



The Standards People

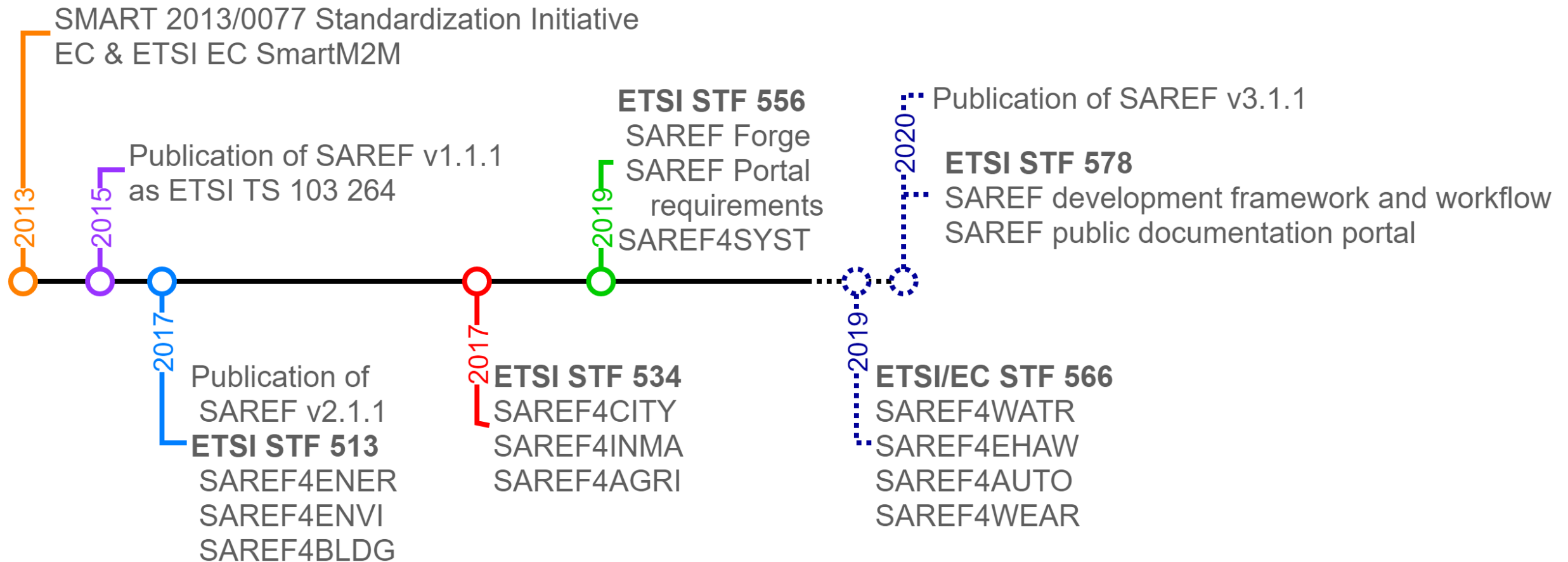
SAREF consolidation with new reference ontology patterns, based on the experience from the SEAS project

Presented by: **Maxime Lefrançois**

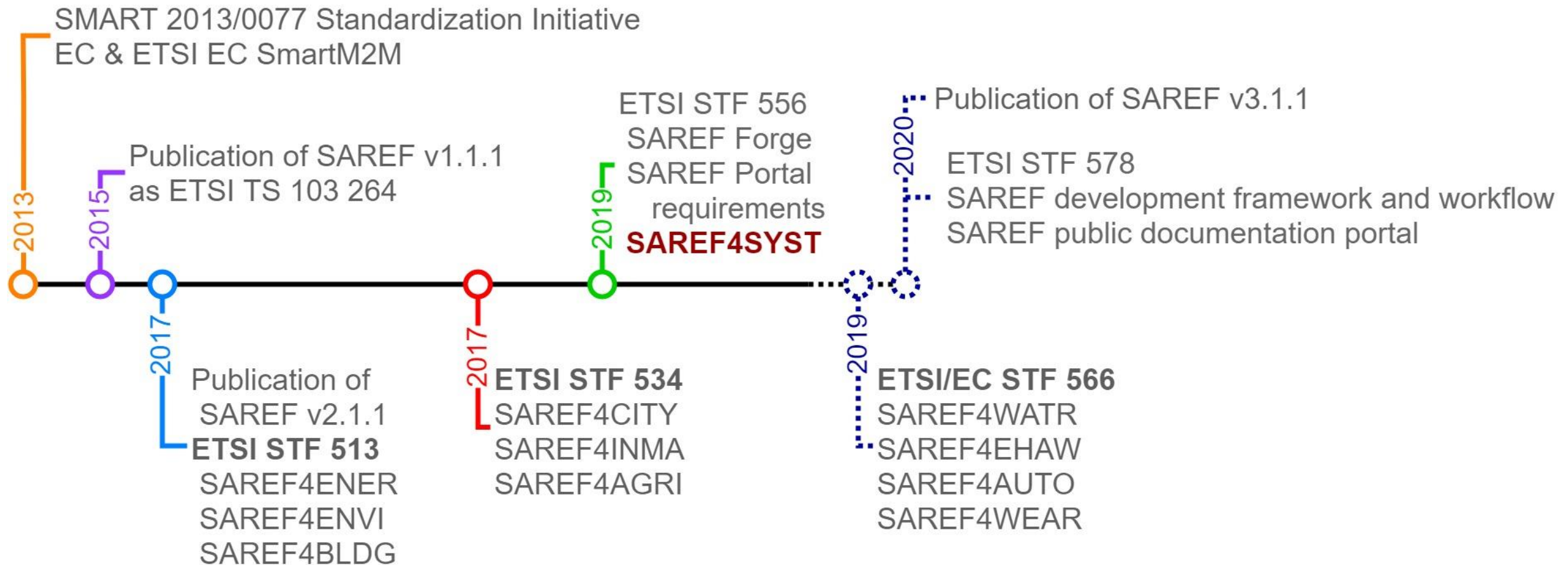
For: W3C LBD-CG

24.02.2020

SAREF activities overview



SAREF activities overview



STF 556: June 2018 – June 2019 (phase 1)

Consolidation of SAREF and its community of users, based on the experience of the EUREKA ITEA - 12004 SEAS project.

- 🌐 Deliverables published
 - 🌐 [D1 TR 103 549](#) Guidelines for consolidating SAREF with new reference ontology patterns
 - 🌐 [D2 TS 103 548](#) SAREF consolidation with new reference ontology patterns, based on the experience from the EUREKA ITEA SEAS project
 - 🌐 [D3 TR 103 608](#) SAREF publication framework reinforcing the engagement of its community of users
- 🌐 + design of the development workflow and the SAREF portal (ongoing in STF 578 -> Sept 2020)

STF 556: June 2018 – June 2019 (phase 1)

Consolidation of SAREF and its community of users, based on the experience of the EUREKA ITEA - 12004 SEAS project.

