Next Generation Emergency Management Systems via Application Virtualization

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ATC Communications
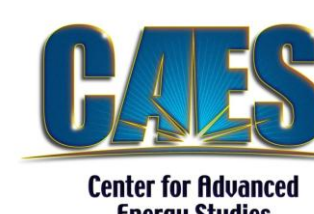
Problem

Emergency Communication System (ECS) infrastructure is becoming increasingly outdated and obsolete.

- Land lines are disappearing
- People are moving away from broadcast television/radio:
  - *Favor streaming media*
- Reverse 911 (Emergency notifications):
  - *Mobile phones have to be registered with the ECS*

Solution

Use broadband, software defined networks and virtualized applications to provide reliable common means of ECS.

User *Y* Access Point
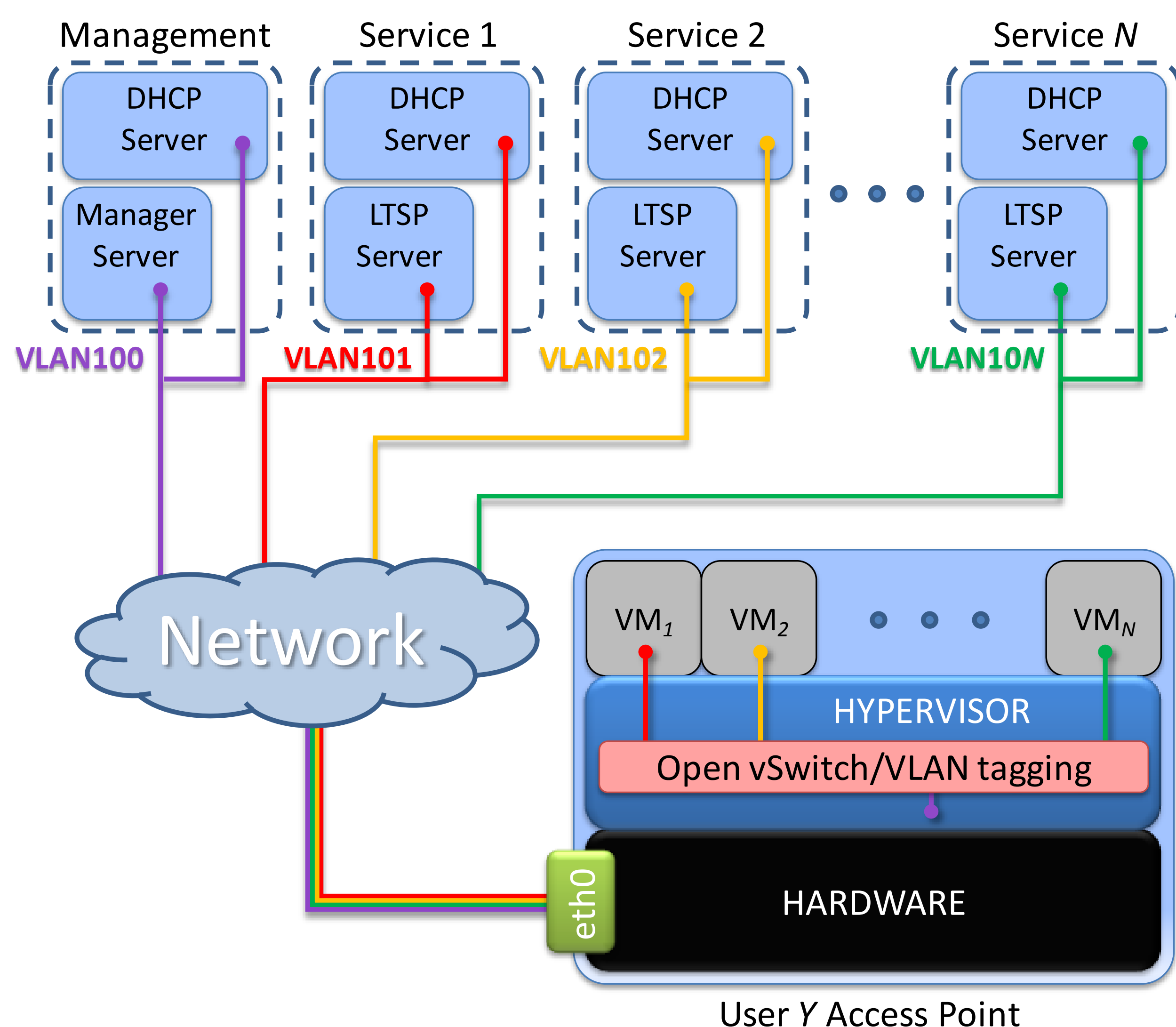
Network Slicing:
- Through network to the application level
- Enables application virtualization
- *OpenFlow* will allow the network to be reconfigured on the fly to add new users, service providers, updates, patches, etc.

