

CNGI-CERNET2 SAVI Deployment Update

China Education and Research Network (CERNET)

/Tsinghua Univ.

IETF79, Beijing

Nov. 9, 2010

Outline

- SAVI Switches Implementation
- SAVI Switches Testing
- SAVI Deployment in CNGI-CERNET2
- SAVI Management System and MIB Design
- SAVI based User Authentication System in CERNET2

SAVI Switches Implementation

SAVI Switch Implementation

- Solutions implemented
 - draft-ietf-savi-dhcp-06
 - draft-bi-savi-stateless-01
 - draft-bi-savi-mix-00 (partially)
- Vendors
 - ZTE、Huawei、H3C (3Com)
 - Ruijie、Digital China (spun off from Lenovo)
 - Bitway、Centac

SAVI-Firmware upgradable

- Savi-upgradable switches in our deployment
 - Switches with at least 2.5 Layer IPv6 capacity
 - SAVI firmware upgrading
 - ZTE: ZXR10 8900,5900,3900A
 - Huawei: S5600, 5300, 3500,3300,2300
 - H3C (3Com): S5500EI, S5500SI, S5120EI、E126A, E152, E328, E352
 - Digital China: DCRS-5950,3950
 - Ruijie: RG-S8600,S5750,S5760,S2900,S2600
 - Bitway: BitStream 7000, 6000, 3000
 - Centec: E600 and E300

Console Example

```
H3C]dis ip check source ipv6
```

```
Total entries found: 4
```

MAC	IP	VLAN	Port	Type
001d-09b6-a763	2001::7D1B:A5AE:44DE:FCB1	2	GigabitEthernet1/0/3	ND-SNP
001d-09b6-a763	FE80::B47E:A4DD:166D:89E0	2	GigabitEthernet1/0/3	ND-SNP
001d-09b6-a763	2001::B47E:A4DD:166D:89E0	2	GigabitEthernet1/0/3	ND-SNP
001d-09b6-a763	2001::1004	2	GigabitEthernet1/0/3	DHCPv6-SNP

Binding State Table of H3C S5500

Entry:

Source IP | Source MAC | Vlan ID | Type(DHCP or ND)

SAVI Switches Testing

Catalogs of SAVI Testing

- CERNET organized formal testing for SAVI switches (several round of tests)
- Test types:
 - Conformance testing
 - Performance testing
 - Test-bed (interoperability) testing
 - Testing in the production network
- Each type has 3 scenarios
 - DHCPv6-only
 - SLAAC-only
 - DHCPv6-SLAAC-mixed
 - In each scenario, the static binding for manual configured address is also tested

SAVI Deployment in CERNET2

SAVI switches installation: 100 Univ. campus net (red dot)

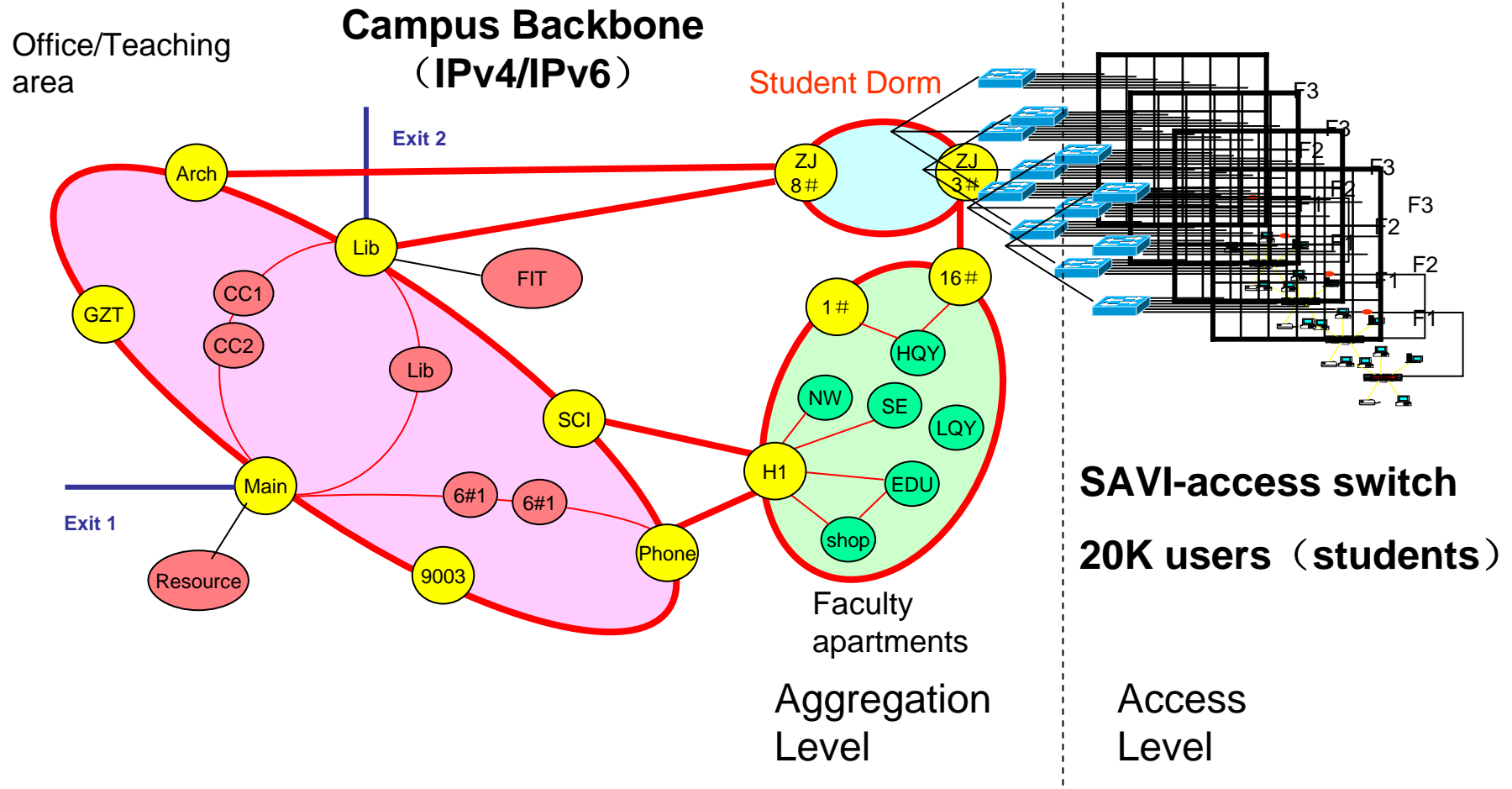


Scenarios in Deployment

- DHCP-only
 - Only DHCP and link local address are allowed.
 - DHCP and link local address snooping are enabled.
- SLAAC-only
 - Only SLAAC address is allowed.
 - SLAAC snooping is enabled.
- DHCP-SLAAC-Mixed
 - DHCP and SLAAC address are allowed.
 - DHCP snooping and SLAAC snooping are enabled.
- Static addresses (usually for servers) are manually configured in the above scenarios.

