

THE INTERNET OF THINGS

How Our Lives Are Being Impacted By
All Of These “Connected Devices”

*By Bob Primak, for the Lexington Technology
Users Group, June 6, 2018: Dec. 2018 update.*

**(My BNUG presentation begins at this point in
this document.)**

Part A: Important Concepts:

Image 001 (automated home diagram)

<http://whyguernsey.com/smart-home-design-plans.html/smart-home-design-plans-delectable-room-some-smart-home-design-plans-full-size-of-uncategorized-designs-in-elegant-house-floors>

Internet of Things definition:

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, collecting and sharing data. Thanks to cheap processors and wireless networks, it's possible to turn anything, from a pill to an aeroplane, into part of the IoT.

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This adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate without a human being involved, and merging the digital and physical worlds.

<https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/>

What is cloud computing?

A beginner's guide

<https://azure.microsoft.com/en-us/overview/what-is-cloud-computing/>

(Told from the perspective of Microsoft's Azure Cloud Platform, which is an example of a Public cloud.)

(use Link) (Image 002)

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Illustration: Cloud Computing

[https://circuitdigest.com/sites/default/files/field/
image/Internet-of-Things-examples.gif](https://circuitdigest.com/sites/default/files/field/image/Internet-of-Things-examples.gif)

Image 002 (Cloud Computing)
(URL above)

"There are three different ways to deploy cloud computing resources: public cloud, private cloud, and hybrid cloud."

"How cloud computing works"

"Cloud computing services all work a little differently, depending on the provider. But many provide a friendly, browser-based dashboard that makes it easier for IT professionals and developers to order resources and manage their accounts."

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Some cloud computing services are also designed to work with REST APIs and a command-line interface (CLI), giving developers multiple options."

Real-Time Processing -- What Is Edge Computing?

Image 003 (Edge Computing) (URL below)

Not Ready for Cloud Computing Yet? Buckle Up for Edge Computing

<https://www.maketecheasier.com/buckle-up-for-edge-computing/>

(Use Link and read entire article if time permits.)

(Stay on Image 003)

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Illustration: Edge Computing

<https://www.windowscentral.com/sites/wpcentral.com/files/styles/xlarge/public/field/image/2018/05/intelligent-edge-microsoft-press.jpg?itok=Lat6fF6>

Players Being Rearranged

Microsoft has Alexa Apps in its Windows 10 Store. Microsoft (briefly) showcased Amazon products (Echo and Dot) in its online Store.

<https://www.windowscentral.com/amazons-alexa-app-now-available-microsoft-store-windows-10>

<https://www.engadget.com/2018/11/18/microsoft-sells-amazon-echo-in-stores/>

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Image 004 (Alexa App in MS Store)

[https://www.microsoft.com/en-us/p/alexa/
9n12z3cctcnz?activetab=pivot:overviewtab](https://www.microsoft.com/en-us/p/alexa/9n12z3cctcnz?activetab=pivot:overviewtab)

Apple has abandoned their long-time networking protocols in favor of the Apple Home Automation Hub. This is not a dedicated device, but leverages AppleTV or an iPad or iPhone.

[https://appleinsider.com/articles/17/08/08/how-to-
automate-your-home-with-apples-homekit-with-or-
without-an-ipad-or-apple-tv](https://appleinsider.com/articles/17/08/08/how-to-automate-your-home-with-apples-homekit-with-or-without-an-ipad-or-apple-tv)

Image 005 (Apple HomeKit Logo)

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<https://appleinsider.com/articles/15/06/03/apple-homekit-guide-details-setup-and-use-remote-access-via-apple-tv>

Image 006 (Apple HomeKit Hub Possibilities)

There is not a single, dedicated hub device with Apple.

Apple Siri AI and huge App Store. IOS replacing MacOS?

<https://support.apple.com/en-us/HT207057>

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Facebook Portal – Leverages Amazon’s Alexa AI.

<https://www.pcmag.com/review/365137/facebook-portal>

Image 007 (Facebook Portal Plus)

<https://www.androidcentral.com/facebook-portal-vs-facebook-portal-plus-whats-difference>

Note that the tech press has been very unwelcoming of anything like this due to Facebook’s recent privacy scandals.

Amazon Echo and Dot Featuring Alexa AI.
Amazon has their own software framework for Home Automation “skills”.

Image 008 (Amazon Echo)

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<https://thewirecutter.com/reviews/what-is-alexa-what-is-the-amazon-echo-and-should-you-get-one/>

Google Home and its Digital Assistant (AI). Apps, but unclear what the future of Android, ChromeOS or the mysterious Fuchsia OS will be.

Image 009 (Google Home Hub)

<https://arstechnica.com/gadgets/2018/10/google-home-hub-review-a-minimum-viable-product-with-potential/>

ISPs like Comcast and AT&T/Time-Warner are moving away from DVRs to streaming services. This allows them to replace modems and routers with Home Automation Hubs and wireless modems.

