# TITLE

# ACTIONS TAKEN BY AN ISLANDED DATA CENTER

## BACKGROUND

**[0001]** A data center, DC, typically includes a group of computing devices that provide computing power for executing applications, or functions thereof. For example, DCs may be used where it would not be feasible or practical to execute one or more resource intensive applications on an individual computing entity, such as a personal computer. In this case, the resource intensive applications, or functions thereof, may instead be executed at the datacenter, thereby taking advantage of the computing power at the data center. Alternatively, or additionally, DCs may be used where it is beneficial that the latency of communications between a computing device executing one or more applications and a further computing device is kept to a minimum. In this case, computing devices of a DC co-located with the further computing device may be used to execute the applications. This minimizes the physical separation of the computing devices and hence inherently minimizes latency of communications between the computing devices. In either case, operation of the applications at the DC are typically controlled by one or more computing entities external to the DC.

## SUMMARY

**[0001a]** According to a first aspect, there is provided a method of controlling applications at a data center, DC, the applications being controllable by one or more computing entities external to the DC, the method including: at a computing system of the DC: obtaining an indication that the applications at the DC are no longer controllable by the one or more computing entities external to the DC; determining, based on the indication, that the applications at the DC are to operate in a disaster recovery mode; and in response to the determination: causing an indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that are already executing at the DC when the determination is made; and causing the indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that start to execute at the DC after the determination is made.

**[0001b]** According to a second aspect, there is provided a computing system for controlling applications at a data center, DC, the applications being controllable by one or more computing entities external to the DC, the computing system including: a memory; and at least one processor configured to: obtain an indication that applications at the DC are no longer controllable by the one or more computing entities external to the DC; determine, based on the indication, that the applications at the DC are to operate in a disaster recovery mode; and in response to the determination: cause an indication that the applications at the DC are to operate in a disaster recovery mode to be communicated to one or more of the applications at the DC that are already executing at the DC when the determination is made; and cause the indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that start to execute at the DC after the determination is made.

**[0001c]** According to a third aspect, there is provided a tangible computer readable medium including instructions which, when executed, cause at least one processor of a computing system to perform functions, the computing system being for controlling applications at a data center, DC, the applications being controllable by one or more computing entities external to the DC, the functions including at least: obtaining an indication that applications at the DC are no longer controllable by the one or more computing entities external to the DC; determining, based on the indication, that the applications at the DC are to operate in a disaster recovery mode; and in response to the determination: causing an indication that the applications at the DC are to operate in a disaster recovery mode to be communicated to one or more of the applications at the DC that are already executing at the DC when the determination is made; and causing the indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that start to execute at the DC after the determination is made.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0002]** Certain embodiments are disclosed with reference to the following drawings.

**[0003]** FIG. 1 illustrates a block diagram of an example computing device which may be used to implement certain embodiments.

**[0004]** FIG. 2 illustrates a block diagram of an example system in which certain embodiments may be implemented.

**[0005]** FIG. 3 illustrates a flow diagram of a method performed at a computing system of a first data center, DC, according to an example.

**[0006]** FIG. 4 illustrates a flow diagram of a method performed at one or more applications of the first DC, according to an example.

**[0007]** FIG. 5 illustrates a flow diagram of a method performed at a computing system of a second DC, according to an example.

**CLAIMS**

1. A method of controlling applications at a data center, DC, the applications being controllable by one or more computing entities external to the DC, the method including:

at a computing system of the DC:

obtaining an indication that the applications at the DC are no longer controllable by the one or more computing entities external to the DC;

determining, based on the indication, that the applications at the DC are to operate in a disaster recovery mode; and

in response to the determination:

causing an indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that are already executing at the DC when the determination is made; and

causing the indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that start to execute at the DC after the determination is made.

2. The method according to claim 1, wherein causing the indication to be communicated to the one or more of the applications at the DC that start to execute at the DC after the determination is made, includes, at the computing system of the DC:

causing data, representing the indication, to be written to a location in storage which applications are configured to access when starting to execute at the DC.

