

# ENI PoC #15

## PINet— Polymorphic Intelligent Network Progress Update

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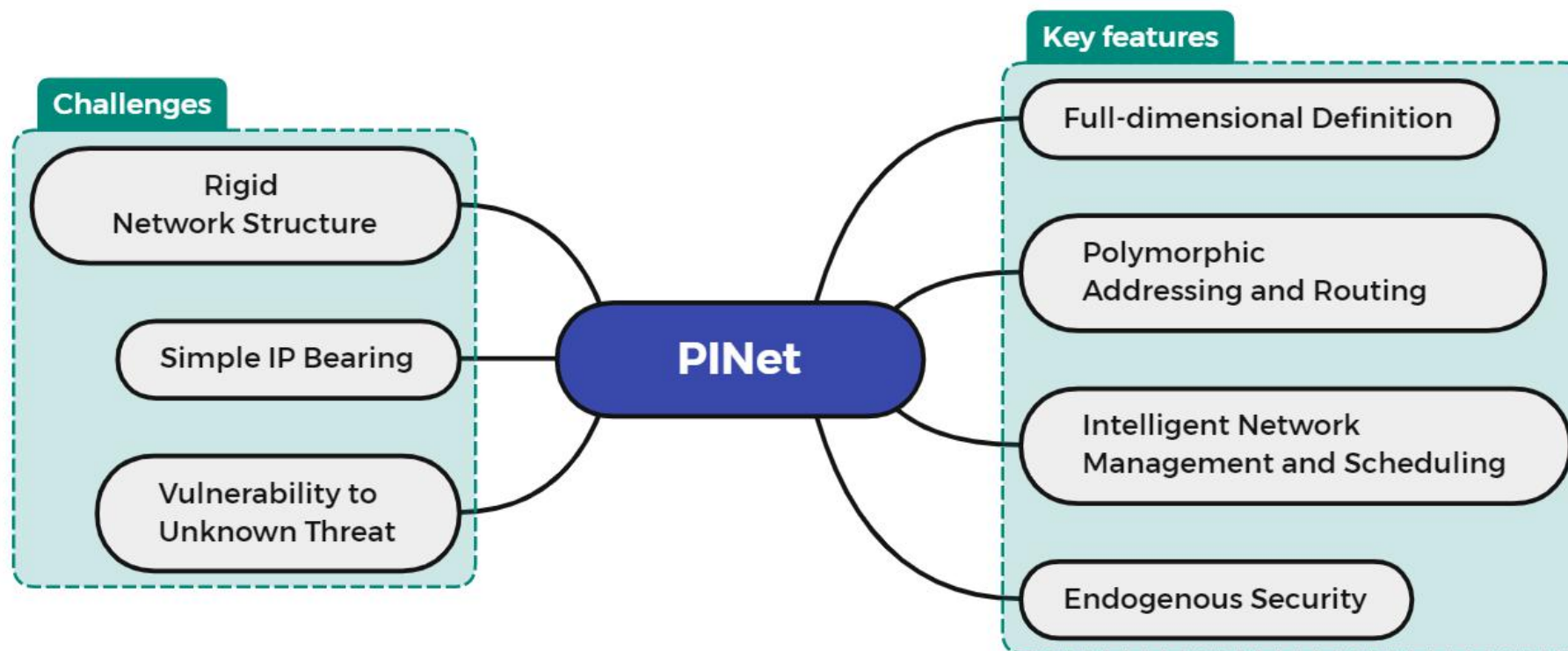
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# PoC Task Plan

# PoC Background



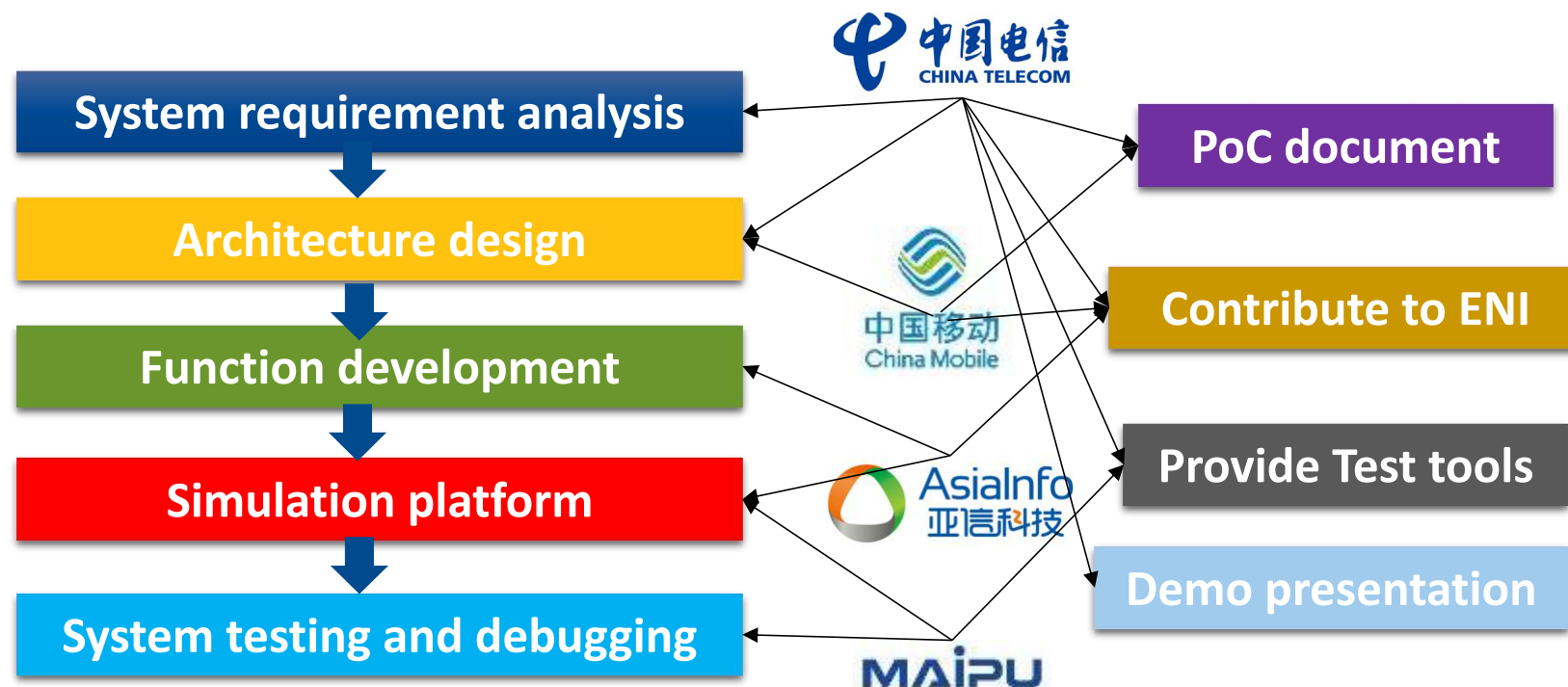
**Short Description:** The current network mainly faced several challenges, such as rigid network structure, simple IP bearing, and difficulty in dealing with unknown threats. Based on above challenges, the goal of this PoC project is to realize polymorphic presentation of addressing and routing, and provide feasible design strategy for operators to automatically deploy network according to different types of business and application scenarios. **PINet fundamentally meets the business requirement of network intelligence, diversification, personalization, high robustness and high efficiency.**

# PoC Goals and PoC Member Task

Host/Team Leader:



Team members:



- **PoC Project Goal #1:** Demonstrate the use of intent-based interface to translate the network application requirement to different network modal configuration and support the coexistence and collaboration of polymorphic network.
- **PoC Project Goal #2:** Demonstrate the use of AI to realize adaptive adjustment and configuration between network resources and diversified services, optimize network structure, resource allocation, function management and service efficiency.

