Cisco live!

February 15 – 19, 2016 ▪ Berlin, Germany

We’re ready. Are you?

Christian Huber, Network Technology, February 2016

BMW GROUP – AN ENTERPRISE INTRODUCING IPv6.

CISCO LIVE 2016.
BERLIN.

BMW GROUP

Rolls-Royce
Motor Cars Limited

BMW GROUP – AN ENTERPRISE INTRODUCING IPv6. WHAT IS THIS PRESENTATION ABOUT?

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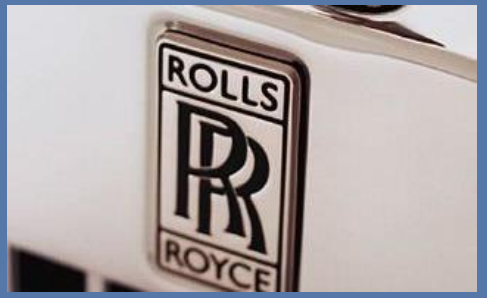
BMW GROUP – AN ENTERPRISE INTRODUCING IPv6. AGENDA.

Agenda.

- Motivation
- Approach
- Network Architecture
- Network Rollout
- Status
- Outlook

BMW GROUP – AN ENTERPRISE INTRODUCING IPv6.
BMW, MINI AND ROLLS-ROYCE.

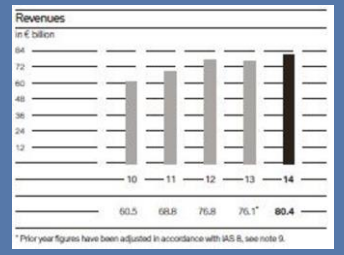
Brands



Figures

116.000 employees

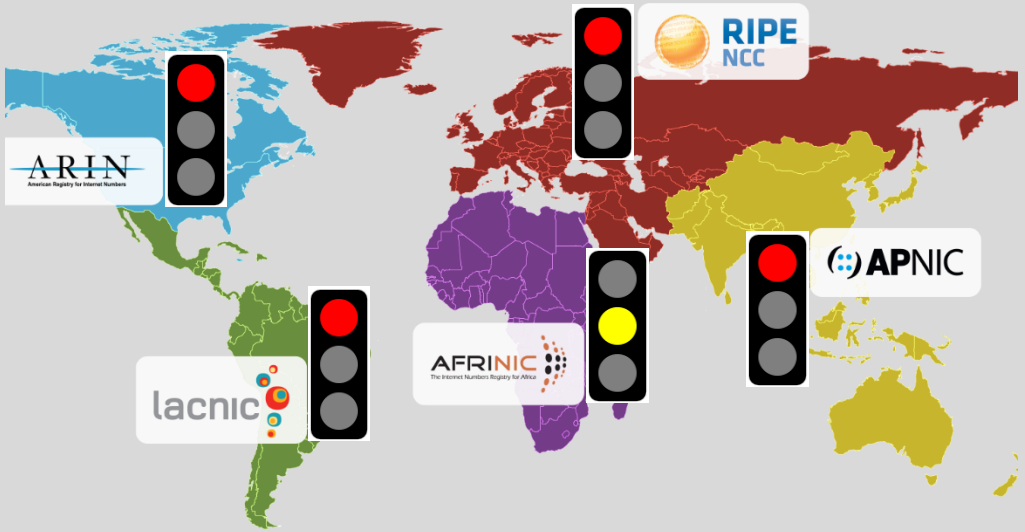
2.1 million cars



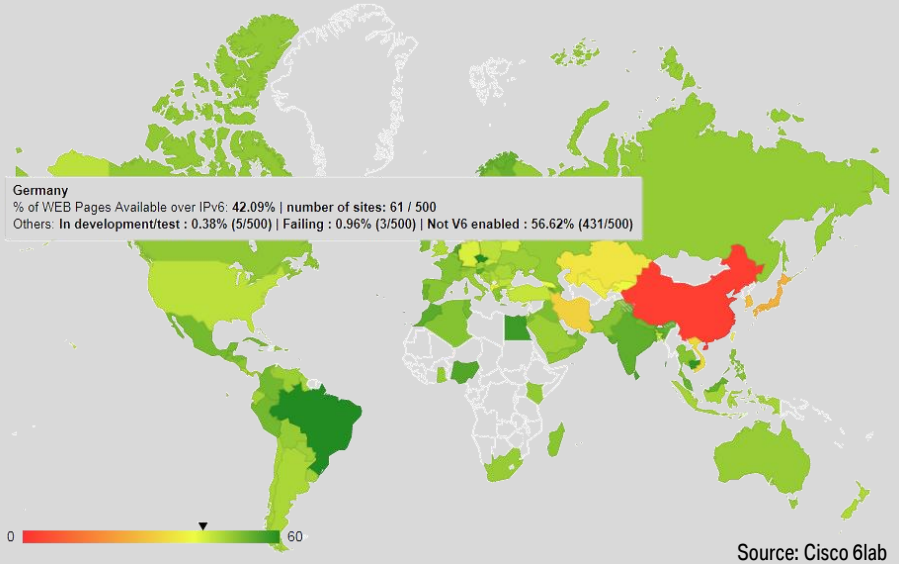
80.4 billion revenue

MOTIVATION.
IPv4 ADDRESS DEPLETION AND MOVE TOWARDS IPv6.

Worldwide IPv4 Depletion.



Web Content available via IPv6.

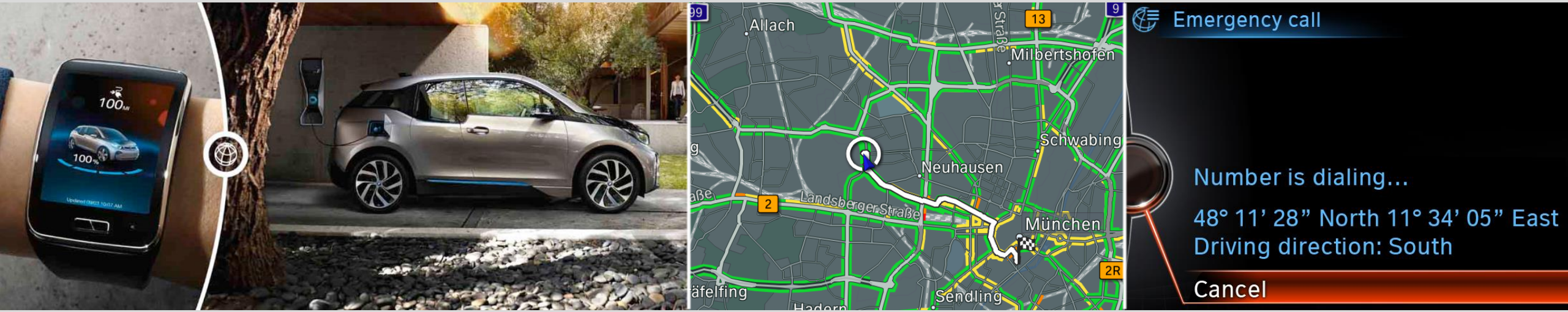


Source: Cisco 6lab

IPv4 resources are depleted worldwide – The Internet is moving towards IPv6.

