Study options for data center industry in Finland and Sweden

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ArctiqDC – Arctic Datacenters project aims to strengthen the regional data centre industry's products, services, solutions and offerings to customers (parties) outside the region, nationally or internationally. This should be done by demonstrating and proving that; Investing and operating data centres in Arctic regions have low and among the lowest investment and operating costs in the world in terms of cooling and power distribution

CONTENT

Arctic data centers need skilled workers. This report gives a snapshot of the education landscape in Finland, Sweden and the Interreg North area for the skills needed in successful data center development, highlights the existing possibilities and where gaps in the education remain. Data was gathered mainly in the autumn period of the 2021/2022 academic year. While broader engineering, physics, mathematics, and data education contribute to the data center, this study seeks to identify those courses that teach the specific, in-depth skills most needed to address the skills gap.

Finland

Directly on data center focused educations are available in Finland only at the level of university of applied sciences and vocational colleges. There are two bachelor of engineering degree programs available in Mikkeli (XAMK Mikkeli, 2021) and Kotka (XAMK Kotka, 2021) and one bachelor of business administration degree program available in Kajaani (KAMK, 2021). These programs provide e.g., system specialists, instructors, software designers, chief operating engineers, programmers, information system managers and cybersecurity specialists for data centers. There is also one special paid course available related to a real estate management of data center in Metropolia University of Applied Sciences in Helsinki (Metropolia, 2021). There are also five bachelor of engineering degree programs available in Kajaani, Jyväskylä, Kotka and Rovaniemi, which are related to data, artificial intelligence, machine learning, internet of things, cybersecurity, software engineering and information networks (KAMK Data, 2021) (KAMK Intelligent systems, 2021) (JAMK, 2021) (XAMK Kotka AI, 2021) (Lapland UAS, 2021). In addition, there are bachelor of engineering studies available in information technology, environmental technology and industrial management in Kokkola (Centria, 2021) and in energy and environmental technology, electrical and automation engineering and data analytics and project management in Oulu. (OAMK energy, 2021) (OAMK eng, 2021) (OAMK Data, 2021)

There has been a three-year EU-project called Green Data Center in South Kymenlaakso Vocational College (Ekami, 2021), which goal has been to create a special international degree program related to data centers. This project has ended in spring 2021 so the results are on the way. But there are already studies at vocational collage level available, which provide possible skills needed in data centers. Especially, Ekami, which locates near Google data center in Hamina, has been focused on educating workers to data centers (Ekami Hamina, 2021). There are a wide range of studies related to technology, electrical engineering, ICT, automation, and computer science available. In addition, IT- and electrical engineering studies are widely available in several vocational colleges in the area from Helsinki to Rovaniemi. (Opintopolku, 2021)

At the university level, it seems that the most relevant university education is provided in Lappeenranta (LUT), Espoo (Aalto), Vaasa and Tampere. All these universities provide studies of Master of Science in Technology related energy systems. LUT offers studies in energy conversion, nuclear engineering, and bioenergy systems (LUT energy, 2021). Aalto provides wide range of studies in automation- and information technology, innovative and sustainable energy engineering and cold climate engineering including arctic research (Aalto, 2021). University of Vaasa provides Smart Energy education program offering students the latest knowledge in ongoing energy transitions and excellent capabilities to renew the industry and create future-proof solutions for sustainable and smart energy systems (Vaasa, 2021). University of Tampere provides environmental engineering program, which promise to pursue a wide range of career opportunities in the different fields of environmental engineering and circular economy (Tampere, 2021) (circularity, 2021). In Lappeenranta, there is also a Master's Programme available in Data-Centric Engineering, which blends applied mathematics with computer science and engineering (LUT Data, 2021). In addition, there are courses available in several universities for data management, big data, AI, IoT, data servers, telecommunication, IT operational automation, remote applications, power distribution, energy conservation and efficiency, green energy and cybersecurity. However, these courses have a general scope, not focused on data center. (Opintopolku university, 2021)

University studies in computer science, automation, process, and environment engineering are also widely available in University of Oulu (Oulu, 2021). Oulu can provide a wide range of skilled workers for data centers, e.g., data scientists, computer science specialists, development and project managers, technical leads, senior design engineers, automation engineers and energy specialists. In addition to Oulu, data related university education is also available in Lappeenranta, Turku, Helsinki, Espoo and Jyväskylä. (LUT Data, 2021) (Turku, 2021) (Helsinki, 2021) (Aalto Data, 2021) (Jyväskylä, 2021)

Sweden

One data center focused education in Sweden is Teknikhögskolan in Eskilstuna that offers a Data center technician (DCO) education. It's a 2-year education on higher vocational education level, where you get the title Data center technician (DCO) and will learn about energy optimization, system monitoring, capacity planning amongst other things. (Teknikhögskolan, 2021)