# Task Plan

Current state

ENI#21

Webinar

ENI#23

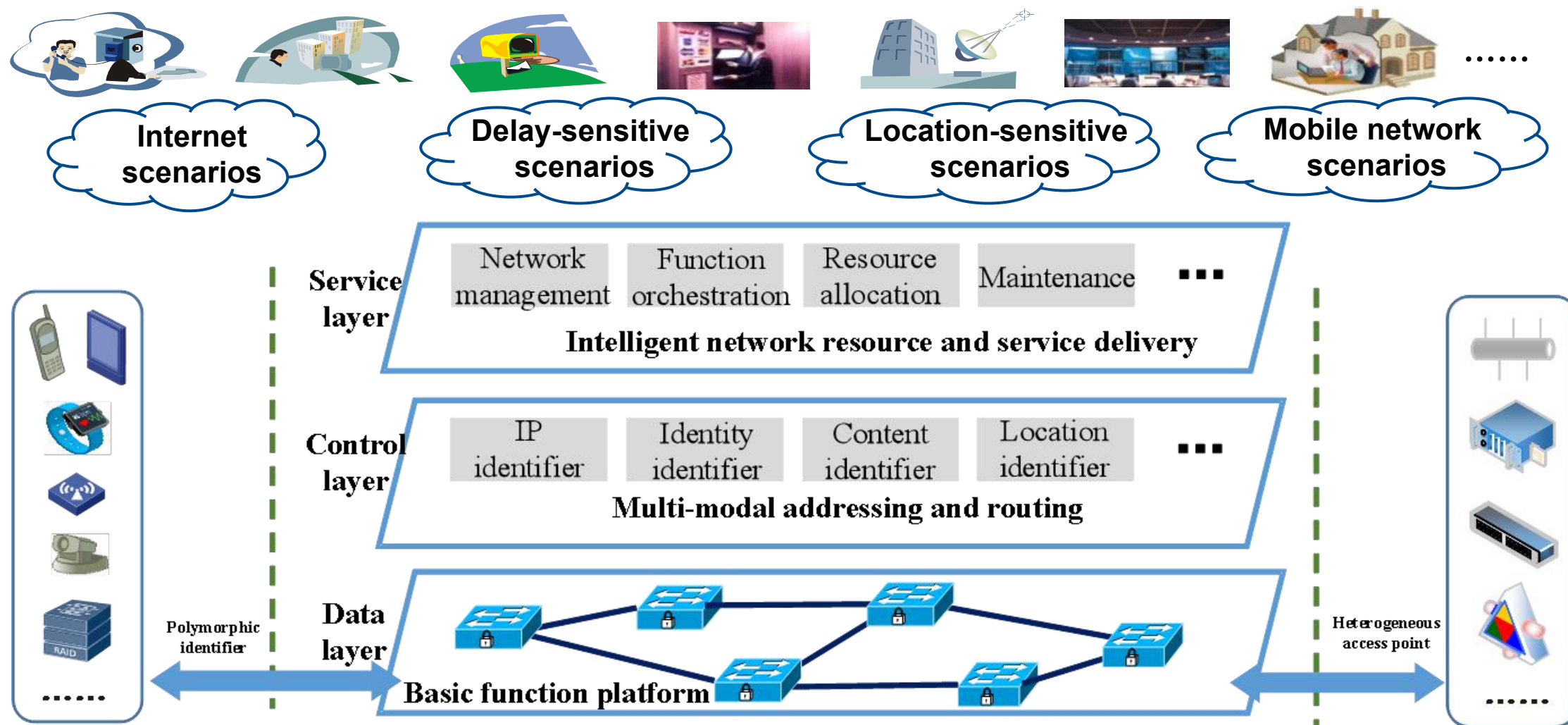
ENI#24

Date \ Task	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022
Specification												
System requirement analysis and architecture design												
Function development												
Simulation platform												
System testing and debugging												
Demo 1												
Demo 2												
Related output contributions												
Final presentation												

