

KOREA FREE ZONE

2016. 06.

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1. Executive Summary

Executive Summary

Free Zone Complex

- Development consortium with disruptive technologies sponsored by LFG Limited
 - Supercomputer
 - On-board HPC
 - TIPN
 - Full-digital Base Station and 64 MIMO Antenna
 - Solar Cell, etc.
- Smart City in Korea : 9.9M m²
 - Next Generation Full-digital Fixed/Mobile Metropolitan Area Network
 - Full Mesh Ad hoc Network for IoT
 - Free Zone, Industrial Park, Smart City
 - Best Practice for New Technologies in Smart City
- Researcher : over 5,000 Persons
 - More than 200 Ventures
 - Development Funds for Core Technologies by LFG Limited
- Global Internet Hub
 - Undersea Fiber Optic Plant : 1 Tbps per Lamda (or per Core)
 - Direct Interconnection with Level 3 and so on
 - Global Internet IX Connectivity

Executive Summary

Global Best On-demand Application Deployment and IoT

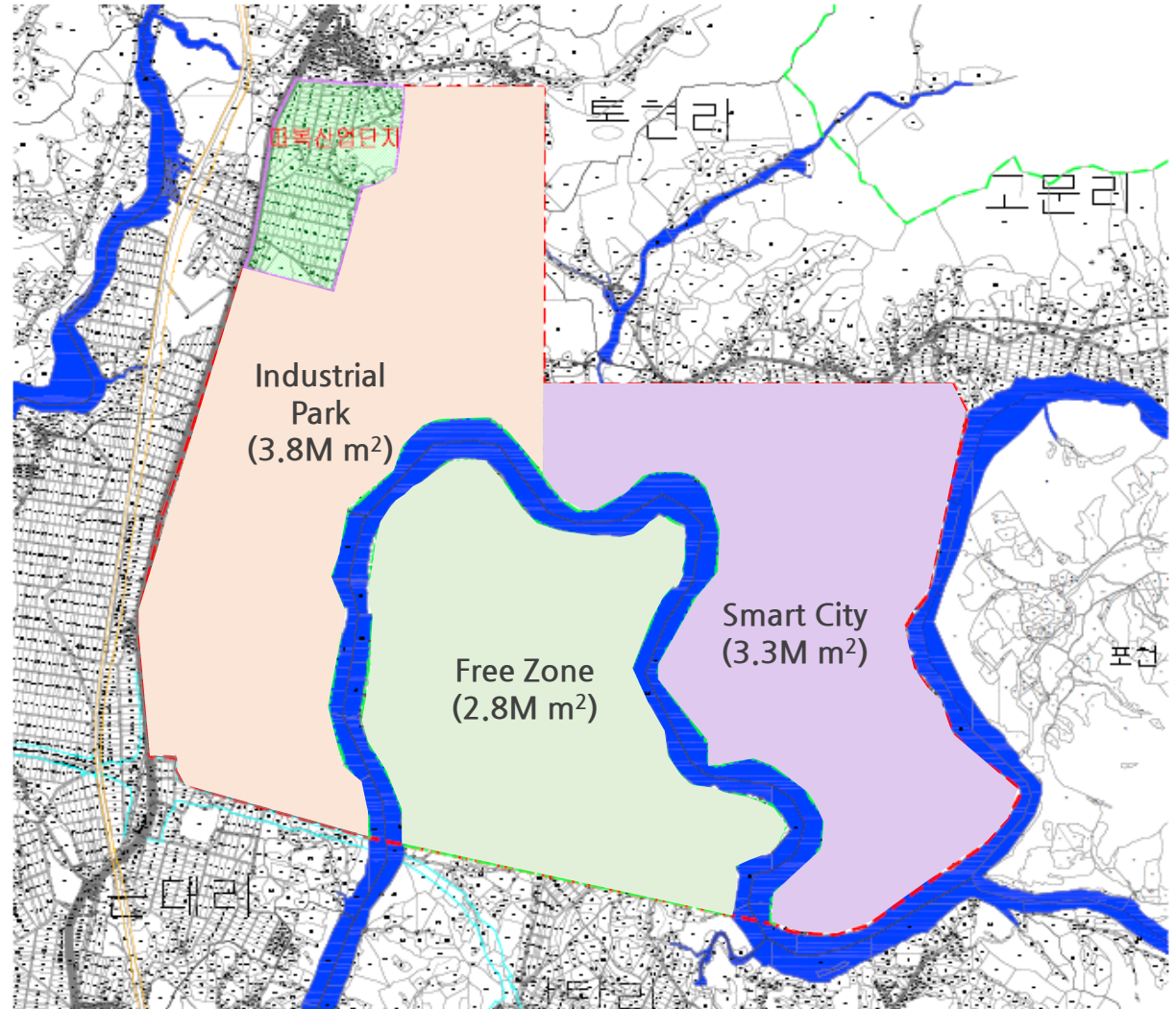
- Global Data Center
 - Global Leading Supercomputer
 - Private, Hybrid, Public Cloud
 - AI-based Software Development Environment : Self-learning, etc.
 - On-demand Application Deployment
- Portal of Portals
 - Global Authentications
 - Gold-Backed Cyber Currency

2. LFG Smart City

LFG Smart City

Location : Yeoncheon-gun, Gyeonggi-do, Korea

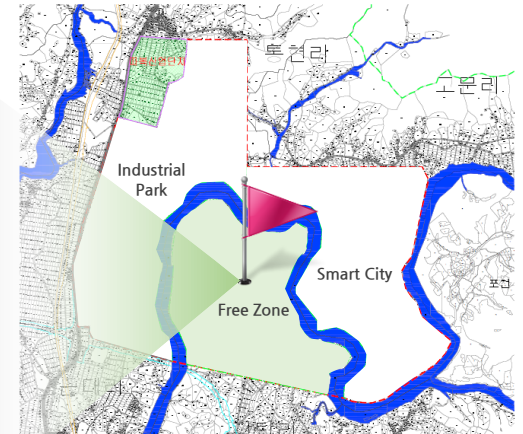
- Square Meter
- 9.9M m²



LFG Smart City

Free Zone

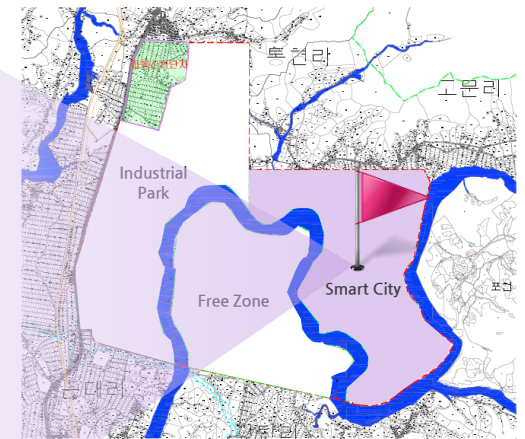
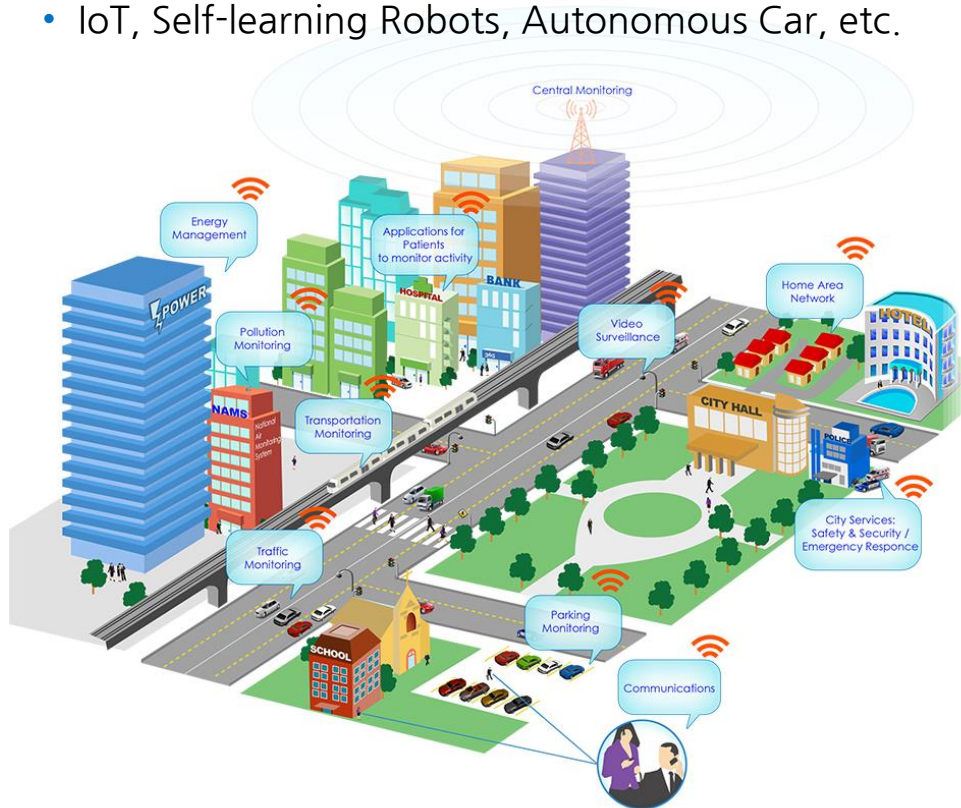
- R&D Center
- LFG Orchestration Capability
- Internet Global Hub
- Global Data Center



LFG Smart City

Smart City

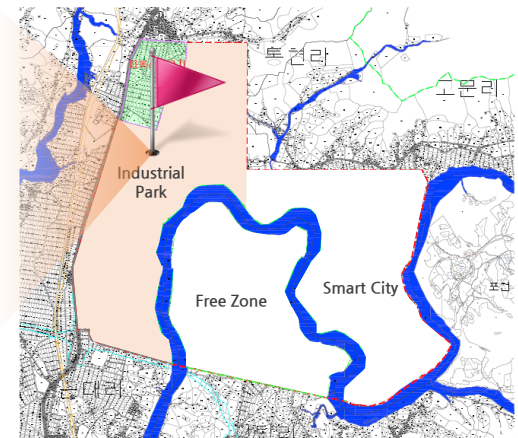
- Facilities
 - Shops, Accommodations, etc.
 - Factories
- Field Test and Trial
 - IoT, Self-learning Robots, Autonomous Car, etc.



LFG Smart City

Industrial Park

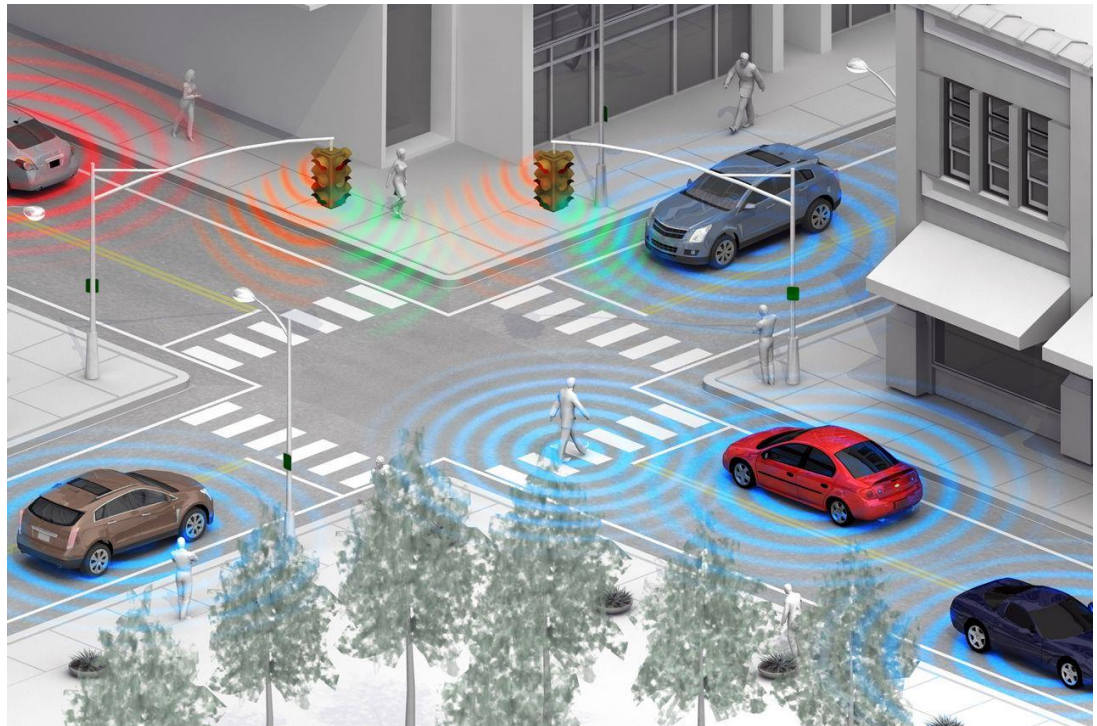
- Enterprise R&D Center
 - 3 SI (Orchestration Capability, Smart Device, IoT, etc.)
 - 200+ Ventures
- Residential Area
- Facilities
 - School, Department Store, Hospital, etc.



