# 完全な5G ネットワーク

## ビジネスを成功に導く設計

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# What is the Perfect 5G Network?

- Fully Automated – AI/ML
- Self-Integrating
- Self-Healing
- Flexible – Agile - Secure
- Services-first design

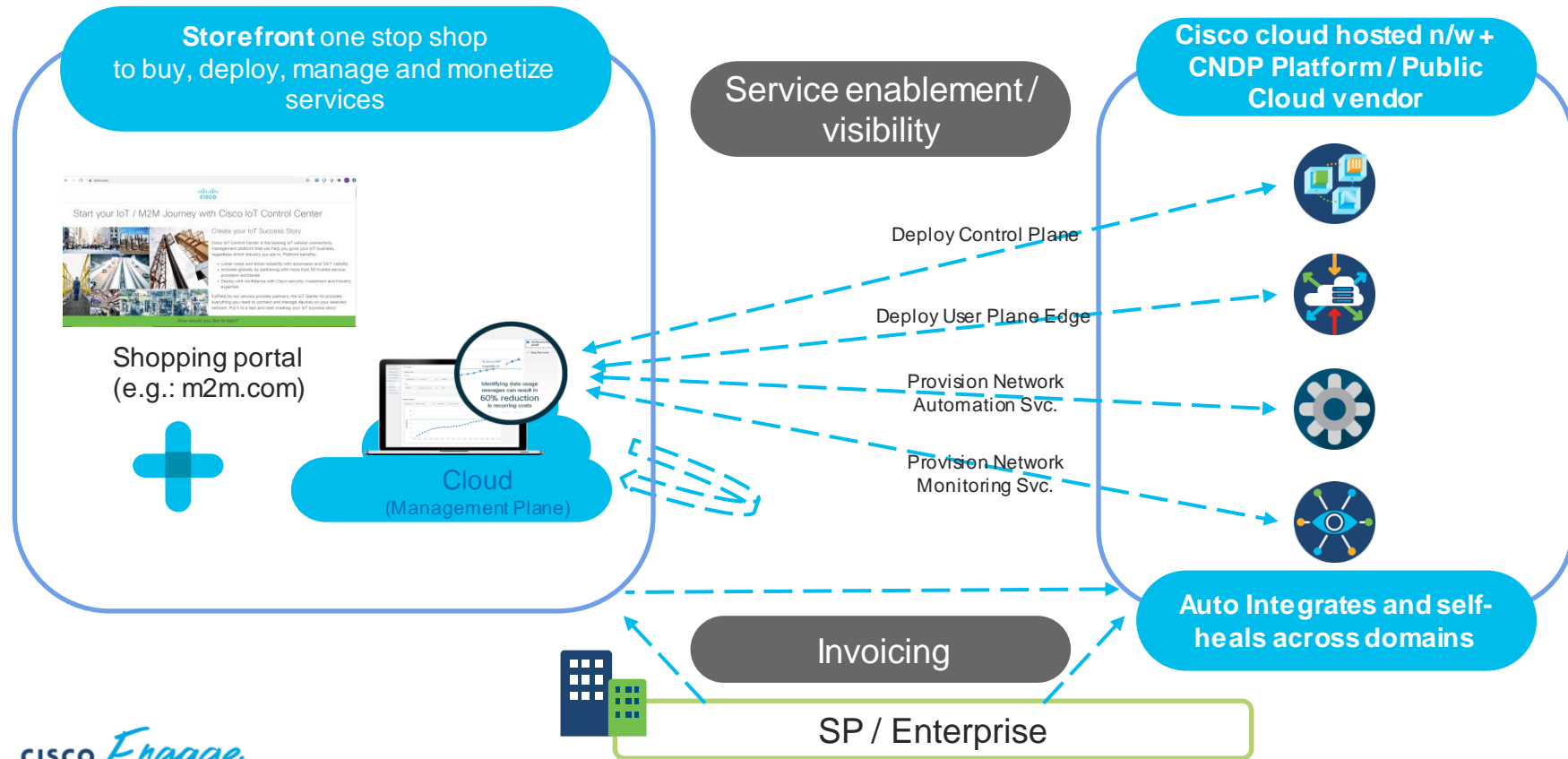… and of course, Open, Reduces costs, Grows revenue, Enterprise IT-friendly, etc.

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# The Friendly "Skynet" … or such



Always Available – Always Meeting the customer's needs

# 5G Perfection – Open Platform
Services you buy, deploy, manage and monetize automatically

**Storefront** one stop shop
to buy, deploy, manage and monetize
services

Shopping portal
(e.g.: m2m.com)

Cloud
(Management Plane)

Service enablement /
visibility

Deploy Control Plane

Deploy User Plane Edge

Provision Network
Automation Svc.

Provision Network
Monitoring Svc.

