Release 1 Primer

What's in there, and why is it important?

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oneM2M www.oneM2M.org

Outline:

What?

Why?

How?

What?

Next?

Where?

Outline:

What is oneM2M about?

Why is it important?

How does it work?

What is covered?

Next steps in oneM2M?

Where to find info?

What is oneM2M about?

What is oneM2M about?

M2M

IoT

IoE

What is oneM2M about?

M2M

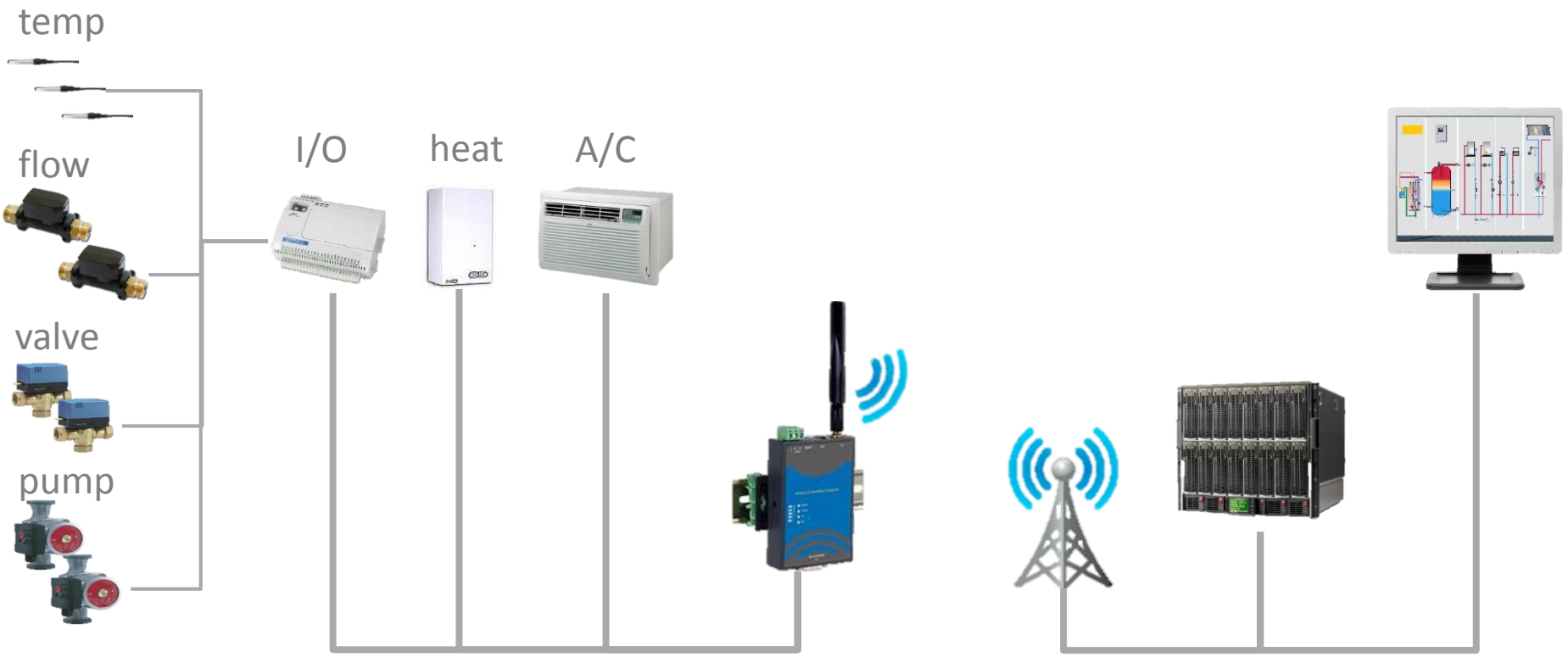
IoT

IoE

…???

Short Recap

HAV



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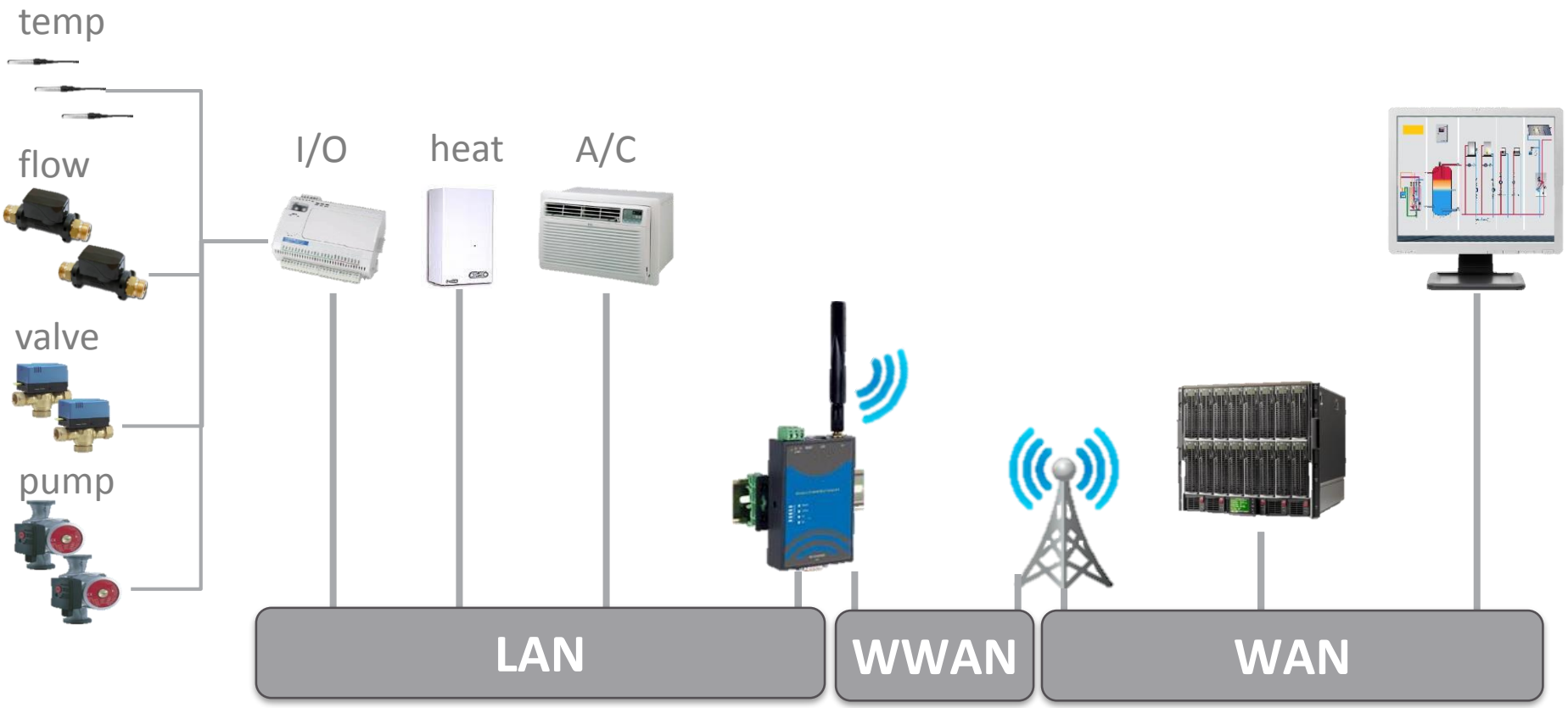

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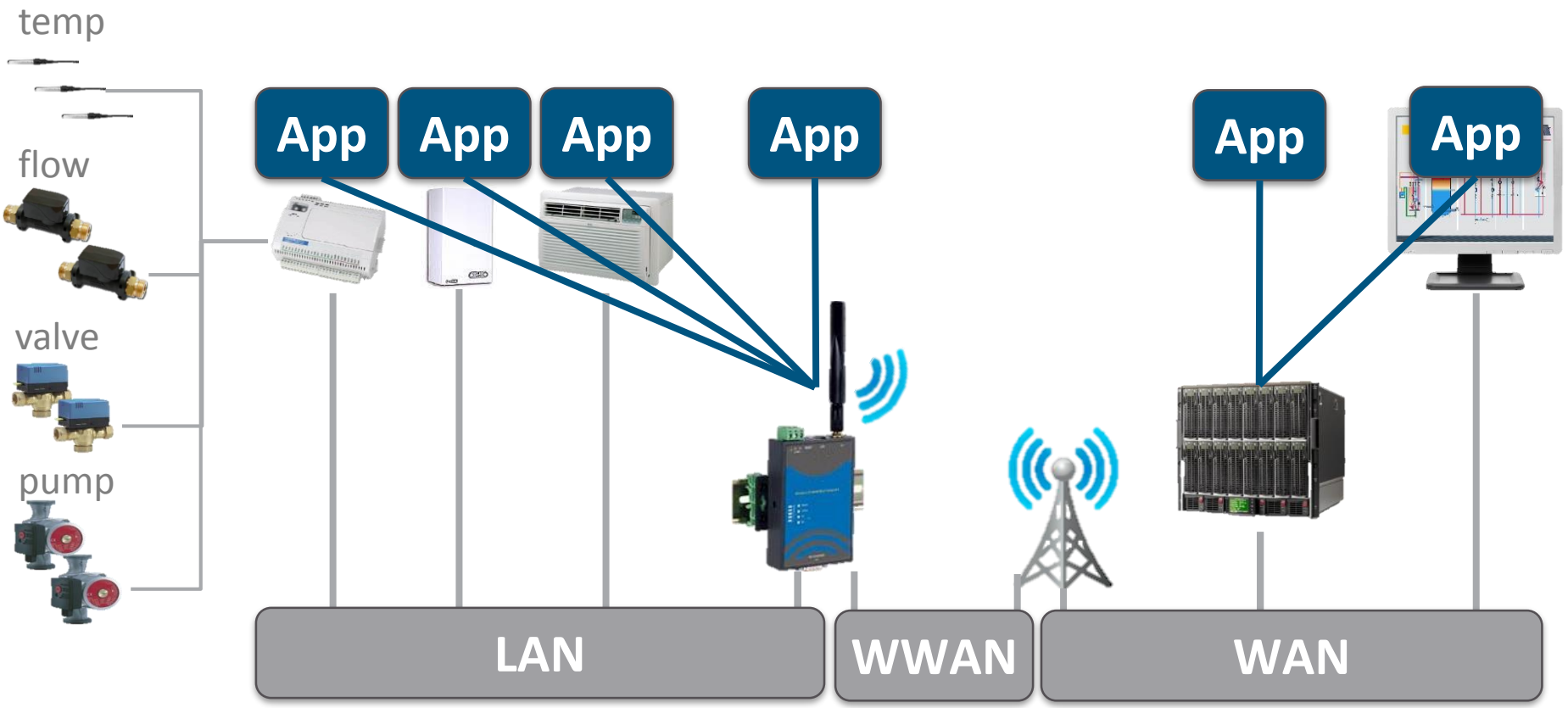

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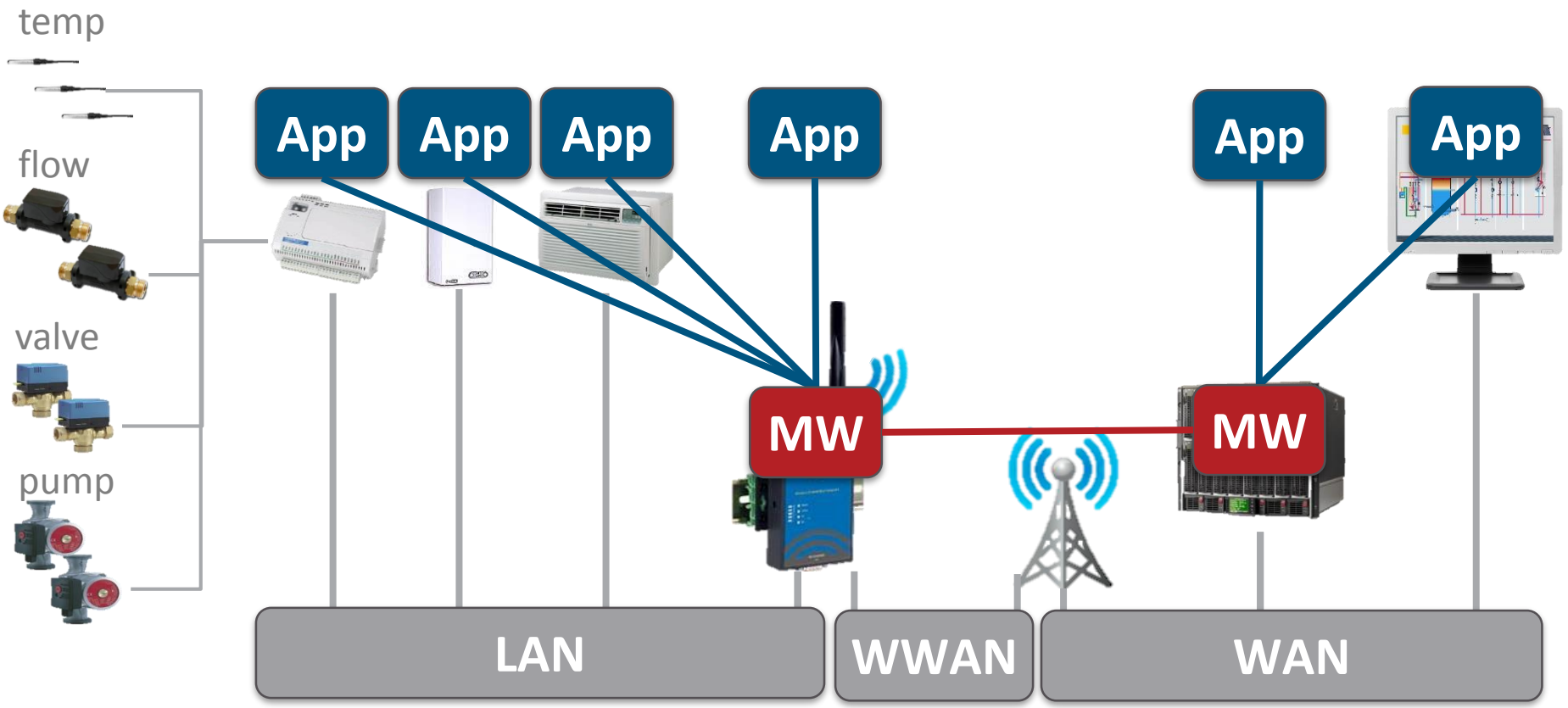

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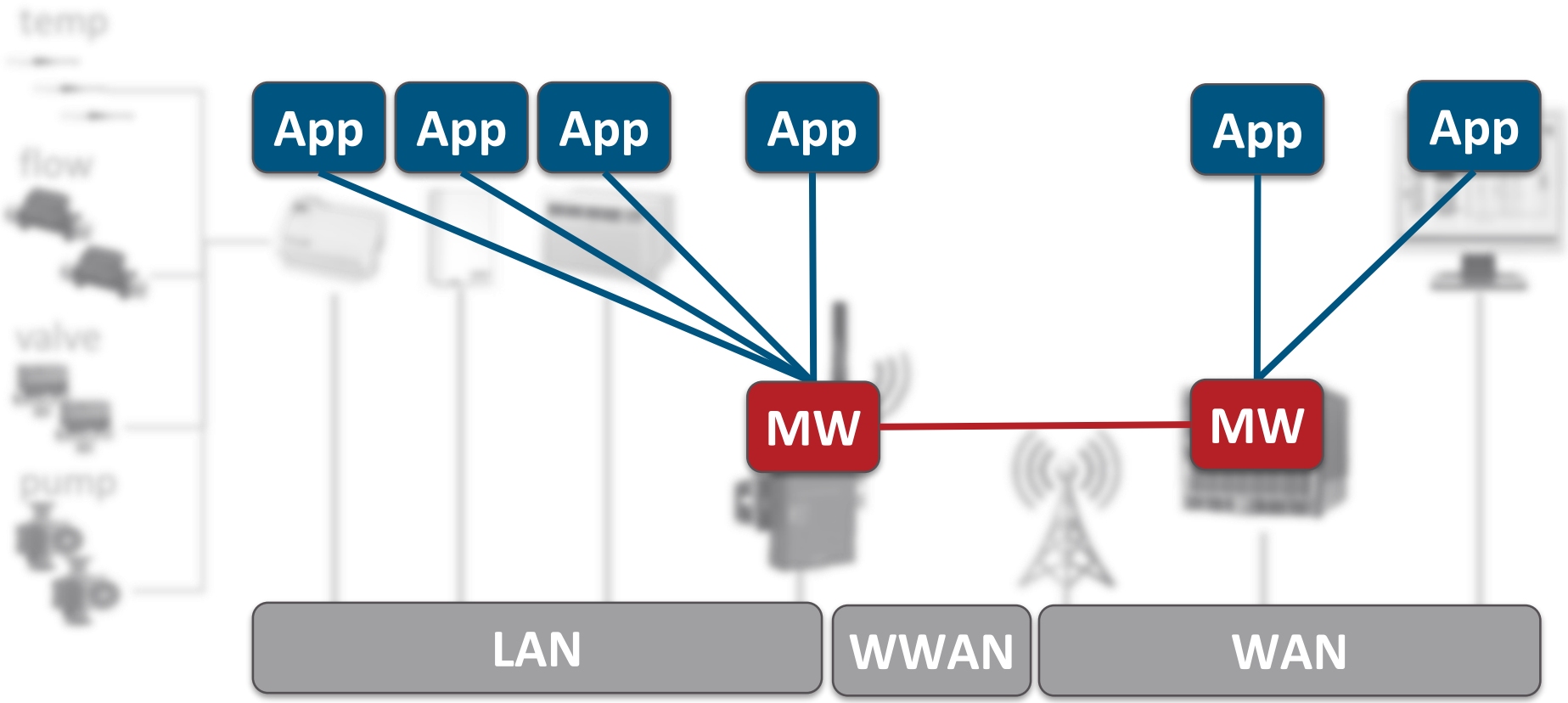

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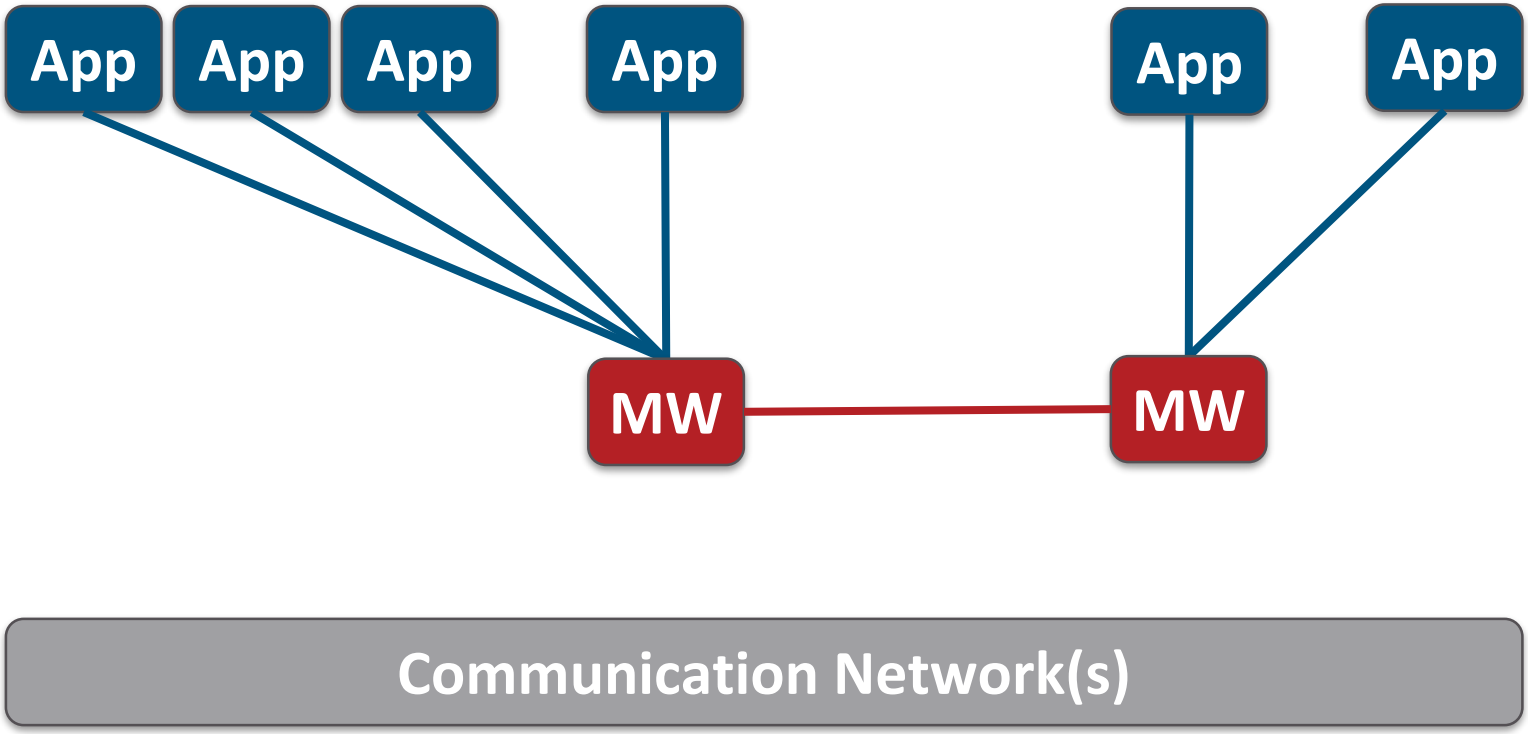

