CHANNEL ASSIGNMENT FOR MULTIHOP CELLULAR NETWORKS USING TWO RAY GROUND MODELS

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ABSTRACT

In multihop cellular networks mobile nodes typically transmit packets during intermediate mobile nodes for enhancing recital. The wireless technology and its application grow faster and faster since last decades. Mobile network is one of the fastest growing technologies in wireless network. This headed to some challenges that face mobile network such as how to serve the big number of users, efficiently of frequencies is scarce and interferes with each other. One of the solutions to deal with such challenges is Cellular Networks which is used to divide a geographical area in to cells so that we can reuse the scarce frequencies in order to support more users and also to decrease interference. Stingy nodes typically don't collaborate that incorporates a negative result on the network fairness and recital. A fair, inexpensive and best incentive mechanism by Selfish Node Detection has been projected to stimulate the mobile node's cooperation. Hashing operations area unit employed in order to extend the safety. Two ray ground models perform has been improve packet delay and Throughput. Additionally Two ray ground models Mechanism has been used to spot the ridiculous nodes that involve themselves in sessions with the intention of dropping the in sequence packets.

Keywords: *Node Mechanism, Channel Allocation, Cellular, Cooperation, Two ray ground etc.*

1. INTRODUCTION

Multihop Cellular Network (MCN) is a kind of new network structure which combines Multihop Adhoc Network (MANET) and Single hop Cellular Network(SCN). It has the advantages of the two networks, and it not only solves the problems of dead spots and hot spots of SCN, but also has the characters of MANET that is rapidly deployable. Now, most routing protocols of MCN is to be realized through the other nodes forwarding data to the BS to communicate with BS. Those routing protocols take no consideration of the user's demand, such as demand for band and relay, and they only find a path. If the path is broken, they should restart a new routing finding process, so their reliability is low.

This paper presents a multipath routing scheme MRMCN. Multipath has better flexibility and reliability than a single path, and it can avoid congestion effectively, and increase the utilization rate of the whole network. There are three communication methods in MRMCN: one hop direct transmission, two hop transmissions with other node forwarding and transmission with BS forwarding. This paper introduces the routing finding, routing choosing and routing maintenance process in detail. We define the quality of the path which is used to assign flow rate for each path.

The basic idea of MRMCN is to choose methods according to the different positions of the communications, then choose appropriate multiple paths according to the demand for band of the source, and then to assign flow rate for each path according to its quality weight. This routing protocol decreases the end to end delay of the data packet, and increases the throughput of the network. Lastly, The result of NS2 simulation shows the availability of this protocol. It is clear from the above discussion that more fundamental enhancements are necessary for the very ambitious throughput and coverage requirements of future networks. Towards that end, in addition to advanced transmission techniques and antenna technologies.

Some major modifications in the wireless network architecture itself, which will enable effective distribution and collection of signals to and from wireless users, are sought. The integration of "multihop" capability into the conventional wireless networks is perhaps the most promising architectural upgrade.

The wireless terminals in the network may act as relays for some other terminals which require relaying assistance ("mobile relays"); or alternatively, the relays might be low-cost low transmit power (compared to base stations) fixed network elements deployed by the service provider ("fixed relays"); hybrids are possible as well. It is clear that a fixed relay will be much less expensive than a base station (due to its low transmit power, limited functionality, etc); in the logical extent, the complexity of a relay may be comparable to that of a wireless terminal. they should restart a new routing finding process, so their reliability is low. This paper presents a multipal relaying can be performed in digital or analog manner. In the case of "digital relaying" or (sometimes referred to as "regenerative relaying" or "decode-and-forward relaying" as well), a relay digitally decodes and re-encodes the relayed signal before retransmission. In the case of "analog relaying", on the other hand, a relay simply amplifies the received signal before retransmission (this case is sometimes referred to as "non-regenerative relaying" or "amplify-and-forward relaying").It should also be remarked that more than one air interface can be used in a cellular multihop network. For instance, the "wireless backhaul" (the links between the relays and BSs or APs) may use one part of the spectrum while the links involving wireless terminals use another part. Alternatively, in a two-hop network, all the single-hop links as well as the BS to relay portion of the two-hop links can use the cellular spectrum and the relay to wireless terminal links can use the unlicensed spectrum.

