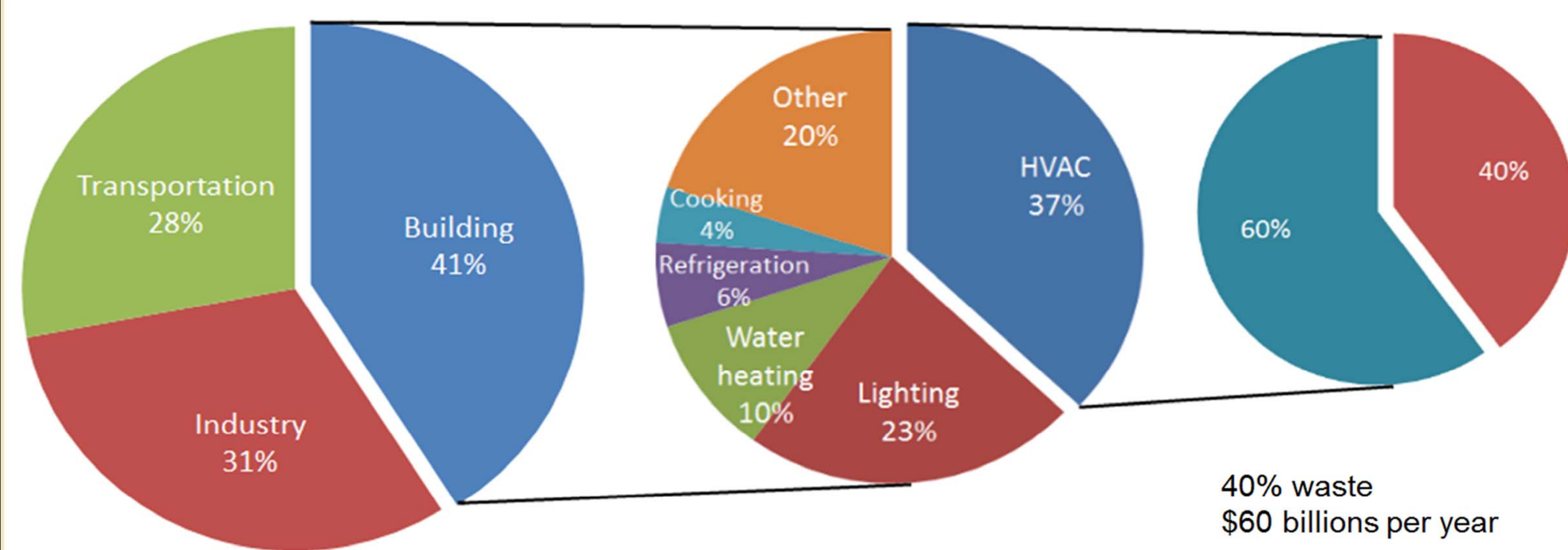


Applying A Self-Managing Approach to Improve the Energy Efficiency in Operating and Maintaining HVAC Systems

