

Higher Standards for Building Optimization and Performance

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Commercial buildings are undergoing a metamorphosis that will make them far safer and more efficient for future generations. Highly advanced technology, newly available, will operate buildings that host thousands of people on a daily basis. By learning the habits of their occupants, buildings outfitted with a true operating system will establish and maintain much higher standards of energy optimization, comfort and safety, raising the bar across the smart buildings industry. These 'vertical cities' are integrated sites where people work, live, and play, and their goal is to meet the challenge of urban sustainability with new technology and optimized systems.

Rudin Management, a long-established, privately owned real estate company that owns 15 million square feet of commercial and residential property in Manhattan, teamed up with Selex ES on the optimization of energy consumption and management of 16 commercial buildings in

New York. Selex ES technologies have helped to define today's standards in safety and efficiency for global communities and public environments. The challenge, however, was how to take that technical intelligence and put it to work where people spend the majority of their time.

Rudin had an innovative idea: to make their commercial buildings smarter and equip customers with the necessary tools to help influence the consumption of energy in a positive way. The goal? Rudin wanted its buildings to be more technologically advanced and environmentally sustainable. ...not a small task.

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Selex ES and Rudin Management knew it would be necessary to address sustainability issues with a multidisciplinary approach, through across-the-board methods that combined technology, engineering, physics, statistics, biology and social sciences. The confluence of expertise between the two companies was further enhanced by the participation of researchers from the Center for Computational Learning Systems (CCLS) at Columbia University in New York. CCLS has extensive longtime experience in applying artificial intelligence to energy and environmental solutions through the development of algorithms and methodologies for machine learning and forecasting. Rudin had already been collaborating with Columbia and filed patent applications outlining a new, more effective Building Operating Systems (BOS).

The new OS called Di-BOSS (Digital Building Operating System Solution) is comprised of numerous innovations. First, the pooling of all systems and sensors found in vertical cities makes it possible to ensure that all complex systems managing specific functions speak the same language. Distribution of electricity and heat, management of the elevators, access control, fire control and the ICT backbone all become part of a central nervous system controlled by the Di-BOSS 'brain'. The critical interconnections between the nervous system and the brain were established by Columbia University via proprietary matrices and algorithms capable of monitoring energy.

In terms of integration, Selex ES's experience in the development and implementation of solutions aiding civil protection and satellites control, allowed them to effectively handle the integration of massive amounts of data collected from the buildings. This information is expressed in real time for those who are responsible for the buildings' operations via Di-BOSS "cockpit style" user interface.

Another innovation is the system's ability to 'learn' from the normal behaviors of a commercial building with respect to acceptable energy

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usage, comfort and safety. Knowing normal baseline behaviors allows the system to recognize anomalies or unusual behavior, flagging them for engineers so adjustments can be made to bring performance and optimization back to acceptable standards. This 'intelligent machine' predicts adverse issues which may affect occupants' comfort and safety negatively, allowing for preemptive attention and action.

Di-BOSS's ability to compare data sets of the learned behaviors of both building and occupants can reveal opportunities for energy savings. A notable example is the process that allows the 'brain' to identify the optimal time for turning on air conditioning systems, varying it in accordance with behaviors recorded in the past and the number of users present in the building at a given time, considering weather forecasts and the state of equipment on a specific day of the year. This allows for a quick reduction of energy consumption and greenhouse gas emissions. Additionally, a module is offered which allows the sharing of data directly with tenants so they can monitor their own consumption and manifest savings through behavior modifications. During the first 12 months of operation at just one of Rudin's buildings with approximately 2 million square feet, the savings totaled roughly \$929,000, mainly through delayed ramp up in the mornings and earlier shut downs in the evening.

The next developments will involve the possibility of exchanging information between the commercial buildings—and comparable infrastructure—and the local power grid, a request already made by New York's grid operator, which is aiming to achieve collaborative demand-response management of power, improved responsiveness in the event

of power failure, greater integration between renewable technologies and energy storage, and promotion of electric mobility.

The goal is to turn commercial buildings into cells of a larger, more complex and intelligent living organism, such as the city where they are located. In the near future this solution will be offered on an international scale, not only to real estate management companies, but also to airports, train stations and military bases, which will benefit from aggregate information control on multiple levels. This project is yet another initiative among others undertaken by the group in the wake of smart solutions based on the integrated management Planet Inspired Solutions, i.e. the portfolio of technological solutions designed to address the challenges of sustainability. In this array of offerings, there are technological solutions and platforms for the following areas: Earth Observation, Natural Resources, Smart Energy, Smart Mobility, Education & Health Care, and Environmental & Security Response.



Bruce Sher, SVP, is leading Selex ES's Smart Building Division in the US Market. Previously, he was VP of Weston and responsible for an energy services team and driving integrated energy management and environmental solutions. With over 25 years of executive energy management experience on both the utility and customer side, he has overseen innovative approaches in the integration of supply and demand-side management. He is also co-founder of Viridity Energy and has been involved in building other start-up smart grid ventures with substantial experience in energy control systems.