LFG Smart City

⚙️ Metropolitan Area Network : High-speed Access @ Anywhere, Any Device

- Access
 - LAN, WiFi, LTE, 5G and beyond
- High-speed IP Network
 - Capacity : 00 Tbps
 - Data Center : 00 Tbps
 - 1/10 Gbps per Venture
- TIPN
 - Capacity : 1 Tbps
 - 1 Gbps per Venture



LFG Smart City

Alternative Energy : Solar Cell

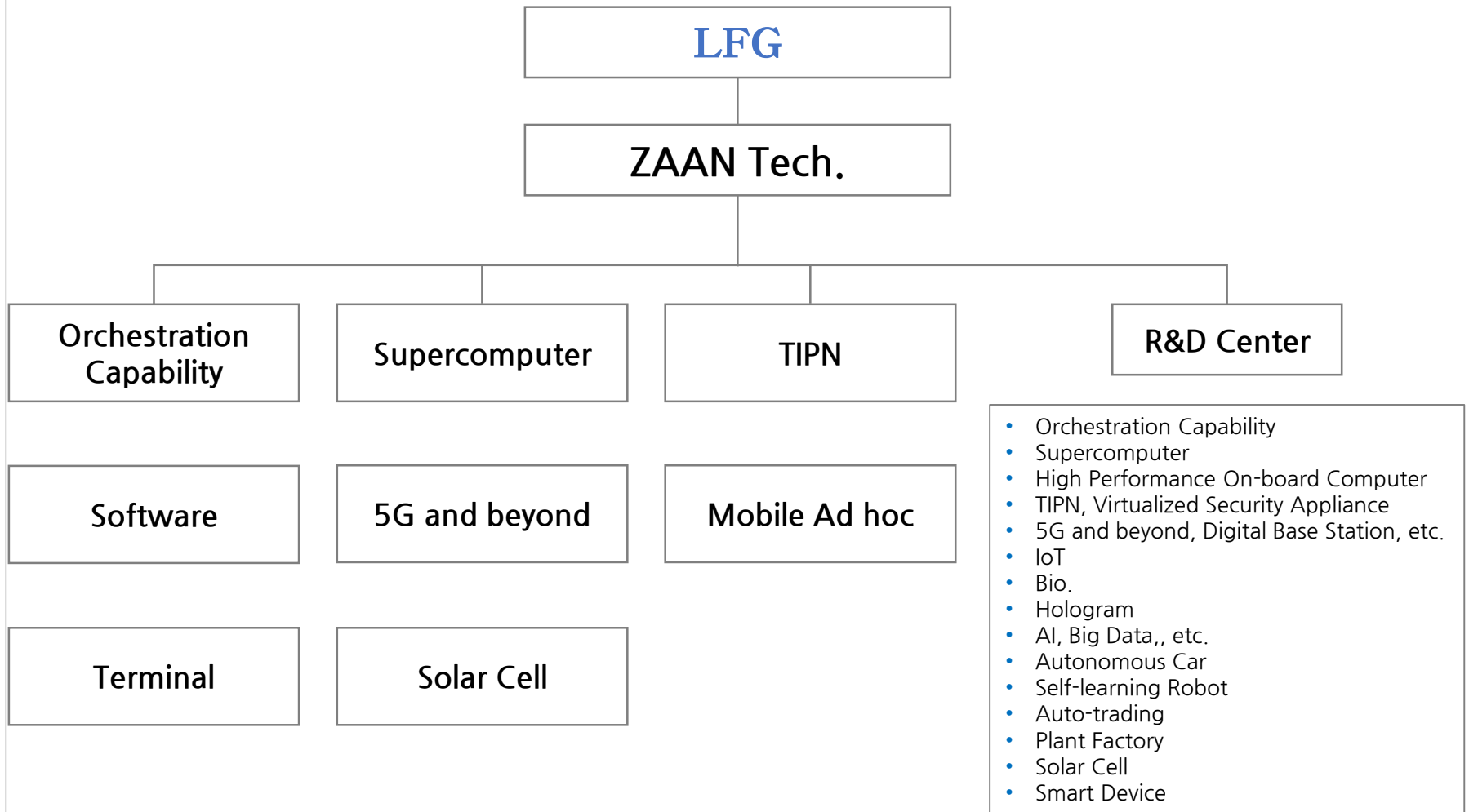
- Solar Cell Plant in LFG Smart City
 - Yeoncheon



3. LFG Development Consortium

LFG Development Consortium

Organization



LFG Global Innovative R&D Center

Major Development (Managed by ZAAN Tech.)

- Orchestration Capability
- Supercomputer
- High Performance On-board Computer
- TIPN, Virtualized Security Appliance
- 5G and beyond, Digital Base Station, etc.
- IoT : Mobile Gateway with Base Station, Cyber Security, ITS, Surveillance, etc.
- Bio.
- Hologram
- AI, Big Data,, etc.
- Autonomous Car
- Self-learning Robot
- Auto-trading
- Plant Factory
- Solar Cell
- Smart Device Management

LFG Global Innovative R&D Center

Key Member and Group (1)

- ETRI
 - Planning
 - Business Management
 - LFG Trusted E2E Architecture for On-demand Application Deployment
 - Orchestration Capability
 - TIPN
 - Mobile Ad hoc Network
 - File System
 - Supercomputer
 - On-board HPC (High Performance Computer)
 - 5G Phased Array Team
- TIPN Group
 - Next Generation TIPN Gateway
 - TIPN-based Mobile Gateway
- Supercomputer Group
 - Supercomputer, On-board HPC
 - Peta-grade File System
 - Hardware-based Encryption

LFG Development Consortium

Key Member and Group (2)

- 5G and beyond Wireless Group
 - 16, 64 Digital MIMO Antenna
 - Full-digital Base Station, etc.
- Software Group
 - Orchestration Platform
 - Global Authentication
 - Smart Device
 - OS
 - AI : Self-learning, etc.
 - Big Data, etc.
- IoT Group
 - Architecture
 - Protocol
 - Proxy Agent, etc.
- Others
 - Self-learning Robot
 - Plant Factory
 - Solar Cell, etc.

LFG Development Consortium

ETRI : Planning

- Role
 - NDA
 - Project Planning
 - Organization
 - ✓ E2E Provisioning Group
 - ✓ TIPN Group
 - ✓ Service IP Network Group
 - ✓ Supercomputer/File System Group
 - ✓ LTE and beyond Wireless Group
 - ✓ Agent Group
 - Project Management
- Subjects
 - Requirements : MRD (Market Requirement Documentation)
 - Survey of Disruptive Technologies
 - Survey of Ventures
 - Milestone
 - LFG Development Consortium and Competitive Analysis

LFG Development Consortium

ETRI : Development

- Role
 - Project Planning
 - Architecture
 - Orchestration Capability and Platform
 - On-demand Application Deployment Model
 - ✓ Terminal
 - ✓ Network
 - ✓ Virtualized Security Appliance
 - ✓ Supercomputer, etc.
 - Agent : Terminal, Supercomputer, Network Devices, etc.
- Subjects
 - Requirements : SRD (System Requirement Documentation)
 - Concept
 - Framework
 - Architecture
 - Interface
 - Development Environment
 - Test Environment
 - Change Management

LFG Development Consortium

Development Process (1)

- Hardware
 - Concept
 - Framework
 - Architecture
 - Requirements : SRD (System Requirement Documentation)
 - Development Environment
 - Test Environment
 - Design
 - ✓ Concept
 - ✓ Detailed
 - Interface
 - Implementation
 - Change Management
 - Documentation
 - Test
 - ✓ Smoke Test
 - ✓ Functional Test
 - ✓ Regression Test

LFG Development Consortium

Development Process (2)

- Software
 - Concept
 - Framework
 - Architecture
 - Requirements : SRD (System Requirement Documentation)
 - Development Environment
 - Test Environment
 - Design
 - ✓ Concept
 - ✓ Detailed
 - Interface
 - Implementation
 - Change Management
 - Documentation
 - Test
 - ✓ Smoke Test
 - ✓ Functional Test
 - ✓ Regression Test
 - Configuration Management

LFG Development Consortium

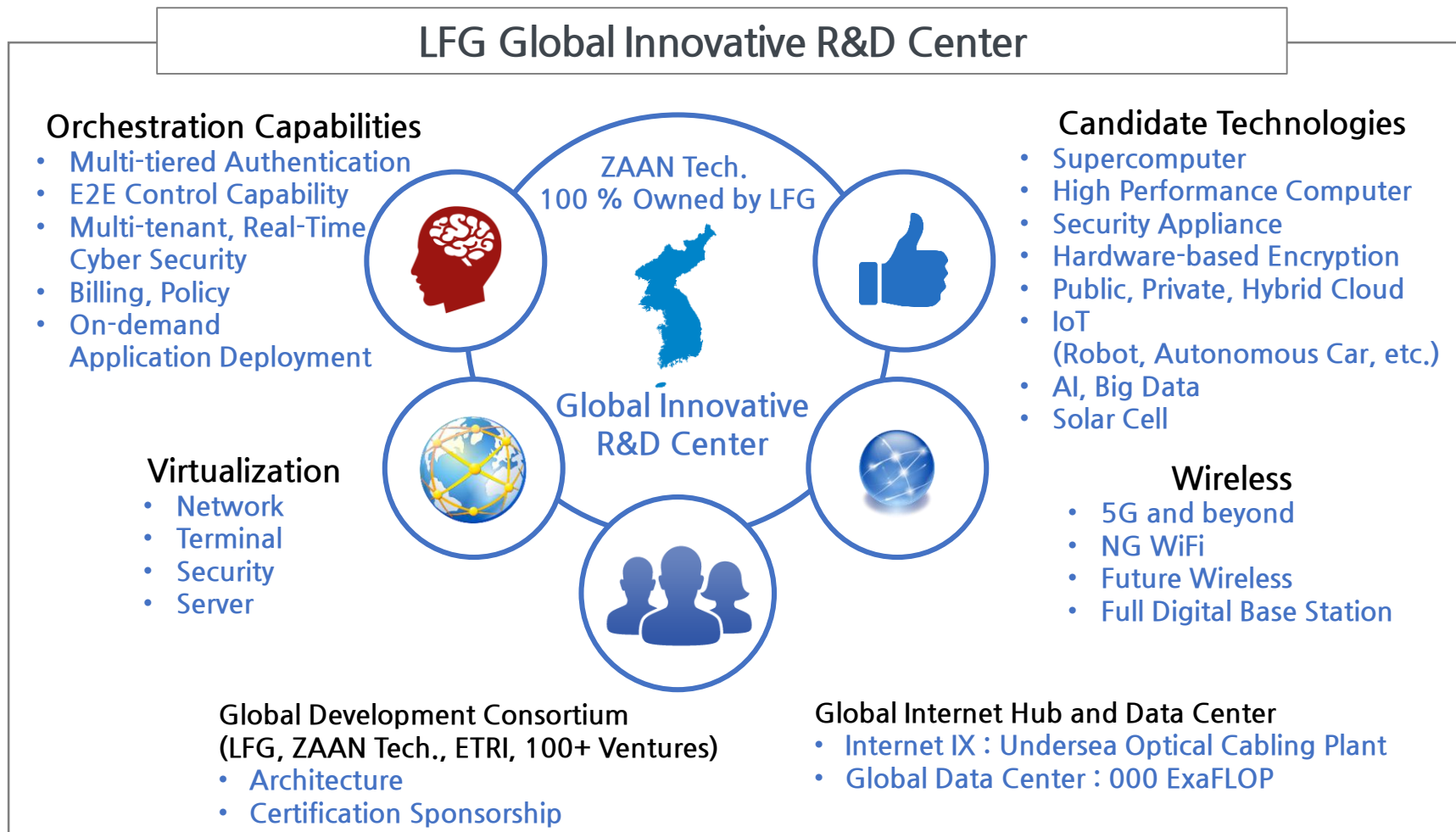
Development Process (3)

- Development Environment
 - Hardware
 - Software
- Test Environment
 - Smoke Test
 - Functional Test
 - Regression Test : NEBS Level 3

4. LFG Global Innovative R&D Center

LFG Consortium - Global Innovative R&D Center

⚙️ Global-leading Disruptive Technologies



LFG Global Innovative R&D Center

⚙️ Development, Regression Test, etc.

- Research Center
 - Researcher : 5,000 Persons
 - ✓ LFG, ZAAAN Tech., ETRI, 200+ Ventures
 - Development Environment
 - Inter-Operability Test Environment
 - Regression Test Environment



LFG Global Innovative R&D Center

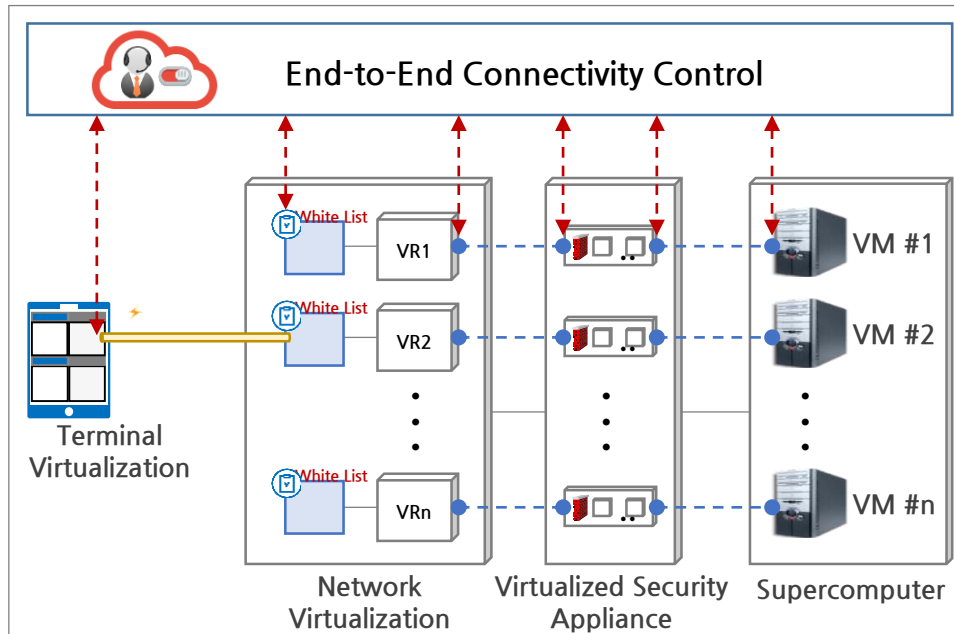
Development : ZAAN Tech.

