View of Connection-Oriented Software-Defined Networking for Wireless Backhaul of Small Cells

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Roger Marks		Voice:	+1 619 393 1913
EtherAirNet Associates		E-mail:	roger@ethair.net
4040 Montview Blvd			
Denver, CO 80207			

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View of Connection-Oriented Software-Defined Networking for Wireless Backhaul of Small Cells

Roger B. Marks
EtherAirNet Associates
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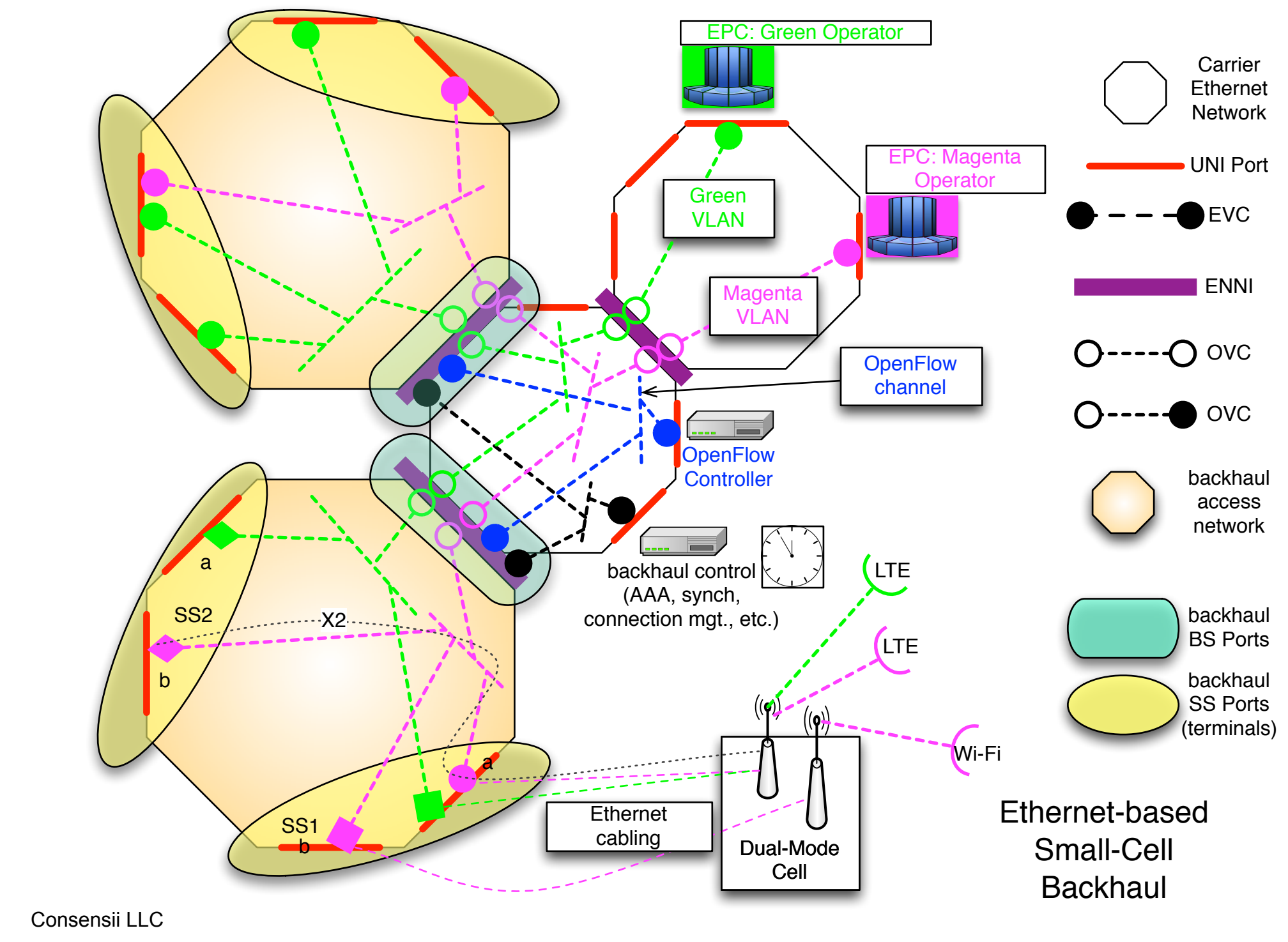
Wireless Backhaul of Small Cells

