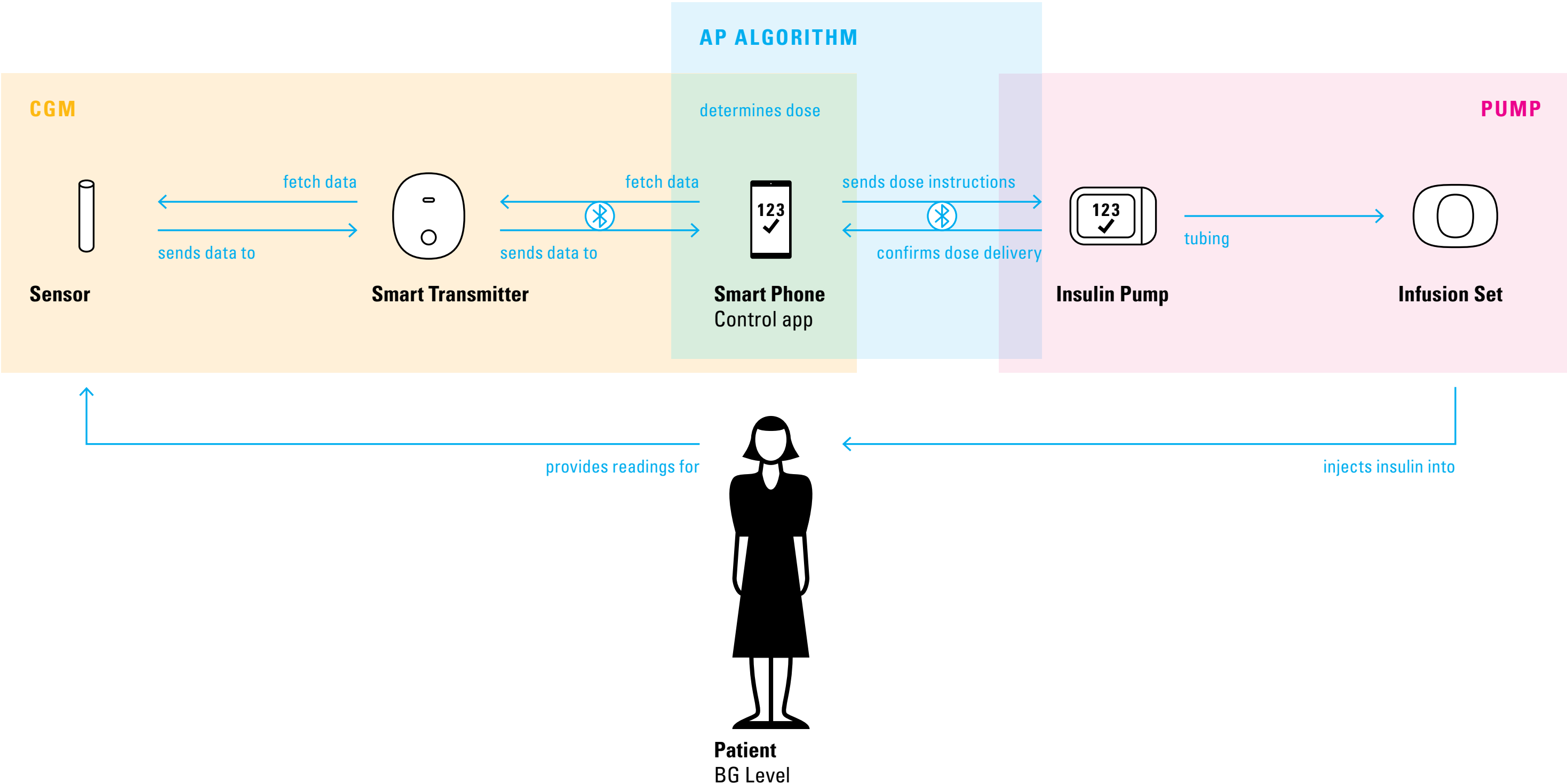# Designing for Complex Adaptive Systems
