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Cybersecurity in a New Light: IT Considerations for Connected Lighting Systems

Dan Kuhl, Evergreen Consulting Group
Levin Nock, Design Lights Consortium
Maurice Karagiorgos, Lutron Electronics

Today's Session

- Use the chat feature to ask questions!
- We will have time at the end for Q&A
- Our presenters will be referencing various technologies today. We do not endorse any specific manufacturers; references are for educational purposes

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Today's Panelists

Dan Kuhl
Sr. Lighting Specialist
Evergreen Consulting Group

Maurice Karagiorgos
Regional Manager/ Systems Application Engineer
Lutron Electronics

Levin Nock
Sr. Technical Manager
Design Lights Consortium

Who is NEEA?

neea

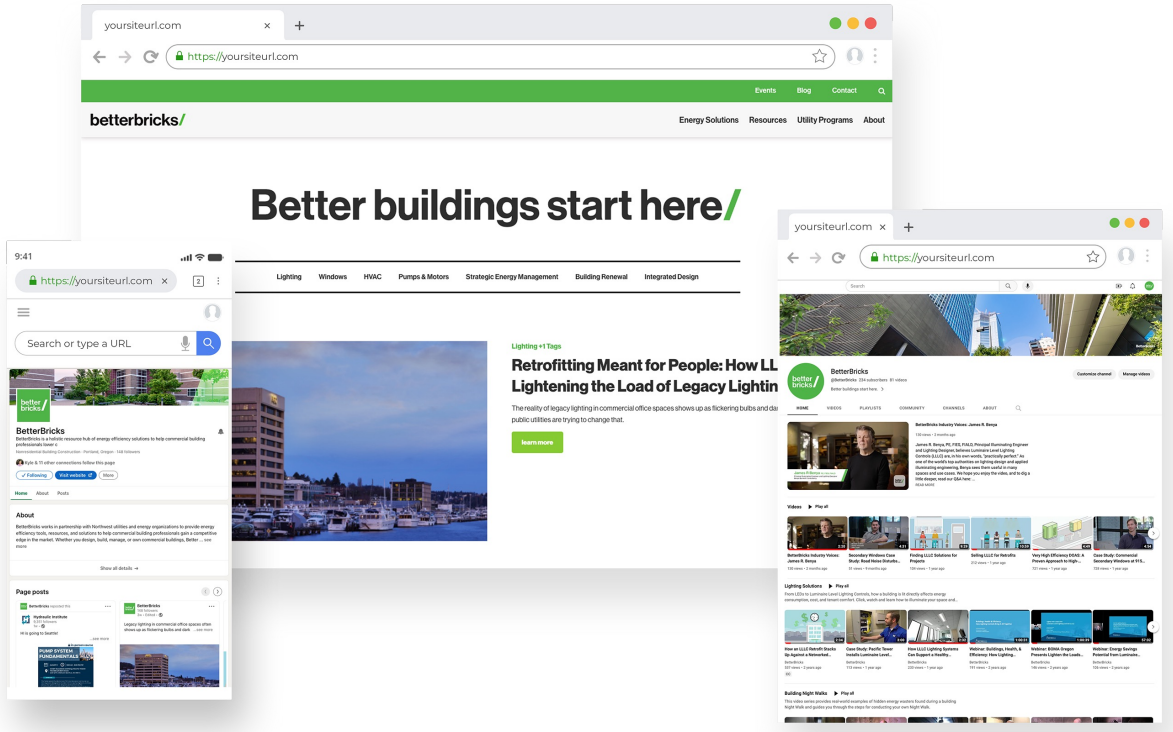
betterbricks/

What is BetterBricks?

Working in partnership with Northwest utilities and energy organizations to provide energy efficiency tools, resources, and solutions to help commercial building professionals gain a competitive edge in the market.

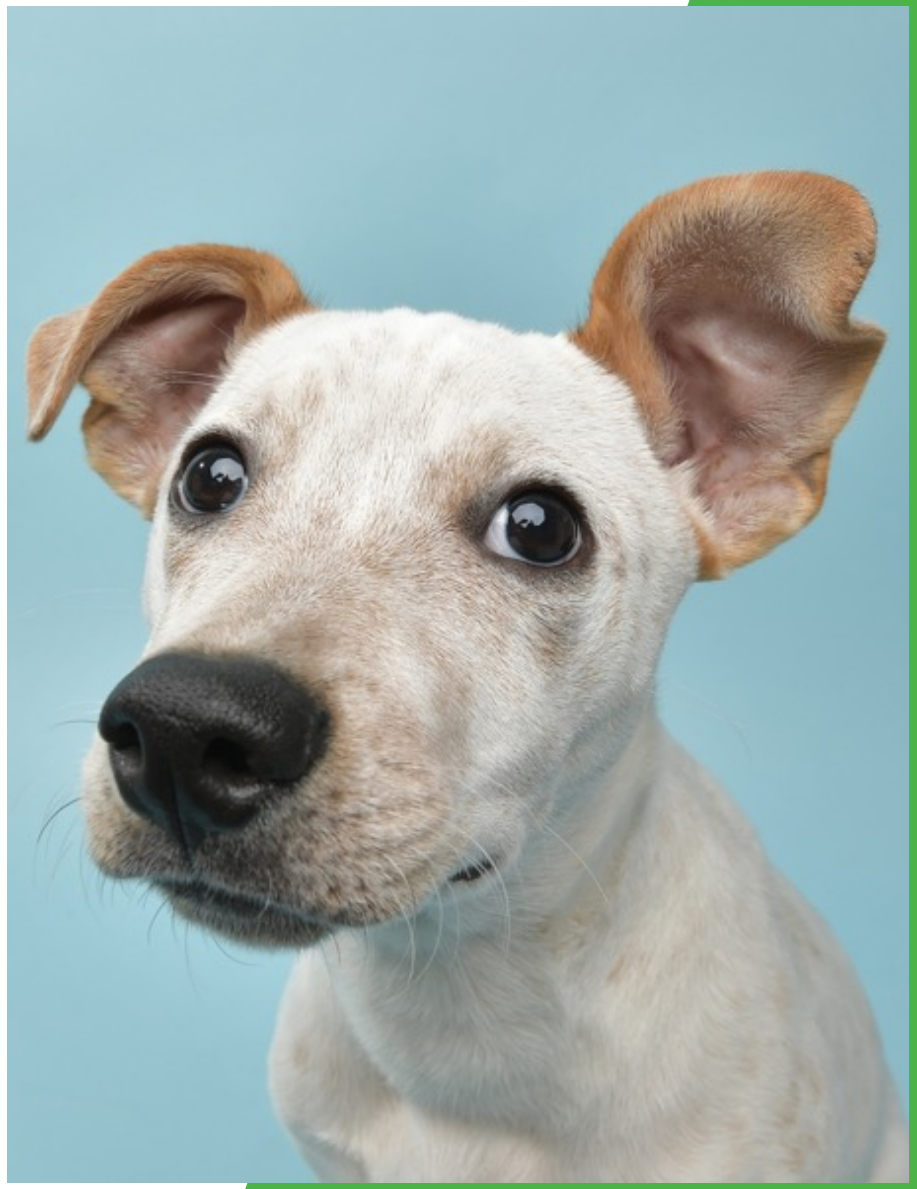
betterbricks.com

LinkedIn/YouTube: @BetterBricks



Cybersecurity

“Someone cracked my password. Now I need to rename my puppy” - Unknown



Cybersecurity & Lighting

- Cybersecurity is the practice of defending networked systems and data from malicious attacks
- Currently there is no one-size-fits-all solution, but multiple 3rd party standards exist
- To determine which security standards will best mitigate risk, end-users need to identify and provide us with the specific criteria that matters

The World of Networked Controls & Cybersecurity

- Cybersecurity for networked lighting controls is of fundamental importance to NLC market adoption
- Hacking of an NLC system could become a headline and cause potential users to question/delay utilizing the technology
- Lost energy savings from canceled or delayed NLC deployment is significant

Why We Need To Know More: The Risks

The Risks Are Rising

- 5,400 cyber attacks daily across all IoT devices
- Attacks are increasing
- 7 million data points compromised daily

The Stakes Are High

- Average payout for successful cyber attack is $330,000
- Estimated that global cybercrime damages will be 10 trillion by 2025
- Company reputation can be damaged, thereby losing business

Source: PSA Certified Website

Why We Need To Know More: US Department of Energy (DOE)

- DOE has set a national goal of tripling the energy efficiency and demand flexibility of the buildings sector by 2030, relative to 2020 level
- DOE forecasts that connected lighting systems can contribute to that goal by delivering 125 T Wh of annual energy savings by 2035, equivalent to the annual output of 50 typical (500 MW) power plants

IT Standards & Best Practices

Section 1: How to communicate IT considerations to both customers and manufacturers for a seamless installation

Section 2: A review of Design Lights Consortium (DLC) IT requirements and protocols, designed to remove the uncertainty around IT concerns

Maurice Karagiorgos – Lutron Electronics

Luminaire Level Lighting Controls Capabilities

Simple Systems

- Occupancy Sensing
- Daylight Sensing
- Personal Tuning
- High-End Trim

Advanced Capabilities

- Demand response or off-site control
- Data collection and monitoring
- 3rd party programming and troubleshooting
- Integration with other building systems

Can the systems that we are considering meet the functional needs and provide the security and protection that we need?

What Functions Do I Want?

Many of today's new systems offer some interesting new options that might affect our IT department.

- Some of those include:
- Off site control of the system
- Data collection and monitoring
- 3rd party programming and troubleshooting
- Integration with other systems

Off Site Control Of The Lighting Control System

This option allows for control of the lighting control system from outside the building or campus

One example would be a school facilities engineer being able to override normal school hours for a snow day or an unscheduled event

This requires that the system be able to be connected to via an app or website that has a connection to the lighting controls system. This can be done through the existing building structure, or a building may ask that the system be kept separate from its current IT structure

Time Commitment From Onsite IT Staff

- Most time commitment occurs before onsite implementation
- Some manufacturers have IT Security Questionnaires that help lay the groundwork
- Keep in mind the time, depending on the project & manufacturer it can take some significant time before it's finalized with the customer

Common IT Department Needs:

Verify presence of Personally Identifiable Information (PII), Electronic Protected Health Information (ePHI), or financial data in the LLLC system.

Assess participation in Generative Artificial Intelligence (Generative AI) within the LLLC system.

Confirm manufacturer's dedicated cybersecurity staff support for the product and/or services.

Check manufacturer's participation in relevant certifications or assessments related to information security.

Evaluate the manufacturer's security program for Risk Measurement, Risk Mitigation, Risk Monitoring, and Risk Reporting.

Examine wired and wireless protocols, security practices, and cryptography securing communication in the LLLC system.

Ensure products within the LLLC system adhere to well-known security standards, with signed and secured firmware, industry best practice cryptography, no universal passwords, and implementation of NIST best practices for passwords and secure communication connections.

Data Collection and Monitoring

Many lighting controls systems are able to give data back to the building operators to better understand the use and energy consumption in their buildings.

