DIY Zoning: Passive Mode

Table of contents

1. Checkpoint

It is still possible to maintain peace between you and HVAC contractors that will inevitably fix your unit (not that I'm saying the failure will be your fault, it's just that all the equipment fails sooner or later, and has to be fixed). The way to do it is to make the system work in passive mode.

Passive mode is hereby defined as controlling dampers only, but not the HVAC unit. The usefulness and efficiency of such a solution is limited in comparison to fully functional zoning system, however, it has two major advantages:

1. You don't have to touch neither your thermostat nor your HVAC unit.
2. Probability of complications dealing with HVAC contractors trying to blame you for equipment failure (and therefore complications dealing with your home warranty company, or the equipment manufacturer) is significantly reduced. Technically, you didn't touch the unit.

In any case, passive mode setup will be a good intermediate step between data collection only system and fully functional zoning system.

2. Passive mode setup

There are two significant differences between full install setup and passive mode setup. In the passive mode, you

- *absolutely must* disable the damper that is located in the same zone as existing thermostat. The simplest way to do it is not to install the actual physical damper, and use the `NullDamper` class in the configuration for the aforementioned zone.
- should either shut it off ("disable" checkbox on the control panel), or make it not voting ("voting" checkbox on the control panel).

3. Passive mode principle

This is how the passive mode system works:

- For the existing thermostat, nothing has changed. It will call for heat (cool) when unhappy, and shut off the HVAC unit when satisfied.
- Meanwhile, all other zones will be controlled by the zoning system. Signal from the zoning system to the HVAC unit will be ignored, but the dampers will move according to the actual demand in the corresponding zone.

- As the zones are satisfied, their dampers will gradually close.
- As the zones are satisfied, the airflow to the zone with the existing thermostat will increase, therefore it will be satisfied sooner than in the case where no zoning system is present.

4. Passive mode requirements

Following conditions must be satisfied in order for the passive mode system to be more or less efficient:

1. The zone with the existing thermostat must have higher heat loss (gain), so the thermostat will call for heat (cool) sooner than the other zones.
2. The zone with the existing thermostat must have higher volume (heat or cool slower than the other zones), so the other zones are satisfied before the thermostat shuts off the HVAC unit.

Note:

In case when the above conditions can't be met, the setpoint on the thermostat will have to be set lower (for cooling) or higher (for heating) than actually needed. This will, of course, somewhat increase the energy consumption, but not significantly. On the other hand, this will allow the rest of the system function properly.

This setup has been working with the DZ implementation for more than two years, and turned out to be quite satisfactory (in fact, so satisfactory that it seriously hindered the progress on implementing the HVAC unit controller).

It is possible to make this mode of operation behave even better by implementing a special case of a zone - if the condition #2 above can't be met, it is possible to temporarily [partially] close the damper in the zone with the existing thermostat in order to make the other zones satisfied sooner than otherwise, but the "return on investment" for this solution is questionable, therefore this will be done only if there's a significant demand for such a solution.

Nevertheless, there is a significant drawback - the more is the difference between the setpoint[s] and the ambient temperature, the better such a setup works. The closer is the ambient temperature to the setpoint, the more unbalanced such a setup will be.

5. Next Step

Now that you have an idea about how well the system is performing, you may (but then again, you may not, keeping in mind all these warnings you've been seeing) decide to go for Total Control.