A wireless SDN inter exchange for mobile systems
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Consider a tactical naval coalition force consisting of multiple nationalities (eg US, NATO etc) with several ships, aircraft, ground troops etc. Each battleship, aircraft (eg AWACS) and ground scouting party is a network in itself. These networks are typically interconnected by multiple satellites (GEOs, MUOs, LEOs, IRIDIUM etc). They can also be interconnected using line of sight ship to ship radio (like WiFI) and long range, low bandwidth HF channels. Routing between these networks is subject to various, possibly complex policies (eg, some situation awareness streams are restricted to US, or to special user groups, others are subject to QoS requirements, etc). In this scenario, it is convenient to implement the Satellite Network as an SDN interconnect network, conceptually like the IXP switch in the SDX paper (SDX: A Software Defined Internet Exchange, Sigcomm 14). For example, a connection request is routed to the satellite controller (acting as Open Flow Controller) via Open Flow connections that are multiplexed on the satellite channel(s). The Controller selects the proper medium for the connection (Geo, Iridium, HF etc) and sets up flow tables that filter the predefined packet headers corresponding to the connection. The Controller is in charge of optimizing the "utility" of the system, typically min delay subject to constraints. With SDN flow classification, virtual subnets can be created across the tactical network. A project of this type (ie, naval SDN backbone design) is funded by ONR at UCLA (main contractor is BOEING)

We are interested in transitioning this concept of "wireless SDN exchange" to a civilian environment with cars, trucks busses, trains (and possibly drones) equipped with satellite radios. Satellite antenna embedding in cars is now feasible. Moreover, in an urban environment, where LTE is available, the OpenFlow Network will be supported by LTE for Km radius ranges and by Satellite (Iridium and Geo) for more extended ranges. We envision that several subnetworks may be interested in this service, like police force, multiparty mobile game players, commuters connected to the navigation server, drivers watching a popular soccer game. The Open Flow controller behind LTE connects the customer to the proper server or user group. It also allocates the medium: LTE, WiFi, WiFI direct, satellite, etc. The advantage of SDN mediated connection is flexibility in virtual network set up in addition to resource allocation, security and privacy. We envision a 2-level hierarchy – LTE and Satellite – for the Open Flow network, coupled with a 2-level controller strategy, to be able to operate seamlessly in areas where LTE is not available, or in disaster recovery situations.