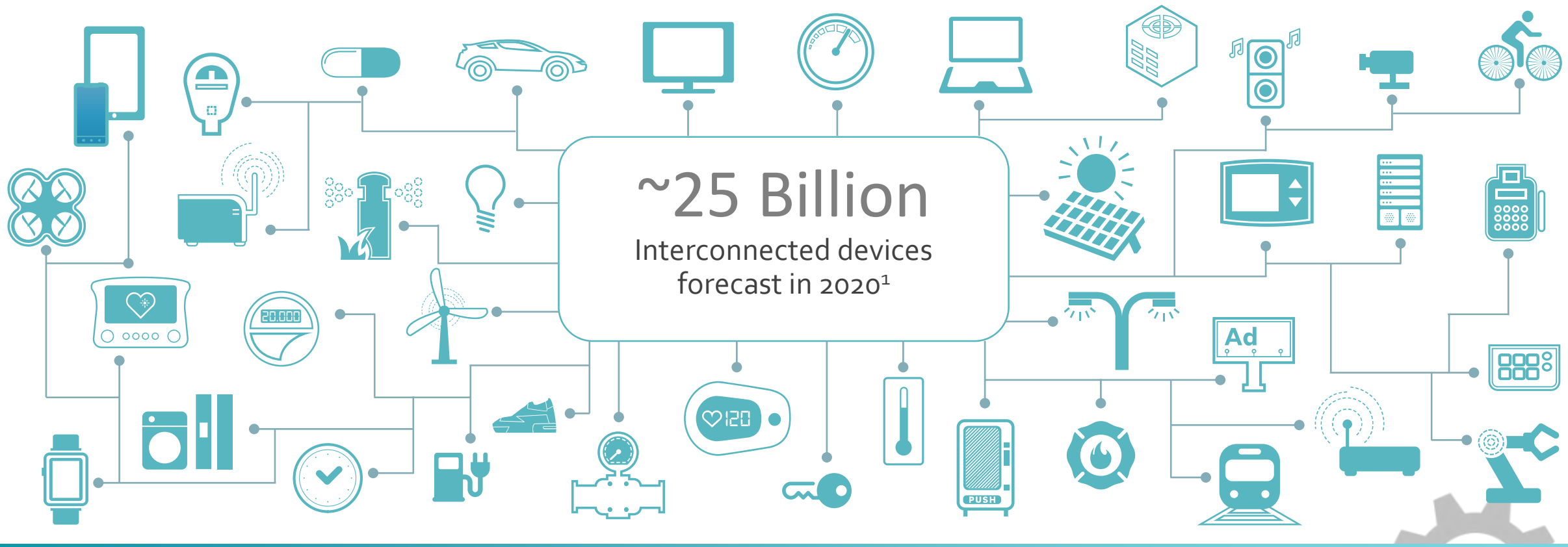
oneM2M Overview and Positioning

Dr. Josef J. Blanz, 2018-02-08

M2M/IoT: Surge of connected things



Transforming industries with innovative services and useful information

Connected Home | Automotive | Smart Cities | Retail | Education | Healthcare | Industrial

1 Source: Machina Research, February, 2014

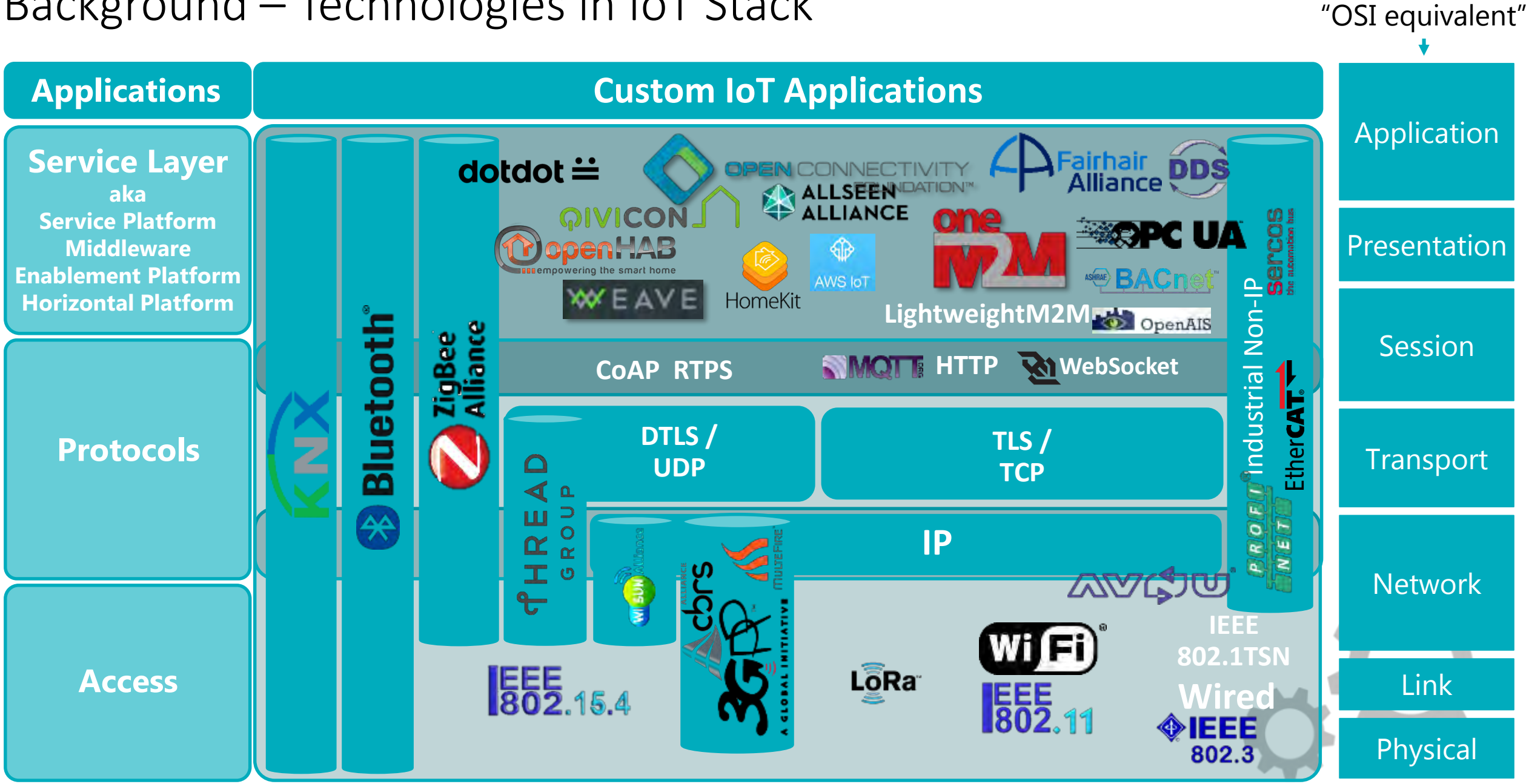
Jungle of Consortia, Standards, OS-Projects

Which groups actually specify technology, which are just doing marketing & promotion?

Which technologies are used / will be used in M2M/IIoT?

Which technologies are overlapping or complementing each other?

Background – Technologies in IoT Stack



Notion of “Proximal” versus “Distal” IoT

Technologies designed with different paradigms in mind ⇔ Synergetic

Technologies with “proximal” scope

- Single private network/subnet = proximal network (e.g. smart home)
- Simplify connecting “things” in reach: Monitor, control, automate, no hierarchy
- Enablers: Discovery, Advertisement, Introspection, On-Boarding
- Needs multi-cast techniques
- A “user” is still in the center of this “proximal” paradigm

Examples

- Consumer: OCF, IoTivity, dotot, KNX;
- Industrial OPC-UA, DDS, Profinet, Sercos

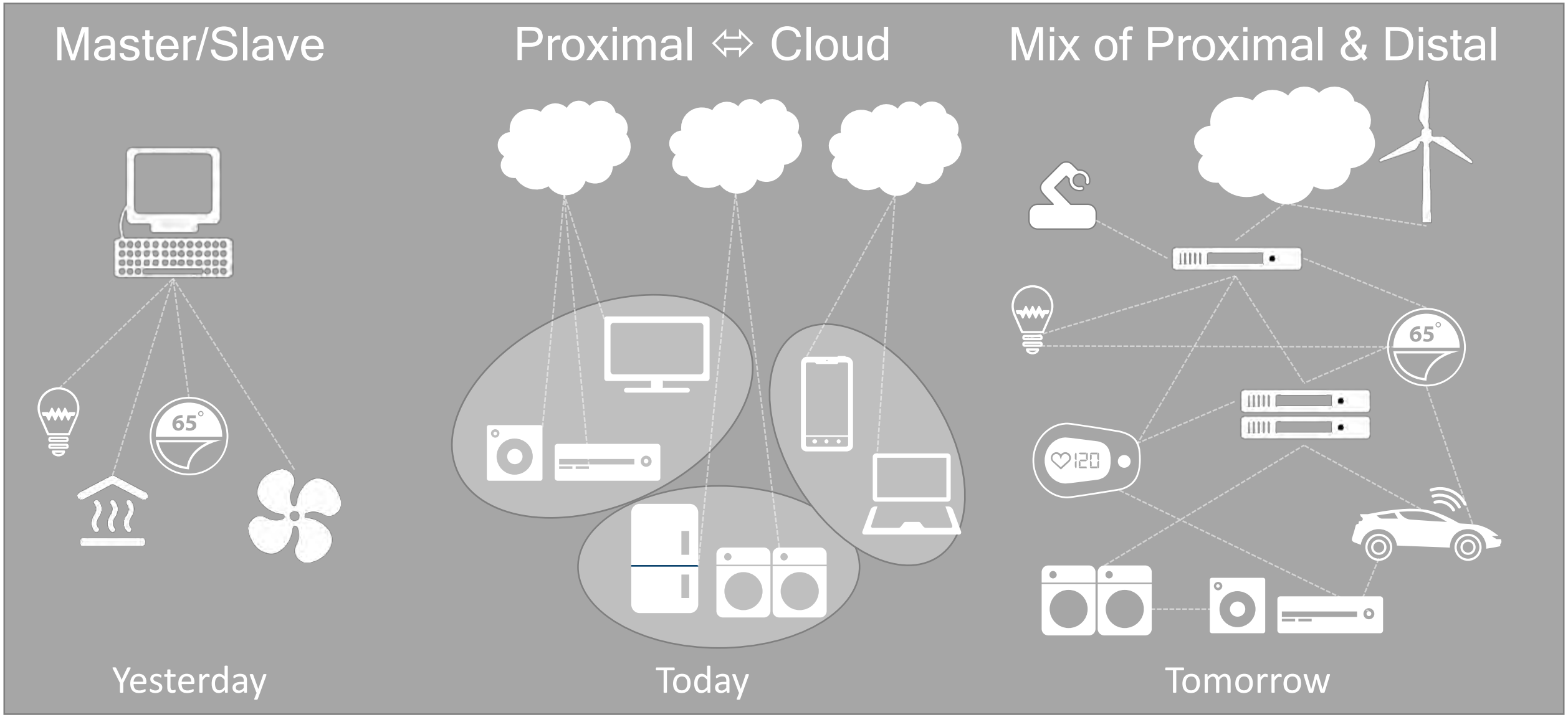
Technologies with “distal” scope

- Large scale deployments of devices in an overlay network
- Hide complexity of network usage / management / access control / sharing
- Storing & sharing of distributed data
- Enablers: Security, access control, selective communications, models
- Agnostic to underlying NW technology
- Utilize optimizations for M2M / IoT, better efficiency in WWAN usage

Examples

- oneM2M, 3GPP MTC, proprietary platforms

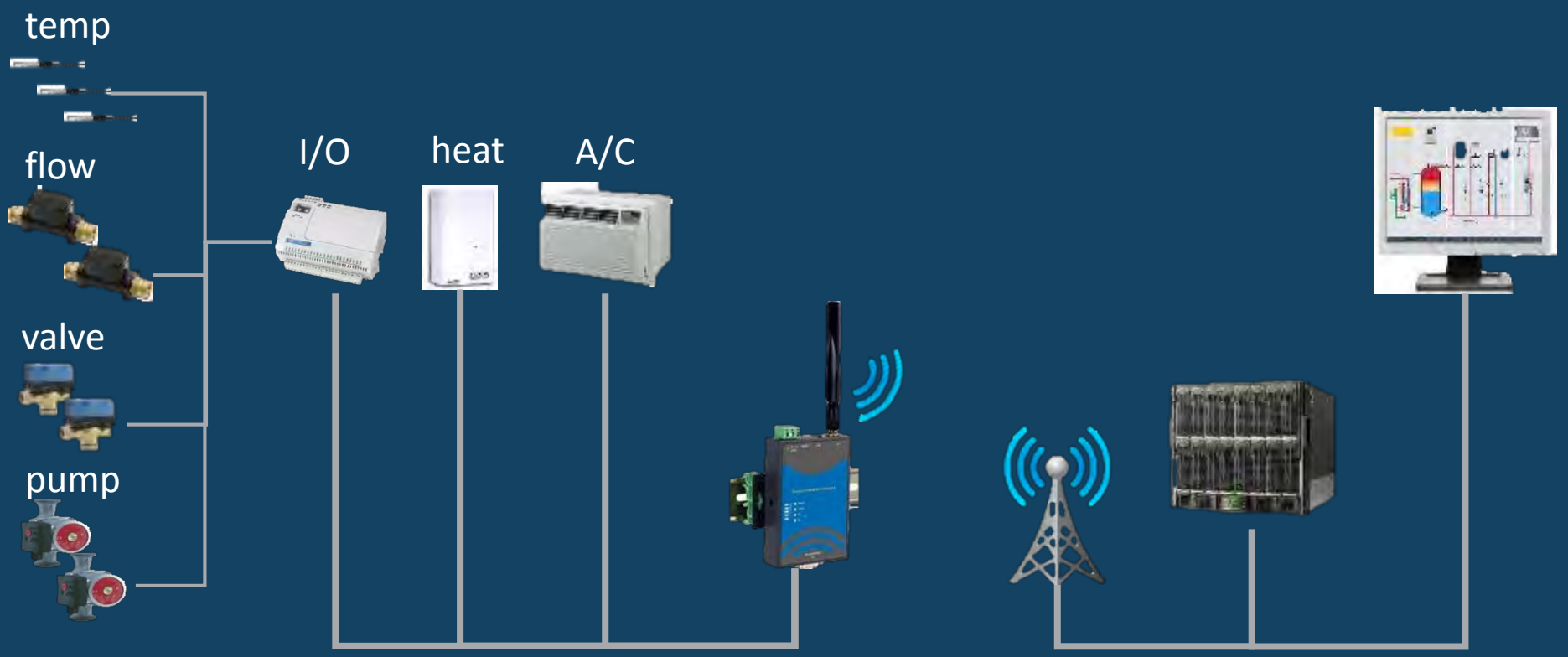
Trend in Evolution of M2M to IoT



M2M Service Layer

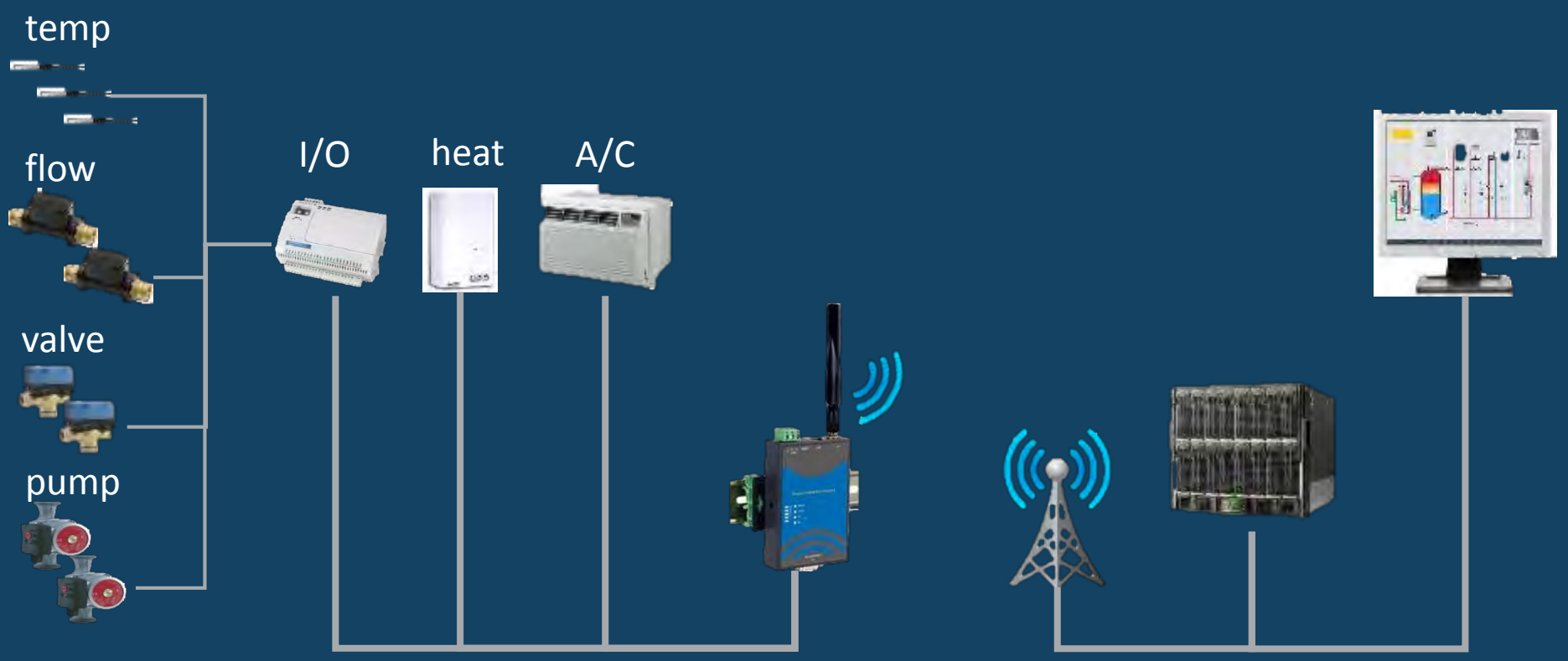
Horizontal Middleware Platform

Example



HVAC (Heating, Ventilation, Air Conditioning)

Example



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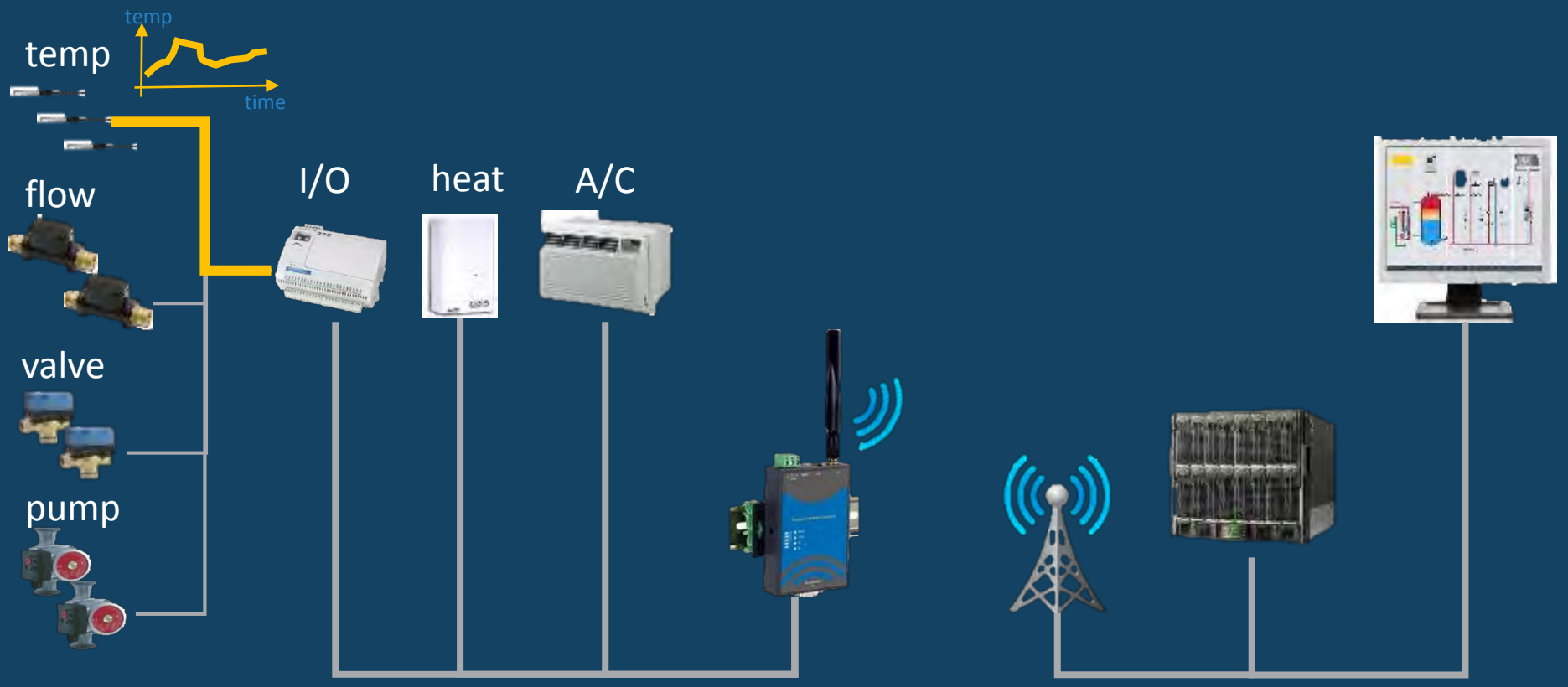

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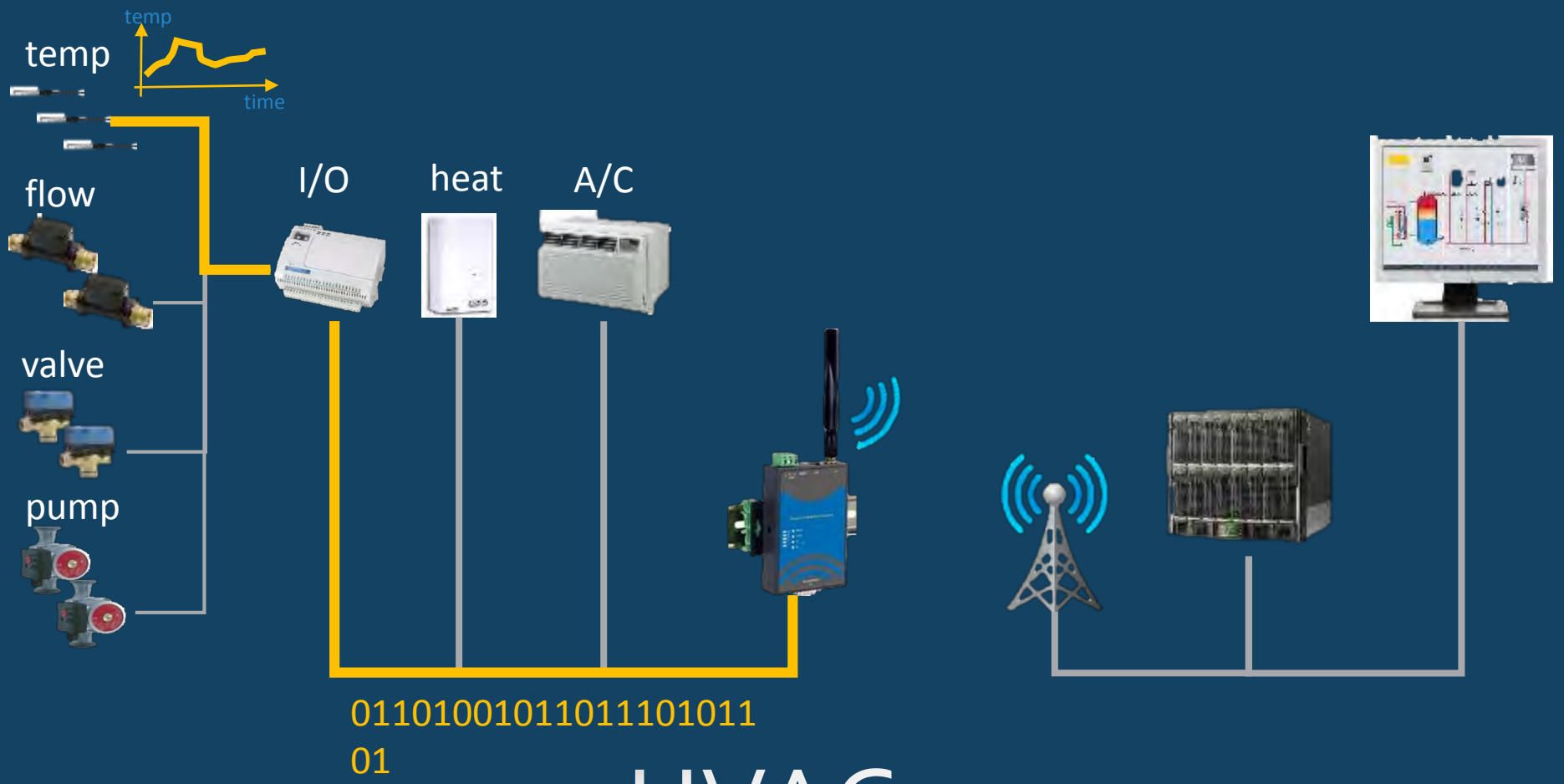
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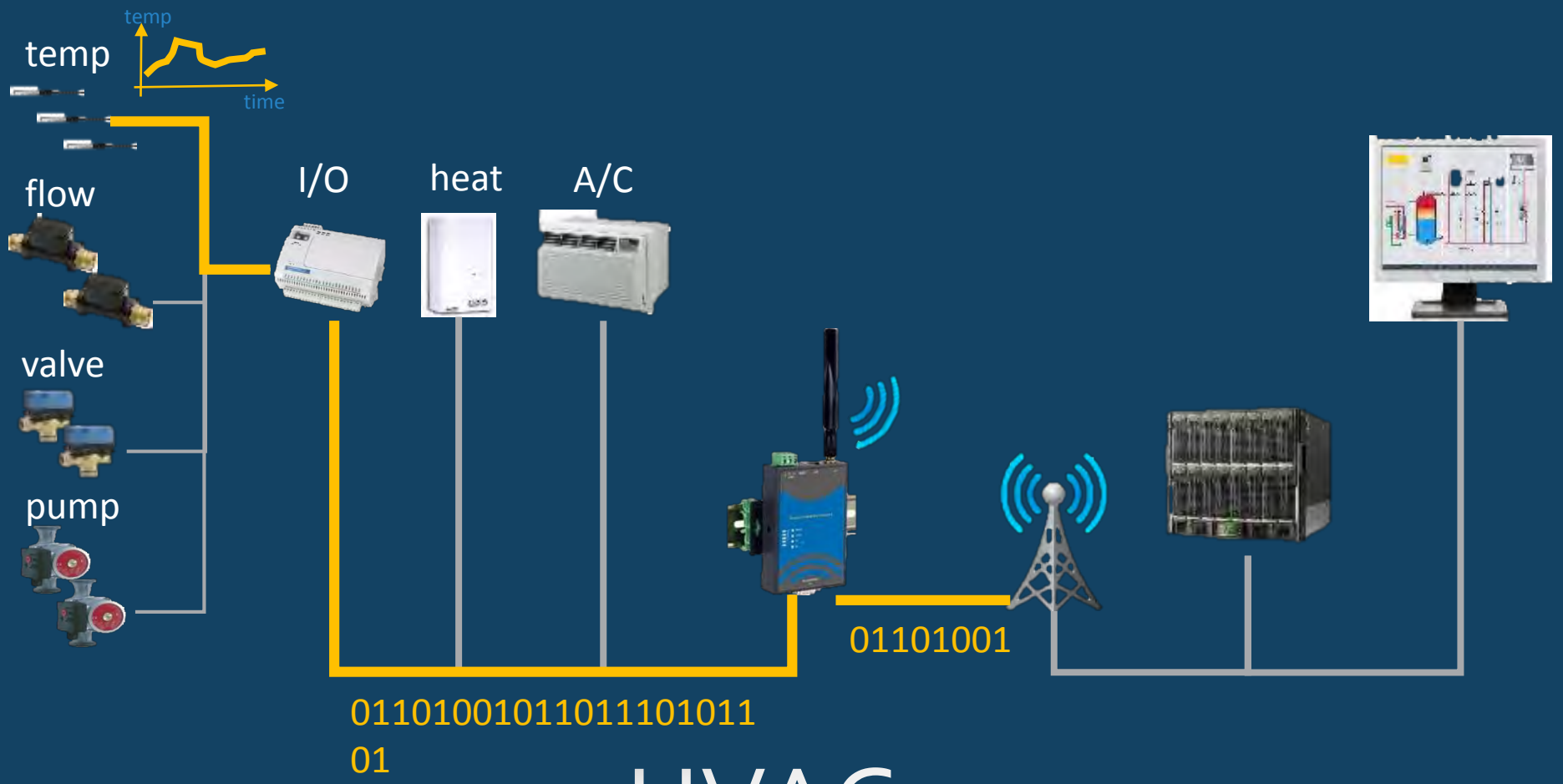

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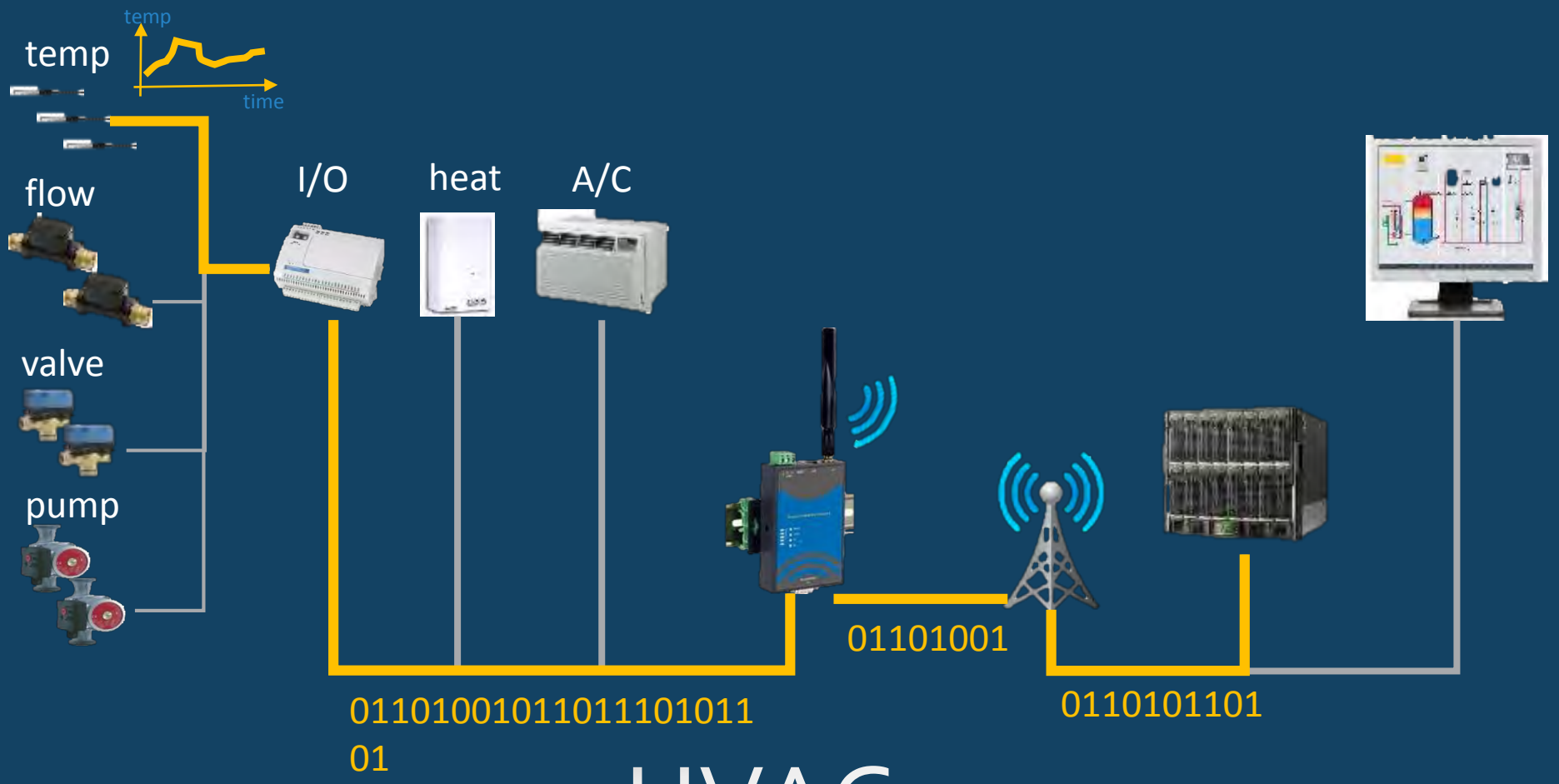
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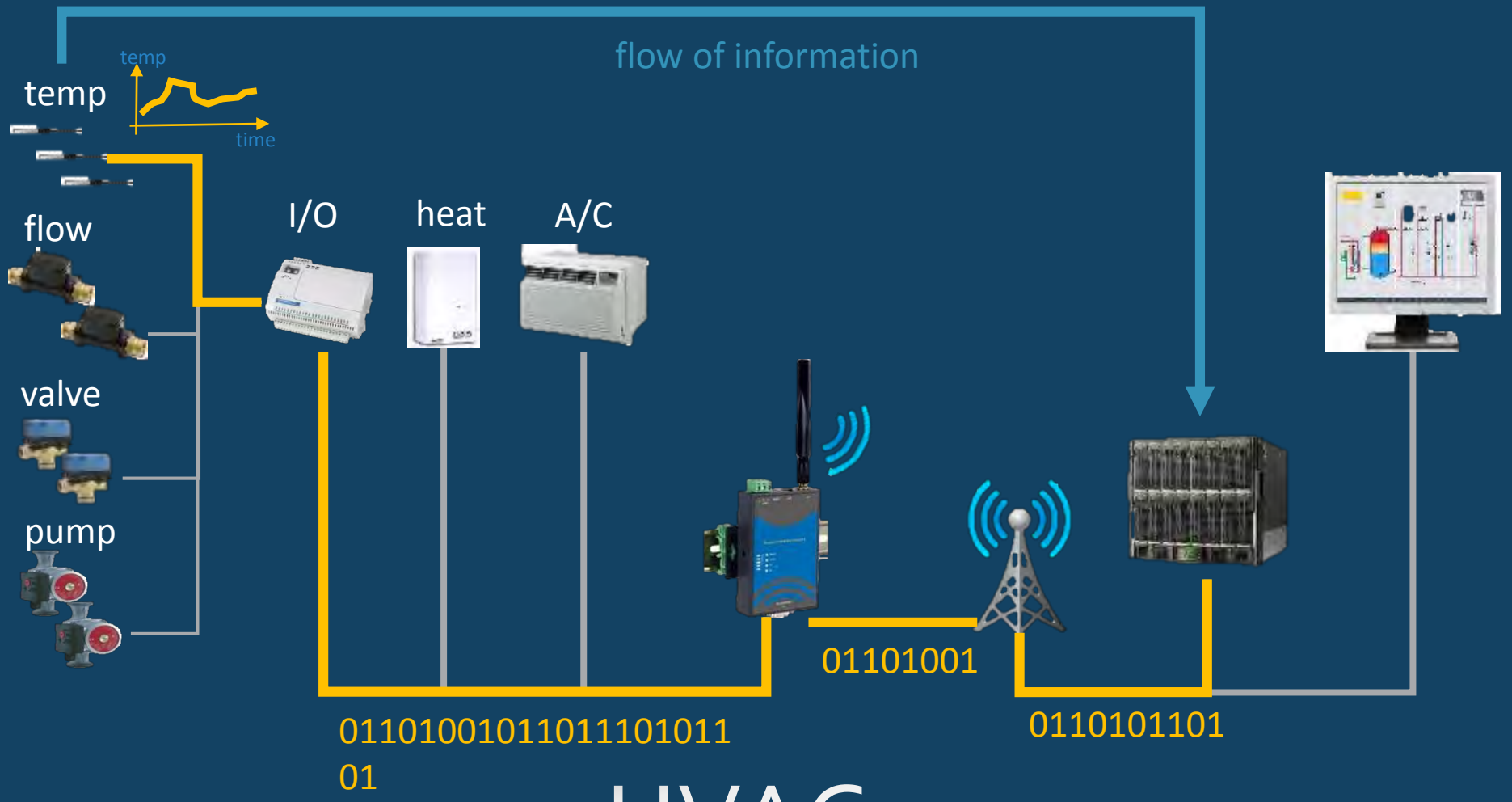
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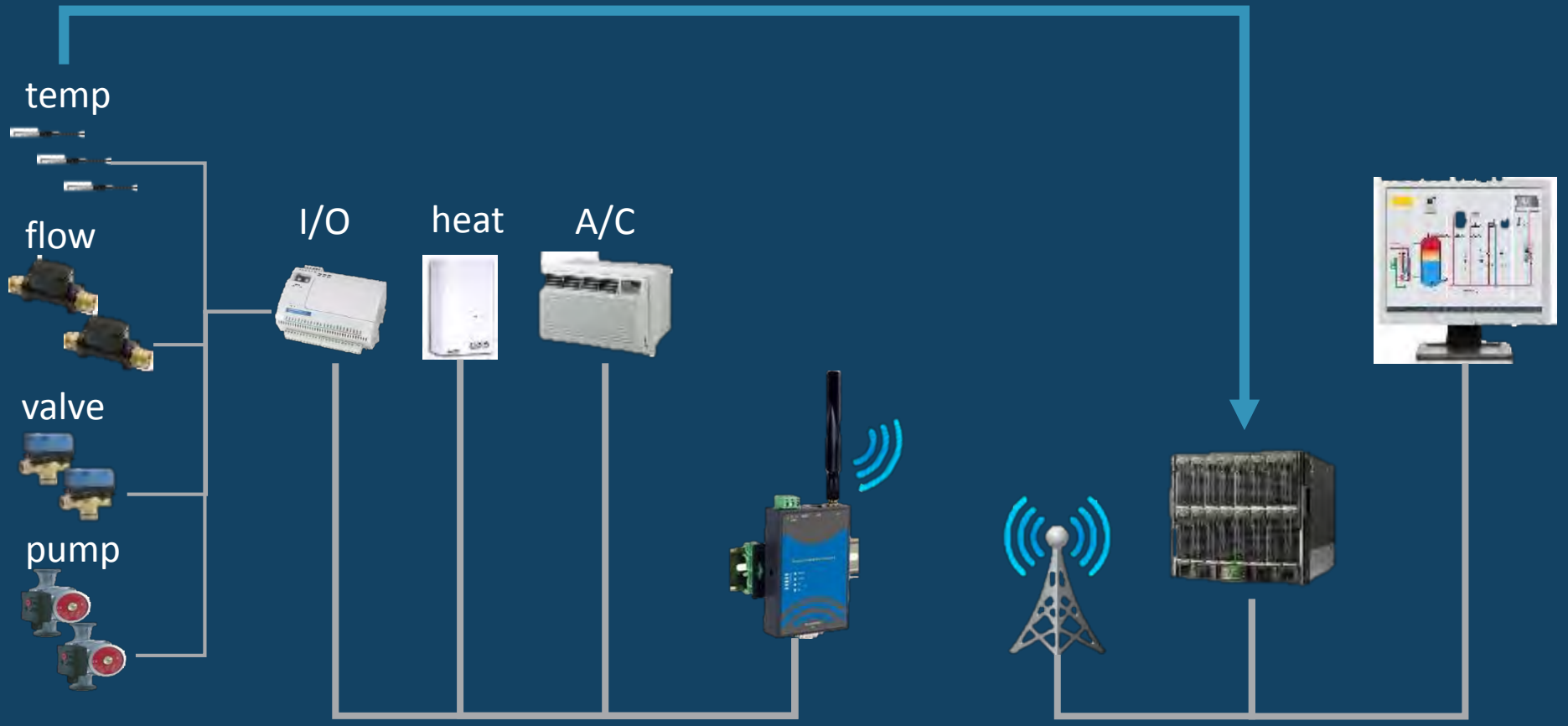

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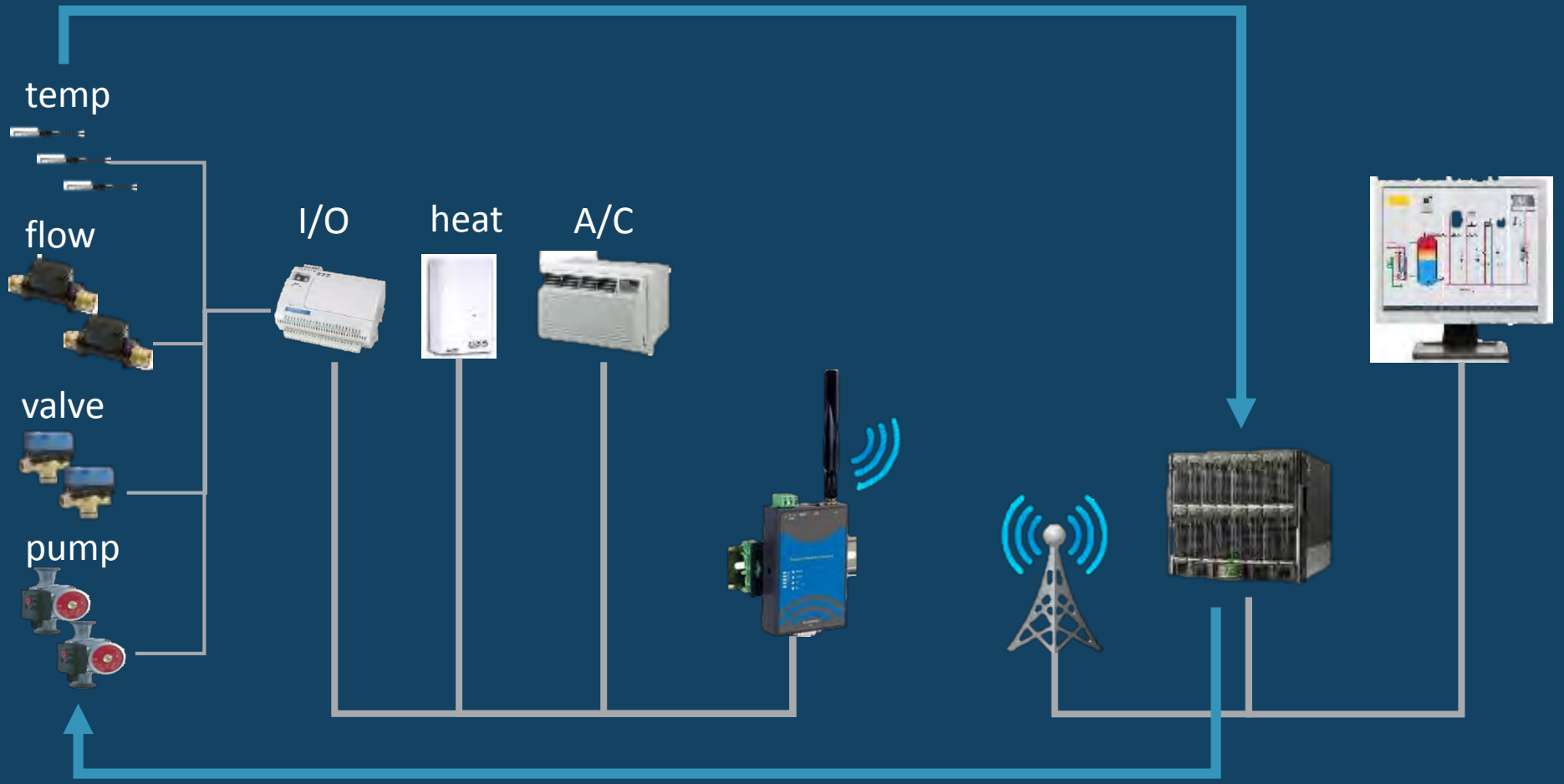

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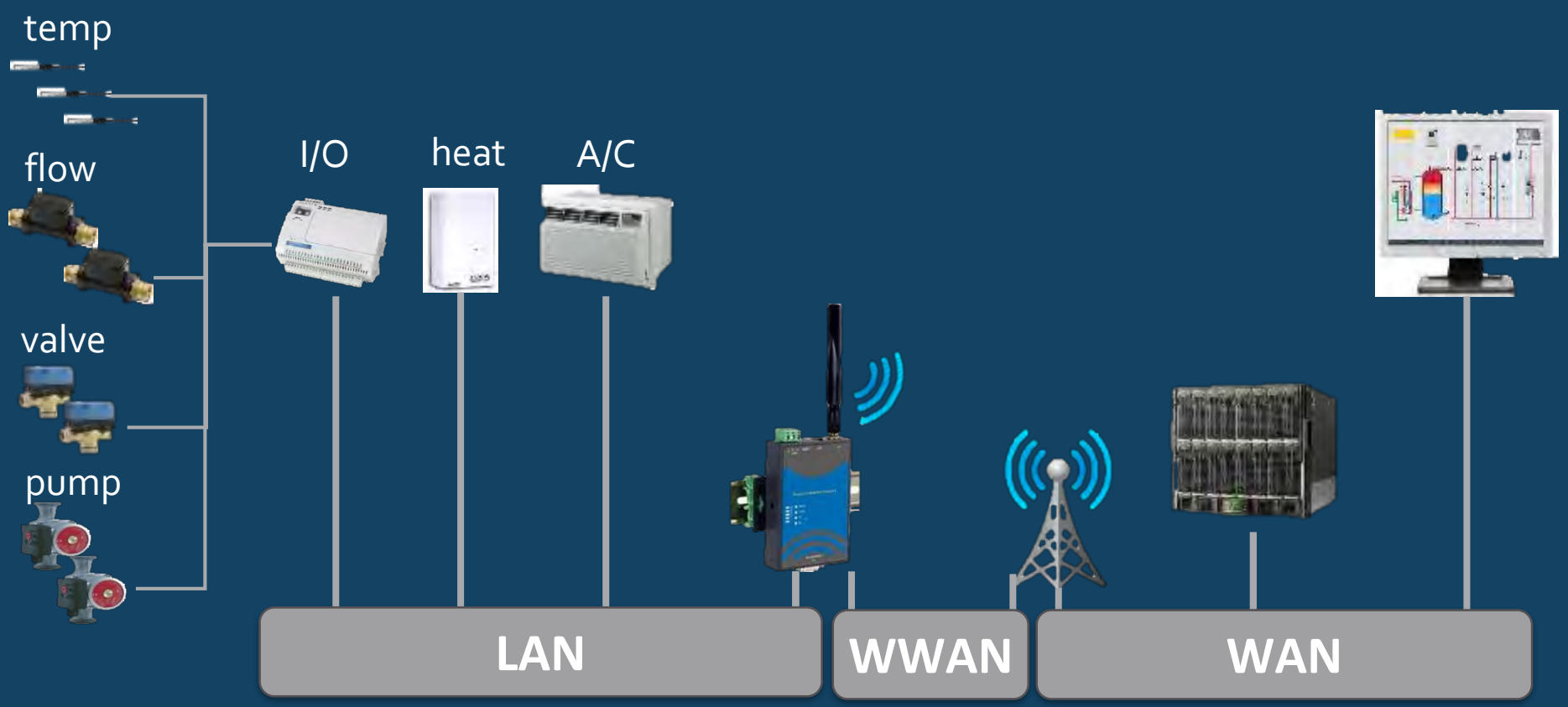

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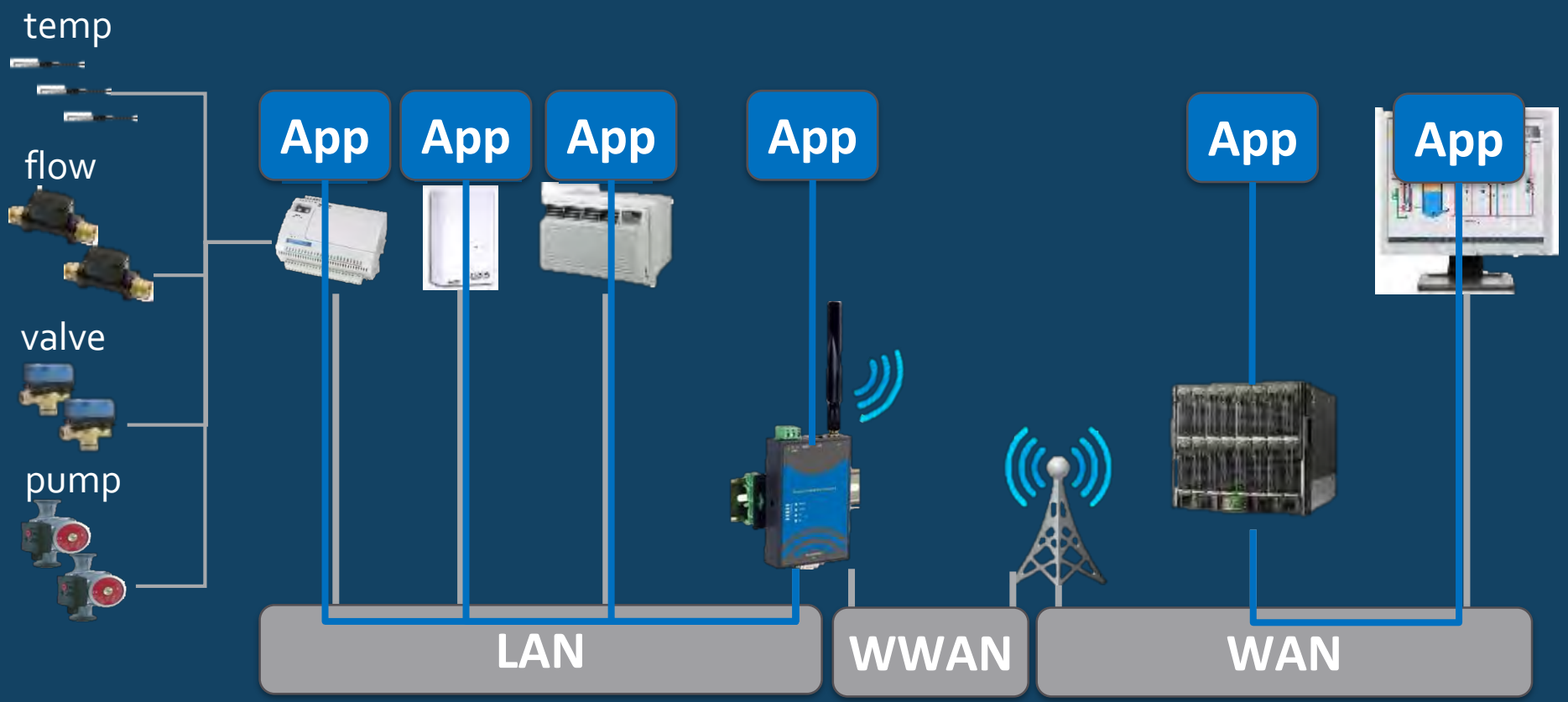

