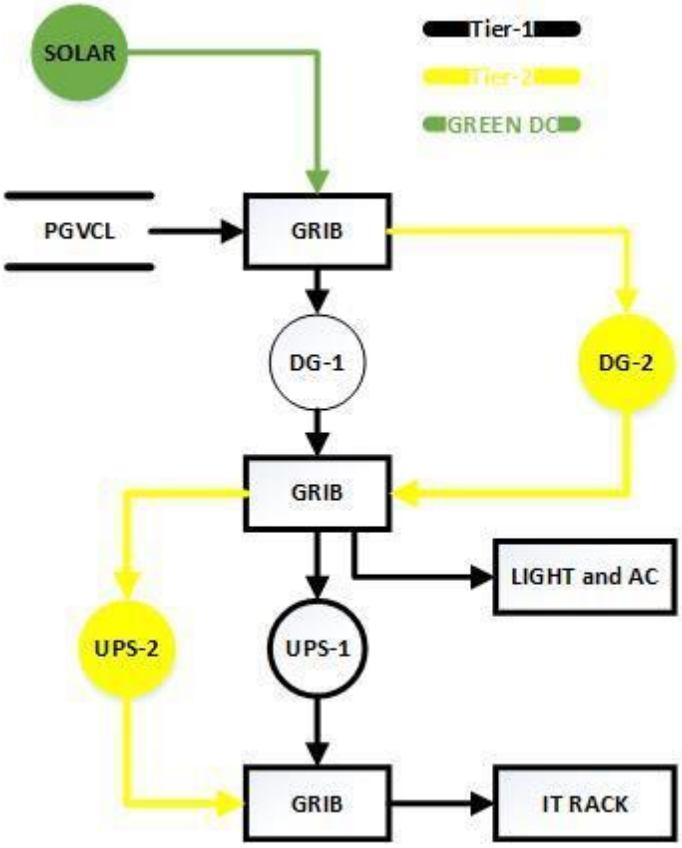

Figure 5.17: TIER/Rated-1 Design of Data Centre

Data centre staff needs to send site plans and blueprints (Tier Certification of Design Documents) to the Uptime Institute to get an official rating. Representatives from the Uptime Institute then visit the centre on-site to inspect operations and assign a rating. The Uptime Institute keeps the exact method of assigning tiers secret, but most key metrics are a matter of public knowledge. The Institute considers the following factors when rating a facility:

Service Availability and Uptime Guarantees.

Redundancy levels (the process of duplicating critical components and keeping them as backups and fail-safes in case of planned or unplanned disruptions).The state of cooling and power infrastructure. Staff expertise and maintenance protocols (particularly the ability to handle concurrent maintainability). Service cost. Operational sustainability and the centre's ability to meet long-term business goals. The time a facility requires to set up a new client. Data centre security levels. Carrier neutrality.

The tier rating system does not require the use of any specific technologies or design choices. The freedom to choose between solutions grants flexibility when meeting tier goals, so every data centre can choose the best way to meet the standards and reach the desired rating.

Indian government wants India to become a global data centre hub by making data centre parks in India. Today, India’s data centre footprint is assessed at 11 million square feet. It is probably going to develop to 30 million square feet by 2030 and could maybe cross 100 million by 2060 containing 5,000 edge data centres the nation over. Multi-tenant, open access, carrier-neutral, diversely-connected Data Parks, augmented with the neutrality and optionality offered by the world leaders.

While reliability goes up with higher levels, tier 4 is not always a better option than a data centre with a lower rating. Each tier fits different business needs, so tiers 3 or 4 (the most expensive options) are often an over-investment.

Typically, the two primary considerations when choosing a tier are cost and uptime. Paying for a level 3 data centre when a cheaper facility would do the job is a waste of money. Likewise, setting up at a tier 2 facility when you require higher uptime can impact your revenue, productivity, customer satisfaction, and reputation.

Active. In an active configuration, the redundant component is operated simultaneously with the original component. However, in case of the original fails, the redundant component will be used. Passive. In a passive configuration, the redundant component

is available yet not operational while the original component is active. It will be activated to provide functionality in the event of a failure.

Load sharing (standby). This full fill the availability gap until the original or active component is completely available. Additionally, load sharing can be used here as a partial or a temporary redundancy method to provide additional capacity.

The Town Data Centre design and architect for GLIA Metoda business, services, and IT infrastructure. The GLIA Metoda has the using the ERP and SAP; followed by the service layer which includes the mail services, print services, and RDBMS services. The last layer is the IT infrastructure which has servers, storage, networking, power, and cooling equipment.

