Self-Optimisation of LTE Home Base Stations

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**Abstract:**

In LTE an extensive use of home base stations, also referred to as home eNodeBs, is foreseen. A home eNodeB will be physically installed by the customer and may be physically inaccessible for the operator. Further, the number of home eNodeBs are foreseen to be large. This gives a need for self-optimisation of home eNodeBs. A home eNodeB is typically installed to cover a given area, e.g. inside a building, and it is desired that the home eNodeB has no coverage holes in that area and also that the edge of the area is covered. However, this must be weighed against the interference caused by the home eNodeB. Further, a seamless mobility to and from home eNodeBs is desired. Due to small coverage areas a handover to a home eNodeB is not always favourable, especially for UEs moving fast.

The SOCRATES (Self-Optimisation and self-ConfiguRATion in wireEses networkS) project aims at developing self-organisation methods to enhance the operations of 3GPP LTE radio networks. In this work, home eNodeB interference and coverage as well as mobility to and from home eNodeB cells have been identified as possible objectives for self-optimisation and selected for further studies. Measurements to use as input for optimisation algorithms have been identified and possible parameters that may be used to control the objectives of the self-optimisation have been identified. A method for considering the prioritizations of different operators have also been developed. In further work, simulations will be used in order to evaluate effects and gains from changing the identified control parameters and based on the results algorithms for the self-optimisation will be developed.
Outline

- Introduction
- NGMN and 3GPP Work
- Use Cases
- Operator Policy
- Measurements
- Control Parameters
- Assessment Criteria
- Future Work
Introduction

- Extensive use of Home eNodeBs foreseen
- Used to improve or create coverage and/or capacity in small areas
- Self-optimisation needed

- Home eNodeB characteristics differ from macro eNodeBs
  - Potentially large number of home eNodeBs
  - Small coverage areas
  - Probably few users per cell
  - May be turned on and off frequently
  - May be switched off and moved
  - Not physically accessible for operators
  - Closed or open access
  - May operate on a separate frequency from the macro eNodeBs

In future communication networks self-organisation is foreseen to be very beneficial. By automating network operation the need of human interaction can be reduced and operational expenditure (OPEX) is lowered while optimising the network efficiency and service quality. The SOCRATES (Self-Optimisation and self-Configuration in wireless networks) project aims at the development of self-organisation methods to enhance the operations of 3GPP LTE radio networks, by integrating network planning, configuration and optimisation into a single, mostly automated process requiring minimal manual intervention. In this work a number of different use cases have been identified and selected for further studies.

In LTE an extensive use of home base stations, also referred to as home eNodeBs, is foreseen. A home eNodeB will be physically installed by the customer and may be physically inaccessible for the operator. Further, the number of home eNodeBs are foreseen to be large. This gives a need for self-optimisation of home eNodeBs. Self-optimisation of home eNodeBs is one of the use cases SOCRATES has selected to study further.

Home eNodeBs will be used to improve or create coverage and/or capacity in small areas, such as a house, a work place or a coffee bar. The home eNodeBs may be deployed in both home environments, office environments and public environments. An office deployment leads to a possible need of closed access for the home eNodeB, while a public home eNodeB should have open access. The characteristics of home eNodeBs differ from macro eNodeBs in the following aspects:

- There will potentially be a large number of home eNodeBs in a radio network
- The coverage areas are small
- There will probably be only a few users per cell
- A home eNodeB may be turned on and off frequently
- A home eNodeB may be switched off and moved to a new geographical position before it is turned on again
- The home eNodeB is not physically accessible for operators
- A home eNodeB may have closed or open access, each with different characteristics:
  - A closed access home eNodeB has the potential to interfere with UEs connected to the macro cell, but within the home eNodeBs coverage area.
  - An open access home eNodeB network could negatively impact fast moving macro cell users, initiating constant handovers.
- The home eNodeB may or may not operate on a separate frequency from the macro eNodeBs

The said home eNodeB characteristics implies different use cases where self-optimisation could be beneficial. A number of use cases have been considered by SOCRATES and are described in the following slides.
NGMN and 3GPP Work

HeNB optimisation work is ongoing within the bodies:

- **3rd Generation Partnership Project (3GPP)**
  - HeNB standardisation is ongoing in 3GPP. Mechanisms standardised for HNBs will also be used for the HeNBs.