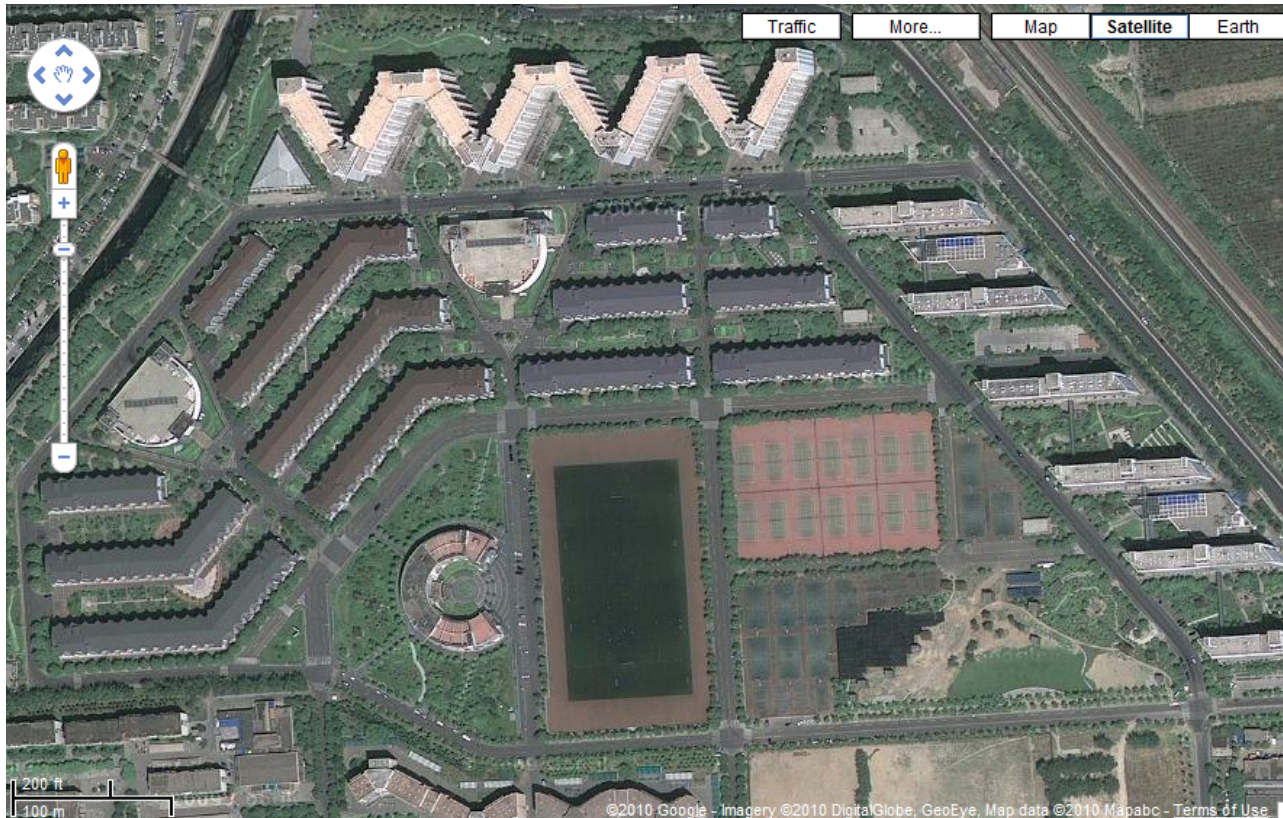
Example: Tsinghua Univ. campus network SAVI deployment (software upgrade at access switch)

subnets	switches	port	hosts	users
114	1018	23414	22644	20280

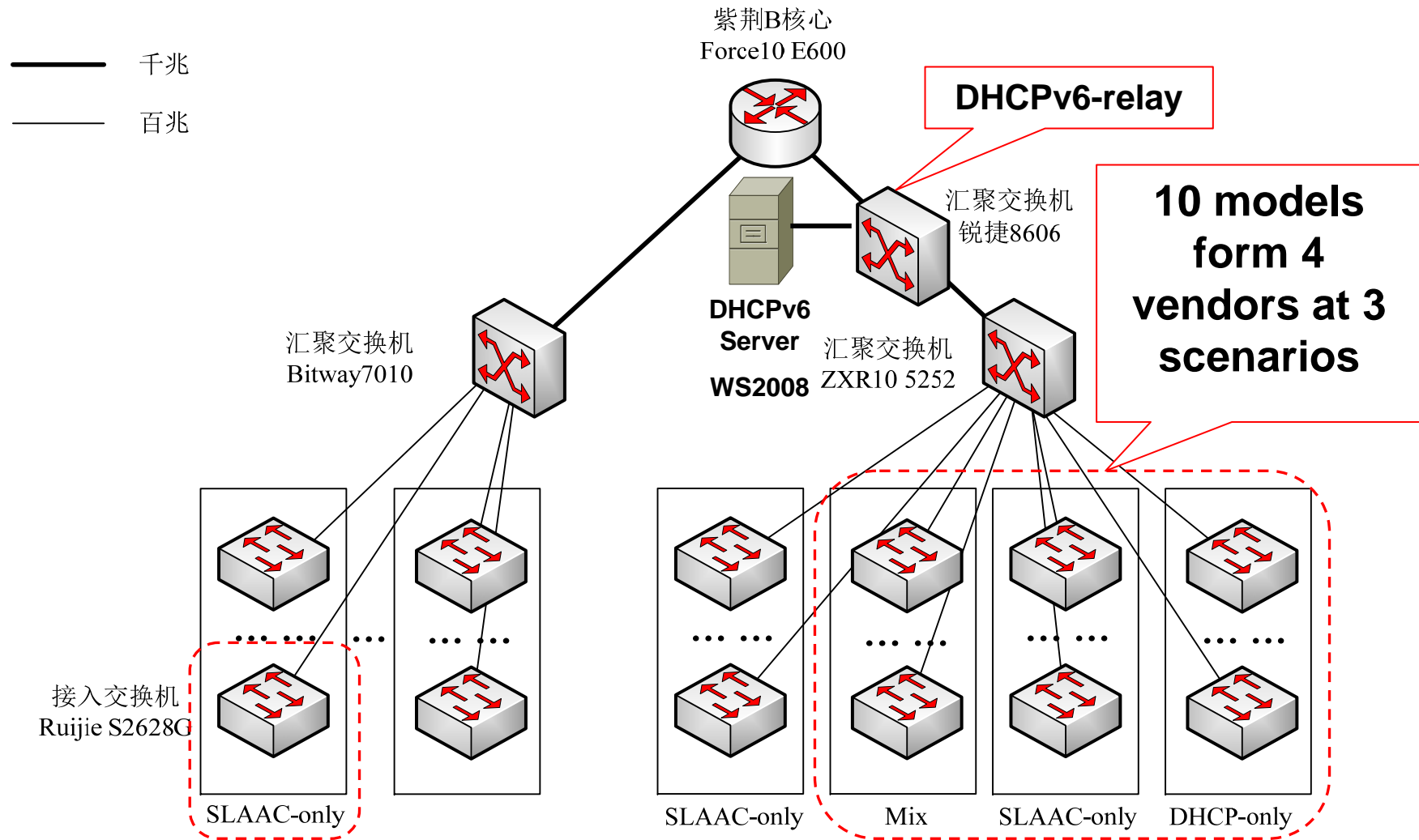


Deployment at Campus Network

- Tsinghua Student Dorms: 27 buildings, 20K+ students



Deployment in Students Buildings



高机房，共4组，每组10台组成1个子网

低机房，共4组，每组10台组成1个子网

Real Deployment in Student Dorms



H3C: DHCPv6-only

Digital China: DHCP-SLAAC-mixed

```
[ZJ14-L01-F-01]display ip check source ipv6
```

```
Total entries found: 5
```

MAC Address	IP Address	VLAN	Interface	Type
001c-b3ab-6162	FE80::21C:B3FF:FEAB:6162	1	GE1/0/5	ND-SNP
940c-6d74-c244	FE80::960C:6DFF:FE74:C244	1	GE1/0/7	ND-SNP
0022-156c-ba34	FE80::222:15FF:FE6C:BA34	1	GE1/0/9	ND-SNP
0011-2517-fe6b	2402:F000:5:C801:3463:B3D8:E63C:8FC8	1	GE1/0/14	DHCPv6-SNP
001f-d0a1-45ed	FE80::AD55:DE48:DDC9:2EDB	1	GE1/0/17	ND-SNP

```
ZJ14-L05-F-05#show savi ipv6 check source binding
```

