802.3da Mixing Segment Consensus Model Collaboration

A Modern Approach

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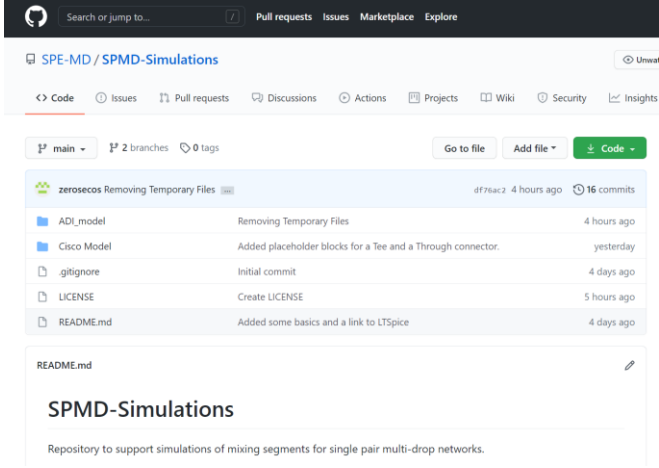
Consensus Model Development Approach

Open-Source Approach

- Tools of Choice for Consensus Model
  - Python
  - LTSpice
- Multiple models shared under permissive MIT License
- Best elements of each to be combined into a consensus model
- Public GitHub serves as repository
  https://github.com/SPE-MD/SPMD-Simulations



Required Features

- Model fidelity to available measurement data
- Offer intelligible description of network being modeled
- Provide front-end mechanism for specifying multiple network topology simulations and executing them en masse
- Also allow for Monte Carlo generation of topologies
- Generate insertion loss and return loss plots

End Game

- Establish a few reference network topologies
  - Specify all details of model required to achieve consistent results among multiple models
- Ensure candidate model for consensus model matches other public and private models employed by the group
- Once accepted by 802.3da group via straw poll, snapshot of model and related documentation will be posted on IEEE802.org as our consensus model

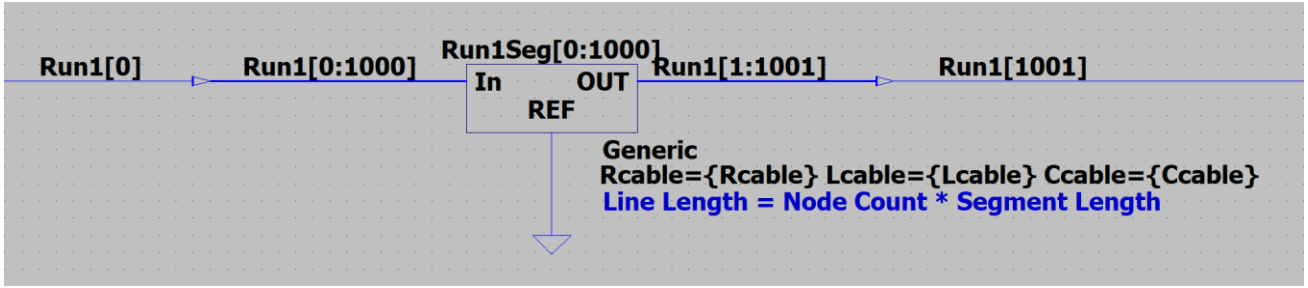
Minor Contributions
Jason Potterf, Cisco

Stupid Spice Tricks

Goal: Provide intelligible schematic view of long chains of simulation segments

Method: LTSpice supports component arrays and bus offsets to effect recursive models.

Result is a simple representation of 1,000 segments in series:



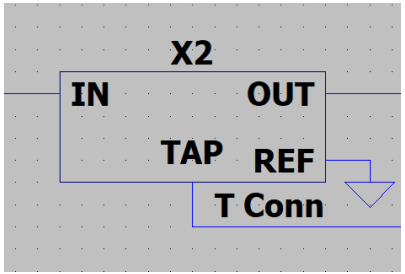
Source: http://ltwiki.org/index.php?title=Undocumented_LTspice

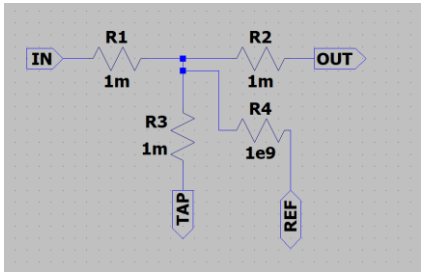
Topology Constructs

Goal: Provide method for testing the same topology against multiple line / connector / endpoint models.

