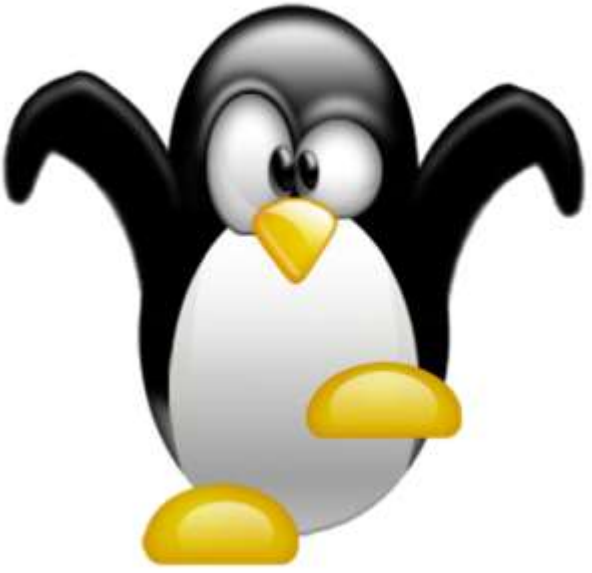
Linux and The network

Jesse Brandeburg

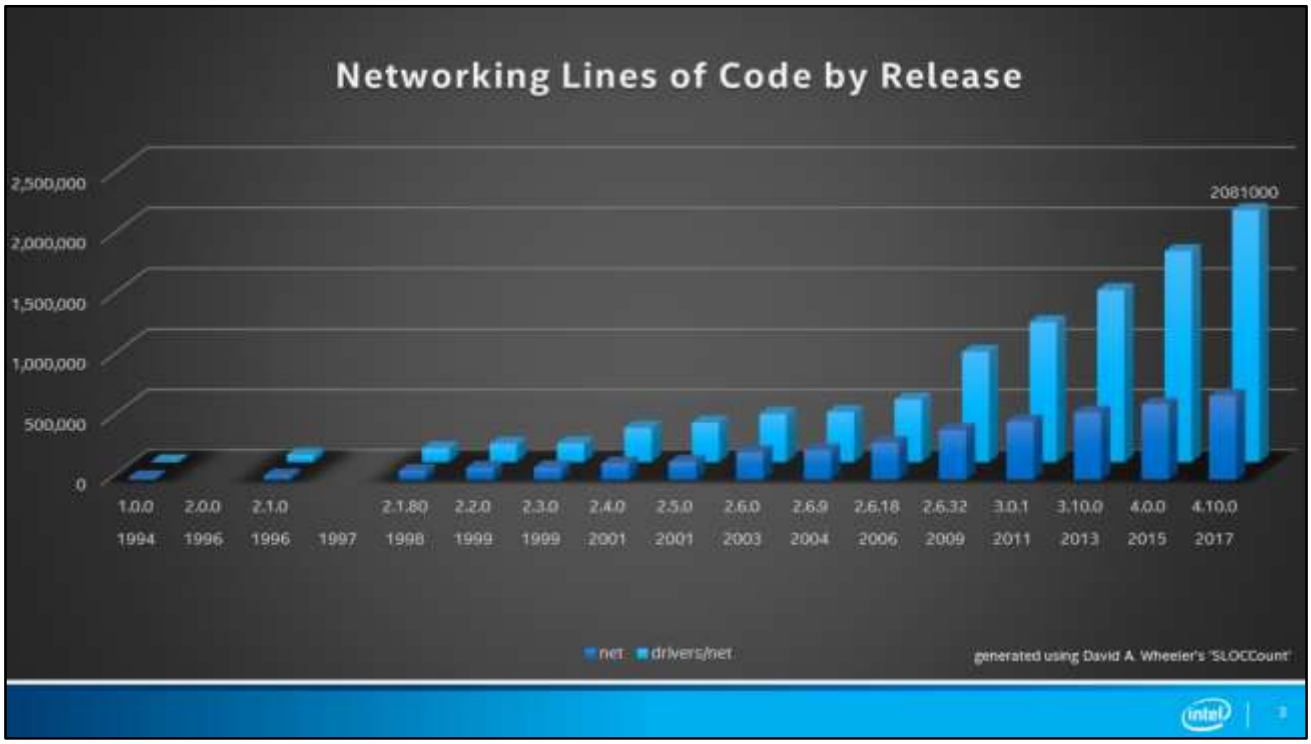


Tux art by fragmeister from Deviant Art

Tux art by fragmeister from Deviant Art (http://fragmeister.deviantart.com/art/Tux-Ninja-33099774) Copyright 2006-2017 fragmeister

Linux is making the infrastructure hum

Most of the time users never know or see it



Where have we been?

1994: Linux 1.0 – 10 network drivers, 250-1300 lines each, 10k LoC. 22k in net/*

Net core code is growing

Drivers/net driver code is growing much faster, majority wireless and ethernet

2009 was where first Intel SR-IOV was introduced

Maybe we can slow down growth of drivers/net by adding more common code?

=======

LoC numbers generated using David A. Wheeler's 'SLOCCount'.

Remember when we had only 1 network port on most devices?

Wish List: would like to see growth by vendor over time

September, 1992: net-1 code released, the first Linux networking code, net news is FUN.

1994: Linux 1.0 – 10 Ethernet drivers, 250-1300 lines each, 10k LoC. 22k in net/*

1994 internet networking? 28.8kbaud modems! Token Ring! ISA cards with

jumpers!

1995: 10Mb Ethernet is *hot*, Choose from Twisted Pair, AUI, or BNC connectors. Plug’n’Play! 56K Modems!

1996: Linux 2.0: drivers/net: 62k LoC, net: 34k LoC

1997: ADSL! Wondershaper, 100Mb PCI NIC cards.

