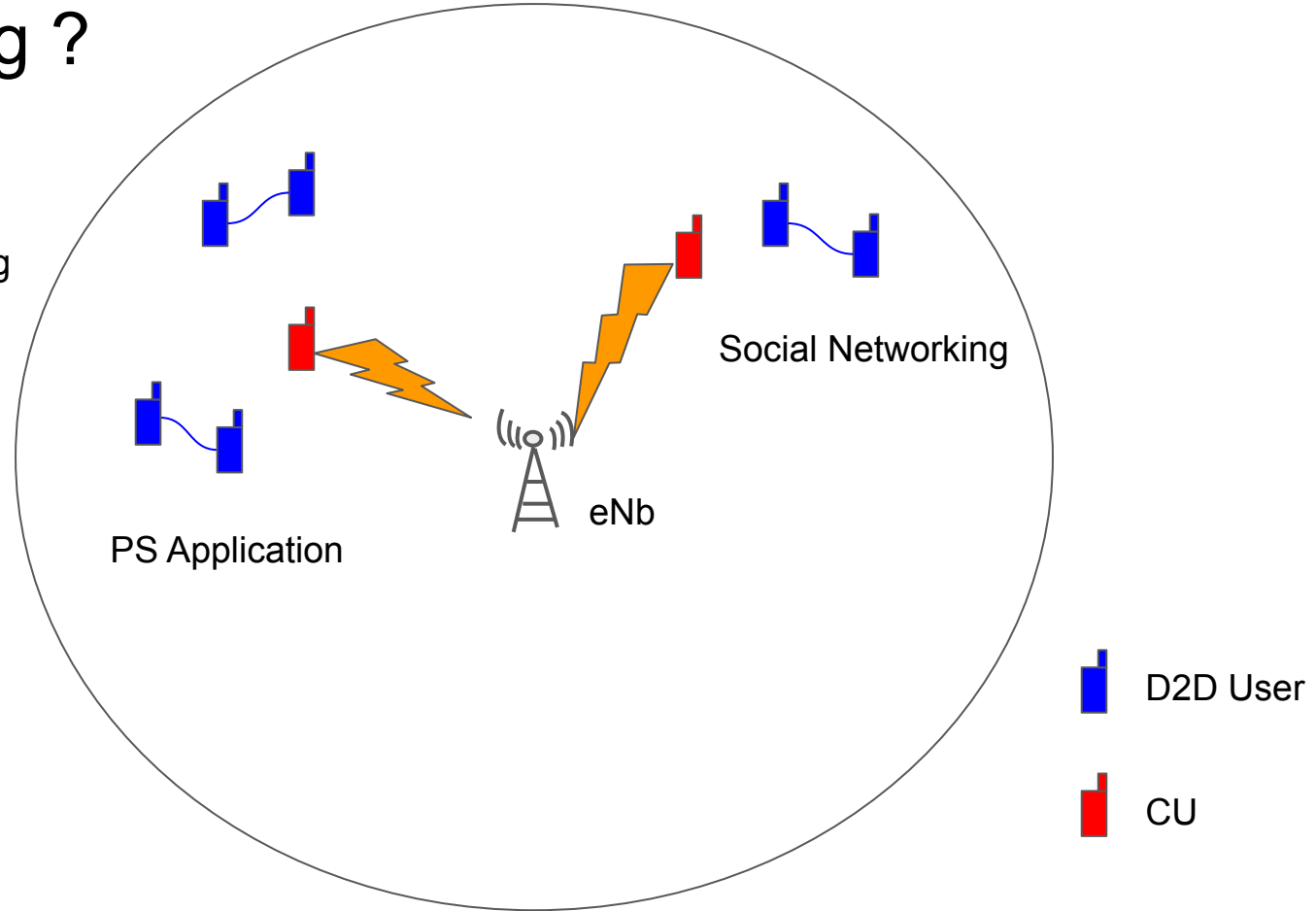# Course Project

IT200 - CCN

- Marks - 40

- Group of max 4.