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Problem Statement



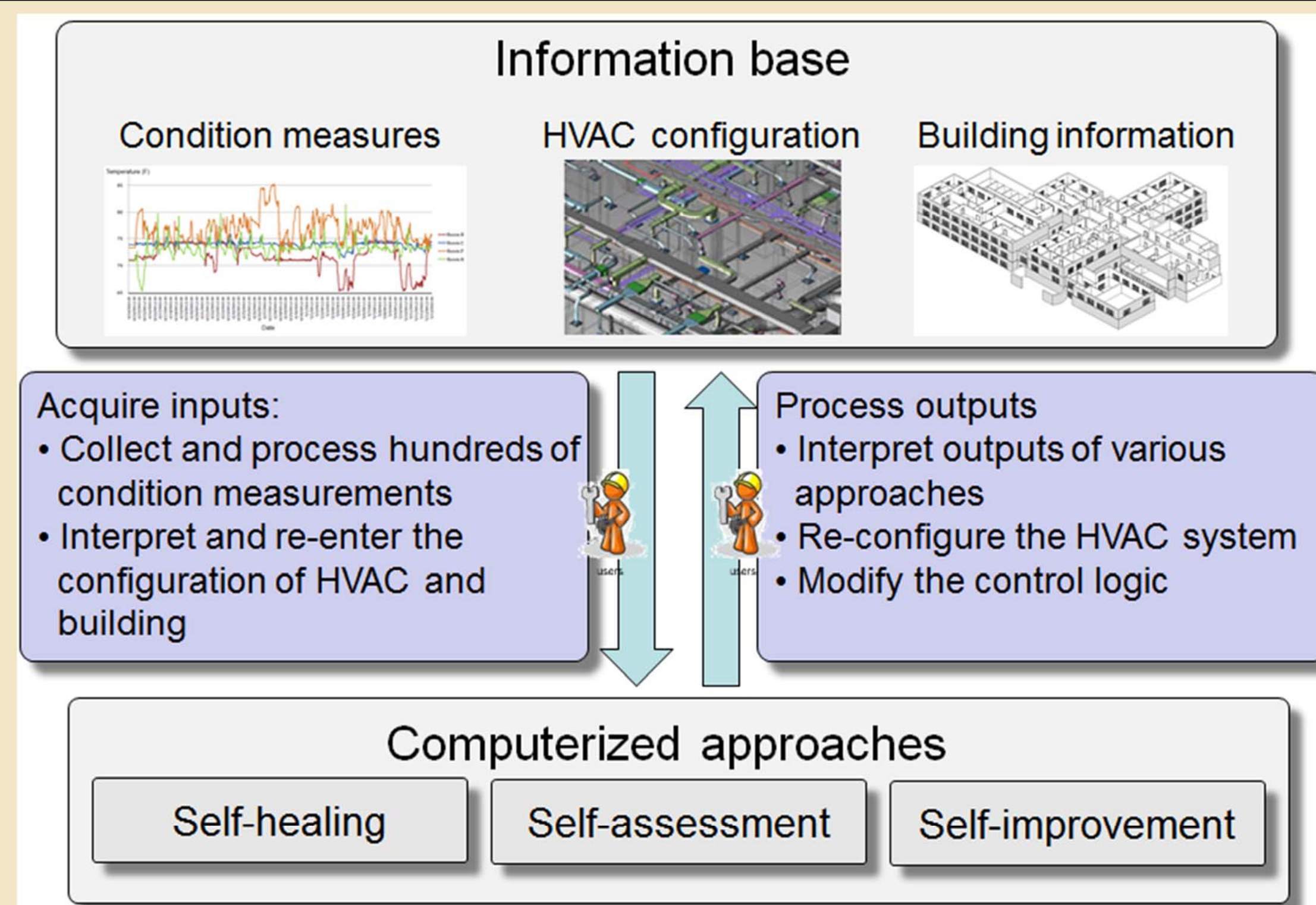
➤ Heating, ventilating and air conditioning (HVAC) systems account for about 16% of the total energy consumption in the United States. However, research shows that 25%-40% of the energy consumed by HVAC systems is wasted because of undetected faults.

Background Research

➤ Previous studies proposed computerized approaches to automatically identify and mitigate the faults in HVAC systems.

