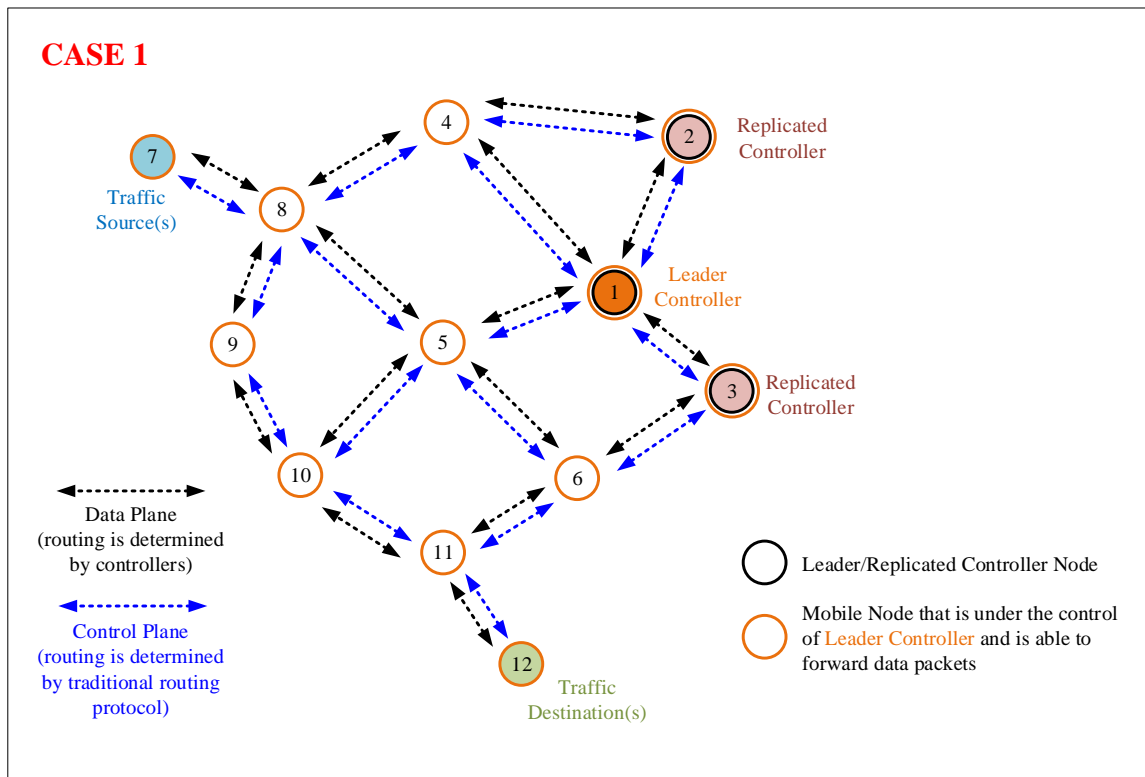


Top View of EstiNet SDN Ad-hoc Add-on

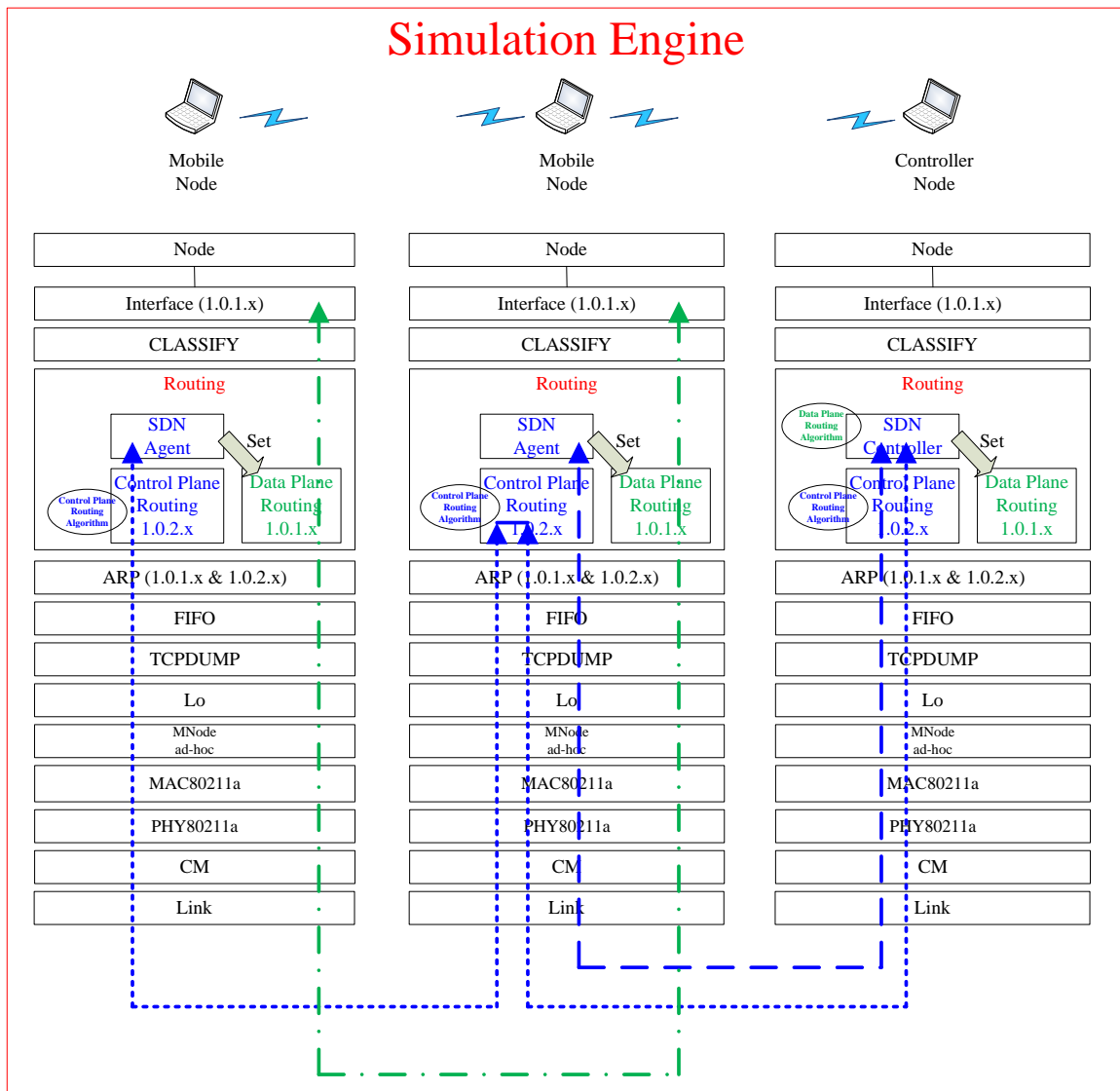
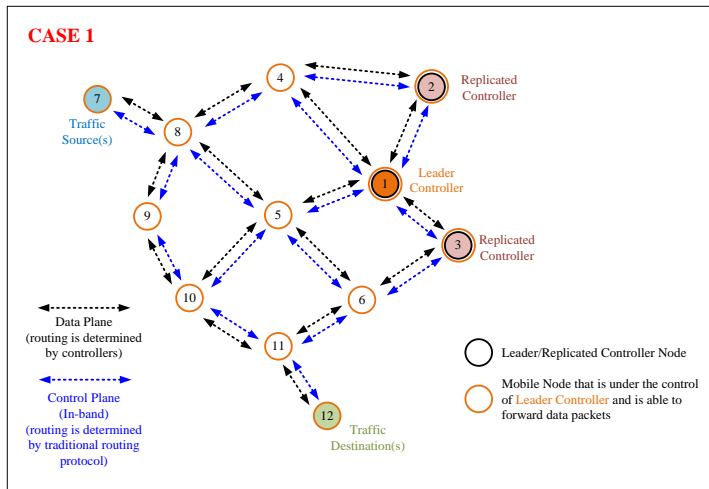
Case 1 SDN Ad-hoc

SDN Control_Plane and SDN Data_Plane are Wi-Fi Ad-hoc mode



In the above figure, we can see that the control plane and data plane are logically separated. That means these two planes use the same wireless channel/medium to transmit messages but the routing decisions are made using different methods in each plane. In the control plane, the routing decision is made by a traditional routing protocol AODV. In the data plane, the routing decision is made by the Leader Controller based on some criteria.

If the network is IP-based, we can separate control plane and data plane using different IP subnet, for example, 1.0.1.x is for data plane while 1.0.2.x is for control plane. The figure below shows the designs of control node's and mobile node's protocol stacks used within EstiNet Simulation Engine. In short, there is a routing mechanism, including routing algorithm and routing table, dedicated for control plane while another routing mechanism, including only routing table, dedicated for data plane. The routing algorithm for data plane is built on the SDN Controller. The SDN Controller sets a data plane routing table through the SDN Agent.



