



Buildings Aware Path Loss Modeling in ns-3

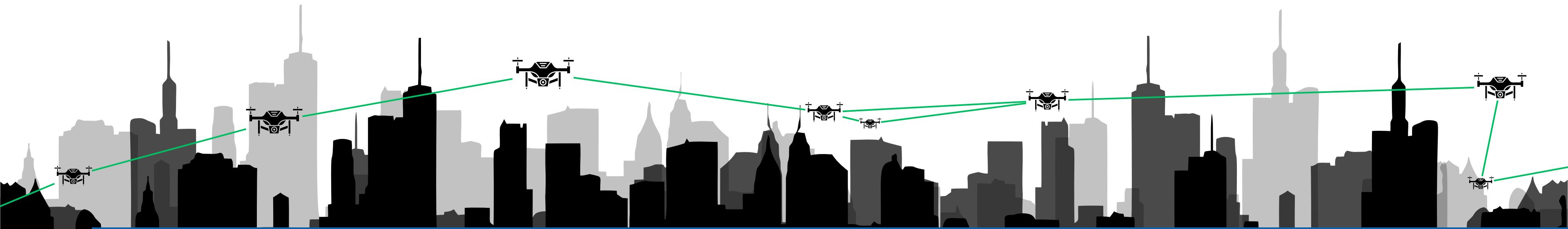
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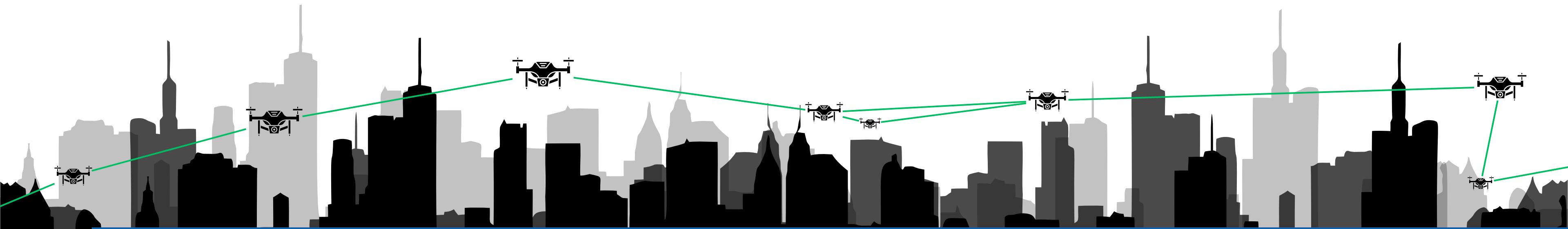
1. The Problem

What are the network performances
under different routing algorithms in
complex urban environments ?



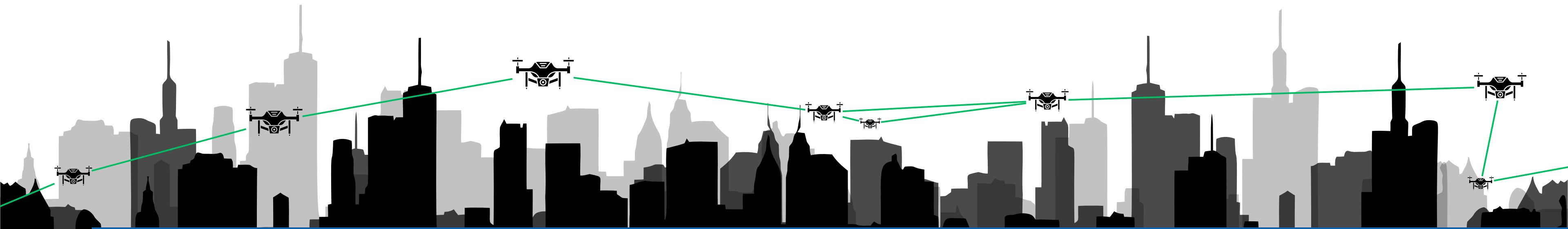
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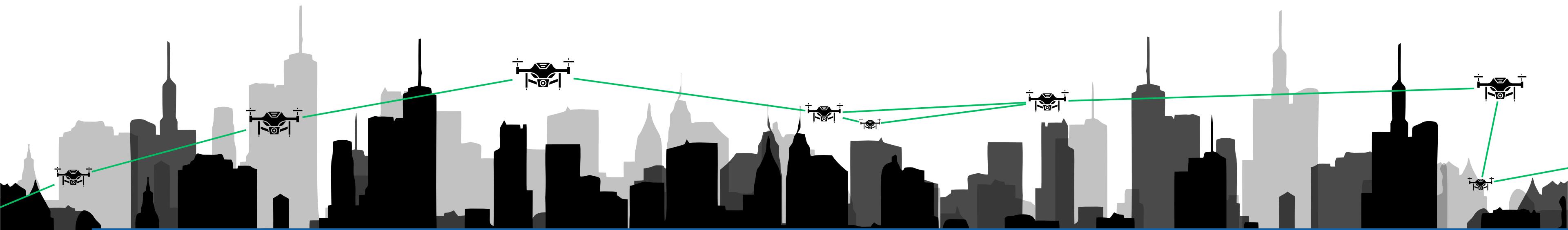
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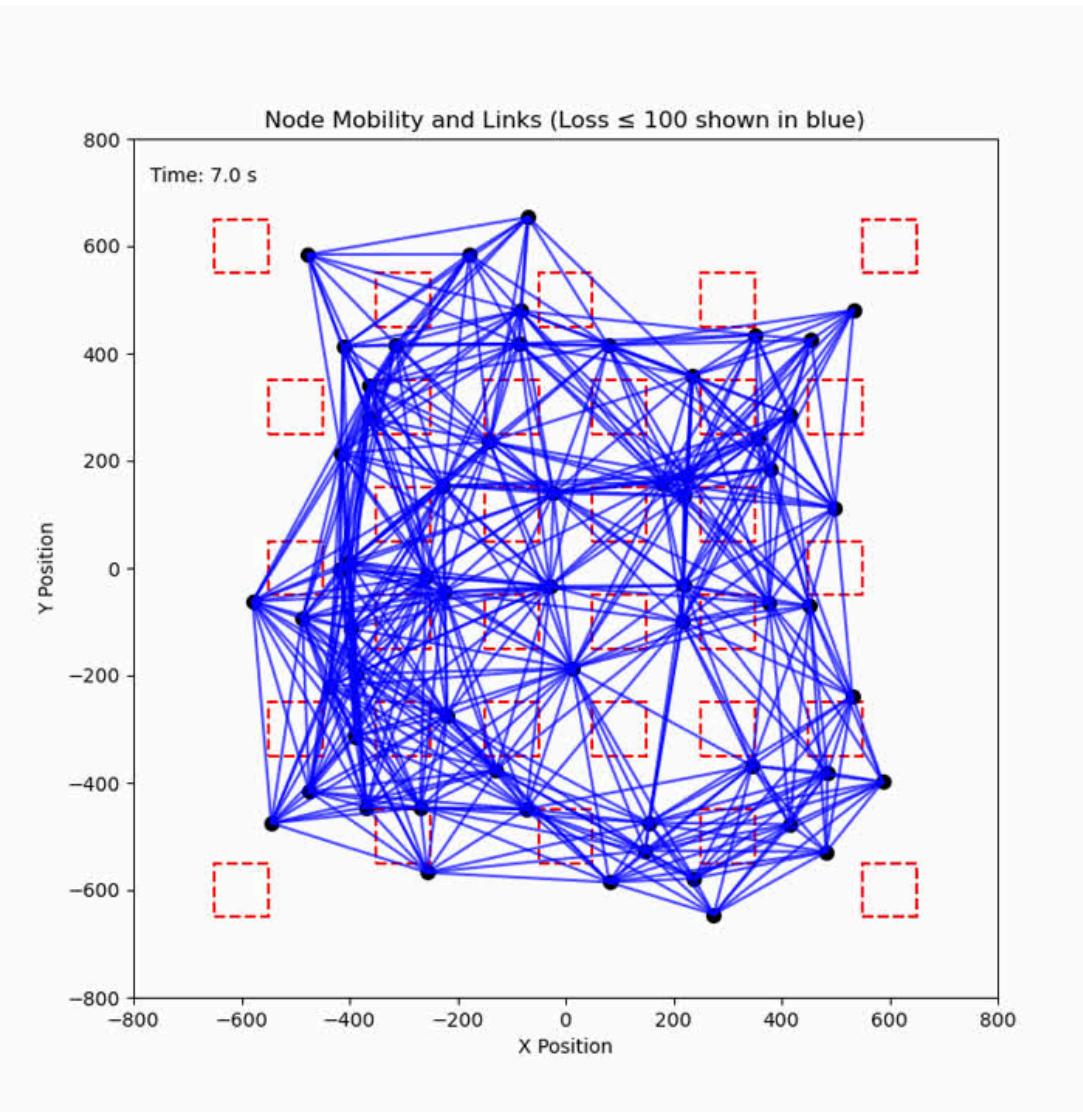
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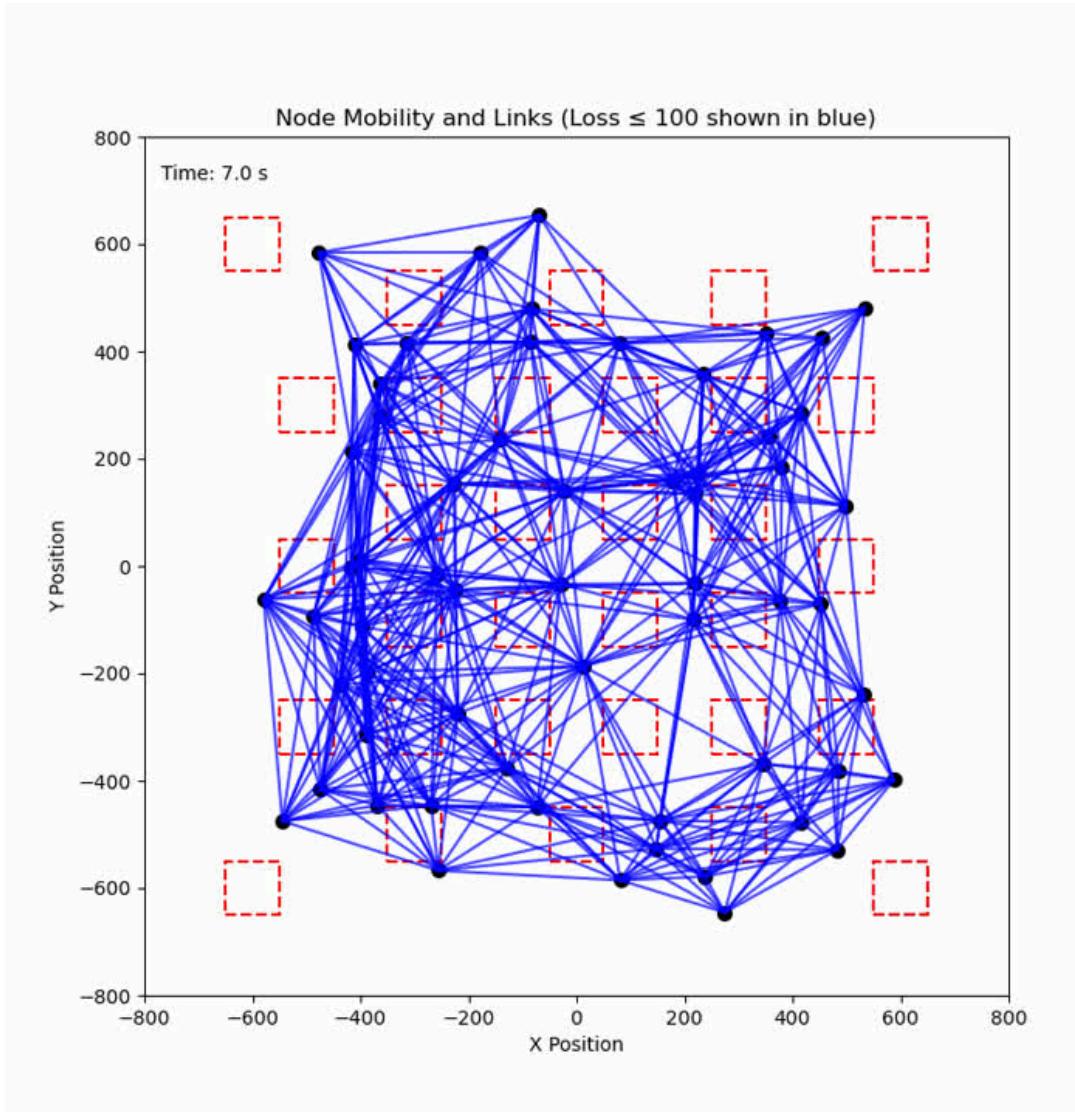
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What ns-3 provides