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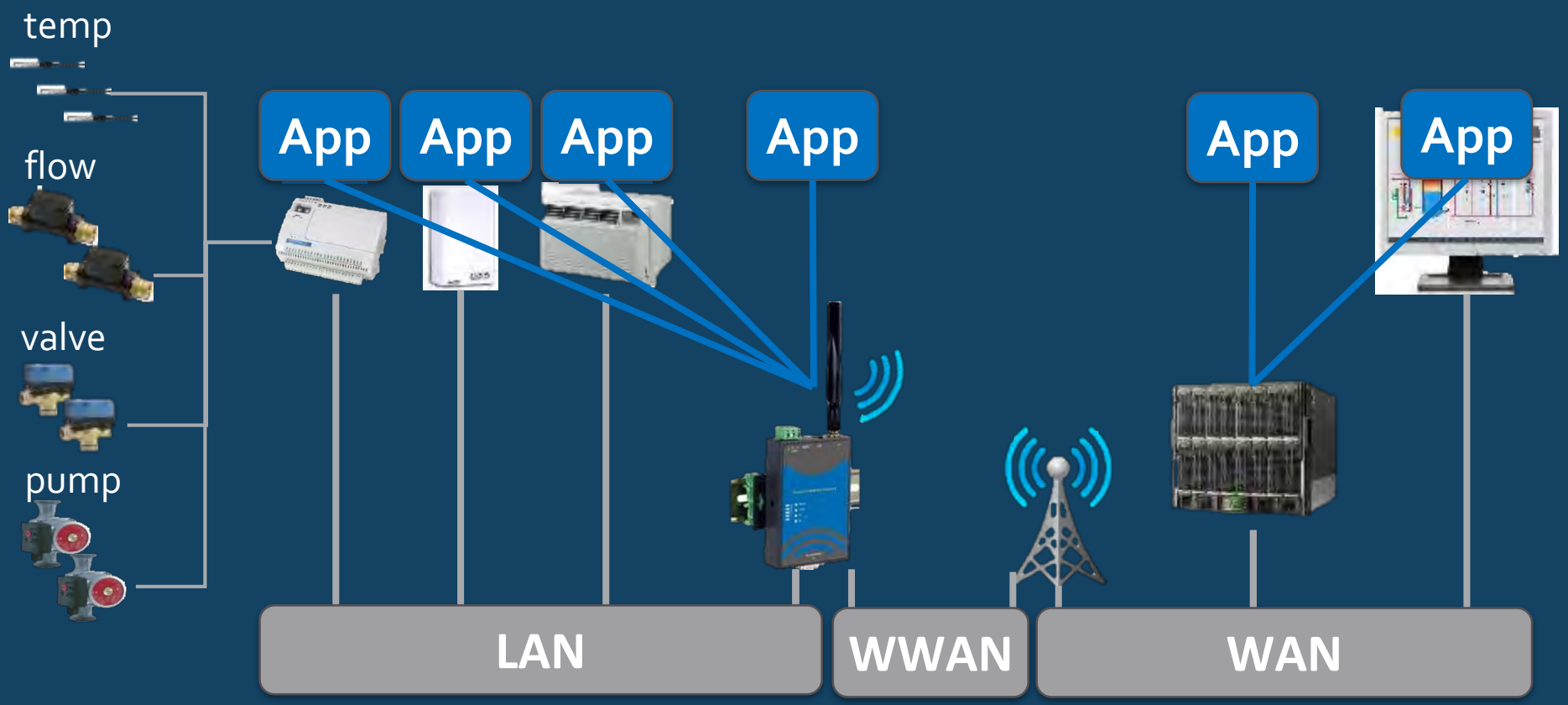

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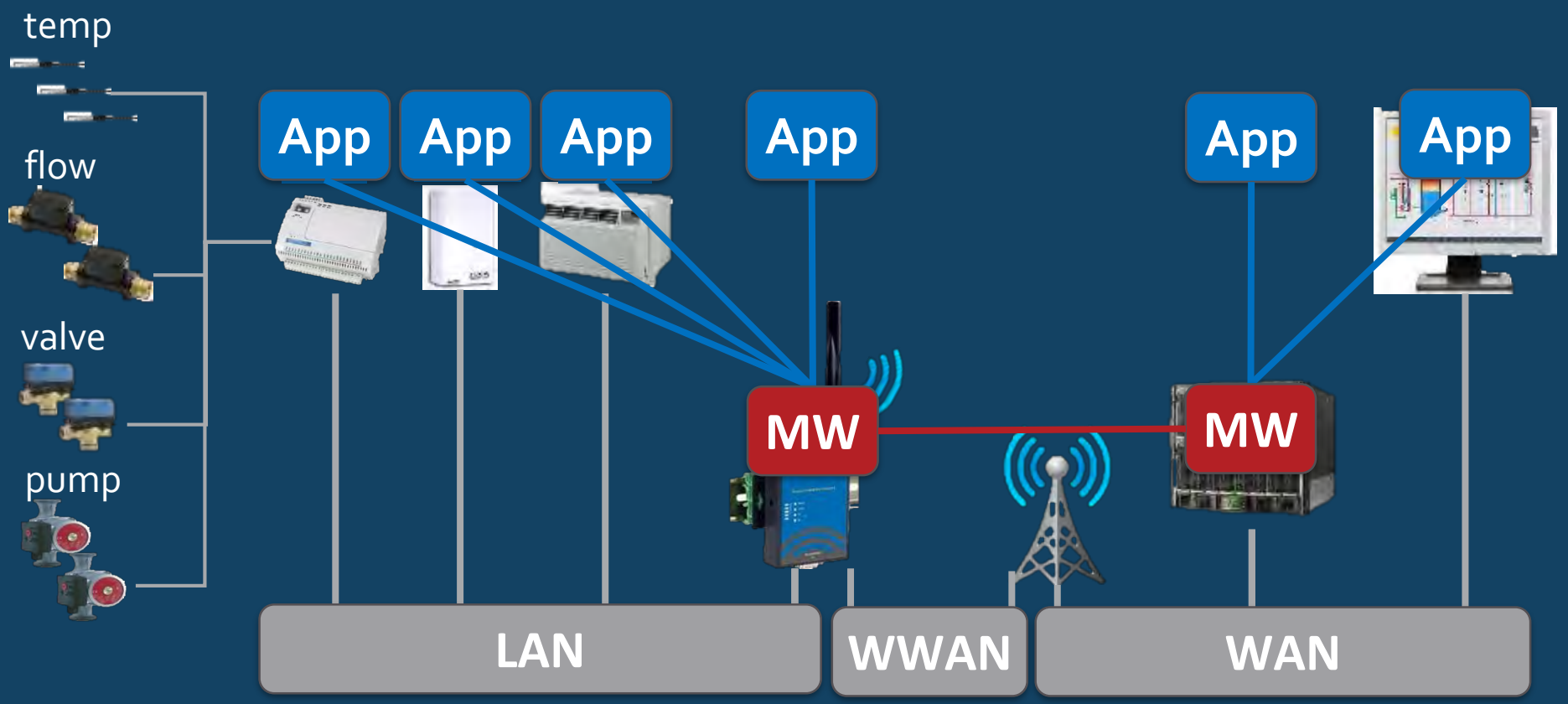

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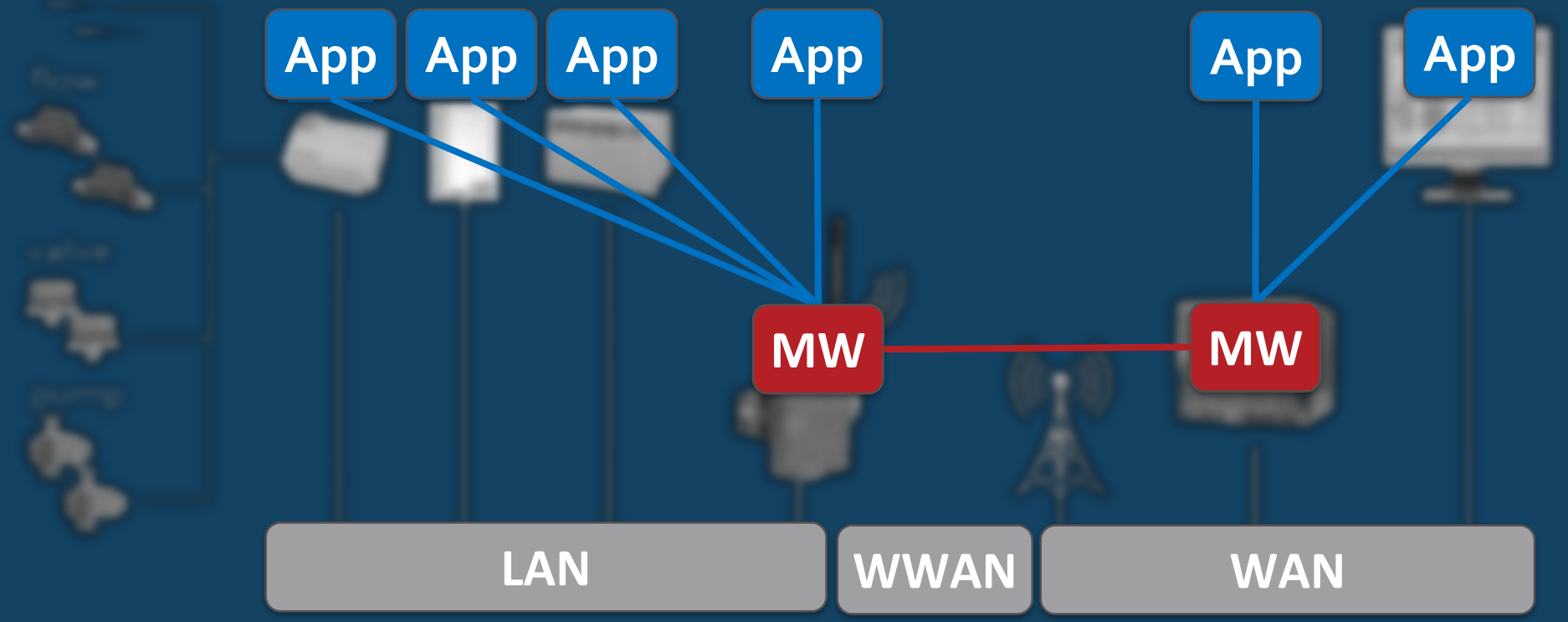

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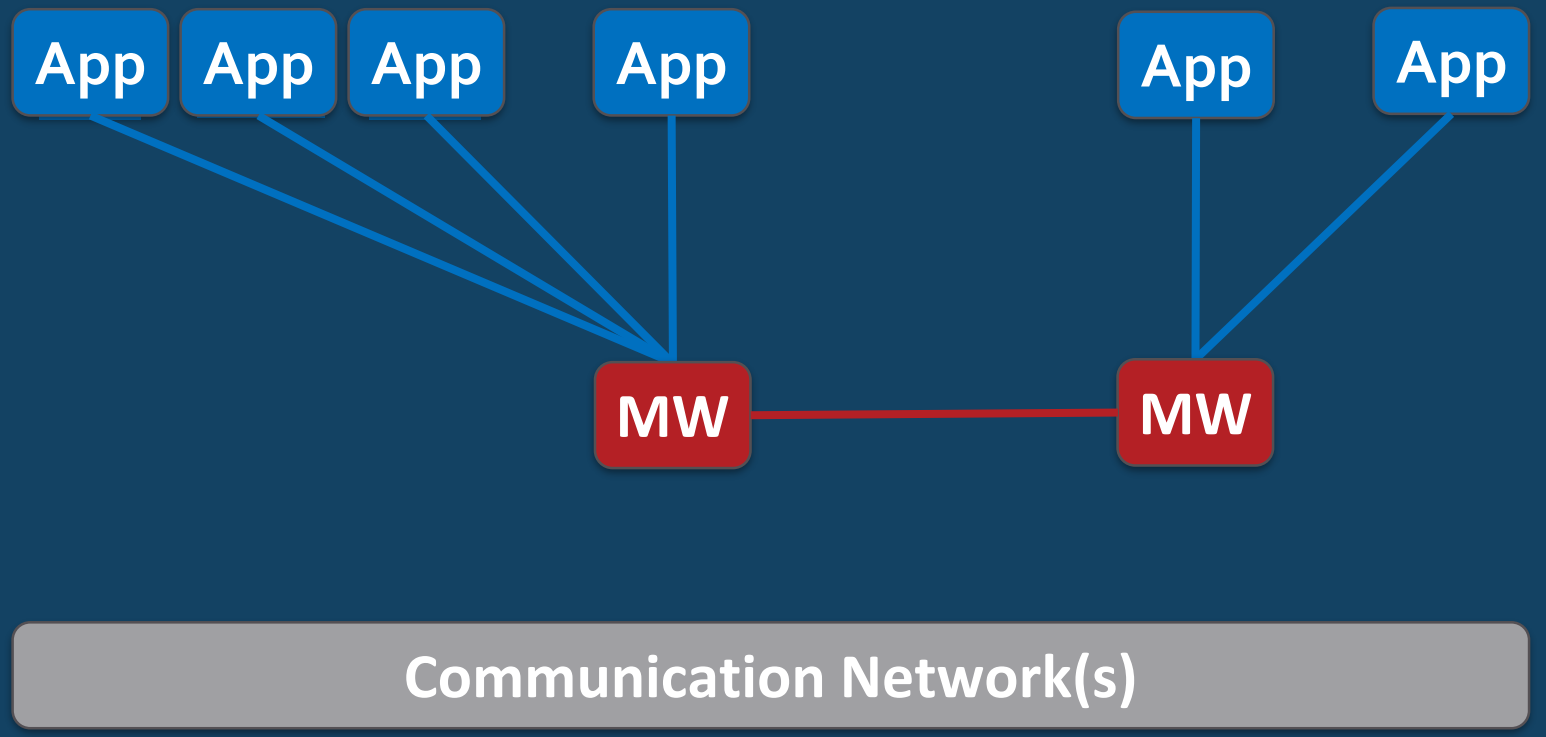
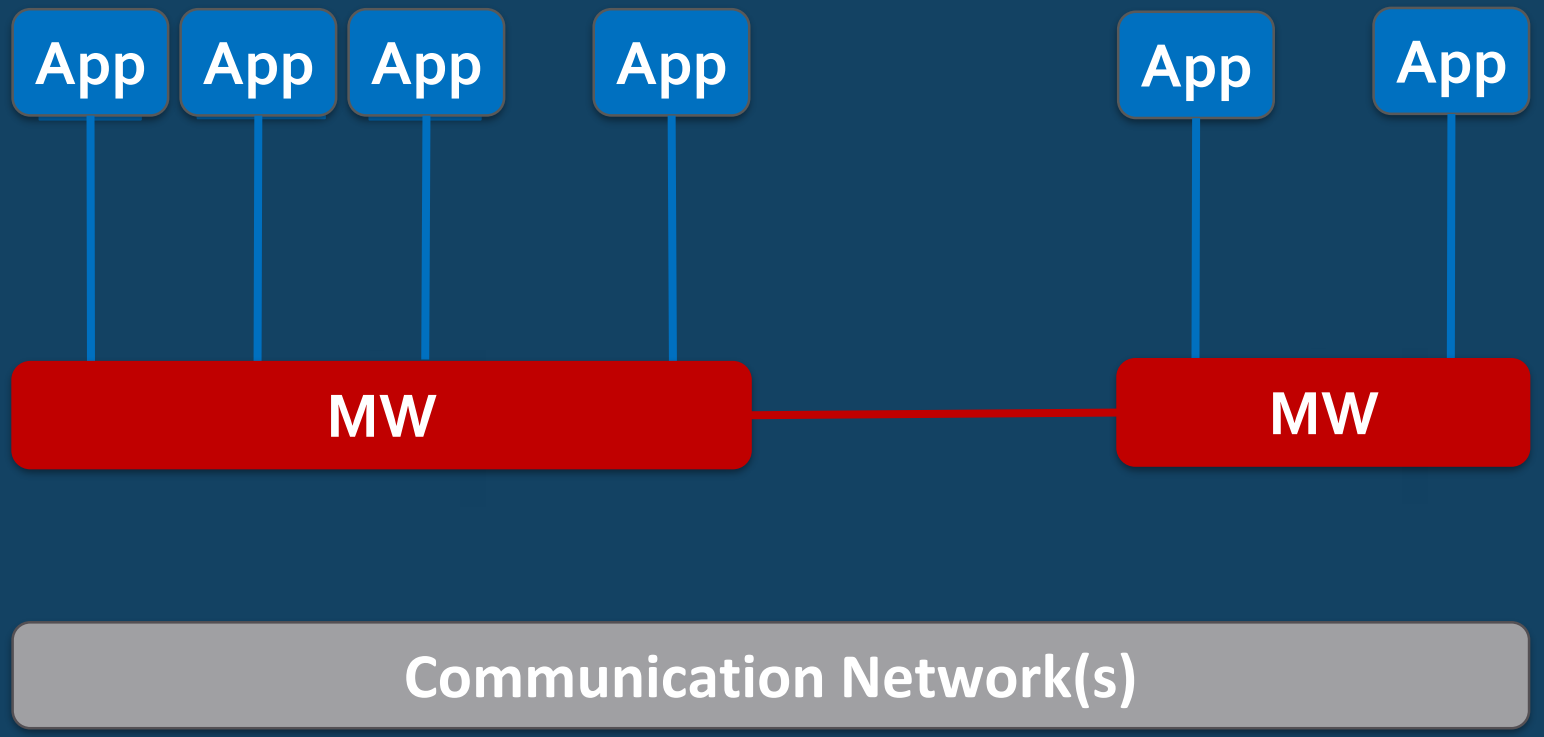


HVAC

Functional Architecture



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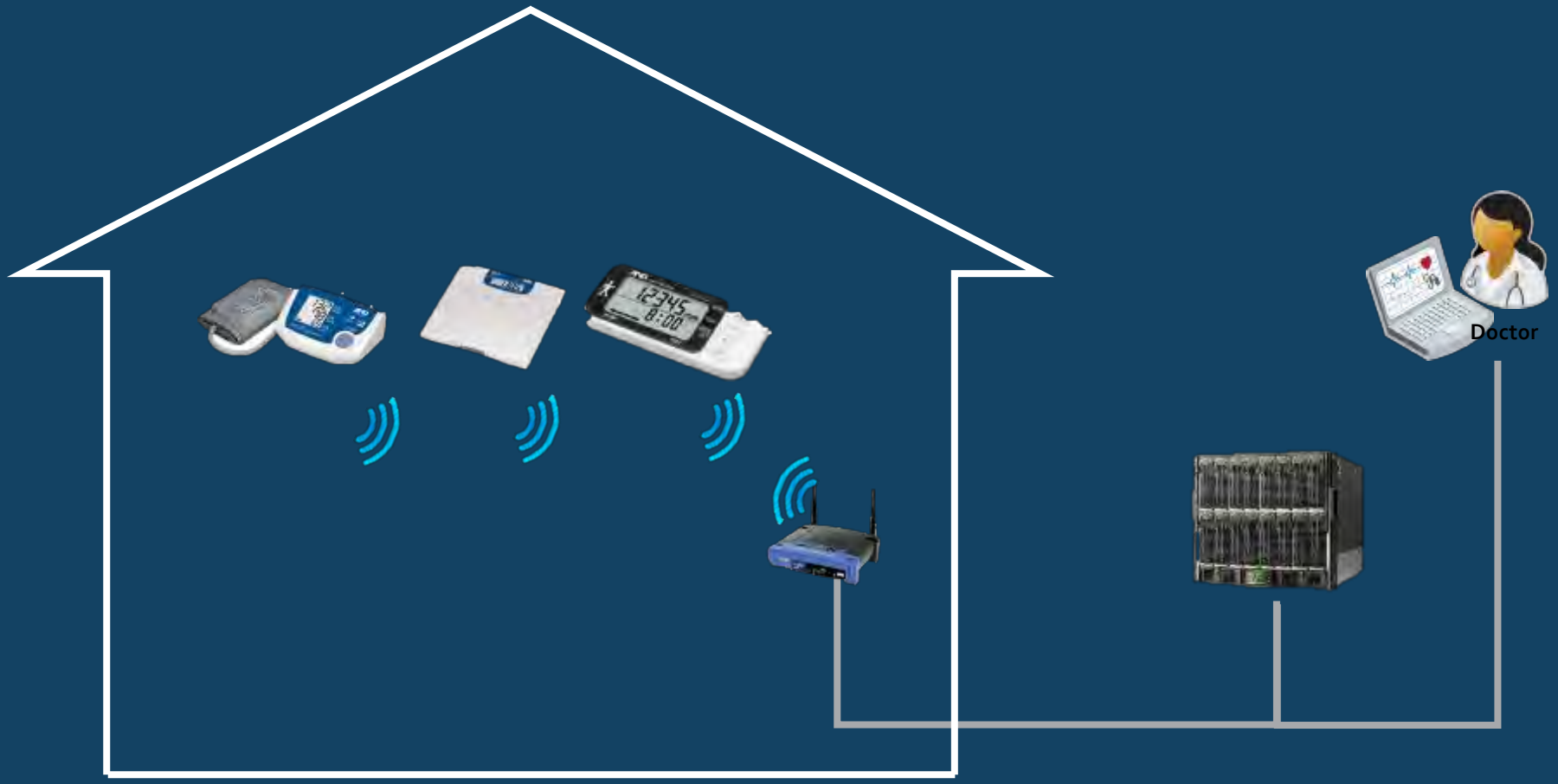

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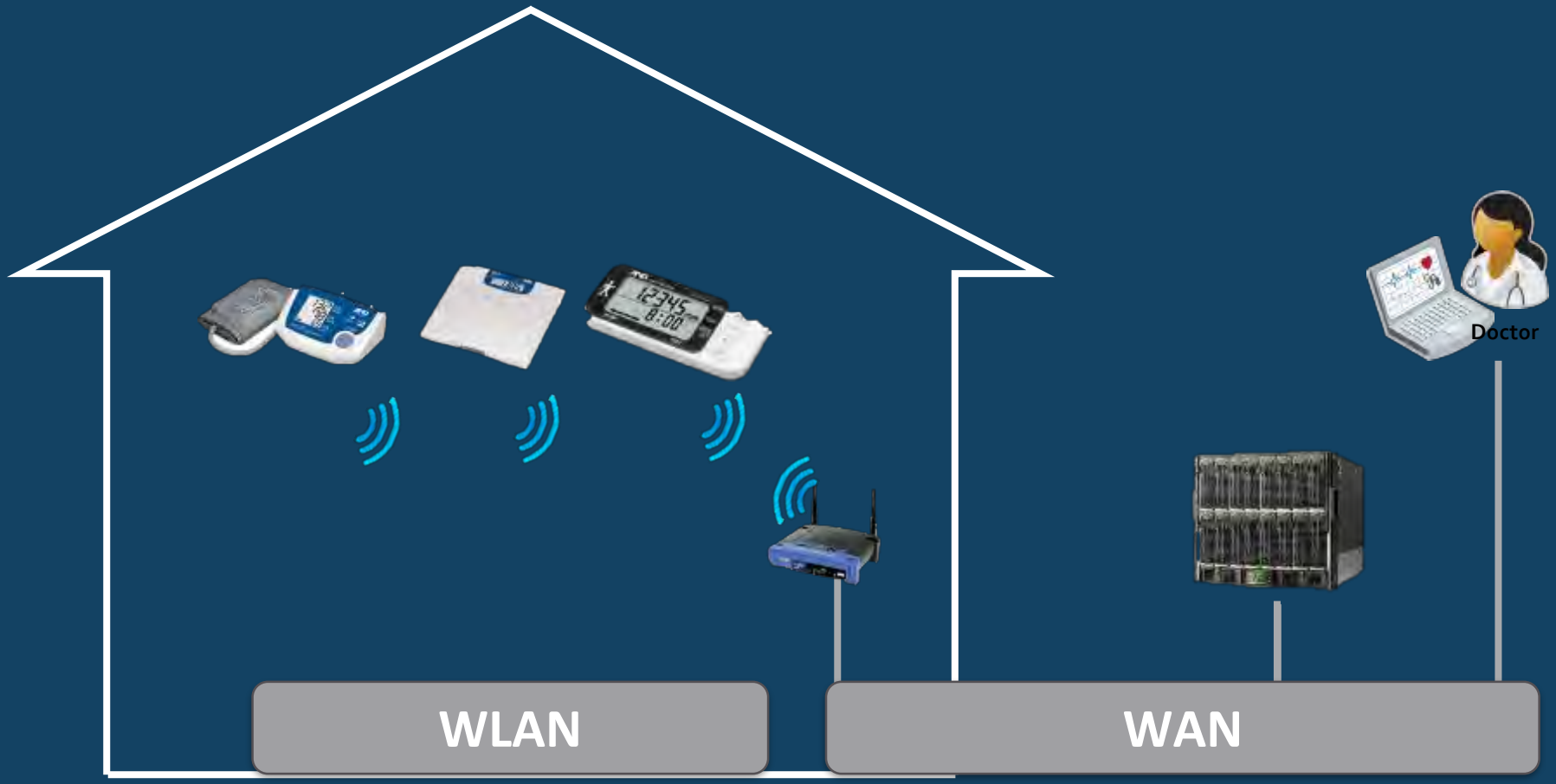

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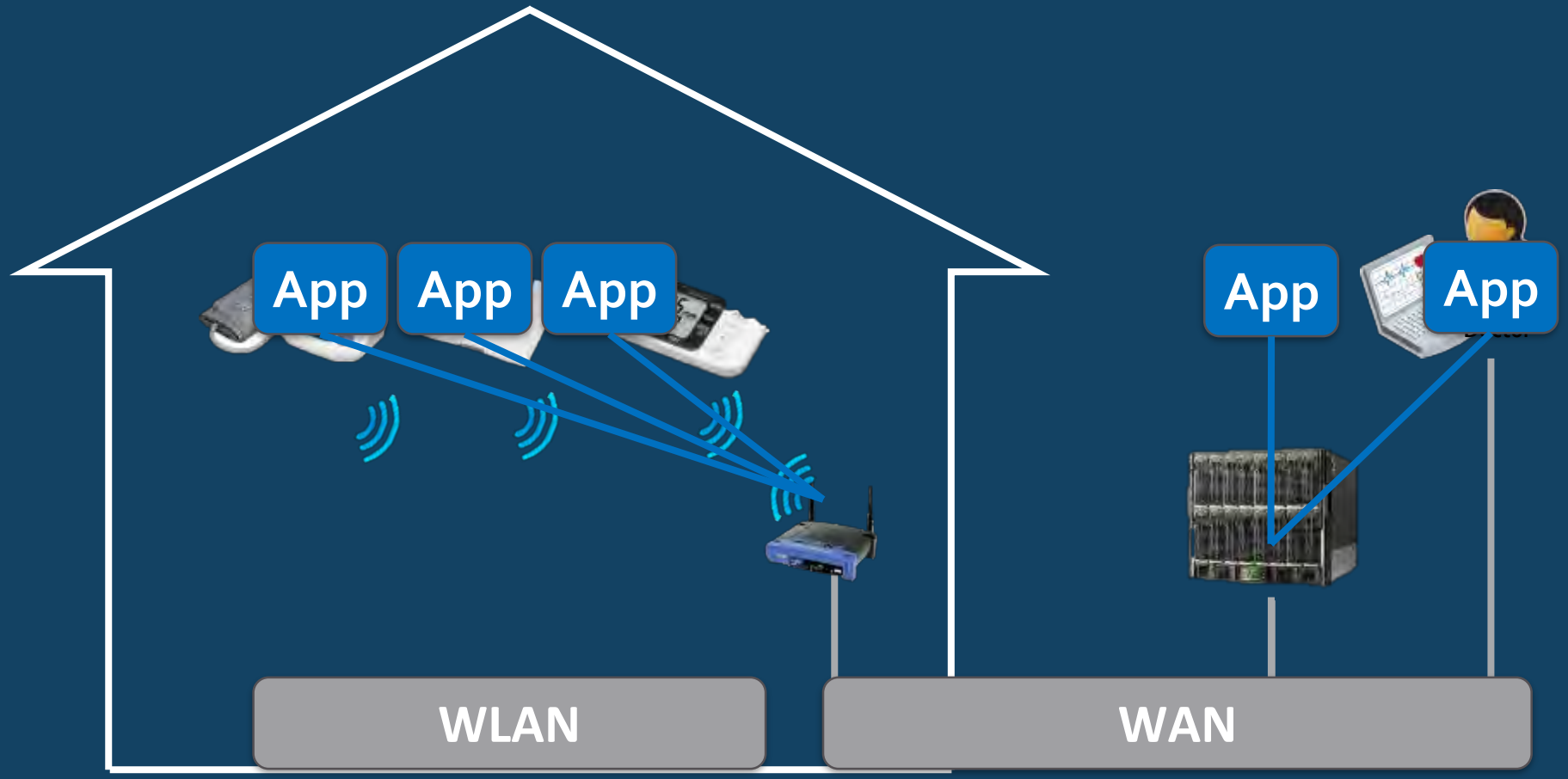

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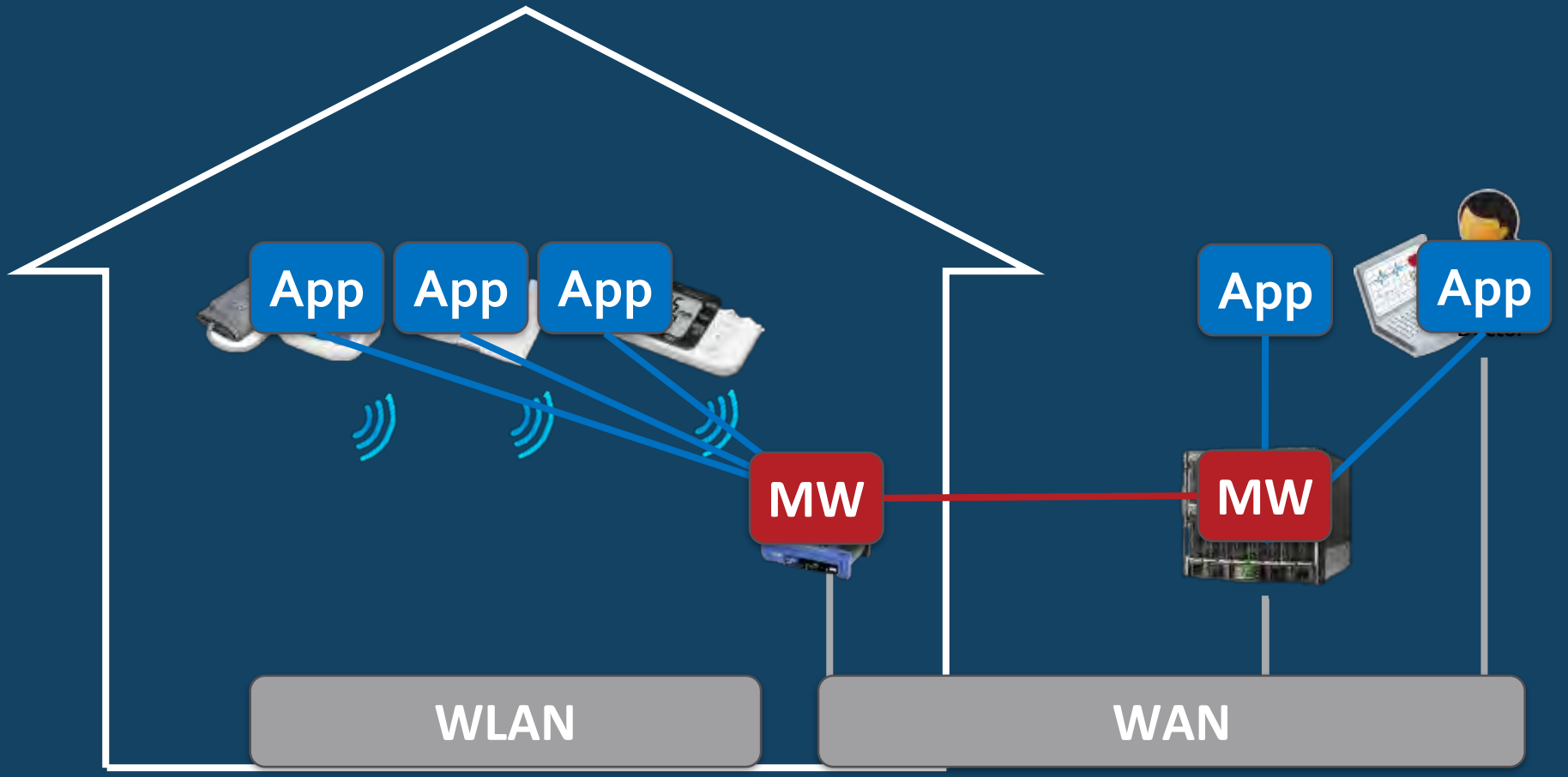

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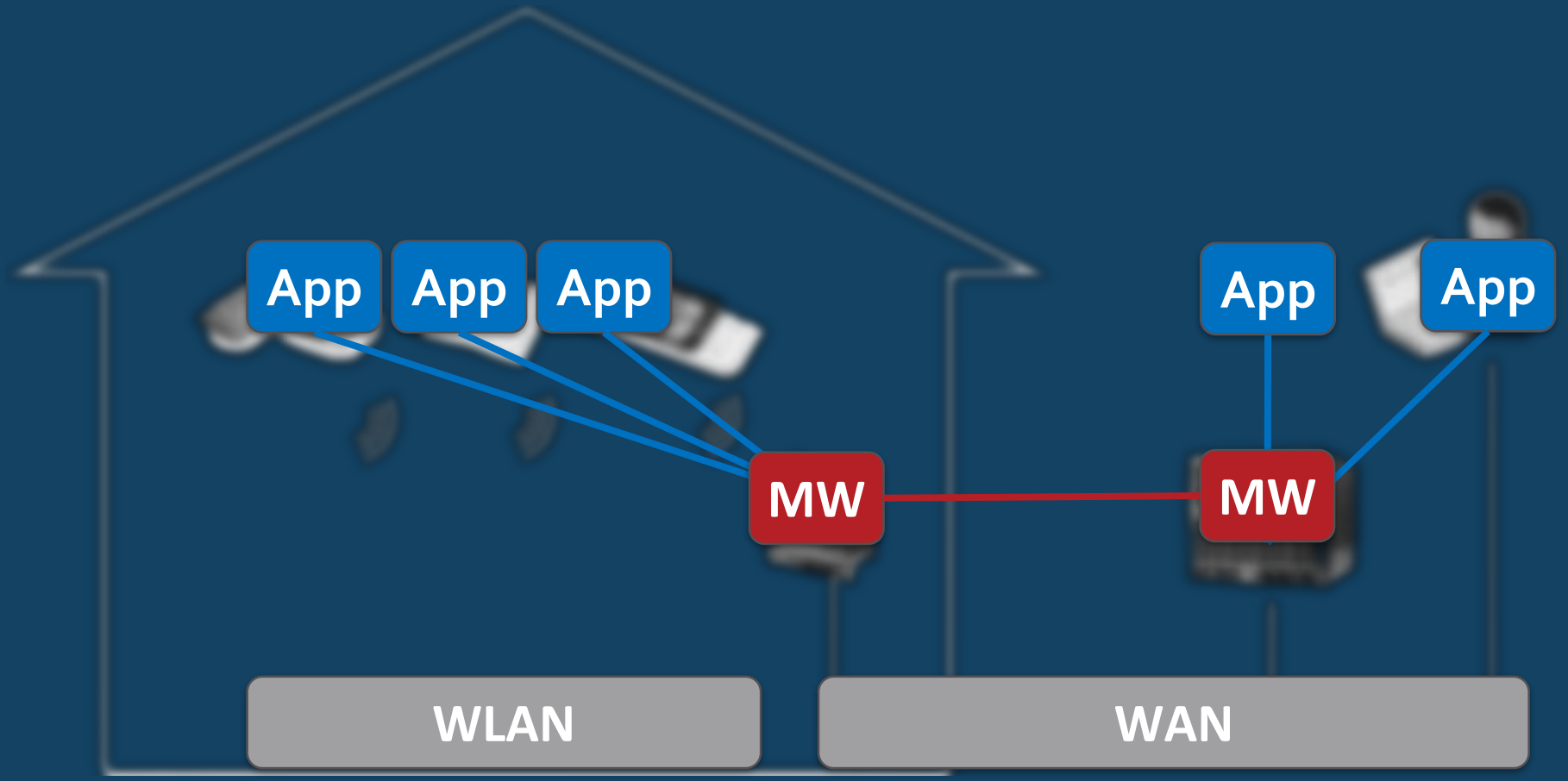

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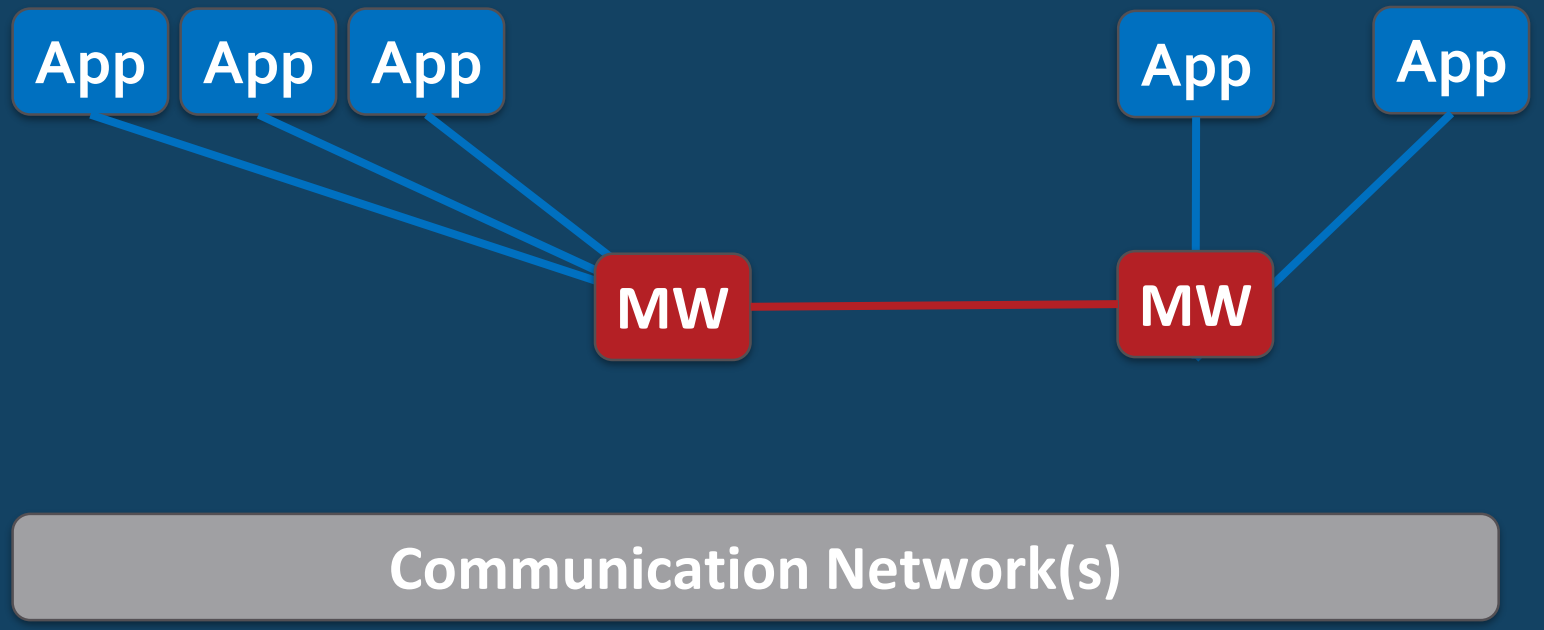

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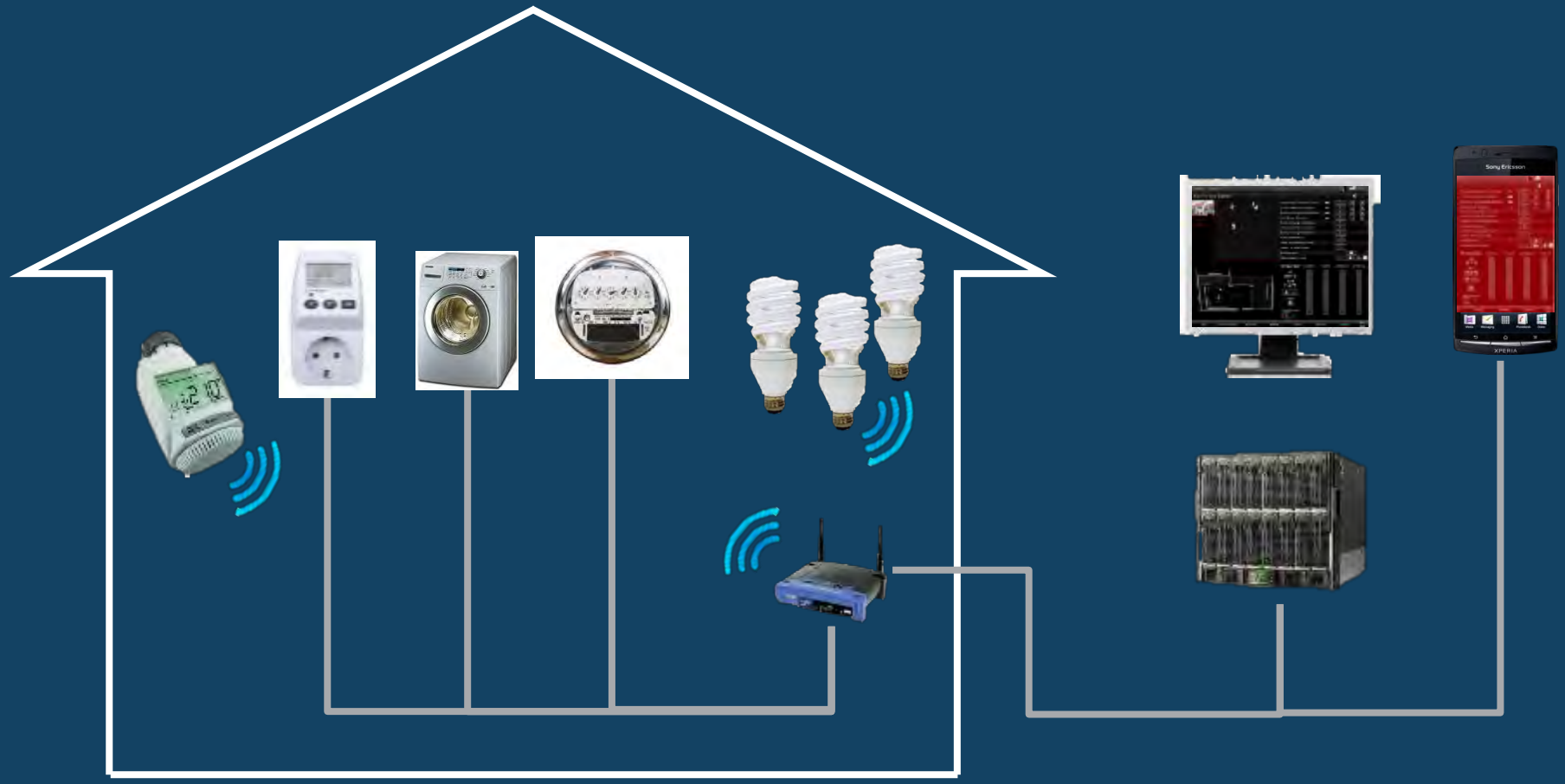
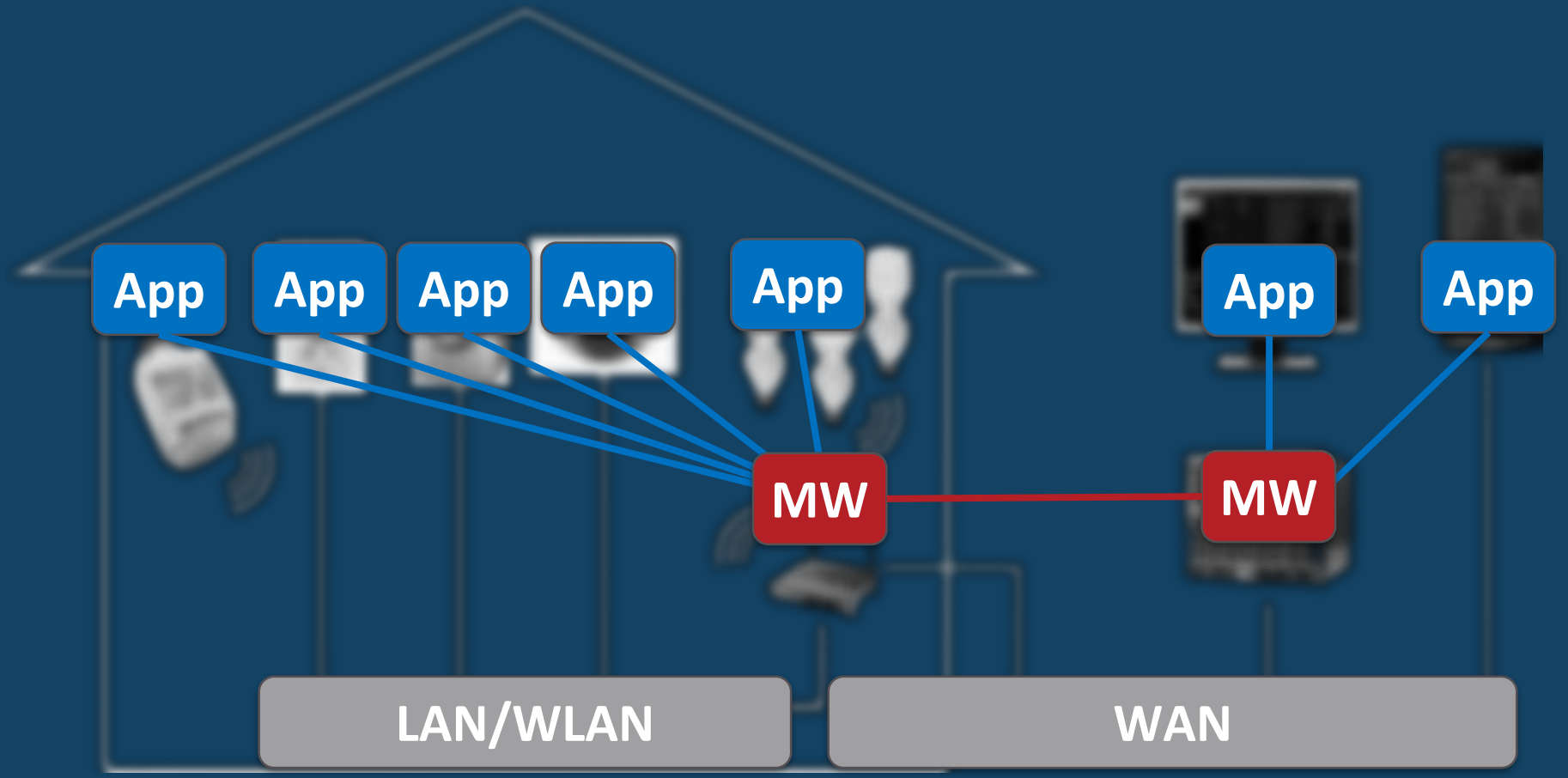
Functional Architecture

eHealth



Connected Home



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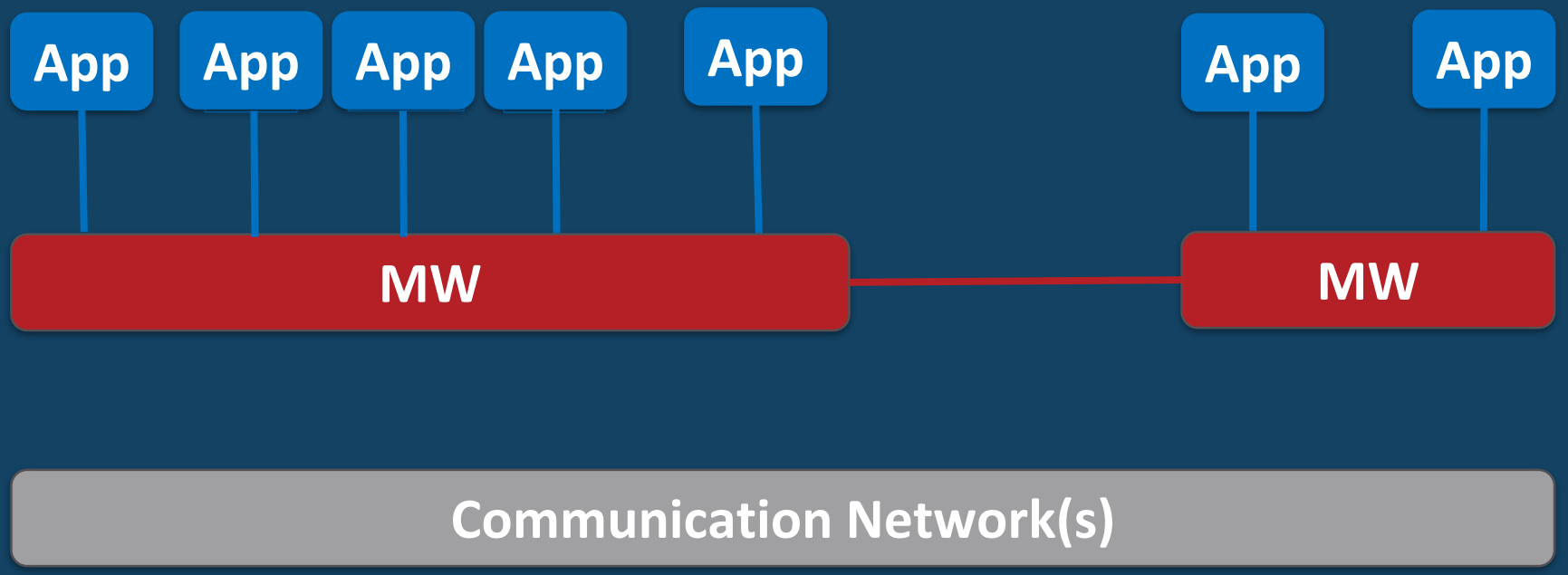
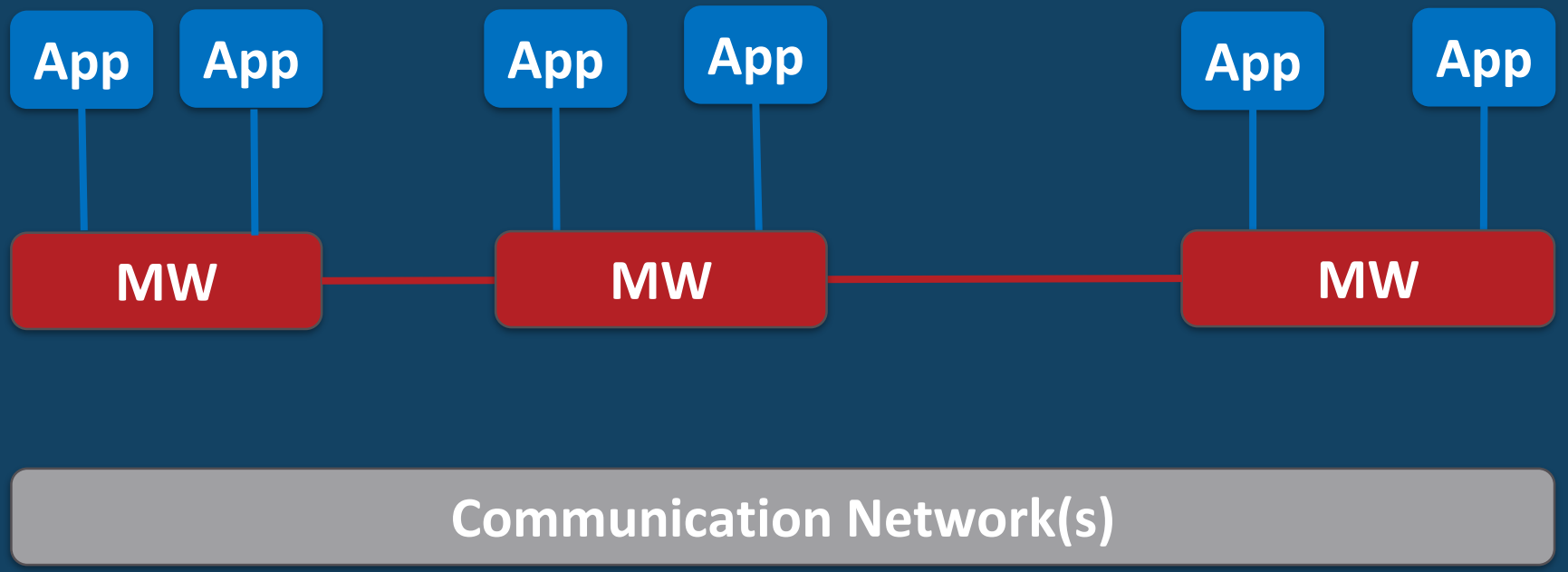
Functional Architecture



