Dr. Ivan Pavlov observed, to get new ideas, read old books. So in developing this talk, I re-read Lewis Mumford’s The Culture of Cities, published in 1938. He discusses the forces that govern city architecture and governance across millennia. His book is chilling – he wrote about the rise of tyrannical governance in cities. He wrote the book in 1938.

Attendees will learn of the security and privacy successes – and failures – of smart city initiatives. By examining components of smart cities (transport systems, buildings, cars, homes, businesses, utilities) attendees will derive an architectural model, policy recommendations, and technology strategies that will support secure, trustworthy smart cities. This model looks forward across likely evolution in technology and the threat landscape for the next ten years. Attendees will discover a path to a safe, trustworthy, resilient, responsive citiescape.

GPS: https://cbsloc.al/2v2pdQ8

Understand the current and likely threat landscape affecting smart cities over the next decade
Discover an architectural model that will give smart cities a cost-effective response to
evolving threats

Recognize security/privacy successes and failures of smart city initiatives within intelligent transport systems, smart buildings, Industrial IoT deployments, smart ports, and governmental and medical infrastructure

Receive a set of policy recommendations to enable trustworthy, resilient smart cities

Explore the technological advances that may help to secure smart cities now and in the future.
Securing Smart Cities: Moving Toward Utopia with Security in Mind


What makes a city smart?

- Data collection, analysis, decisions
- Intelligent buildings, intelligent transportation systems, IoT enabled homes, distribution of goods and services, emergency services, health care and monitoring (epidemiology)
- Maintenance and investment in infrastructure – roads, bridges, traffic flow, Real-time governance (P2G 2.0)

What risks will a smart city face?

- Hackers, city state actors, business process compromise

Focus on Ports and Maritime

- Buildings, transport systems, safety and security, diverse infrastructure

Securing the smart citizen

- Civic information governance, 911 for software defects, civics includes s/w awareness
55 percent of humanity lives in cities, and the percentage is growing.

**Cities the UN Classifies As Megacities**

<table>
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<th>Rank</th>
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What is a Smart City?

The Smart City integrates data and digital technologies into a strategic approach to sustainability, citizen well-being, and economic development.

— Scottish Government, 2014
ET City Brain from Alibaba Cloud dot Com

ET City Brain is an intelligent system that uses big data computing and deep neural networks to process massive logs, videos, and data streams from systems and sensors across an urban center.

Alibaba Cloud’s ET City Brain solution helped city administrators in Downtown Hangzhou in analyzing the live streams from its traffic cameras. With this implementation, Downtown Hangzhou’s incident identification accuracy rate improved to above 92%. The system dramatically increased the accident reporting rates and reduced response times for emergency response teams.

In Xiaoshan District, Hangzhou, ET City Brain enabled smart automation of the traffic signals. This implementation shortened daily commutes by three minutes and increased travel speeds by 15%. Further, the city administrators used this system to prioritize the passage of emergency response vehicles. This has reduced the arrival time of ambulances by half and rescue teams can now reach their destination 7 minutes earlier.

Inefficiency is not uncommon for urban transport systems. There are always certain
routes which operate at full capacity, while on certain routes buses and trains are often vacant. ET City Brain helped Suzhou city in efficiently managing its bus networks and increase passenger volumes by 17% on pilot bus routes.
If people don’t understand how the system of systems works, they will develop conspiracy theories to explain why things happen. Better to make these systems visible, transparent, and verifiably so, than try to deploy such an infrastructure retroactively, in response to protest or civic unrest.
Smart buildings monitor individual motion (residents, visitors, employees, public safety, maintenance), temperature (inside and outside), lighting (interior and exterior), energy consumption and generation, sound levels and quality, moving components, physical access systems, air quality (noxious gasses, particulates), water pressure, room occupancy, fire suppression equipment, HVAC, waste disposal/processing, structural health, external weather, and link to intelligent transportation systems, public safety systems, and parking structures,
Current Attacks Against Cities
This January, the Trend Micro™ Smart Protection Network™ handled over 200 billion queries; detected 9 new ransomware families; and blocked 4.6 billion threats—most were email threats at 90.3%. This continues the trend we detailed in our 2018 Security Roundup and shows that messaging threats are still front and center.
Business Email Compromise

BEC Will Reach Two Levels Deeper
Simply Security
January 22 2019

https://blog.trendmicro.com/bec-will-reach-two-levels-deeper/
Ransomware

Ransomware Attacks Create Dilemma For Cities: Pay Up Or Resist?
- NPR, July 9 2019

Hit by Ransomware Attack, Florida City Agrees to Pay Hackers $600,000
- New York Times, June 19 2019

Technology
Second US town pays up to ransomware hackers
- BBC News, 26 June 2019
South Africans shivering in the dark after file-scrambling nasty hits Johannesburg power biz
- The Register, 25 July 2019

Figure 11. WannaCry accounted for more than half of ransomware detections for the second year: Year-on-year comparison of WannaCry detections versus other ransomware detections combined

https://www.theregister.co.uk/2019/07/25/johannesburg_ransomware_infection/
Source:
https://www.google.com/maps/d/viewer?mid=1UE6Nko9iRG1tLci_AeqqszxGzs&ll=38.28433623967063%2C-94.99983504999994&z=4
Cryptocurrency Mining Detections Surpass 1 Million


Future Smart City Attacks
Possible Future Attack Scenarios

Subverting Machine Learning
Supply Chain Attacks
5G and Edge Vulnerabilities
IIoT Vulnerabilities and Dependencies
Trust in Civic Governance