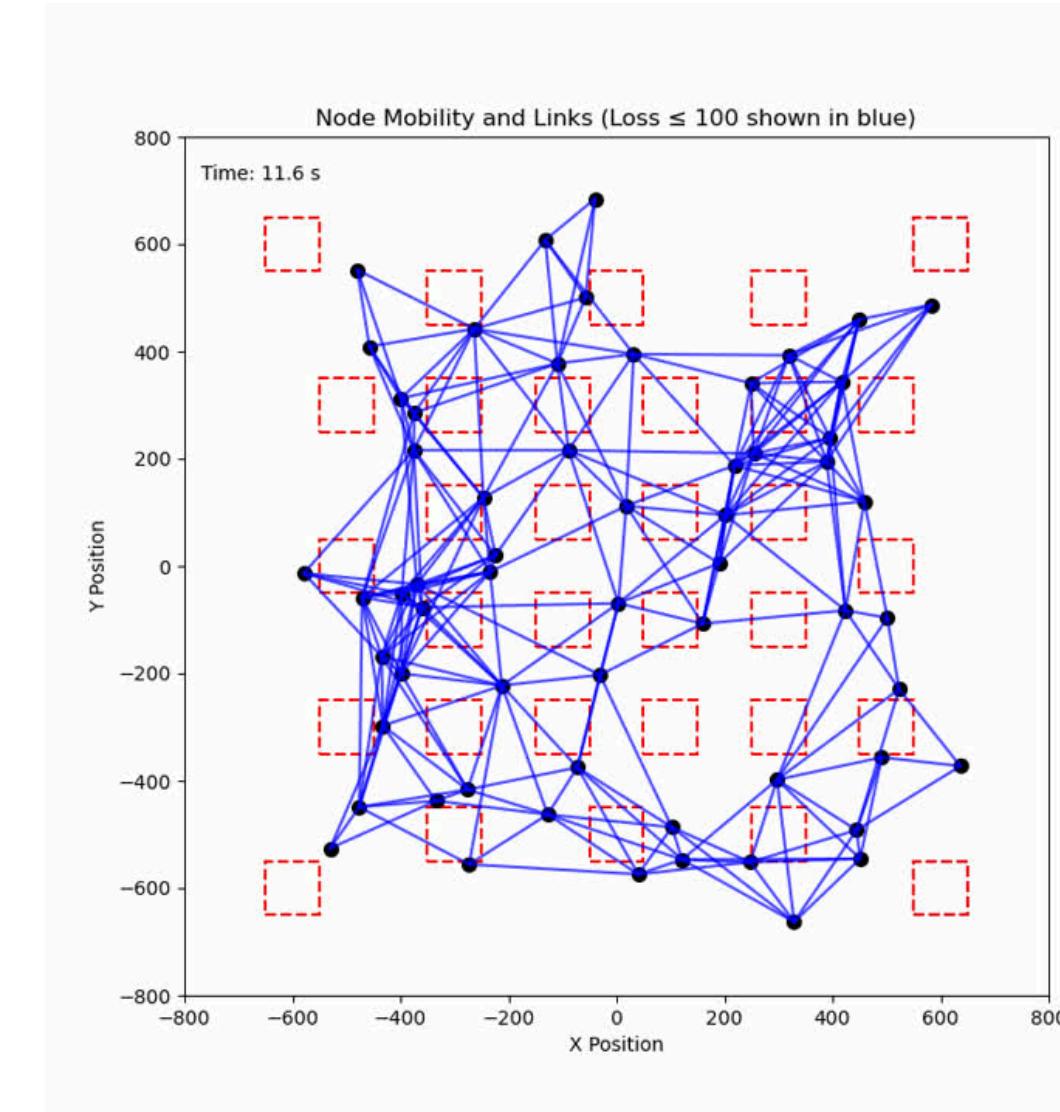


1. The Problem

What ns-3 provides

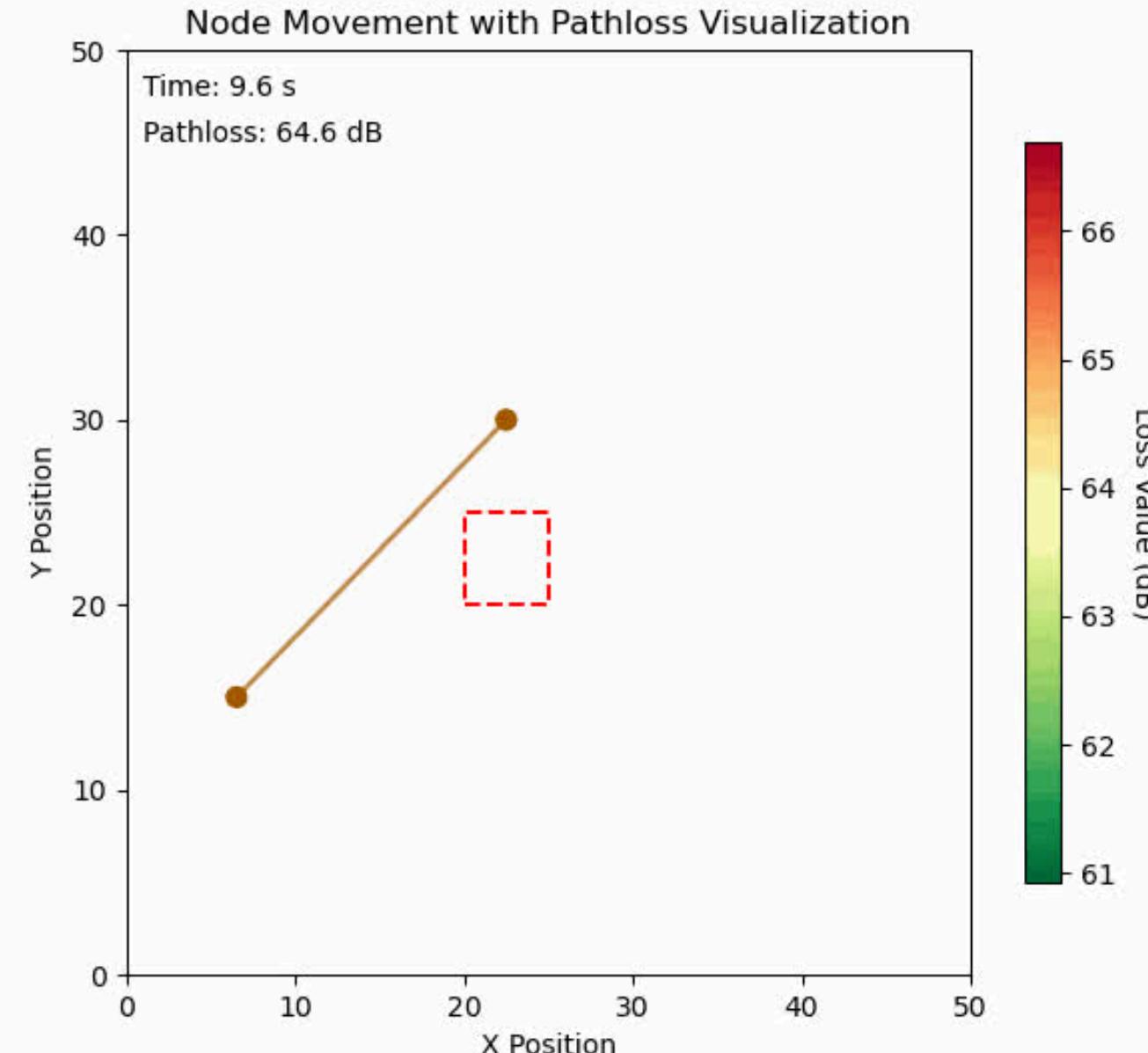


What I need



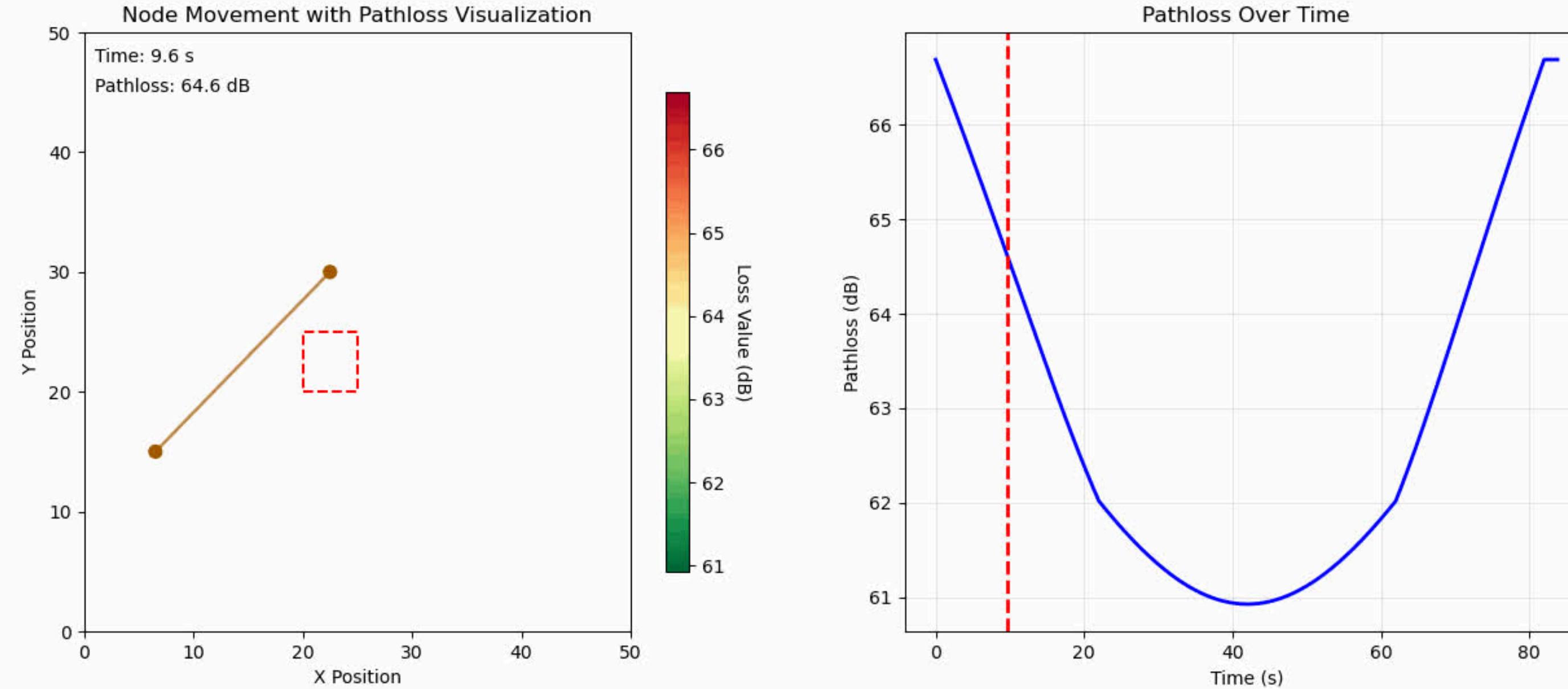
1. The Problem

Taking a smaller scales as a case study



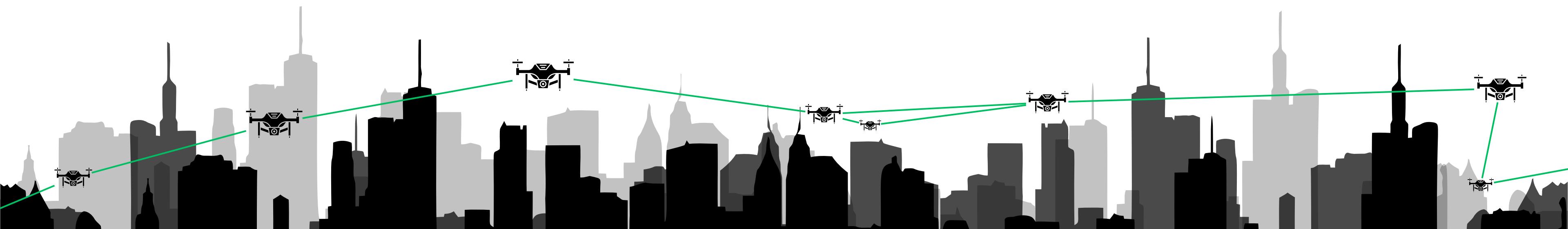
1. The Problem

we see that the building is being ignored



Summary

- I. The problem
- II. Other paper ignore the loss model, a crucial component
- III. Taking buildings into account for the signal propagation
- IV. Implementation and results
- V. Outlook



2. Other paper ignore the loss model, a crucial component

71 %

of 35 papers on routing algorithm
performance evaluations are done with

n S - 3

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Have common set up

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Taking buildings into account for the signal propagation

3. Taking buildings into account for the signal propagation

Dominant path model



Figure 3 : The dominant path method where the signal, considered as a ray, interacts with the object in the medium (penetration, diffraction, reflection).

3. Taking buildings into account for the signal propagation

Dominant path model

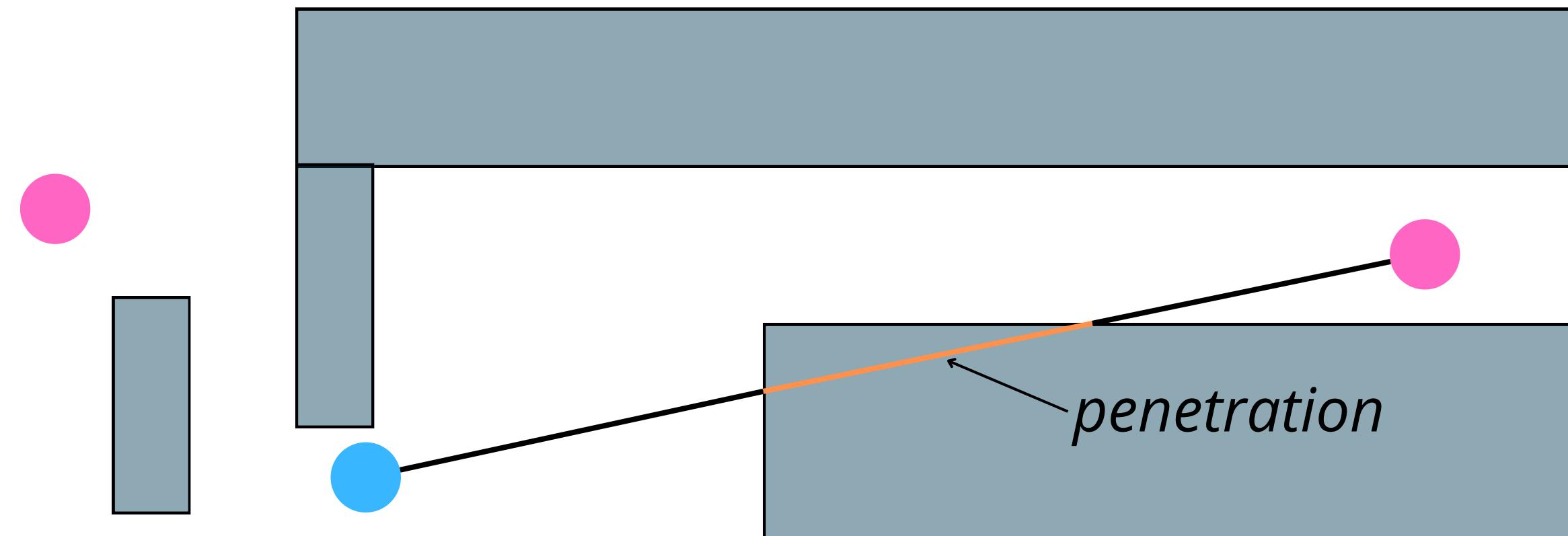


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3. Taking buildings into account for the signal propagation