- **Next Generation Mobile Networks (NGMN)**
  - NGMN work on HeNB has been presented by means of the public deliverables:
    - Informative List of SON Use Cases
    - NGMN Recommendation on SON & O&M Requirements.

- **SOCRATES** regularly exchange information with NGMN and 3GPP, via liaison persons.

Home eNodeB self-optimisation aspects are also considered within the 3rd Generation Partnership Project (3GPP) standardisation body and the mobile network operators’ alliance Next Generation Mobile Networks (NGMN).

**3rd Generation Partnership Project (3GPP)**

Home eNodeB standardisation is currently ongoing in 3GPP. Some 3GPP documentation handles both 3G Home NodeBs and LTE Home eNodeBs. The mechanisms standardized for HNBs will probably also be used as starting point for the HeNBs. Interference, architecture, open/closed subscriber groups and mobility are issues under development and discussion in 3GPP standardisation. Even though there are still a many issues not decided upon and documented in technical specifications, a lot of discussions are ongoing in 3GPP in the area.

**Next Generation Mobile Networks (NGMN)**

In the NGMN document “Informative List of SON Use Cases” two use cases related to Home eNodeBs are presented, aiming at radio parameter optimisation and transport parameter optimisation. The Home eNodeB use case in SOCRATES is closely related to the NGMN radio parameter optimisation use case, although the SOCRATES use case contains more details. The transport parameter optimisation use case considers the connection of the Home eNodeB to the fixed transport network and is out-of-scope for SOCRATES. In the document “NGMN Recommendation on SON & O&M Requirements” requirements for two home eNodeB related use cases are specified.

SOCRATES regularly exchange information with NGMN and 3GPP. This is primarily done via liaison persons from the industrial partners in the consortium. Results from the SOCRATES work will be used as input to NGMN and 3GPP.
### Home eNodeB Optimisation Sub Use Cases

Self-organisation of home eNodeBs has been divided into four sub use cases:

- **Home eNodeB Neighbour Relations**
  - Detect neighbouring eNodeBs
  - Maintain and optimise the neighbouring cell list

- **Home eNodeB Handover Optimisation**
  - Decide if handover should take place
  - Optimise handover parameters

- **Home eNodeB Interference and Coverage Optimisation**
  - Optimise the coverage area while minimising interference

- **Home eNodeB Initialisation and Configuration**
  - Connect to operator network
  - Find appropriate settings to run smoothly without problems for other eNodeBs and UEs in the network.

Two of these sub use cases have been selected for further studies.

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As previously described, home eNodeB characteristics implies different use cases where self-organisation could be beneficial. A number of use cases have been considered by SOCRATES and the objectives of these are described below.

**Home eNodeB Neighbour Relations**
A home eNodeB should automatically, with minimal customer intervention detect neighbouring eNodeBs, including other home eNodeBs and maintain and optimise the neighbouring cell list to provide seamless mobility to and from the home eNodeB.

**Home eNodeB Handover Optimisation**
A home eNodeB should automatically, with minimal customer intervention decide if a handover (between macro and home eNodeB or between home eNodeBs) should take place and optimise handover parameters in order to provide seamless mobility between home eNodeBs and from home eNodeBs to macro eNodeB and vice versa.

**Home eNodeB Interference and Coverage Optimisation**
A home eNodeB should automatically, with minimal customer intervention configure radio parameters to, under constraints on the provided service, optimise its coverage area and minimise the interference in the network.

**Home eNodeB Initialisation and Configuration**
A home eNodeB should upon switch-on automatically, with minimal customer intervention connect to the operator network and find the appropriate settings to get up and run smoothly in the network without causing problems for other eNodeBs and UEs in the network.

The two sub use cases *Home eNodeB Handover Optimisation* and *Home eNodeB Interference and Coverage Optimisation* are considered to be the most relevant sub use cases for SOCRATES. They offer a research challenge and also have significant differences from the corresponding macro eNodeB use cases. Therefore, these sub use cases have been selected as use cases to study further in SOCRATES.
### Home eNodeB Handover Optimisation

**Handover optimisation objective:**
- Automatically decide if a home eNodeB handover should take place
- Optimise handover parameters in order to provide seamless mobility

**Aspects to consider for handovers to or from home eNodeBs:**
- Small coverage areas
- Closed Access Groups
- Frequency changes

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**Handover to and from home eNodeBs**

A home eNodeB should automatically, with minimal customer intervention decide if a handover (between macro and home eNodeB or between home eNodeBs) should take place and optimise handover parameters in order to provide seamless mobility between home eNodeBs and from home eNodeBs to macro eNodeB and vice versa.