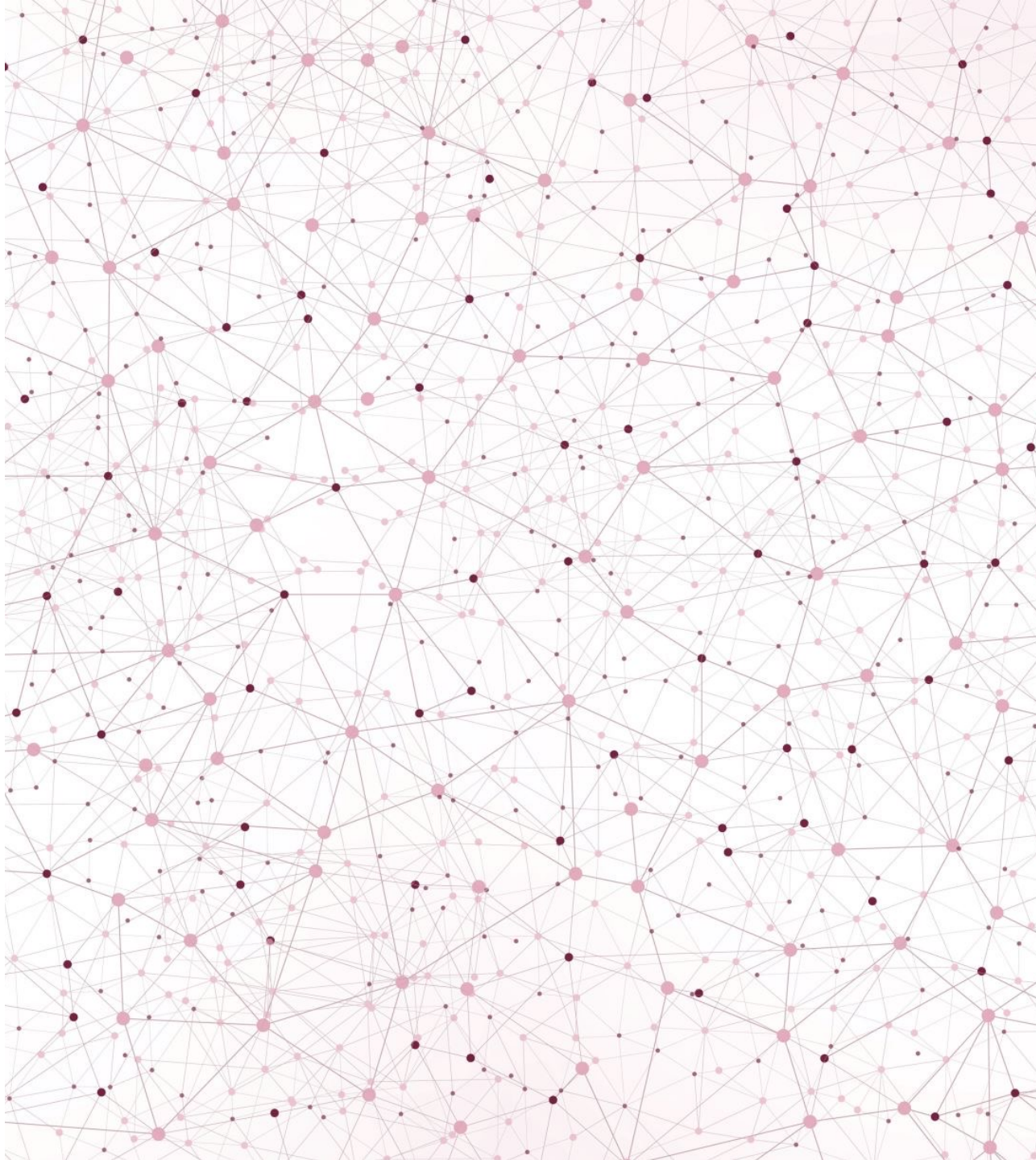
- Data collection would include:
- Total energy savings for a building and individual spaces
- Areas that are heavily used and areas that are scarcely used (allows for reallocation)
- Hours of operation for spaces
- Identification of problem areas and spaces – devices being left on or spaces with the lights on with no employee's present
- Some data collection may be required by the local PUD to receive funding

3rd Party Programming and Troubleshooting

- Often times, manufacturers will offer programming and troubleshooting from an offsite location. While this often is a cost savings versus on-site services, it has to be managed from as IT perspective

- If 3rd party programming is wanted or required, generally two options exist – access to the lighting control system by allowing access to the lighting controls through the IT or a direct connection via a wireless device (such as a laptop brought onto the site)

- A third option exists where a laptop or device is brought on-site and is physically hooked to the building internet and then removed after programming is completed. This needs to be done with cooperation of the IT department to ensure security or the building



Integration With Other Systems

This has become a very common option used with lighting controls systems and other systems within a building – mostly commonly HVAC. Other systems will use the occupancy controls of the lighting controls system to determine whether to turn on and off HVAC inside an area.

- Traditionally, this is done using BACnet or similar communication protocol and done using the existing IT system to bring communication to the two systems
- Additionally, buildings may want to have a single scheduling system that will send commands to the lighting system
- Each of these systems and connections need to be communicated and reviewed with the IT Department

Does This System Reside On My Current IT?

- Current lighting controls systems can reside completely outside and separate from a building's IT system, reside as part of a building's IT, and/or can be a hybrid of the two options

- Many systems do not need to reside on a building's IT and either had a stand along programming interface or do not need of at all. These systems stand completely alone, can be programmed and adjusted without accessing building IT and often do not or cannot integrate to other building systems or be accessed from outside the building. These systems tend be used for smaller buildings or areas, not be able to communicate across areas and tend to have less options that systems that need a programming front end or front ends that do not communicate via IT or other means

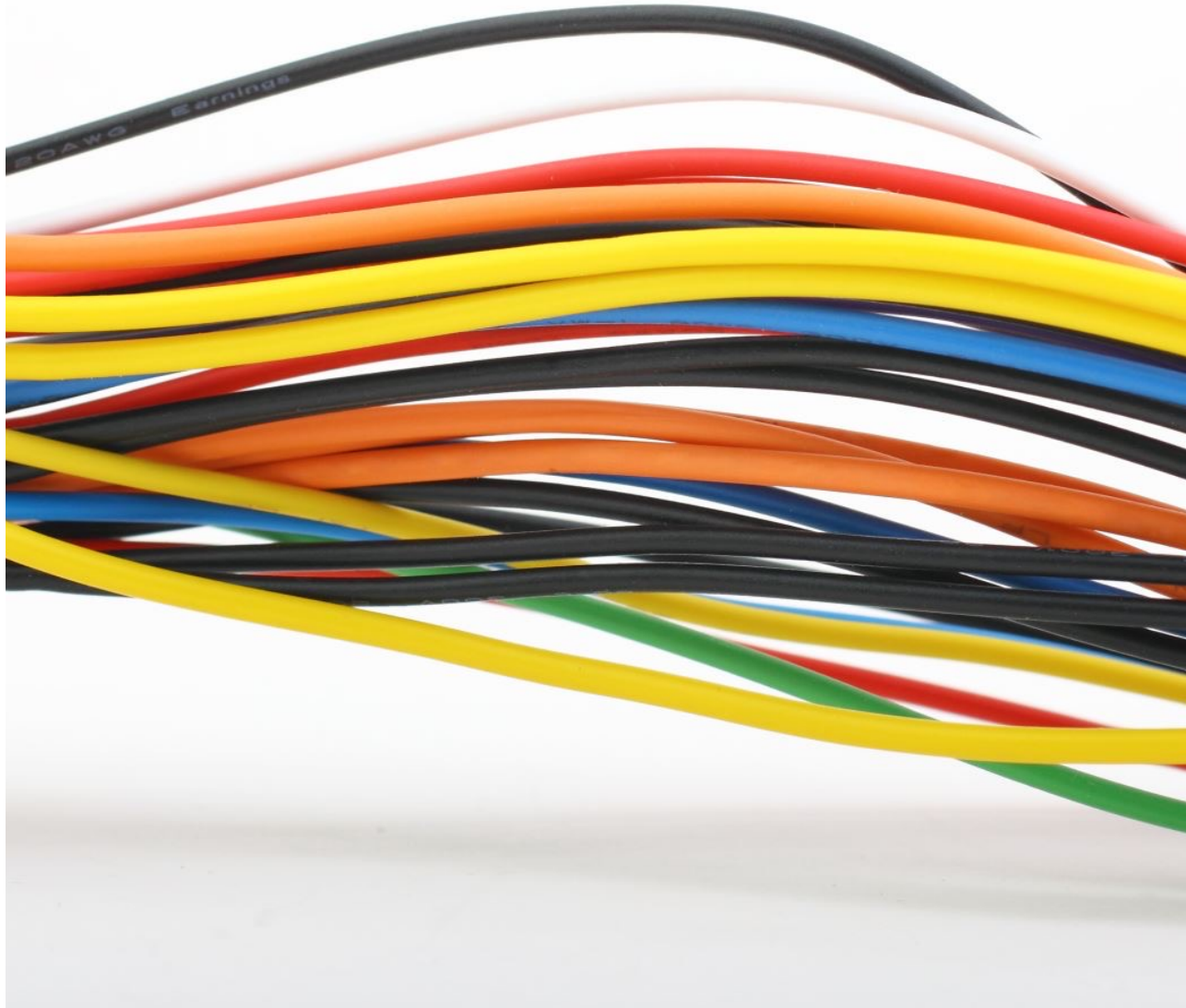
Options and building needs should be discussed with IT

Does This System Reside On My Current IT?

- Systems that use front ends that need access to an IT system come in two options – those that use IT to communicate internally and those that use IT to speak externally of the building

- Systems that use IT to communicate internally use the IT wiring as the communication conduit across the building and will need the IT department to route the devices to each other

- Those systems that reside within a building's existing IT systems are often separated by placing them onto their own virtual server to separate the controls from their normal IT systems



Does This System Reside On My Current IT?

- Systems that reside on a building's IT network MUST BE discussed with IT Departments prior to the system's installations

- Complete sets of specifications for the lighting controls system, including the system's Security Statement and IT Implementation Guides should be provided for review – one such example can be found at: https://assets.lutron.com/a/documents/040437.pdf

Levin Nock – Design Lights Consortium

What is the DLC?

- Non-profit
- Promotes high-quality, energy-efficient lighting products
- US and Canada

All NEEA Member Programs are DLC Member Programs

APPLICATION PORTAL

Welcome to The MyDLC Dashboard

Dashboard
QPL Search
Connect with DLC
News & Updates
Events & Webinars
Application Pre-submission Tools
Resources & Tools

Find Qualified Products

By Model or Manufacturer | Select a QPL

News & Updates

Quick Links

- Request DLC Data Access Subscription
- Product Submission Instructions
- DLC Resource Hub

Upcoming Events

Feb 21, 2024

Submitting Product Images to the SSL QPL

DLC Qualified Product Lists (QPLs)

	SSL (Solid State Lighting)	NLC	Horticulture	Luna
Launched	2010	2016	2019	2022
Products	C&I LED Luminaires, Lamps, Retrofit Kits	Networked Lighting Control Systems	Horticultural LED Luminaires, Lamps, Retrofit Kits	Outdoor LED Products meeting DLC night sky guidelines
Products Listed	313,056	67	1,610	251
QPL Activity	3,800 Product Views/**Day**	1,000 Product Views/Month	4,000 Product Views/Month	200 Product Views/Month