Dominant path model

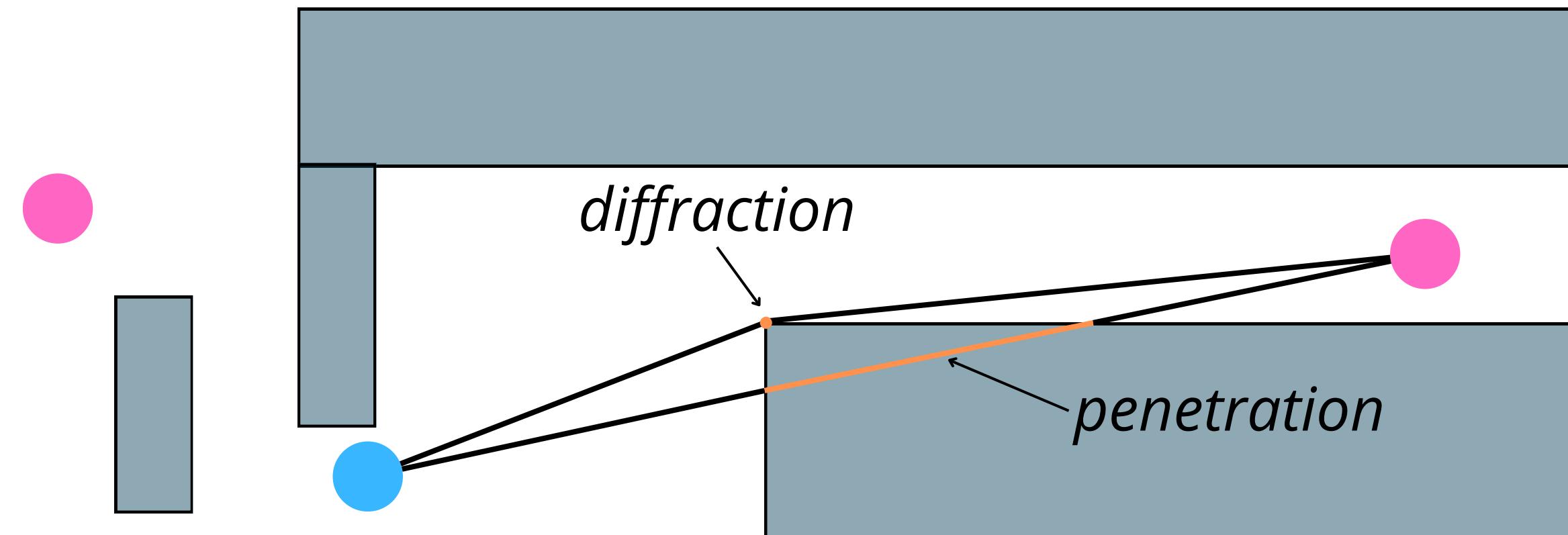


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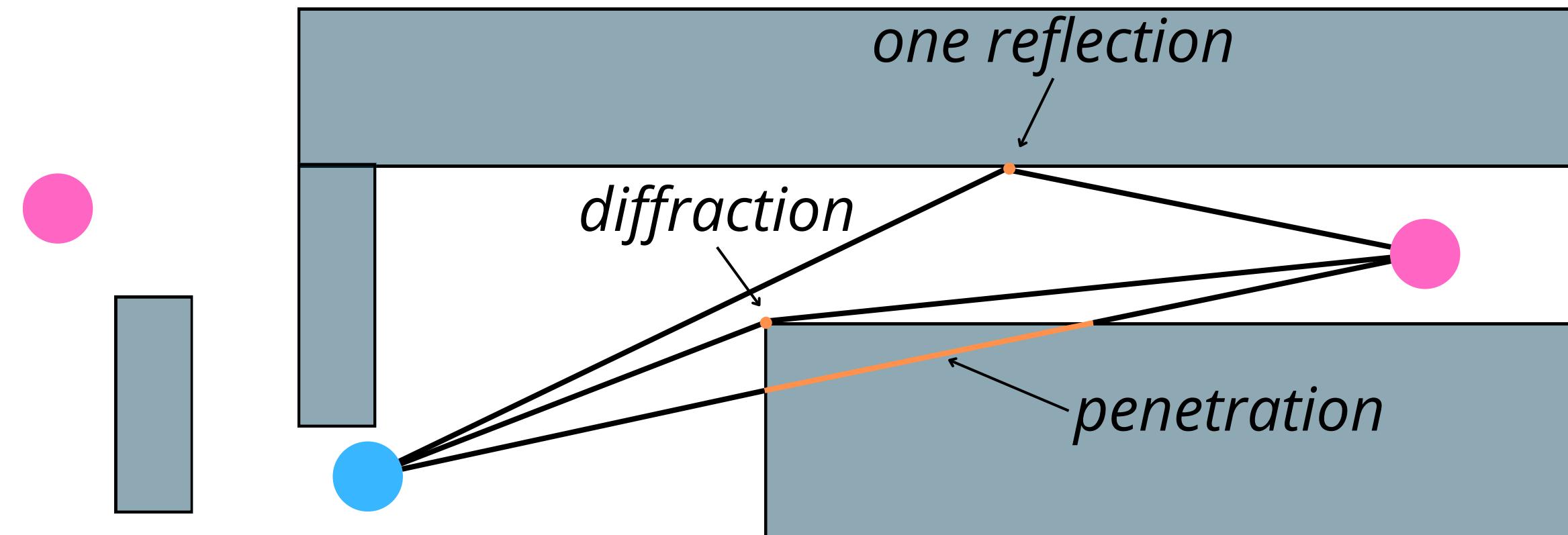


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3. Taking buildings into account for the signal propagation

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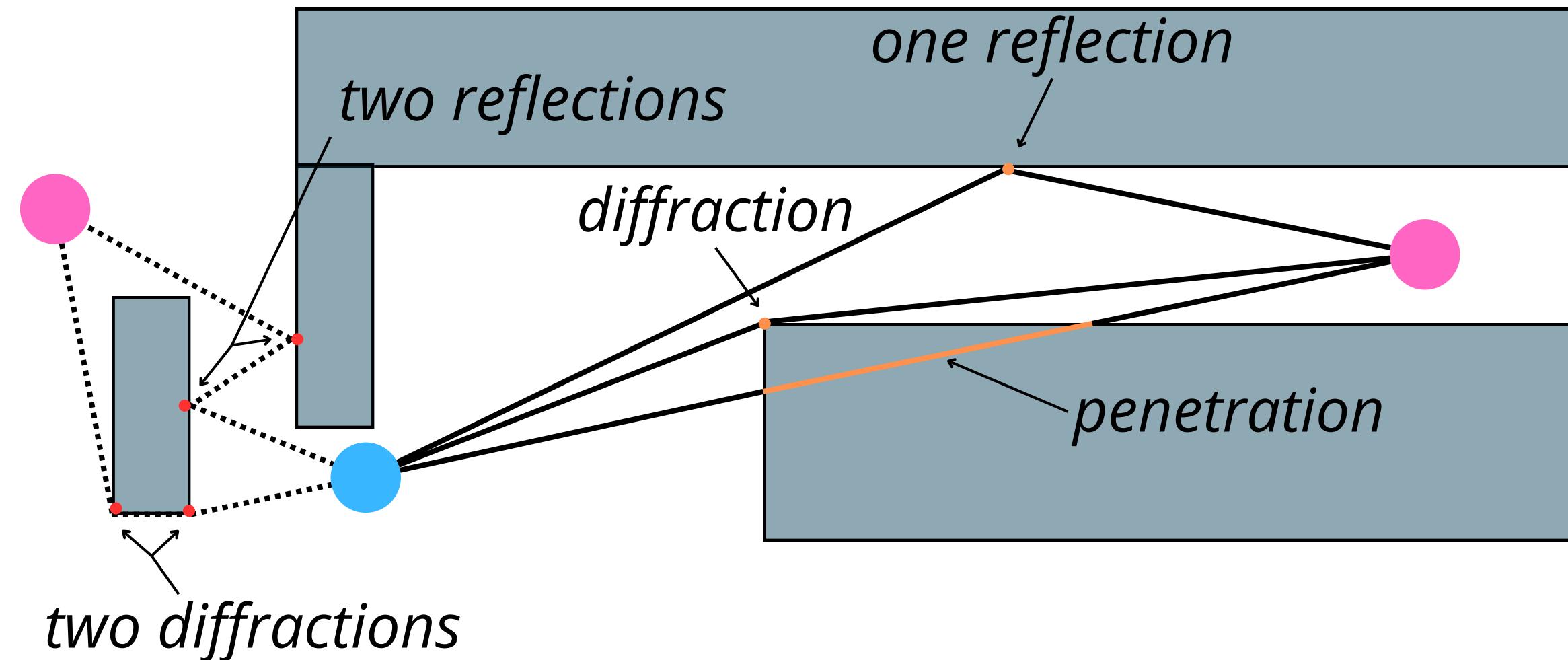


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3. Taking buildings into account for the signal propagation

Dominant path model

Penetration

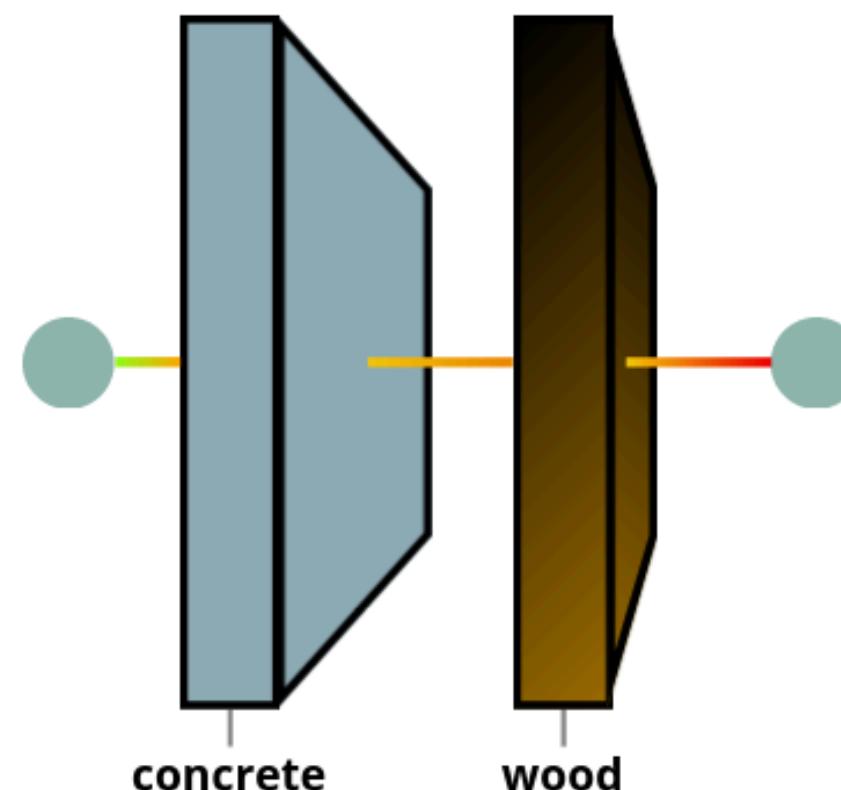


Figure 4 : Visual representation of signal penetration, diffraction and reflection on objects.