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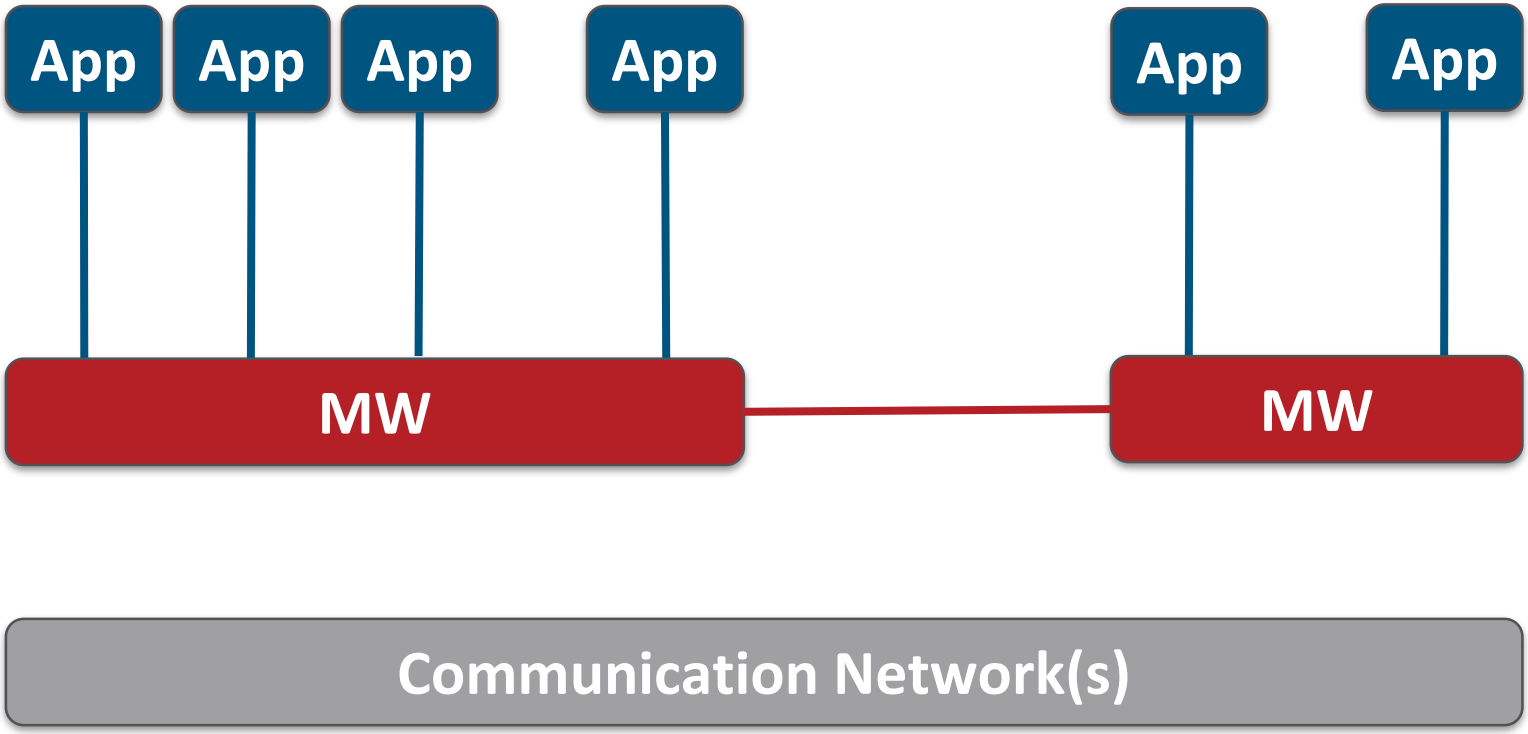
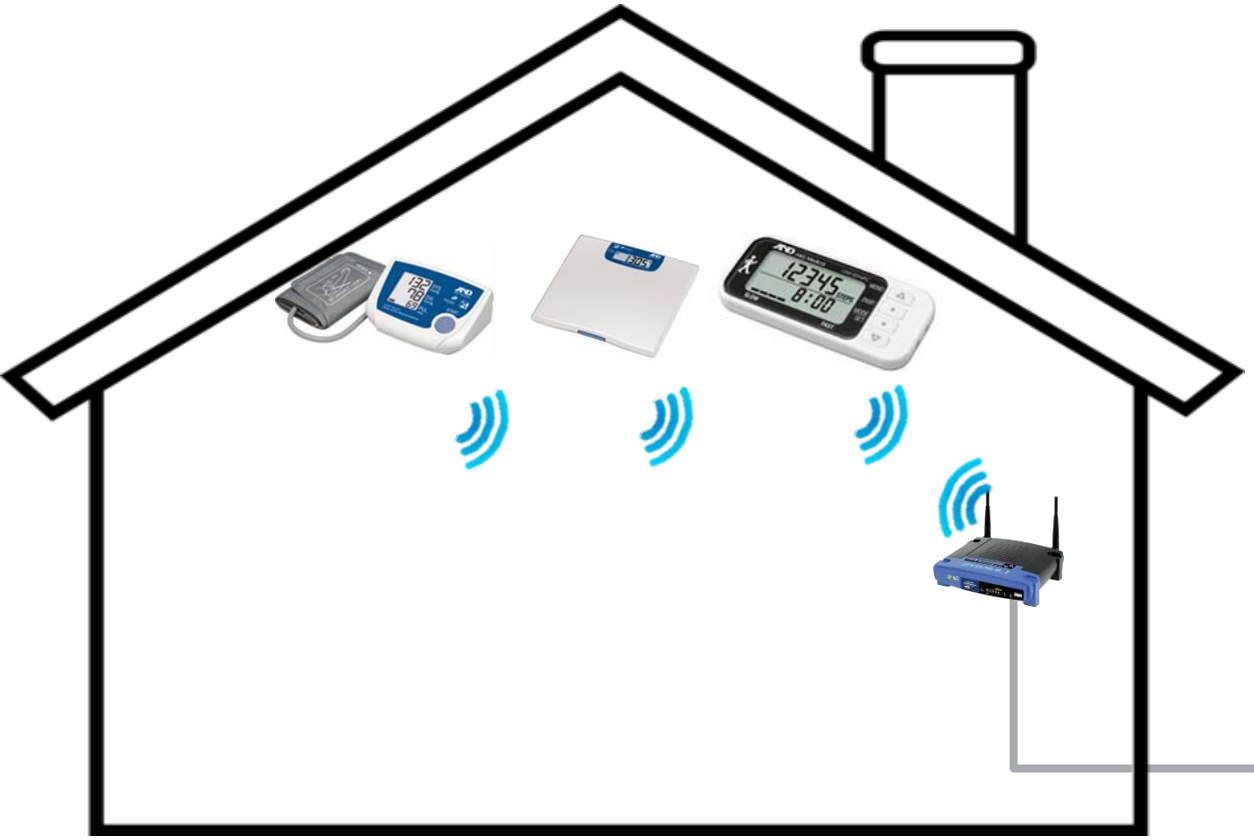


eHealth



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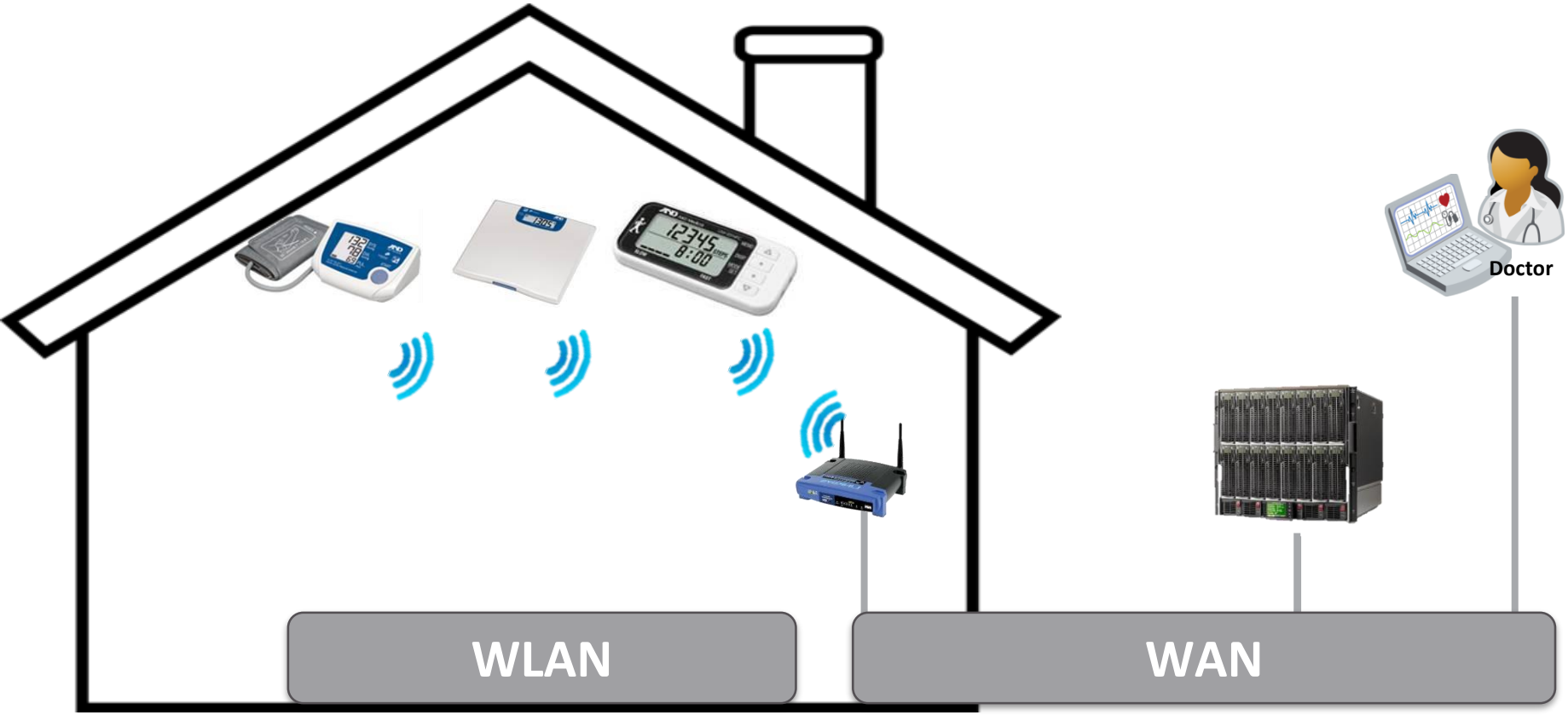

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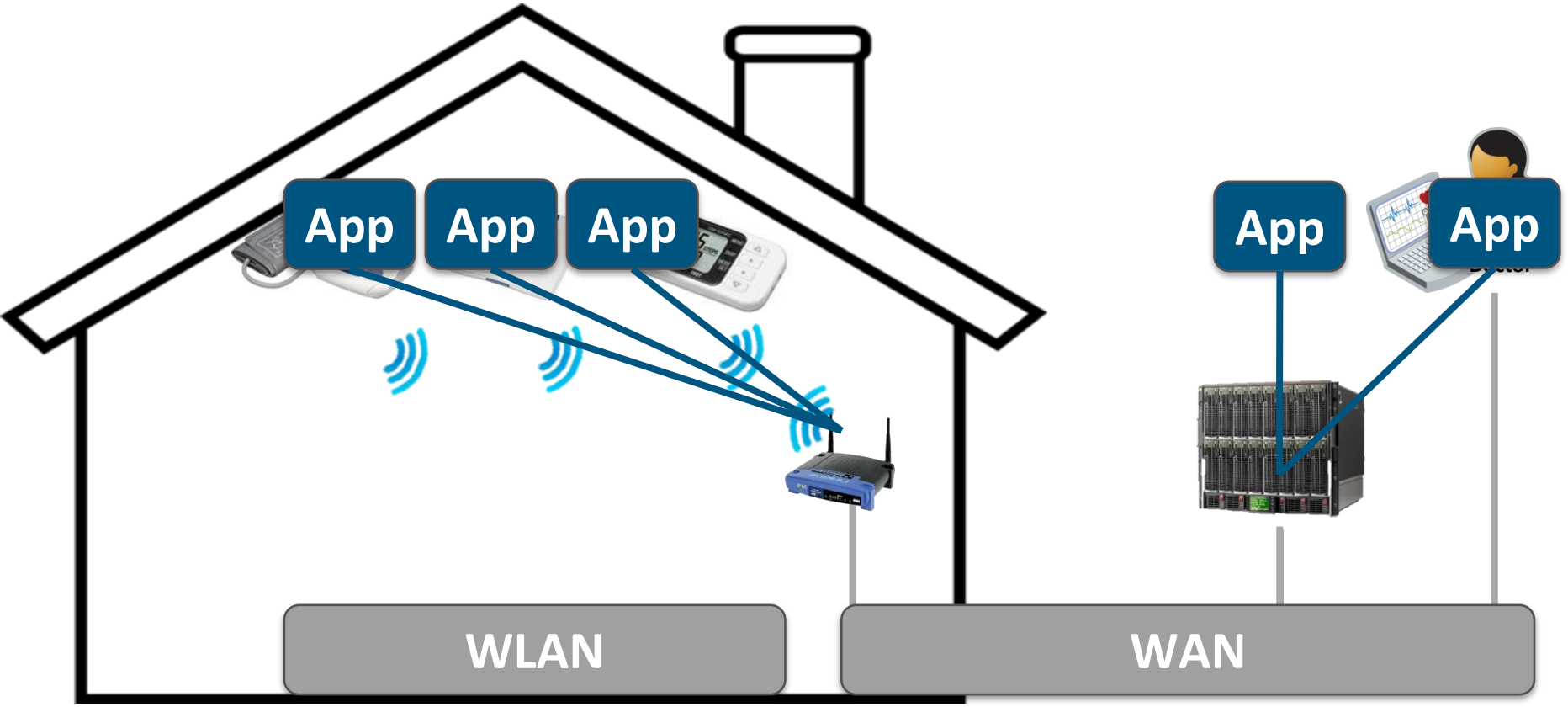

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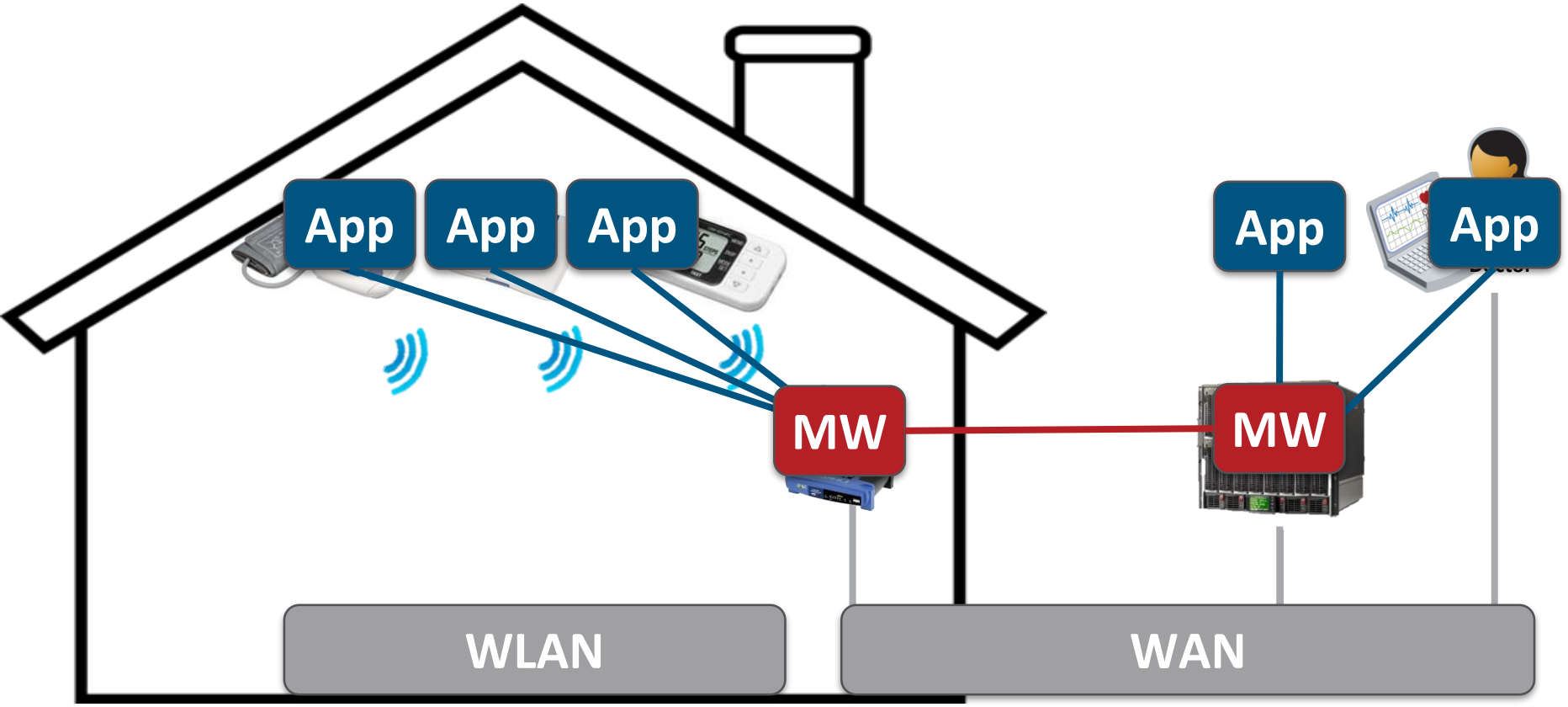

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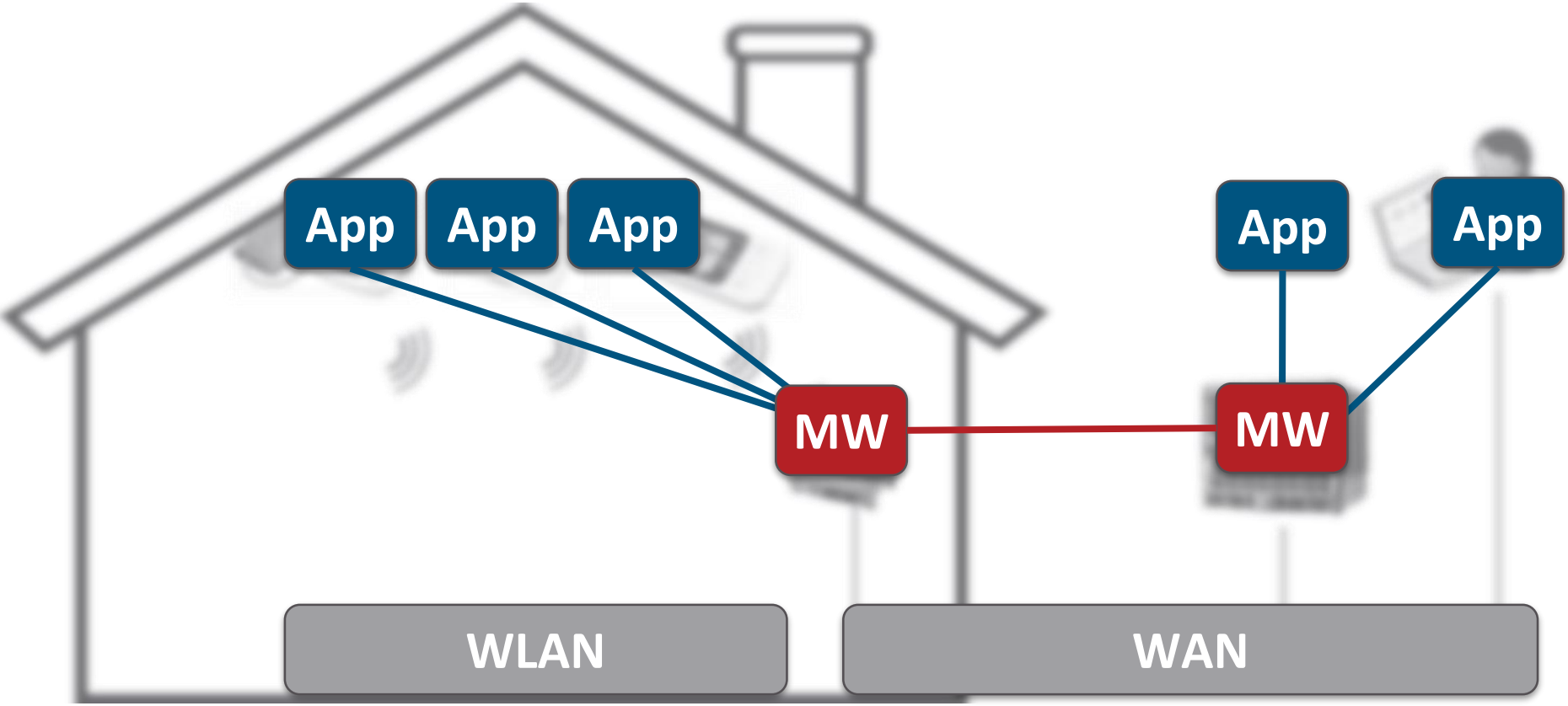

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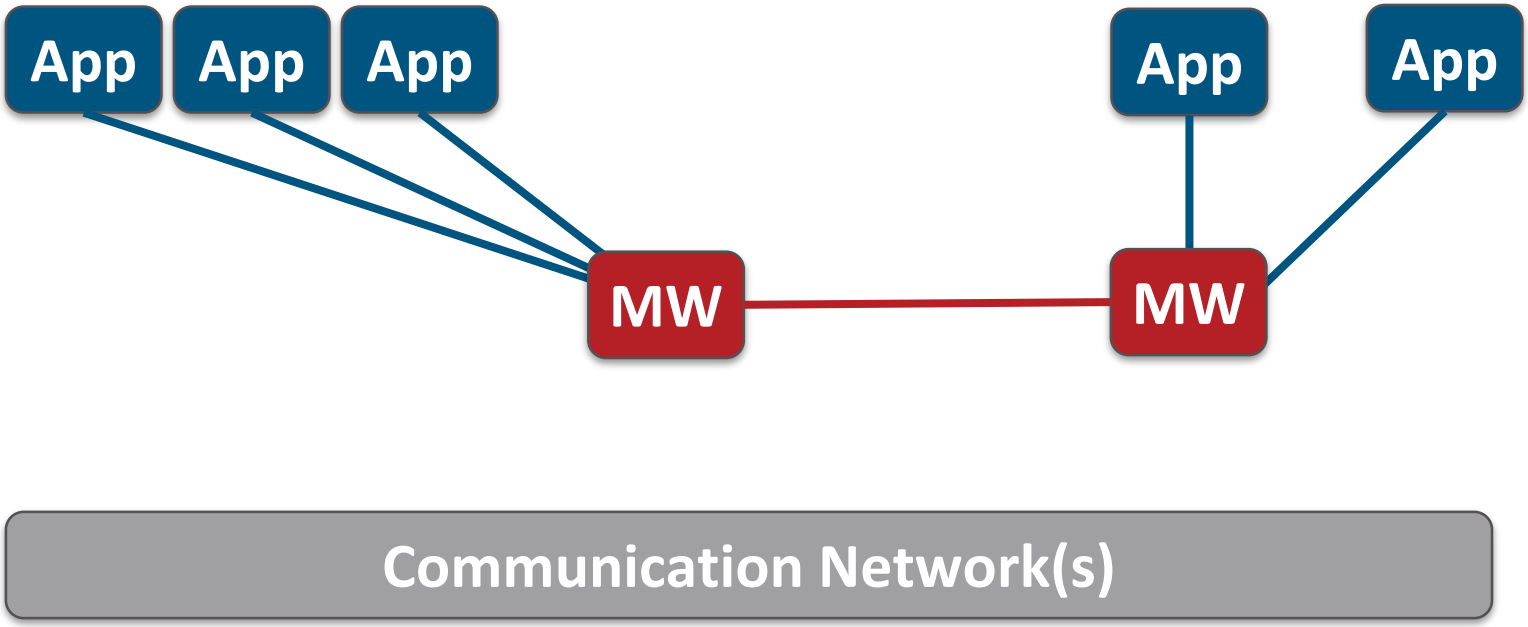