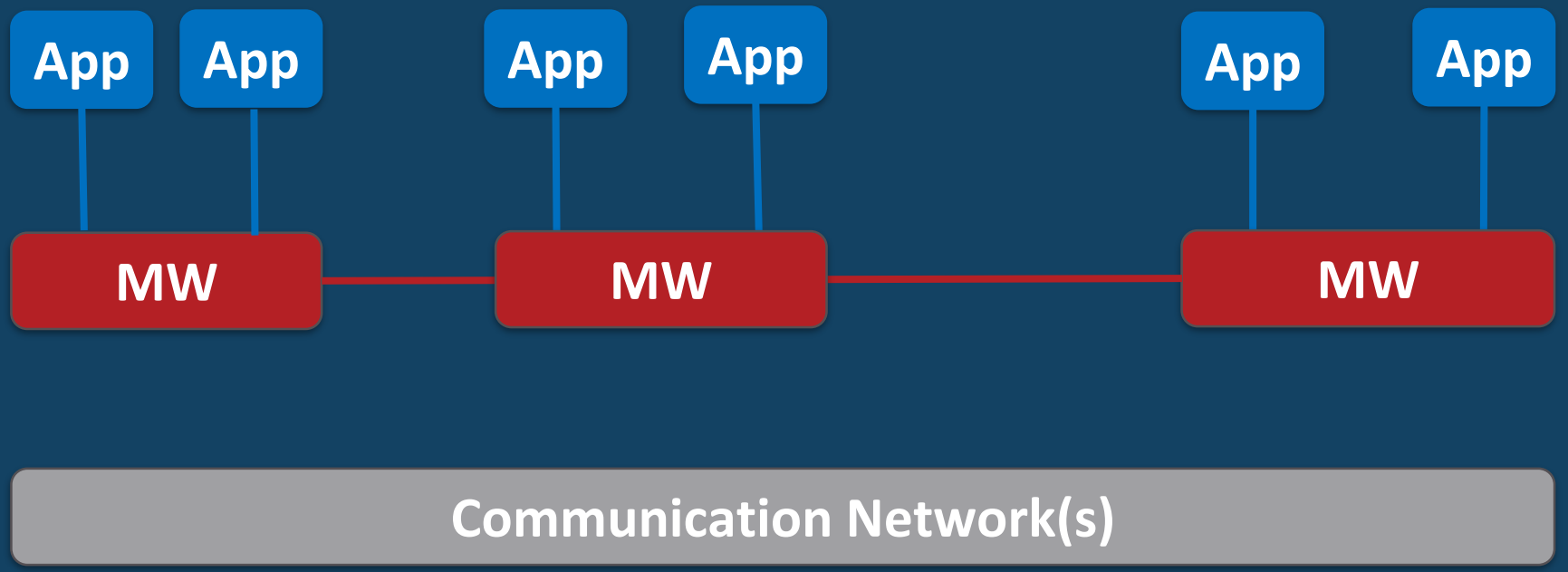
Connected Home

Functional Architecture



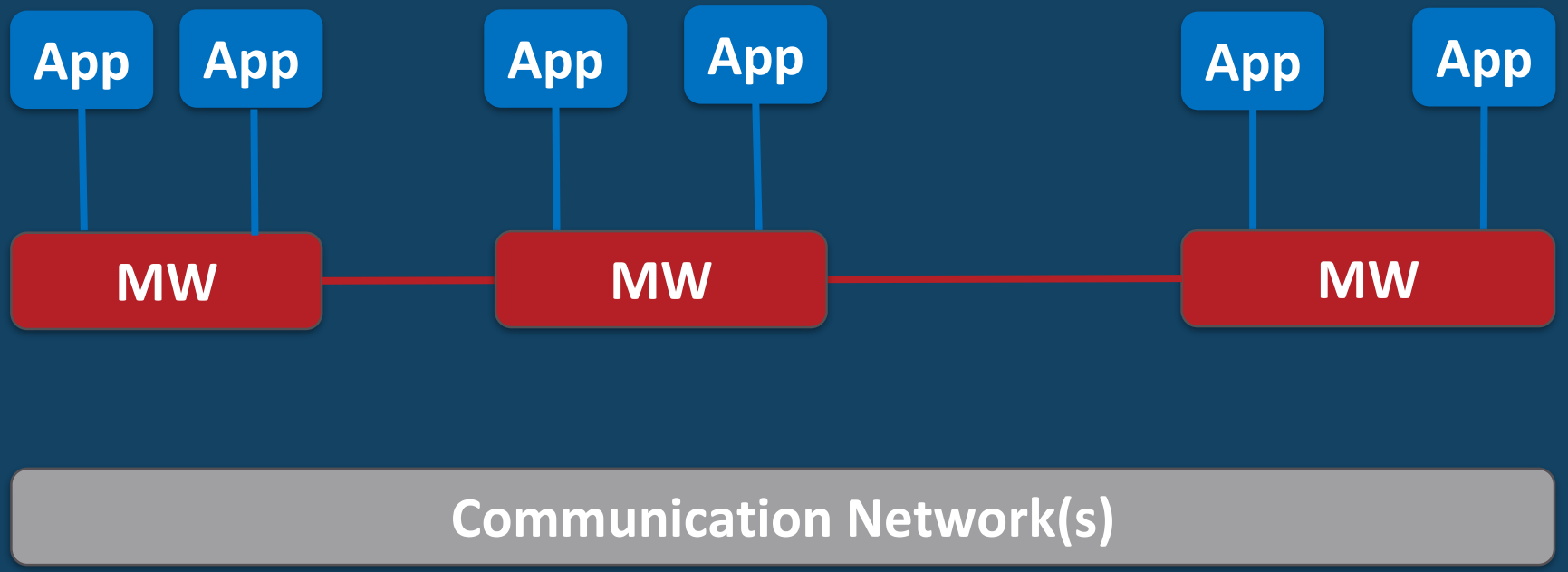
Automotive

Functional Architecture



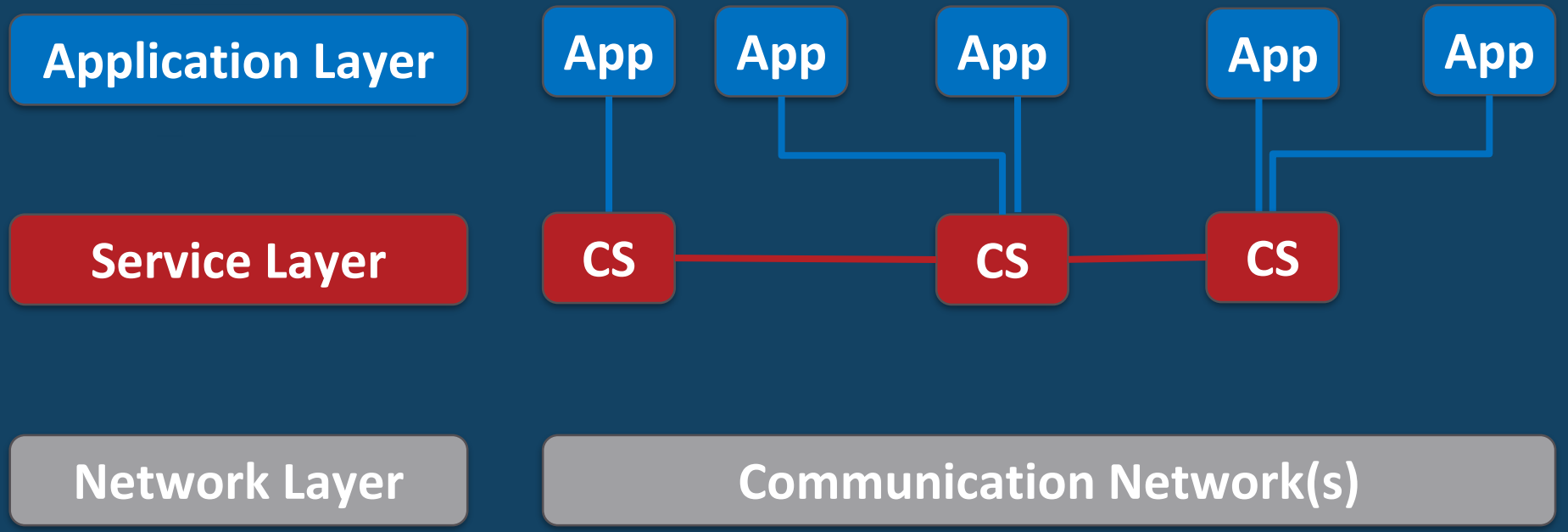
Metering

Functional Architecture



Industrial Production

M2M / IoT Service Layer



App: Applications
CS: Common Services

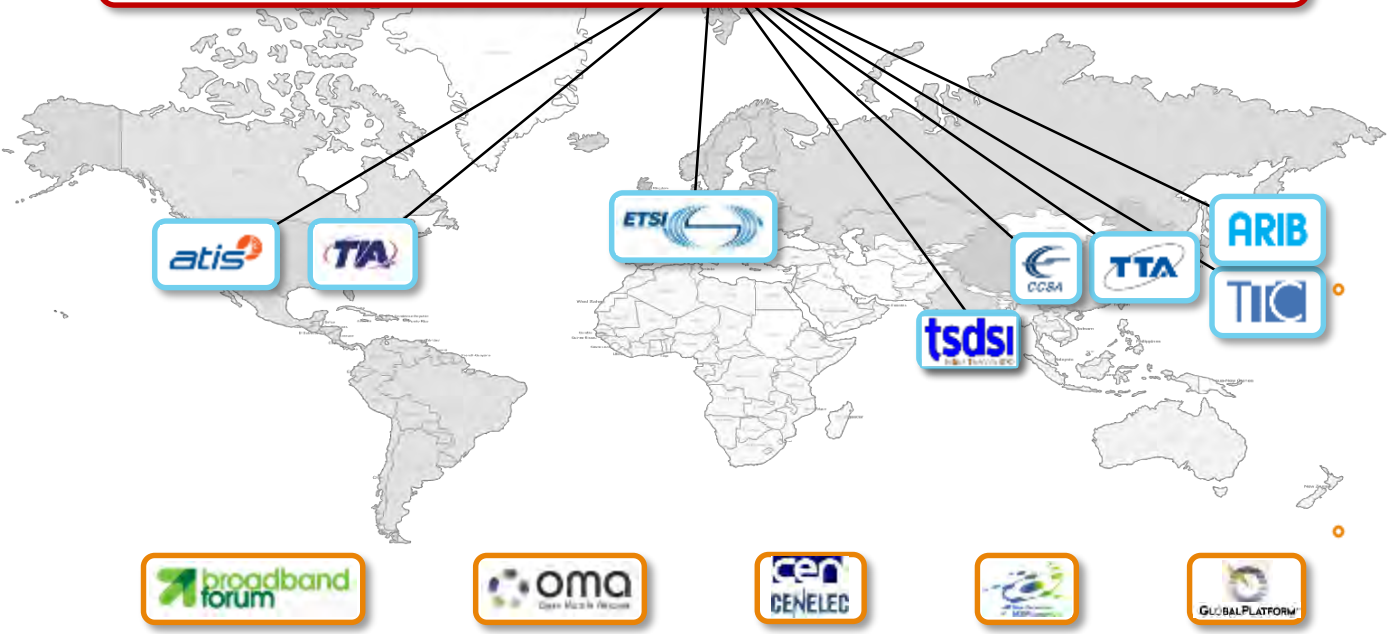
oneM2M Partnership

Standardizing an
Open Horizontal M2M Service Layer Platform

Motivation for oneM2M: Consolidation

Global partnership initiative:
Consolidate standardization of M2M/IoT functions

~200 member organizations in oneM2M

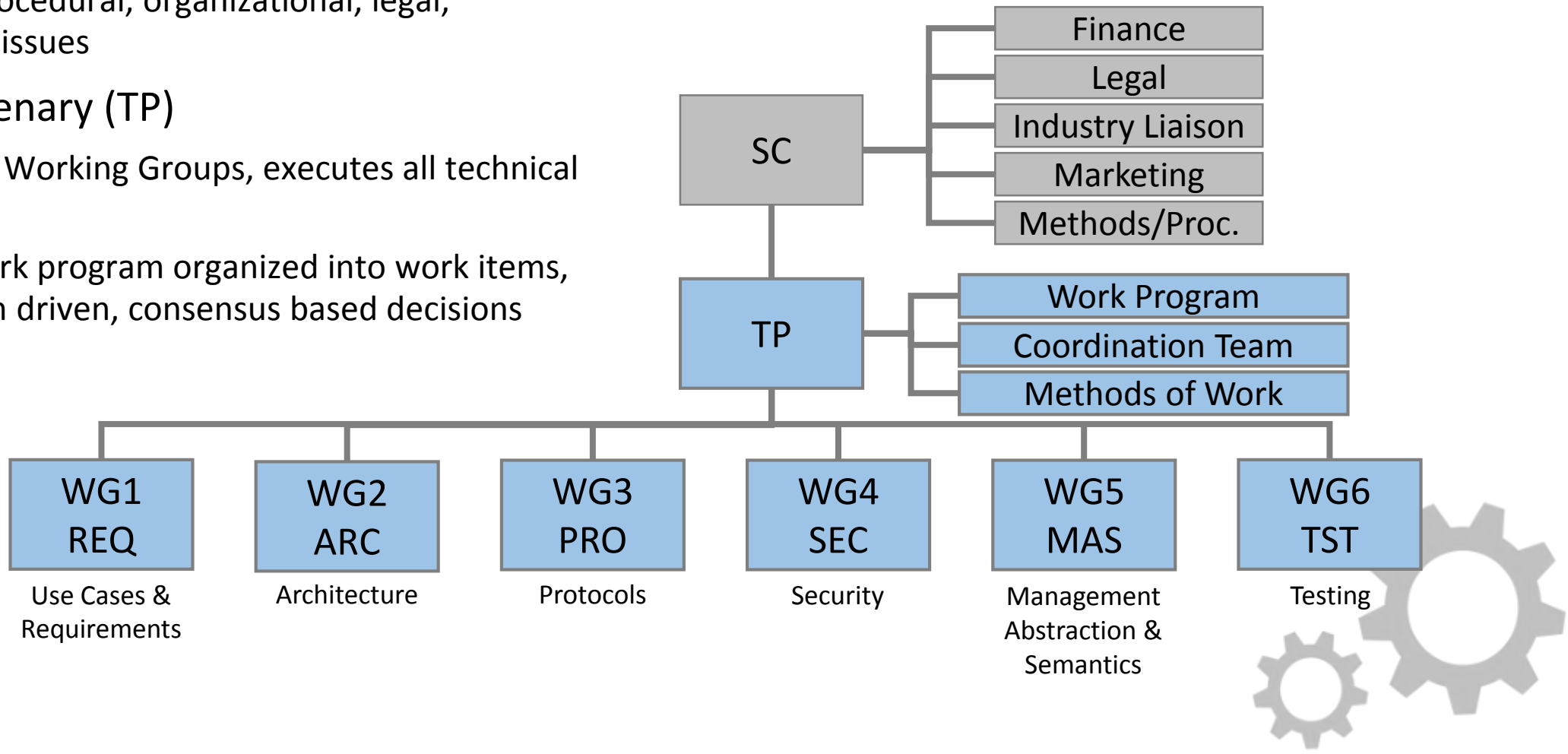


one M2M

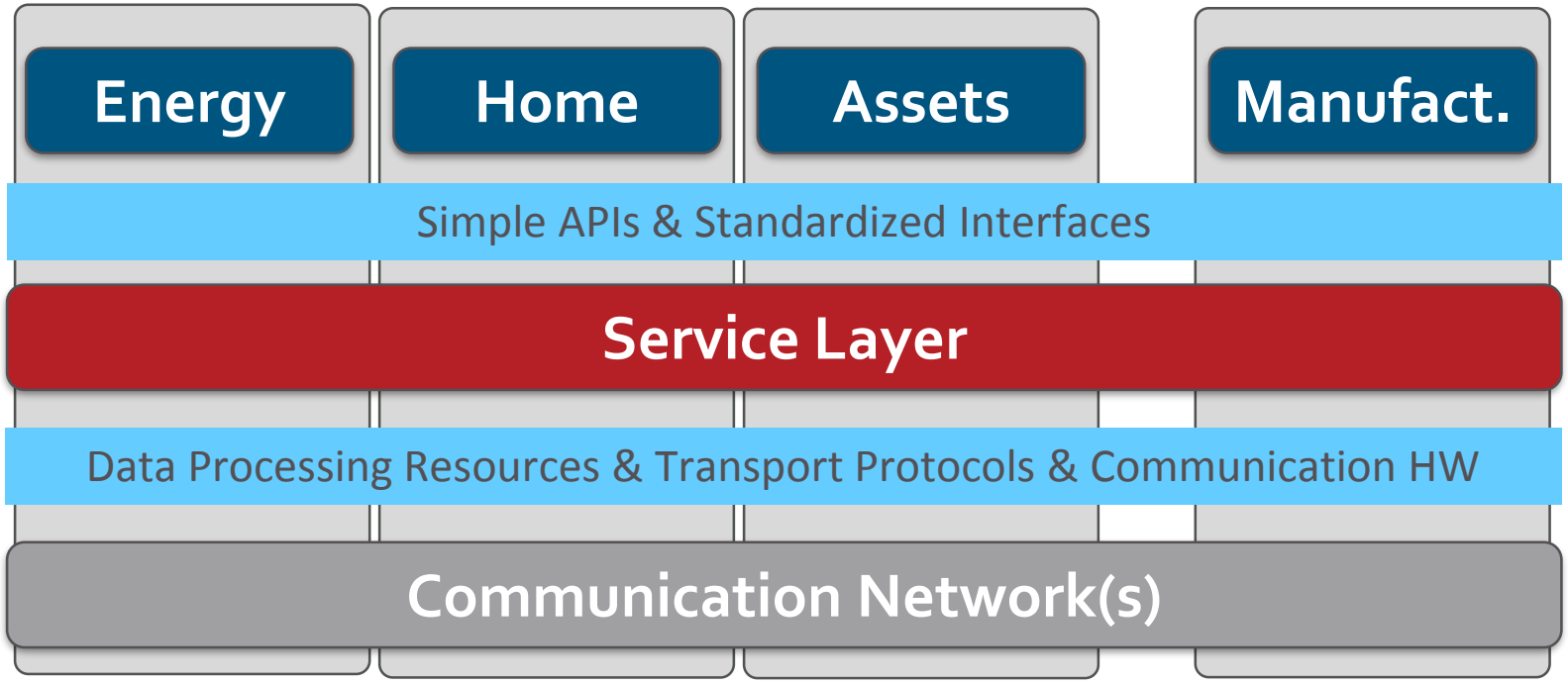
- Partner Type 1: ARIB, ATIS, CCSA, ETSI, TIA, TTA, TTC & TSDSI: **All major Telecom SDOs around globe**
  - Members (e.g. companies) participate in oneM2M via admitting Partner Type 1
  - IPR policy of admitting Partner Type 1 organization is binding for members
  - Partner Type 1 organizations are committed to transpose specifications into standards
- Partner Type 2: BBF, CEN/CENELEC, New Generation M2M Consortium, OMA, Global Platform
  - Fora/Associations/Consortia participate & contribute in oneM2M with compatible IPR regime
- Milestones
  - Created in 2012, avoiding standards fragmentation
  - Published Rel-1 Q1/15, Rel-2 Q3/16, Rel-2a Q1/18
  - Rel-3 to be completed by Q3/18
  - 5 interop test events so far, several developer events
  - Open source implementations (6), commercial take up

Organizational Structure of oneM2M

- Steering Committee (SC)
  - Handling procedural, organizational, legal, and budget issues
- Technical Plenary (TP)
  - Contains all Working Groups, executes all technical work
  - Focused work program organized into work items, contribution driven, consensus based decisions



oneM2M: Standard for M2M / IoT



Horizontal layer of functions commonly needed across different market segments / not segment-specific

Similar to generic versus use case-specific computer/OS in early times of computers

- Standard for a middleware platform
- Sits between applications and processing/communication HW
- On sensors, actors, gateways, cloud
- Authentication/authorization/encryption
- Connects producers/consumers securely
- Hides complexity of NW usage from apps
- Controls when communication happens
- Increases efficiency of data transport
- Stores and shares data
- Supports access control
- Notifies about events
- Talks to groups of things
- Device & life cycle manages, large scale

Smart Cities: Platform integration around oneM2M

Europe and Asia

Several demos, larger scale pilots, commercial deployments

Documents from ETSI M2M Workshop 2016 and IoT Week 2017

industrial internet CONSORTIUM

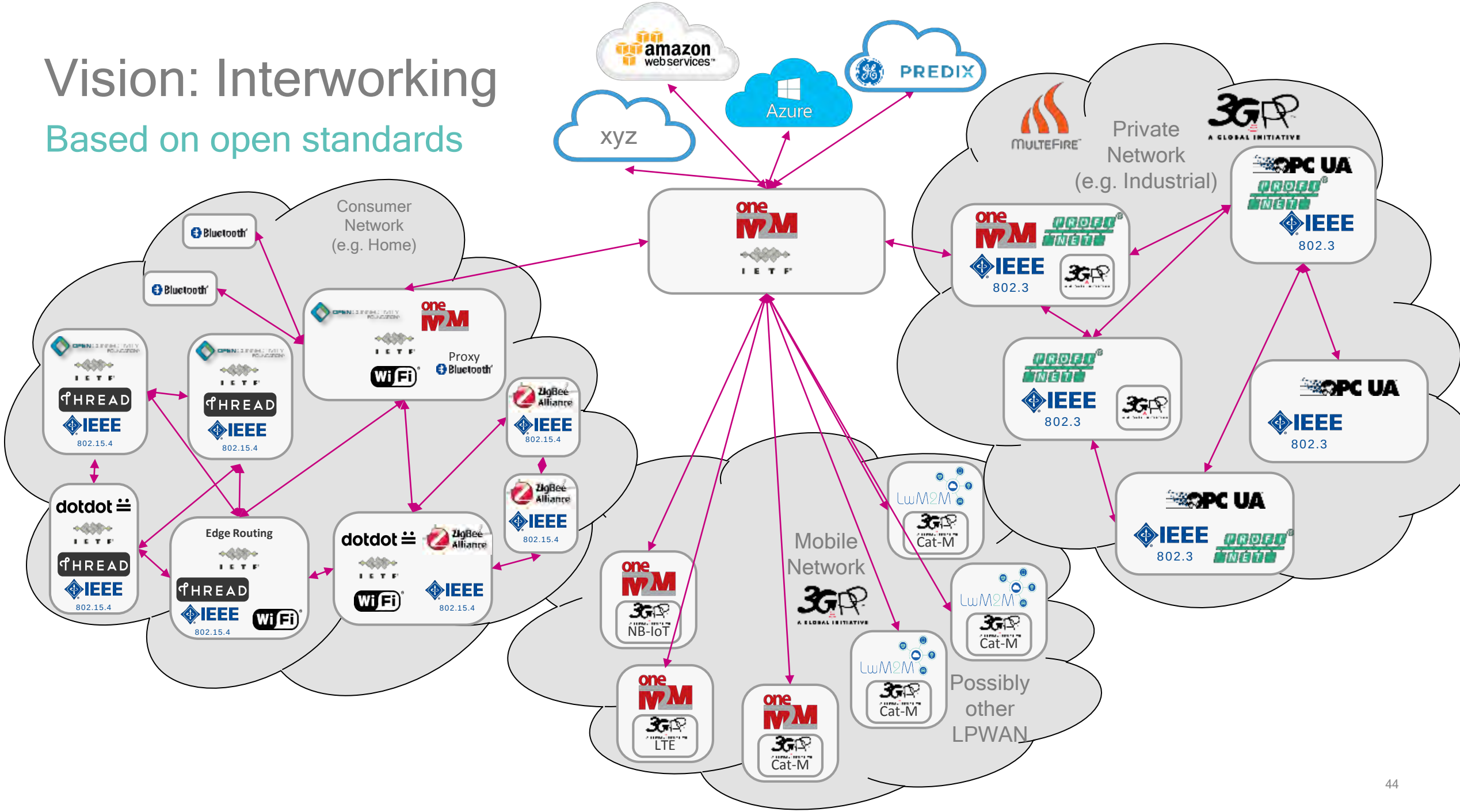
oneM2M

Interworking is Key

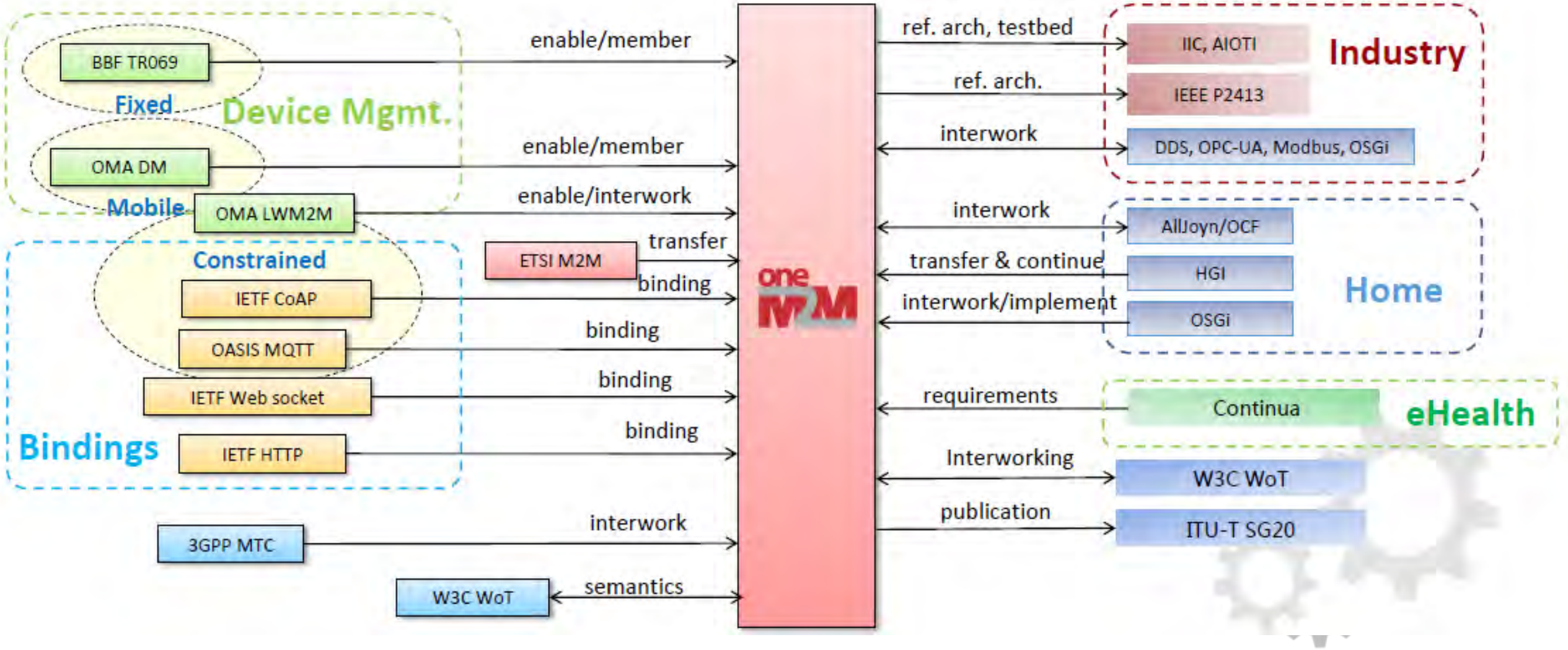
- A number of open IoT standards are very complementary
- Need for simple interworking & more consolidation

Vision: Interworking

Based on open standards



Industry collaboration around oneM2M (from InterDigital & Huawei)



TR-0018 chapter 10 – OPC-UA interworking

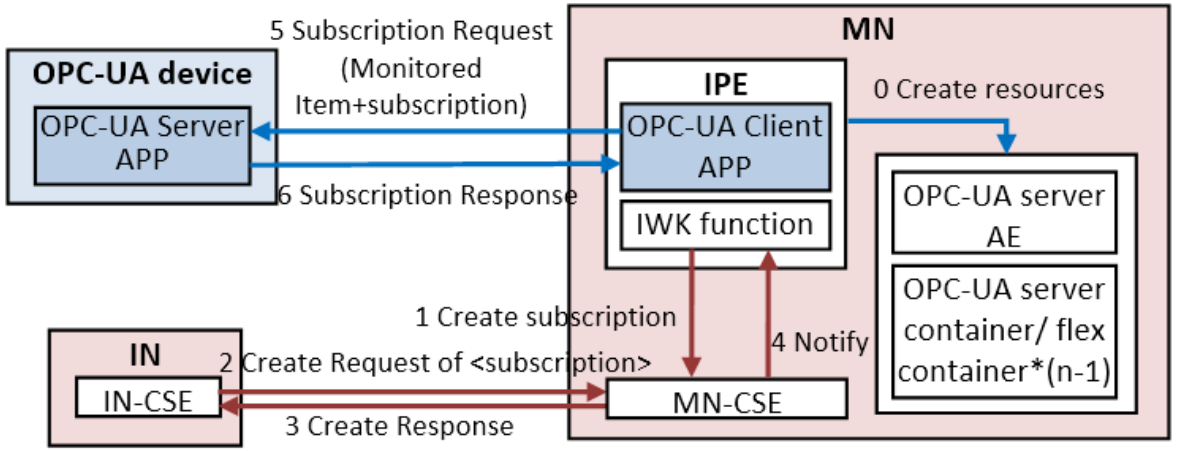


Figure 10.3.4.2.2-1: Interworking procedure for Subscription

Example figures from TR-0018

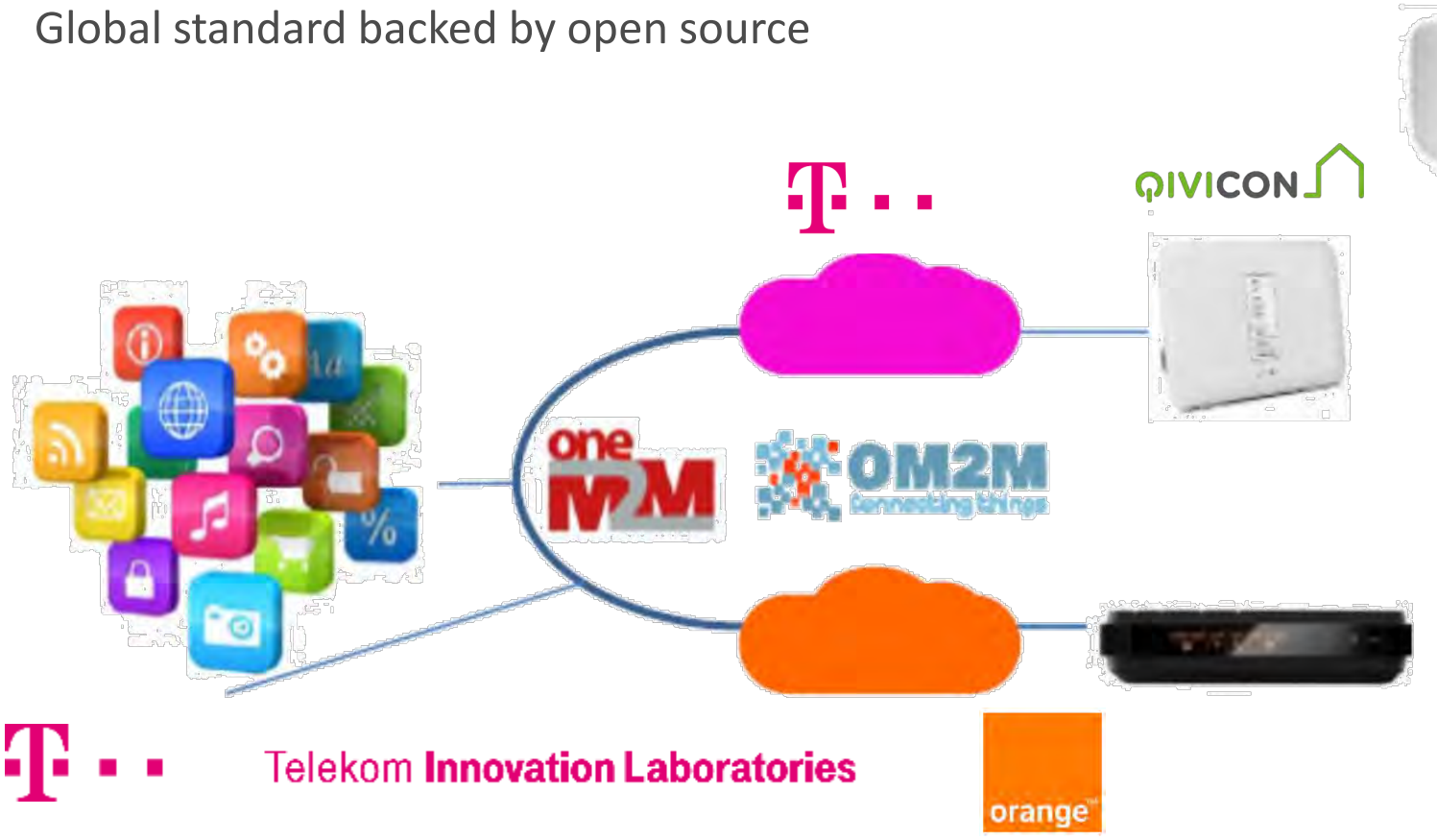
Example: Demo of Orange & Deutsche Telekom

oneM2M as unified API to operators' Consumer IoT

omeM2M APIs & data models: Abstracting out specifics of DT & Orange

Applications independent of operators' Smart Home solution

Global standard backed by open source



New Eclipse Member Orange and Deutsche Telekom demonstrate joint initiative on oneM2M based cloud APIs for Smart Home and consumer IoT

23/10/2017
France
11:53 GMT

Download the press release

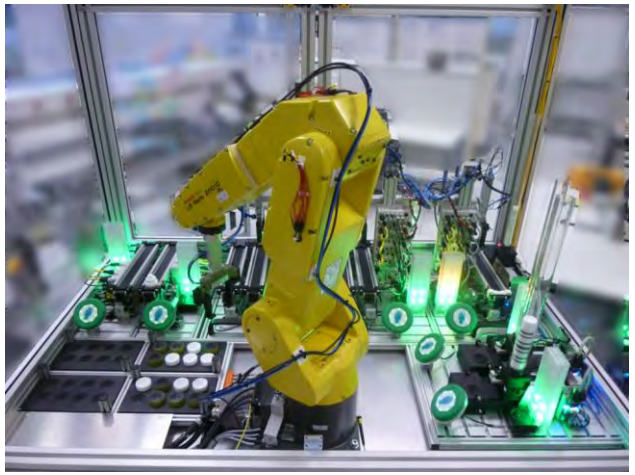
Eclipse IoT projects – Eclipse OM2M and Eclipse SmartHome – are used and enhanced to ease the life of developers.

In Ludwigsburg, Germany, during EclipseCon (October 24 – 26), the new member of the Eclipse Foundation, Orange together with member Deutsche Telekom, will showcase and

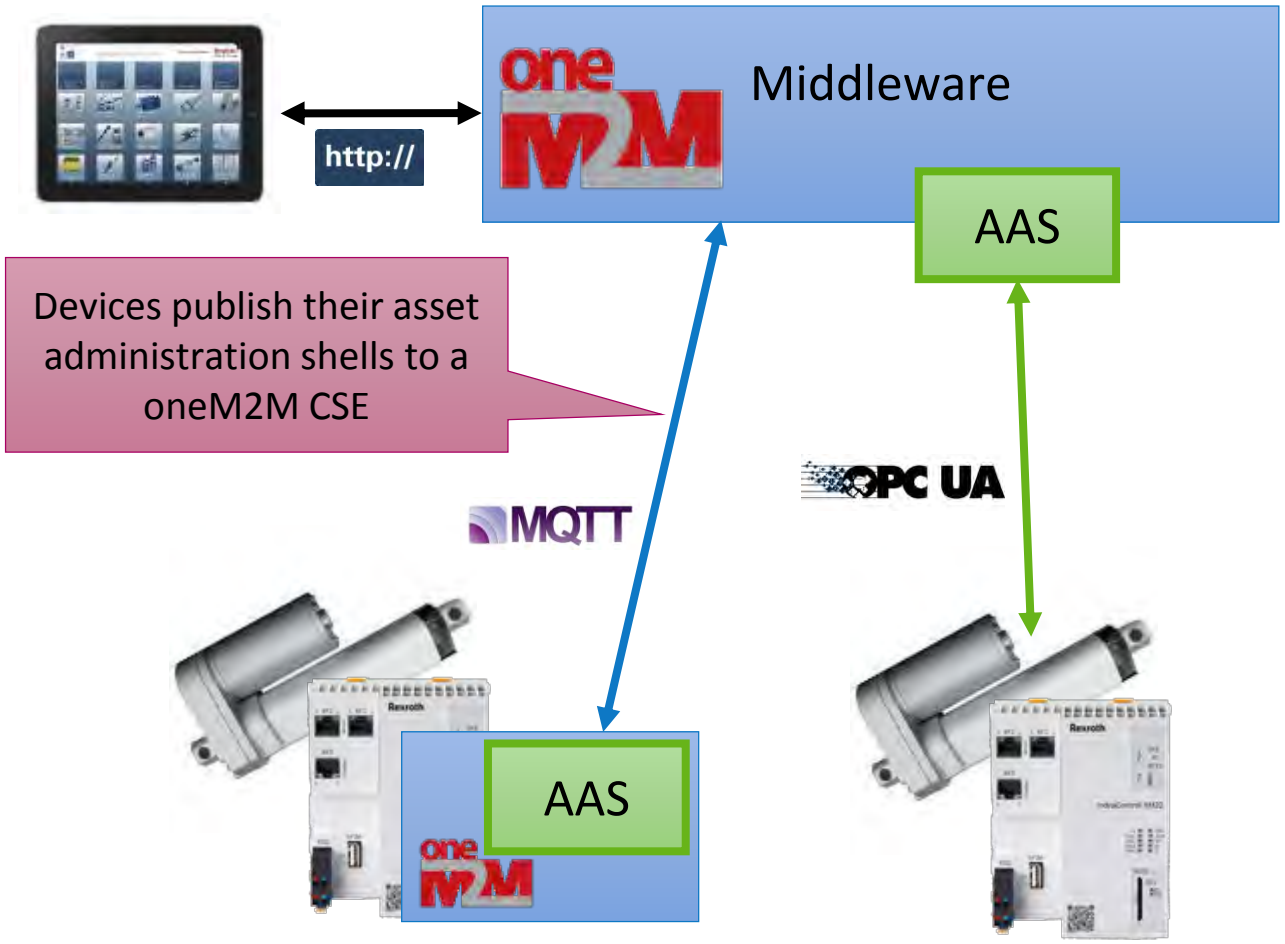
Bosch Corporate Research
Overview on research project ‘SmartControl’

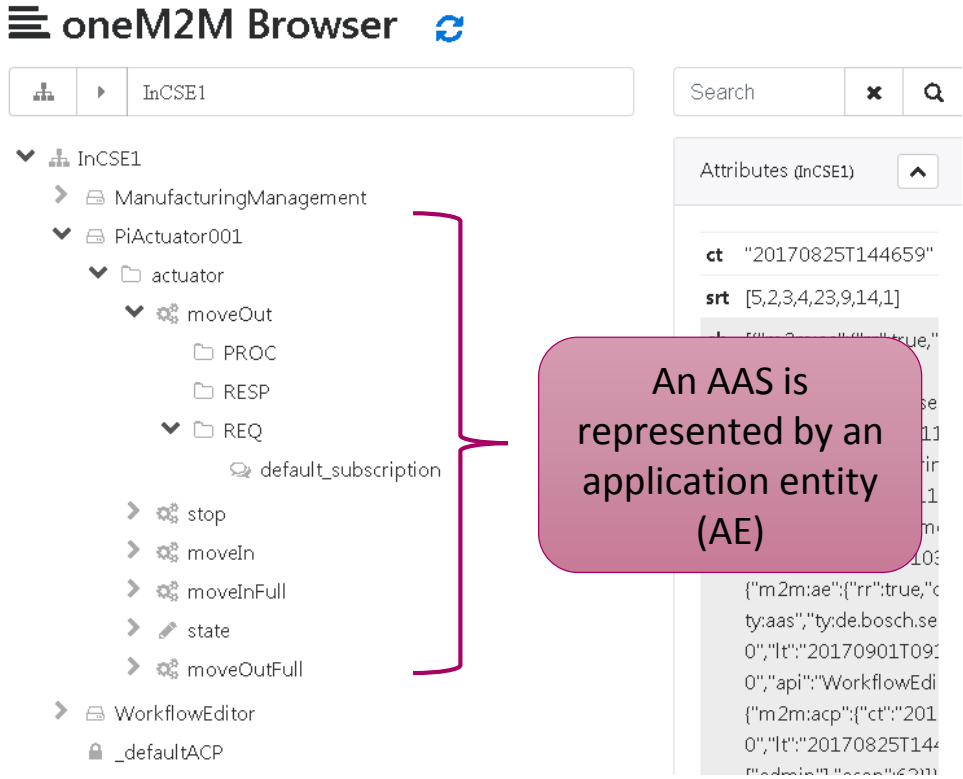
- Project aims at reducing engineering effort and increasing scalability in the context of Industry 4.0
  - Engineering is based on so-called asset administration shells (AAS, = “digital twins of machines”)
  - Together with a wide range of industry partners, structure and interfaces of these AAS are defined in the public funded collaborative project “BaSys 4.0”

- In SmartControl, oneM2M is used as middleware technology to store and retrieve asset administration shells
  - Utilizing Eclipse oM2M as oneM2M platform
  - Providing a mapping from BaSys 4.0 interfaces to oneM2M
  - Contributing to the BaSys 4.0 open source stack (Eclipse BaSyx)



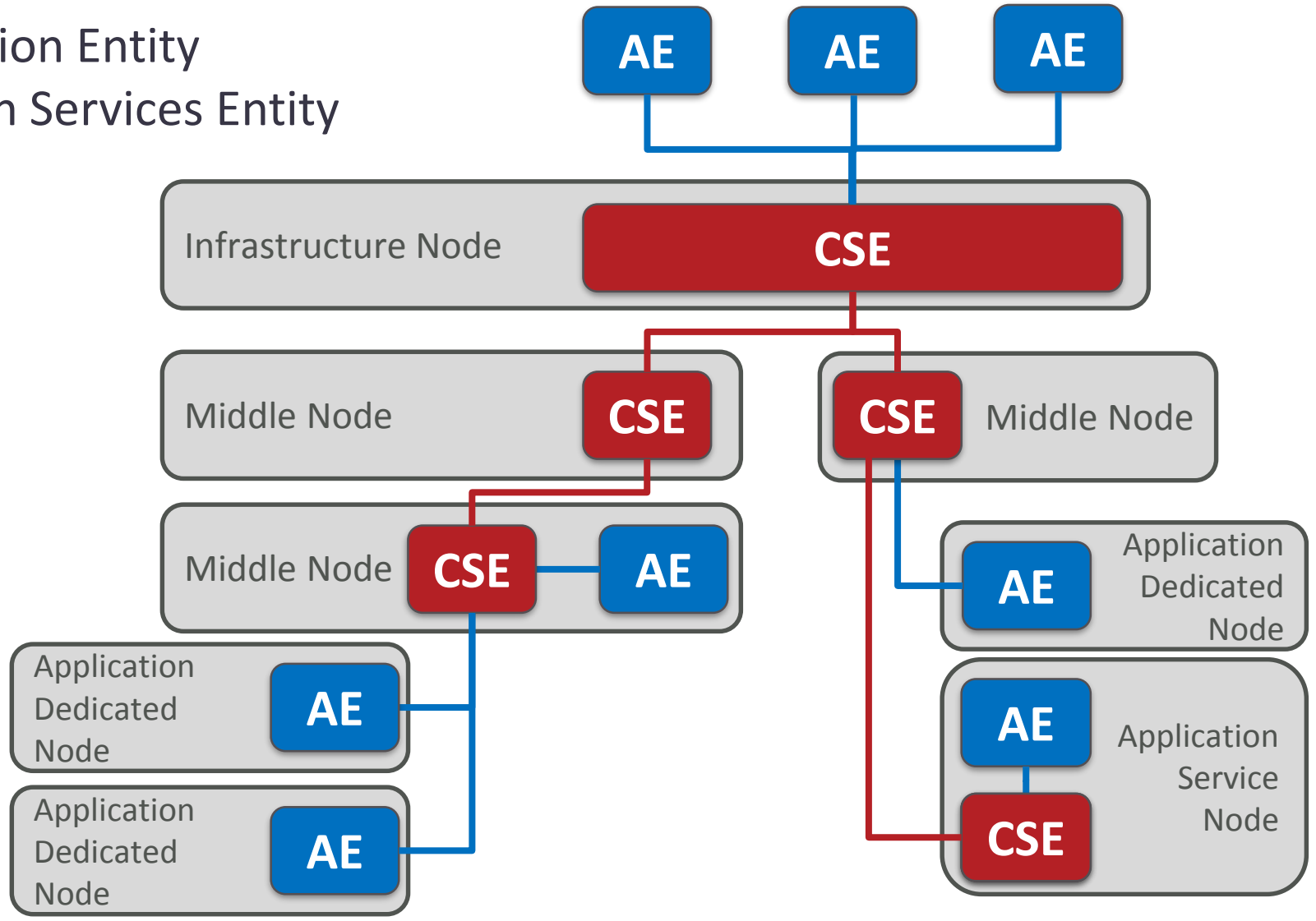
Bosch Corporate Research
Infrastructure with oneM2M



