nuRF Enterprise System
v2.2

Real Time Location System (RTLS)

Setup Guide for System Integrator

Rev 1.3.2

By

FCC Statement (nuRF 2401AP):

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

FCC Statement (nuRF 2401T-A/ nuRF 2401T-P):

NOTE: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE Statement:

RF INTERFERENCE WARNING: This is a Class A product. In a domestic environment this product may cause radio frequency (RF) interference, in which case the user may be required to take adequate measures.

Free Alliance Letter head

CE Declaration of Conformity

For the following equipment:
Active RFID Wireless Receiver
(Product Name)
nuRF 2401AP,   nuRF 2401T-A, nuRF 2401T-P
(Model Designation)

is herewith confirmed to comply with the requirements set out in the Council (European parliament) Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility of Radio and Telecom device (1999/5/EC). For the evaluation regarding this Directive, the following standards were applied:

EN 301 489-1 V1.8.1: (2008-04)

EN 301 489-3 V1.4.1 (2002-08)

EN 60950-1: 2006

EN50371 : (2002-03)

EN 300 440-2 V1.2.1: (2008-05)

EN 300 440-1 V1.4.1: (2008-05)

The following importer/manufacturer is responsible for this declaration:

Free Alliance Sdn Bhd
(Company Name, Manufacturer)

Suite B-3-2 Block B, Plaza Damas,
Sri Hartamas, 50480 Kuala Lumpur,
MALAYSIA
(Company Address, Manufacturer)

Person responsible for this declaration:

Aravinthan Varatharaju
(Name, Surname, Manufacturer)

Senior Hardware Design Engineer
(Position/Title)

(Legal Signature)

Sri Hartamas, K.L, Malaysia   25/6/2010
        (Place)   (Date)

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1.0 Background

This document is intended as a set up guide to the System Integrator for Free Alliance's nuRF Enterprise System 2.2's Real Time Locating System.

For instructions on installing and setting up the nuRF Enterprise System, refer to the Installation Manual or contact your solution provider.

For instructions on configuring the nuRF Enterprise System, refer to the User Manual or contact your solution provider.

RTLS feature is only available in nuRF Enterprise System.

2.0 Real Time Location System Setup

Real Time Locating System (RTLS) provides tracking and location of the nuRF Tags in real time, accessible by users via the nuRF Web Application.

The RTLS is set up during system deployment after the system infrastructure has been finalized and typically performed as the final process. The set up of the RTLS does not require specialized tools or equipment, and can be performed using the actual infrastructure and nuRF Tags.

The process includes the following steps that are undertaken by the system integrator:

a. <u>Manage Map</u>
- To upload map image file and assign Access Points locations in the map.
- Refer to section 2.1.

b. <u>Site Survey</u>
- To generate an RSSI reference map for the coverage area.
- Refer to section 2.2.

c. <u>Sampling Algorithm</u>
- To select the RTLS sampling method.
- Refer to section 2.3.

d. <u>nuRF Web Application: Map View</u>
- Monitor and track the location of the nuRF Tags in real time.
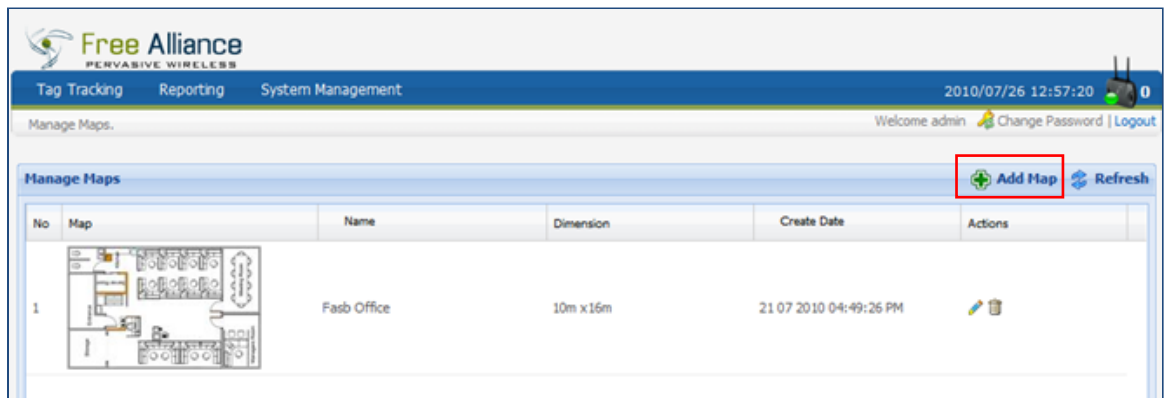- Refer to section 2.4.