- Course Project Evaluation - Immediately After End Sem theory exams.
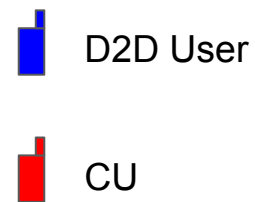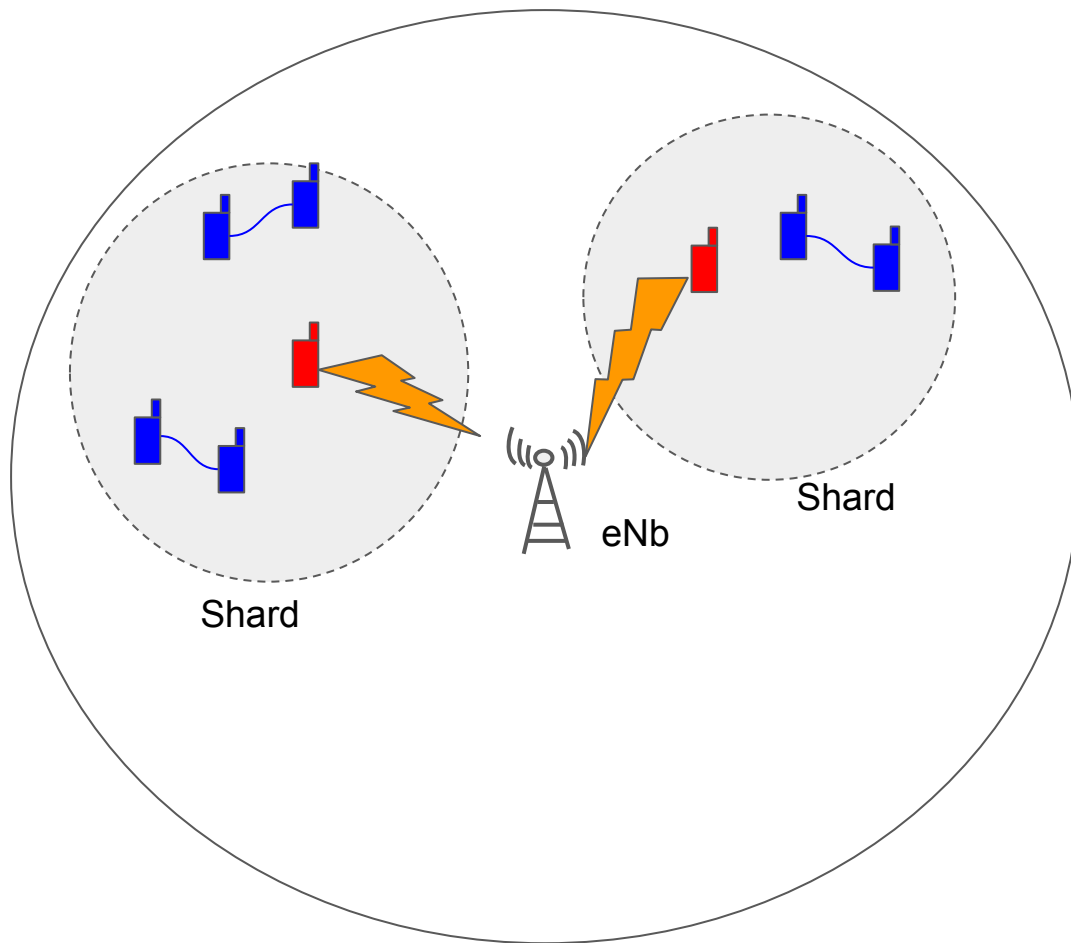
Why Sharding ?

Sharding is the new clustering

PS Application

eNb

Social Networking

D2D User

CU

Why Sharding ?

- eNB has to check the type of application before the resource allocation

    - Whether they are first responders ?

        - Many PS applications are there

    - The first responders has to be given more preferences.

- Checking every time the type of application

    - Differentiating PS applications with the commercial application - takes time.

    - Additional responsibilities for the eNB

Shard

eNb

Shard

D2D User

CU

After Sharding

- All D2D pairs will be put in to different shards based on their application.