In certain cases it may be beneficial not to hand over to home eNodeBs, especially for fast moving UEs served by macro cells. The coverage areas of home eNodeBs will typically be small and for example it may not always be beneficial to hand over UEs to the home eNodeB as the UE might leave the cell soon. Further, for closed access home eNodeB target cells the handover should be based on the UE’s access rights. In case the home eNodeB operates on a separate frequency from the macro eNodeBs, frequency changes could be avoided in order to facilitate handovers, or encouraged in order to decrease interference, by rating candidate base stations on another frequency as worse or better handover candidates.
**Home eNodeB Interference and Coverage Optimisation**

Interference and coverage optimisation objective:
- optimise coverage area
- minimise interference in the network.

Aspects to consider for interference and coverage optimisation:
- Coverage holes
- Size of coverage area
- Closed access home eNodeB interference
- Trade-off coverage – interference

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Home eNodeB Interference and Coverage Optimisation

A home eNodeB should automatically, with minimal customer intervention configure radio parameters to, under constraints on the provided service, optimise its coverage area and minimise the interference in the network.

For the home eNodeB user, it is important that the home eNodeB provides coverage for the entire area it is intended to do. For example, a home eNodeB is often intended to cover a building, and there should be no coverage holes in that building. The detection and removal, or minimisation, of coverage holes is therefore desired, as well as a coverage area large enough to cover the areas where users normally move. The coverage area of a home eNodeB can be maximised by configuring radio parameters, such as for example the cell power. This is however a trade-off with the interference caused by the home eNodeB. The coverage-interference trade-off is somewhat more complex for closed access home eNodeBs than for open access home eNodeBs. UE's with no access rights to a closed access home eNodeB in the area will be served by other eNodeBs, but may still have a stronger signal from the closed home eNodeB. The closed access home eNodeB will then cause interference for the UEs. Further, UEs served by the closed access home eNodeB may cause uplink interference on other eNodeBs, especially if the closed access home eNodeB is situated closely to the other eNodeB.
Different operators may have different marketing priorities and performance targets. An operator could for example focus on providing coverage and consider degraded quality at the cell edge acceptable. It is essential that operators have the ability to adjust the self-optimisation to reflect these priorities, so that the radio access network is tuned accordingly. The primary attributes proposed for the operator prioritisation are accessibility, retainability, quality and coverage. Other requirements operators might have include restrictions of the change in macro performance as HeNBs are deployed and the ability to over-ride the self-optimisation at sensitive locations, e.g. the CEO's house.

A possible simple approach to reflect the operators’ priorities in the optimisation is to define a utility function where normalized metrics for the considered attributes can be weighed differently. Further, different weighting priorities may be used for different cells. The utility function could then serve as input to the optimisation algorithm. Other definitions for such utility function could also be considered, for example by using different key performance indicators (KPIs).
### Measurements for HeNB Handover Optimisation

<table>
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<tr>
<th>UE measurements</th>
<th>eNodeB measurements</th>
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<td>RSRP Measurements</td>
<td>Downlink Reference Signal Transmit Power</td>
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<table>
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<tr>
<th>UE History</th>
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<tr>
<td>Last visited cell</td>
<td></td>
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<tr>
<td>Cell type</td>
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<tr>
<td>Time UE stayed in cell</td>
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A number of measurements may be used as input to the home eNodeB handover optimisation. The SOCRATES work on identifying such measurements is currently ongoing. The proposed measurements may be performed by UEs, by the home eNodeB or by neighbouring eNodeBs. Further, also the UE history could be useful for the home eNodeB handover optimisation.

**UE measurements:**

**RSRP Measurements** - The Reference Signal Received Power (RSRP) may be measured for both the serving cell and other surrounding cells and the measurements are reported to the serving eNodeB.

**RSRQ Measurements** - Reference Signal Received Quality (RSRQ) gives an indication of the signal to interference ratio and may be used to detect a bad interference situation in downlink.

RSRP and RSRQ will be used to evaluate which cell provides the best serving conditions to the UE.

