

**Moderator: Jean Rice**  
**January 15, 2020**  
**2:00 pm ET**

Coordinator: Welcome and thank you for standing by. At this time all participants will be in a listen-only mode for the duration of today's call. Today's conference is being recorded. If you have any objections, you may disconnect at this time. I would now like to turn the meeting over to Ms. Jean Rice. You may begin.

Jean Rice: Thank you. Hello and thanks to all of you for joining us today for our Broadband USA monthly Webinar series where we discuss various kinds of topics and issues related to broadband. I'm Jean Rice and I'm Senior Broadband Specialist with NTIA's Broadband USA program and I have to say I'm super delighted to moderate this Webinar on benefits of smart building technology.

Smart buildings have a role to play in smart cities and communities and looking at exponentially positive impact on tenants and surrounding communities. This panel will discuss smart buildings, use cases, the foundational technologies that support them and the benefits that can be reaped by them.

It's my pleasure to introduce the presenters today who I've worked with for the last two years on the Global Cities Team Challenge Smart Building Super Cluster which you'll be hearing more about later during this Webinar.

Our presenters are Limor Schafman, Senior Director, Smart Buildings Program for the Telecommunications Industry Association, Jiri Skopek who is the Board of Governors Vice Chair for the 2030 District Network, and Benny

Lee who is the Director of the San Mateo County's Public Wi-Fi and a Councilman in San Leandro County so he's coming with both hats.

Around the country, you know, we're seeing a great deal of smart building projects emerging. In Virginia, UVA worked with Habitat for Humanity on smart apartments for low-income residents with chronic illnesses just as their vital signs can be automatically transmitted to caregivers.

In Denver a public-private participant including Panasonic, the City of Denver and the utility there are working on a development near the airport that includes solar park smart buildings that were cooperatively developed to using a parking lot which collects solar energy and then it also connect to a vehicle, modern and new vehicles being transported into the airport from the smart building.

The City of Schenectady, New York is working with National Grid on building energy savings because they have very cold winters. In Coral Gables, Florida where it's a more southern climate, they're taking a real comprehensive approach to having a look at smart building with integrating in smart cities.

And the integration in smart cities is important because it can be done for public safety, whether that's flood control or fire, smart buildings can help with working with transportation, just a whole host of issues that we'll be bringing-up and talking about today.

Today our speakers are just going to give a real deep dive into that technology layers, the challenges that are faced, you know, and the opportunities there are for smart cities and smart buildings to work together but before we start, I'd

like to just review a few of the logistics for today's Webinar. First we'll open the Webinar for questions after the completion of the presentation.

As you hear each presenter, please use the question box on the right-hand side of the screen and submit your questions or your comments. Second, the presentation along with the transcript and audio recording of today's session will be available on the Broadband USA Web site within seven days of this Webinar under events/past events tab.

Finally please visit our Broadband USA Web site for information on our technical assistance program including useful guides, products, publications and other tools that can assist you with planning, funding and implementation your broadband or smart cities project.

Our first speaker is Limor Schafman and Limor is with TIA, Telecommunication Industry Association, and she worked with NIST and I in starting-up the Smart Buildings Group within the Global Cities Team Challenge area. She is a business and technology thought leader, a market strategist and business development evangelist, entrepreneur, international corporate attorney and public speaker.

She currently leads the Telecommunication Industry Association Smart Buildings Program which is creating a marketplace for the ITT and real property ecosystems which together are developing best practices, specifications and standards for the smart building environment.

Limor is also co-chair of the NIST Global Cities Team Challenge Smart Building Super-cluster and the Greater Washington Board of Trade connected DMV buildings and urban designs solutions group.

In addition to her work on the legal, theme park, video game and technology industry, she is the former president of the World Future Society DC chapter and cofounder of the Chair Emeritus of the local IPV 6 forum into that local chapter so please, let's welcome Limor. Limor?

Limor Schafman: Thank you so much Jean and it's a pleasure to be here with all of you, very excited to share with you what we've been doing here with the Smart Building Super-cluster overall and why smart buildings are so important to our initiative as GCTC as part of moving forward with smart cities across the globe.

Since this is a global program and to that point if you don't mind going to the next slide, Jean, why don't you introduce to us just a little bit more what the Global Cities Team's Challenge is all about?

Jean Rice: Happy to do that. Global Cities Team Challenges is a project that was started by NIST, our sister agency in the Department of Commerce, and NTIA is a partner as our other agencies like DHS and International Trade and NSF. What it does it's basically a way for people to collaborate on innovation, bringing together all sectors, industry, universities, nonprofits, state and local governments and Federal agencies.

So for example on the Smart Building Cluster, we have someone from all of those groups. On the Federal level, we also have Department of Homeland Security working very closely on public safety and resilience on smart buildings and to the smart cities community and NASA which is also working on taking a look at urban mobility of the future and then of course NTIA.

And the whole hope of Global Cities Team Challenges gets the groups working together to foster innovation in the smart cities area to help with

long-term sustainability and interoperability so that we kind of move the needle forward in the smart cities area so that more and more cities can adopt.