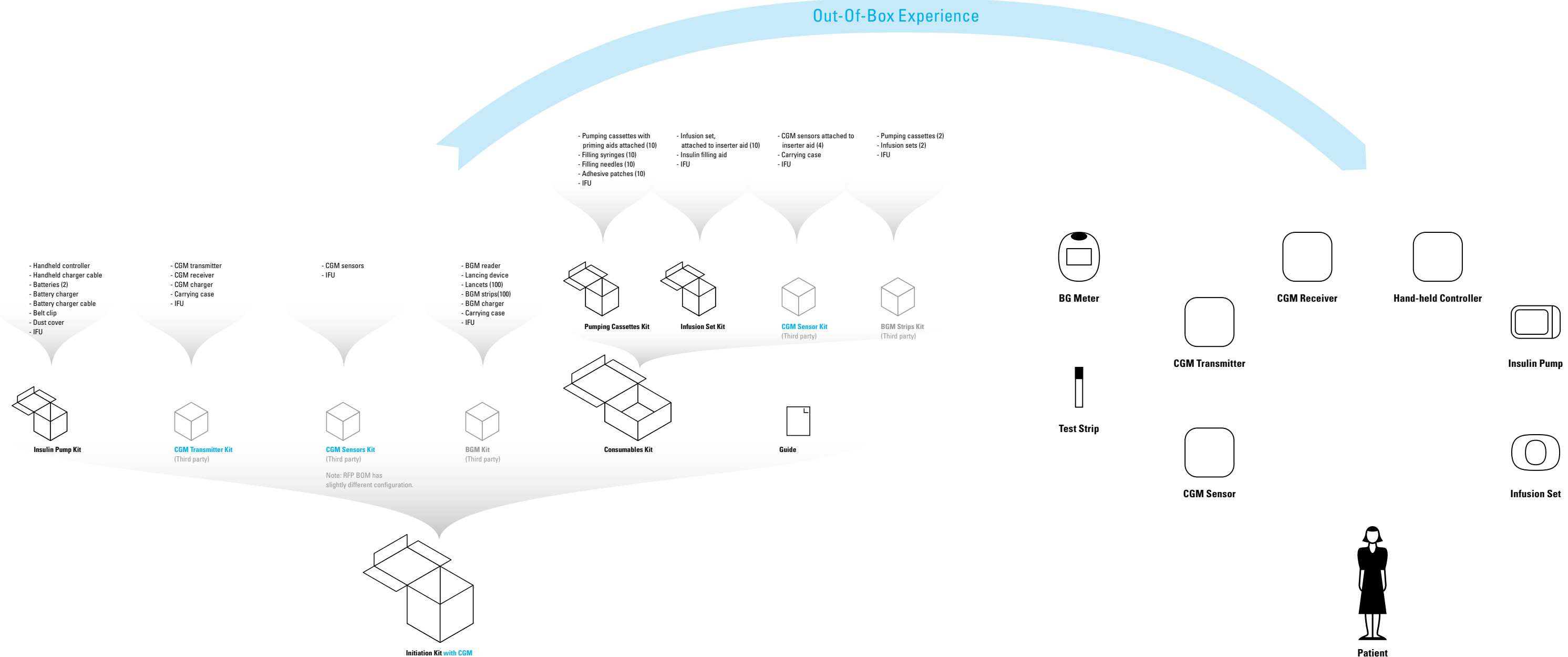## Cybernetics in Recent Work