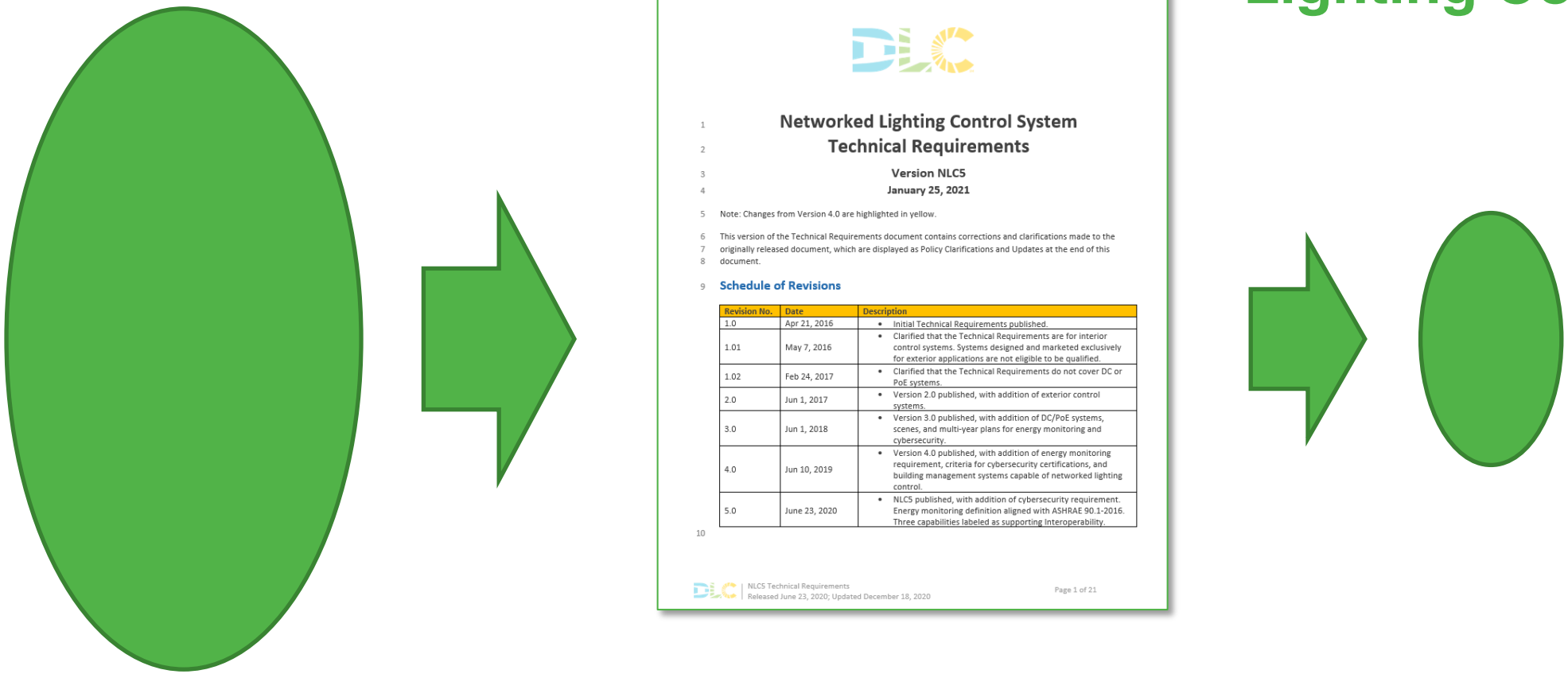
What the DLC does

- Is a nonprofit
- Maintains lists of qualified products
- Lists are used for rebates & incentives
- Creates policies
- Refers to standards

and does not do

- Does not create standards
- Does not test products
- Does not offer direct rebates or incentives
- Does not sell lighting products

All Lighting Controls



Networked Lighting Control System
Technical Requirements

Version NLC5
January 25, 2021

Note: Changes from Version 4.0 are highlighted in yellow.

This version of the Technical Requirements document contains corrections and clarifications made to the originally released document, which are displayed as Policy Clarifications and Updates at the end of this document.

Schedule of Revisions

Revision No.	Date	Description
1.0	Apr 21, 2016	• Initial Technical Requirements published.
1.01	May 7, 2016	• Clarified that the Technical Requirements are for interior control systems. Systems designed and marketed exclusively for exterior applications are not eligible to be qualified.
1.02	Feb 24, 2017	• Clarified that the Technical Requirements do not cover DC or PoE systems.
2.0	Jun 1, 2017	• Version 2.0 published, with addition of exterior control systems.
3.0	Jun 1, 2018	• Version 3.0 published, with addition of DC/PoE systems, scenes, and multi-year plans for energy monitoring and cybersecurity.
4.0	Jun 10, 2019	• Version 4.0 published, with addition of energy monitoring requirement, criteria for cybersecurity certifications, and building management systems capable of networked lighting control.
5.0	June 23, 2020	• NLC5 published, with addition of cybersecurity requirement. Energy monitoring definition aligned with ASHRAE 90.1-2016. Three capabilities labeled as supporting Interoperability.

NLC5 Technical Requirements
Released June 23, 2020; Updated December 18, 2020

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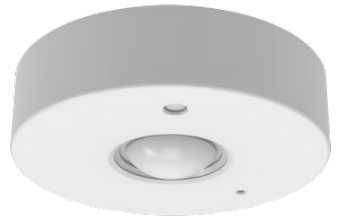
DLC-qualified Networked Lighting Controls

The DLC's Requirements for Networked Lighting Controls

- Networking of Luminaires and Devices
- Occupancy Sensing
- Daylight Harvesting
- High-End Trim
- Zoning
- Individual Luminaire Addressability
- Continuous Dimming
- Energy Monitoring (except room-level)
- **Cybersecurity (as of 2/28/2022)**



Photos: Digital Lumens, Enlighted, LinkedIn, Nedap, RAB

You have 0 saved items

Save Search Criteria | View Saved Searches

Listed Products

Manufacturer
filter this list

Brand
filter this list

Ease of Implementation

Technical Requirements Version
5.0 (67)

Interior Scope

Exterior Scope

Advanced Capabilities

User Interface

Integral Controls

Wired/Wireless Communication

Search by system name, manufacturer, brand, or product ID

Search Tip: For an exact search, use quotes around the search term (ex. "PVO5LXDK").

Prev 1 2 3 Next

Viewing **1-25** of **67** results

Add All Results to My List

LiteLogic

Add to my list

Manufacturer: Barron Lighting Group Inc.
Brand: Trace-Lite

Exterior Scope: Structured Parking,Area/Building Exterior/Parking,Streetlight (residential streets)
Technical Requirements Version: 5.0

LiteLogic

Add to my list

Manufacturer: Barron Lighting Group Inc.
Brand: Trace-Lite

Interior Scope: Room or Zone,Structured Parking
Technical Requirements Version: 5.0

GEBC

Add to my list

Manufacturer: Homewell Inc
Brand: GEBC

Interior Scope: Portfolio/Enterprise,Whole Building,Room or Zone,Structured Parking
Technical Requirements Version: 5.0

Keilton + autani

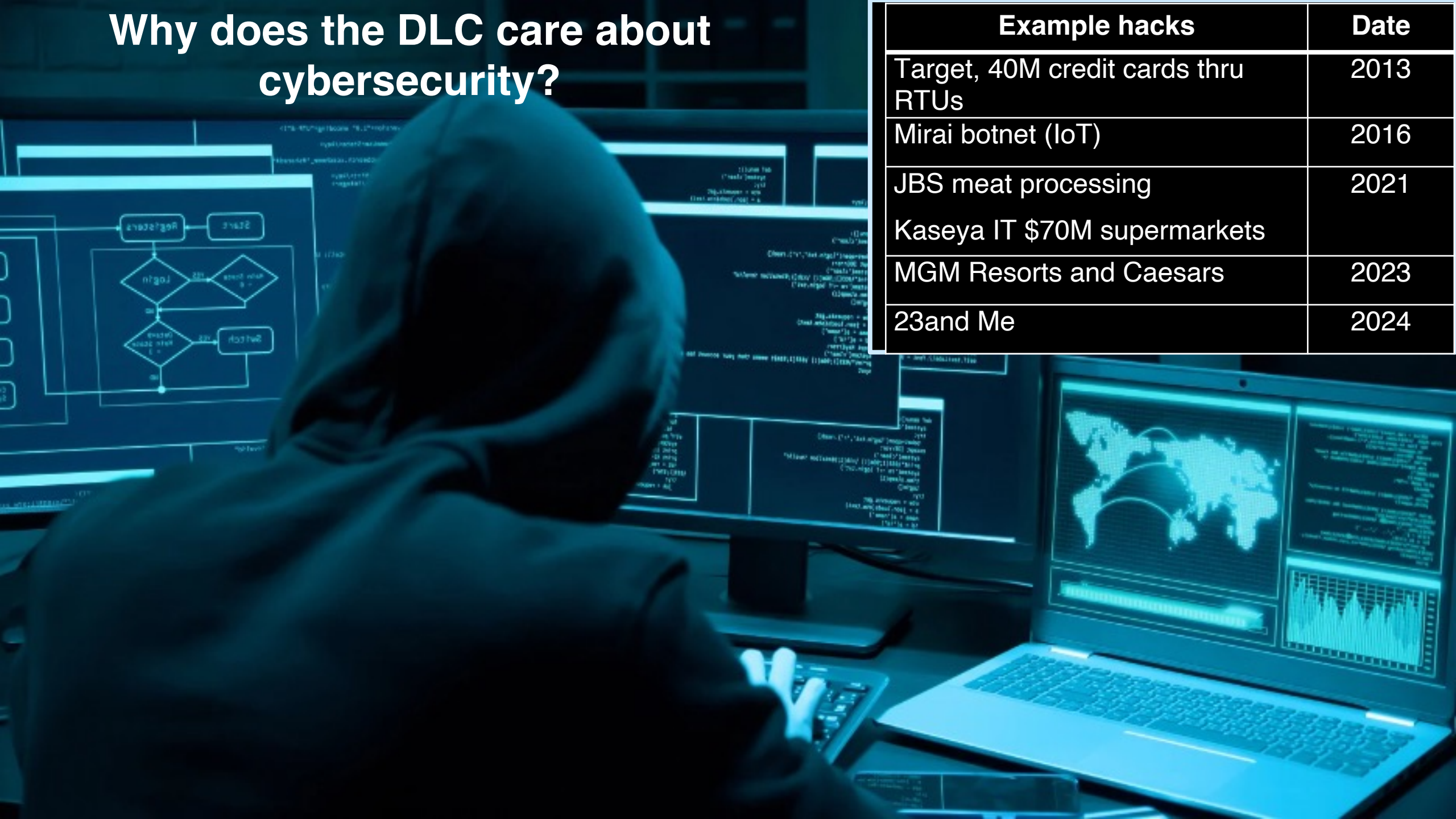
Add to my list

Manufacturer: Litetrace
Brand: Keilton + autani

Exterior Scope: Structured Parking,Area/Building Exterior/Parking,Streetlight (residential streets)
Technical Requirements Version: 5.0

Why does the DLC care about cybersecurity?

Why does the DLC care about cybersecurity?

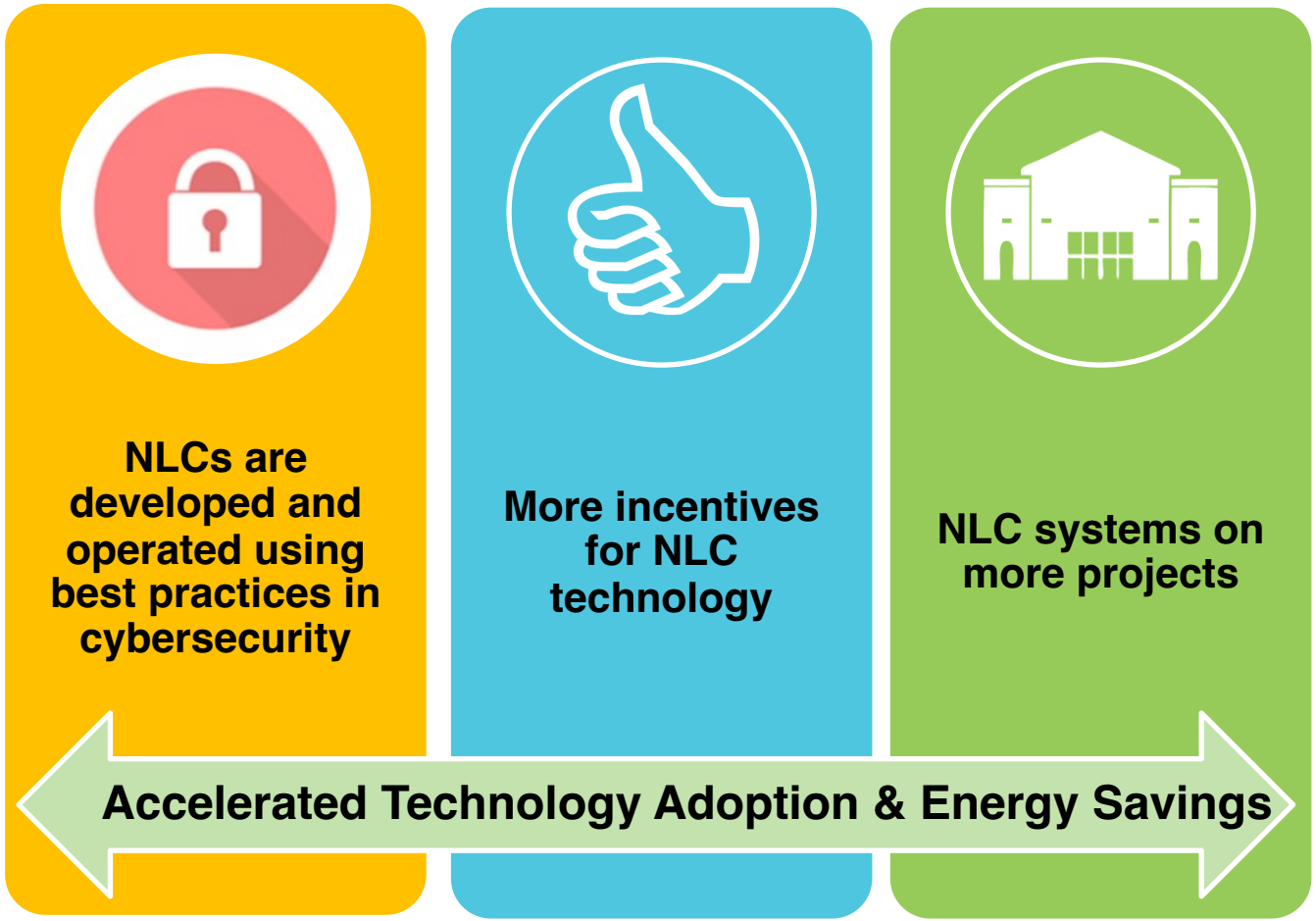


Example hacks	Date
Target, 40M credit cards thru RTUs	2013
Mirai botnet (IoT)	2016
JBS meat processing Kaseya IT $70M supermarkets	2021
MGM Resorts and Caesars	2023
23and Me	2024