A heuristic channel assignment scheme called the Minimum slot waiting first is used to Minimum Slot Waiting First consists of two phases: the proposing phase and the checking phase. A channel which contributes minimum delay is proposed for the node when assigning a channel on a relaying path. The selected channel is called proposed channel and the node the current node. Based on four rules a, b, c and d the channel is checked for channel conflicts. Rules a and b are used to check co-timeslot conflicts where as rules c and d are used for checking co-channel conflicts. The proposed channel is accepted if no rules are violated else the channel is eliminated. The two phases are:

1. Proposing phase: A channel that contributes the lowest relay delay is proposed to the current node on the path.
2. Checking phase: Rule a: The current node is not receiving on the time slot of the proposed channel. Rule b: The next hop node is not transmitting on or temporary assigned with the time slot of the proposed channel. Rule c: Nodes on the other routes having there transmission zones in which the next hop node falls are not transmitting on the proposed channel. Rule d: Nodes that are in the transmitting zone of the current node are not receiving on the proposed channel.

2. PROPOSED WORK

We define the quality of the path which is used to assign flow rate for each path. The basic idea of Multihop Cellular Network is to choose methods according to the different positions of the communications, then to choose appropriate multiple paths according to the demand for band of the source,
and then to assign flow rate for each path according to its quality weight. This routing protocol decreases the end to end delay of the data packet, and increases the throughput of the network. Lastly, The theory and practice of MCN communication has matured to the point where time division duplex is now an integral component of several recent WiFi and cellular standards, such as 802.11n, 802.11ac, long-term evolution (LTE), Wi-MAX, and investigate and understand some general features of a basic channel model from theoretical and practical point of view that minimize delay in different number of receiver nodes by using Channel Assignment as with two ray ground propagation model. The post-user-selection distribution depends strongly on the type of selection criterion, and is often difficult the distribution was derived in a single-antenna system with known co-channel statistics, but the latter assumption is unreasonable in most multi-user scenarios which Based on the resulting discoveries, develop new techniques and strategies to enhance the performance of the network model as with output parameter performance ratio with coverage distance , path loss exponent with timestamp which we have to simulate in MATLAB tool.

2.1 Estimation of the m-parameter

In this section two different methods to calculate the m-parameter in the m distribution will be introduced. The methods are the moment method and the maximum likelihood method.
It is proposed in that it is possible to use the moment method to estimate the m parameter. The estimator is

$$\hat{m}_1 = \frac{\hat{\mu}_2^{\,2}}{\hat{\mu}_4 - \hat{\mu}_2^{\,2}} \quad (1)$$

Where

$$\hat{\mu}_k = \left(\frac{1}{N}\right)\sum_{i=1}^{N} r_i^{\,k} \text{ ,k=2or4} \quad (2)$$

It is a suggested to use a maximum-likelihood (ML) estimation to obtain the ML-optimal-m value of the measured channel amplitude. Let $R_1, R_2, ..., R_N$ be random i.i.d. variables that corresponds to a multihop m fading channel. The log-likelihood function (LLF) of the independent multivariate m-distribution based on $R_1, R_2, ..., R_N$ is given by

$$LLF = \ln\left[\prod_{i=1}^{N}\frac{2}{\Gamma(m)}\left(\frac{m}{\Omega}\right)^{m} r_i^{2m-1} e^{-\left(m r_i^2 / \Omega\right)}\right] = N\cdot\ln\left[\frac{2}{\Gamma(m)}\left(\frac{m}{\Omega}\right)^{m}\right] + (2m-1)\sum_{i=1}^{N}\ln r_i^2 - \frac{m}{\Omega}\sum_{i=1}^{N} r_i^2 \quad (3)$$

Where {r_i, i = 1,2,…,N} are samples of {R_i, i=1,2,…,N}. Taking the derivative of the LLF with respect to m, and setting it equal to zero, we obtain

$$-\varphi(m) + \ln m = \frac{\frac{1}{m}\sum_{i=1}^{N} r_i^2}{\Omega} - 1 + \ln\Omega - \frac{1}{N}\sum_{i=1}^{N}\ln r_i^2 \quad (4)$$