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<https://www.engadget.com/2018/01/10/comcast-xfinity-home-automatino-controls-for-internet-customers/>

Image 010 (Xfinity Modem and Home Automation Hub)

https://medium.com/@petershimming_74122/xfinity-smart-home-hub-and-gateway-ces-2018-adcd95bcebde

This means 5G wireless modems, with no wired connections between the nearest 5G neighborhood node and your equipment. No technicians enter your home, and no physical setup is required.

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It may also mean no need for the type of franchise agreements which currently limit your selection of local providers. Only the common “boxes” on utility poles would need to be leased from other utility companies and permitted.

Image 011 (5g Equipment in the Field)

<https://www.nytimes.com/2018/03/02/technology/5g-cellular-service.html>

No matter what certain network operators say, in the US at this time, there are only very limited and highly experimental 5G networks available. And only in a few cities. No 5G hardware yet.

<https://www.pcmag.com/news/364647/at-t-reveals-5g-hotspot-launching-soon>

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Concept: 5G wireless communications

Image 012 (5g without Content)

(This is not an article I’m recommending – it’s just
the source of this image.)

[https://www.electronics-notes.com/articles/
connectivity/5g-mobile-wireless-cellular/
technology-basics.php](https://www.electronics-notes.com/articles/connectivity/5g-mobile-wireless-cellular/technology-basics.php)

What 5G is and what it is not:

(PC Mag article, above)

From time to time, cell phone carriers announce
“5G networks”. Until very recently, none of these
had the characteristics of real 5G communications.

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In 2019, Samsung and others will begin releasing true 5g hotspots, modems (“radios”) and cell phones. Prices and specs have not yet been announced. Keep in mind, as yet, only 5 US cities have very limited 5g data networks in place.

AT&T is the leading ISP/phone company in this space so far.

How 5G Works (PC Mag ca. Fall 2018)

<https://www.pcmag.com/article/345387/what-is-5g>

Image 013 (How 5g works – waves and antennas)

<http://www.emfexplained.info/?ID=25916>

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Like other cellular networks, 5G networks use a system of cell sites that divide their territory into sectors and send encoded data through radio waves. Each cell site must be connected to a network backbone, whether through a wired or wireless backhaul connection.

5G networks will use a type of encoding called OFDM, which is similar to the encoding that 4G LTE uses. The air interface will be designed for much lower latency and greater flexibility than LTE, though.

5G networks need to be much smarter than previous systems, as they're juggling many more, smaller cells that can change size and shape. But even with existing macro cells, Qualcomm says 5G will be able to boost capacity by four times over

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current systems by leveraging wider bandwidths and advanced antenna technologies.

The goal is to have far higher speeds available, and far higher capacity per sector, at far lower latency than 4G. The standards bodies involved are aiming at 20Gbps speeds and 1ms latency, at which point very interesting things begin to happen.

Why 5G is bringing edge computing and automation front and center

<https://www.networkworld.com/article/3255426/lan-wan/why-5g-is-bringing-edge-computing-and-automation-front-and-center.html>

(Use Edge Computing illustration.)

Image 003 again.

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“The rise of 5G coincides with the explosion of connected devices and systems associated with the Internet of Things (IoT). Smart heating systems, wearables and [TV or video streaming in moving – *ed.*] vehicles all bring with them large amounts of data. In addition to more processing power, 5G promises speeds (at least) 10 times faster than those of 4G...”

“Processing these high volumes of data, at a faster speed, will require new antennas, new devices, and new applications for wireless data. No matter what the setup looks like, the influx of additional data - which will need to be processed in real-time - will drive the need for edge computing.”

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Real-time processing also needs to be done at a location close to where the data will come from and be used.

Networking has to change to keep up with the new 5G speed and need for Edge Processing.

One example:

Wi-Fi Alliance’s Wi-Fi EasyMesh certification aims to standardize mesh networks

<https://www.pcworld.com/article/3272469/wi-fi/wi-fi-alliances-wi-fi-easymesh-certification-aims-to-standardize-mesh-networks.html>

Image 014 (from this article)

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EasyMesh promises to bring to mesh networks the same interoperability assurances that conventional routers have long offered. If Linksys decides to make its Velop product line EasyMesh compatible, and Netgear does the same, for example, you’ll be able to use Netgear’s Orbi Outdoor access point with a Linksys Velop router.

That’s important, because to date, Netgear is the only manufacturer offering an outdoor mesh access point—but it only works with Netgear’s Orbi-series routers.

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A Little bit About Security and the IoT:

How to Secure Your (Easily Hackable) Smart Home

<https://www.tomsguide.com/us/secure-smart-home-how-to,news-19380.html>

This list is Image 015 (screenshot).