**Cisco cloud hosted n/w +
CNDP Platform / Public
Cloud vendor**

**Auto Integrates and self-
heals across domains**

Invoicing

SP / Enterprise

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# Self-Integrating Network

Enterprise Campus



Branch Office

Fast, Self-Validating

Branch Office

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# Self-Healing Network
## Connectivity, Functions, and Services

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# Unified End-to-End Service Delivery



Access and Security/Policy Management

Enterprise Management

SP Management

Service Configured

Enterprise Network

Service Provider Network

Wi-Fi 6

Campus/Branch sites

Private 5G

Wi-Fi

OpenRoaming

5G

Remote sites

Software Defined Infrastructure

4G/5G

4G/5G

4G/5G

SaaS

IaaS

WAN

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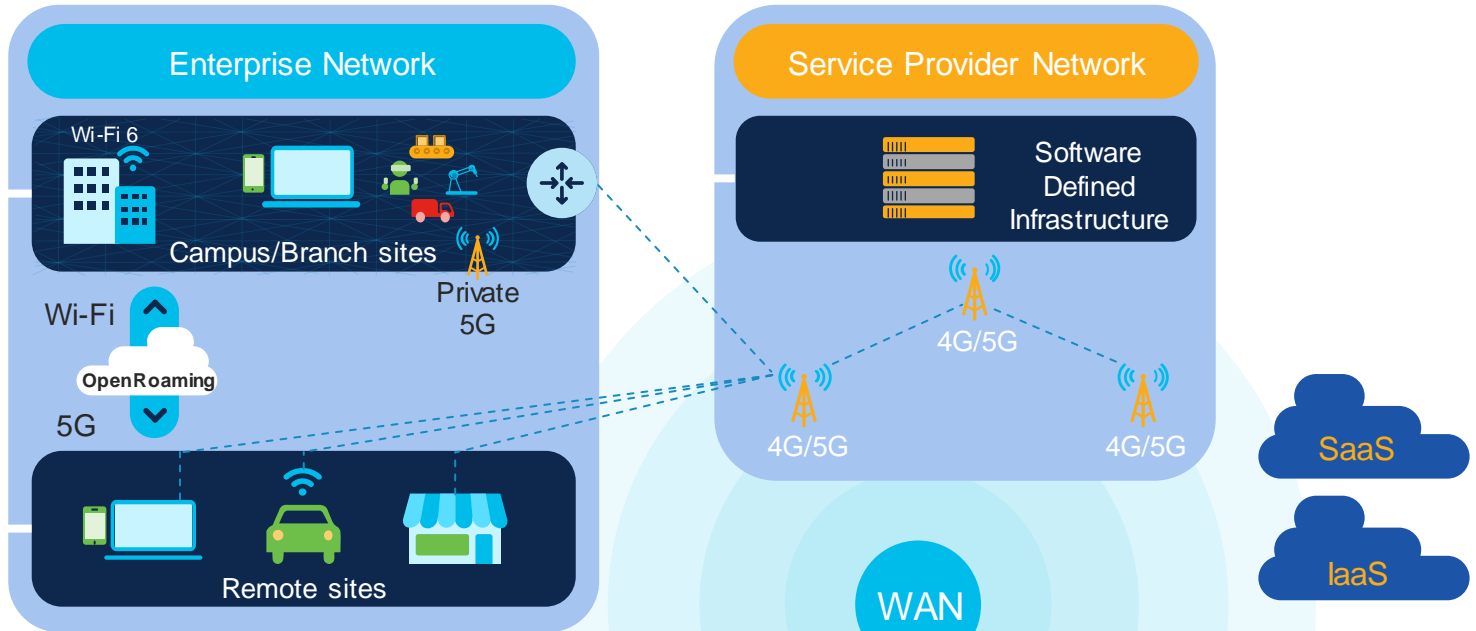
# It Drives the 4th Industrial Revolution…

## $12.3T

revenue growth
in industries by 2035*

## 7X traffic

930 EB/year in 2022
79% will be video**

a changing world

## $3.5T

mobile industry growth and 22
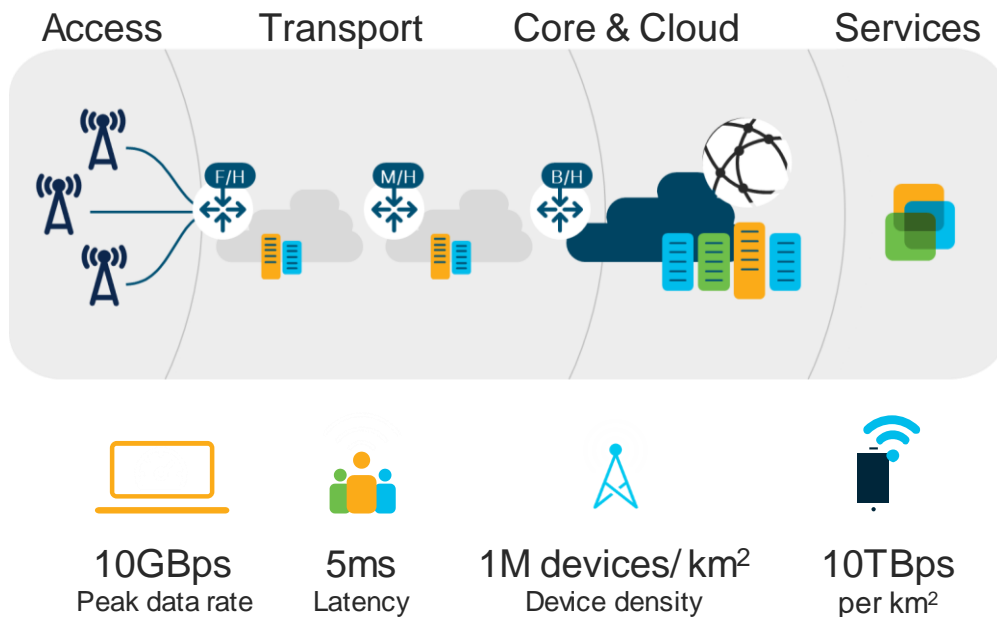million jobs by 2035*