Hugh Dubberly
Dubberly Design Office

Increasingly, we are designing for complex adaptive systems—systems which involve feedback, learning, and conversation.
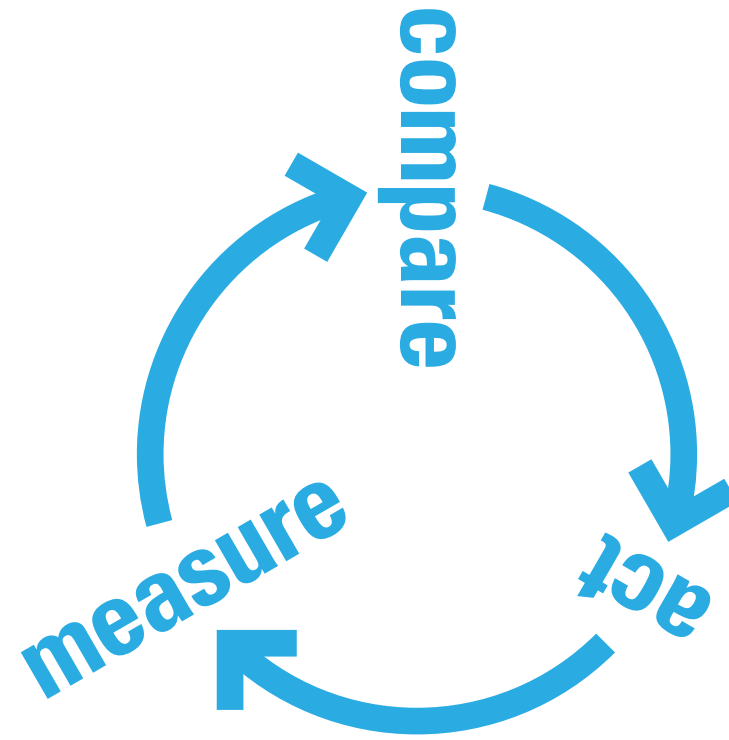