

Improving Asset Utilization & ROI

December 2008

[A case study on the usage of a real time asset tracking system for estimating and improving the utilization rates and the return on investment of mobile assets.]

1 Introduction

The utilization of assets forms the basis for the profitability of a firm. However, how do we measure the utilization of assets that are mobile? On most occasions, the number of mobile assets needed (Fork-Lift-Trucks, Dozers, Loaders, etc. for example) is estimated based on a conservative back of the envelope calculation. This directly results in overbuying the assets and leads to a lower utilization rate. The approximate calculation mechanism is done because a clear picture of the mobility patterns, the routes that are taken by the assets and the bottlenecks, etc, are not known.

PervCom Consulting has developed devices and system solutions for remote tracking, monitoring and management of assets using Active RFID tags / sensors with wireless mesh networking technologies. With this technology, the utilization pattern of assets can be monitored in real-time through error-free identification of assets, their locations and their activity status.

With PervCom's RTLS system, we have devised an optimization model that would enable you to track the assets in real-time, to decide the optimal number of assets needed and to realize a closed loop control system to dynamically allocate assets at different point-of-requests, leading to over-all cost savings, better operation management and immediate RoI.

In order to show the real business benefit from PervCom's Real Time Locating System (RTLS), we have done a field trial at Hindalco, Belur to track their FLT's to provide an accurate account of the asset utilization and to pinpoint areas of bottleneck. This will help to:

- A. Reduce costs by reducing number of assets and
- B. Improve utilization by optimally allocating the available assets

Business Benefits:

PervCom's unique Asset Utilization Management Software integrated with the generic RTLS solution generates fast ROI for your organization in two different ways:

- A. Enable you to track your enterprise assets/objects in real-time and helps you decide the optimal number of assets required for daily operation. Thus, you can minimize the number of mobile assets required at your enterprise.**
- B. Enables you to establish a closed-loop control over the tagged enterprise assets/objects in a centralized way to optimize their performance by improving their utilization rate. Thus, you can allocate required resources in the required area of operation by simply communicating with the tagged assets (such as mobile vehicles, FLTs, Dozers etc).**

In this white paper, we report our case study on the real-time tracking of mobile assets in a leading manufacturing firm in India. We track the movement of Fork-Lift-Trucks in the factory premises through an IEEE 802.15.4 based system for a period of around 100 hours. With the captured data, we are in a position to present an accurate account of the asset utilization and pinpoint areas of bottleneck. With the true mobility pattern, we have devised an optimization model that gives the ideal number of assets needed and provides a precise reading on the cost savings and the return on investment.

2 The Real-Time Tracking System

The real-time asset tracking system is manufactured by PervCom Consulting Pvt. Ltd. and is based on the upcoming IEEE 802.15.4 protocol. The system comprises of tiny nodes (wireless devices) that communicate in the ISM (Industrial, Scientific & Medical) band. This band which corresponds to 2.4 – 2.5 GHz, is de-licensed in most parts of the world, including in India. The RTLS system comprises of two components:

- Setting up of the Wireless Mesh Network
- Setting up of the Software GUI.

The assets that are to be tracked are attached with a small wireless device, denoted as the 'tag'. The function of the tag is to periodically send information of the location of the asset. The factory premises is set-up with a series of wireless routers which forward the data received from the tag to the centralized computer. The computer hosts a GUI that dynamically shows the current location of the asset as well as keeping a record of its activity. The software has functionalities where the asset utilization and bottleneck in the routes taken by the assets can be pinpointed. A pictorial representation of the RTLS system is shown (Figure 1).

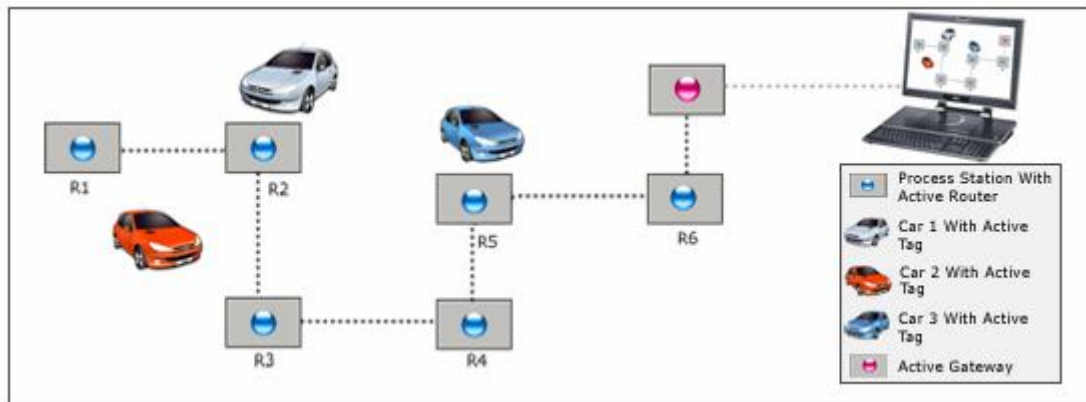


Figure 1. Schematic Diagram of the RTLS System.