Method: Define standard component symbols for building topologies that allow easy internal specialization.

Sample below shows placeholder for a T-connector model.



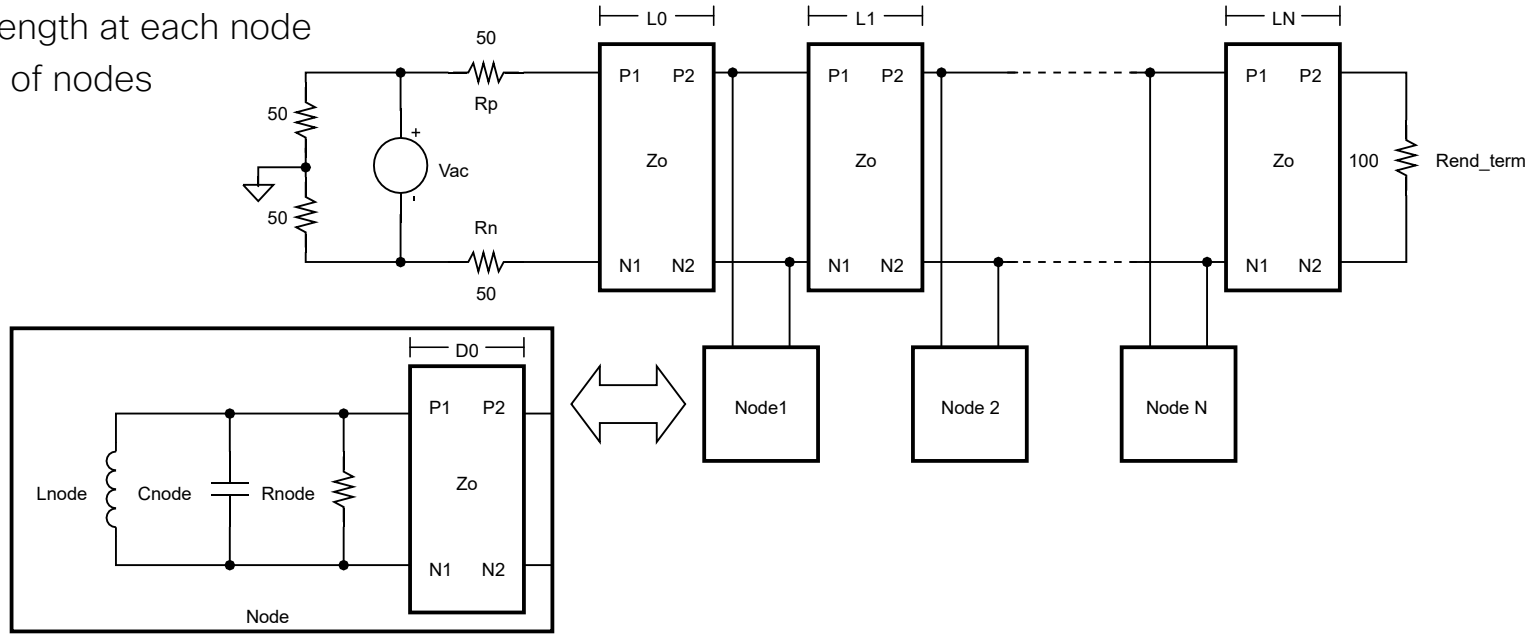


First Major Contribution
Michael Paul, ADI

Python-Based Programmable Mixing Segment Model

Programmable

- Lx – Length between nodes
- Dx – Drop Length at each node
- N – Number of nodes
- Lnode
- Cnode
- Rnode
- Etc…

