



Riverbed Modeler

University Program Module Description

riverbed[®]

University Modeler Base Product & Add-Ons

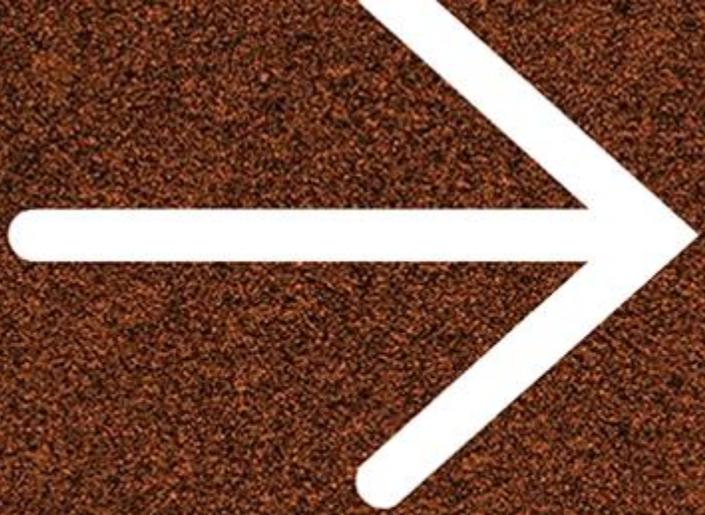
- Users start with the base Modeler Wireless Suite and add specific models/modules to tailor their purchase
- Model/Module Add-on Options include:
 - 802.16 (WiMAX) Model
 - IPv6 for R&D Specialized Model
 - LTE Specialized Model
 - MPLS Specialized Model
 - Shared Code Module
 - System-in-the-Loop Module
 - UTMS Specialized Model