- Orchestration Capability
- Supercomputer
- High Performance On-board Computer
- TIPN, Virtualized Security Appliance
- 5G and beyond, Digital Base Station, etc.
- IoT : Mobile Gateway with Base Station, Cyber Security, ITS, Surveillance, etc.
- Bio.
- Hologram
- AI, Big Data,, etc.
- Autonomous Car
- Self-learning Robot
- Auto-trading
- Plant Factory
- Solar Cell
- Smart Device Management

LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Orchestration Capability

- Orchestration Capability Research Center
 - Researcher : 300 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ FTL, 20+ Ventures
 - Global Authentication
 - End-to-End Connectivity Control



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Smart Device

- Smart Device Research Center
 - Researcher : 1,000 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ SI, 20+ Ventures
 - App Store
 - Agent Version Management
 - Call Center, etc.

BYOD Terminal



LFG Global Innovative R&D Center

LFG R&D Center : Supercomputer

- Supercomputer Research Center
 - Researcher : 100 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ , 5+ Ventures



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : On-board High Performance Computer

- On-board HPC Research Center
 - Researcher : 200 Persons (50 Persons per Application)
 - ✓ LFG, ZAAAN Tech.
 - ✓ ETRI
 - ✓ , 5+ Ventures
 - Processing Power : Over 200 TeraFLOP
 - Target Cost : Less than \$ 3,000
 - Application : Autonomous Car, Self-learning Robot, Mobile Ad hoc Gateway, etc.



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : TIPN

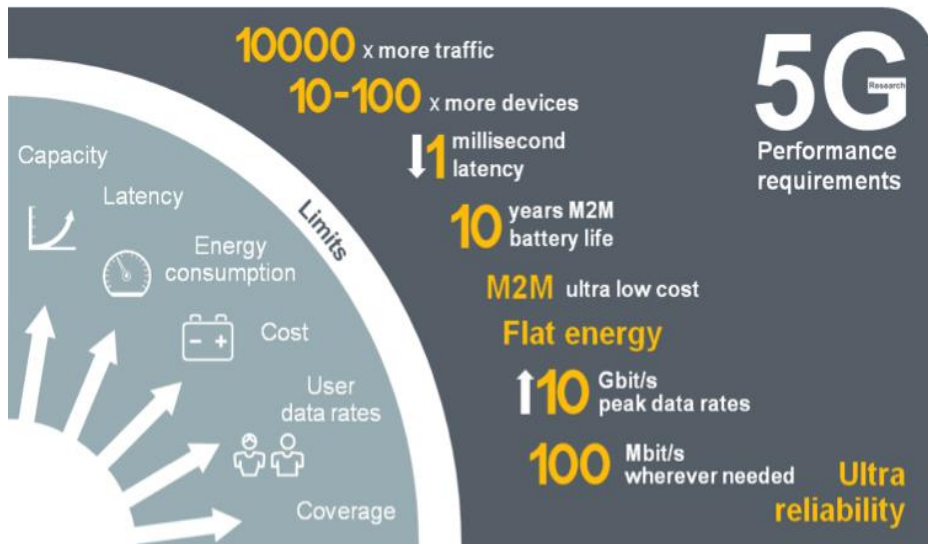
- TIPN Research Center
 - Researcher : 200 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ 10+ Ventures
 - Virtualized Security Appliance : 200 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ 10+ Ventures



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : 5G and beyond

- 5G and beyond Research Center
 - Researcher : 100 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ FTL, 10+ Ventures
 - 64 MIMO Antenna
 - Full-digital Base Station
 - Interworking with Mobile Ad hoc Network



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Self-learning Robot

- Self-learning Robot Research Center
 - Researcher : 500 Persons (50 Persons per Application)
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ FTL, 20+ Ventures
 - Processing Power : Over 200 TeraFLOP
 - Target Cost : Less than \$ 20,000 (Including On-board HPC)
 - Application
 - ✓ Humanoid Robot, Noosphere, BigDog, Drone, Self-fueling Robot, Cosmology, etc.



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : IoT

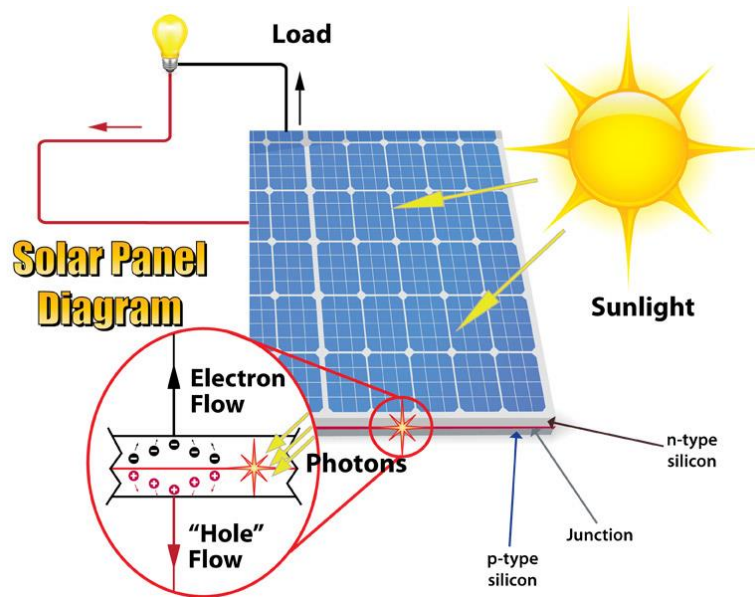
- IoT Research Center
 - Researcher : 500 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ 20+ Ventures
 - Mobile Ad Hoc Gateway with HPC
 - Proxy Agent
 - Interworking with TIPN and LFG Orchestration Capability



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Solar Cell

- Solar Cell Research Center
 - Researcher : 50 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ FTL, 5+ Ventures



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Plant Factory

- Plant Factory Research Center
 - Researcher : 100 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ 10+ Ventures
 - Alternative Energy : Solar Cell, etc.
 - Vegetable for Smart City



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Autonomous Car

- Autonomous Car Research Center
 - Researcher : 200 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ 20+ Ventures
 - Self-learning on Supercomputer (AI, Big Data, etc.)
 - Co-development with Autonomous Car Manufacturing



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Hologram

- Hologram Research Center
 - Researcher : 100 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ FTL, 10+ Ventures
 - HPC-based Hologram



LFG Global Innovative R&D Center

⚙️ LFG R&D Center : Bio.

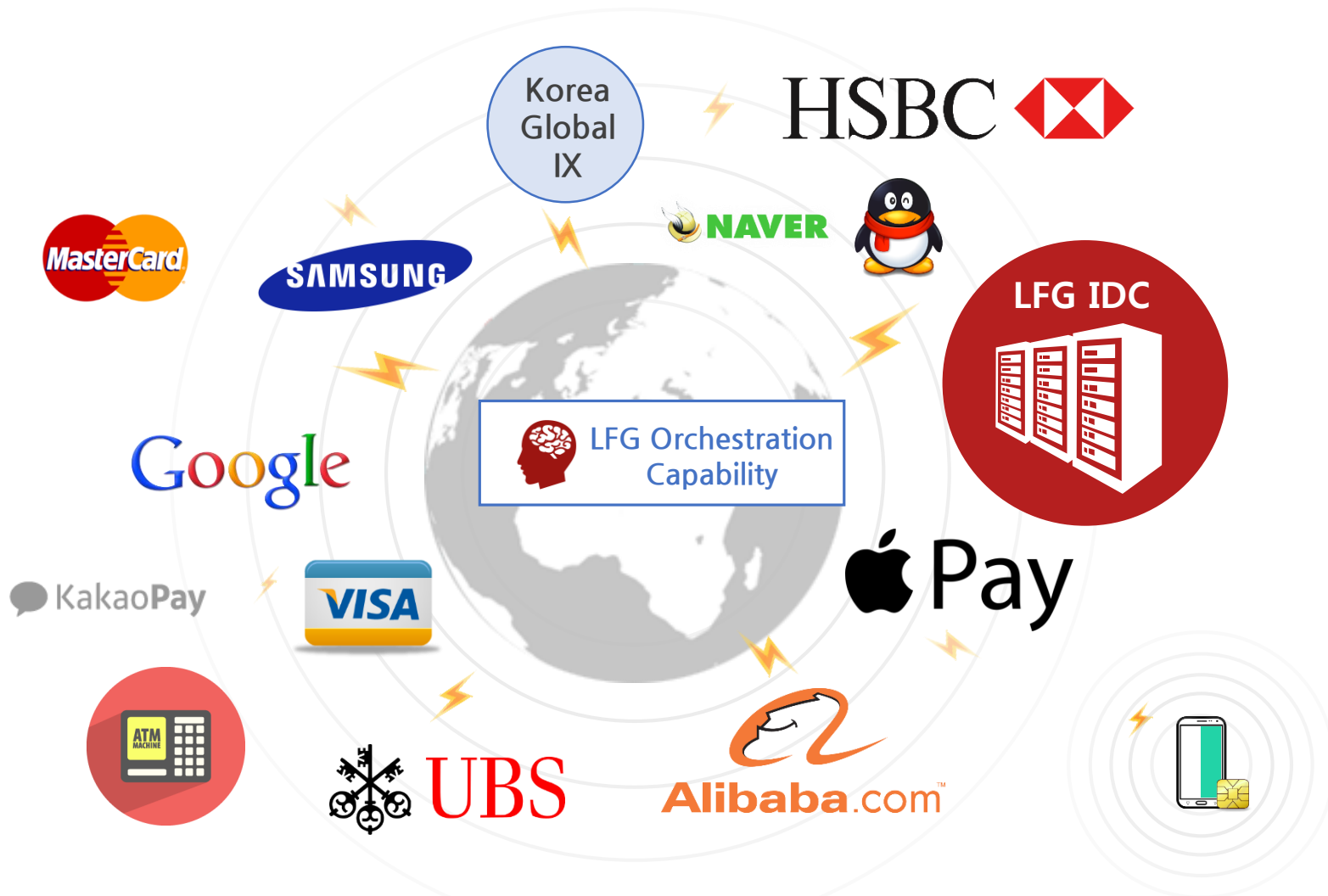
- Bio Research Center
 - Researcher : 100 Persons
 - ✓ LFG, ZAAN Tech.
 - ✓ ETRI
 - ✓ 5+ Ventures