Folkuniversitetet in Borlänge, a vocational college, offers a cloud- and virtualization technician education where you will learn to work with installation and service of hardware and software. This provides IT operation technicians, support technicians, IT-infrastructure specialist, network technician and datacenter developer. (Studentum, 2021)

Karlstad university offers a short master level course within load balancing for data center networks. Umeå university offers a master level course within cloud computing where the fundamentals of data centers are one part. Both these courses have admission requirements that demands credits from computing science education and some specific courses given in the two universities. (Karlstads universitet, 2021) (Umeå universitet, 2021)

Luleå University of Technology has a higher Education Diploma Programme in Computer Networking where cloud services and big data in data centers are areas that the education covers. The students also have the opportunity to take Cisco's international certification after finished studies, which is desirable on the international market. They also have Master of Science and bachelor's degrees within computer science, electrical engineering, sustainable energy system, data science, information security, applied artificial intelligence. (Luleå tekniska universitet, 2021)

KTH Royal institute of Technology has a joint master's programme in Security and Cloud Computing (SECCLO) that focus on modern computing systems, cloud computing and information security. SECCLO is an Erasmus Mundus joint master's degree between six technical universities. It offers students a broad understanding of the latest and future technologies for mobile computing systems and secure cloud. KTH also have several master's programme within data, computer science, ICT, cyber security, network engineering, energy systems and software engineering. (KTH, 2021)

Almost all the bigger universities around Sweden, for example in Umeå, Uppsala, Gothenburg and Jönköping, have Master of Science and bachelor's degrees within energy systems, data, computer science, electrical engineering and data science. These and many more universities in Sweden have relevant education and courses for the data center industry but with a more general scope.

Within the Interreg North program area

Interreg Nord is an EU program to support cross-border cooperation in order to strengthen the social and economic development. The area includes the northern parts of Norway, Sweden and Finland. (Interreg Nord, 2021).

In the northern part of Sweden, Luleå University of Technology offers good education for the datacenter industry as described above even though most of the education have a more general scope. It is the only Swedish university in the Interreg north area although Umeå university is close. No other relevant education could be found within the northern Swedish area.

In the northern Finland, University of Oulu provides good learning opportunities for the data center industry in a general scope (Oulu, 2021). There are only two universities in the Interreg North area, in Oulu and Rovaniemi. University of Rovaniemi does not provide any computer science and engineering studies.

The only pure data center focused studies in northern Finland are provided in Kajaani at the level of university of applied sciences (KAMK, 2021) (KAMK Data, 2021) (KAMK Intelligent systems, 2021). Kajaani is not officially inside the Interreg North area, but it locates so near the boundary that it can be counted in. In addition, there are three universities of applied sciences located in the Interreg area, which provide engineering studies in general scope. Lapland UAS provides engineering studies in data science, machine learning, electrotechnology, automation and information and communication technology in Rovaniemi and Kemi (Lapland UAS programmes, 2021) and Centria UAS provides engineering studies in information technology, environmental technology and industrial management in Kokkola (Centria, 2021). There is also a special bachelor of engineering program available in data analytics and project management in Oulu (OAMK Data, 2021).

There are also a wide range of vocational studies related to technology, electrical engineering, ICT, automation, and computer science available in several vocational colleges in the Interreg north area in Finland from Kokkola to Rovaniemi. (Opintopolku, 2021)

UiT – The Arctic University of Norway offers Master of Science in applied computer science, data engineering, applied physics and mathematics and energy systems. They are located in Narvik, Alta, Tromsø and Bodø. (UiT, 2021) On vocational college level, Fagskolen i Nord offers an IT operations technician education in Tromsö. The school has its own server room where the student gets to install and operate the servers and cloud-based solutions. (Fagskolen i Nord, 2021)

The only pure data center focused education in Norway is on vocational level in Fagskolen Viken – Data center infrastructure technology. The education has been designed with a collaboration between the school and the data center industry in Norway. It is situated in south of Norway, Koningsberg, but can be studied online. (Fagskolen Viken, 2021)

Conclusion

It seems that there is a lack of data center focused university education in both Finland and Sweden, but especially in the Interreg North area. Some data center focused university of applied sciences and vocational college education are available. In Interreg North area, there are only one university of applied sciences, which provides pure data center focused studies, it is located in Kajaani in Finland. In addition, there is possible to study online a special vocational degree, Data center infrastructure technology, which is provided by Fagskolen Viken, located in south of Norway, Koningsberg. However, there are related university studies (on data, energy, and computer science) in several universities and skills can be achieved. The findings point to an opportunity for universities to play a more active role in developing and nurturing the skills required.

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