

Rittal – The System.

Faster – better – everywhere.

► Efficient, green and secure data centre



 **LEFDALMINE**
DATACENTER

ENCLOSURES

POWER DISTRIBUTION

CLIMATE CONTROL

IT INFRASTRUCTURE

SOFTWARE & SERVICES

FRIEDHELM LOH GROUP



A mountain of data.

Lefdal, the data centre of the future.

The really ground-breaking projects that pave the way for the future with genuine pioneering spirit are often to be found not in the bustling world centres, but in the quieter backwaters.

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One particularly impressive example of this is the Lefdal Mine Datacenter (LMD) – one of the world's largest data centres, which is currently being built in a decommissioned mine on the west coast of Norway. The ambitious goal is to make LMD the number one in Europe with peak values in terms of cost efficiency, security, flexibility and sustainability. A five-storey tunnel system with 75 chambers provides 120,000 square metres of space for an infrastructure with a potential total capacity of 200 MW. Each level of LMD is reached via a central access road, with secondary roads providing direct links to the individual chambers. Even deep underground, the trucks can drive in two lanes. Think big? Think very big!

RITTAL AS A STRATEGIC TECHNOLOGY PARTNER.

"Lefdal will simply outshine everything that's come before it", says Rittal's Executive Vice President Andreas Keiger, responsible for European sales. Rittal has been involved in the project as a strategic technology partner for a long time. IBM compiled an initial feasibility analysis and then came with Lefdal to Rittal, asking it to develop the concept

for installing the server components – Rittal's expertise is well known and highly valued around the world. What's more, as a leading innovator, it was clear the company would take on the challenge.

THE MOST EFFICIENT SOLUTION IN THE WORLD

"This will be the most efficient solution we can achieve anywhere in the world", explains Keiger. "Lefdal uses 100 percent renewable energy and we have reached a PUE value of 1.1." It would also be difficult to improve on the Power Usage Effectiveness and environmental friendliness of the server cooling system, as Lefdal makes use of the fjord water that surrounds it. The fjord, which is 565 metres deep and is fed by four glaciers, acts as a heat exchanger. Mats Andersson, head of marketing at LMD, has a very evocative way of putting it:

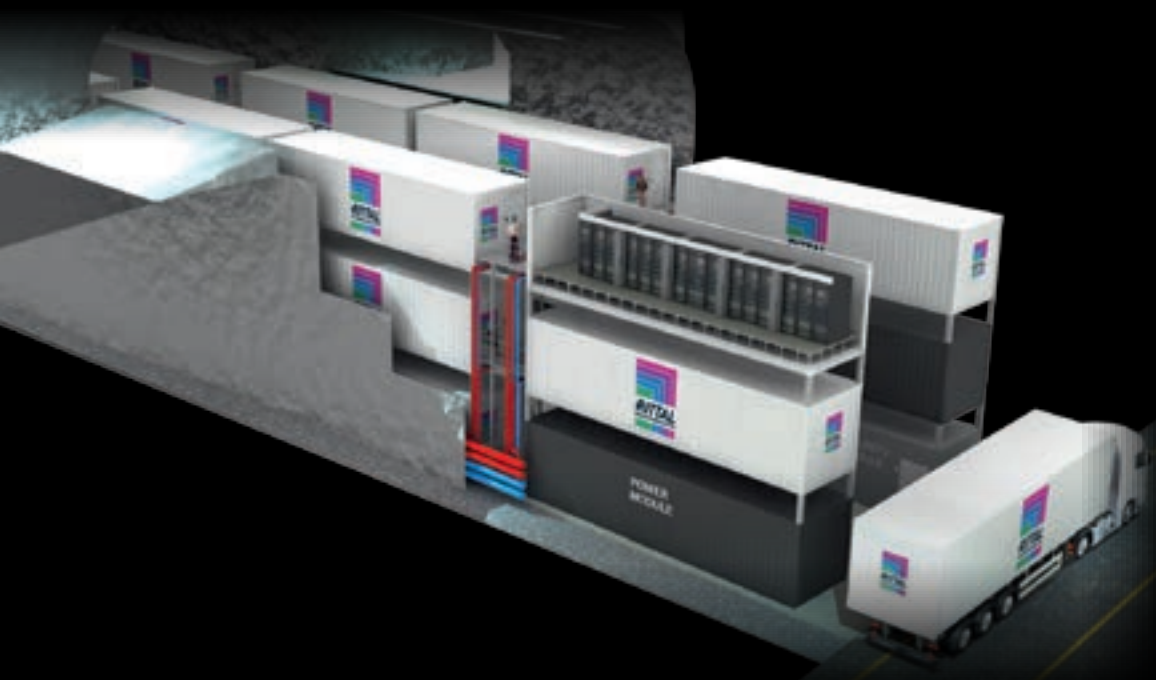
"The fjord is our fridge." Keiger adds: "The surroundings themselves provide favourable conditions and Rittal ensures maximum efficiency inside". Taking into account the Total Cost of Ownership, Lefdal Mine Datacenter is 40 percent more cost-effective than other data centres in Europe.