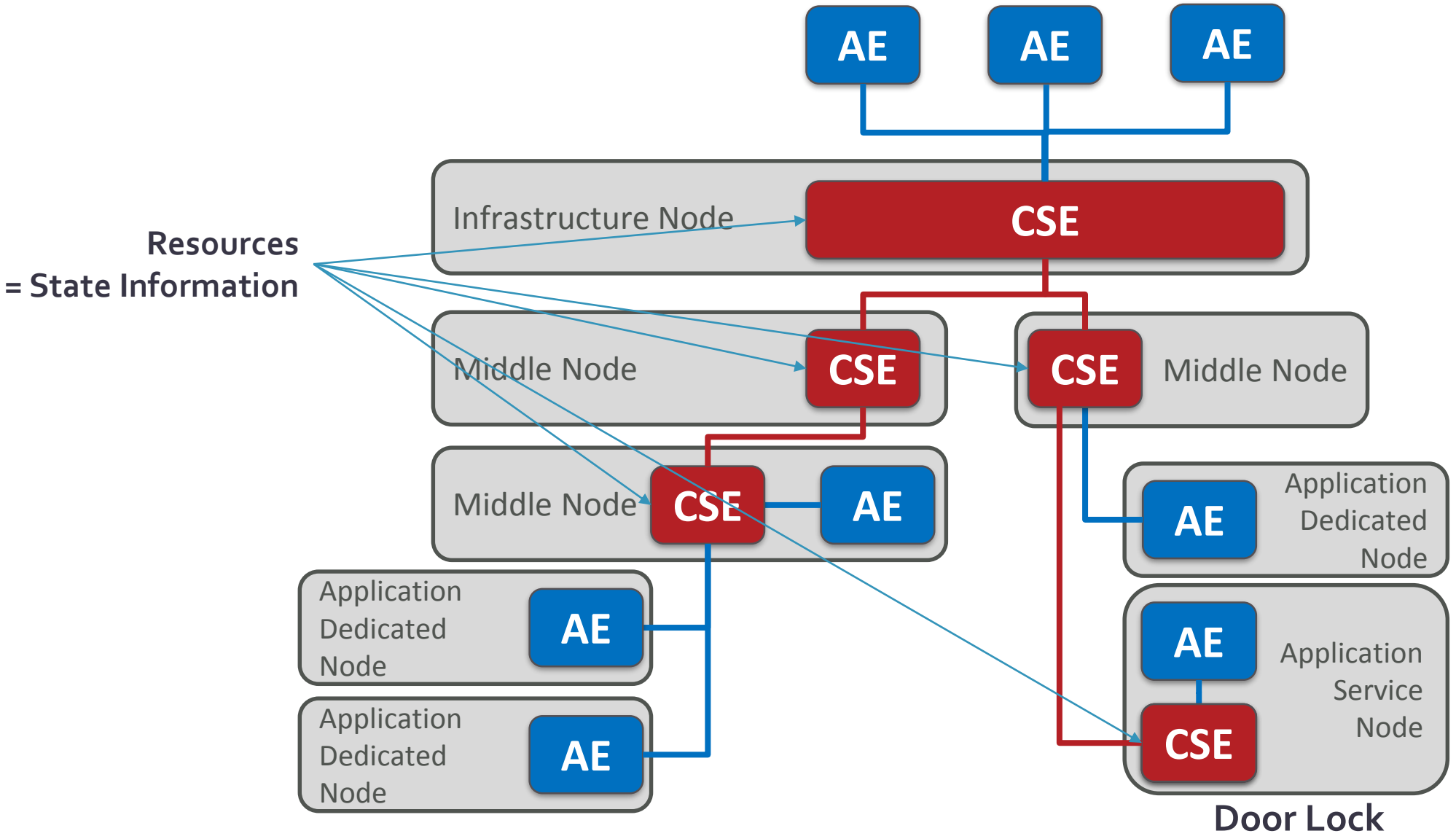


Topology

AE: Application Entity
CSE: Common Services Entity



RESTful Style & Access Control



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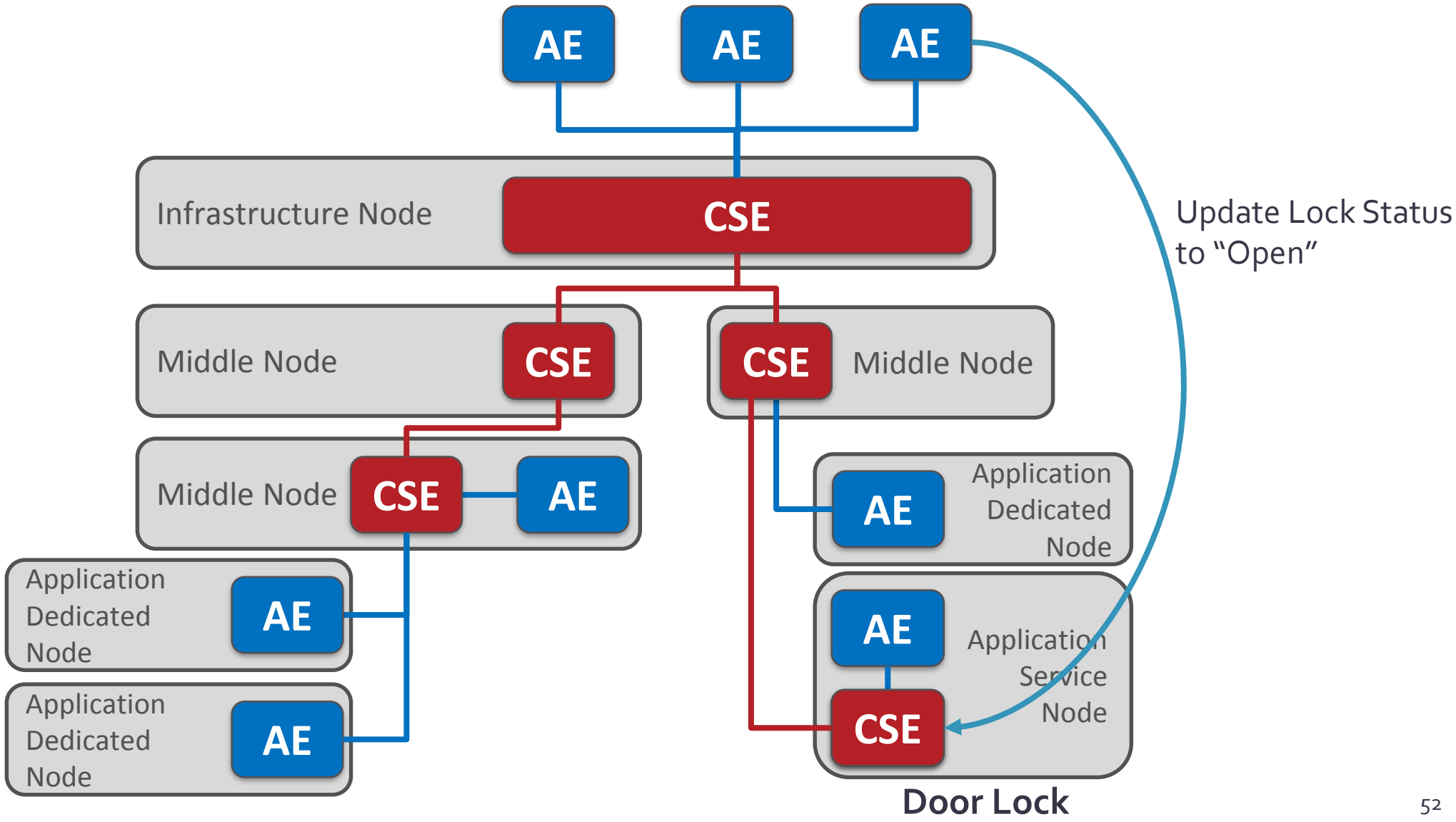

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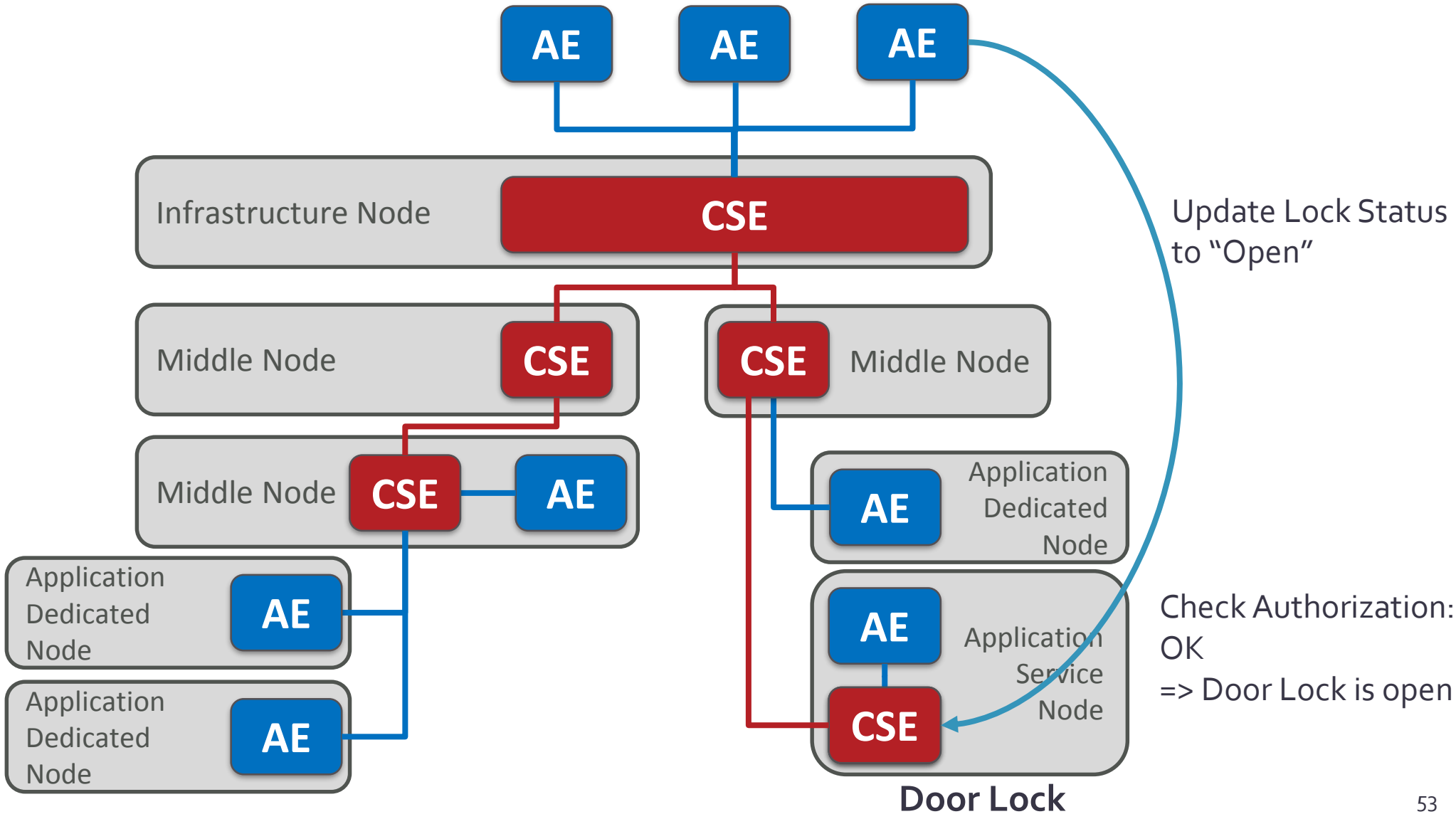

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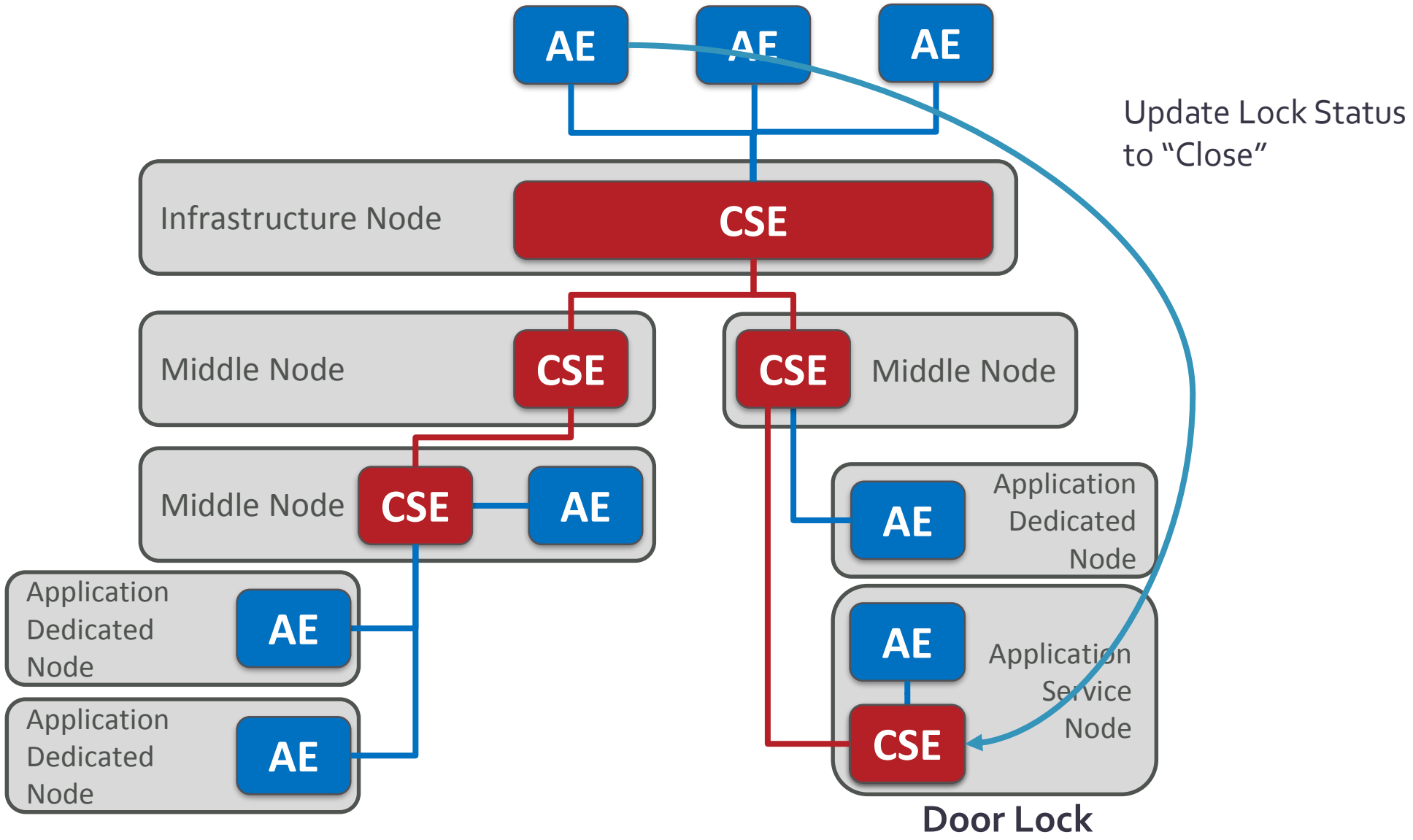

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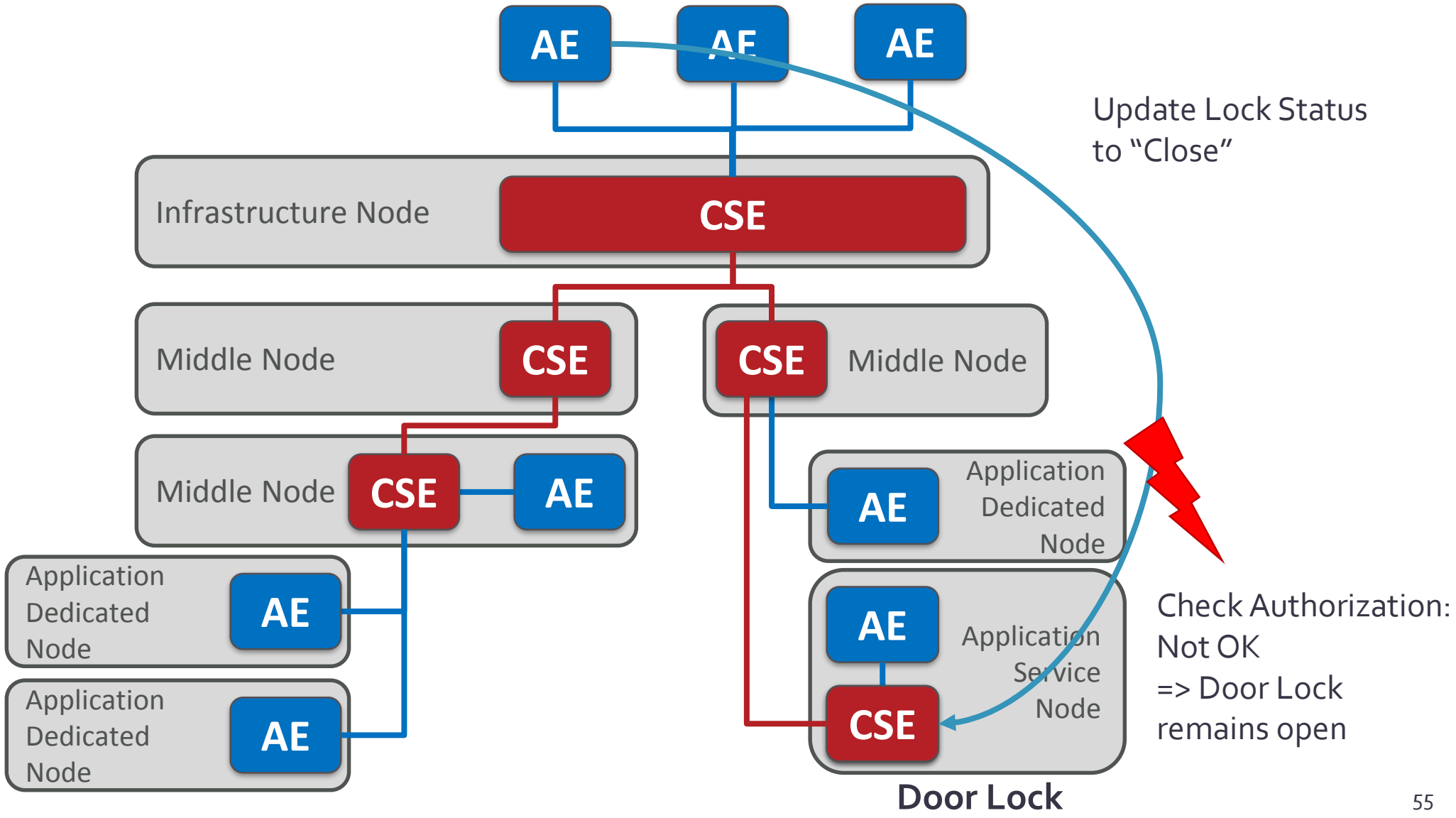
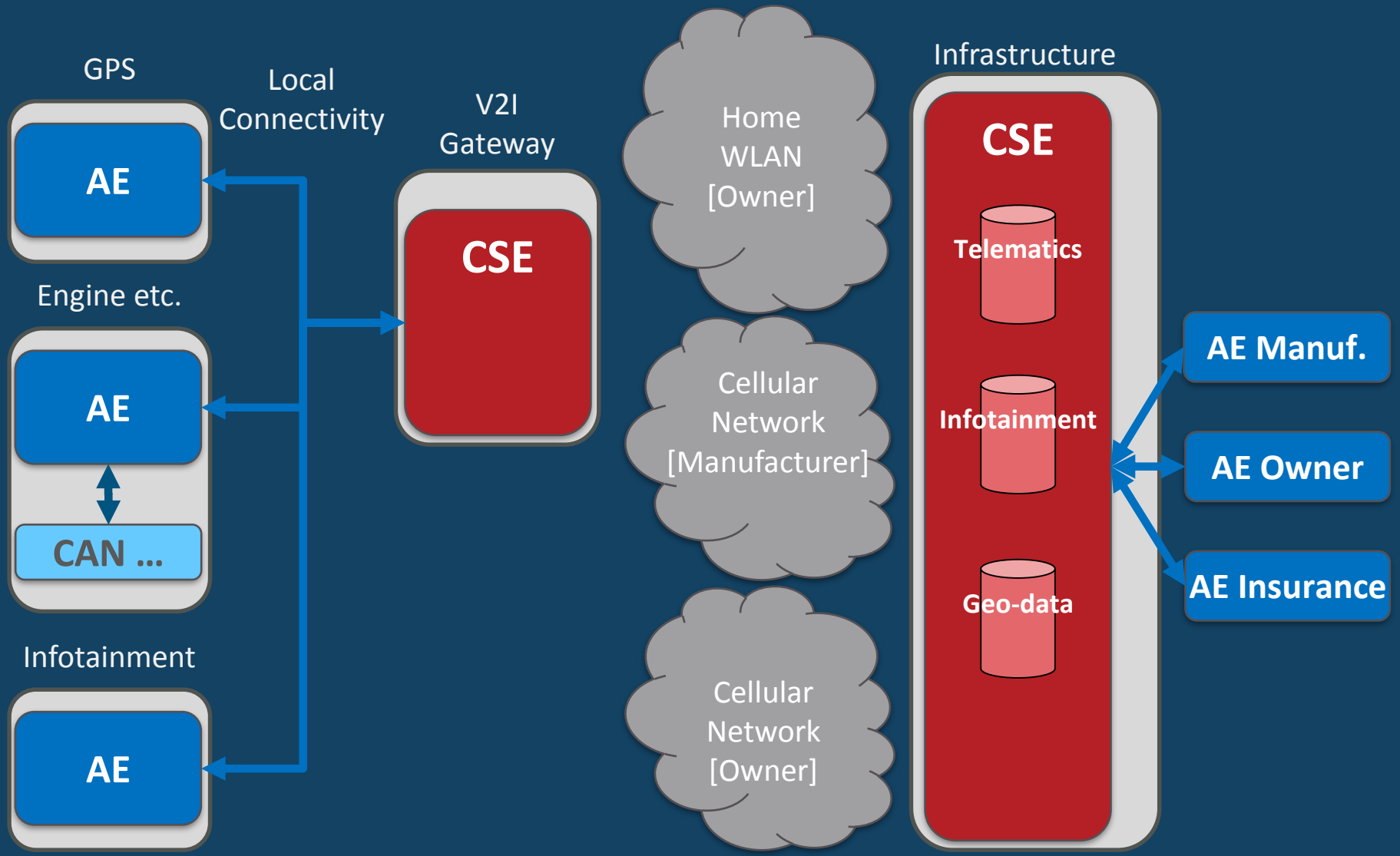
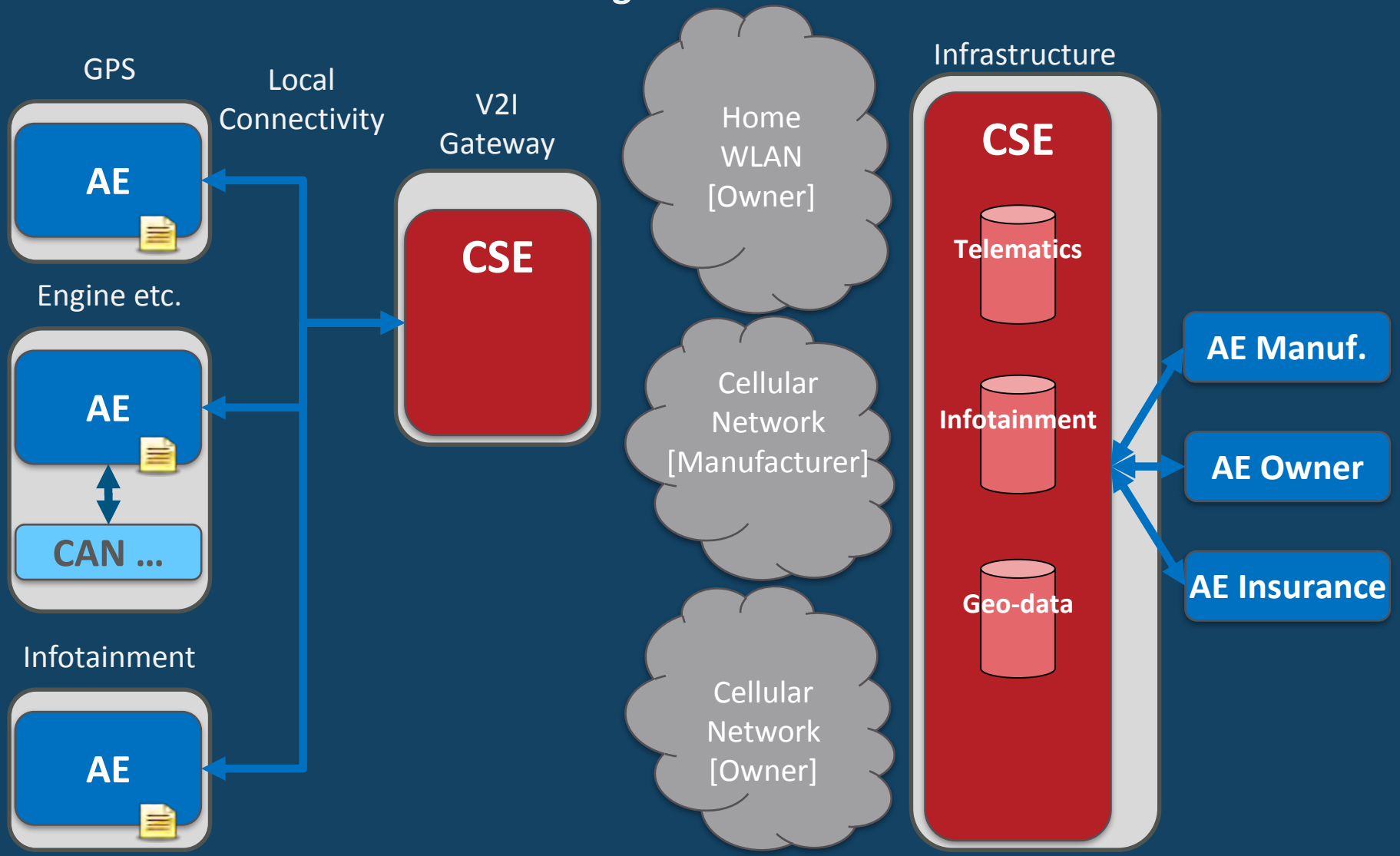


Efficient Data Sharing



Efficient Data Sharing

At Home: In Owner's WLAN Coverage



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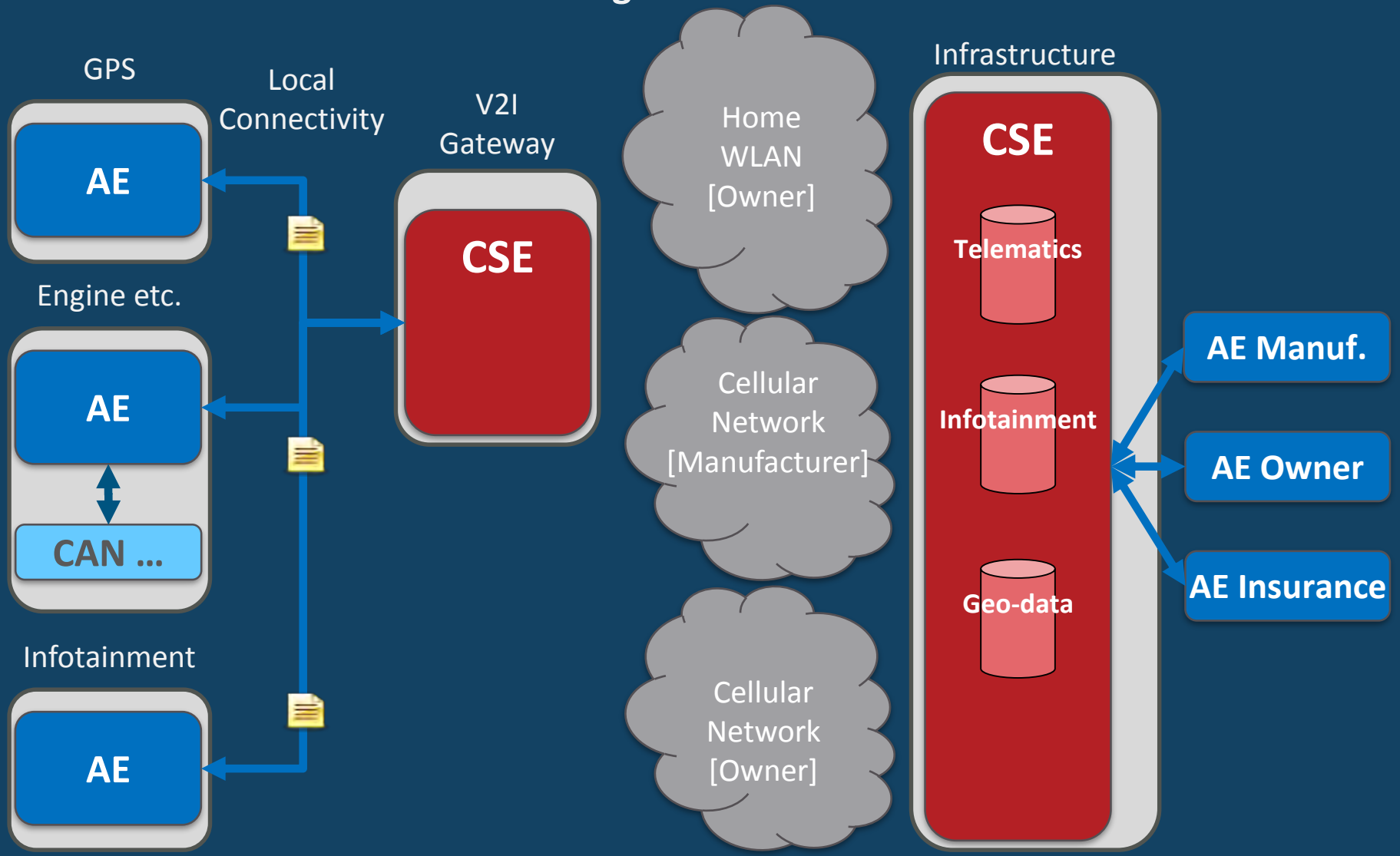

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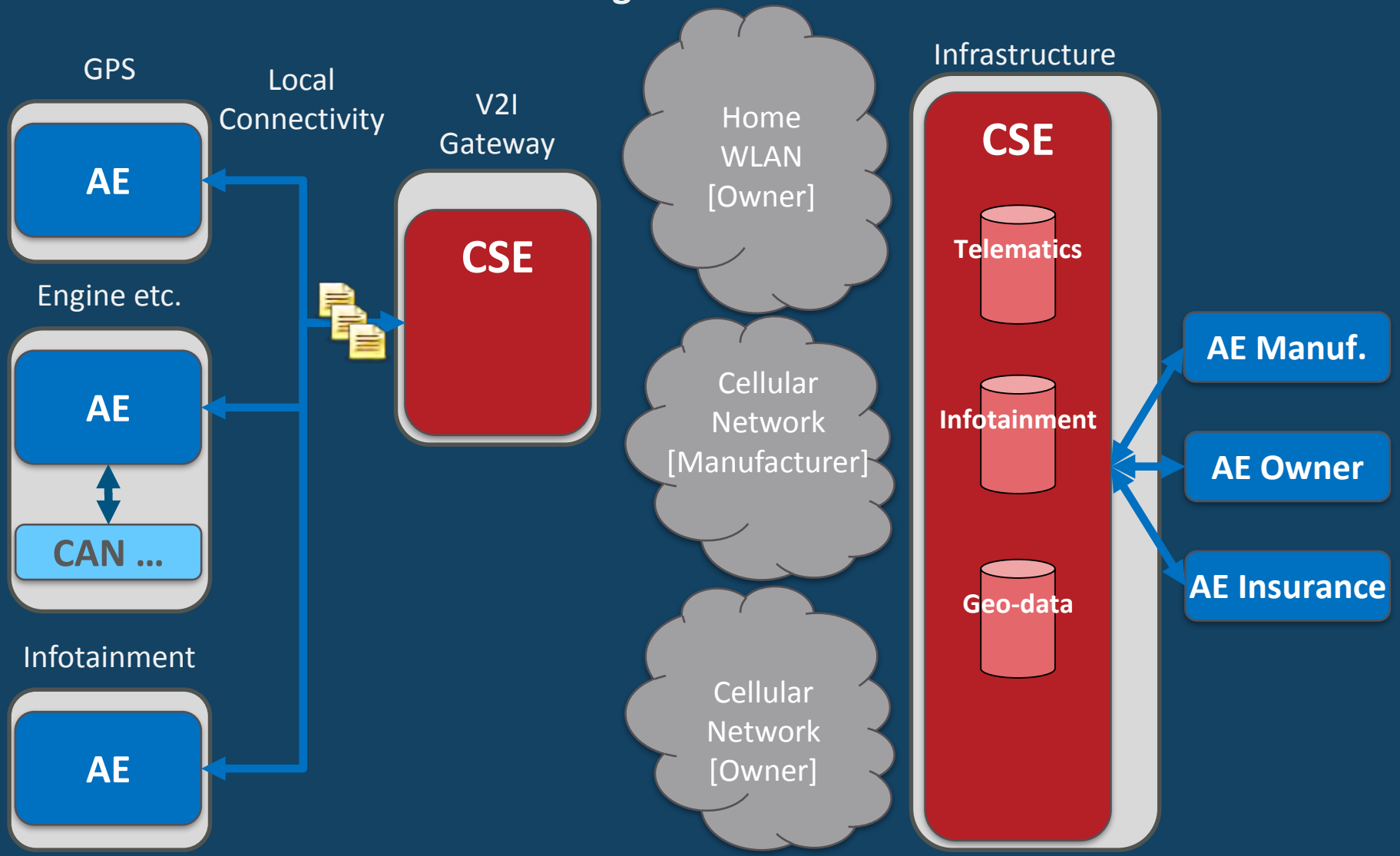

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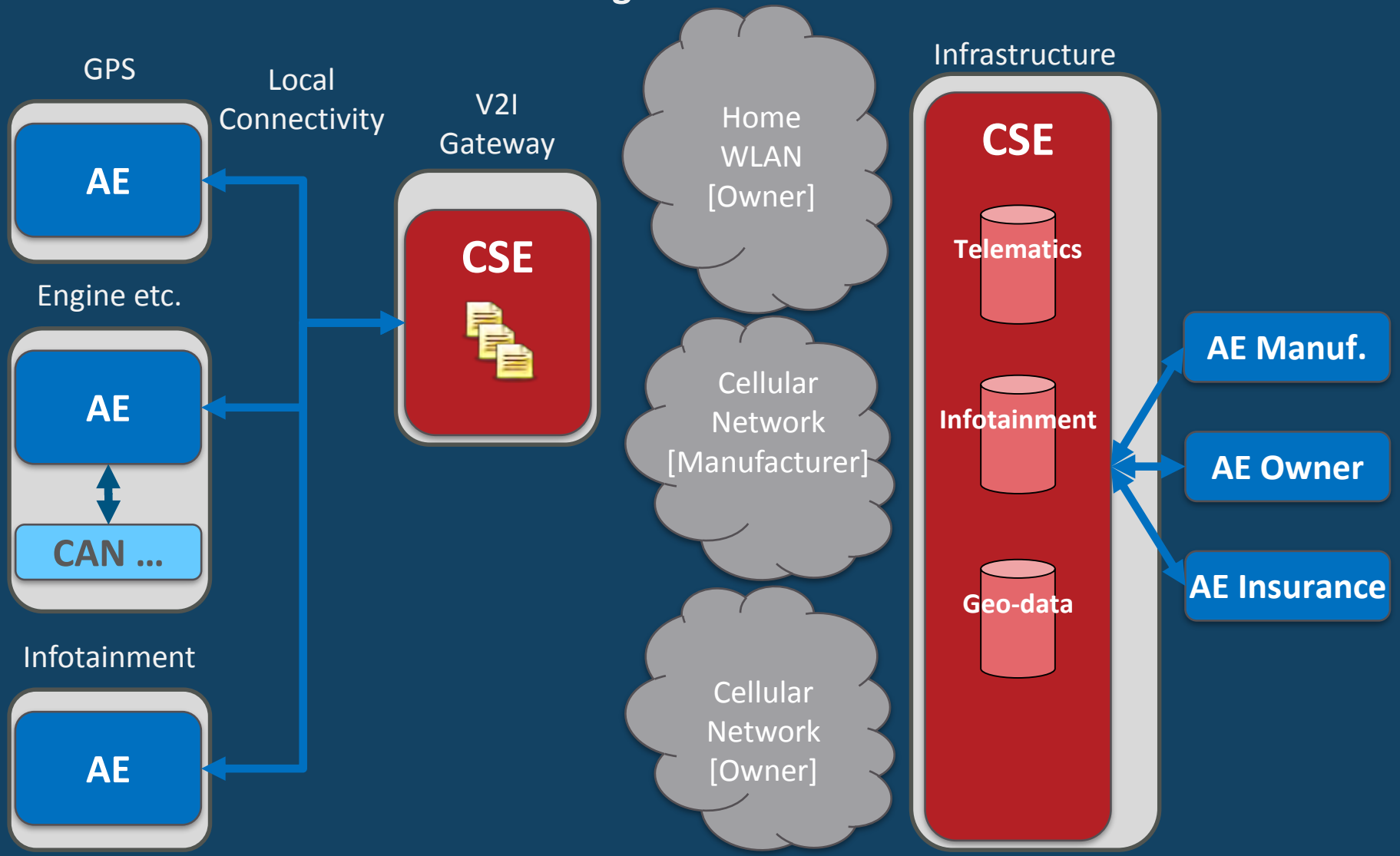

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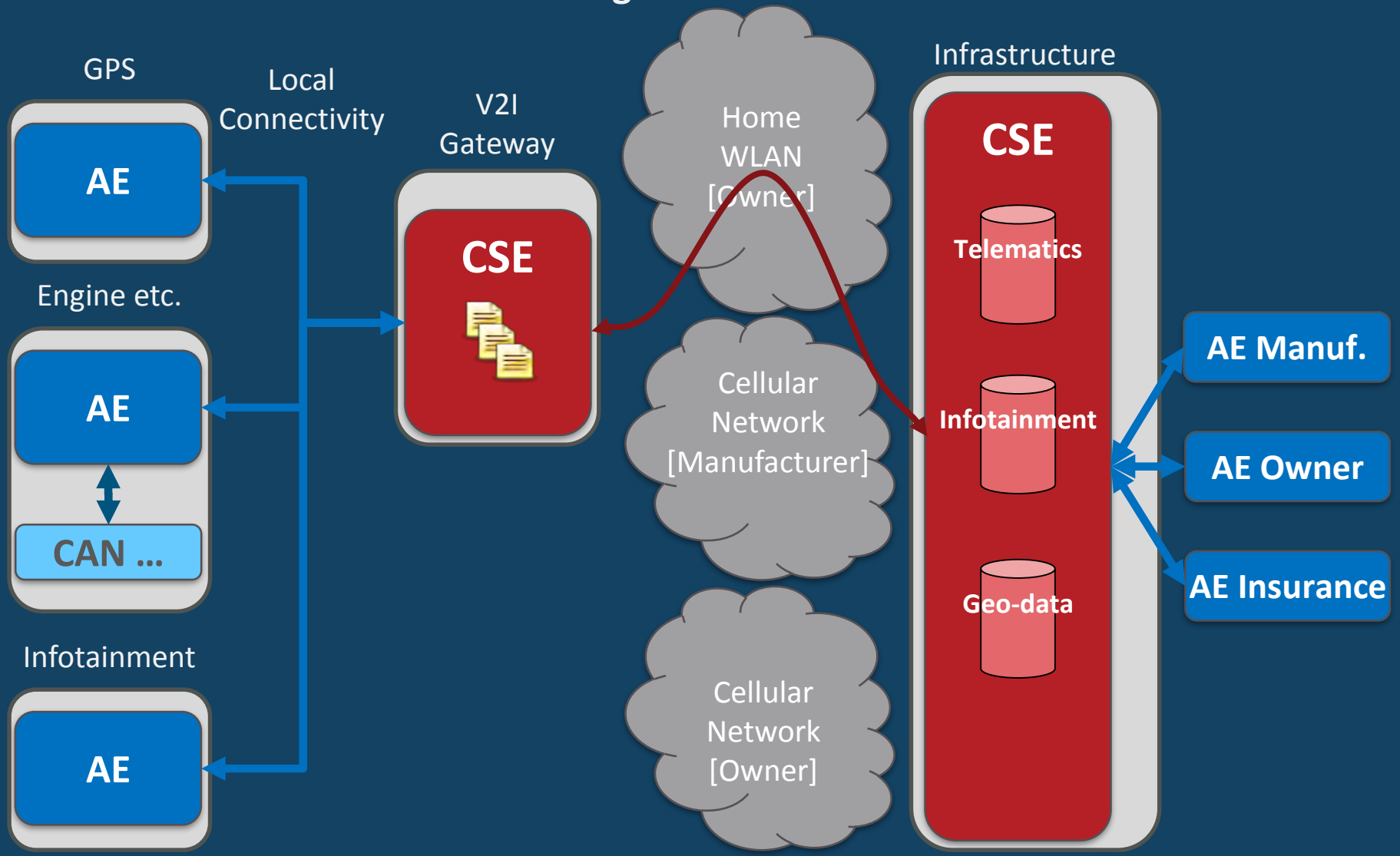

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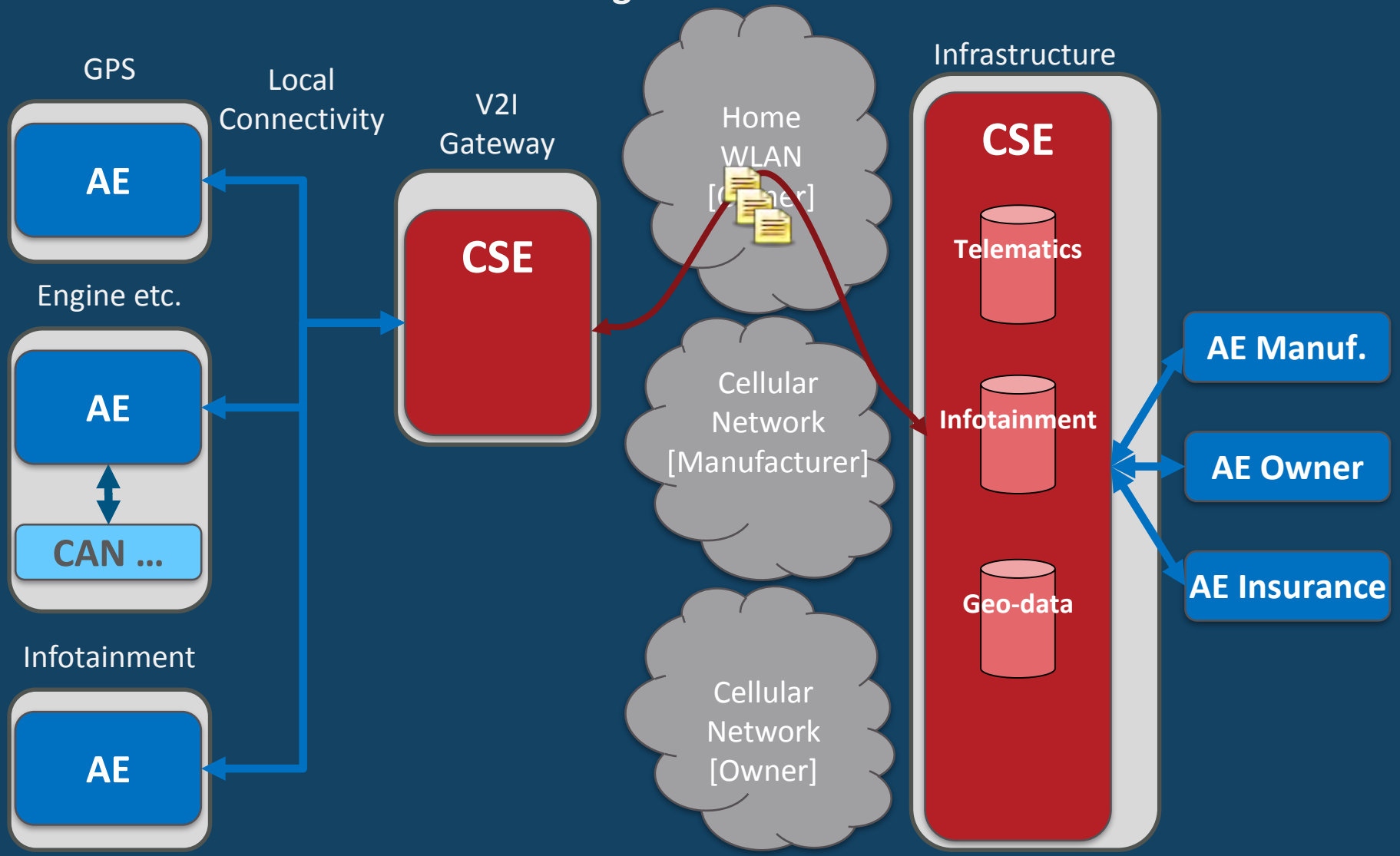

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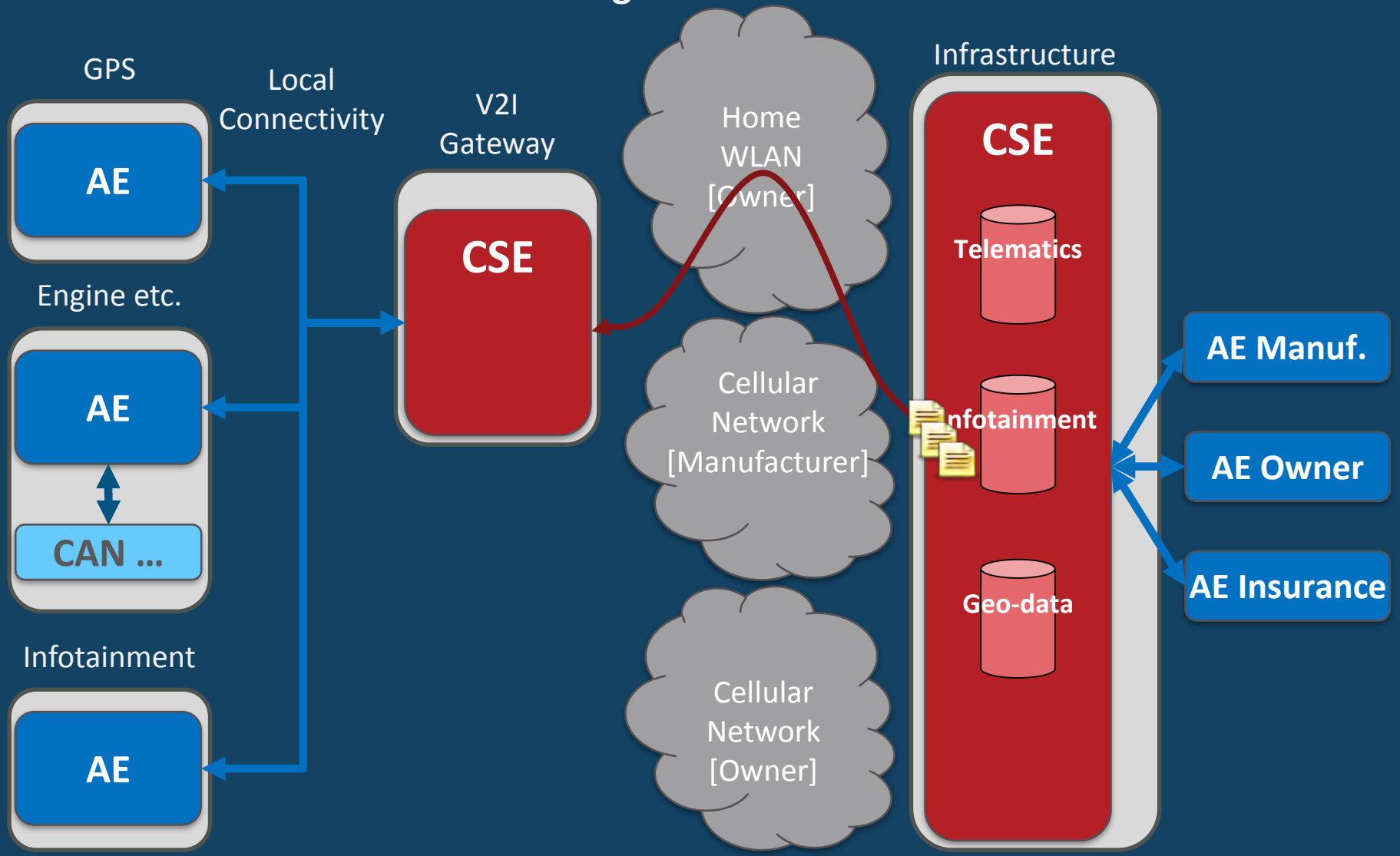