## More people, more things

5.7 billion mobile users in 2022**

3X speed increase**

IoT/M2M traffic grows 8x by 2022**

**…and in the perfect 5G world, regulations keep pace with technology**

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# …as well as a transformation in networking and IT



Access    Transport    Core & Cloud    Services

10GBps
Peak data rate

5ms
Latency

1M devices/ km$^2$
Device density

10TBps
per km$^2$

**1** **Massive capacity upgrades**
10x increase in bandwidth and 10x reduction in latency will require major upgrades and improved expenses and revenues

**2** **Architectural transformation**
Disaggregation, decomposition, and self-integration, along with move to virtualization and cloud native enabling significant transformation and disruption of existing incumbents

**3** **Enterprise applications**
5G will enable licensed wireless to become a more strategic component of enterprise IT plans – mobile workforce, IoT, industrial, in-building

**4** **New Business Models and Ecosystem**
Competitive environment, new capabilities, and customer demand opening up new business opportunities across the value chain

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# It Solves Problems!
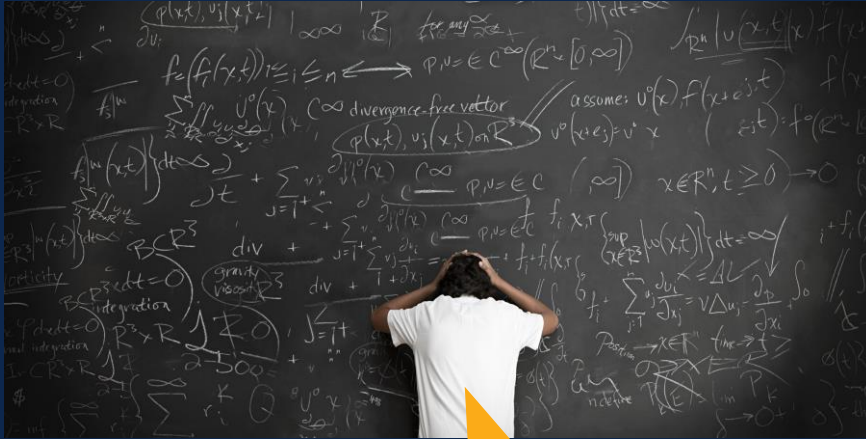
The network has thought about your problem, and offers a solution

You, and a problem you have !

# What is a reasonable starting point?

## … one that is real and working today!

Emerging Networks
- Rakuten Mobile

Existing Networks
- T-Mobile

Opex and Capex aspects
- Software driven – cloud native
- Distributed
- Open RAN
- Automated

# Open RAN Is Key to 5G Future

## IP O-RAN Advantage

- **30-50% Reduction in CAPEX**
- Best of Breed Elements
- Simplified IP Architecture
- Multi-access Convergence

- **Contributing to Working Groups 1-5**
- New Radio Options Possible: Small Cell, Drones, Satellites, etc.
- Full Spectrum Flexibility: CBRS, 4G, 5G, Public, & Private

O-RAN ALLIANCE

Member

## Partnerships

Parallel WIRELESS    NEC    World Wide Technology    New!

Current Open RAN ecosystem includes Altiostar, Intel, Redhat, JMA Wireless, Radisys, Blue Danube, Tech Mahindra, Mavenir, World Wide Technology, ASOCS, VIAVI, RF Pixels, and Parallel Wireless.
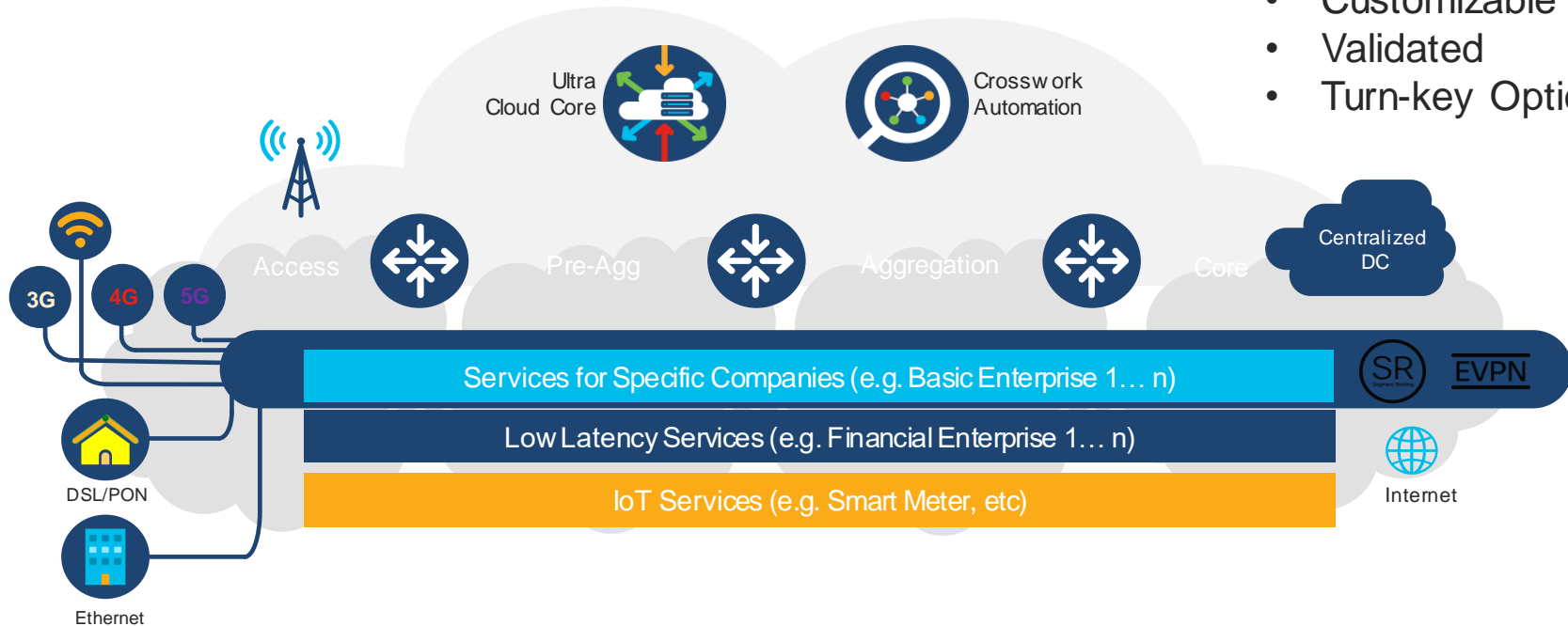
## Momentum