2.1 Manage Map

To upload the map or floorplan of the coverage area and indicate Access Point(s) at their mounting location:
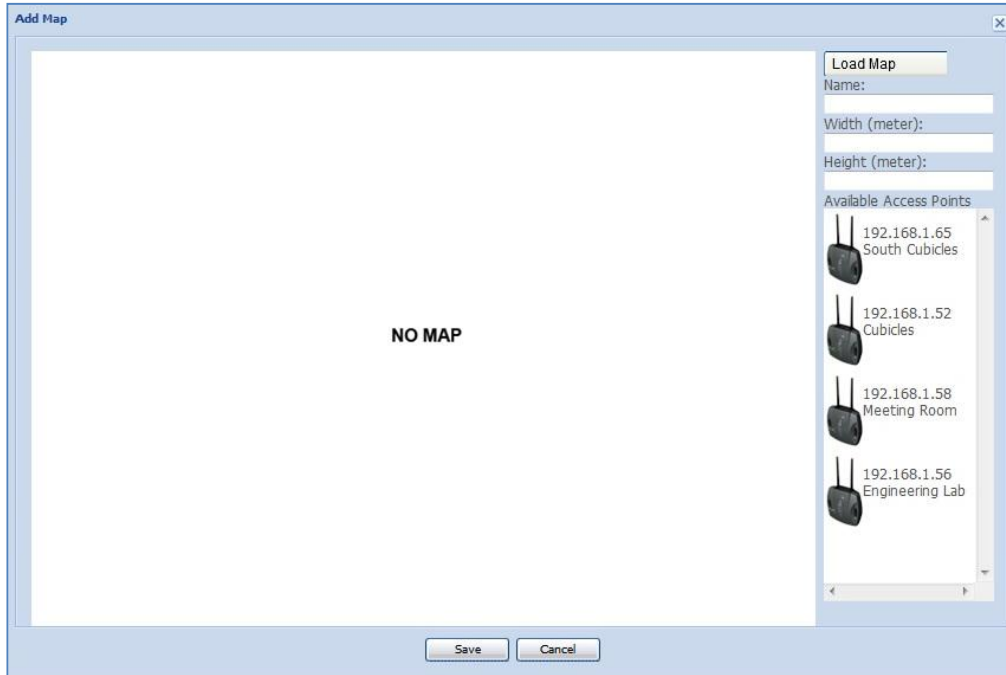
2.1.1 Click on the menu item "System Management" and click on "Manage Maps".
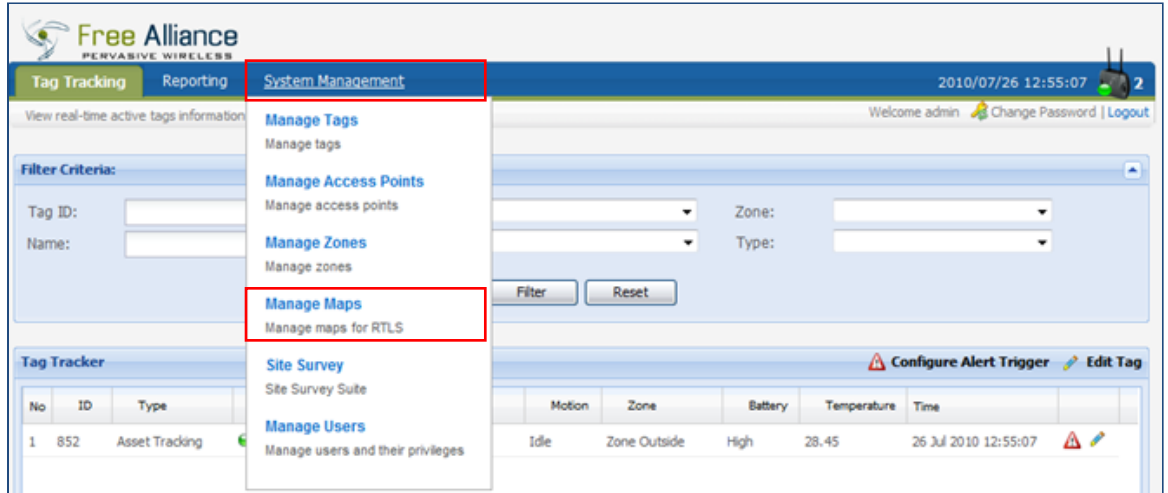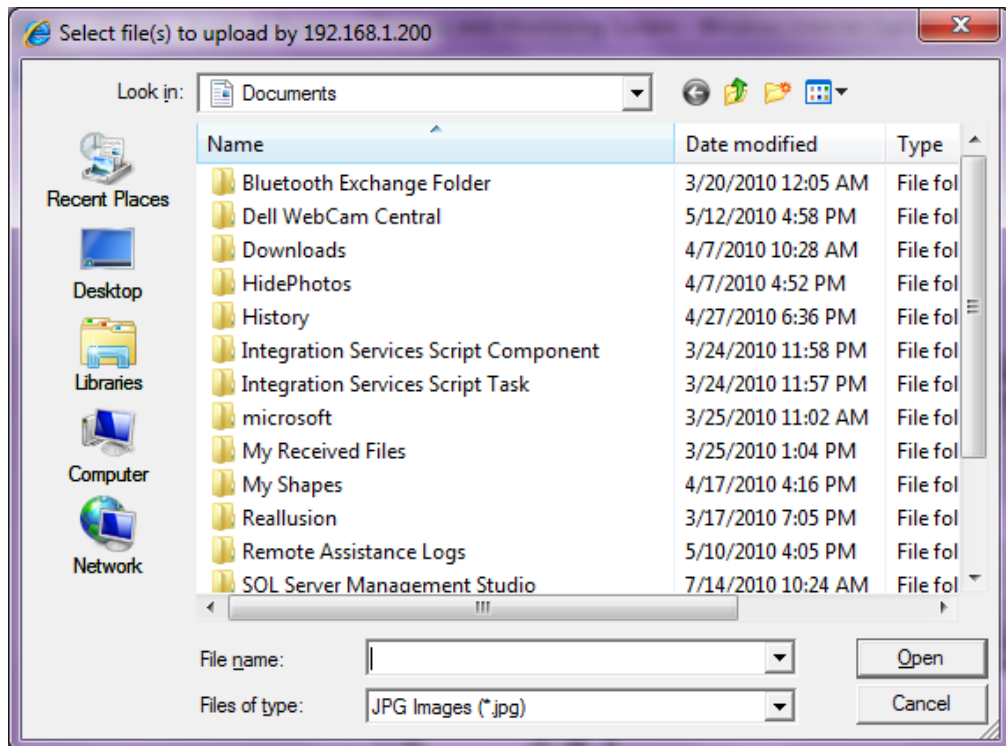