Services and resources available via the Internet have to be IPv6 enabled in order to ensure connectivity.

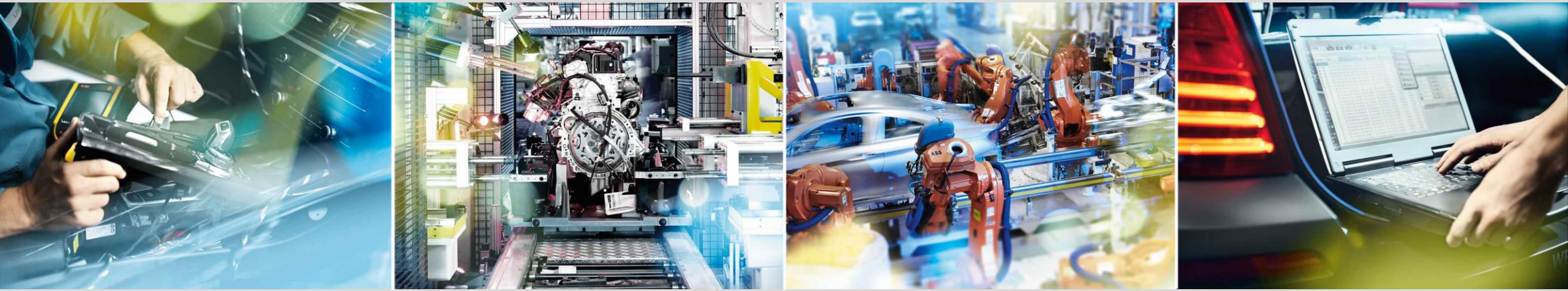
MOTIVATION.
CONNECTEDDRIVE.



ConnectedDrive – A service for BMW customers, provided and hosted by BMW, running on an end device built by BMW.

Every BMW built (2,000,000+/ anno) requires IP connectivity to our Data Centre – Scalability provided by IPv6 is key!

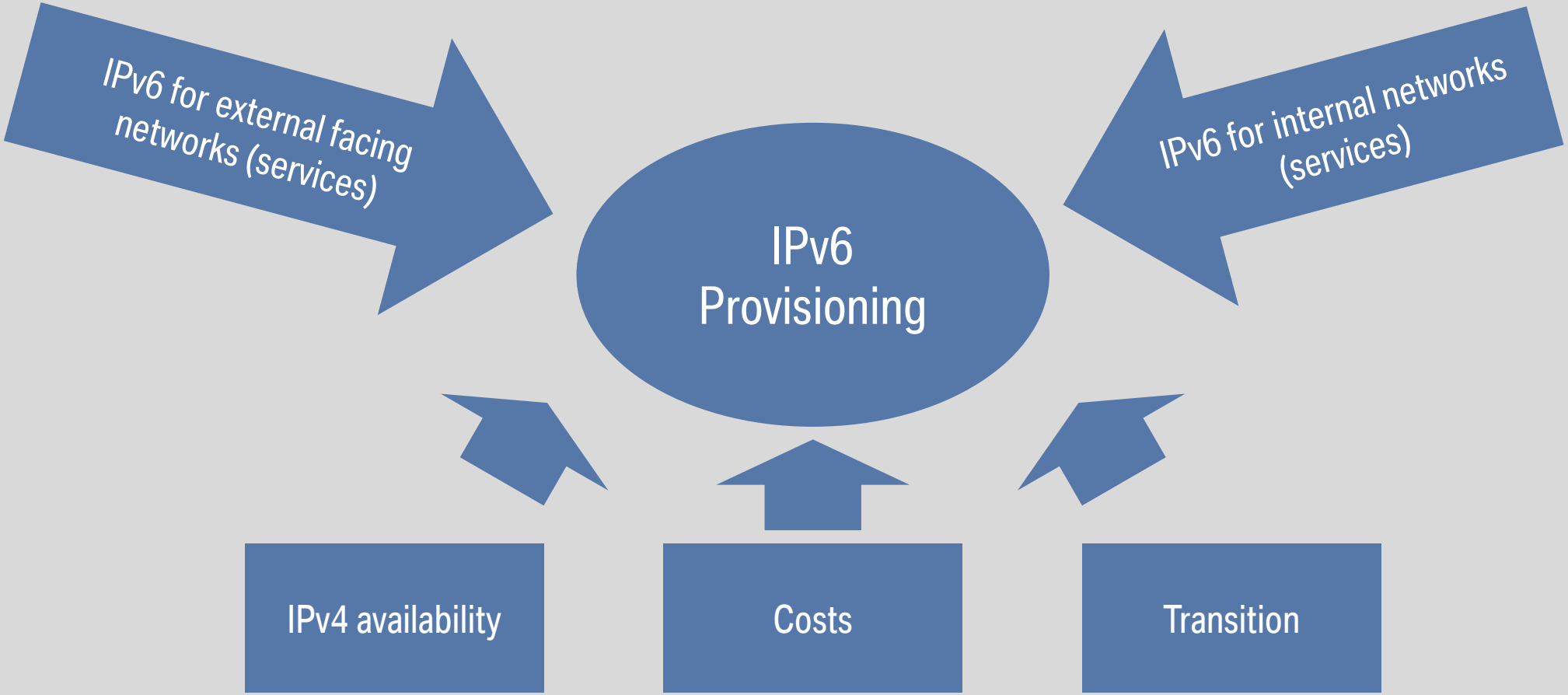
MOTIVATION.
INDUSTRIE 4.0.



Industrie 4.0 (Internet of Things) brings thousands of additional end devices to manufacturing environments.

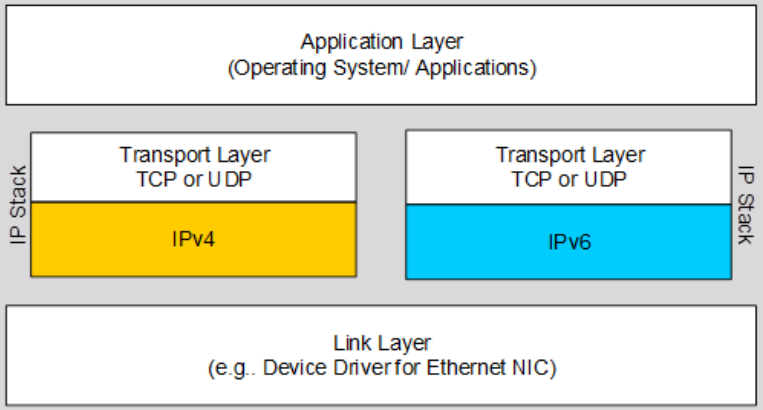
Scalability, end-to-end communication and ease of use are required – Features only provided by IPv6!

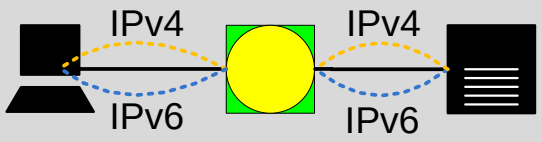
APPROACH.
REQUIREMENTS.



