LEFDAL MINE
DATACENTER

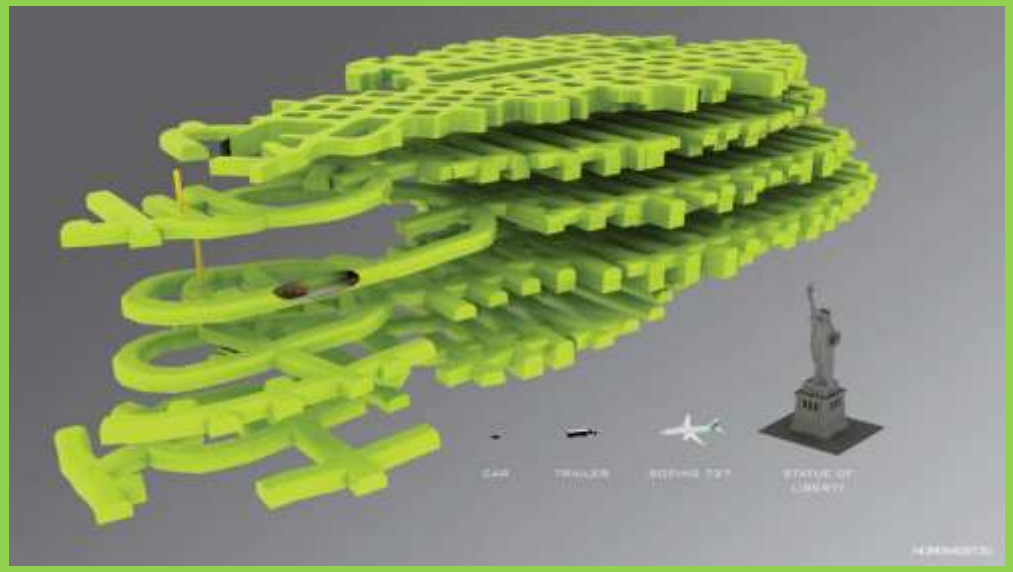
Facility Location

Lefdal Mine is located in the region Sogn og Fjordane between Måløy and Nordfjordeid. It is situated next to a deep, cold fjord with a stable and ample supply of price leading CO2-neutral energy (hydroelectric). It has excellent links to the local road network, shipping port, communication and fiber networks, two local airports and a helipad on site.

Facility Topology

- **The mine today consists of six levels divided into 75 chambers with a potential white space area of 120.000 m².**
- **The entry point leads to a 1300 meters long access road – "Spiral" – which is 14 meters wide and 8.5 meters high.**
- **The Spiral gives access to each floor level which has a central access road – "The Avenue".**
- **The Avenue provides direct access to vacant chambers on each floor level, these chambers are the 'Streets' and vary in depth (average 100 meters).**

Containers
Container-based solutions provides a rational production remotely, quick installation in the facility and the equipment can easily be replaced or moved.
Data halls
If the customer prefers a traditional data hall one have several options on how to design the hall. LMD has together with IBM and Rittal developed a solution based on three stories concrete buildings with three floors of whitespace. These building are constructed inside the mine and have a low construction cost. Each building will have 2-2.500 m2 of net whitespace. Customers can lease from one Base unit (Cage) to an entire building.
Shelters – Security room
The customer can also choose shelters/security rooms as housing. LMD has together with Rittal developed a special designed shelter solution for perfect fit in the streets. The shelter solution is modular, has quick delivery and can be built in two floors.
Single Location – Dual site
One can use the facility as single location – dual site, either using different streets or different levels in the mine for the two data centers.



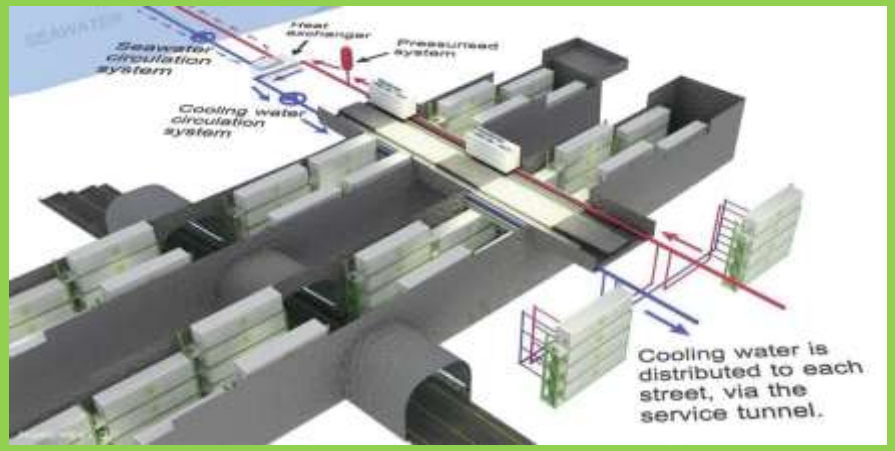
Cooling System

European leading Cooling solution
Lefdal Mine Datacenter is one of the world's most energy effective data centers. The cooling solution will lead to a PUE ranging from 1.08 to 1.15 – depending on UPS configuration and scale of capacity. Less than 3% of the power spent on IT is used for cooling with a 5 KW/rack configuration.