The town data centre providing the facilities needs to consider these options to enhance the IT power infrastructure PGVCL, Generators, and UPS Redundant Supply to provide uninterrupted Power supply to the data centre 24 hrs. Also Used Solar energy to green power supply for the environment. Adaptive architecture designs are flexible and scalability without having incremental losses under legacy power systems. The systems should be reliable and available 99.999% of the time.

Town Data Centre

I propose the town data centre it's a hybrid data centre the back side server room or data centre is also public like a cloud, or edge data centre but user connection is hybrid mode ones a local LAN or optical fibre cable or wireless connection and the second one is also internet through its means if the user needs cloud environment so it's available and if user need server room or on-premises data centre environment so also available the town data centre provides services to user requirement.

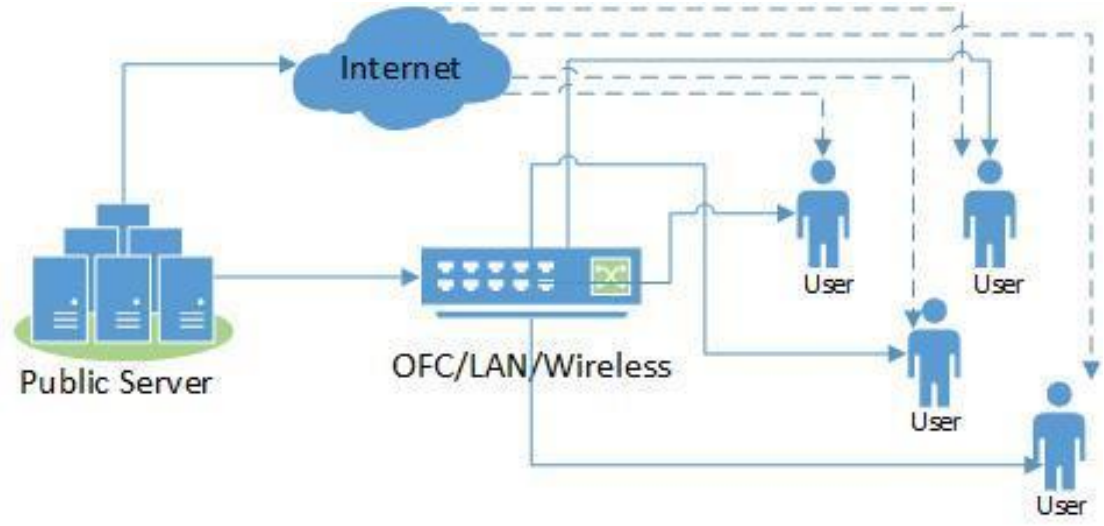

Figure 5.18: Town Data Centre

Improving the total cost of ownership is critical. CAPEX entails what equipment will install in the data centre, leaving room for flexibility if future power needs scale-up; while OPEX is directly linked to the operational efficiency of the data centre.

Architectures risk is always a risk in any large-scale IT initiative, especially one that involves switching out hardware and networking equipment while implementing, migrating, or upgrading mission-critical applications. Combinations of equipment and software to optimize the value of a configuration for a customer. Performance risk is the risk that they won't perform as promised. Cloud Data Centre increases Internet data usage. Local Data centre are decreased internet usage. Local Data Centre decrease, DoS, Ransomware, Malware attacks.

Expectations of data centres are focused on the five 'pillars' of availability, cost-effectiveness, flexibility, manageability, and security. In turn, these pillars let us make a data centre checklist of best practices for the DC infrastructure. Data centres have to stay up and running. Outages can be expensive in both financial and reputational terms. Data centres need to be organized to prevent such problems or at least to detect them at the earliest possible requirements;

The data centre building is also centre of excellence, Core Power Supply is PGVCL and the secondary is Solar panel, and also Power Generators and UPS provide the uninterested power supply. GLIA Metoda Users requirement does not require redundant servers and storage with failover provisions at hardware and software levels but we deploy backup servers at units on premises. Single as per requirement speed network links entering. Sufficient air conditioning for all of the equipment being operated in the data centre. Smoke, fire, humidity, and flood detection, including underneath data centre raised floors

Cost-Effectiveness

Data centre and colocation service providers need to be profitable. Customers expect cost savings. Data centre operations, therefore, need to be high-quality, yet also be efficient and avoid unnecessarily high levels of expenditure. Tiered data storage according to needs for everyday, occasional, or archival use. Virtualization to maximize physical server productivity via virtual machines (VMs)

Manually of systems administration routines. Power and cooling analysis to prevent excessively hot or cold spots from forming. Ergonomic shipping and installation facilities, including weather-proof receiving docks. Proximity to access routes and fuel storage, while avoiding hazards like airports and oil refineries

As GLIA METODA no competition increases among data centre colocation providers, so not require more value-added services and facilities. The Centre of Excellence in These might include conference rooms, offices, and access to office equipment. The basic elements of town data centre requirements are there like power, space, network, and remote hands.