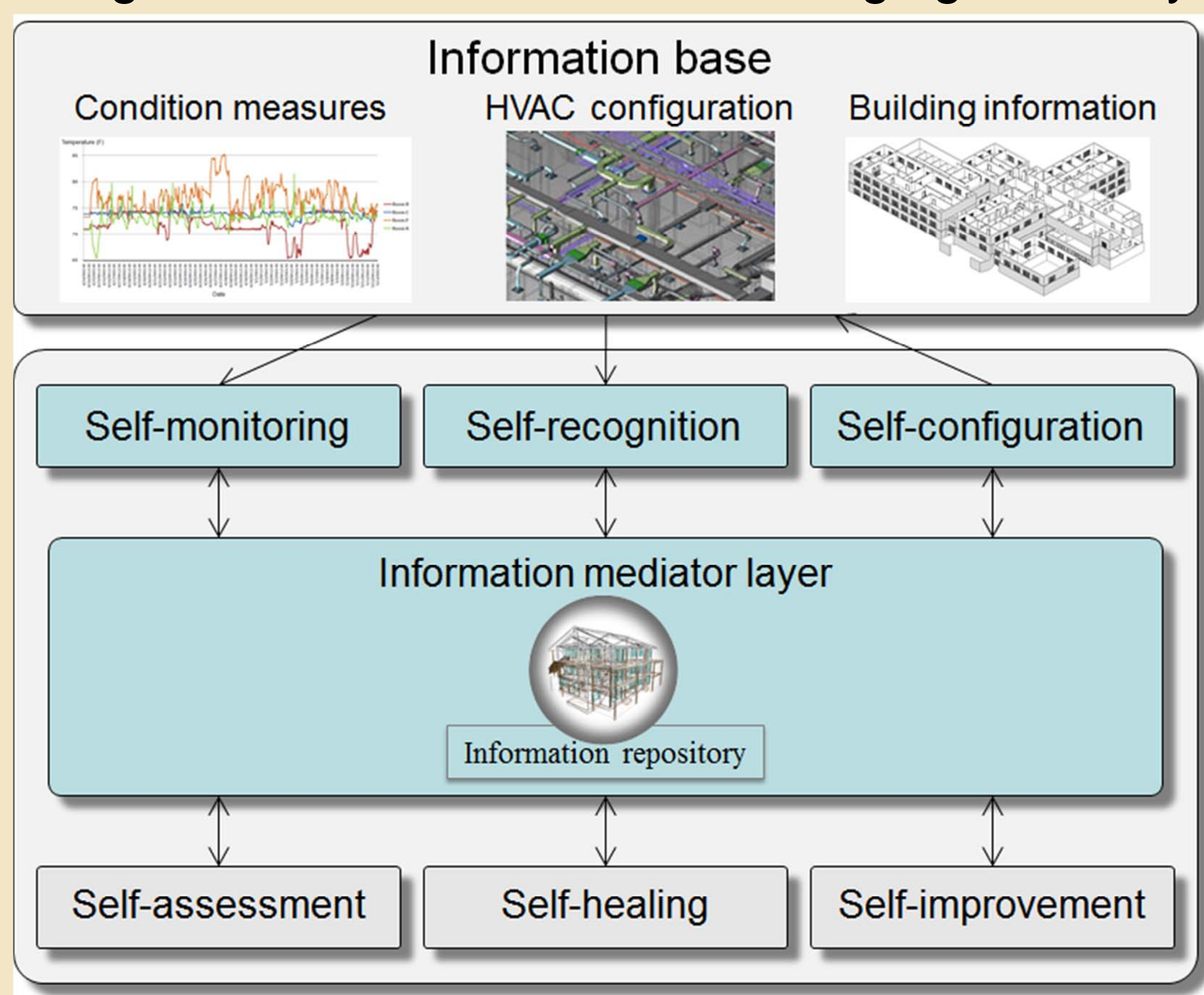
Approach	Energy Saving	Information source
Computerized FDD	20%-30%	IEA (2006)
	5%-20%	Roth et al. (2005)
Automated Commissioning	20%-30%	Liddament (1999)
	20%	Liu et al. (2002)
Optimized operating schedule	10%-40%	Mansson and McIntyre (1997)
	23%	IEA (2004)

➤ However, due to the complex information requirements of these approaches, it is difficult for the HVAC systems operators to manually collect and provide the needed information to them.

