Learn to Code (securely). Now.

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Topics for this talk:

- A coder is the modern day blacksmith (and why is that important?)
- In the Age of the Empire
- Control (OAM) separation from Data (bearer) – at every level
- The Future
  - iPhone's battle with FBI
  - Cloud and OpenStack
  - SDN
  - Secure coding
  - IoT
  - Networks – 4G, 5G and more
- Ethical justification of what you do: Talk among friends and others

The modern blacksmith?

- There is a blacksmith forge in Waltham – Carl West at Prospect Hill Forge will teach you to make a useful tool from a piece of steel.
  - Carl makes the point that blacksmiths were a prime **contributor to the flourishing of human civilization: because they made real the tools** (knives and swords, scythes, hammers, horseshoes, belt buckles, hooks, latches, chains, …) **that allowed people to be productive**
- Paul Ford article @ Bloomberg "What is Code?" http://www.bloomberg.com/graphics/2015-paul-ford-what-is-code/
- **Coders create the new tools** that will be used to make civilization flourish.
- Lousy blacksmiths make poor quality tools that break easily. Good ones create durable tools that work well for years.

Start with piece of stock steel material:

- Heat
- Apply Hammer
- Make ends pointy
- Curl the tip
- Shape as desired
- Decorate with twist in the center

Where and how will we use these tools?

- Cloud and virtualization
  - Software Defined Everything (SDx)
    - “instant gratification” == “customer satisfaction” == “user experience”
    - (almost) instantaneous deployment
    - (almost) instantaneous (massive) scaling from 10 to a thousand to a million
  - Services MUST be crafted to be secure (not easily breakable)
    - OWASP: Open Web Application Security Project (Jim Weiler, ISSA NE member) https://www.owasp.org/index.php/Boston
    - Rugged Code: https://www.ruggedsoftware.org/ (see the Manifesto)

The Rugged Manifesto

I am rugged and, more importantly, my code is rugged.
I recognize that software has become a foundation of our modern world.
I recognize the awesome responsibility that comes with this foundational role.
I recognize that my code will be used in ways I cannot anticipate, in ways it was not designed, and for longer than it was ever intended.
I recognize that my code will be attacked by talented and persistent adversaries who threaten our physical, economic and national security.

I recognize these things – and I choose to be rugged.

I am rugged because I refuse to be a source of vulnerability or weakness.
I am rugged because I assure my code will support its mission.
I am rugged because my code can face these challenges and persist in spite of them.
I am rugged, not because it is easy, but because it is necessary and I am up for the challenge.

https://www.ruggedsoftware.org/

In the Age of the Empire

- Each Jedi knight must make their own light saber.
  - They must be self-reliant
  - They must personally know what the parts are that went into it
  - They must personally know how to repair it
  - Each light saber has the maker's special capability (power) that works with that individual's nature
  - When charging the line of Stormtroopers, you do NOT want to see the label "manufactured by Empire Light Sabers, inc." (they will just switch it off when you most need it)
  -
  - This actually comes from Arnold Reinhold's "ciphersaber" idea – google it

In the Age of the Empire (2)

- You too can be a Jedi knight (don't think small)
  - In fact it is your duty
- It is vitally important to "do right"
  - ETHICS – be very clear in your own mind what is "ethically supportable"
  - iPhone battle with FBI
  - Killer Robots https://www.stopkillerrobots.org/
    - Today we have drones armed with lethal weapons
    - What happens tomorrow when armed robots go into a school or apartment and have to make a decision to deploy the weapon, and on whom?
- Use your power to create tools wisely
  - Scientists who created nuclear bombs oppose using those weapons http://www.inesap.org/