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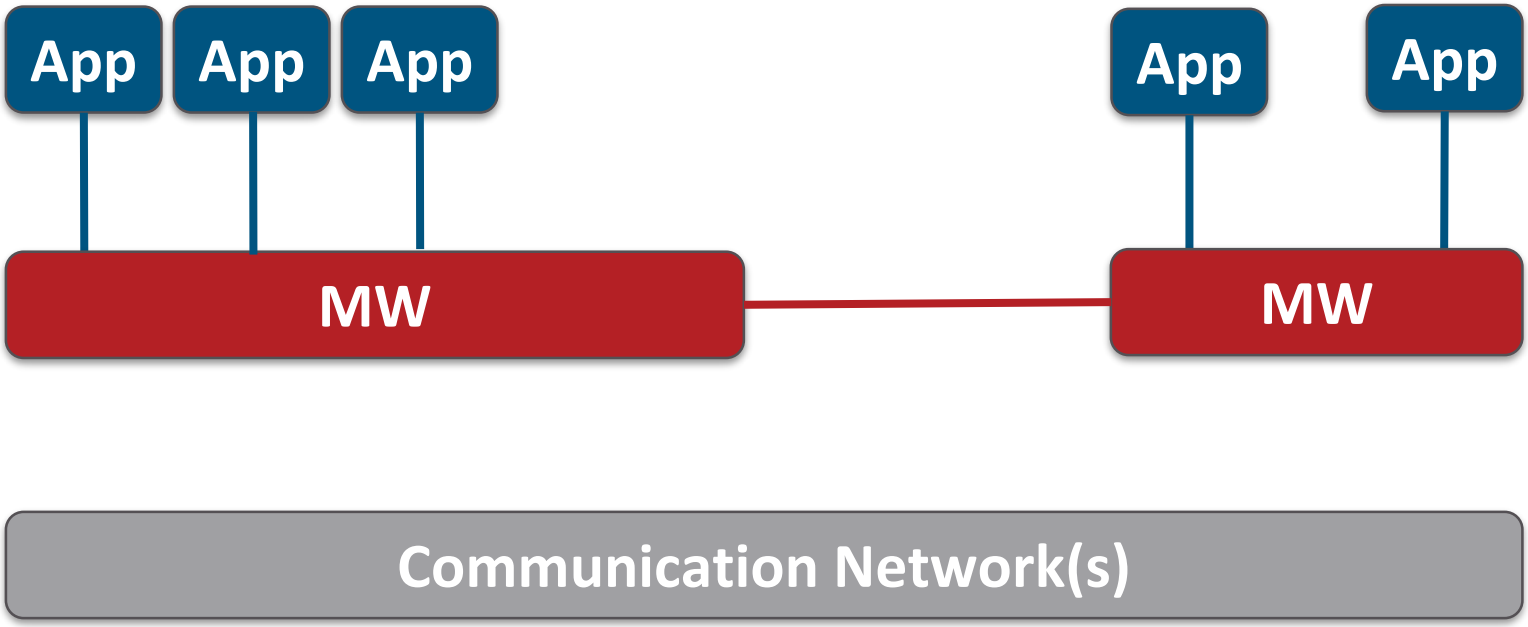
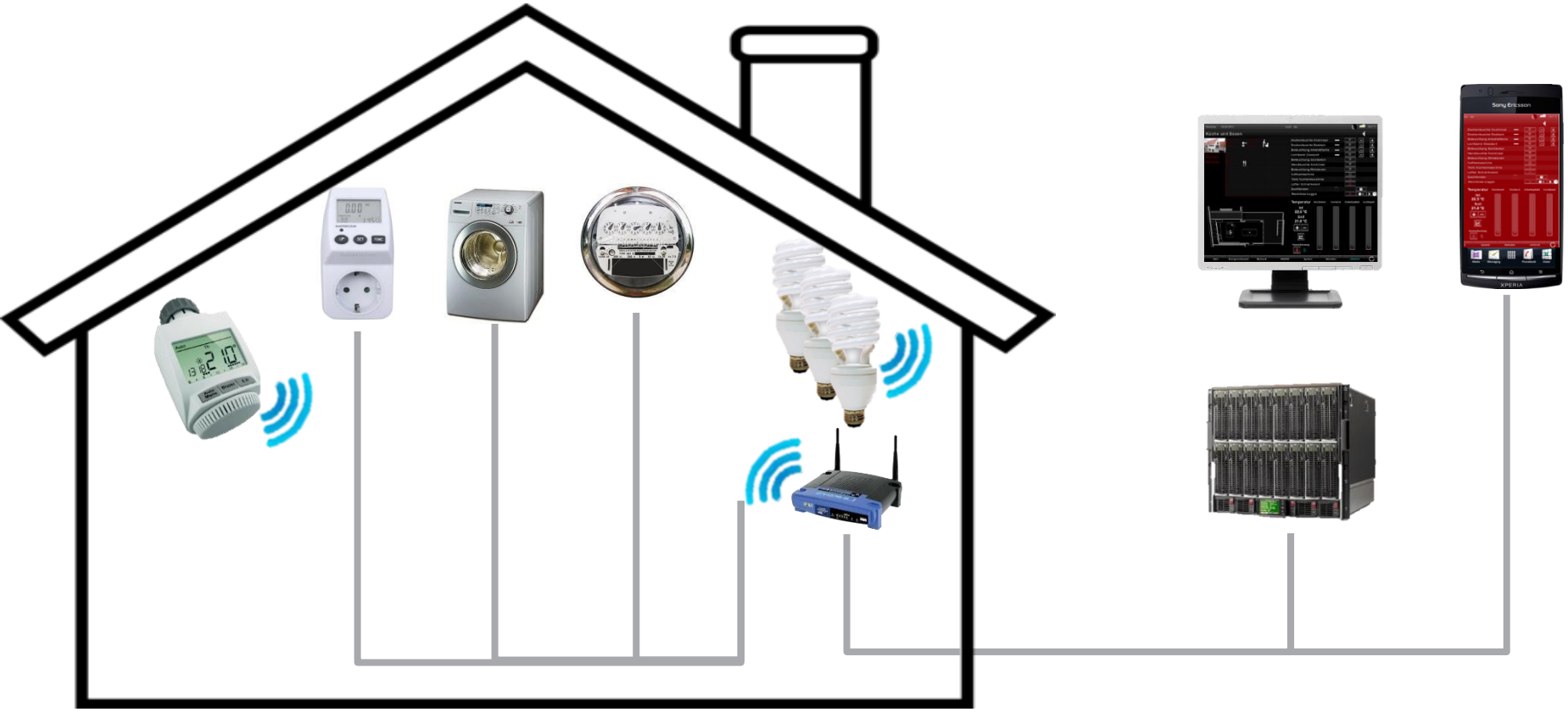


Smart Home



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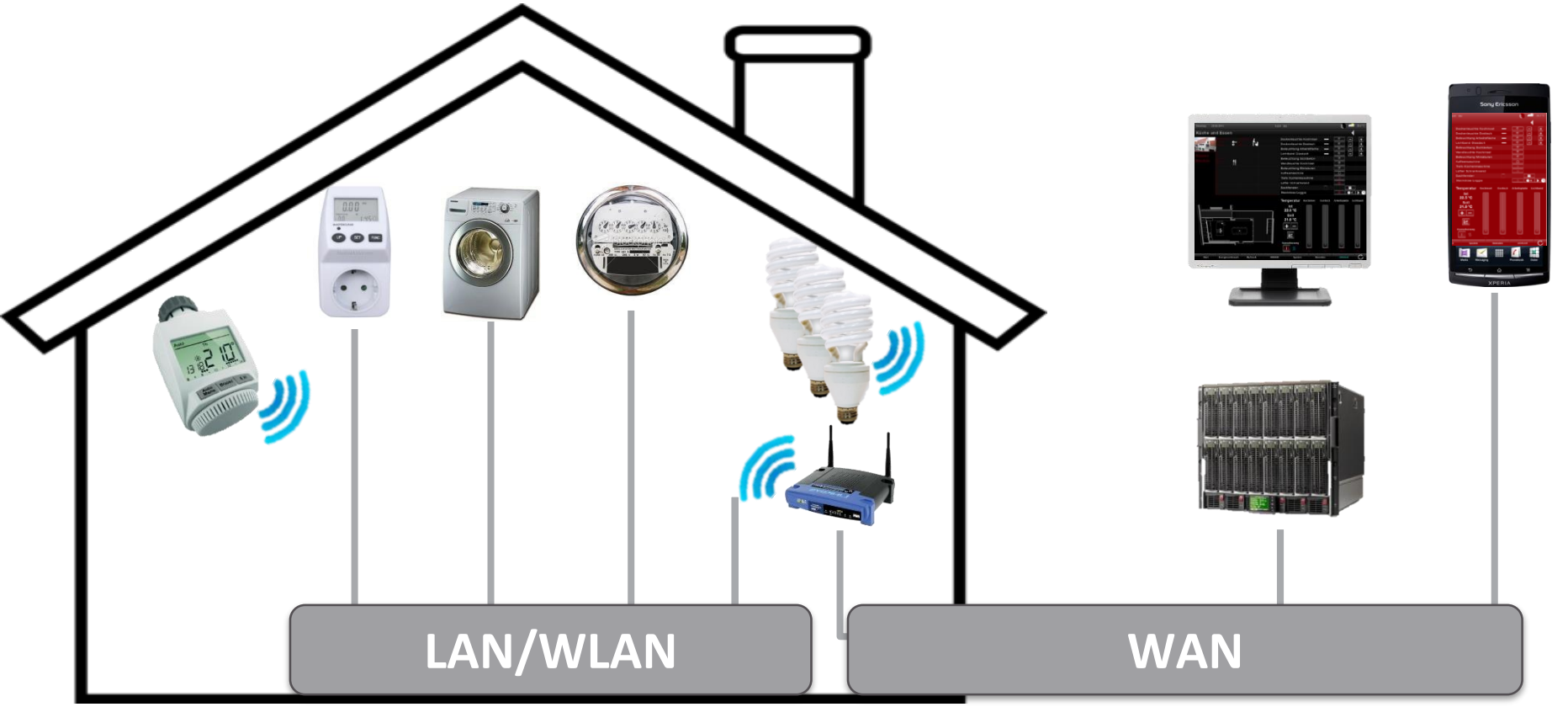

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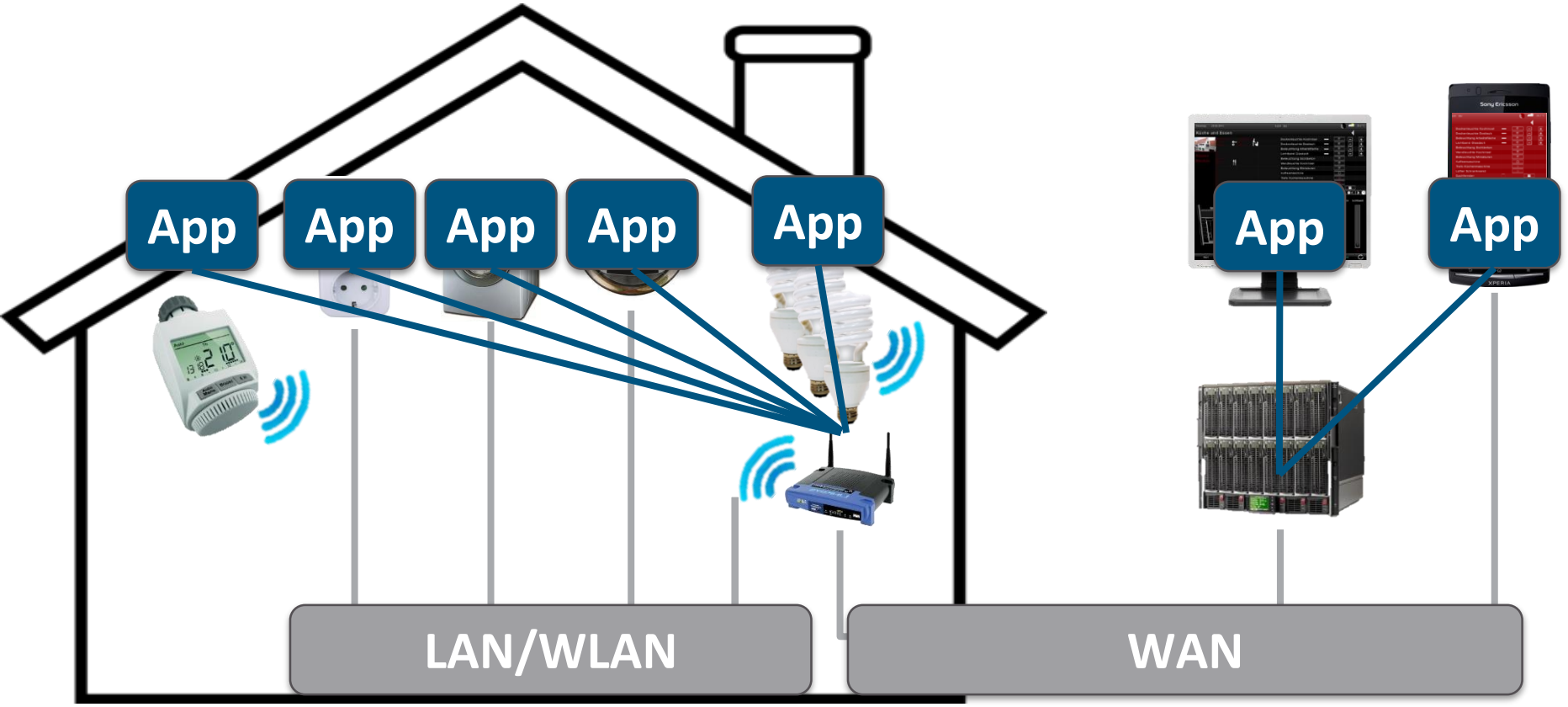

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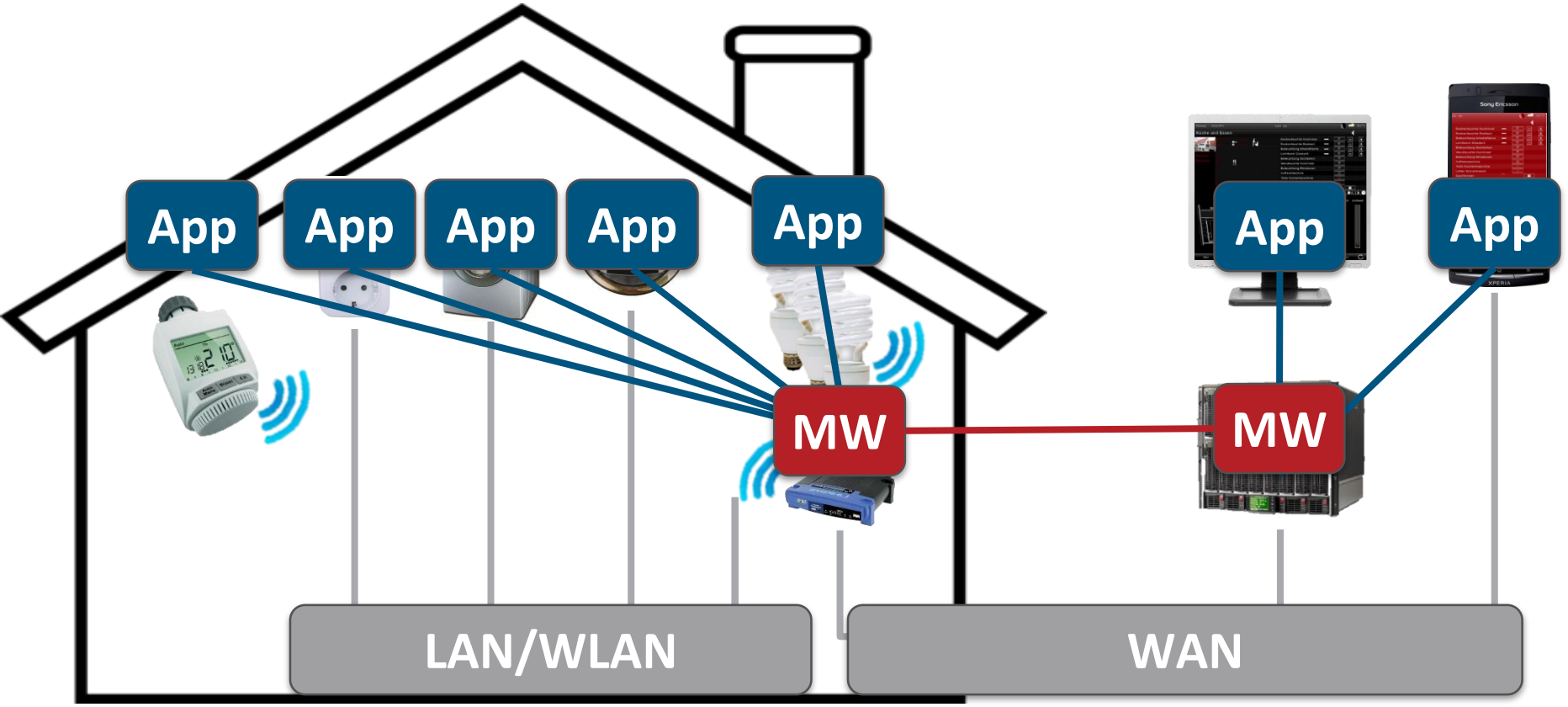

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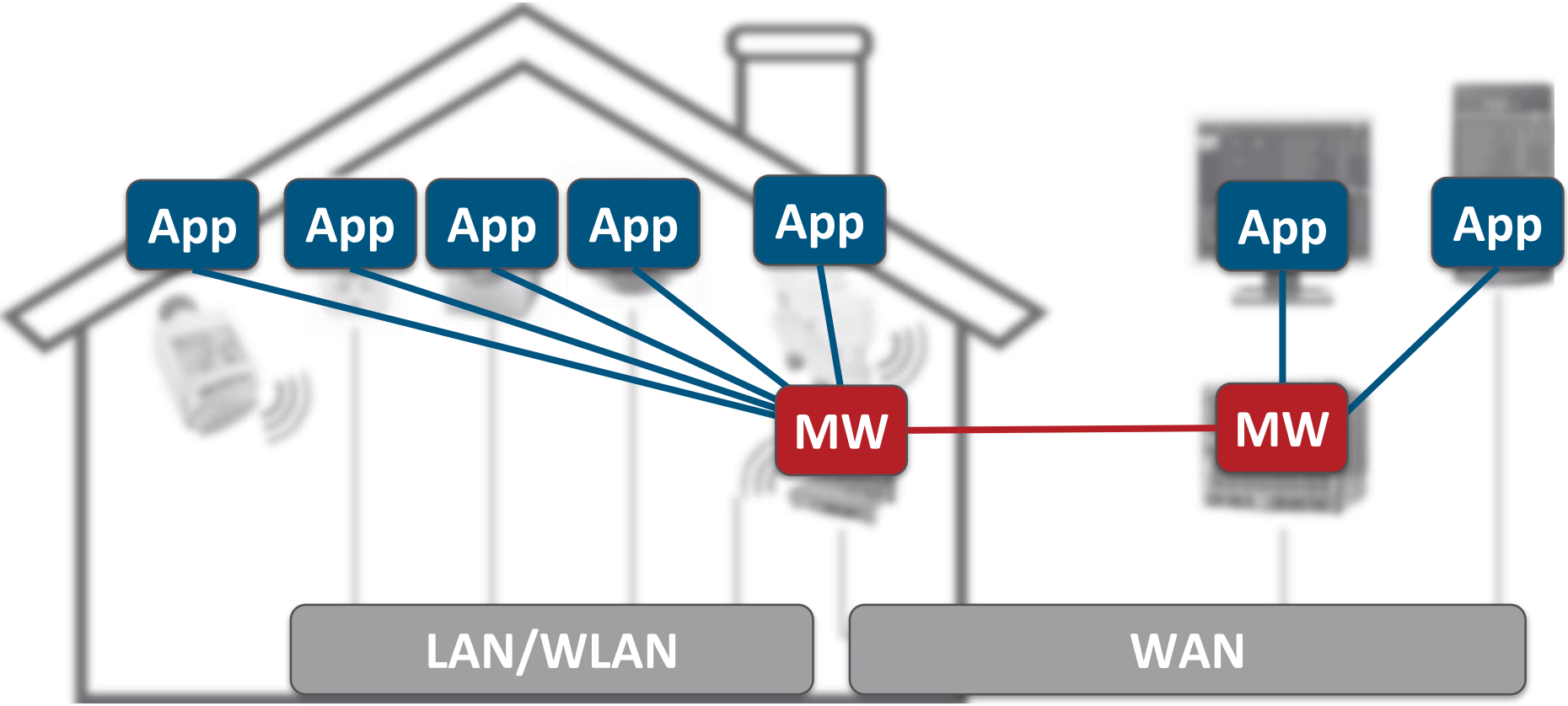