2.1.2 User will be navigated to the screen shown below. Click on the "Add Map" to add new map.
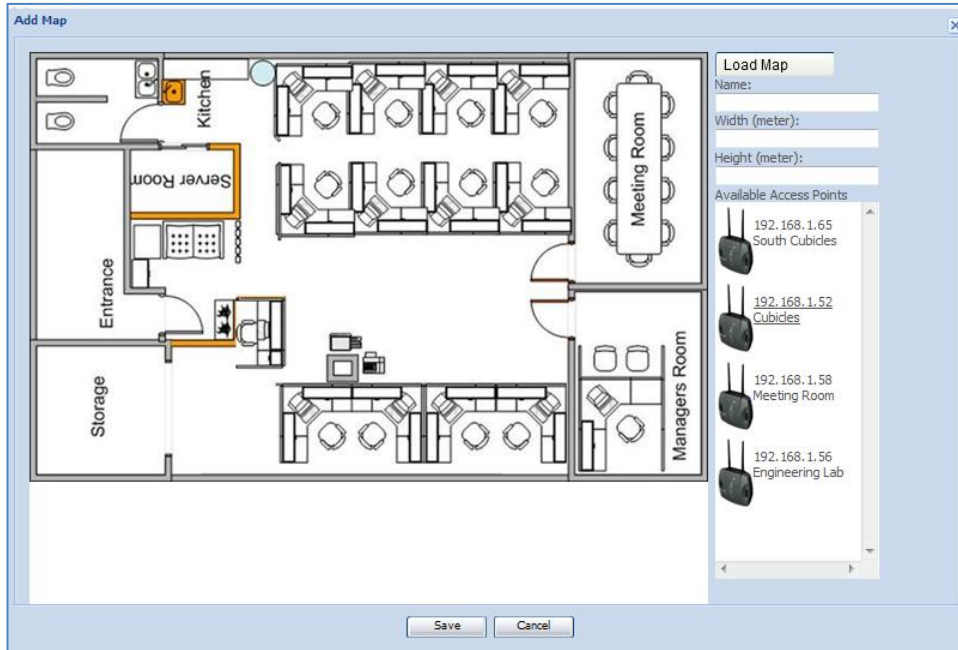
2.1.3 "Add Map" Page will be shown as below.

2.1.4 Click on the "Load Map" button and then choose your map layout file.

2.1.5 Select the file and click on the "Open" button to upload the map layout.

2.1.6   After the file is loaded, "Add Map" Screen will be shown.

2.1.7   Insert the map name in the "Map Name" section.

2.1.8   Insert the width and height of the total area represented in the map in meters

2.1.9   Click and drag the Access Point to the location where the AP is installed and then release the AP.
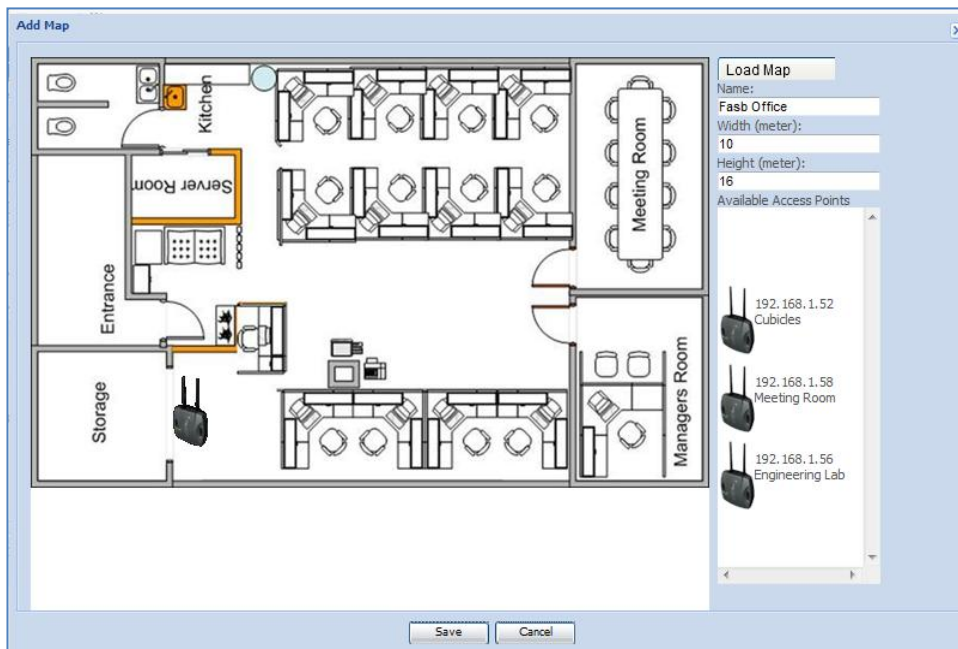
   NB: RTLS requires all connected Access Points to be indicated on the map.

2.1.10 Click on the "Save" button.

2.2 Site Survey

Site Survey is a one-time calibration process where the System Integrator performs RF signal mapping in the coverage area to generate an RSSI reference map used by RTLS.

Prior to starting the Site Survey, sampling points shall be selected as to minimize possible interruptions and optimize the process. Points must be selected to represent the areas where nuRF Tags are expected to be tracked.

The Site Survey requires that one nuRF Tag (preferably an Active Tag to minimize user intervention) be assigned as the Site Survey Tag, whose RF signal will be recorded to generate the RSSI reference map.