3. Taking buildings into account for the signal propagation

Dominant path model

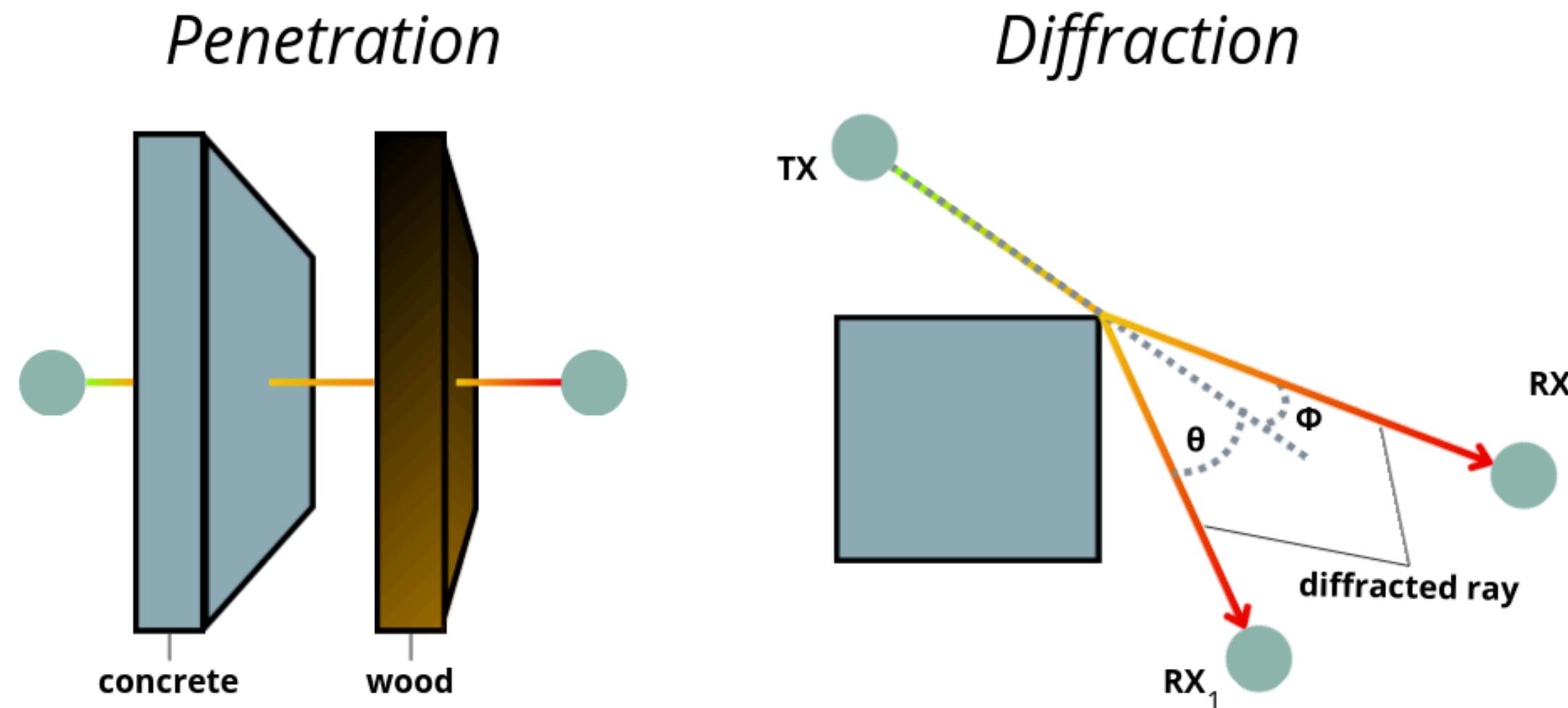


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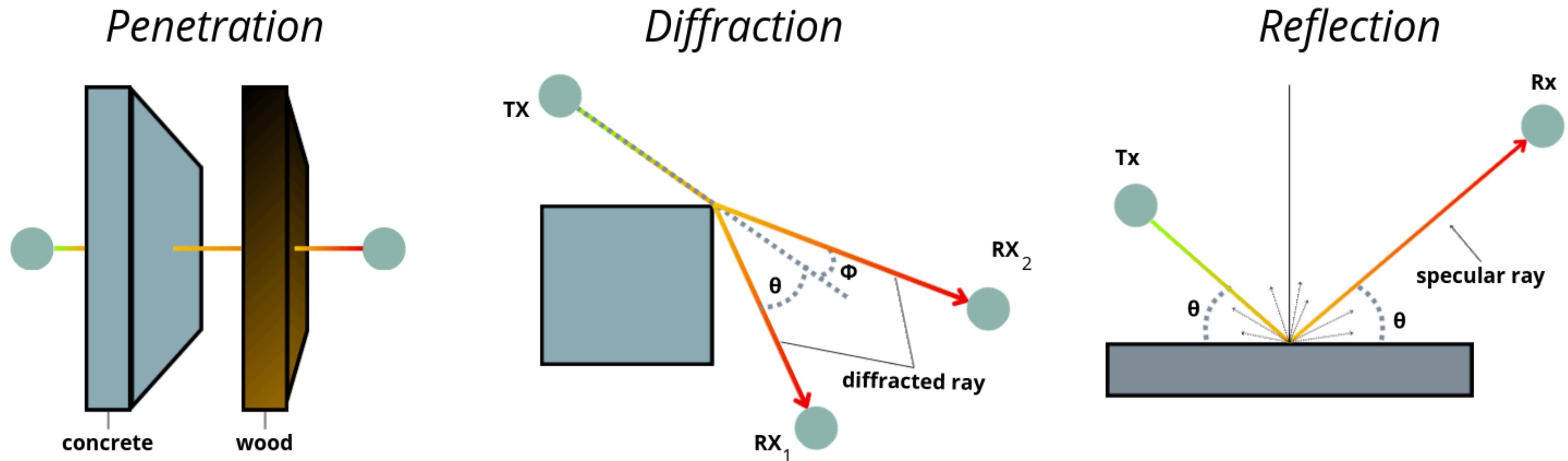
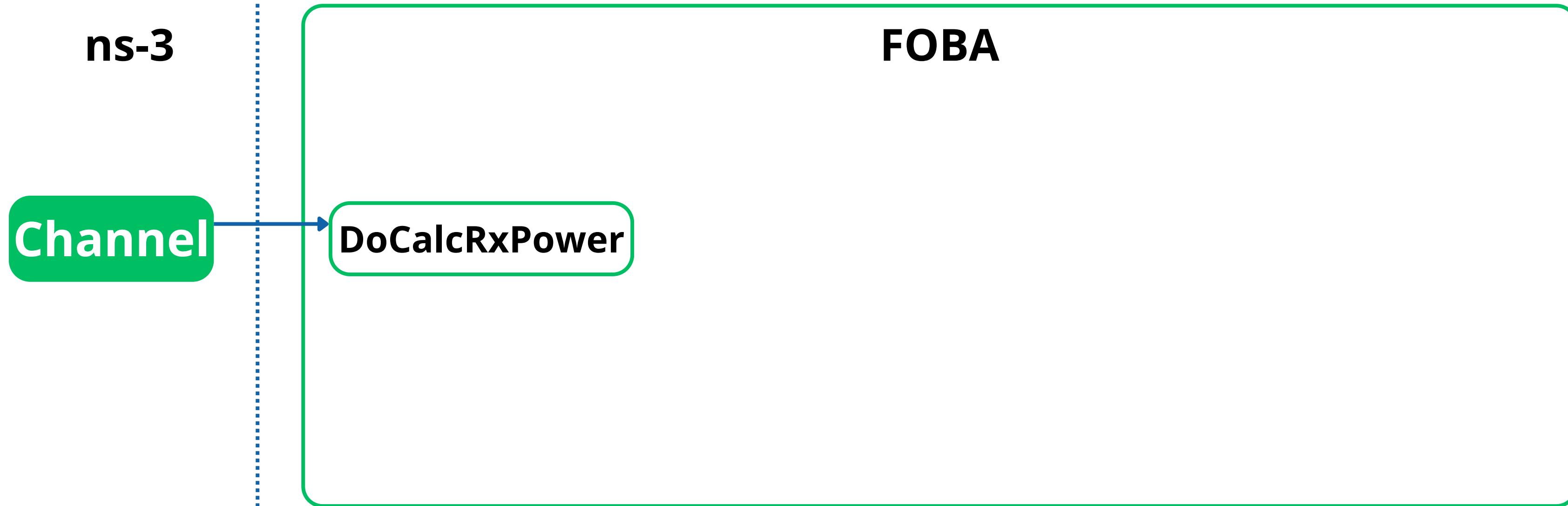


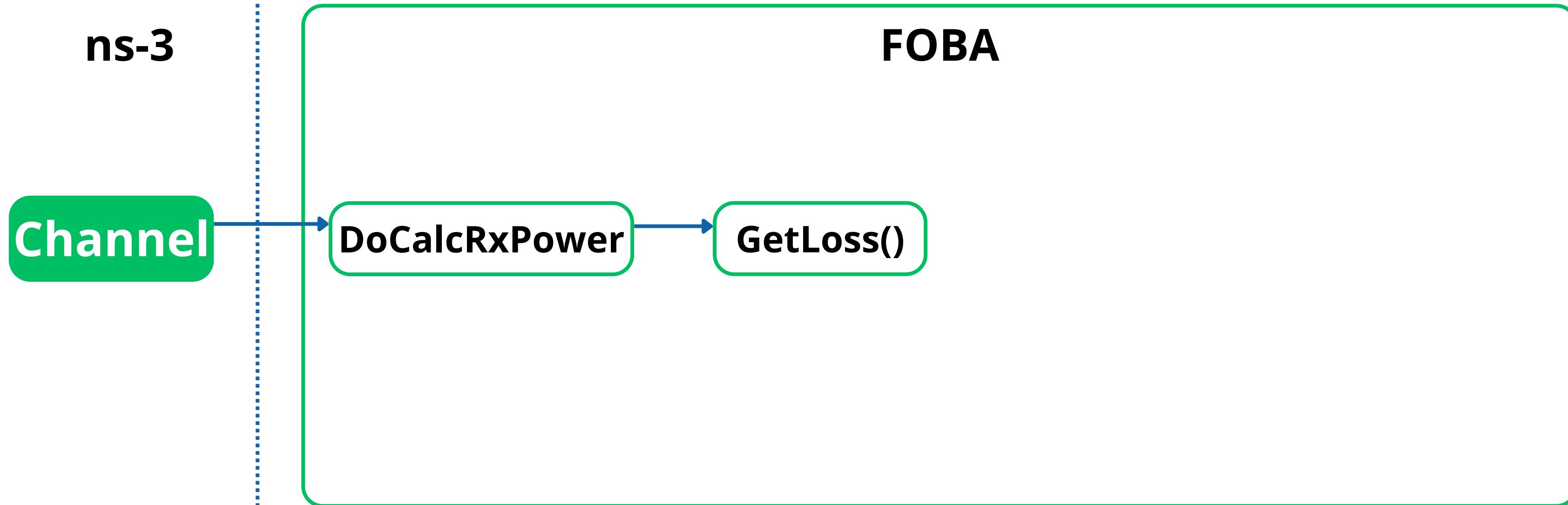
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Implementation and results