Seawater and freshwater circuit
The solution is based on cold seawater used as cooling source through a heat exchanger for a closed fresh water circuit that cools computers via CRAH, LCP or Zucs solutions.
The proximity to the fjord ensures access to unlimited 8 C seawater year around. The fjord is deep (565 meters) and has four glaciers connected to it. The mine is situated just below sea level so there is no need to use energy lifting the water.
The seawater will cool down the fresh water circuit from 30 C to 18 C. The prototype has been running for 10 years in the data centers of LocalHost AS – an IT consultancy and operation company within the group.

Certified by IBM/CH2M Hill
IBM/CH2M HILL concluded that the Lefdal Mine Datacenter cooling solution will enable the facility to run with an industry leading PUE under 1.1 once the design is fully developed. The cooling solution offers 20-30% improvement over current leading edge designs operational or under construction in Europe.

Technical specifications
A+B salt water pipelines from the fjord to heat exchangers – 2N redundancy
A+B fresh water pipelines from heat exchangers to each designated IT area – 2N redundancy
Containment is used to avoid mixing of cold/hot air in the data center



Power

Low power costs
The last 20 years Norway has been one of the price leading markets in Europe. Increasing production ensures low prices also for the future. In addition, the Norwegian government in 2016 reduced the consumption fee with 0,125 NOK/kWh.
Unlimited access
The national grid, connected to several hydro-power plants in the vicinity of Lefdal Mine Datacenter, provides the facility with sufficient power for any foreseeable future.
The grid loss is at an absolute minimum. The current power supply has a statistical reliability of 99.97% (last 10 years), which is consistent with Tier-III requirements. The total power production in the area is presently 12.7 TWh (100 % renewable). The planned capacity for the data center will be ramped up in steps as the project develops.
Green Power
98.5 % of total power production is Hydroelectricity. Norway produces nearly twice as much renewable energy as any other Nordic country.
Technical specifications
One hydroelectric power source – A second independent feed is planned in 2018
N+1 generators
A+B UPS power, each UPS being 1600kVA with internal N+1 redundancy. The setup delivers 2N +1 power redundancy to each rack
Bus bars from each UPS-cluster with tap off boxes to two PDUs in each IT rack (2N redundancy)
We can offer different power densities ranging from 2-50 kW per rack.

Data Connectivity

LMD is a carrier-neutral supplier of data center services providing highly secure environments for housing and connectivity of IT and network systems. As a tenant, you decide on your carrier or peering partner. The choice of connectivity providers in our data centers enables you to compare offers and reduce your costs while increasing performance. You will also benefit from a community of potential partners and customers housed in the same data center.

All suppliers can deliver multiple fiber runs of capacity from national commercial access points (NIX, BIX), and to the nearby UNINETT connection points. The suppliers have redundant paths to the local distribution point. Lefdal Mine Datacenter is a part owner in one of the infrastructures.

Our data center have two Carrier-Meet-Me-Rooms to guarantee redundancy at all times. The rooms are subject to strict regulations for access and cable management to ensure the maximum security. Standard connection for a designated IT space is 12 fiber pairs connecting customer IT space with Meet-Me Room A and 12 fiber pairs connecting customer IT space with Meet-Me room B.

Services

Client capacity can be in the form of dark fiber, wavelength and layer2 IP transport from the data center to customer chosen location. Redundant and independent fiber connections route into the site. A+B fiber network terminated in each designated container and whitespace area. Two redundant meet-me rooms are available for external and intra connection needs.

Latency

Lefdal Mine Datacenter can connect to London with 17 ms latency round trip. The same route offers great access to Ireland and US. Frankfurt and Amsterdam at 20 and 22 ms round trip. Traffic to mainland Europe will either go through UK, Sweden or Denmark.

Security

High Security
Lefdal Mine Datacenter aim to offer one of Europe's most secure data center facilities. The data center is an underground mountain hall facility with leading infrastructure. The design and documentation of the infrastructure installations are highly confidential and are not shared externally. The Uptime Institute Tier III standard, and IBM Level 3 has been used as references for the technical solution.

Security and Access Control
The facility is accessed from two single points of entry above ground. Specially trained security forces will monitor the facility and the surrounding areas 24/7/365 and are responsible for our three-stage authentication process and intelligent camera systems.
Each container, white space area and street will be provided with intrusion detection and activation of any security device shall alarm at the main panel instructing staff to investigate. The alarm will be CCTV to provide instant visual surveillance and event viewing/recording by the security staff.
Each avenue, street, container and white space area will have card access system. The system will use proximity based smart cards that will provide door status, automatic door locking and access control within restricted areas.

Fire and Smoke Detection / Control
All IT areas are provided with a fully automatic fire and smoke detection system, and every container is provided with automatic detectors to protect personnel and equipment. The fire and smoke detection system detects fire, heat and/or related smoke production at a very early stage.

Fire Suppression
The data center will have a high-pressure water mist fire suppression installation, inert gas and oxygen reduction system. The system comprises a high-pressure pump unit, stainless steel tubing and the necessary sprinkler heads in each designated area. The installation is designed to provide a maximum fire suppression performance with a minimum water usage.

RITTAL

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