Rakuten Mobile    telenor    etisalat
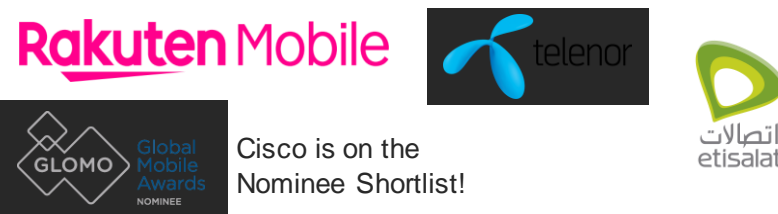
GLOMO Global Mobile Awards NOMINEE    Cisco is on the Nominee Shortlist!

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# Winning 5G from the Inside Out
## Deployed Software-defined 5G Architecture

**Commercially Deployed**
**Built with Experience**

- Customizable
- Validated
- Turn-key Options

Enterprise + IoT + 5G Mobile Slicing



Ultra Cloud Core

Crosswork Automation

Access

Pre-Agg

Aggregation

Core

Centralized DC

3G    4G    5G

DSL/PON

Ethernet

Services for Specific Companies (e.g. Basic Enterprise 1… n)

Low Latency Services (e.g. Financial Enterprise 1… n)

IoT Services (e.g. Smart Meter, etc)

SR    EVPN

Internet

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# The End Game
## Transformative Software-Defined Network



Automation | Orchestration | Assurance

Enterprise

vRAN, Far Edge

User Plane, Edge Apps

Control, Policy, Core

Private + Public Hybrid Cloud

5G

5G

4G LTE

F/H

M/H

B/H

Converged SDN Transport

Built to drive successful business outcomes

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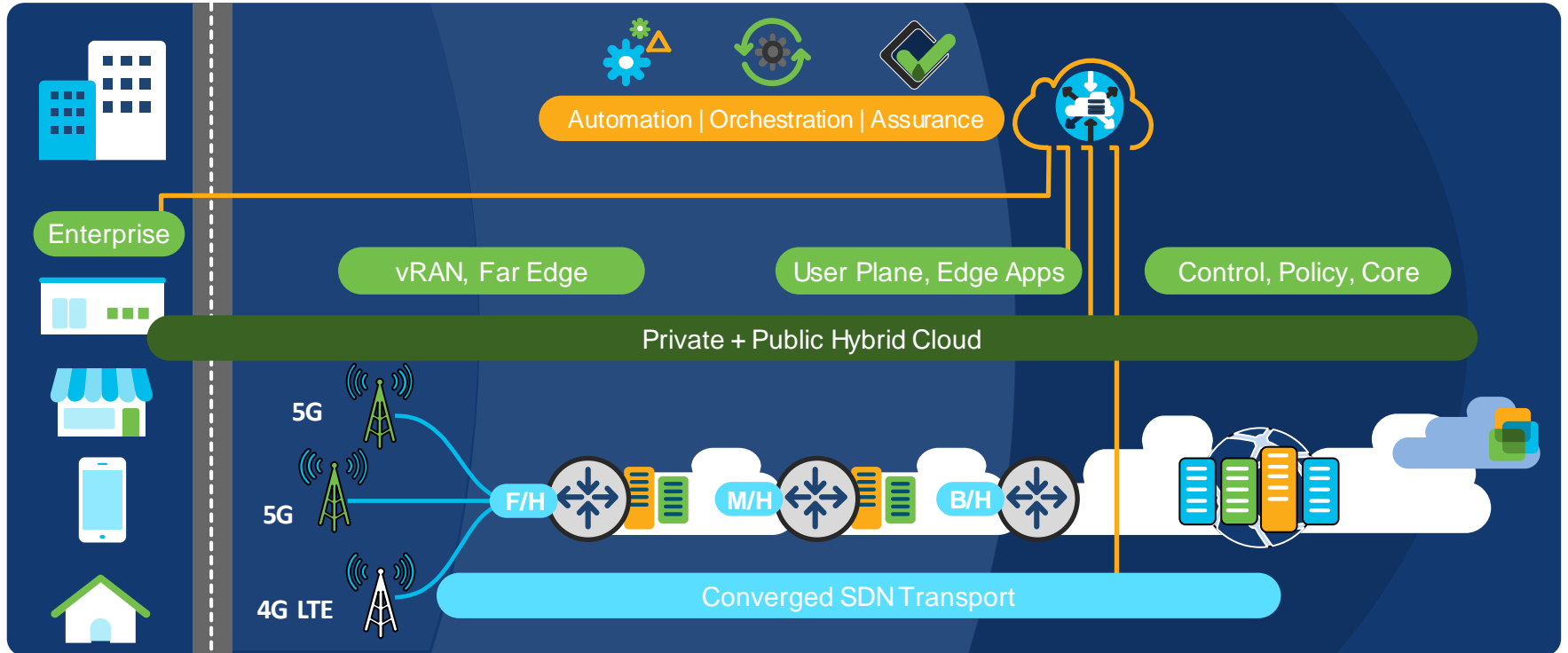
# Tying it all together with Automation

