

IP-over-P2P Overlay and Applications

Renato Figueiredo
Associate Professor
CAC Center & ACIS Lab
University of Florida

Backdrop

- Software-Defined Networking (SDN)
 - Flexibility – virtualization of the network
- Who defines the network?
- Who owns the resources running SDN?

Backdrop

- IPOP: an open-source user-centric SDN
- Who defines the network?
 - End users themselves
 - Leveraging Online Social Networks (OSNs)
 - *Map social network to virtual network links*
- Who owns the resources running SDN?
 - End users themselves
 - Software at the endpoints: VMs, PCs, mobile
 - *Peer-to-Peer links directly connect endpoints*

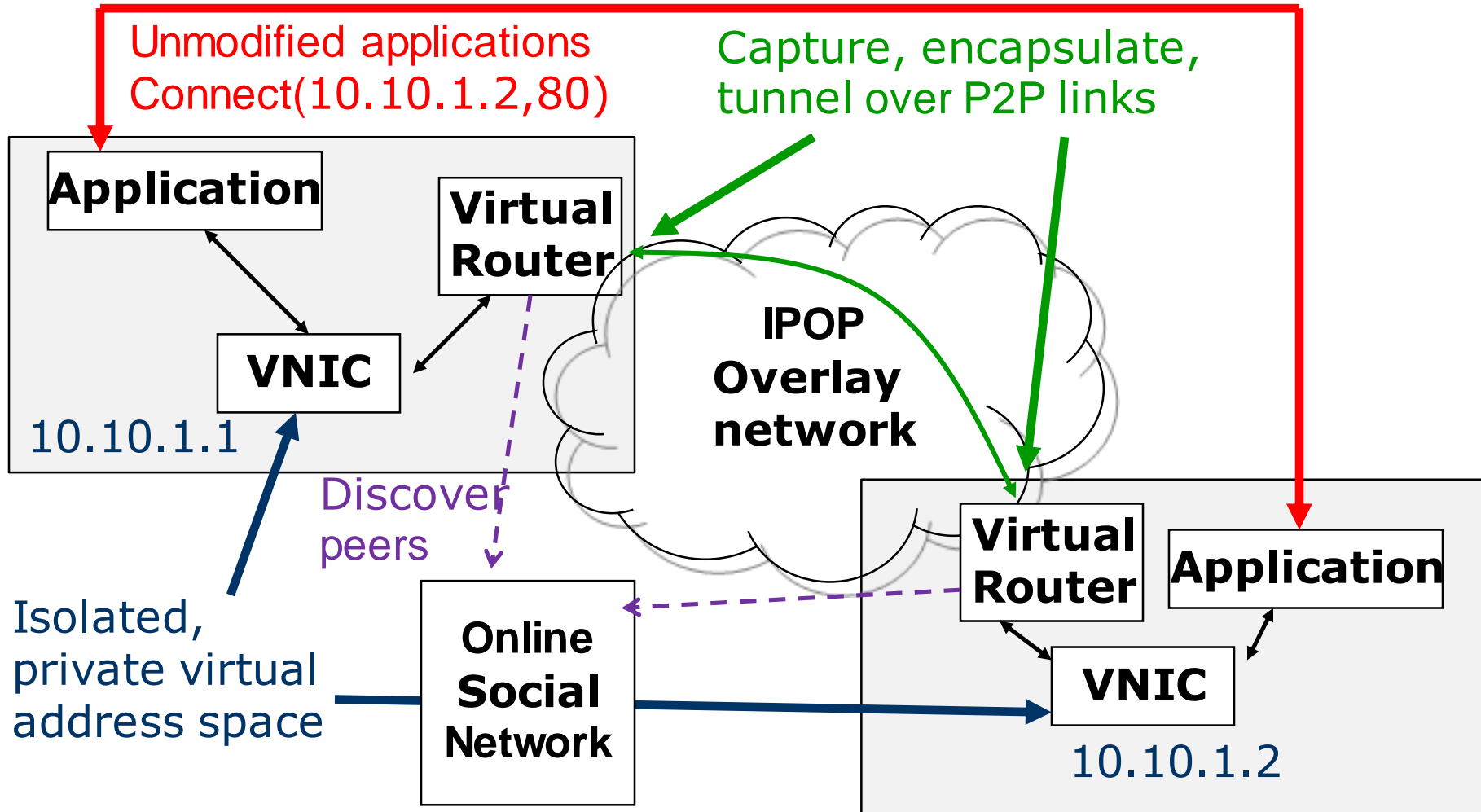
Use cases

- Ad-hoc virtual private clusters
- Collaboration environments
- Cloud-bursting
- Mobile device off-loading
- Emerging social networking applications
- ...