# Architecture

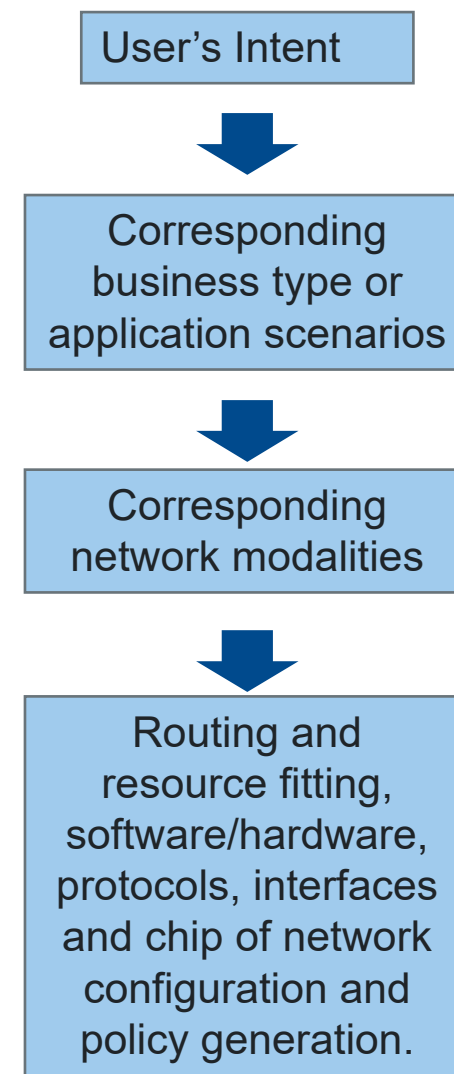
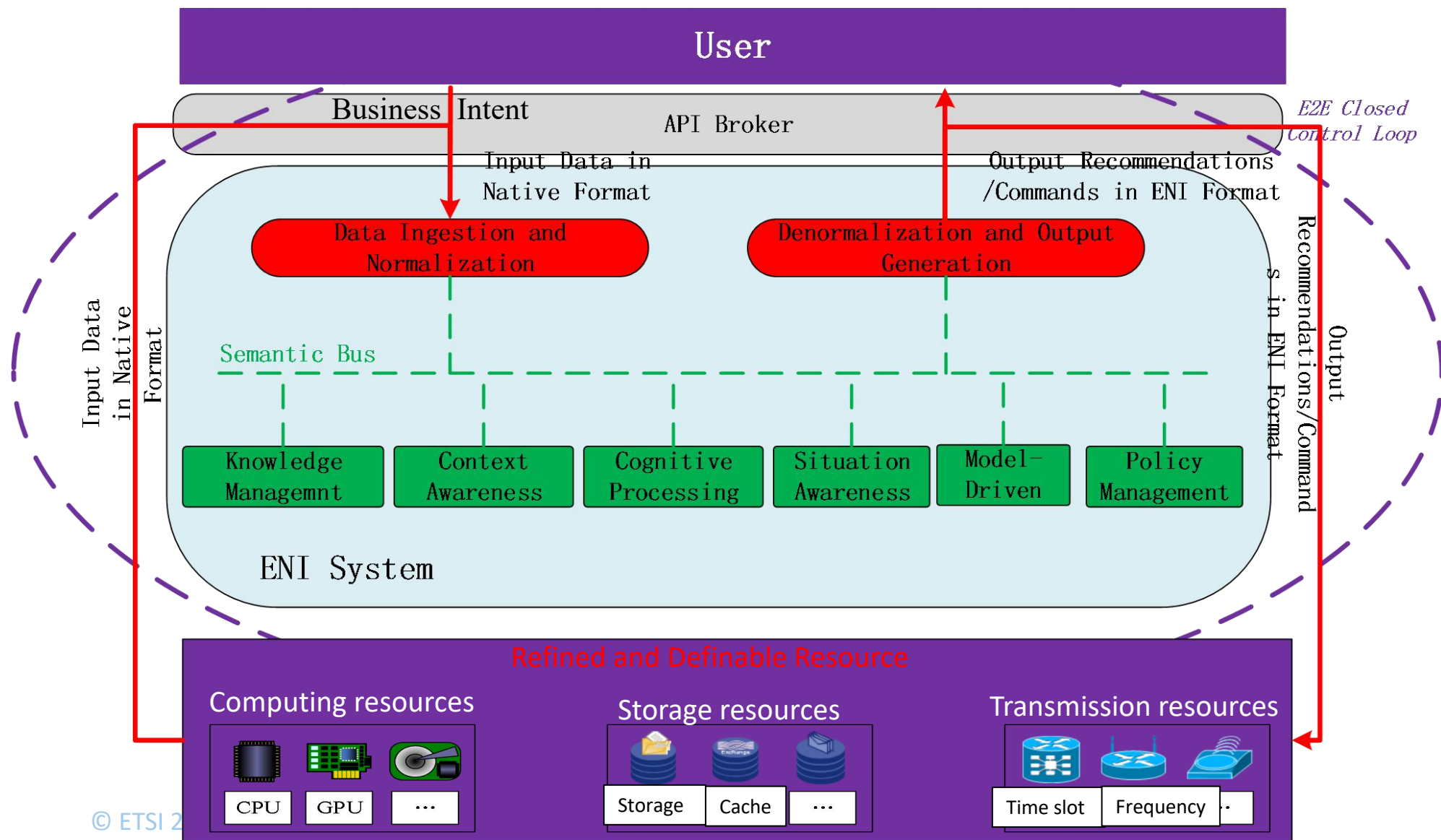