All Access Points registered within the system will be actively recording the RF signal during the Site Survey. It is critical to ensure that all APs are properly mounted in their final location and properly registered and recognized by the nuRF Enterprise System.

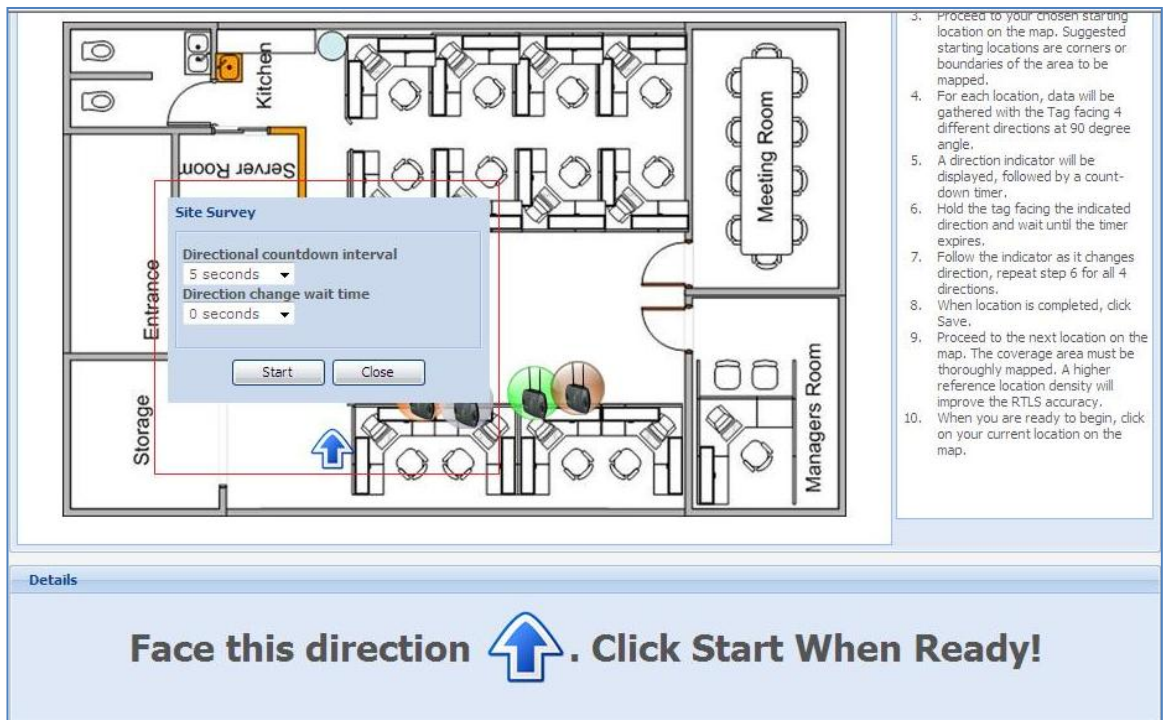Instructions are provided on the Site Survey tool during the process.