3 The Methodology for Tracking Utilization Pattern of Assets

A sample number of mobile assets are tagged for tracking in order to estimate asset utilization pattern of any industry. Wireless Mesh Network is set up through out the tracking zone by deploying wireless routers at strategic locations. During the entire period of tracking, the PervTrack system software records the activity status of the assets i.e., the amount of time an asset remains stationary at a particular location and the time for which the assets are mobile or active. The asset utilization rate is calculated as:

$$\text{Utilization Rate (\%)} = \frac{\text{Amount of time spent Active}}{(\text{Amount of time spent Idle}) + (\text{Amount of time spent Active})} \quad (1)$$

An asset is termed as idle, if it spends more than a pre-set time (e.g., 15 minutes) at a particular location continuously.

Based on the utilization data, it is possible to gather some insight on the bottlenecks and flaws in the current operational process. This also enables the management to decide optimal number of assets that are sufficient for full scale production.

Since the industries mostly deal with very high-value mobile assets, therefore, these real-time observations on asset utilization helps the management to streamline their operational process, cut down their capital expenditure as well as maintenance cost to a great extent – ROI on this new technology is thus at once visible to the management.

4 Asset Utilization Improvement through Closed Loop Control

PervCom's Active RFID based Wireless Mesh Networking technology **enables both-way communication** between Active Tags attached to the mobile assets/vehicles and the Central Control Station. PervTrack offers a close loop control mechanism to achieve optimal asset utilization. Close loop control system is a two-step process: a) Request generation and b) Assigning assets from set of idle assets.

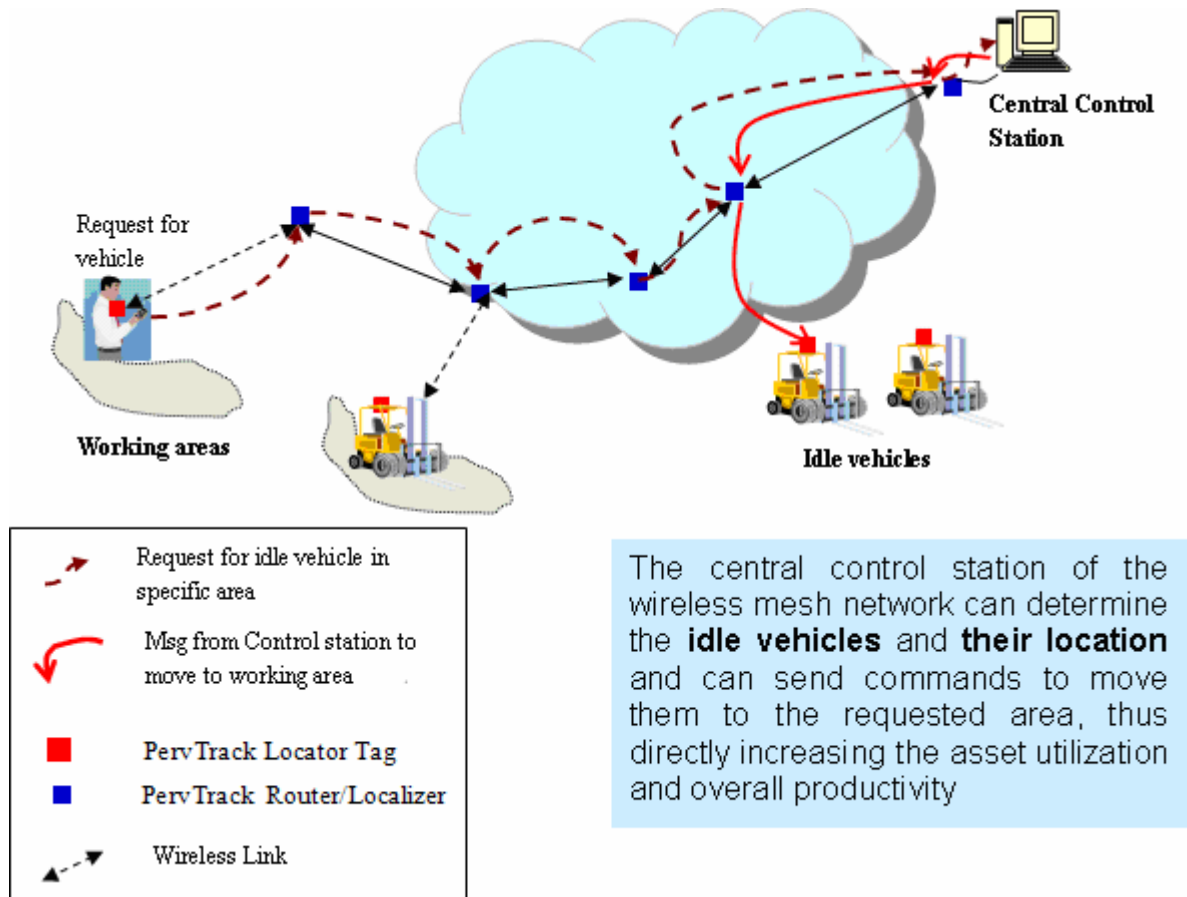
a) Request generation using press-button switch of PervTrack Locator Tag