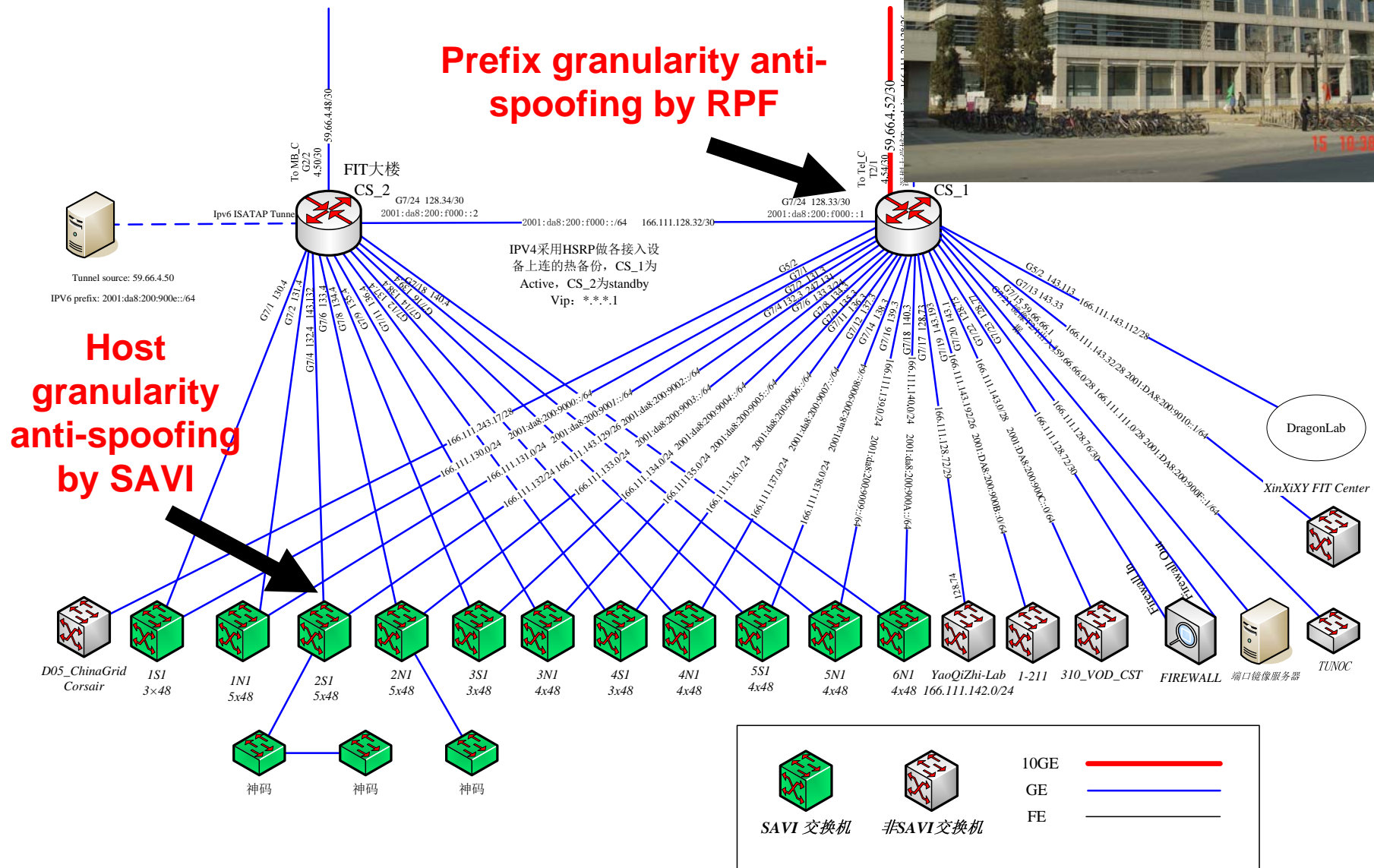
```
Static binding count: 0
```

```
Dynamic binding count: 8
```

```
Binding count: 8
```

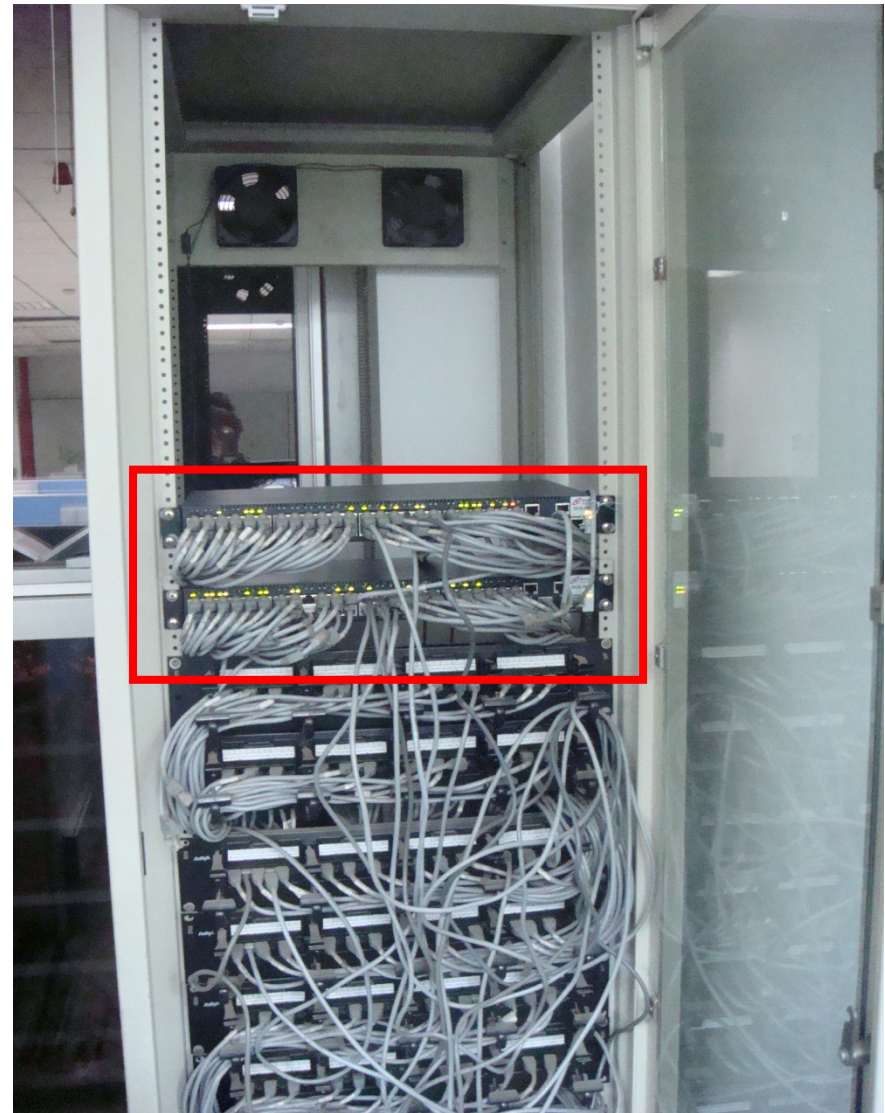
MAC	IP	VLAN	Port	Type	State	Expires
90-e6-ba-78-f2-06	2402:f000:5:ca01:d999:3fae:bf36:4178	1	Ethernet1/14	dhcp	BOUND	1012389
90-e6-ba-78-f2-06	fe80::14df:55e9:2639:43ba	1	Ethernet1/14	slaac	BOUND	4374
90-e6-ba-78-f2-06	2402:f000:5:ca01:14df:55e9:2639:43ba	1	Ethernet1/14	slaac	BOUND	14276
90-e6-ba-78-f2-06	2402:f000:5:ca01:2840:a378:d686:fc0b	1	Ethernet1/14	slaac	BOUND	14276
c8-0a-a9-41-b5-a1	2402:f000:5:ca01:639b:f7c8:7999:13c8	1	Ethernet1/21	dhcp	BOUND	1036459
c8-0a-a9-41-b5-a1	fe80::d1d8:1aa5:45b2:b883	1	Ethernet1/21	slaac	BOUND	14058
c8-0a-a9-41-b5-a1	2402:f000:5:ca01:d1d8:1aa5:45b2:b883	1	Ethernet1/21	slaac	BOUND	14058
c8-0a-a9-41-b5-a1	2402:f000:5:ca01:8c12:15a3:553e:f8a5	1	Ethernet1/21	slaac	BOUND	14058