To begin, click on the menu item "System Management" and click on "Site Survey"
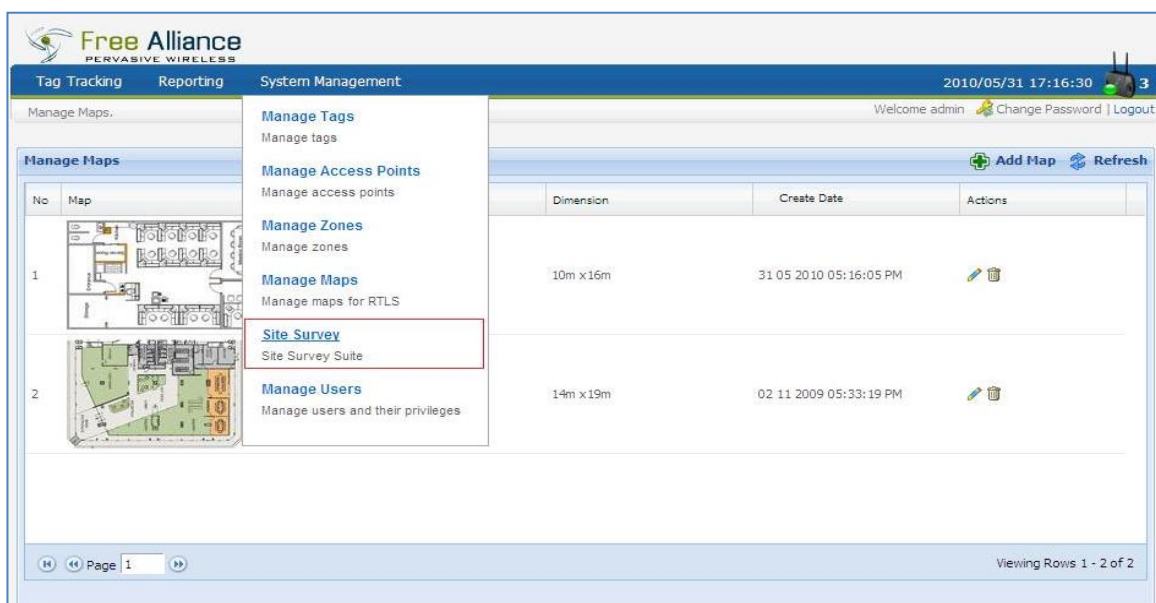
2.2.1 "Site Survey" page will be shown as below. Select map & tag to start Site Survey.
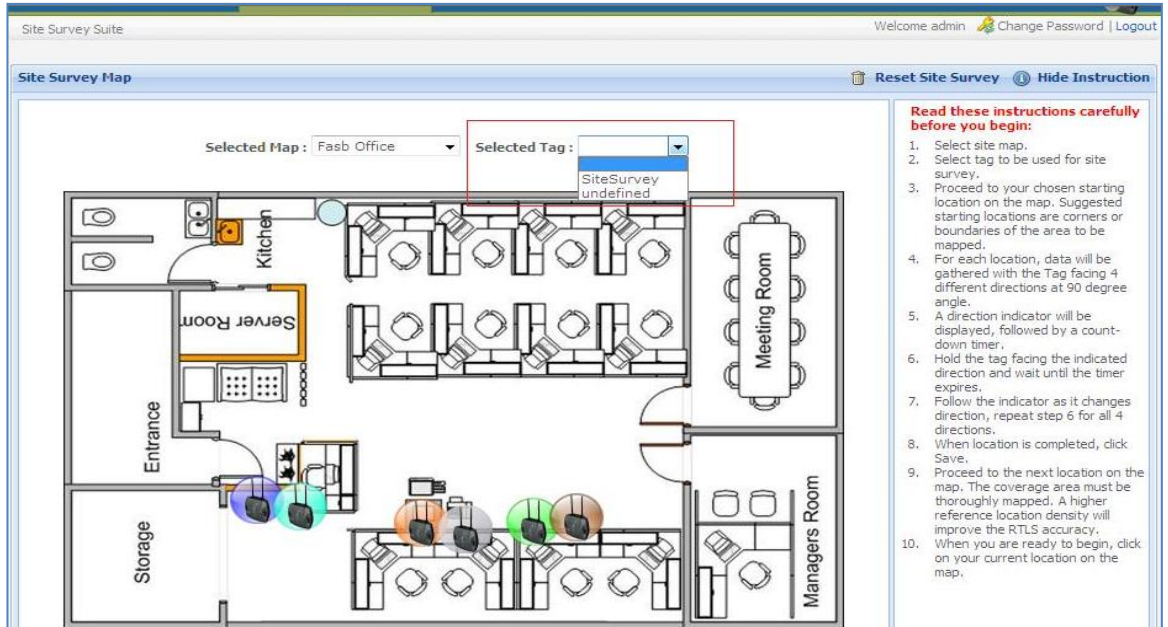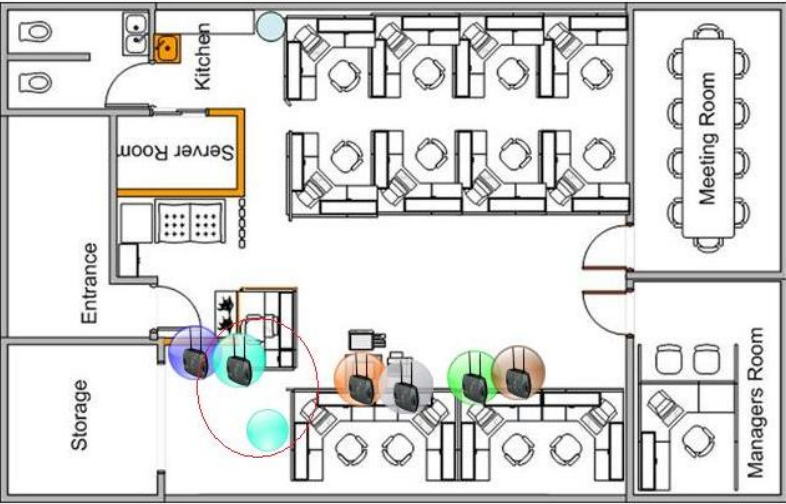

2.2.2 Click on the position where the tag is located.

- Choose the "Directional countdown interval" to record these positions.

- Choose the "Direction change wait time".

- Click Start.

- Click Save after finished recording in this position.

2.2.3 The bubble will appear in same color with the nearest Access Point antenna.
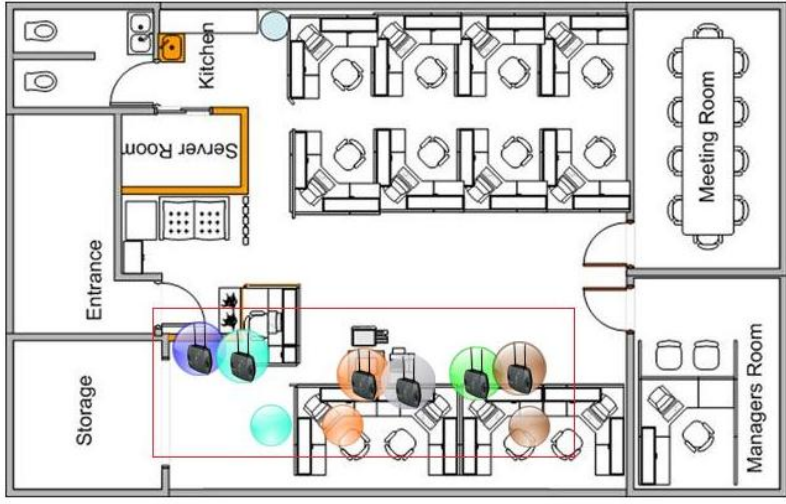

2.2.4 Repeat these steps for all positions in the map where tracking and monitoring is to be performed.

2.2.5 The screen will appear as shown below when site survey is performed on other locations.

2.3   Sampling Algorithm

The RTLS supports two methods of sampling while performing location estimation of the nuRF Tags. Depending on the application requirement and user preference, the optimal method can be chosen as follows:

- Primary zone sampling
  - o The RTLS Engine estimates the Tag location based on the current Primary Zone of the Tag, ie the AP receiving the strongest RF signal from the Tag. The estimated location will be selected from the subset of locations associated to the particular Primary Zone only.