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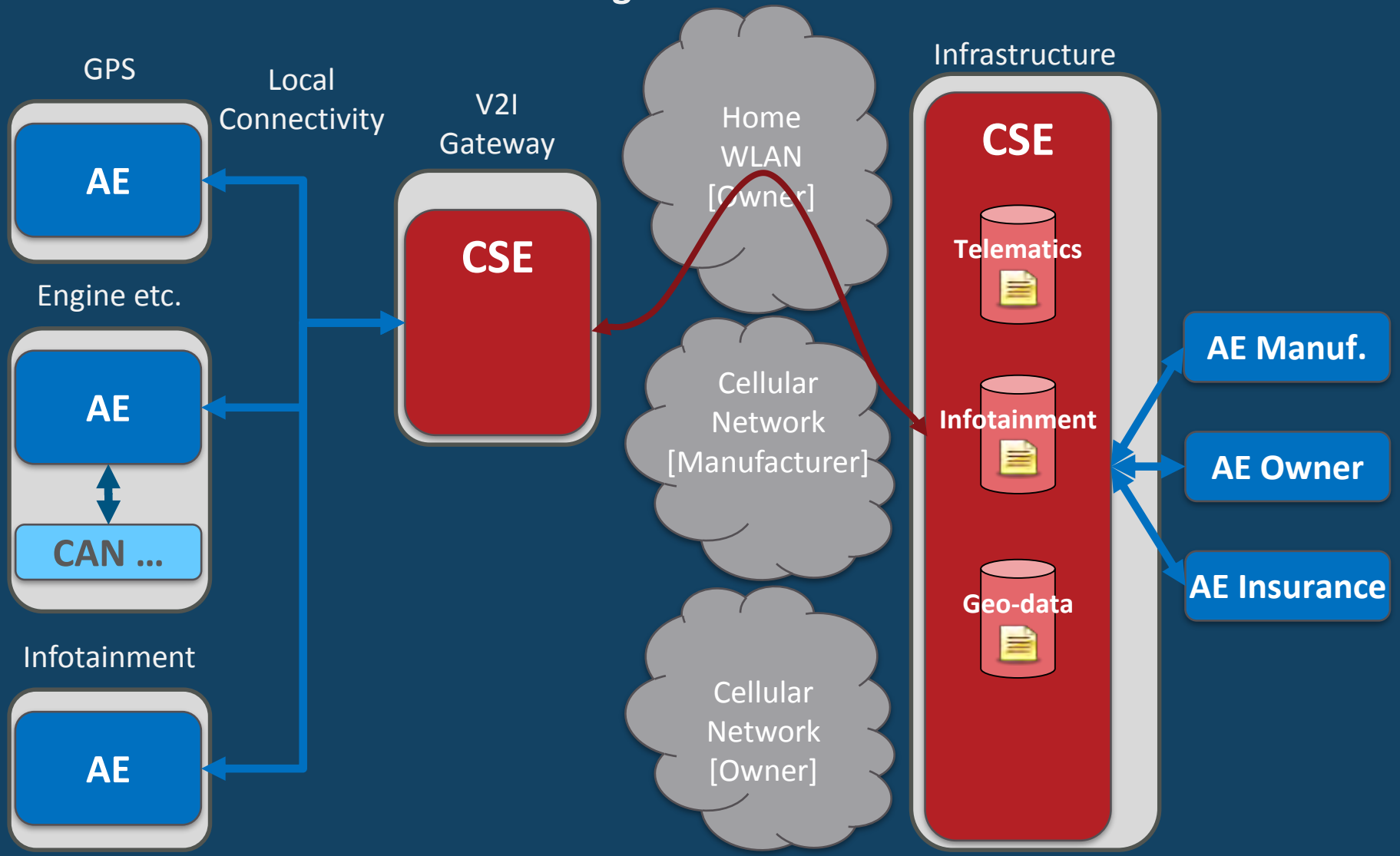

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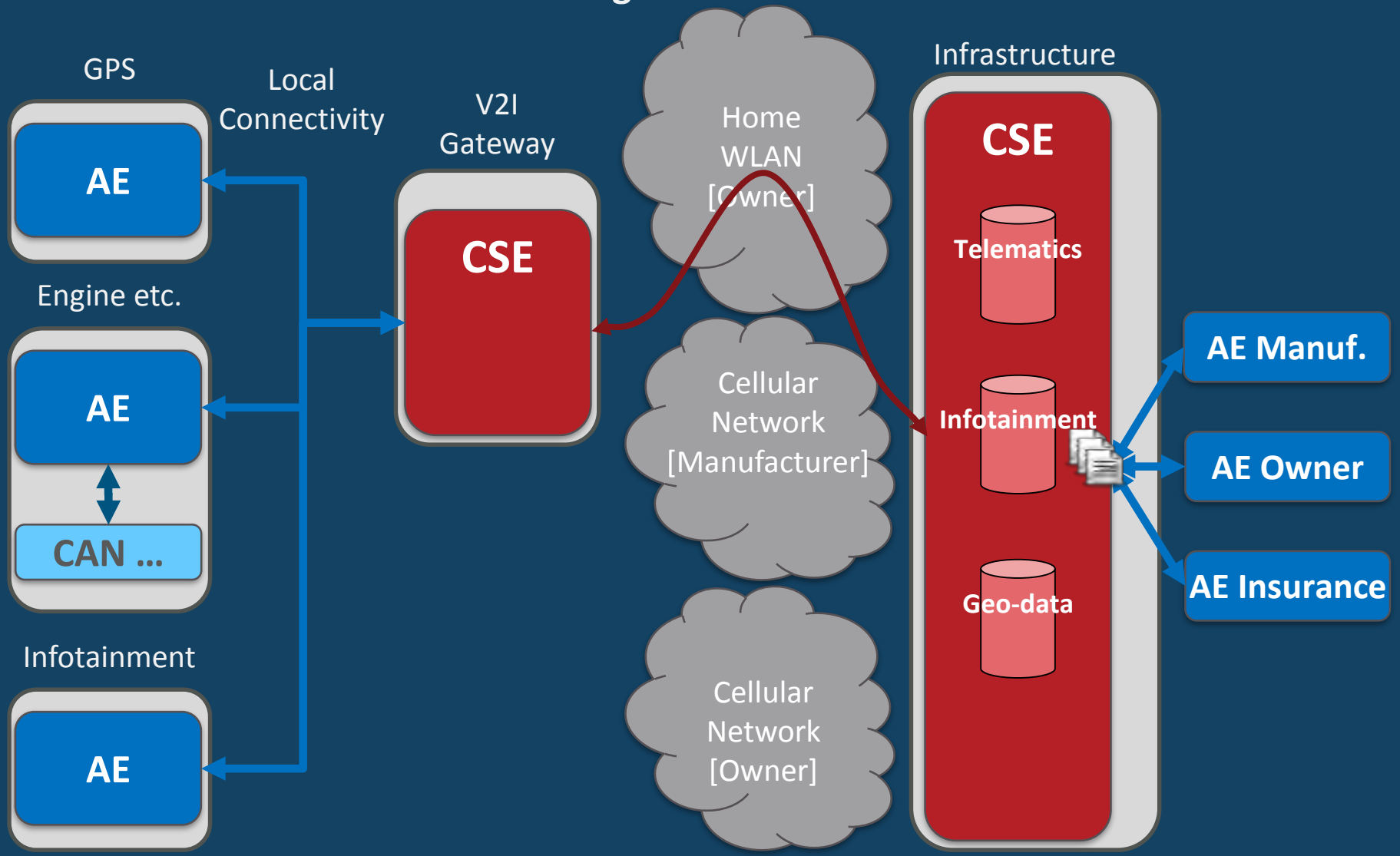

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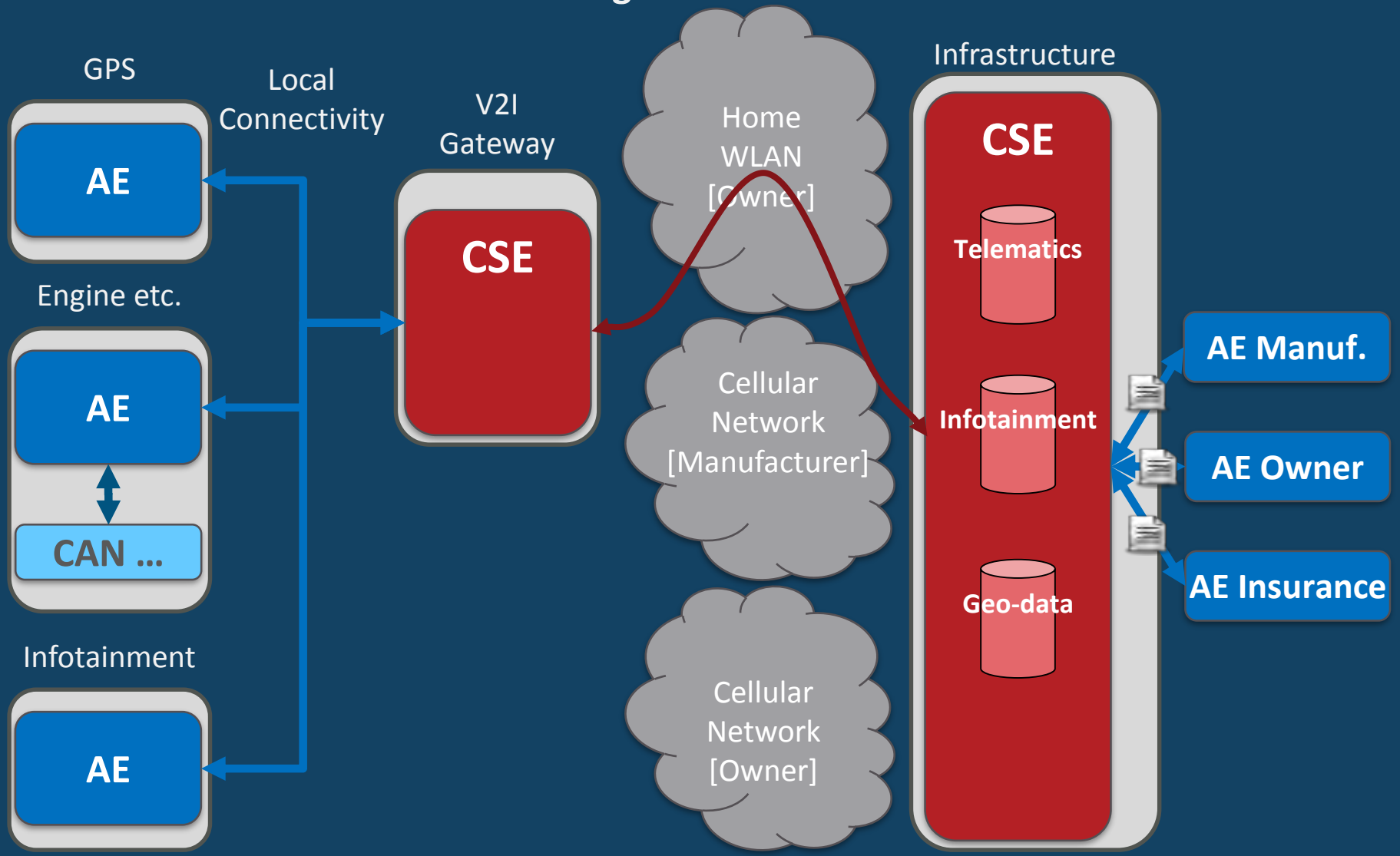

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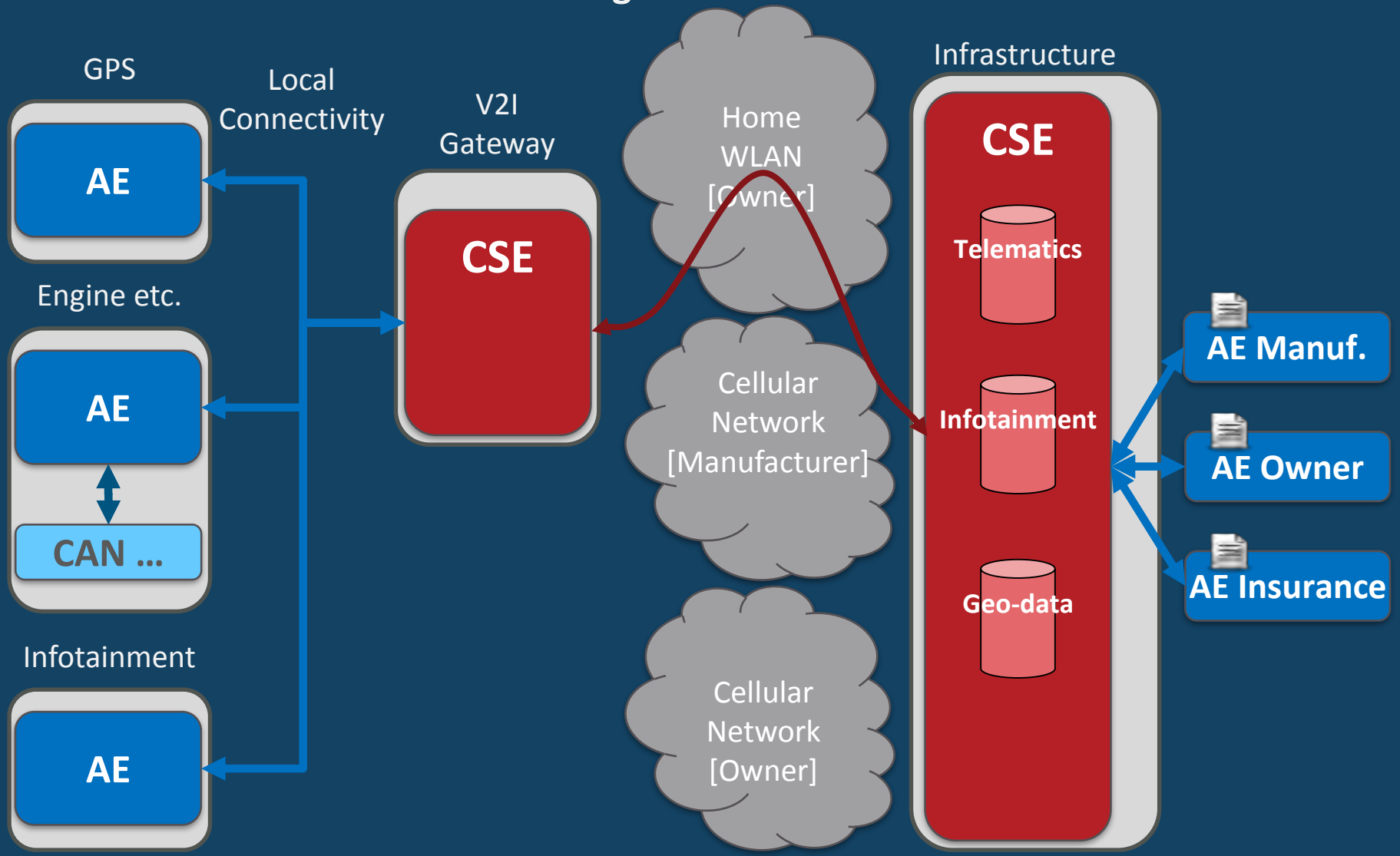

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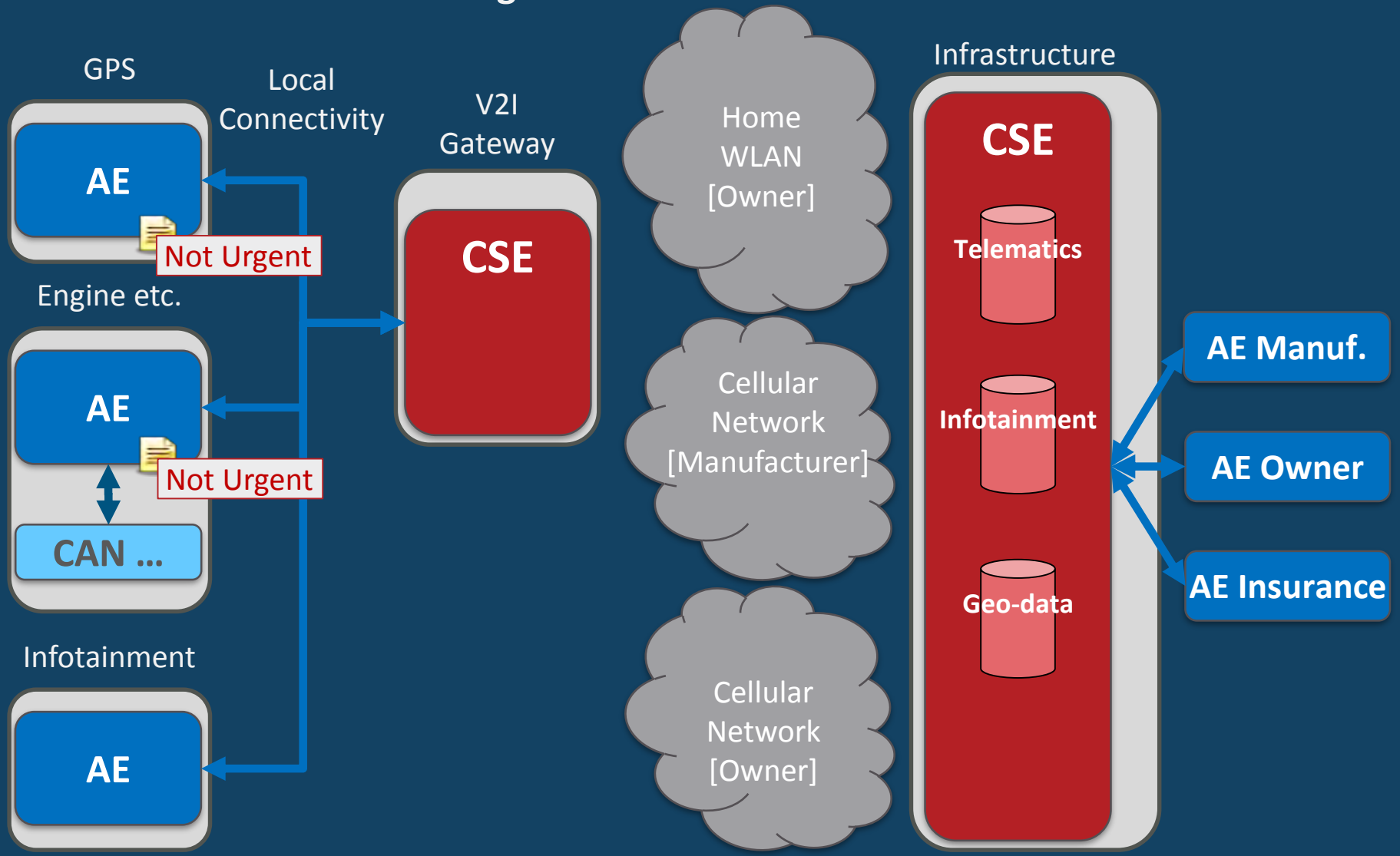

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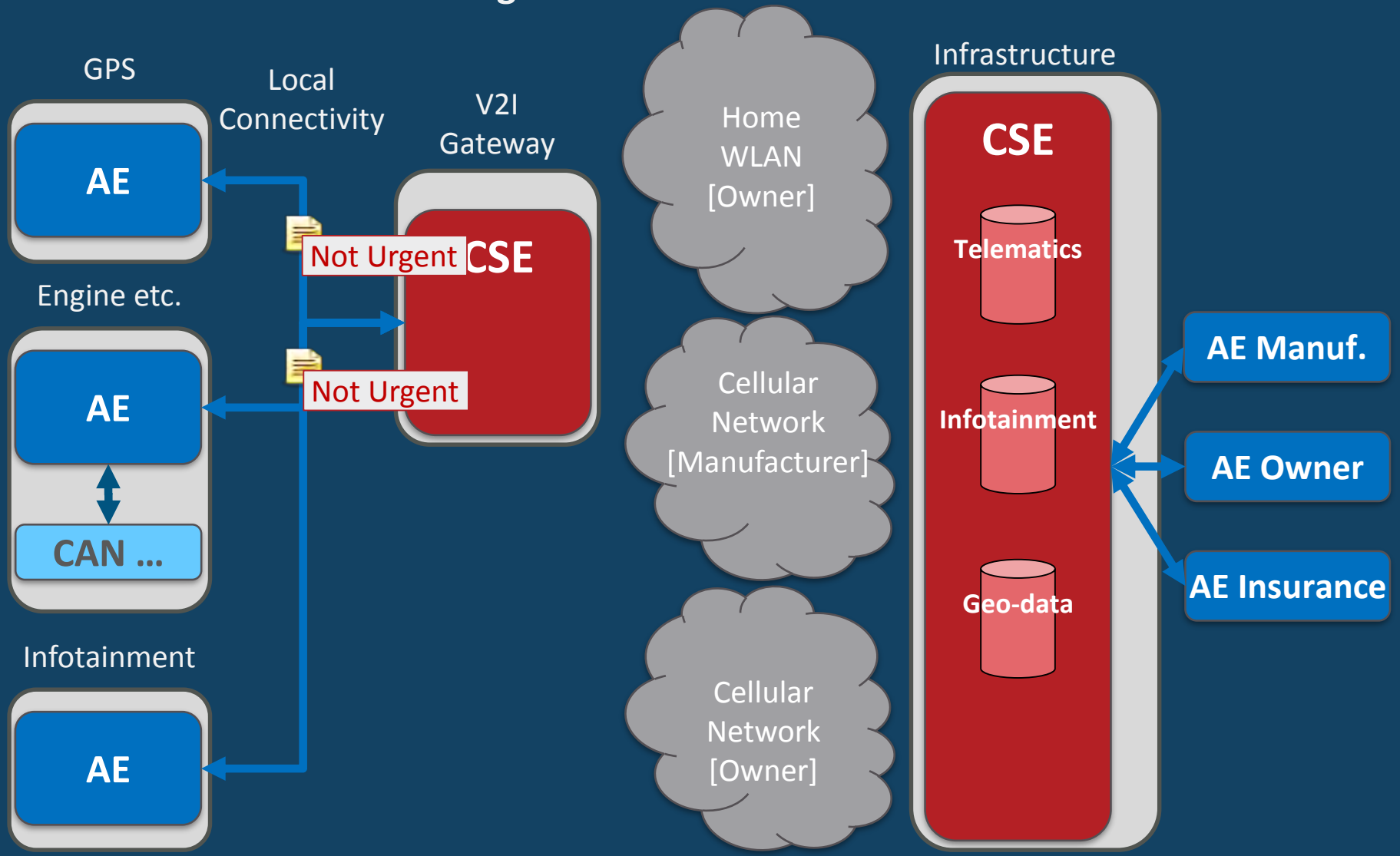

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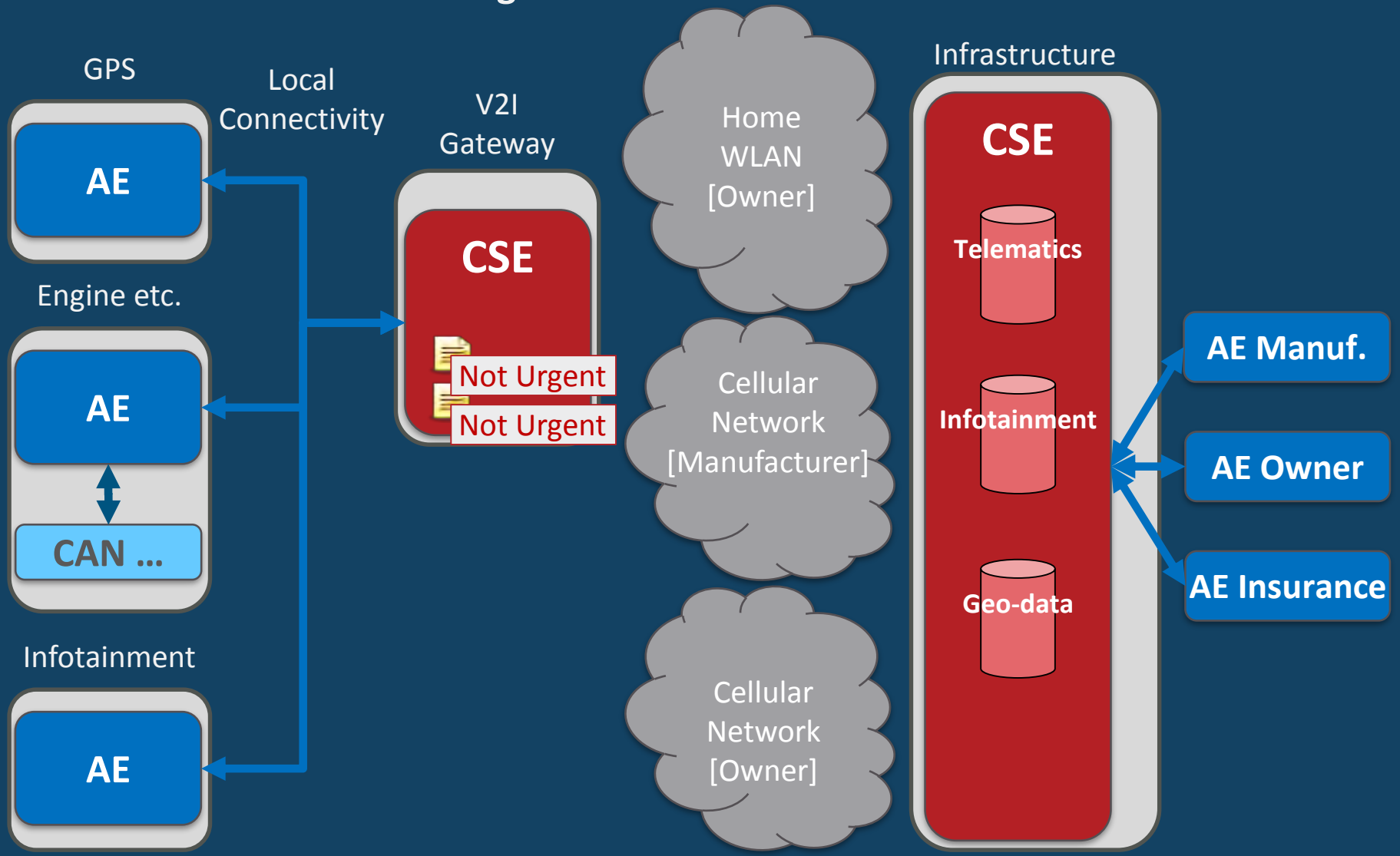

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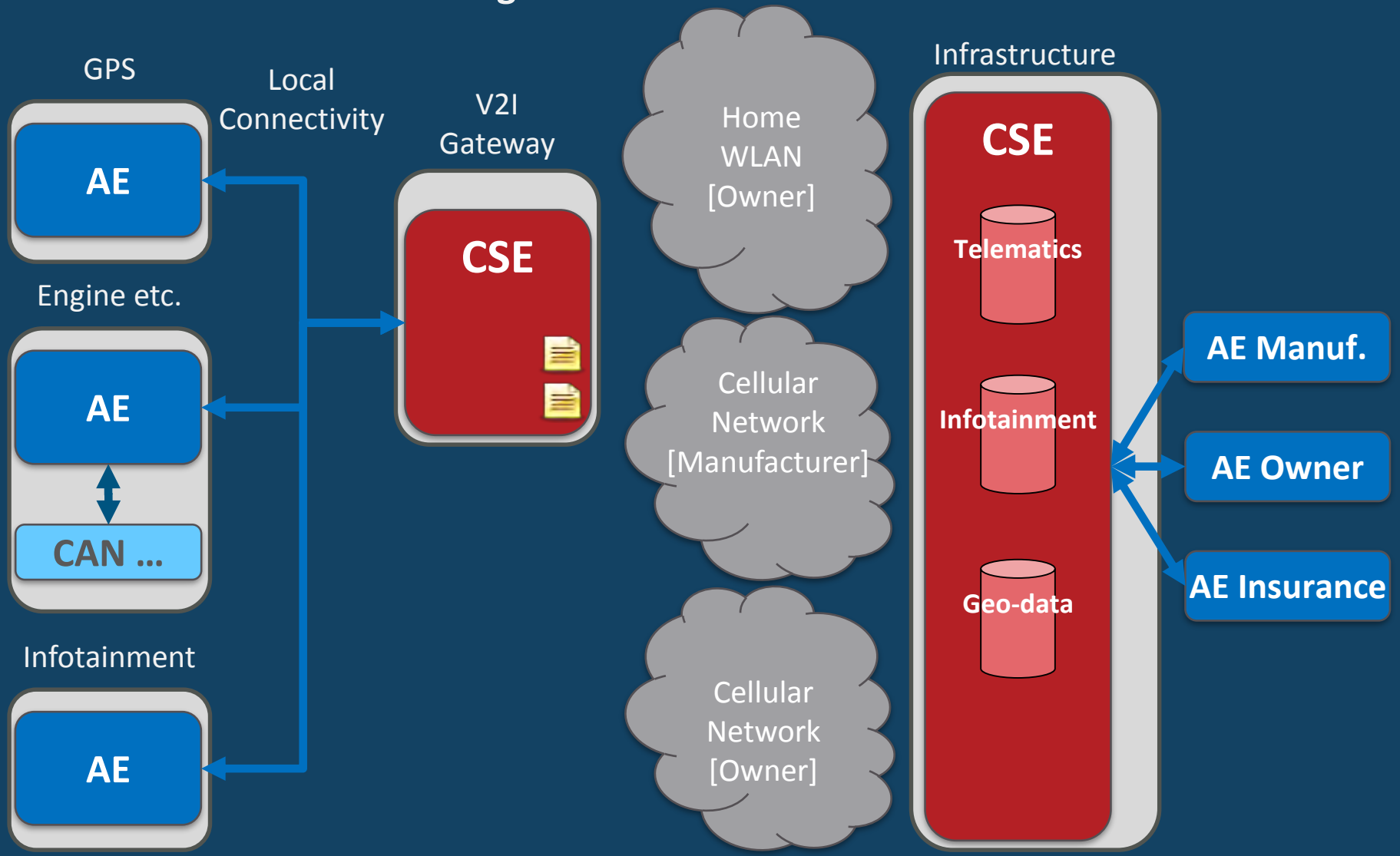

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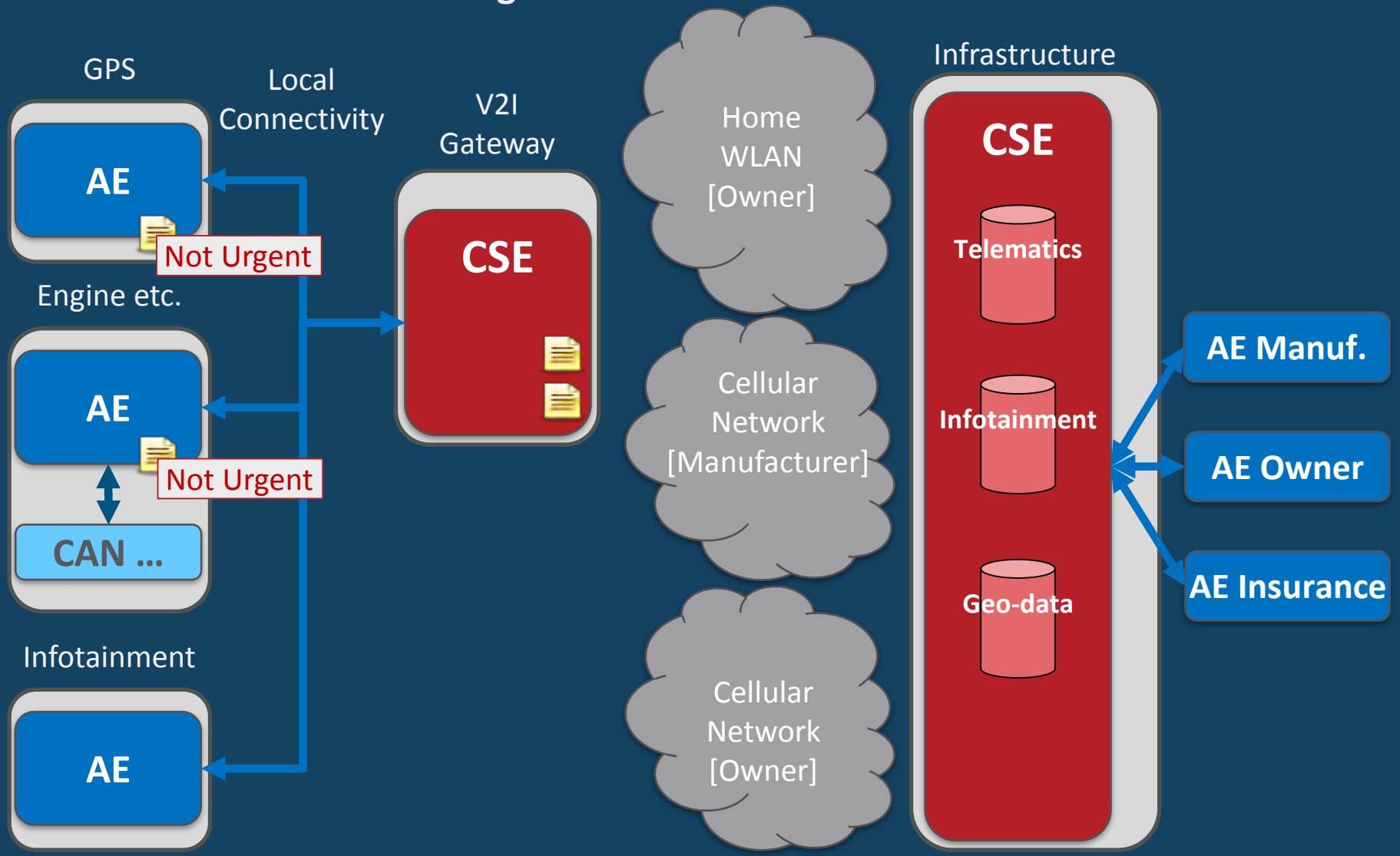

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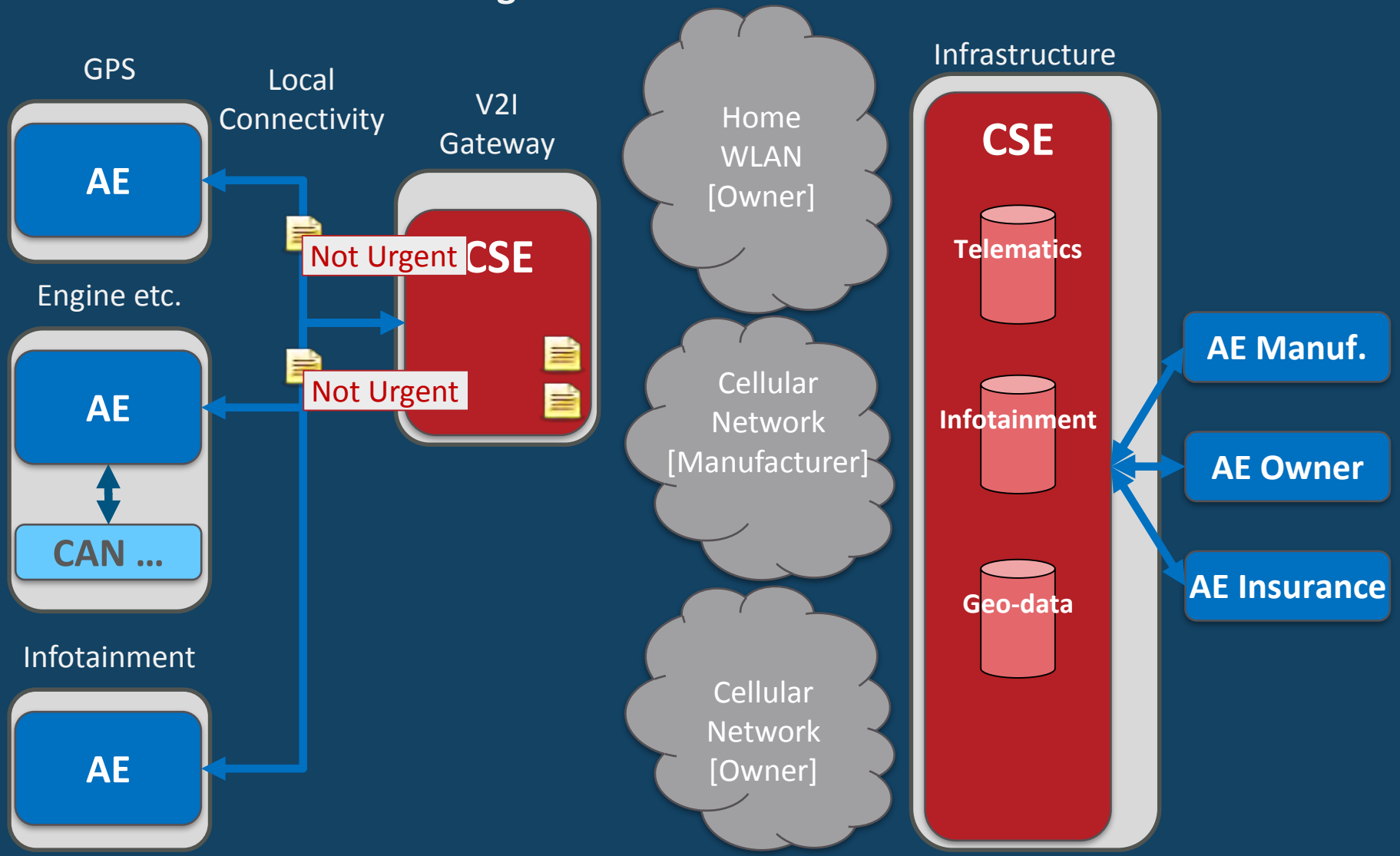

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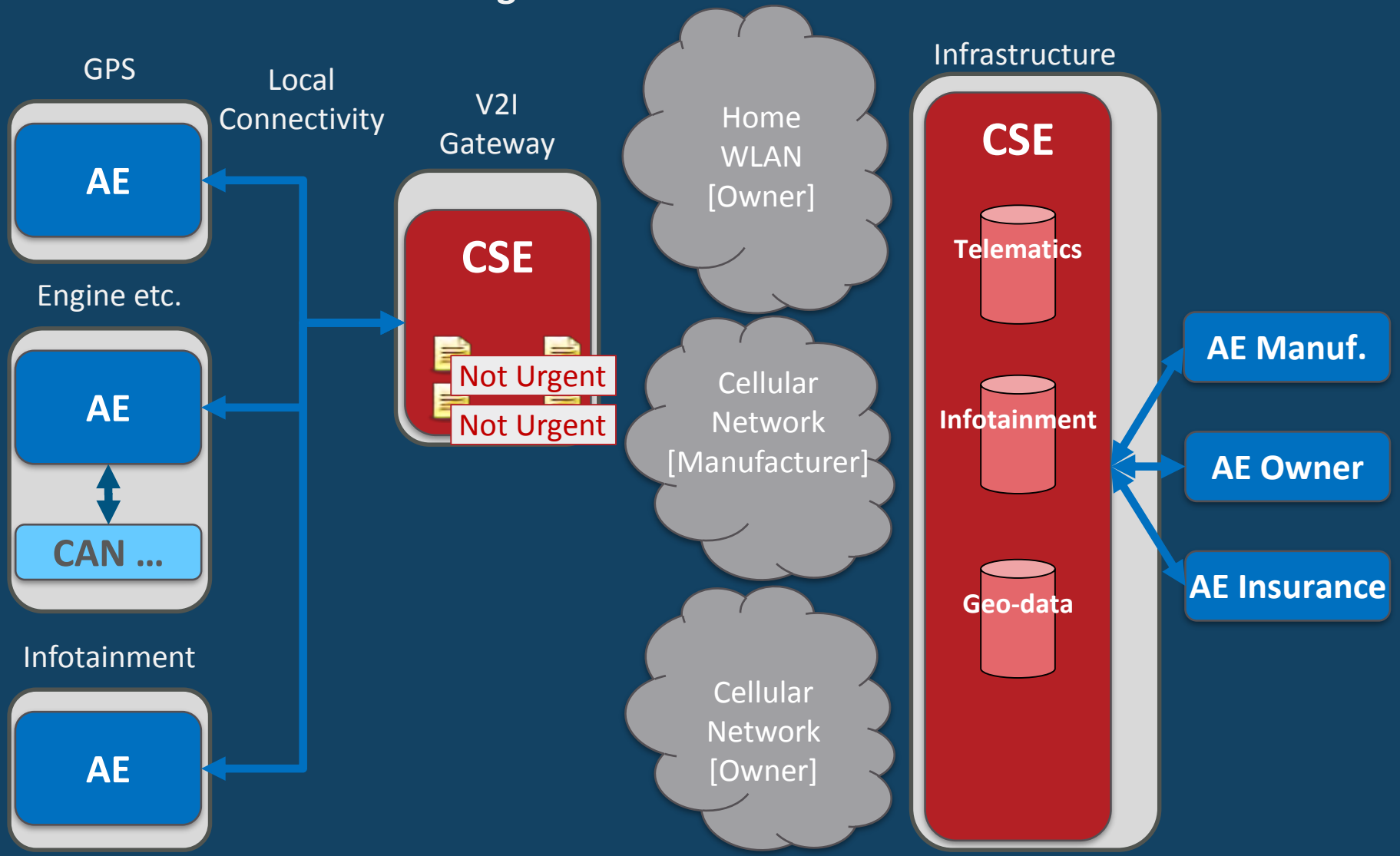

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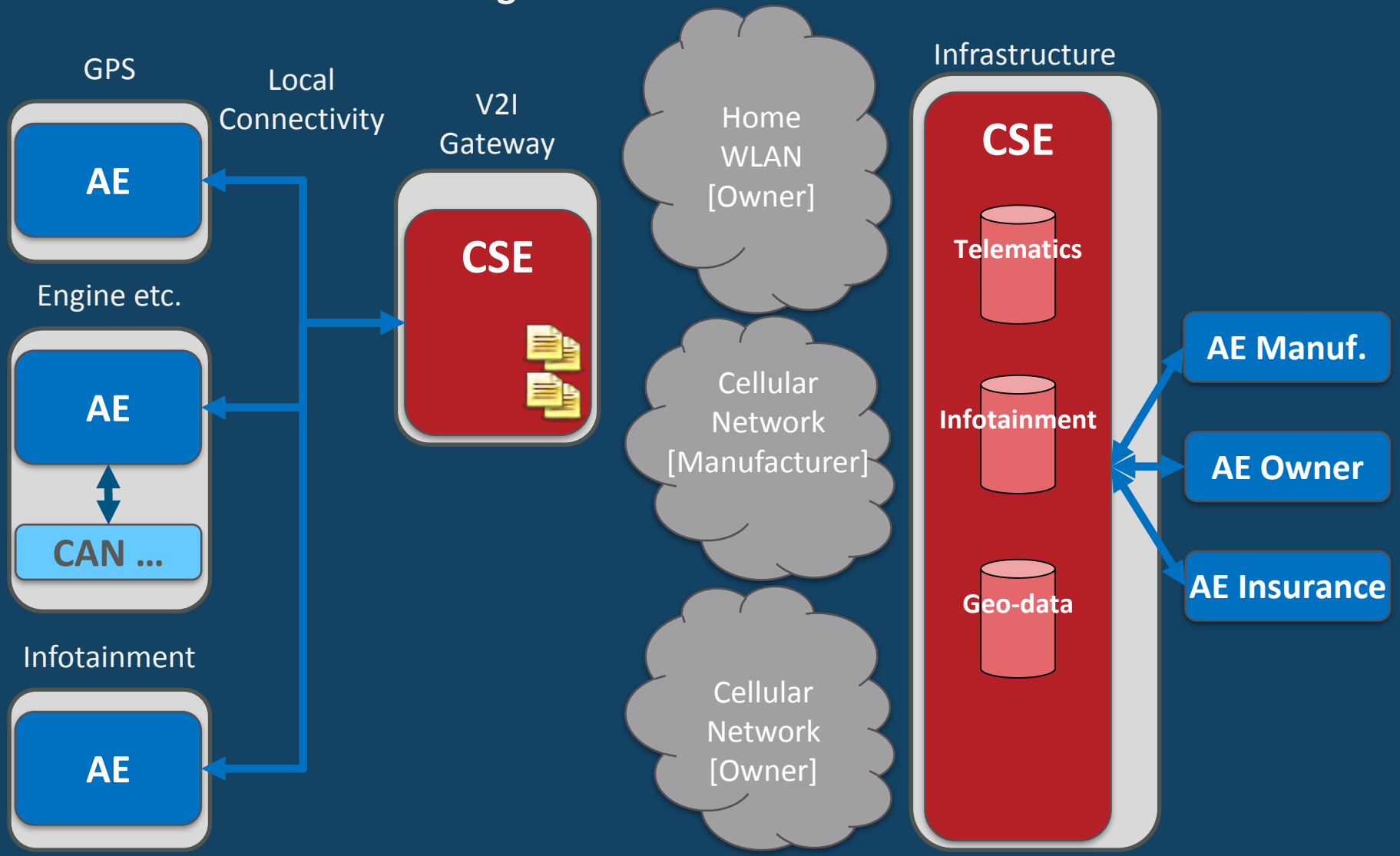

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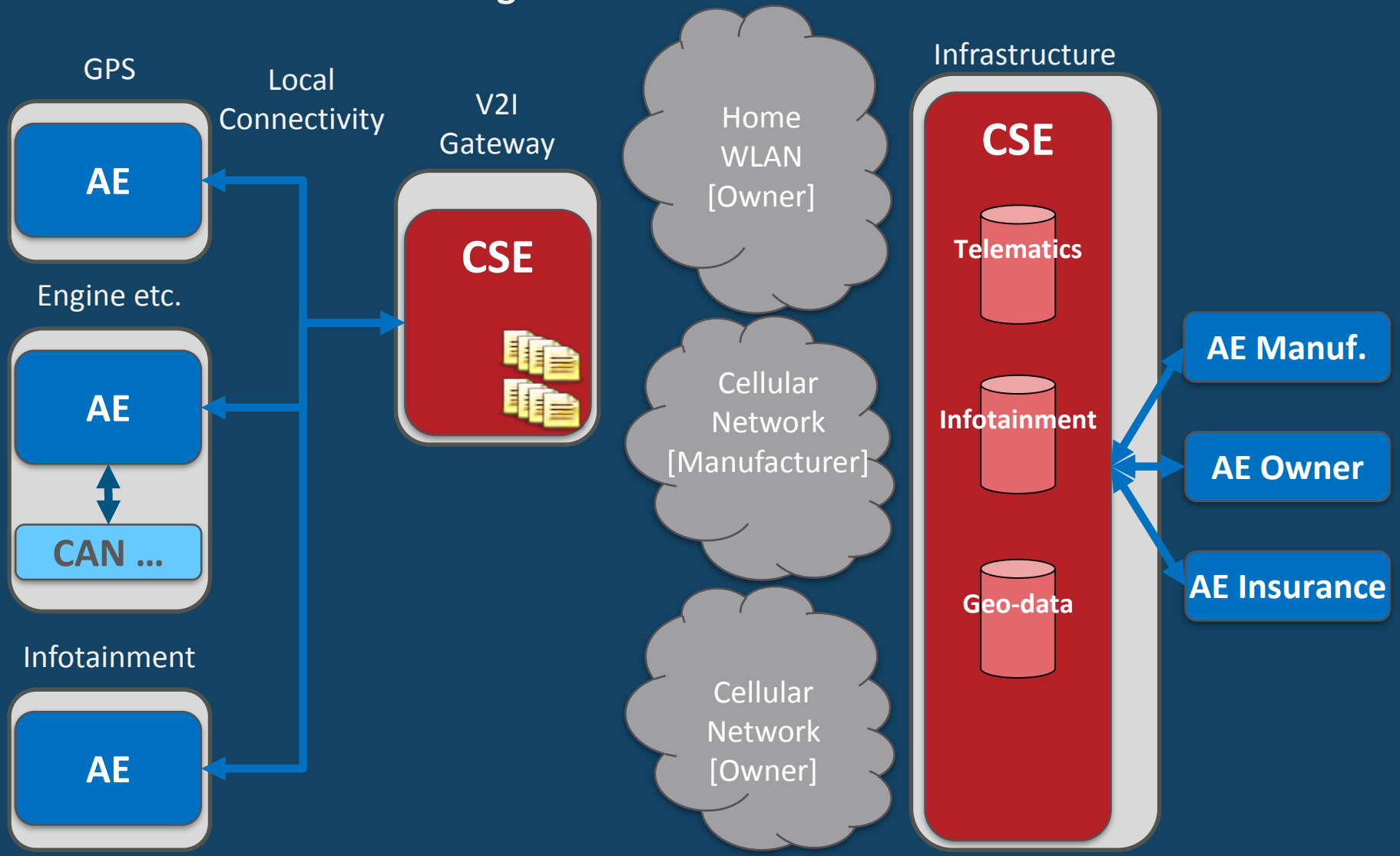