5. LFG Global Internet Hub

LFG Global Internet Hub

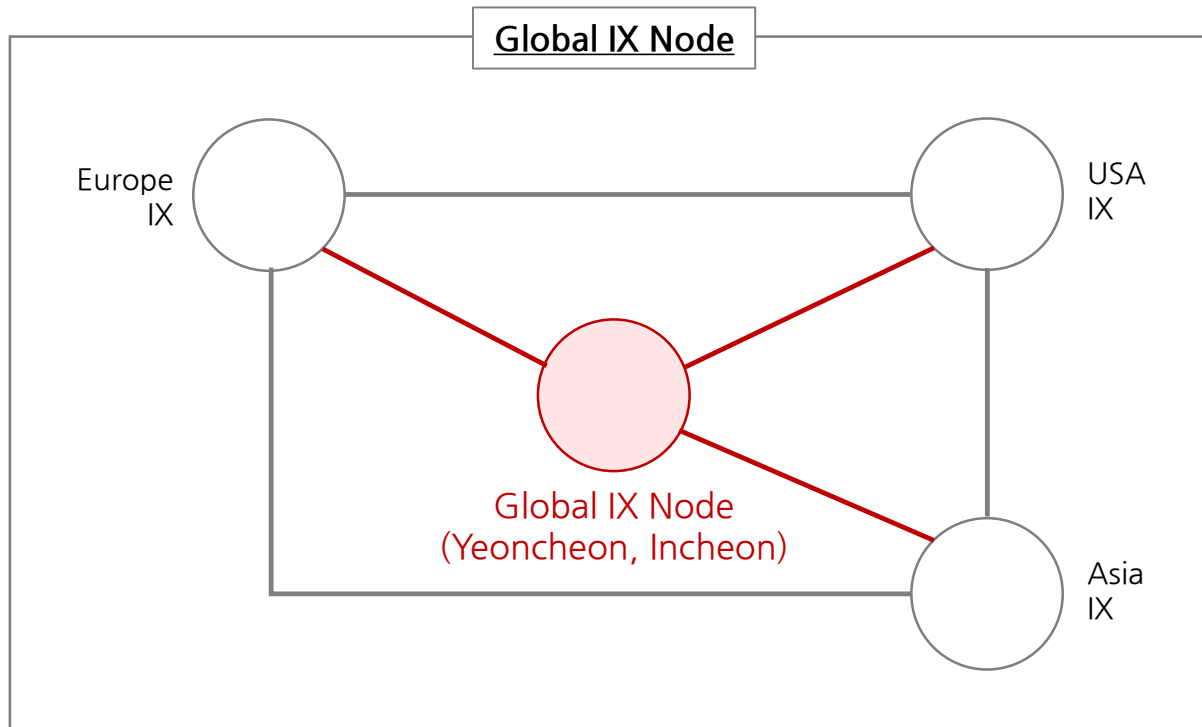
LFG Orchestration Capability



LFG Global Internet Hub

Global Internetwork : Global IX Node

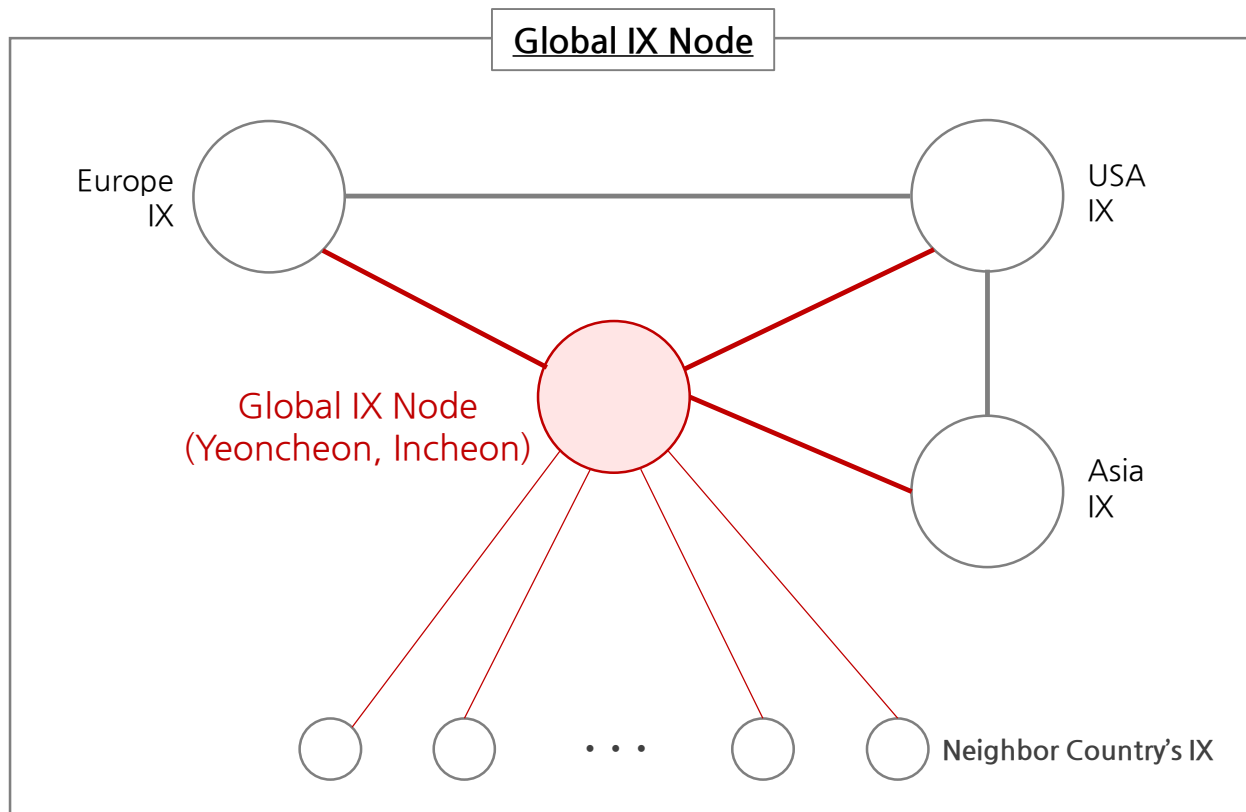
- Global IX Node



LFG Global Internet Hub

Global Internetwork : Global IX Node

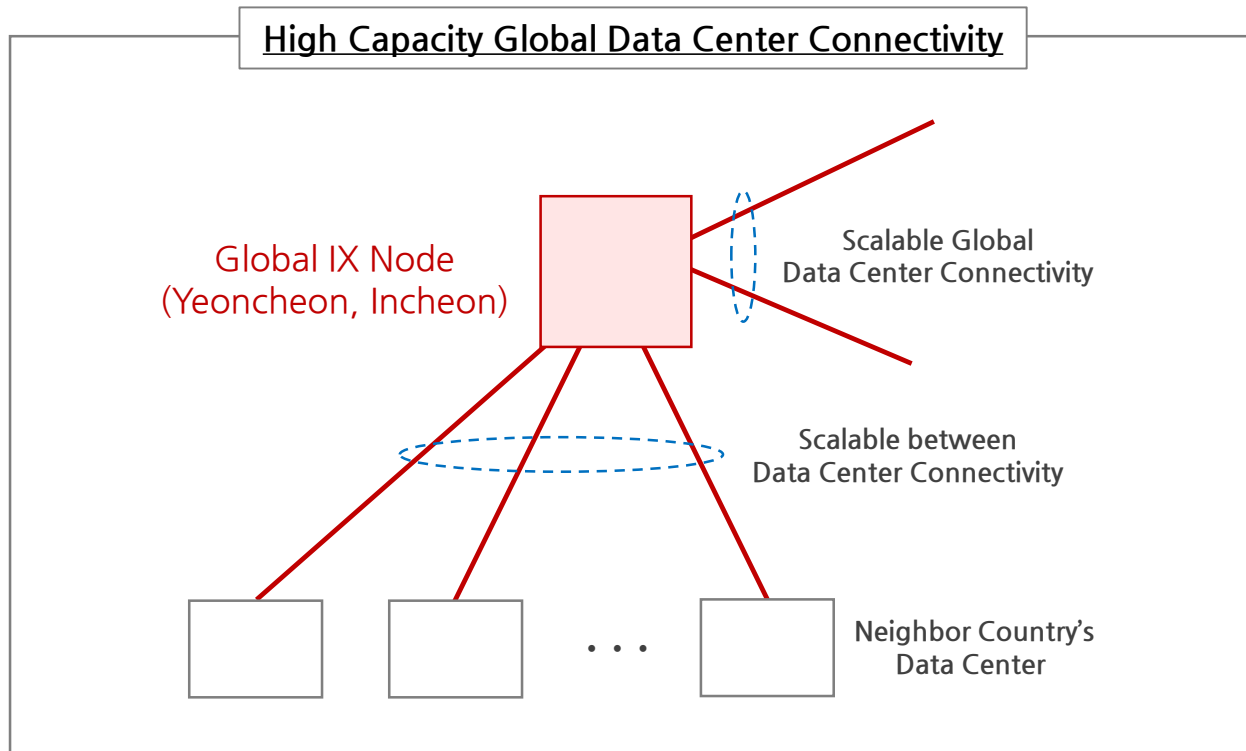
- Global IX Node
 - Neighbor Country's IX Peering and Transit



LFG Global Internet Hub

⚙️ Global Data Center : Hub of Data Center

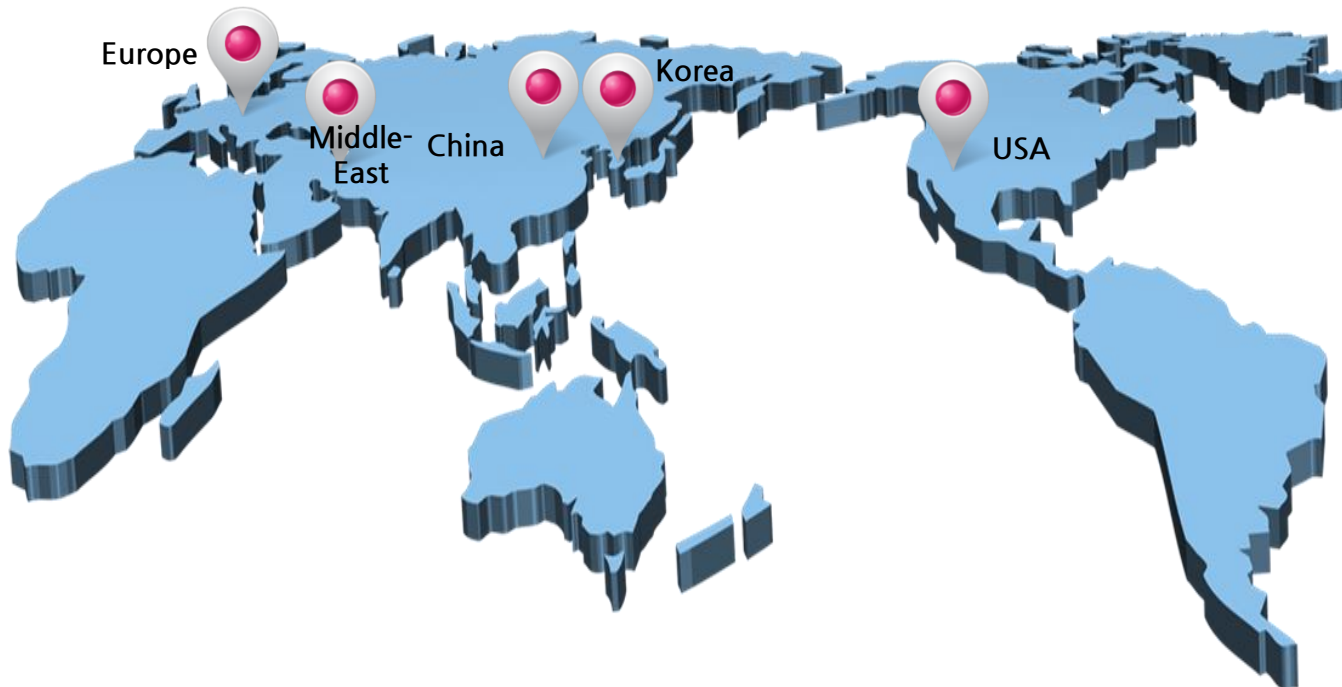
- Scalable Global Data Center Connectivity
 - Scalable Neighbor Country's Data Center Connectivity



LFG Global Internet Hub

⚙️ Global Undersea Fiber Optic Cabling Plant

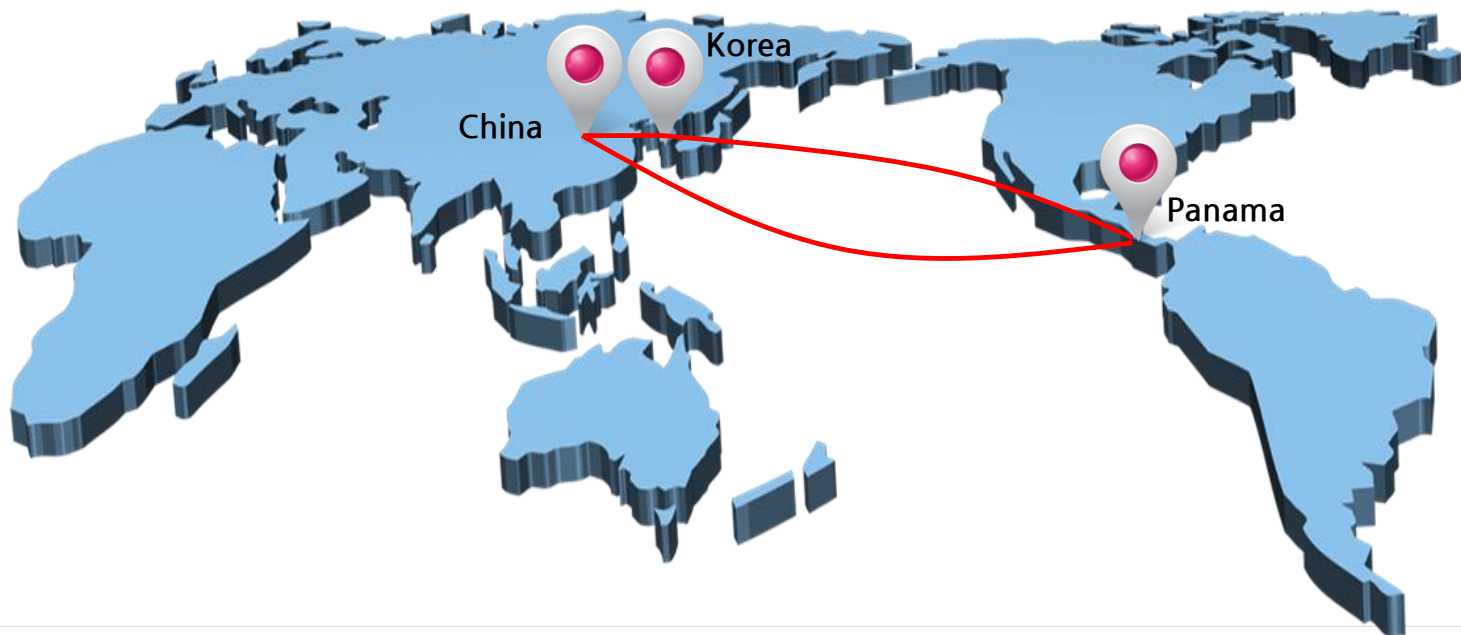
- Purpose
 - Internet Hub
 - High-speed Data Center Interconnection
 - Virtual Network and Computing @ Anywhere
 - Free Roaming @ Anywhere