PRAGMA Use Case

- Lake modeling
 - Numerical simulation of phytoplankton dynamics
 - Paul Hanson, U. Wisc; Cayelan Carey, Virginia Tech
- Goal:
 - “Burst” simulation to cloud resources on demand
- Challenges:
 - Customized private cloud
 - Condor, Windows-based application workflow
 - Condor configuration
 - VPN configuration
 - Dealing with firewalls/address translation

Overview

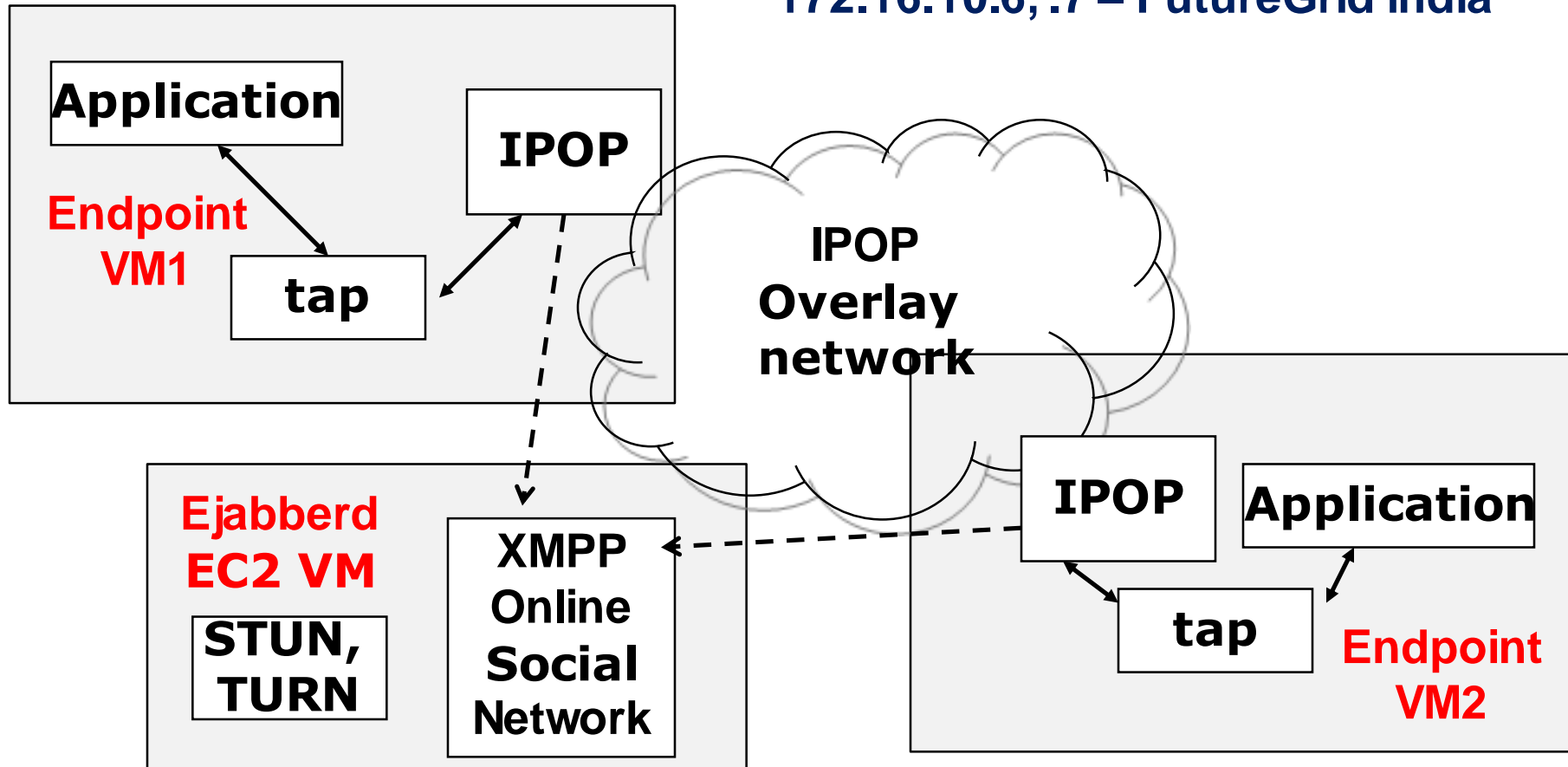


Technology overview

- OSN Server
 - XMPP-based (e.g. ejabberd, Google+ Hangouts)
- User-defined Networks
 - GroupVPN – flat IP address space (cluster)
 - SocialVPN – per-user subnet; dynamic IP translation
- Endpoints
 - Virtual NIC (tap), user-level IPOP process
- NAT traversal
 - STUN hole-punching; TURN relay

Demo setup

my_pragma_group_1:
172.16.10.2, .3 – EC2 East
172.16.10.4, .5 – FutureGrid sierra
172.16.10.6, .7 – FutureGrid india



OSN: Groups/users

- Private server: Ubuntu 12.04 + ejabberd + TURN

ejabberd Web Admin

184.73.83.142:5280/admin/server/ejabberd/users/

ejabberd 2

ejabberd

- Access Control Lists
- Access Rules
- Virtual Hosts
- ejabberd**
- Access Control Lists
- Access Rules
- Users**
- Online Users
- Last Activity
- Nodes
- Statistics
- Nodes
- Statistics

Users

User: @ ejabberd

Password:

Add User

User	Offline Messages	Last Activity
alice@ejabberd	0	2013-10-11 22:48:56
bob@ejabberd	0	2013-10-11 22:48:56
carol@ejabberd	0	Never
my_pragma_group_1@ejabberd	0	Online
my_pragma_group_2@ejabberd	0	Never
my_pragma_group_3@ejabberd	0	Never
svpnuser@ejabberd	0	Never

Thank you!

- Open-source code (MIT license)
 - <http://ipop-project.org>
 - <http://socialvpn.org>
- Feel free to contact me with any questions:
 - renato@acis.ufl.edu
- National Science Foundation
 - PRAGMA: 1234983
 - IPOP: 1339737
 - FutureGrid: 0910812
 - Eager: 1265341
 - CAC Center: 0758596