Example: SAVI deployment in Tsinghua FIT building

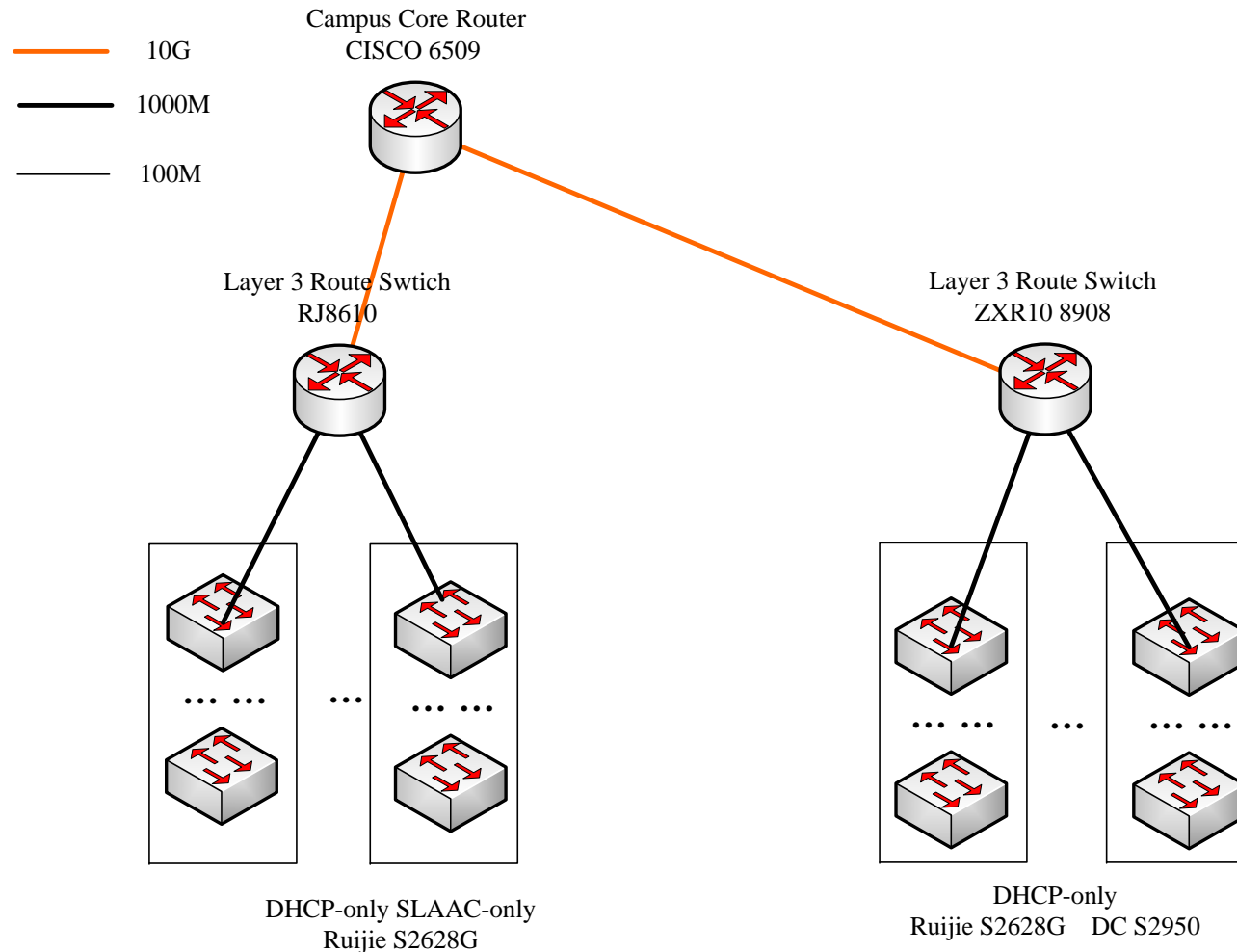


Deployment in Office Building

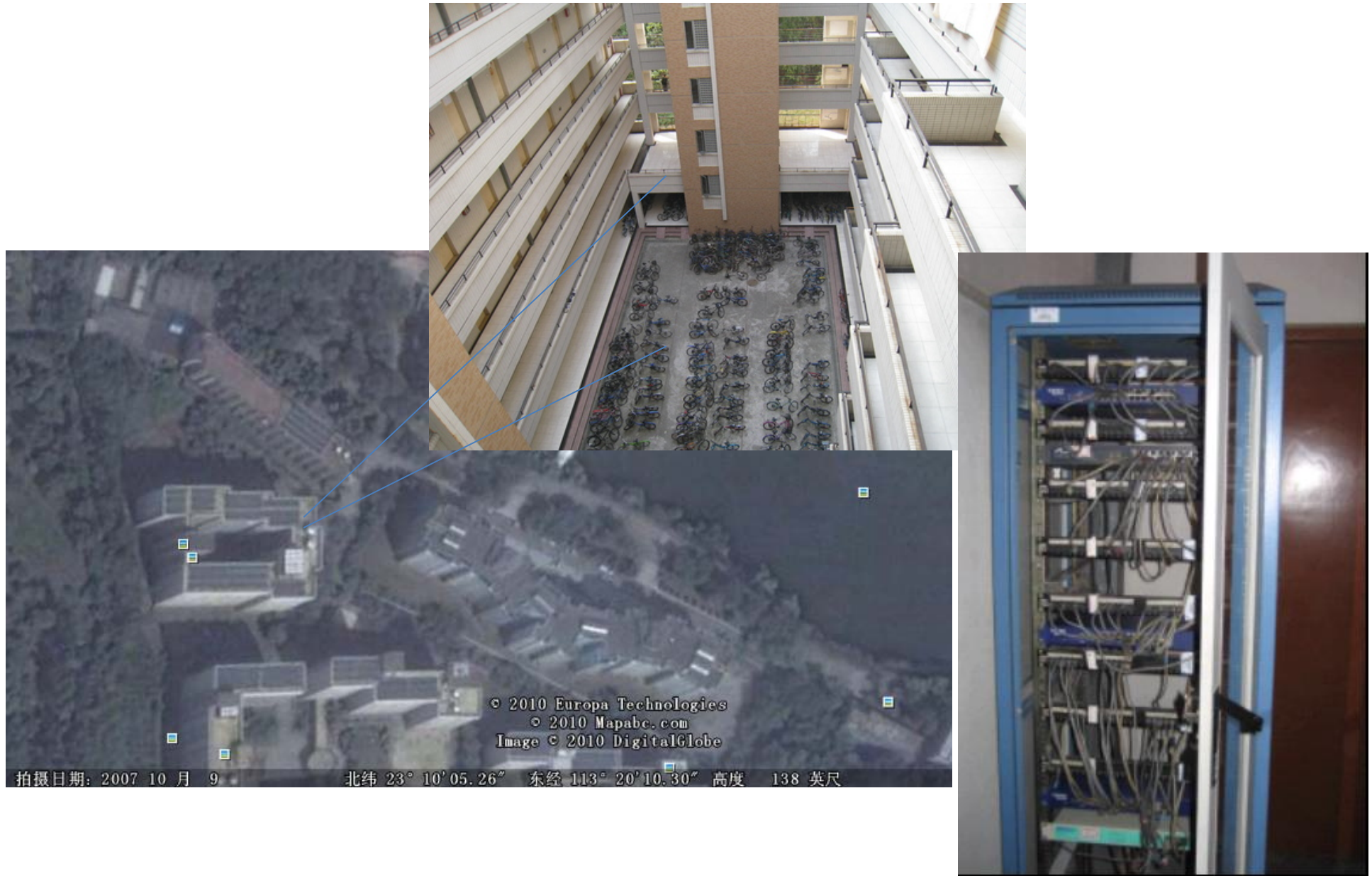
- FIT Building of Tsinghua Univ
- From Oct 2009- (more than 1year)
- No initial DAD-NS loss observed (link local addr bound)
- Ruijie RG-2652
- Digital China S3950 Switches



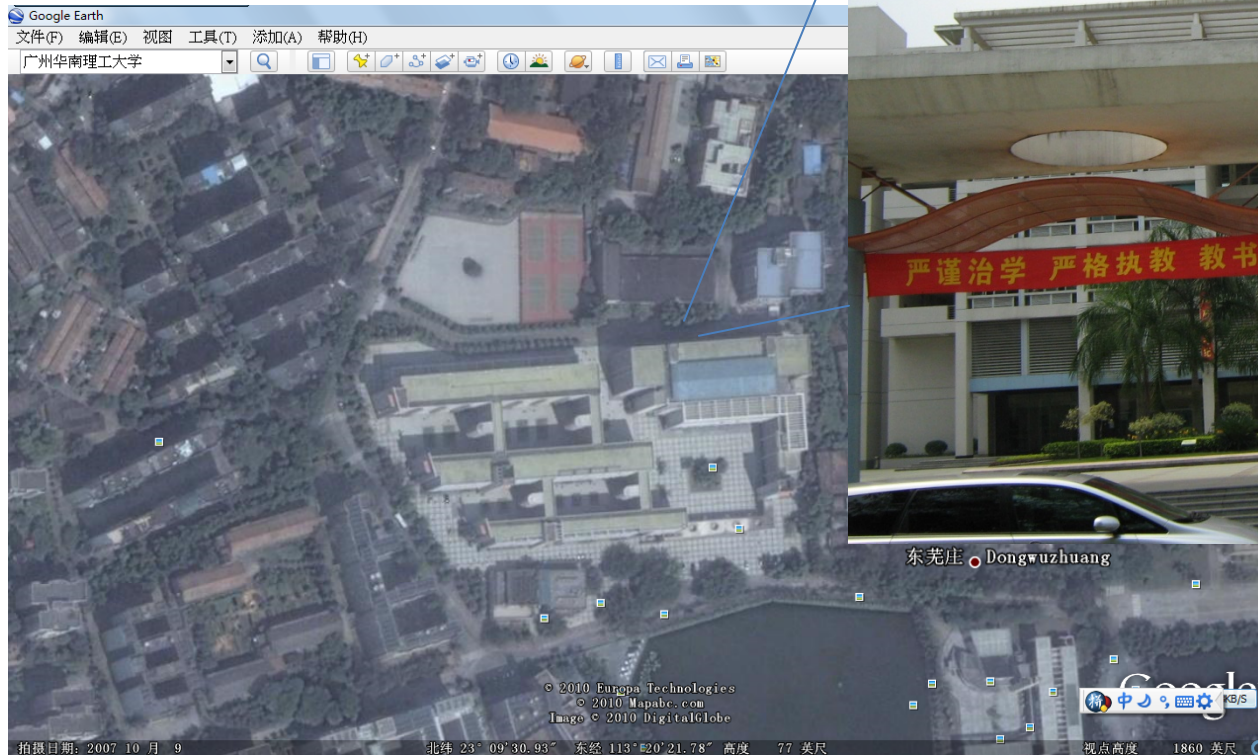
Example: South China Univ. of Tech. campus network SAVI deployment (Guangzhou City)