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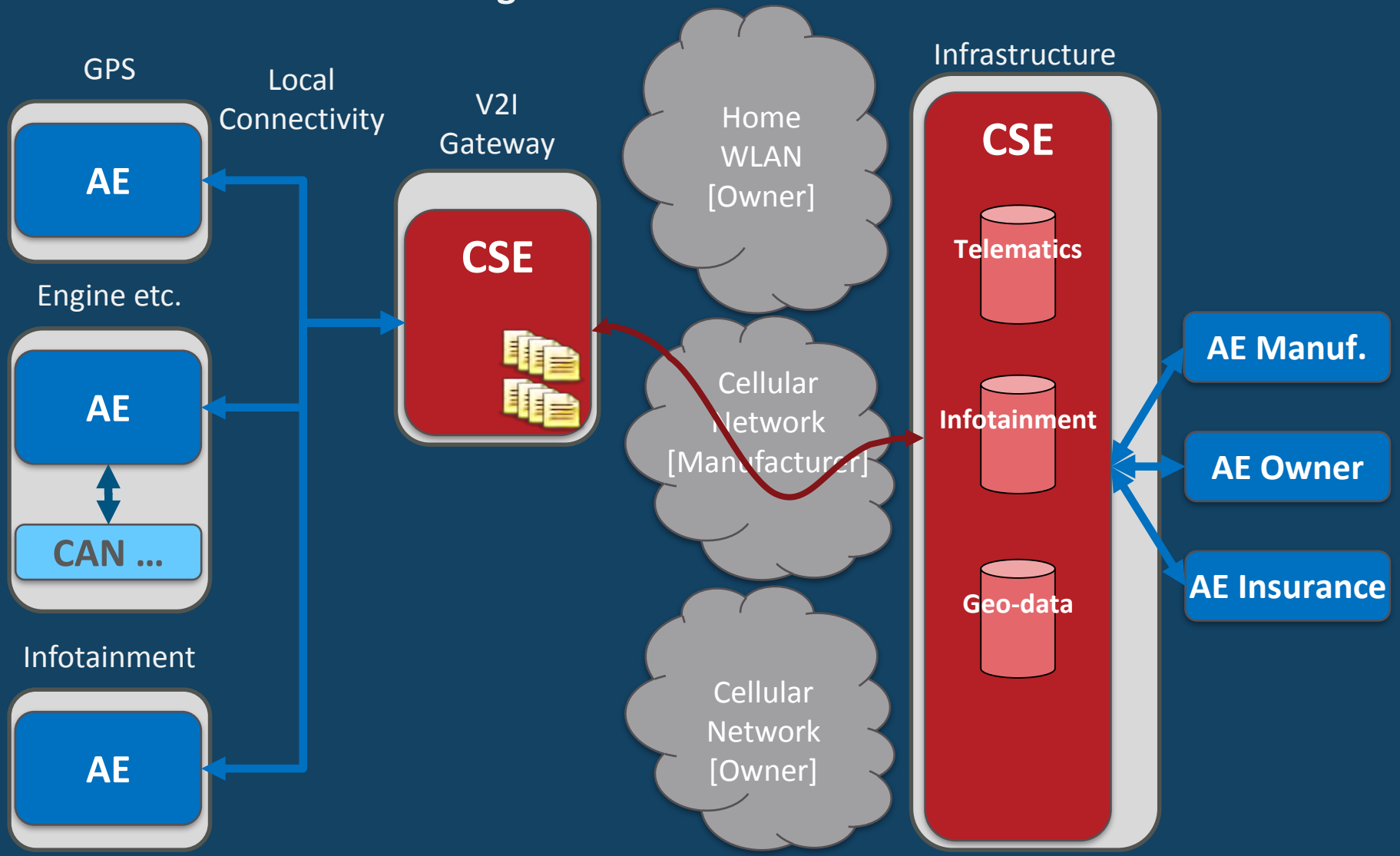

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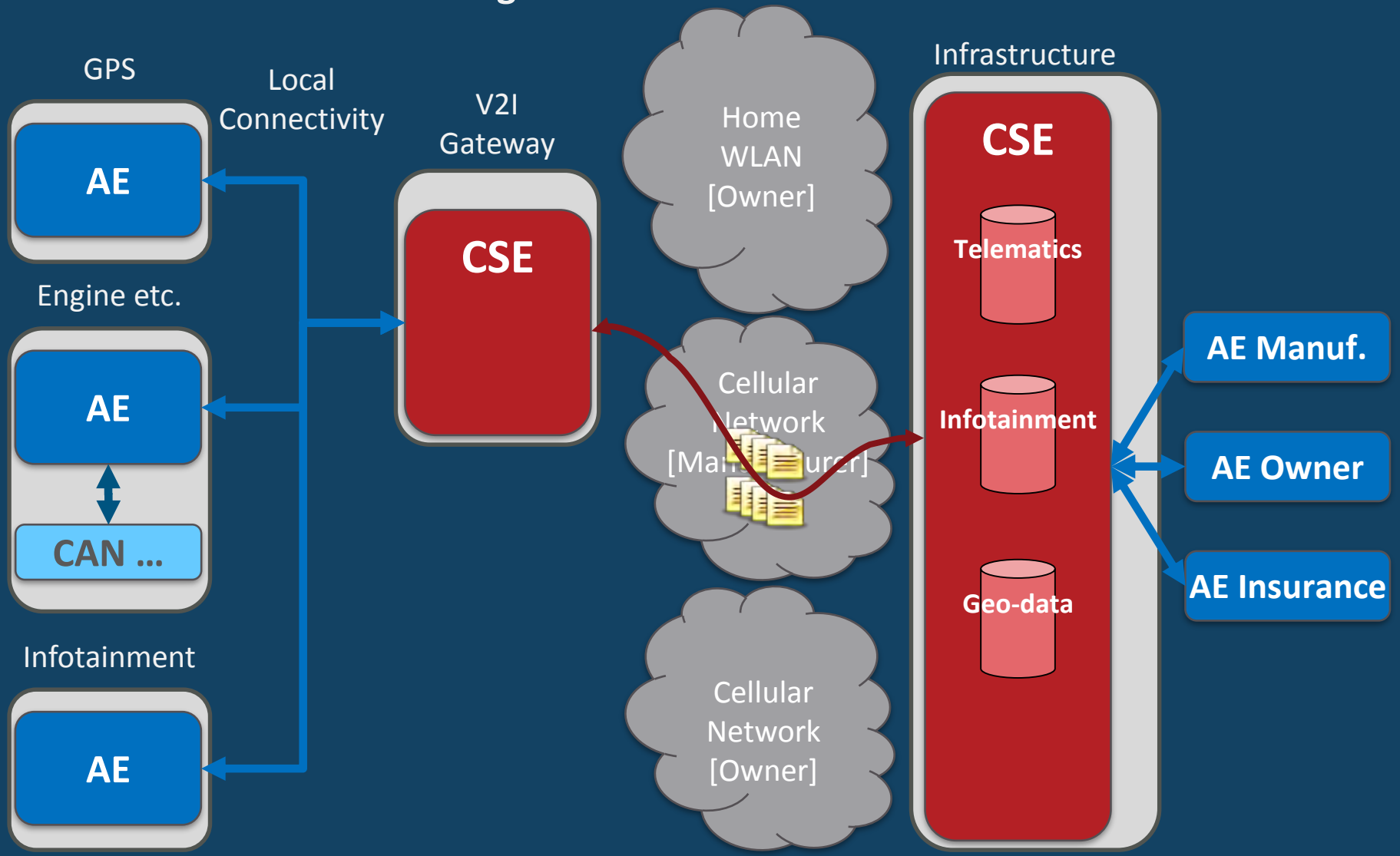

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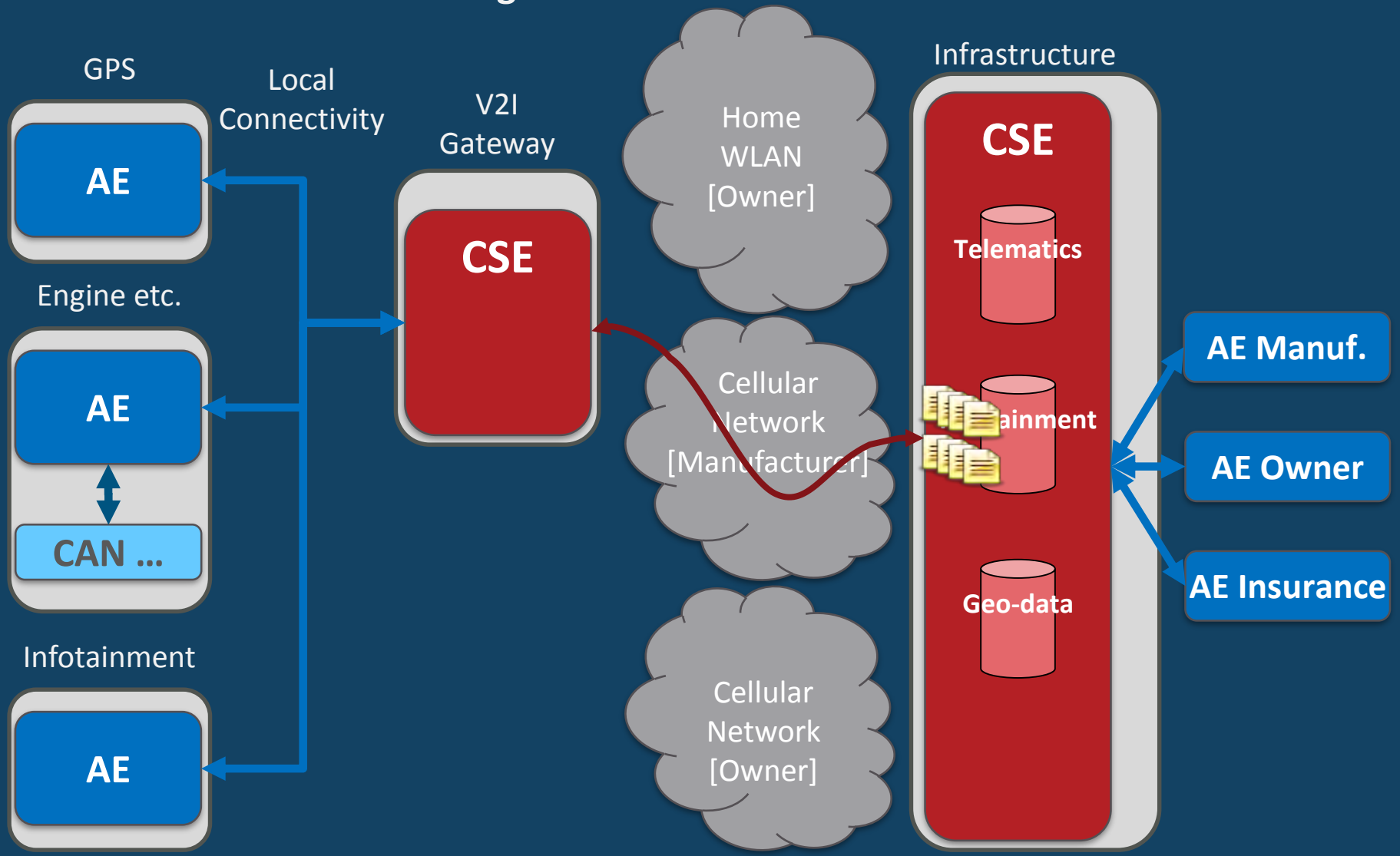

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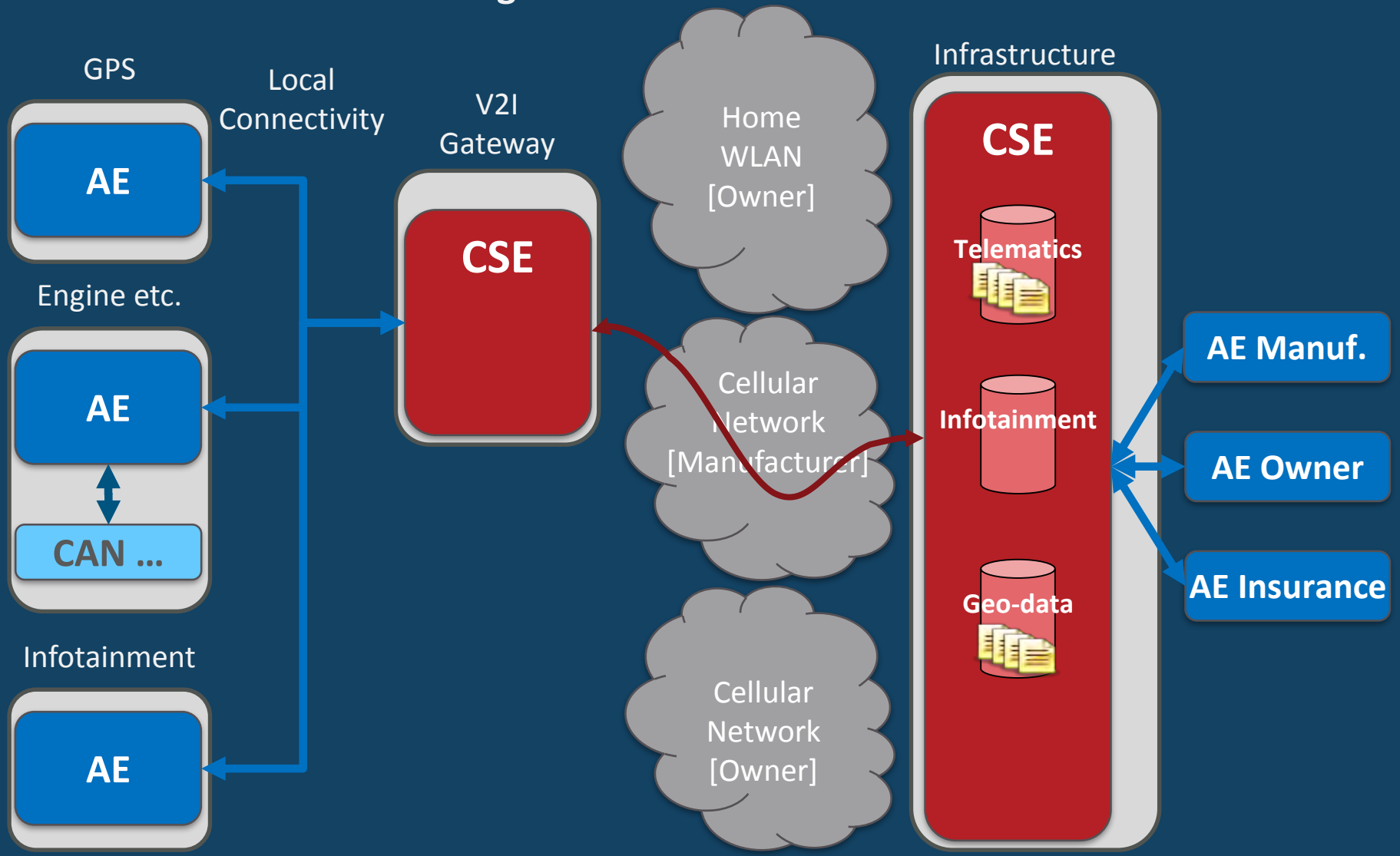

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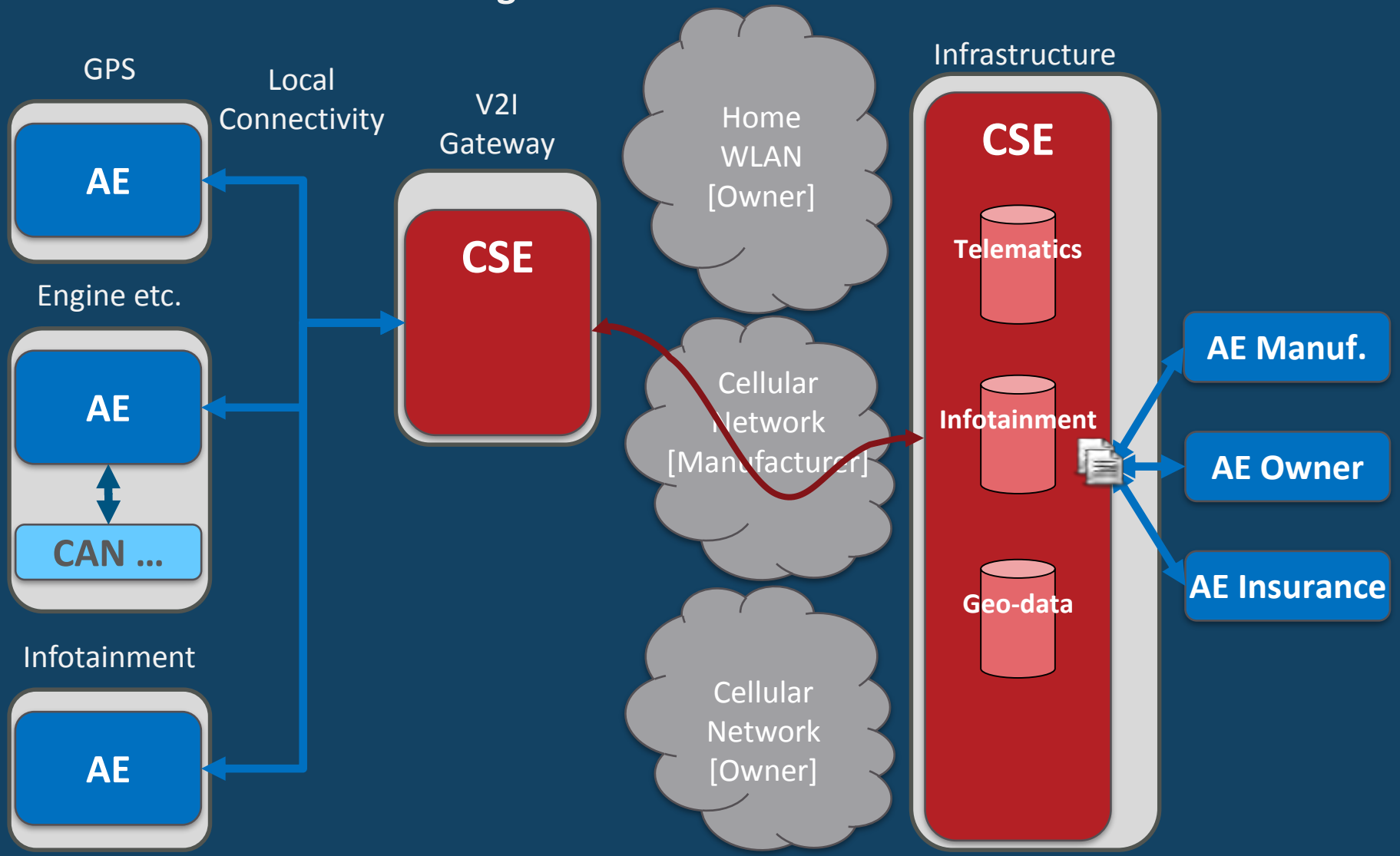

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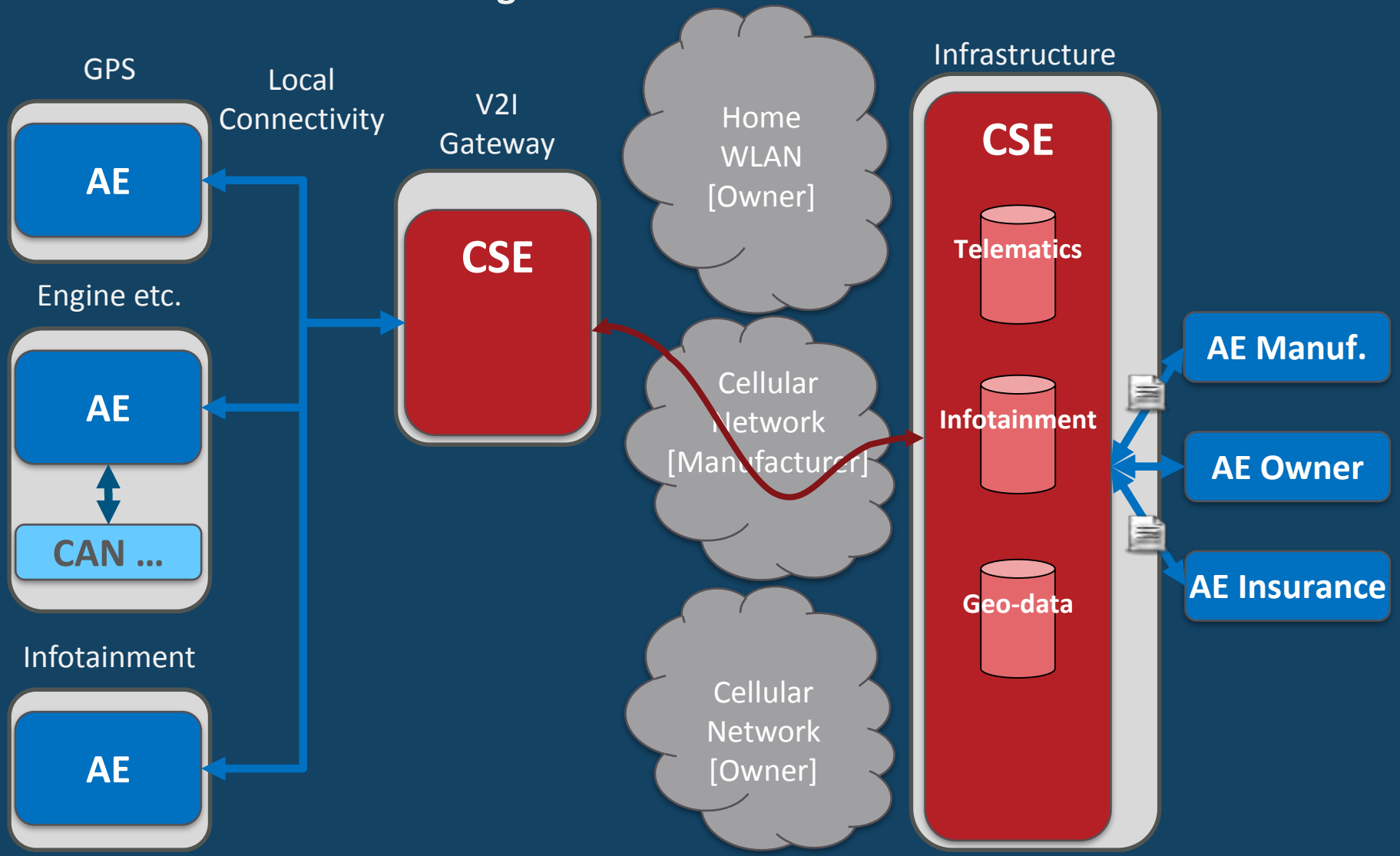

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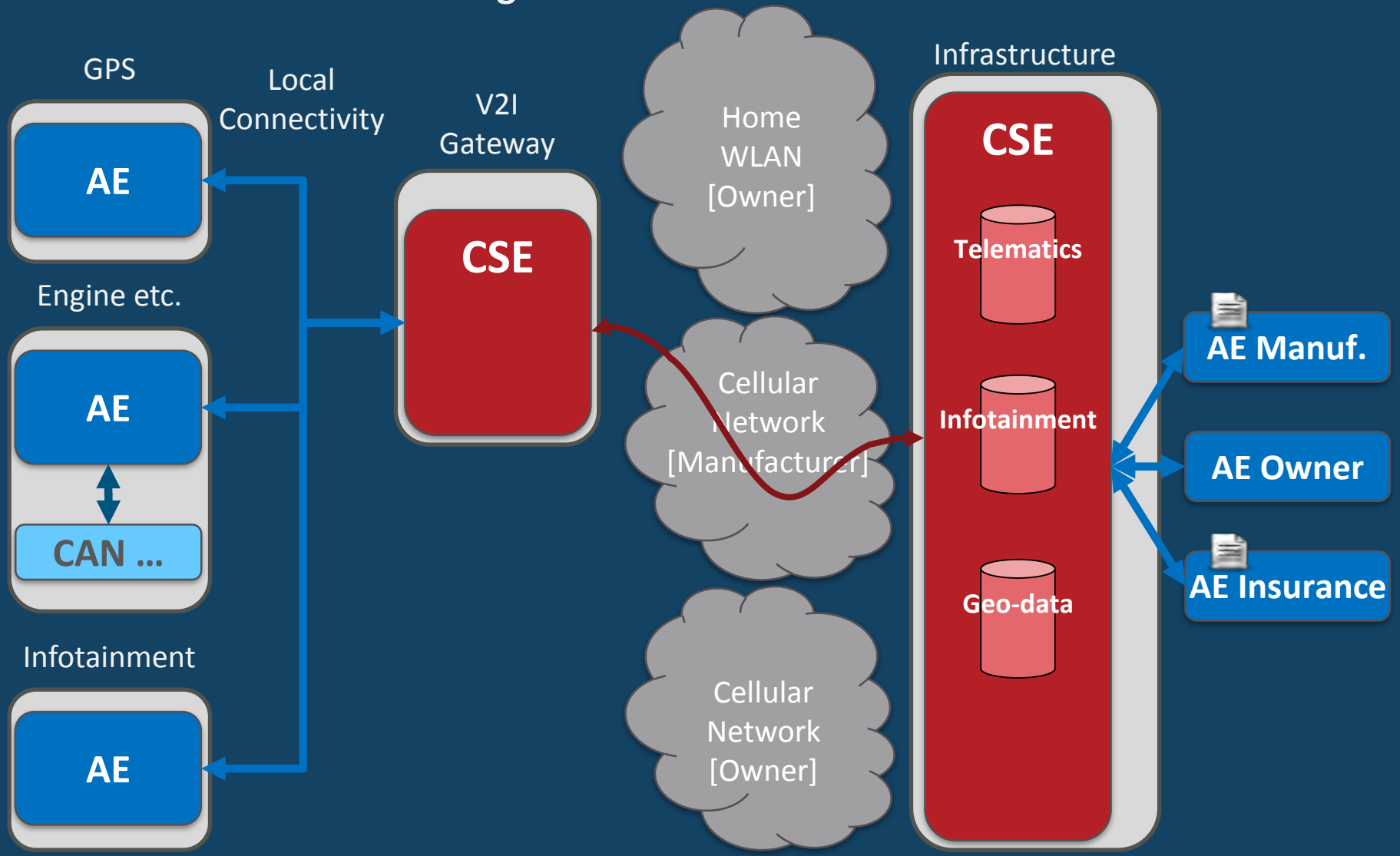

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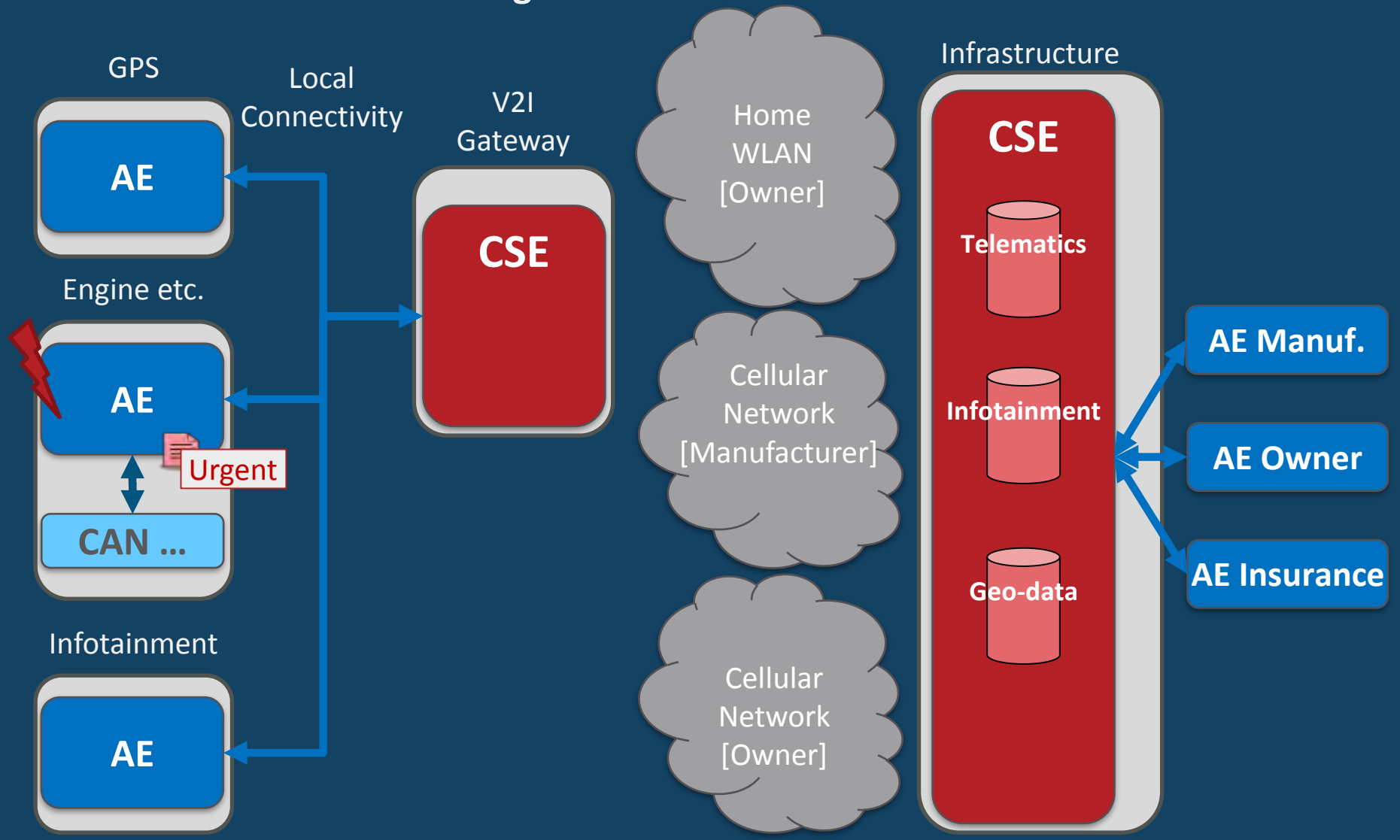

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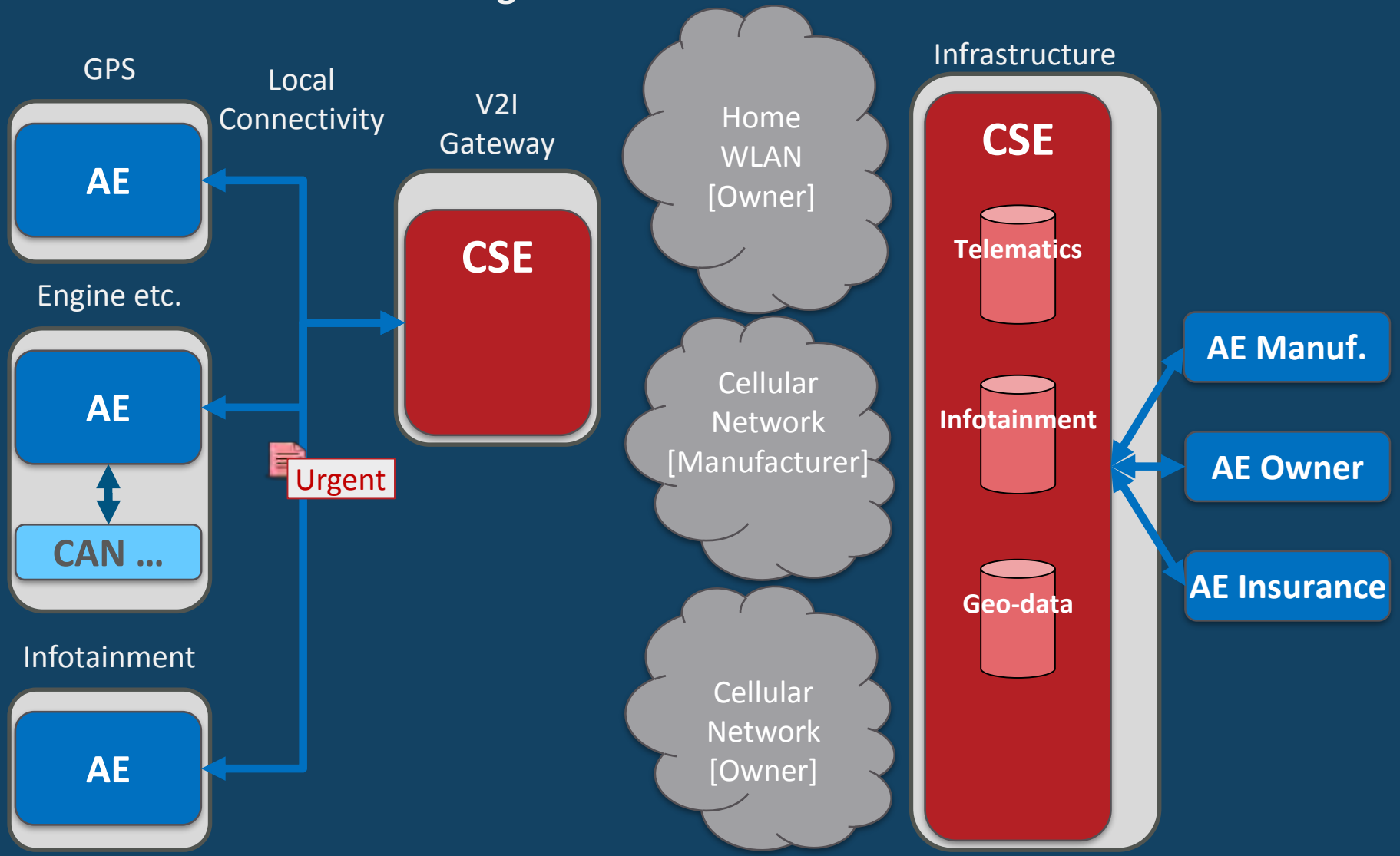

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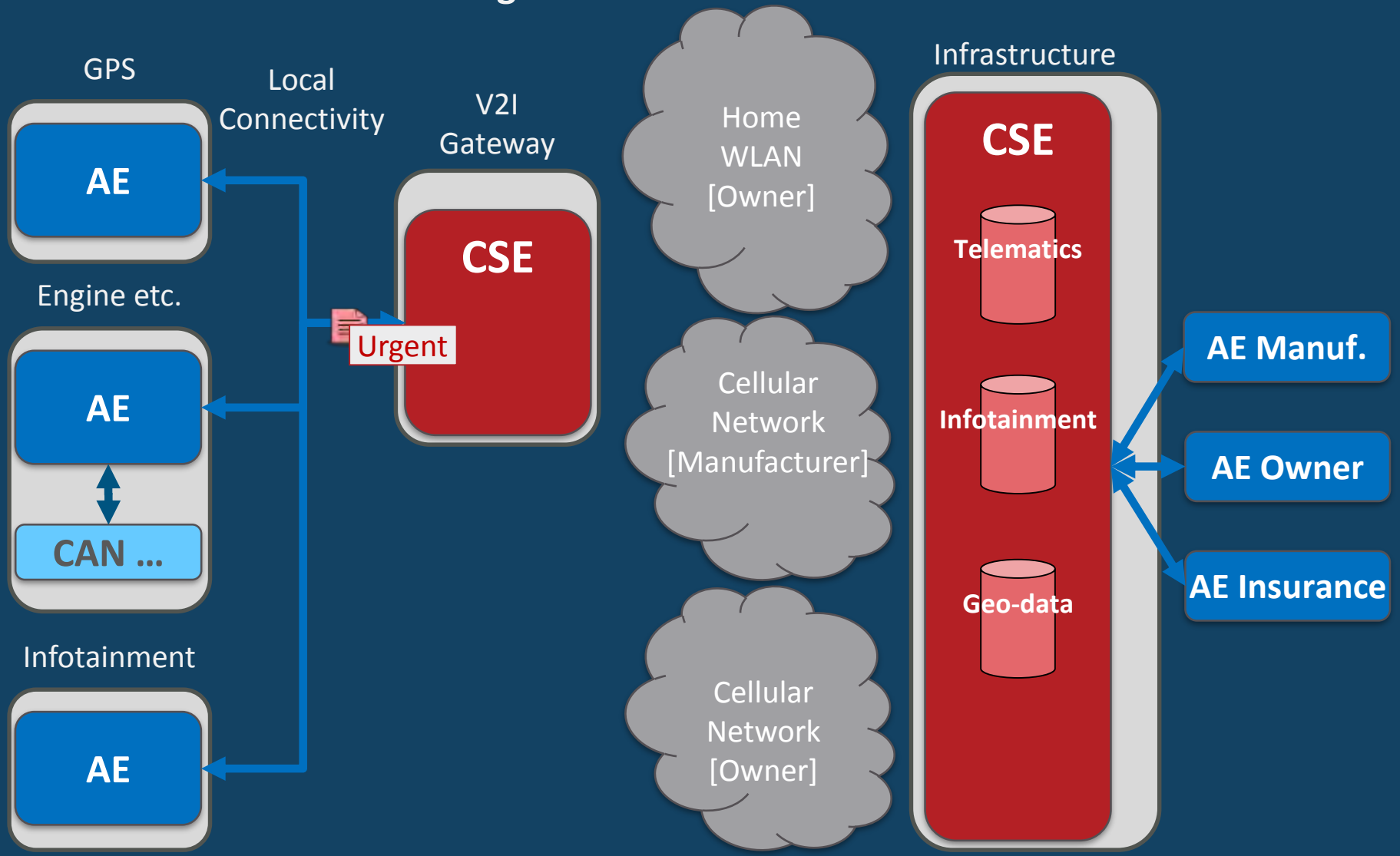

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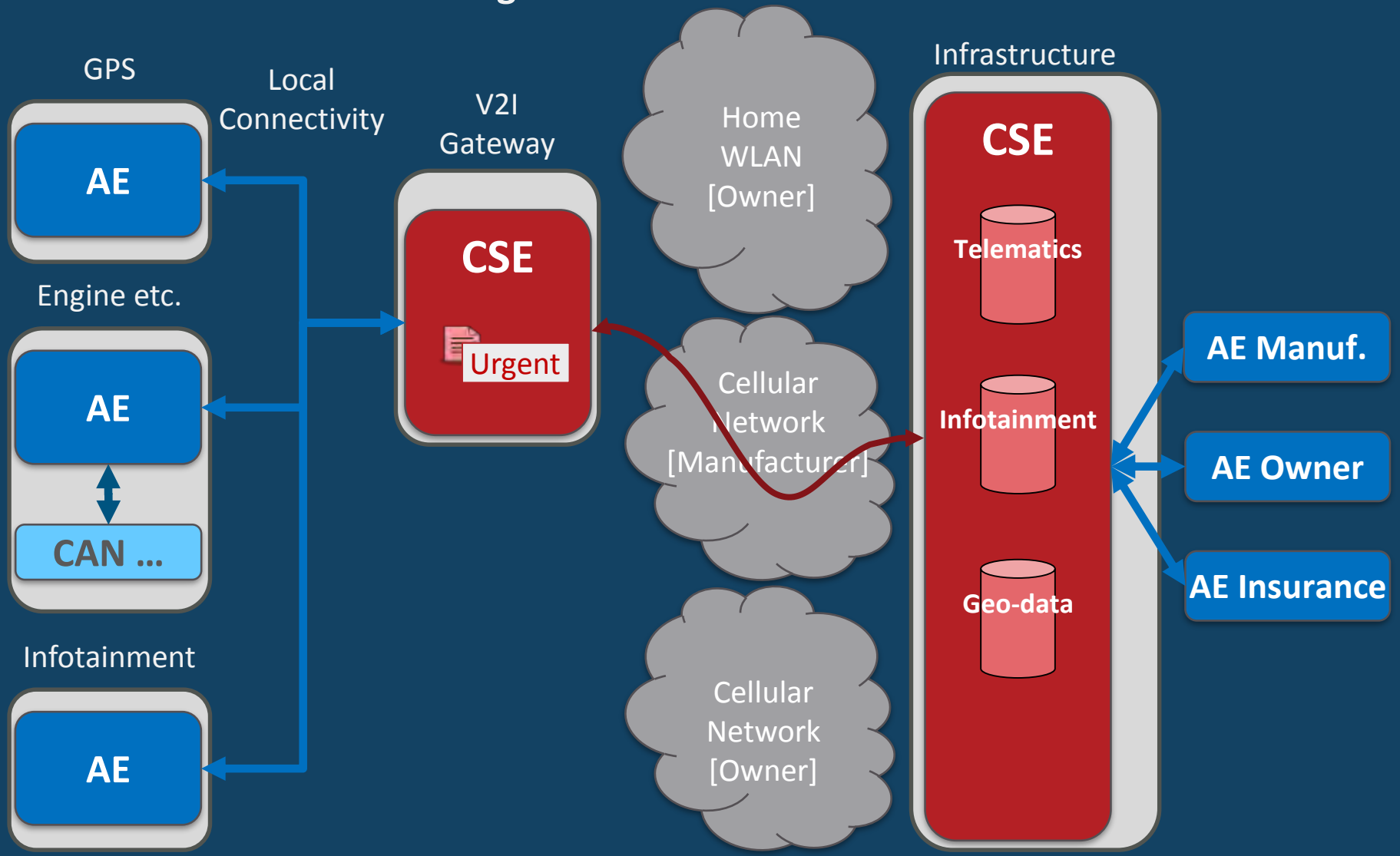

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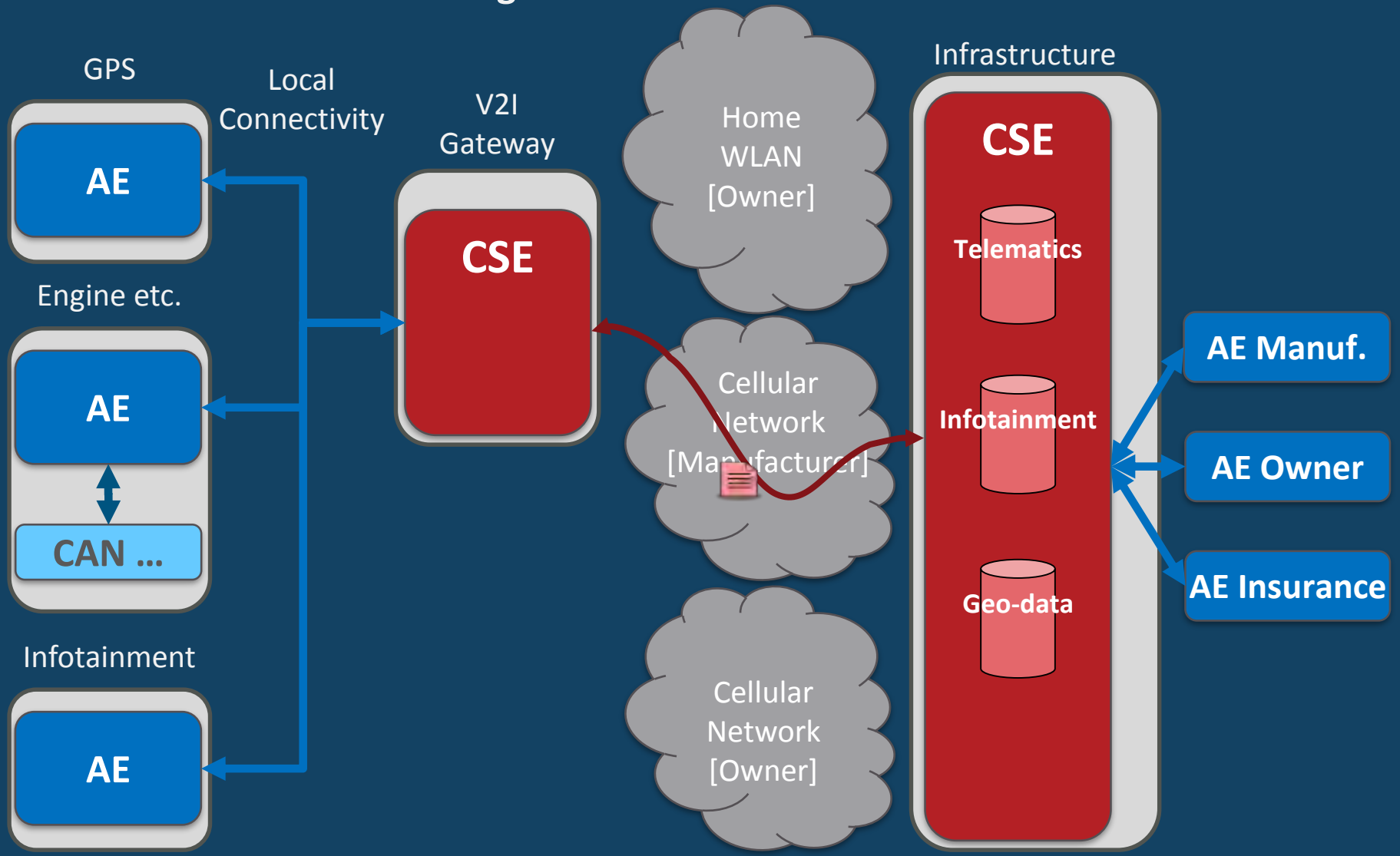

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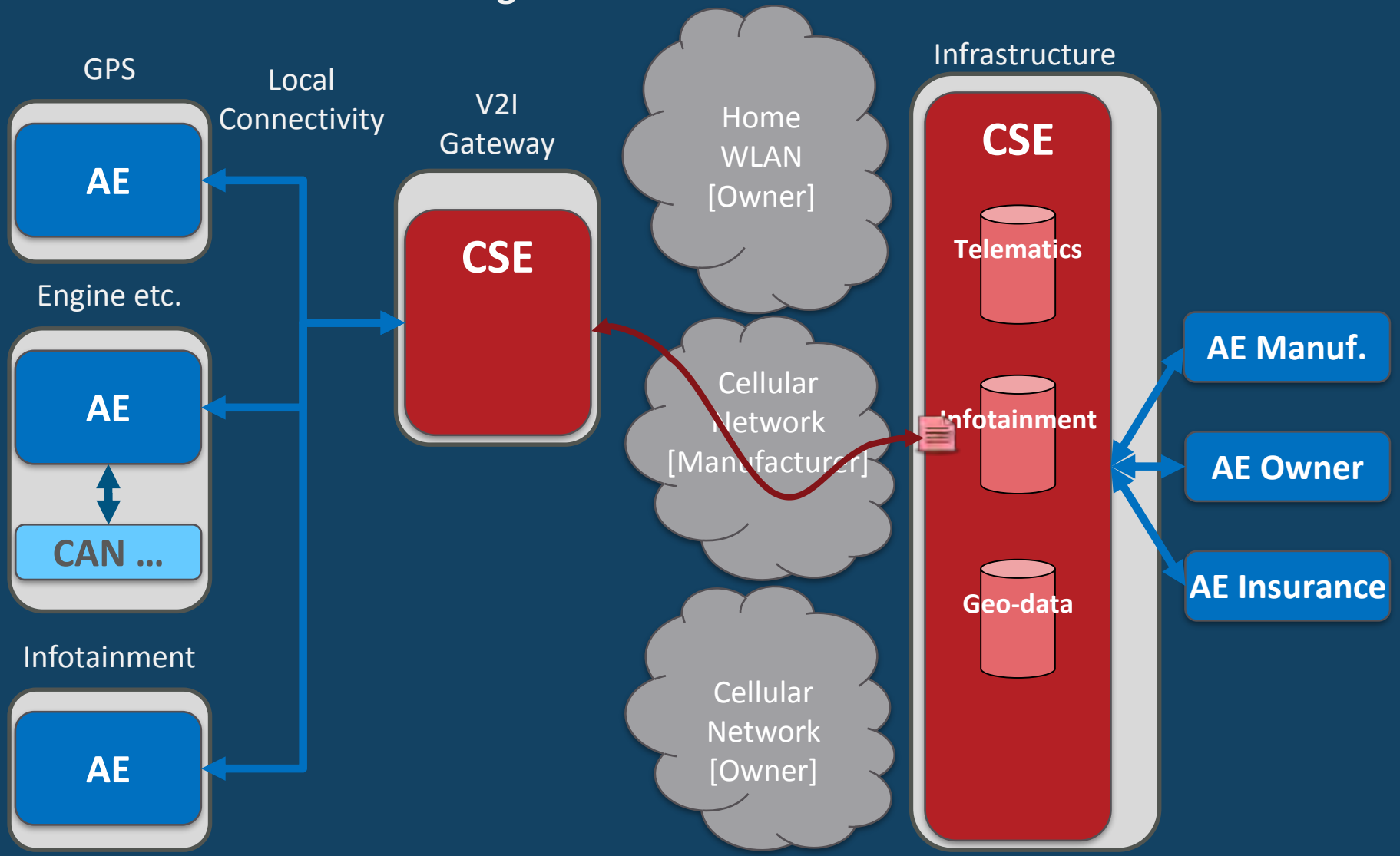

