PRAGMA 29

PRAGMA Experimental Network Testbed (ENT)

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ENT Goals

- Build a breakable international SDN testbed for use by PRAGMA researchers
  - By no means a production system
  - Complete freedom to access and configure network resources
- Provide access to SDN hardware/software to PRAGMA researchers
- Offer networking support for PRAGMA multi-cloud and user-defined trust envelopes

ENT Progress

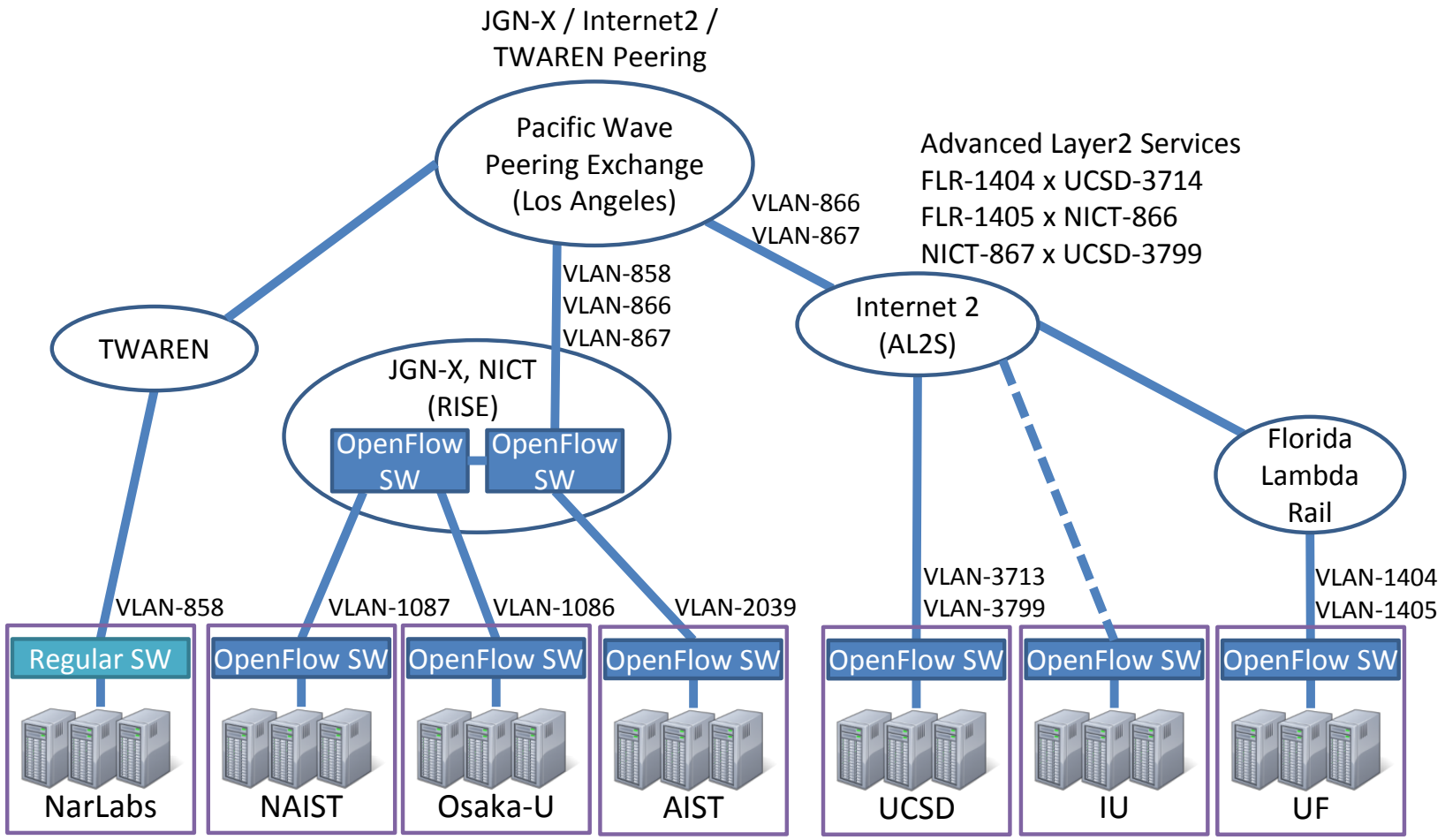
- PRAGMA 25 – Start of the project
- PRAGMA 26
  - Preliminary international links configuration
  - Preliminary tests using GRE tunnels
- PRAGMA 27
  - International links connecting Japan (NAIST, AIST, Osaka U) and US (UF and UCSD) established
  - Experiments with multi-path controllers
- PRAGMA 28
  - Connection to Taiwan (NCHC) established
  - Network slicing with AutoVFlow