SAVI deployment: Student Dorms



SAVI deployment: Teaching and Learning Building: 4 buildings, 100+ classrooms



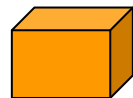
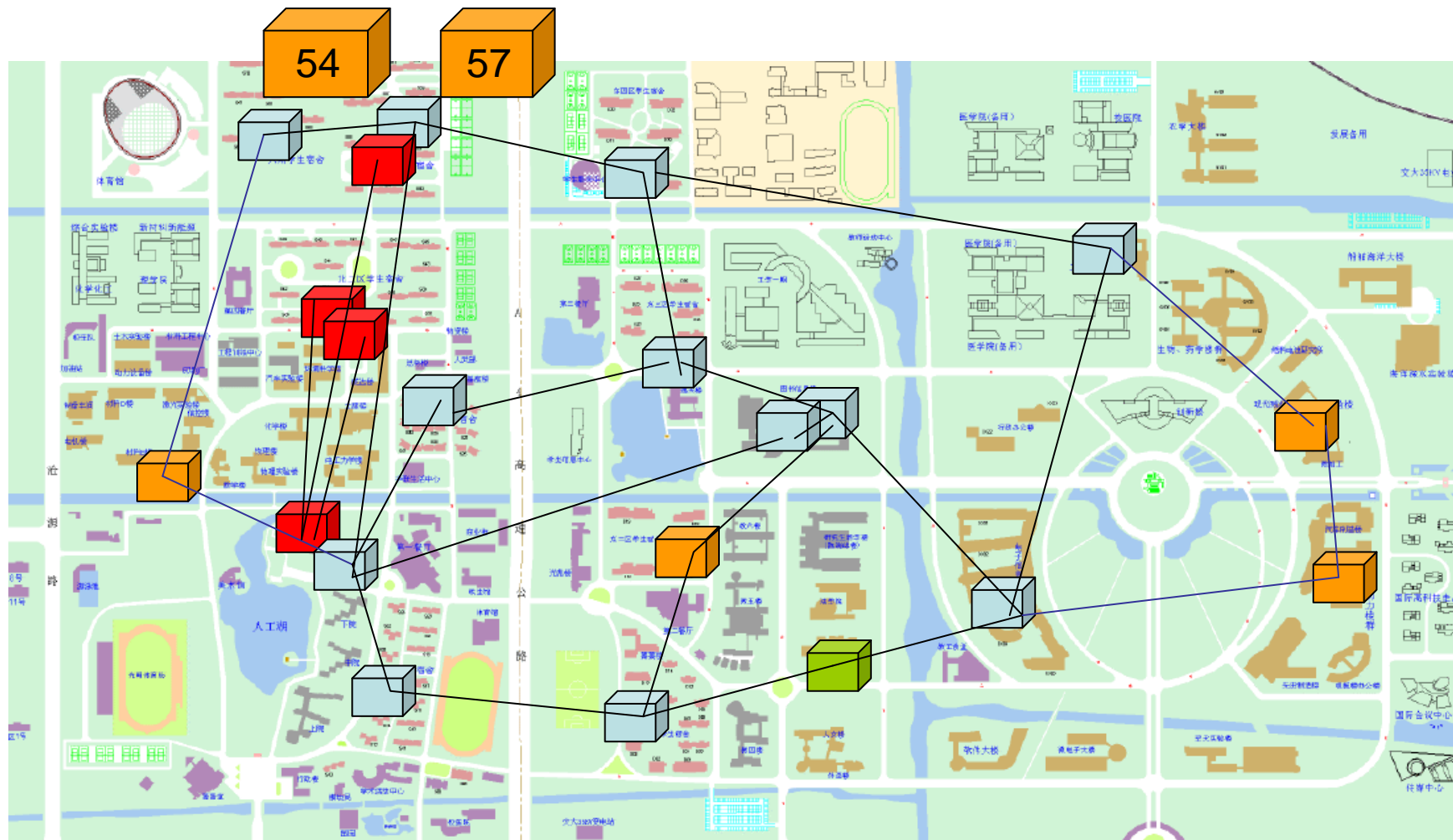
东莞庄 Dongwuzhuang

Example: Shanghai Jiaotong Univ. campus network SAVI deployment



access switches become SAVI-ready
by firmware upgrade.

SAVI Deployment at Campus Network

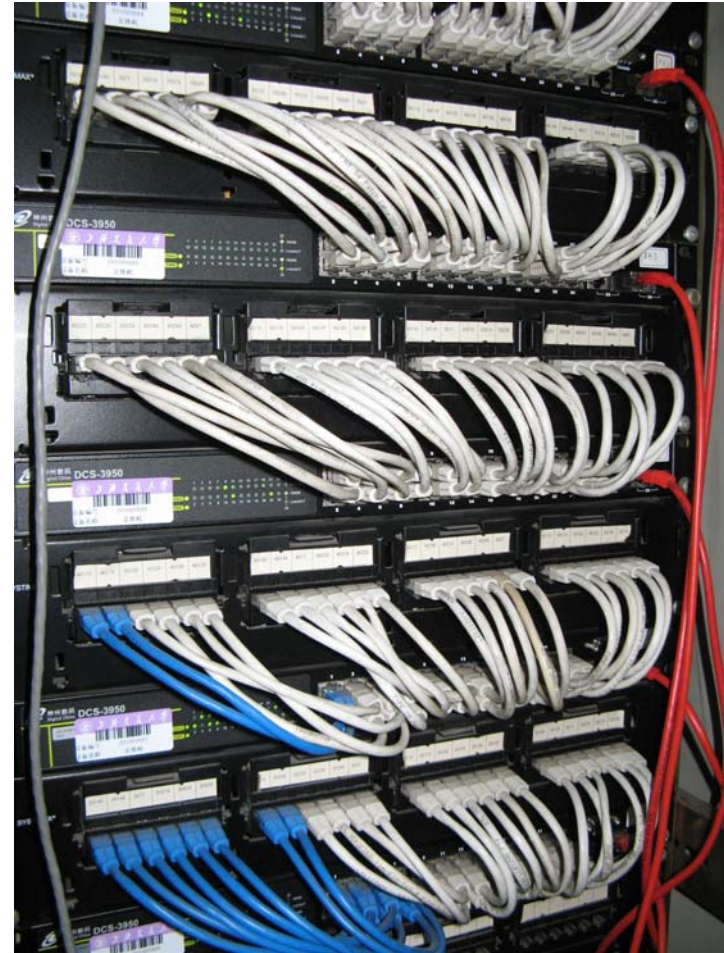


Student Dorms Deployed

SAVI Deployment in Student Dorms



Dorm 57



Dorm 54

Example: Xi'an JiaoTong Univ. campus network SAVI deployment



SAVI Deployment in Student Dorms



Example: Northeast Univ. campus network SAVI deployment (Shenyang City)