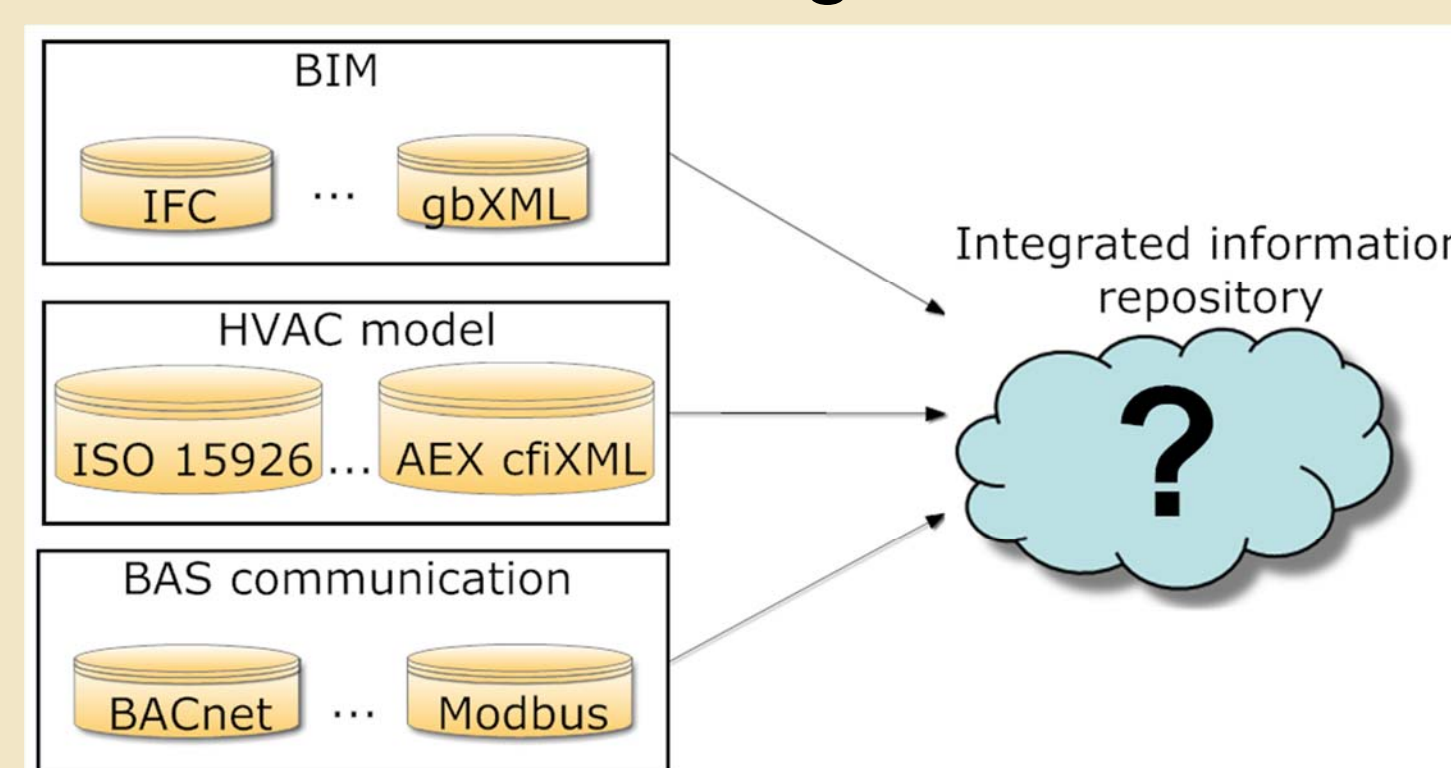


Vision and objectives

