

WHAT IS CLAIMED IS:

1. A method of group creation for a pair of an unmanned aerial vehicle (UAV) and an unmanned aerial vehicle-controller (UAV-C) in a service enabler architecture layer (SEAL) architecture, the method comprising:

determining, by an unmanned aerial system application enabler (UAE) server, the pair of UAV and UAV-C in the SEAL architecture;

transmitting, by the UAE server, a group creation request for the pair of UAV and UAV-C to a SEAL group management (GM) server of the SEAL architecture;

receiving a first response message, by the UAE server, from the SEAL GM server in response to the group creation request; and

creating a group including the pair of the UAV and the UAV-C based on the first response message, the group being used for quality-of-service (QoS) management, wherein the group creation request includes:

an identity of an UAE client, the UAE client corresponding to the pair of UAV and UAV-C,

an identity of the UAV, and

an identity of the UAV-C.

2. The method of claim 1, wherein the group creation request further comprises a civil aviation authority (CAA)-level identity of the UAV.

3. The method of claim 1, wherein the group creation request further comprises:

a timeout period that defines a waiting time limit to wait for the first response message from the SEAL GM server after the group creation request is transmitted to the SEAL GM server.

4. The method of claim 3, the method further comprising:

transmitting another group creation request when the first response message is not assigned to the UAV server within the timeout period.

5. The method of claim 1, wherein the first response message further comprises a group creation result that indicates whether the group is successfully created for the pair of the UAV and the UAV-C.

6. The method of claim 5, wherein in response to the group creation result indicating that the group is successfully created for the pair of the UAV and the UAV-C, the first response message includes a group identity (ID) that is assigned to the pair of UAV and UAV-C.

7. The method of claim 5, wherein in response to the group creation result indicating that the group is successfully created for the pair of UAV and UAV-C, the first response message includes a plurality of subgroup IDs associated with the pair of UAV and UAV-C.

8. The method of claim 6, further comprising:
performing, by the UAE server, the QoS management for the pair of UAV and UAV-C based on the assigned group ID.

9. The method of claim 8, wherein the performing the QoS management further comprises:

establishing direct command and control (C2) communication for the pair of UAV and UAV-C using an initially allocated network QoS setup, the UAV and the UAV-C being registered to a network;

monitoring, by the UAE server, a current network condition of the pair of UAV and UAV-C based on feedback information from the pair of UAV and UAV-C;

in response to the direct C2 communication failing to meet a pre-defined QoS requirement, transmitting, by the UAE server, a QoS adaption request to a SEAL network resource management (NRM) server; and

receiving, by the UAE server, from the SEAL NRM server an updated QoS requirement, wherein the feedback information of the pair of UAV and UAV-C includes:
the group ID assigned to the pair of UAV and UAV-C, and
a network resource requirement indicating required C2 communication resources.

10. The method of claim 9, wherein the monitoring further comprises:

monitoring, by the UAE server, the current network condition of the pair of UAV and UAV-C based on the one of the group ID and a subgroup ID assigned to the pair of UAV and UAV-C.

11. The method of claim 9, further comprising:
adjusting the C2 communication for the pair of UAV and UAV-C based on the updated QoS requirement.
12. The method of claim 9, further comprising:
in response to receiving the feedback information of the pair of UAV and UAV-C for the current network condition, providing a second response message, by the UAE server, to the pair of UAV and UAV-C, the second response message including a QoS result that indicates whether the direct C2 communication of the pair of UAV and UAV-C meet the pre-defined QoS requirement.
13. An apparatus, comprising:
processing circuitry configured to:
determine a pair of an unmanned aerial vehicle (UAV) and an unmanned aerial vehicle-controller (UAV-C) in a service enabler architecture layer (SEAL) architecture;
transmit a group creation request for the pair of UAV and UAV-C to a SEAL group management (GM) server of the SEAL architecture;
receive a first response message from the SEAL GM server in response to the group creation request; and
create a group including the pair of the UAV and the UAV-C based on the first response message, wherein the group is used for quality-of-service (QoS) management, wherein the group creation request includes:
an identity of an UAE client, the UAE client corresponding to the pair of UAV and UAV-C,
an identity of the UAV, and
an identity of the UAV-C.
14. The apparatus of claim 13, wherein the group creation request further comprises a civil aviation authority (CAA)-level identity of the UAV.

15. The apparatus of claim 13, wherein the group creation request further comprises:

a timeout period that defines a waiting time limit to wait for the first response message from the SEAL GM server after the group creation request is transmitted to the SEAL GM server.

16. The apparatus of claim 13, wherein the first response message further comprises a group creation result that indicates whether the group is successfully created for the pair of the UAV and the UAV-C.

17. The apparatus of claim 16, wherein in response to the group creation result indicating that the group is successfully created for the pair of UAV and UAV-C, the first response message includes a group identity (ID) that is assigned to the pair of UAV and UAV-C.

18. The apparatus of claim 17, wherein the processing circuitry is further configured to:

perform, by the UAE server, the QoS management for the pair of UAV and UAV-C based on the assigned group ID.

19. The apparatus of claim 18, wherein the processing circuitry is further configured to:

establish direct command and control (C2) communication for the pair of UAV and UAV-C using an initially allocated network QoS setup, the UAV and the UAV-C being registered to a network;

monitor a current network condition of the pair of UAV and UAV-C based on feedback information from the pair of UAV and UAV-C;

in response to the direct C2 communication failing to meet a pre-defined QoS requirement, transmit a QoS adaption request to a SEAL network resource management (NRM) server; and

receive from the SEAL NRM server an updated QoS requirement, wherein the feedback information of the pair of UAV and UAV-C includes:

the group ID assigned to the pair of UAV and UAV-C, and

a network resource requirement indicating required C2 communication resources.

20. The apparatus of claim 19, wherein the processing circuitry is further configured to:

in response to receiving the feedback information of the pair of UAV and UAV-C for the current network condition, provide a second response message to the pair of UAV and UAV-C, the second response message including a QoS result that indicates whether the direct C2 communication of the pair of UAV and UAV-C meet the pre-defined QoS requirement.