- Fixed broadband wireless access can provide Carrier Ethernet services to sites not accessible with wired Carrier Ethernet.
  - supporting Ethernet Virtual Connections among a set of ports
- A major application is backhaul of wireless cells
  - particularly small cells (LTE, Wi-Fi, etc.) that require placement choice driven by user capacity requirements rather than wired backhaul availability
  - mobile operators prefer Ethernet backhaul connectivity for cells
  - IP rides over Ethernet
- Backhaul may be shared
  - could be provided by an independent provider of backhaul service, to multiple mobile operator customers, just like wired Carrier Ethernet
  - cells may carry LTE, 3G, Wi-Fi, etc.
  - even the cell may be shared among multiple mobile operators
- Capacity must be shared
  - capacity sliced among mobile operators and services, with SLA commitments
  - customer traffic is comprised of multiple flows with varying QoS requirements
- Problem being addressed in IEEE 802.16r project



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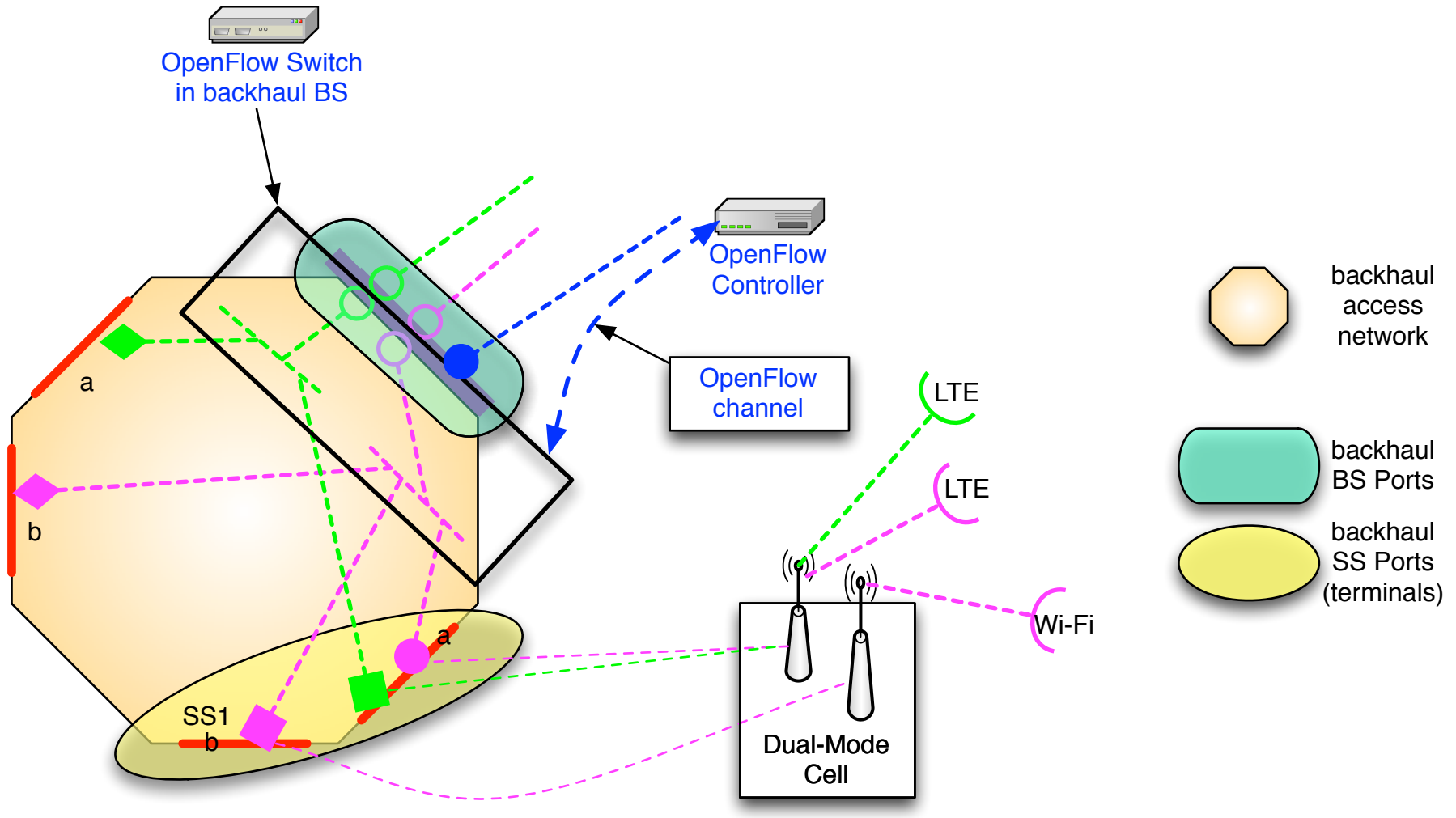
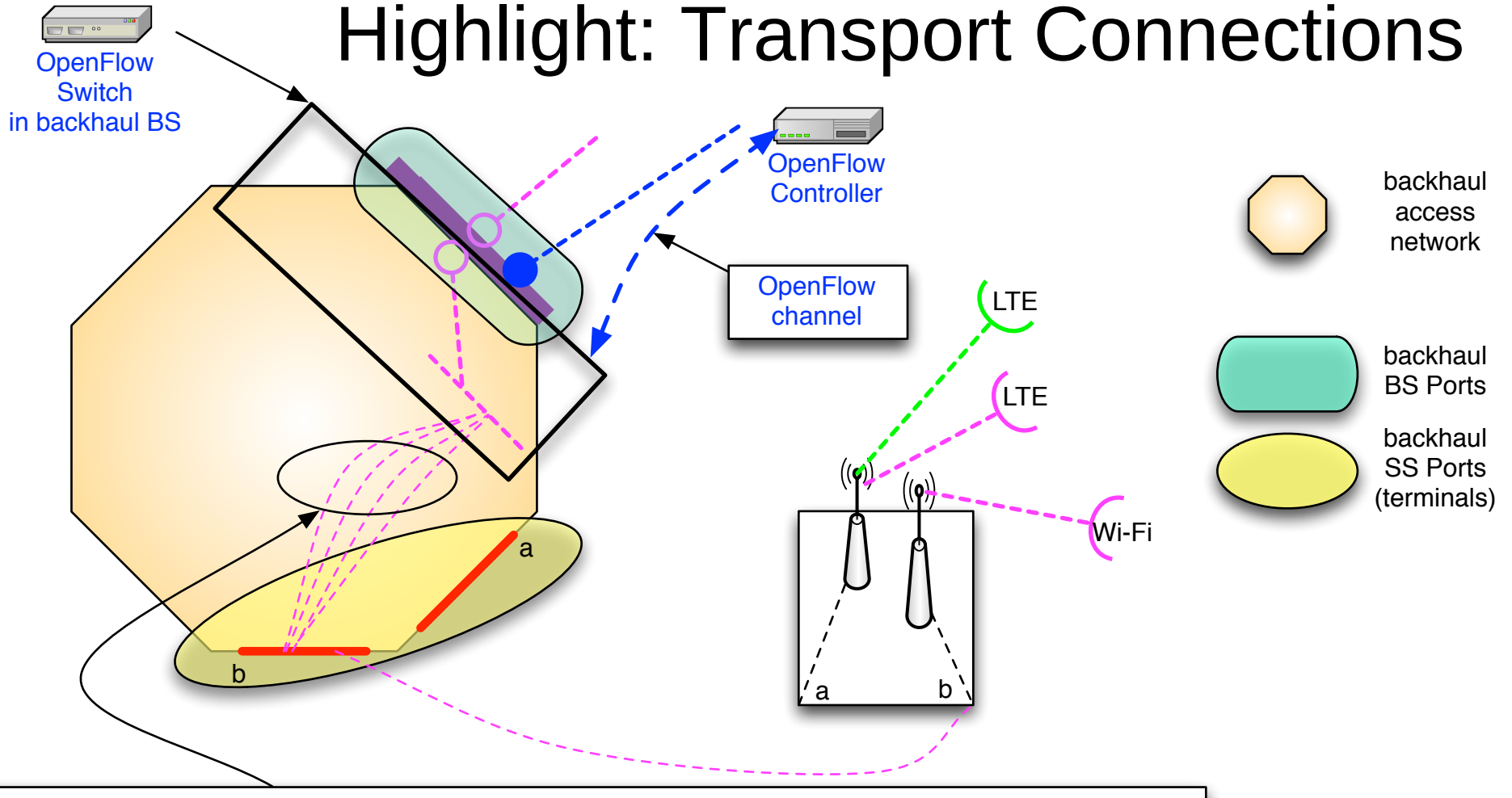
Highlight: OpenFlow Switch and Controller



Highlight: Transport Connections



- multiple transport connections (typically over the air or on other bandwidth-constrained channel)
  - for example, IEEE 802.16 point-to-multipoint access, providing connection-oriented service over the air
- each connection maps one switch (virtual) port to one SS (virtual) port
- differentiated QoS; each connection has specified QoS parameters, known to OpenFlow controller
- connections can be assigned to mix of channels and technologies
  - for example, some connections may be point-to-point microwave, Wi-Fi, wired Ethernet, etc.
- connections assigned by OpenFlow switch per flow based on programmed flow tables
- backhaul controller manages connections, radio parameters, scheduling, etc. to meet specified QoS
  - OpenFlow controller not responsible for details
  - backhaul controller feeds back status and reporting to OpenFlow controller

Connection-Oriented Software-Defined Networking for Wireless Backhaul of Small Cells: First-Order Open Issues for OpenFlow

- OpenFlow messaging so controller can manage transport connections
    - request connection setup, specify connection QoS
- Assigning connection identifiers via flow tables