ENT Accomplishments & Activities (PRAGMA 29)

- ENT backbone
  - Connection to IU established with GRE links
    - Rocks cluster and Open vSwitch Roll were used
- Visualization
  - perfSONAR
    - deployed at NAIST, UCSD, IU
- Usability study by Andy (student from UCI)
- ENT published a paper at PRAGMA-ICDS15
  - Received the best paper award

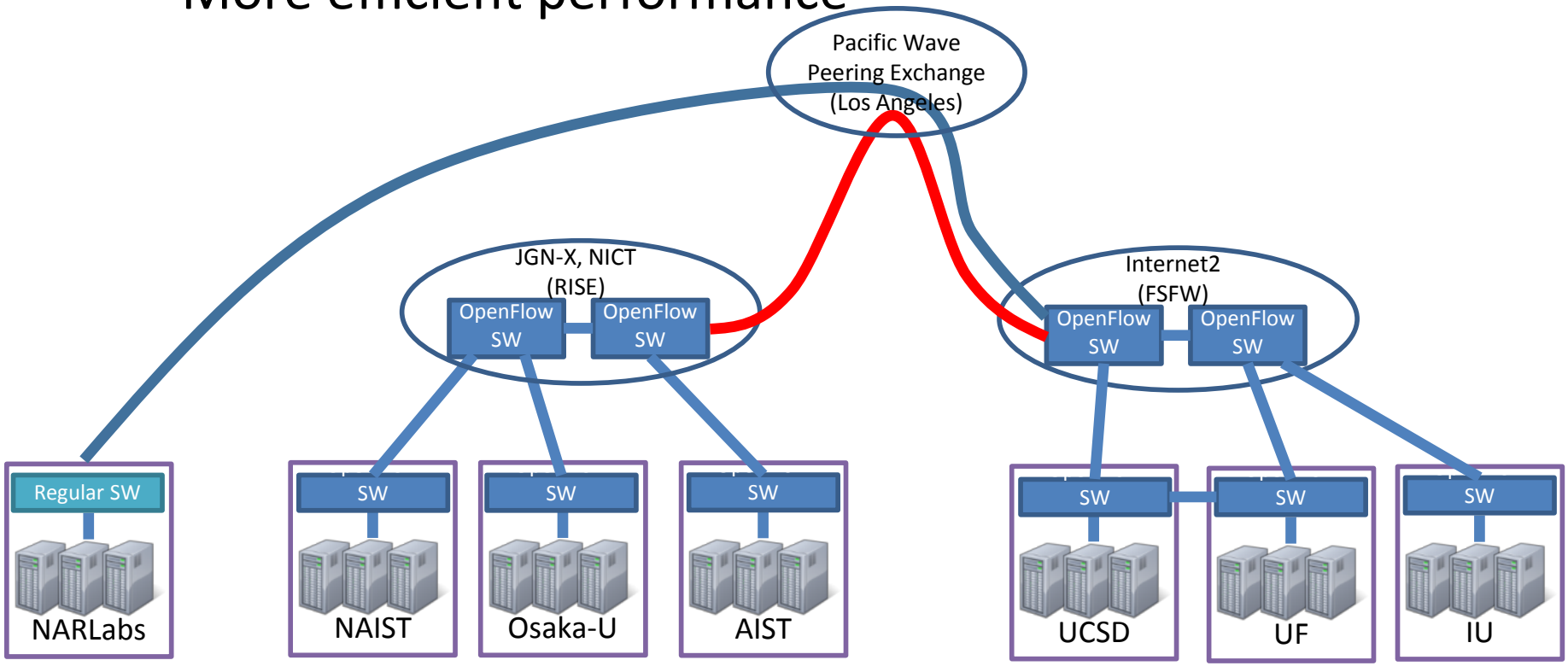
ENT Activities: ENT backbone

- Indiana University (IU) nodes are up (connected via GRE)
- IU will try to use ENT for trust data sharing