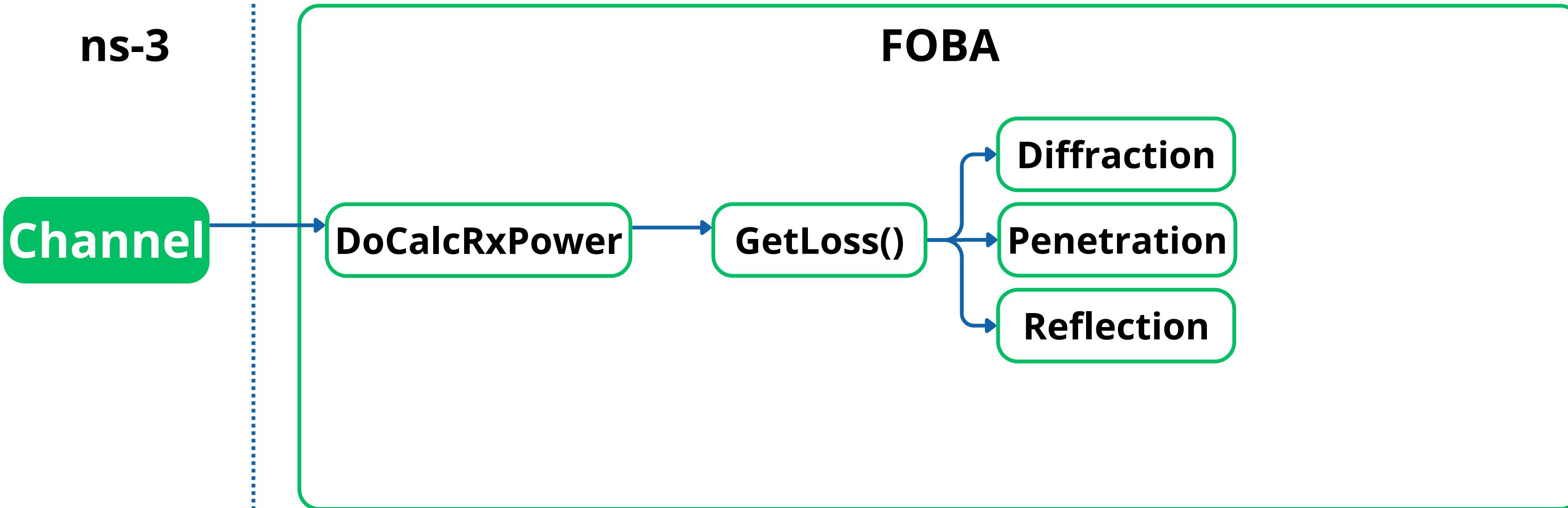
4. Implementation and results



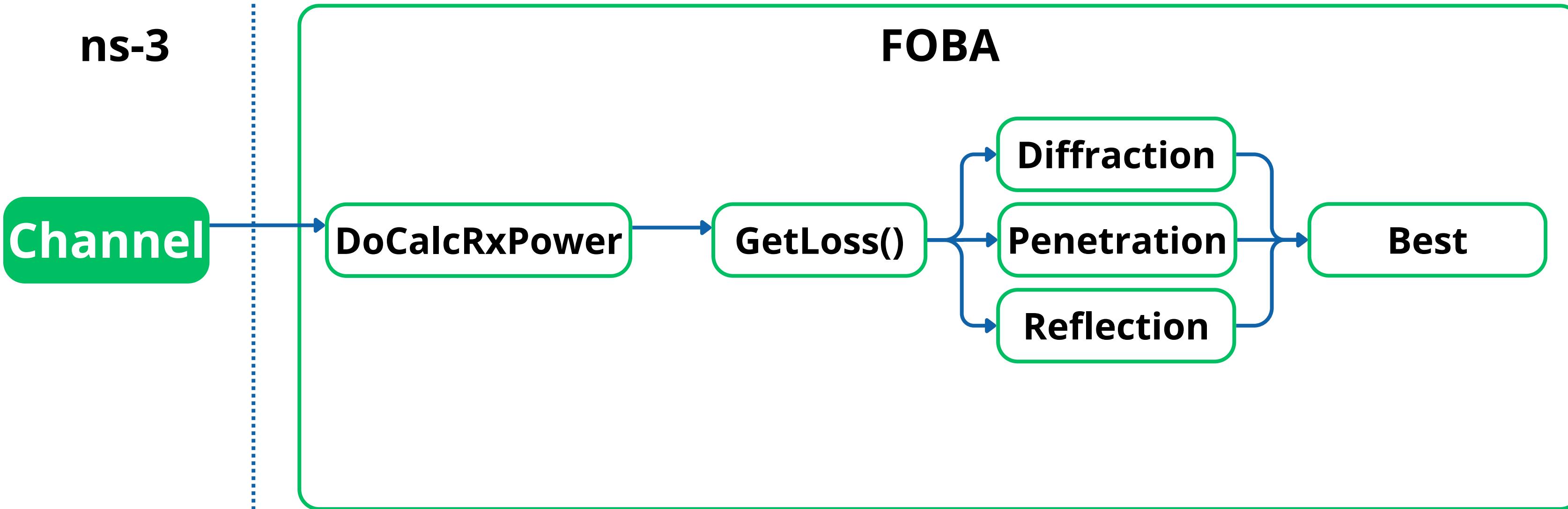
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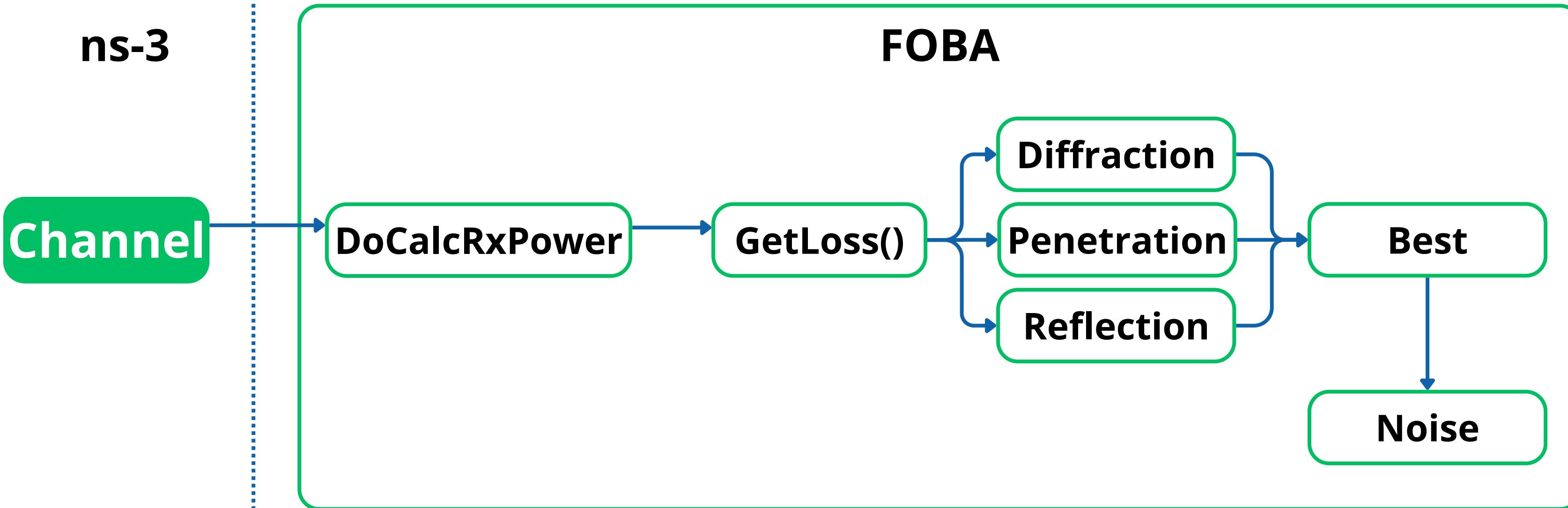
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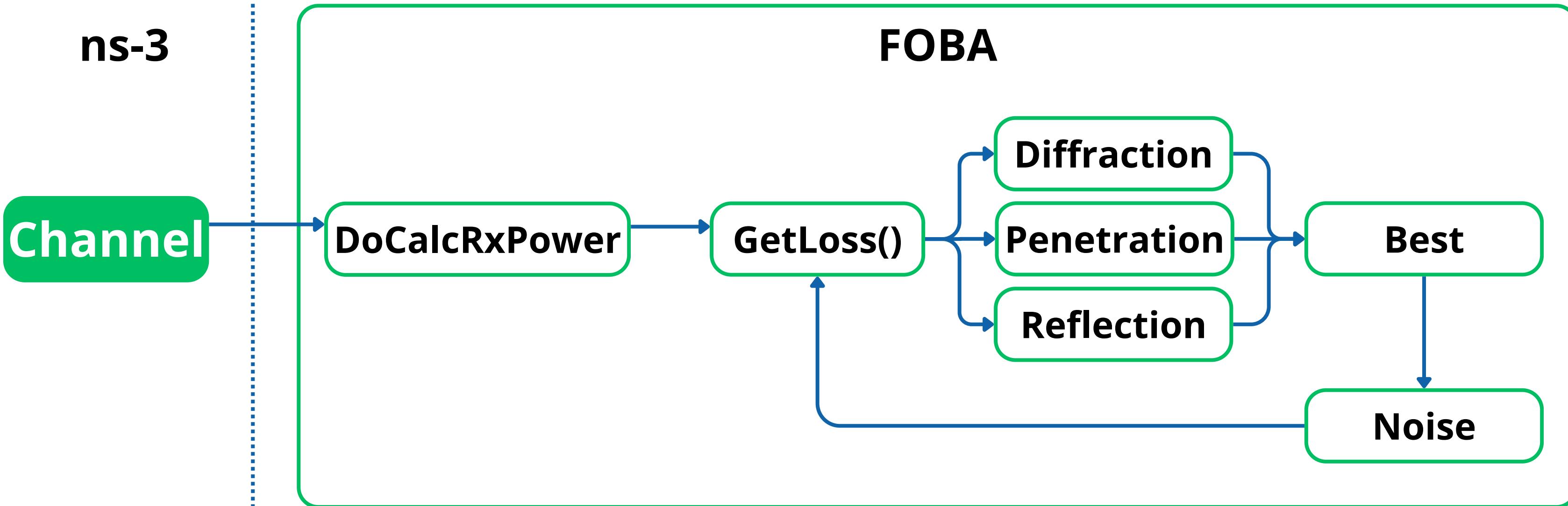
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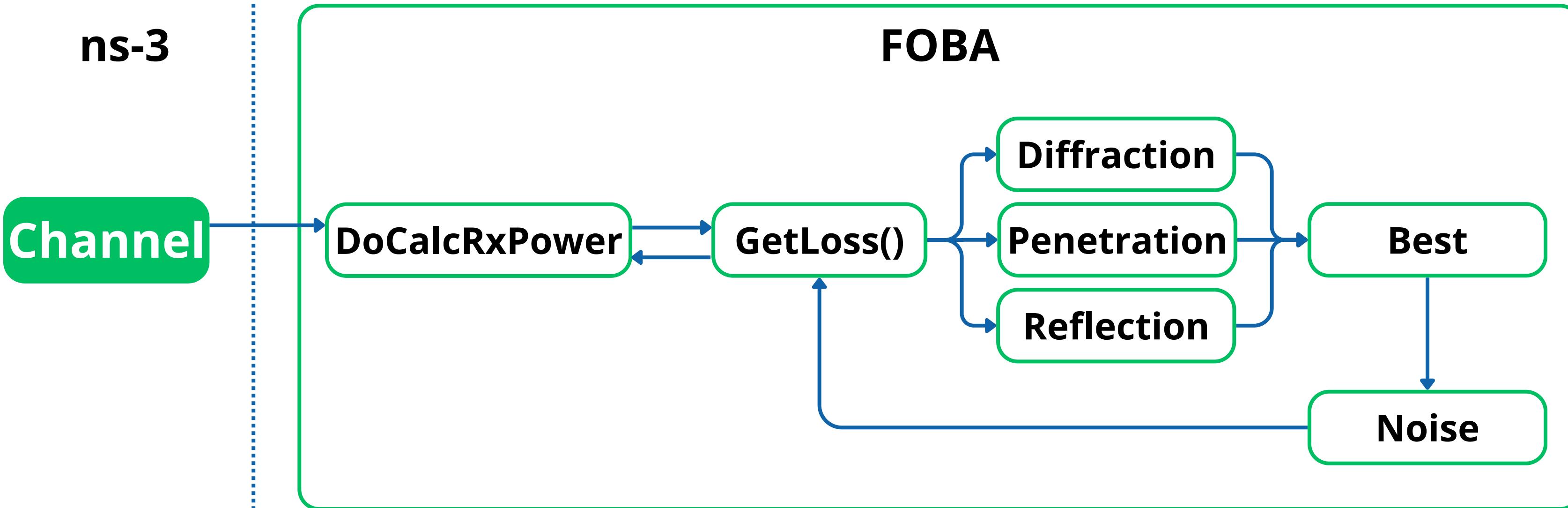
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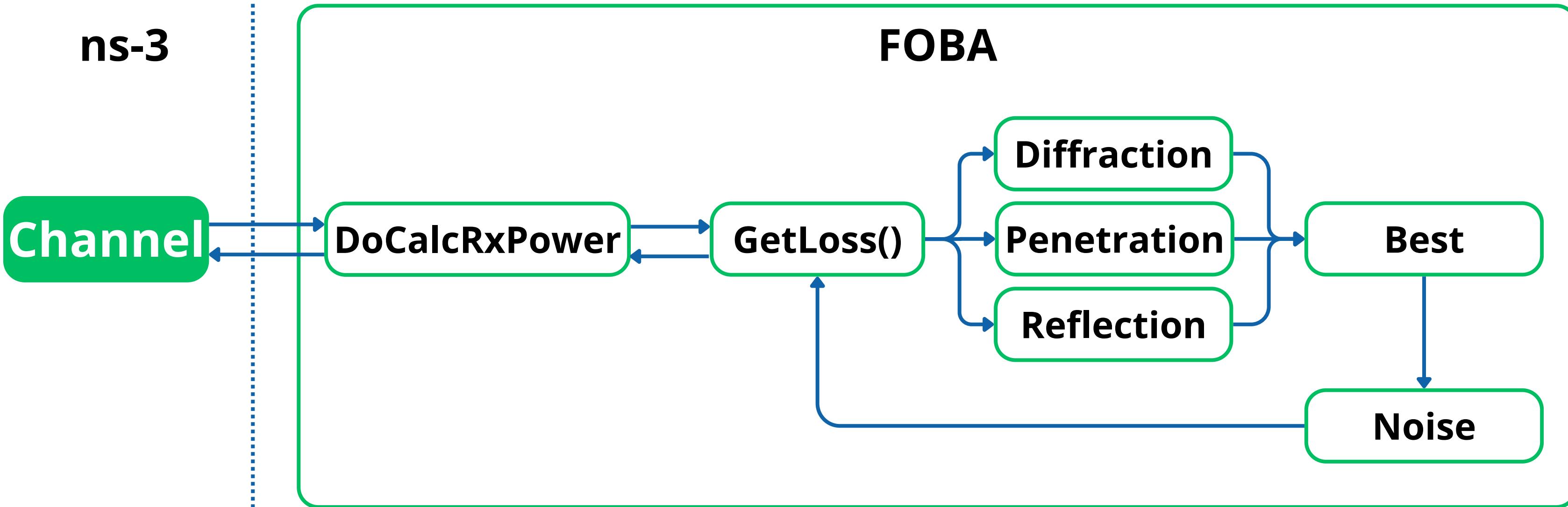
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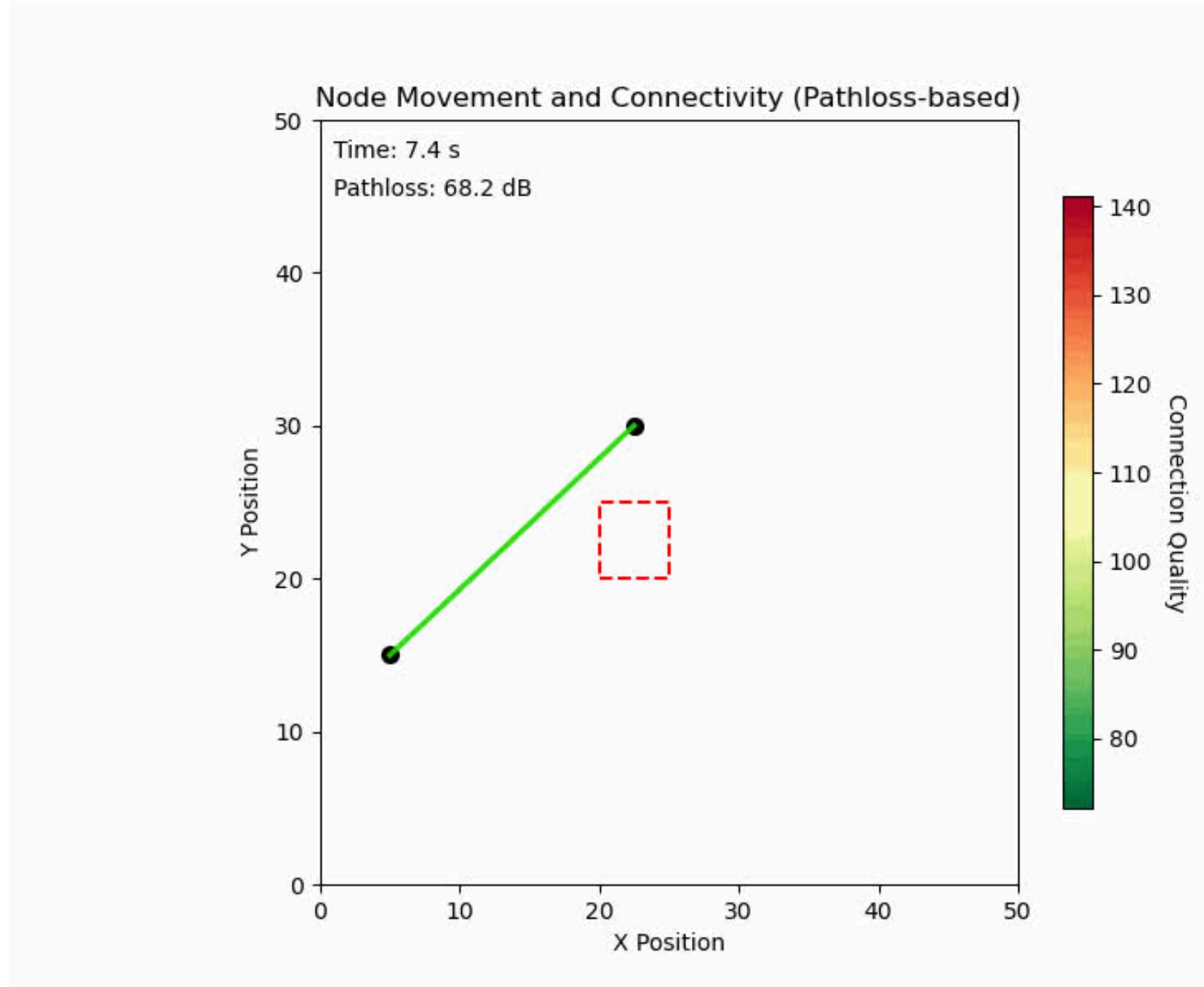


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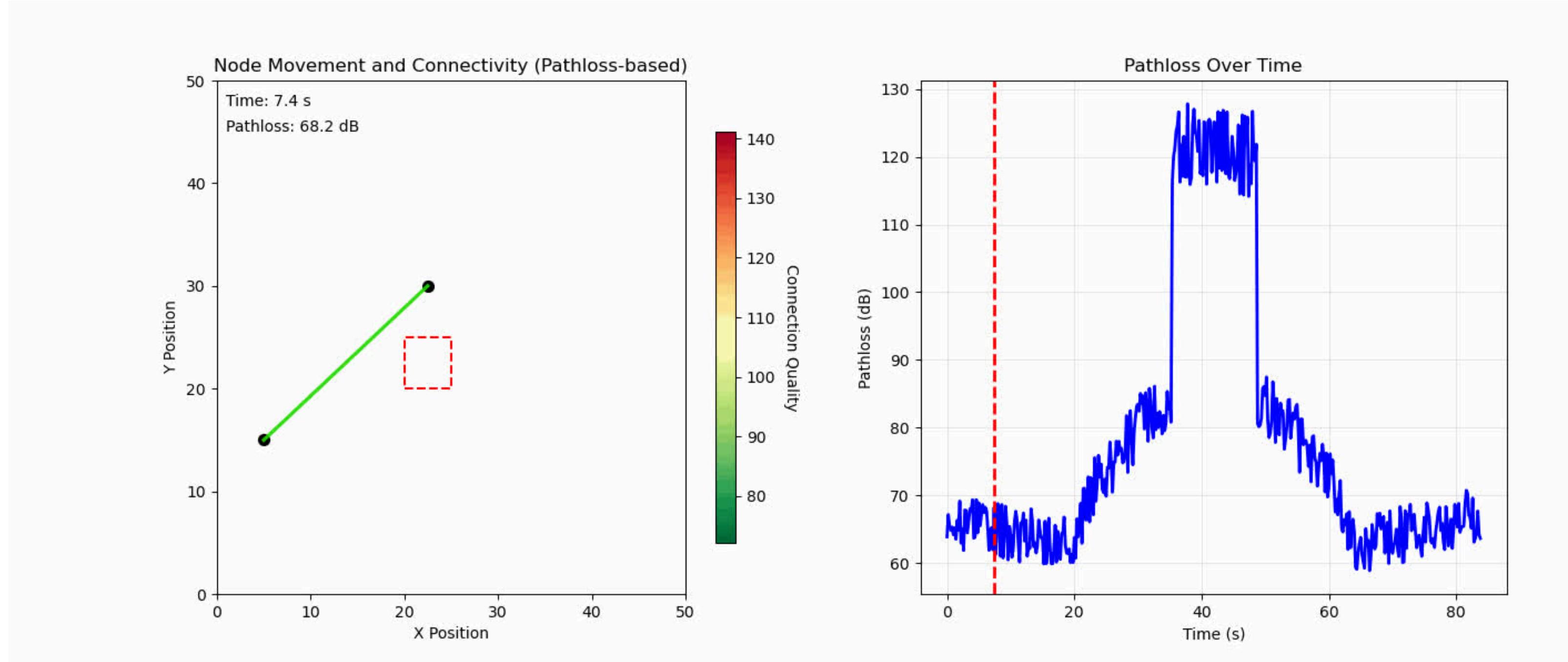
4. Implementation and results

