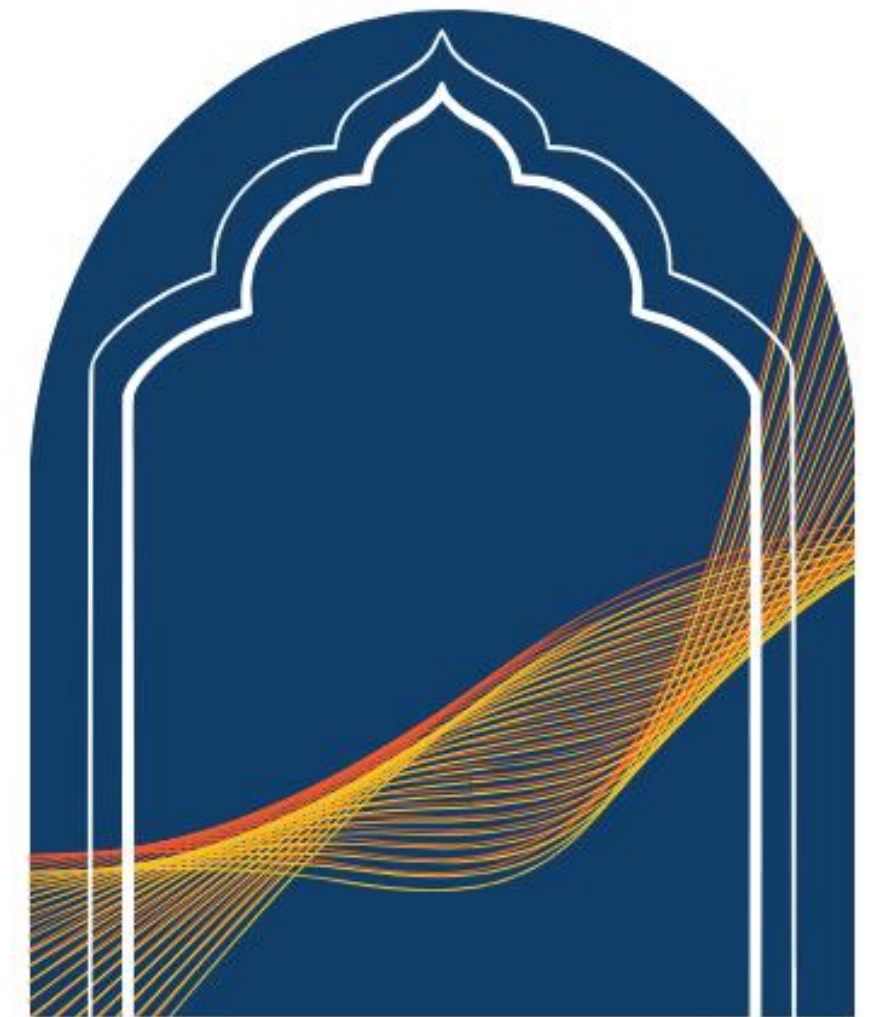


Interoperability -Power Sector

Swetha Ravi Kumar
January 30, 2024

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OUR PAPER

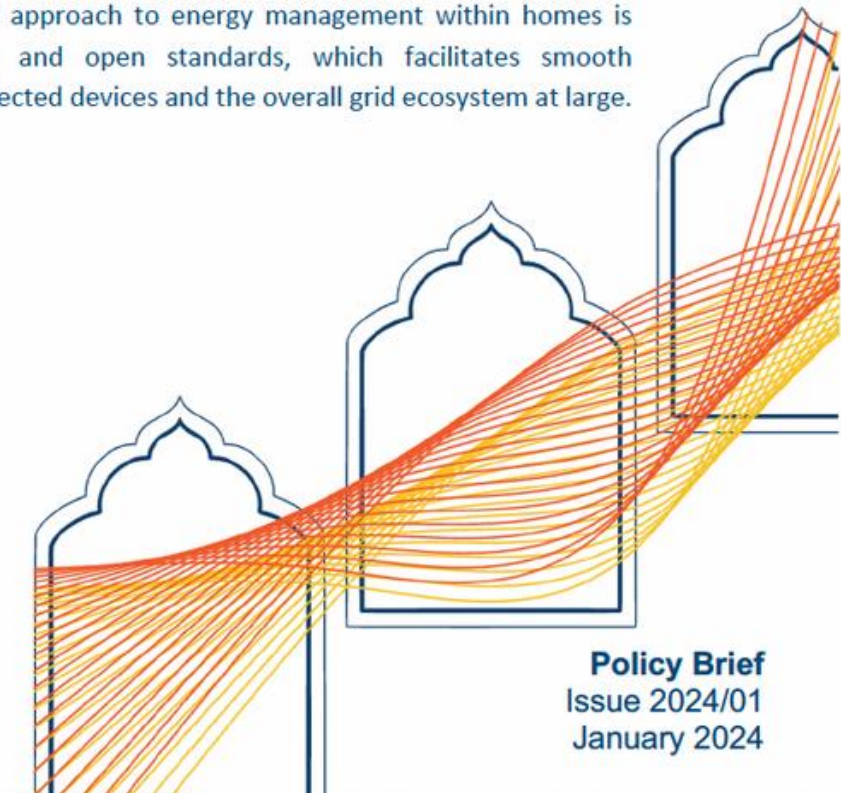
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Interoperability and open standards for home connected devices: Unlocking benefits for the power sector

Highlights

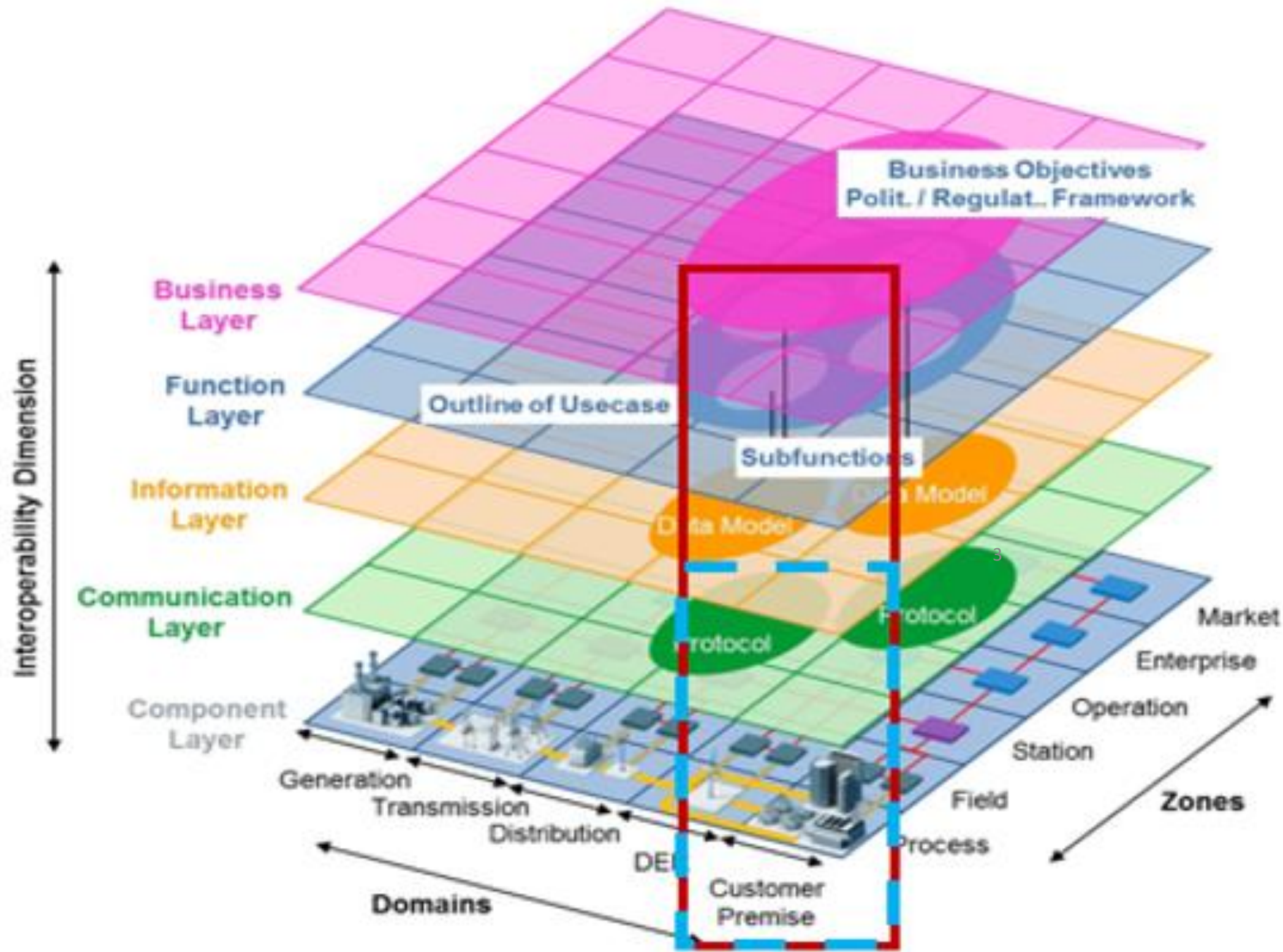
- The smart grid universe is continuously expanding, and interoperability will be a key enabler in unlocking benefits across the power sector value chain. However, leveraging on the potential of interoperability would require understanding the interaction between layers, domains and zones and the necessary policy pre-requisites needed.
- A lot of emphasis in the smart grid space is on applications in the transmission and distribution domains, however an emerging hotspot is the consumer premises itself, particularly with the rapid rise of smart appliances and home connected devices.
- The numerosity and multiplicity of brands of home appliances for various applications makes the interaction amongst home connected devices challenging. Open standards will play a crucial role in unlocking interoperability benefits for device manufacturers, consumer or prosumer and the power sector.
- An all-encompassing and integrated approach to energy management within homes is made possible by interoperability and open standards, which facilitates smooth communication between home-connected devices and the overall grid ecosystem at large.