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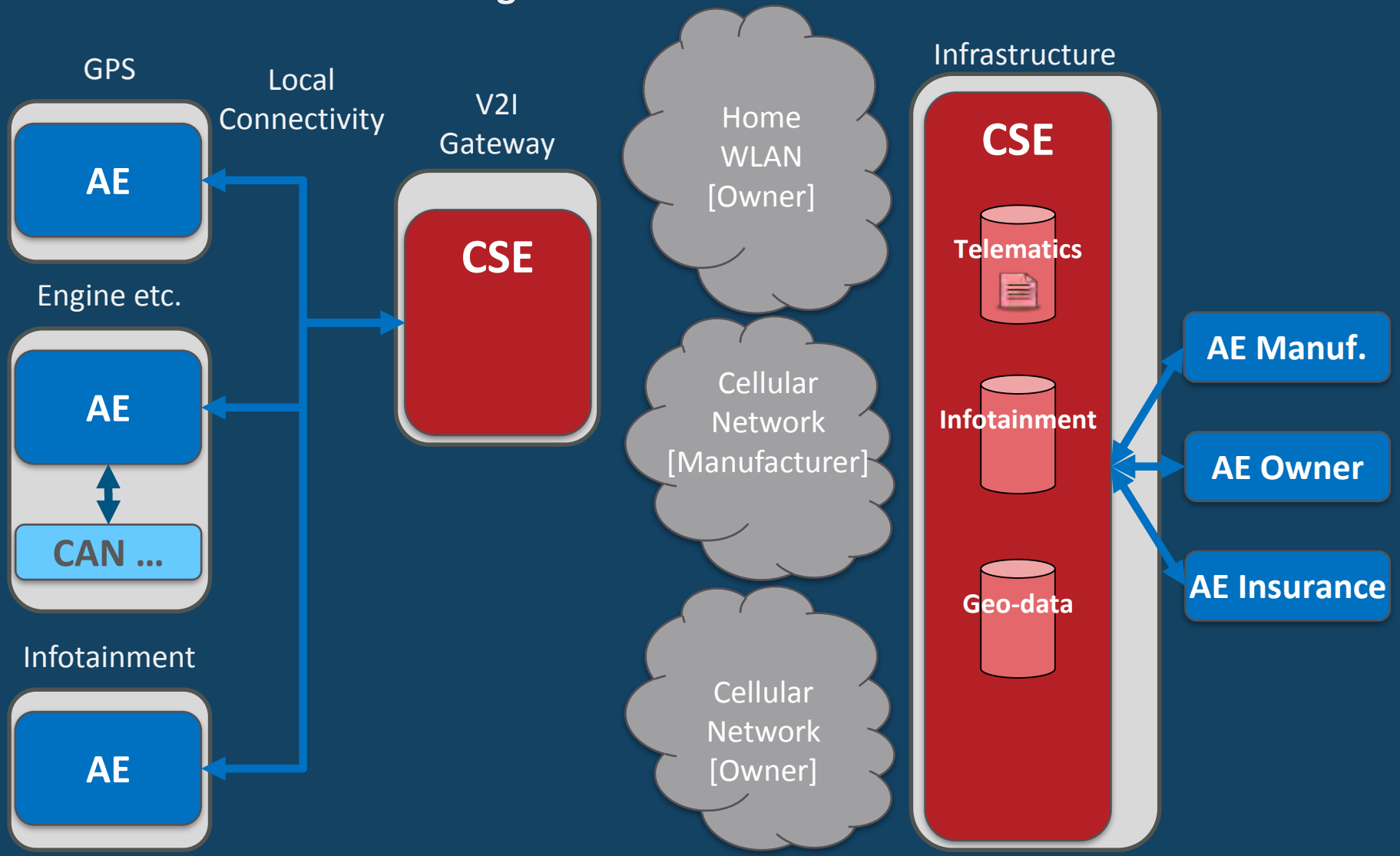

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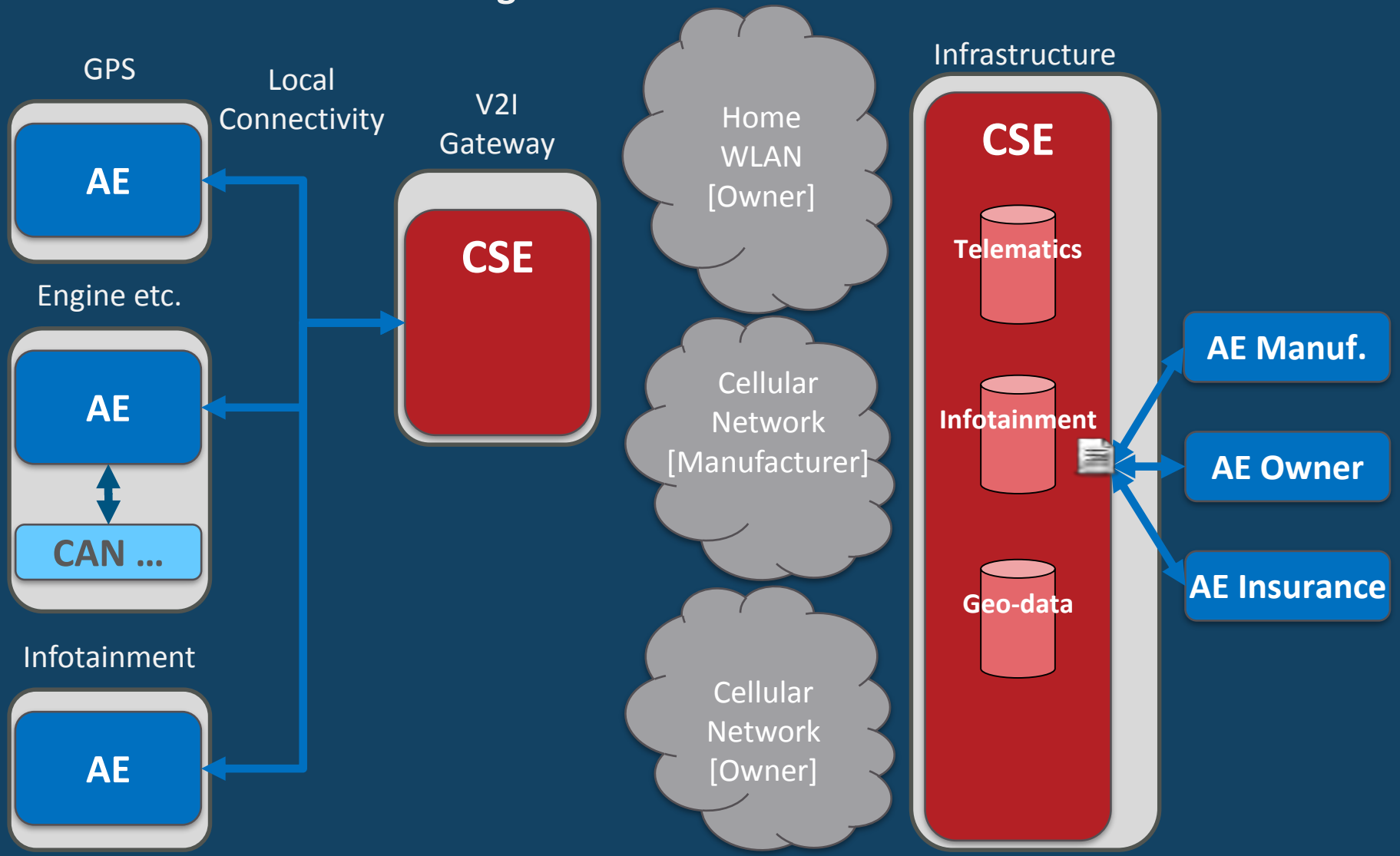

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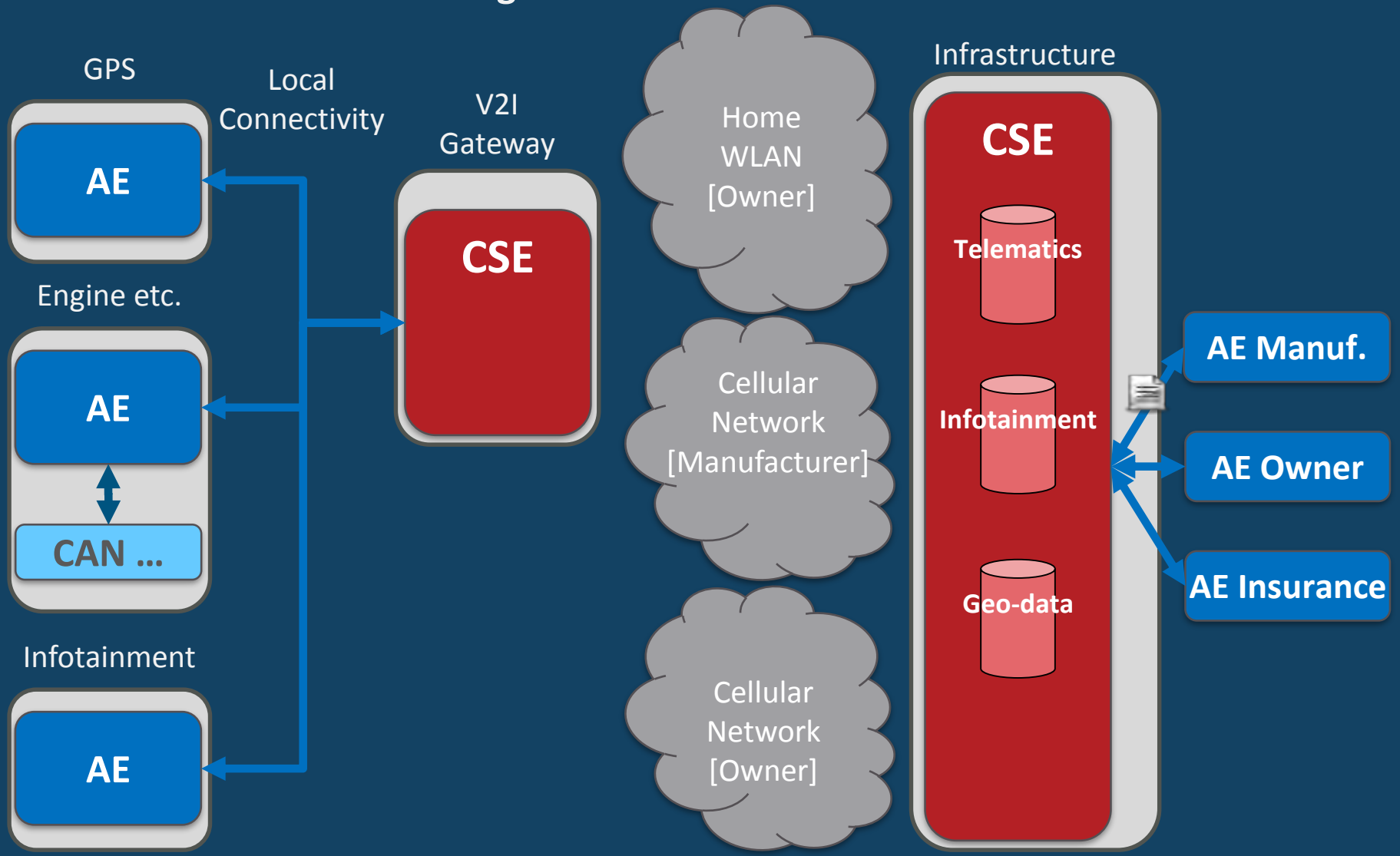

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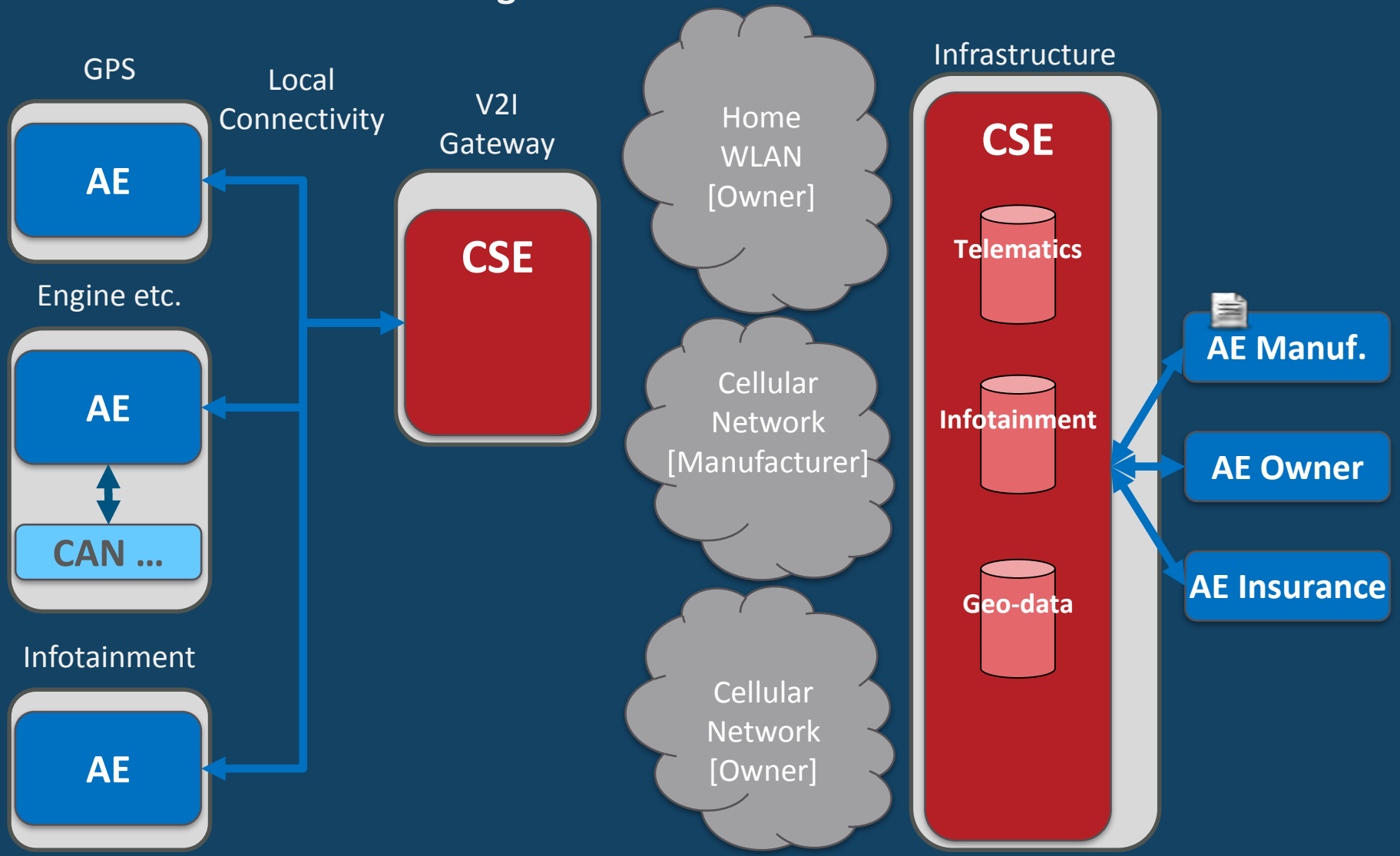

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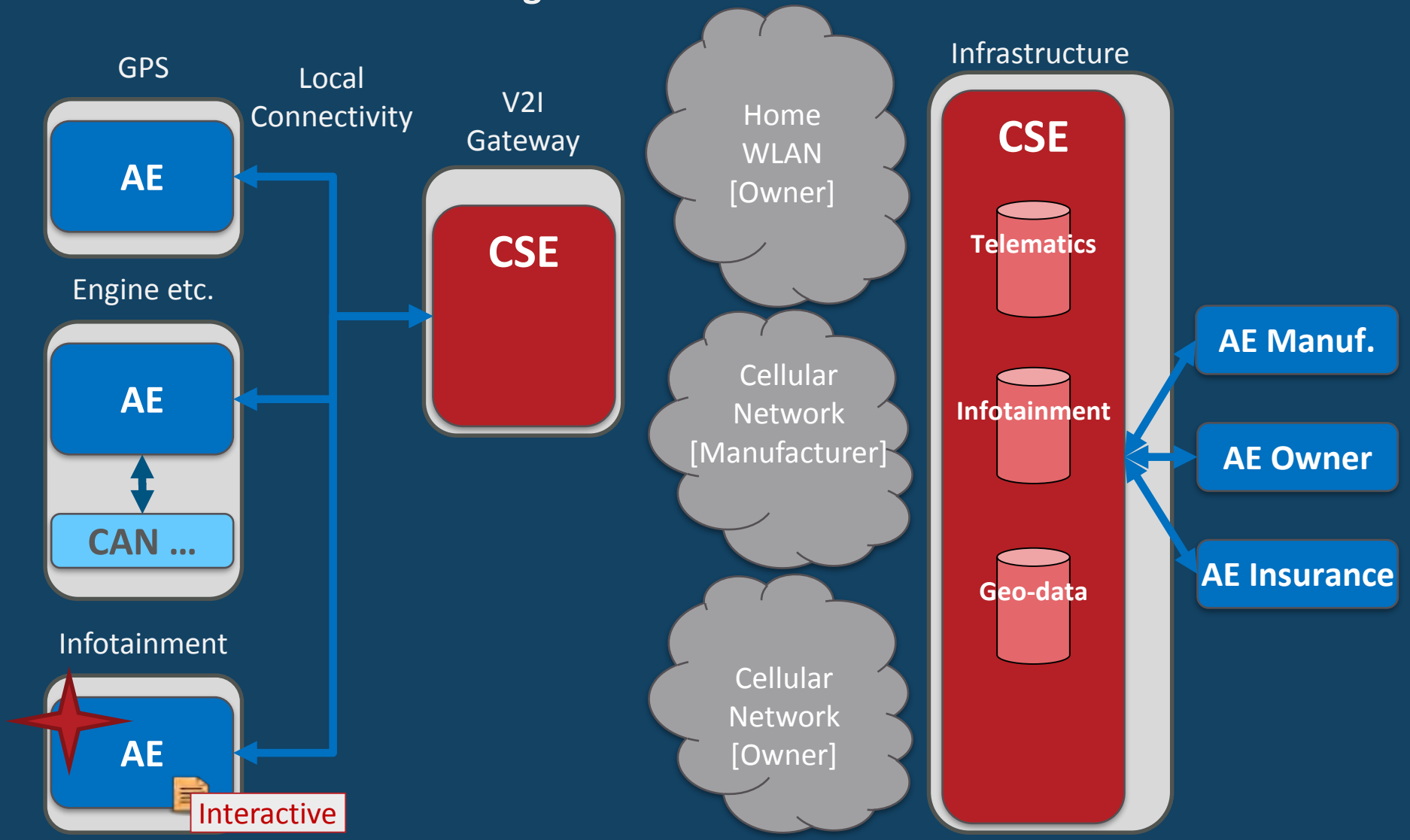

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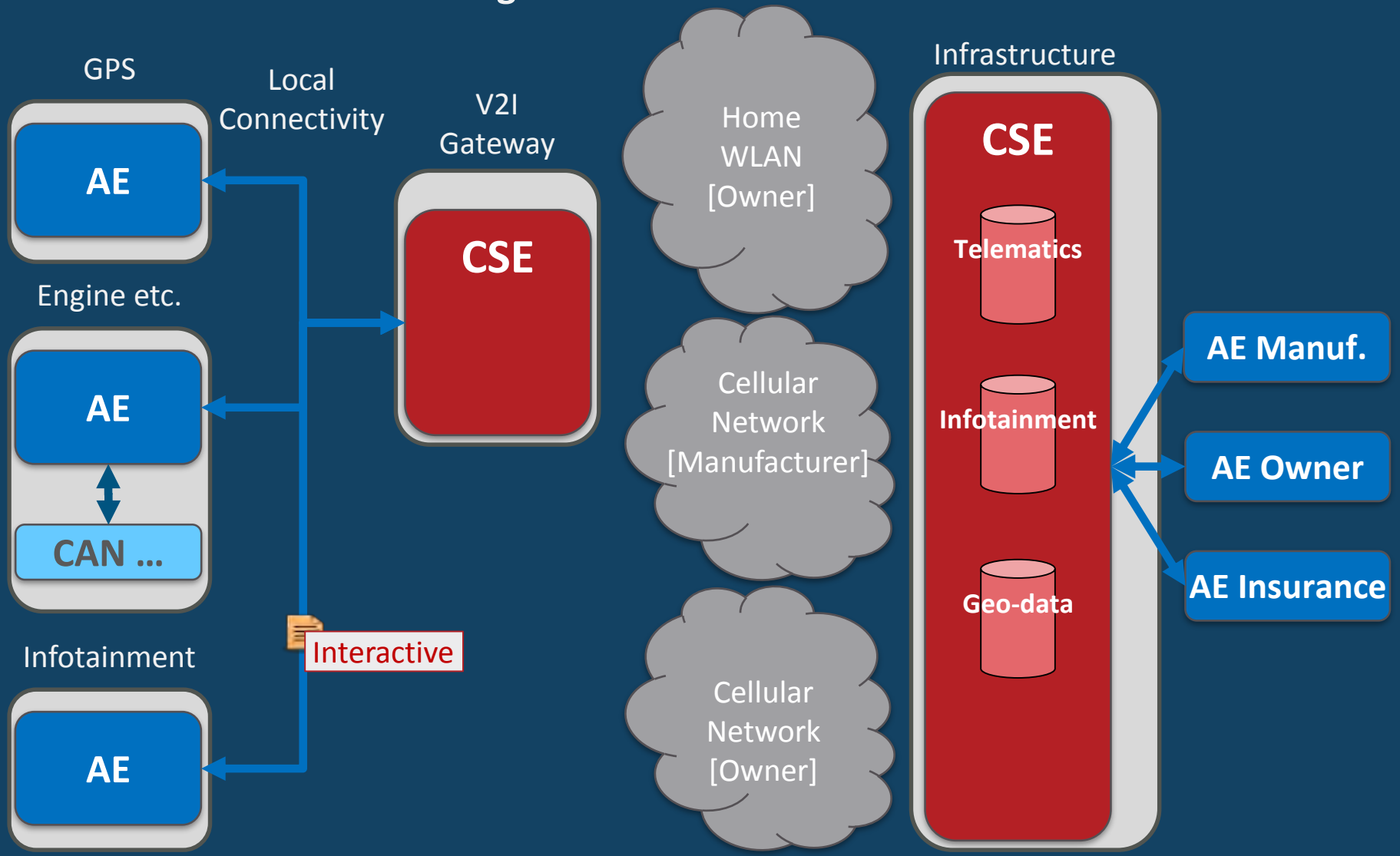

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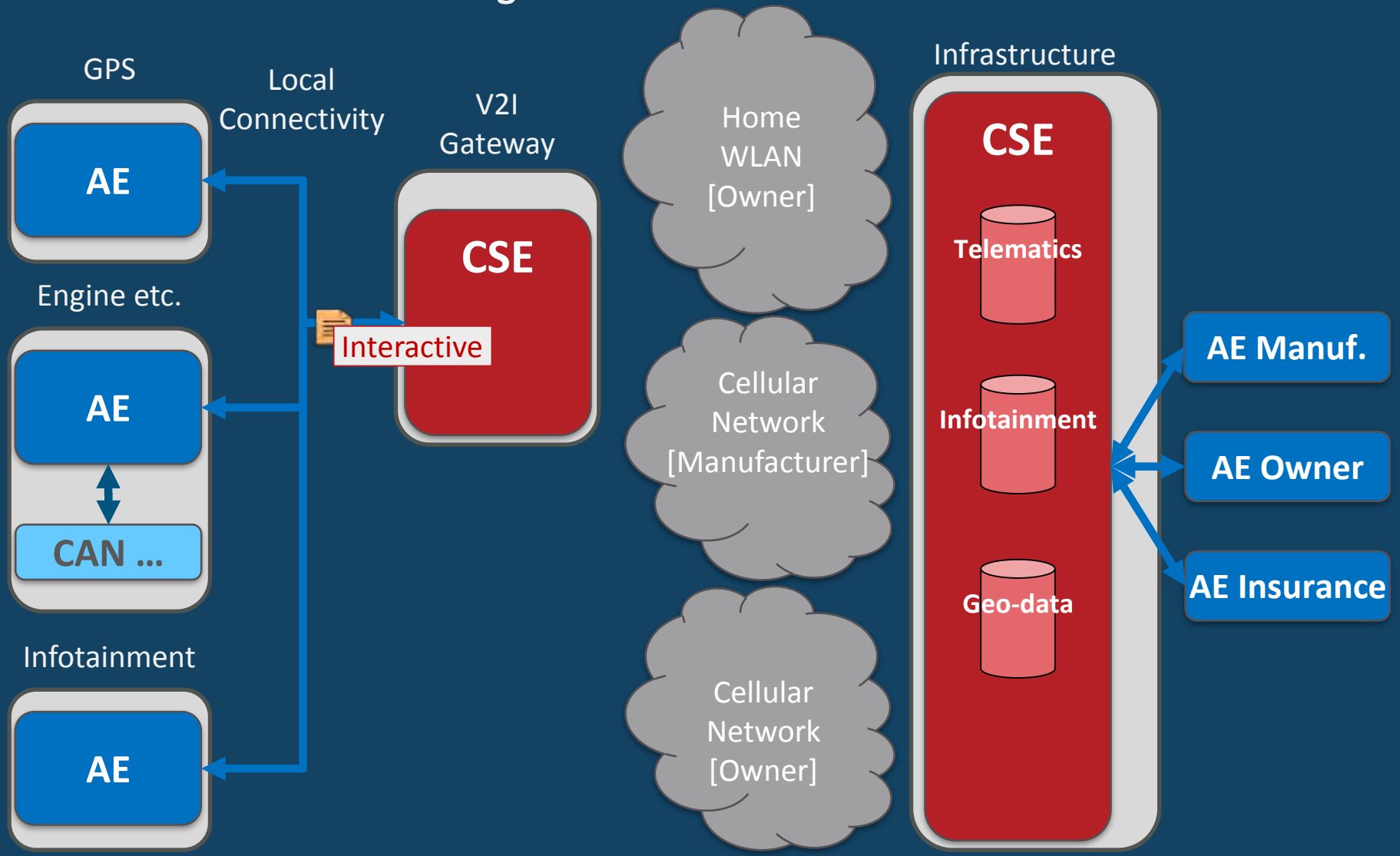

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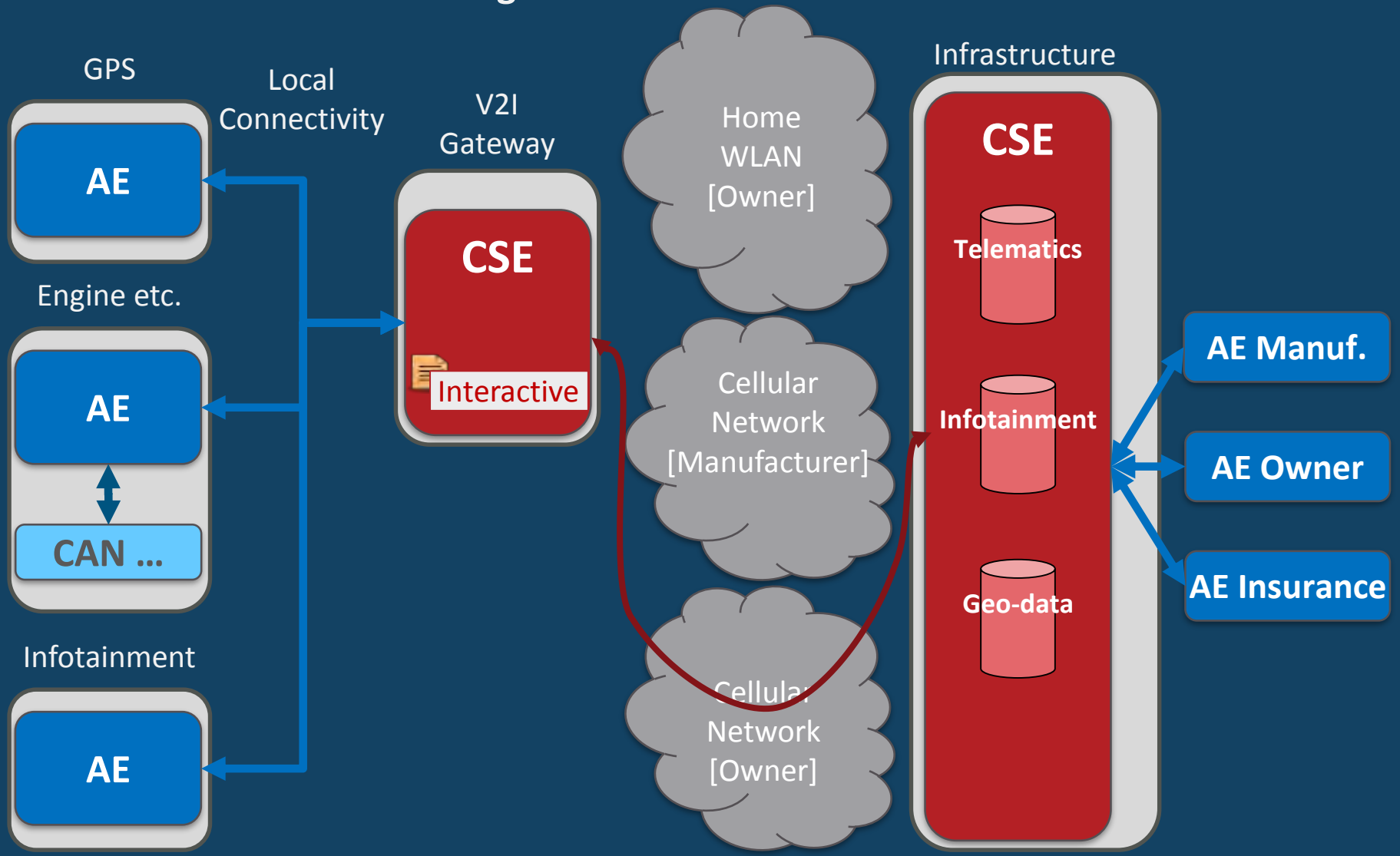

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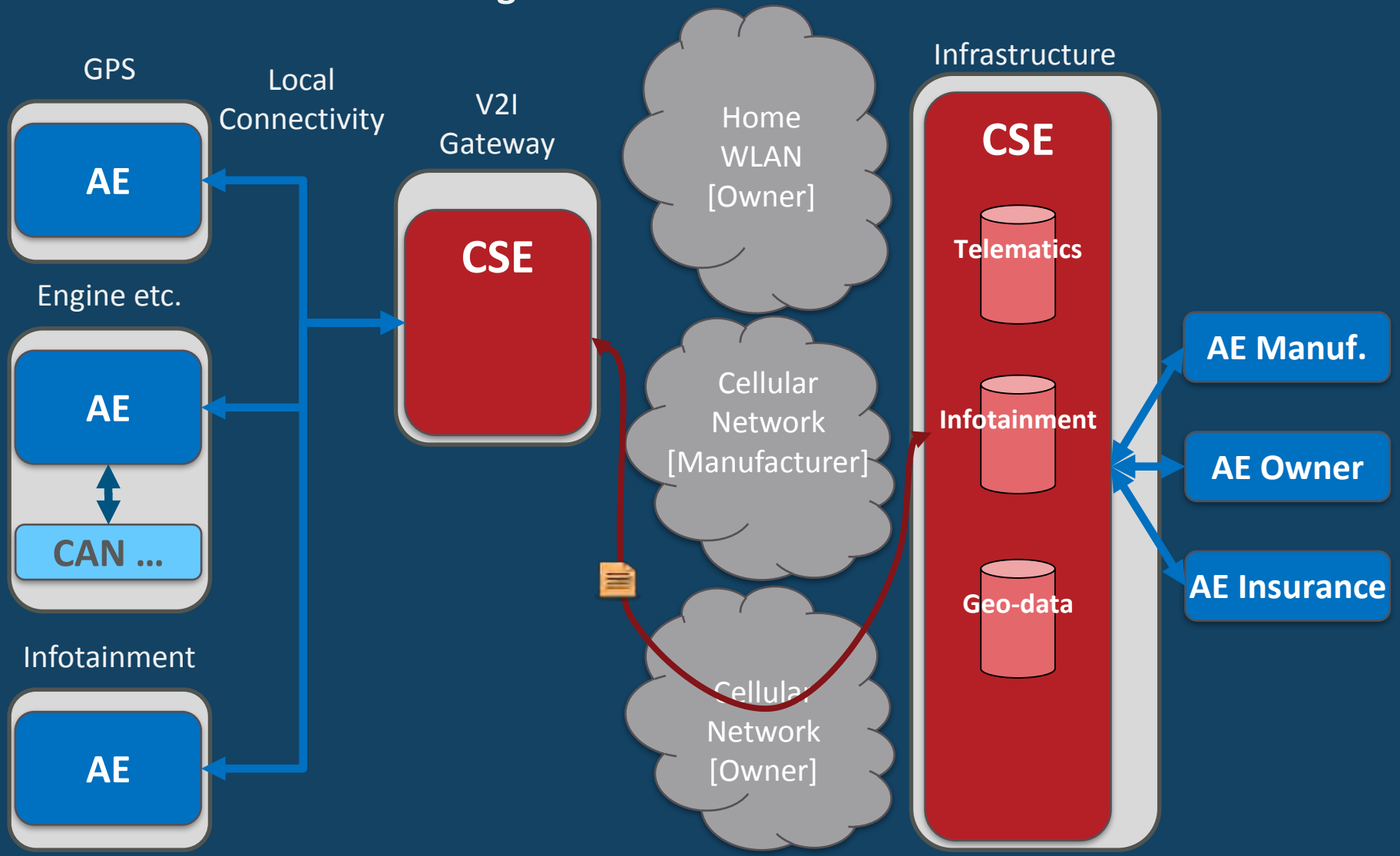

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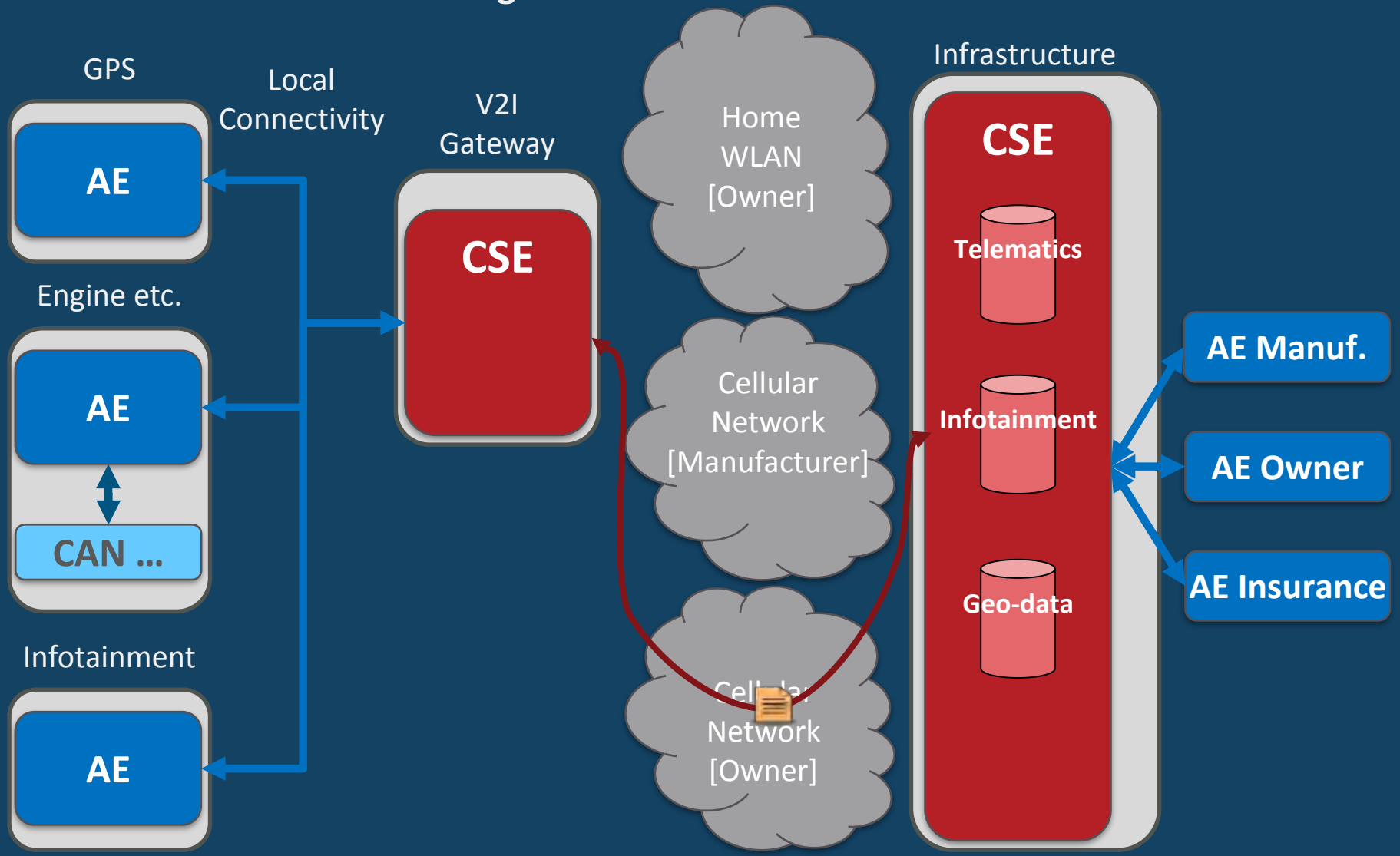

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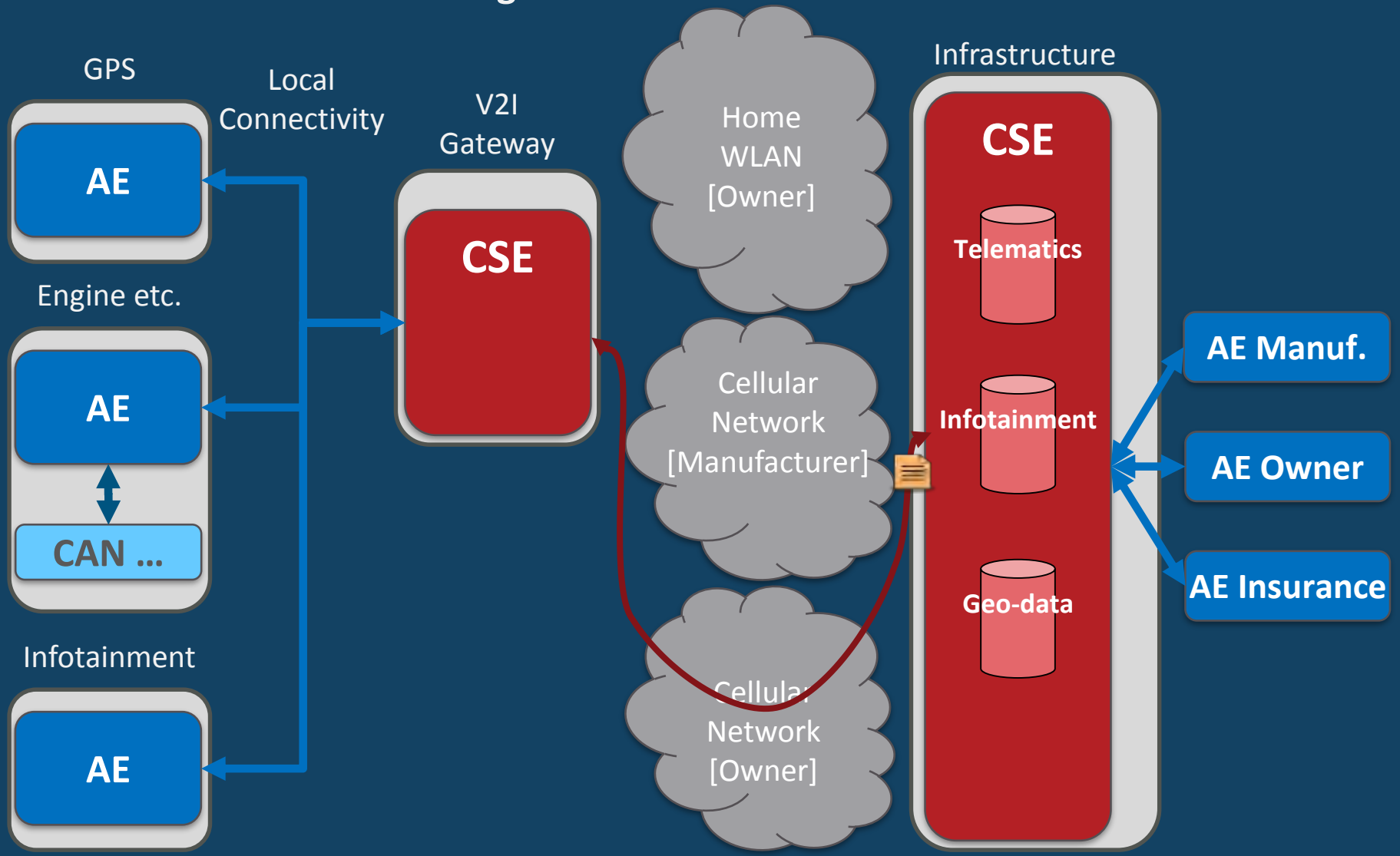

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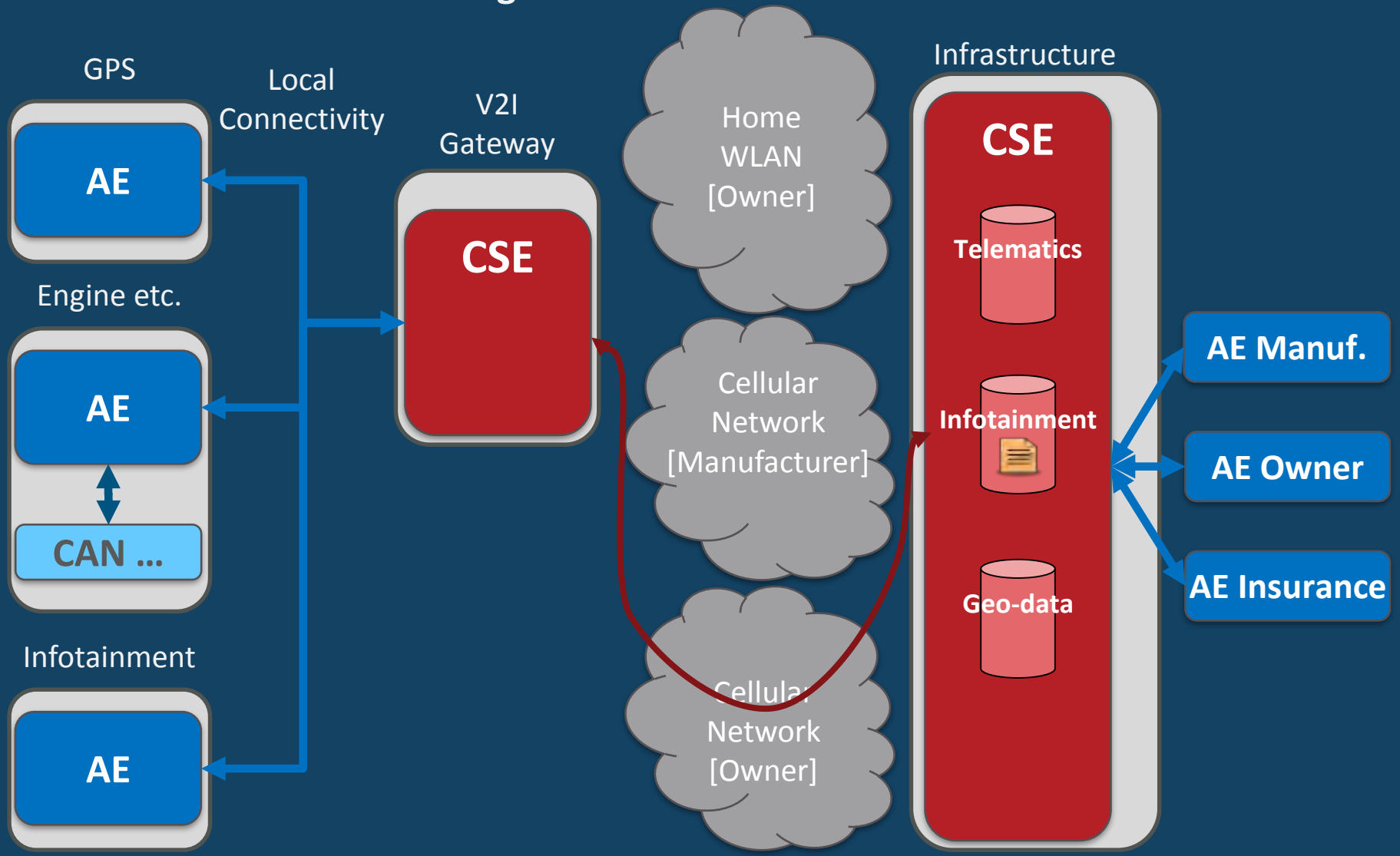

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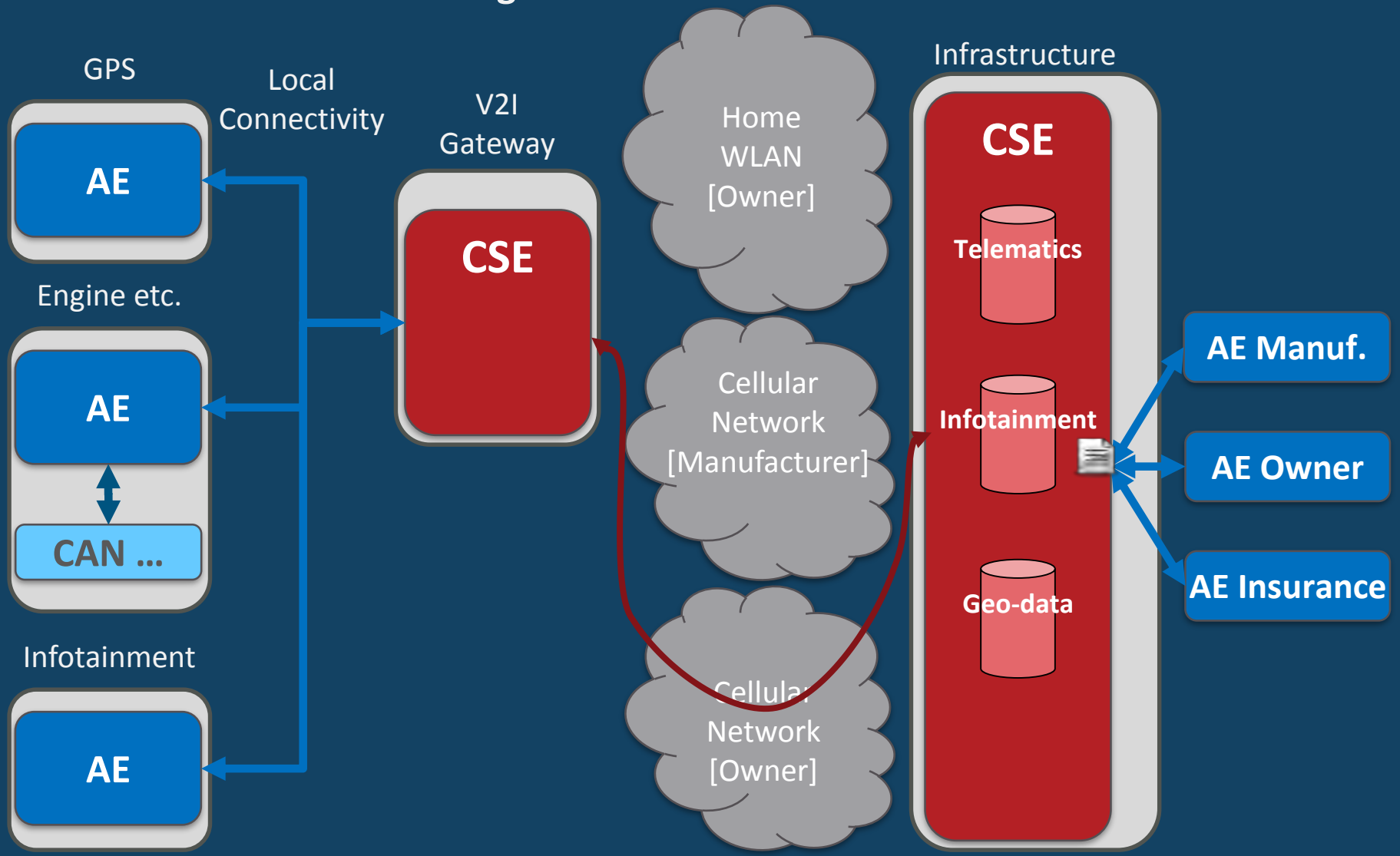