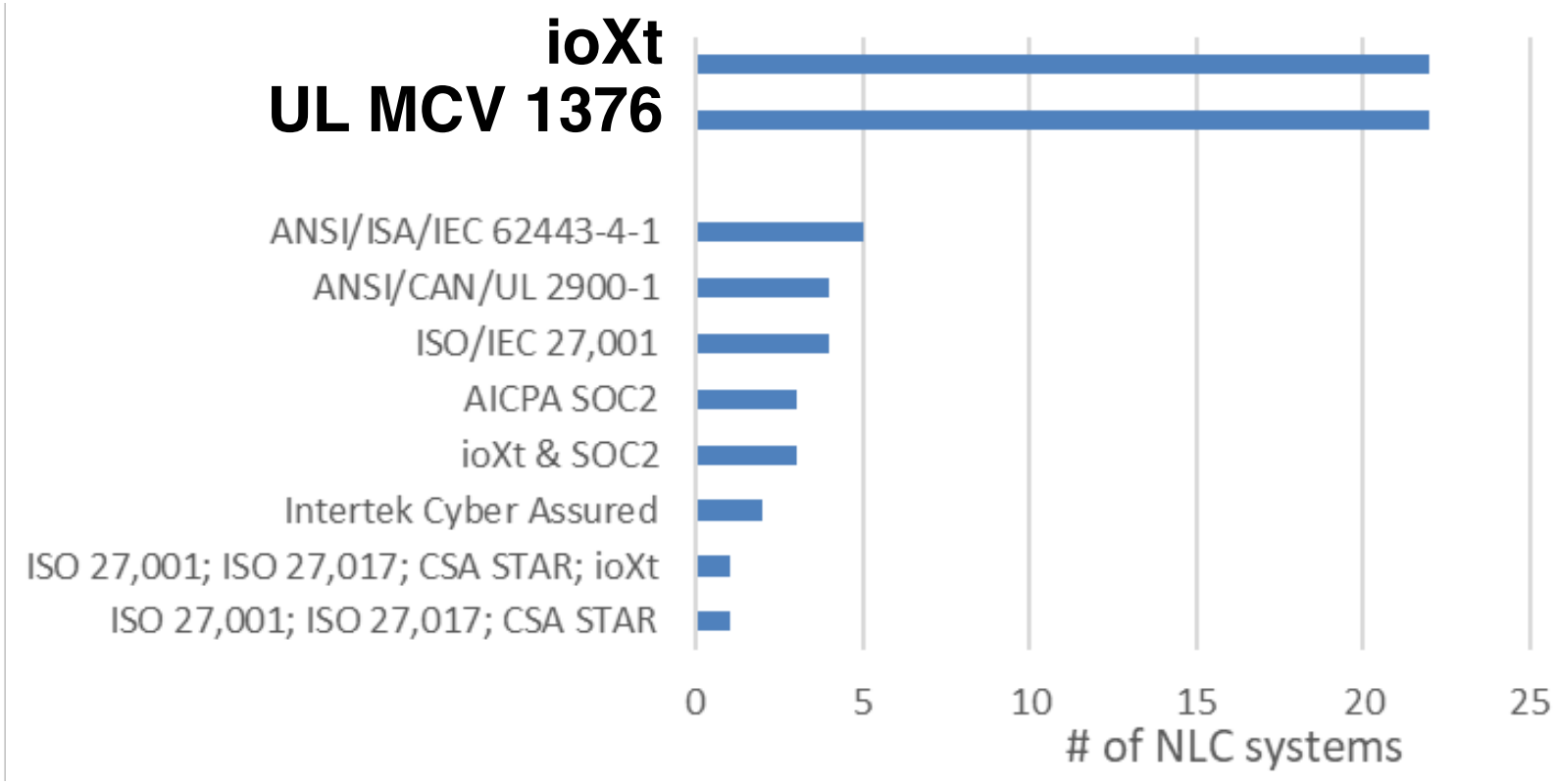
DLC Cybersecurity Initiative Intent

- Ensure listed NLC systems address cybersecurity
- 3rd party certifications
- Disclose those efforts for users of the QPL (Qualified Products List)

DLC Goals



Certifications of Systems on the NLC QPL

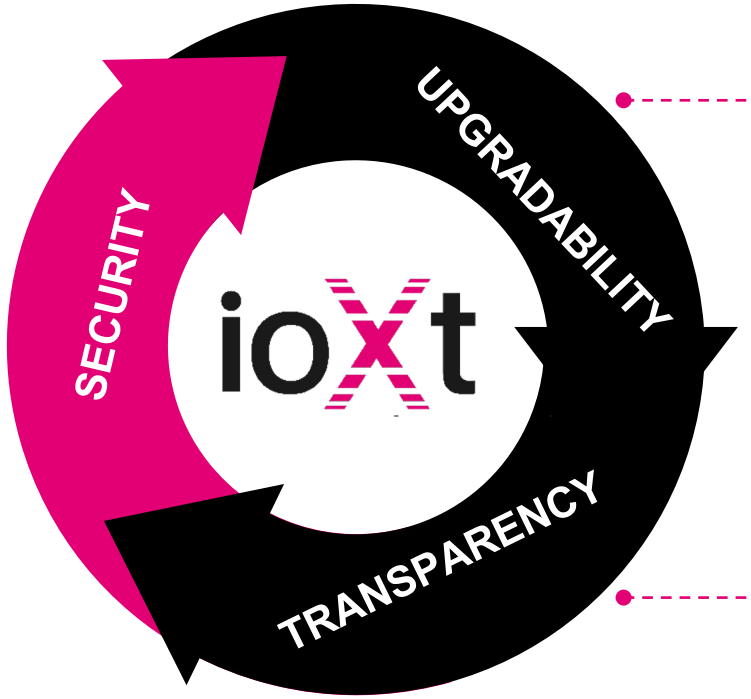


Popular

ioXt Security Pledge

SECURITY

- No Universal Passwords
- Secured Interfaces
- Proven Cryptography
- Security by Default



UPGRADABILITY

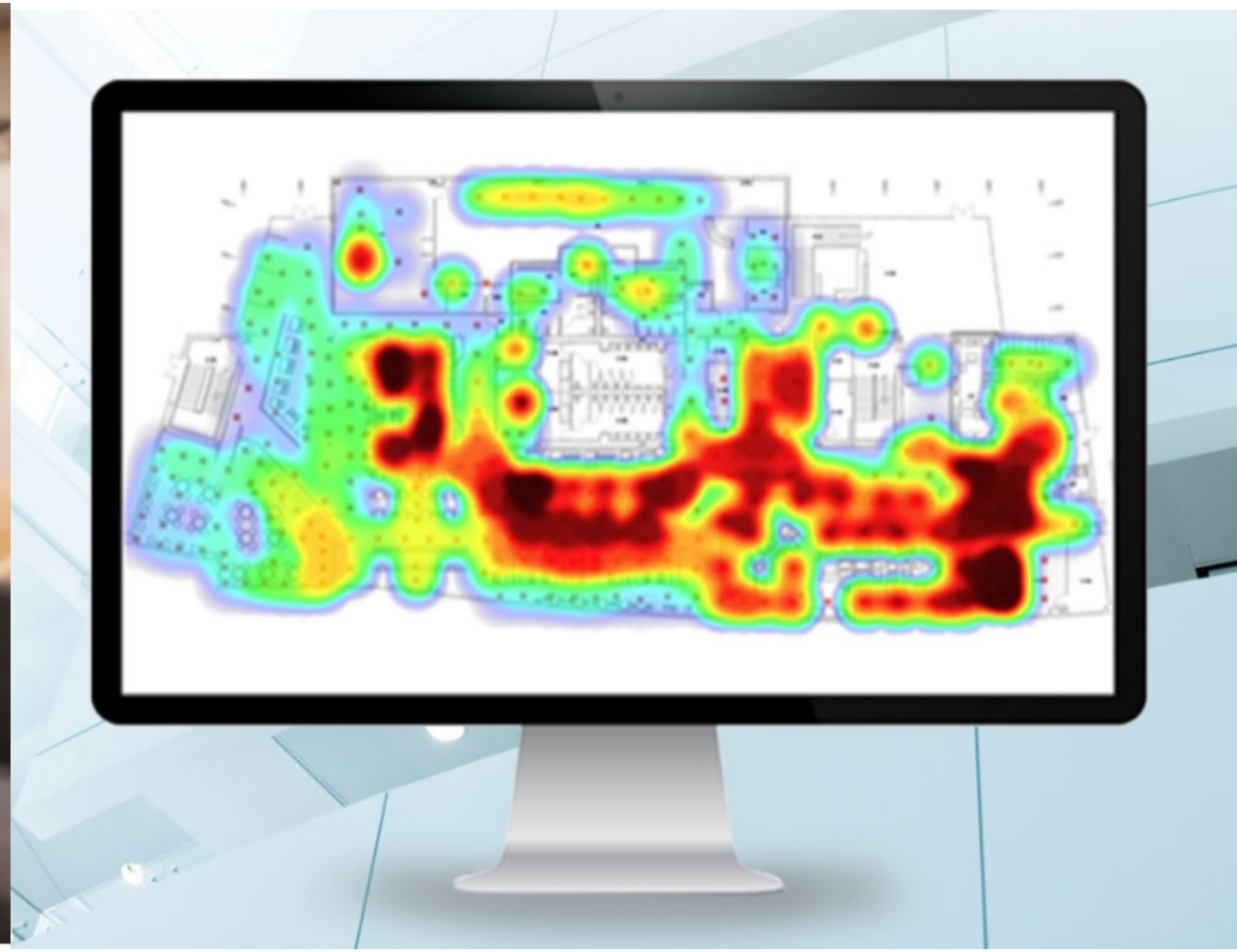
- Automatic Security Updates
- Verified Software