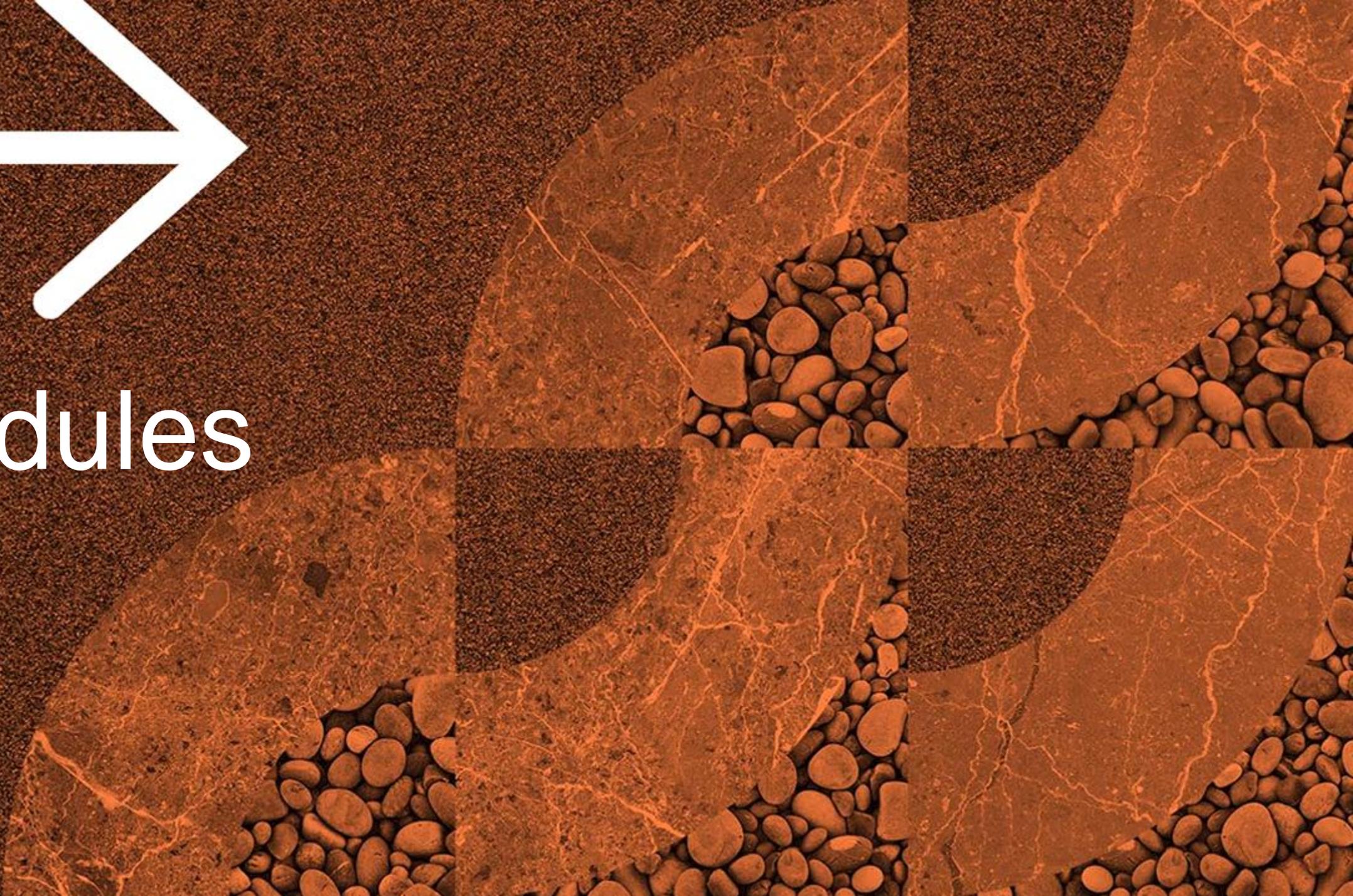
Modeler Wireless Suite

Modeler Wireless Suite [MDW]

- Includes Modeler [MD], Simulation Runtime [SRS] and the Wireless [WM] and Terrain Modeling [TMM] modules
- Example use cases:
 - Find out the optimum combination of TCP parameters for specific traffic and network conditions
 - Study the performance of MANET routing protocols for different scenarios
 - Develop a new adaptive data rate algorithm for hybrid 802.11g/802.11n networks
 - Develop a new wireless protocol, such as a wireless mesh sensor network protocol



Modules

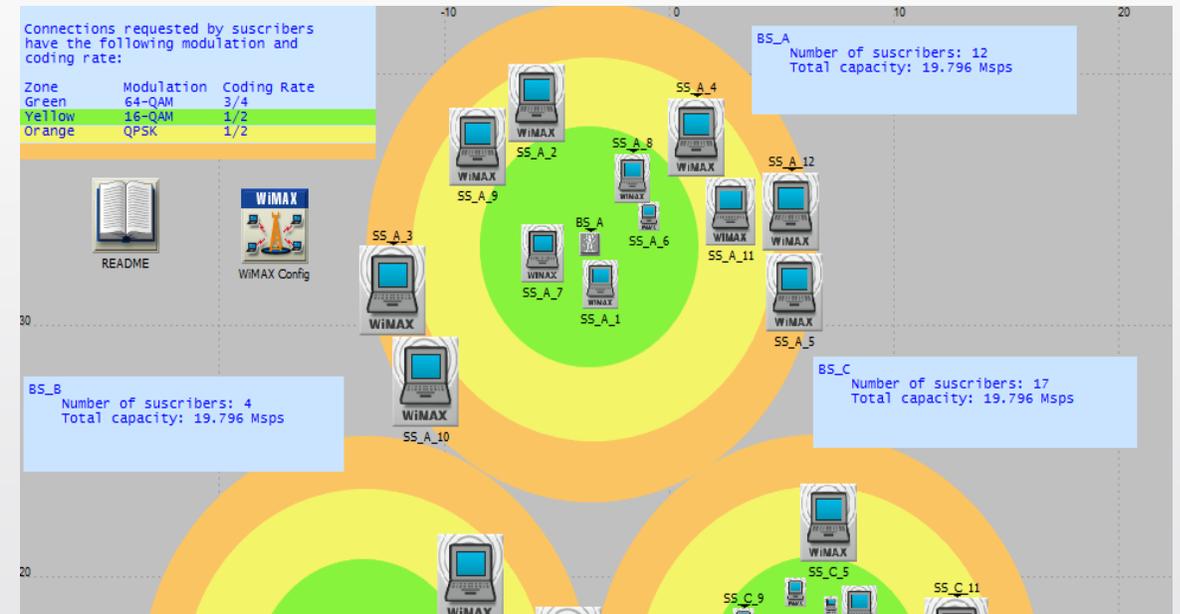


Modules

- This section describes the modules and specialized models available for Modeler
- All modules can be added to the Modeler Wireless Suite base package, although there may be some prerequisites