And in each group like this super-cluster, which is just another name for a group working on a topic area, they do blueprints which are basically things that cities can access on the Global Cities Team Challenge website and is a blueprint for how to move forward.

So there's one on what other cities and communities and all sectors have got for public Wi-Fi, public safety, transportation, smart Ag. and rural so the whole host it's a collaborative effort to work together to learn from the ground up and then let others learn from the various projects. Back to you, Limor.

Limor Schafman: Thanks, Jean, and that's great and if you don't mind moving to the next slide for just a second, what you're going to see there is some of the topics that Jean was talking about and smart buildings really plays an important role and what we're doing overall is each one of these sectors is developing a blueprint and framework as Jean has described and then what we're going to do is we're going to roll it up into one giant, aggregated blueprint and framework that we're going to propose.

Again this is for a global perspective so that all municipalities around the world can move forward to that next level of smart city capabilities. Now then the question is what does smart building do in smart cities? What role do they play? Next slide, please.

And so the first thing that we want to look at is the fact that innovation happens in smart cities. We know this because the moment you put communications infrastructure in a smart city and we can see that by the various places where fiber loops have been brought in or significant high-

speed bandwidth that immediately communities of companies come in and that's where economic development really starts to surge.

So we know that this is vitally important. Next slide, please and so when you're looking at that built environment, buildings are of course building blocks of cities, right, but usually at least to date, we've been looking at bricks and mortars like once you build it, it's concrete, that's it.

What's so exciting about what we're talking about today is that we're talking about the digitization of this environment and so once we look at a digitization, now these buildings actually become the building blocks of smart cities. Smart buildings to build smart cities. Next slide, please.

And when we do that, then we start evolving to that next level so now again traditionally city infrastructure has been very much you know, again bricks and mortar that are about as we've begun this digitization evolution within the smart city infrastructure side, next slide, then we see the communications are being put in place and we start connecting people to people.

And then next slide again, if you notice that as we've moved forward and you've already experienced this yourself, as we moved forward to that next first level of smart "city-ness", transportation was the common denominator which a lot of cities use to take those first steps, connecting people to transportation to municipal public transportation services so that we can start getting to know when is that bus arriving? When is that metroline arriving?

What's the best route that I could be taking so that was the next step? Now next step after that, next slide please, there was though still a missing piece and that was next slide, the fact that buildings, you know, were missing.

So what's really exciting now is these buildings are becoming digitized in a number of different ways and they are starting to enter the ecosystem, next slide please and what's exciting about that is then we're able to bring that human experience and innovation to everyone to the citizens at large.

Because what's so important about what's happening is that now with cities what the expectations of the public particularly because we start having these smart home abilities, we start wanting that in our overall built environment both in terms of our residential apartments but also in terms of our offices, our office buildings, our municipal buildings, our sports stadiums, our entertainment venues.

We want this capability to interact with our environment to be wherever we are. That's becoming our expectation so then the question is and this is very important for municipalities because the municipalities want to serve their citizens. They want to provide that feedback and exchange with them so it's an incredible opportunity for municipalities of all sizes.

I want to emphasize that what we're doing here with GCTC it's not just for these megacities. It's for municipal of 200 people to 43 million people or more as these megacities are growing and what we're seeing is that overall everyone is really concerned with resilience, with sustainability, with wellness, with fit well, with happy citizens, connected citizens and smart buildings with smart cities enable us to have it.

So now how do we get to that smart building, let's take a look. Next slide, please so the first thing we did at the Telecommunications Industry Association, we recognized in the marketplace that both for our ICT members as well as the real estate marketplace that people were talking about smart

buildings but they didn't really know what, not that they didn't know what they were saying.

They were all talking about different things. They all were having different references so we thought you know what? The first thing we need to do is create a definition of a smart building so this is what we have. A smart building uses an interoperable set of technology systems and infrastructure to optimize building performance and occupant experience.

And then another concept and I think that every word in here is very specifically determined and happy to answer questions later on but that's how we're conceiving of the smart building and then now the next slide, please what we've also done over the past two years of the smart building program is also define how we're looking at the building overall.

So we see the building as a service and by the way this extends to the city in terms of defining the city as a service, right, because we want to have certain infrastructure. We are here to serve the occupants, the people who visit, who live in and work in these spaces and that's the purpose of the constructed built environment and now the digitized built environment as we go forward.

So let's talk about and take a closer look of how do we get this platform to be built? Next slide, please. So, the first thing that you have is just your overall fundamental infrastructure, right, let's say for example plumbing which is the equivalent to sewage systems in the building. Next slide, please.

Then of course in order to enable this connectedness, we need communications infrastructure. That is absolutely fundamental. This is fiber, this is wireless, etcetera, going throughout all different kinds of wireless communications infrastructure. Next slide, please.



Next you have your power and your energy and particularly also because especially in the built-in building environment communications and power and energy are so interconnected and becoming increasingly so with power for Ethernet and other new technologies coming forward so all these three are considered to be foundational.