Home Device:
- Hypervisor runs a virtual machine (VM) for each app
- Thin client (application running at Service Provider)
- Each VM connected to unique virtual network
- Virtual networks share one physical NIC using *Open vSwitch*

Service Provider:
- Each Service Provider has a virtual network dedicated to their specific application.

Advantages:
- Quality of service
- Class of service
- Bandwidth control

CAES - **C**enter for **A**dvanced **E**nergy **S**tudies
A research and education partnership among Idaho Universities (UI, ISU, BSU), and Department of Energy (INL)

Approach

Remotely Controllable Browser for ECS Applications:
- Enables the service provider to push web pages and control browser environment to users for their specific service.

VOIP-Based 911 Interface:
- Enables 2-way voice communication between service providers and users.
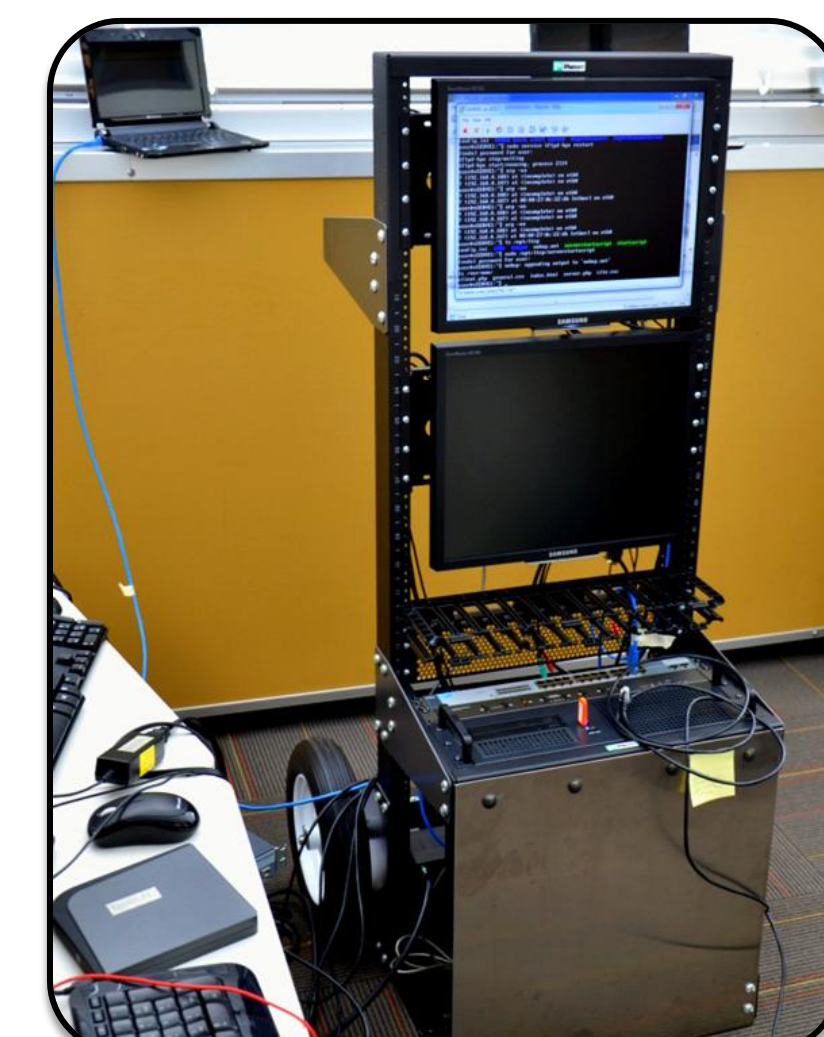- Visually scaled down to start communication with emergency service provider with press of a button.

Remote Hypervisor Management:
- Enables management service provider to push a virtual machine screen to the front.

Thin Clients:
- Uses a Preboot Execution Environment (PXE) boot to run a thin client (Using *LTSP*).

Mobile Testbed

- Contains virtual servers running various services
- Servers connected to switch configured for multiple VLANs
- Home and Management devices attached to the switch

GENI Rack at University of Idaho (CAES)

- The framework will be migrated to GENI
- Will enable full use of *OpenFlow*
- Will enable Larger scale implementation

Future Work

- Migration to GENI.
- Thin or 0-client implementation on the home device.
- Optimize LTSP image for ECS applications.
- Detailed performance analysis.
- System at scale testing in production environment.