Size, shape, and geological quality of the land and building, Availability of sufficient and extendable power supply, Availability of good communication network, Local prices for electricity, water, and network access, Availability of sufficient space for future extensions of the data centre, Possibilities for use of free-cooling and/or reuse of hot water, Proximity of R&D environment, Easy access for deliveries and visitors, Limitations due to local building, fire and security codes, Limitations due to the protection of local fauna, flora, water, etc.

One-time active and passive Installation charges for the end user

Sr. No	IT Equipment's	Make and Model	QTY	Unit	Unit Price	Amount	Power Watt
1	TP Link P to P Air Radio	CPE520 5GHz 300Mbps 16dBi Outdoor CPE, 20km	2	nos	7999	15998	14
2	TP Link P to P Air Radio	CPE210 2.4GHz 300Mbps 9dBi Outdoor CPE 5km	2	nos	3899	7798	10.5
3	TP Link P to P Air Radio	CPE710 5GHz AC 867Mbps 23dBi Outdoor CPE 15 km	2	nos	6999	13998	8
4	Ubiquity LBE M5 23	30km, 100mbps	2	nos	5999	11998	4
5	TP Link P to P Air Radio	CPE510, 15km, 300mbps	2	nos	2965	5930	10.5
6	Ubiquity AF-5U	1+Gbps, 100+km, 5G	2	nos	101767	203534	40
7	2 core fibre optic cable	2Core OFC Armed	1	meter	6	6	0
8	4 core fibre optic cable	4 core OFC Armed	1	meter	8	8	0
9	6 core fibre optic cable	6 core OFC Armed	1	meter	10	10	0
10	12 core fibre optic cable	12 core OFC Armed	1	meter	28	28	0
11	24 core fibre optic cable	24 core OFC Armed	1	meter	32	32	0

12	48 core fibre optic cable	48 core OFC Armed	1	meter	51	51	0
13	24 core fibre LIU	Rack mount	1	nos	4500	4500	0
14	48 core fibre LIU	Rack mount	1	nos	9500	9500	0
15	Missnelious Charges	As per actual	1	nos	500	500	0
16	Labour Charges	As per actual	1	nos	500	500	0

Table 5.20: End User Installation IT Equipment Active Passive Cost

5.17 Cost and Revenue of Town Data Centre

The data centre design and architecture are the solution for the deployment of the data centre but data centre deployment is costly and time-consuming. Today cloud world is famous in the data centre but this is a third-party services provider. Data centre deployment requires much more money and proper business planning is given a reward as per calculation. In this table are calculating how to earn money in the town data centre.

Sr. No	Table	Yearly Cost	One Time Cost
1	Technical and admin Employee	3192000	0
2	Internet Leased Line and PRIL Facility	258000	0
3	Office Furniture	0	178118
4	Yearly Budget	30250000	0
5	Server cost	0	257233880
6	Data Centre 600 KVA Power Supply Setup Cost	1096102	6730000
7	Space for Data Centre	0	9750000
8	Software	0	0
9	IT Infra Office Equipment's Setup	0	1035230
10	Data Center Air Cooling cost	0	960938
11	IT Infra Office Cabling and Floor charges	0	463600
12	Data Center 40 Rack Setup Cost	0	21994370
	TOTAL	34796102	298346136

Table 5.21: Forty Rack Data Center Cost

Total forty rack town data centre design require 30 crore budget and every maintenance are three crore. The minimum server rental charges for full load town data centre generate income every year approx. 4.6 crore in seven years planning 32.2 crores are generate income. And another maintenance is as per actual but other services are generated maintenance cost. 40 RACK Town Data Centre Architect Estimated Cost of Data Centre Server Subscription

Sr. No	Plane	Monthly	Yearly	Users	Income Services	Income Support	Income DBS
1	Tally/Miracle/Shree/ Small ERP	3000	36000	800	28800000	28800000	28800000
2	CMS/UMS/ Mid ERP	5000	60000	100	6000000	6000000	6000000
3	SAP/HANA Large ERP	10000	120000	100	12000000	12000000	12000000
				Total Revenue	46800000	46800000	46800000

Table 5.22: Revenue Data Center Services

The data center also generates 1U dedicated space or colocation services and technical support and maintenance charges.

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