LFG Global Internet Hub

⚙️ LFG Consortium : Global Undersea Fiber Optic Cabling Plant

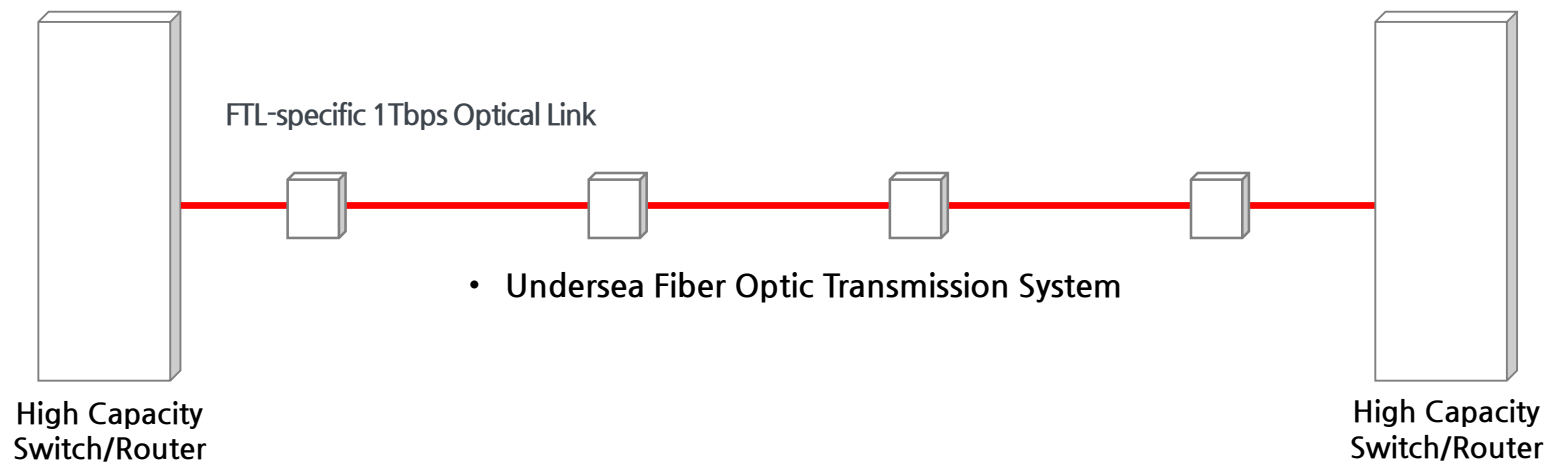
- Purpose : High-speed LFG Data Center Interconnection
 - Data Center Interconnection
 - Virtual Network and Computing @ Anywhere
 - Free Roaming @ Anywhere
- LFG Consortium Global Undersea Fiber Optic Cabling Plant Implementation Plan
 - 1st Step : Korea, South America, China, etc.
 - 2nd Step : Expand to Global



LFG Global Internet Hub

⚙️ LFG Consortium : 1 Tbps Undersea Fiber Optic Link

- High-speed Undersea Fiber Optic Transmission System
 - Global-leading High-speed Undersea Fiber Optic Transmission System
 - FTL-specific 1T Optical Link : IPV4 or preferably IPV6
- High Capacity Switch/Router



6. LFG Global Data Center

LFG Global Data Center

⚙️ LFG Internet Global Data Center : 10 ExaFLOP

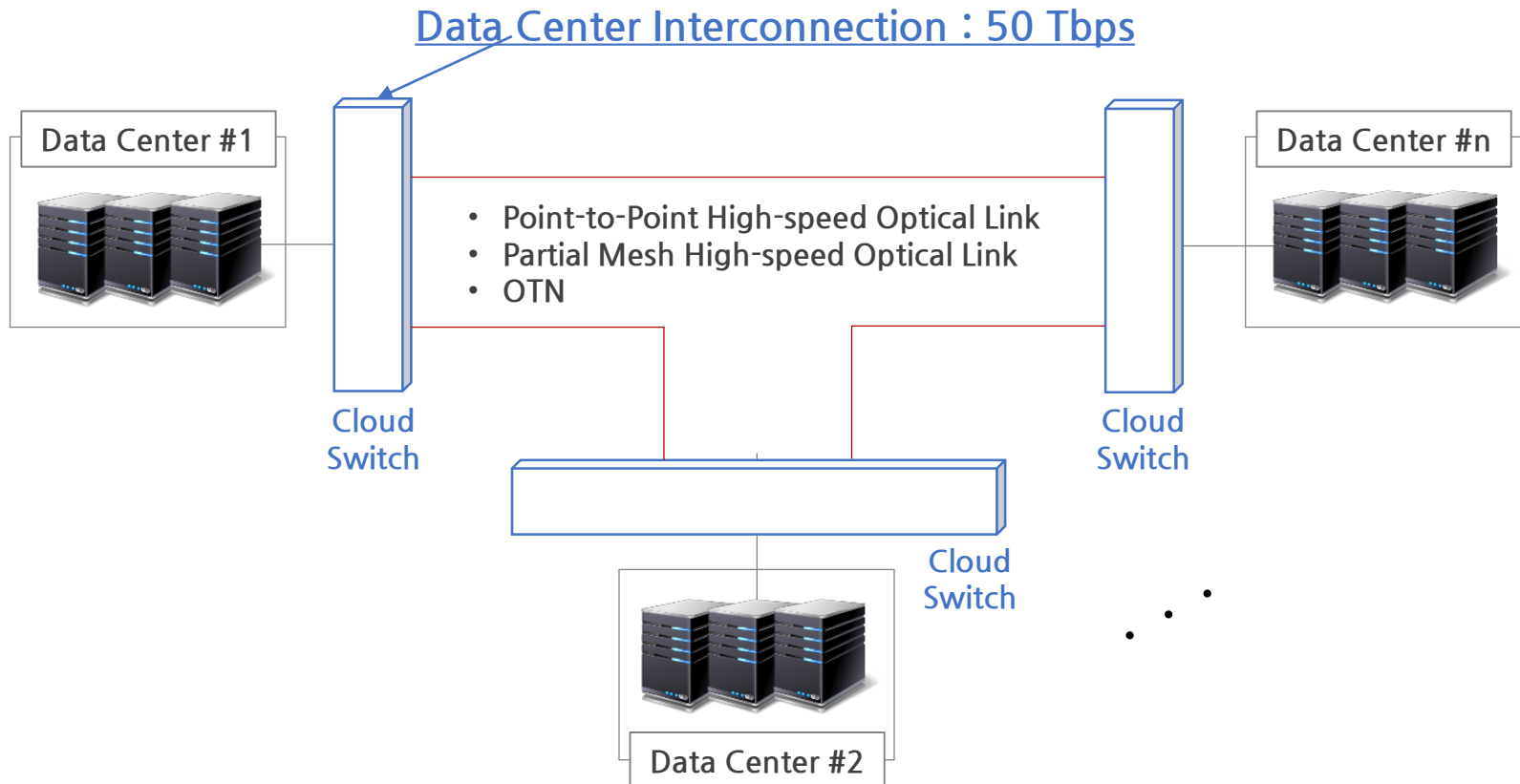
- Supercomputer : 5 PetaFLOP (Floating-point Operations per Second)
 - Size
 - ✓ 3 X 19" Rack
 - ✓ Rack Size : 19" X 34" X 73.5"



LFG Global Data Center

⚙️ LFG Global-best DCI : Scalable Cloud Switch

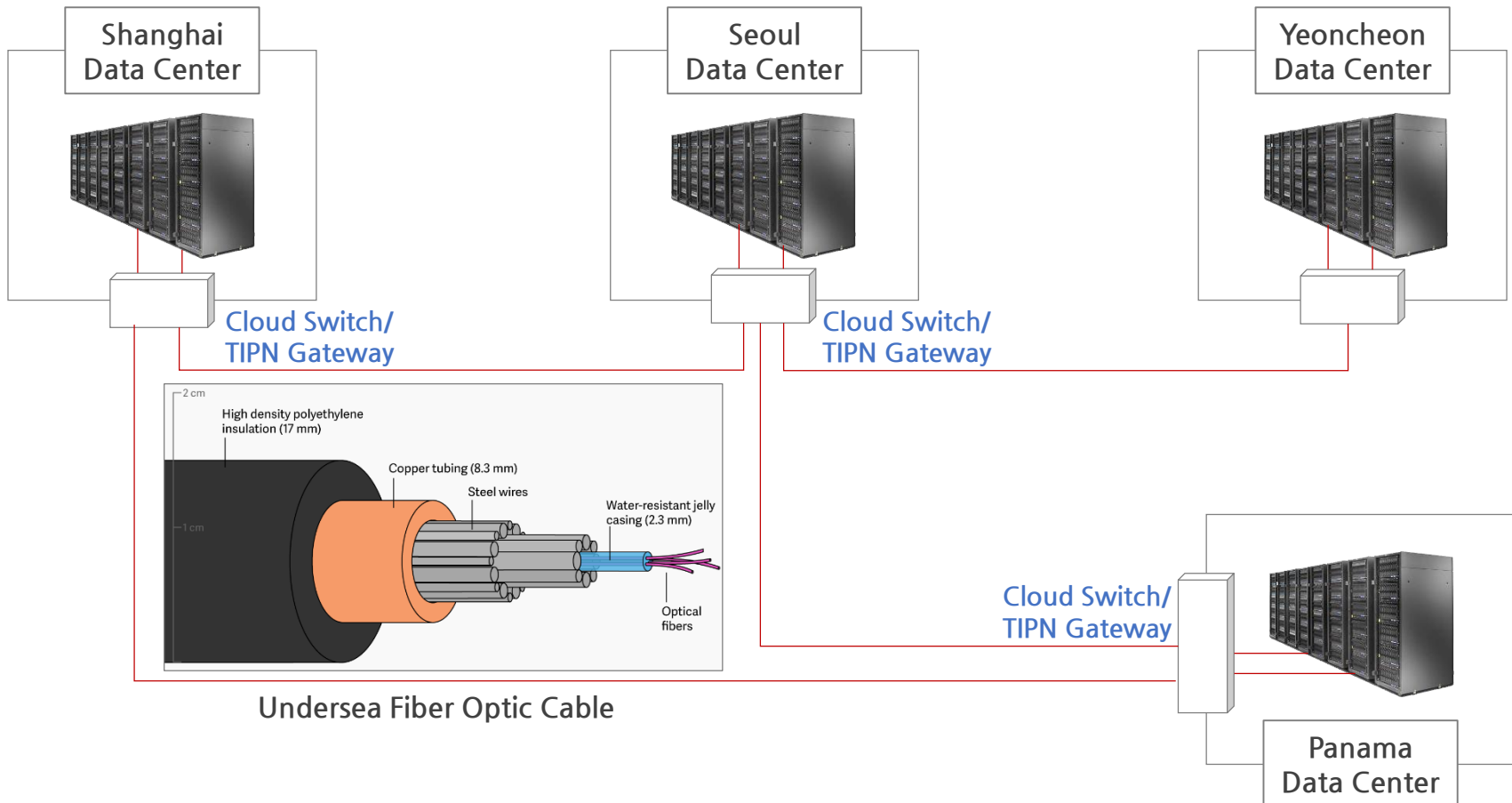
- High-speed Optical Link : 50 Tbps
- Topology
 - Point-to-Point, Mesh, OTN, etc.



LFG Global Data Center

LFG Global DCI Site : Shanghai, Seoul, Yeoncheon, Panama

- Global Undersea Fiber Optic Cabling Plant



LFG Global Data Center

Reference - TATA Communications

- Undersea Fiber Optic Cabling Plant



LFG Global Data Center

⚙️ Global DCI using undersea fiber optic cabling plant

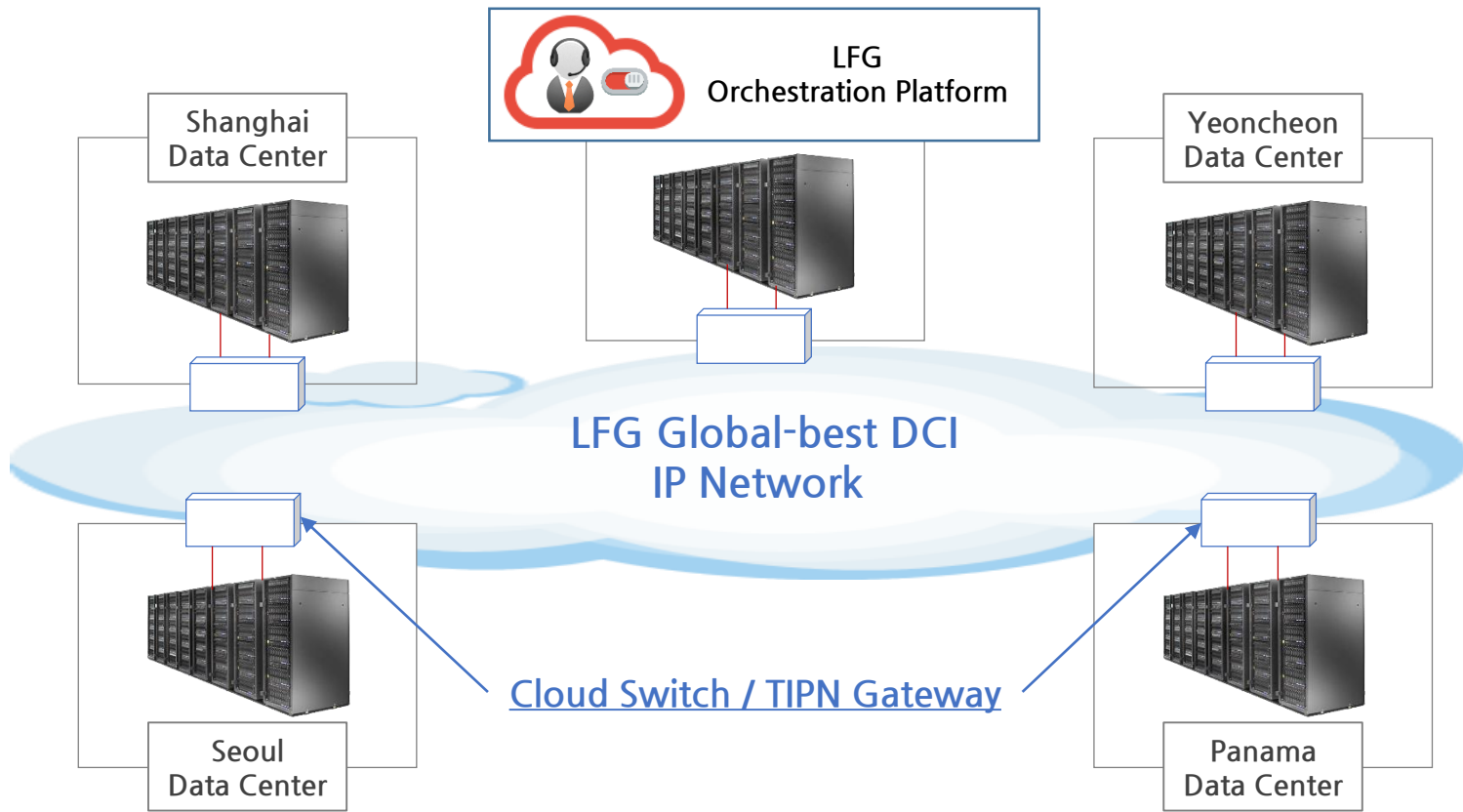
- High-speed LFG Data Center Interconnection Solution
 - High Speed Data Center Interconnection
 - Virtual Network and Computing @ Internet Contents Provider, Cloud Service Provider
 - Trusted Transaction @ Anywhere
- LFG Global Undersea Fiber Optic Cabling Plant Implementation Plan
 - 1st Phase : Shanghai, Seoul, Panama, etc.
 - 2nd Phase : Expand to Global