TRANSPARENCY

- Security Expiration Date
- Vulnerability Reporting Program

ioXt
internet of secure things

Residential/Consumer vs. Commercial

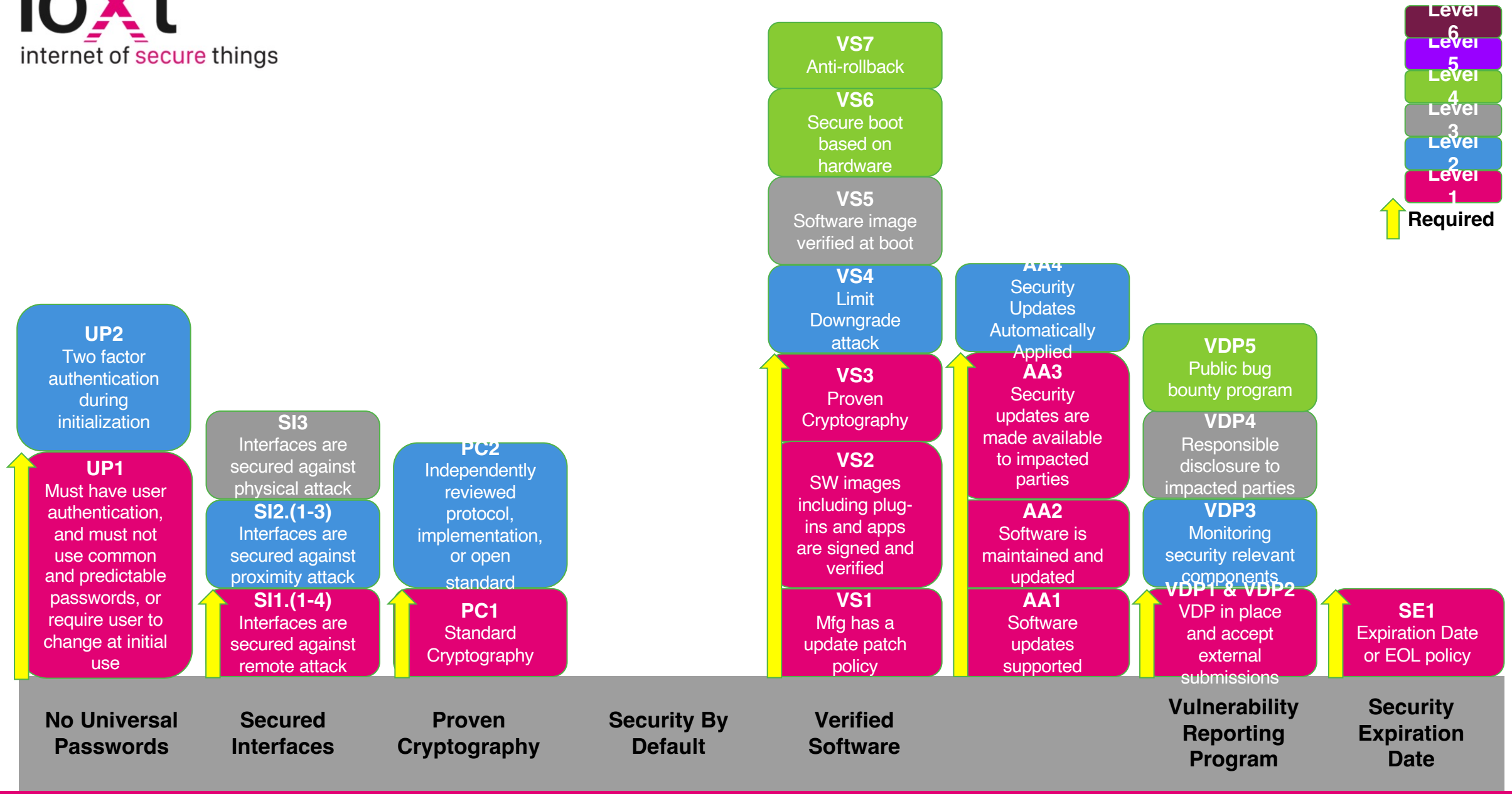


Canva.com

J2inn.com

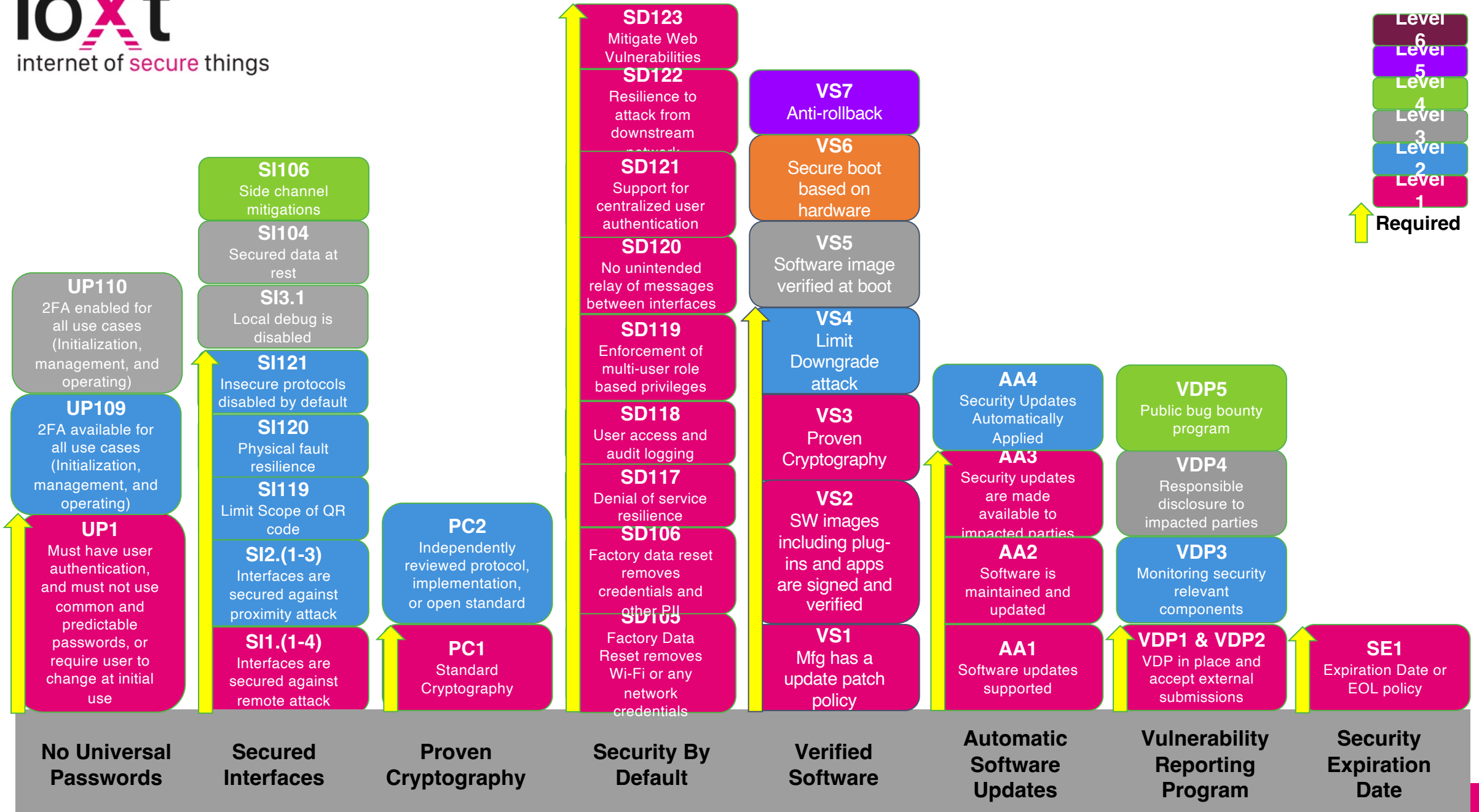
ioXt
internet of secure things

Base Profile



Network Lighting Controller Profile

ioXt
internet of secure things

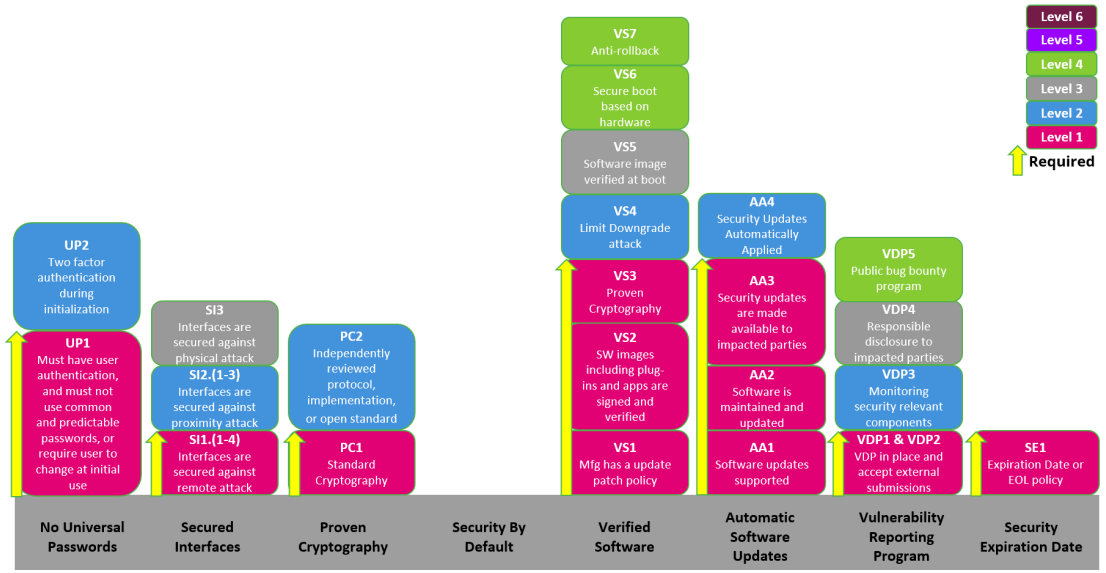


ioXt
internet of secure things

Commercial

Residential/Consumer vs. Commercial

Base Profile