You see they're all colored the same color. Once we have those now things start to get really interesting. Next slide, please. Then you start having information management. What we mean by that is the data capture use, management, privacy policies, security policies around the data.

Then next slide, please, once you have that data, you start dealing with systems but your systems are no longer going to be siloed, not only within a building but also siloed across the departments of the municipal. Now they're going to become interoperable and they're going to be sharing that data across them in order to improve efficiencies. Next slide, please.

And then when you start developing that, then you start bringing-in autonomy and automation. That's when you start using your machine learning, your artificial intelligence in order to streamline the flow of data and the effective use of data in order to enable people to experiencing next slide, please and that experiential part is where that value prop is that results as a point of all the different platform layers that you have led up to.

So when you're looking here at this value prop, here we're talking about the building but it does expand out in your imagination, so think out what that means from a municipal perspective where now you're allowing you're in a building so occupants and the visitors to get the experience they need to be

productive to be helpful and well to be happy within their environment and expand that to your citizenry in your municipalities.

You want to make sure that you're providing them the services that they need so this is how we're thinking of the smart building within the smart city context and you can see how this supports the overall objectives of developing a smart city. So, now I'm going to turn it over to Jiri who's going to really start talking about the productivity and operations of the building and the built environment.

Jean Rice: Great, and just before we do that Limor, let me just ask a quick question. We talked about municipalities being interested in smart buildings and I know that they're interested in smart buildings for their own buildings and they're also interested in how to interface with private buildings. Tell me, what do you think a local government can do to invite the development of these smart buildings?

Limor Schafman: Sure, thank you so much for the question Jean. I think a couple of things. First, I think that municipalities and I would put this also on the Federal level, they should be looking at adopting policies and standards and procedures for having their own buildings to be smart buildings and then two, just as they've done with sustainability and lead standard, that they should be also adopting this.

And how that's been adopted within policies and municipalities, the same should be done with smart buildings standards and policies because that should happen across boards particularly because in order to truly achieve sustainability and resilience and public safety and security, smart buildings are the way to actually achieve all these sustainability goals for example that the

cities are rolling-out, smart buildings has an important role to play in that so that's how I would address that question.

Jean Rice: Great, thanks so much Limor. Our next speaker as you said is Jiri Skopek. Jiri provides advice to building owners and managers on sustainable development fields of design, asset to facility management, emergency preparedness, business continuity, smart buildings, innovative planning and business development solutions. So, he has a whole host of areas that you look at when you take a totality look at smart buildings and their role.

He is the vice chair of the Districts 2030 Network Board of Governors and of course he is a member of the Global Cities Team Challenge Smart Building Super-Cluster and he's working now on the blueprint that they'll be having out soon.

Jiri is best known for developing green globes environmental assessment tools which have been adopted and are promoted in North America by various organizations such as the Green Building Initiative, POMA in Canada and for 12 years he was also the managing director of sustainability with JLL.

As an architect and planner, he contributed to Toronto's skyline master plan as a master planner for the Book Sale Place and his experience throughout the world including Paris, Oman, Qatar and Saudi Arabia so let's welcome Jiri. Jiri?

Jiri Skopek: Thank you very much, Jean. So, very excited to be part of the global team and work on productivity and quality of life. Obviously we know how productive it is important for our economic, but we also know how the smart building could contribute to improvement of the quality of life. So, when we

actually look at the buildings, we don't sort of see them any longer as just functional space.

We also expect them now to respond to our needs or perhaps even to our wishes. So, when we wake-up in the morning and if we I don't know how many of you do have a smart house. I'm trying to put one together that you can speak to Google and you can speak to Siri and you can turn-on the lights.

You can even get your coffee made and perhaps even when you leave to get your door to lock behind you. Now you have a certain expectation and the great thing is if you could get to your work most direct and fastest route perhaps with coordinated traffic signals and then be even guided into a parking space and behold, maybe there'll be a meeting room setup for you with all the right lighting, temperature and acoustic conditions.

So, this all can happen now and in all of this we are supported by this cloud-based universe of digital assistance. Next slide, please. That who actually makes all this happen, and who pays for it too so we have a number of stakeholders in the building starting with the owners and obviously their focus is on ROI.

Then we have the organizations which lease or occupy the buildings and those are typically the corporate tenants, and they see the building as a service. Then are the people who run the buildings, the building management and they want a seamless operation and economical operation as well. And, finally, we actually have the occupants that's the sort of the bulk of the buildings really who want to have a good human experience. Next slide, please.

So let's take a look at these stakeholders one by one. Starting with the owners and investors, we know that most of the real estate is owned by large financial

institutions, and they want high value but very low risk. Now whether the public or private sector organizations, they also want to be seen as the leaders and so they often invest kind of the market buildings which do push the envelope.

So on the left you see what's now considered as the smartest building. It's the Deloitte Edge in Amsterdam, which is also a net zero building. But, we have the bulk of these other buildings whether it's commercial buildings, hospitals, malls and light industrial buildings. How do we actually make those buildings smart? That's a big question. Next slide, please.