LFG Global Data Center

⚙️ Low Cost, High Speed, Global Data Center Interconnect

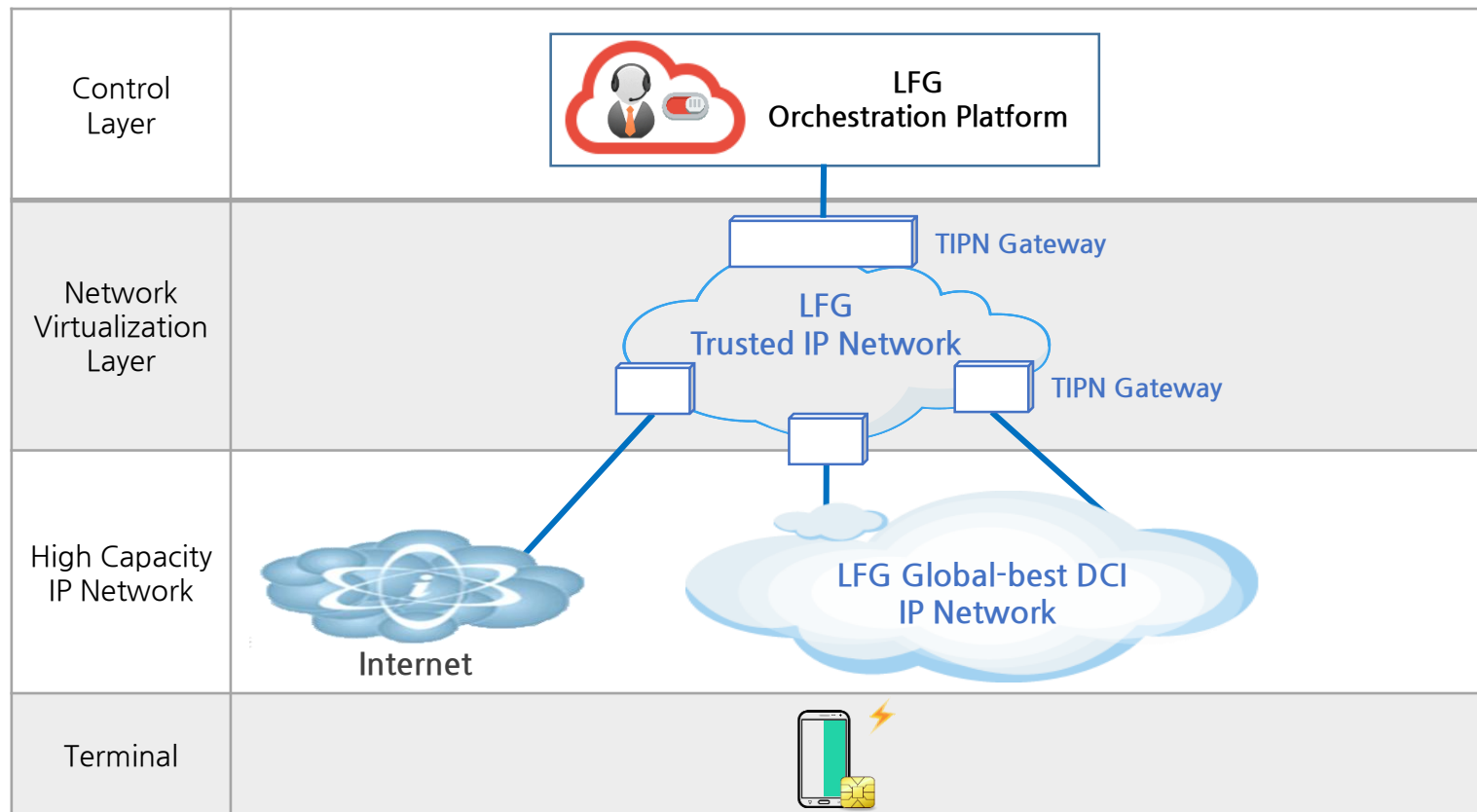
- Contents @ Anywhere (Through ICP)
- Virtual Computing and Storage Resources @ Anywhere (Through CSP)



LFG Global Data Center

Network Virtualization Layer : TIPN Gateway (Overlay Model)

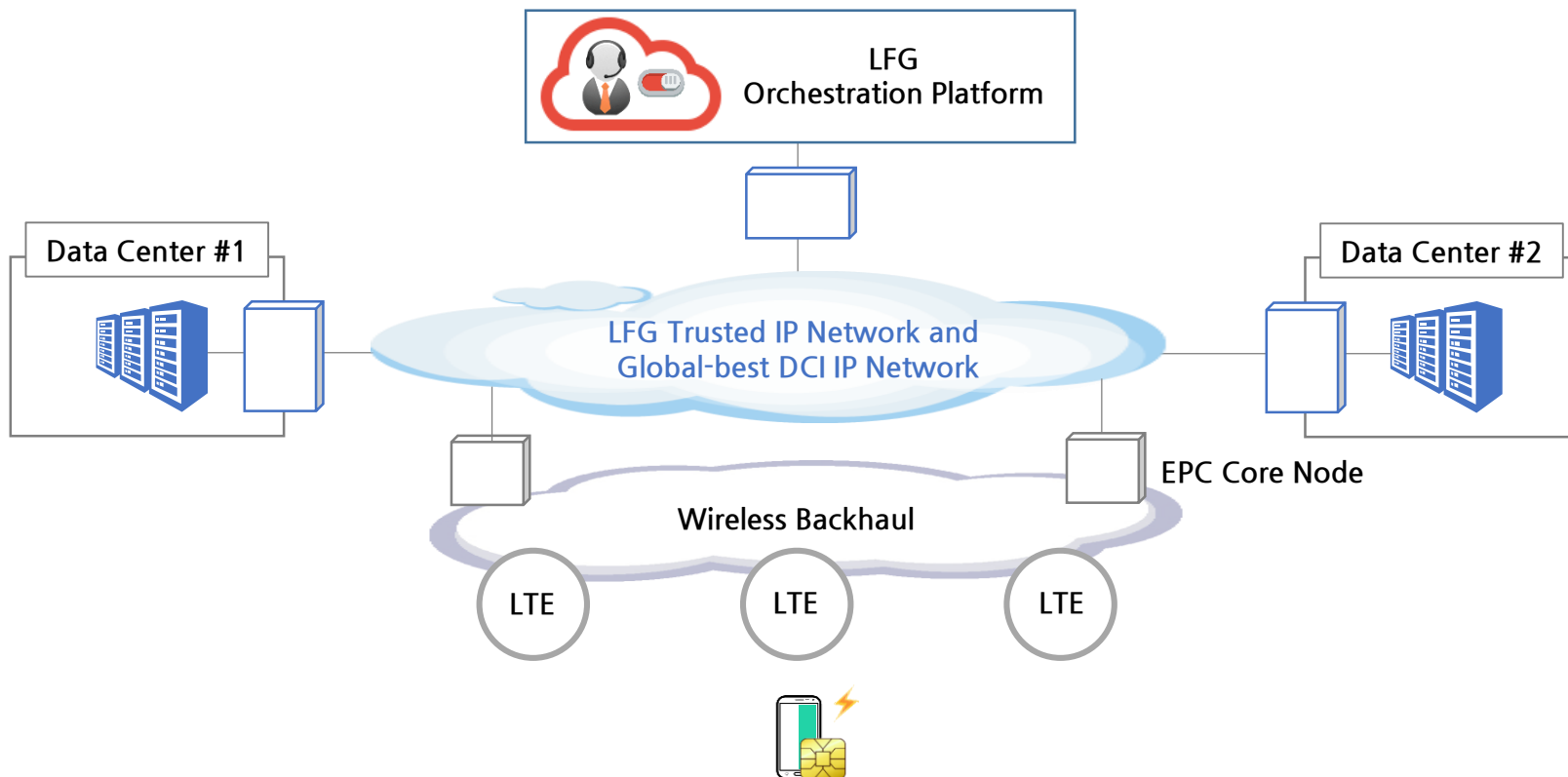
- Trusted Transaction Service : LFG Trusted IP Network
 - Separation of the network control plane from the forwarding plane
 - Control plane controls TIPN Gateway, Terminal, Link, etc.



LFG Global Data Center

Virtualized MVNO Services @ Enterprise

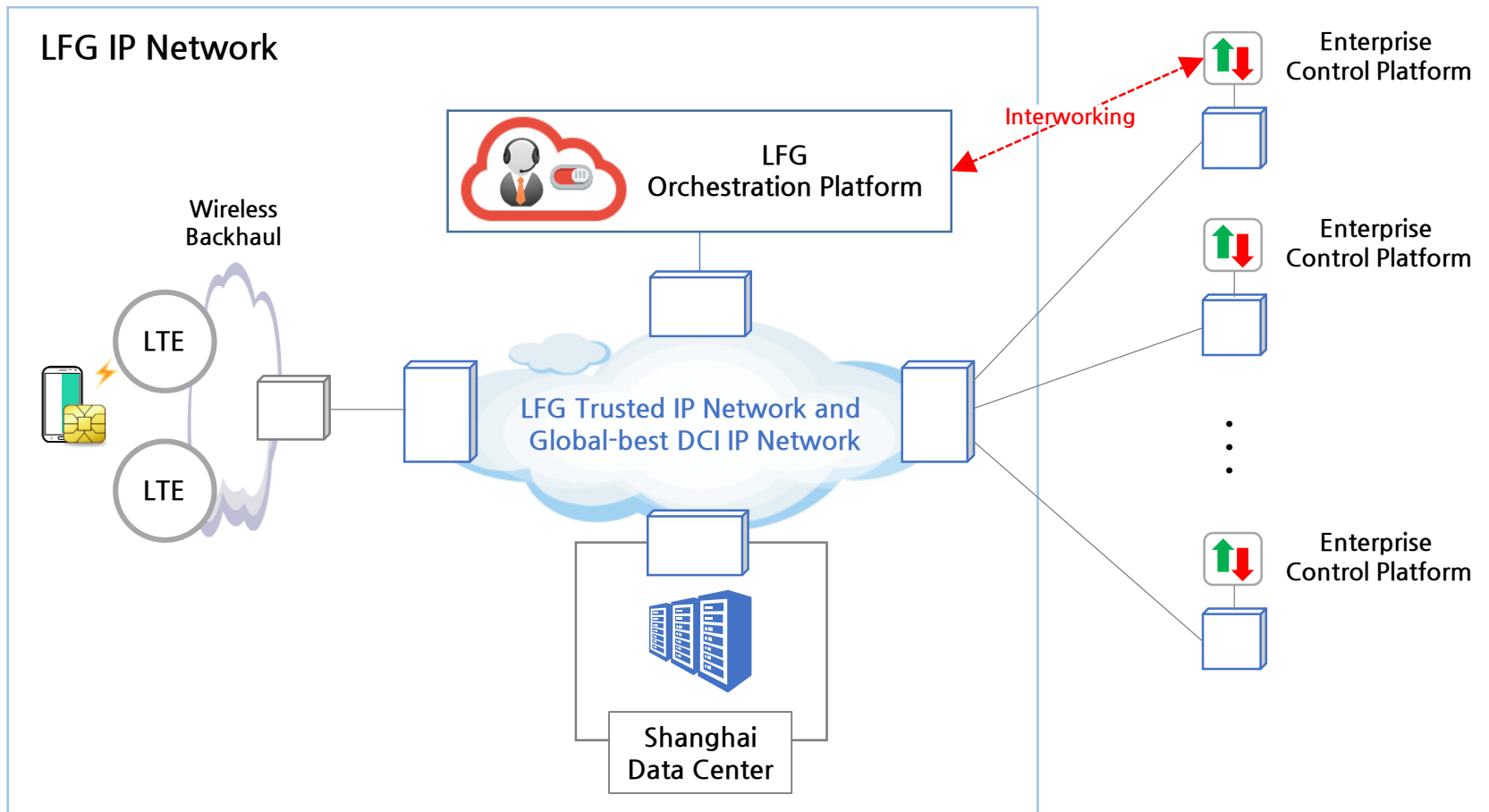
- On-demand Network, Computing and Storage Resources : Global-best DCI
- Virtualized MVNO : B2B Customer



