

# Challenges with addressing in IoT networks

a pitch for

FA-IINAS: Functional Addressing for internets with Independent Network Address Spaces

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# Motivation:

- How could we evolve beyond current IPv6 ?
  - Several proposals / discussions in other parts of IETF.
  - With significant push-back, citing concerns about survival and stability of the Internet
- Claim: 128 bit addresses are not always a benefit... why ?
  - Most answers circle around short addresses for small networks as more efficient on wire/air.
  - But IPv4 also felt easier than IPv6... So there seem to be operational aspects.
- So i tried to figure out the operational issues i have encountered.
  - Mostly in networks i would consider to be IoT or at least have strong IoT elements.
  - Manufacturing / Transportation - mostly not “constrained”
- And came up with some new extended addressing solution
- But: This presentation is just meant to discuss the operational issues.
  - Idea/Solution part itself to be presented later in the week in INTARA/RTGWG meeting
- And maybe the problem itself is worth more discussion in iotops

# Problem: Arbitrary composition of networks with independent address spaces

- 90% TCP/IP systems are NOT “on the Internet”
  - Most not even “connected to the Internet” (heavy filtering / application gateways)
- Many challenges with IPv6 addressing.
  - PD – complex multihoming e.g.: IPv6 (S,D) forwarding, SP change causes renumbering, undesirable long prefix/host-parts (compression, management)
  - PI – loss of aggregation, admin/cost of assignment/delegation, limited space for extensibility (128 – 64 – prefixlength)
  - ULA – not “generic” addresses  
Worse than RFC1918 ?!

## The IETF Protocol Iceberg

### The Internet

RFC8799: Limited Domain  
(internetworking)

Service Provider  
Enterprises, Federations,..  
Defense, Public safety,  
IoT / OT (operational technologies)  
Manufacturing, Energy,  
Oil&Gas, Transportation,...

Broad use of IETF ‘TCP/IP’ solutions:  
QoS, Multicast, MPLS, security,  
transport beyond TCP/UDP

*Access to Internet only in parts  
often also highly undesirable*

# The Smart Manufacturing “Network of Networks”

Internet

Component/  
OEM Networks  
*Just in time order*

Customer /  
Networks  
*Predict maint*

Regulator/  
Security  
Networks  
*Police / fire / ..*

Cloud Data-Center  
/Compute/ Store  
Networks (public)

Industry federation network

Manufacturer Global Network

Manufacturing Plant Network(s)

Assembly Line Network 1  
Sensors, motors/actors, cameras, PLC

Assembly Line Network N  
Sensors, motors/actors, cameras, PLC

Worker Network  
Phone, Safety Sensors, Camera  
RFID scanner, Task Actors, ...

Mobile Robot  
Networks

Cameras

Robots

Process  
Control

Logistics  
Mgmt

Inventory  
Mgmt

Envir.  
Control

Electrical  
Control

Security  
Mgmt

IT / OT interconnect network (LAN, Metro, WAN)

IT / Office  
Networks

Store / POS  
Networks

Data-Center /Compute/Store  
Networks (private)

Inspiration and challenge:  
Generic addressing, network composition via NAT

Global scope IPv4/Pv6 addresses should not be “burned in”. You don’t own them. You just lease them.