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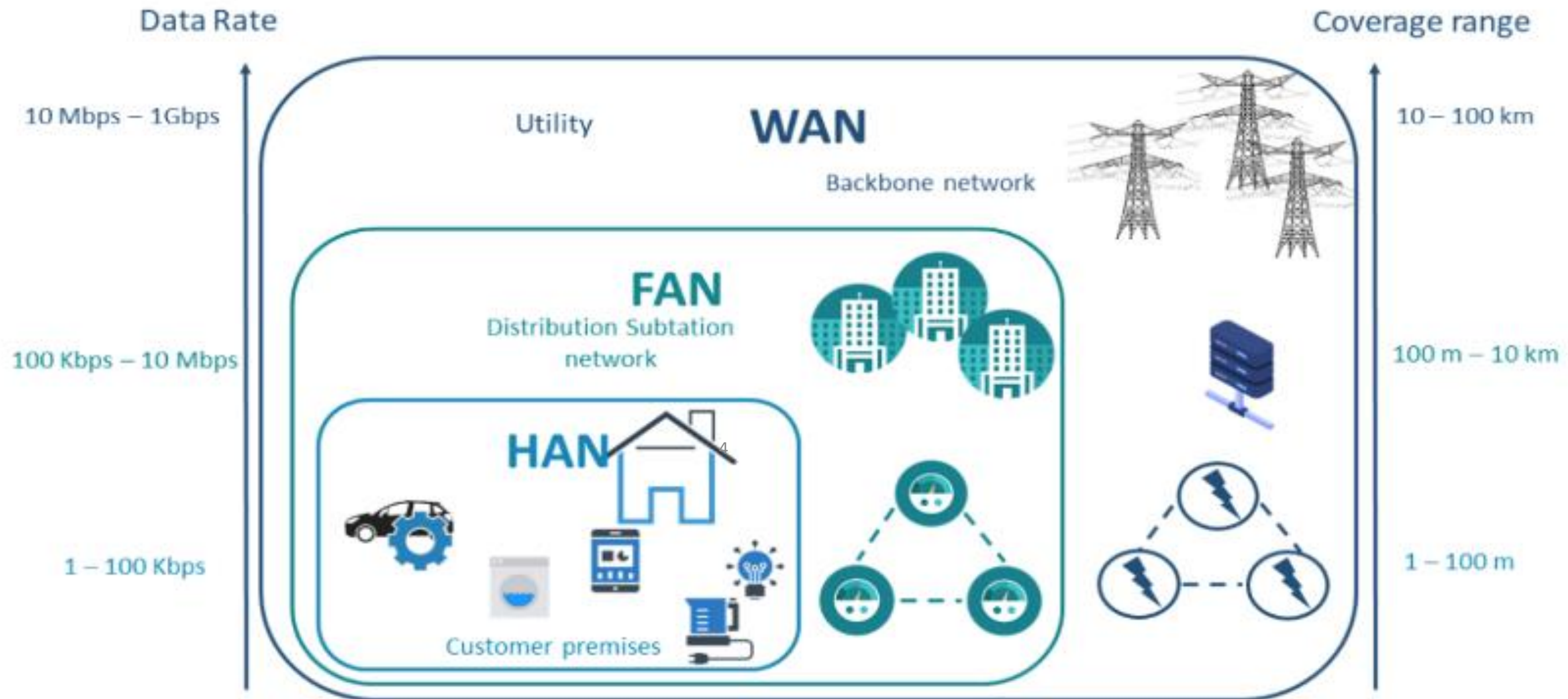
TOO VAST A UNIVERSE - SO WE FOCUSED ON...