So then we have the corporate tenants, the organization which lease the buildings, and for them, the data are becoming part of the enterprise data management strategy, and that's usually managed by the IT department, the information technology department. And, you can see all these kind of a different complicated processes, how they gather the data, how they process the data and how they use the data.

Now the new thing is that they can start using some of the building data as well and that's the domain of the OT, the operational technology and you can start combining these data so you can get the data from the building and combine them with data about absenteeism, space occupancy and so on and that will start to give you an indicator of the productivity of the whole organization.

However, there is a potential for a conflict because the IT people usually see the OT data as potential source of cybersecurity threat or potential for cyber-attack. So, there is sometimes you have this conflict between the IT and OT, and this is really unfortunate because that could actually cause roadblock for

many projects to happen, that kind of uncertainty. So, that's very important issue to address. Next slide, please.

Okay, so now we're coming to the occupants, and how they get the human experience in the building. You know, as you know, if you drive to work and there's a traffic jam and so you're getting late for work and suddenly you find out that your cellphone is discharged. So, that's kind of not very good, and you come to your meeting and it's a maze, you know, you find it very difficult to find a place and then you get there and it's cold and it's drafty. So, you probably aren't going to be very productive that day.

On the other hand, if you do come to a place which is, you know, nice and cozy, you actually have a pleasant experience getting there and everything works, then you're going to love that building. Next slide, please. So, we actually have now a means to do that.

The smart buildings can provide healthier and more comfortable environment because they control the air, temperature, lighting, the acoustic condition, as well as some of the other aspects which are listed on the last data. So, we can create this healthier environment and control that healthy environment through the smart buildings. Next slide, please.

We can also increase the productivity through providing greater convenience and time savings. So, again we can do that through space management, wayfinding, mobility option, having cooperative spaces and so on and that really enhances that human experience in the building. Next slide, please.

But, there is lots of technical attributes which are listed here on the left. And, these are becoming critical to drive the organization for activity and also contribute to the quality of life in the workplace. Now we know that these are

subject of development of the digital assistance, and they are also the best in prop tech. And, we see many startups which are involved with building these different applications which are starting to deliver some of these attributes.

Next slide, please. So, now we actually come to the building facility and management operation whose job is to make it all happen. Let us not forget that the main responsibility of the management of the building to the owners is to save money and retain occupants. So, it's not surprising that the main focus has been on energy and on energy saving and information system, for energy monitoring and measurement and so on. Because the energy is the key controllable item so the savings are very important. And, the slide on the left actually lists some of the measures which then help us to reduce the energy consumption in the building. However, the operational savings probably provide even greater opportunities for savings through full detection, equipment production and now it takes predictive cleaning and so on.

And since we can actually now monitor every piece of equipment, we can also deal with any kind of an issue through work orders. We can also record those work orders and then they give us a knowledge which equipment needs most equipment, which needs more repairs. And, then if we do a capital planning, you know, we know that that particular equipment if it's got too many repairs, that probably needs replacement.

So you know, we now can drastically reduce time and cost of operation and maintenance with some efficiency gains of about 50 to 70%. Next slide, please. So, we also know that we are increasingly experiencing extreme weather disruptions. In fact, last year was some of the worst years on record, you know, with billions of dollars in damages.

And, one way we can actually counteract that and build more resiliency in the buildings and in the building system is through microgrid. We now have more and more equipment, which actually runs on DC, the lead life run on DC, there are now motors so-called software motors which actually run on DC.

We can also integrate renewals directly into the DC grid. So, we don't have to go through the AC/DC exchange and lose all that energy through that transition. But, what's really going to drive the DC networks and DC microgrid will be the car charging.

It makes no sense to charge the car on AC and convert it to the DC. Also, you know, when you do it in prime time, you pay the extra money. So, once the electric car is going to drive up this ecosystem, obviously you're going to see more and more DC microgrids, and that will also not only reduce the energy because you now dealing with low voltage in the whole building. But, also, it will increase our resiliency and resiliency of the grid.

There are actually some buildings now which do exactly that. There is a Marriott hotel in Texas now which runs on power over Ethernet and does have complete DC network. So, you know, we really have a good solution for that. Next slide, please.

So, we do have a technology which can help us increase productivity and improve your quality of life. And, if we want to improve the operational productivity and quality of life, we need to address objectives and needs of all the stakeholders. And, we can do that through human experience and building system optimization, as well as reduction of the impact on the environment. Thank you.



Jean Rice: Thank you, Jiri. That was very helpful description of how the buildings work together, and what are the thoughts of the owners and what are their needs, as well as the tenants. And, I love that you are really paying attention, just like Limor did and I know Benny does too, in terms of the human element. I call it people-centric design, but the idea is that you try to work on things that can benefit people.

And, I'm just wondering you mentioned productivity, and I have to say that, you know, that's of big interest for those of us interested in economic development. What would you say is like the most important factor for a smart building to help in productivity?