Cloud, OpenStack, SDN, SDx are **complex interwoven interactions**

Programmability

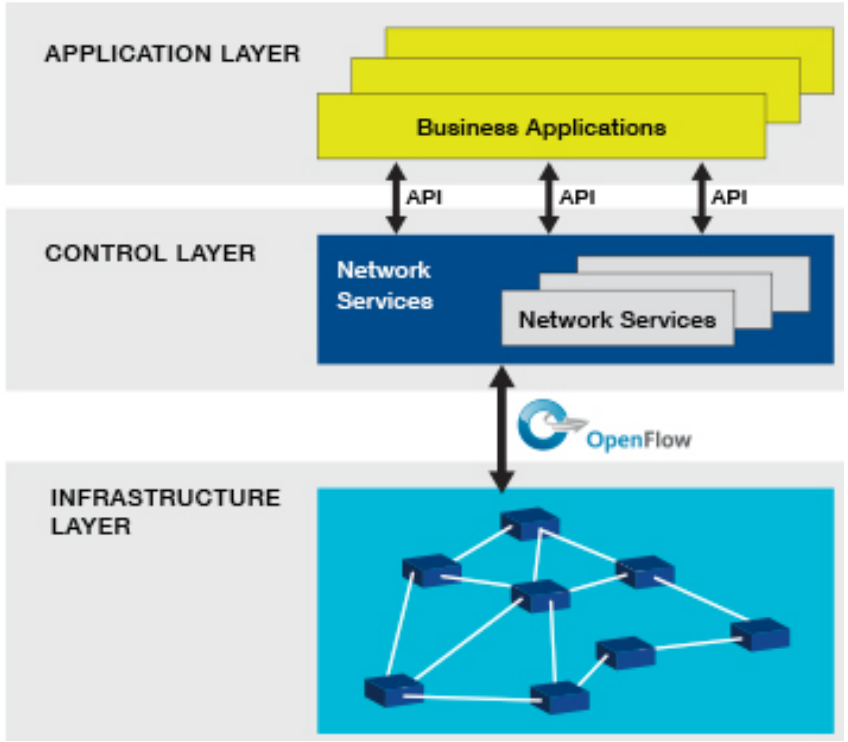
- Enable innovation/differentiation
- Accelerate new features and services introduction

Centralized Intelligence

- Simplify provisioning
- Optimize performance
- Granular policy management

Abstraction

- Decouple:
  - Hardware & Software
  - Control plane & forwarding
  - Physical & logical config.



- The promise of SDN- **do not forget this**:
  - Separation of
    - Control Plane
    - Data Forwarding Plane
    - https://www.opennetworking.org/sdn-resources/openflow

[Subtext: security must be enforced at many levels: network, server, application, user/admin, failure]

Do NOT mix “control” vs “data forwarding”

- It’s like letting passengers into the cockpit
  - Passengers love it but very unsafe in flight
- It’s like adding the “ICBM launch control room” to the public tour
  - “Here are the big red launch buttons .. No don’t touch them .. Stay behind the ribbon, would you?“
- Do NOT let the data forwarding and customer network connectivity have access to the “control” areas
  - those areas can affect other customers
- Would you let the zoo residents control the gates
  - so they can let themselves out?

A view to the future (general comments)

- Each of these topics deserves a conversation lasting a case of your favorite beverage.
  - Feel free to comment in real time

- Cloud and OpenStack
- SDN (software defined networking), SDx (x = anything, everything)
- Secure coding (make durable tools)
- IoT
- Networks – 4G, 5G and more

IoT (internet of things) and 5G

- IP cameras
- Appliance (fridge, dishwasher, washer/dryer, - “phone home for maintenance)
- My favorite, Raspberry Pi (and variants)

- CARS ! CARS ! CARS !
  - Self driving cars
  - With 5G connectivity, latency goes from (for a car traveling @60mph, communication latency drops from 5 feet → 1 inch)(not counting compute time or reaction time of brakes or motors on steering)

Autonomous vehicles have to make their own decisions

One of the first ethics questions that come up in an introductory course is similar to this:

Should a self-driving autonomous car:

1. Run over and kill a mother and child in a carriage that stepped out in front of the car --- OR:
2. Steer away, and cause the death of 15 pedestrians and others waiting at the bus stop on the sidewalk --- OR:
3. Steer the other way, and commit suicide for itself and its passenger by driving off the cliff …

What will your car do?

What will your killer robot decide?

NPR SciFri segment on Self-Driving Car

http://www.sciencefriday.com/episodes/january-8-2016/

Takeaways:

- Be a blacksmith who makes durable, reliable tools that are not easily subverted from their proper use
- Make your own light saber, know how to fix it yourself
- Separate “control” and “data forwarding”
- Think (ahead) about the ethical implications of what you do (what will your code / program in the self-driving car decide?)

  and: “Software Has Eaten The World”

https://www.justsecurity.org/30046/software-eaten-world-human-rights-security-governance/

Questions ?

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--or--

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Wide open big ideas that will influence everything we do in the future*:

- identity -- one or many? (as user, as admin, as anon) - names (dns, URL, IP address,)
- ownership - or license/permission?
- control - allow others to do __ (?) are you owner? (governance - who can do what)
- provenance - authentic or gossip
- uniqueness - (value?)
- opaqueness - (privacy)

*from a talk given by Dan Geer