# PINet Architecture

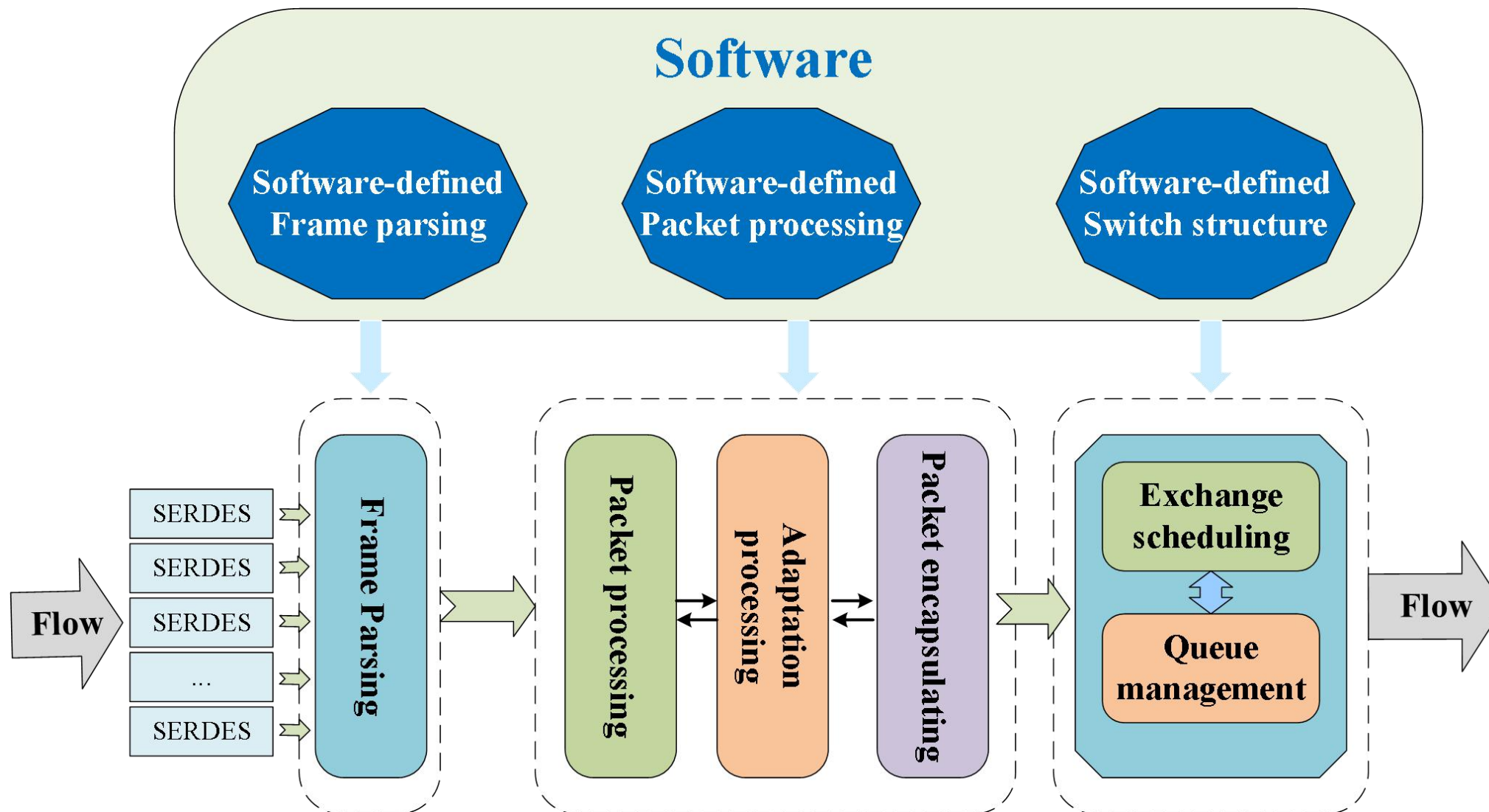




# Mapping to ENI Reference Architecture

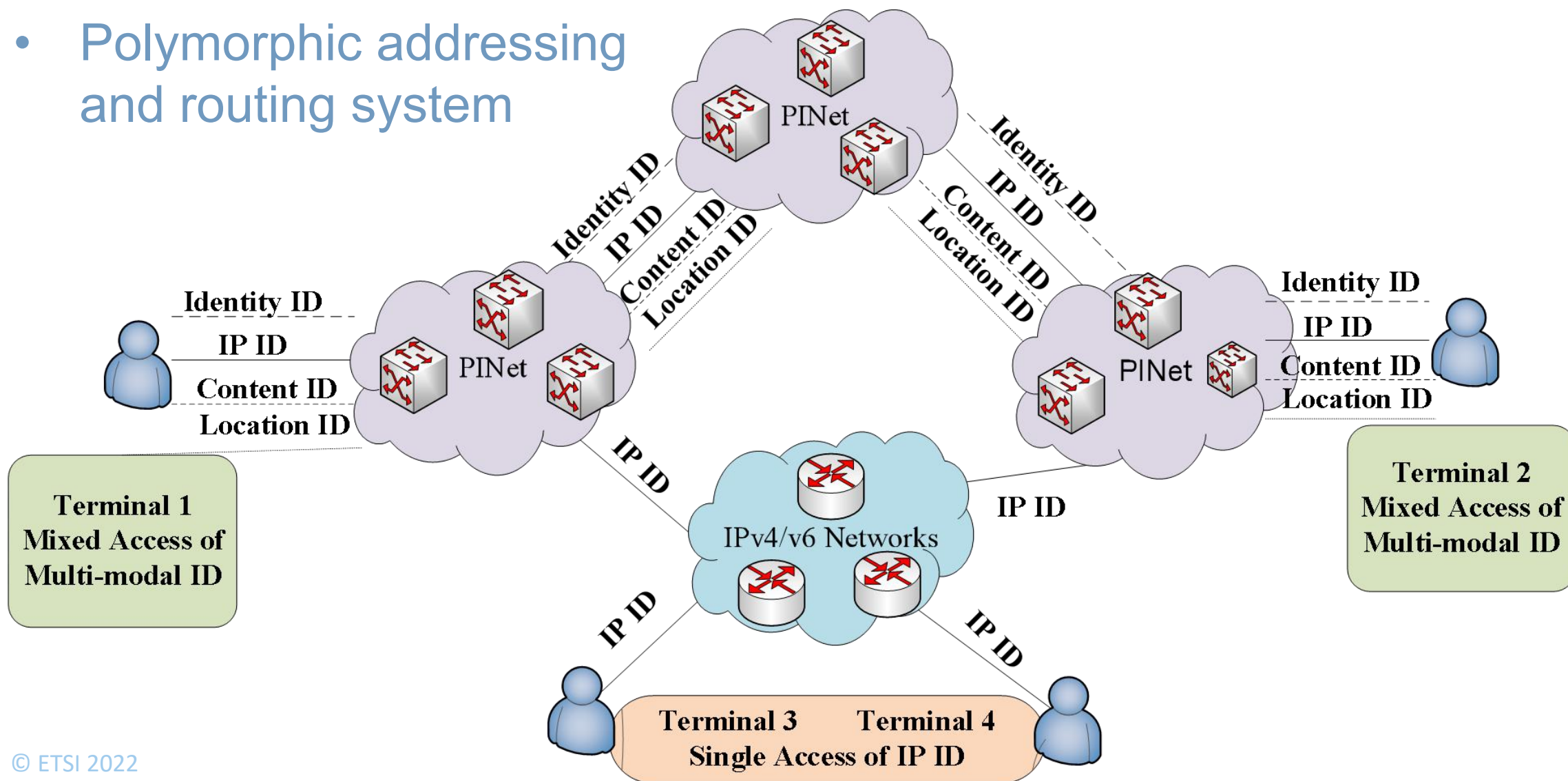


# Data Layer of PINet: Full-dimensional Definition

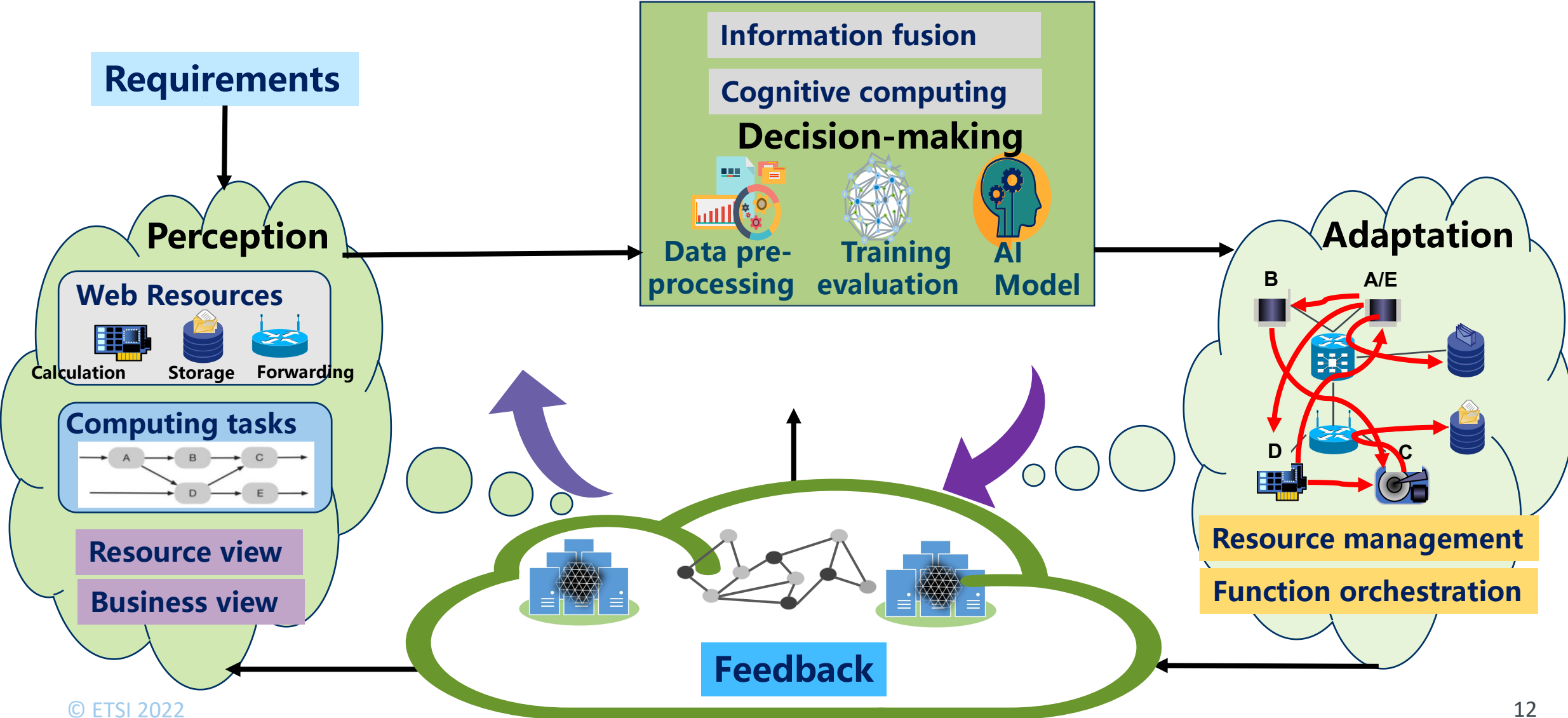


# Control Layer of PINet: Polymorphic Addressing and Routing

- Polymorphic addressing and routing system

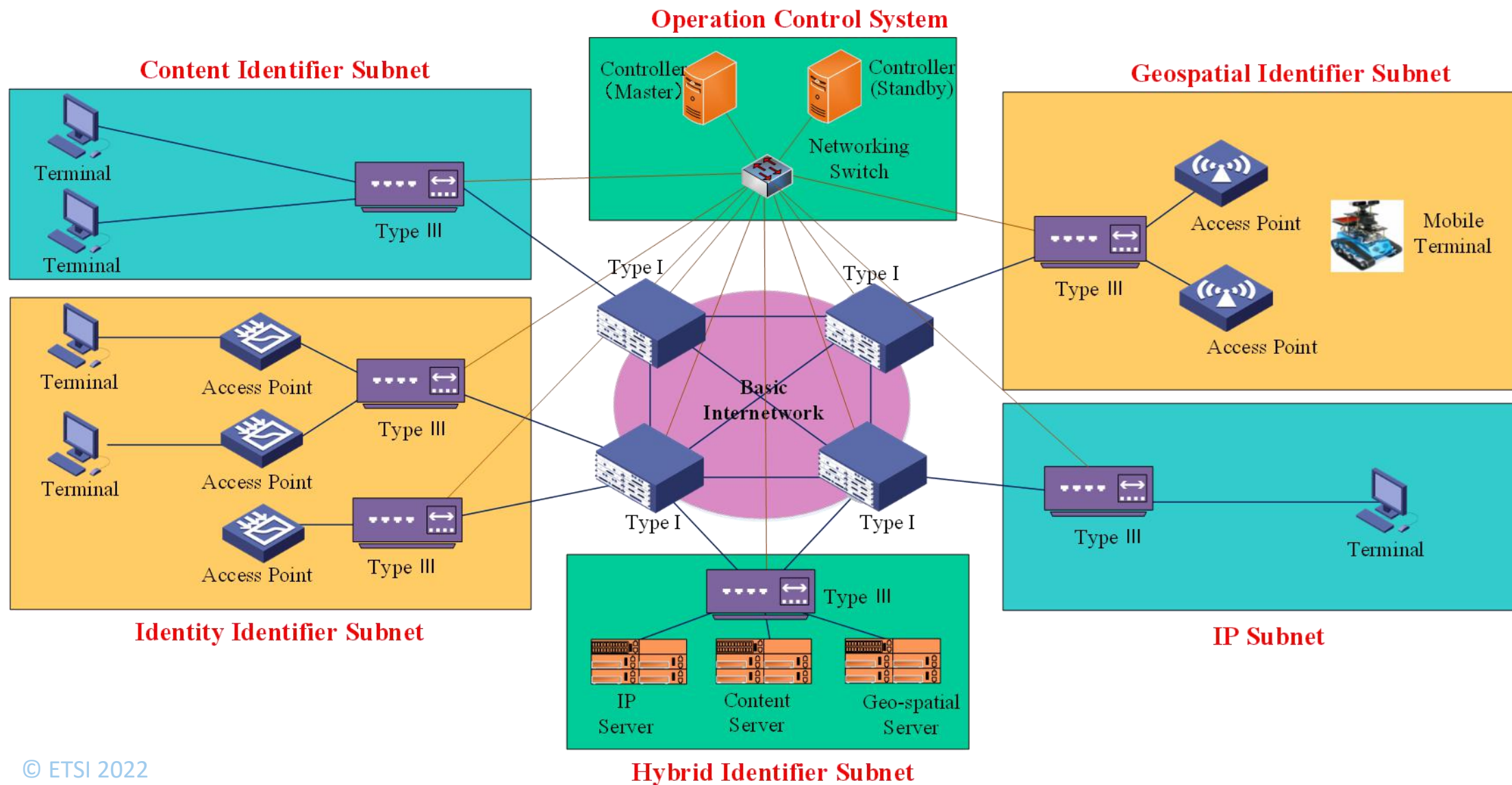