Where $\varphi(...)$ is the psi function, also called the digamma function, defined as $\varphi(m) = \Gamma'(m) / \Gamma(m)$, where $\Gamma'(m) = \frac{\partial\Gamma(m)}{\partial m}$. The statistic for m in requires knowledge of σ^2 which is usually not known. Substitution of the unbiased maximum-likelihood estimators of Ω, $\hat{\Omega} = \left(\frac{1}{N}\right)\sum_{i=1}^{N} r_i^2$, in (4) yields

$$-\varphi(m) + \ln m \approx \Delta \quad (5)$$

Where the approximation in (6) becomes exact as N approaches infinity, and where

$$\Delta = \ln\left[\frac{1}{N}\sum_{i=1}^{N} r_i^2\right] - \frac{1}{N}\sum_{i=1}^{N}\ln(r_i^2) \quad (6)$$

The parameter Δ is determined by the observed samples only and it is independent of m. The ML estimation of the m parameter requires solving the nonlinear equation (6), which does not lead to a closed-form solution for the estimator. An asymptotic expansion of the psi function $\varphi(z)$ is given as:

$$\varphi(z) \approx \ln z - \frac{1}{2z} - \frac{1}{12z^2} + \frac{1}{120z^4} - \frac{1}{252z^6} + \ldots \quad (7)$$

$12\Delta m^2 - 6m - 1 = 0$ for m, we obtain using the second order approximation $\varphi(z) \approx \ln z - \frac{1}{2z} - \frac{1}{12z^2}$ in (8) and solving $12\Delta m^2 - 6m - 1 = 0$ for m, we obtain

$$\hat{m}_2 = \frac{6+\sqrt{36+48\Delta}}{24\Delta} \quad (8)$$

as the ML-estimator for m. In eq (8) all negative solutions have been discarded since only positive m values are of interest.

It is stated in [4] that the $\hat{m}_1$ works badly when the m-value is low but gets better with higher m-values but never gets as good as $\hat{m}_2$.

2.3. Power spectral density

Power Spectral Density (PSD) is the frequency response of a random or periodic signal. It tells us where the average power is distributed as a function of frequency.

- The PSD is deterministic, and for certain types of random signals is independent of time[1]. This is useful because the Fourier transform of a random time signal is itself random, and therefore of little use calculating transfer relationships (i.e., finding the output of a filter when the input is random).

- The PSD of a random time signal x(t) can be expressed in one of two ways that are equivalent to each other

  1. The PSD is the average of the Fourier transform magnitude squared, over a large time interval

  $$S_x(f) = \lim_{T\to\infty} E\left\{ \frac{1}{2T} \left| \int_{-T}^{T} x(t) e^{-j2\pi f t} dt \right|^2 \right\} \quad (9)$$

  2. The PSD is the Fourier transform of the auto-correlation function.

$$S_x(f) = \int_{-T}^{T} R_x(\tau) e^{-j2\pi f t} dt \quad (10)$$

$$R_x(\tau) = E\{x(t)x^*(t+\tau)\} \quad (11)$$

•The power can be calculated from a random signal over a given band of frequencies as follows:

1. Total Power in x(t):

$$P = \int_{-\infty}^{\infty} S_x(f) df = R_x(\mathbf{0}) \quad (12)$$

,It should also be considered that leads to a more complicated implementation.

2. Power in x(t) in range f_1 - f_2:

$$P_{12} = \int_{f_1}^{f_2} S_x(f) df = R_x(\mathbf{0}) \quad (13)$$

•If a random signal x(t) is passed through a time-invariant filter with frequency response H(f), the resulting signal y(t) has a PSD as follows,

The von Karman velocity power spectral density S_V for vertical and lateral gusts is

$$S_v(\Omega) = v_{rms}^2 \left(\frac{L}{\pi}\right) \frac{1+\frac{8}{3}(aL\Omega)^2}{\left[1+(aL\Omega)^2\right]^{11/6}} \quad , (ft/\sec)^2/(rad/ft) \quad (14)$$

$$S_V(\beta) = v_{rms}^2 (2L) \frac{1+\frac{8}{3}(2\pi a L\beta)^2}{\left[1+(2\pi a L\beta)^2\right]^{11/6}} \quad , (ft/sec)^2/(cycles/ft) \quad (15)$$

$$S_v(f) = v_{rms}^2 \left(\frac{2L}{U}\right) \frac{1+\frac{8}{3}(2\pi a f L/U)^2}{\left[1+(2\pi a f L/U)^2\right]^{11/6}} \quad ,(ft/\sec)^2/Hz \quad (16)$$