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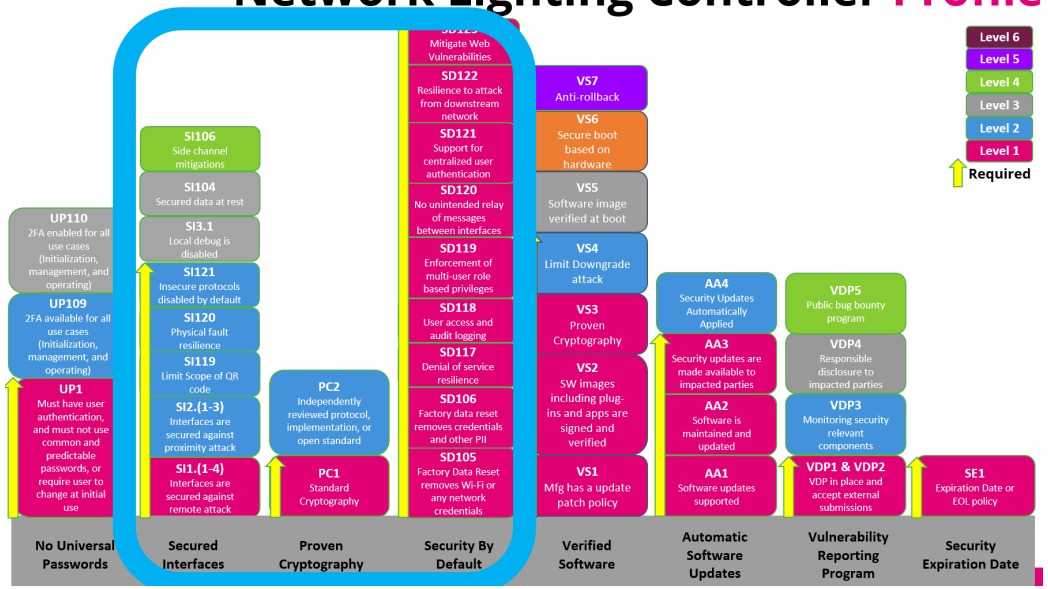
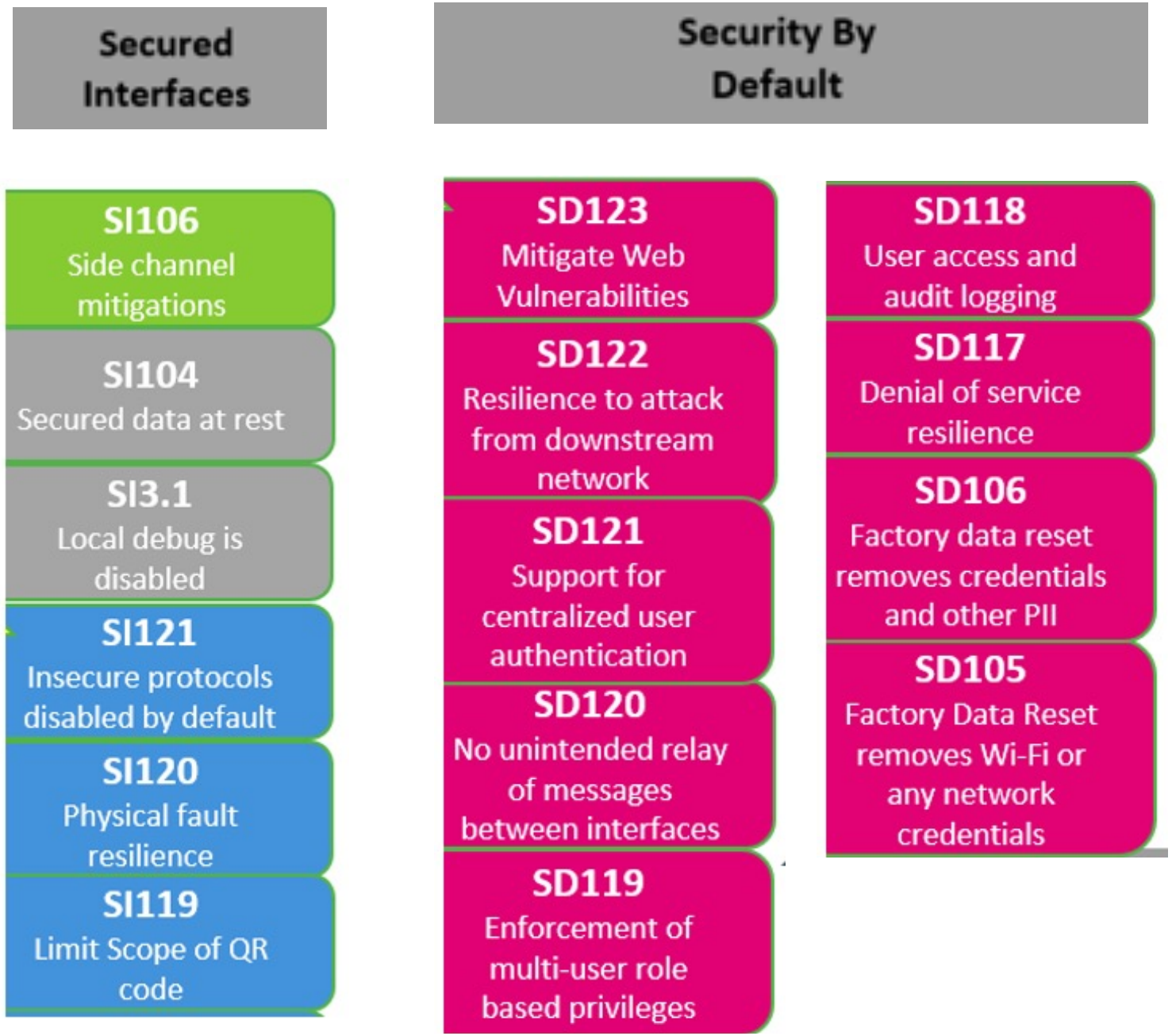


ioXt
internet of secure things

Additional Requirements for Commercial NLC



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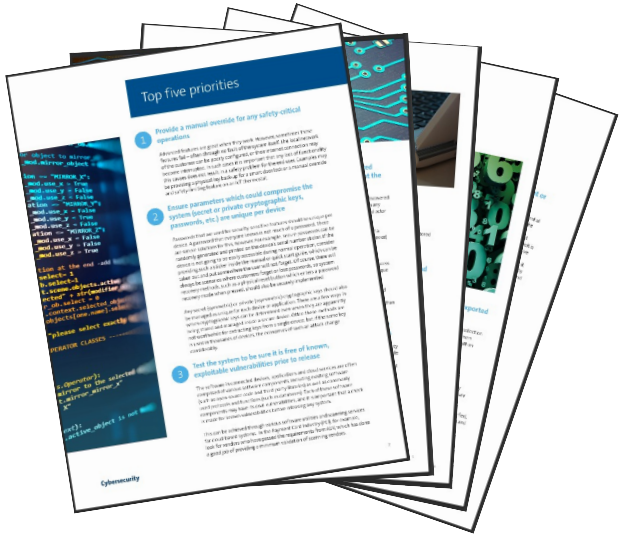
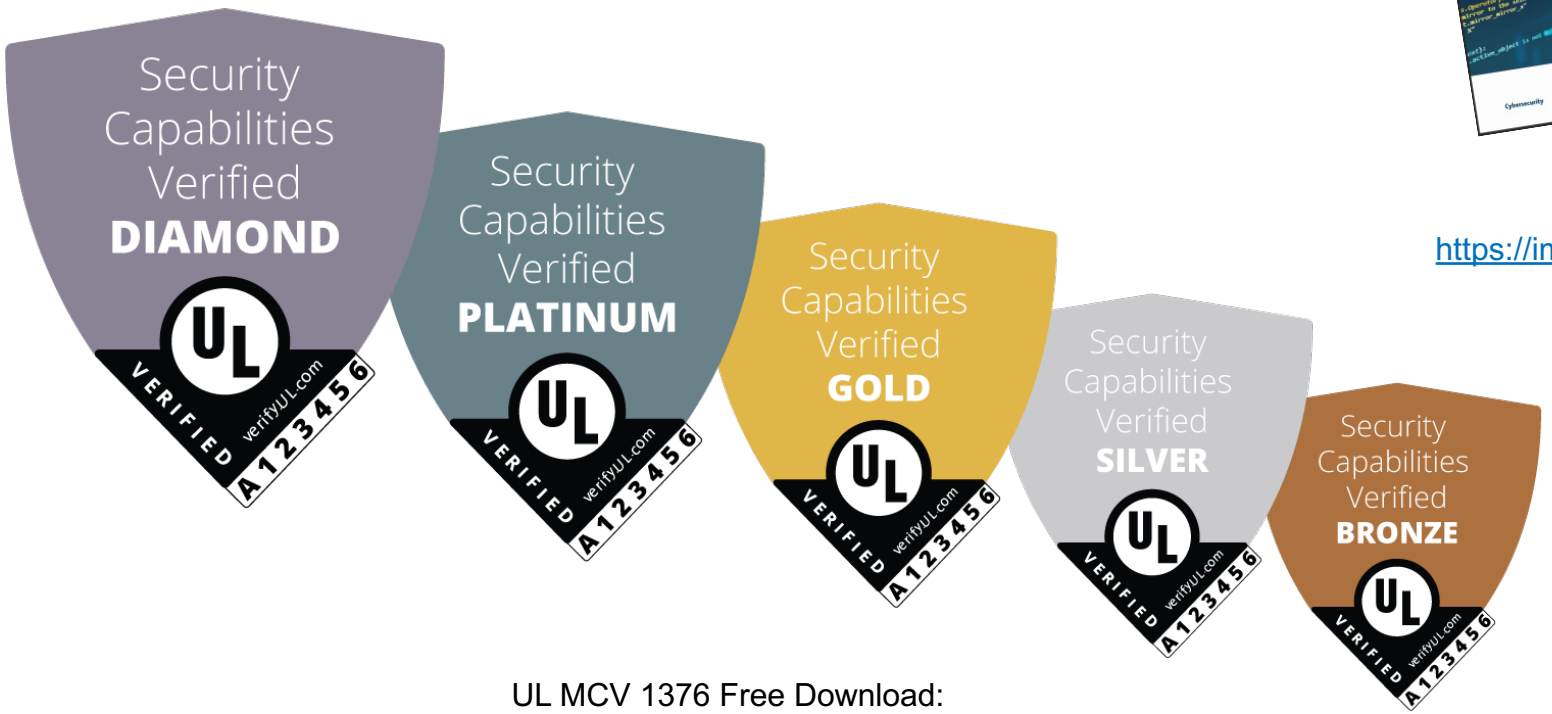
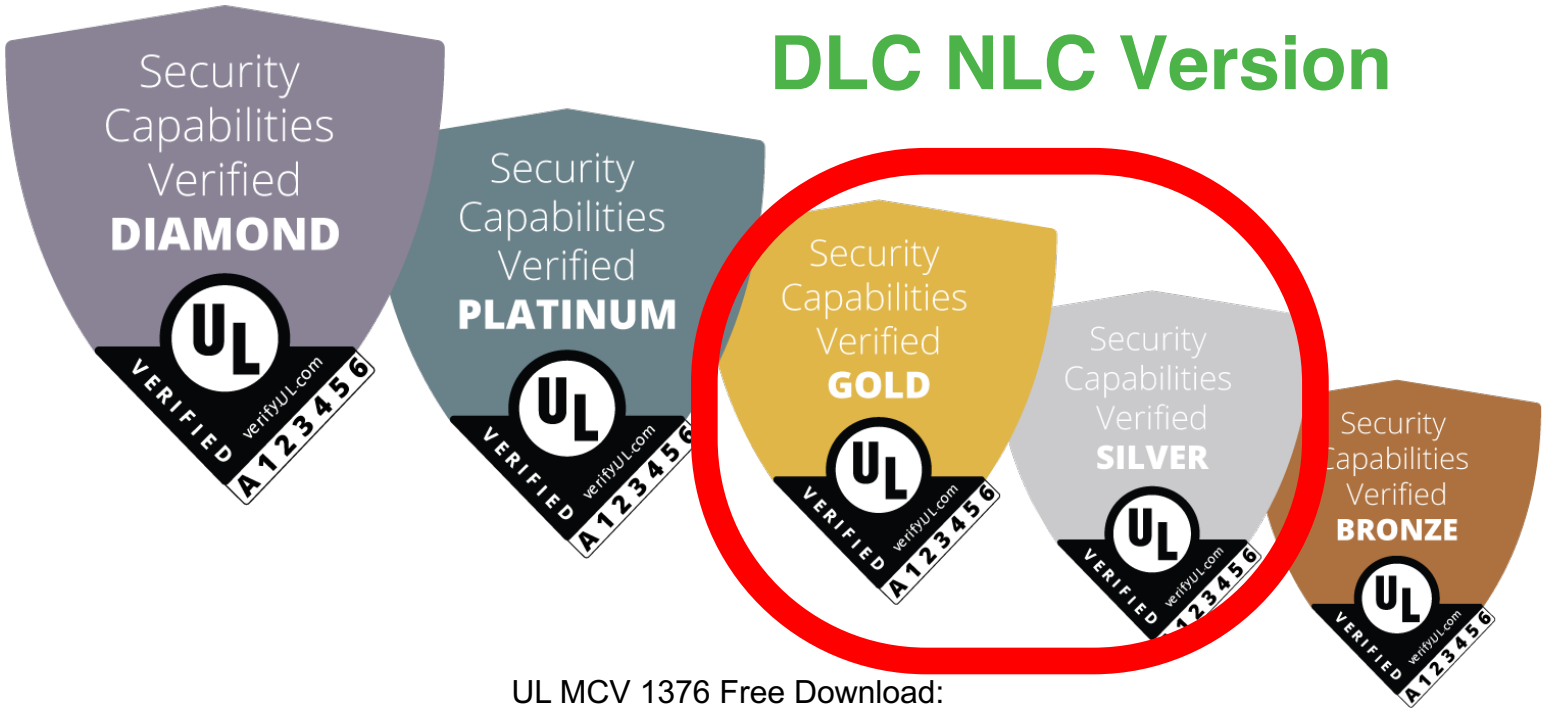


https://ims.ul.com/IoTSecurityTop20



UL MCV 1376 Free Download:
https://www.shopulstandards.com/ProductDetail.aspx?UniqueKey=35953