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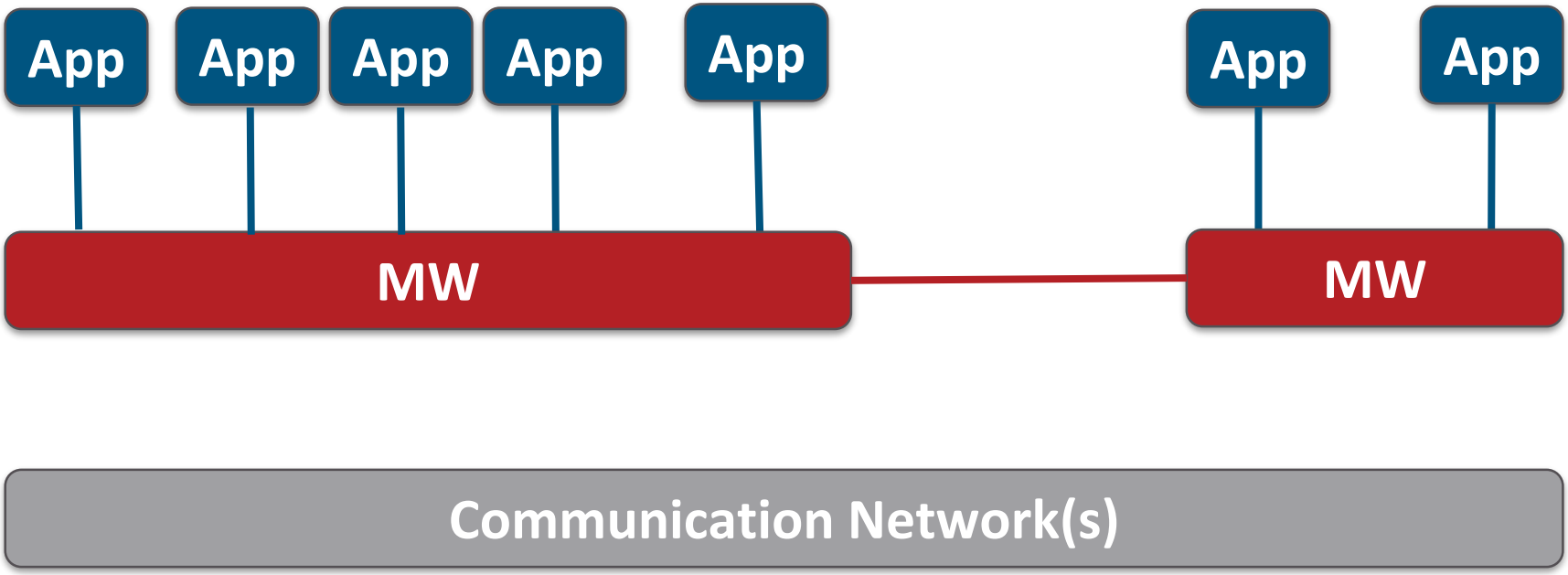
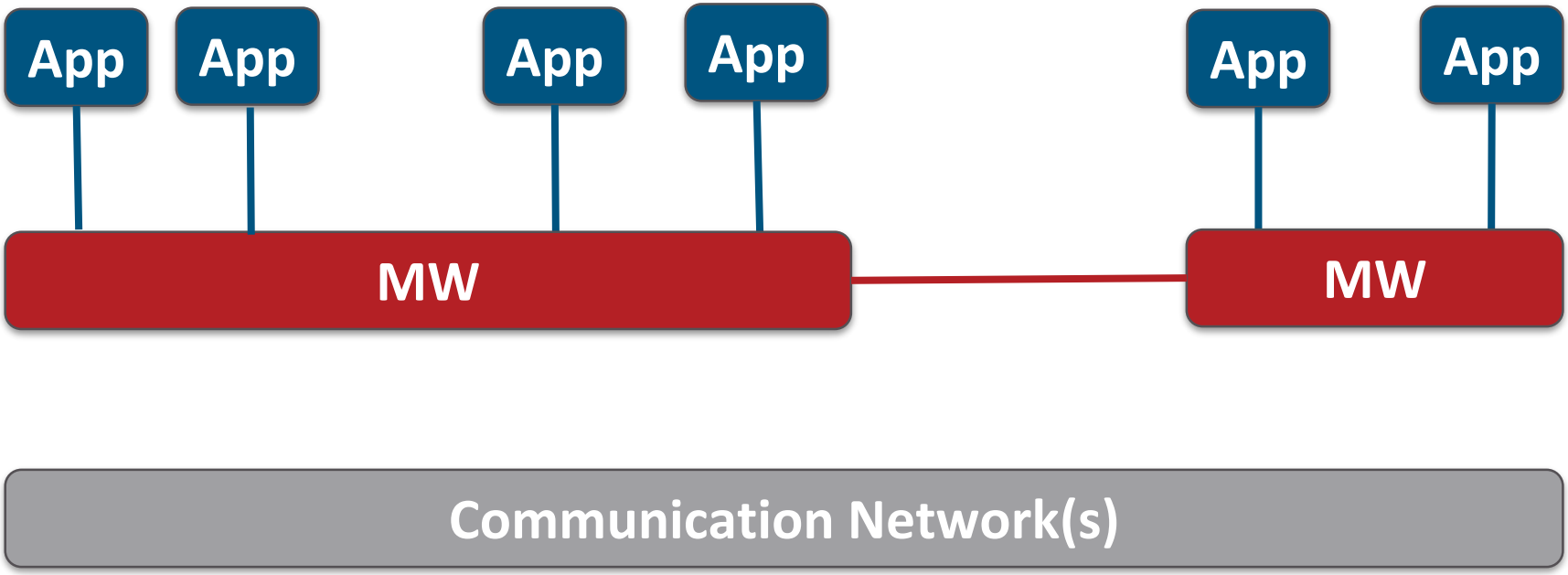
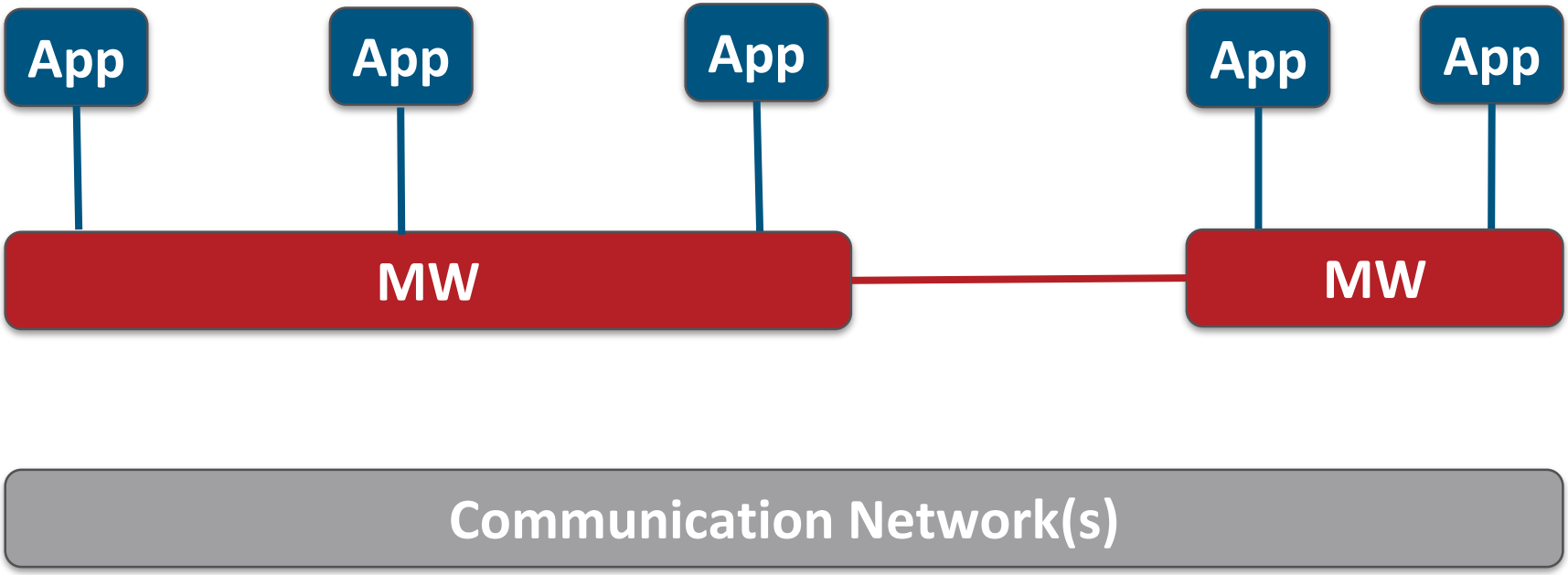


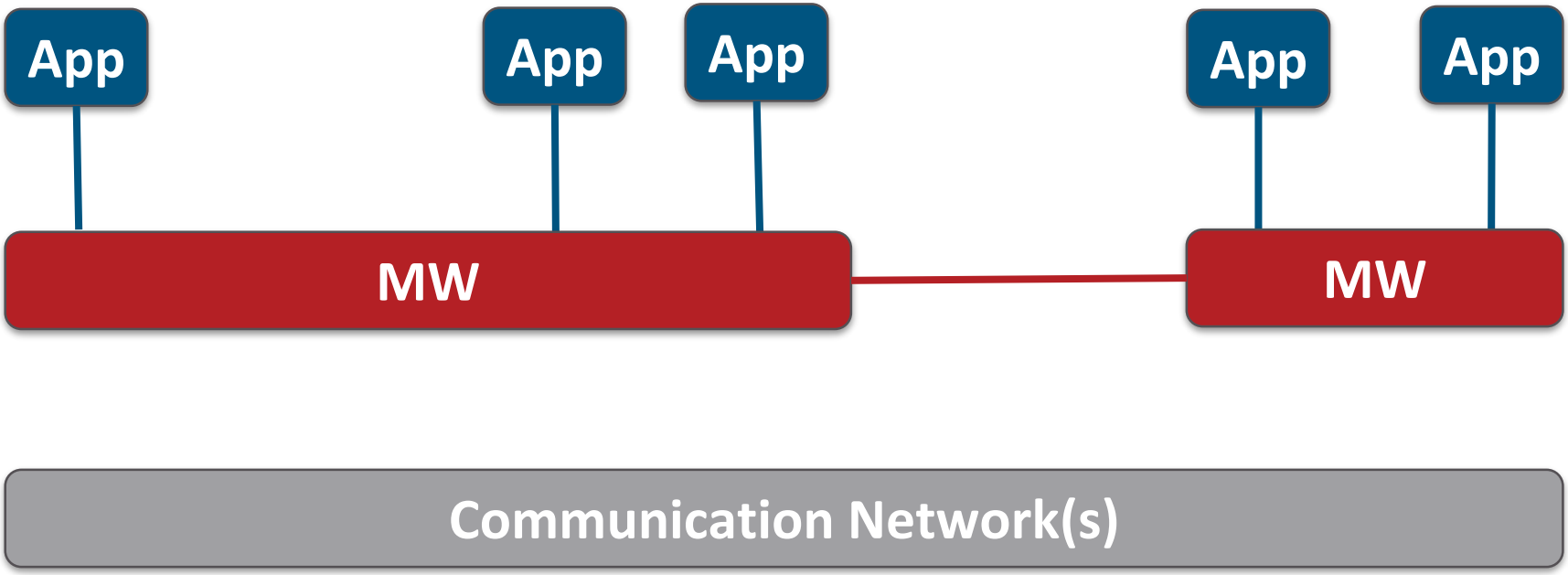
Automotive



Metering



Asset Monitoring



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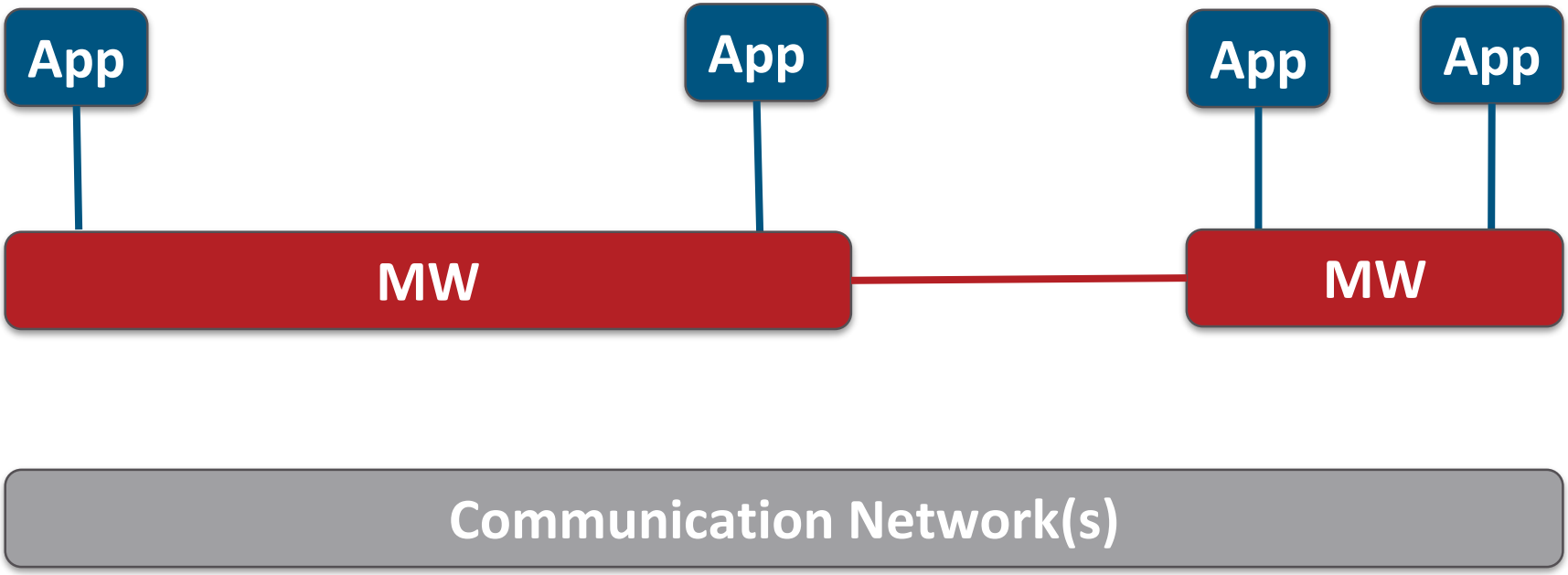
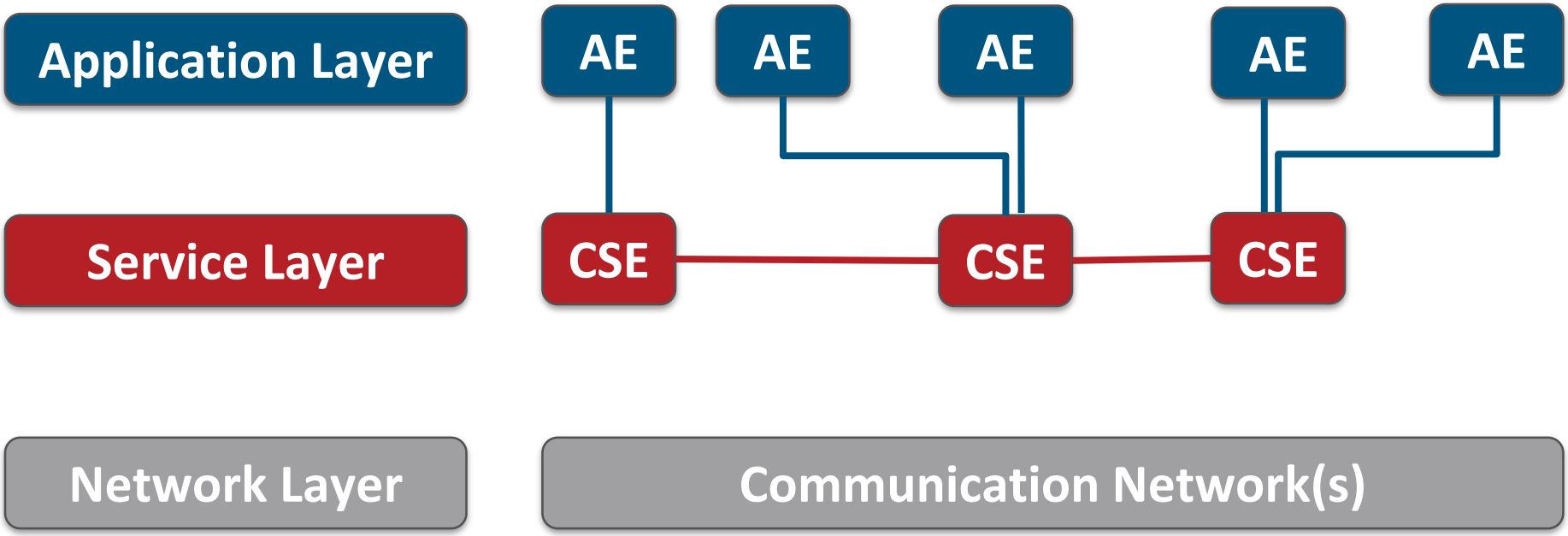


It all looks similar

It is all one…

It is all oneM2M

oneM2M

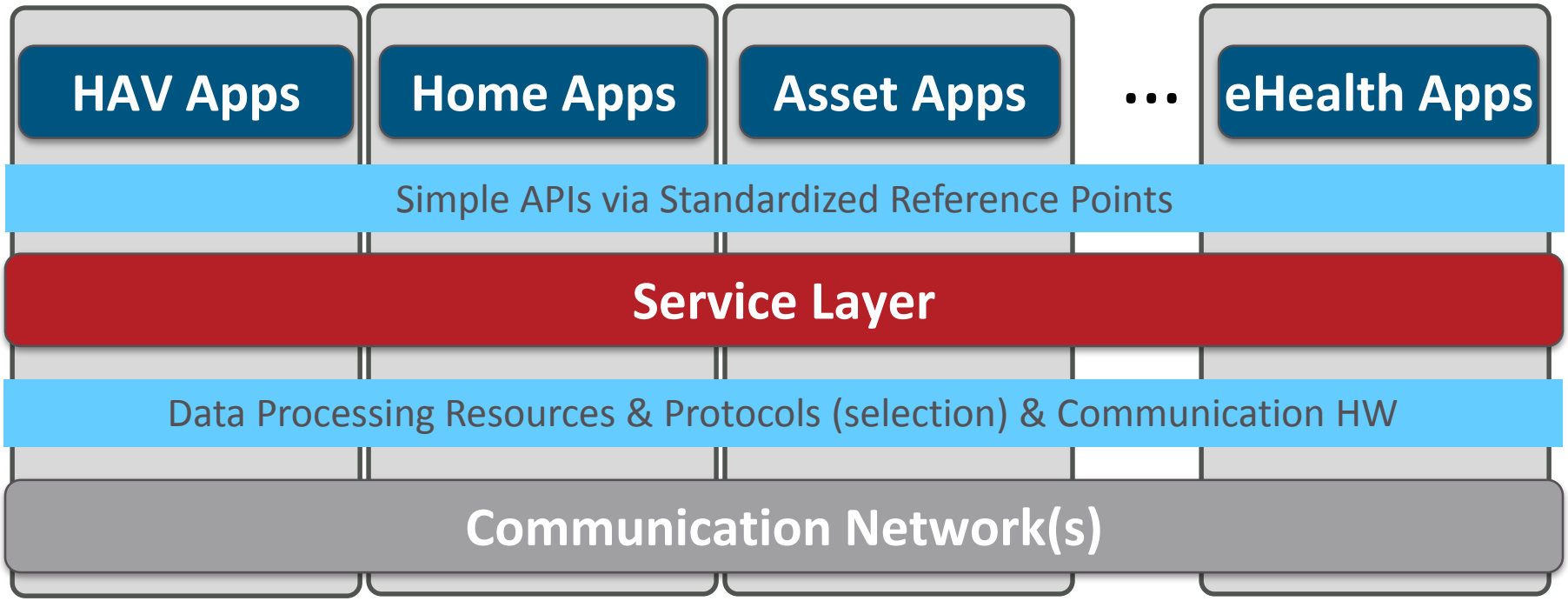


AE: Application Entity
CSE: Common Services Entity

oneM2M

- It is Software/Middleware
- It sits between applications and data processing & communication HW
- Integrated into devices/gateways/servers e.g. sensors, actors, things, routers, cloud
- Connects data producers and consumers in secure manner
- 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
- Manages devices on large scale

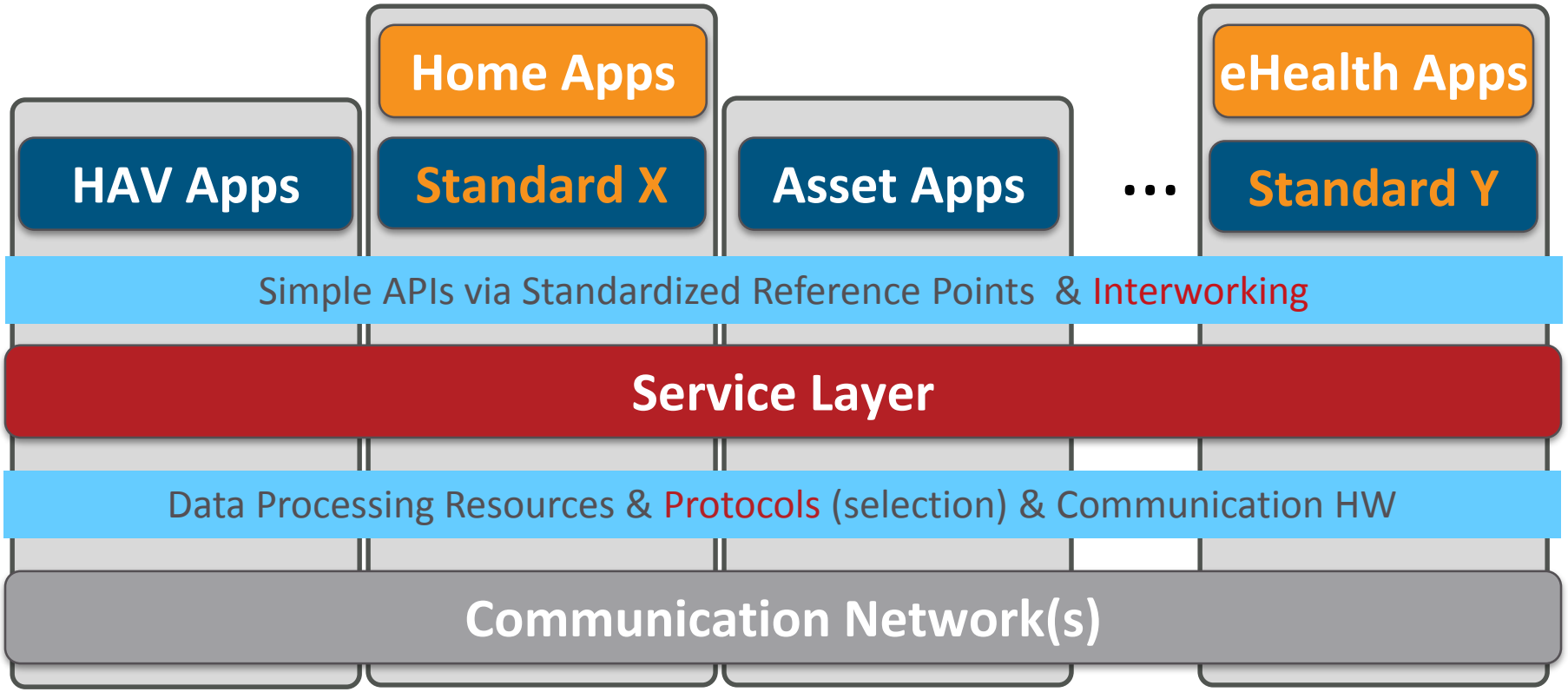
oneM2M



Horizontal layer of functions commonly needed across different segments

Similar: Generic OS versus use case-specific application

Interworking



Horizontal layer of functions commonly needed across different segments

Similar: Generic OS versus use case-specific application

Check out last webinar for…

Taking a Look Inside

by Nicolas Damour

Senior Manager for Business and Innovation Development,
Sierra Wireless
and Chair of Architecture Working Group

Held on October 30th 2014

http://www.onem2m.org/technical/webinars

Why is it important?

Why is it important?

Cost ↓

Fragmentation ↓

Opportunities ↑

Why is it important?

Cost ↓

Fragmentation ↓

Opportunities ↑

…???