# Service Layer of PINet: ENI Assisted Intelligent Management and Scheduling



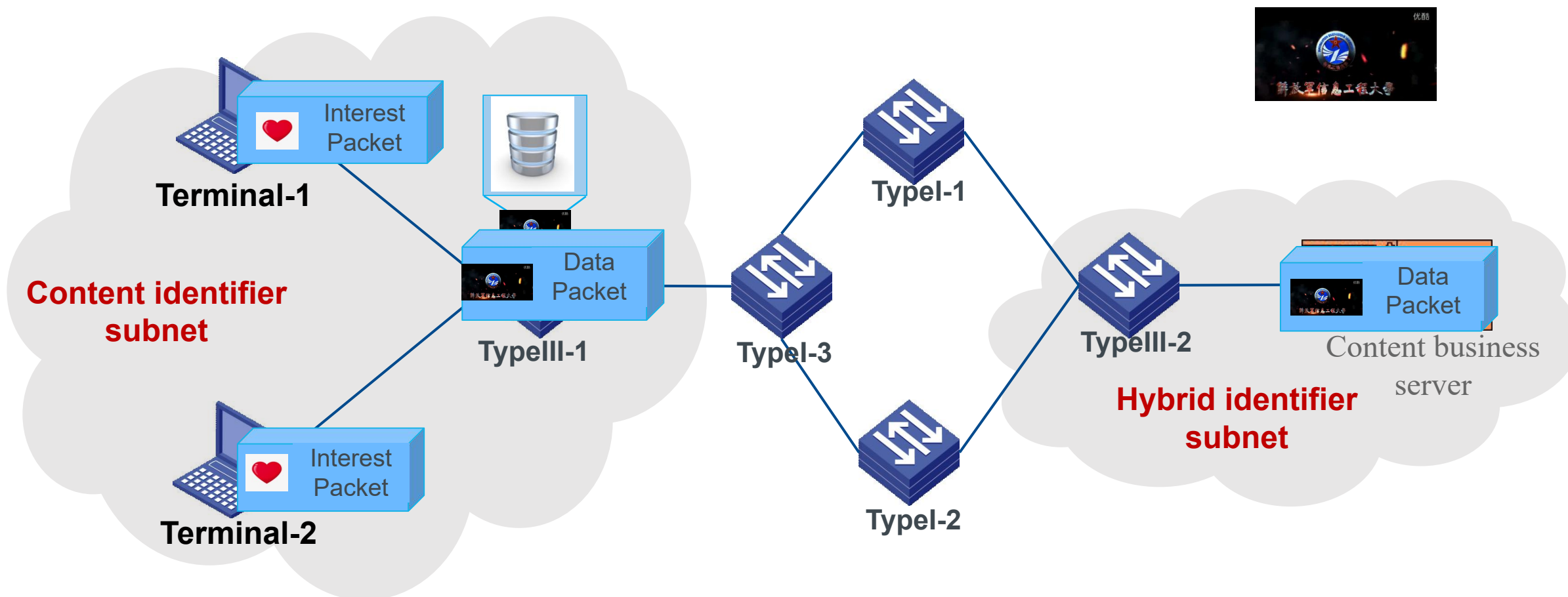


# Topology of Polymorphic Intelligent Network



## Demos

# Demo1: Content identifier service applications





# Demo 1: Content identifier service applications

## Experimental process



```
ndn-server@ndnserver-Standard-PC-i440FX-PIIX-1996:~$ ls
examples.desktop  install_dependency.sh  name.pdf  ndnfs.py  ndnputchunks3
Preparing the input...
Ready... (took 1153263527 nanoseconds)
```