- 🌐 Deliverables published
 - 🌐 [D1 TR 103 549](#) Guidelines for consolidating SAREF with new reference ontology patterns
 - 🌐 [D2 TS 103 548](#) SAREF consolidation with new reference ontology patterns, based on the experience from the EUREKA ITEA SEAS project
 - 🌐 [D3 TR 103 608](#) SAREF publication framework reinforcing the engagement of its community of users
- 🌐 + design of the development workflow and the SAREF portal (ongoing in STF 578 -> Sept 2020)

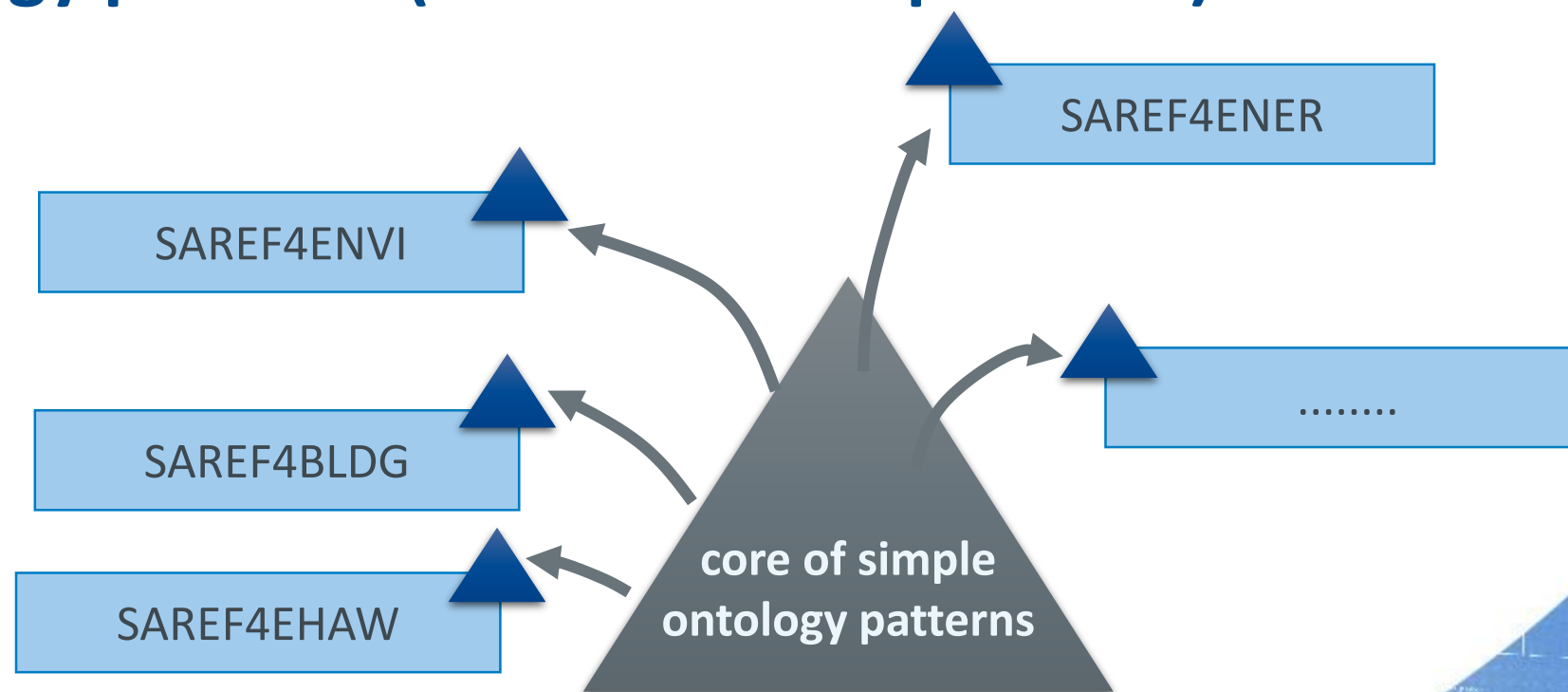
The original vision of the STFs (described in TR 103 549)

Make SAREF an ontology created by instantiating simple ontology patterns (the SEAS core patterns)

- One for describing **features of interest and their properties**
- One for describing **how properties can be assigned values**
- One for describing **procedures that are executed**
- One for describing **systems and how they interact**

The original vision of the STFs (described in TR 103 549)

Make SAREF an ontology created by instantiating simple ontology patterns (the SEAS core patterns)

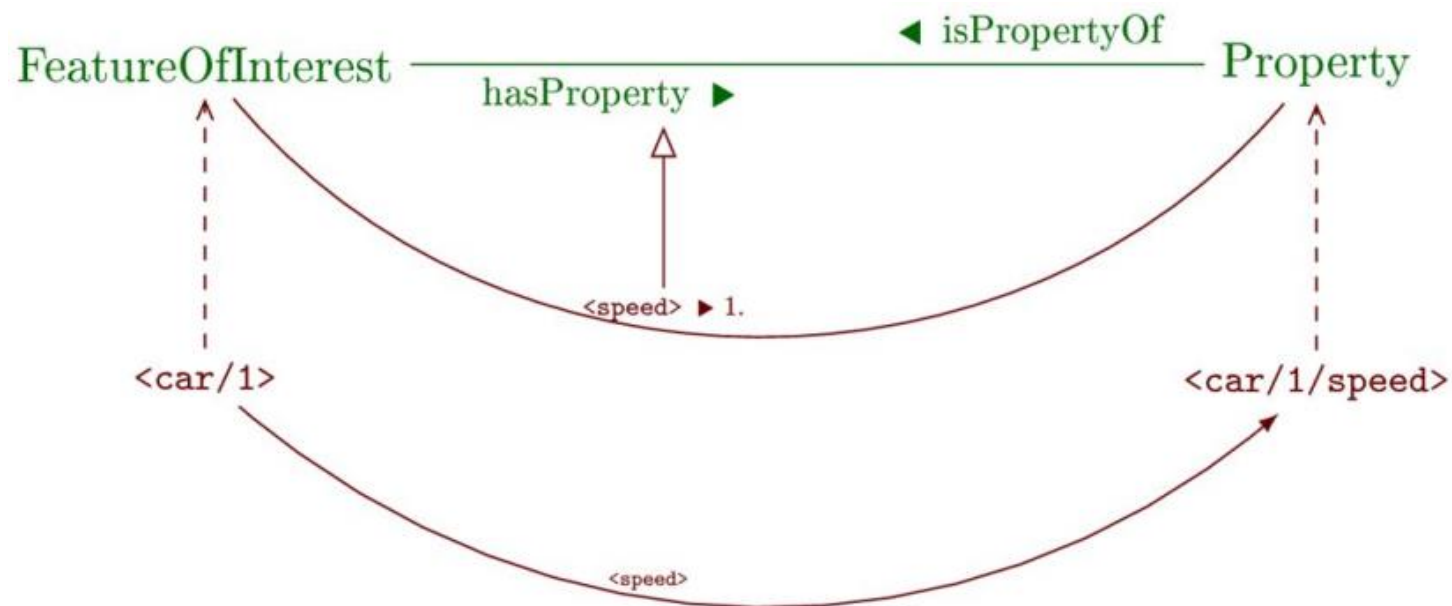


Features of Interest and Properties

Inspired from the W3C Semantic Sensor Network Ontology SOSA/SSN

SEAS has a pattern for Features of Interest and Properties

A similar pattern has been introduced in SAREF v3.1.1 (published recently)
see <https://saref.etsi.org/core/>



SAREF already has a way to model Functions and Services, which first needs to be cleaned and clarified



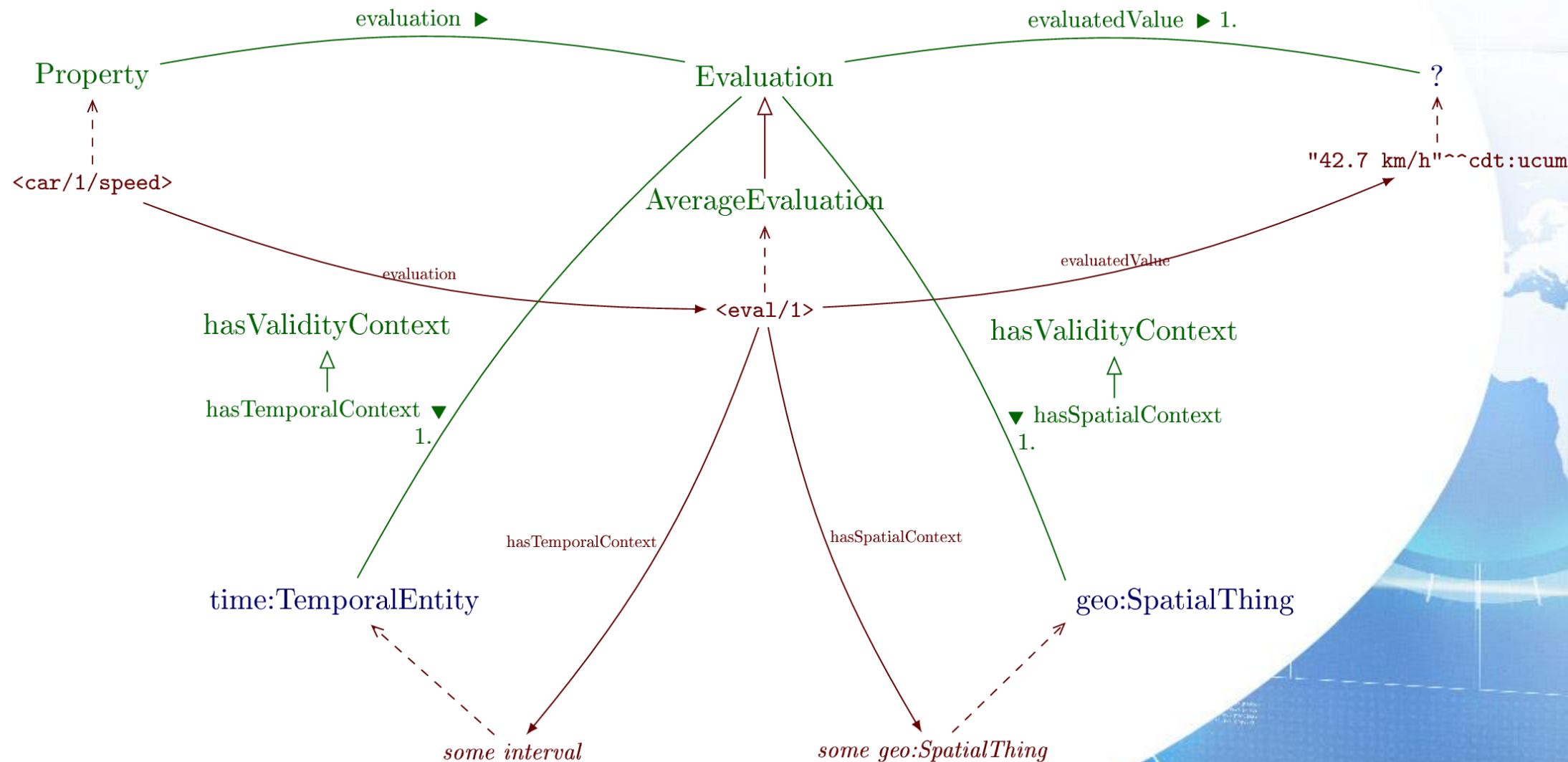
How properties can be assigned values

SEAS has a pattern for describing how properties can be assigned values.

Procedures that are executed, which generalizes a core pattern in the W3C Semantic Sensor Network Ontology SOSA/SSN

SAREF already has Measurements. (Incompatible but less expressive, see TR 103 549)

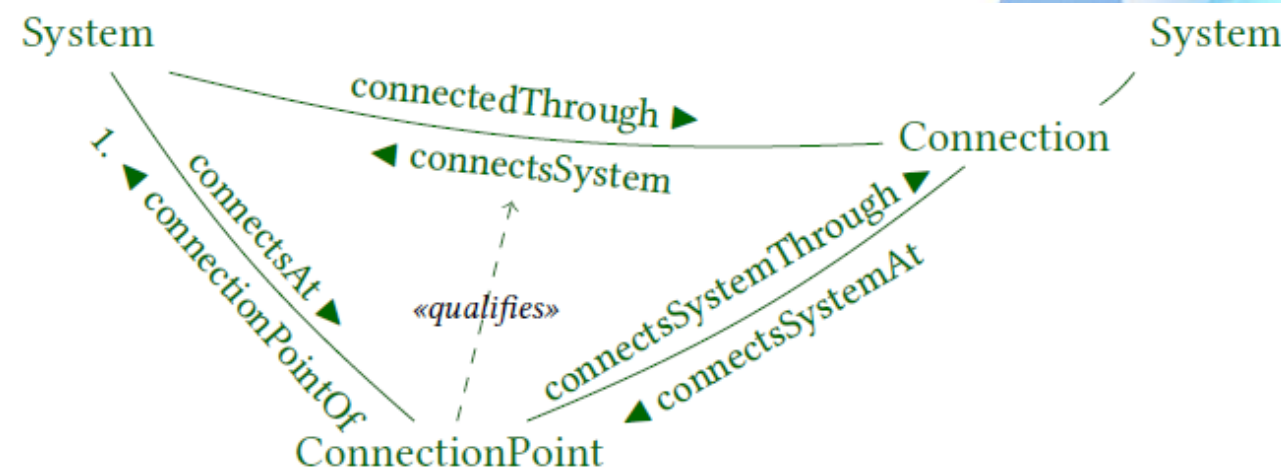
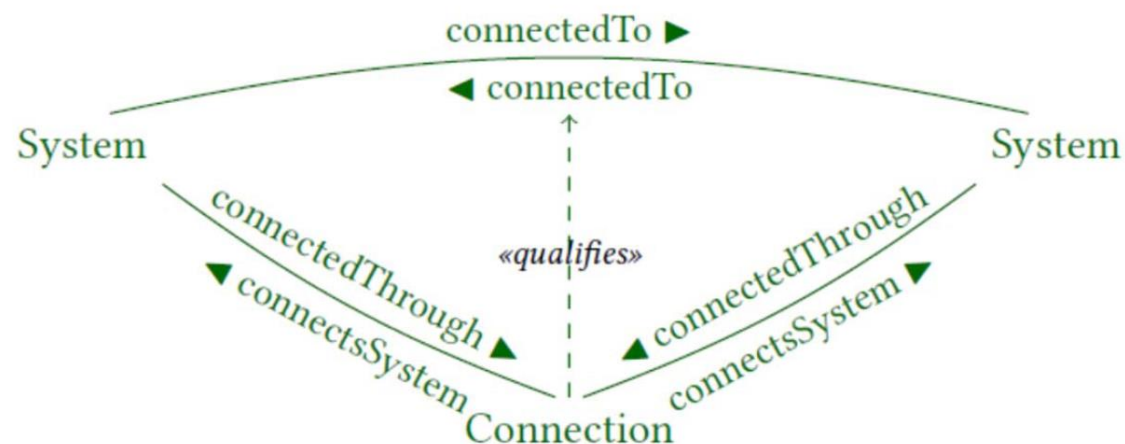
How properties can be assigned values



Systems, connections, connection points

SEAS has a pattern for Systems that are connected that are executed, which generalizes a core pattern in the W3C Semantic Sensor Network Ontology SOSA/SSN

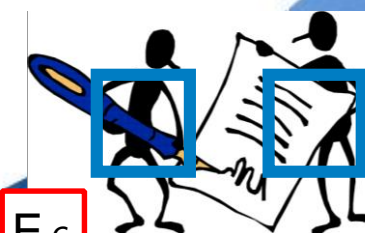
Published as the **SAREF4SYST** ontology pattern in [TS 103 548](#)



TS 103 548: the SAREF4SYST ontology pattern

Qualify **systems**

- ✓ The environment in a specific place
- ✓ A building, a room
- ✓ An appliance
- ✓ A set of appliances
- ✓ A business partner



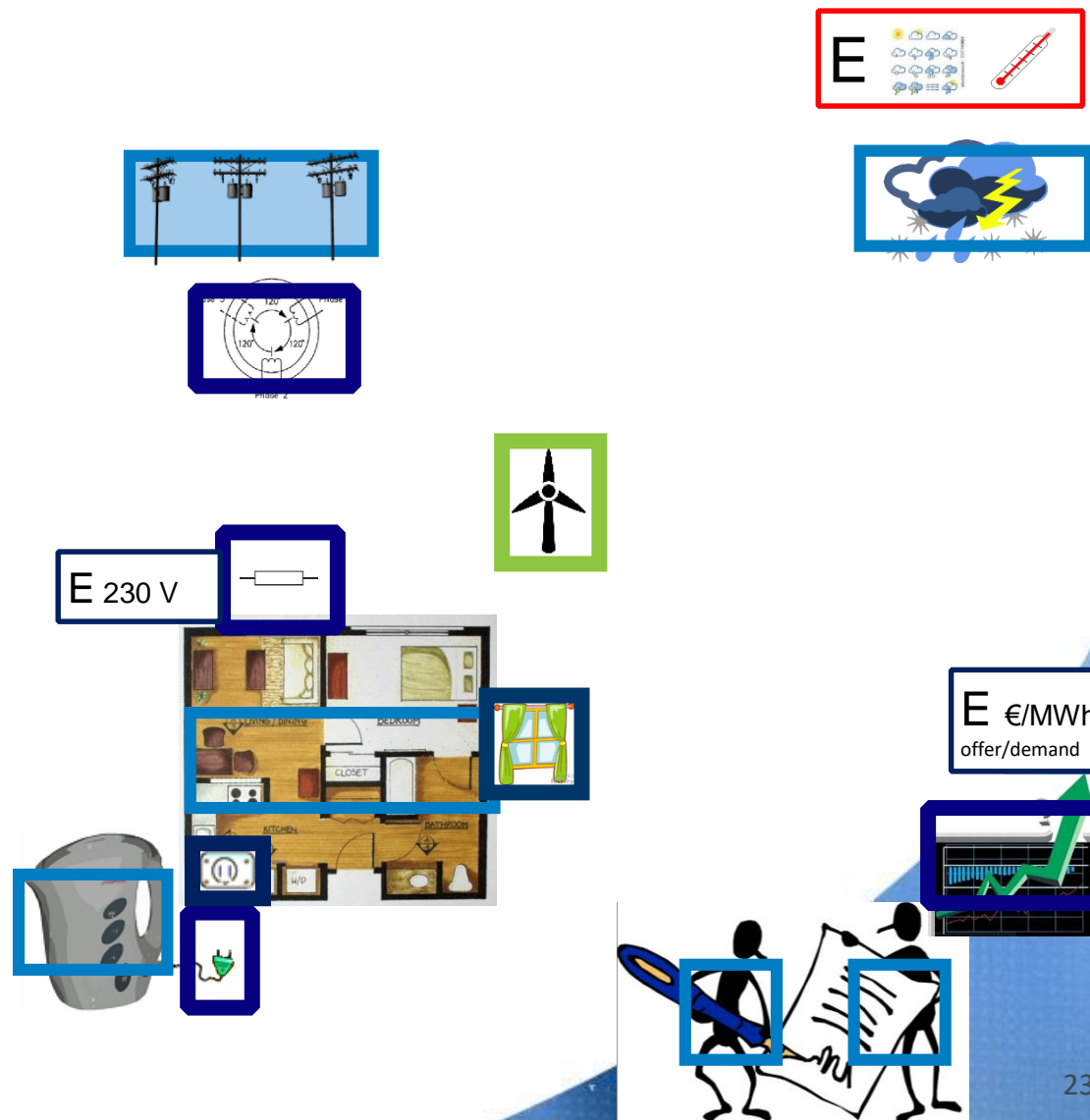
TS 103 548: the SAREF4SYST ontology pattern

Qualify **systems**

- ✓ The environment in a specific place
- ✓ A building, a room
- ✓ An appliance
- ✓ A set of appliances
- ✓ A business partner

Qualify their **connection points**

- ✓ Wall, window, ceiling
- ✓ Plug, Socket
- ✓ Offer, demand



TS 103 548: the SAREF4SYST ontology pattern

Qualify **systems**

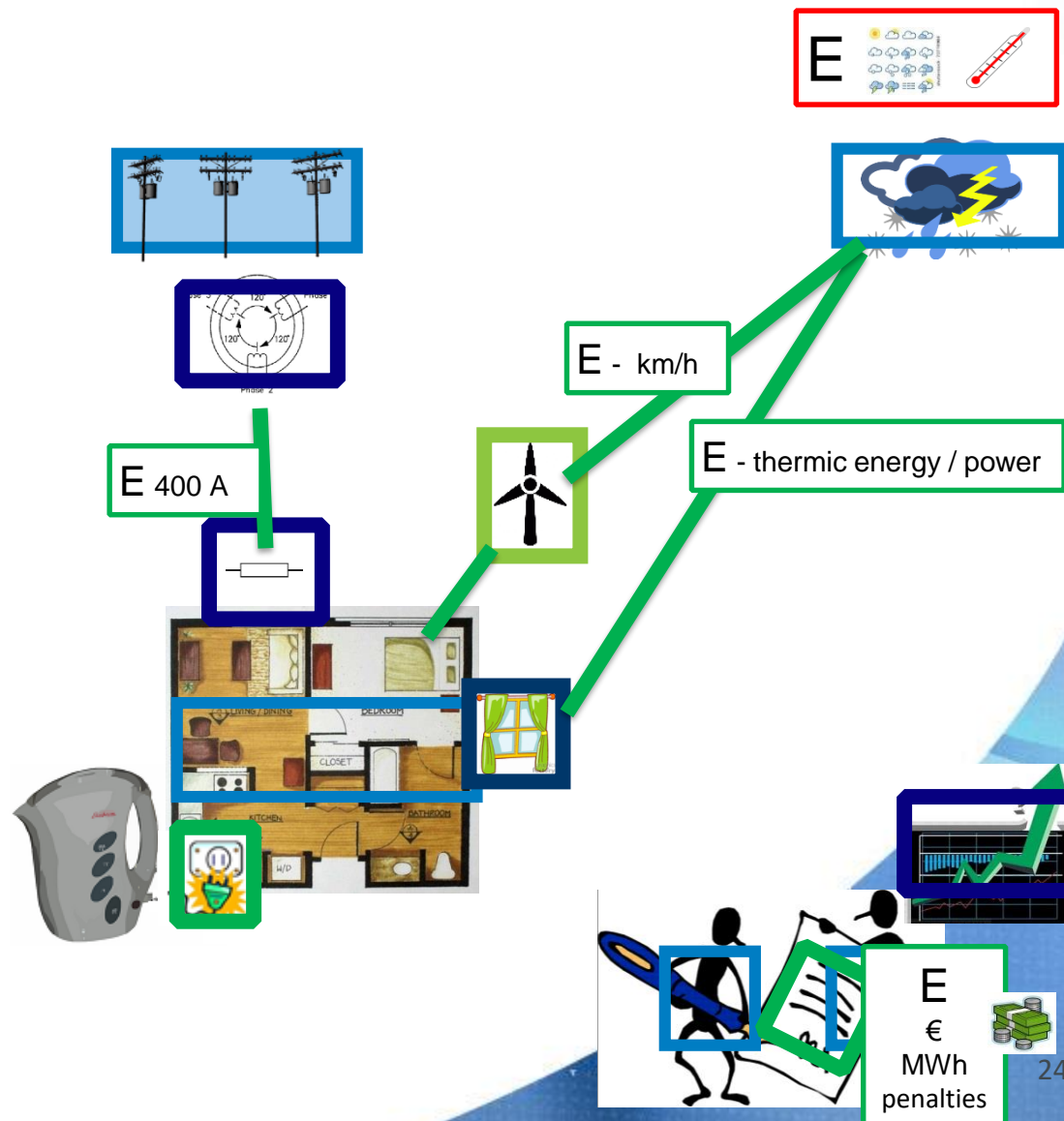
- ✓ The environment in a specific place
- ✓ A building, a room
- ✓ An appliance
- ✓ A set of appliances
- ✓ A business partner

Qualify their **connection points**

- ✓ Wall, window, ceiling
- ✓ Plug, Socket
- ✓ Offer, demand

Qualify the **connections** between these systems (flows)

- ✓ Electric energy flows
- ✓ Water volume/ thermic energy / light flows
- ✓ ...



Use case: Smart Energy

A specific system

A specific type of connection

- Electric power systems can exchange electricity with other electric power systems.
The electric energy can flow both ways in some cases (from the Public Grid to a Prosumer), or in only one way (from the Public Grid to a Load).
- Electric power systems can be made up of different sub-systems.
- Generic sub-types of electric power systems include producers, consumers, storage systems, transmission systems.
- The properties that are relevant for these systems include power production, consumption, energy stored.
- These properties may be measured or acted on by IoT devices.

Use case: Smart Energy

A specific system

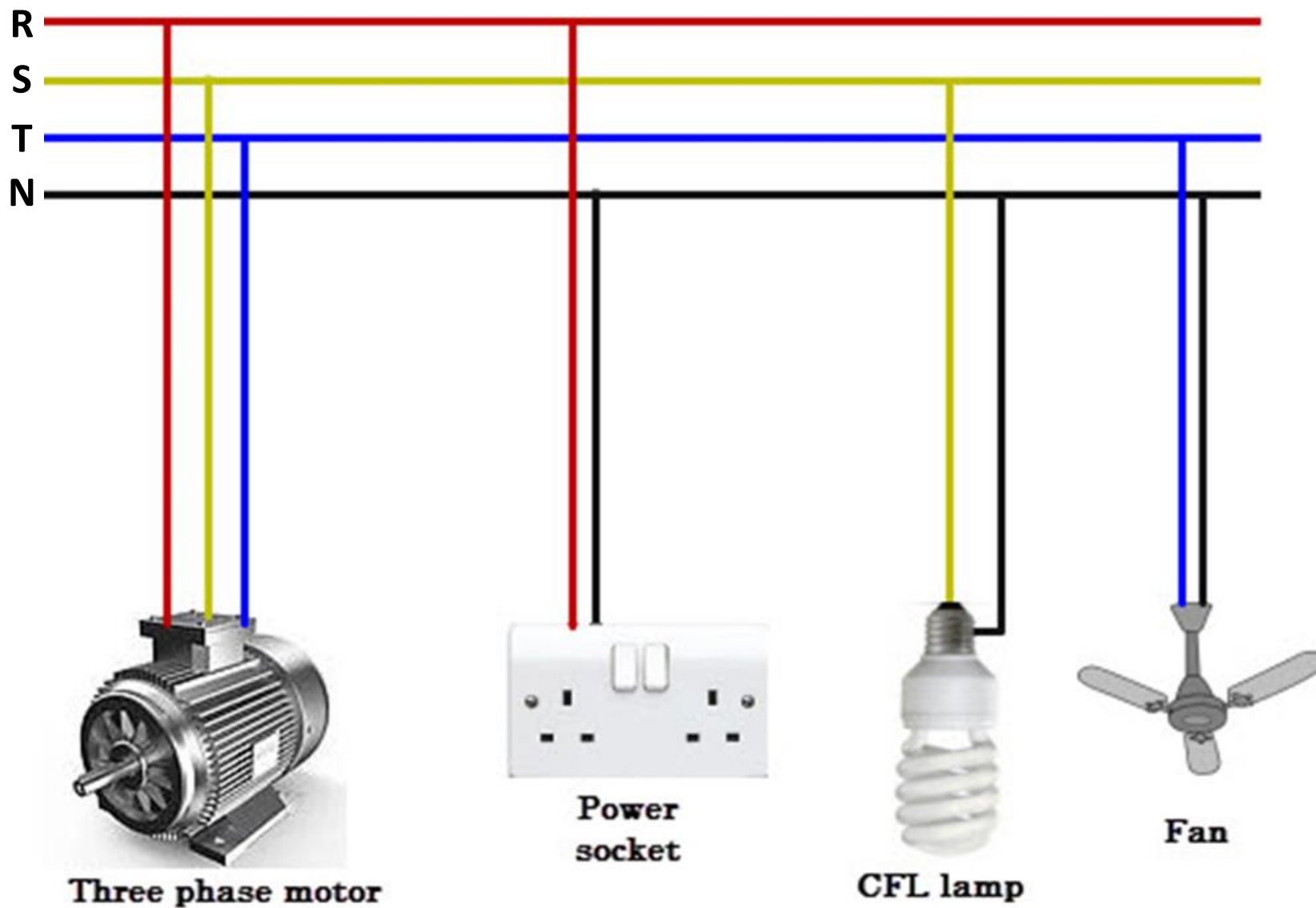
A specific type of connection point

- Electric power systems may be connected one to another through electrical connection points.
- An Electric power system may have multiple connection points (Multiple Winding Transformer generally have one single primary winding with two or more secondary windings).
- Generic sub-types of electrical connection points include plugs, sockets, direct-current, single-phase, three-phase connection points.
- The properties that are relevant for these connection points include voltage, resistance, conductance, reactance, susceptance, and can be measured between two wires of the connection points.

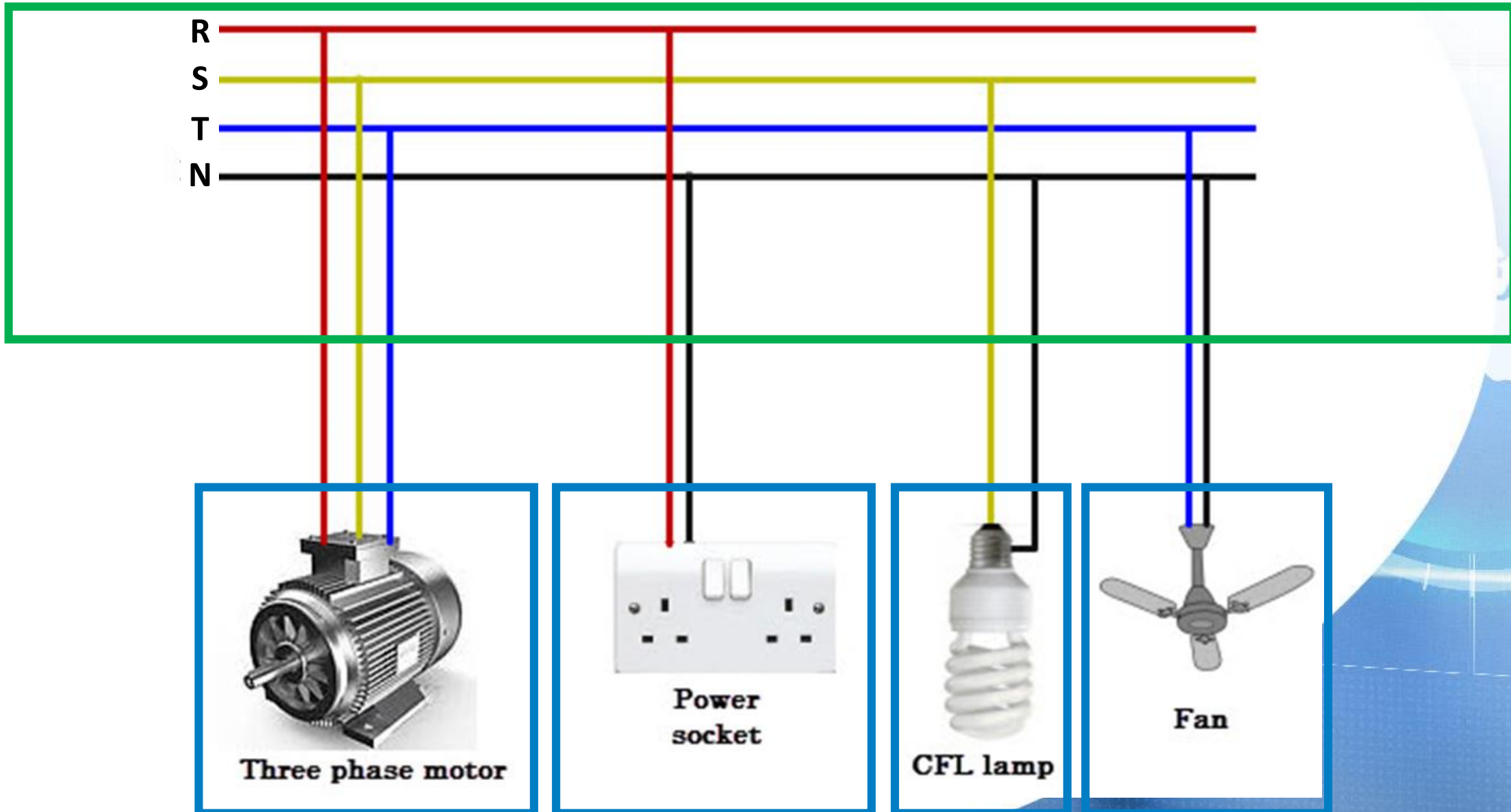
Use case: Smart Energy

- An Electrical connection may exist between two Electric power systems at two of their respective connection points.
- Generic sub-types of electrical connections include Single-phase Buses, Three-phase Buses.
- A single-phase electric power system can be connected using different configurations at a three-phase bus (RN, SN, TN types).
- The properties that are relevant for a three-phase electric bus include voltage between the different wires R, S, T, N (R-to-N, S-to-N, R-to-S, etc.).
- IoT devices can be used to measure and control this voltage at different points of the grid.

Use case: Three-phase power grid





ThreePhasePowerBus




ThreePhasePowerBus

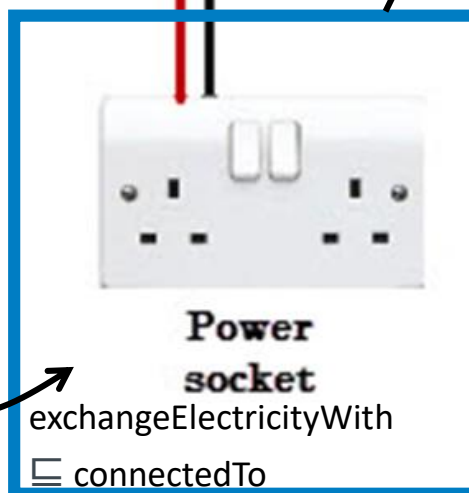
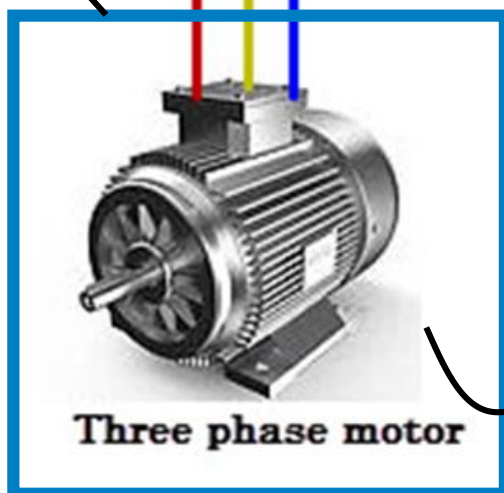


connectedInTriangleThrough
 connectsSystem

connectedInRNThrough
 connectsSystem

connectedInTNThrough
 connectsSystem

Motor



ThreePhasePowerBus



connectedInTriangleThrough
 ≡ connectsSystem

connectedInRNThrough
 ≡ connectsSystem

Motor

power
 rotationSpeed
 torque
 on/off

voltage?*
 current?*



Three phase motor



Power
 socket

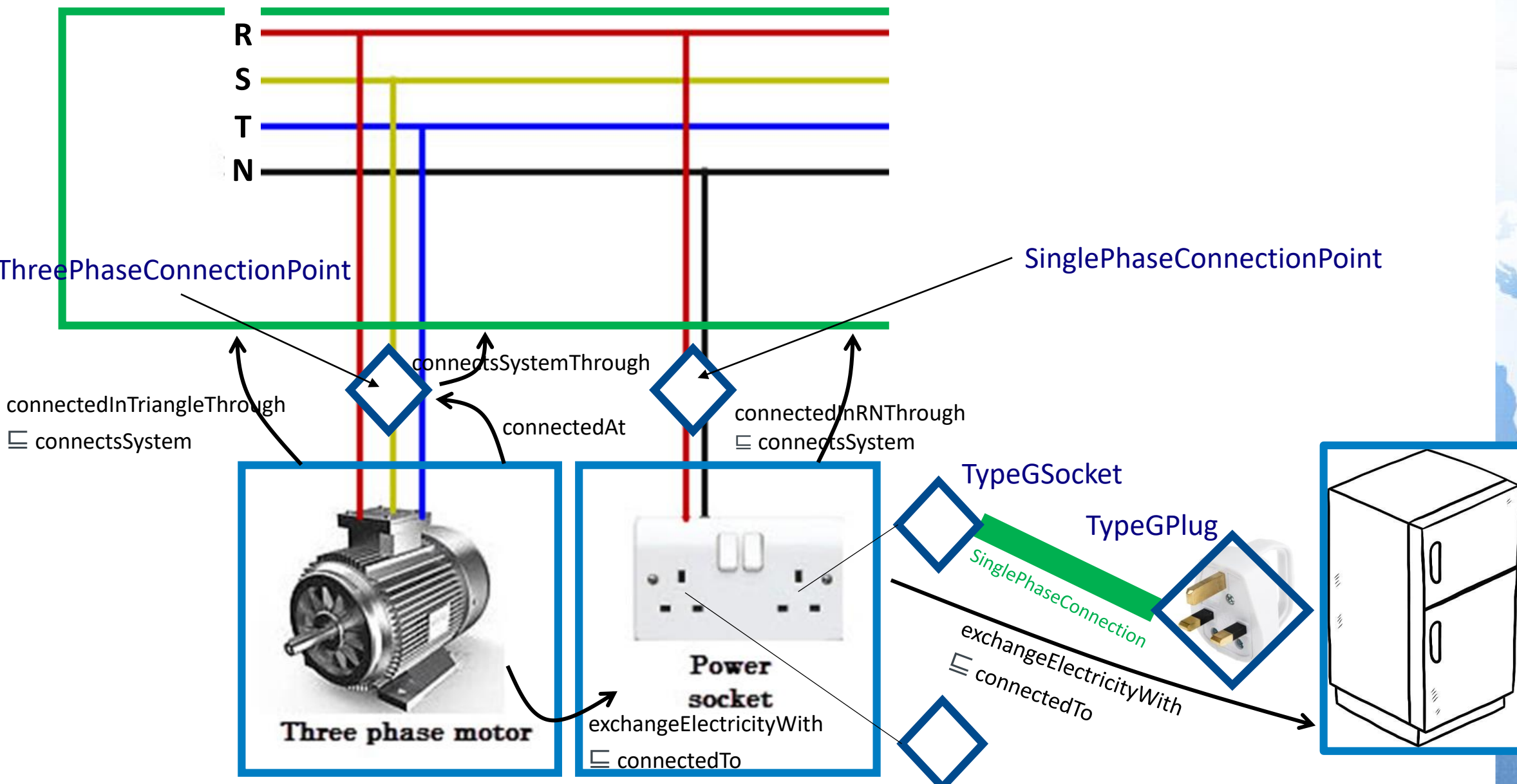
PowerSocket

voltage?*
 current?*

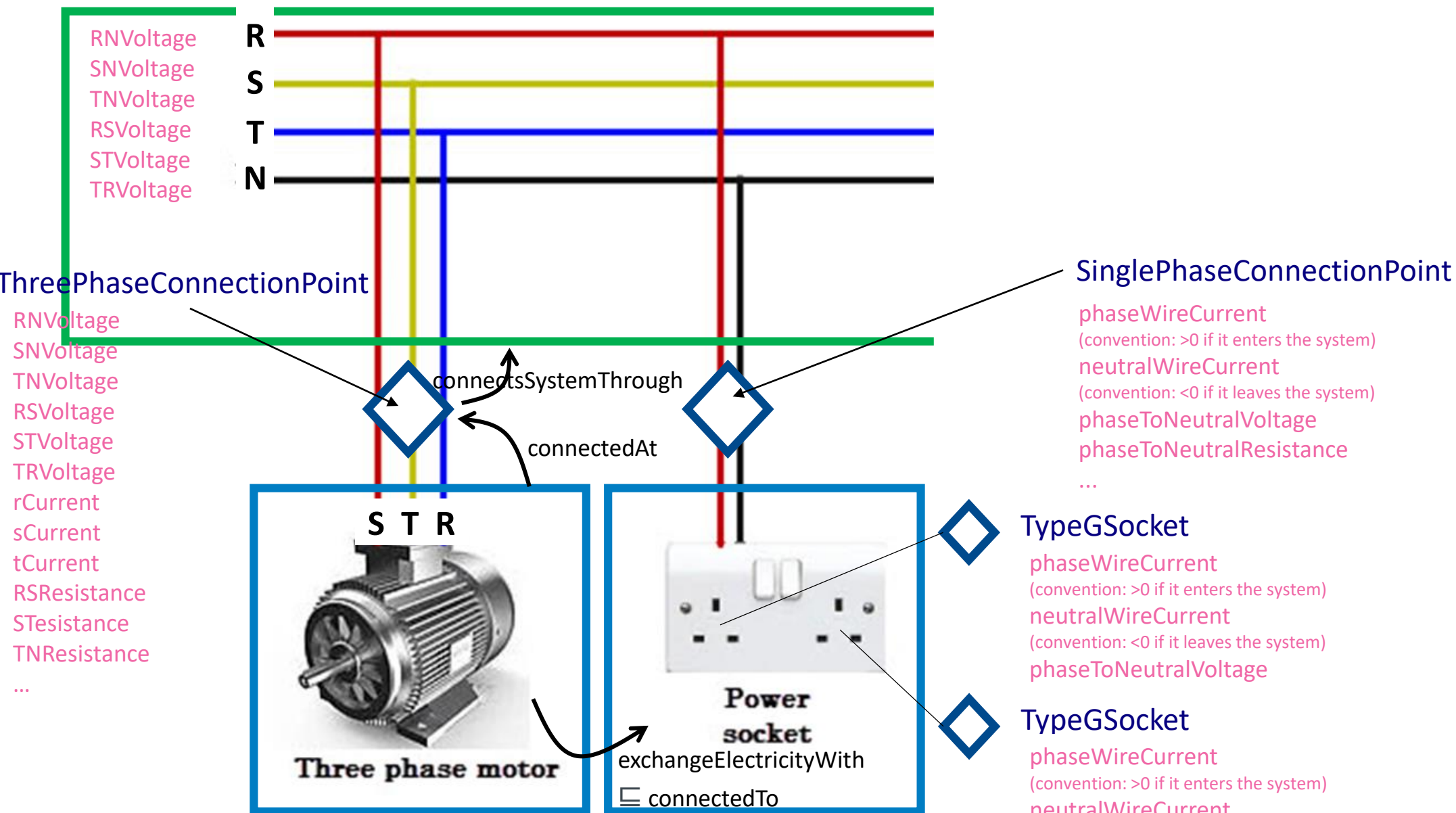
*NO

exchangeElectricityWith
 ≡ connectedTo

ThreePhasePowerBus



ThreePhasePowerBus



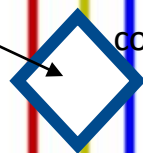
ThreePhasePowerBus

RNVoltage
 SNVoltage
 TNVoltage
 RSVoltage
 STVoltage
 TRVoltage

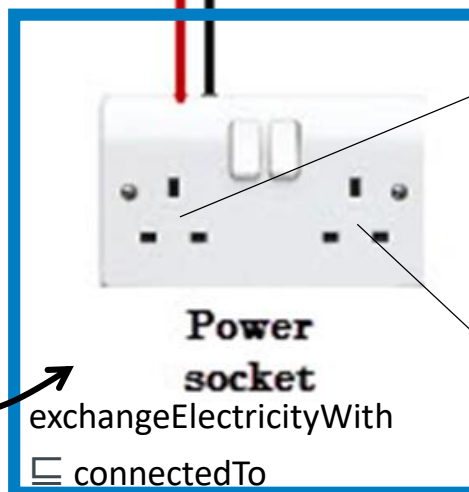
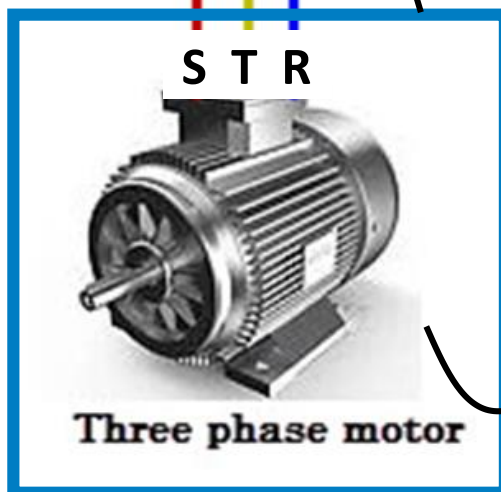


ThreePhaseConnectionPoint

RNVoltage
 SNVoltage
 TNVoltage
 RSVoltage
 STVoltage
 TRVoltage
 rCurrent
 sCurrent
 tCurrent
 RSResistance
 STesistance
 TNResistance
 ...



connectsSystemThrough
 connectedAt



exchangeElectricityWith
 connectedTo

As a matter of fact, here
 $\text{bus.RNVoltage} = \text{socket.phaseToNeutralVoltage}$
 $\text{bus.RSVoltage} = \text{motor.STVoltage}$
 $\text{bus.STVoltage} = \text{motor.TRVoltage}$
 $\text{bus.TRVoltage} = \text{motor.RSVoltage}$
 $\text{motor.sCurrent} + \text{socket.phaseWireCurrent} + \dots = 0$
 ...

SinglePhaseConnectionPoint

phaseWireCurrent
 (convention: >0 if it enters the system)
 neutralWireCurrent
 (convention: <0 if it leaves the system)
 phaseToNeutralVoltage
 phaseToNeutralResistance
 ...

TypeGSocket

phaseWireCurrent
 (convention: >0 if it enters the system)
 neutralWireCurrent
 (convention: <0 if it leaves the system)
 phaseToNeutralVoltage

TypeGSocket

phaseWireCurrent
 (convention: >0 if it enters the system)
 neutralWireCurrent

SAREF consolidation with new reference ontology patterns, based on the experience from the SEAS project

Presented by: **Maxime Lefrançois**

For: W3C LBD-CG

24.02.2020