3. The method according to claim 2, wherein the one or more of the applications at the DC already executing at the DC are configured to access the location, and causing, at the computing system of the DC, the data to be written to the location in storage causes the indication to be communicated to the one or more of the applications at the DC already executing at the DC.

4. The method according to claim 2, wherein causing, at the computing system of the DC, the data to be written to the location in storage includes:

causing a function to be modified so as to represent the indication, the function being stored in a library that is used by the applications at the DC, wherein the library is accessible by the applications at the DC when starting to execute at the DC, the function being one that the applications at the DC call from the library when starting to execute at the DC.

5. The method according to any one of claims 1 to 4, wherein causing the indication to be communicated to the one or more applications at the DC already executing at the DC includes, at the computing system of the DC:

causing data, representing the indication, to be written to a location in storage which applications are configured to access when executing at the DC.

6. The method according to any one of claims 1 to 5, wherein causing the indication to be communicated to the one or more applications at the DC already executing at the DC includes, at the computing system of the DC:

transmitting a message, including data representing the indication, to the one or more applications at the DC already executing at the DC, over an internal communications network of the DC.

7. The method according to claim 6, wherein transmitting the message includes multicasting the message to the one or more applications at the DC already executing at the DC over the internal communications network.

8. The method according to any one of claims 1 to 7, wherein obtaining the indication that applications at the DC are no longer controllable by the one or more entities external to the DC includes, at the computing system of the DC:

determining that one or more communications connections between the DC and one or more further data centers, DCs, have become inoperative.

9. A computing system for controlling applications at a data center, DC, the applications being controllable by one or more computing entities external to the DC, the computing system including:

a memory; and

at least one processor configured to:

obtain an indication that applications at the DC are no longer controllable by the one or more computing entities external to the DC;

determine, based on the indication, that the applications at the DC are to operate in a disaster recovery mode; and

in response to the determination:

cause an indication that the applications at the DC are to operate in a disaster recovery mode to be communicated to one or more of the applications at the DC that are already executing at the DC when the determination is made; and

cause the indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that start to execute at the DC after the determination is made.

10. The computing system according to claim 9, wherein causing the indication to be communicated to the one or more of the applications at the DC that start to execute at the DC after the determination is made, includes:

causing data, representing the indication, to be written to a location in storage which applications are configured to access when starting to execute at the DC.

11. The computing system according to claim 10, wherein the one or more of the applications at the DC already executing at the DC are configured to access the location, and causing the data to be written to the location in storage causes the indication to be communicated to the one or more of the applications at the DC already executing at the DC.

12. The computing system according to any one of claims 9 to 11, wherein obtaining the indication that applications at the DC are no longer controllable by the one or more entities external to the DC includes,:

determining that one or more communications connections between the DC and one or more further data centers, DCs, have become inoperative.

13. A tangible computer readable medium including instructions which, when executed, cause at least one processor of a computing system to perform functions, the computing system being for controlling applications at a data center, DC, the applications being controllable by one or more computing entities external to the DC, the functions including at least:

obtaining an indication that applications at the DC are no longer controllable by the one or more computing entities external to the DC;

determining, based on the indication, that the applications at the DC are to operate in a disaster recovery mode; and

in response to the determination:

causing an indication that the applications at the DC are to operate in a disaster recovery mode to be communicated to one or more of the applications at the DC that are already executing at the DC when the determination is made; and

causing the indication that the applications at the DC are to operate in the disaster recovery mode to be communicated to one or more of the applications at the DC that start to execute at the DC after the determination is made.

14. The tangible computer readable medium to claim 13, wherein causing the indication to be communicated to the one or more of the applications at the DC that start to execute at the DC after the determination is made, includes:

causing data, representing the indication, to be written to a location in storage which applications are configured to access when starting to execute at the DC.

15. The tangible computer readable medium according to claim 14, wherein the one or more of the applications at the DC already executing at the DC are configured to access the location, and causing the data to be written to the location in storage causes the indication to be communicated to the one or more of the applications at the DC already executing at the DC.