LFG Global Data Center

Direct Trusted Network Service Model

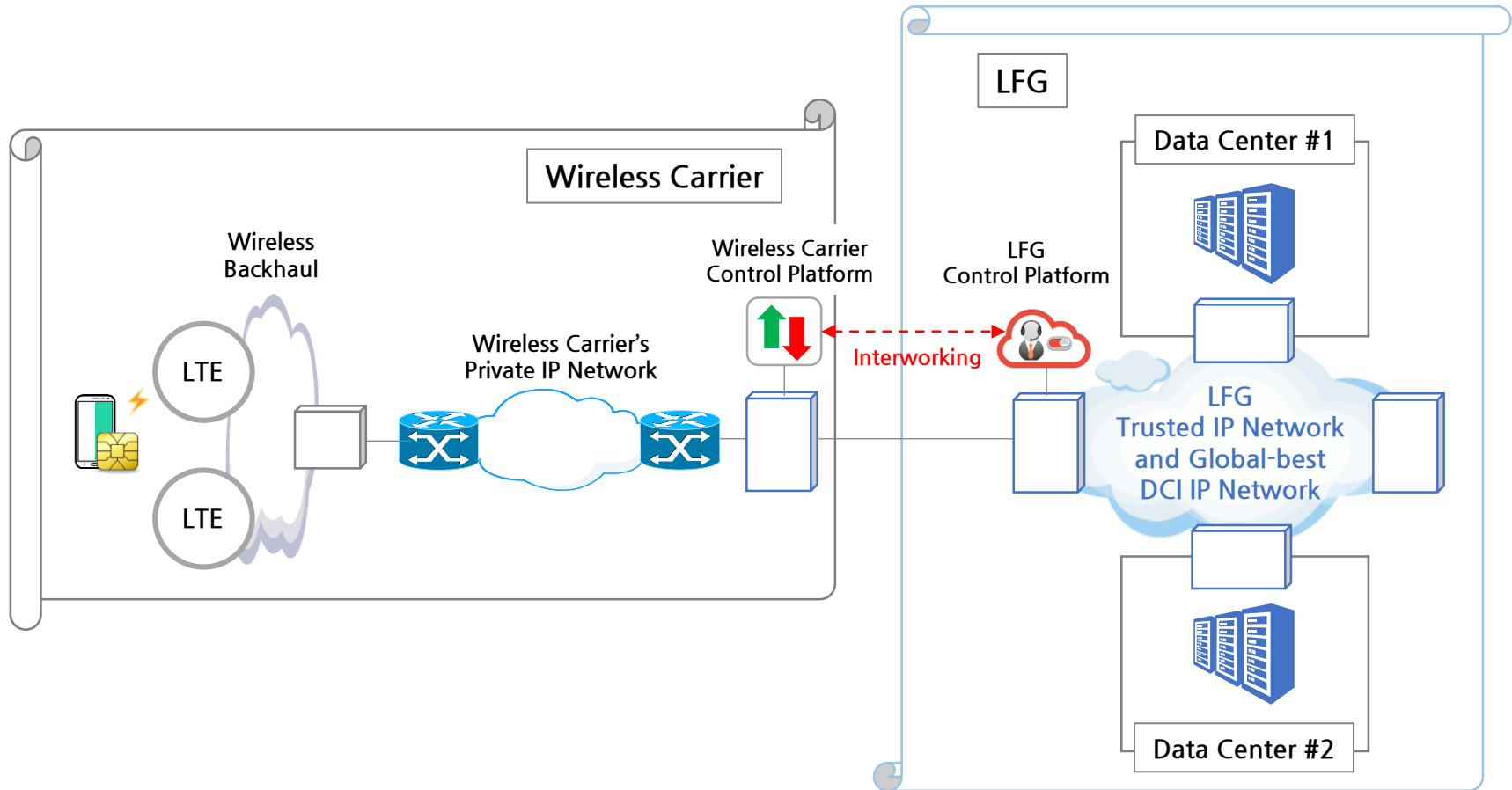
- Typical Configuration



LFG Global Data Center

⚙️ In-direct Trusted Network Service Model

- Typical Configuration

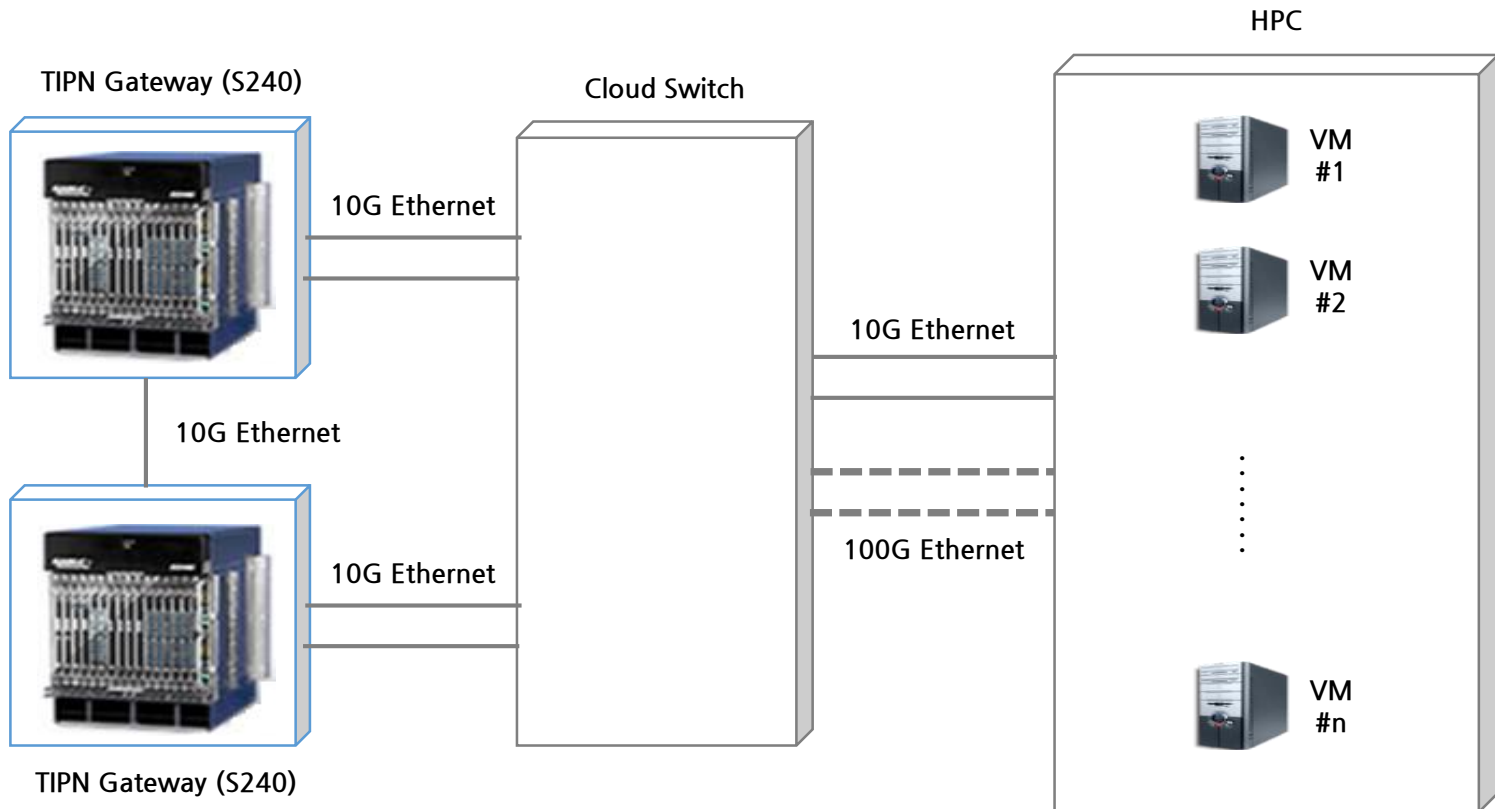


7. LFG Test-bed

LFG Test-bed Phase #1

Phase #1 : Data Center and Internet IX (Korea)

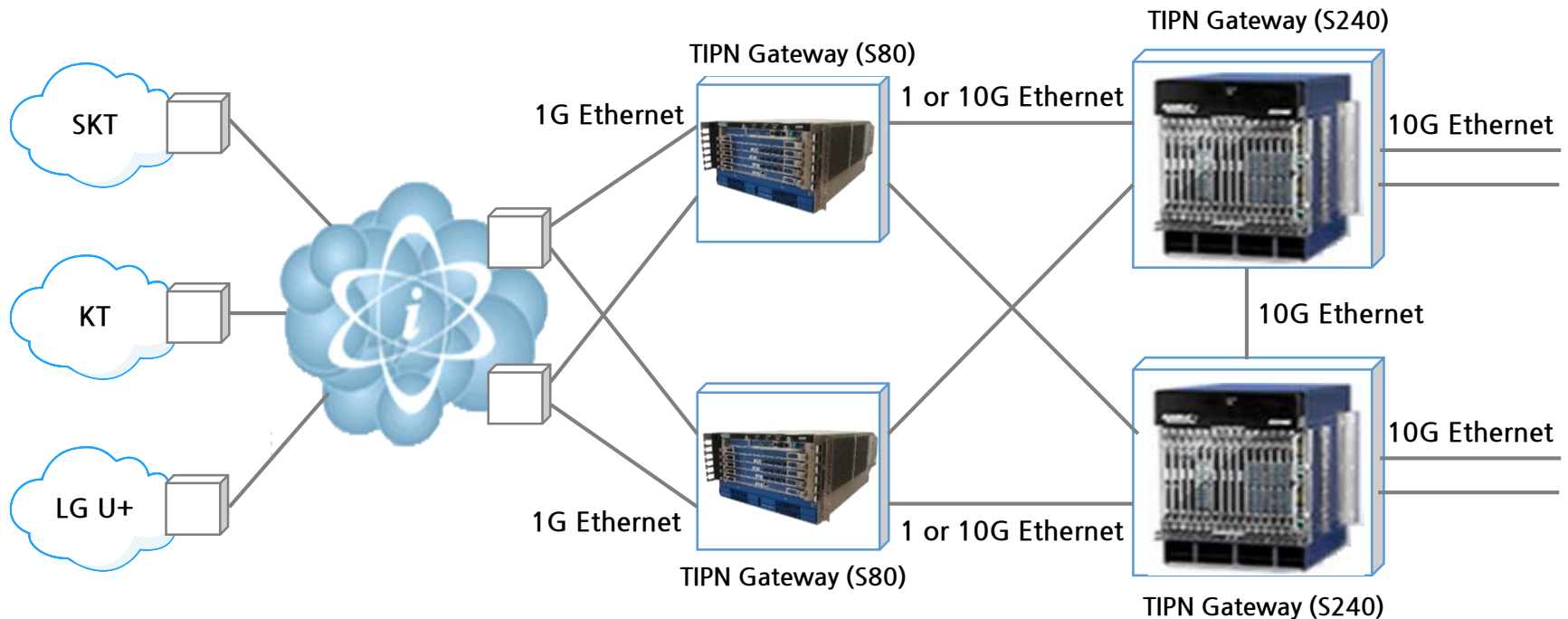
- Data Center
 - TIPN Gateway
 - HPC
 - Cloud Switch



LFG Test-bed Phase #1

Phase #1 : over Internet

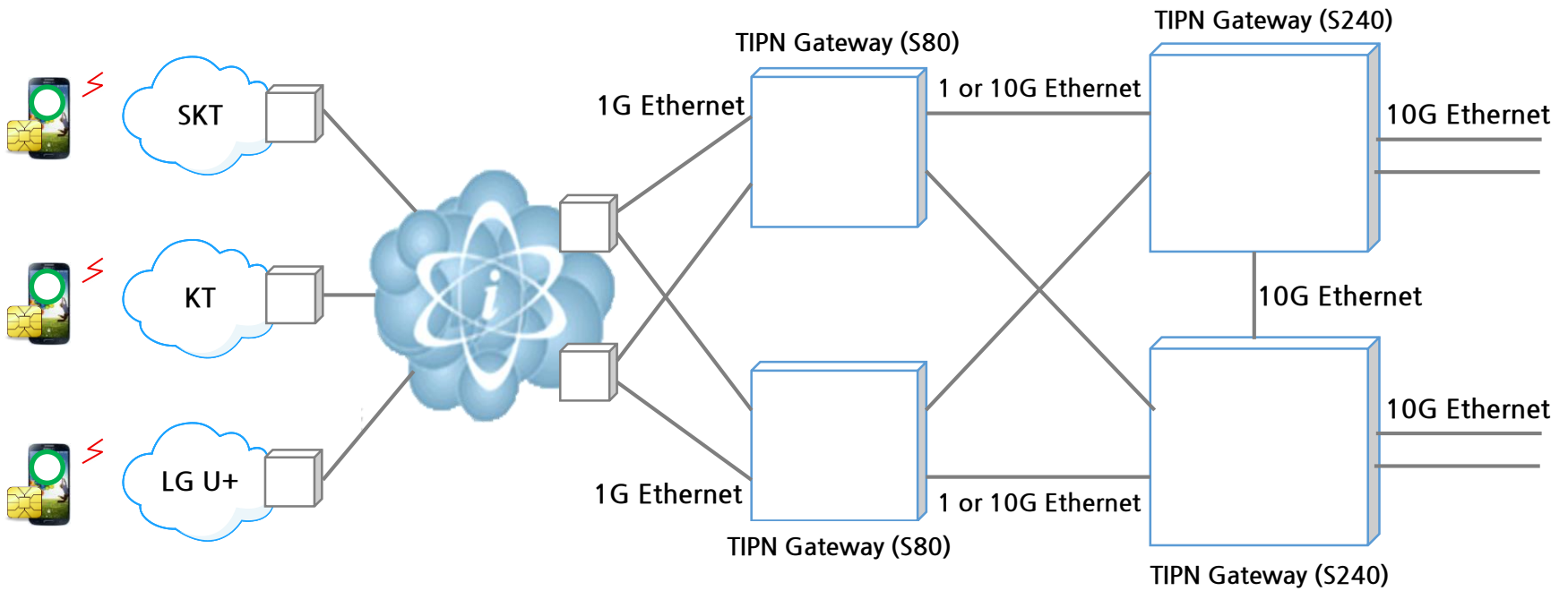
- IX Border Router ↔ TIPN Gateway
 - IX : KT, LG U+ or SKT
 - Inter-networking : BGP