5G and Edge Vulnerabilities

Many moving parts
Bugs live at the interfaces

1. Physical infrastructure
2. NFV
3. Internet backhaul

5G requires new handsets and antenna infrastructure.
100x more antennae, many more handoffs – cheap antennas easy to hack
Services deployed dynamically, on demand – all virtualization vulnerabilities now built in to the service
Set-up and tear-down in milliseconds – weak auditability and monitoring
Using Internet for backhaul rather than cellular networks – opening telephone traffic to Internet vulnerabilities
The PLC is a transducer, the OT equivalent of a modem. Or, if you will, the audio equipment equivalent of any of the transducers: the microphone that converts audio into electronic signals, the speaker that reverses the process and converts an electronic waveform into sound waves, or the phonograph cartridge that tracks the bumps and grooves in a record and creates an electronic signal modeling the sound encoded in those grooves.

If the PLC is hacked, the sensor’s data can be misrepresented. If the network behind the PLC is hacked, its information can be replaced – masking the actual problems the sensor reads. This was the Triton attack.
Source: [https://armis.com/urgent11/](https://armis.com/urgent11/)

Used in over 2 billion IoT and IIoT devices.

The vulnerabilities reside in VxWorks’ TCP/IP stack (IPnet), impacting all versions since version 6.5, and are a rare example of vulnerabilities found to affect the operating system over the last 13 years.
April 6, 2019, came and went, and, as in 1999, no planes fell out of the sky. But several planes had to stay on the ground. China Aviation Review tweeted round a photo of what purports to be a cockpit console screen reading "22 AUG 1999," which you may remember was the date of the previous GPS rollover. "Multiple Boeing 787s in China experienced GPS 20 years rollover issue. Some aircrafts have to be grounded waiting for an update," the tweet read.

We haven't been able to confirm that, although Sean Gallagher at Ars Technica did confirm that the Chinese flight in the photo was delayed by four and a half hours. We also saw a report from SimpleFlying.com that "at least 15" 787s in China were grounded as result of the rollover, and a Reddit thread that said a KLM flight from Amsterdam to Bogota on April 7 was grounded due to "something to do with the data being wrong."

But we can confirm that New York City's own government-use wireless network, NYCWiN, crashed at 7:59 p.m. Eastern time April 6, exactly when the GPS rollover took place, according to the New York Times. The system was restored ten days later, April 16, 2019.

"Elements of our private wireless network have been disrupted by a worldwide GPS system update," the city's Department of Information Technology and Telecommunications said on April 10, according to the New York Daily News. NYCWiN uses "377 transmitters" spread out "over 300 square miles across five
boroughs" to give city agencies, including the police, fire and transportation departments "real-time access to high-speed voice, video, and data communications," according to the description on the city's official website.

Since the system down during the rollover, traffic lights have not been able to sync up in order to maximize traffic flow, and police-car mounted cameras haven't been able to upload footage, according to the New York Post. The NYPD doesn’t rely on NYCWiN but uses Verizon cellphones instead.

The city apparently pays Northrop Grumman, one of the country's premier defense contractors, about $37 million yearly to keep the system up and running. NYCWiN initially went online in 2009 and cost $500 million to build out.

"We are testing the equipment right now and expect to have NYCWiN back up this weekend," a city spokeswoman told the New York Post. IN fact it was the subsequent Tuesday, April 16, when it came back on-line.
Google’s Sidewalk Labs plan for Toronto’s Quayside waterfront has sparked controversy over how much information will be collected, to whom it will be sold, and how that data might be used.

https://www.forbes.com/sites/jilliandonfro/2019/06/24/alphabet-google-sidewalk-labs-smart-city-plans-for-toronto-waterfront/#82bd3a63ca72

Quayside details:: $900M US
https://www.theguardian.com/world/2019/jun/24/google-toronto-smart-city-sidewalk-project-alphabet-redevelopment

When people do not understand how something works, they will guess. These guesses will give rise to conspiracy theories, which can subvert social cohesion. During the 2016 presidential elections in the US, social media attacks undermined trust in the electoral system. Social media are powerful amplifiers of falsehoods. Successful smart cities must allow the residents to understand how things work.
Securing Smart Cities
Civic Information Security

Build Trustworthiness
Strengthen Civic Participation

Times of Israel https://www.timesofisrael.com/dial-119-for-hacker-alert/
Conclusions and Next Steps

Identify Constituents
Identify Key Services
Build Architectural Model
Use Relevant Standards – ISO 37120, ISO 37106
Map Inter-system Dependencies
Create a Cyber Emergency Response Team
Segment Networks
Authenticate Users
Encourage User Participation
Update Technology

Mark Twain said “History doesn’t repeat itself but it rhymes.” We have confronted new complex technologies before, and our track record is mixed at deploying it safely. We know what to do, we just haven’t configured the solution to match the projected environment properly.
References

The Culture of Cities, Lewis Mumford. Harcourt, Brace, Jovanovich, Orlando, FL, 1938


Interoperability In Smart Cities, Mater’s Thesis, Kristin Revik Gabrielsen, Dept of Design, Norwegian Univ of Science and Technology, June 2017


Maritime Europe Strategy Action, European Technology Platform of the Waterborne Industries, TIG4.eu-Maritime

VWVols Urgent/11 problem https://arsiv.com/urgent11/


Google Sidewalk Labs Unveils ‘Smart City’ Plans For Toronto Waterfront https://www.forbes.com/sites/jillianfrn/2019/06/24/alphabet-google-sidewalk-labs-smart-city-plans-for-toronto-waterfront/#92bd9a65a72