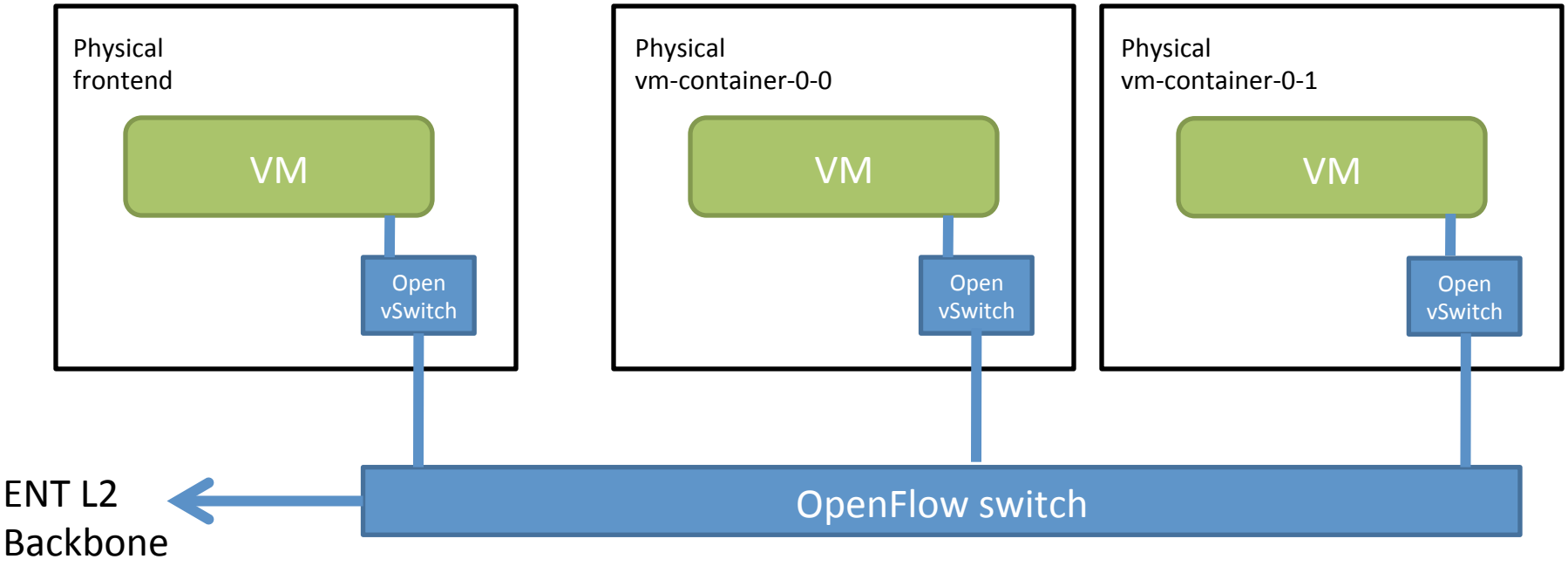
ENT Activities: Expansion

- Working on interconnecting RISE service (JGN-X) and FSFW service (Internet2)
  - Gives more flexibility for control
  - More efficient performance



ENT Activities: Deployment with Rocks Cluster

- Open vSwitch Roll
  - Automate installation of Open vSwitch on Rocks and connect the cluster to OpenFlow switch
    - https://github.com/rocksclusters/openvswitch
    - Document: https://github.com/pragmagrid/pragma_ent/wiki/Installing-Rocks6.2-cluster-with-Open-vSwitch-Roll