Narrow Interoperability: focuses on the level of devices and is used to describe technical systems. It typically covers interoperability among information and communication technology (ICT) systems.

Broad Interoperability: focuses on the level of organisations. It considers that political, legal, regulatory, organisational, and social factors influence technical systems and their performance.

IN MORE OF A 2D VIEW



DEVICE CLASSIFICATION - POWER SECTOR

Type	Description	Devices	
Detection Devices:	These devices enable input or output functions to enable working of different home appliances.	Sensors Thermostat	
Switches/Plug:	Enables supply of power to home devices. Note the device itself need not be smart, but the plug can enable the smartness through its features.	Smart Plugs	
Non-Shiftable (NS) Devices:	These appliances cannot be shifted to other slots. They should remain ON continuously without any interruption for the entire duration for which they are scheduled.	Refrigerator <u>Door bell</u> Water purifier Light fixtures Fan TV Audio Video Equipment	Mobile phone Laptops PV Microwave Grinder Mixer Cooking range
Shiftable Non-Interruptible (SNI) Device:	These appliances can be adjusted to any other time slots. However, these appliances cannot be interrupted during their functioning. Within them, some of them can be shifted but would depend on consumer behavioural aspects,	Air conditioner Dishwasher Washing Machine Water Heater Coffee Machine Pool pumps	Based on consumer need and choice: Microwave Grinder Mixer Cooking range
Shiftable Interruptible (SI) Devices:	These appliances are flexible and can be adjusted to other time intervals. They can be interrupted during their functioning.	Iron Vacuum cleaner EV Inverter	

All this is great, but how interoperable are these various consumer devices?