Linux 2.1.0: net: 34k LoC, drivers/net: 64k LoC

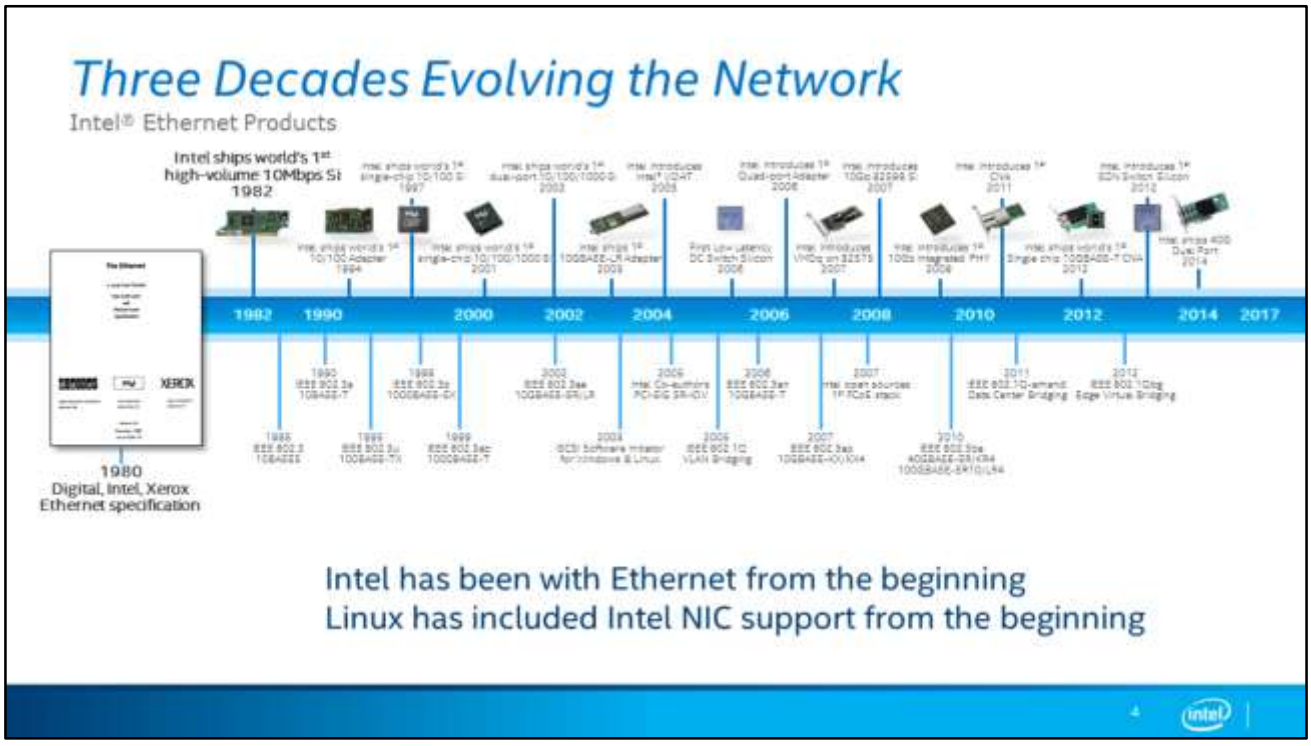
Linux 2.2.0: net: 99k LoC, drivers/net: 152k LoC

Linux 2.3.0: net: 102k LoC, drivers/net: 156k LoC

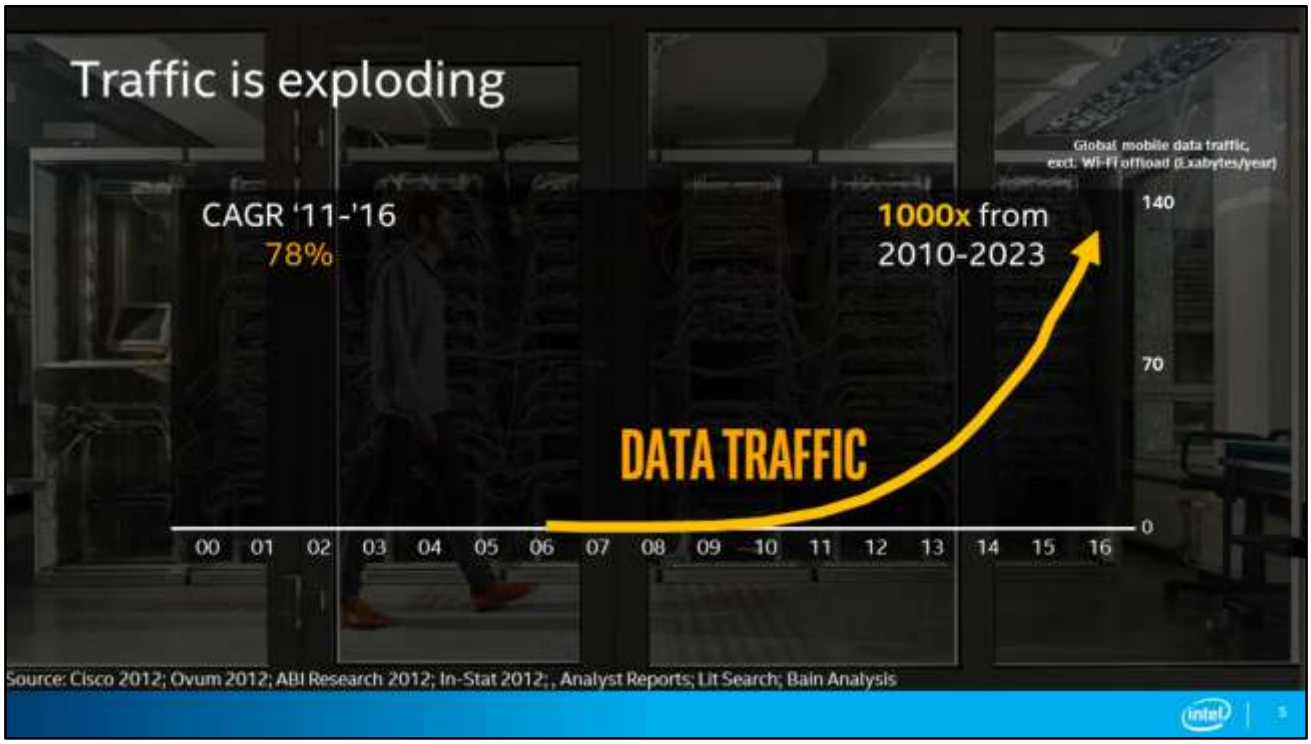
Linux 2.4.0: …

Linux 2.5.0:

Linux 2.6.0:



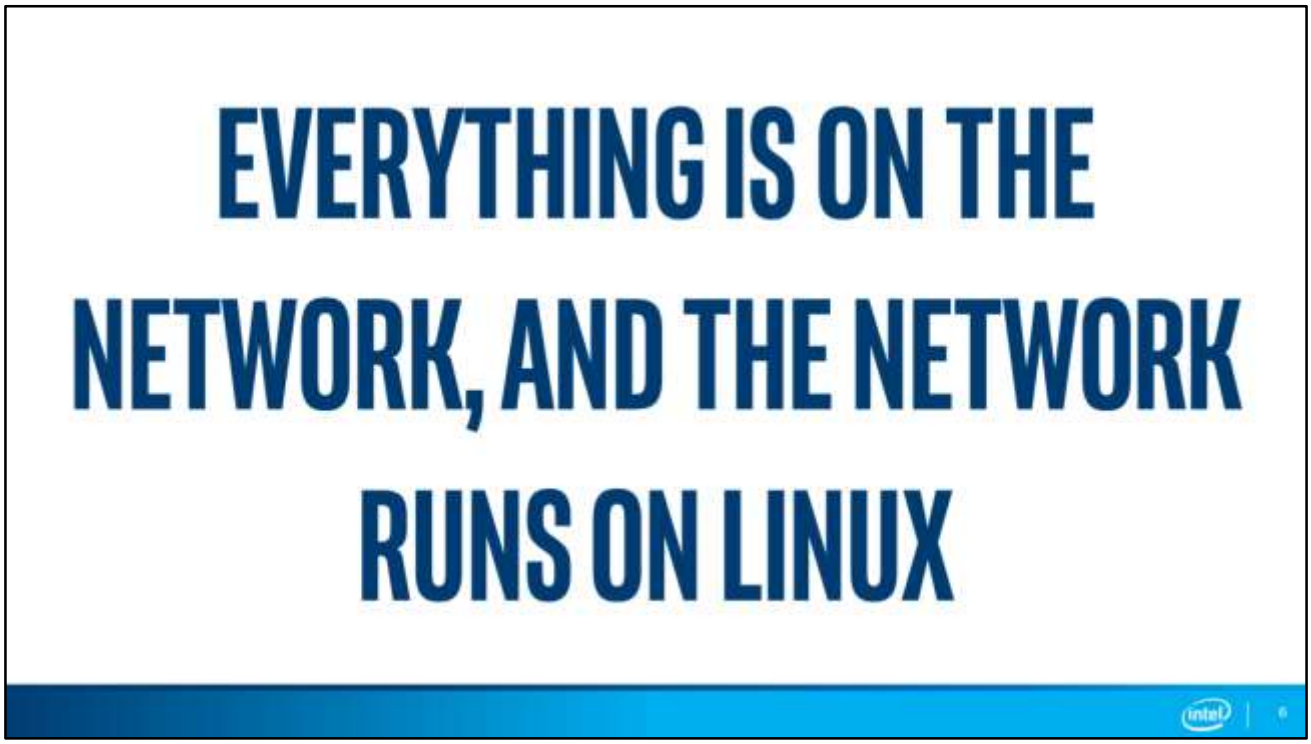
Intel has been around Ethernet since the beginning



Data growth coming is massive (1000x)