The von Karman velocity power spectral density S_V for longitudinal gusts is

$$S_V(\Omega) = v_{rms}^2 \left(\frac{2L}{\pi}\right) \frac{1}{\left[1+(a L\Omega)^2\right]^{5/6}} \quad , (ft/sec)^2/(rad/ft) \quad (17)$$

$$S_V(\beta) = v_{rms}^2 (4L) \frac{1}{\left[1+(2\pi a L\beta)^2\right]^{11/6}} \quad , (ft/sec)^2/(cycles/ft) \quad (18)$$

$$S_V(f) = v_{rms}^2 \left(\frac{4L}{U}\right) \frac{1}{\left[1+(2\pi a f L/U)^2\right]^{5/6}} \quad , (ft/sec)^2/Hz \quad (19)$$

The Dryden velocity power spectral density S_V for vertical and lateral gusts is

$$S_V(\Omega) = v_{rms}^2 \left(\frac{L}{\pi}\right) \frac{1+3(L\Omega)^2}{\left[1+(L\Omega)^2\right]^2} \quad , (ft/sec)^2/(rad/Hz) \quad (20)$$

$$S_V(\beta) = v_{rms}^2 (2L) \frac{1+3(2\pi L\beta)^2}{\left[1+(2\pi \beta)^2\right]^2} \quad , (ft/sec)^2/(cycles/ft) \quad (21)$$

$$S_V(f) = v_{rms}^2 \left(\frac{2L}{U}\right) \frac{1+3(2\pi f L/U)^2}{\left[1+(2\pi f L/U)^2\right]^2} \quad , (ft/sec)^2/Hz \quad (22)$$

The Dryden velocity power spectral density S_v for longitudinal gusts is

$$S_V(\Omega) = v_{rms}^2 \left(\frac{2L}{\pi}\right) \frac{1}{\left[1+(L\Omega)^2\right]^2} \quad , \quad (ft/sec)^2/(rad/Hz) \qquad (23)$$

$$S_V(\beta) = v_{rms}^2 (4L) \frac{1}{\left[1+(2\pi\,\beta)^2\right]^2} \quad , \quad (ft/sec)^2/(cycles/ft) \qquad (24)$$

$$S_V(f) = v_{rms}^2 \left(\frac{4L}{U}\right) \frac{1}{\left[1+(2\pi\, f\, L/U)^2\right]^2} \quad , \quad (ft/sec)^2/Hz \qquad (25)$$

2.4 Spreading of Sequence

A fundamental problem in wireless communications is to allow multiple share simultaneously a finite amount of spectrum. This is referred to as the multiple access problem. This problem arises in wired environments as well, e.g., the Ethernet. At a high level, multiple access schemes can be divided into five categories:

• Frequency division multiple accesses (FDMA): In FDMA, the spectrum is divided into individual channels, each of which is allocated to an individual user for a period of time. During this period no other user can use the same channel (piece of the spectrum); other users, however, could be simultaneously using other disjoint pieces of the spectrum.
• Time division multiple access (TDMA): In TDMA, time is divided into slots, and in any slot one user transmits/receives over the entire spectrum for the duration of the slot. No other user uses the channel during the slot. Data has to be sent in bursts, so digital data and digital modulation must be used with TDMA.
• Spread Spectrum multiple access (SSMA): In spread spectrum, the transmission bandwidth of the signals is several orders of magnitude greater than the minimum bandwidth required for transmitting a given piece of information. However, many users can share the same spread spectrum bandwidth without interfering with one another. Spread spectrum uses encoding techniques that are different than the ones we discussed in the preceding chapter; these will be the focus of this chapter. The two most common techniques for implementing SSMA are frequency-hopping spread spectrum (FHSS) and direct sequence spread spectrum (DSSS).
• Space division multiple access (SDMA): Another multiple access method is to divide the space into areas such that a receiving node can distinguish among signals received from these areas. In SDMA, a node can simultaneously receive/send signals to/from multiple users, spread across its 360-degree span, by using directional antennas that concentrate energy within a narrow arc of the span.
• Carrier senses multiple accesses (CSMA): In CSMA, wireless nodes sense the medium for an on-going transmission, to avoid collisions. CSMA schemes widely used in ad hoc networks as well as the IEEE 802.11 wireless LAN, both of which will be studied in detail later in the course.