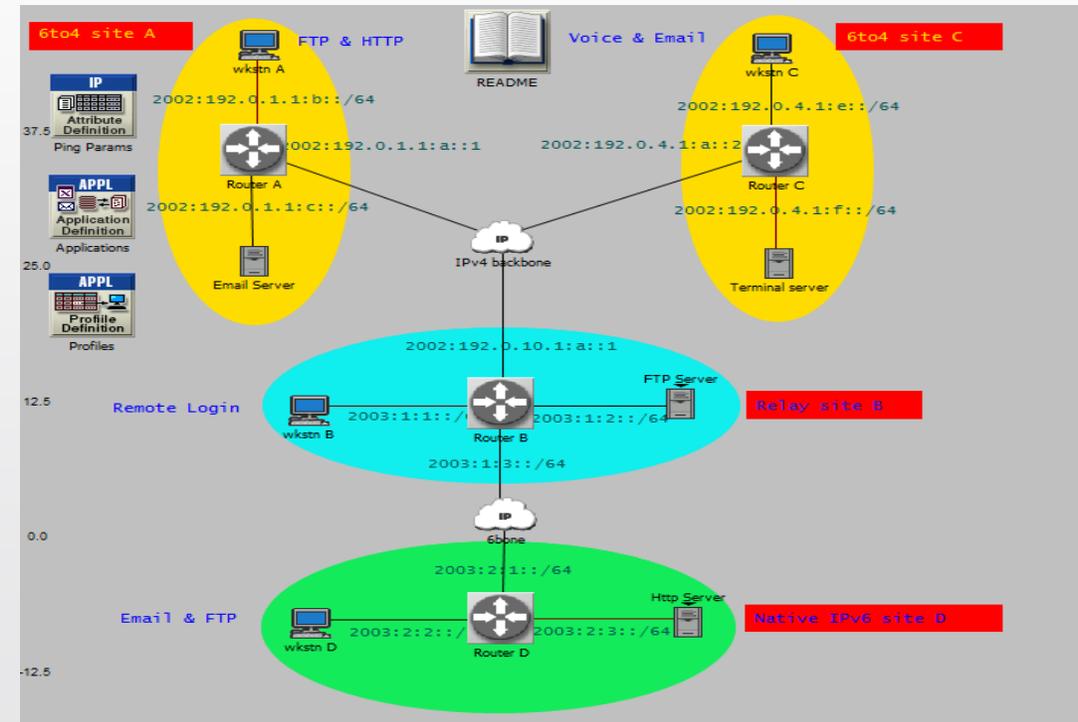
802.16 (WiMAX) Specialized Model [802.16]

- A detailed and high fidelity model of the WiMAX protocol
- Example use cases:
 - Study a hybrid 802.11/ 802.16 network
 - Develop modifications to the WiMAX protocol for use in smart grid deployments



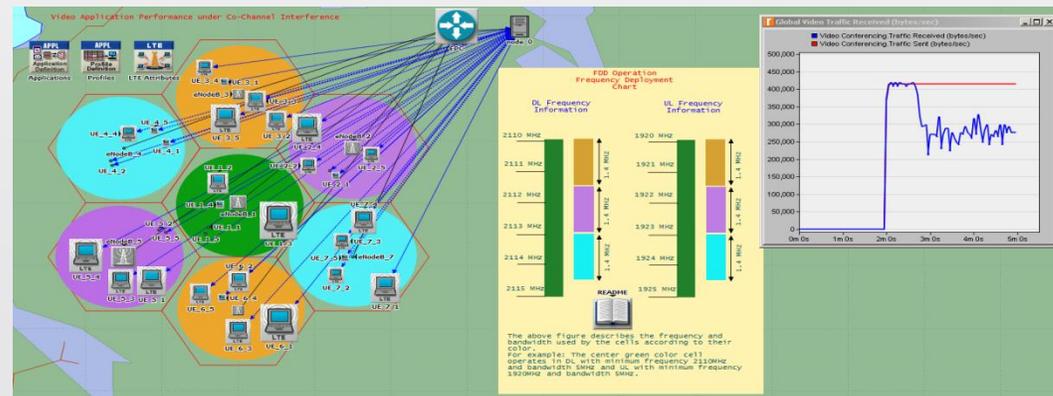
IPv6 Specialized Model [IPV6]