PROTOCOL & STANDARD

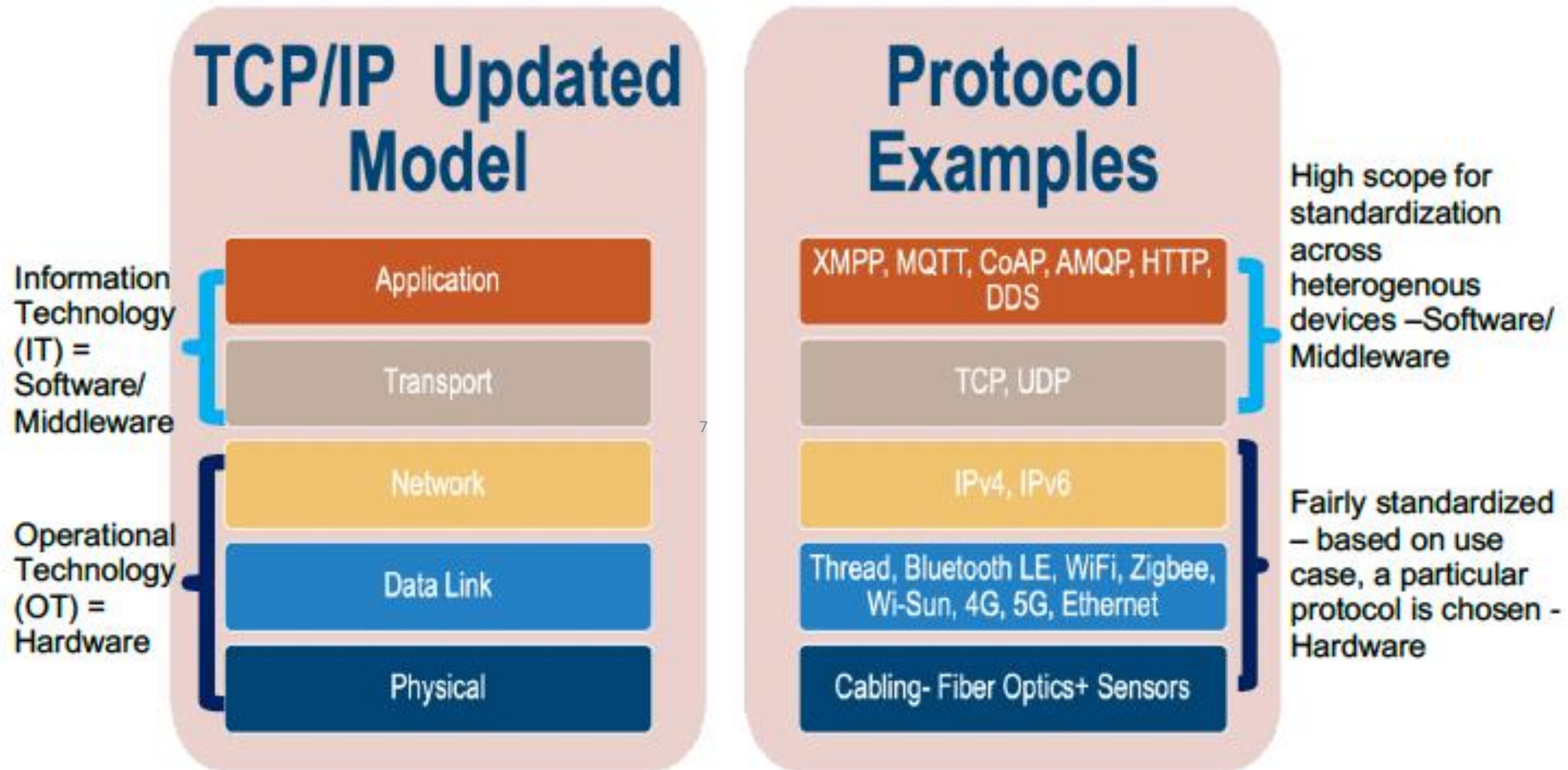
ALLOWING DEVELOPERS TO
UTILISE PRE-EXISTING SOFTWARE
AND ELIMINATE COMPATIBILITY
CONCERNS,

