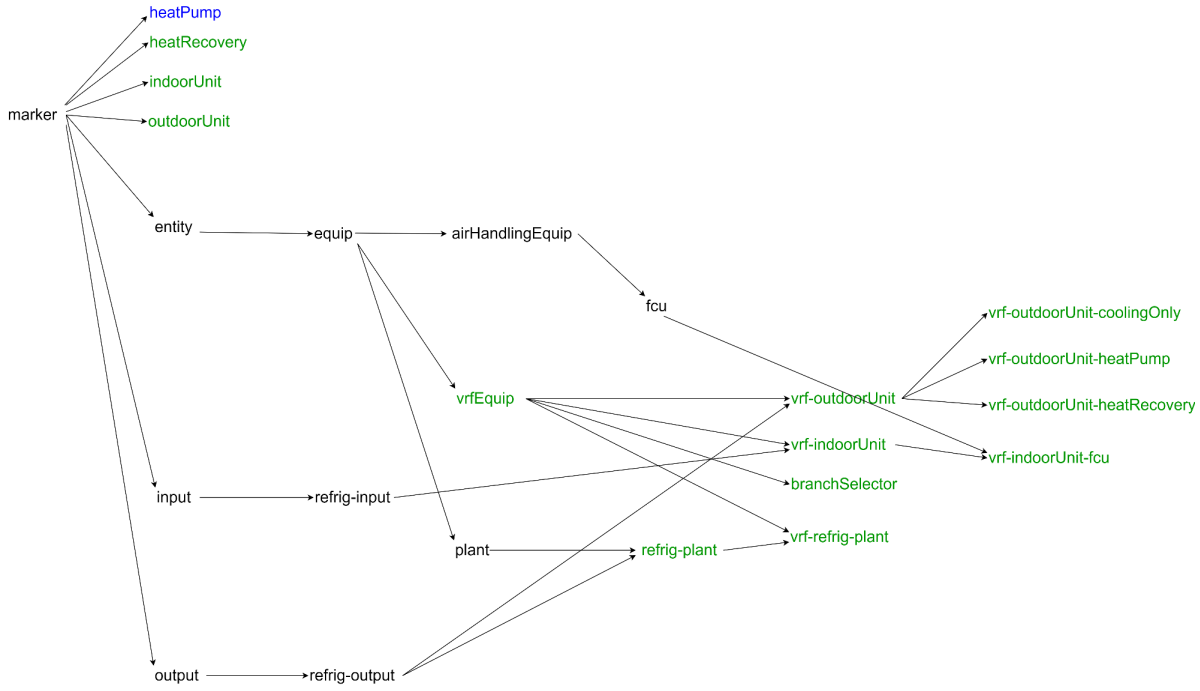
VRF system definitions

1. Proposed taxonomy of each equipment



2. Proposed marker

1) coolingOnly Current: https://project-haystack.org/doc/lib-phIoT/coolingOnly
2) heatPump Current: https://project-haystack.org/doc/lib-phIoT/heatPump

Note that a new definition for heatPump has been finalized as a generic "adjective" marker in the Labs WG

Heat pump VRF system can reverse the direction of the refrigerant flow to provide heating or cooling to the indoor space. All indoor units connected to a heat pump system can use individual control and set points, but they operate in the same mode of either heating or cooling at any given time.

ASHRAE: thermodynamic heating/refrigerating system to transfer heat. The condenser and evaporator may change roles to transfer heat in either direction. By receiving the flow of air or other fluid, a heat pump is used to cool or heat. Heat pumps may be the air source with heat transfer between the indoor air stream to outdoor air or water source with heat transfer between the indoor air stream and a hydronic source. https://xp20.ashrae.org/terminology/index.php?term=heat%20pump#:~:text=Heat%20pumps%20may%20be%20the,tower%2C%20or%20domestic%20water).

3) **heatRecovery**: heatRecovery systems are heat pump systems that can provide simultaneous heating and cooling. All indoor units connected to a heat recovery system not only can use individual control and set points, but they can also individually operate in heating or cooling mode at any given time.
4) **indoorUnit**: Indoor units operate to satisfy a heating or cooling load.
5) **outdoorUnit**: Outdoor unit has one or more compressors. As each indoor unit sends a demand to the outdoor unit, the outdoor unit delivers the amount of refrigerant needed to meet the individual requirements of each indoor unit.

3. Proposed equipment

vrfEquip

- Def: VRF systems are HVAC systems that use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
- Meta
  - Children: See below
  - Def: vrfEquip
  - Doc: See above
  - Is: equip
  - Lib: lib:phIoT
- Usage: vrfEquip, equip
- Supertypes
  - Marker
    - Entity
      - Equip
- subtypes
  - vrf-outdoorUnit
    - vrf-outdoorUnit-coolingOnly
    - vrf-outdoorUnit-heatPump
    - vrf-outdoorUnit-heatRecovery
  - vrf-indoorUnit
    - vrf-indoorUnit-fcu
  - branchSelector
  - vrf-refrig-plant
- Tags
  - dis
  - equipRef
  - id
  - siteRef

refrig-plant

- Def: Plant used to generate refrigerant for cooling or heating. See Plants.
- Conjunct
  - Refrig: Fluid used in refrigeration and heat exchange. Refrigerants typically alternate between liquid and gas state.
  - Plant: Central plant used to generate a substance for a process
- Meta
  - Def: refrig-plant
  - Doc: See above
  - Is: plant, refrig-output
  - Lib: lib:phIoT
- Usage: refrig plant equip
- Supertypes
  - Marker

            - Entity
                - Equip
                    - Plant
            - Output
                - Refrig-output
- Subtypes
    - Vrf-refrig-plant
- Tags
    - dis
    - equipRef
    - id
    - siteRef
    - spaceRef

vrf-refrig-plant

- Def: Plant used to generate refrigerant for cooling or heating in VRF system. See Plants.
- Conjunct
    - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
    - Refrig: Fluid used in refrigeration and heat exchange. Refrigerants typically alternate between liquid and gas state.
    - Plant: Central plant used to generate a substance for a process
- Meta
    - Children: See below
    - Def: vrf-refrig-plant
    - Doc: See above
    - Is: vrfEquip, refrig-plant
    - Lib: lib:phIoT
- Usage: vrf refrig plant equip
- Supertypes
    - Marker
        - Entity
            - Equip
                - Plant
                    - Refrig-plant
                - Vrf Equip
        - Output
            - Refrig-output
- Tags
    - dis
    - equipRef
    - id
    - siteRef
    - spaceRef
- Children
    - outdoorUnit equip

    - alarm sensor
    - hvacMode sp

vrf-outdoorUnit

- Def: equipment to generate cold or hot refrigerant for cooling or heating in VRF system. Outdoor unit has one or more compressors to generate cold or hot refrigerants.
- Conjunct
    - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
    - outdoorUnit: outdoor unit delivers the amount of refrigerant needed to meet the individual requirements of each indoor unit
- Meta
    - Children: See below
    - Def: vrf-outdoorUnit
    - Doc: See above
    - Is: vrfEquip, refrig-output
    - Lib: lib:phIoT
- Usage: vrf outdoorUnit equip
- Supertypes
    - Marker
        - Entity
            - Equip
                - Vrf Equip
        - Output
            - Refrig-output
- Tags
    - dis
    - equipRef
    - id
    - siteRef
- Children
    - Condenser fan freq sensor
    - hvacMode sp

vrf-outdoorUnit-coolingOnly

- Def: equipment to generate only cold refrigerant for cooling in VRF system. Outdoor unit has one or more compressors to generate cold refrigerants.
- Conjunct
    - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
    - outdoorUnit: outdoor unit delivers the amount of refrigerant needed to meet the individual requirements of each indoor unit
    - coolingOnly: Equipment without heating
- Meta
    - Children: See below
    - Def: vrf-outdoorUnit

    - Doc: See above
    - Is: vrfEquip, refrig-output
    - Lib: lib:phIoT
- Usage: vrf outdoorUnit equip
- Supertypes
    - Marker
        - Entity
            - Equip
                - Vrf Equip
                    - vrf-outdoorUnit
        - Output
            - Refrig-output
- Tags
    - dis
    - equipRef
    - id
    - siteRef
- Children
    - Condenser fan freq sensor
    - hvacMode sp

vrf-outdoorUnit-heatPump

- Def: equipment to generate cold or hot refrigerant for cooling or heating in VRF system. Outdoor unit has one or more compressors to generate cold or hot refrigerants.
- Conjunct
    - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
    - outdoorUnit: outdoor unit delivers the amount of refrigerant needed to meet the individual requirements of each indoor unit
    - heatPump: heat pump system can reverse the direction of the refrigerant flow to provide heating or cooling to the indoor space
- Meta
    - Children: See below
    - Def: vrf-outdoorUnit
    - Doc: See above
    - Is: vrfEquip, refrig-output
    - Lib: lib:phIoT
- Usage: vrf outdoorUnit equip
- Supertypes
    - Marker
        - Entity
            - Equip
                - Vrf Equip
                    - vrf-outdoorUnit

            - Output
                - Refrig-output
- Tags
    - dis
    - equipRef
    - id
    - siteRef
- Children
    - Condenser fan freq sensor
    - hvacMode sp

vrf-outdoorUnit-heatRecovery

- Def: equipment to generate cold or hot refrigerant for cooling or heating in VRF system. Outdoor unit has one or more compressors to generate cold or hot refrigerants.
- Conjunct
    - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
    - outdoorUnit: outdoor unit delivers the amount of refrigerant needed to meet the individual requirements of each indoor unit
    - heatRecovery: heatRecovery systems are heat pump systems that can provide simultaneous heating and cooling.
- Meta
    - Children: See below
    - Def: vrf-outdoorUnit
    - Doc: See above
    - Is: vrfEquip, refrig-output
    - Lib: lib:phIoT
- Usage: vrf outdoorUnit equip
- Supertypes
    - Marker
        - Entity
            - Equip
                - Vrf Equip
                    - vrf-outdoorUnit
        - Output
            - Refrig-output
- Tags
    - dis
    - equipRef
    - id
    - siteRef
- Children
    - Condenser fan freq sensor
    - hvacMode sp

vrf-indoorUnit

- Def: Indoor units of VRF system which operate to satisfy a heating or cooling load.
- Conjunct
  - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
  - indoorUnit: Indoor units operate to satisfy a heating or cooling load in a zone based on a zone thermostat temperature set point.
- Meta
  - Children: See below
  - Def: vrf-indoorUnit
  - Doc: See above
  - Is: vrfEquip, refrig-input, refrig-output
  - Lib: lib:phIoT
- Usage: vrf indoorUnit equip
- Supertypes
  - Marker
    - Entity
      - Equip
        - Vrf Equip
    - Input
      - refrig-input
    - Output
      - Refrig-output
      - air-output
- Tags
  - dis
  - equipRef
  - id
  - siteRef
  - spaceRef
- Children
  - discharge|fan|run|cmd
  - discharge|fan|run|sp
  - discharge|cmd|speed|fan
  - discharge|sp|speed|fan
  - cooling|effective|zone|air|temp|sp
  - effective|heating|zone|air|temp|sp
  - filter|sensor
  - hvacMode|cmd
  - hvacMode|sp
  - occupied|cmd
  - occupied|effective|sp

- cooling|occ|zone|air|temp|sp
- heating|occ|zone|air|temp|sp
- run|cmd
- state|run|sensor
- cooling|unocc|zone|air|temp|sp
- heating|unocc|zone|air|temp|sp
- zone|air|temp|sensor
- return|air|temp|sensor
- discharge|air|temp|sensor

vrf-indoorUnit-fcu

- Def: VRF Indoor unit fan coils operate to satisfy a heating or cooling load in a zone based on a zone thermostat temperature set point.
- Conjunct
  - Vrf: HVAC systems use refrigerant as the cooling and heating medium. This refrigerant is conditioned by one or more outdoor units and is circulated within the building to multiple indoor units.
  - indoorUnit: Indoor units operate to satisfy a heating or cooling load in a zone based on a zone thermostat temperature set point.
  - fcu: fcus recirculates air in a space and performs one or more of the functions of cleaning, heating, cooling, humidifying, dehumidifying, or ventilating the air.
- Meta
  - Children: See below
  - Def: vrf-indoorUnit-fcu
  - Doc: See above
  - Is: vrfEquip, refrig-input, fcu, refrig-output
  - Lib: lib:phIoT
- Usage: vrf outdoorUnit equip
- Supertypes
  - Marker
    - Entity
      - Equip
        - Vrf Equip
          - Vrf-indoorUnit
    - Input
      - refrig-input
    - Output
      - Refrig-output
      - air-output
- Tags
  - dis
  - equipRef
  - id
  - siteRef
  - spaceRef

- Children

    - discharge|fan|run|cmd
    - discharge|fan|run|sp
    - discharge|cmd|speed|fan
    - discharge|sp|speed|fan
    - cooling|effective|zone|air|temp|sp
    - effective|heating|zone|air|temp|sp
    - filter|sensor
    - hvacMode|cmd
    - hvacMode|sp
    - occupied|cmd
    - occupied|effective|sp
    - cooling|occ|zone|air|temp|sp
    - heating|occ|zone|air|temp|sp
    - run|cmd
    - state|run|sensor
    - cooling|unocc|zone|air|temp|sp
    - heating|unocc|zone|air|temp|sp
    - zone|air|temp|sensor
    - return|air|temp|sensor
    - discharge|air|temp|sensor

branchSelector

- Def: Branch selectors are used for the heat recovery VRF system as control devices directing the liquid refrigerant or gas refrigerant to zones requiring cooling or heating.
- Meta
    - Children: See below
    - Def: branchSelector
    - Doc: See above
    - Is: vrfEquip
    - Lib: lib:phIoT
- Usage: branchSelector equip
- Supertypes
    - Marker
        - Entity
            - Equip
                - Vrf Equip
- Tags
    - dis
    - equipRef
    - id
    - siteRef