Reduced CAPEX

- Lower complexity of development
  - Functions provided by the M2M SL do not need to be developed in a proprietary way, think “library”
  - Programmer does not need to be a communications expert
- Standardized protocols & APIs
  - simplifies application development, testing and interworking of components
- Horizontal SL reduces deployment cost
  - No need for vertical/segment-specific platforms
  - Shared infrastructure, still isolated well and secure
  - Allows for scaling; same components in different industries
- Higher component volumes
- Faster Time to Market

CAPEX Impact

Application Development

Simple APIs

e.g. Library

General Purpose Volume ↑

e.g. Modules or Gateways

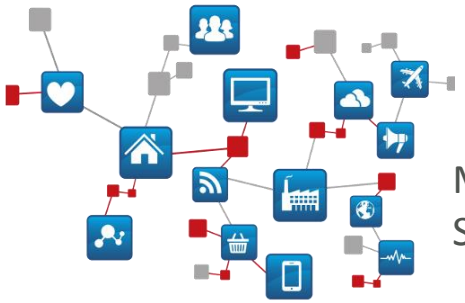
Unified Platform

Server

Developer:

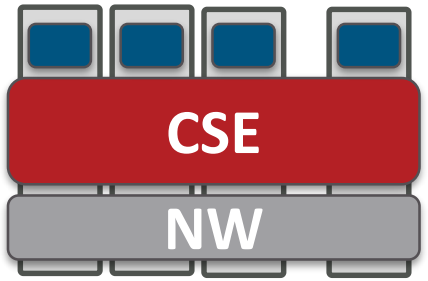
- CSE functions ready to use
- No module/network expert needed
- App development independent of underlying transport
- Standard message exchanges
- Focus on use case logic
- Faster development process

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



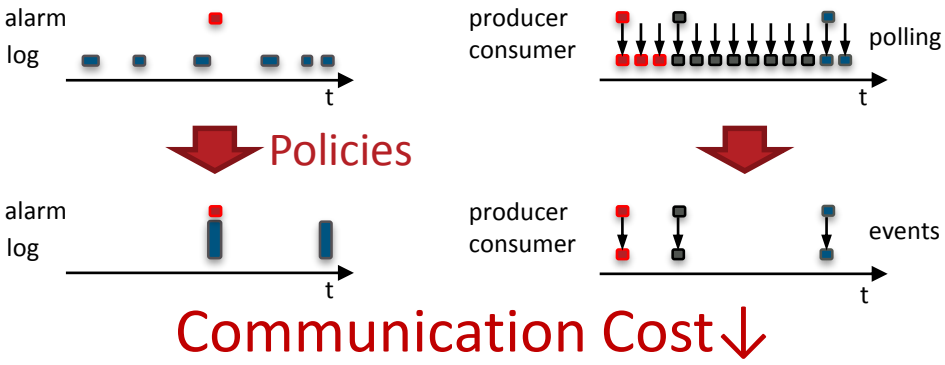
Lower CAPEX

Reduced OPEX

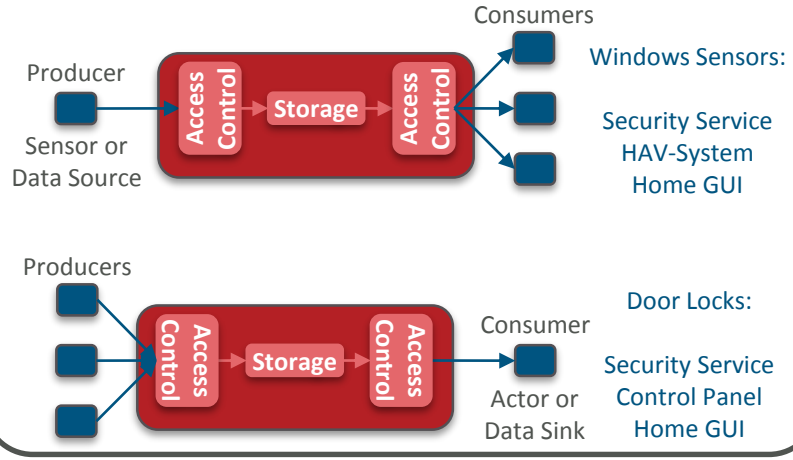
- Communication Efficiency
  - Policy-Driven Communication
    - Store-and-forward with Scheduling and Access Selection
    - Allows to adjust to cost / efficiency needs
  - Event Communication
    - Only send information when relevant events happen
- Sensor/Actor/Data Sharing
  - Produce once, consume multiple times
    Share sensors / actors across use cases
- Flexibility
  - Utilize best transport network to meet business needs
  - Applications do not need to be aware of connectivity options supported by devices
- Same service layer for different verticals / segments
  - Reduces cost of operation
  - Possibility to share infrastructure with other verticals and only pay for service used

OPEX Impact

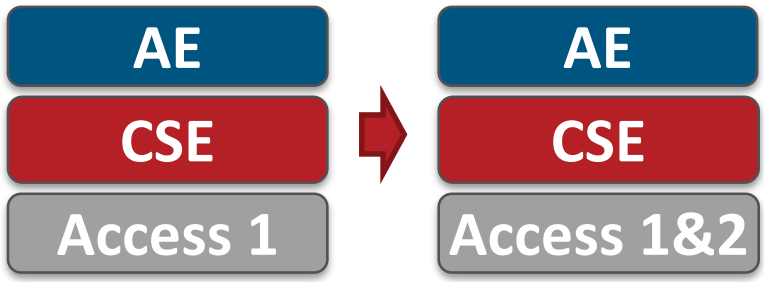
NW Efficiency & Protection



Sensor/Actor/Data Sharing



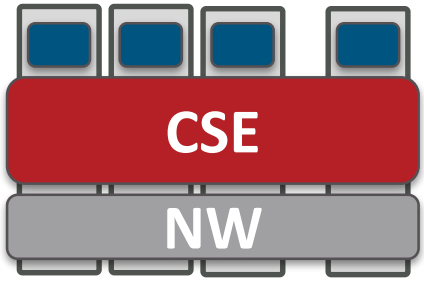
Flexible Choices



Lower OPEX

Single Platform

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

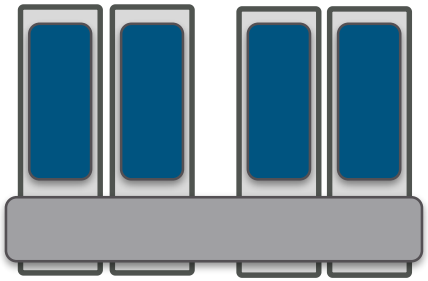


Horizontal Opportunities

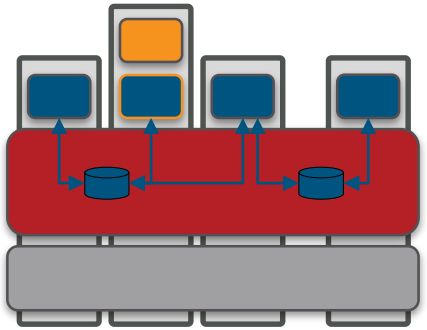
- Share sensors/actors/events/data across applications or verticals
  - Allows for new business models / added value
  - Governed by access control
- Unified horizontal M2M/IoT data & event communication and sharing platform
  - Streamlined communication and sharing functions
  - Easy interworking with vertical/application-specific standards
  - Developer can just focus on application logic
    - Does not need to implement communications / data sharing details
- Address new markets and products
  - Due to reduction in CAPEX/OPEX and complexity, M2M & IoT solutions can be addressing use cases where development cost and time was prohibitive so far

Motivation for Transition

Vertical Silos



Interconnected Silos

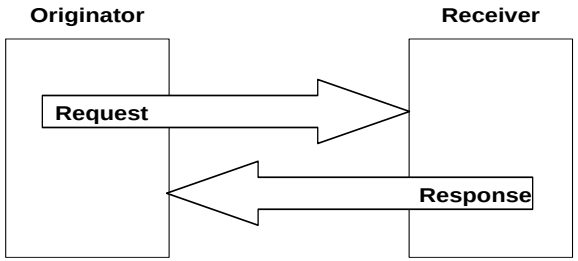


- Intra-Vertical or Intra-Use Case
  - Lower cost
    - CAPEX & OPEX impact as explained, easier to maintain, focus only on Apps
  - Larger eco system: More choices
    - Transition from one SP to another SP using same standard
    - Chose from different SW/HW vendors that offer standard compliant products
    - Select products that match with individual requirements, minimize cost for customization
- Inter-Vertical or Inter-Use Case
  - All of the motivators above, plus:
  - New opportunities
    - Shared access to sensors/actors/events/data allows for new business models / added value
    - X-access allows for synergies between so-far isolated silos

How does it work?

Request / Response Paradigm

- Entities communicate with each other via pairs of requests and responses
- A request-message triggers a response message



  - Request/Response pattern allows for robust data transport when needed
  - Request/Response pattern allows for subscribe/notify mechanisms
  - Request / Response pattern is quite flexible as it can be used to accommodate other message passing patterns as well.
- Originators: AEs or CSEs
  Receivers: CSEs, AE (optional)

Resource oriented approach in oneM2M

REST = Representational State Transfer

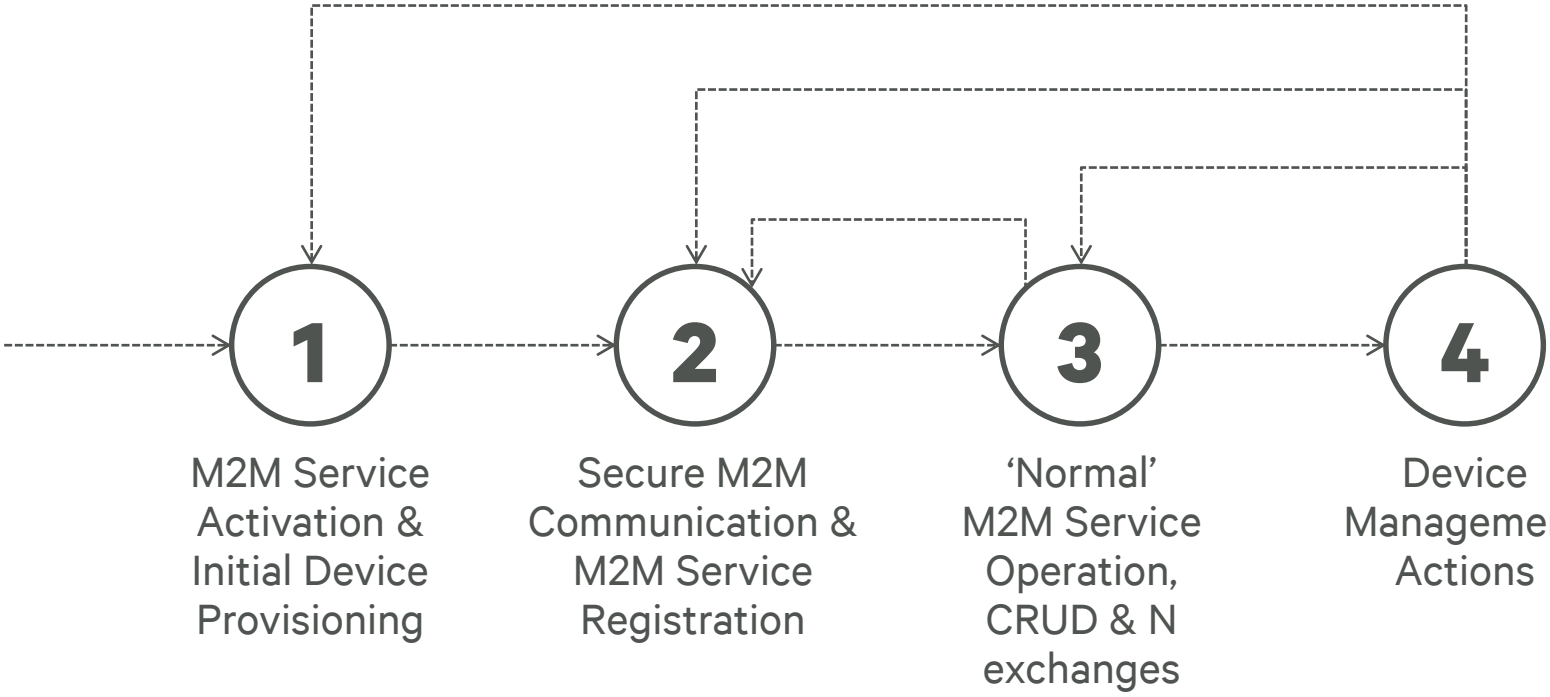
- Dissertation by Thomas Roy Fielding, 2000 {HTTP contributor}
- Architectural style for distributed applications
- State information is residing in hosted resources only
  - Interfaces between entities use stateless communication
  - Requests can be processed based on resource state and request itself => idempotent
- State transition is done by manipulation of resources
- Simple and uniform interfaces are used to access resources
  - Create, Retrieve, Update, Delete
- All services offered via addressable resources with access control
- Idempotency is key for scalability (caches, proxies, drops, repetitions)
- oneM2M not strictly REST but RESTful / resource oriented
  - Also added notifications

Simplified Event Flow

- Secure Remote Provisioning
  - Supports legacy Device Management protocols
  - Roll-out of Security Credentials, Registration Targets, Entity-IDs etc.
- Establish Secure Communication *
  - Hop by hop between neighboring oneM2M entities
- Data Sharing governed by Access Control *
  - Discovery of resources (special form of Retrieve)
  - CRUD access to data sharing resources (e.g. containers, groups)
  - Establishment of subscriptions
  - Execution of Notifications when subscriptions trigger
  - Policy-driven communications
    - CMDH: Communication Management and Delivery Handling
- Device Management
  - Application life cycle management, diagnostics etc.

* Some more details on following slides

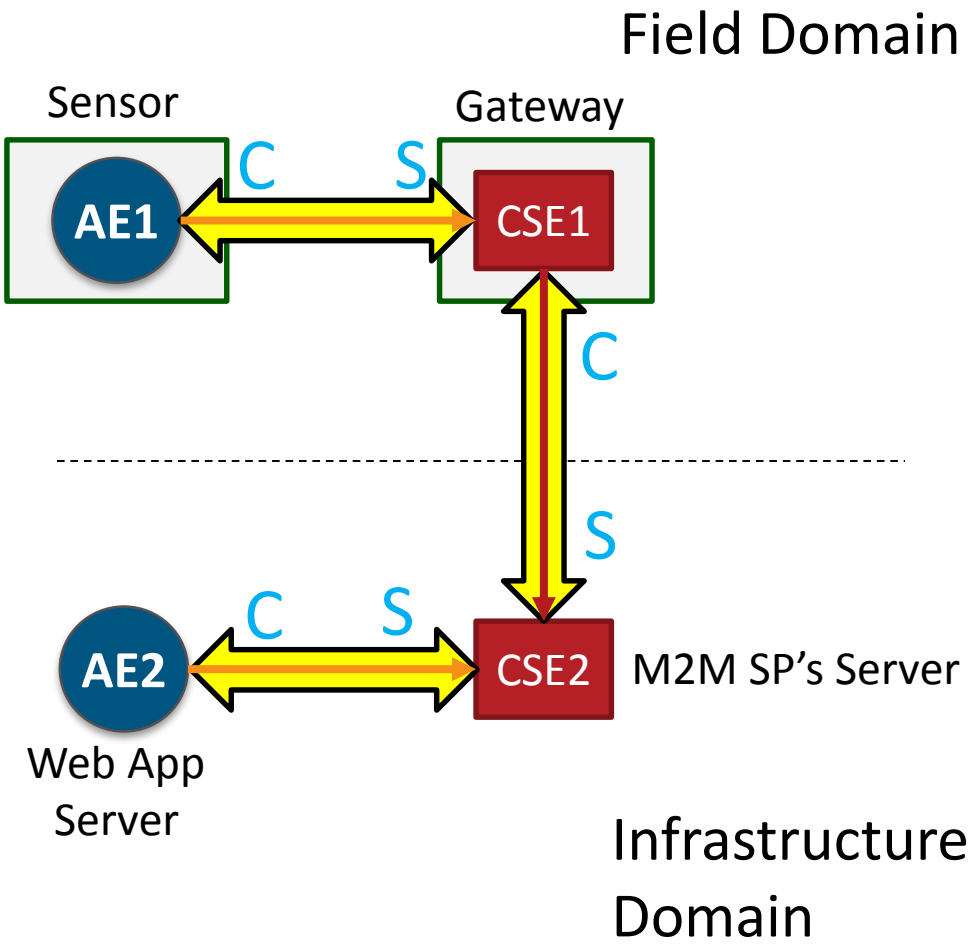
10,000 foot view



Secure Communication

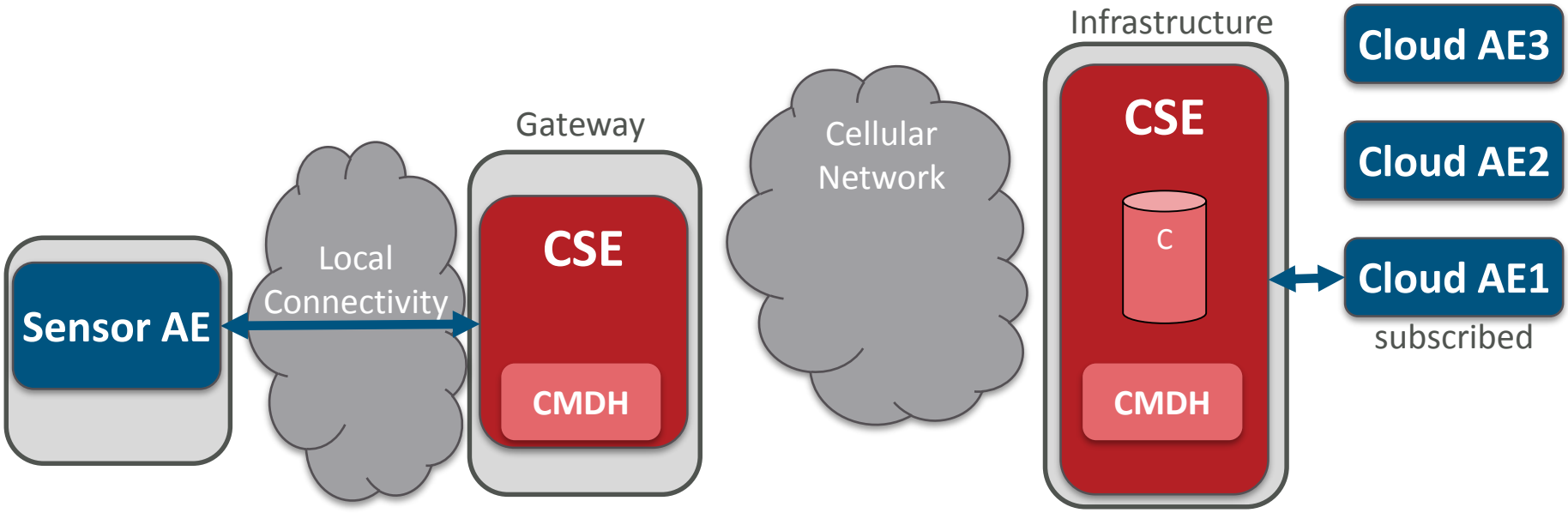
From "Facing the Challenges of M2M Security and Privacy" Webinar by Phil Hawkes

- Hop-by-Hop
- TLS/DTLS v1.2
- AE-CSE
  - AE: TLS Client (C)
  - CSE: TLS Server (S)
- CSE-CSE
  - CSE1: TLS Client (C)
  - CSE2: TLS Server (S)



Check out : https://www.brighttalk.com/webcast/11949/133367 for details on authentication options etc.

Example: Data Sharing



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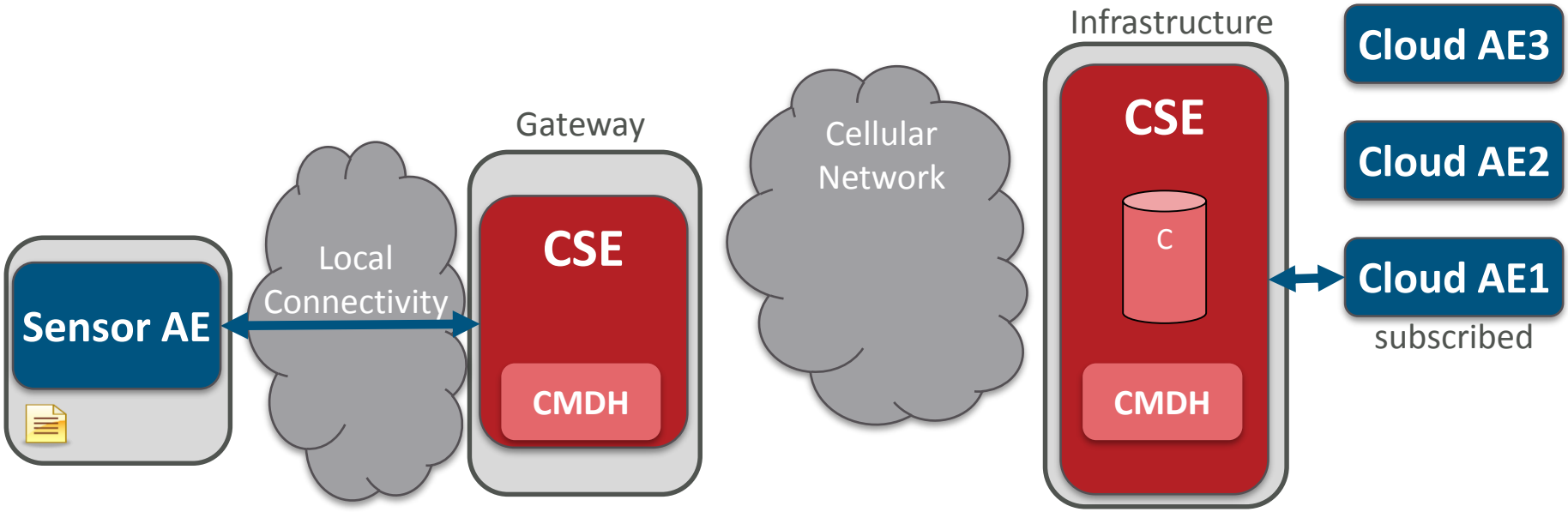


New measurement #1 taken

Originator: Sensor AE; Receiver: CSE on Gateway; Target: CSE in cloud

Create //SL-Cloud/C, not urgent, complete by 4:00 am

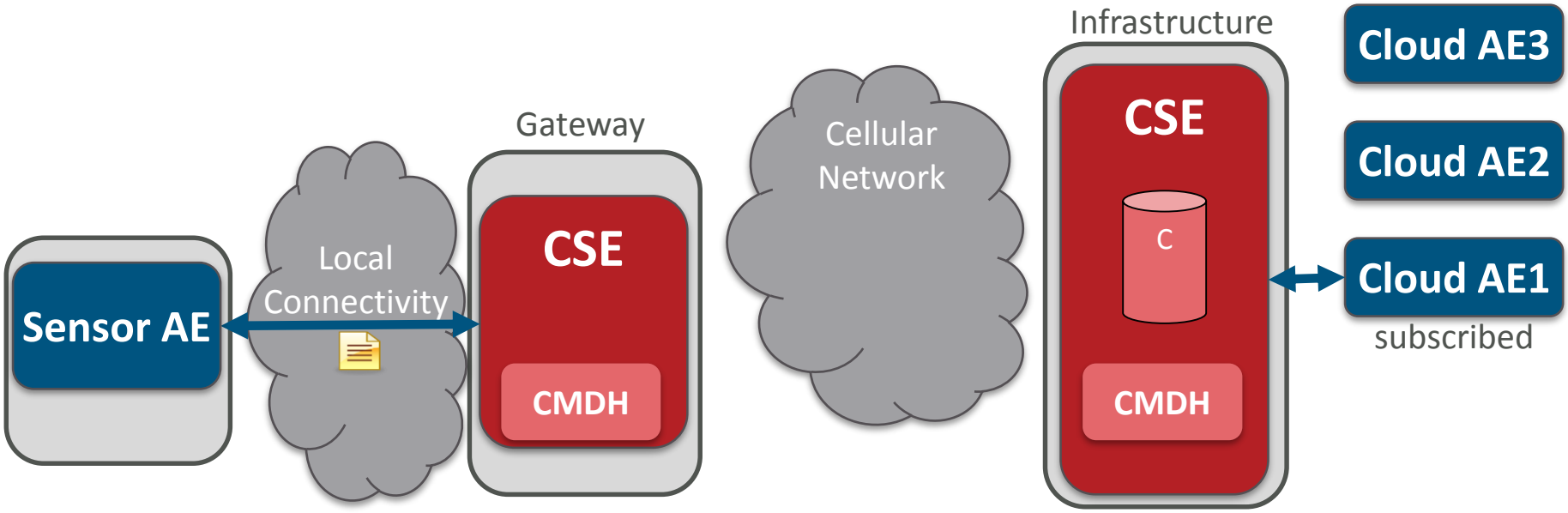
Policies on MN say: For “not urgent” => only from 2 am to 5 am