STANDARDISATION FOSTERS
CREATIVITY, INNOVATION, AND
UNIQUENESS

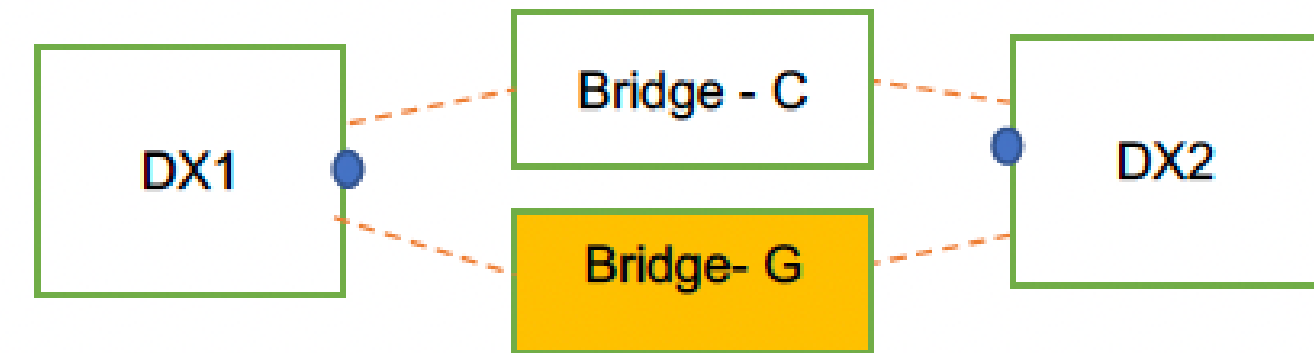
Protocol defines a set of rules used by two or more parties to interact between themselves.

Standard is a formalized set of guidelines or requirements that define how something should be done and is accepted by most of the parties that implement it.

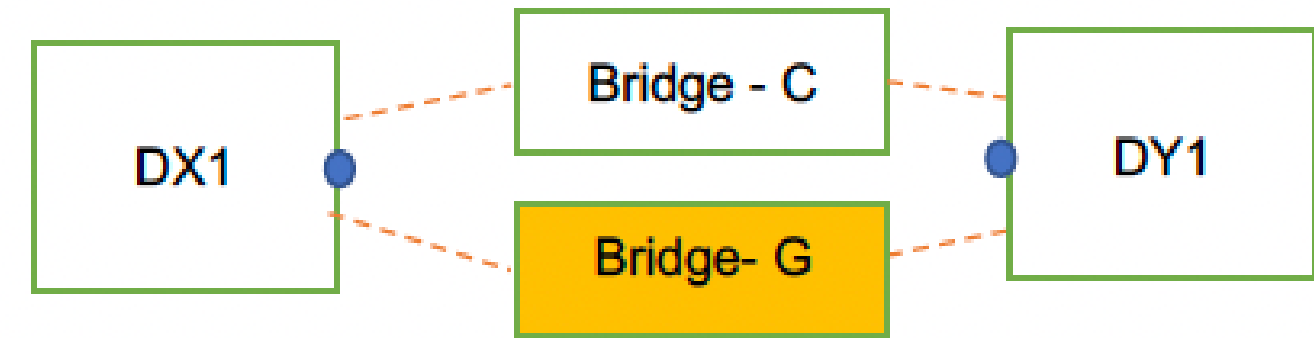
WHERE IS THE STANDARDISATION EFFORT HAPPENING FOR DEVICES?



