

Future Wireless Cities

2016 NSF Workshop



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OVERVIEW

Population: 14,500 – 5,000 Addresses

Wired:

- 30+ miles SM backbone fiber
- Active Ethernet 12 remote offices (nodes, switching locations)
- 40, 10 and 1 Gbps, layer 2 transport abstracted from edge to edge through OpenFlow
- Utilities, anchor institutions, (schools, PSAP), 6 providers, 50 businesses and 10+ residents (pilot)

Wireless:

- 1.5 Gbps 5 mile wireless bridge to County Dispatch
- 3.65 licensed point to multipoint – primarily City infrastructure (small properties), some residences
- 150' monopole, 2x 60' wooden poles, 3x +20' above grade water tanks, 120' grain elevator and misc.
- All fiber backhaul

Challenges:

1. Automated Open Access – true separation of services from infrastructure – SDN to the edge
2. Develop and establish a new economic model to support – charge for infrastructure not bandwidth!

WIRELESS VISION

Connectivity as a utility:

- All access moving towards wireless
- Correct application of SDN at edge capable of providing ubiquitous connectivity (wired/wireless)
- True wired/wireless roaming within City
- Hardware agnostic

Safety as a utility:

- All access moving towards wireless
- Correct application of SDN at edge capable of providing dedicated wireless priority and security
- Fiber to the home, wireless in the home, SDN drop service onto the device(s) or app(s) of choice
- Move from current kludge to centralized operational model allow for personalization from edges

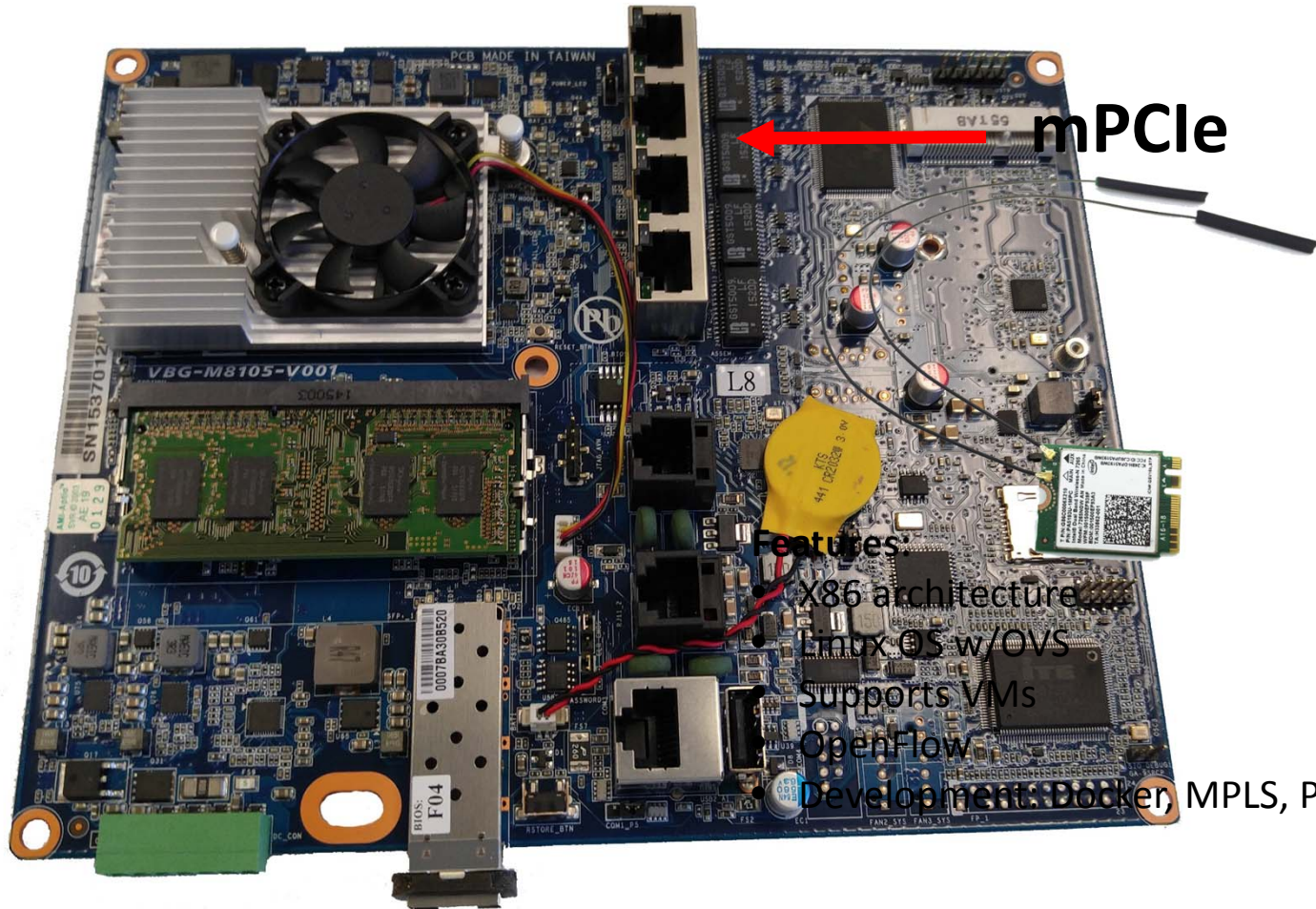
Innovation:

- Correct SDN edge application provide virtually instant support for new services and experimentation
Abstraction + Control to Users = migration to model only users (no provider distinction)
- Correct economic model will support safety and other public interest services at no additional cost!

INFRASTRUCTURE



INFRASTRUCTURE



FUTURE DEVELOPMENT

In Home:

- Equipment: Indoor/Outdoor (both)
- SDN capable equipment = Premise SDX (wired/wireless)
- Opt in / Opt out wireless roaming as selected in profile

In City:

- Fiber utility member = ubiquitous access (wired or wireless roaming – ‘take it with you’)
- Provide public safety / first responders with dedicated, private network and COS
- Develop other use cases for education, home automation, etc.

Systemic:

- Implement IPv6sec with Class Of Service(COS) and U of U authentication and security model
- Create / provide the ability to ‘terminate’ network or service directly on/to any device or application

Summary: Edge wireless devices ‘slice’ capable / aware, deliver slice(s) to application(s)

CITY TESTBED

Hardware:

- True edge to edge SDI
- Developing premise SDX (wired / wireless)
- Developing operator SDX (requirement for economic model sustainability)
- Infrastructure: properties, fiber nodes, towers, poles and @ address
- ROW, easement and permitting ownership

Software:

- True edge to edge SDI
- Portal for stakeholders: Owner/Operator, service provider and subscriber
- Ability to dynamically & instantly provide network programmability to user
- Developing next generation applications – public safety

Support:

- Supportive staff and elected officials
- Service or application choice native to system (opt-in/opt-out)
- Economic model = move from bandwidth scarcity to abundance = use/innovation encouraged
- Partnerships and relationships: Municipal utilities, first responders, PSAP, school district, commercial service providers, ILECs, NSF, U of U, IRON and INL



Thank you.