CSE on Gateway accepts and buffers request in CMDH

10:00 pm

Container Resource

Example: Data Sharing



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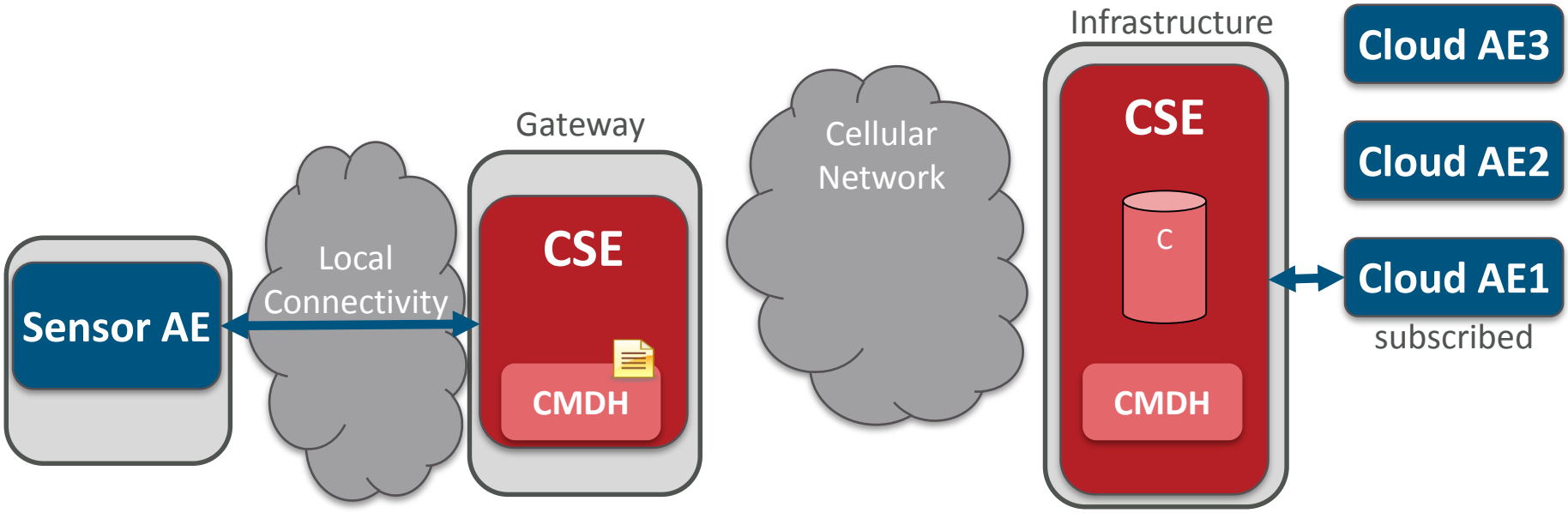
10:00 pm

Example: Data Sharing



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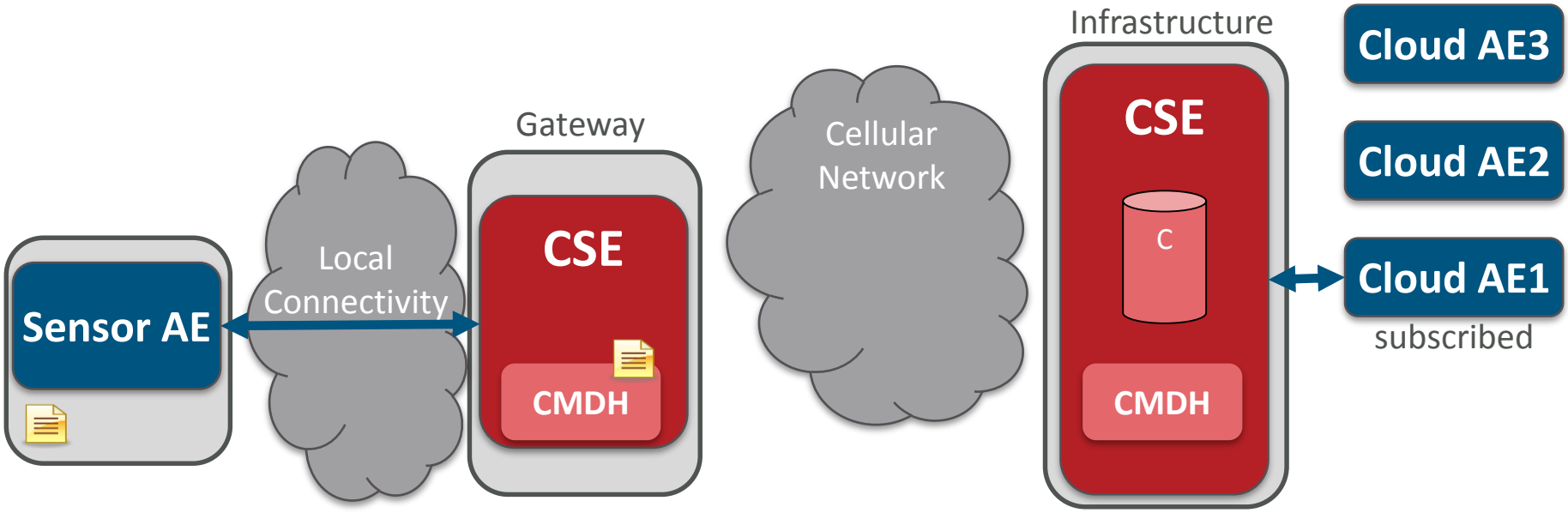
CSE on Gateway accepts and buffers request in CMDH

10:00 pm

Example: Data Sharing



New measurement #2 taken

Originator: Sensor AE; Receiver: CSE on Gateway; Target: CSE in cloud

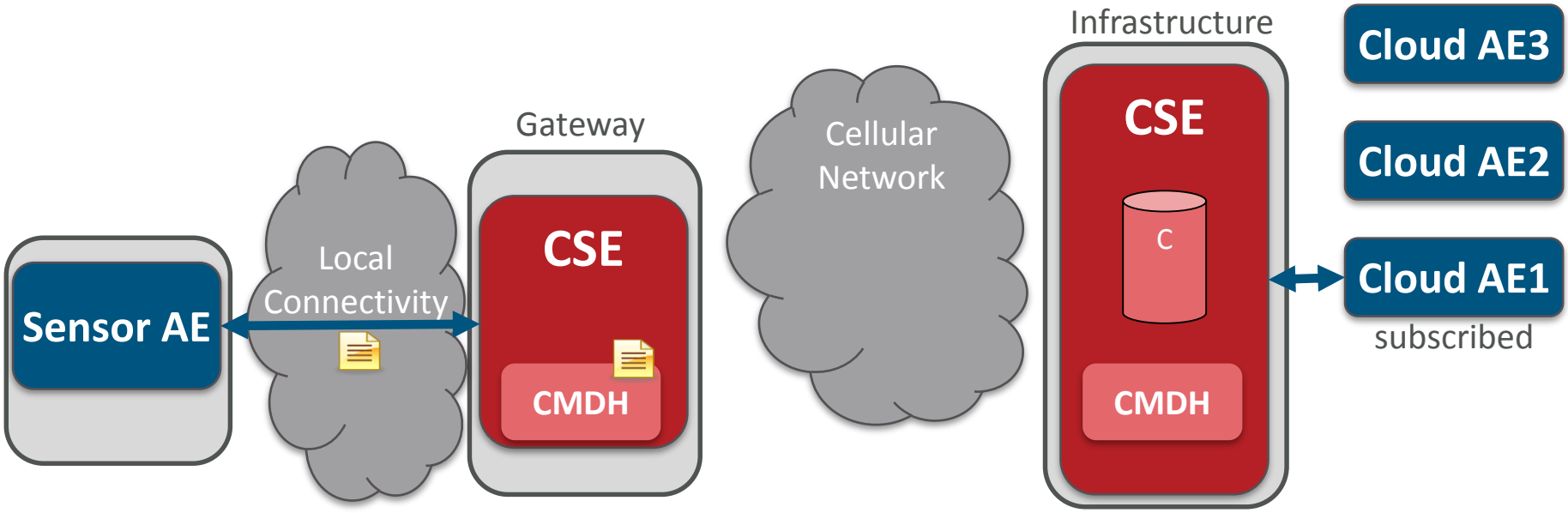
Create //SL-Cloud/C, not urgent, complete by 4:00 am

Policies on MN say: For “not urgent” => only from 2 am to 5 am

CSE on Gateway accepts and buffers request in CMDH

10:05 pm

Example: Data Sharing



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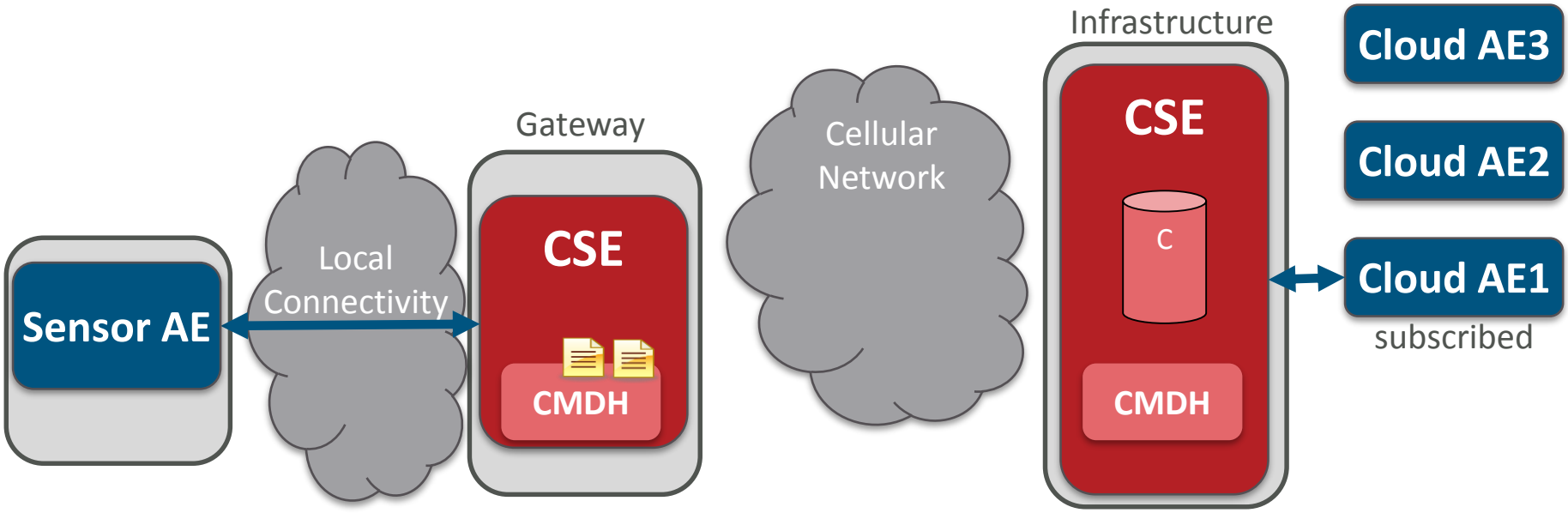
CSE on Gateway accepts and buffers request in CMDH

10:05 pm

Example: Data Sharing



New measurement #2 taken

Originator: Sensor AE; Receiver: CSE on Gateway; Target: CSE in cloud

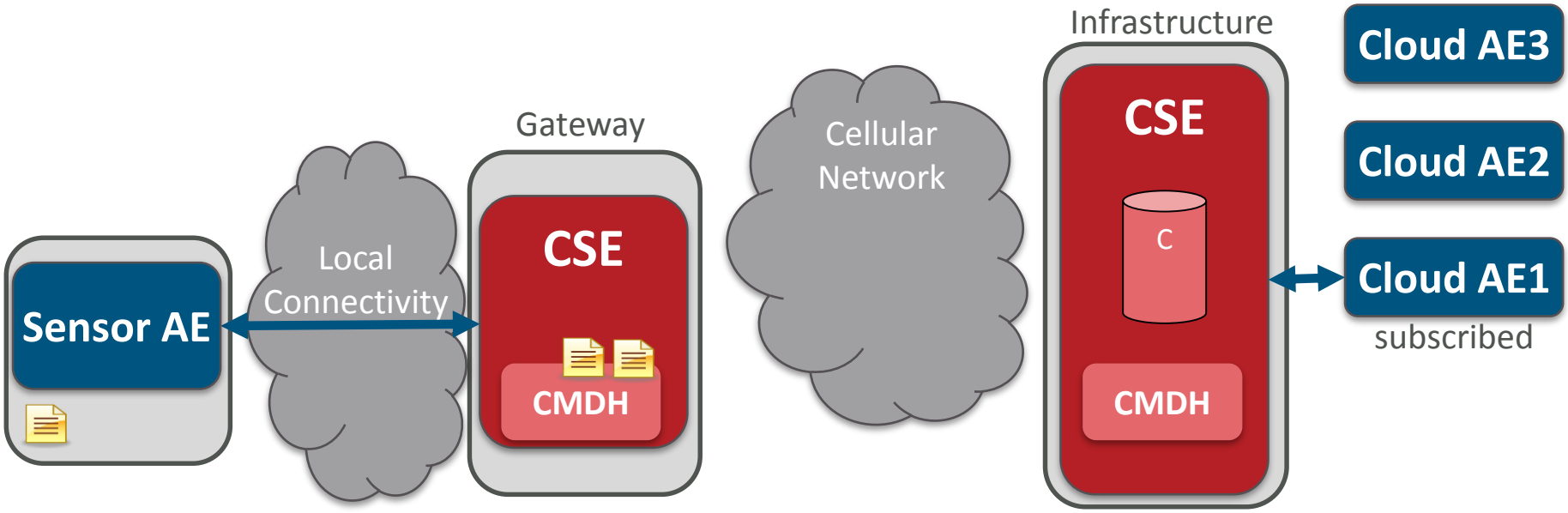
Create //SL-Cloud/C, not urgent, complete by 4:00 am

Policies on MN say: For “not urgent” => only from 2 am to 5 am

CSE on Gateway accepts and buffers request in CMDH

10:05 pm

Example: Data Sharing



New measurement #24 taken

Originator: Sensor AE; Receiver: CSE on Gateway; Target: CSE in cloud

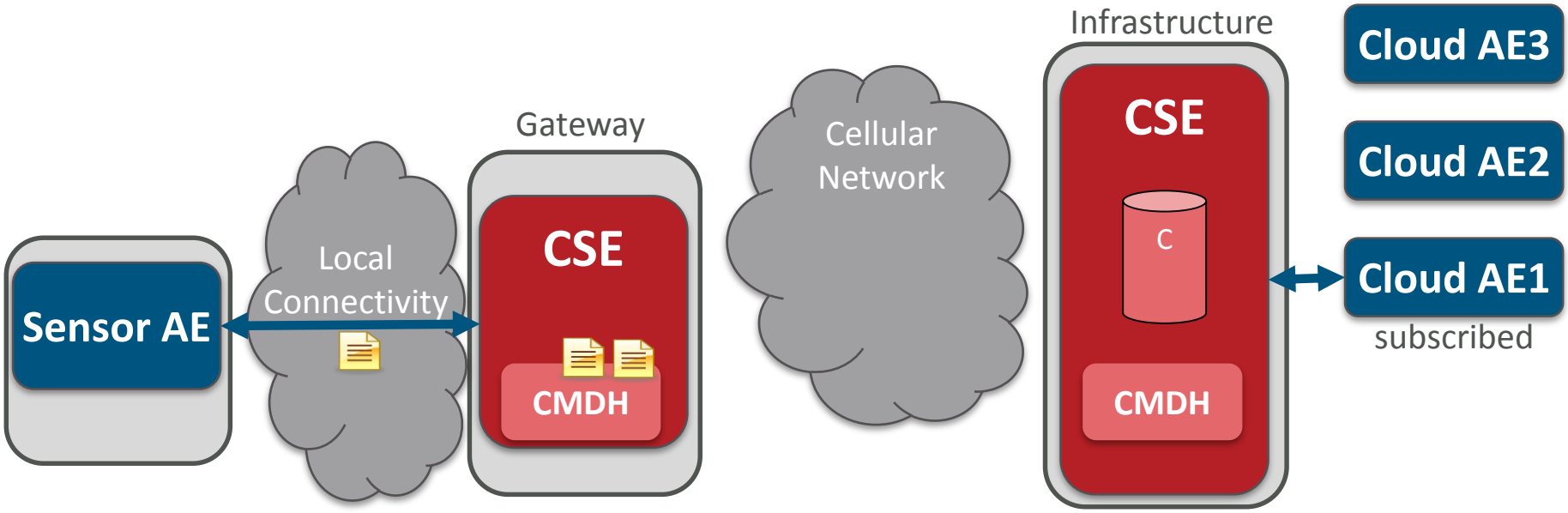
Create //SL-Cloud/C, not urgent, complete by 4:00 am

Policies on MN say: For “not urgent” => only from 2 am to 5 am

CSE on Gateway accepts and buffers request in CMDH

11:55 pm

Example: Data Sharing



New measurement #24 taken

Originator: Sensor AE; Receiver: CSE on Gateway; Target: CSE in cloud

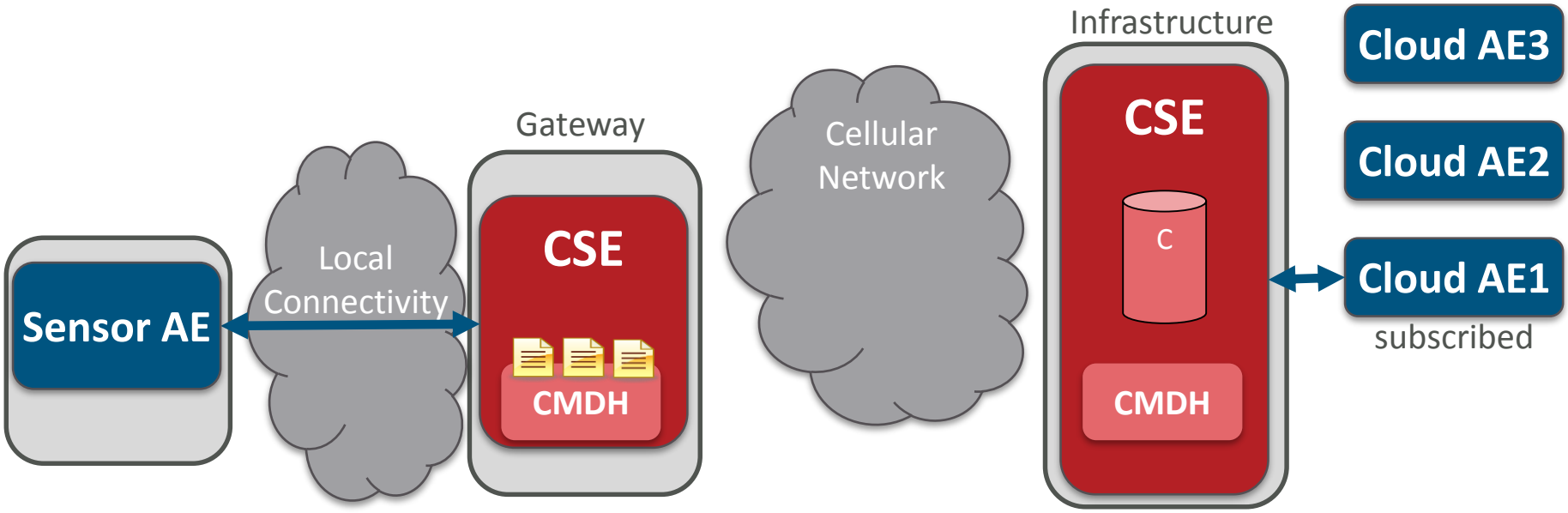
Create //SL-Cloud/C, not urgent, complete by 4:00 am

Policies on MN say: For “not urgent” => only from 2 am to 5 am

CSE on Gateway accepts and buffers request in CMDH

11:55 pm

Example: Data Sharing



New measurement #24 taken

Originator: Sensor AE; Receiver: CSE on Gateway; Target: CSE in cloud

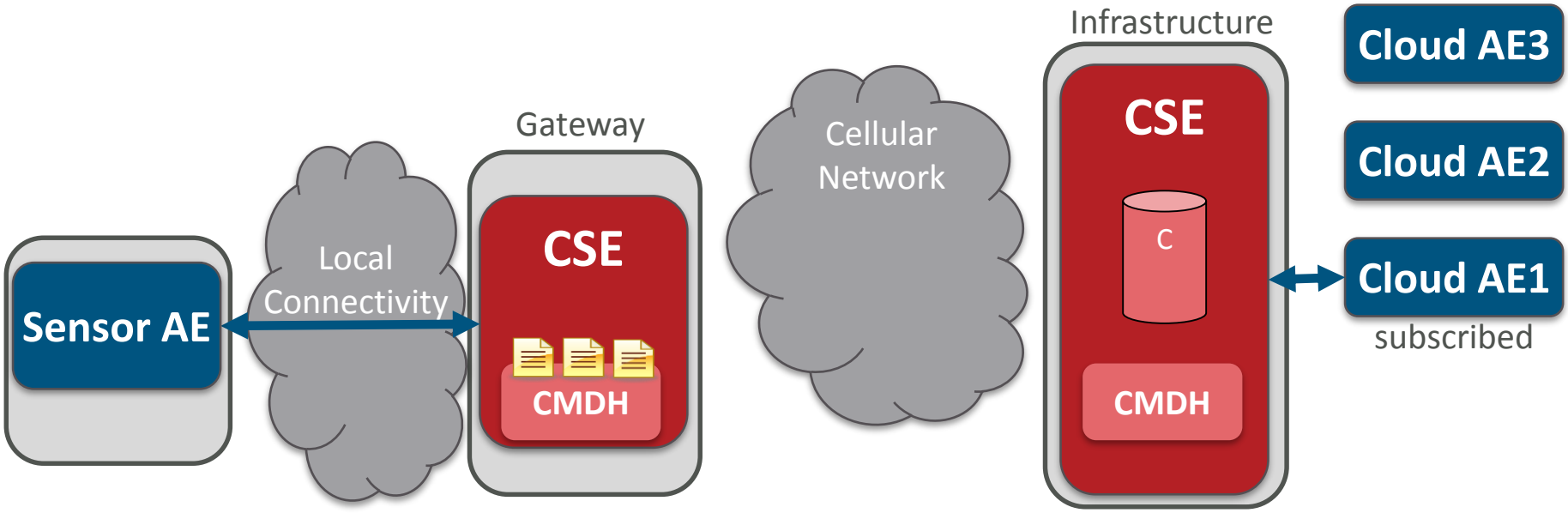
Create //SL-Cloud/C, not urgent, complete by 4:00 am