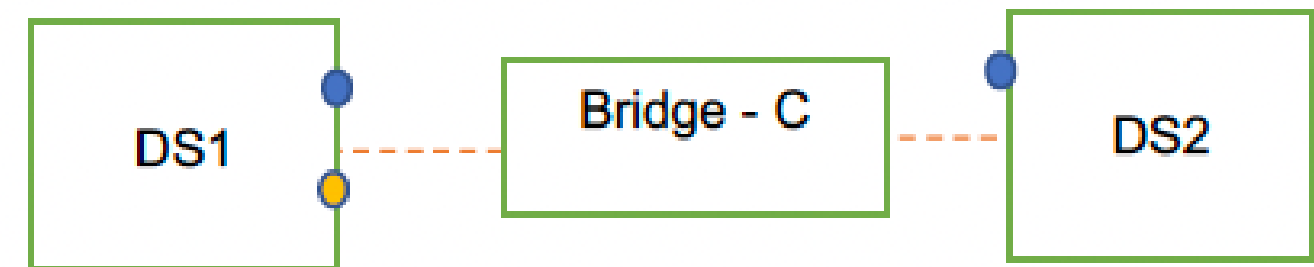
COMMUNICATION IS NOT ALL THAT SIMPLE



Same Company – Different Devices



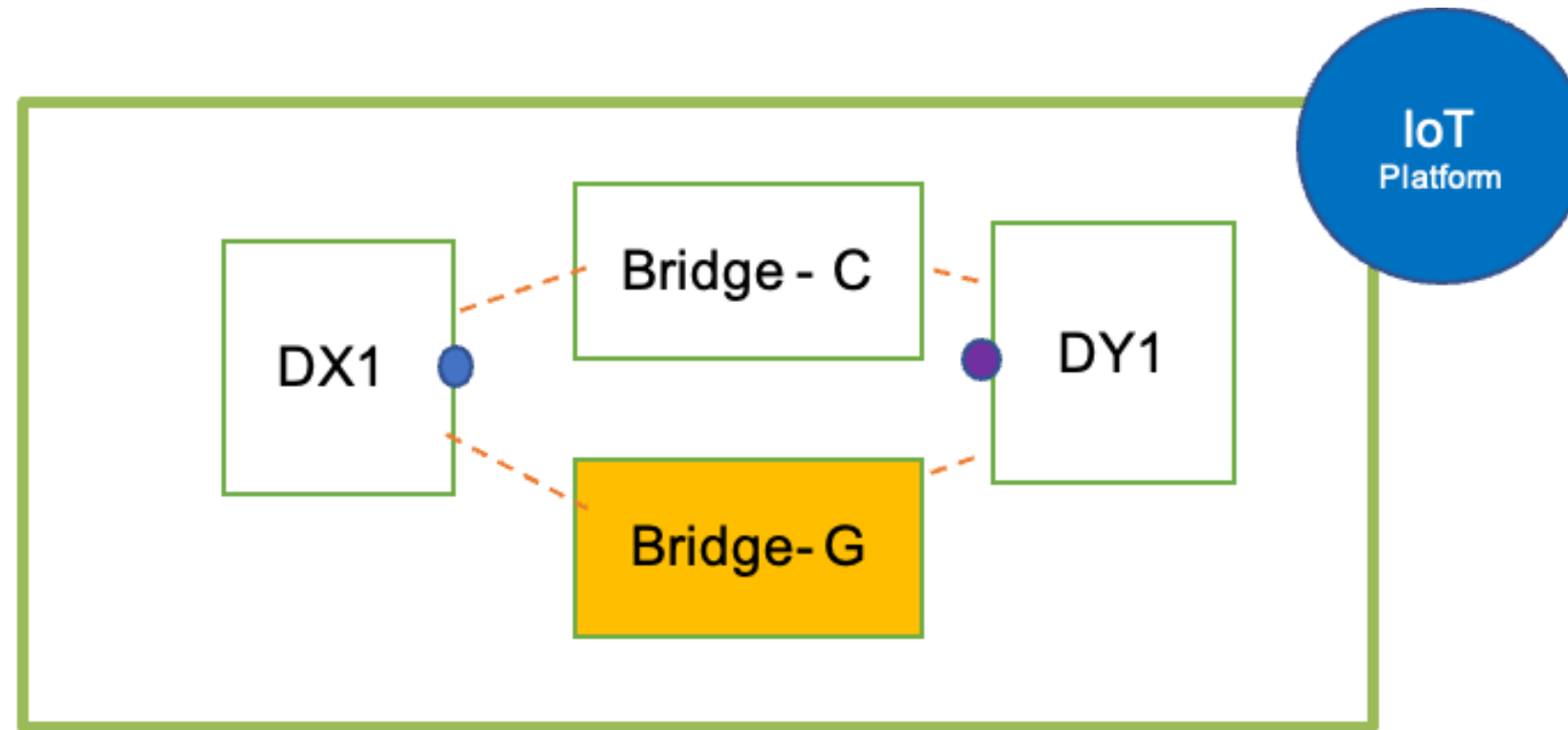
Different Company – Different Devices



Different/Same Company – Different Smart Device

- Smart Level A – Common Language to understand each other
- Smart Level B - Common Language to understand each other + capability to enable functions.

COMMUNICATION IS NOT ALL THAT SIMPLE - BUT NOT IMPOSSIBLE



**OPEN
STANDARDS
AN ENABLER FOR
INNOVATION**

HAN Connected Devices
Sensors, Thermostats, Plugs, etc
Home Appliances
DER- Rooftop PV, Invertor, EV

MATTER Standard/ Proprietary
Protocols
SunSpec Standard/
Proprietary Protocols

Device
Software
Packages

Data Standard – User Data Protection, Date Use for
Scalability, Unlocking Benefits,....

Unlocking Benefits

Consumer will have **more choices** w.r.t to device selection and will not be locked into a particular brand due to legacy buying

Improve **visibility and understanding** of their own energy usage and its management

Nudge consumers to move from passive to **active participation** in the power sector

Active Choices

Start to **integrate smart home appliances** into their home and/or where possible convert existing devices to smart mode by adding a smart layer

Participate in **demand response programs** of the power sector

Regulatory Enablers

Increase **consumer awareness** on potential benefits of owning smart devices/appliances

Ensure **consumer data protection** as systems become interoperable. Specifically which stakeholder has access to consumer data and for what purpose.

Unlocking Benefits

Utilizing real-time data from devices for **product enhancement**

Increased customer outreach by integrating compatible appliances/ devices beyond ones brand through **IoT platform**

'aggregators or virtual power plants (VPPs)', which links smart consumer premises to power sector demand response programs or bidding in the power market.

'product-as-a-service', which broadens the value proposition beyond a product and offer the product pricing based on usage.

Active Choices

Gradually convert their **device portfolio to smart device portfolios**