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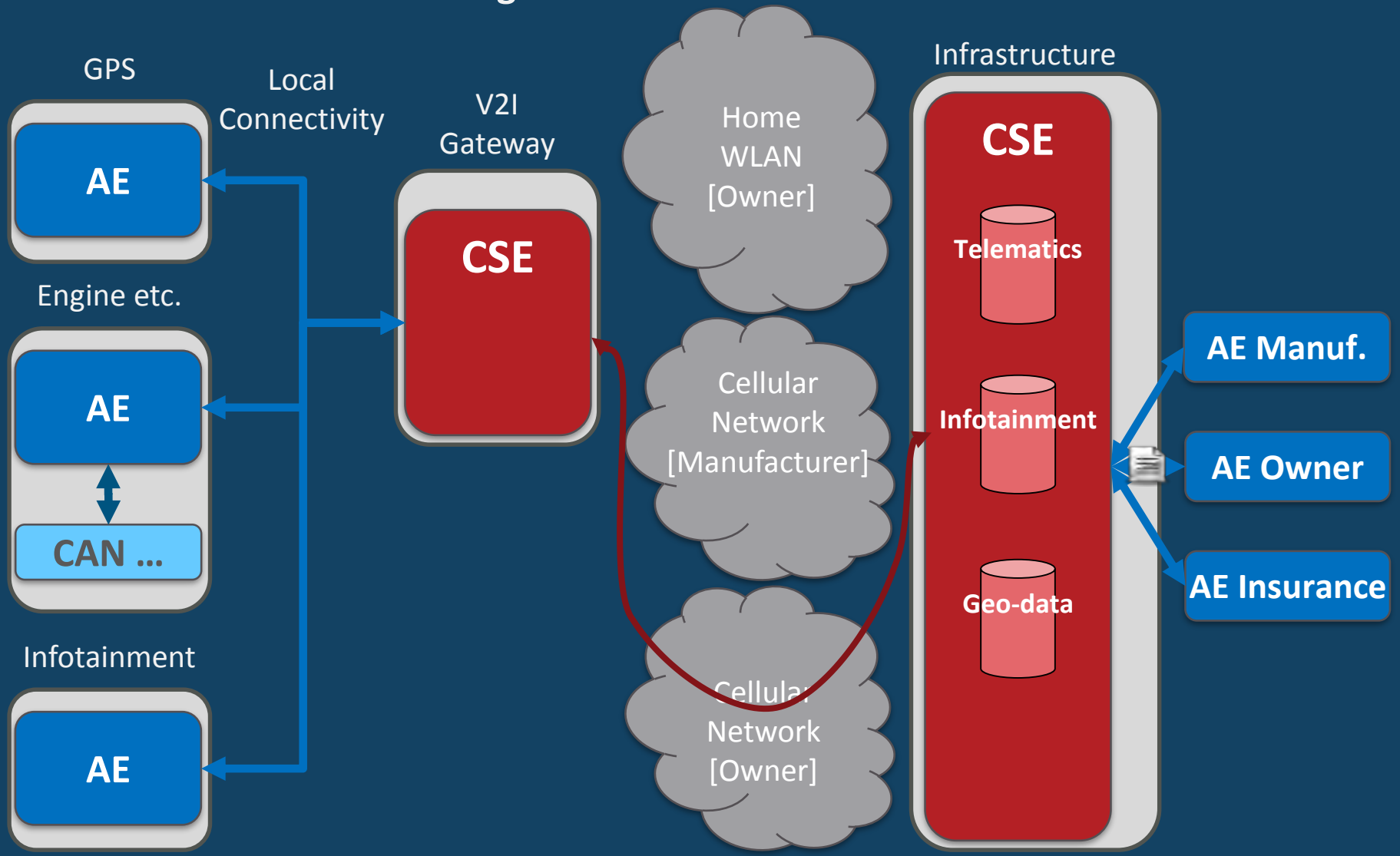

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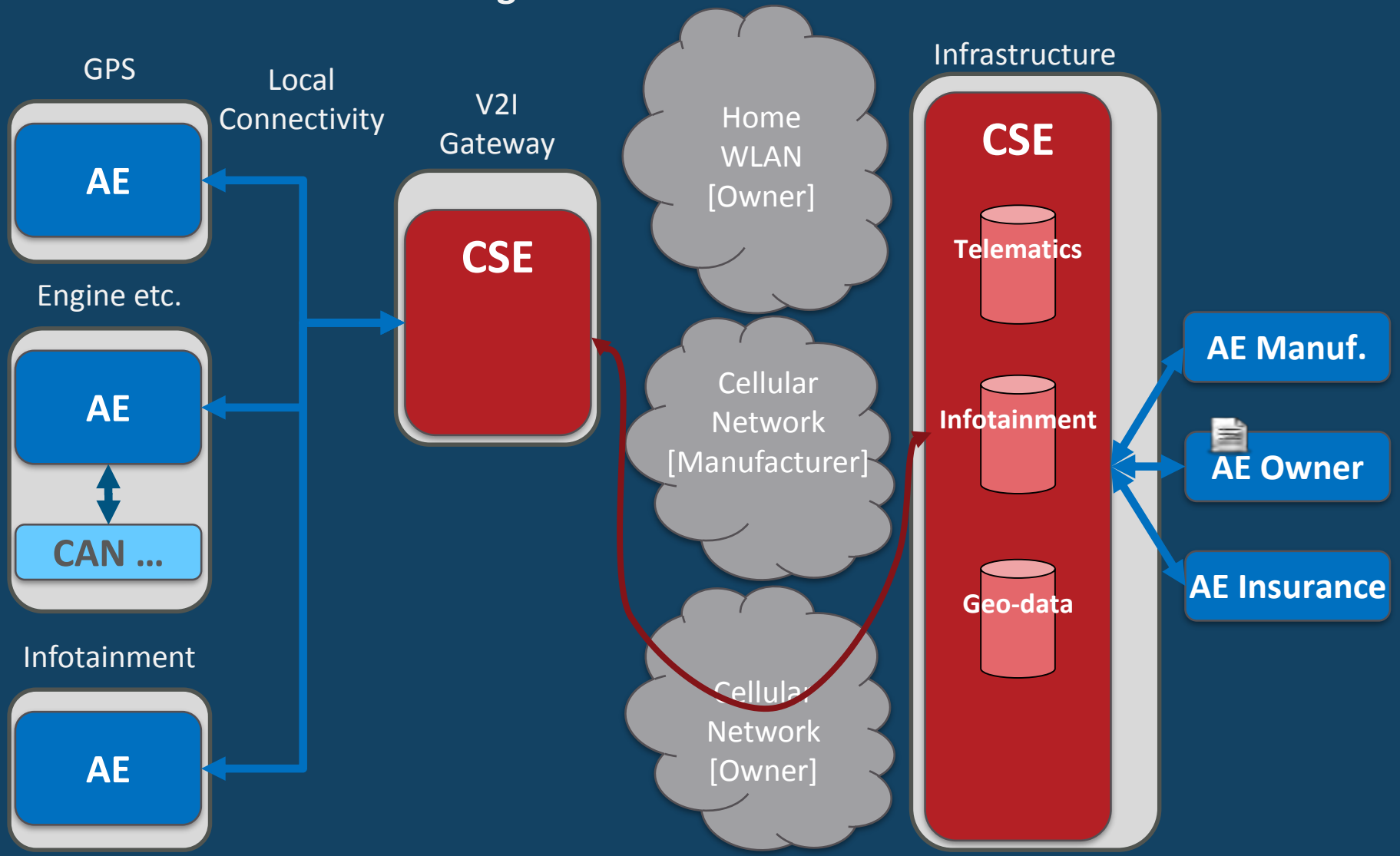
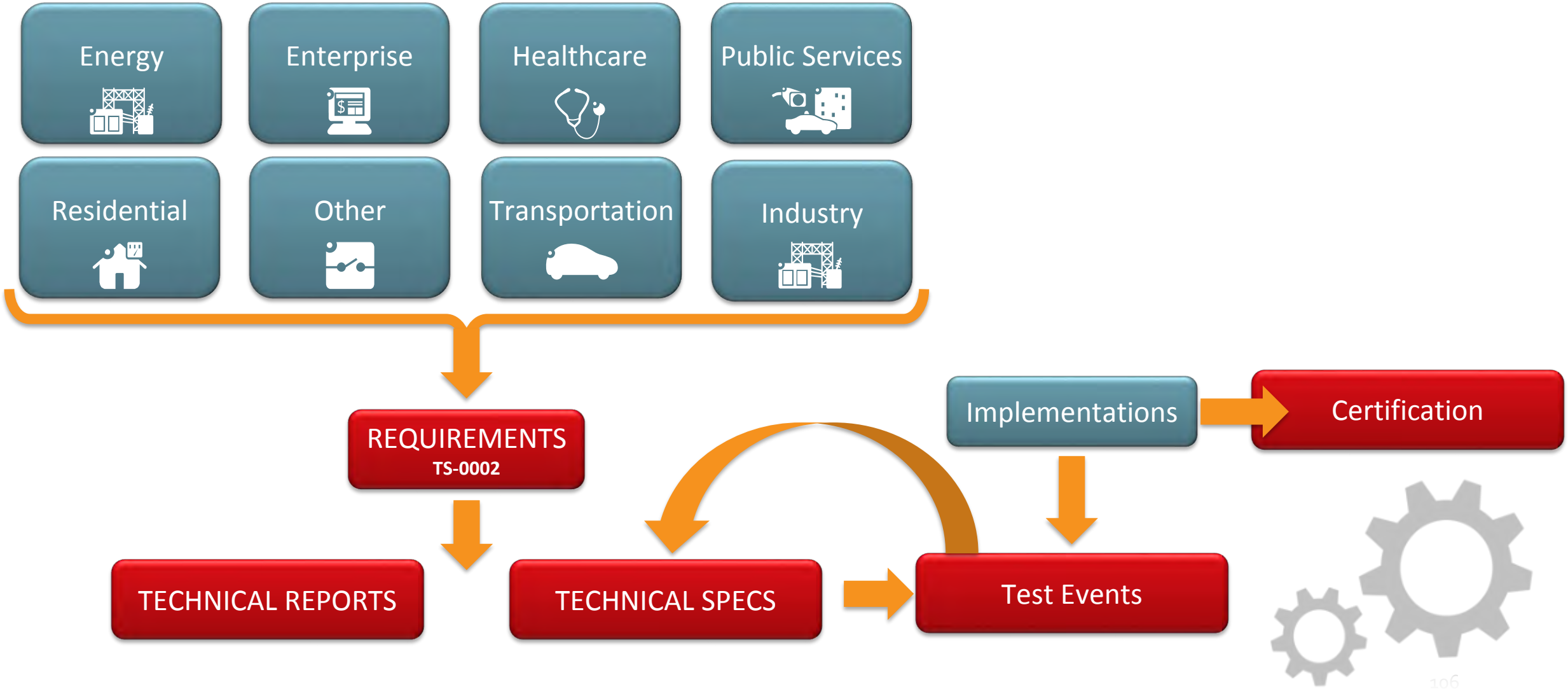


Releases of oneM2M

Status Quo and Next Steps

Work Process



Key Features Rel-1 & 2

Simple NW Usage, Enhanced Data Efficiency, NW Protection

- Hides complexity of network technology from applications
- Transport of M2M/IoE traffic gets very simple and more efficient at the same time
- SL is in charge to enforce policies when which modem is used… not the applications
- Capable to use MTC/M2M features of 3GPP (so far triggering, more for Rel-3)

Reliable and Scalable Security

- Hooks up entities using proven authentication/authorization/encryption

Discovery & Data sharing based on Access Control

- Share data amongst one or more stakeholders / applications
- Possibly across different industry segments

Device Management

- Enable efficient management of large number of devices / nodes

Key Features Rel-1 & 2 (contd.)

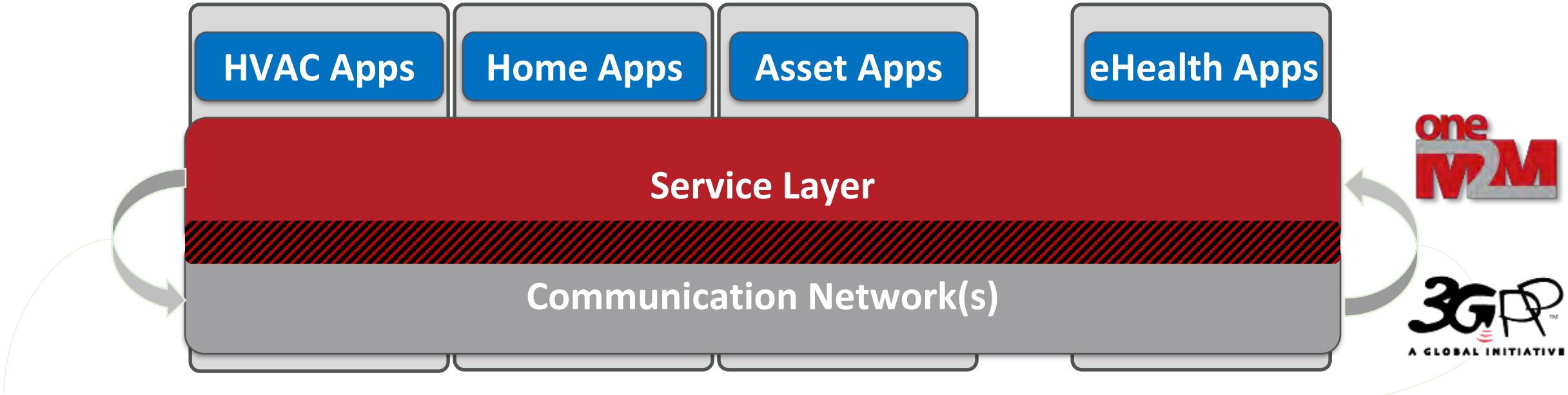
Selection of protocols: Pick what suits deployment scenario best

- HTTP, CoAP, MQTT, Websockets
- Serializations of data: XML, JSON, CBOR

“Interworking Glue”

- Proximal IoT: OCF/AllJoyn, LwM2M
- Home Domain:
  Information models to bridge different eco systems
  Abstracting out specifics of Proximal IoT technology
  Alignment with OCF progressing
- Industrial Domain:
  Some features in Rel-2 (time series)
  More to come in Rel-3 (OPC UA, DDS, Modbus)

Outlook Rel-3: 3GPP Interworking / better integration



Use MTC features of 3GPP Communication Network:

- Control features based on available meta information
- E.g. Power Saving Mode, Traffic Patterns
- Dynamically switch modes of operation / parameters

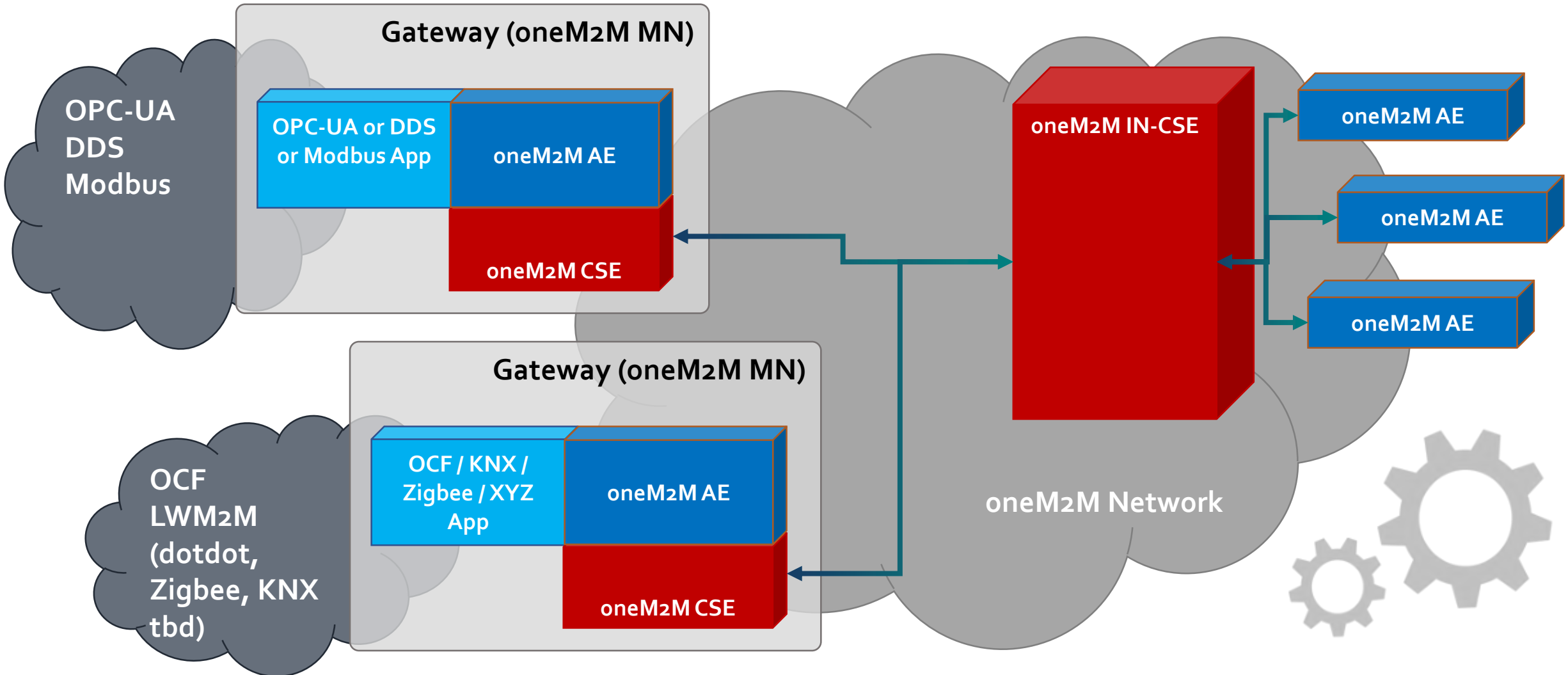
Provide information to oneM2M SL:

- Meta information for better scheduling
- Schedules of allowed network usage
- Information on location, loss of connectivity etc.

Related interfaces of 3GPP being integrated with oneM2M provides simplicity, efficiency & scalability enhancements

Outlook Rel-3: Proximal IoT Interworking

Other Technologies connected via oneM2M Entities & Ressources



Release 3 Highlights

3GPP Interworking

- Tight integration with 3GPP features for MTC / NB-IoT (long sleep cycles etc.)
- Usage of functions exposed by 3GPP via SCEF (Developer does not need to know)
- Goal: Increase efficiency, lower power consumption, protect network, control traffic

Proximal IoT Interworking

- Generic scheme for “bridging” between oneM2M and other technologies
- Improvement of existing OCF/AllJoyn/LwM2M interworking, addition of OSGi / W3C
- Seamless functionality across border of Proximal IoT (Abstraction)

Industrial Interworking

- New “bridging” specifications for Modbus/DDS/OPC-UA
- Relationship with IIC

Implementations / Deployments

Industry-driven Open source implementations

eclipse smarthome

LAAS-CNRS

OM2M Connecting things

Fraunhofer FOKUS

open mtc

KETI

OCEAN

CISCO

OPEN DAYLIGHT

IotDM

atis

OSIoT

oasis

Oasis SI oneM2M Server

Announcements, Demos, Commercial implementations

SPIRENT

सेंटर फॉर डेवलपमेंट ऑफ टेलीमैटिक्स
भारत सरकार का दूरसंचार प्रौद्योगिकी केन्द्र
सी-डॉट C-DOT
Centre for Development of Telematics
Telecom Technology Centre of Govt. Of India

LG

SIERRA WIRELESS

InterDigital

GridNet

QUALCOMM

oneM2M Standards Certified by TTA

Hansol NexG

BOSCH

e◇device Connectivity That Cares

kt

SK telecom

MODACOM

LG U+

Hewlett Packard Enterprise

iconectiv

easy global market

HUAWEI

PILOT THINGS

sensinov Global IoT Platform

Creative Convergence ntels

ICEPCO

orange

NEC

HARMAN A SAMSUNG COMPANY

T

Actility

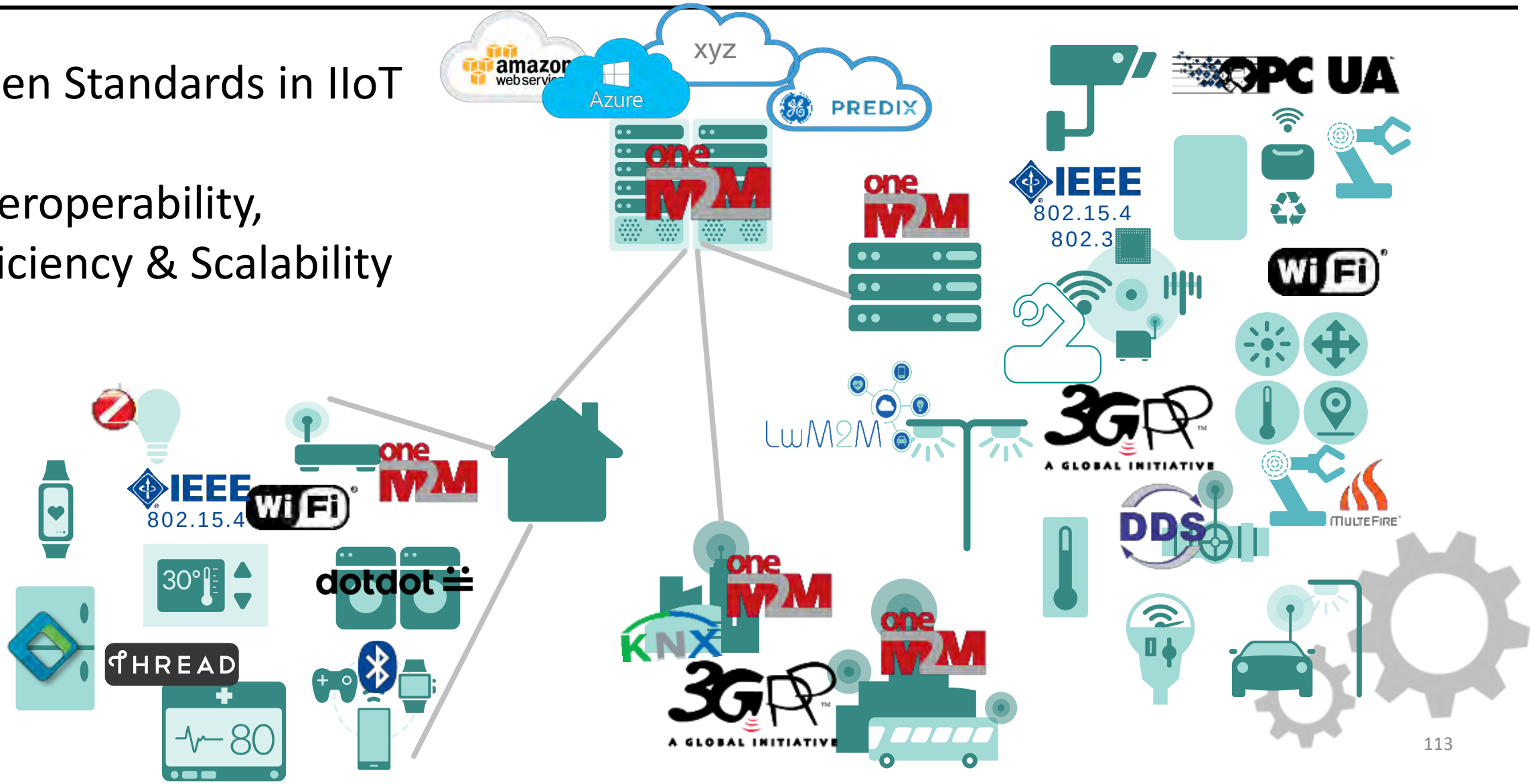
5 interoperability events held so far, 2 expected in 2018

Vision: oneM2M actin as interworking “glue”

Open Standards in IIoT

⇔

Interoperability,
Efficiency & Scalability



Links & Contact

Website	http://www.oneM2M.org
Webinars	http://www.onem2m.org/insights/webinars
Published Specifications	http://www.onem2m.org/technical/published-documents
Latest Drafts	http://www.onem2m.org/technical/latest-drafts
Events	http://www.onem2m.org/news-events/events

Contacts:

Secretariat	oneM2M_Secretariat@list.oneM2M.org
Liaison matters	oneM2M_liaison@list.oneM2M.org

The End ☺

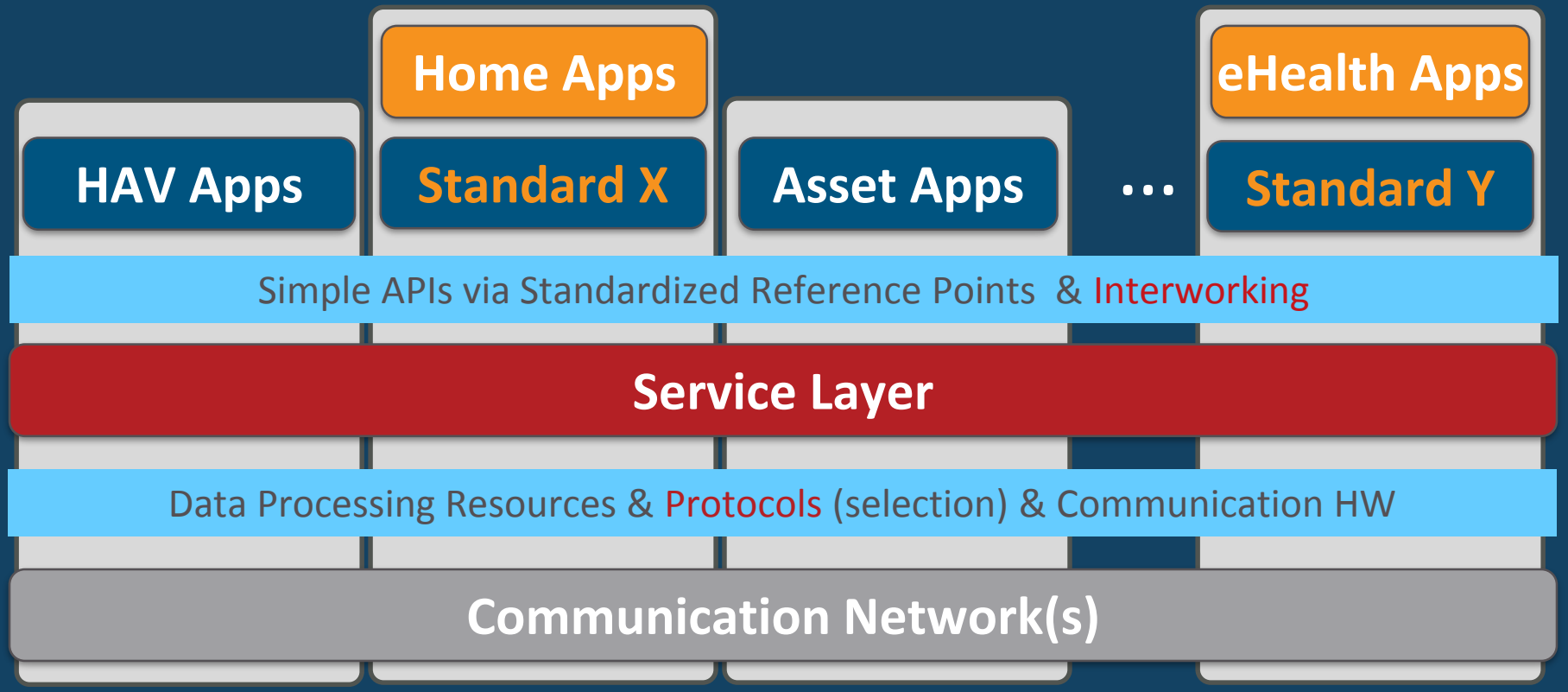
Thank You!

Dr. Josef J. Blanz (jblanz@qti.qualcomm.com)
Qualcomm Technologies Inc.
Principal Engineer
M2M & IoT Standards & Industry Fora

Chairman oneM2M Industry Liaison Committee
Vice-Chairman oneM2M Technical Plenary

Backup

Interworking



Impact:
Efficiency / Aggregation ↑
NW Protection ↑
Cost ↓
Fragmentation ↓
New Opportunities ↑

CAPEX Impact

Application Development

Simple APIs

e.g. Library

General Purpose Volume ↑

e.g. Modules or Gateways

Unified Platform

Server

Developer:

- CSE functions ready to use
- No module/network expert needed
- App development independent of underlying transport
- Standard message exchanges
- Focus on use case logic
- Faster development process

Service Deployment

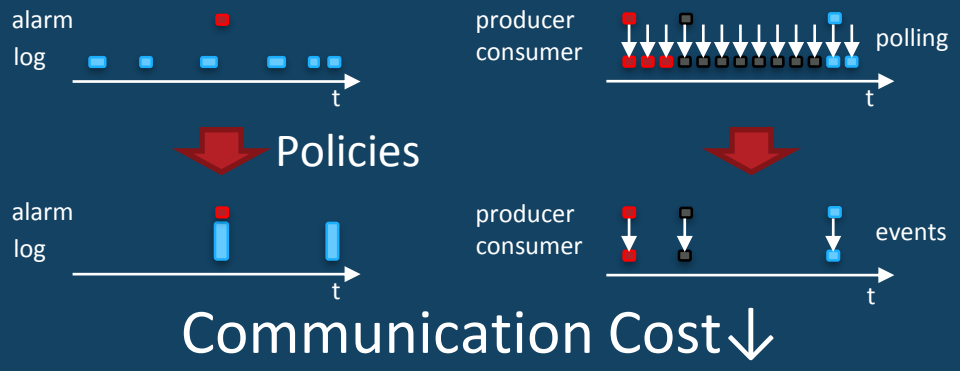
M2M/IoT Service Provider

- Only one platform
- Serves commonly needed functions to different use cases and applications
- Shared infrastructure & core service across different customers / verticals

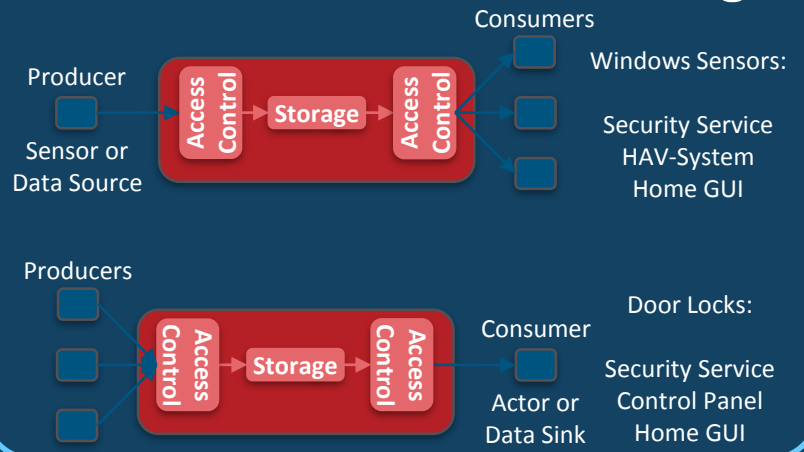
Lower CAPEX

OPEX Impact

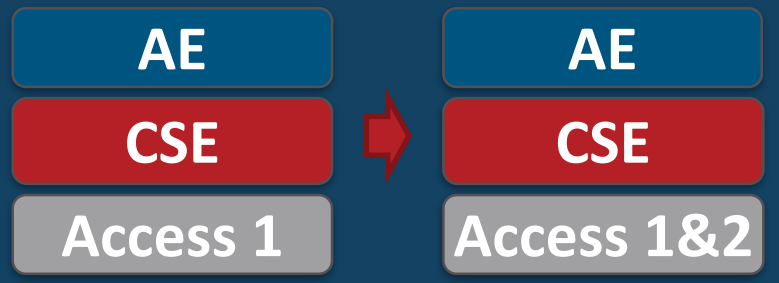
NW Efficiency & Protection



Sensor/Actor/Data Sharing



Certification: Flexible Choices



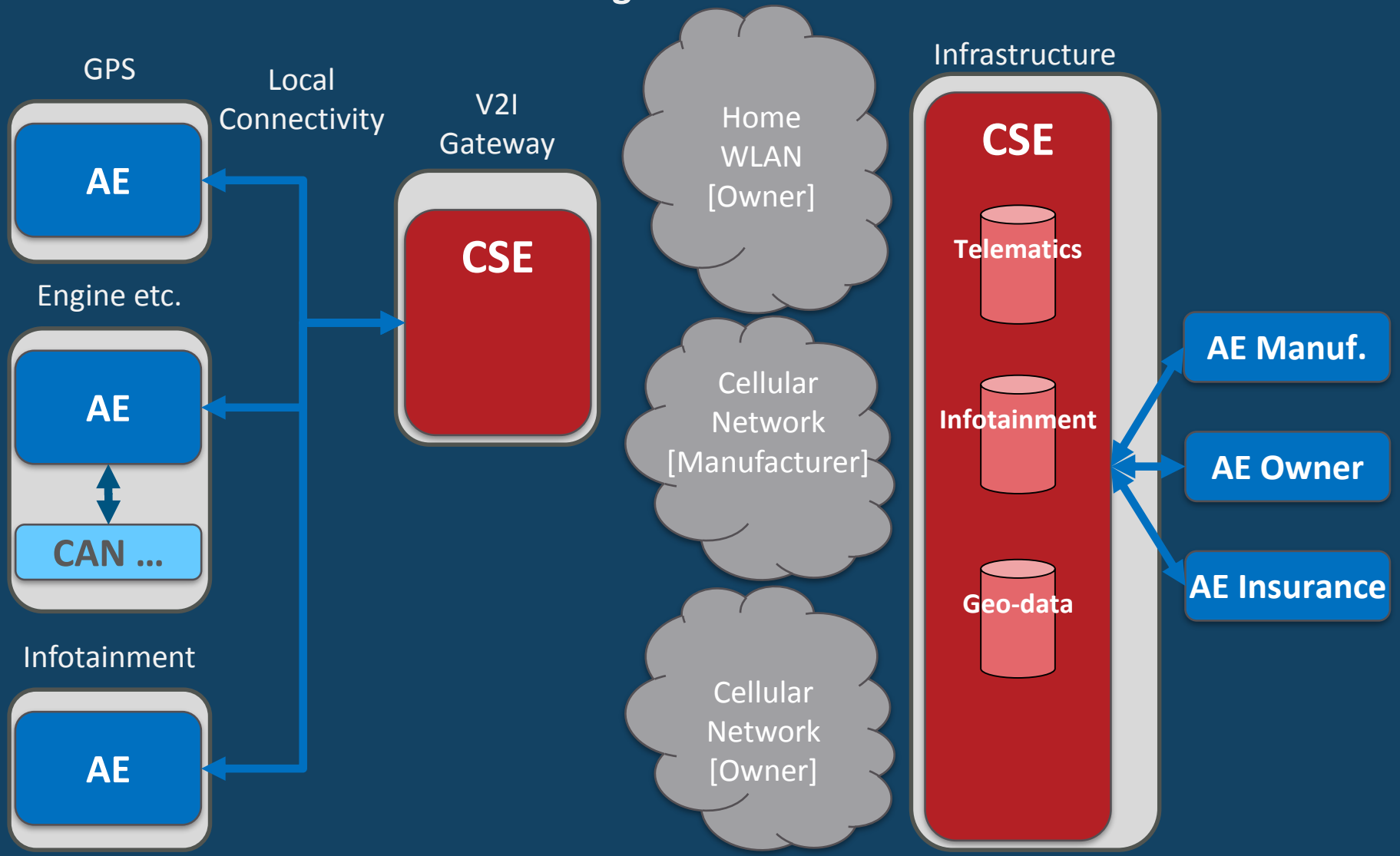
Lower OPEX

Single Platform

- Minimize maintenance expenses
- Shared infrastructure
- Scalable to volume/processing needed

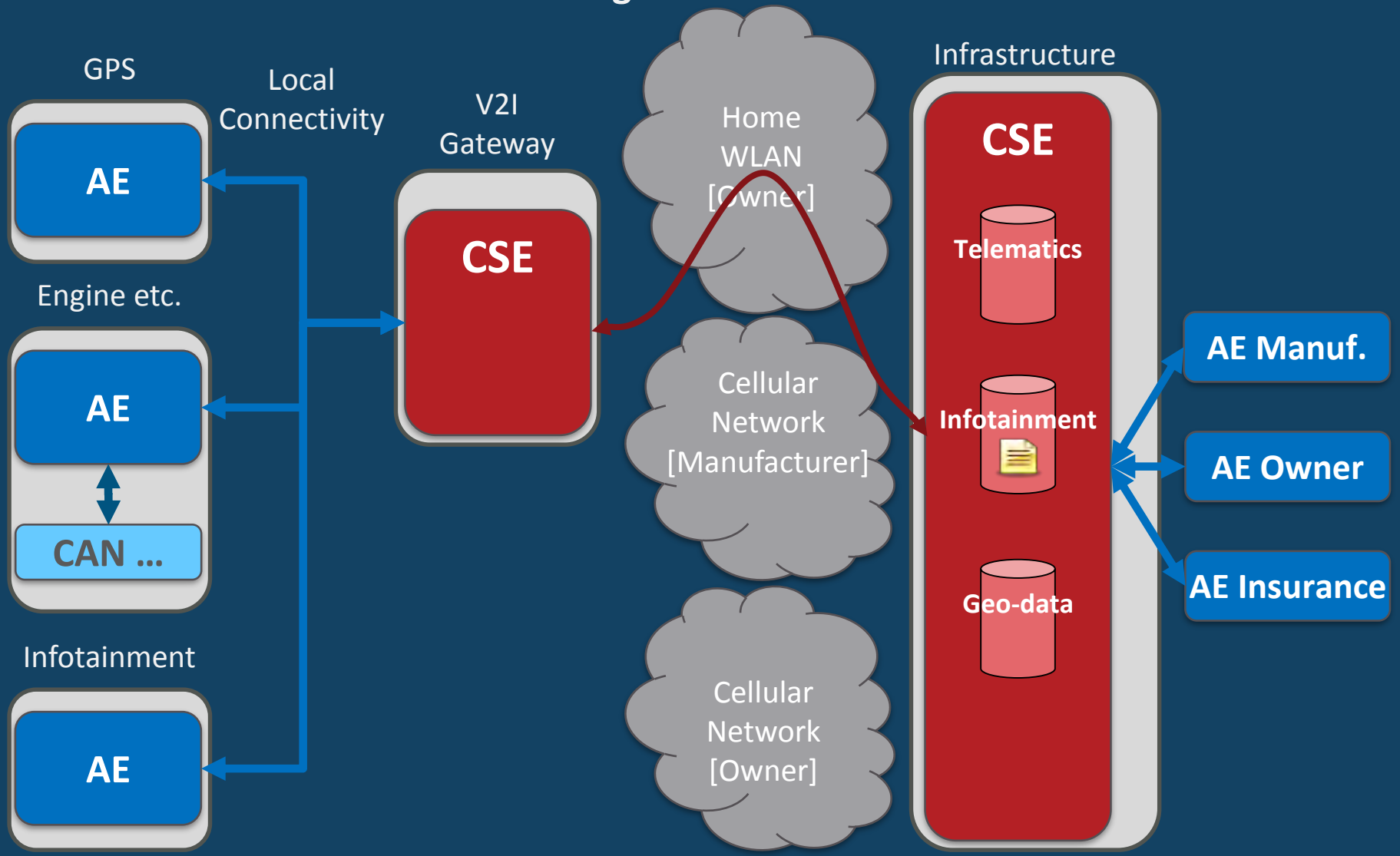
Efficient Data Sharing

At Home: In Owner's WLAN Coverage



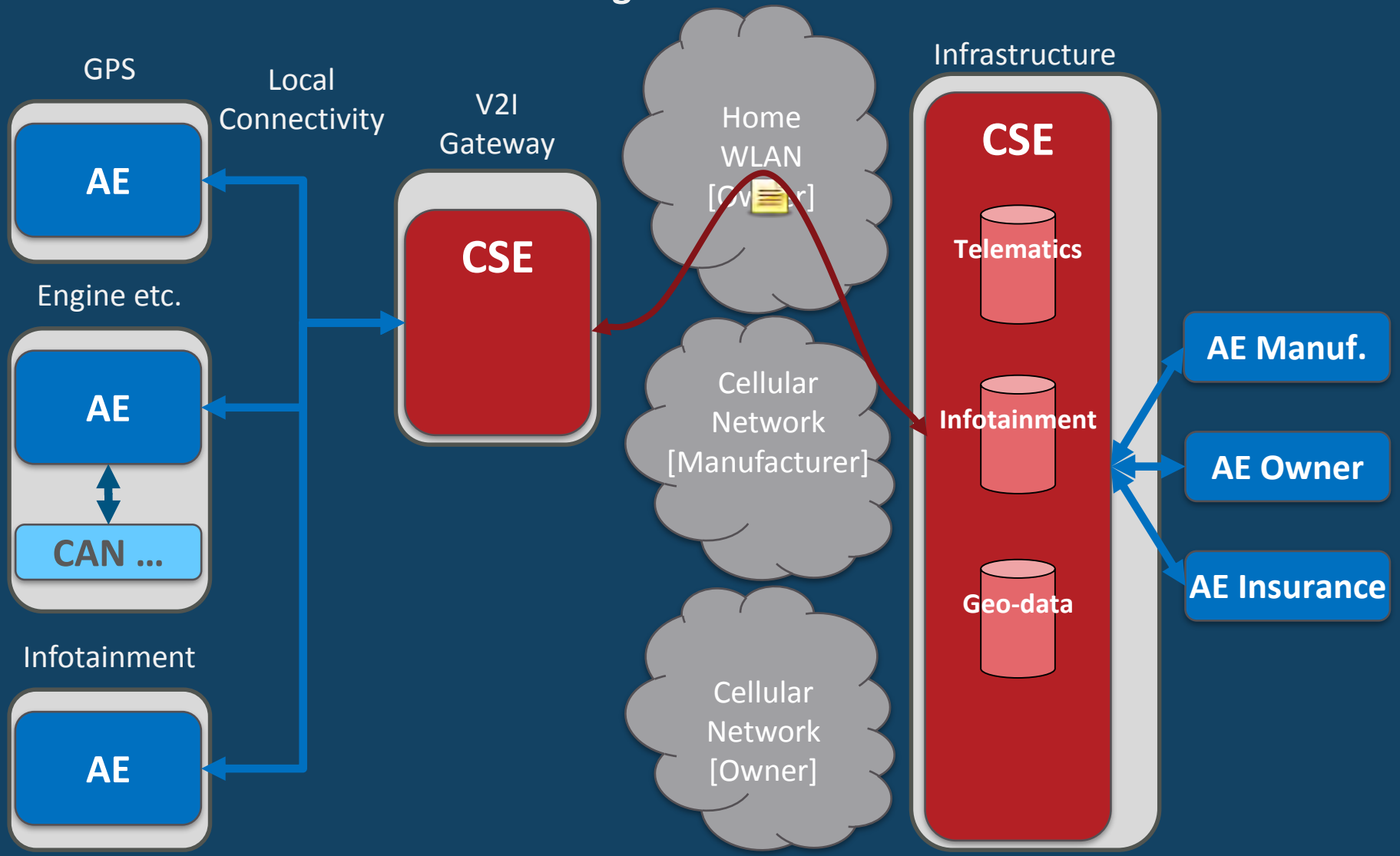
Efficient Data Sharing

At Home: In Owner's WLAN Coverage



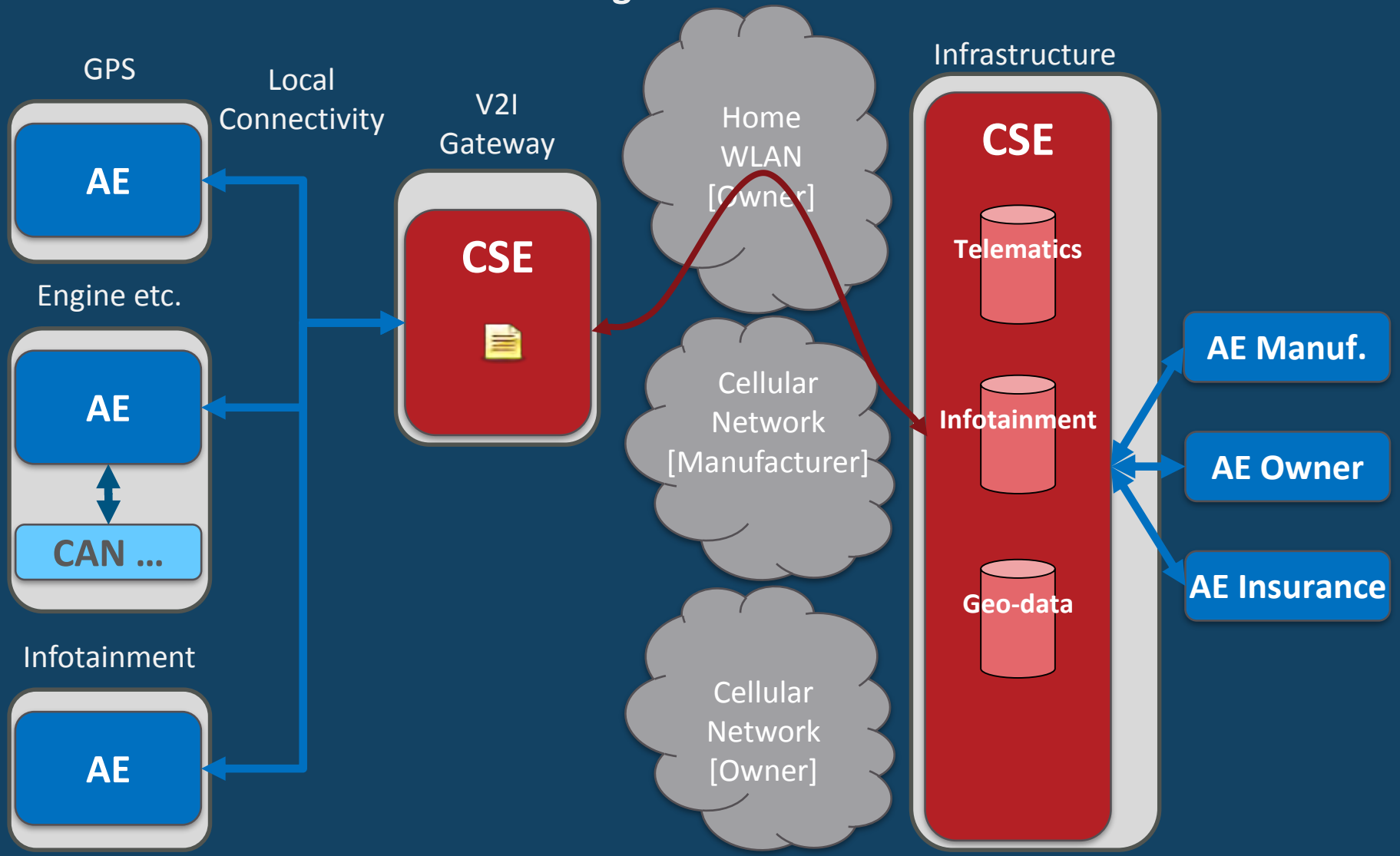
Efficient Data Sharing

At Home: In Owner's WLAN Coverage



Efficient Data Sharing

At Home: In Owner's WLAN Coverage



Efficient Data Sharing

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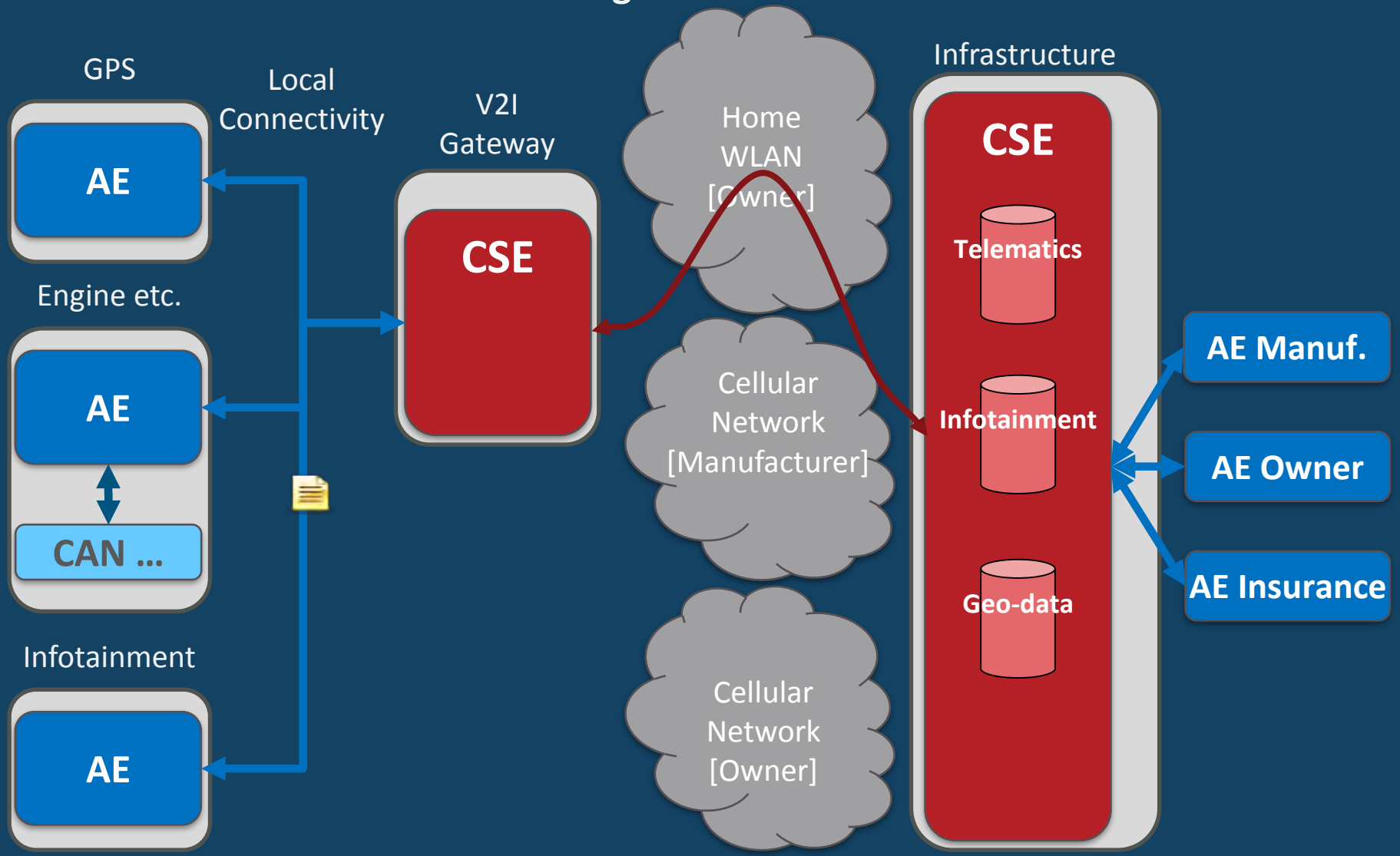

Efficient Data Sharing

At Home: In Owner's WLAN Coverage