2.5 BPSK

A very popular digital modulation scheme, binary phase shift keying (BPSK), shifts the carrier sine wave 180° for each change in binary state .BPSK is coherent as the phase transitions occur at the zero crossing points. The proper demodulation of BPSK requires the signal to be compared to a sine carrier of the same phase. This involves carrier recovery and other complex circuitry.

The constellation diagram is shown in the figure 2

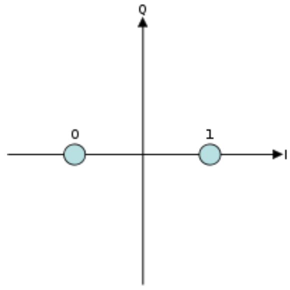

Figure 2: Constellation diagram for BPSK

General equation for BPSK is given by following formula.
$S_1(t) = g(t)\cos(2\pi ft)$
$S_2(t) = g(t)\cos(2\pi ft + \pi) = -g(t)\cos(2\pi ft)$
Here, g(t) is the pulse shapping filter and raised cosine filter is generally used. If its amplitude is A then its value will be

$$A=\sqrt{\left(\frac{2Eb}{Tb}\right)} \qquad (26)$$

For binary case we require only one basis function for modulation scheme.

$$\emptyset = \cos(2\pi f c\, t)\sqrt{\frac{2}{Tb}} \qquad 0<t<Tb \quad (27)$$

We have done the MATLAB modulation and demodulation for BPSK in MATLAB for user selected 5 bit inputs. The Figure 3 shows the modulation and demodulation waveforms for the input [1 0 1 1 0].

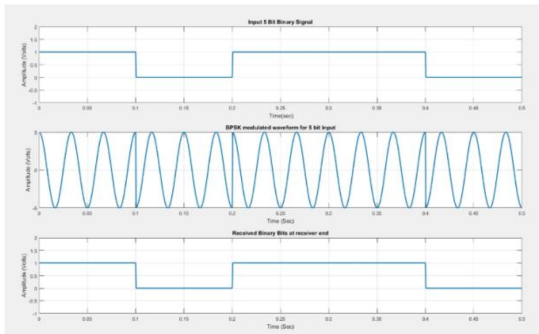

Figure 3: BPSK modulation and Demodulation

As this is BPSK, probability for symbol error and probability for bit error will be equal and its equation is given by following equation [3].

$$P_b = Q\left(\sqrt{\frac{2Eb}{No}}\right) \qquad (28)$$

AWGN channel (frequency):
AWGN (Additive white Gaussian noise (sound)) classic equation is given as-

$$\mathbf{V_t = U_t + N_t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (29)$$

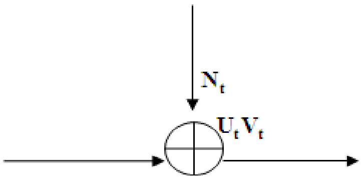

Figure 4: Blok diagram of AWGN classic

Noise (sound) occurs in all communiqués patterns working over an equivalent physical channel (frequency), such as wireless. The highest bases are current contextual noise (sound), and electrical noise (sound) in the receiver loudspeakers, and inter-cellular interference. In adding to this noise (sound) (sound) can also be produced inside to the communiqués method as a result of Inter-Symbol Interference (ISI), Inter-Carrier Interference (ICI), and Inter-Modulation Distortion (IMD). These foundations of noise (sound) decrease the Signal to Noise (sound) Ratio (SNR), eventually warning the spectral competence of the method. Noise (sound), in entirely its forms, is the main damaging effect in greatest wireless communiqué approaches.

$$f_X(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \cdot \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) \qquad (30)$$

It is consequently significant to research the belongings of noise (sound) on the infrastructures error rate and certain of the compromises that occurs between the level of noise (sound) and method haunted competence.
Maximum kinds of noise (sound) current in wireless communiqué approaches can be demonstrated accurately using Additive White Gaussian Noise (sound) (AWGN). This noise (sound) has a unchanging spectral thickness (making it white), and a Gaussian distribution in largeness.