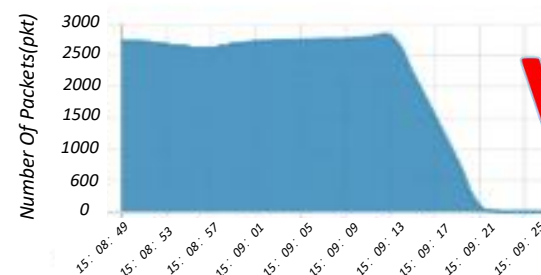
Get Video & Play

## Experimental results

### 1.Core Network Traffic Statistics

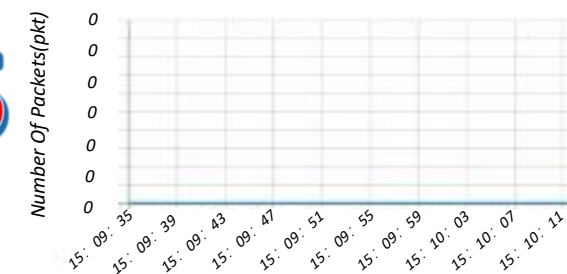
#### First Request

Traffic Rate Statistics On Content Identifier



#### Second Request

Traffic Rate Statistics On Content Identifier



VS

### 2. The time consumption

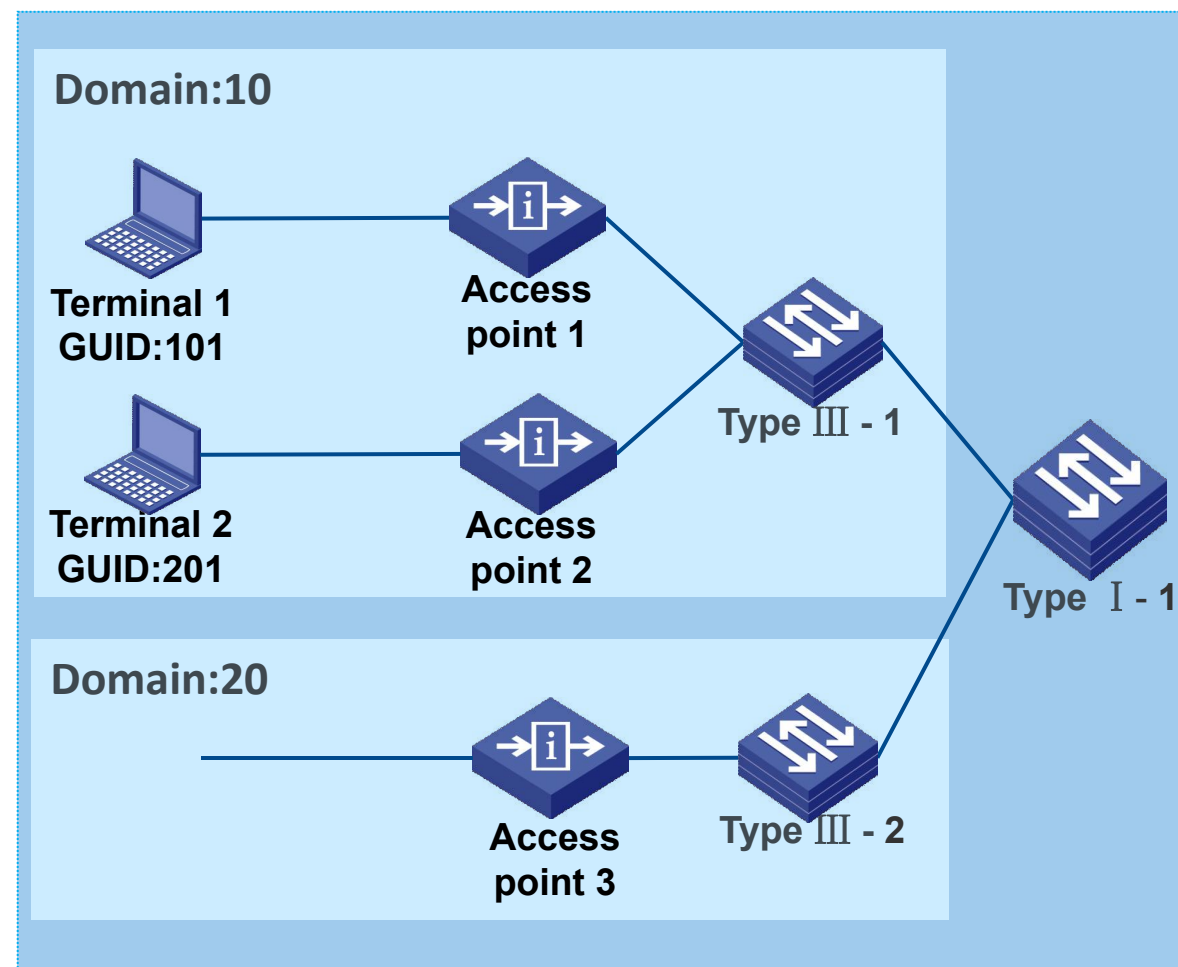
```
root@zjlab-hd-host:~# ndncatchunks3 /snt/sedan/state -o>zjlab.mp4
TIMEOUT: last interest sent for segment #1875
Took 38.9765 s
```

```
root@zjlab-hd-host:~# ndncatchunks3 /snt/sedan/state -o>zjlab.mp4
TIMEOUT: last interest sent for segment #1875
Took 13.753 s
```

VS

## Demo 2: Identity identifier service applications

- Divide into two domains. Two access points are deployed in Domain 10 and one access point is deployed in Domain 20.
- Terminal 1 connects to Access point 1 and terminal 2 switches from Access point 2 to Access point 3
- Expected result: Terminals 1 and 2 PING each other successfully, and the switchover does not lose packets