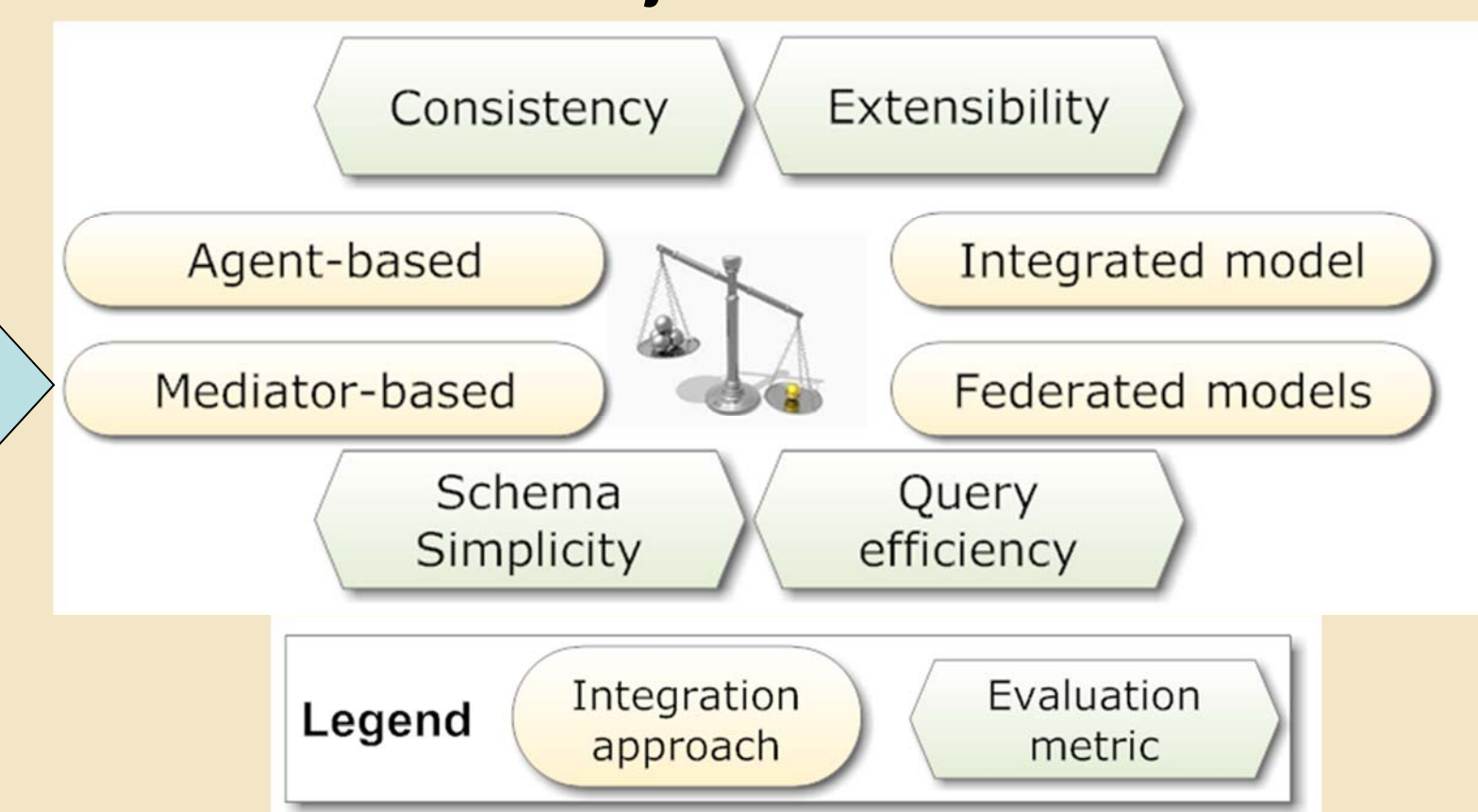
An integrated framework for self-managing HVAC systems