Jiri Skopek: Well, certainly getting that air to breathe is the best way to improve the productivity. There are a number of studies, particularly by the Harvard School of Medicine, which actually shown that if you actually increase the ventilation, you can increase the productivity significantly and that has been measured. And, you can also get some savings doing that so that's a very good way.

But, you know, we are now sort of walking how do you enhance the operation of the whole age work as well, you know, how do you control the temperature, how people can respond to you know, getting the right kind of a temperature.

Sometimes, you have these kind of a conflict that half of the building is freezing and the other half of the building is too hot. So, you know, again, through control of the HVAC, through the smart building systems, you can elevate all these problems so all these kind of critical aspects which are actually at the bottom of the Maslow hierarchy of, you know, meeting people's needs can be done by smart buildings very effectively.

Jean Rice: Great, thanks. I hadn't thought about the air quality one. That's terrific. Okay, our final speaker on smart buildings today is Benny Lee. He has over 20 years of experience in the financial industry covering technology systems, architecture process design and business intelligence before he moved into local government so he has a real great background both in the public sector and the private sector.

Currently, he is the Director of the San Mateo County Public Wi-Fi program, and also he works with the San Mateo County lab, which covers civic innovation projects. And, they specialize in various smart city projects not only for this county itself but kind of regionally as well for the cities within the county.

Under his leadership, the County of San Mateo has expanded to over 90 free public Wi-Fi locations and about a million hours of online usage monthly. His other work includes federal advocacy, the NIST Global Cities Team Wireless Super-cluster, as well as the super-cluster here for smart buildings and data super-cluster. Benny has been a San Leandro City Councilman since 2012.

Like I said, he's got the two hats. He focused on fiscal sustainability, solving social challenges and is driven towards driving smart technologies, innovation and use these that ties it all together. And, of course, San Leandro, like San Mateo County, is very active in the smart cities field and implementing products and projects to assist citizens. He serves and advises multiple regional boards and organizations so let me turn it over to you, Benny.

Benny Lee: Thank you, Jean. Now also I want to add that I've been working on the Global Cities Team Challenge for close to 3-1/2 years to the public Wi-Fi

super-clusters blueprint, which actually you can download and that will actually help you municipalities get into public Wi-Fi. Go ahead and move to the next slide.

So today's discussion, we're going to talk about six different areas. Of course, we've talked about SMC labs and helped Wi-Fi set a context. We're going to talk about how this all started in communications evolution, how it fits in with smart buildings to benefit the wireless smart buildings, the future of Wi-Fi and wireless for smart buildings and the next steps for County of San Mateo. Next slide.

So County of San Mateo is about 455 square miles. It's right nestled in-between San Francisco and Silicon Valley, San Jose. Seventy-five percent of our county is rural, right, and we have a lot of agriculture out there, and the other 25% is very urban where 90% of the population resides.

But we still have different challenges which is one of the reasons why we started the public Wi-Fi program. Started in actually in 2013, but the first site was launched in 2014. And, it was a game-changer because it was done in a rural area.

Today we actually have nearly a hundred locations with free public Wi-Fi. That's as of last month. We average over a million hours of usage per month. What does that mean? It means that if you were to line-up all the users in terms of the hours that they use, it would add-up to over 100 years of usage in one month.

So as a result, we wanted more innovations that are happening in the county. So, what we did was we started a program two years ago called the FMC labs where we were going to test-out new technologies and invite companies, ILC

companies, innovation companies to come-in and actually help us solve problems rather than just sell products.

Together we partnered with them to solve a challenge. Next slide. You know, this all started with instant communication. It started with the telegraph 170 years ago. Believe it or not, everybody had to learn a new language, and that new language was Morse code. That lasted for about 25 to 30 years until the telephone was invented and as you can see, we have a couple of handfuls of handling the phone until we got to the rotary dial phone. Next slide.

And, of course in the last 50 years we had the great invention of the cellphone, and the cellphone has also evolved quite a bit. The phone has evolved to what we call the smartphone because it's not just a phone that we use it for. We use it for many other different things. We use it for instant messaging. We use it for social networks.

We use it for a reminder to use it as a tool when we want to get information. Sometimes we talk into the phone just so that the phone responds back. You know, other devices are connecting as well so that's why we're terming at the Internet of Things wireless communications is not just about smart phones alone. It's about other devices that connect. Next slide.

But, we also need to fit-in to smart buildings, and if we take a look at the current design for a building and speaking to what Jiri talked about the smartphones, 20 years ago I dragged over 2500 foot of Cat 5 cables through my house so that I could have three drops in every single room. The interesting aspect is that cable is only capable of 100 megabits and as a result, Wi-Fi is actually a lot faster than 100 megabits nowadays.

And if you take a look at the picture on the right side, it basically shows some policy in terms of how you connect to PCs. The challenge that you have with the old network architecture is that dragging wires is very difficult to scale. You have to add more switches, and every time you add more switches, you have to add more network drops and typically when you do a building design, you tie-in all of that in the beginning.

You try to build into scale, but you realize that that scale may not fit later on. Next slide. So, this is an example of some good practices and bad practices. The good practices is that when you build-out your network where you want to build it out like that middle picture, where you have all the wires really organized and all the switches very well-organized.