This method is preferable in most cases, as it optimizes the CPU and memory usage during processing, and provides smoother location estimation for all Tags. This method is also particularly useful for large scale deployment where the total number of Site Survey reference points is large (generally >50).

The drawback of this method is that the transition of the estimated location of fast moving Tags may be slower and may result in a perceived 'lag' on the visual of the Tag tracking.

This method should not be selected if the APs are laid out in high density and highly overlapping manner.

- Full sampling
  - o The RTLS Engine estimates the Tag location by sampling ALL the reference points as recorded during the Site Survey.

This method is the preferred method for most small scale deployments (3 – 10 APs), and where computing and networking resources are available with significant buffer.

The advantage of this method is the ability to reflect a more responsive estimation of location based on a more complete set of sampling data. The drawback is that the RTLS Engine will commit more CPU and memory resources for the processing.

2.3.1 Click on the window "Start" button and browse for "Microsoft SQL Server 2008".
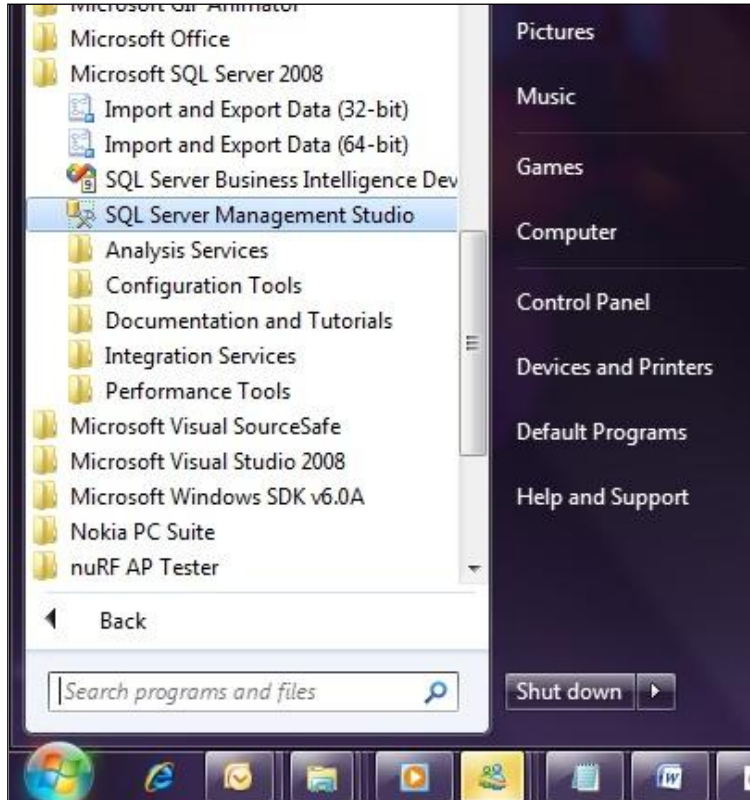
2.3.2 Click on the "SQL Server Management Studio

2.3.3 SQL Server Logon Screen will be shown as below.
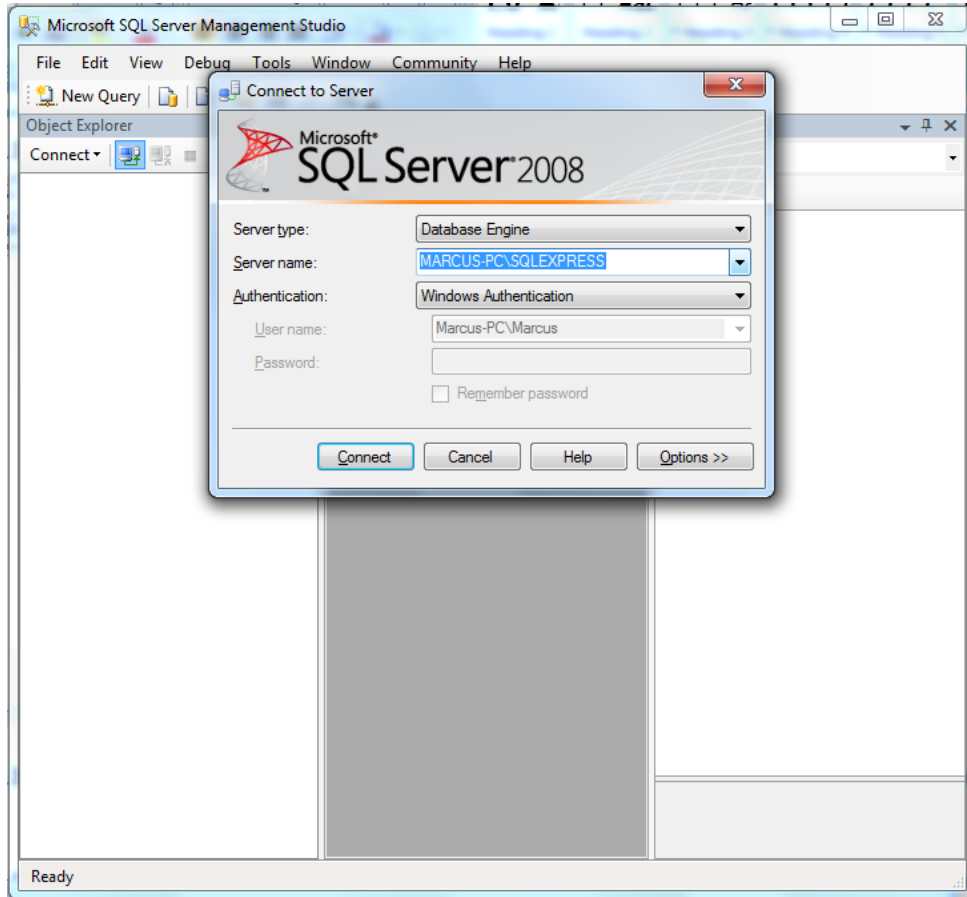
2.3.4 Log on to the Microsoft SQL Server 2008 using "SQL Server Authentication" or "Windows Authentication". Password is required for "SQL Server Authentication" authentication type.