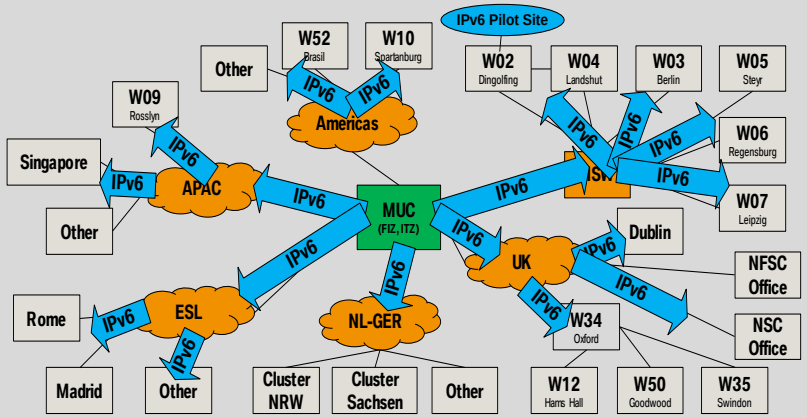
APPROACH.
DUAL STACK AS TRANSITION METHOD.

Dual Stack.



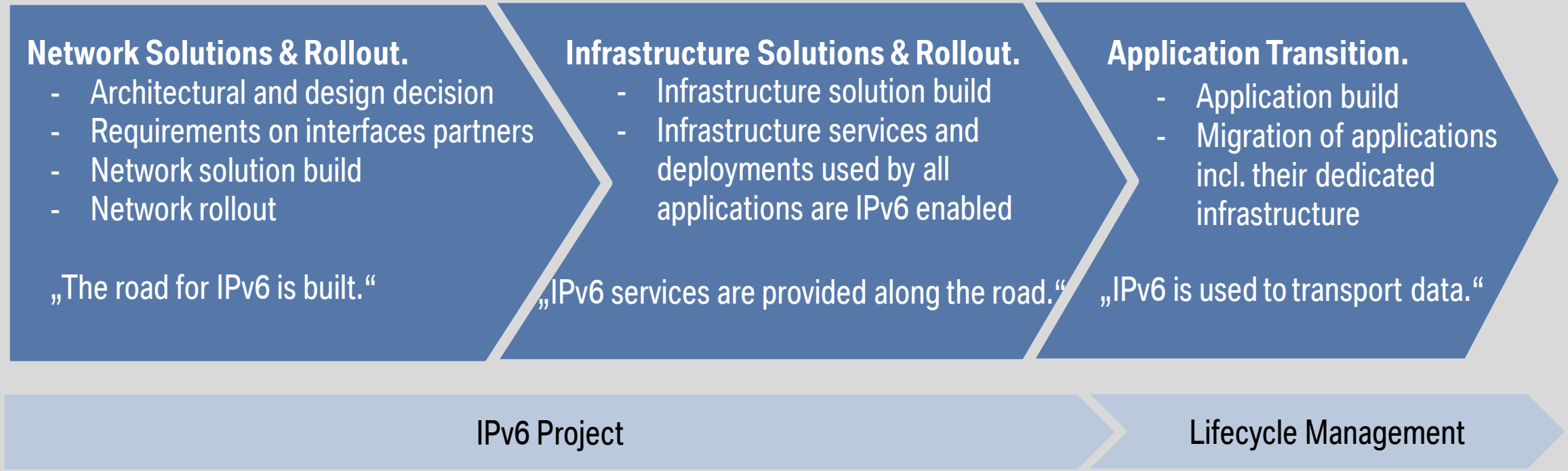


Core to Edge Rollout.

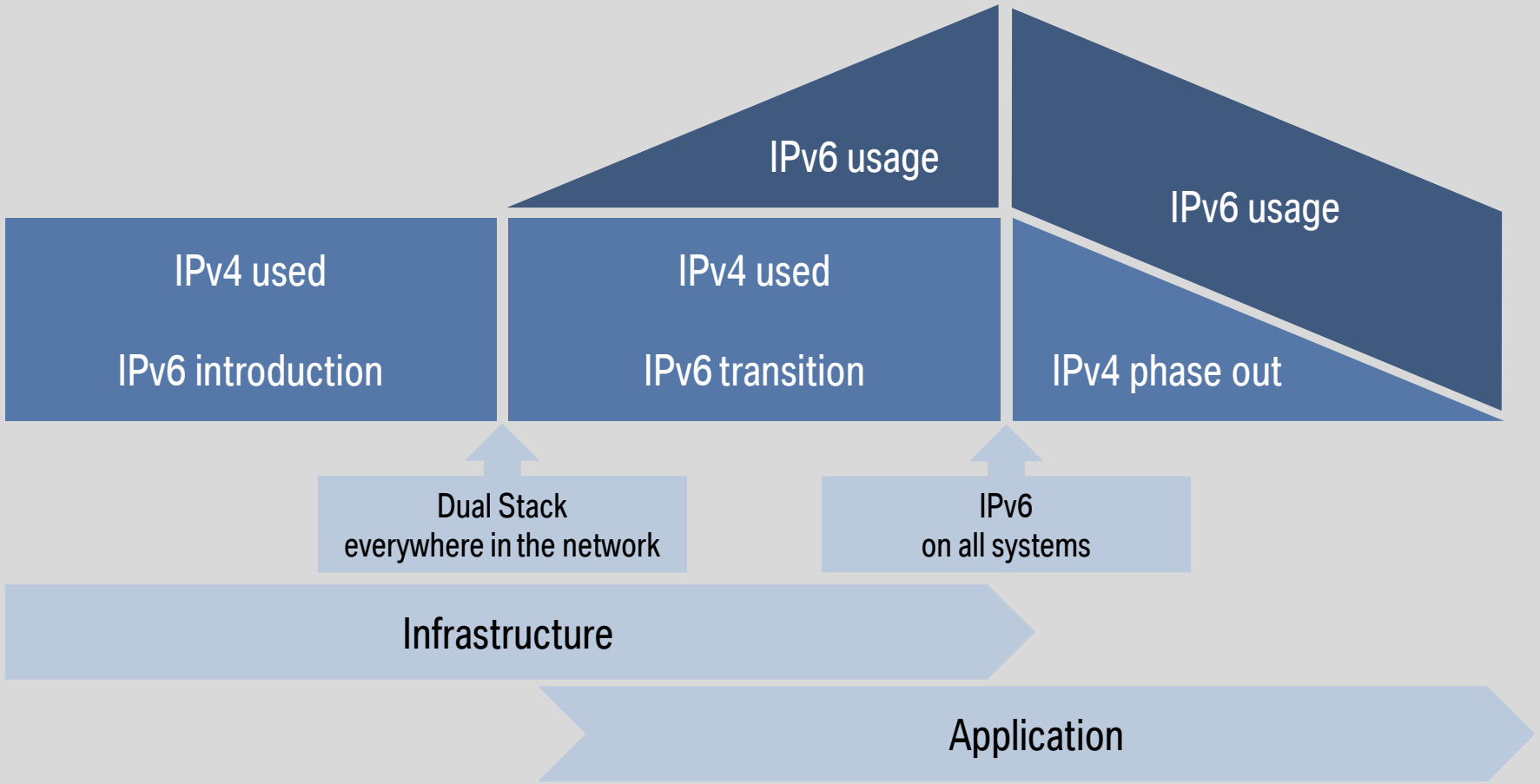


Dual Stack is the only transition method that enables a scalable, long-term, cost efficient and riskless transition towards IPv6.