- A detailed and high fidelity model of IPv6
- Example use cases:
 - Study a hybrid IPv4/IPv6 network
 - Study OSPFv3 routing in an MANET IPv6 network
 - Develop modifications to IPv6



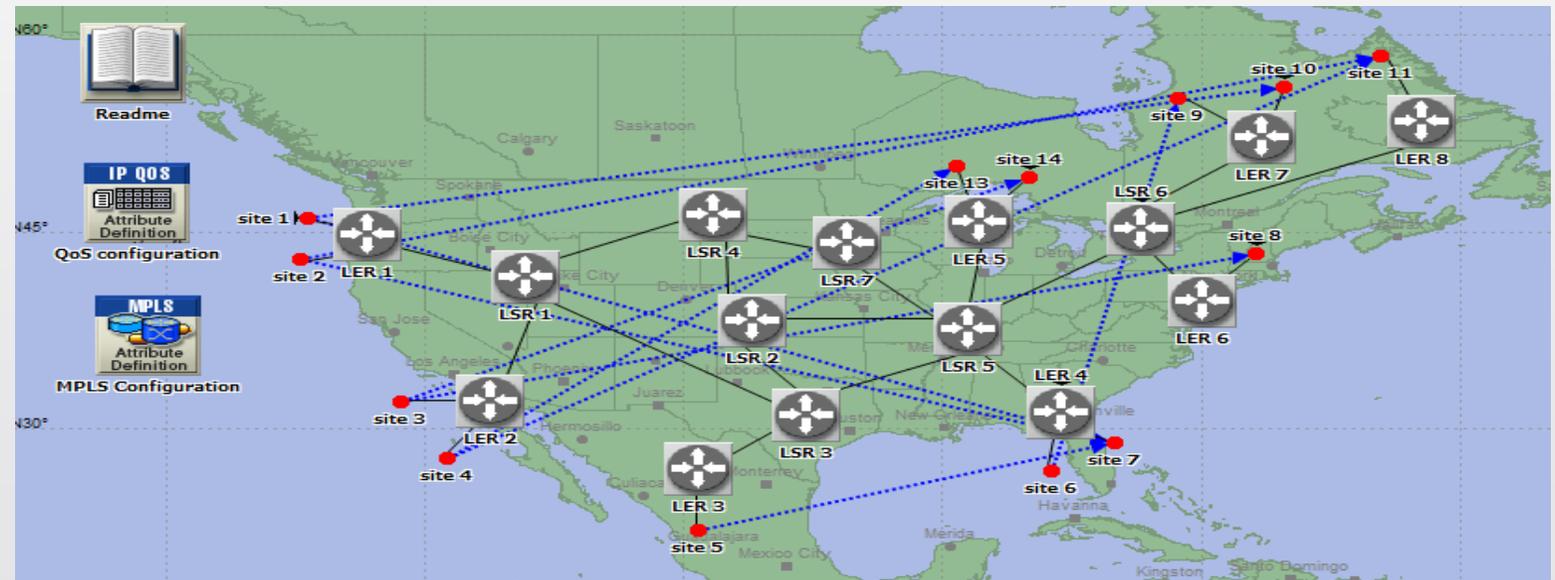
LTE Specialized Model [LTE]

- A detailed and high fidelity model of LTE based on 3GPP's release 8 and release 9 specifications
- Example use cases:
 - Determine optimal LTE settings for a given network
 - Implement and study proprietary scheduling and frame generation algorithms
 - Study tactical military networks incorporating LTE