Network has to carry and deliver all this data

Leading to…

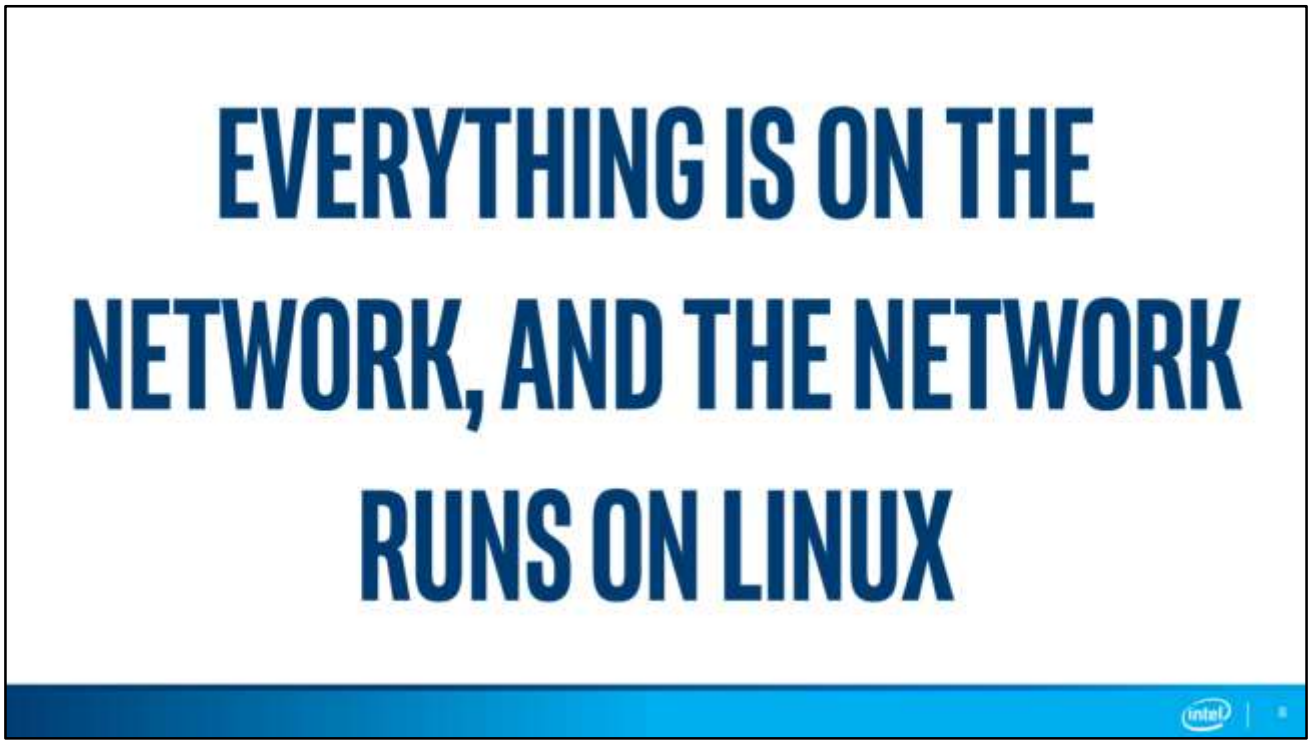

EVERYTHING IS ON THE
NETWORK, AND THE NETWORK
RUNS ON LINUX
intel

The Linux kernel and network stack is present now in all of these locations, we all gain from having Linux in more places in this picture

For instance, BBR is more deployed by having Linux everywhere

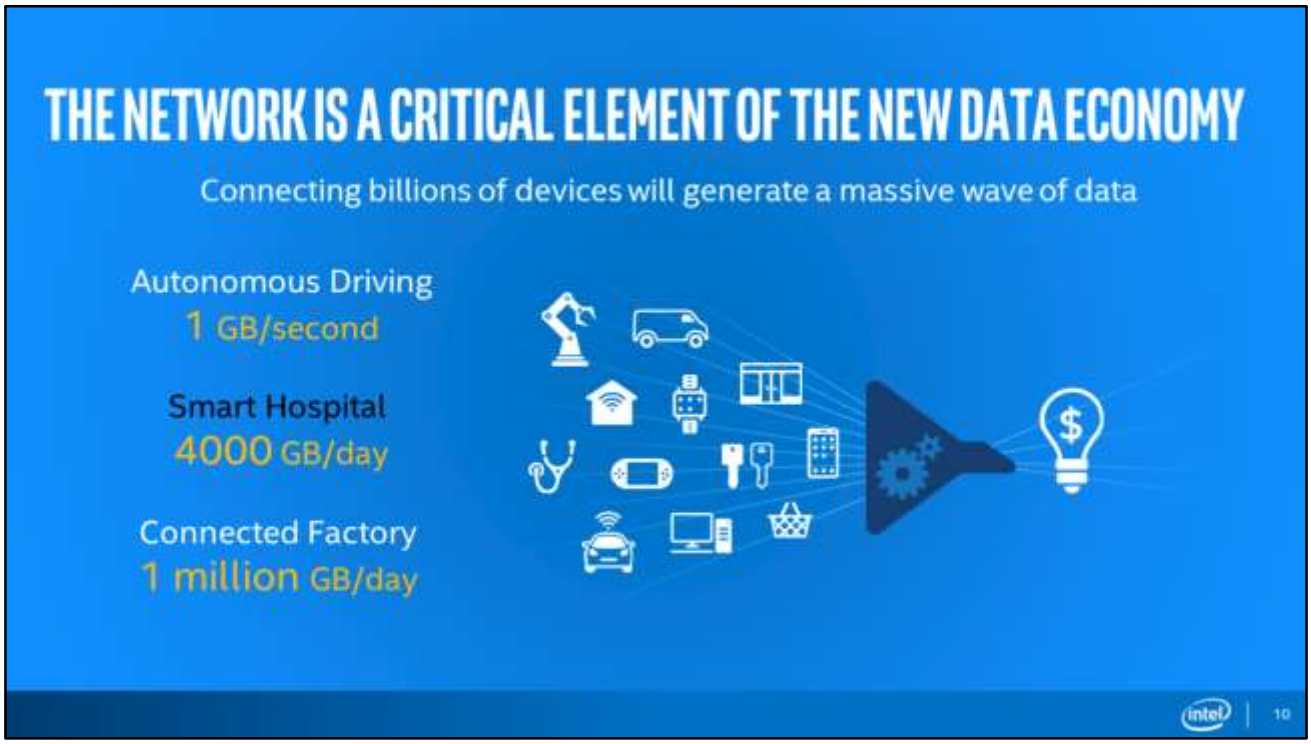
Wireless is ever more present

High speed connections are moving out to the Base Station and further with 5G, meaning more data arriving at the DC



Say it with me now!

More and more devices and 'things' are becoming connected every day – it will have a massive impact on our world. How will we accommodate this influx?