APPROACH.
INFRASTRUCTURE FIRST – APPLICATIONS FOLLOW (I).



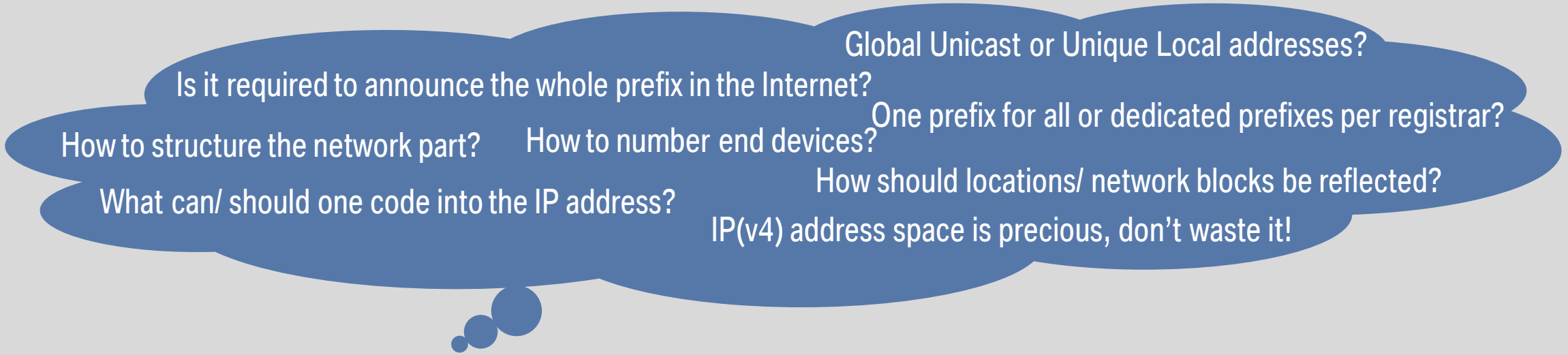
APPROACH.
INFRASTRUCTURE FIRST – APPLICATIONS FOLLOW (II).



NETWORK ARCHITECTURE. DESIGN PREMISE.

Build a network architecture and design that lasts and is at least as available and reliable as IPv4!

NETWORK ARCHITECTURE.
NETWORK DESIGN – ADDRESS PLAN.



Plan reserves.

You only do an IP address design once a lifetime.

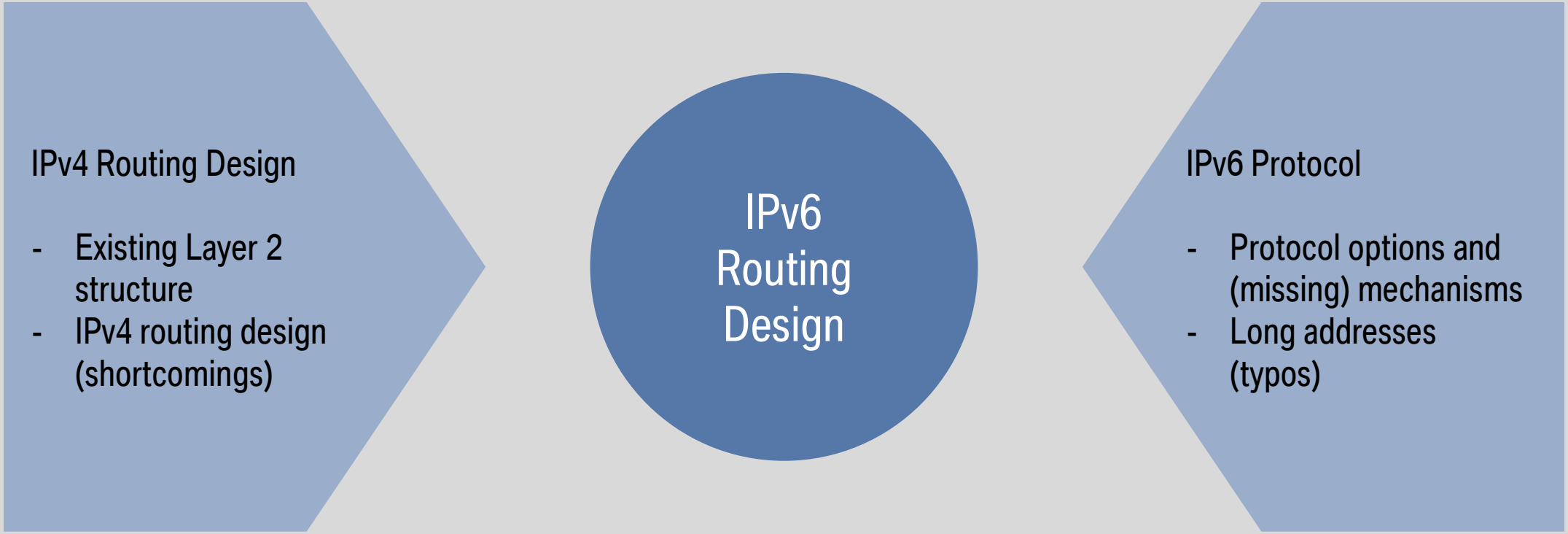
Keep it simple.

An IP address is just a number. Code only things into the address plan, people can remember and require for daily operations.

Follow Best Practices.

What everybody does will be supported for good.