UL MCV 1376



DLC NLC Version

UL MCV 1376 Free Download:
https://www.shopulstandards.com/ProductDetail.aspx?UniqueKey=35953

UL MCV 1376

UL IoT Security Rating (UL MCV 1376)	UK DCMS	NIST	ETSI	CSDE
Software Updates	●	●	●	●
Data & Cryptography	●	▲	●	●
Logical Security	●	●	●	●
System Management	●	●	●	●
User Identifiable Data	●	▲	●	■
Protocol Security	●	●	●	●
Process & Documentation Requirement	●	■	●	●

Alignment Key

● FULLY ALLIGNED

▲ PARTIALLY ALIGNED

■ MINIMALLY ALIGNED

https://www.ul.com/resources/ul-and-dlc-cyber-program-qualified-products

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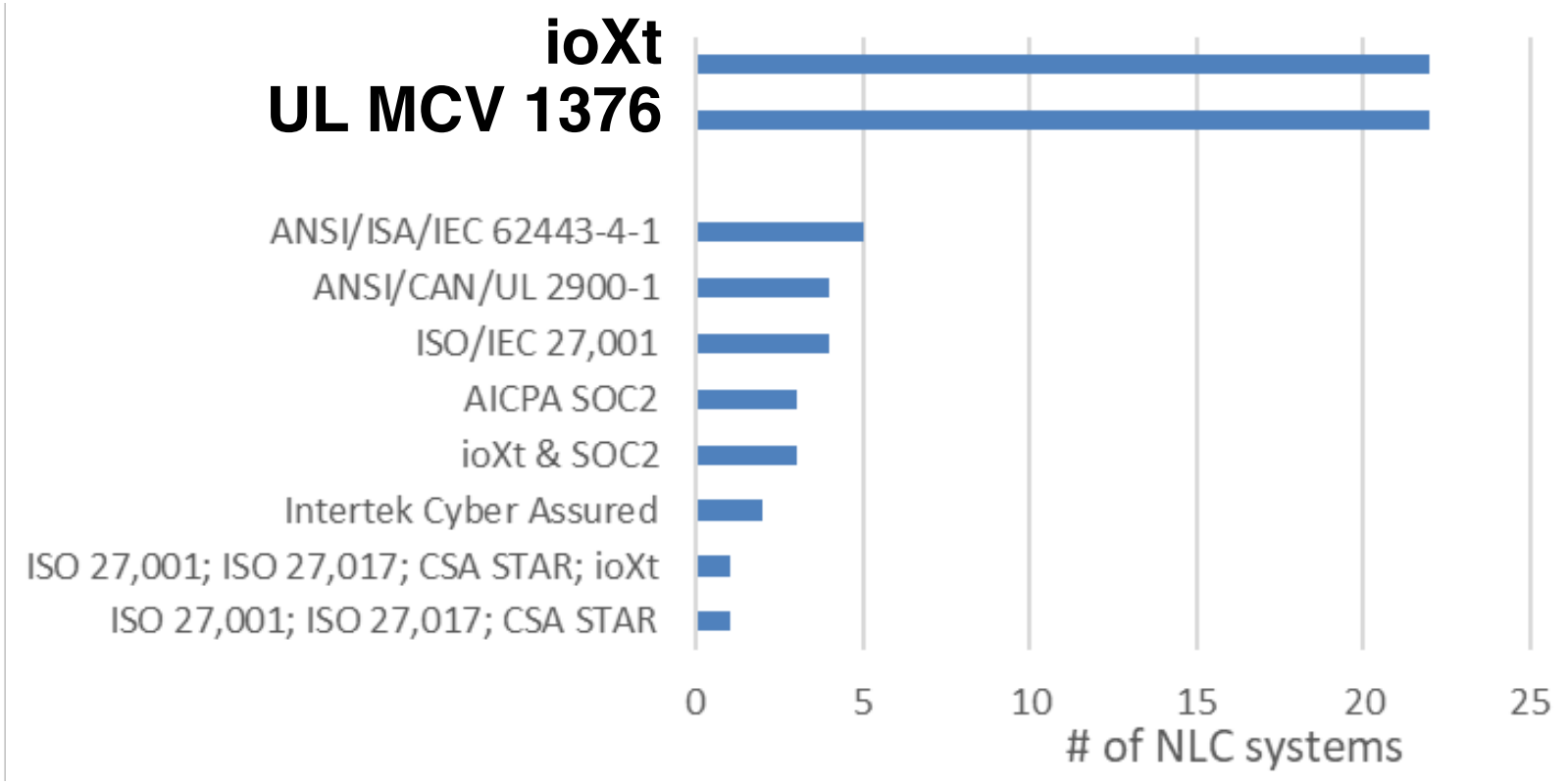
Certifications of Systems on the NLC QPL



Popular

Less Popular

Why so many certifications?

ANSI/ISA/IEC 62443

ANSI/ISA/IEC 62443

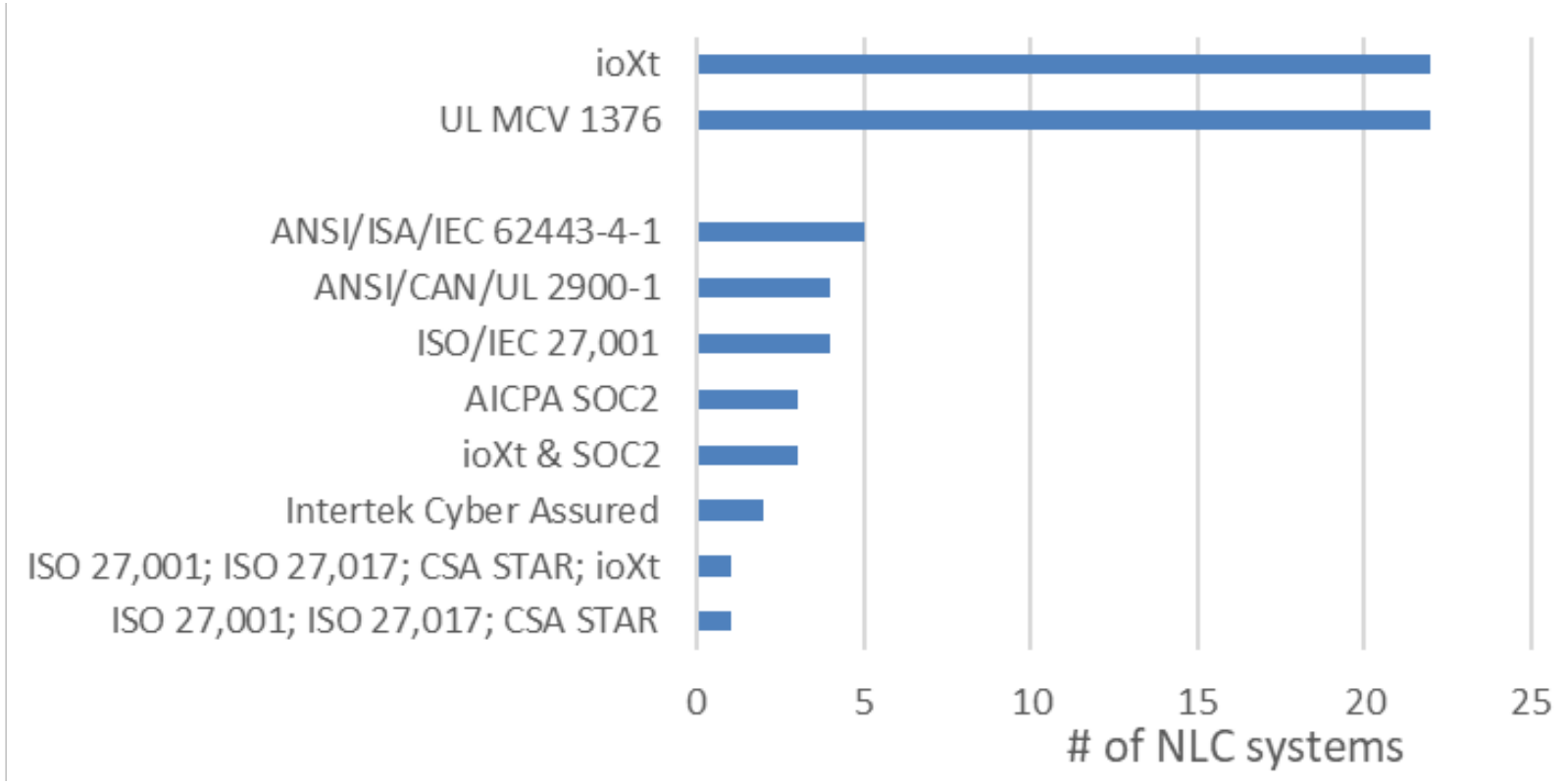
www.ISA.org

www.IEC.ch

www.ANSI.org

ANSI/CAN/UL 2900-1

Certifications of Systems on the NLC QPL



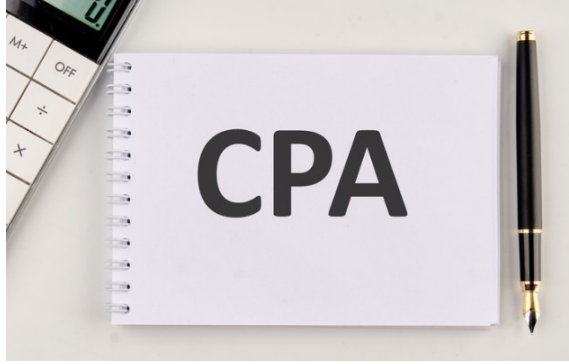
Less Popular

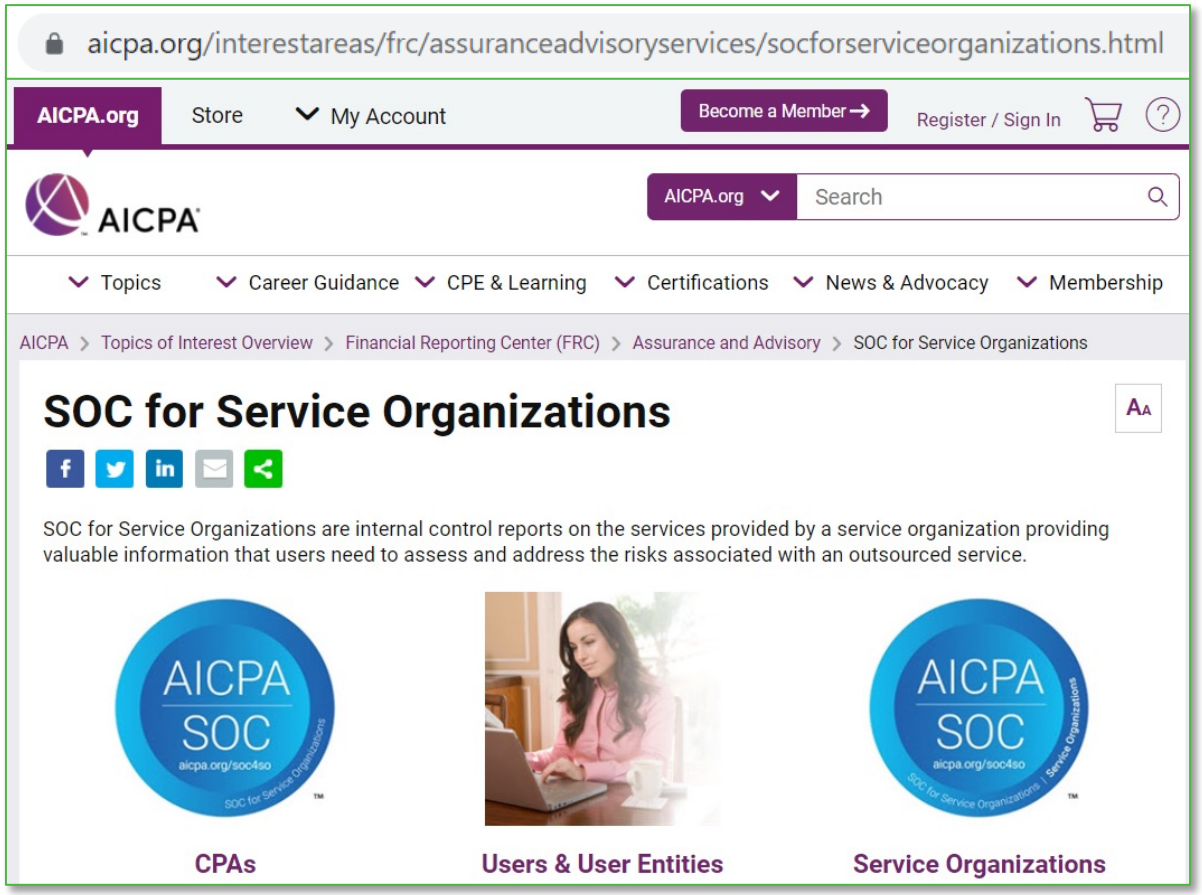
betterbricks/

ISO/IEC 27001
for Information Security Management Systems

https://www.iso.org/isoiec-27001-information-security.html

AICPA SOC 2





https://www.aicpa.org/interestareas/frc/assuranceadvisoryservices/socforserviceorganizations.html