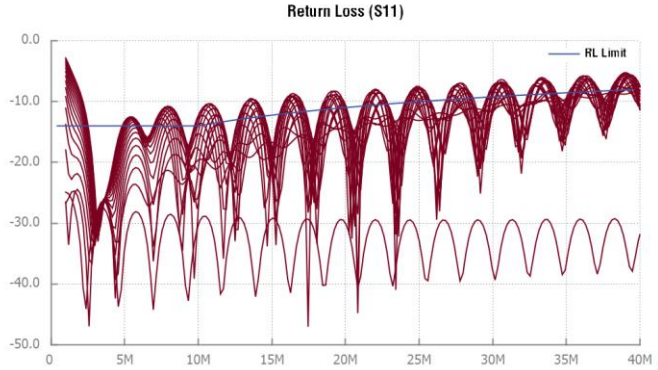


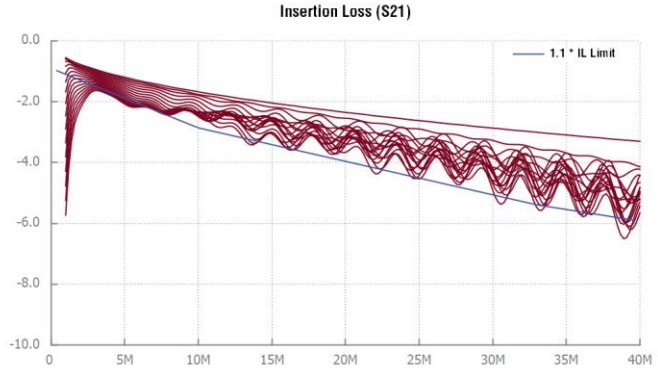
Experiment Setup

- Measure Mixing Segment without PDs
- Then add PDs sequentially
  - Start with PD1
- Continue until all 16 PD on mixing segment at specified “Attach Points”
- Lnode = 80uH
- Cnode = Variable
- Rnode = 10kΩ
- Cable Length = 50m

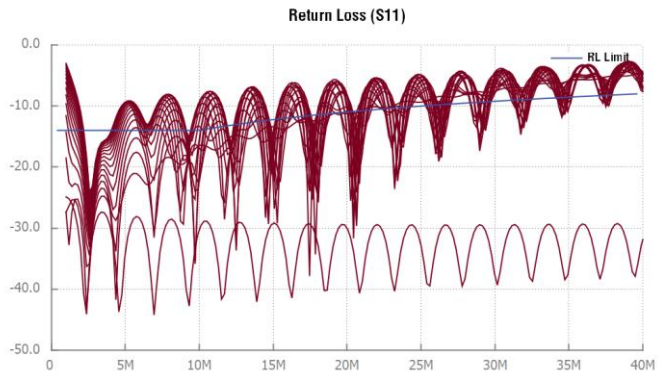
PD	Attach Point (m)	Drop (m)
01	0.600	0.300
02	41.600	0.300
03	42.200	0.300
04	42.800	0.300
05	43.400	0.300
06	44.000	0.300
07	44.600	0.300
08	45.200	0.300
09	45.800	0.300
10	46.400	0.300
11	47.000	0.300
12	47.600	0.300
13	48.200	0.300
14	48.800	0.300
15	49.400	0.300
16	50.000	0.300

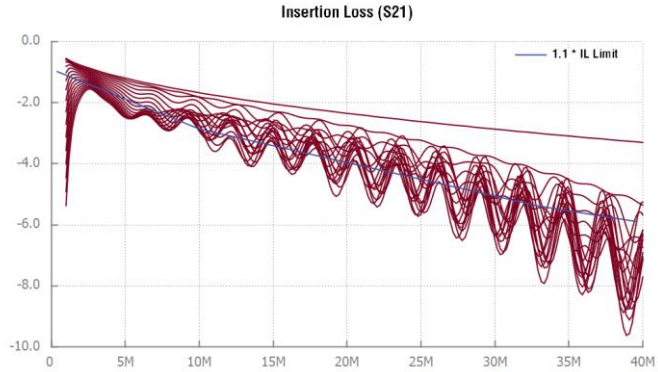
Results (1 – 16 nodes, 80uH PoDL)





► 15pF per Node





► 30pF per Node