**eNodeB measurements:**

**Downlink Reference Signal Transmit Power** - The downlink reference signal transmit power is the linear average of reference signal powers (in Watt) over the bandwidth in which the eNodeB is operating.

**Received Interference Power** - The received interference power includes the thermal noise power and is a set of UL received interference powers, and is measured per PRB.

**Thermal Noise Power** - Thermal noise power is measured over the whole system bandwidth. If sent with received interference power, both measurements are made over the same time period.

The eNodeB measurements can be used to determine the power resources used to serve UEs and interference conditions at the eNodeB.

**UE history**

Upon handover, the target cell is given information regarding the cells previously visited by the UE that may be used as input to the handover self-optimisation.

**lastVisitedCellID** - Cell identification of the visited cell

**cellTypeID** - Cell type of the visited cell (e.g. macro cell)

**timeUE-StayedInCell** - Duration of the stay in the cell, expressed in seconds
The handover process for LTE is described in 3GPP standardisation by means of different events. The events specify parameters that can be used to self-optimise the handover to and from HeNBs.

- **Thresholds** – allow RSRP/RSRQ degradation
- **Hysteresis** – avoid ping-pong effects and limit number of measurement reports
- **Offsets** – favouring/discriminating particular cells and frequency changes
- **Reference signals and/or total downlink power** – determine the coverage but impact handover.

### Control Parameters for the HeNB Handover Optimisation

The handover is described in 3GPP standardisation by means of different events. The events specify parameters that can be used to optimise the handover and can lead to different actions in the network, such as when the UE should start measuring the reference signal from neighbouring cells and when it should handover to a different cell. The handover is based on RSRP or RSRQ measurements collected from the UEs.

**Thresholds**
The connection from the serving cell is considered bad when the RSRP/RSRQ levels degrade below a threshold. Thresholds are used to set the allowed signal degradation in the serving cell before the handover takes place.

**Hysteresis**
A hysteresis parameter is used for the triggering of events in order to limit the number of reports due to insignificant measurement fluctuations. The hysteresis parameter can also be used in order to avoid ping-pong effects.

**Offsets**
Offsets are typically positive or negative values assigned to the serving and the neighbour cells. The UE receives these offsets which are added to the measured RSRP/RSRQ value. These parameters can be used for favouring or discriminating a particular cell or a particular carrier frequency change.

**Reference signals and/or total downlink power**
Adjusting reference signals and/or total downlink power at the home eNodeB parameters is also a possible approach for the optimisation. Cell-specific reference signals are transmitted in downlink subframes in a cell. Such signals can be transmitted with higher energy compared to the remaining physical resource elements. Furthermore, the total downlink power can also be adjusted. These parameters determine the coverage of the HeNB and impact the UE’s handover. There should be some coordination with the coverage and interference optimisation use case when optimising these parameters. With respect to the threshold, hysteresis and offset parameters, reference signal and total downlink power parameters are considered less important for the optimisation.
**Measurements for HeNB Interference and Coverage Optimisation**

**UE measurements:**
- RSRP Measurements
- RSRQ Measurements
- Downlink Received Interference Power
- User Throughput
- Packet Delay
- Packet Loss Ratio

**eNodeB measurements:**
- Uplink Received Interference Power
- Downlink Received Interference Power
- Call Dropping Ratio
- Timing Advance before Call Drops

It is still for further investigation how the proposed measurements agrees with 3GPP standards.

Similarly to the home eNodeB handover optimisation, a number of measurements may be used as input to a coverage and interference optimisation mechanism for home eNodeBs. The purposes of the measurements are to retrieving home eNodeB coverage information, detecting bad interference situations and to measure the impact of the interference and coverage optimisation. The SOCRATES work on identifying such measurements is currently ongoing. It is still for further investigation how the proposed measurements agrees with 3GPP standards.

**UE measurements:**
**RSRP Measurements** – RSRP may be measured for both the serving cell and other surrounding cells and the measurements are reported to the serving eNodeB to retrieve information on the home eNodeB coverage.

**RSRQ Measurements** – RSRQ measurements gives an indication of the signal to interference ratio and may be used to detect a bad interference situation in downlink and to identify resource blocks or sets of resource block with high interference.

**Downlink Received Interference Power** - Measurements of the downlink received interference power may be used in order to detect a bad interference situation and to identify resource blocks with high interference.