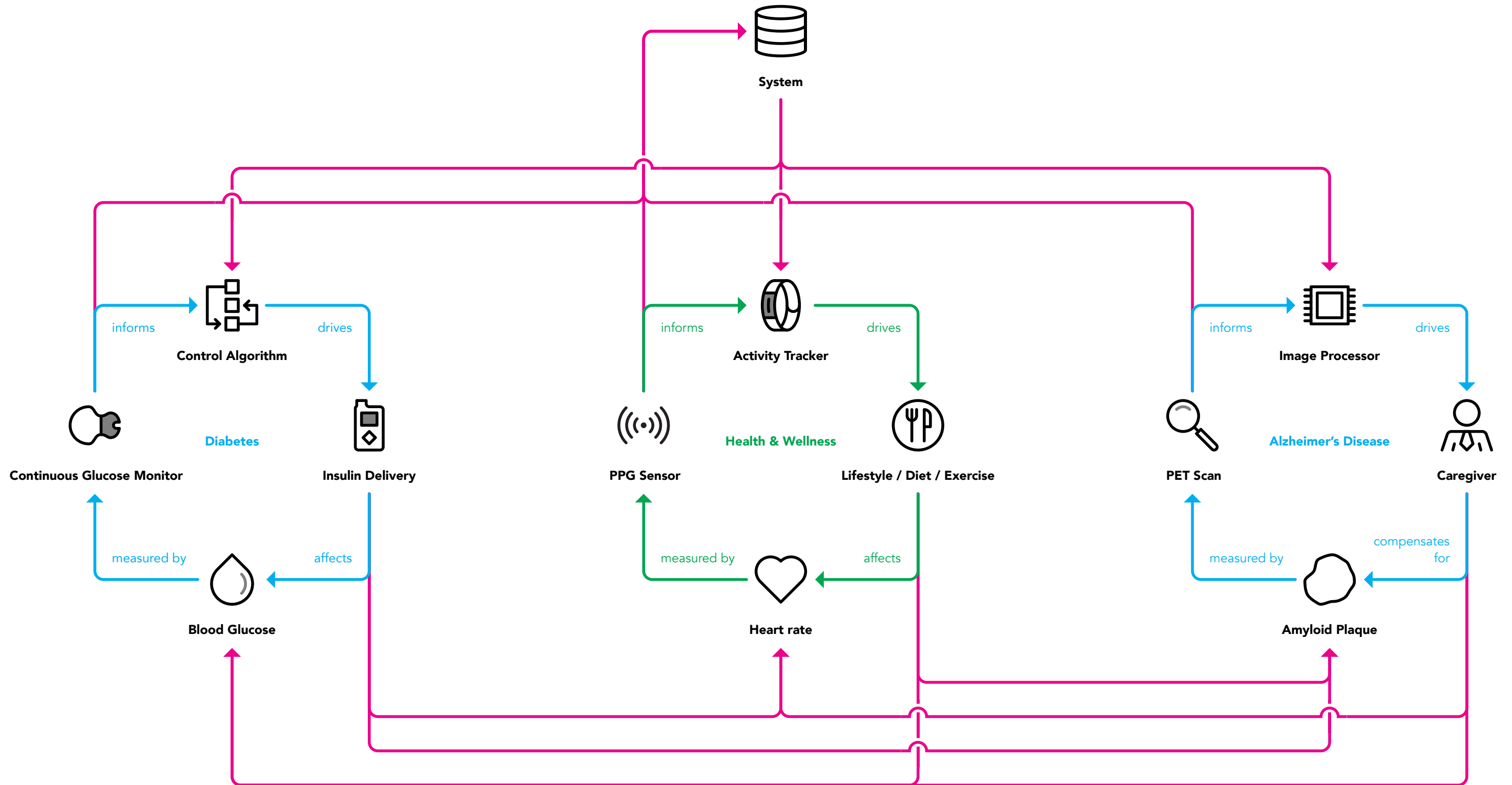
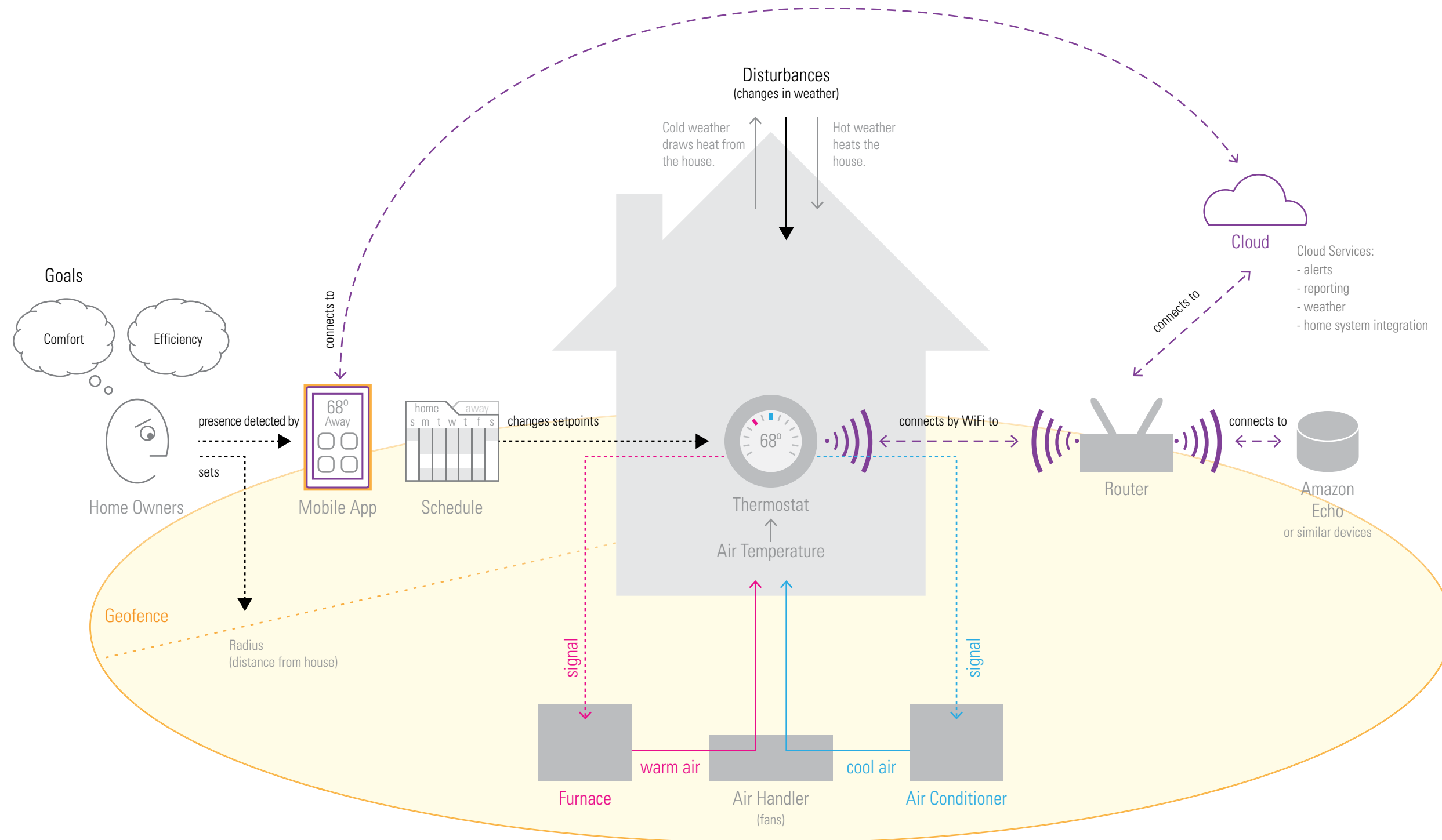# Blood glucose + insulin management systems for diabetes patients—an "artificial pancreas".