LFG Test-bed Phase #1

Phase #1 : over Internet, Proxy Agent

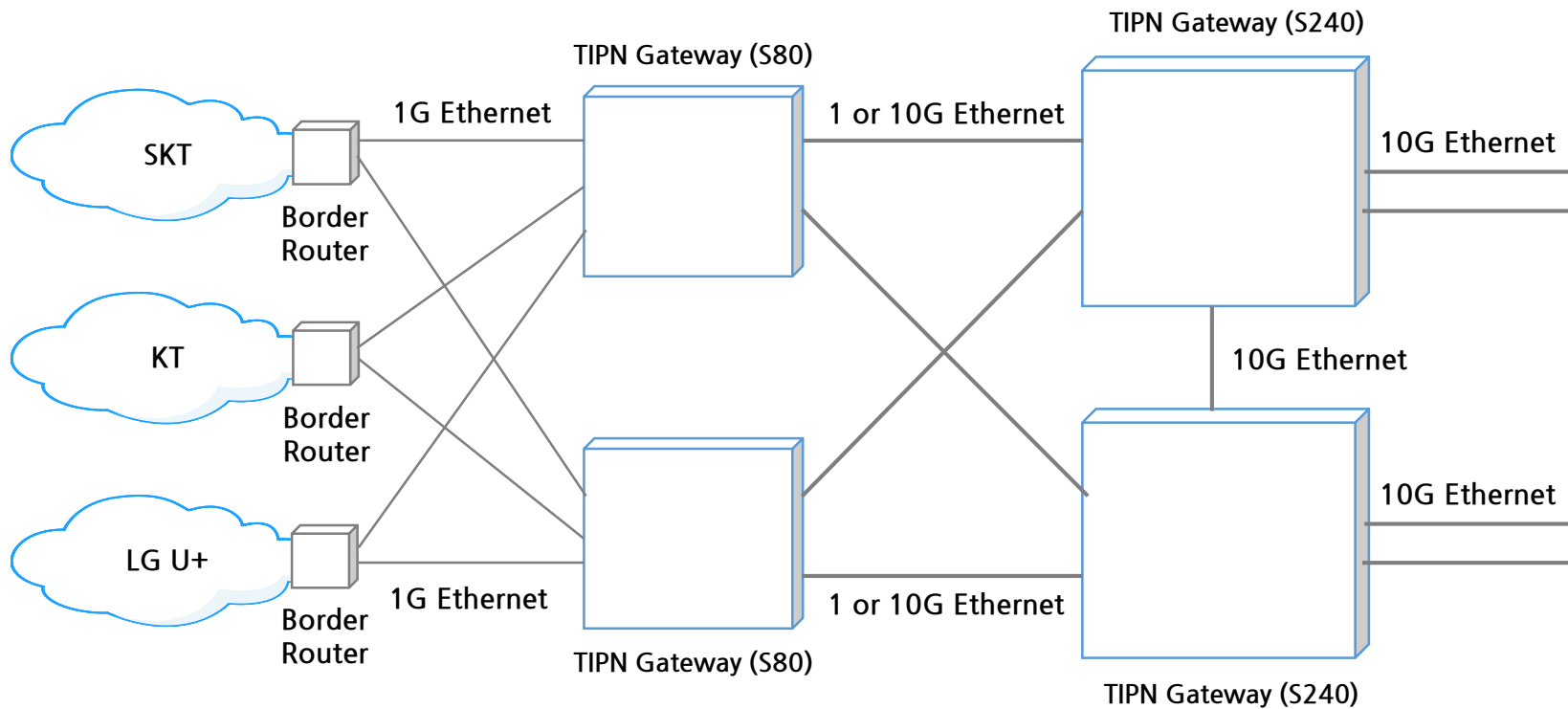
- Smart Device
 - USIM
 - TIPN Agent : Trusted IP Agent, Security Posture, TDM, E2E Encryption Agent, etc.
 - Additional Features



LFG Test-bed Phase #2

Phase #2 : Via Wireless Carrier's Private IP Network

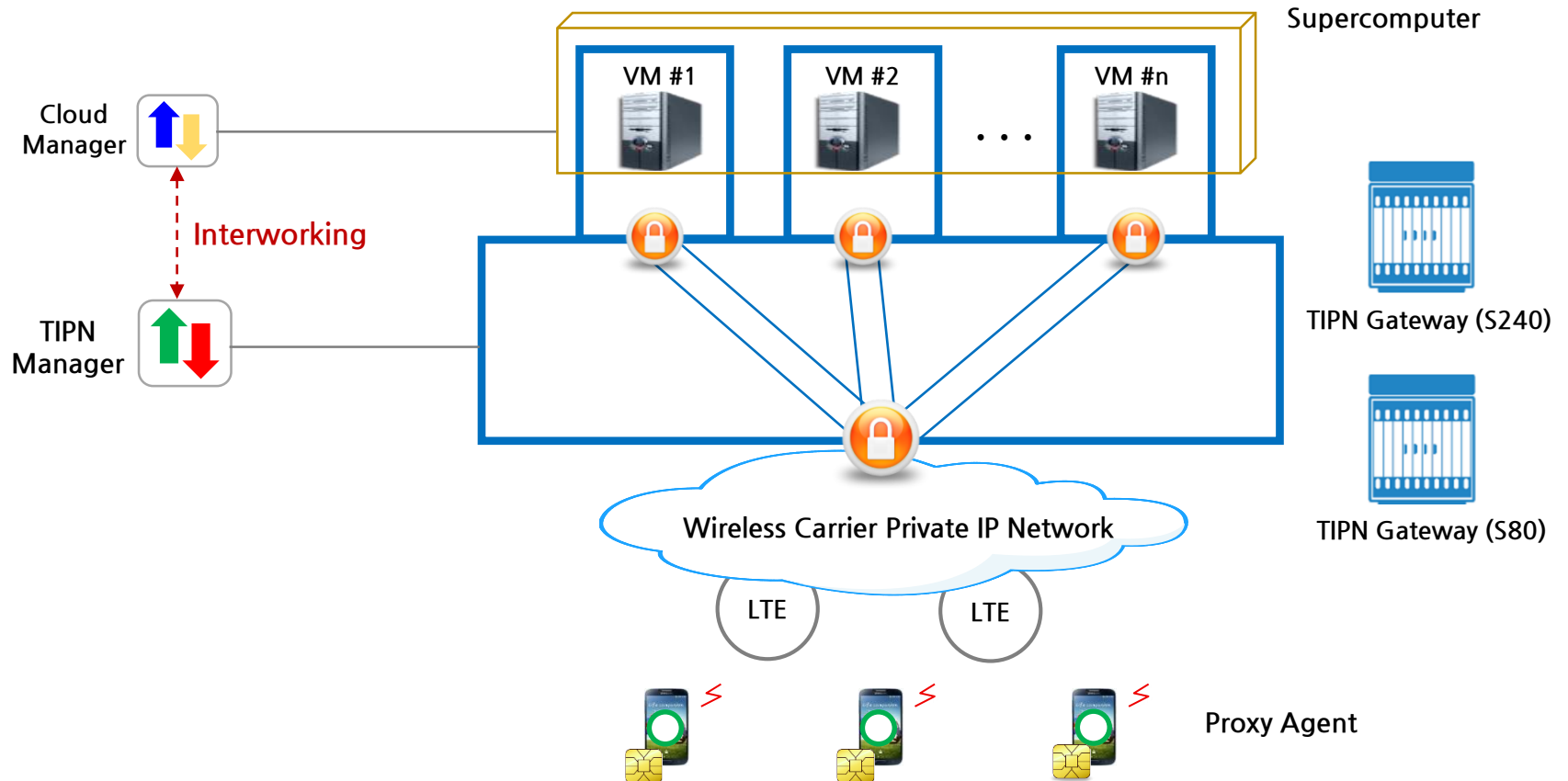
- Wireless Carrier's Border Router ↔ TIPN Gateway
 - Wireless Carrier : SKT, KT, LG U+, (LFG)
 - Inter-networking : BGP



LFG Test-bed Phase #2

Phase #2 : Via Wireless Carrier's Private IP Network

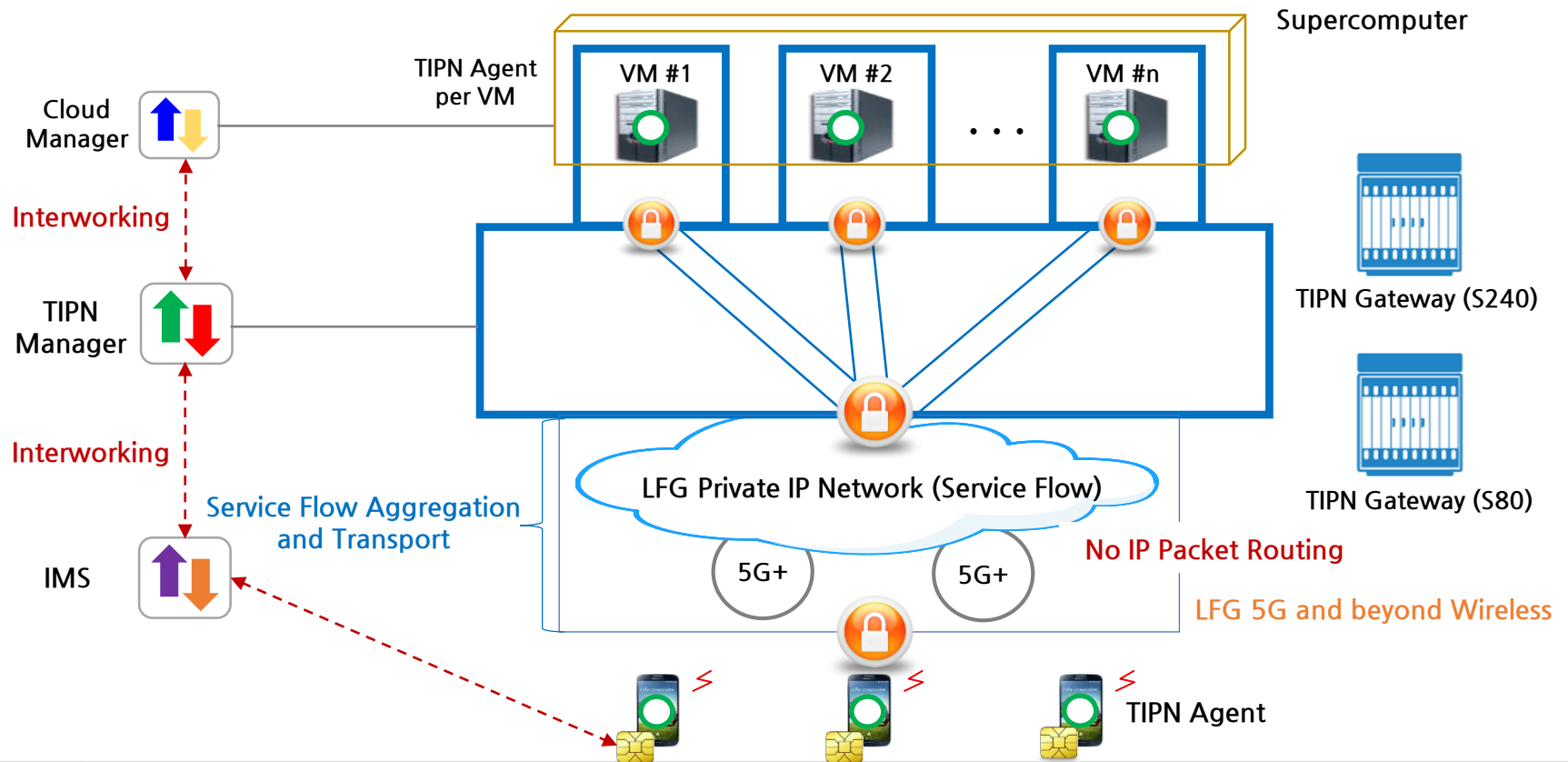
- Multi-teired Authentication
- Supercomputer
 - Enhanced Cloud Manager



LFG Test-bed Phase #3

LFG Wireless IP Network : 5G and beyond

- LFG Wireless IP Network : Service Flow Aggregation and Transport
 - Flow-based Network Virtualization
 - Service Flow : Virtual Network No. X (No IP Packet Routing)



LFG Global Development Consortium