Policies on MN say: For “not urgent” => only from 2 am to 5 am

CSE on Gateway accepts and buffers request in CMDH

11:55 pm

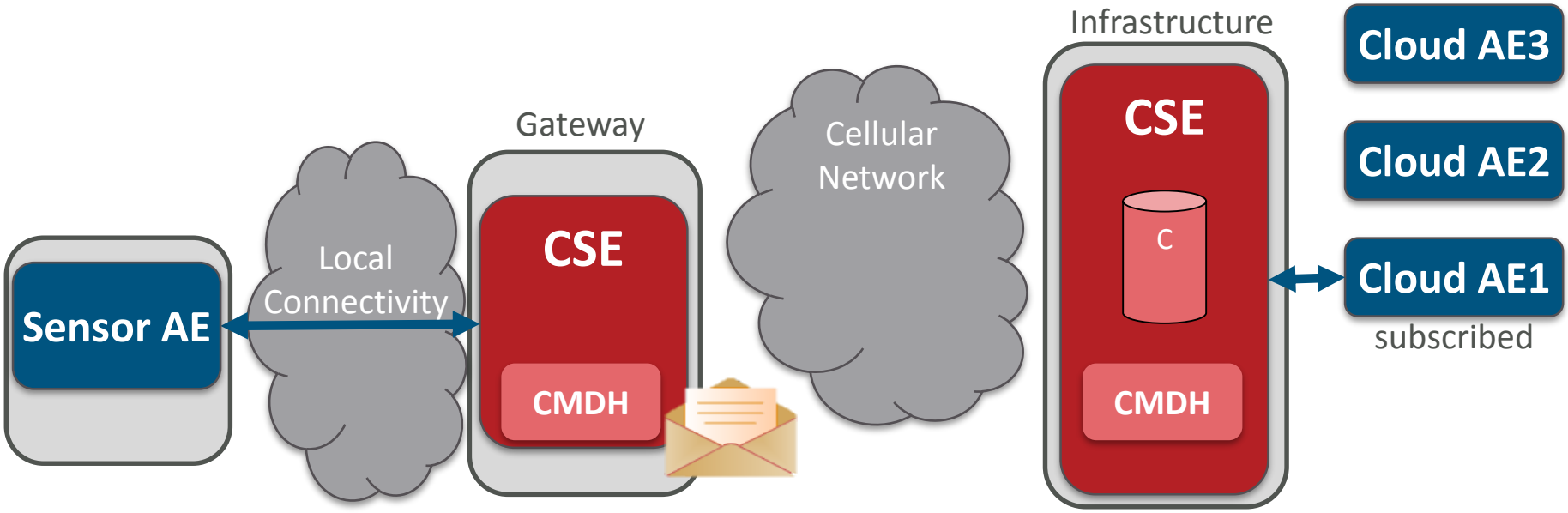
Example: Data Sharing



CMDH in Gateway decides to forward buffered requests.
Bundles them in a single payload, sends Request to cloud.
CREATE <delivery>, event category="not urgent", lifespan={soonest of all buffered}
CSE in cloud finds out it is the final target. Accepts the request

02:00 am

Example: Data Sharing



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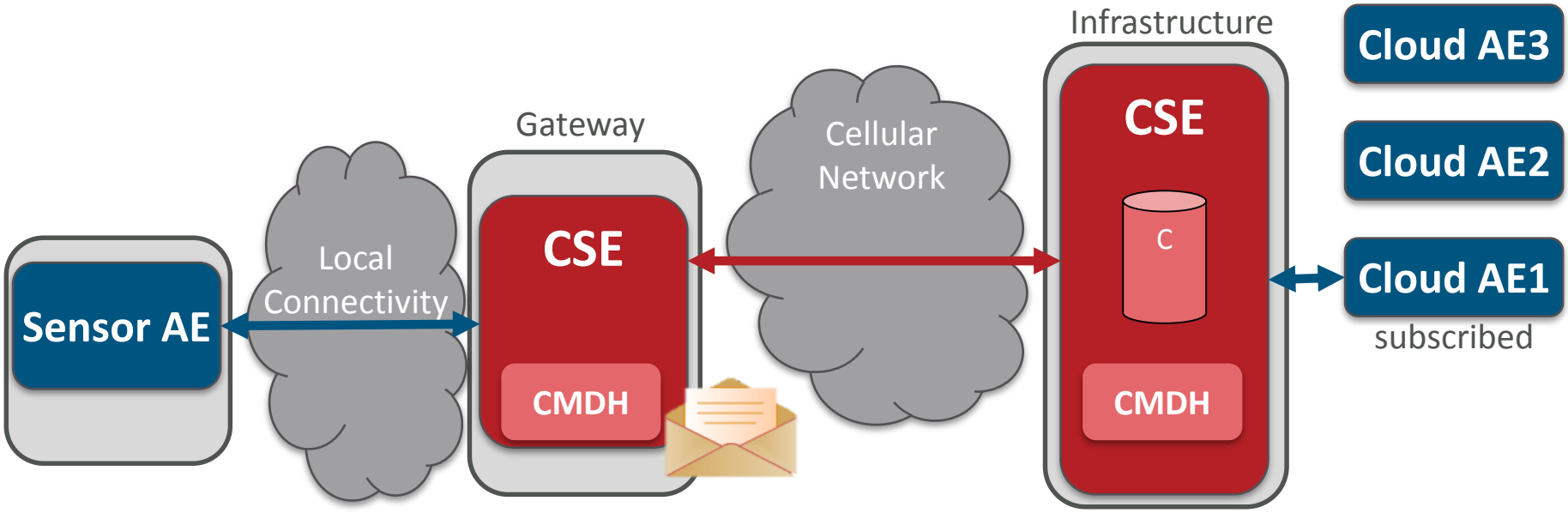

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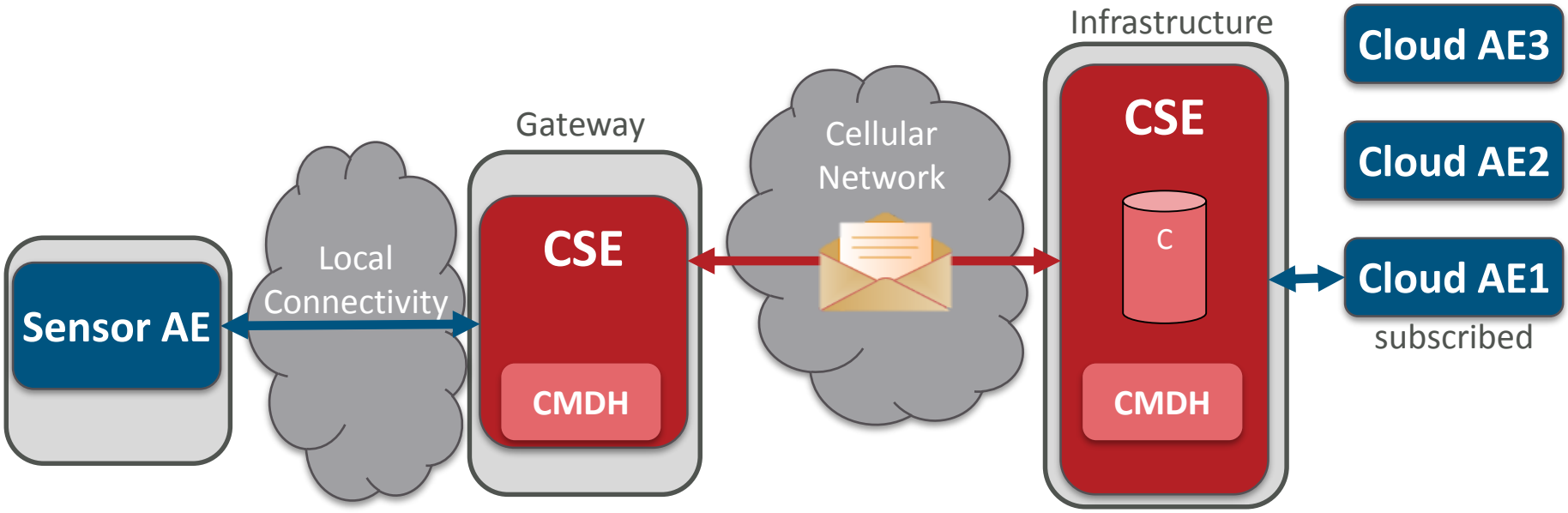

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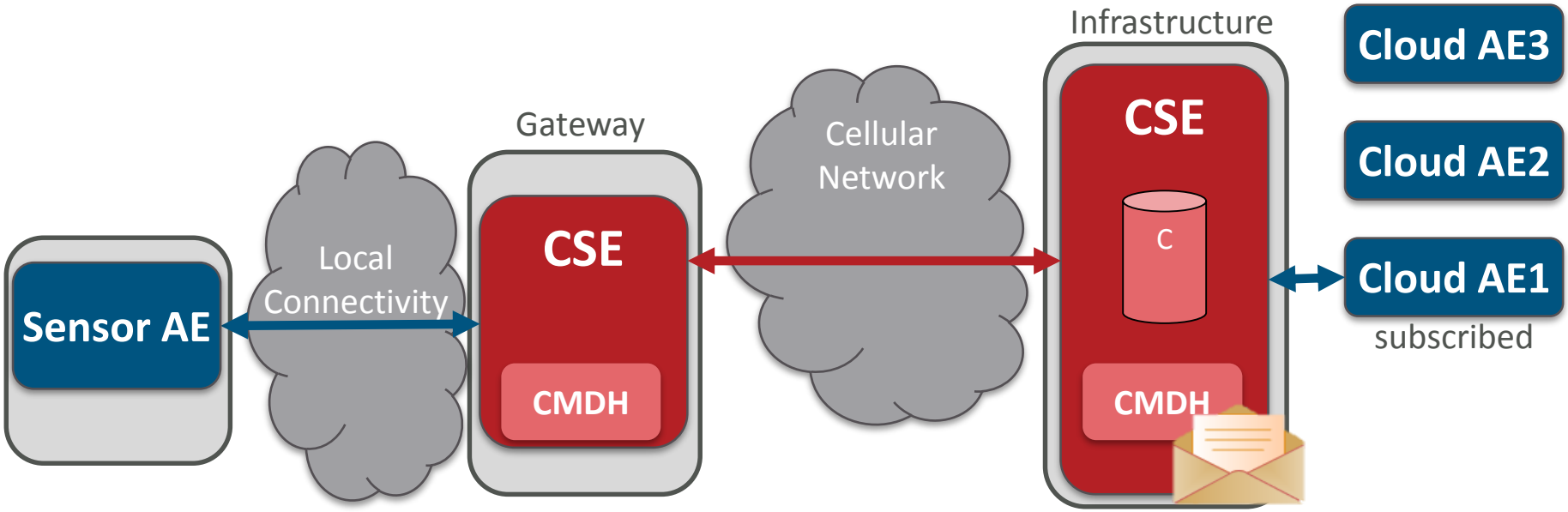
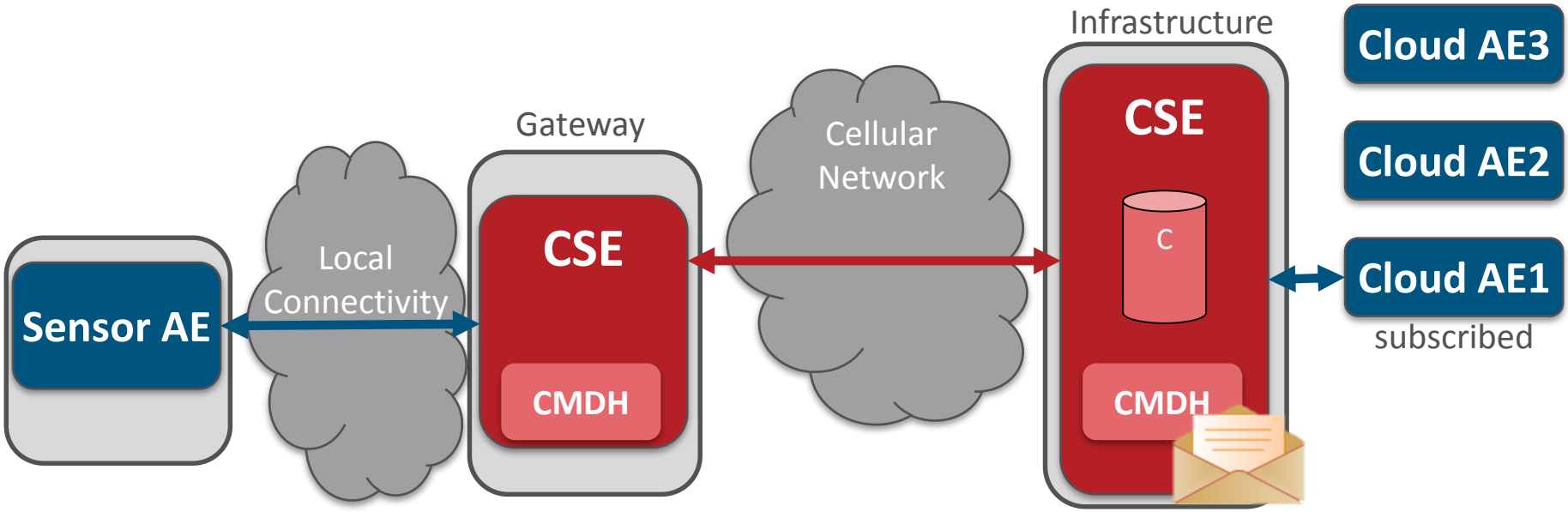
Example: Data Sharing



CMDH in Gateway decides to forward buffered requests.
Bundles them in a single payload, sends Request to cloud.
CREATE <delivery>, event category="not urgent", lifespan={soonest of all buffered}
CSE in cloud finds out it is the final target. Accepts the request

02:00 am

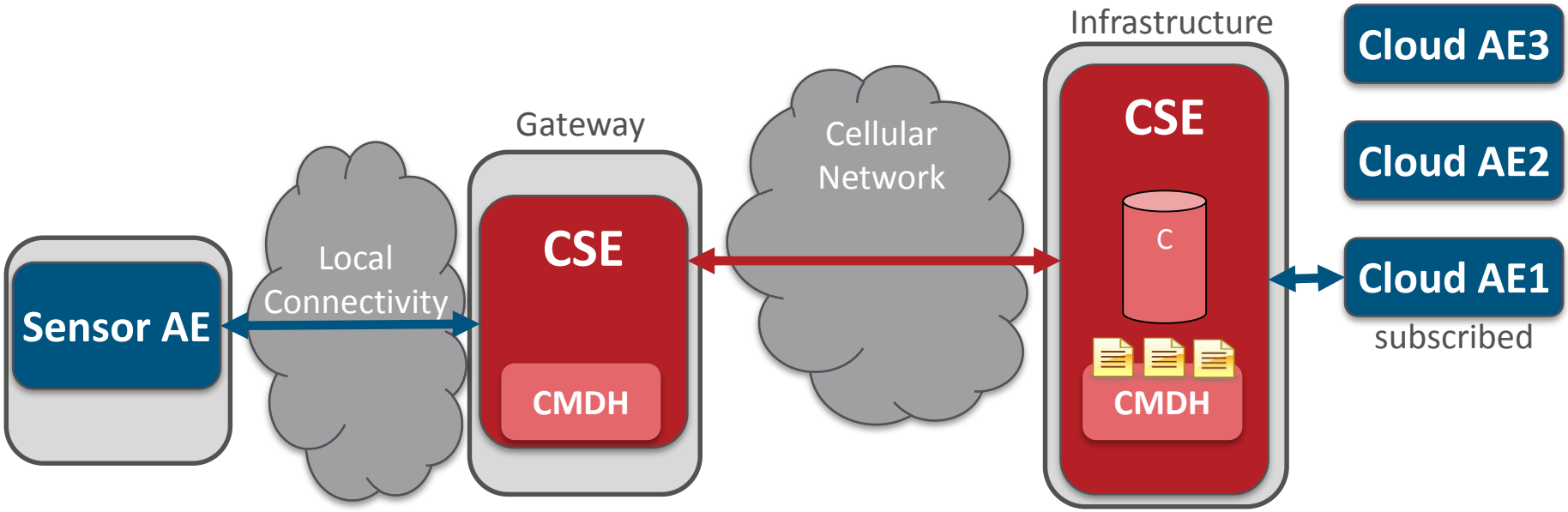
Example: Data Sharing



CMDH in cloud unwraps the contained requests,
CSE in cloud produces all the requested Creates to C

02:00 am

Example: Data Sharing



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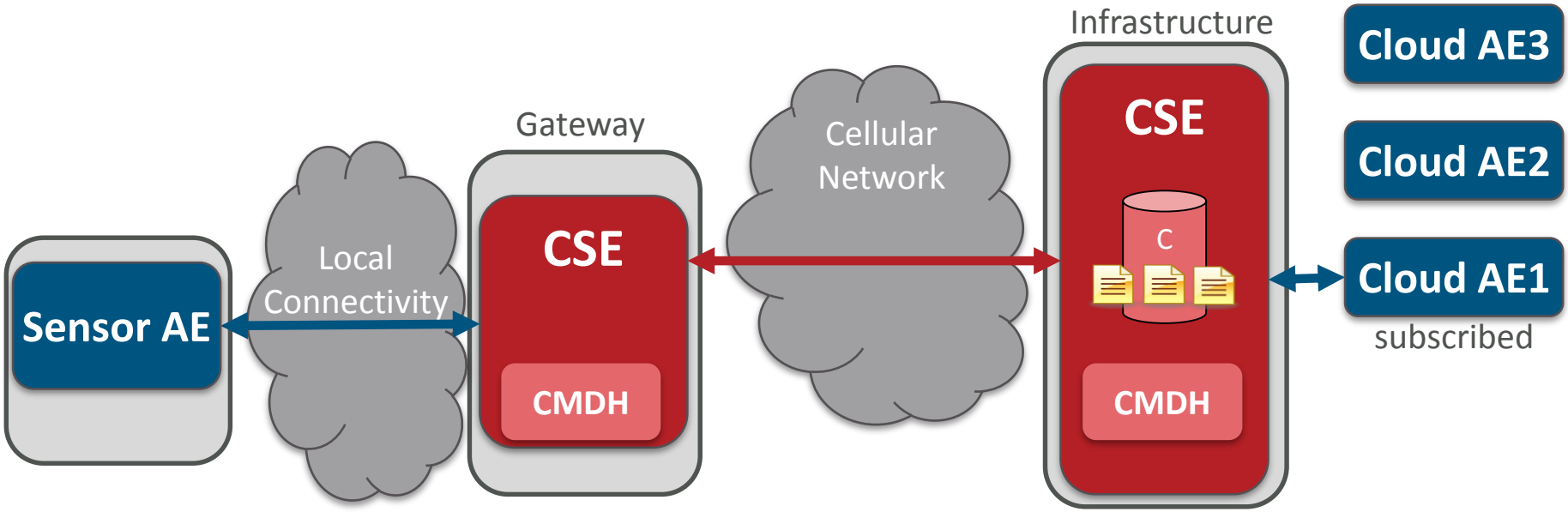
02:00 am

Example: Data Sharing



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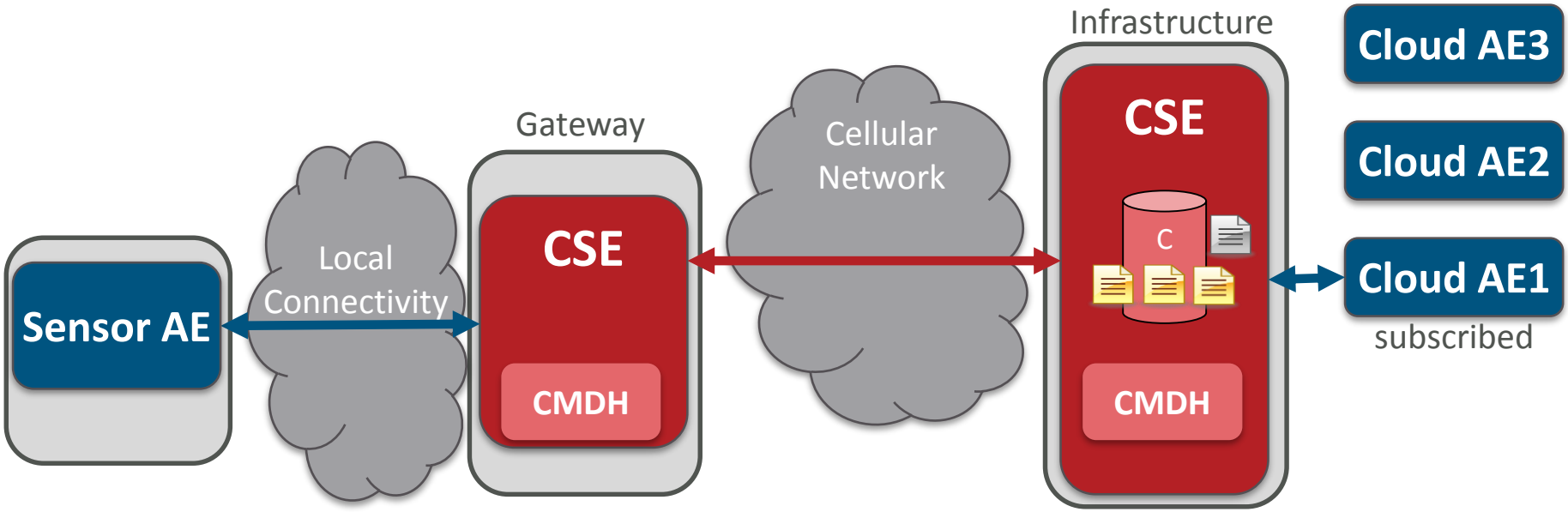
02:00 am