| Converged SDN Transport | 5G Service Delivery and Assurance | Foundation of Network Operations | Closed-loop Operations | Cloud-enhanced Operations |
|---|---|---|---|---|
| • Dynamic bandwidth management | • Elastic ability to spin up/down services | • Mass scale network telemetry | • Alert before customers impacted | • Identify BGP network events rapidly |
| • Realtime network optimization | • Automated network slice provisioning | • Device management and event correlation | • Reduce noise to Increase operational effectiveness | • Attest network hardware, software with forensic data |
| • Turnkey solutions across operations lifecycle | • Real-time remediation based on KPIs | • Support for multi vendor/domain | • Intelligent, proactive remediation | • Reduce hardware, software integration costs |

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# What is Missing



- HetNet / AnyNet (… with seamless roaming)
- Converged over anything – any access mechanism
- As a Service
- Extend domain capabilities (for Enterprise and verticals)
  - The customisation
- AI (predictive) management of Network Slices
  - Support for 1,000's of slices
  - Are the slices we have, the slices that we need?
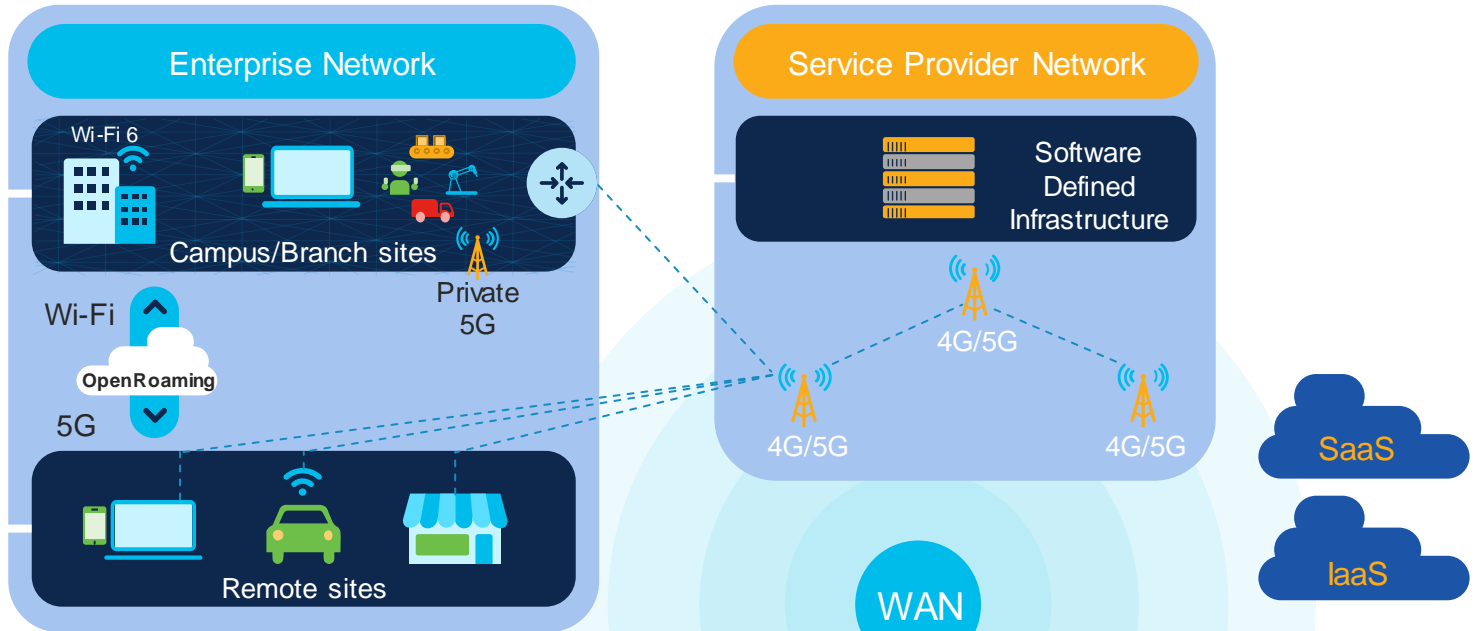  - Do we have the regulation that we need (localisation, network reuse, etc) ?