2.3.5 The screen will appear as shown below.

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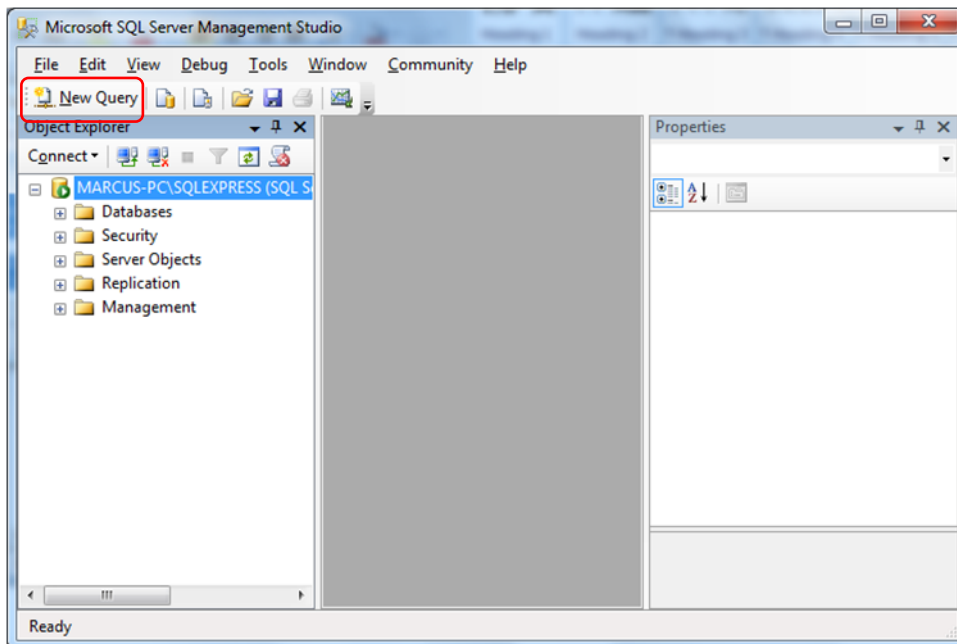
2.3.6 Click on "New Query" to create a new query on the database. The screen will appear as shown below.
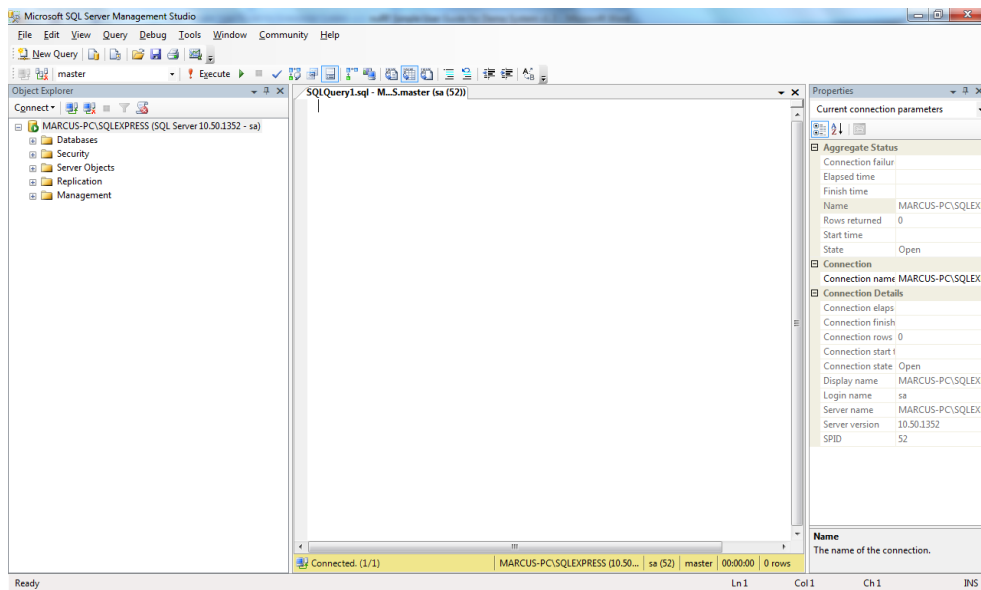
2.3.7 Change the database from "master" to "nuRF.2010.02.02" database
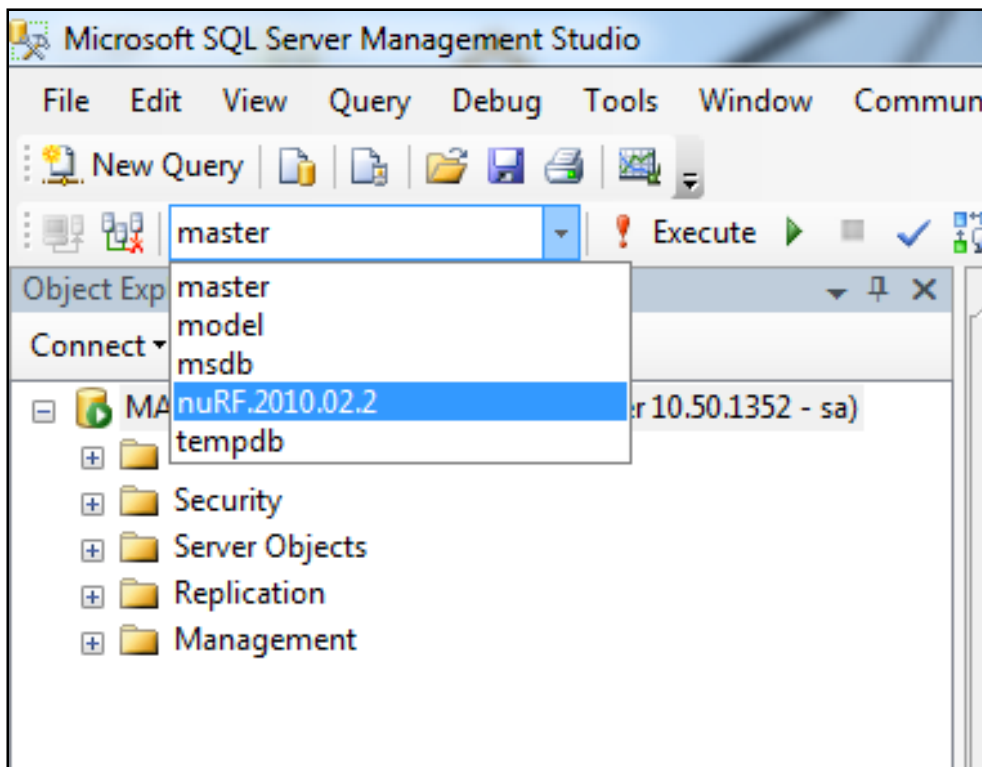
IMPORTANT:

If user decides to use "Primary Zone Sampling", proceed to section 2.3.8.

If user decides to use "Full Sampling", proceed to section 2.3.10.

Both sections are mutually exclusive.

2.3.8 Primary Zone Sampling

Execute below SQL script to create SQL Stored Procedure in SQL Server Management Studio

```sql
CREATE PROCEDURE [dbo].[usp_MapNodes_GetByMapZoneID]
    -- Add the parameters for the stored procedure here
    @p_MapID BIGINT,
    @p_ZoneID BIGINT
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    -- Insert statements for procedure here
    SELECT
mn.ID,mn.Code,mn.MapID,mn.ActualTop,mn.ActualLeft,mn.Created,mn.Modified
    FROM fasb_MapsNodes AS mn
    INNER JOIN fasb_MapsNodesRelativedZone AS mnrz ON mnrz.MapNodeID =
mn.Code AND mnrz.MapID=mn.MapID
    WHERE mnrz.MapID = @p_MapID
    AND mnrz.ZoneID = @p_ZoneID
    AND mnrz.ZonePriority IN (1)
END
```

2.3.9 Proceed to section 2.3.12 to continue.

NB: Do not refer section 2.3.10 if user adopts "Primary Zone Sampling".

2.3.10 Full Sampling

Execute below SQL script to create SQL Stored Procedure in SQL Server Management Studio.

```sql
CREATE PROCEDURE [dbo].[usp_MapNodes_GetByMapZoneID]
    -- Add the parameters for the stored procedure here
    @p_MapID BIGINT,
    @p_ZoneID BIGINT
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    -- Insert statements for procedure here
    SELECT
mn.ID,mn.Code,mn.MapID,mn.ActualTop,mn.ActualLeft,mn.Created,mn.Modified
    FROM fasb_MapsNodes AS mn
    INNER JOIN fasb_MapsNodesRelativedZone AS mnrz ON mnrz.MapNodeID =
mn.Code AND mnrz.MapID=mn.MapID
    WHERE mnrz.MapID = @p_MapID
    AND mnrz.ZoneID = @p_ZoneID

END
```

2.3.11 Proceed to section 2.3.12 to continue.

NB: Do not refer section 2.3.8 if user adopts "Full Sampling".

2.3.12 In this section, user will perform few simple SQL Statements to insert the node data.

NB: This step shall be performed every time user redoes the site survey.

2.3.13 Execute SQL script to delete the OLD data as shown below.

```
Delete from fasb_MapsNodesRelativedZone
```

2.3.14 Execute below SQL script to select the Map ID.

```
Select ID from fasb_Maps
```

2.3.15 Note down the ID value which will be used on the following steps. Value is integer type.

2.3.16 Replace the Map ID Value (value 11 as highlighted in red below) with the noted ID value on the following statement below.

```
INSERT INTO fasb_MapsNodesRelativedZone
(MapID,MapNodeID,ZoneID,ZonePriority,Created,Modified)
SELECT 11,MapNodeID,AccessPointID,row AS
ZonePriority,GETDATE(),GETDATE() FROM (
    SELECT row_number() over (partition by MapNodeID order by
    MapNodeID,RSSI desc) as row,
    MapNodeID,
    AccessPointID,
    RSSI
    FROM fasb_RSSIMatrix WHERE TagApplicationID=8) AS tbl1
```

2.3.17 Execute above SQL script to insert the data.

2.3.18 Exit Microsoft SQL Server 2008.

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2.4 *Map View*

The real time location and movement of the Tags is displayed in Map View from the nuRF Web Application 2.0.

    2.4.1   Click on the menu item "Tag Tracking" and click on "Map View".

    2.4.2   Select the location map in the "Selected Map" option.

    2.4.3   "Map View" Page will appear as shown below.

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