- $Shard_i$ - PS application

- $Shard_j$ - Commercial Application

- If a resource request comes from $Shard_k$

  - eNB immediately knows, whether it is a PS or commercial application.

  - Without taking much time, eNB can allocate resource.

Sharding Methods

- Clustering methods

- Partitioning clustering

  - K-Means Clustering

  - Quality Threshhold Clustering

  - Expectation Maximization Clustering

  - Mean shift

Experiment 1:

1. The available Device to Device (D2D) pairs should be sharded (cluster) based on the application, Public Safety and Commercial Applications. For Sharding, any clustering algorithm can be considered.

2. A shard may contain any number of D2D Pairs.

3. Each shard should have at least one Cellular User (CU).

4. Display the shard members.

The Results Expected

- Shard Display.

- Which clustering algorithm is used ?

- Why ?

SINR

- Signal to Interference plus Noise Ratio (SINR).

  - Also called as SNIR

- Gives upper bound on channel capacity.

  - Signal Quality

- Ratio between the actual signal and unwanted interference and noise.

- Very important in Wireless Network.

  - Why ?

A Wired Network Scenario
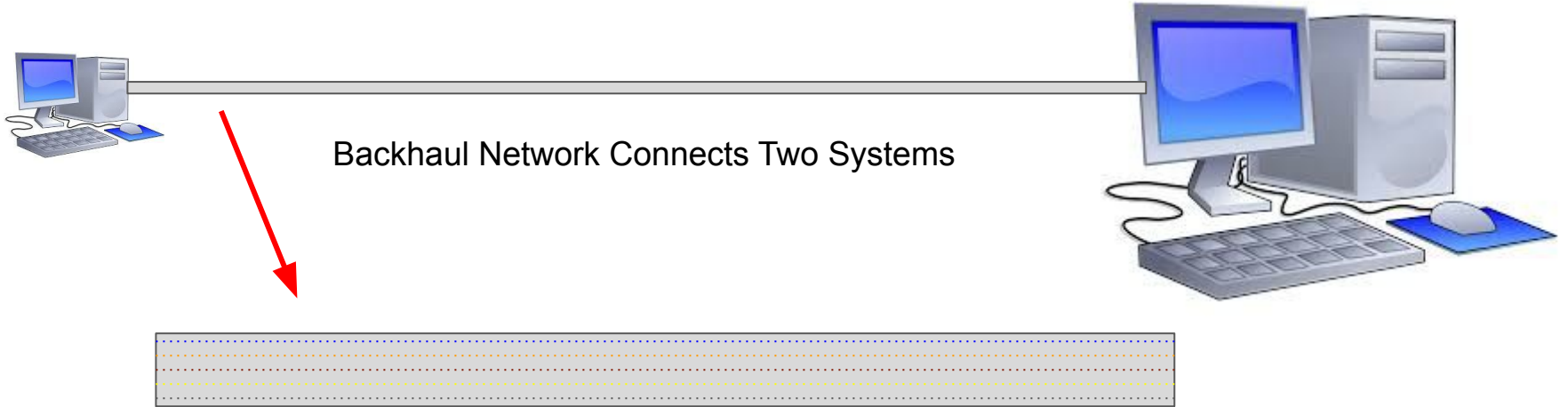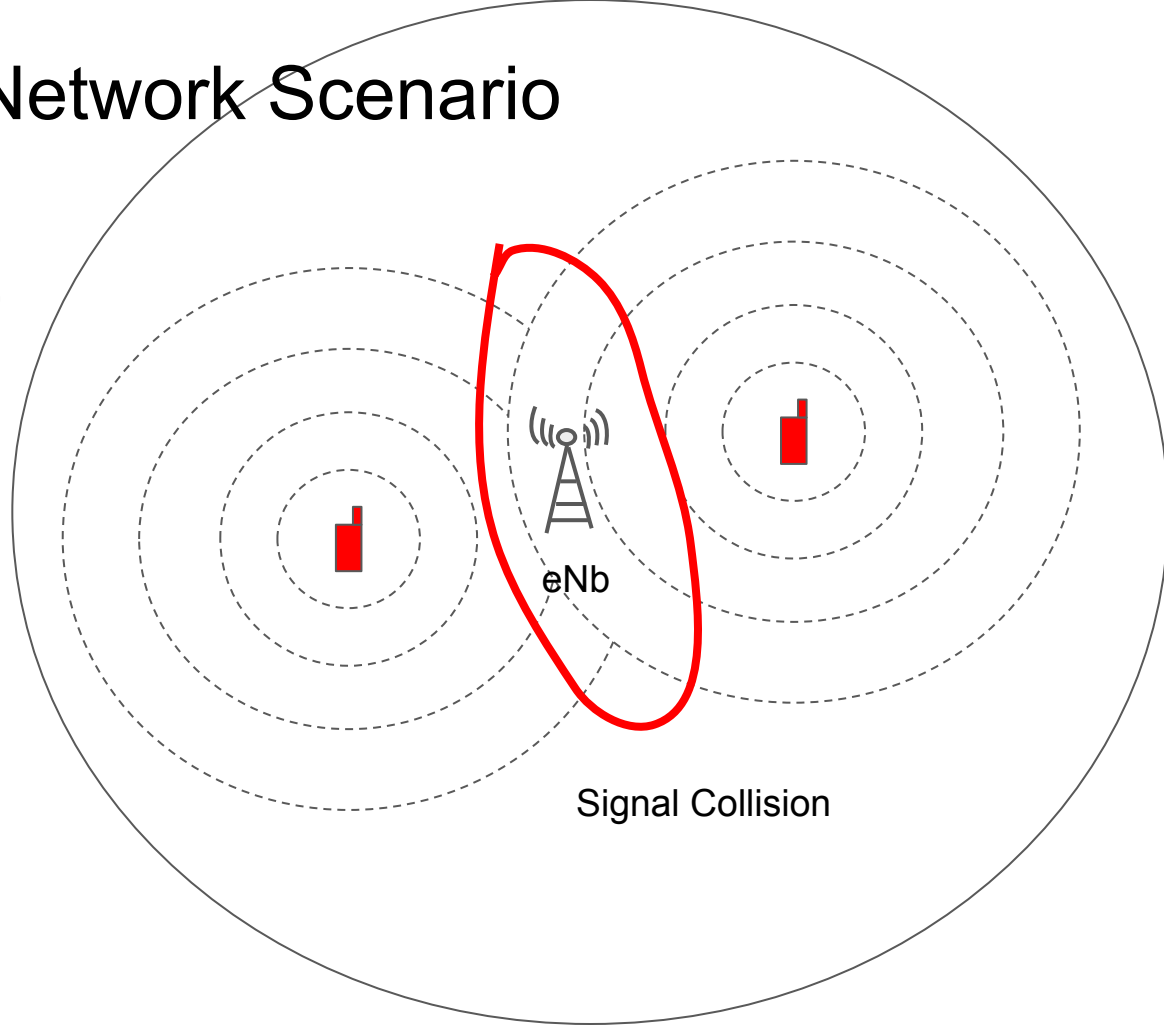
Backhaul Network Connects Two Systems

Backhaul Network Closer Look

············· Signals

- Clear Separation of Signals
- No signal collisions/interference

A Wireless Network Scenario

Signal Transmits in 360^0

eNb

Signal Collision

Difference Between Interference and Noise

- Noise - Unwanted signals

- Can be caused by

  ○ Signal - capture, storage, transmission, processing, or conversion

- Interference - Unwanted Noise

  ○ Caused by other near by signals.

- SINR - Interference + Other Noise

- Earlier SNR, now SINR

  ○ Noise from signal collision and other noise has been separated.

Why SINR ?

- Influences the data rate.

- Channel capacity will be known, thereby you can adjust the data rate.

- You can reduce the Tx power to reduce the interference.

How to calculate SINR in NS3 ?

- Should be calculated @ the destination node

- Based on the received signals.

- Follow the youtube videos.

Experiment 2

- Based on the Shards formed in the previous experiment

- Start the D2D communication at regular intervals (1 sec)

- Take the default attributes.

- Find the SINR at specified time.