And, typically that happens right in the inception. Your challenge is that, you know, sometimes you lose good resources. Resources move on and then as a result you get a little mess. This is what we call a spaghetti wiring result as a result of that. That is a big challenge to try to solve those issues becomes even harder to solve. Next slide.

The interesting aspect is that if you take a look at 90% of buildings designed today, they're still doing it as business as usual. Meaning that they're still wiring-up the buildings, connecting the wires to the computers and even the laptops which are mobile, most people still connect at the docking stations and the docking stations are connected to wires.

That's still what we consider the old way of doing it and it's not really the smart way of doing it. Next slide. So, what we want to do is we want to transform the environment and why wireless is important is because wireless is evolving. We have high-speed wireless today.

The wireless is actually as fast as most of the cables that you can get and most of the devices that you have and you can compete with the speed of the wireless. So, we know that we have tiny bandwidths through wireless. When you take a look at the wiring closet, right what you see in that middle picture above is actually an example of a typical very well-installed facility on a given floor.

Now on a given floor you will have multiple switches. It's like a 50,000 to 100,000 square foot office environment and what you will have is literally hundreds of wires that is going to be well-organized and connected to the switches. But, you change that paradigm and put in a completely wireless environment and put in wireless access points.

As a result you can actually scale-up much quicker, and the result you see is right on the bottom where that entire floor just requires one rack, one switch and the wires are just connecting directly to the wireless access point for any wireless devices that need to communicate with devices. Next slide.

You know, the whole benefit of wireless and smartphone is it's quick deployment with fewer wires drops. You can manage all from one location. You don't have to physically go and crawl under the desk and actually wire-up through the low conduit. As a result all devices can be connected, and you can move from the first floor up to seventh floor very seamlessly by lifting and shifting.

You have full control of the environment because the tools that are designed today give you that same capability. In fact, most of the wireless providers, part of designing their tools to be even more seamless with a lot more security. You could leverage other devices. Printers are not the only devices

that you could be leveraging. There are IoT devices that will improve the productivity that you need in your building.

And you can have other kind of wireless uses, wireless tracking, asset tracking, actually the detection of presence within the environment. Next slide. So, the future of Wi-Fi and wireless for smart buildings, 5G is just around the corner. The challenge with 5G right now is it requires near proximity to a wireless tower. You have to have line of sight.

That's the great thing about 5G. It's very fast but you have to be close, you have to have line of sight. The challenge also is that it doesn't penetrate walls or physical structures. So, we still have a gap within a building structure so even if you were right next to a 5G tower right next to your office, right next to your home, you're not going to be able to capitalize on that signal.

You can probably get the 4G signal, but not the 5G. So, with higher speeds requiring a need for data processing or productivity, you're at Wi-Fi 6 which has Internet market, promises connectivity of upwards of one gigabit per second and the FCC is in discussion, right, of adding the 6 gigahertz spectrum to Wi-Fi which promises connectivity speeds of upwards of 5 gigabits per second. And, we know that more wireless ILT devices are connecting directly to Wi-Fi.

You know, I think I mentioned earlier about the fact that I dragged 2500 feet of cable into my house, and now, my house is because I wanted to have the first smart home 20 years ago. Now, I have a very smart home because of that fact that all I have is wireless connectivity throughout the house and I can connect all the devices in my house. Next slide.

So, SMC labs has been chartered to analyze on smart building usage particularly looking at the wireless end, looking at building-out wireless connectivity so it's for instructions of our new office building and also possibly retrofitting existing buildings.

We're seeking to simplify the administrative experience for not just only the network administrators, but also the user experience so that we can increase and improve mobility within the building. Next slide. I want to thank everybody for this opportunity, and I look forward to any questions that you may have for myself.

Jean Rice: Thanks so much, Benny. Benny, you've really seen the Wi-Fi evolving, evolving in your own county. What do you think is the next kind of level of innovation in Wi-Fi for these smart buildings?

Benny Lee: Well, you know, it's all like the cellphones. The cellphone evolving into a smartphone. It's no longer just a phone, it's a tool. Wi-Fi is going to be the next-gen tool that every single building needs to have because it's not just about connecting all the devices, but the results of connecting the information looking at presence tracking and also leveraging that information for security uses as well as analytic uses.

Jean Rice: Great, thanks so much Benny. I'm just about to start on the questions that we all have for you. If anyone has additional questions, please type it into the question box. And, let me just go ahead and let's start-off with a question back to you Limor and let the other folks if they want to chime-in. You know, we've had a lot of discussion now about how to make things resilient, how to handle public safety, how to handle, you know, disasters and I know you've looked into that and what role do you see the smart building playing in a city's look at how it can handle resiliency?



Limor Schafman: Sure, so I think a couple of things. One again, going back to that policy question, I think is important for resilience of overall infrastructure, and as it extends in and through the buildings, to be looked at from a communications perspective, from a public safety perspective, all the fundamental infrastructures of a community and of the city.