3. SIMULATION RESULTS

The simulation of two ray method is done by using MATLAB software. The result is centered on the average archival rate.In a wireless communication channel, the communicated signal can travel from transmitter to receiver over multiple reflective paths. This gives rise to fading which causes fluctuations in amplitude, phase and angle of entrance of the received signal.

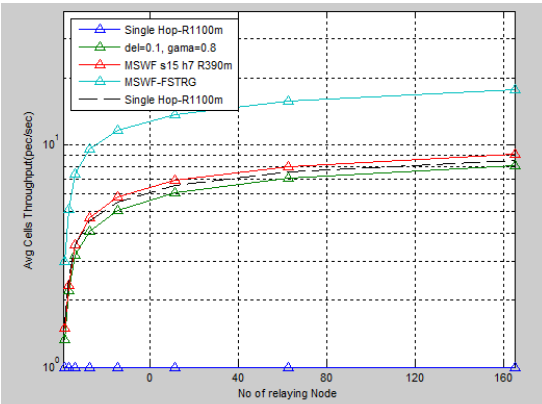

Figure 5: Performance of two ray ground models compare for Average cells Throughput

The result got shows that there is an improvement in capacity of Multihop channel when the Two ray ground fading solution is implemented to achieve capacity maximization is used to allocate different powers to the sub channels. And for correlated channel with two ray algorithm, the channel capacity with respect in increase in number of transmitting and receiving antenna for fixed values of snap length.

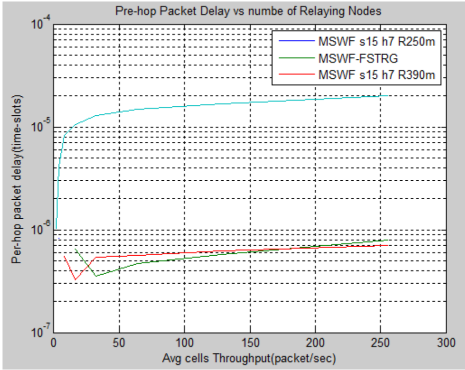

Figure 6: Performance of two ray ground models compare for Per-hop packet Average cells Throughput.

Since the available frequencies for channel allocation in cellular communication networks are scarce, whatever way to improve the utilization of these resources is important to support better service. In this work our model helps to optimally allocate the scarce channels and thus provide better service. The strength of our proposed work comes from the dynamic and intelligent way of allocation channels.

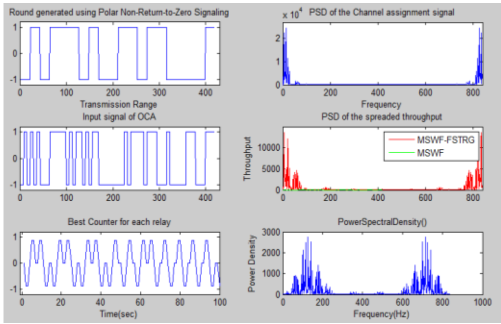

Figure 7: Round generated using Polar Non-return to Zero signalling and PSD of the channel assignment signal.

4. CONCLUSION

After resulting the performance of multi-mode pre-coding for Two-ray ground systems when the feedback rate available for conveying the channel state information is limited. We implemented an optimal ML receiver and a low-complexity MSWF-type receiver for this scenario which affect the efficiency of this technique, Single Hop-R1100m, del=0.1, gama=0.8, MSWF s15 h7 R390m, MSWF-FSTRG and Single Hop-R1100m.

A new dynamic channel allocation method based on artificial intelligent was proposed, the base stations here should be intelligent to communicate with other base stations in order to allocate channel intelligently to reach the optimal balance between the available frequencies and the number of users. The transmitter it transmits with the same amount of energy from all antennas and when there is a lot of noise in the channel or a AWGN channel there is a good chance that the signals different multipath gets independent fading. One of the solutions to deal with such challenges is Cellular Networks which is used to divide a geographical area in to cells so that we can reuse the scarce frequencies in order to support more users and also to decrease interference.

This work introduces the importance of dynamic channel allocation in cellular networks and how much gain could be utilized by this technique. The Methodology depend on an intensive reading of what other research has been done in the field, then the model factors and the goal was built according to the main importance issues in this field. In order to realize the complications and limitations of the topic and to have comprehensive understanding many work in the literature have been revised. The mechanism was tested in two different scenarios, with uniform and non-uniform load distribution.

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