Comming back to the first scenario



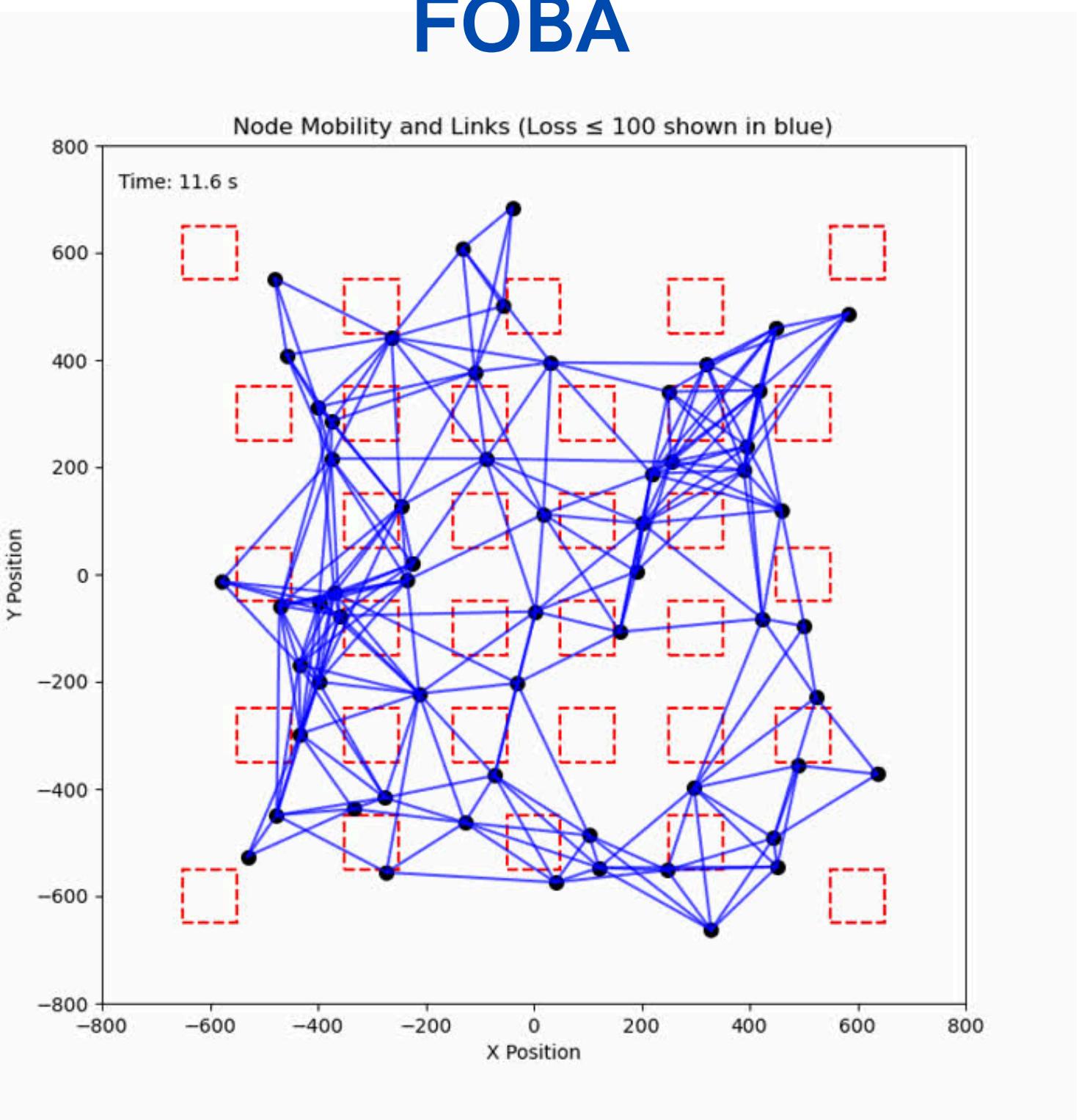
4. Implementation and results

we see that now, the buildings does affect the loss value

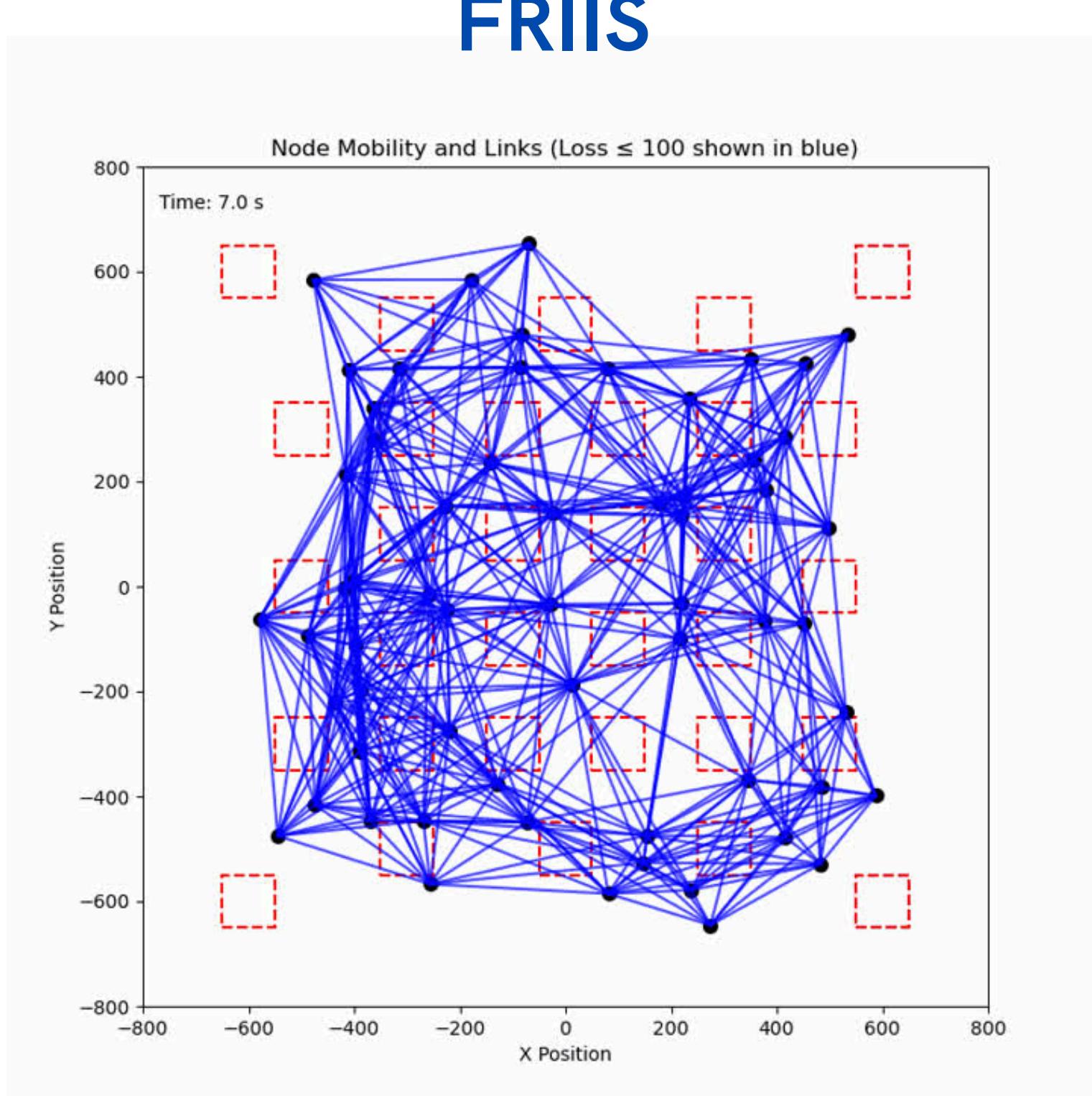


4. Implementation and results

FOBA



FRIIS



4. Implementation and results

Performance tests

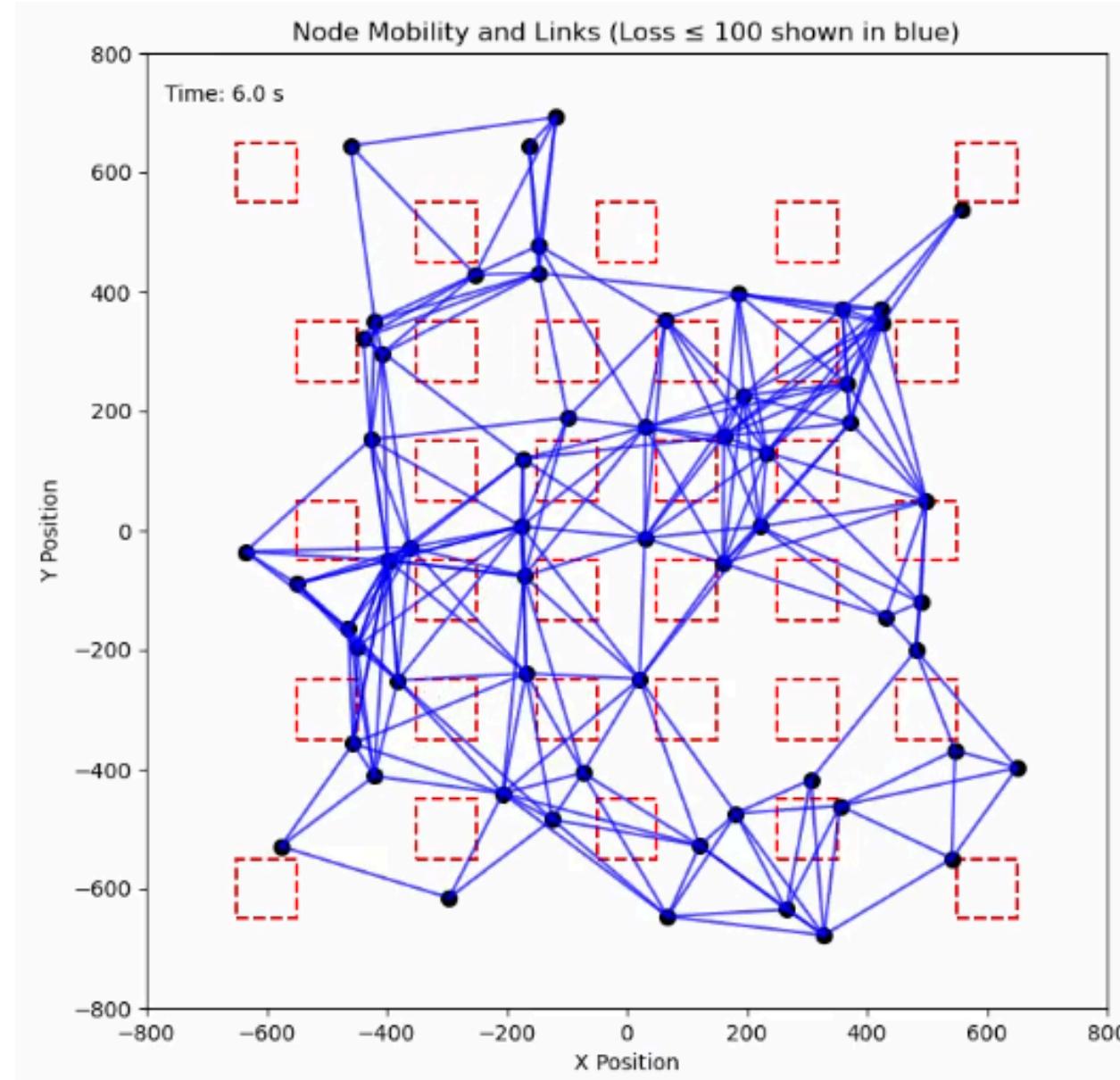


Figure 9 : Scénario complexe avec le modèle FOBA

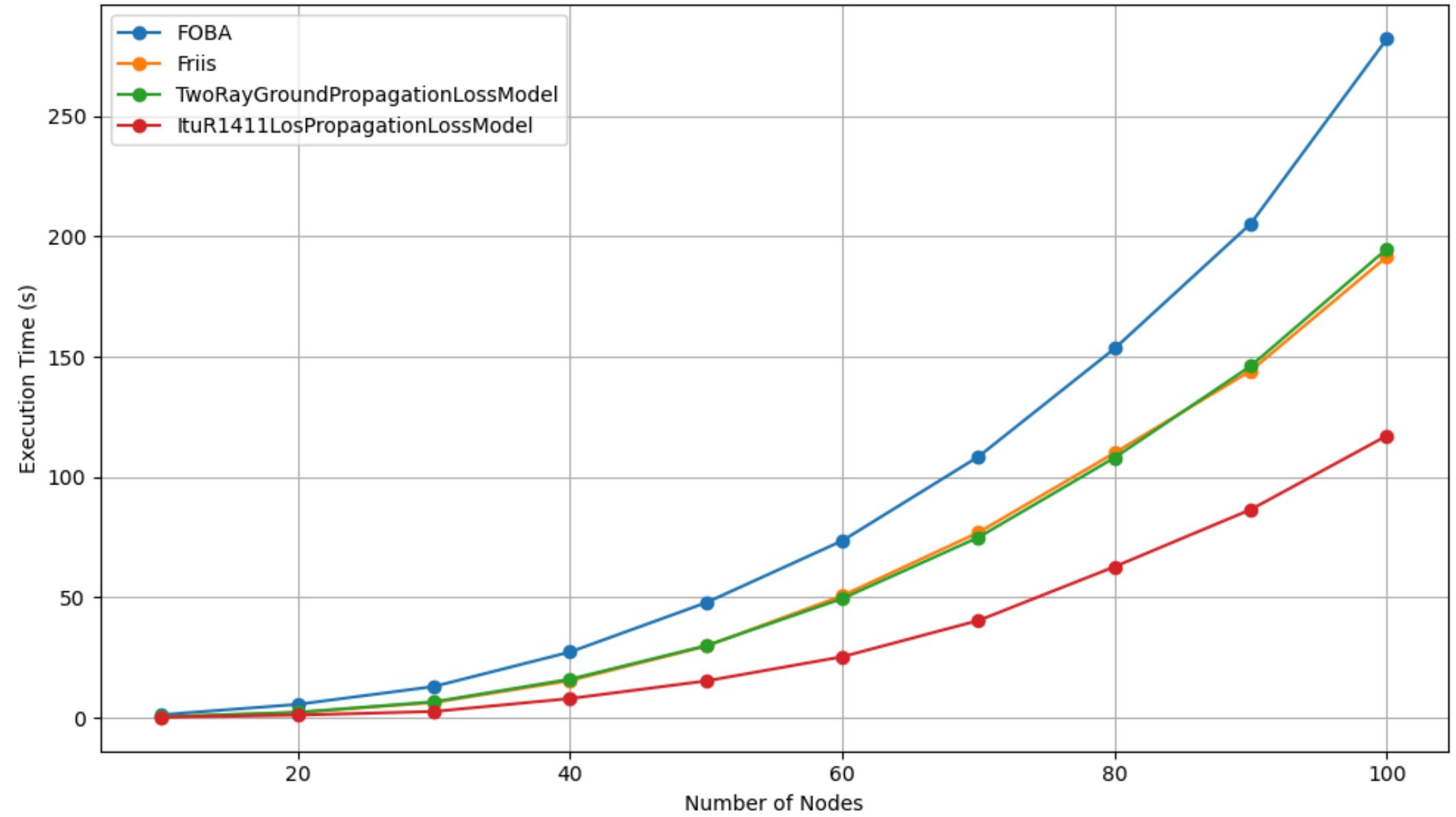


Figure 10 : Comparaison des performances de FOBA avec d'autres modèles

4. Implementation and results

Path loss modeling



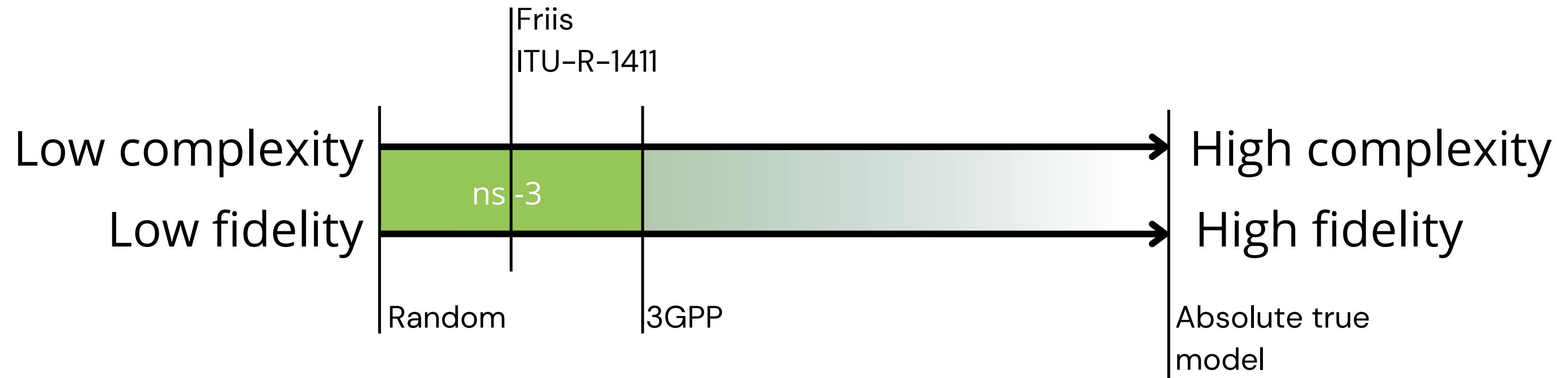
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Path loss modeling