# Demo 2: Identity identifier service applications

## Experimental results

```

root@zjlab-OptiPlex-7060-China-HDD-Protection: ~
64 bytes received: seq_n=3, time=244.7539 msec
64 bytes received: seq_n=4, time=268.1360 msec
64 bytes received: seq_n=5, time=303.2891 msec
64 bytes received: seq_n=6, time=330.7371 msec
64 bytes received: seq_n=7, time=350.2341 msec
64 bytes received: seq_n=8, time=321.3740 msec
64 bytes received: seq_n=9, time=372.8091 msec
64 bytes received: seq_n=10, time=383.8560 msec
64 bytes received: seq_n=11, time=187.3000 msec
64 bytes received: seq_n=12, time=199.0710 msec
64 bytes received: seq_n=13, time=5902.3391 msec
64 bytes received: seq_n=14, time=5025.2229 msec
64 bytes received: seq_n=15, time=4156.8320 msec
64 bytes received: seq_n=16, time=3280.7141 msec
64 bytes received: seq_n=17, time=2400.1570 msec
64 bytes received: seq_n=18, time=1523.6992 msec
64 bytes received: seq_n=19, time=654.8911 msec
64 bytes received: seq_n=20, time=202.2290 msec
64 bytes received: seq_n=21, time=258.1421 msec
64 bytes received: seq_n=22, time=217.8481 msec
64 bytes received: seq_n=23, time=277.1638 msec
64 bytes received: seq_n=24, time=315.9702 msec
64 bytes received: seq_n=25, time=355.4800 msec
64 bytes received: seq_n=26, time=638.7590 msec
64 bytes received: seq_n=27, time=234.7549 msec
64 bytes received: seq_n=28, time=217.7810 msec
64 bytes received: seq_n=29, time=232.9778 msec
30 packets transmitted, 30 received
rtt min/avg/max/std = 187.3000/999.1022/5902.3391/ 0.0000 msec
root@zjlab-OptiPlex-7060-China-HDD-Protection: ~#

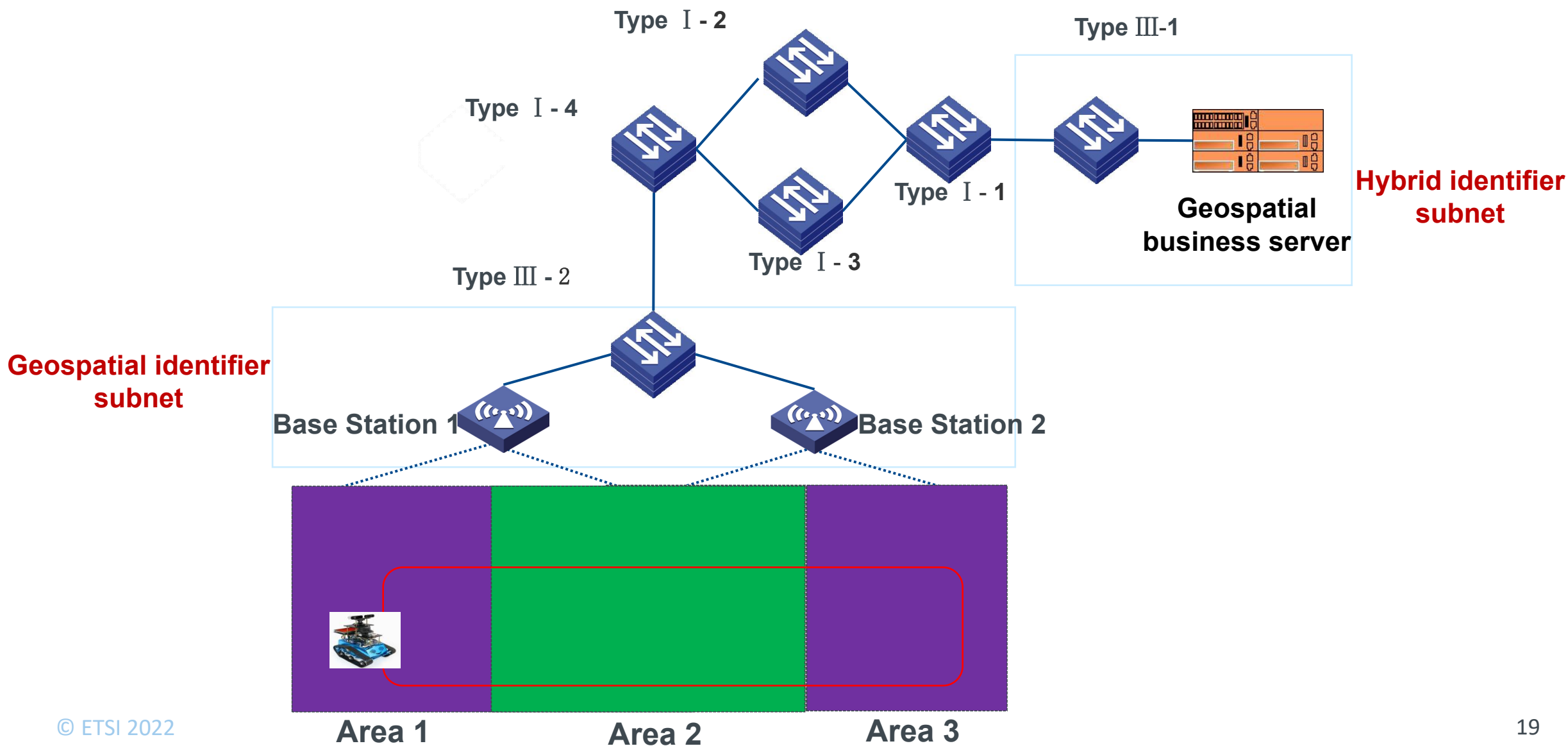
```

Access Point 2

Switching

Access Point 3

# Demo 3: Geospatial identifier service applications





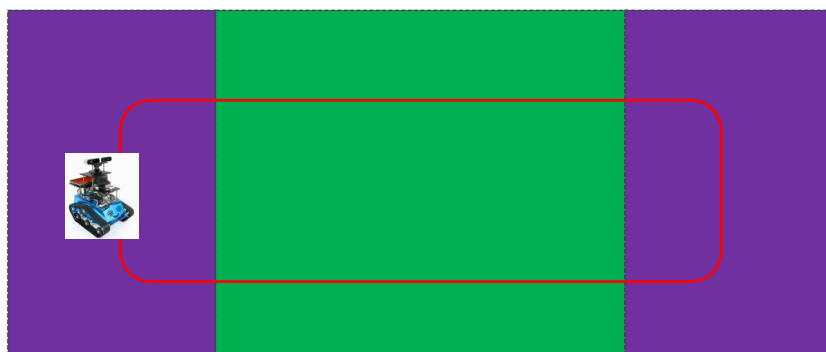
# Demo 3: Geospatial identifier service applications

## Designed Scenario 1

Action: Single area message push

(Send message to area 1)

Expected result: When the car enters area 1, the light will be on. When the car leaves area 1, the light will go out.