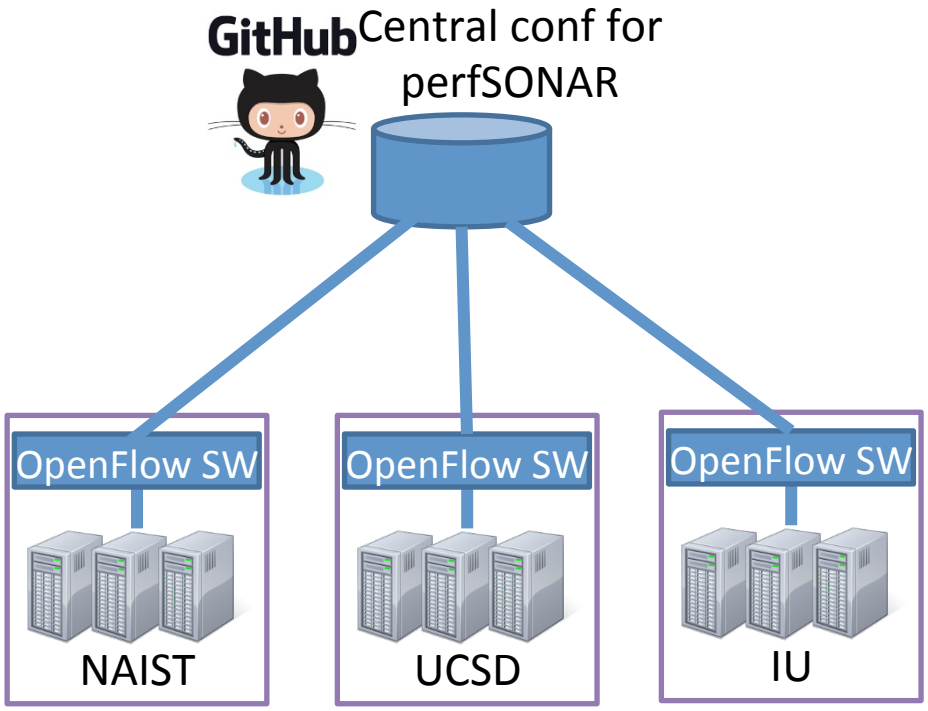


Resources

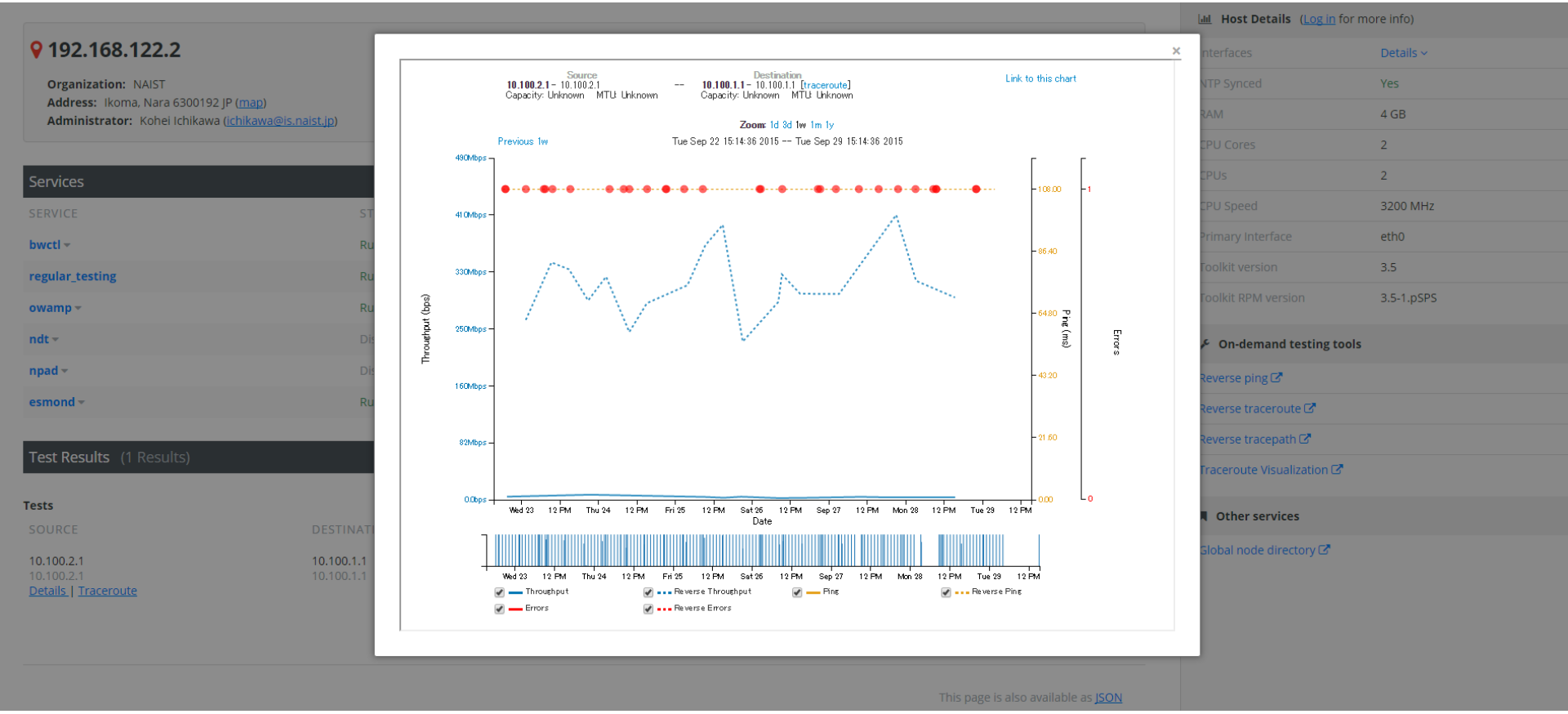
- L2 paths established through Internet2, FLR, JGN-X and Pacific Wave
  - VLAN-1404 (UF) to VLAN-3714 (UCSD)
  - VLAN-866 (JGN-X) to VLAN-1405 (UF)
  - VLAN-867 (JGN-X) to VLAN-3799 (UCSD)
- L2 paths established through JGN-X and Pacific Wave
  - VLAN-866, 867 (JGN-X) to the RISE OpenFlow switch in Tokyo
  - VLAN-2039 (AIST) to the RISE OpenFlow switch in Tokyo
  - VLAN-1086 (OsakaU) to the RISE OpenFlow switch in Osaka
  - VLAN-1087 (NAIST) to the RISE OpenFlow switch in Osaka
  - TWAREN
- OpenFlow-enabled Switches
  - PICA8 switch at UF, UCSD, NAIST, AIST, IU
  - HP switch at Osaka-U
- Servers
  - 19 nodes dedicated to PRAGMA-ENT at UF
  - 8 nodes dedicated to PRAGMA-ENT at UCSD
  - 4 nodes dedicated to PRAGMA-ENT at NAIST
  - 4 nodes dedicated to PRAGMA-ENT at AIST
  - 5 nodes dedicated to PRAGMA-ENT at Osaka-U
  - 3 nodes dedicated to PRAGMA-ENT at IU

ENT Activities: perfSONAR deployment

- Central mesh configuration for perfSONAR was uploaded on Github
- Once perfSONAR node is deployed at your site, you can easily join to the mesh group



ENT Activities: perfSONAR results



Usability study for using ENT

- Improve the usability of ENT
  - Collect network statistics and user data
  - Identify weak points and provide user-friendly designs

Future Plans

- Network expansion (more sites)
  - Interconnecting RISE (JGN-X) & FSFW (Internet2)
- Trust data sharing
  (HathiTrust Digitalized Books Corpus)
  - Address data licensing and security with SDN
- End user support
  - Visualization
  - Usability study
  - ENT operation center
  - Wiki: https://github.com/pragmagrid/pragma_ent/wiki

Roadmap of ENT

- Pragma30
  - Expand ENT to more Asian countries
    - China, Korea, Thai, Indonesia, Philippines
  - Stable AutoVFlow
  - Monitoring & visualization tool
- Pragma31
  - Reservation or scheduling service
    - VM & Network
- Pragma32
  - User friendly UI & API
  - Making reservation from Web or API & automation
- Pragma33
  - Expand ENT to at least 10 institutions