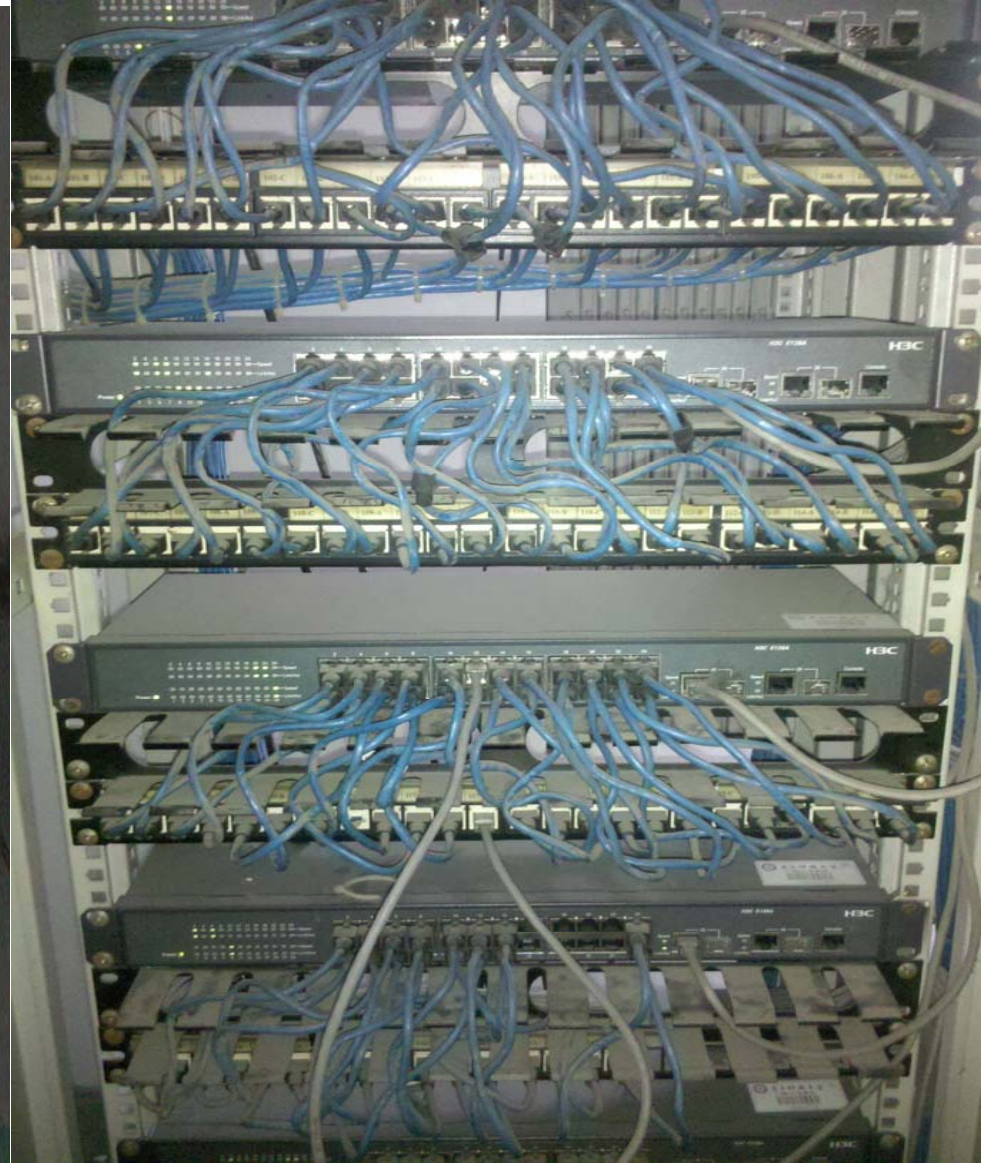
SAVI Deployment in office buildings



Example: Huazhong Univ. of Sci&Tech campus network SAVI deployment (Wuhan City)

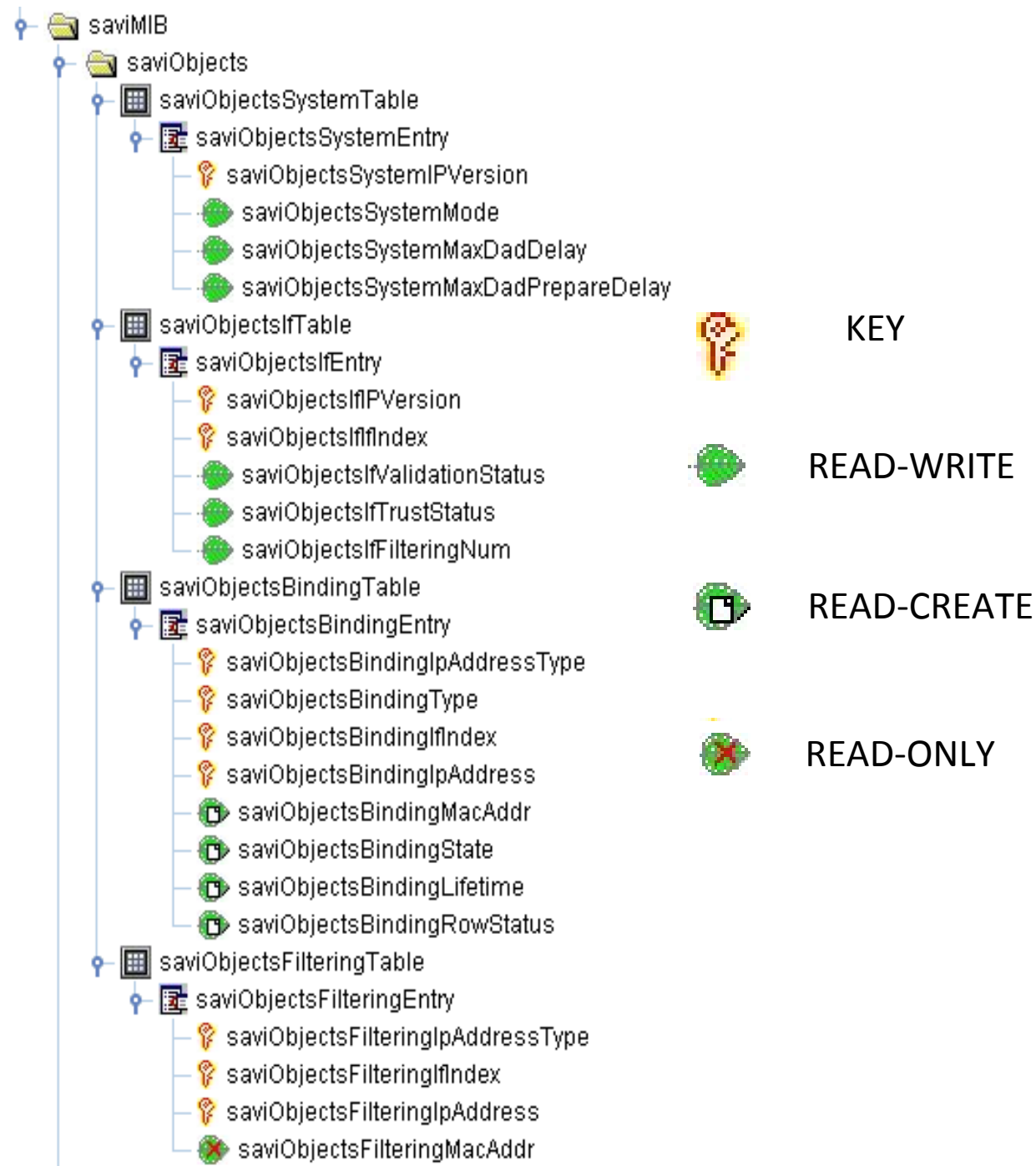


UESTC campus network SAVI deployment (Chengdu City)



SAVI Management System and MIB Design

SAVI MIB Tree



Global View (data gathered in Tsinghua FIT building)