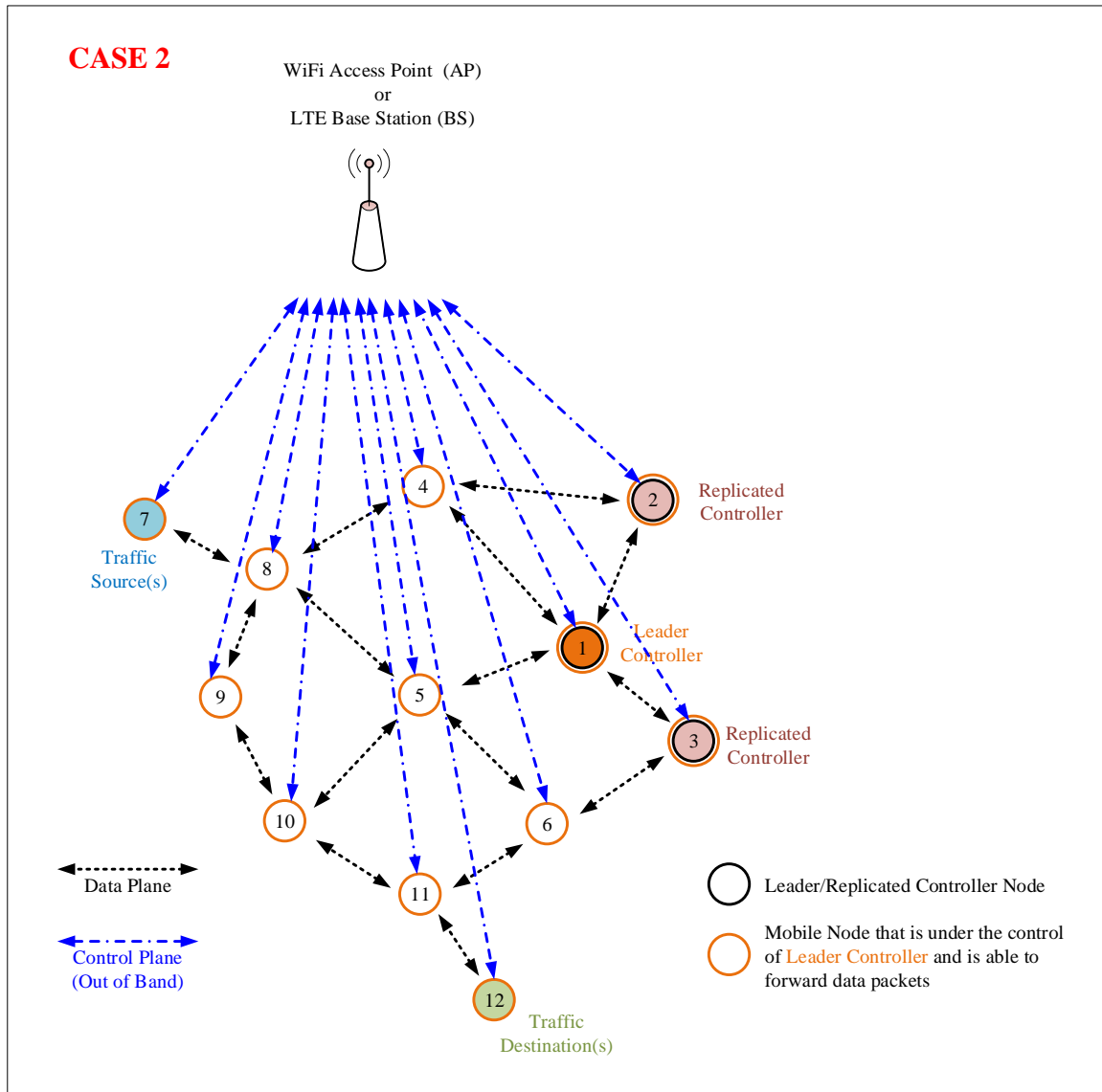
In the previous figure, we can see that the SDN Controller is implemented as an EstiNet Simulation Engine's module. In other words, we plan to not to use existing SDN controllers in the simulation. The major reasons are:

Existing SDN controllers adopt OpenFlow protocol to control switches. The OpenFlow messages are designed for a controller to control a switch device. Because a mobile/sensor node device is different from a switch device, almost all OpenFlow messages are not fit for a mobile/sensor node. As we know, in our simulation cases, the controller is responsible for changes the data plane routing rules for each mobile/sensor node. The messages used between the controller and the mobile/sensor node could be very few, such as neighbor update from a mobile node to a controller, routing rule setting from a controller to a mobile node, etc. Thus, we implement a tiny controller to realize the required functionality. Implementing controller within EstiNet module not only supports multiple controller instances but also providing a faster and easier way to add data plane routing algorithm, job sharing mechanism, and statistics collecting mechanism.

Case 2 SDN Infra Ad-hoc

SDN Control_Plane is Wi-Fi Infrastructure mode.

SDN Data_Plane is Wi-Fi Ad-hoc mode.



To compare CASE2 with CASE 1, user can find that the major different is that there is a separate infrastructure network for the control plane. In other words, it is an out-of-band control plane. The data plan mechanism is the same as CASE1.