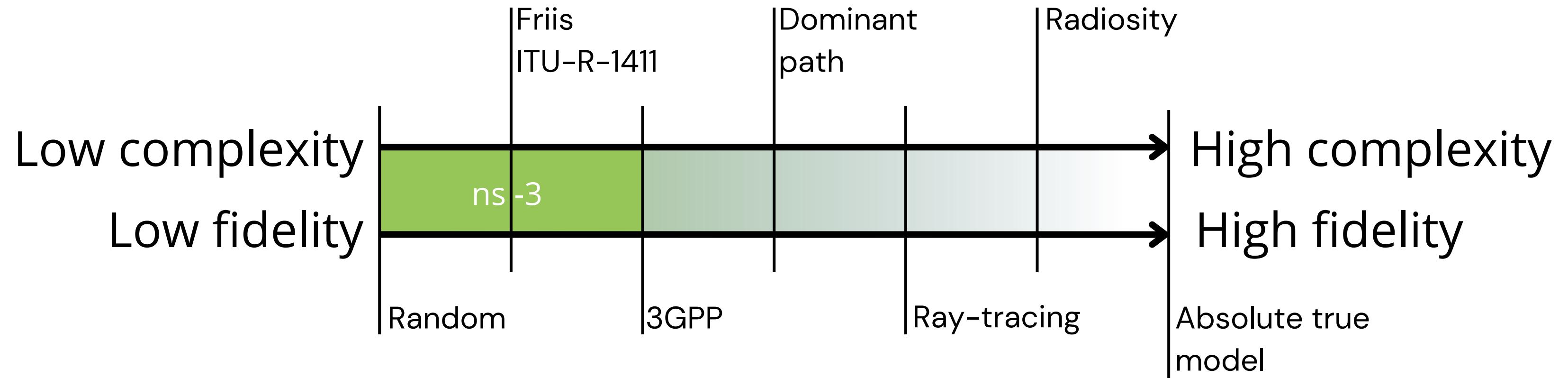
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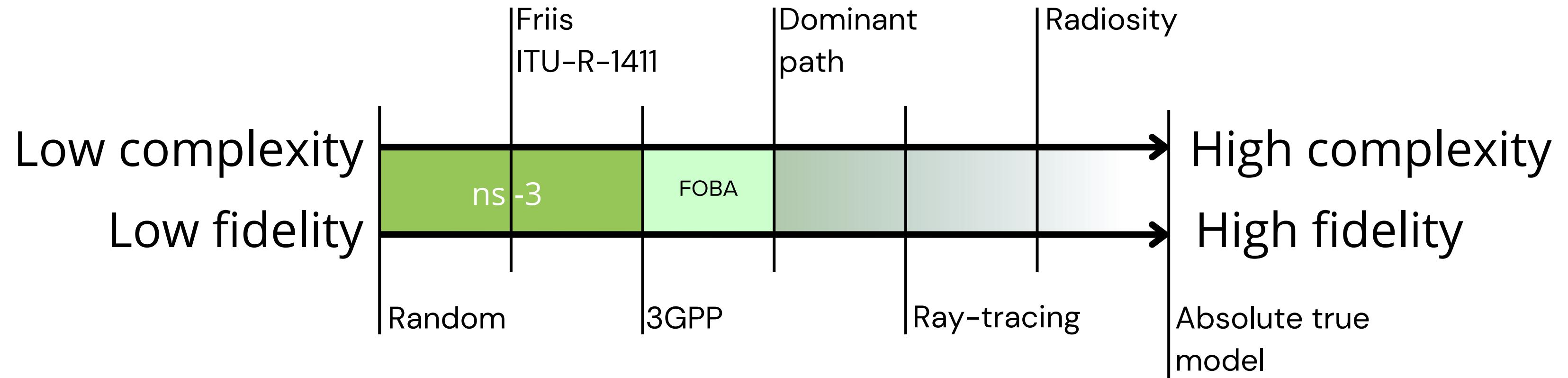


Figure 2 : Visual mapping of the different loss model approaches

4. Implementation and results

Path loss modeling

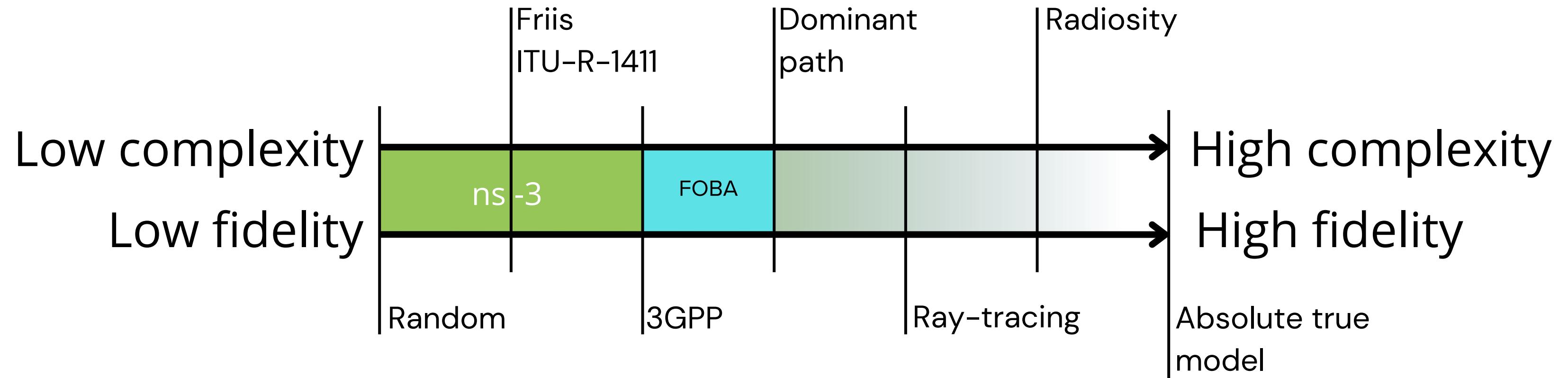


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Outlook

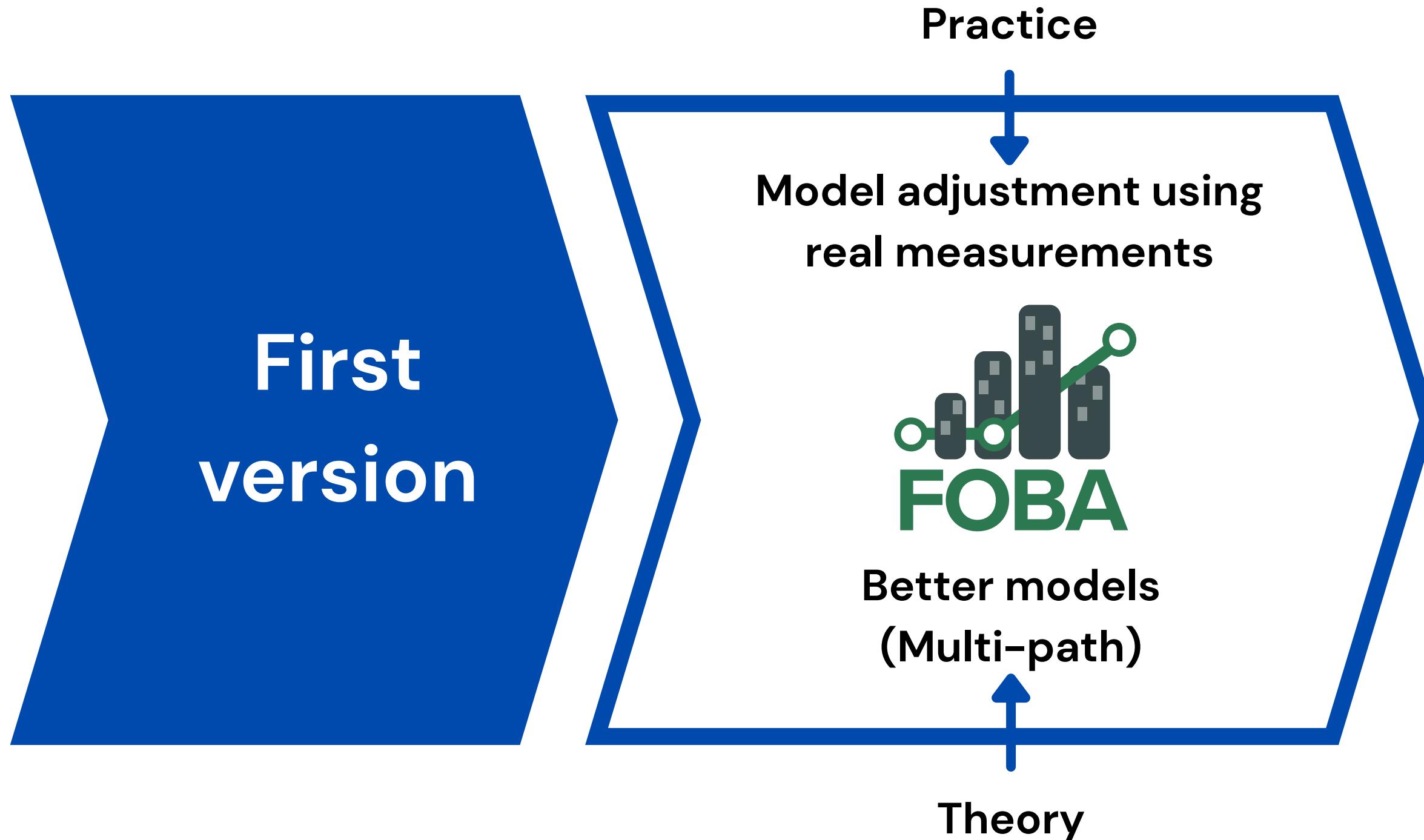
5. Outlook

First
version

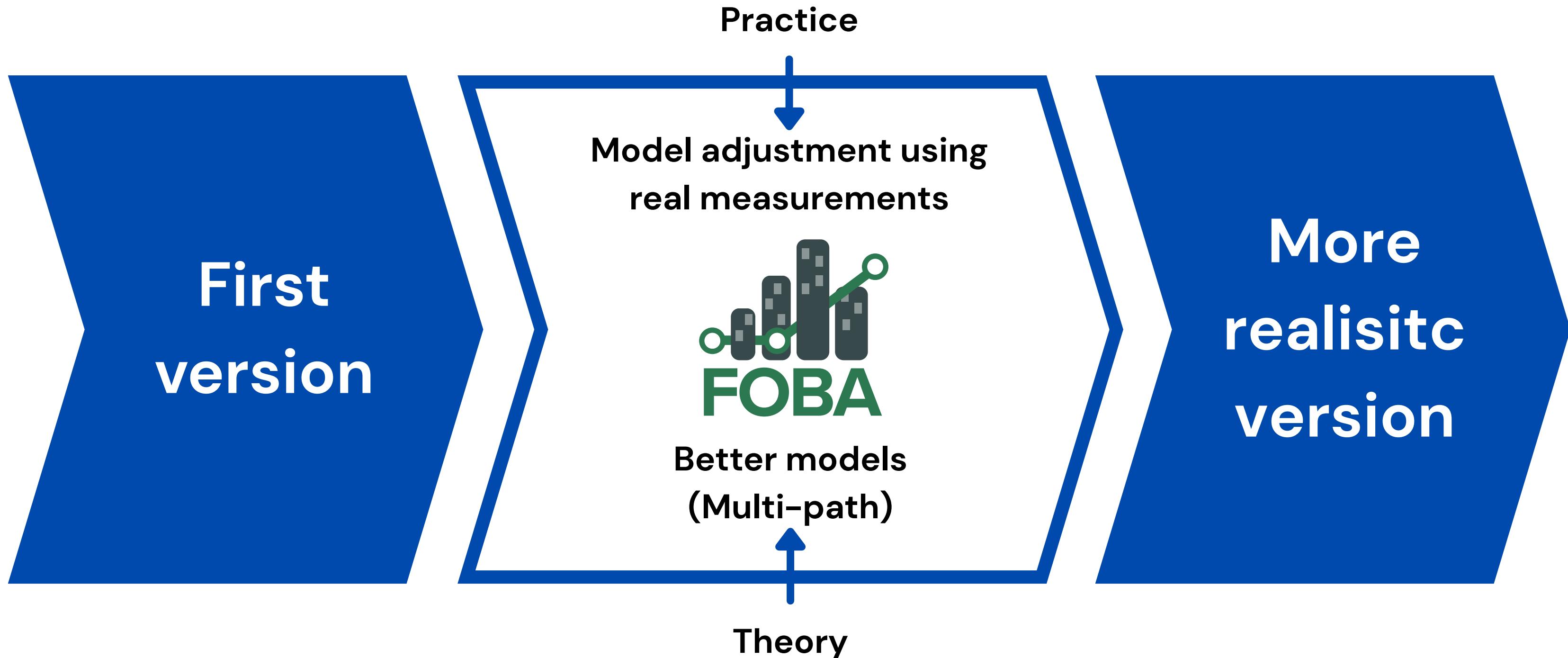
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5. Outlook





Available on GitHub

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Questions ?