Area1

Area2

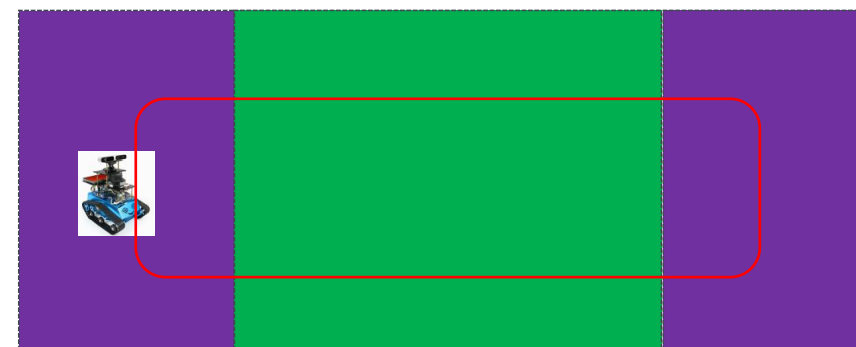
Area3

## Designed Scenario 2

Action: Multi-area message push

(Send message to area 1 and 3)

Expected result: When the car enters area 1 or area 3, the light will be on. When the car enters area 2, the light will go out.



Area1

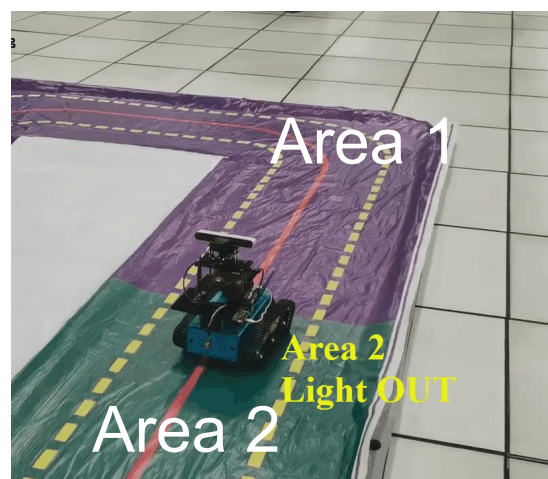
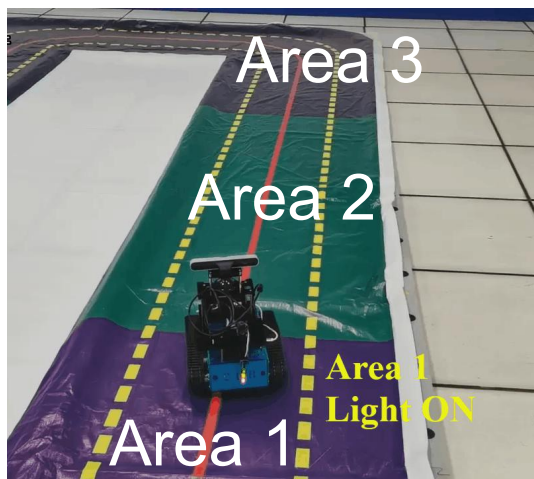
Area2

Area3

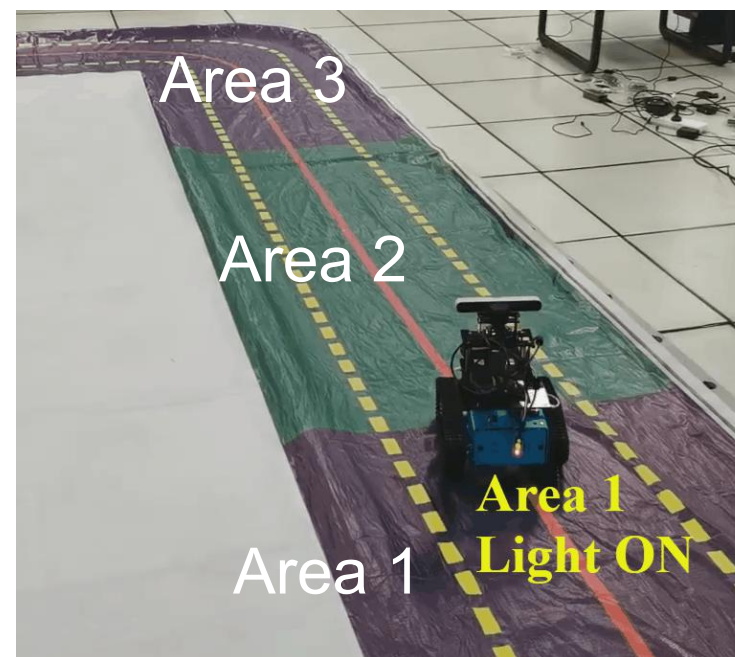
# Demo 3: Geospatial identifier service applications

## Experimental results

### Single area message push



### Multi-area message push





## PoC Impact



# Third party certification

## Test Report from **CAICT** 中国信通院 (China Academy of Information and Communications Technology)

  
  
170009013402

  
中国认可  
检测  
TESTING  
CNAS L0570

**CAICT**  
报告编号: B21B20388

### Test Report

**Product Name :** PINet System

**Model No.:** PINET-SCT-005

**Applicant :** National Digital Switching System Engineering & Technological Research Center

**Manufacturer :** National Digital Switching System Engineering & Technological Research Center

**Test Category :** Applied Test

中国泰尔实验室



A list of the tested content				
System name: Polymorphic intelligent network				
	Test item	Measured item	Qualified item	Unqualified item
Test content:				
1、PINet networking function	10	10	10	0
2、Content identifier application	5	5	5	0
3、Identification identifier application	7	7	7	0
4、Geospatial identifier application	4	4	4	0
5、IP identifier application	5	5	5	0
Total	31	31	31	0

**100%qualified**

# PoC Impact

## 2021 CT PINet Online Forum



## PINet summits by key scholars



**I. MCLab**

**Jack Lee**  
Hong Kong  
无共同联系人

- Focus on **Systems Research**
  - Solving **real-world** problems
  - Designing **practical** solutions
  - Implementing **operational** systems
- Aim for **Impact**
  - Ground-breaking **innovations**
  - Technology** transfer to industry
  - Contribute to the **Global** Internet community

The Chinese University of Hong Kong

## 2021 Summer Camp: PINet Science



## Some 20+ PINet related seminars



# PoC Impact

Apr 28 2022, ETSI WEBINARS

## PINet— Polymorphic Intelligent Network (ENI POC #15)

▶ Apr 28 2022 | Duration: 44 mins



 Presented by

# PoC Milestones and Current Progress

# PINet—Polymorphic Intelligent Network

## PoC Milestones and Current Progress

PoC Milestone	Stages/Milestone description	Target Date	Additional Info
P.S	PoC Project Start	12/2021	Presentation during ENI #20 ✓
P.D1	PoC Demo 1	03/2022	Presentation during ENI #21 ✓
P.D2	<del>PoC Demo 2</del>	<del>05/2022</del>	<del>Demo at Beijing CTIDC conference 2022</del> <b>Cancelled because of epidemic situation in Beijing</b>
P.D2	PoC Demo2	04/2022	ETSI Webinar ✓
P.C1	PoC Expected Contribution 1	07/2022	Contributions to ENI Requirement.
P.C2	PoC Expected Contribution 2	08/2022	Contributions to ENI Use Case.
P.C3	PoC Expected Contribution 3	09/2022	Contributions to ENI Terminology.
P.R	PoC Report	09/10/2022	PoC-Project-End Feedback
P.E	PoC Project End	11/2022	Presented to ISG ENI for information

Current

Target

Milestones need to be entered in chronological order. NOTE: