Agent-aware Networking:
Digital Banking Use Case & Architecture

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Content

Digital banking Scenario

- focusing on the bank union member interconnection case
- based on an on-going joint innovation project with UnionPay

"Agent-Aware Networking"

- Align with "DA-ITN (Data & Agent aware Inference and Training Network)
- Narrow down into:
    - (mostly) Enterprise network scenarios
    - Agent communication specific
- Agent Gateway based Architecture
    - A new plane built upon underlay network infrastructure
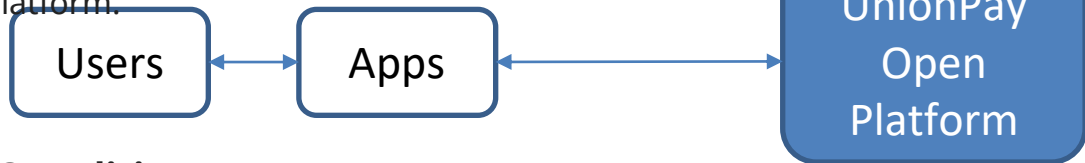   - Synergy with underlay networks (e.g. through APN)

High-level illustration of banks interconnection system

- **UnionPay**
  - ✓ "Public Infrastructure" and "Rule-Setter" in the payment/financial domain in China.
- **Open Banking Platform**
  - ✓ All member banks adhere to the unified technical standards established by the alliance, seamlessly integrating their core systems with the alliance's central platform.

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Users  ⟷  Apps  ⟵⟶  UnionPay Open Platform  →  Commercial Bank 1
                                              →  Commercial Bank 2
                                              ⋮
                                              →  Commercial Bank N
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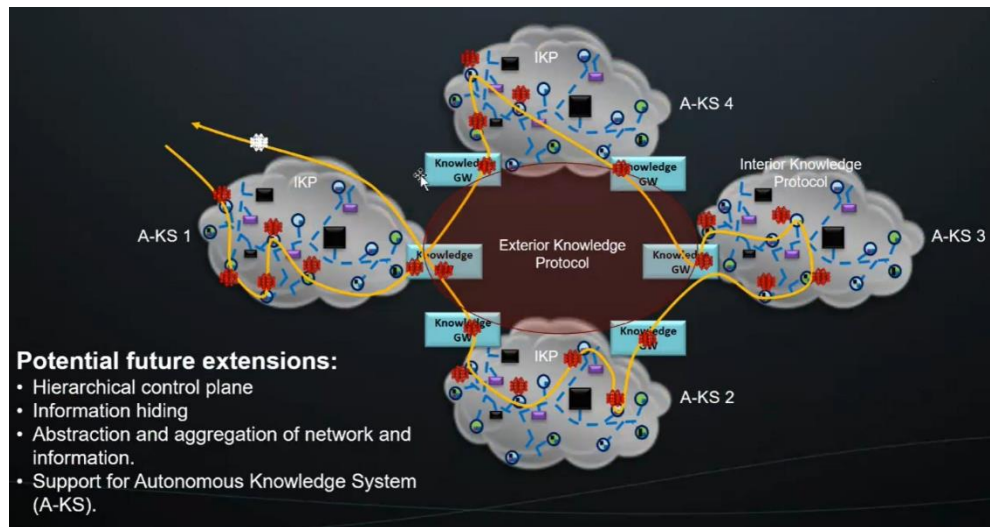
- **IPO auditing use case**
  - ✓ when a company applies for listing, underwriters and lawyers need to conduct a thorough review of the company's bank account transactions to verify the authenticity of its revenue and the compliance of its funds.
  - ✓ Companies normally hold accounts in dozens of different banks, that the review process becomes extremely cumbersome.
  - ✓ The digital interconnection system established by the banking alliance plays a critical role.
- **API to Agentic**
  - ✓ Traditional API calls demonstrate significant limitations when dealing with complex and ever-changing business environments.
  - ✓ Agentic interconnection/orchestration fundamentally overturns the traditional models

Inspiration from DA-ITN: overlay network & gateways

Potential future extensions:
- Hierarchical control plane
- Information hiding
- Abstraction and aggregation of network and information.
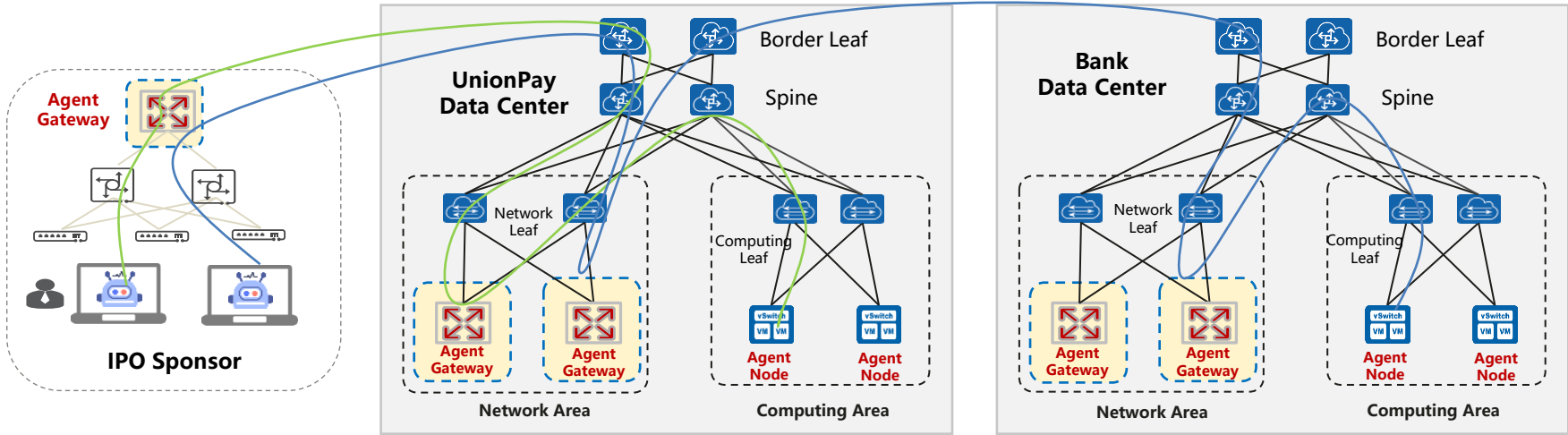- Support for Autonomous Knowledge System (A-KS).

- ■ Quoted presentation in IETF123 DA-ITN side meeting：
- ✓ Hierarchical Design: Similar to the IGP/BGP hierarchy, intra-domain & inter-domain
- ✓ Aggregation: Similar to prefix aggregation, gateways also perform data aggregation processing across the IGP-to-BGP hierarchy.
- ✓ Autonomy: Through distributed interactions between gateways, autonomous systems are achieved within domains and between domains.
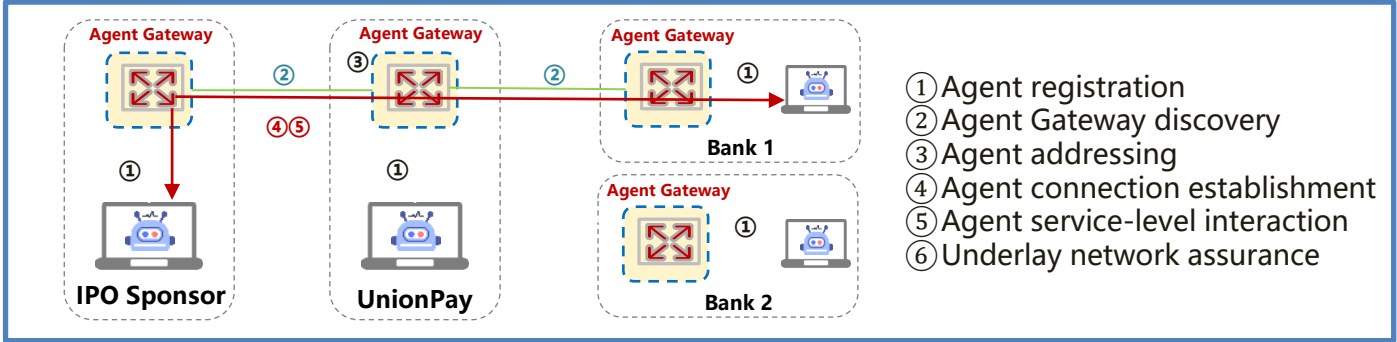
- ■ General idea: (cross-vendor) agent communication needs an overlay network to bearer, and operators are suitable to run the overlay network
- ■ Benefit of the overlay：
- ✓ Distributed agent discovery based on agent metadata sync between (agent) gateways. (routing-alike)
- ✓ Agents observability also based on agent metadata sync
- ✓ Synergy with underlay, e.g. instance VPN/Slicing for multiple agent communication to guaranteed QoS/Secuirty

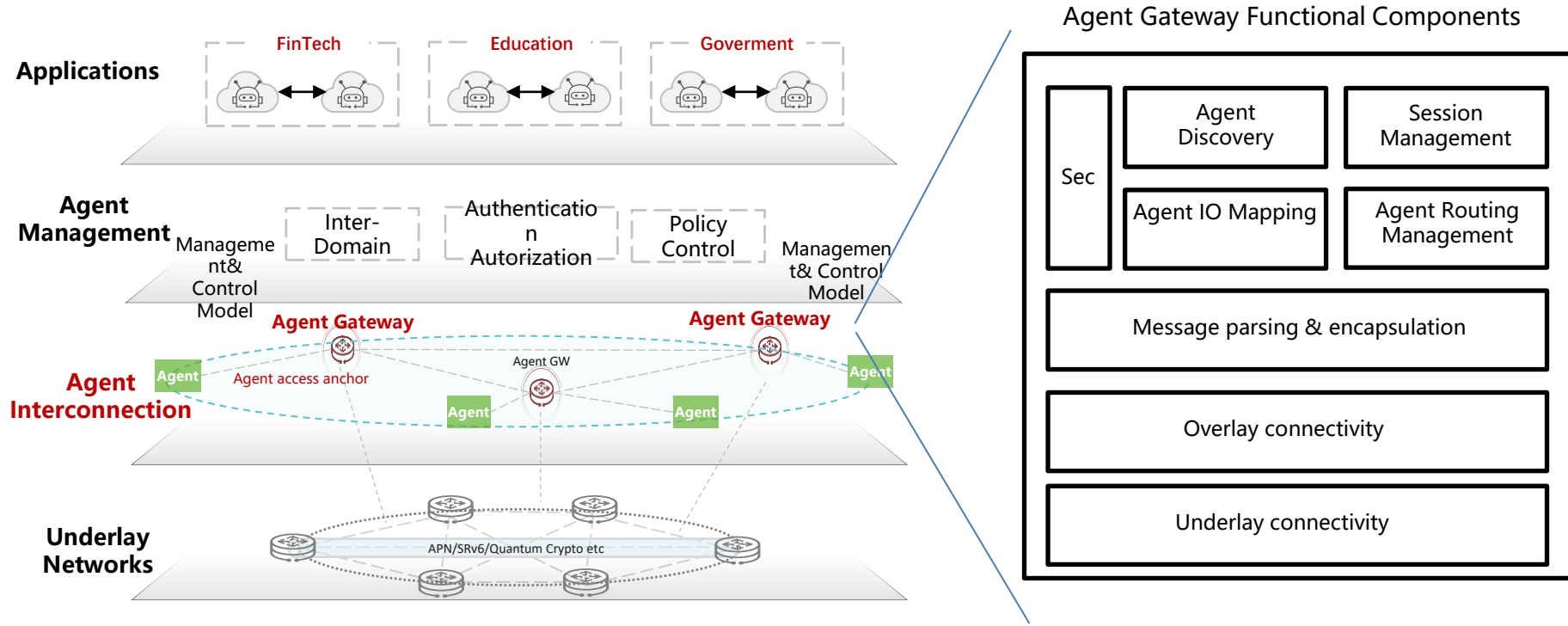# Solution architecture based on Agent Gateways and the overlay interconnection

Underlay Network Deployment View

Agent Gateway

UnionPay Data Center

Border Leaf

Spine

IPO Sponsor

Network Leaf

Computing Leaf

Agent Gateway

Agent Gateway

Agent Node

Agent Node

Network Area

Computing Area

Bank Data Center

Border Leaf

Spine

Network Leaf

Computing Leaf

Agent Gateway

Agent Gateway

Agent Node

Agent Node

Network Area

Computing Area

Agent Interconnection Overlay View

Agent Gateway

Agent Gateway

Agent Gateway

Bank 1

IPO Sponsor

UnionPay

Agent Gateway

Bank 2

① Agent registration
② Agent Gateway discovery
③ Agent addressing
④ Agent connection establishment
⑤ Agent service-level interaction
⑥ Underlay network assurance

Architecture abstraction: A new plane built upon underlay network infrastructure

Agent Gateway Functional Components

Underlay synergy: fine granular services for agent communication

1. Interaction of Agents needs Differentiated SLA Guarantee from network

- **Tool invocation** tasks (real-time interaction): **High** sensitivity to latency and jitter, **Low** bandwidth
- **Text generation** tasks: **Medium** sensitivity to latency, **Low** bandwidth.
- **Image generation** tasks: **Low** sensitivity to latency, **Medium** bandwidth demands.
- **Video generation** tasks: **Low** sensitivity to latency and jitter, **Very High** bandwidth demands.
- ➔ **Agents need to tell the network what SLA they want.**

2. Agents need Secure Transmission from network

- **Online shopping and payment scenarios:** personal account information and financial data require higher level of security for transmission.
- **Enterprises scenarios:** some agents that can access sensitive data are not allowed to collaborate with external agents to prevent data leakage.
- ➔ **Agents need to tell the network what Security they want.**

3. Agents need Measurement and Visualization from network

- The quality of communication may need to be measured for purposes such as fault localization, troubleshooting, and visualization.
- ➔ **Agents need to tell the network what Advanced Services they want.**

Solution candidate: APN (Application-aware Networking)

APN (Application-aware Networking) is a technology that enables applications to express their requirements, and enables networks to be aware of applications' requirements.

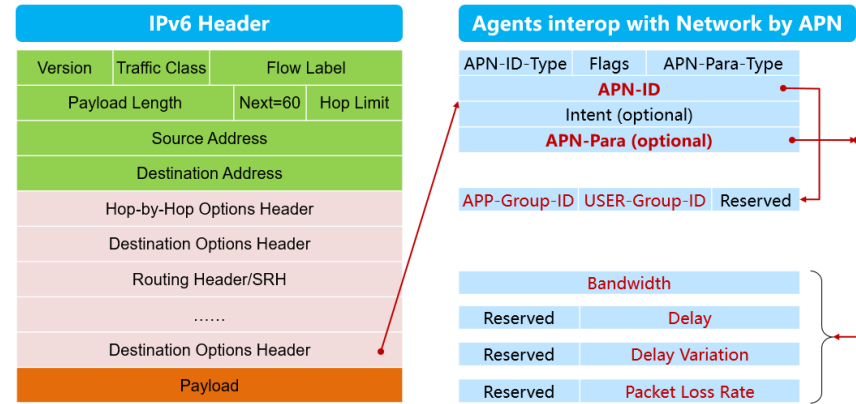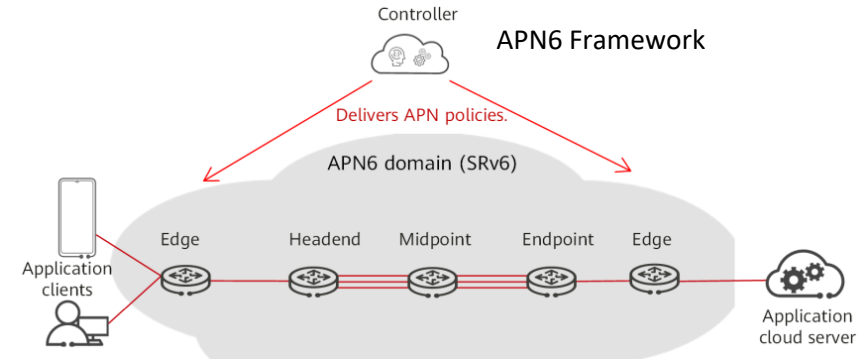**1. Agents use APN params to tell the network what SLA they want.**

- Bandwidth, Delay, Delay Variation, Packet Loss Rate parameters

2. Agents use APN ID to identify their group, to tell the network what Security they want.

- e.g. APP-Group-ID 0x0001 stands for using IPsec tunnel, and 0x0002 stands for plaintext transport
- e.g. User-Group-ID 0x0001 stands for security group 1, and 0x0002 for security group 2

3. Agents use APN IDs to identify their requirement for advanced services.

- e.g. APP-Group-ID 0x01** for measurement
- e.g. APP-Group-ID 0x02** for troubleshooting
- e.g. APP-Group-ID 0x04** for path visualization

Controller

APN6 Framework

Delivers APN policies.

APN6 domain (SRv6)

Application clients | Edge | Headend | Midpoint | Endpoint | Edge | Application cloud server

IPv6 Header		
Version	Traffic Class	Flow Label
Payload Length	Next=60	Hop Limit
Source Address		
Destination Address		
Hop-by-Hop Options Header		
Destination Options Header		
Routing Header/SRH		
......		
Destination Options Header		
Payload		

Agents interop with Network by APN		
APN-ID-Type	Flags	APN-Para-Type
APN-ID		
Intent (optional)		
APN-Para (optional)		
APP-Group-ID	USER-Group-ID	Reserved
Bandwidth		
Reserved	Delay	
Reserved	Delay Variation	
Reserved	Packet Loss Rate	

- draft-li-rtgwg-apn-framework
- draft-li-rtgwg-apn-app-side-framework

APN for Agent Communication

1. AI Agent in user side or server side

- subscribe to network services from ISP
- send packets carrying requirements by APN ID or APN params

2. APN-Edge forwards the packets transparently.

- or encaps APN ID according to ISP subscription info.

3. APN-Head identifies the requirements of agents **based on the APN ID and APN params**, then:

- For SLA guarantee, steers the packets to a TE tunnel, a network slice, and/or a QoS queue buffer.
- For secure transmission, steers the packet to a IPsec tunnel, or enforce access control.
- For advanced services, executes measurement, and report telemetry data to network controller.

4. APN-Midpoint and APN-Endpoint provide same services **based on the APN ID and APN params,** or according to the information encapsulated by APN-Head.
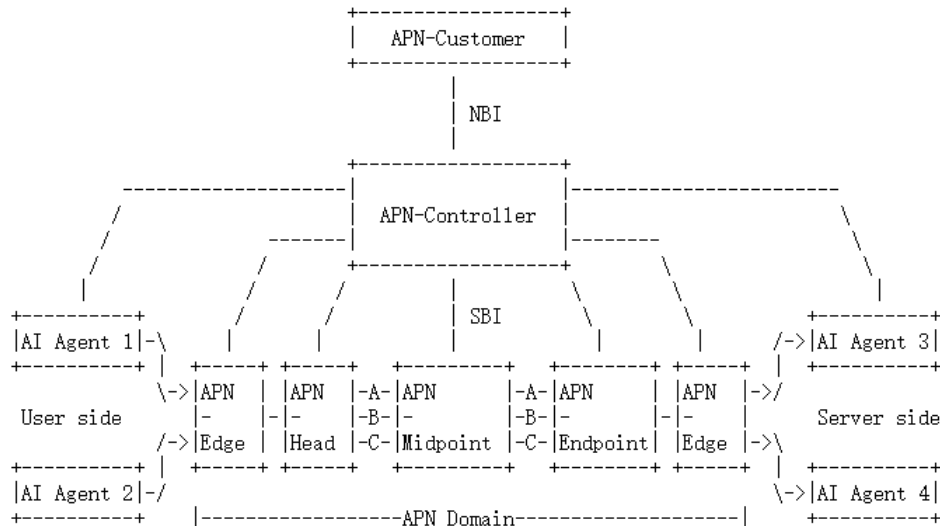

Figure 1: Using APN framework in IoA scenarios

draft-mao-rtgwg-apn-framework-for-ioa

Thank You!

Further reading:
- https://datatracker.ietf.org/doc/draft-men-rtgwg-agent-networking-in-digibank/
- https://datatracker.ietf.org/doc/draft-zlgsgl-rtgwg-agents-networking-framework/
- https://datatracker.ietf.org/doc/draft-mao-rtgwg-apn-framework-for-ioa/