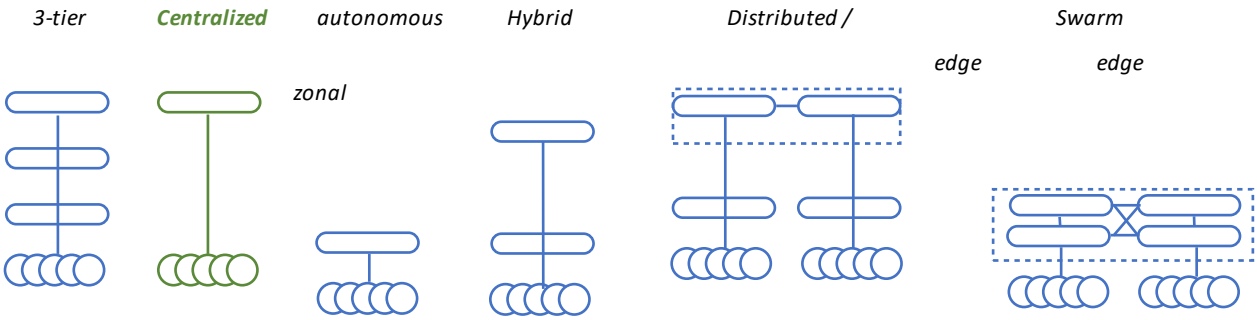
IIC Architecture - Centralized pattern

Key question	Information, compute location
Alternatives	Autonomous edge, Hybrid, Swarm
Stakeholder	Service/Product designer

1. Problem

Information can be kept in the things at the edge, in a central location, distributed in all those places, replicated in diverse locations or can follow many creative schemes. In the same idea, applying logic on the information can be done at several places:



In those diagrams, rounds represent things which can be sensors, controllers. The rectangular objects represent levels/nodes of data handling and/or storage.

Distributed or Zonal pattern is a case where a number of systems collaborate to solve the problem. The presence of horizontal links intend to picture intra-level communication as opposed hierarchical communications nature of the 3-tier or centralized patterns.
The « geographic dispersion » can be between states in USA or between zones in a car (rear/left, rear/right, front/left, front/right, central1, central2).

The swarm pattern is a dynamic collection of collaborative nodes such as cars in a platoon.

Choosing one pattern can be either difficult or almost imposed by regulatory or operational constraints. Each pattern is described in a specific pattern document. Pattern description

2. Description

The centralized pattern places information and/or its handling on a central data center or a cloud.

2.1. Solution

The centralized pattern places information and its handling in a single node. This node may be composed of multiple components of a cloud solution (see computing model class of patterns), architecturally it is considered as a single node.

The pattern is composable with « autonomous edge » pattern into « hybrid» pattern: information stored at the edge may be a cached relevant subset of the full information base that may be centralized.

2.2. Model

Things produce data and sends it to a single node. The node applies logic to the data and may also be responsible for things management and other analytics.

2.3. Stakeholder

This pattern is intended for the service or product designer that need to weigh efficiency, costs and possible regulatory constraints when choosing an overall system pattern such as the autonomous edge

3. Guidance

3.1. Advantages

Scaling from 1 thing to millions of things is an easy task as there is now best practice for growing central capacity through cloud hosting.

Centralized maintenance of application and data is simple by construction.

Physical protection of servers and data are a simple way to mitigate many threats that are facing more geographically dispersed patterns such as autonomous edge, distributed or swarm.

3.2. Disadvantages

Bandwidth costs and latencies to deal with data are typical limitations of the centralized approach.

Integration in edge computing environment may be problematic. For instance, elders may not have internet at all at the moment they want to benefit of the service. Partnerships with telecom operators may become necessary.

3.3. Other considerations

It may be a good practice to start a service with a central architecture then apply the autonomous edge as the service usage grows. If this is designed from the beginning, then the most effective way to do it is to design the entire hybrid architecture from scratch but colocate all components in a centralized location. As the service usage grows, components can be gradually pushed out to the edge.

Regulatory on data may be a hurdle where some data need to be contained in the same geography as the people associated to the data (health…).

4. Application notes

See more on applying the pattern in:

- Remote health monitoring / centralized pattern
- Analytics / centralized pattern