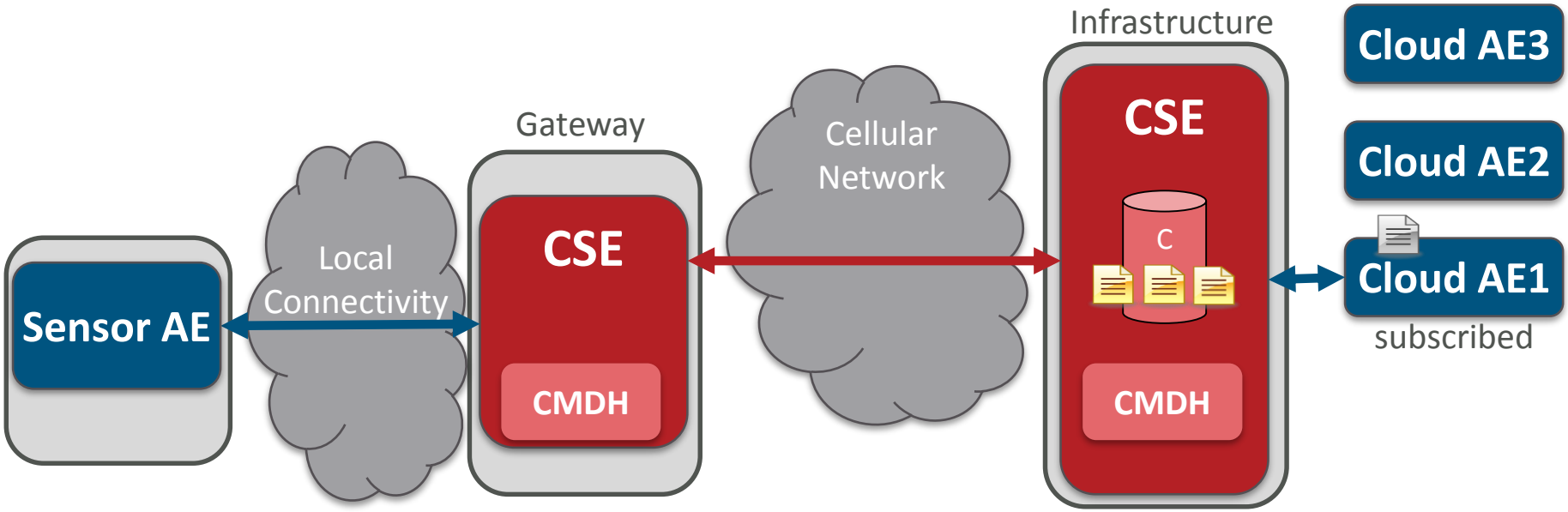
Example: Data Sharing



CSE in cloud notifies M2M Customer's Application "Cloud AE1" about new data in C

02:00 am

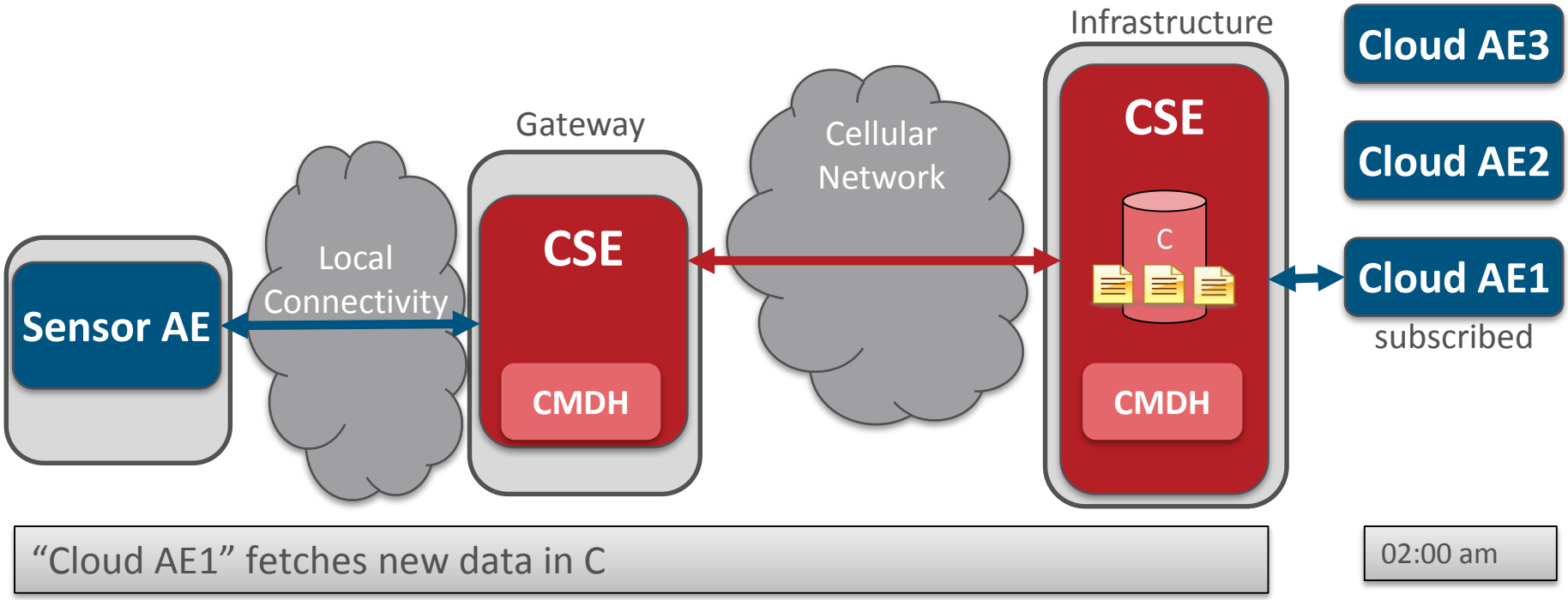
Example: Data Sharing



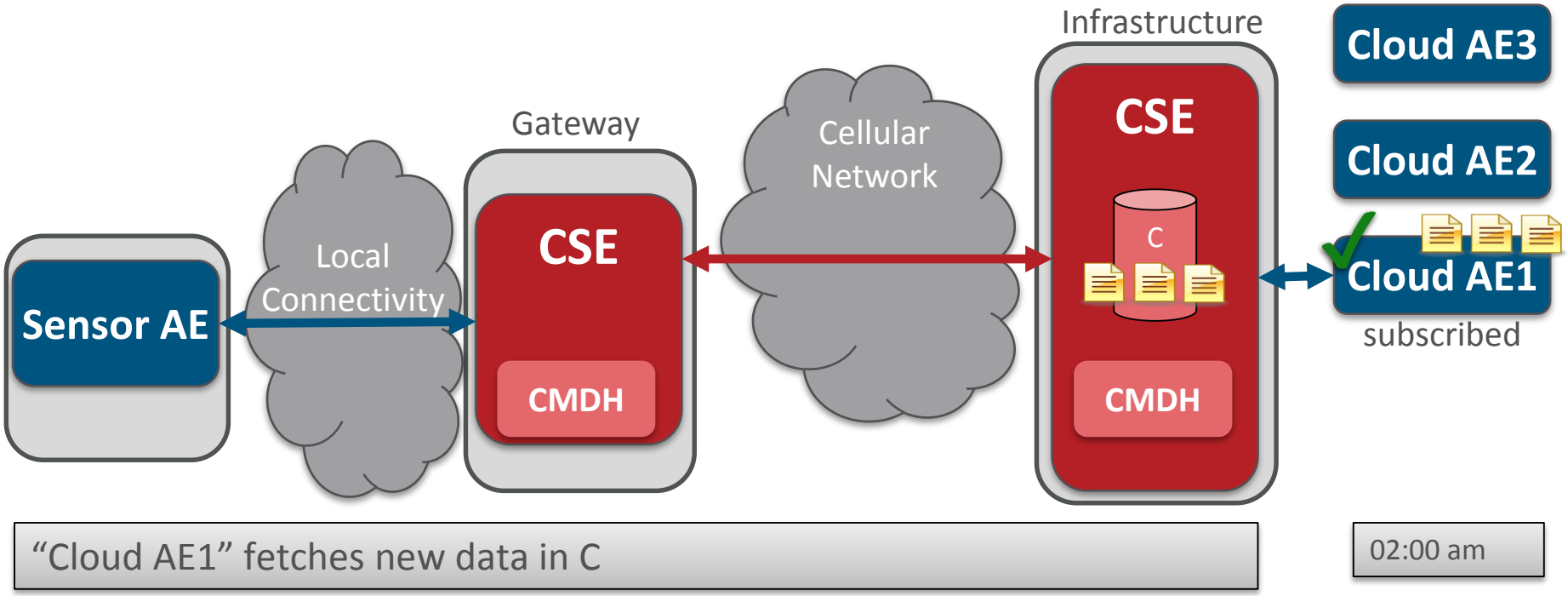
CSE in cloud notifies M2M Customer's Application "Cloud AE1" about new data in C

02:00 am

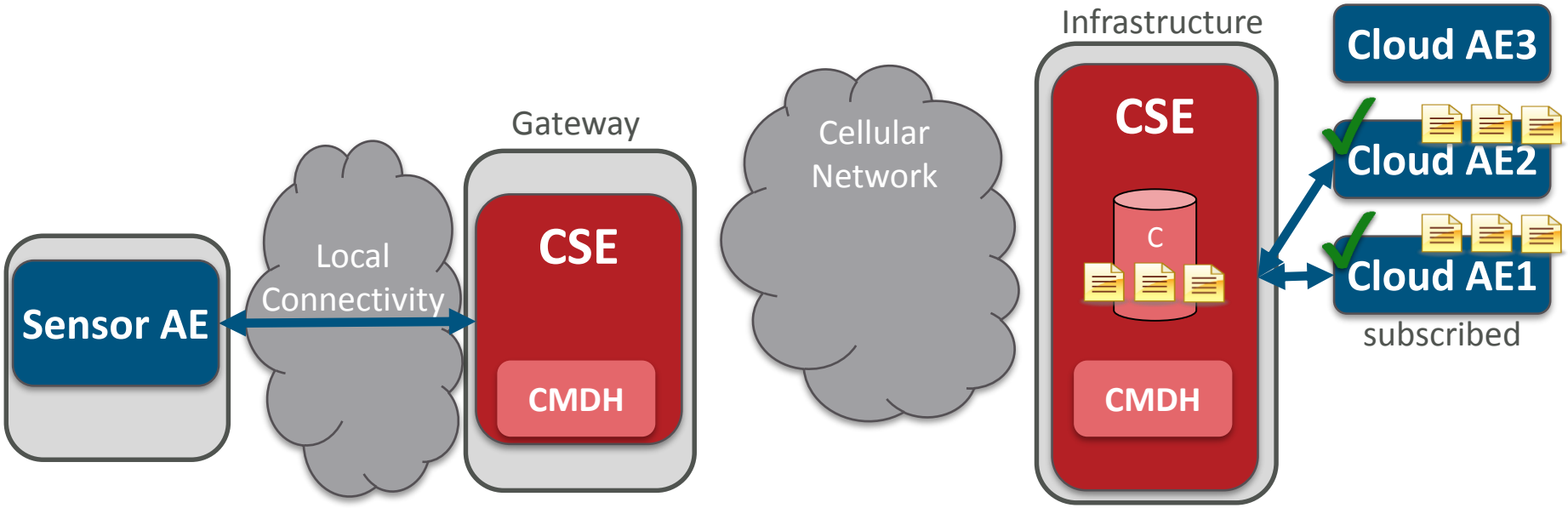
Example: Data Sharing



Example: Data Sharing



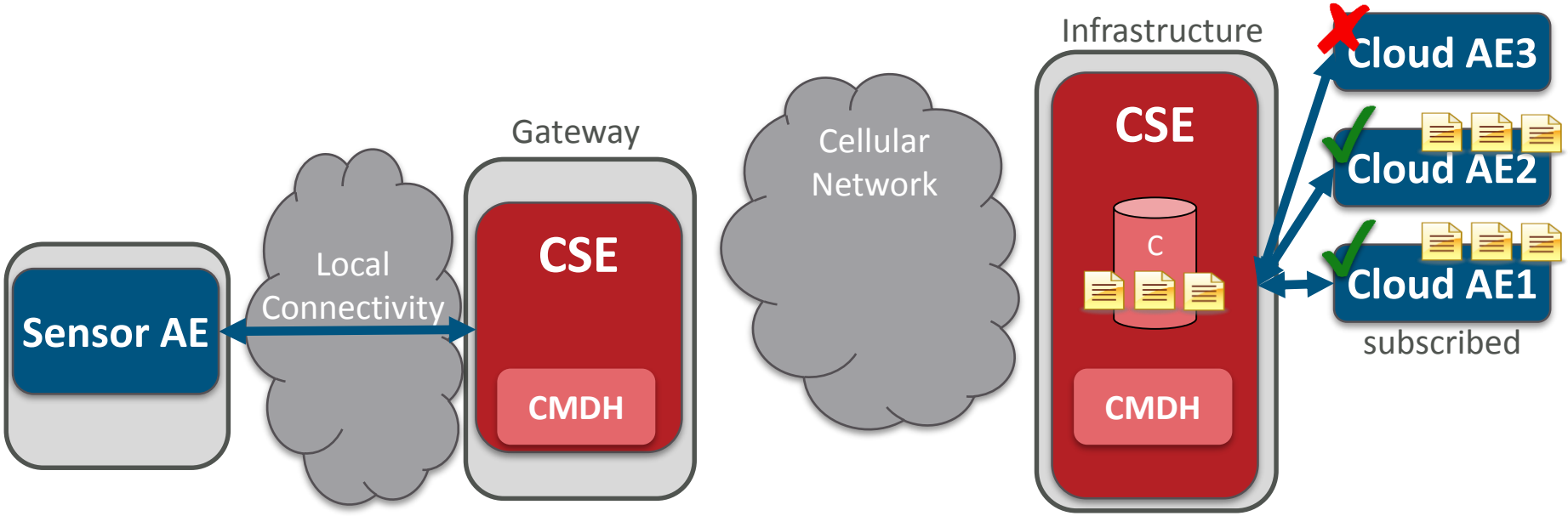
Example: Data Sharing



"Cloud AE2" fetches data in C once a day at 3:00 am.
Got Access Privileges => OK

03:00 am

Example: Data Sharing



"Cloud AE3" tries to fetch data in C at 4:00 am.
No Access Privileges => Denied!

04:00 am

What is covered?

From "TAKING A LOOK INSIDE" Webinar by Nicolas Damour,

Requirements **TS-0002** (WI-0001)	Functional Architecture **TS-0001** (WI-0002)	Definitions & Acronyms **TS-0011** (WI-0003)	Service Layer Core Protocols **TS-0004** (WI-0009)
HTTP Protocol Binding **TS-0009** (WI-0013)	CoAP Protocol Binding **TS-0008** (WI-0012)	Management Enablⁿᵗ - OMA **TS-0005** (WI-0010)	Management Enablⁿᵗ - BBF **TS-0006** (WI-0010)
MQTT Protocol Binding **TS-0010** (WI-0014)	Security Solutions **TS-0003** (WI-0007)		

See webinar at https://www.brighttalk.com/webcast/11949/129553
Work program at http://ftp.onem2m.org/Work Programme/

Next steps in oneM2M

The Work Program for Release 2 of oneM2M Specifications includes the following areas:

- Architecture enhancements
  - Advanced interworking with other systems:
    AllJoyn interworking, OMA LWM2M interworking
  - Improvement of communications efficiency
  - Optimized group-based operations
  - API description for programmers
  - Support of Time Series Data, Support of Event Descriptors / Conditional Action Triggers
  - Interworking with 3GPP Rel-13 MTC features
- Protocol enhancements
  - New binding: Support of Websockets as a transport
- Abstraction and Semantics
  - Analysis of device and data models used in Home and Industrial Domains
  - Development of semantic support for M2M data: E.g. Ontologies for smart appliances

Next steps in oneM2M

Continued…

- Security enhancements
  - Securing communication traversing multiple oneM2M hops
  - Authorization enhancements: Distributed authorization functions, dynamic authorization with tokens
  - Enhancements to remote configuration of security parameters
  - Secure Environment Abstraction: Access functions in secure environments using a common API.
- Interoperability and Conformance Testing
  - Development of interoperability and conformance testing methodologies and test specifications

It is planned to establish a public email reflector for technical Q&A
Possibly also an online forum

Where to find info?

- **Web Site**
  http://www.oneM2M.org
- **YouTube Channel**
  https://www.youtube.com/c/onem2morg
- **Webinars**
  www.onem2m.org/technical/webinars
- **Published Specifications**
  http://www.onem2m.org/technical/published-documents
- **Events**
  http://www.onem2m.org/news-events/events
- **Documents developed in oneM2M: TRs, candidate TSs, ratified TSs**
  http://ftp.onem2m.org/Deliverables
- **Meeting documents & contributions**
  http://ftp.onem2m.org/Meetings

Join us at the oneM2M Showcase & Workshop

- Live Demonstrations of oneM2M implementations
- Keynotes and Panel discussions on hot M2M and IoT topics

1-2 June 2015, Dallas, TX, USA

http://www.tia2015.org/workshop-3-onem2m-showcase-and-workshop

In conjunction with TIA's
"Network of the Future" Conference 2015
http://www.tia2015.org

Thank You!

Q&A

Contact Information

Dr. Josef J. Blanz

Principal Engineer

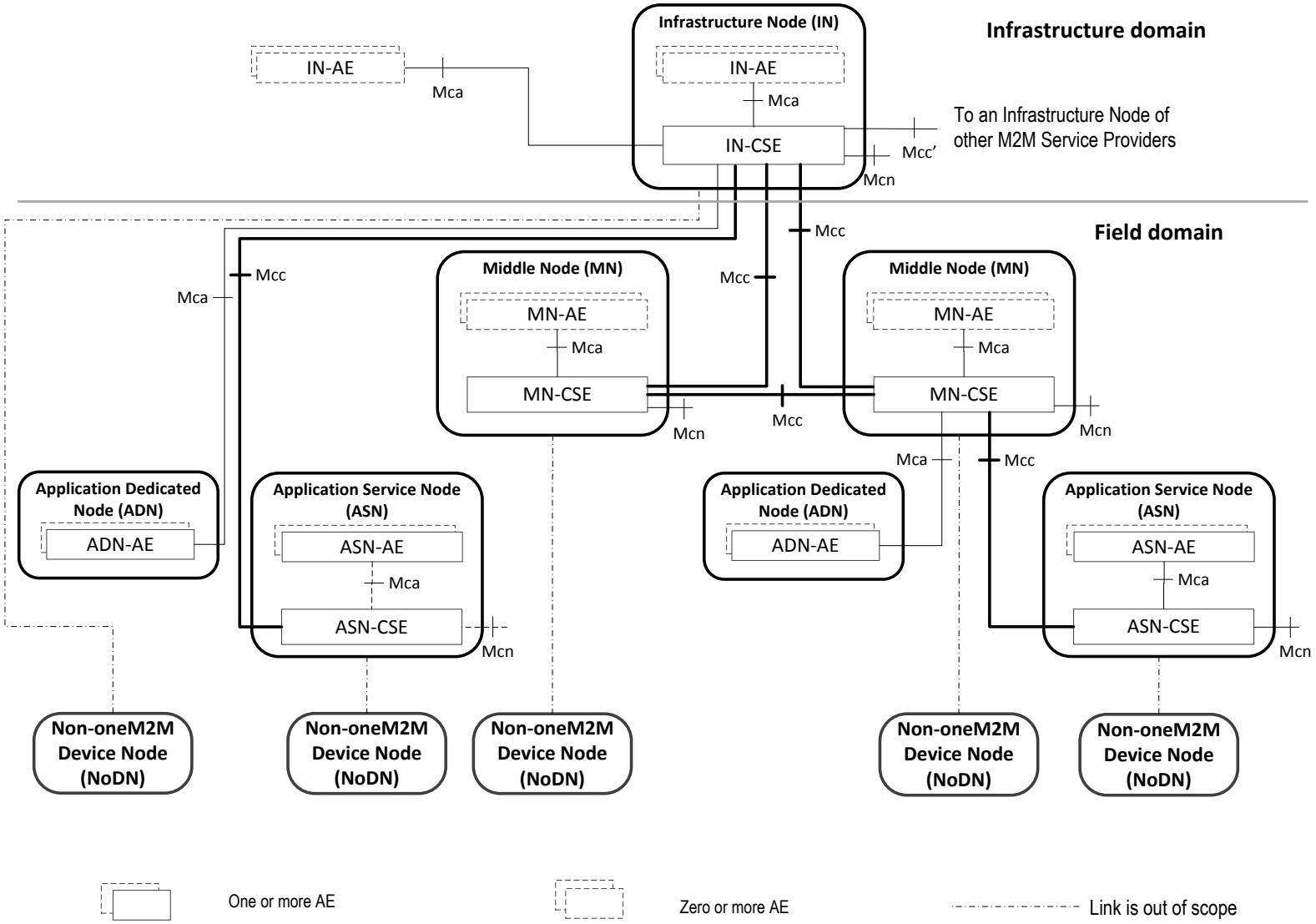
Qualcomm Standards & Industry Organizations

+49 6326 701230

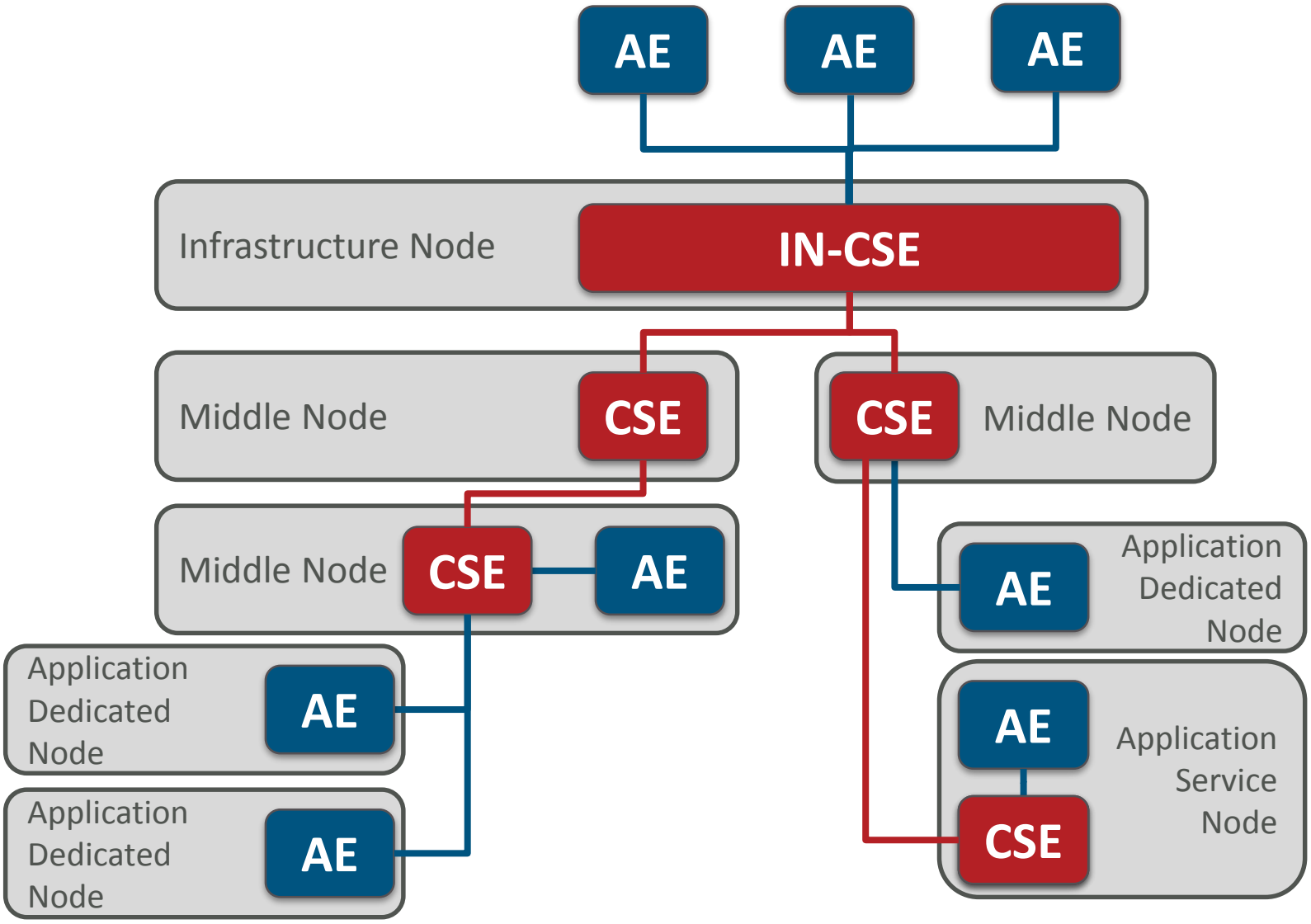
jblanz@qti.qualcomm.com

Backup Material

Supported Configurations



Topologies


AE
AE
AE
Infrastructure Node
IN-CSE
Middle Node
CSE
CSE
Middle Node
Middle Node
CSE
AE
AE
Application Dedicated Node
Application Dedicated Node
AE
Application Dedicated Node
AE
AE
Application Service Node
CSE