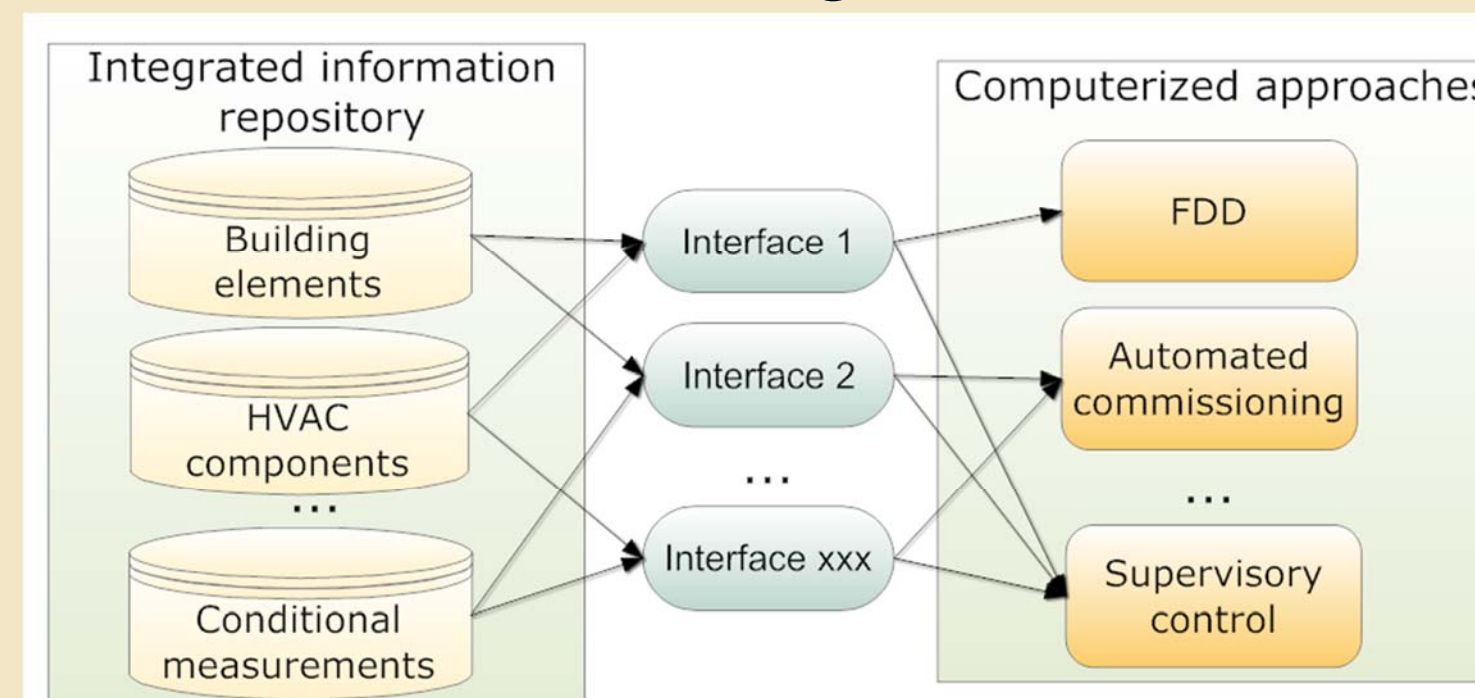
Challenge 1



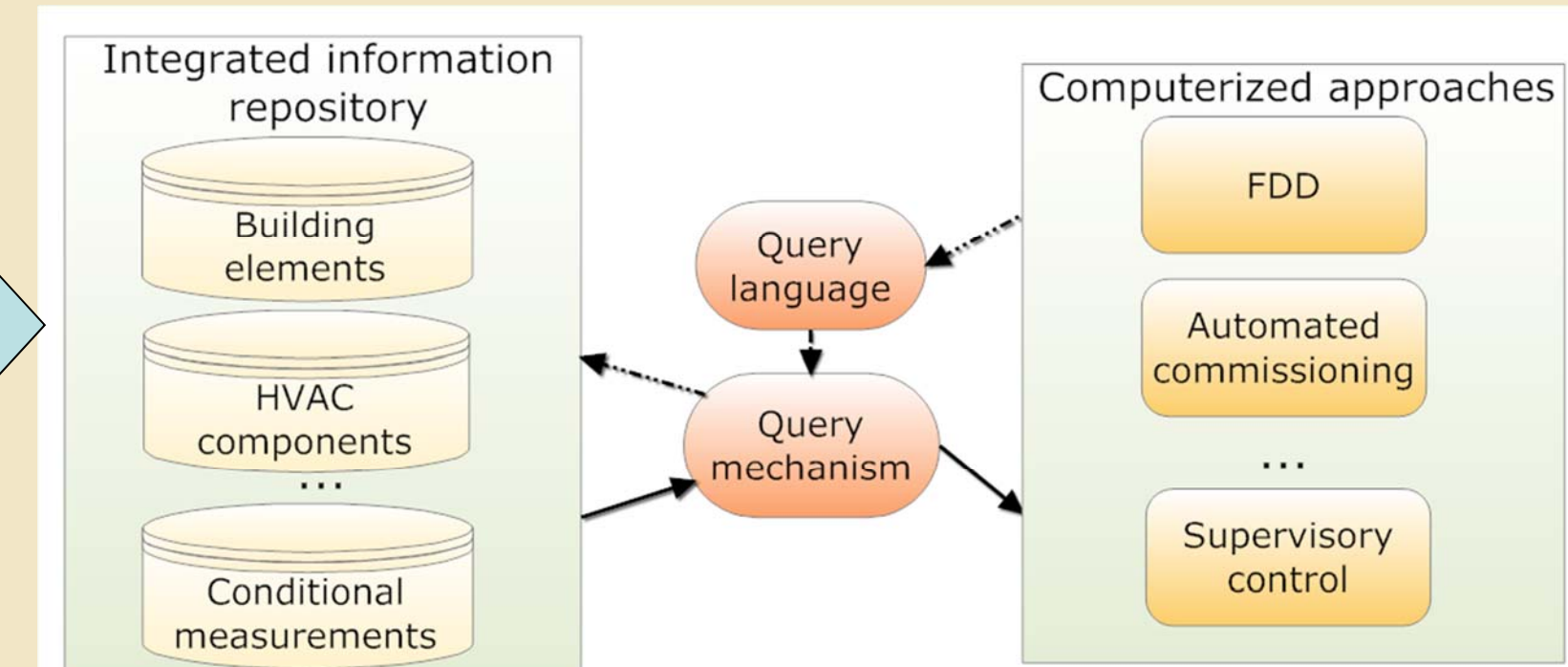
Objective 1



Challenge 2



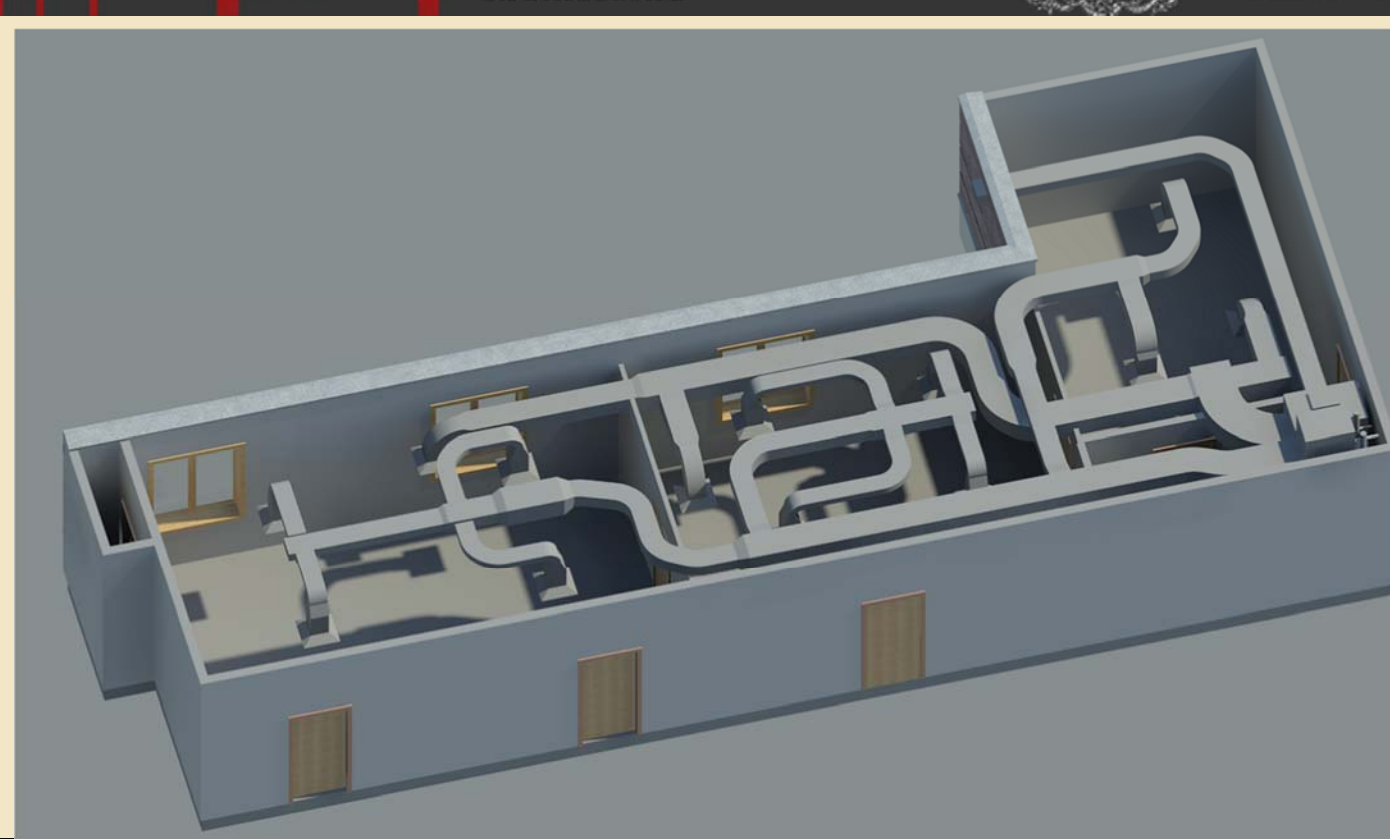
Objective 2



Testbed – HVAC system in the PSII Lab at CMU

Fine-grained and open HVAC control

- Stand-alone air handling unit
- Programmable control algorithms
- 54 sensing & controlling points
- BACnet enabled communication
- Economizer for optimal control
- Individual VAV box with reheat coil for each space



Test: Building and HVAC system Information modeling and integration