- Create two different Wi-Fi networks
- Firewall the network
- Install a unified threat management appliance (UTM)
- Install security software wherever possible
- Check manufacturers' websites for firmware updates (signed firmware updates vs. unsigned)

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**There's the hard way (manually or using a
security router)**

**[Other] How to secure IoT devices in home
network for a newb[ie]**

[https://www.dslreports.com/forum/r31652367-
Other-How-to-secure-IoT-devices-in-home-
network-for-a-newb](https://www.dslreports.com/forum/r31652367-Other-How-to-secure-IoT-devices-in-home-network-for-a-newb)

(Just reference this article.)

**and there's an easier way (buy a security
appliance):**

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Example of a device to protect IoT Things (Review):

These security appliances cost money and need
subscriptions to updating services.

Bitdefender Box 2

[https://www.pcmag.com/review/357433/
bitdefender-box-2](https://www.pcmag.com/review/357433/bitdefender-box-2)

Image 016 (BitDefender Box 2)

[https://mashable.com/article/bitdefender-box-2-
review/#.B.DO461jmqV](https://mashable.com/article/bitdefender-box-2-review/#.B.DO461jmqV)

(Again, the reference is for the illustration only, not
a recommended reading suggestion.)

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"The battle for the Internet of Things has just begun," [John] Maddison [of Fortinet] said. "The ultimate winners of the IoT connected home will come down to those vendors who can provide a balance of security and privacy vis-à-vis price and functionality."

More IoT security tips:

8 tips to secure those IoT devices

Make sure the Internet of Things isn't a route for hackers to get into your home or workplace

<https://www.csoonline.com/article/3085607/internet-of-things/8-tips-to-secure-those-iot-devices.html>

(Use the article and read from it.)

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Privacy and Home Assistants:

How to Make Sure Alexa, Google Home Don't Hear Too Much

<https://www.tomsguide.com/us/alexa-google-home-privacy,news-27038.html>

There is a Mute Button. Use it when you aren't asking for assistance or doing something else with your devices.

So, in the future:

Google Duplex:

**HOW GOOGLE'S EERIE ROBOT PHONE
CALLS HINT AT AI'S FUTURE**

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<https://www.wired.com/story/google-duplex-phone-calls-ai-future/>

(Just call up the article.)

This was a demo of a bot so realistic that people it called could not identify it as a robot.

GOOGLE’S SELFISH LEDGER IS AN UNSETTLING VISION OF SILICON VALLEY SOCIAL ENGINEERING

<https://www.theverge.com/2018/5/17/17344250/google-x-selfish-ledger-video-data-privacy>

(Reference this article and give a brief rundown on its contents.)

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“Black Mirror”

(<https://www.netflix.com/title/70264888>)

This is a Netflix streaming-only series which envisions a dystopian world in which one’s social media reputation and popularity scores determine everything you may and may not do, and your entire social status.

Given what China is reported to be doing with linking credit scoring and even “reeducation” sentences with social media scoring, this is not an impossible future.

Back to the Google “Selfish Ledger” Video:

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<https://www.theverge.com/2018/5/17/17344250/google-x-selfish-ledger-video-data-privacy>

(Reference this article and give a brief rundown on its contents.)

(In the Google video)

Foster (the author) envisions a future where “the notion of a goal-driven ledger becomes more palatable” and “suggestions may be converted not by the user but by the ledger itself.” This is where the “Black Mirror” undertones come to the fore, with the ledger actively seeking to fill gaps in its knowledge and even selecting data-harvesting products to buy that it thinks may appeal to the user. The example given in the video is a bathroom scale because the ledger doesn’t yet know how much its user weighs.

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The video then takes a further turn toward anxiety-inducing sci-fi, imagining that the ledger may become so astute as to propose and 3D-print its own designs. “Welcome home, Dave, I built you a scale.”

Foster’s vision of the ledger goes beyond a tool for self-improvement. The system would be able to “plug gaps in its knowledge and refine its model of human behavior” — not just your particular behavior or mine, but that of the entire human species. “By thinking of user data as multigenerational,” explains Foster, “it becomes possible for emerging users to benefit from the preceding generation’s behaviors and decisions.”

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Foster imagines mining the database of human behavior for patterns, “sequencing” it like the human genome, and making “increasingly accurate predictions about decisions and future behaviours.”

“As cycles of collection and comparison extend,” concludes Foster, “it may be possible to develop a species-level understanding of complex issues such as depression, health, and poverty.”

Questions? Ideas?

Discussion Time

*June 6, 2018 – By Bob Primak,
for Lexington Technology User Group*

(Amended for posting at the LTUG Yahoo Group)

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*(This version updated for a shorter talk for the
Boston Network Users Group (BNUG))*

(BNUG Talk scheduled for Dec. 4, 2018.)

– Bob Primak –

– Dec. 03, 2018 (last revision) –
(More revisions pending if time allows.)

*(Further revised to put in most of the illustrations
used. Revised Dec. 03, 2018, evening, by Bob
Primak.)*