SAVI管理系统

用户管理显示统计验证

注销

全局视图

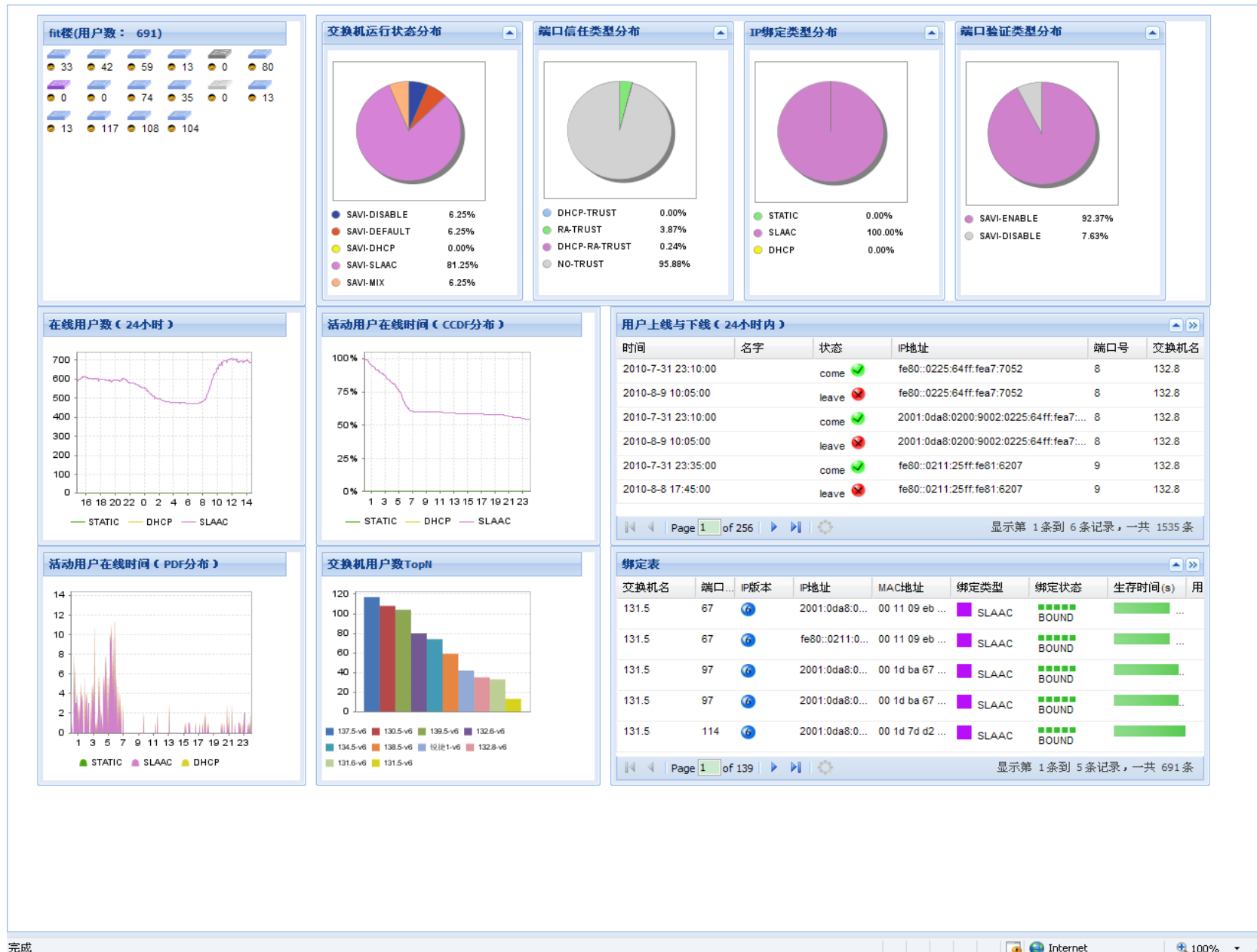
交换机列表SAVI信息列表

子网名称	交换机数	设备状态 (DISABLE DEFAULT SLAAC DHCP MIX)	用户数
net2	0		0
信楼	19	<div><div>0</div><div>103</div><div>22</div><div>41</div><div>2</div><div>43</div><div>0</div><div>50</div><div>10</div><div>16</div><div>106</div><div>57</div><div>5</div><div>54</div><div>82</div><div>15</div><div>11</div><div>0</div><div>81</div></div>	698
测试网段	1	<div><div>12</div></div>	12
中兴测试	0		0
神码交换机子网	4	<div><div>0</div><div>38</div><div>0</div><div>40</div></div>	78

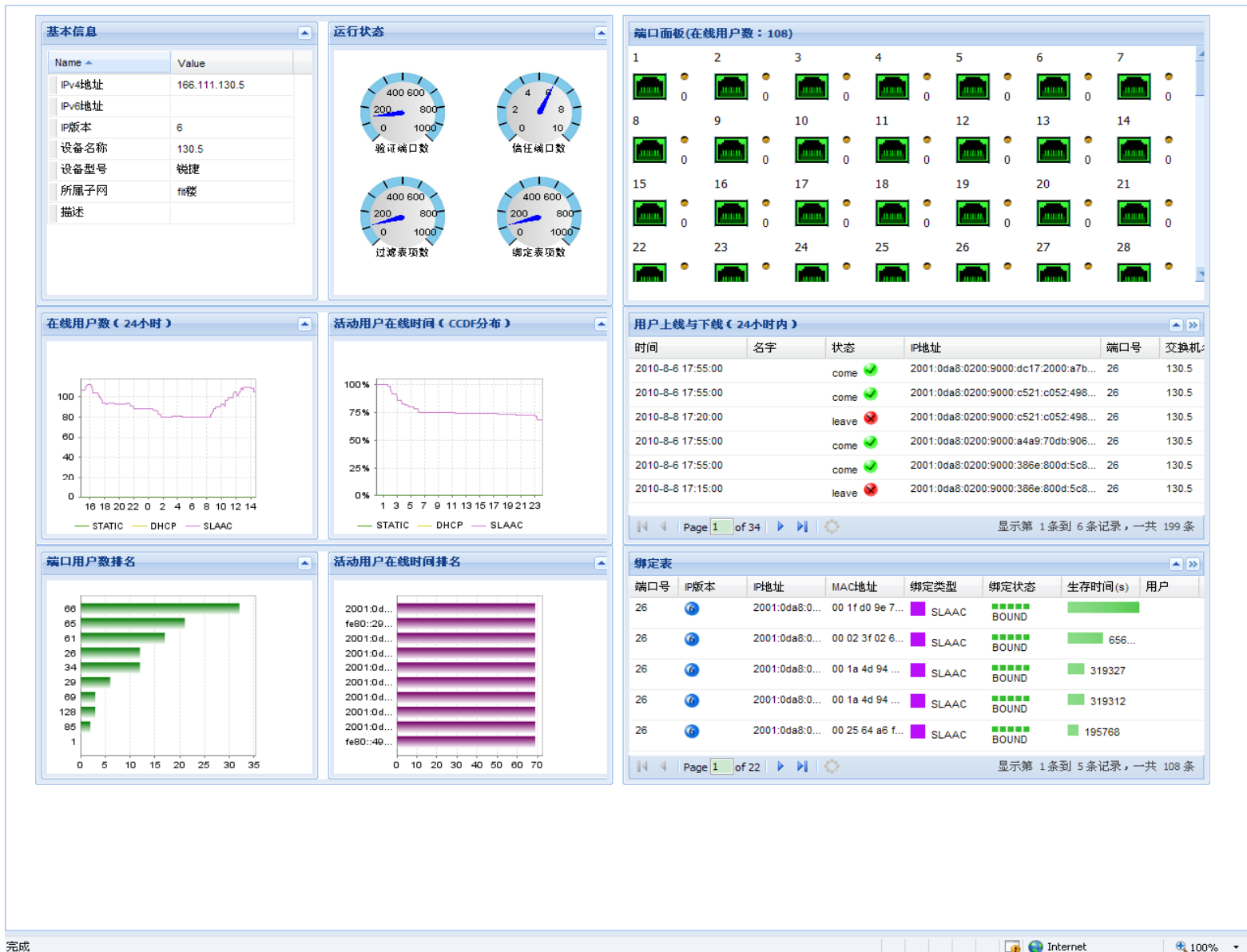
Page 1 of 1

显示第 1 条到 5 条记录，一共 5 条

Subnet View



Switch View



SAVI Port Info at One Switch

SAVI管理系统 - Microsoft Internet Explorer

http://166.111.143.238/SaviManager2/mainFrame.do

文件(E) 编辑(E) 查看(V) 收藏夹(A) 工具(T) 帮助(H)

Windows Live 最近更新 个人资料 邮件 照片 日历 MSN 共享

SAVI管理系统

用户 管理 显示 统计 验证 注册

交换机端口列表(143.198)

端口号	IP版本	验证状态	信任类型	最大过滤数	绑定表
4227625	IPv6	Enable	NO-TRUST	100	>>
4227633	IPv6	Enable	NO-TRUST	100	>>
4227641	IPv6	Enable	NO-TRUST	100	>>
4227649	IPv6	Enable	NO-TRUST	100	>>
4227657	IPv6	Enable	NO-TRUST	100	>>
4227665	IPv6	Enable	NO-TRUST	100	>>
4227673	IPv6	Disable	DHCP-RA-TRUST	100	>>
4227681	IPv6	Enable	NO-TRUST	100	>>
4227689	IPv6	Enable	NO-TRUST	100	>>
4227697	IPv6	Enable	NO-TRUST	100	>>
4227705	IPv6	Enable	NO-TRUST	100	>>
4227713	IPv6	Enable	NO-TRUST	100	>>
4227721	IPv6	Enable	NO-TRUST	100	>>
4227729	IPv6	Enable	NO-TRUST	100	>>
4227737	IPv6	Enable	NO-TRUST	100	>>
4227745	IPv6	Enable	NO-TRUST	100	>>
4227753	IPv6	Enable	NO-TRUST	100	>>
4227761	IPv6	Enable	NO-TRUST	100	>>
4227769	IPv6	Enable	NO-TRUST	100	>>
4227777	IPv6	Enable	NO-TRUST	100	>>
4227785	IPv6	Enable	NO-TRUST	100	>>
4227793	IPv6	Enable	NO-TRUST	100	>>
4227801	IPv6	Enable	NO-TRUST	100	>>
4227809	IPv6	Enable	NO-TRUST	100	>>