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# Traditional Economics are Breaking
## Digitization is more than a strategy, it's a necessity

### Current

**Revenue Flat**

CAGR 0.3% (2017-2022)

**Costs Growing**

Capex YoY 2.5% (2017-2022)
Opex typically ~5:1 ratio

**Borrow to Operate**

Highly Leveraged Debt-To-Equity: > 70%

**Translation**

Impact on Company Value
EV/EBITDA Ratio of ~7.59 (lowest among all industries)

### Needs Help

**Grow Revenue**

Enterprise Services
IoT Services
Edge Services (Telco Cloud)
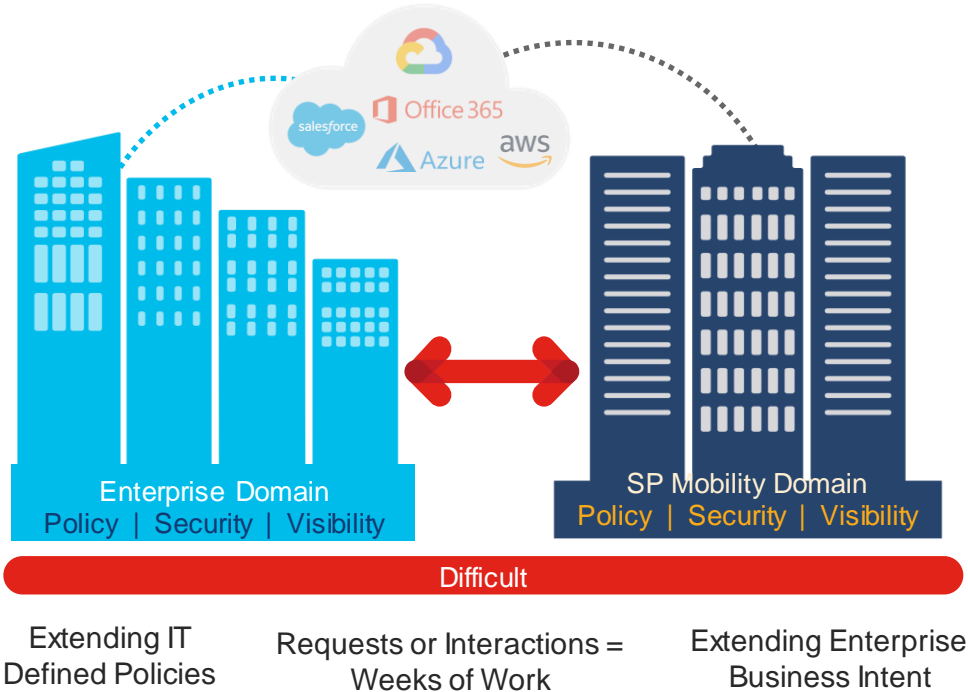
**Reduce Costs**