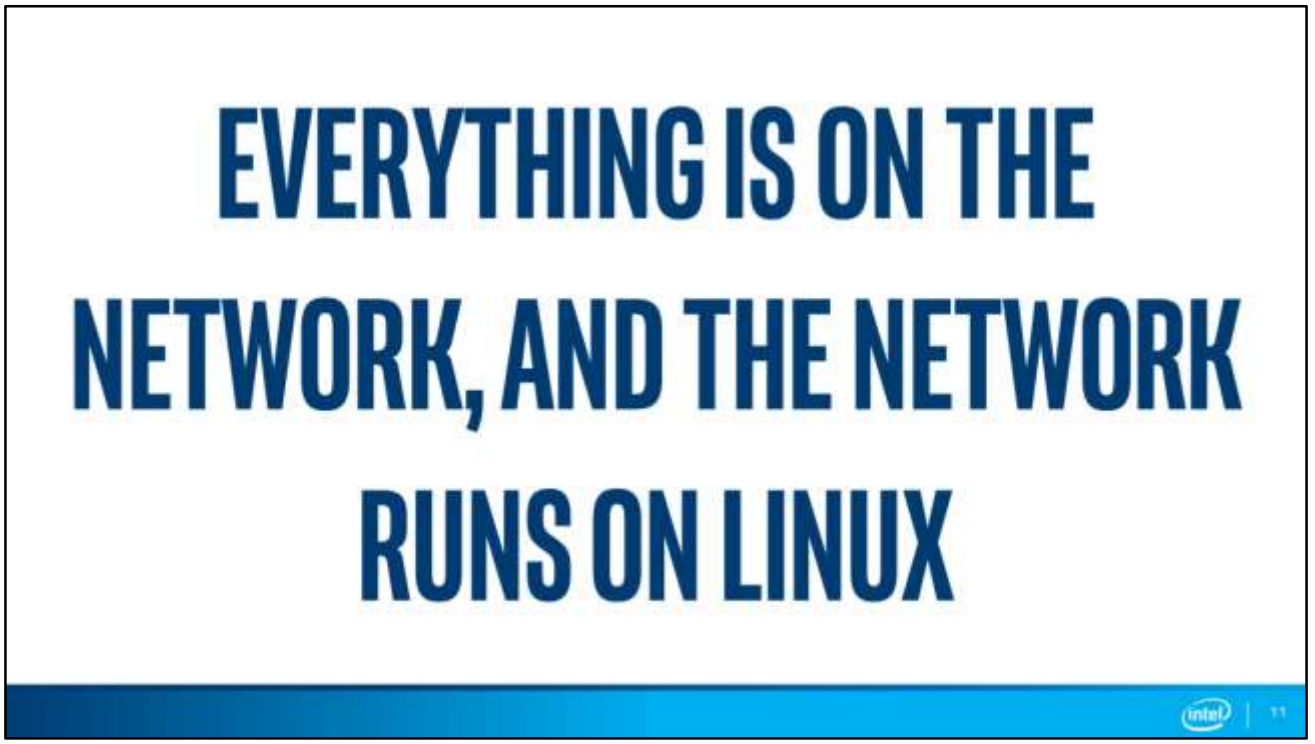
Here are some examples of what the flood of data actually means

All this data has to be stored, and it has to be transported

Big changes in efficiencies, revenue opportunities, and agile decision-making are coming to existing business models for service providers, enterprises, and consumers.

Service providers and their networks will see massive increases in the volume of data, simultaneously requiring a new, streamlined architectures to cope with the scale and speeds, but generating opportunities for new revenue stream.

The insights 5G hopes to deliver represent the opportunity for enterprises to re-invent their businesses. But in order to do so, the will need new cloud-based architectures to cope with said volume, as well as the machine learning to extract value from said data.


EVERYTHING IS ON THE
NETWORK, AND THE NETWORK
RUNS ON LINUX
intel
11

So, what's going to happen?

Everything in the network is going to be grown in Scale and Scope

Many of today's technologies weren't designed to handle the massive scale of all these new connections. We need to design in new requirements for our wireless technologies and core network capabilities that accommodate new deployment models.

This guy is having a really good time!

All enabled by the network!

Since most new growth is cloud based or cloud connected,

At the same time, the Visual Cloud grows every day demanding more and more bandwidth.

To keep up with high bandwidth usages like streaming video, real-time broadcasting, and VR, networks need more speed and capacity.

Like Tom's IoT talk said

Low latency requirements of new usage models will push the network to perform

5G especially will enable low latency and higher throughput for all sorts of applications.

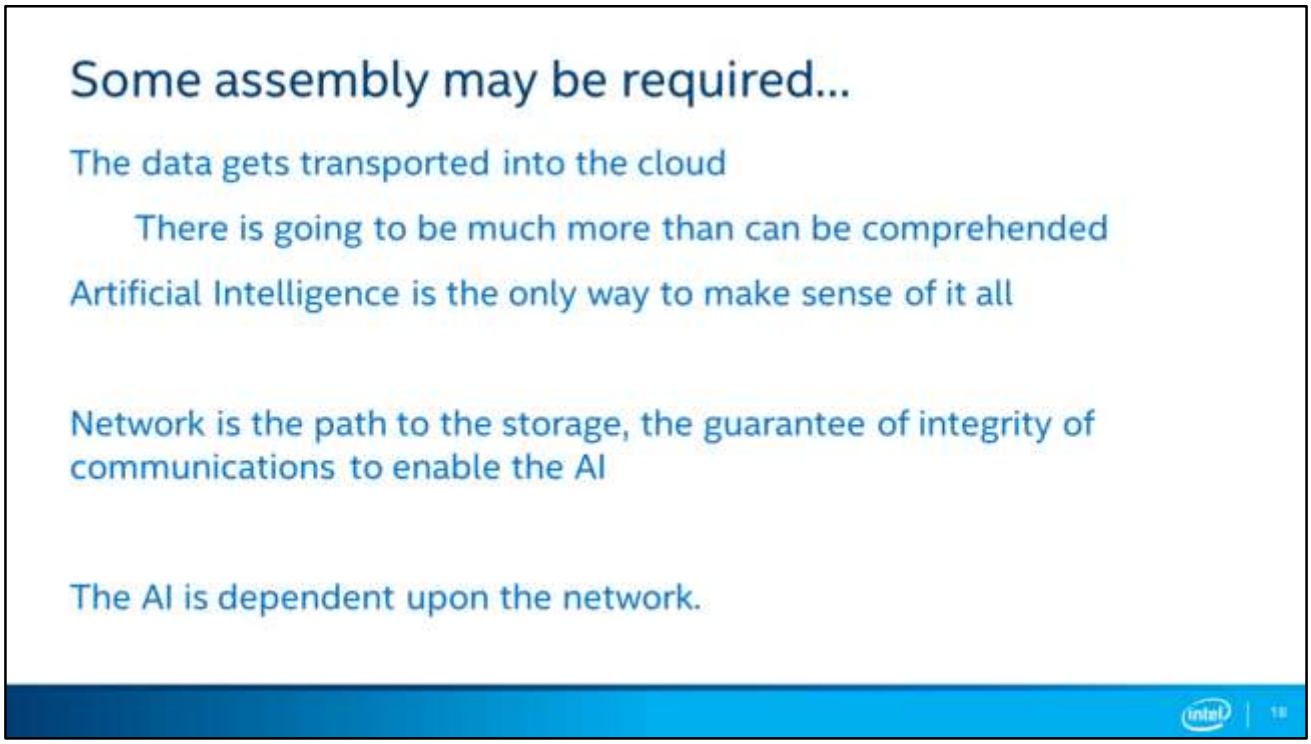
Thingy's need security in their design, and in the communication

The Linux Kernel Network stack is the best place to do truly secure communications

Many of these devices may be running a linux implementation.