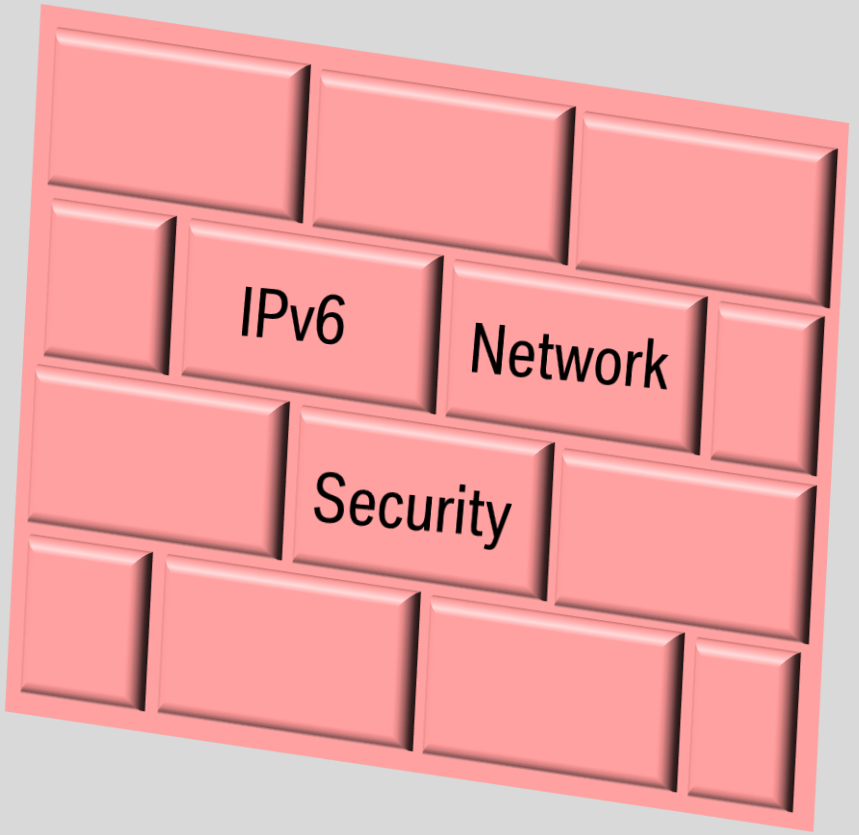
NETWORK ARCHITECTURE.
NETWORK DESIGN – ROUTING DESIGN.



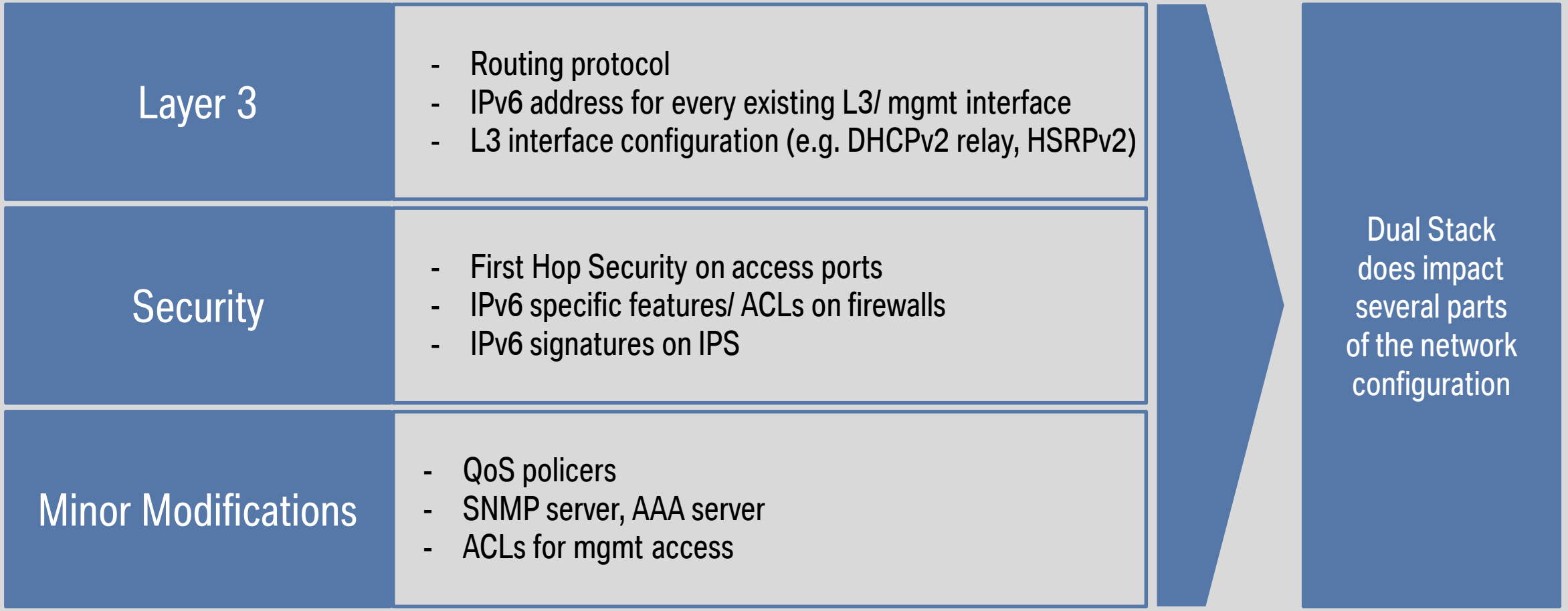
NETWORK ARCHITECTURE.
NETWORK DESIGN – SECURITY.

Known threads using IPv6

New threads based on IPv6 protocol mechanisms

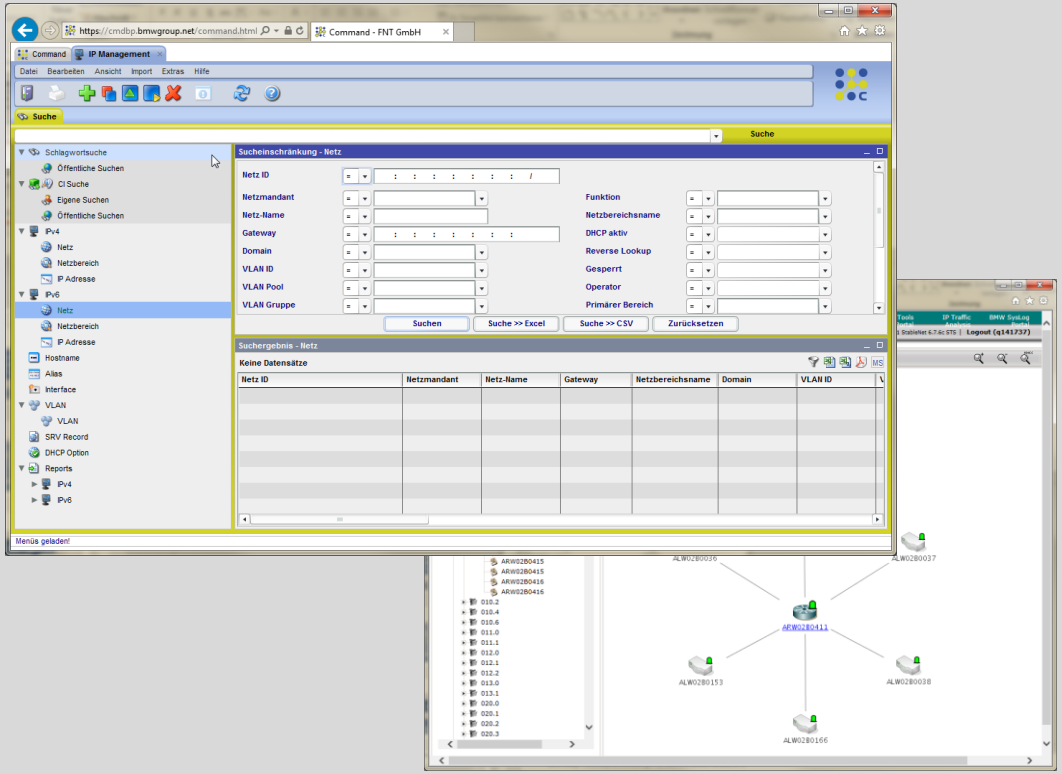


NETWORK ARCHITECTURE.
NETWORK DESIGN – FEATURES/ CONFIGURATION.