Product delivery and set-up systems—the "out-of-box-experience".

Out-Of-Box Experience

- Pumping cassettes with
  priming aids attached (10)
- Filling syringes (10)
- Filling needles (10)
- Adhesive patches (10)
- IFU

- Infusion set,
  attached to inserter aid (10)
- Insulin filling aid
- IFU

- CGM sensors attached to
  inserter aid (4)
- Carrying case
- IFU

- Pumping cassettes (2)
- Infusion sets (2)
- IFU

- Handheld controller
- Handheld charger cable
- Batteries (2)
- Battery charger
- Battery charger cable
- Belt clip
- Dust cover
- IFU

- CGM transmitter
- CGM receiver
- CGM charger
- Carrying case
- IFU

- CGM sensors
- IFU

- BGM reader
- Lancing device
- Lancets (100)
- BGM strips(100)
- BGM charger
- Carrying case
- IFU

Pumping Cassettes Kit

Infusion Set Kit

CGM Sensor Kit
(Third party)

BGM Strips Kit
(Third party)

Insulin Pump Kit

CGM Transmitter Kit
(Third party)

CGM Sensors Kit
(Third party)

BGM Kit
(Third party)

Consumables Kit

Guide

Note: RFP BOM has
slightly different configuration.

Initiation Kit with CGM

BG Meter

Test Strip

CGM Transmitter

CGM Sensor

CGM Receiver

Hand-held Controller
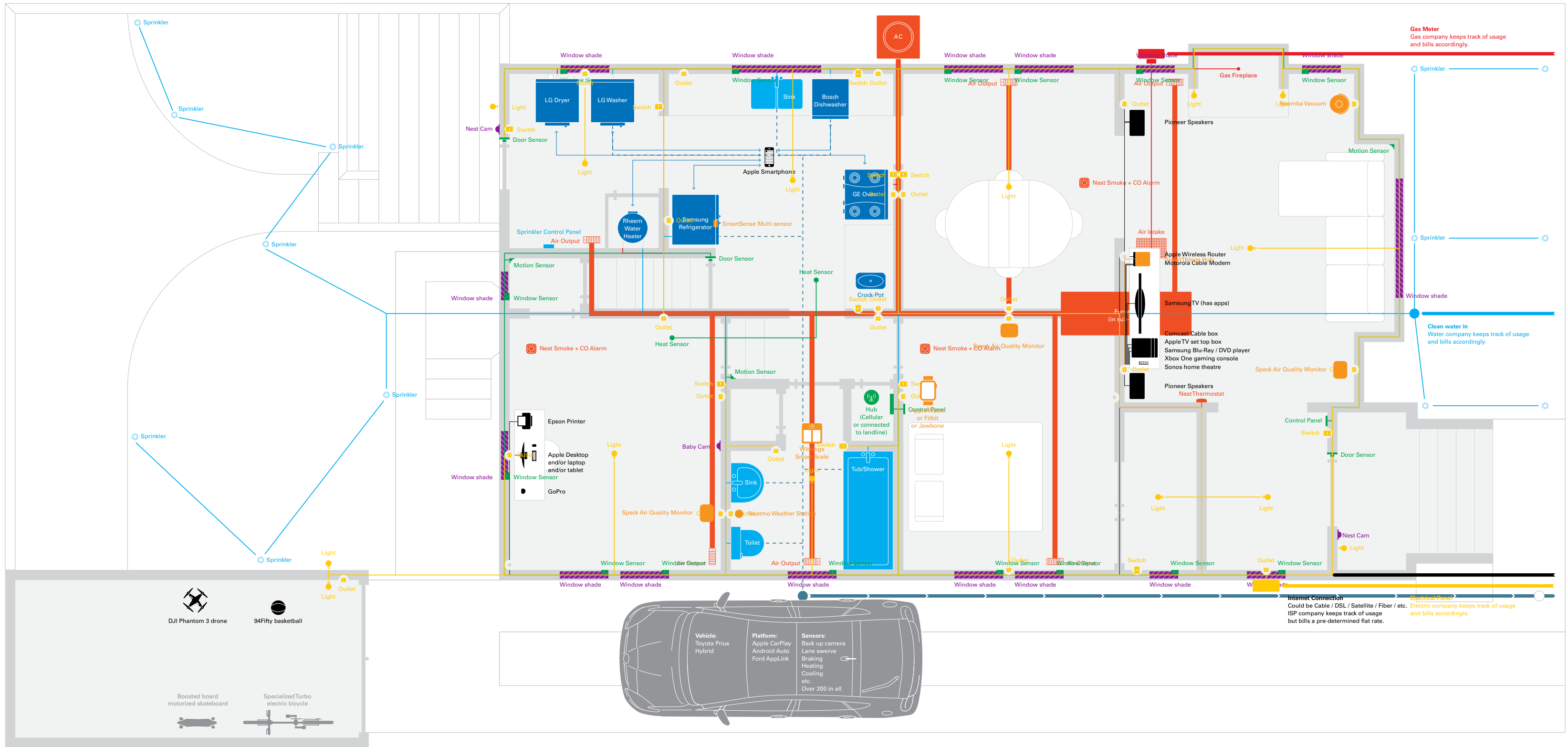
Insulin Pump

Infusion Set

Patient

Integration of individual disease management systems in a larger ecology.

A smart thermostat is similar to a disease management system.

Disturbances
(changes in weather)

Cold weather draws heat from the house.

Hot weather heats the house.

Cloud

Cloud Services:
- alerts
- reporting
- weather
- home system integration

connects to

Goals

Comfort

Efficiency

connects to

68°
Away

home   away
s m t w t f s

68°

connects by WiFi to

connects to

Home Owners

presence detected by

sets

Mobile App

changes setpoints

Schedule

Thermostat

Air Temperature

Router

Amazon Echo
or similar devices

Geofence

Radius
(distance from house)

signal

warm air

cool air

signal

Furnace

Air Handler
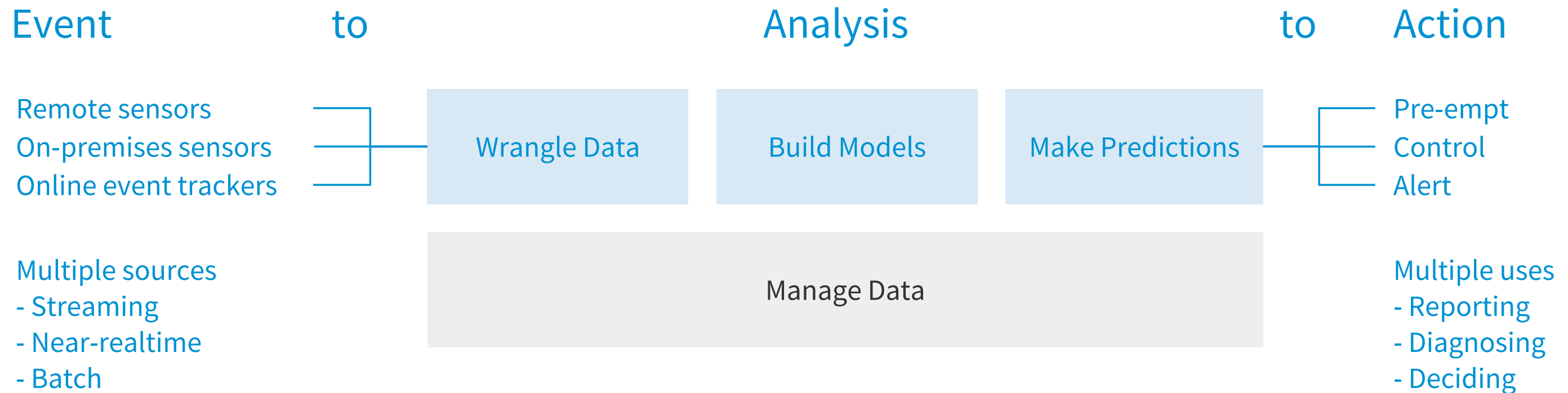(fans)

Air Conditioner

Integration of individual home systems in a larger ecology.