Hardware offload of crypto operations is a requirement

It’s required%



There is no way to store all this data on an internet “thing”

Guess where the AI lives?

The AI is dependent upon the network

This is one example of how All the Bits come together

How many parts do you think might be running Linux? A: All of them…

Many companies believe we will have some level 5 (fully autonomous) by 2020, with many limited scope autonomous cars starting in 2018

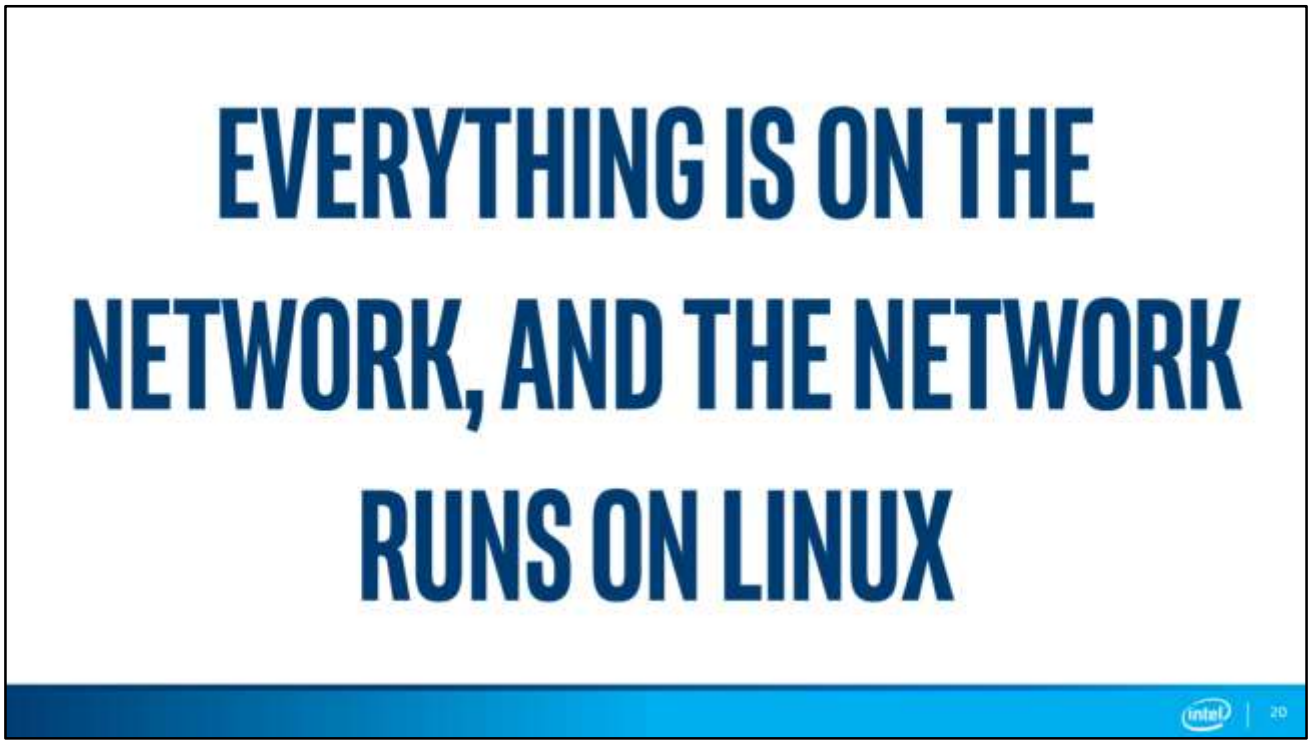
Cloud: Powerful analytics required to make sense of massive data from moving vehicles

Core Network: A virtualized, flexible network can isolate vehicle data in a ‘slice’ separating it from other types of traffic

Access: Cloud computing at the mobile edge closer to vehicles lowering latency

Wireless: New 5G radios will support ‘vehicle to vehicle’ and ‘vehicle to everything’ connectivity designed to support automated driving scenarios

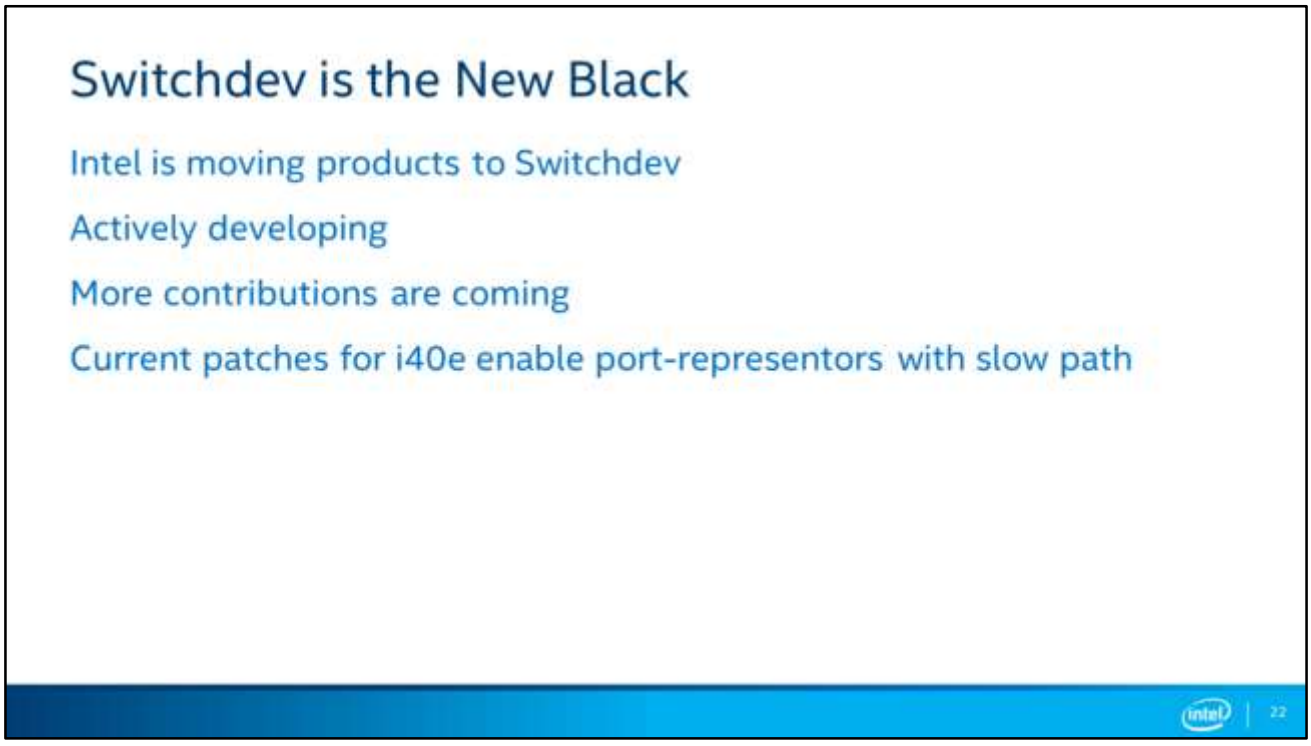
Smart: Vehicles will have intelligence to manage internal systems and connect to cloud