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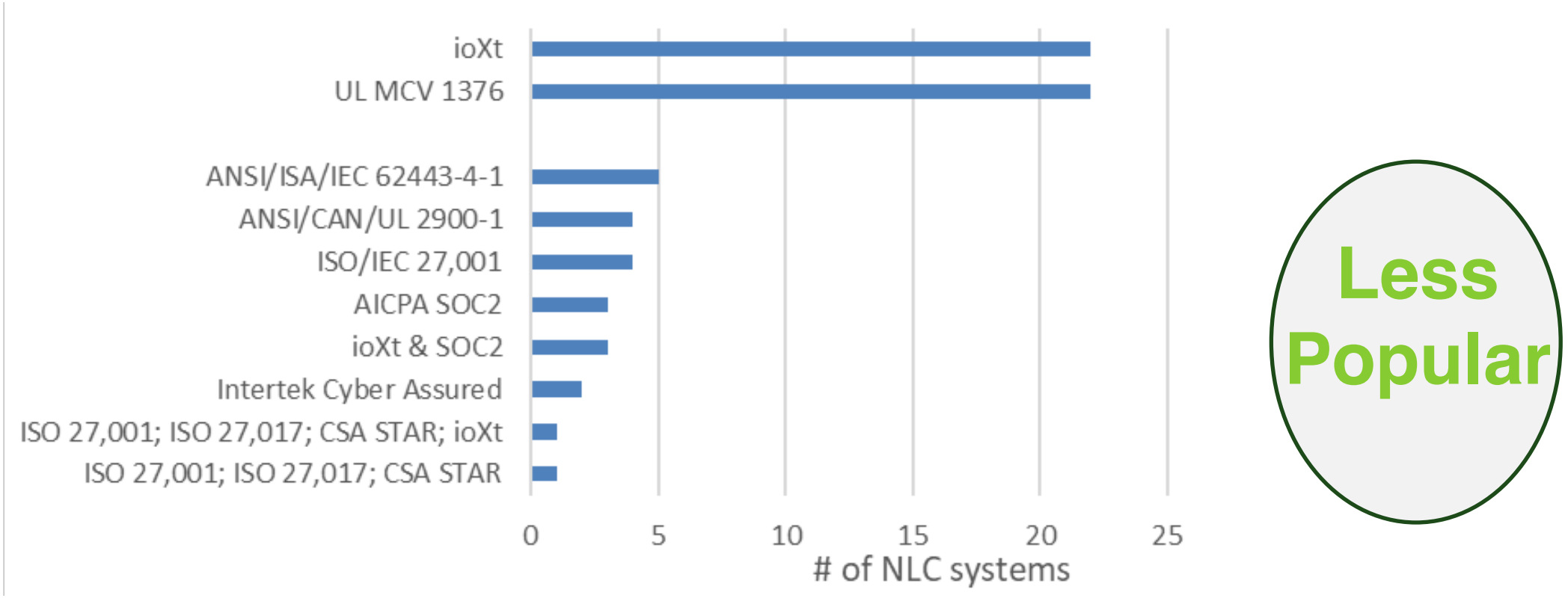


Less Popular

Intertek Cyber Assured

WHY DID INTERTEK DEVELOP CYBER ASSURED?

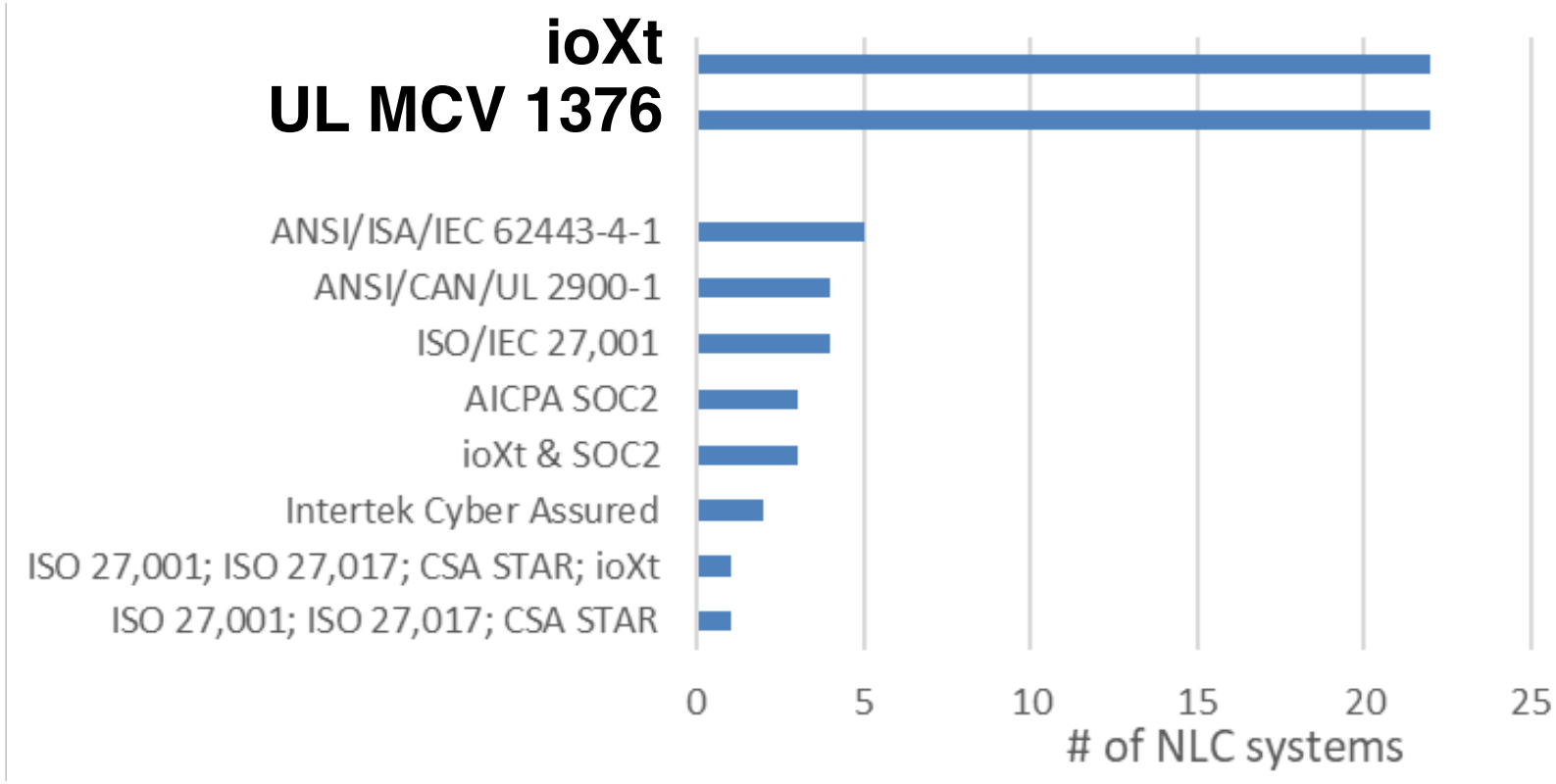
- Cyber Assured developed from the ground up specifically for consumer IoT products
  - Security requirements for Medical or Industrial Control devices do not always translate to a light bulb or a smart plug.
- Cyber Assured provides reasonable security that is appropriate for relatively low cost consumer products.
- Cyber Assured incorporates end-to-end security, includes:
  - The IoT Device
  - Mobile App
  - Cloud Service

INTERTEK CYBER ASSURED

CSA STAR™
Cloud Security Alliance Security, Trust and Assurance Registry

https://cloudsecurityalliance.org/star/registry/

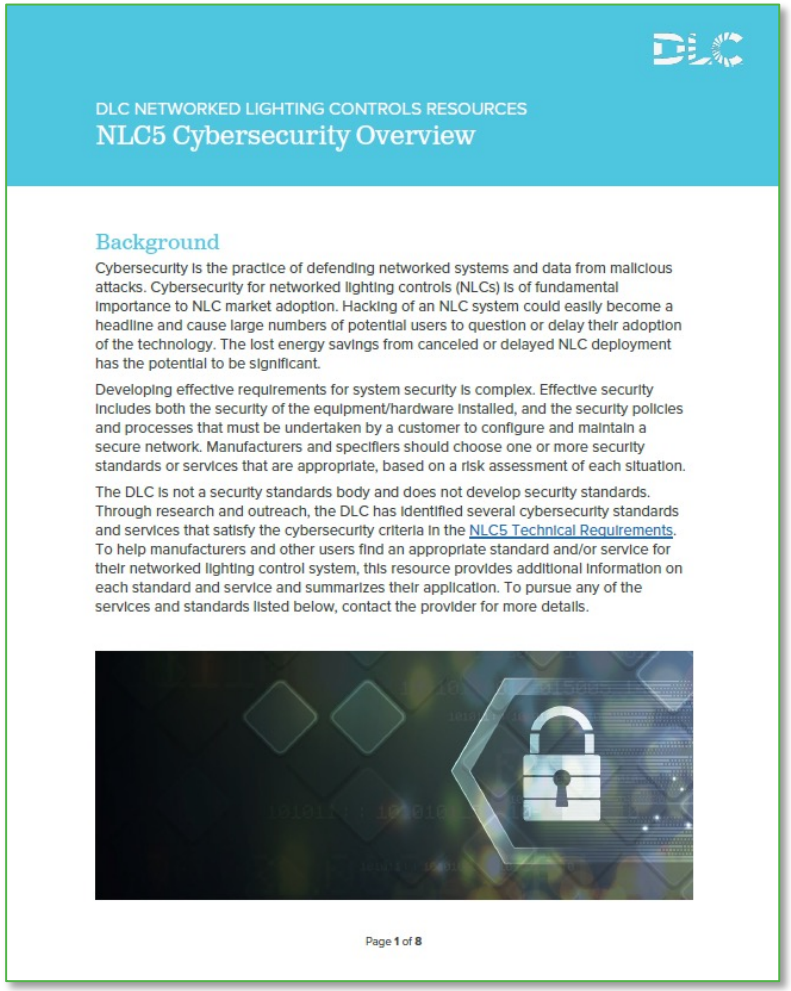
Certifications of Systems on the NLC QPL



Popular

For More Details

https://www.designlights.org/news-events/events/webinar-whats-next-for-cybersecurity-at-the-dlc/



https://www.designlights.org/dlc-report/nlc5-cybersecurity-overview/

Resources

Resources

- DLC Cybersecurity Standards Guide
- Lighting Controls Association – 8 Tips for Lighting Cybersecurity
- BetterBricks.com – Wireless Guides & Sequence of Operations

Questions

Thank You!

Levin Nock – Design Lights Consortium

Maurice Karagiorgos – Lutron Electronics

Additional information provided by:
Acuity
Avi-On Lighting
Cooper Lighting
Fernhill Shopworks
Illuminating Engineering Society
Lighting Controls Association
RAB Lighting

betterbricks/

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