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Sustainable in-building coverage with reduced carbon footprint

Bassin 7 in Århus, Denmark uses centralized coverage soluition with reduced carbon footprint

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Summary

The environmental goals of today lead to harder requirements on buildings in terms of their insulation and energy consumption. Because of these demands, most new buildings are completely sealed off from outdoor mobile signals. Successful voice and data traffic require a dedicated coverage system inside the building.

The systems most commonly used in the Nordics today are based on the principle of installing the mobile operators' equipment in each building. This leads to a waste of energy and to unnecessarily high operational costs, typically placed on the end customer. In addition, this setup makes it more difficult for the building owners to achieve the much-coveted environmental classification.

A more efficient method is to centralize the operators' equipment and use a shared system for distribution of the mobile signals. This will dramatically reduce energy consumption and running costs for both the building owners and the operators. Most importantly, it will also lead to a reduction in carbon footprint. Sweden, and the other Nordic countries should take the lead in the adoption of this technology. The solutions are generally available on the market and several successful deployments have been made in Århus, Denmark.

Calculations in this document show that reductions in CO_2 emissions of 60-70% can be achieved by adoption of this new technology.

Building owners and construction companies need to take a more active role in persuading mobile operators in the Nordics to adopt centralized solutions with shared infrastructure, in order to drive down CO_2 emissions.

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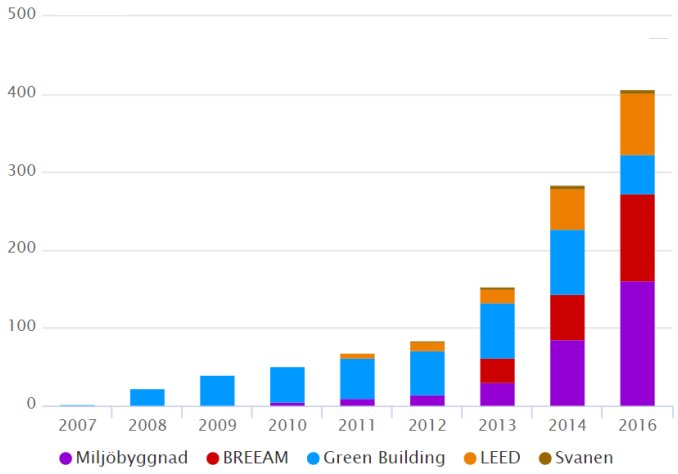
Environmental classification of buildings

The focus on environmental impact of buildings has increased in the last years. According to the European Commission, buildings are responsible for 40% of the energy consumption and 36% of the emissions of CO_2 within the EU[1]. A favorable environmental classification is key in selling or renting out a building or office space at a high value. Hence, in addition to environmental advantages, there are also financial incentives.

In the Nordics, there are a number of classification methods[2] for buildings:

- **Miljöbyggnad** - details important aspects of a building's energy use, indoor environment and construction materials used
- **Green-Building** - is aimed at corporations, building owners and property managers who want to improve energy efficiency
- **BRE Environmental Assessment Method (BREEAM)** - is a classification system from the UK, administered by BRE (Building Research Establishment)
- **LEED** - Leadership in Energy and Environmental Design evaluates buildings ambient environment, water and energy use, materials and indoor climate
- **Svanen** – assessment performed by Miljömärkning Sverige AB

The diagram below shows the rapid increase in certifications for buildings in the Stockholm area until year 2016.



Number of classified buildings in Stockholm up to 2016

An important fact is that telecom and IT equipment often is excluded both in assessments and efforts to reduce the energy and emissions, despite that fact that they are a large contributor.

In-building coverage – an ever-increasing demand

The environmental goals of today lead to harder requirements on buildings in terms of their insulation and energy consumption. As a result of these demands, metal-based materials are used both in walls and windows, due to their reflective properties. These reflective properties apply also to mobile signals and consequently, most new buildings are completely sealed off from outdoor networks. Successful voice and data traffic require a dedicated coverage system inside the building. As some 80% of the mobile traffic is generated or terminated indoors, this is a significant problem[3].

More than 80% of the traffic is generated indoors

Another factor that further adds to the need for in-building solutions is that fixed line connections have played out their role for most consumers, both for voice and data services.

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Traditional solutions are inherently inefficient

The coverage solutions most commonly used in the Nordics today are based on the principle of installing the mobile operators' equipment, or base stations, in each building. These base stations typically feed so-called passive systems consisting of coaxial cables and antennas. The base stations require their own fiber connections, power, cooling and relatively large physical space in the buildings.

In the Nordic countries we have 3-4 operators in each country, with several different technologies, typically referred to as Generations (2G, 3G and 4G) and the quantity of base stations in a building quickly becomes substantial.

This leads to a waste of energy and to unnecessarily high operational costs, typically placed on the end customer. In addition, this setup makes it more difficult for the building owners to achieve the much-coveted environmental classification.

There are huge savings to be made, for the building owners and the operators, by using a coverage solution that is more efficient, where the equipment is shared among the operators.