In addition, I think the way smart buildings play a role is for example as the evolution continues to grow and the digitization of this environment and we start moving into building information models which are digitized and which will evolve into digital twins which is something that Jiri also referred to which is the virtualization of the entire built environment into an image whether it's 2D or 3D dashboard and imagery of what the environment is.

It'll allow for the municipal to really take a look and know at any given moment in time the status operational status of its infrastructure. And, then you start extending that also to the smart grid, you start extending that to overall communications and all of a sudden you can just imagine, you know, if you're looking at it almost like a video game environment, just imagine you're seeing this digitized frame and you're seeing the entire city right there in front of you and seeing how it's operating.

Incredible power in that, and I think that's how the built environment is going to evolve and how it's going to support municipalities in terms of ensuring as much as possible, the continual resilience and then, you know, getting things back up and running as certain situations occur as quickly as possible. It's going to be this overall increased digitization and as a result this digital dashboard of seeing where everything is and how it's functioning.

Jean Rice: I think you're right and really good points. I really appreciate your bringing up the digital twins. I do think that is being used very helpfully in this regard and can move forward as we go past. Okay, Jiri or Benny do you want to add anything to that?

Jiri Skopek: Well, you know, I think when you start with the actual warning, you know, when you have a sort of concept whether you have weather event like a tornado or hurricane or flooding, FEMA now has all these maps where you can actually go and you know, through and you can get this information in real time what is actually happening so that's kind of the warning effect.

The next thing many actual disasters strike is the first responders. So, you know, if you have a fire for example or, you know, you have some other emergency, the first responders can be actually warned where that particular event is or how it affects the building so as they are driving or you know, flying, whatever through the building, they actually get complete information where they need to go and so on.

So they don't lose any time and they can respond very fast or you know, they can direct evacuation of people if that's necessary. And, finally you know, you can run the buildings. If they have to be evacuated and they have to be empty for a couple of days for example, you could run them in a default mode and you can probably do it remotely provided you have that kind of a resiliency through microgrid.

And you know, you're like the emergency generators are not located in a basement like has been cased in, you know, some of the hurricane situation but they are now either on the roof or you actually have a battery recharge probably even the safe event the generator so you can run the building in default mode and keep all the people away in safety.

Jean Rice: Great, thanks. Benny? Did you want to add something?

Benny Lee: Yes, yes, absolutely, and I spoke about the next generation of Wi-Fi, leveraging the waves, right, to actually detect presence. In fact, when you think of an audit from a public safety perspective using just this one example, there's an incident in the building. There's a fire in the building.

You can actually do detection of where all your human resources are, where folks are situated in the building or in defense situation where there's a fire. You can actually when you direct firefighters to go within the building, they know where the rescues should happen, as well as where are the fires and the danger zones are and where the imminent dangers are going to extend.

So those are some of the uses that we're looking into in terms of leveraging just Wi-Fi signals to do that presence detection.

Jean Rice: Thanks Benny and I know you do a lot of work in the cybersecurity area. We'll just start with you and then I'll go on to the others but you know, we always encourage smart cities to start thinking cybersecurity immediately as they start the planning process. What are your thoughts for people looking at what kind of cybersecurity issues they have regarding smart buildings?

Benny Lee: Are you starting with me or are you starting with Limor?

Jean Rice: Yes, I'll start with you.

Benny Lee: Okay, yes, well so when you're talking about Wi-Fi, Wi-Fi is basically the signal that anybody can connect to. What you would have to do is you would

have to integrate smart management tools along with detection tools and you would also have to monitor those tools in terms of any kind of intrusion.

The great thing about the technology is spoofing is very hard, but it's still possible. It requires somebody who would have to be an absolute expert in it, but the systems themselves are designed very well from a security perspective but then there's always the gap that has to be done.

I think what we have to do is we also have to push from a legislative perspective to ensure that we're putting out new tools including IoT tools that we have to inject the cybersecurity frameworks into those designs.

That's not really happening right now in every single ILT design. Some of the ILT designs are coming-out with that from a Wi-Fi perspective. Wi-Fi is really focused-in on the security and they're always trying to include the standards on that.

Jean Rice: Okay, great, Jiri?

Jiri Skopek: Well, you know, I mentioned the cybersecurity in that IT/OT conflict, and it is very real. Obviously, you know, it does require the integration of the IT and OT and the best way to do that is right at the beginning, you know, through an integrated design process where you get all the players around the table and these issues are addressed right at the beginning.

That's obviously the best way. It is an involved process, but it is necessary because you need to build the confidence of those two teams. Right now, you know, what's typically happened and you know, we've been running a JLL buildings, banks and government buildings.

So we still kind of the use very often the separate channels because you know, that kind of a concept is very real so the operation and the building data goes through one channel, the separated Wi-Fi and, you know, the processes are going through another thing. But, really the future is the integration and so we have to devise ways how this can be done effectively.

Jean Rice: Great, Limor?