**User Throughput** - User throughput is a performance metric that may be used to detect problems in the network and to measure the impacts of the coverage and interference optimisation.

**Packet Delay** - The packet delay is a performance metric, which may be used to detect problems in the network and to measure the impacts of the coverage and interference optimisation. The packet delay may be measured at different layers.

**Packet Loss Ratio** - The packet loss ratio is a performance metric, which may be used to detect problems in the network and to measure the impacts of the coverage and interference optimisation. The packet loss ratio may be measured on different layers.

**eNodeB measurements**

**Uplink Received Interference Power** - The uplink received interference power, including thermal noise, is measured in the eNodeB s. The uplink received interference may be used by the home eNodeB to identify a situation with high interference, and, in particular, identify resource blocks with high interference.

**Downlink Received Interference Power** - Measurements of the downlink received interference power may be used in order to detect a bad interference situation and to identify resource blocks with high interference. It has been discussed in 3GPP whether 3G home NodeBs should be able to perform measurements on co-channel macro eNodeB created interference. The measurement result could also be reported to neighbouring home eNodeB cells in order to coordinate spectrum restrictions.

**Call Dropping Ratio** - The call dropping ratio may be used to detect problems in the network, which may depend of a bad interference situation, and in order to measure improvements due to the optimisation.

**Timing Advance before Call Drops** - The timing advance before a call drop indicates how far away from the eNodeB a call has been dropped and may be used to retrieve information on the home eNodeB coverage area.
A number of parameters have been identified, that may be used to control the coverage and interference have been identified.

Proposals for control parameters are
- Downlink Power
- Uplink Power
- Scheduling Parameters
- Multiple antenna parameters

A number of parameters have been identified, that may be used to control the coverage and interference have been identified, as well as experiencing.

**Downlink Power**
In order to increase the area in which the HeNB is considered to be the best serving cell the reference signal power and the synchronization signal power may be increased. These signals may also cause interference on other cells and the power settings for them are hence considered to be control parameters for both coverage and interference. Further, the total downlink power may be also considered to be a control parameter for both coverage and interference.

**Uplink Power**
The uplink power on the PUCCH, PUSCH and sounding reference signals is controlled by power-control mechanisms. The uplink power control is a combination of an open-loop and a closed-loop mechanism. The parameters controlling the PUCCH power, the PUSCH power and the SRS power may be considered as control parameters for the coverage and interference.

**Scheduling Parameters**
The scheduler controls how the shared resources should be divided between the UEs for each time instant. By using lower transmission power on parts of the resources, or by completely avoiding scheduling some UEs on parts of the resources, interference can be reduced for UEs using the same resources in other cells. Parameters for this may be considered as control parameters for uplink and downlink interference.

**Multiple Antenna Parameters**
LTE supports multiple antennas which can be used for different purposes to affect data rates or coverage. LTE supports downlink transmission on up to four antenna ports and UEs are equipped with at least 2 and up to four receive antennas. Multiple antenna parameters may be considered as control parameters for interference and coverage optimization.
Assessment Criteria

- Need for metrics and methods to assess the gain of self-optimisation
- Objectives with respect to both HeNBs and eNBs should be considered

**HeNB objectives:**
- High throughput for data
- Satisfactory speech quality for voice
- Avoid blocked/dropped calls

**eNB objectives:**
- Minimise negative impact of HeNB

Some proposed **assessment metrics:**
- Call setup success ratio
- Call dropping ratio
- Handover success ratio
- Coverage

- UL/ DL Interference
- User throughput
- Ping-pong handover ratio

In the SOCRATES work, an important task is to define metrics and methods to assess the gains of the home eNodeB self-optimisation algorithms. The metrics and approach to be used for the assessment of home eNodeBs optimisation are introduced below.

In order to be able to determine what metrics that are appropriate for the home eNodeB optimisation assessment, there is a need to understand the objectives of the self-optimisation, with respect both to the home eNodeBs and the macro eNodeBs. The main objectives of the self-optimisation with respect to the home eNodeBs are to provide high throughput for data, satisfactory speech quality for voice and to avoid blocked/dropped calls. These objectives have to be taken into account since they will be impacted by the solutions to the HeNB sub use cases. On the macro cell level, the objective for the self-optimisation is to minimise the negative impact of home eNodeBs.