Page 1 of 2

显示第 1 条到 25 条记录, 一共 28 条

2010 清华大学信息网络工程研究中心 | 隐私声明 | 使用条款

当前时间: 2010-8-9 14:49:15 | 当前用户: root

完成

开始 Windows Live Messen... SAVI管理系统 - Micr... 文档 1 - Microsoft Word

Internet 100%

14:49

SAVI Binding Table

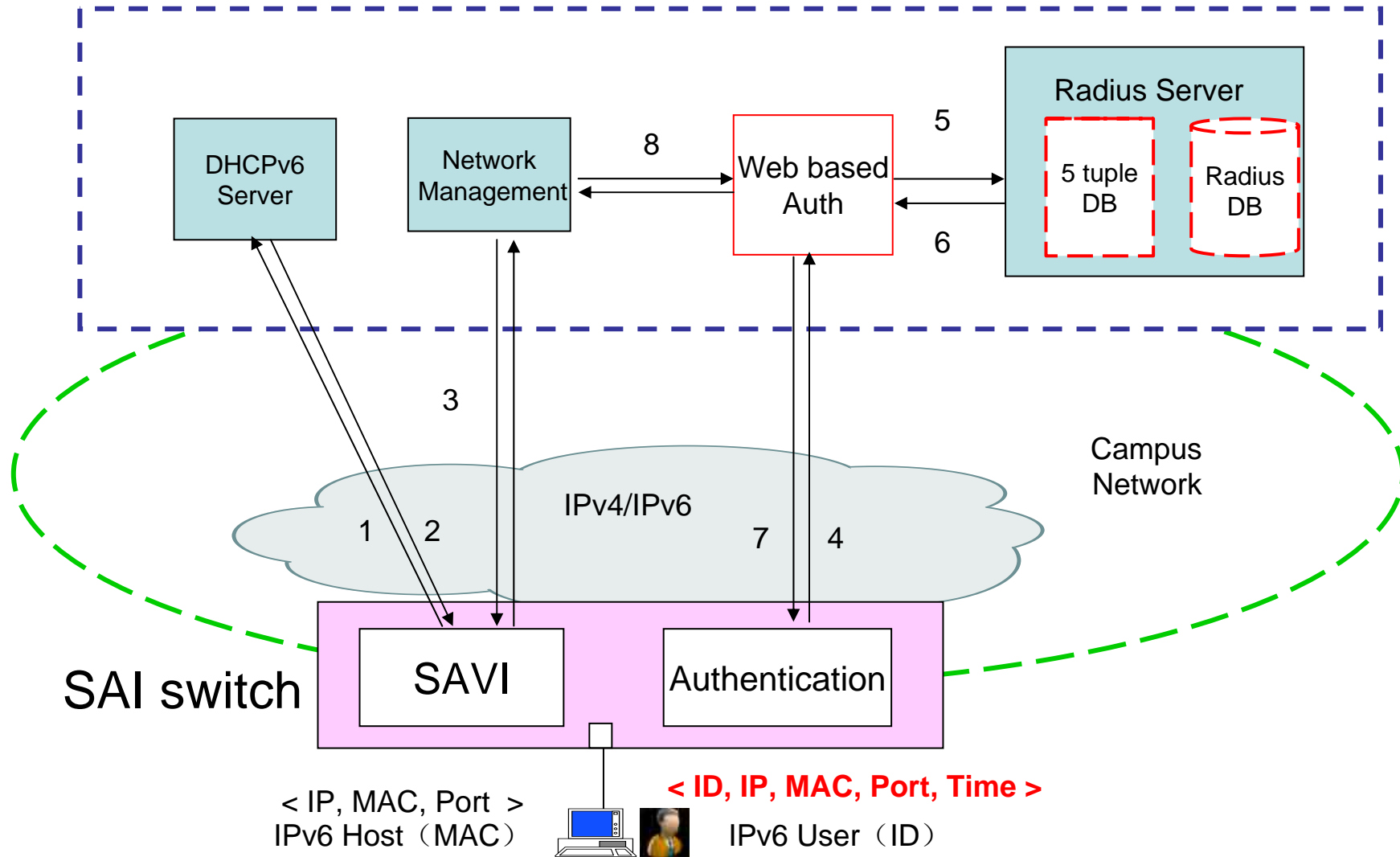
SAVI管理系统								
用户 管理 显示 统计 验证								
交换机绑定表(131.5)								
显示STATIC 显示SLAAC 显示DHCP 显示全部								
端口号	IP版本	IP地址	MAC地址	绑定类型	绑定状态	生存时间(s)	用户	是否在过滤表?
67	6	2001:0da8:0200:9001:0211:09ff:feeb:4f29	00 11 09 eb 4f 29	SLAAC	<div><div></div></div>	B 1314		✓
67	6	fe80::0211:09ff:feeb:4f29	00 11 09 eb 4f 29	SLAAC	<div><div></div></div>	B 1310		✓
97	6	2001:0da8:0200:9001:586c:830a:a2ff:8d00	00 1d ba 67 4e f2	SLAAC	<div><div></div></div>	B 5383		✓
97	6	2001:0da8:0200:9001:695f:fa6f:ed93:b57c	00 1d ba 67 4e f2	SLAAC	<div><div></div></div>	B 5383		✓
101	6	2001:0da8:0200:9001:0211:95ff:fefe:45f1	00 11 95 fe 45 f1	SLAAC	<div><div></div></div>	B 1365		✓
114	6	2001:0da8:0200:9001:e94c:a027:d213:2399	00 1d 7d d2 5b 88	SLAAC	<div><div></div></div>	B 2343		✓
114	6	2001:0da8:0200:9001:f999:9aaa:5f38:fa1e	00 1d 7d d2 5b 88	SLAAC	<div><div></div></div>	B 2343		✓
114	6	fe80::e94c:a027:d213:2399	00 1d 7d d2 5b 88	SLAAC	<div><div></div></div>	B 2342		✓
125	6	2001:0da8:0200:9001:0215:17ff:feb5:bb6c	00 15 17 b5 bb 6c	SLAAC	<div><div></div></div>	B 8541		✓
125	6	fe80::0215:17ff:feb5:bb6c	00 15 17 b5 bb 6c	SLAAC	<div><div></div></div>	B 8540		✓
126	6	2001:0da8:0200:9001:0217:9aff:feba:eaca	00 17 9a ba ea ca	SLAAC	<div><div></div></div>	B 7669		✓
126	6	2001:0da8:0200:9001:0217:9aff:feba:eacd	00 17 9a ba ea cd	SLAAC	<div><div></div></div>	B 7627		✓
126	6	2001:0da8:0200:9001:021a:64ff:fe8a:2c8c	00 1a 64 8a 2c 8c	SLAAC	<div><div></div></div>	B 1392		✓
126	6	2001:0da8:0200:9001:021a:64ff:fe8a:2d64	00 1a 64 8a 2d 64	SLAAC	<div><div></div></div>	B 14361		✓
126	6	2001:0da8:0200:9001:021e:0bff:fe21:9c64	00 1e 0b 21 9c 64	SLAAC	<div><div></div></div>	B 1366		✓
126	6	2001:0da8:0200:9001:0221:5aff:fe46:94ff	00 21 5a 46 94 ff	SLAAC	<div><div></div></div>	B 1365		✓
126	6	2001:0da8:0200:9001:0221:5aff:fe46:95eb	00 21 5a 46 95 eb	SLAAC	<div><div></div></div>	B 2192		✓
126	6	2001:0da8:0200:9001:0221:5aff:fe47:1fe9	00 21 5a 47 1f e9	SLAAC	<div><div></div></div>	B 1366		✓
126	6	fe80::0217:9aff:feba:eaca	00 17 9a ba ea ca	SLAAC	<div><div></div></div>	B 7668		✓
126	6	fe80::0217:9aff:feba:eacd	00 17 9a ba ea cd	SLAAC	<div><div></div></div>	B 7625		✓
126	6	fe80::021a:64ff:fe8a:2c8c	00 1a 64 8a 2c 8c	SLAAC	<div><div></div></div>	B 1391		✓

Page 1 of 2

显示第 1 条到 25 条记录, 一共 27 条

SAVI based User Authentication System in CERNET2

System Overview



Thank You!
Q & A