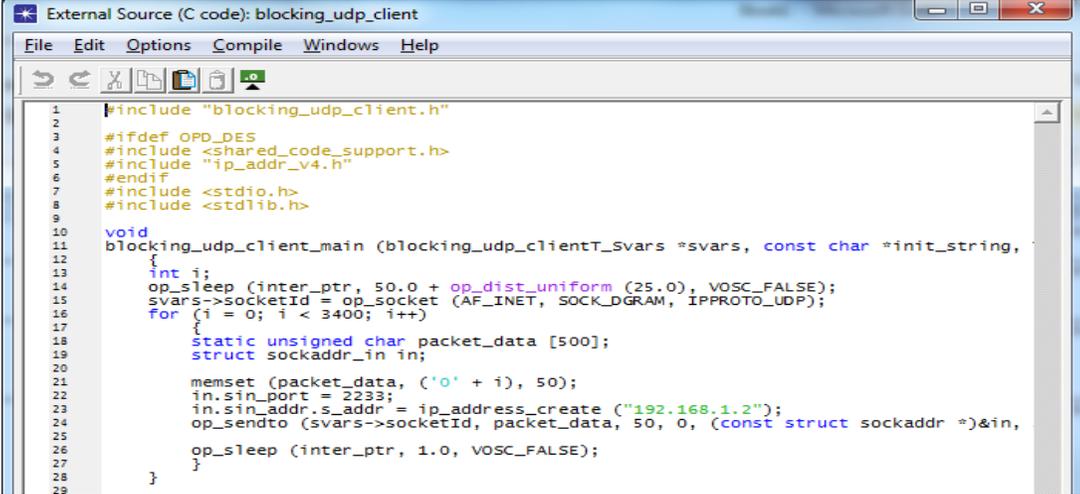
MPLS Specialized Model [MPLS]

- A detailed and high fidelity model of MPLS
- Example use cases:
 - Study the effect of introducing MPLS into an existing ATM network
 - Conduct traffic engineering studies using dynamic LSPs with explicit or CSPF routes



Shared Code Module [SHRCD]

- Makes it easier to share code between a model and a real device
- Write code once and run it on multiple platforms
- Example use cases:
 - Write a Linux application and test it both in the live environment or in Modeler
 - Allows someone familiar with socket programming but not with Modeler to develop protocol models faster



```
External Source (C code): blocking_udp_client
File Edit Options Compile Windows Help
1 #include "blocking_udp_client.h"
2
3 #ifdef OPD_DES
4 #include <shared_code_support.h>
5 #include "ip_addr_v4.h"
6 #endif
7 #include <stdio.h>
8 #include <stdlib.h>
9
10 void
11 blocking_udp_client_main (blocking_udp_clientT_svars *svars, const char *init_string,
12 {
13     int i;
14     op_sleep (inter_ptr, 50.0 + op_dist_uniform (25.0), VOSC_FALSE);
15     svars->socketId = op_socket (AF_INET, SOCK_DGRAM, IPPROTO_UDP);
16     for (i = 0; i < 3400; i++)
17     {
18         static unsigned char packet_data [500];
19         struct sockaddr_in in;
20
21         memset (packet_data, ('0' + i), 50);
22         in.sin_port = 2233;
23         in.sin_addr.s_addr = ip_address_create ("192.168.1.2");
24         op_sendto (svars->socketId, packet_data, 50, 0, (const struct sockaddr *)&in,
25
26         op_sleep (inter_ptr, 1.0, VOSC_FALSE);
27     }
28 }
29
```

System-in-the-Loop Module [SITLM]

- Provides real packet capture, translation, and transmission
- Allows models to communicate with live equipment
- System-in-the-loop Unlimited [SITLMU] allows unlimited simulations to use the SITL module at once
- Example use cases:
 - Connect a simulated OSPF network to a real router and study the performance of the end-to-end system
 - Run real applications over an in-development network to see how the real applications will perform



UMTS Specialized Model [UMTS]

- A detailed and high fidelity model of UMTS based on 3GPP's release 99, release 4 and release 5 specifications
- Example use cases:
 - Investigate the effects of hard, soft and softer handovers on application performance
 - Study a hybrid LTE/UMTS network (requires LTE specialized model)