Acknowledgments

This work has been co-funded by ONERA and the French Ministry of Defence's Innovation Agency (AID).

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4. Implementation and results

Simulation Description

Simulation Parameter	Value
ns-3 Version	3.44
Wi-Fi Standard	802.11g
Simulation time	400 s
Routing Protocol	AODV
Loss models	FOBA, Friis
Application	CBR (1 source, 1 sink)
Transport Protocol	UDP
Packets size	1024 (bits)
Packets rate	50 packets per seconds
Mobility model	ConstantPositionMobilityModel

4. Implementation and results

Simulation Description

Simulation Parameter	Value
ns-3 Version	3.44
Wi-Fi Standard	802.11g
Simulation time	300 s
Routing Protocol	OLSR
Loss models	FOBA, Friis, Two Ray Ground, ITU-R 1411
Application	CBR (4 sources, 4 sinks)
Transport Protocol	UDP
Packets size	1024 (bits)
Packets rate	50 packets per seconds
Mobility model	RandomWalk2dOutdoorMobilityModel

2.ns-3, signal propagation and path loss modeling

Signal propagation

- Decrease with the distance
- Obstacles may interfere with the strength of the signal

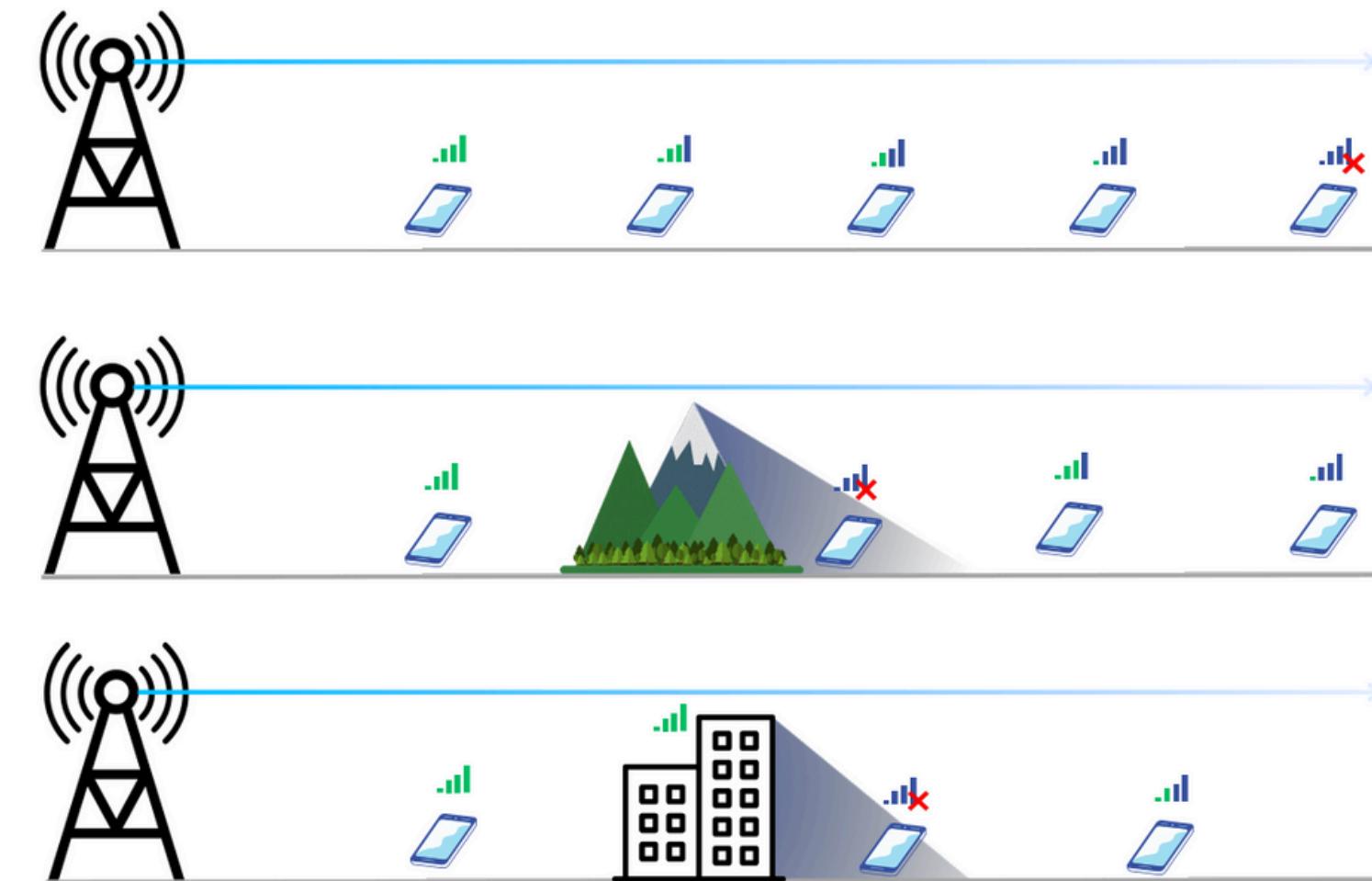


Figure 1 : Visual representation signal strength in multiple settings

2.ns-3, signal propagation and path loss modeling

Transparent buildings

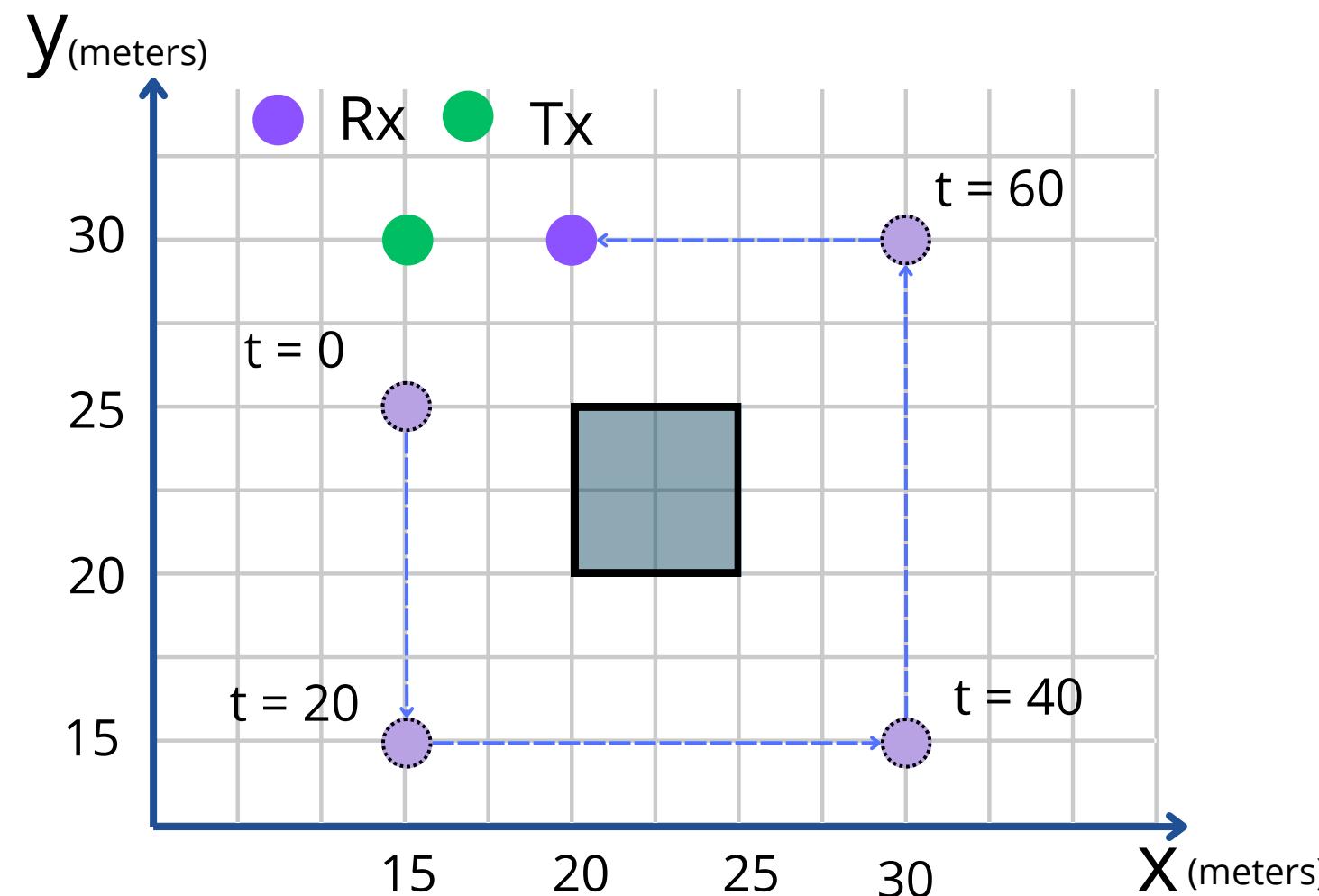


Figure 2 : Visualisation d'un scénario de mobilité

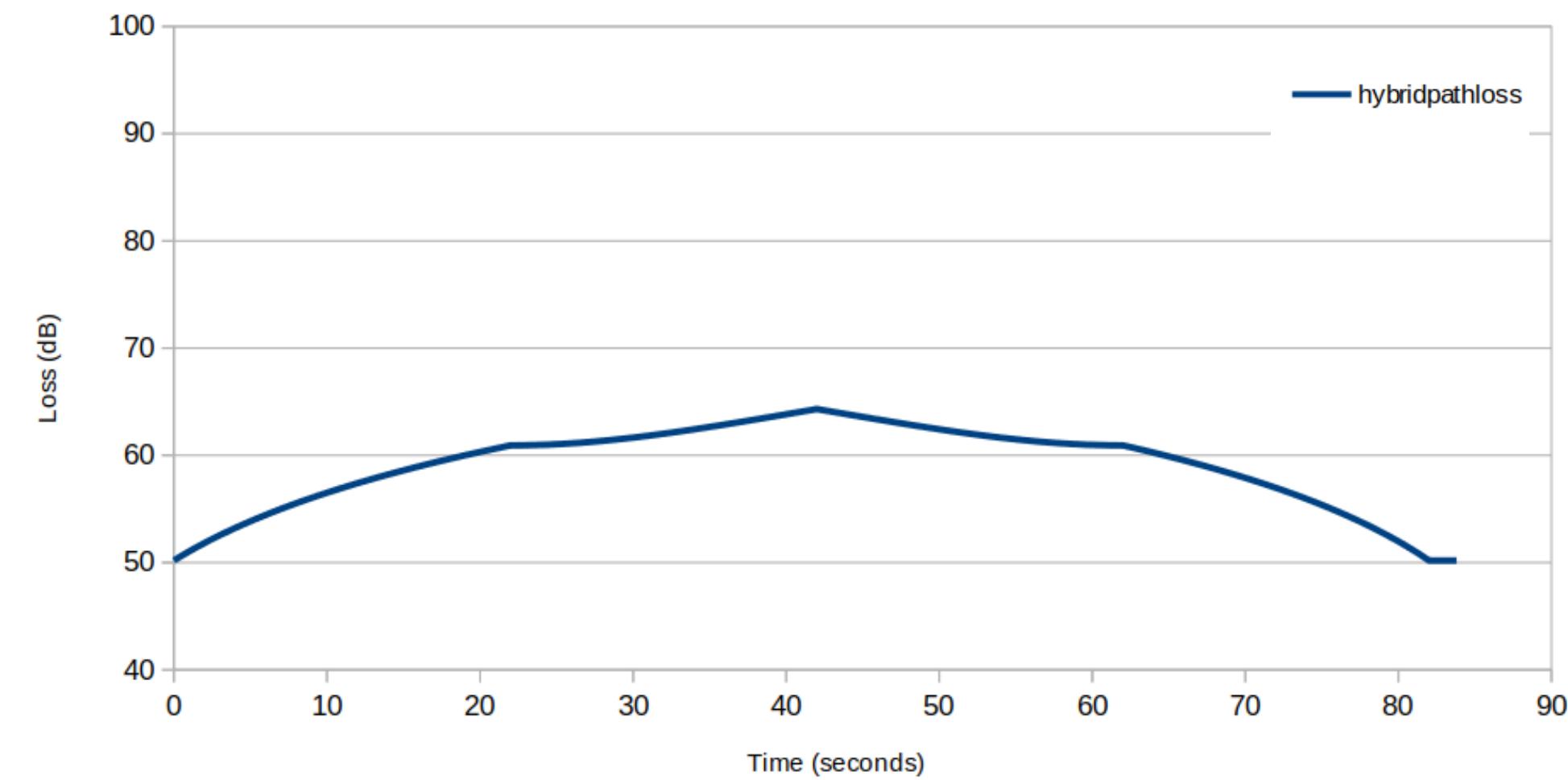


Figure 3 : Valeurs de pertes en fonction du temps