Limor Schafman: Thank you, Jean. Here at TIA, we are very focused on end-to-end security across the supply chain both from the communication supply chain perspective as well as overall. If you're looking at the built environment, we're expecting cybersecurity and advocating for cybersecurity to be embedded within every single element, all that entire chain of connectivity that's happening.

And, we think it's extraordinarily important so can't emphasize enough how much cyber needs to be protected because we're dealing with the smallest device is a wearable walking into the building and if someone has through the Wi-Fi through the public Wi-Fi one of the most significant and maybe Benny might want to talk about this, one of the most significant ways for breach to happen.

We need to make sure that our public Wi-Fi is secure so that when someone is walking in, things are not being tracked and all of a sudden the entire infrastructure is being hacked, i.e., what happened to Target because it's going through some HVAC system or something like that.

So we have a lot of security issues happening with this overall IT-enabled built environment, and we're looking at it here at TIA but I think overall it's something that we should all be very concerned with and take a look at.

Jean Rice: Thank you all for your comments on that. Jiri, I want to start the next question with you. We're probably got time for just this last question to go around everyone but, you know, if a city or states wants to say okay, how can we have our buildings and private buildings work seamlessly in some ecosystem as we go forward in smart whether it's for civic engagement or whether it's for public safety or new forms of transportation?

Who are the stakeholders that they should bring to the table?

Jiri Skopek: Well, obviously the best thing would be to bring kind of everybody to the table. That would be the most ideal thing but, you know, it is a complex problem and you know, sometimes it's busy. They sometimes are reluctant to participate. So, what we've been seeing in the smart city ecosystem was still kind of the focusing on individual projects.

You know, whether it's the lighting or whether it's the transportation, but eventually we do have to get more to that kind of a comprehensive approach.

Jean Rice: Thanks. Benny?

Benny Lee: Yes, you know, one of the things that I have found very useful over the last like 30 years of my career is that going to conferences, conferences bringing-up these topics in the conference, bringing-up these discussions in the conferences and also working with user groups and workgroups definitely in the industry such as working with Limor who is in charge of the specific area of TIA.

So conferences are very important, (exports) are very important, right, and also working with industry user groups.

Jean Rice: Great, Limor?

Limor Schafman: And I will add I would completely agree with both of those comments. I think you just need to make sure that the stakeholders include the different industries that are involved depending on what is being planned. And, let's say considering what we're talking about, certainly the real estate marketplace to A&E firm, construction, the real estate developers, the owner/operators, the facility managers, all of them are absolutely crucial.

And, then on the ICT side, all the different kinds of companies that go on to create and produce all the infrastructure, as well as the applications that are developed on top of that infrastructure. And, I would say, if I may, add one element that I think is really important is it's great to bring those stakeholders together, but then we really need to listen to them.

And we really need to hear very closely what are their concerns, what are their issues, where they are and help them in developing the safe and sound and secure, but also very effective and efficient the smart built environment that we're all aiming towards.

Jean Rice: Yes, and I think those are all great points from all three of you on bringing the stakeholders together. And, you're kind of doing that with the Greater Washington Board of Trade basically their regional movement for smart cities Limor and you're putting key people together in solutions groups to discuss these kinds of things, right?

Limor Schafman: Yes, absolutely so we're very pleased to be able to be a part of the Greater Washington Board of Trade has taken on the initiative of creating a smart

region broadly bringing in the Commonwealth of Virginia, the State of Maryland and the District of Columbia in order to put together a program.

And they're doing this in a number of different topics to put together what are the best ways for us to create a digitized environment which supports the citizens of the region and the buildings and urban design group which I co-lead is focused as you can imagine on buildings and the urban design and what we're working on is developing proposals in terms of what kind of projects and each group, each section is doing this.

What kind of digitized and applications and what kind of environments do we want to lead in and so what kind of policies and applications do we want to see going forward so they're doing it from that perspective and here at TIA we are working on an overall smart building standard and certification program and have brought together the different ecosystems I've described earlier in order to develop something like that which is all that.

Jean Rice:

Well, terrific. I want to thank all my panelists and these great ideas to help people and kind of background on smart buildings and how they fit into the smart city ecosystems that are developing.

It's just terrific to be with you and I want to thank my colleagues Chris Holt and Elaine Sloan for working on this behind the scenes for this webinar. Please all of you join us again on February 19th at 2:00 Eastern Time for our next webinar and the topic is the Role of States in Expanding Broadband Access.

Thank you again to our speakers and to our attendees for joining us and as a reminder, the presentation, transcript and audio recording will be available on Broadband USA website in seven days. And, of course, Broadband USA is



available for technical assistance to help expand broadband connectivity, promote digital inclusion, smart cities and broadband adoption. You know, please e-mail us at [broadbandusa@ntia.gov](mailto:broadbandusa@ntia.gov) or visit us as well on our website and take advantage of our toolkits and publications and thank you so much.

Also I do want to say that our contact information for speakers is on and I know that they always welcome inquiries as well so we do thank you again for joining us today and have a wonderful afternoon. Thank you.

Limor Schafman: Thank you so much, Jean.

END