Massive Scale
Power Efficiency
Automated Operations

**Improve Margins**

# Cross-Domain Operations and Visibility
## Simplify the complex

### Separate Enterprise and SP Domains



**Enterprise Domain**
Policy | Security | Visibility

**SP Mobility Domain**
Policy | Security | Visibility

**Difficult**

Extending IT Defined Policies

Requests or Interactions = Weeks of Work

Extending Enterprise Business Intent

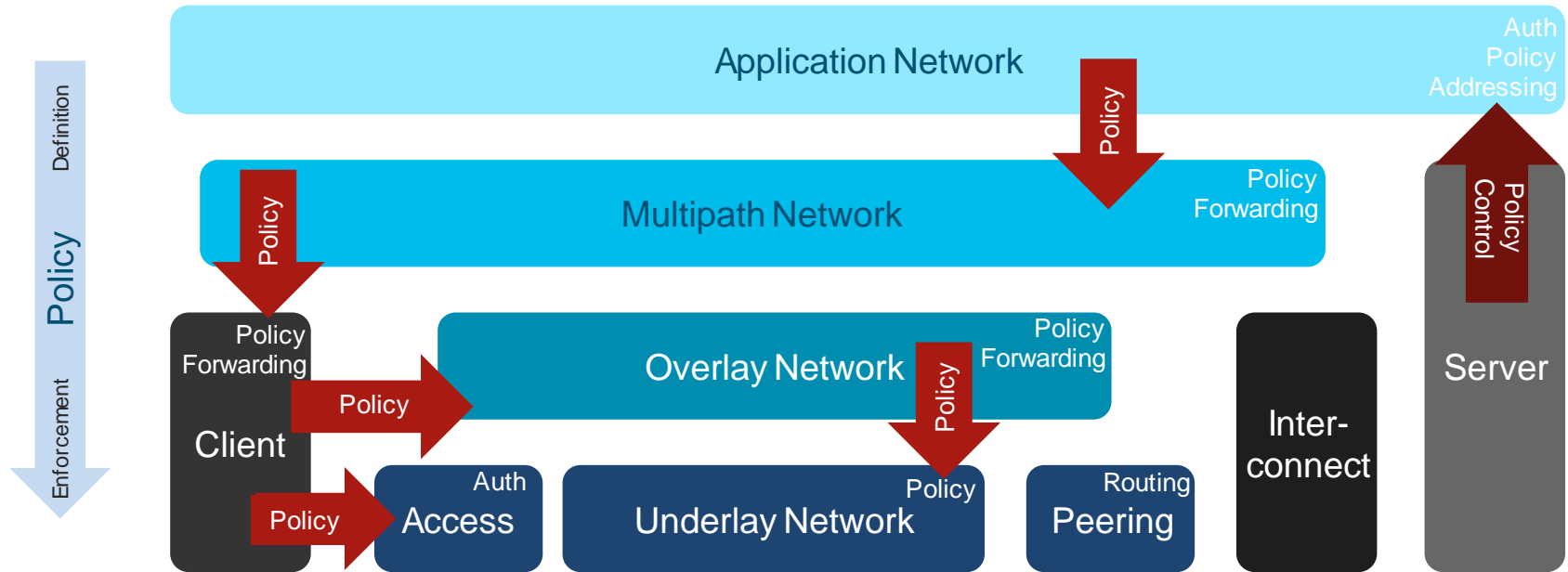### Cross Domain Transparent Operations



ENT — SP

**Expanded Relationship**
of Transparency and Integration

**Meet Demands**
of Customization and Immediacy

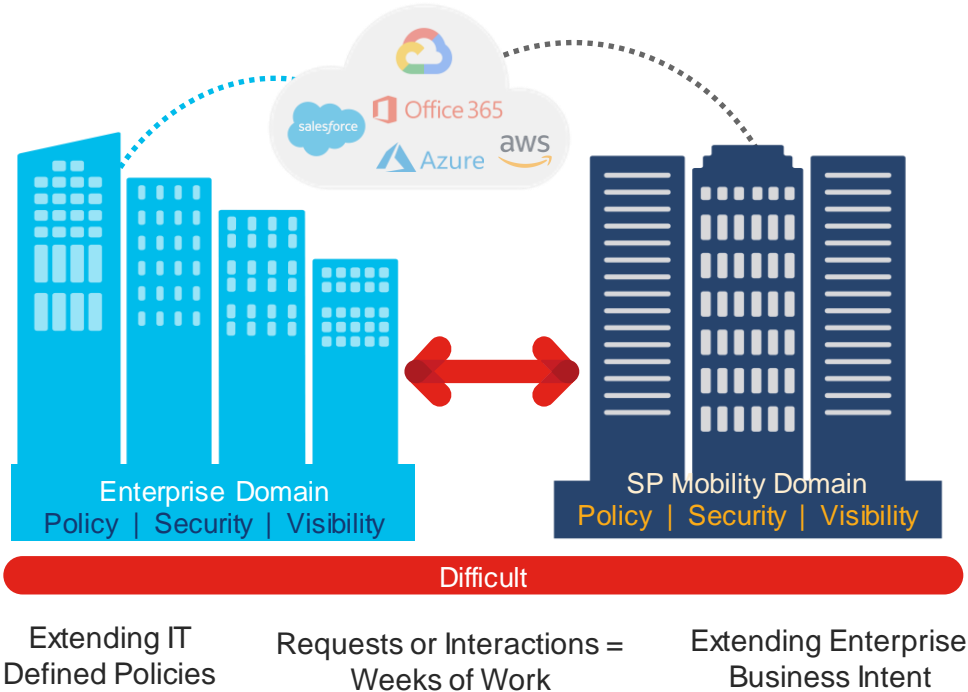**Match the Agility**
of Enterprise Business

# Integrated Policy Percolation via Common APIs

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# How do we get there?