NETWORK ARCHITECTURE.
OPERATION SOLUTIONS/ TOOLS.

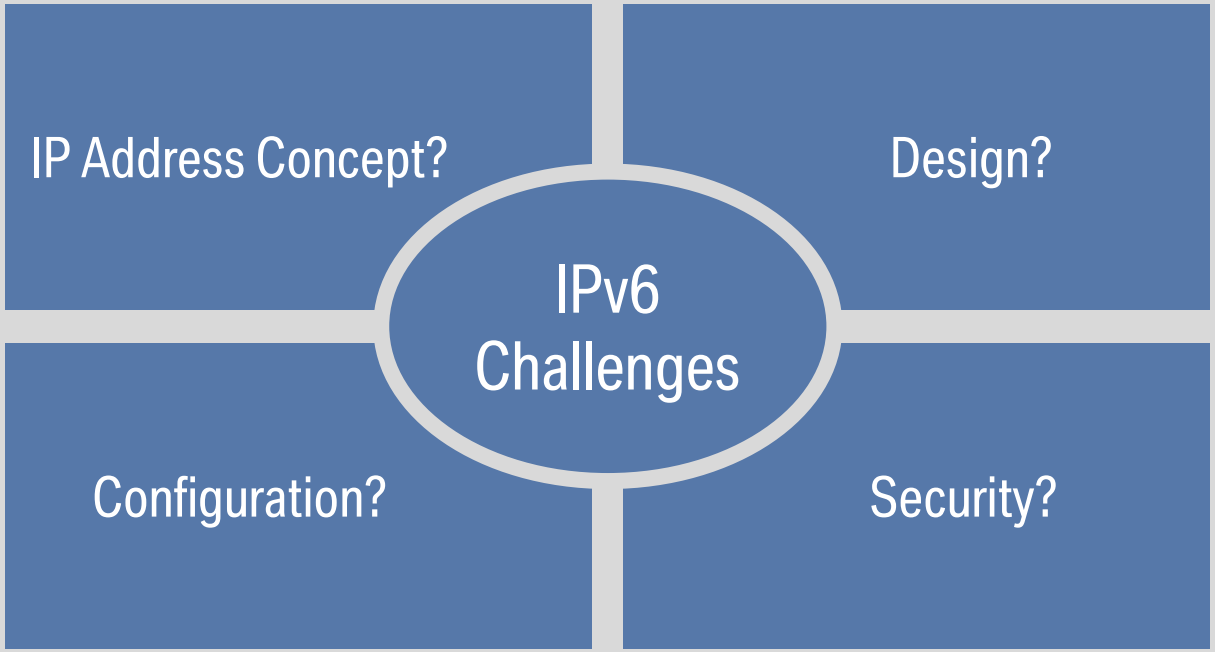
IPv6 is used to communicate



IPv6 is processed as data/ information

IPv6 support in operation solutions/ tools is key to success!

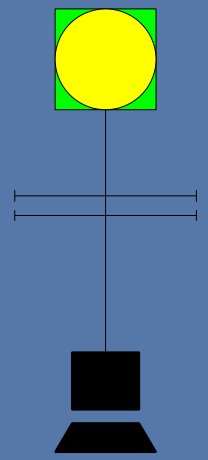
NETWORK ARCHITECTURE. CHALLENGES.



The challenges in an IPv6 project are the differences between IPv4 and IPv6 and those can be mainly seen at the interface to other IT systems.

NETWORK ARCHITECTURE. CHALLENGES - EXAMPLE.

Setup.



Access Router
(Dual Stack)

DATA vlan (untagged)
VOICE vlan (dot1q tagged)

Windows 7 end device
(Dual Stack, DHCP)

Challenge.

- NIC runs on “auto-tagging” (depending on NIC driver version)
  → Client sees IPv6 RA’s from both subnets
- Client has two default gateways (DATA and VOICE vlan)
- Only DATA default gateway is reachable

```
C:\Users\Q345055>ipconfig

Windows-IP-Konfiguration

Drahtlos-LAN-Adapter Drahtlosnetzwerkverbindung:

   Medienstatus. . . . . . . . . . . : Medium getrennt
   Verbindungsspezifisches DNS-Suffix: muc

Ethernet-Adapter LAN-Verbindung:

   Verbindungsspezifisches DNS-Suffix: muc
   IPv6-Adresse. . . . . . . . . . . : 2a03:1e80:f003:506::10:ac60
   Verbindungslokale IPv6-Adresse  . : fe80::55dc:40d7:d26d:1391%11
   IPv4-Adresse  . . . . . . . . . . : 10.145.6.64
   Subnetzmaske  . . . . . . . . . . : 255.255.255.0
   Standardgateway . . . . . . . . . : fe80::1e80:f003:1:3%11
                                       fe80::fe80%11
                                       10.145.6.1
```