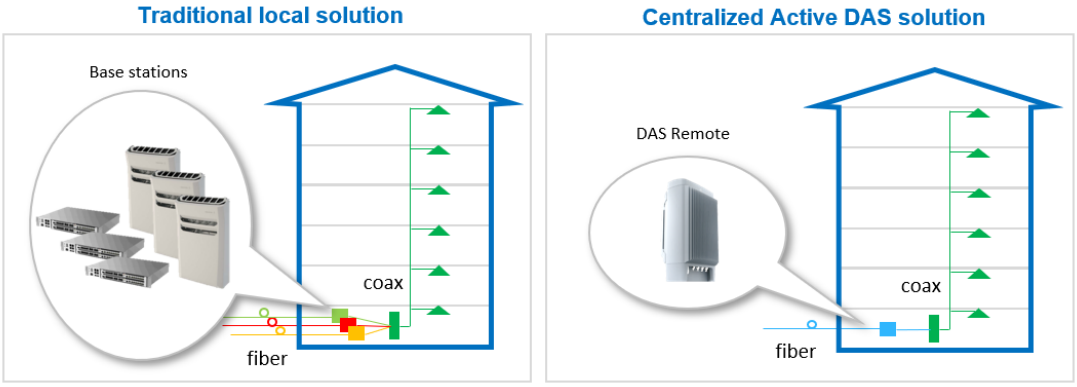
New technology can reduce emissions

A more efficient method is to centralize the operators' equipment and use a shared system for distribution of the mobile operators signals.

Shared infrastructure reduces the environmental impact

With a so called Active Distributed Antenna System (DAS), the operators' signals are fed into a common fiber system and distributed to remote units, capable of handling several operators and technologies. These remote units can then feed a passive antenna system in the building. By placing the operators' equipment at a central location, for instance a data center, a whole city can be serviced from a single location.

This will dramatically reduce energy consumption and running costs for both the building owners and the operators. Most importantly, it will also lead to a significant reduction in carbon footprint. Sweden, and the other Nordic countries should take the lead in the adoption of this technology. The solutions are generally available on the market and successful deployments have been made for instance in Århus, Denmark.



Comparison of the local and centralized coverage solution

By sharing the equipment in the buildings between the operators, dramatic reductions in cost, space, power consumption and emissions are achieved. The more buildings that share the system, the greater the financial and environmental benefits.

Another advantage with a centralized solution is that future upgrades to new technologies, like 5G, is simplified, as the upgrades typically can be done without visiting each building.

Building owners need to take an active role in the selection of mobile solutions

Customarily, property owners and construction companies have left the issue of mobile coverage to the network providers. This has more often than not led to the deployment of systems with an unnecessarily high environmental impact. To change this, property owners and construction companies need to take back the initiative and push for the use of better solutions, like the centralized DAS.

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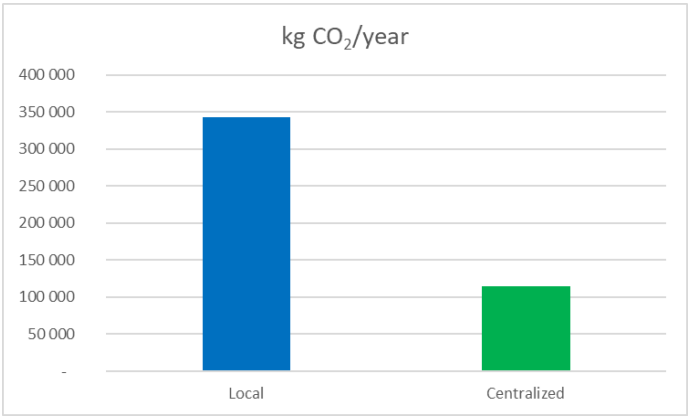
Examples of CO_2 reducing solutions

In the city of Århus, the second largest city in Denmark, KM Telecom and the communications company Stofa use a centralized solution to offer in-building coverage via their fiber network to residential buildings all over the city[4]. To date, some 20 buildings are connected and if the expansion continues at the same rate, more than 100 buildings will be connected by the end of 2020.

Frederiks Plads (left) and Pakhusene (right) in Århus covered by Stofa's City DAS

There are great financial and environmental benefits associated with the centralized model. As a rough example we can study a building of 300,000 sqm, that with a traditional local coverage solution would consume about 485,000 kWh per year. This corresponds to a CO_2 emission of 343 tons per year[5], comparable to 73 passenger cars. With a centralized solution, the emissions can be reduced by 2/3, about 230 tons per year.



A centralized solution reduces CO_2 emissions by 66%

Comparison of emissions for the Traditional solution and Centralized (ADAS)

Conclusions

The construction and property markets are governed by harder and harder environmental goals. These goals are to some extent counteracted by the use of inefficient mobile coverage solutions, often dictated by the Nordic operators. It is about time that the technical solutions available are being utilized to offer coverage in an environmentally sustainable way, while also reducing costs for all parties.

MIC Nordic is available for consultations, designs and implementations of centralized, environmentally friendly coverage solutions.

[1] https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings
[2] http://miljobarometern.stockholm.se/energi/energianvandning-och-energiproduktion/miljocertifierade-byggnader/
[3] https://www.abiresearch.com/press/abi-research-anticipates-building-mobile-data-traf/
[4] https://telecomdrive.com/denmarks-aarhus-deploys-jma-wireless-teko-c-das-solution/
[5] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

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