## Phased Approach

Phase – 1: Cross Domain

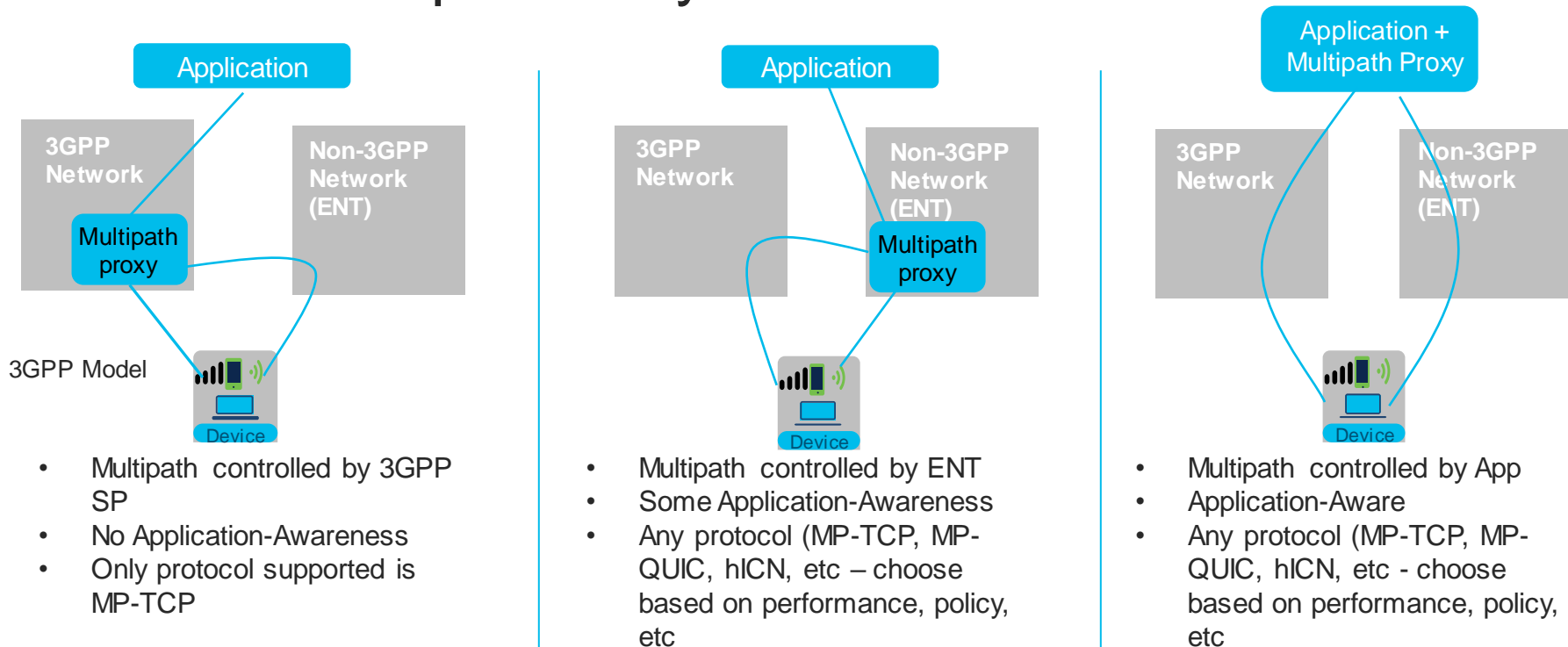Phase – 2: Flexible Multipath

Phase – 3: App Policy Standards

# Cross Domain Policy, Visibility, and Control
## End-to-end for everyone and everything

Enterprise + IoT + 5G Mobile Slicing



- Coverage of Remote and Roaming Assets
- Ensure SLA of Mission Critical Communications
- Mobile SD-WAN
- Secure Endpoints: SIM-based Authentication
- Create Intelligent Rules and Policy-based Actions

# Flexible Multipath: Beyond 3GPP Vision



3GPP Model

- Multipath controlled by 3GPP SP
- No Application-Awareness
- Only protocol supported is MP-TCP

- Multipath controlled by ENT
- Some Application-Awareness
- Any protocol (MP-TCP, MP-QUIC, hICN, etc – choose based on performance, policy, etc

- Multipath controlled by App
- Application-Aware
- Any protocol (MP-TCP, MP-QUIC, hICN, etc - choose based on performance, policy, etc

**Need to build-in support for all three models of multi-connectivity, multi-path**

# Third element on app policy percolation standardization
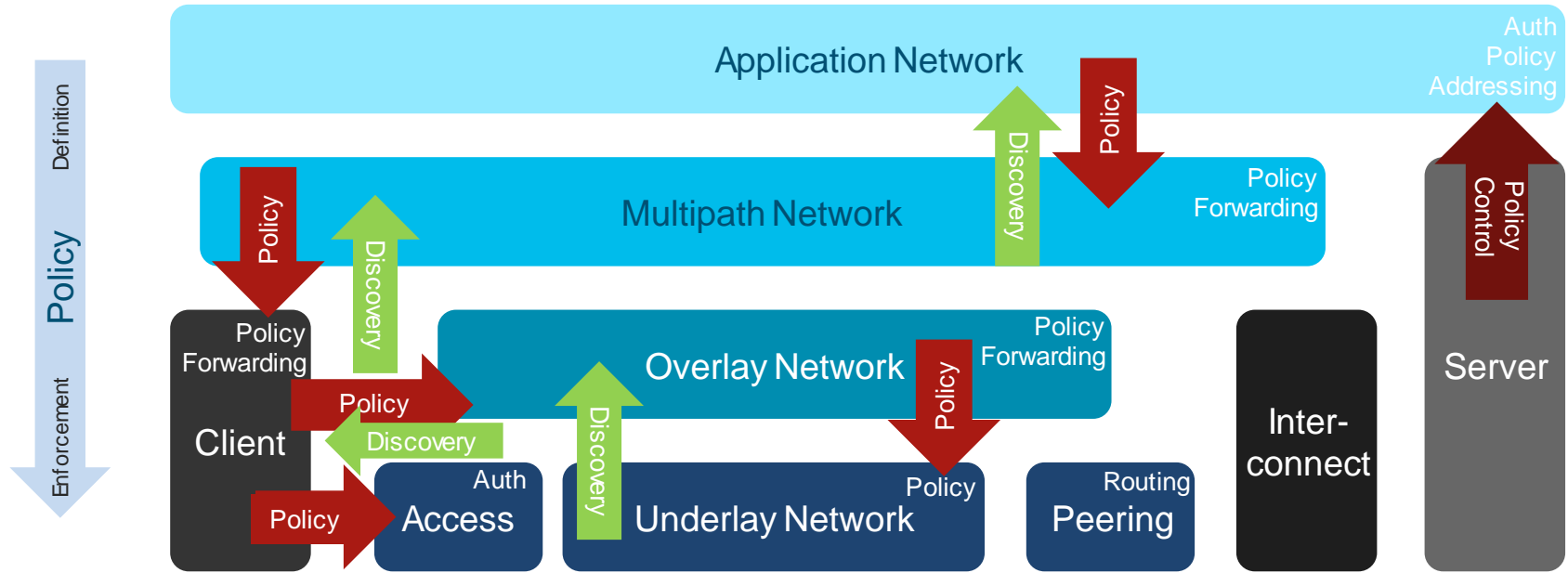
As the internet goes dark, policy propagation, enforcement and discovery are central to providing seamless services cross-domain

… and of course, we'd call it 6G, right?

By the time we have got the perfect 5G network … we may well be calling it 6G

Thank you