Metrics that have been proposed to use for the assessment are
- Call setup success ratio
- Call dropping ratio
- Handover success ratio
- Coverage
- UL/ DL Interference
- User throughput
- Ping-pong handover ratio
Assessment Criteria (2)

- Assessment based on comparison between HeNB with self-organisation (SON) and a reference case
- Assessment metrics serve as input to the overall metric:

\[ M_{\text{Alg}_X} = \alpha \text{GoS score} + \beta \text{QoS score} + \gamma \text{Coverage metric} + \delta \frac{M_{\text{capacity}}}{M_{\text{capacity\_ref}}} \]

where the weighting factors \(\alpha, \beta, \gamma\) and \(\delta\) reflect the relative importance of different metrics.

The assessment should be based on the performance comparison of a network of HeNB cells with SON and a reference case, i.e. without SON or very basic SON functionality. When assessing the performance of one self-optimisation algorithm, the metrics previously described may be used. However, when comparing multiple home eNodeB self-optimisation algorithms, it should be possible to evaluate which algorithm that is most beneficial. To do this a small number of metrics are weighted into an overall metric. For other metrics, constraints can be applied. If these constraints are not met, the algorithm will be considered unsuitable.

The overall metric for assessing an algorithm \(X (\text{Alg}_X)\) includes:
- Grade of Service (GoS) score that is a weighted sum of various blocking and dropping metrics.
- Quality of Service (QoS) score that is a weighted sum of various QoS metrics.
- Coverage and capacity metrics in relation to the corresponding reference value

The weighting factors \(\alpha, \beta, \gamma\) and \(\delta\) reflect the relative importance of different metrics. For example, if the GoS score is twice as important as the QoS score, then \(\alpha\) will be twice as large as \(\beta\). Weighing factors can also be 0, if the metric is considered not relevant for a certain use case or scenario.

The absolute value of \(M_{\text{Alg}_X}\) has no meaning. However, the relative values of the overall metric will be used to compare different solutions. For all metrics, higher values correspond with better performance.
For the **handover optimisation**:

- Coverage and capacity are not taken into account in the overall metric ($\gamma = \delta = 0$).
- Constraints on coverage and capacity.

\[
\text{QoS score}_{\text{HO}} = a \frac{M_{\text{throughput}}}{M_{\text{throughput \_ref}}} + b \frac{M_{\text{ping-pong}}}{M_{\text{ping-pong \_ref}}}
\]

\[
\text{GoS score}_{\text{HO}} = \frac{M_{\text{handover success ratio}}}{M_{\text{handover success ratio \_ref}}}
\]

For the **interference and coverage optimisation**:

\[
\text{QoS score}_{\text{CI}} = \frac{M_{\text{throughput}}}{M_{\text{throughput \_ref}}}
\]

\[
\text{GoS score}_{\text{CI}} = \frac{M_{\text{call success ratio}}}{M_{\text{call success ratio \_ref}}}
\]

The QoS and GoS are defined differently for the two home eNodeB optimisation use cases.

For the home eNodeB handover optimisation, coverage and capacity will not be taken into account in the calculation of the overall metric ($\gamma = \delta = 0$). However, constraints will be placed on the coverage and capacity. While the QoS score (QoS score HO) will be based on throughput and ping-pong handover ratio metrics, the GoS score will be based on handover success ratio. ($a$ and $b$ are the weighting factors for the throughput and ping-pong metrics, respectively.) These metrics are thought to be the most important for the QoS and GoS overall assessment for the handover optimisation, however other metrics could also be included or evaluated through constraints.

For the home eNodeB interference and coverage optimisation, the QoS score is based in the throughput metric whereas the GoS score is based in call success ratio metric. For this use case, also coverage and capacity are evaluated through the overall metric for each algorithm.
Future Work

- Scenario definitions
- Simulator implementation
- Controllability study
- Algorithm development and evaluation
- Integration with other self-organisation algorithms

Future work includes
- Defining scenarios to study for the sub use cases, including traffic, propagation etc.
- Implementing a simulator to be used for experimental studies
- Performing a controllability study in order to establish the basic coupling between control parameters and KPIs and to examine what gains can be achieved by modifying these parameters.
- Developing and evaluating algorithms for the home eNodeB self-optimisation
- Integrate with other self-organisation algorithms