LARGE-SCALE, MODULAR SOLUTIONS

To ensure it can always provide the optimum solution along with flexibility and cost efficiency, LMD has opted for large-scale modular solutions. "Our customers can 'grow' or 'shrink' in line with their needs", points out Andersson. "We can add more technology based on a plug-and-play concept." To do that, LMD is using standardised data centre infrastructure modules throughout.

"The surroundings themselves provide favourable conditions and Rittal ensures maximum efficiency inside."

Andreas Keiger, Executive Vice President European Sales, Rittal



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RITTAL – A PARTNER THAT BRINGS EXPERIENCE

Rittal can put the full range of its experience to use in this large-scale project, as the scalability of the data centre is based on the modular, standardised RiMatrix S solution. Rittal developed the modules for the data centre in close cooperation with LMD and IBM. The portfolio includes five modules with ten or twelve server racks and one network rack. Customers can choose between five, ten or 20 kilowatts per rack, depending on output requirements, and redundant power distribution and back-up are already integrated in 2N redundancy. The Liquid Cooling Package climate control solution is also included. It draws in waste air from the servers, cools it via the high-performance heat exchangers linked to the cold seawater circuit at a temperature of 7°C, and returns it to the system.

A UNIQUE OFFERING FOR GROWING DEMAND

LMD's offering is truly unique in the whole of Europe and is the answer to the constantly growing demand for data centre space. "The world is changing around us quicker than ever before", says Arne Norheim, Country General Manager, IBM. He cites four trends that have had a significant influence on the

digital world: "Big Data, the Cloud as the new business model, mobile usage and social tools. The end result of these trends is that billions of gigabytes of data are generated every day." The growth is exponential. "Some 90 percent of the data that is being stored around the world has been generated over the course of the past two years", continues the IBM expert. Keiger is looking to the future: "We assume that the global data volume will double every 18 months or so." That is another reason why it will become increasingly important for companies to find a place where they can safely manage and store their sensitive data from the moment it is generated through to when it is deleted.

YOU CAN'T GET MUCH MORE SECURE

The fact that using an existing mine saves costs compared to building a data centre on a green field site is of secondary importance, but fits in well with the recurrent theme at LMD – maximum efficiency. However, there is another invaluable advantage to the underground data centre – security. There is only one entrance point to the facility, which ensures maximum access control. The rock formation also provides natural protection from electromagnetic pulses and specially trained

security staff patrol the entire installation around the clock. A three-stage authentication process and intelligent camera systems provide additional security.

Besides potentially driving the growth of whole sectors of the Norwegian economy, Lefdal Mine Datacenter could also lead the way for the whole of Europe. And Rittal has been there almost from the very start.