Remember when your car is driving you down the road, how much Linux contributes to the networked world.

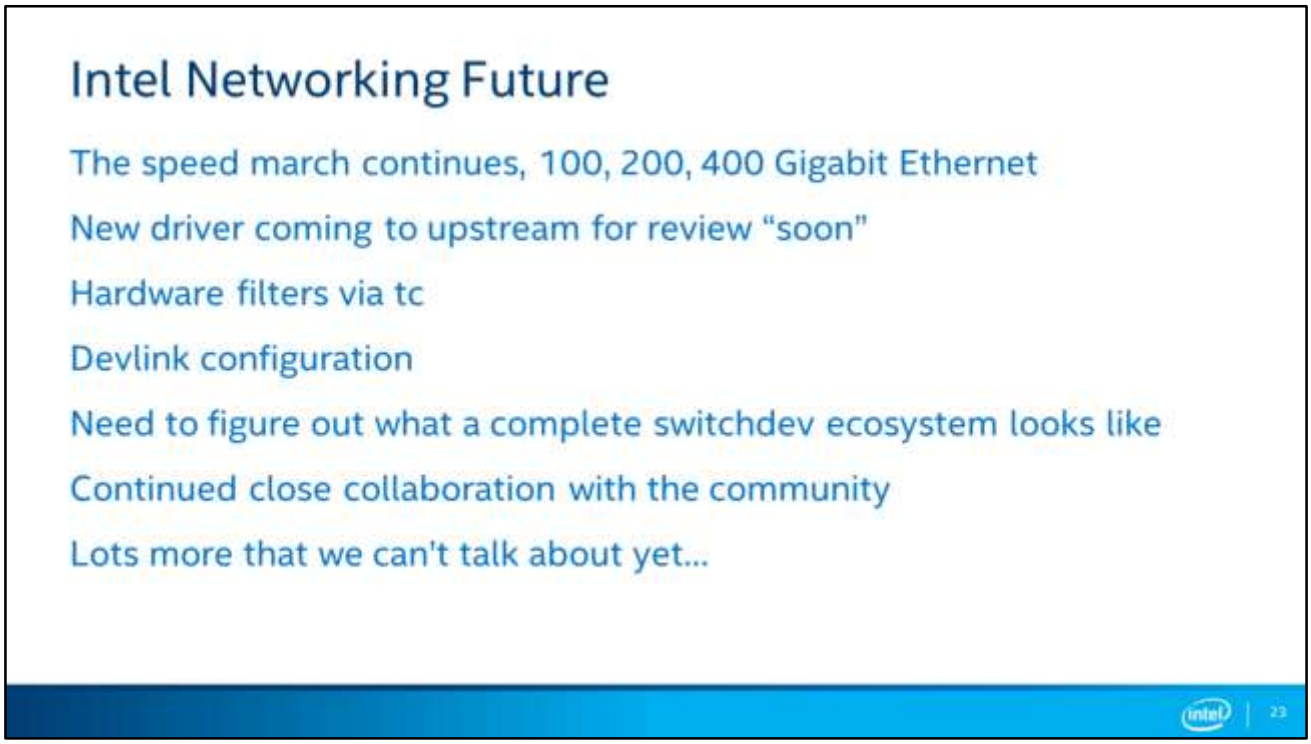
WHAT'S IN STORE

Intel-next



NIC and Switch products (particularly ones with Network Virtualization support) are moving to switchdev