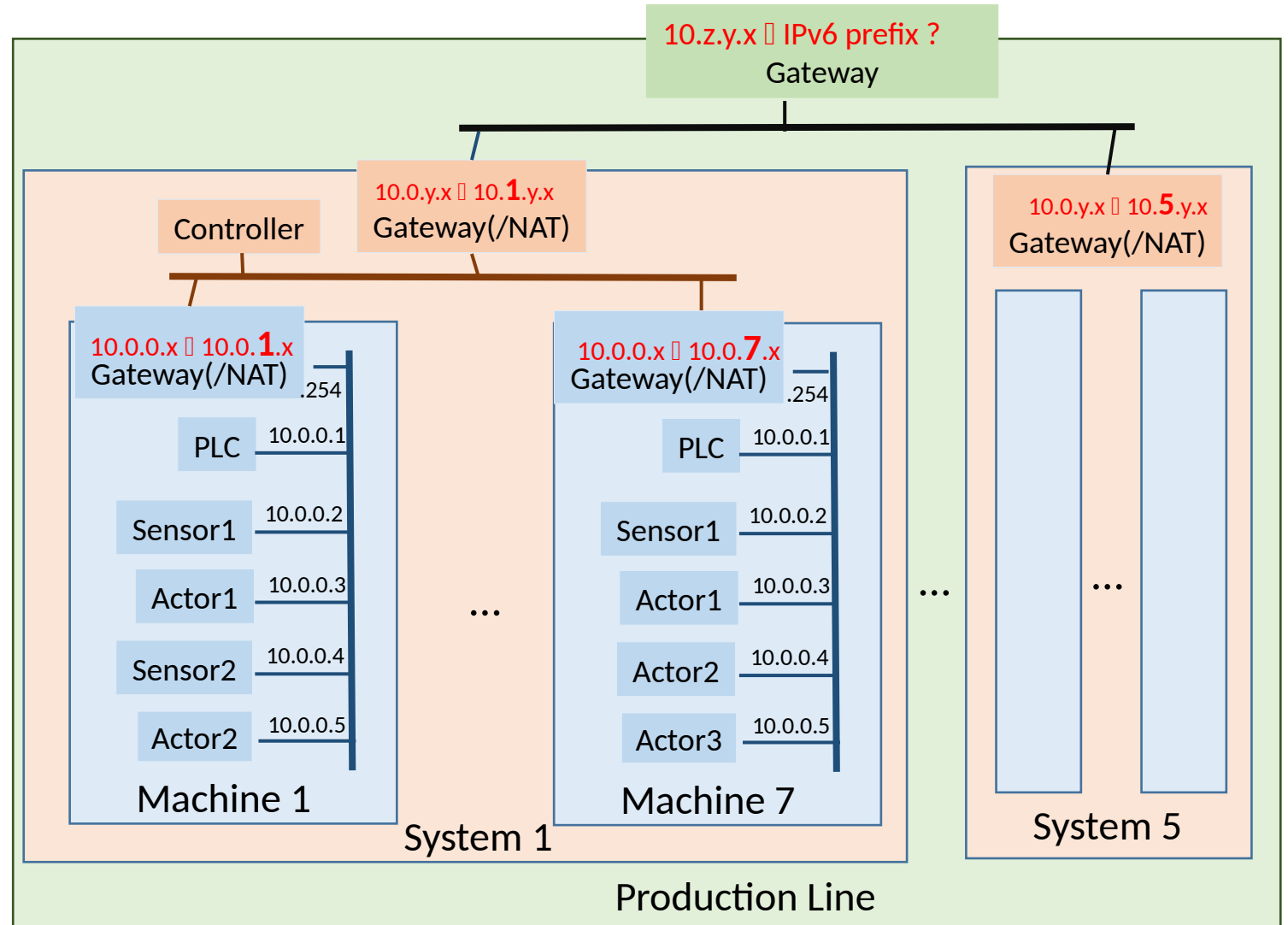
RFC1918 allows to manufacture equipment with “generic” addresses. Addresses you own forever. But must use NAT to interconnect.

Two tiers of composition can very easily be done with two tiers of stateless static NAT.

IPv6 worse ?! ULA (IPv6) not equivalent to RFC1918. Supposedly no NAT.

Stochastical prefix collision. Still have only 16 bit “Subnet ID” to play with, same as Net 10.

Not just industrial issue.



# What's next ?

- Pitch: If these problems look interesting, please check out solution proposal
  - Presented later in the week in INTAREA and RTGWG
- Forget future solutions:  
Is addressing for IoT networks/deployments something we could/should look more into in iotops ?
  - Issues with owning addresses, being able to burn them into equipment as vendor
  - Issues of managing address space
  - Issues connecting multiple address spaces / NAT (especially for IPv6)
    - Do not think IPv6 with NA was a topic for BEHAVE WG (NAT WG).
- Addressing challenges/requirements for IoT networks docs ?
- Very happy to discuss any issues encountered to brainstorm if/what we could do in IETF about it.

The End