75 chambers with
up to three levels

100 per cent
renewable energy



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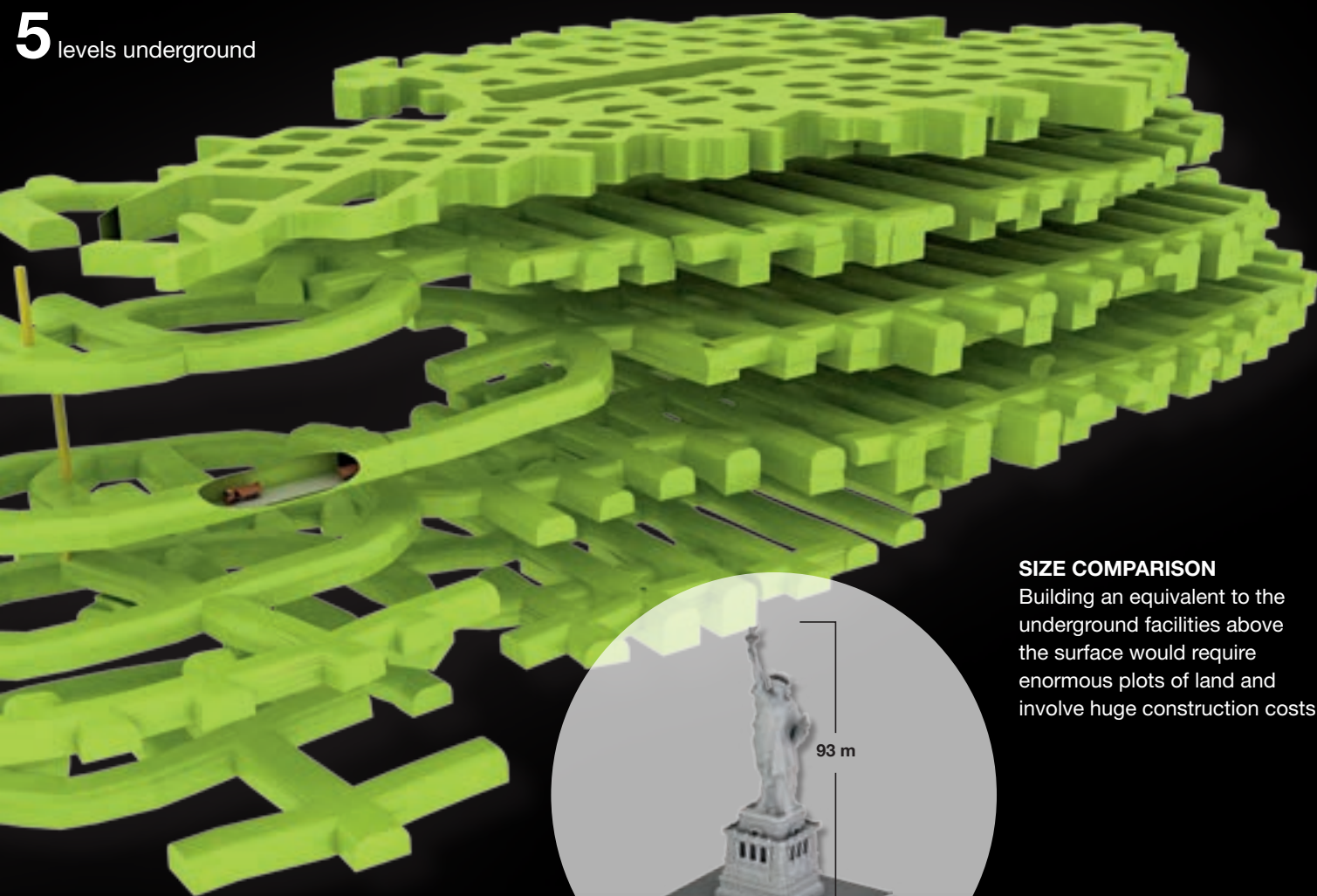
CLIMATE CONTROL

Key data at a glance:

- One of the biggest data centres in the world in a decommissioned mine on the west coast of Norway
- Peak values in terms of cost efficiency, security, flexibility and sustainability
- Flexible, modular solutions based on a plug-and-play concept
- Developed in close collaboration with Lefdal Mine Datacenter and IBM
- Customers can tailor their solution to their specific requirements

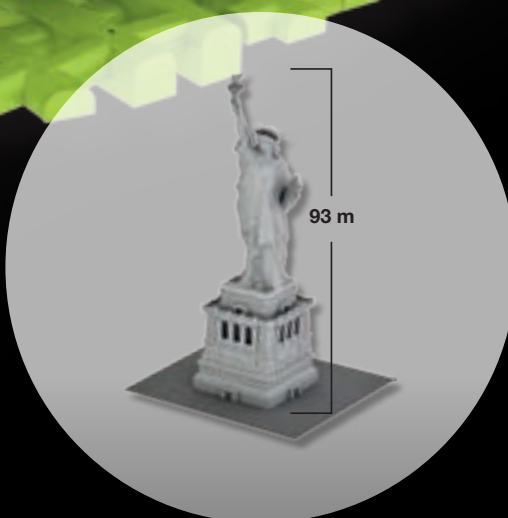
120,000 square metres

5 levels underground



SIZE COMPARISON

Building an equivalent to the underground facilities above the surface would require enormous plots of land and involve huge construction costs.



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Customised container solution: The RiMatrix Balanced Cloud Center.

Rittal offers the RiMatrix Balanced Cloud Center (BCC), which has been specially adapted to the specific opportunities and requirements of customers and the Lefdal site.

IT racks, containers, climate control technology and power supplies from Rittal, the cloud infrastructure from iNNOVO and OpenStack cloud management software let companies quickly establish a variety of cloud models. These range from an on-premises private cloud to the use of virtual private data centres with proven and safe components, including servers, storage and network systems. Companies can operate their server and storage systems in a standardised and cost-effective way with services from the cloud, provided as IT as a Service (ITaaS).