We believe switchdev is the right path



New speeds

Hardware features we will expose through tc for our switch like products

Tc is our way forward to connect our hardware classifiers to the kernel

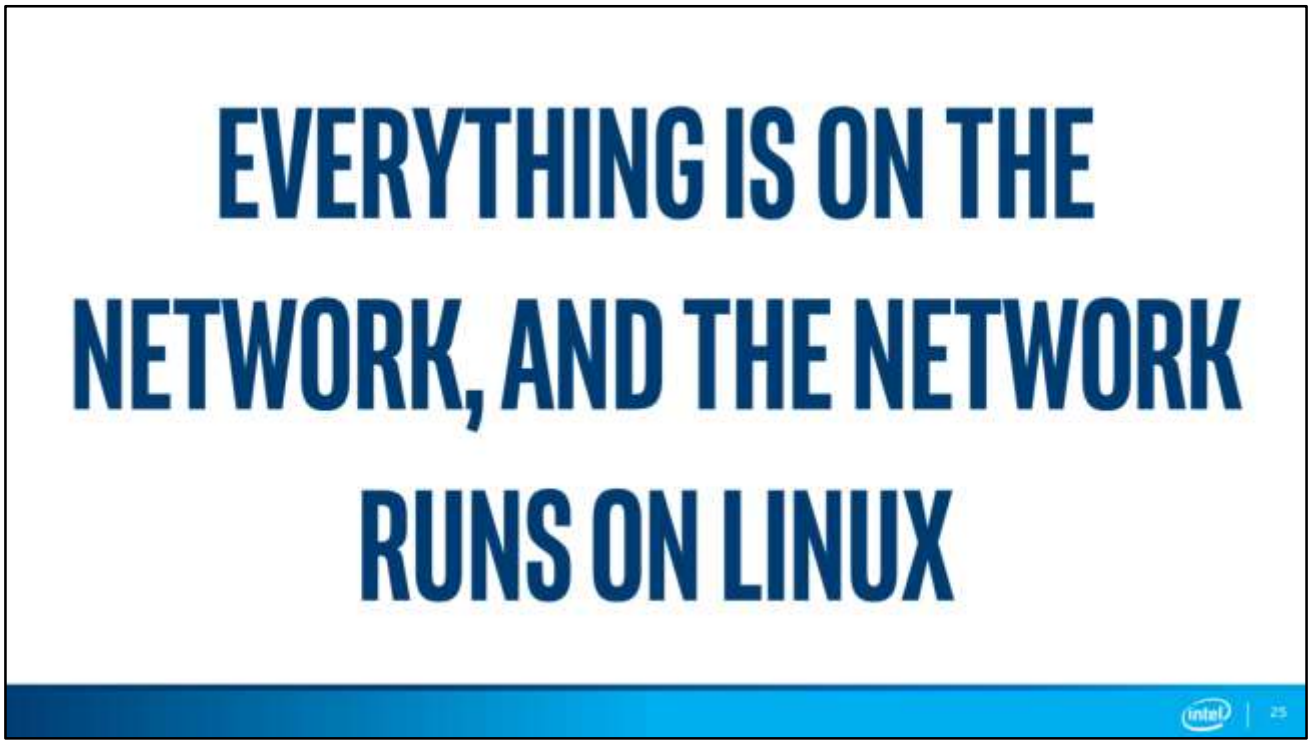
Intel sees the benefit of Open Source components

Linux networking enables us to serve our customers better

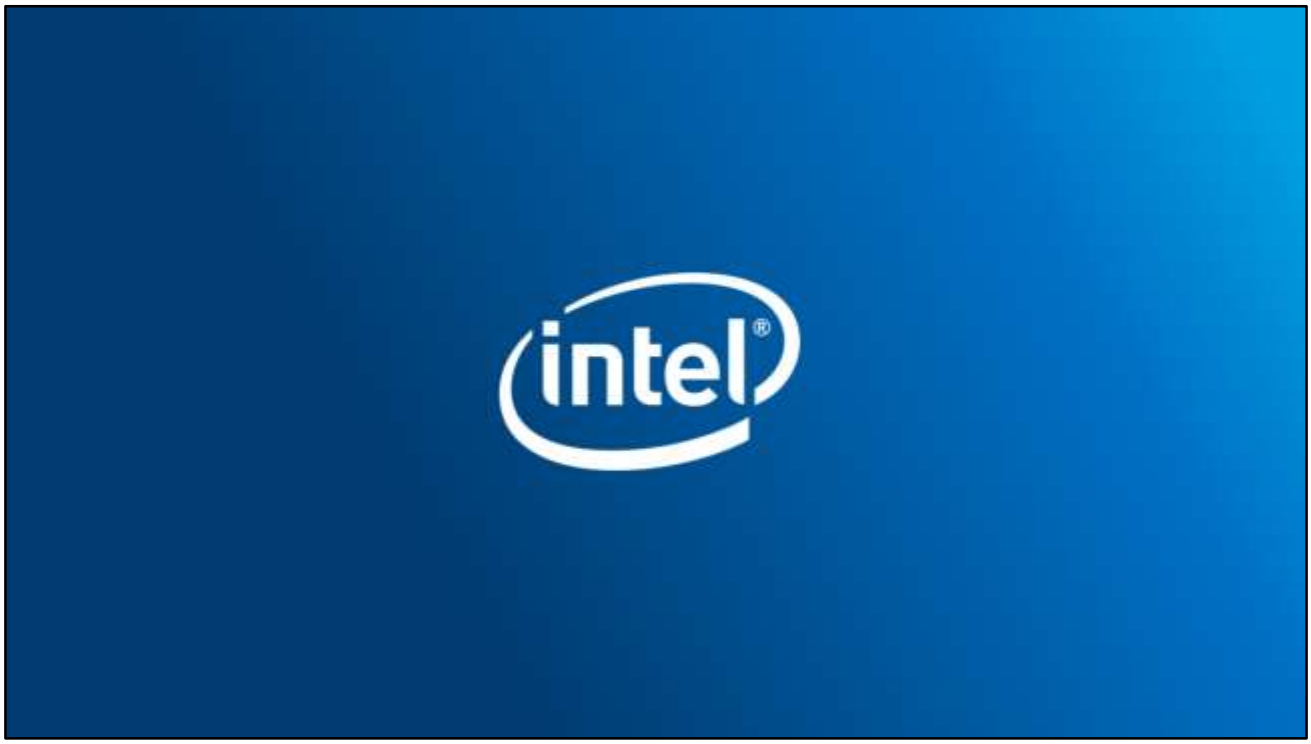
Let's work together to make Linux the best choice for networking

The Benefits of a Strong Ecosystem in the Industry

Intel works closely with other companies to build a strong ecosystem. Cooperating across competitive lines and building up the entire ecosystem sparks innovation, reduces development effort for everyone, advances open networking standards, increases interoperability, and ultimately, reduces time to market for network vendors.


EVERYTHING IS ON THE
NETWORK, AND THE NETWORK
RUNS ON LINUX
intel
25

Remember!


intel