Adopt open connectivity standards to enable their devices to become part of a larger ecosystem

Regulatory Enablers

Bringing in open connectivity standards to increase competition amongst traditional and non-traditional players in various consumer durables market segment.

Creating a **level playing field for new and small companies** to offer niche products that can easily integrate into a larger ecosystem

Unlocking Benefits

Real time access to consumer data and information, which will guide the electricity utilities in maintaining **reliability in running its grid system**

Better distribution of renewable energy systems, particularly **DER across the grid**, as utilities will have more clarity due to data and information.

Improved billing efficiency due to better insight into consumer usage

Active consumer participation both at the distribution grid level through **demand response programs** and at the market level by participating via aggregators

Plan power procurement and grid planning based on accurate consumer data

Better resource adequacy planning at the utility level because interoperability enables better integration of diverse supply and demand-side resources

Active Choices

Promote **adoption of open connectivity standards**, which will in turn enable consumers to become active consumers on the grid system.

Ensure existing and new information and **communication systems on the grid systems are compatible** with the consumer premises systems to enable interoperability

Adopt interoperable smart billing and smart grid infrastructure at the grid level to **interact with new service providers**

Regulatory Enablers

Enable demand response programs to encourage more active consumer participation, including introducing **time-of-use tariffs**

Allow for new entrants such as **aggregators or virtual power plants (VPPs)** to participate in the power markets

Ensure **consumer data protection** as systems become interoperable

Improving **awareness and understanding of utility personnel** on information collection and flows between portions of the grid and linking it to different grid management situations

THANK YOU - YES WE CAN ;)