In the case of the turnkey cloud data centre in ISO or non-ISO container format, components such as racks, climate control and power supply are available as predefined modules. The server, network, and storage are all included with the delivery and are already pre-configured. In addition, the established open source OpenStack framework is used as cloud management software. The result is a standardised and completely virtualised cloud data centre, suitable for standard applications, as well as for highly demanding ones, such as high-performance computing (HPC) or big data purposes.

CLOSE COLLABORATION BETWEEN RITTAL AND iNNOVO CLOUD GMBH

RiMatrix BCC was created in close co-operation between Rittal and iNNOVO Cloud GmbH. Rittal has put its expertise in fail-safe IT infrastructure and data centre modules into the new solution. iNNOVO Cloud GmbH has many years of experience in designing and operating cloud platforms. "The new service offers customers flexibility, allowing them to choose whether to buy, lease or rent a RiMatrix BCC Container and operate it on- or off-premises. Alternatively, they can rent a flexible virtual data centre from the RiMatrix BCC container on demand and receive managed services for parts of the cloud platform", says Sebastian Ritz, CEO of iNNOVO Cloud GmbH.

OPENSTACK – A PLUS POINT

The OpenStack cloud management software used in the RiMatrix BCC consists of a variety of open-source software components. Companies can thus build and manage their own powerful cloud environment made of preconfigured standard modules. The focus is on components for "IT as a Service" (ITaaS) so that servers, storage, network and applications are run in the data centre in as standardised a

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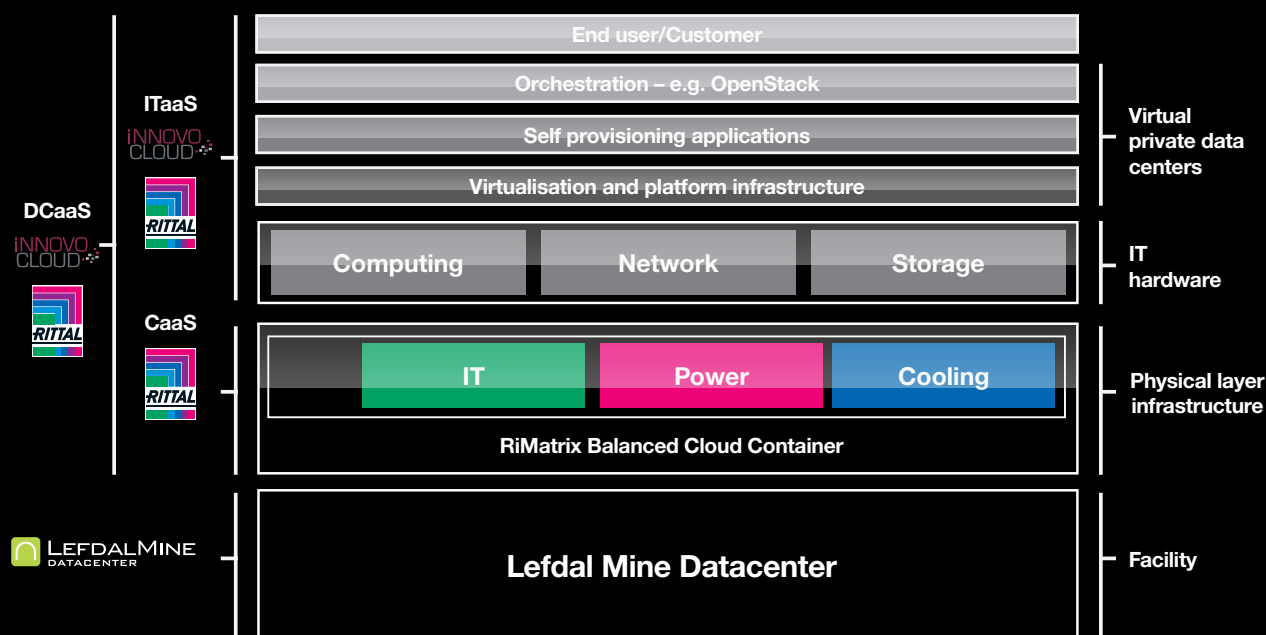
- Compatible with the infrastructure and conditions at Lefdal Mine Datacenter
- Created in close cooperation between Rittal and iNNOVO Cloud GmbH.
- Standardised and completely virtualised cloud data centre
- Maximum flexibility for customers
- OpenStack cloud management software for establishing a dedicated cloud environment
- On-premises solutions for customers or suitable for cloud delivery
- Capex and Opex models available

way as possible, thus laying the foundations for a dedicated and personalised cloud platform. OpenStack is turnkey and pre-configured in the RiMatrix BCC based on customer-specific workload requirements. There is also the option of having it run by iNNOVO.

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IT as a Service



You can find the contact details of all Rittal companies throughout the world here.



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