Machine learning applied to patient EKGs to detect heart disease.
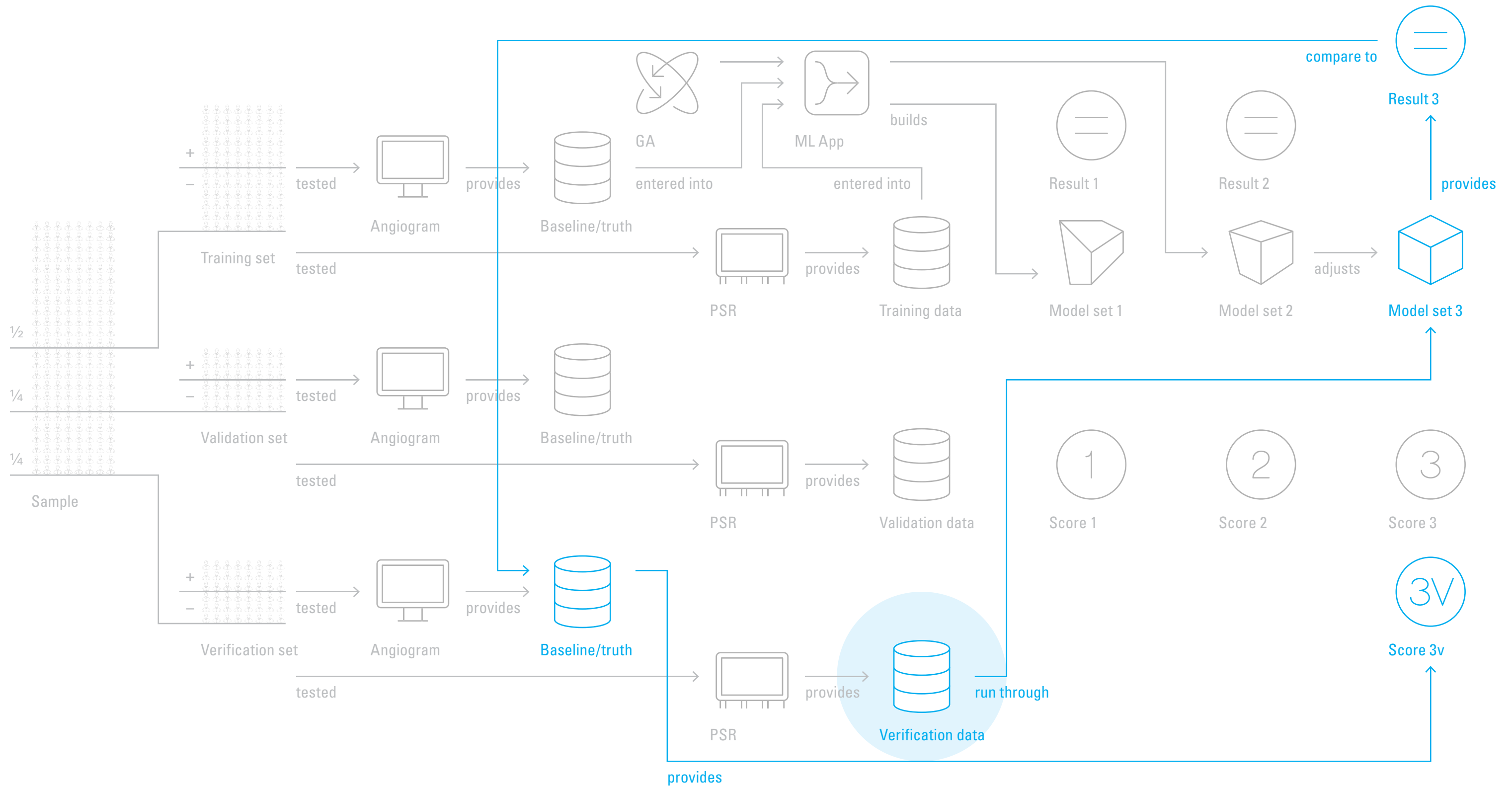
Building a data refinery for satellite imagery.

Event   to   Analysis   to   Action

Remote sensors   Pre-empt
On-premises sensors   Wrangle Data   Build Models   Make Predictions   Control
Online event trackers   Alert

Multiple sources   Multiple uses
- Streaming   Manage Data   - Reporting
- Near-realtime   - Diagnosing
- Batch   - Deciding

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