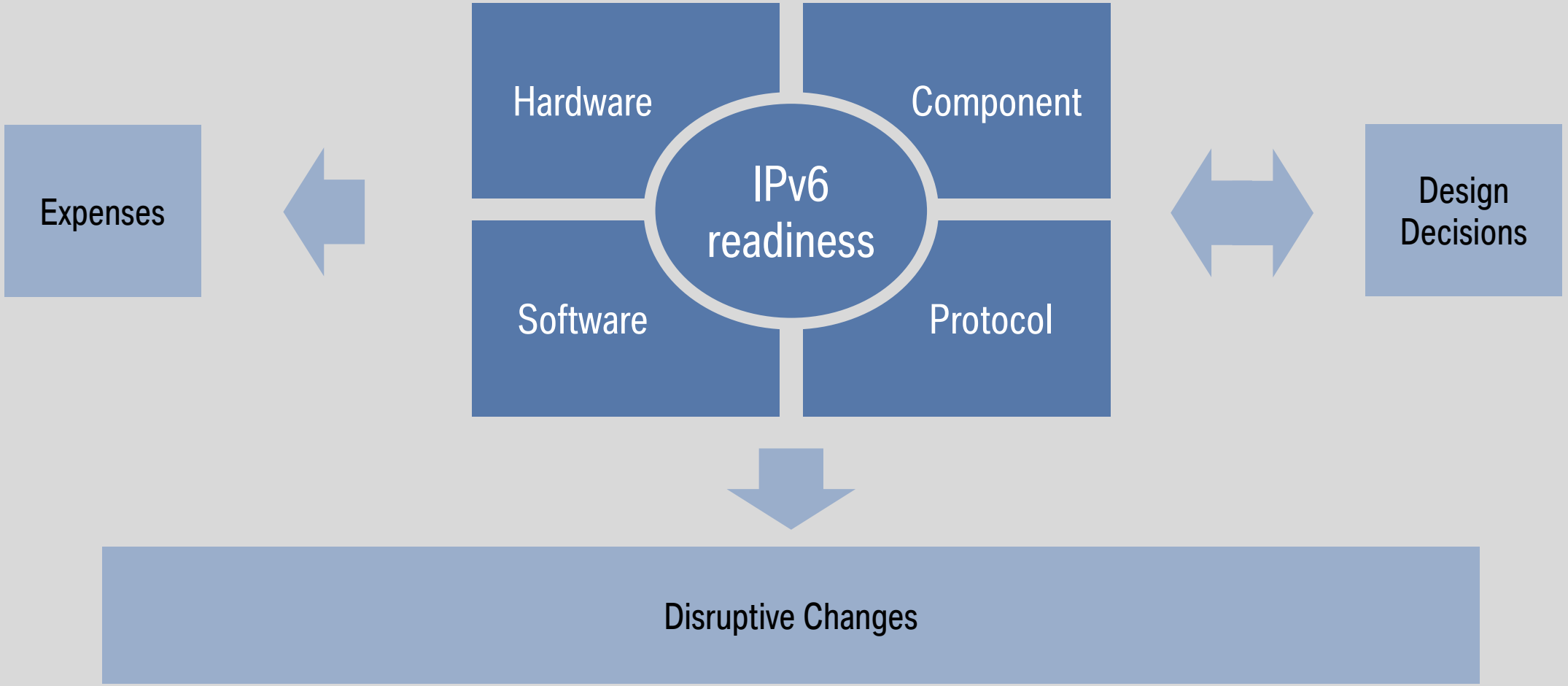
```
C:\Users\Q345055>netsh interface ipv6 show route

Veröff.  Typ       Met   Präfix                    Idx  Gateway/Schnittstelle
-------  --------  ----  ------------------------  ---  --------------------
Nein     Manuell   16    ::/0                      11   fe80::1e80:f003:1:3
Nein     Manuell   256   ::/0                      11   fe80::fe80
Nein     Manuell   256   ::1/128                   1    Loopback Pseudo-Interface 1
Nein     Manuell   8     2a03:1e80:f003:506::/64   11   LAN-Verbindung
Nein     Manuell   256   2a03:1e80:f003:506::10:ac60/128  11  LAN-Verbindung
Nein     Manuell   8     2a03:1e80:f003:507::/64   11   LAN-Verbindung
Nein     Manuell   256   fe80::/64                 11   LAN-Verbindung
Nein     Manuell   256   fe80::/64                 12   Drahtlosnetzwerkverbindung
Nein     Manuell   256   fe80::55dc:40d7:d26d:1391/128  11  LAN-Verbindung
Nein     Manuell   256   fe80::84de:3eb6:1101:7643/128  12  Drahtlosnetzwerkverbindung
Nein     Manuell   256   ff00::/8                  1    Loopback Pseudo-Interface 1
Nein     Manuell   256   ff00::/8                  11   LAN-Verbindung
Nein     Manuell   256   ff00::/8                  12   Drahtlosnetzwerkverbindung
```

Solution.

Neighbor Discovery Router-Preference “High” is activated for all DATA vlans

→ End device prefers DATA vlan

NETWORK ROLLOUT.
IPv6 READINESS.

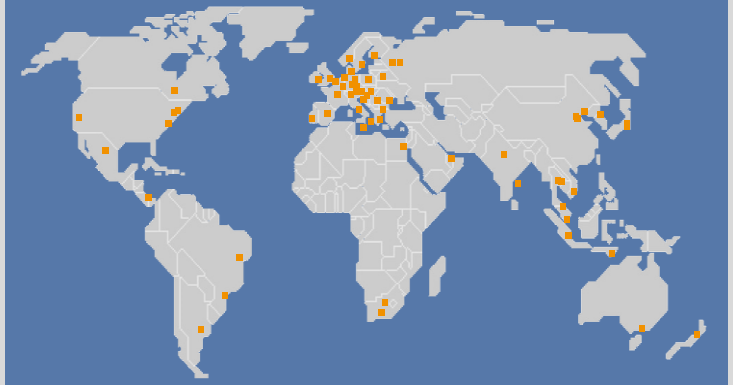


NETWORK ROLLOUT. SCALE.

Network Infrastructure

20,000+ components

Locations



250+ locations

Individual Parameters

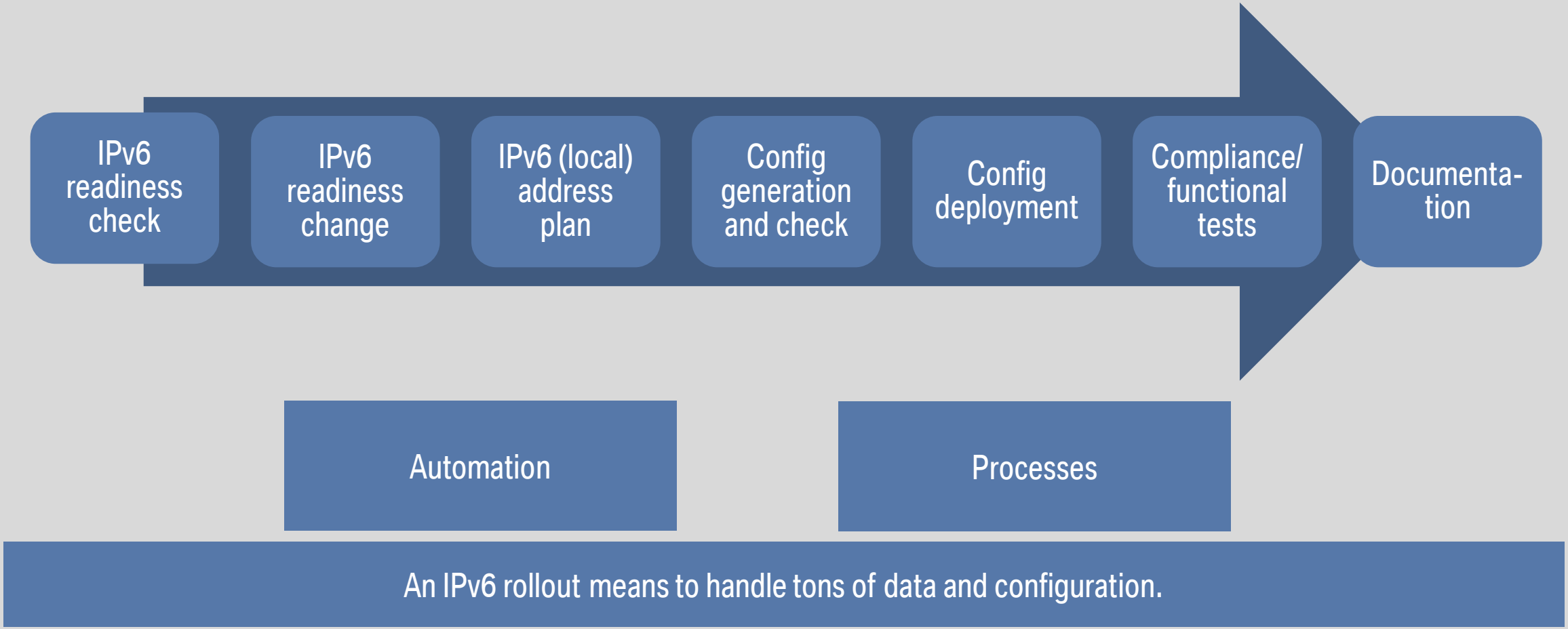
```
DISTRIBUTION# sh ipv6 interface brief
TenGigabitEthernet2/1   [up/up]
    FE80::1E80:10:1:1
    2A03:1E80:10:27::3
TenGigabitEthernet2/2   [up/up]
    FE80::1E80:10:1:1
    2A03:1E80:10:2::2
TenGigabitEthernet2/3   [up/up]
    FE80::1E80:10:1:1
    2A03:1E80:10:3::2
TenGigabitEthernet2/4   [up/up]
    FE80::1E80:10:1:1
    2A03:1E80:10:4::2
TenGigabitEthernet2/5   [up/up]
    FE80::1E80:10:1:1
    2A03:1E80:10:5::2
TenGigabitEthernet2/6   [up/up]
```

```
ACCESS# sh run int vlan 1
!
interface Vlan1
 description Data
 ip address 10.255.111.1 255.255.255.0
 ip helper-address 160.50.1.1
 ipv6 address FE80::1E80:10:1:11 link-local
 ipv6 address 2A03:1E80:10:51C::1/64
 ipv6 dhcp relay destination 2A03:1E80::1
end
```

55,000+ subnets

An IPv6 rollout is all about scale!

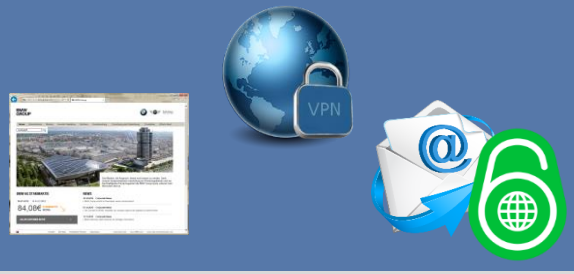
NETWORK ROLLOUT.
WHAT IS AN IPv6 ROLLOUT LIKE?



BMW GROUP – AN ENTERPRISE INTRODUCING IPv6. STATUS.

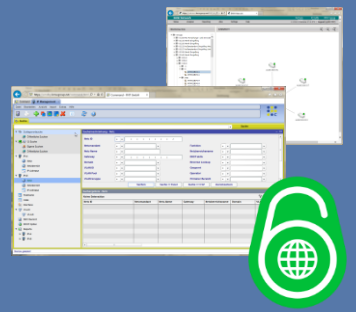
ConnectedDrive R&D

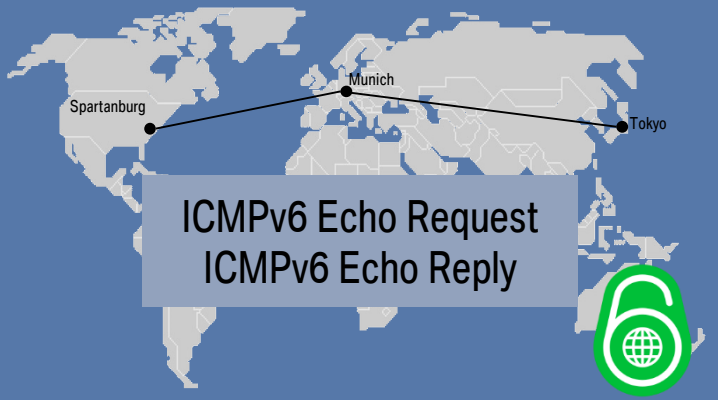
1st Services



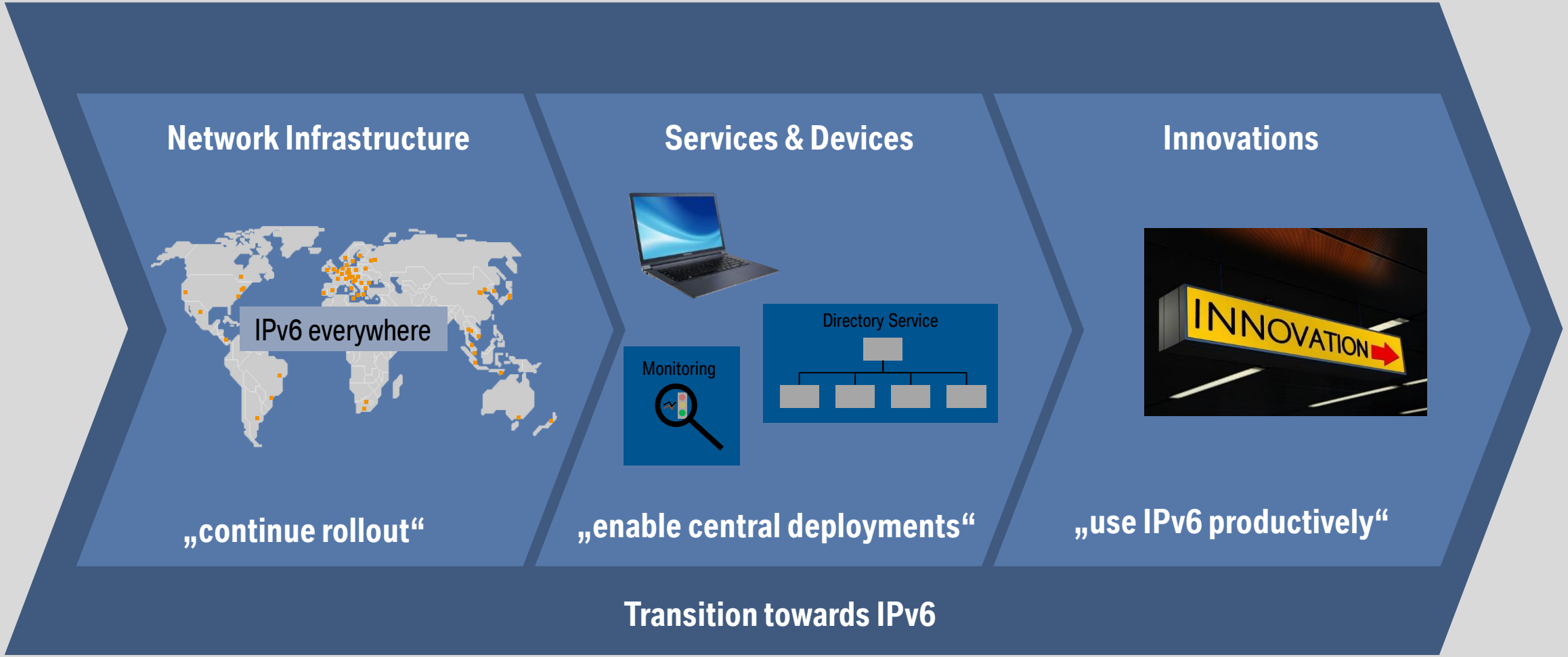
Infrastructure Solutions

Network Solutions and Rollout





BMW GROUP – AN ENTERPRISE INTRODUCING IPv6. OUTLOOK.



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