Any supervisor in any working area can send a message by pressing a request button on his tag asking for assigning an additional asset in that location.

b) Assigning assets from set of idle assets

The PervTrack software at central control station keeps track of the location and activity status of assets. Thus, it can immediately identify and locate the idle asset and can send an automatic message to the nearest idle asset directly asking them to report to the working area where the asset is needed.

In this way the closed loop control mechanism of the PervTrack RTLS system can improve the asset utilization rate and enhance productivity to an immediate effect. Also, with proper job distribution analysis, the PervTrack RTLS system can reduce the number of operational vehicles required at any manufacturing plant, resulting essential operational cost reduction. The diagram below depicts the closed loop control mechanism to enhance productivity.



5 Report based on the above Methodology

A case study with a sample of 9 Fork-Lift-Trucks (FLT) was carried out in a large aluminium plant using the above methodology to estimate the utilization patterns of FLT's during the entire tracking period of 100 hours. Few snapshots of our utilization reports are shown below highlighting our observations. PervTrack Locator Tag Router/Localizer

Figure 2 reveals that the FLT utilization rates varied from 14% to 59% for a 5 minute idle time and from 22% to 76% for a 10 minute idle time.

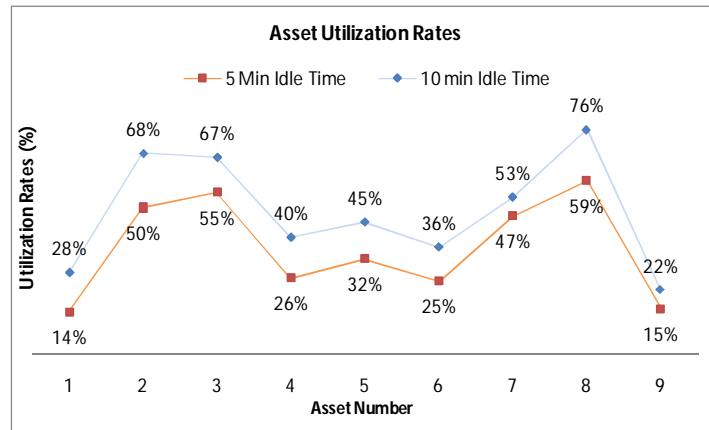


Figure 2: The FLT utilization rates for the 9 tracked items

The activity chart for a particular FLT (in Figure 3) shows that the particular FLT underwent a large number of idle periods and low number of active periods. The end result is a low utilization rate of 15%.

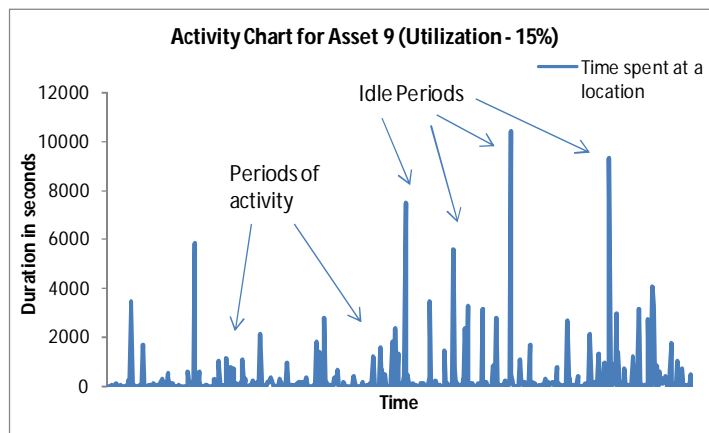


Figure 3: Activity chart for FLT 9 with large number of inactive periods render a low utilization rate.

A breakup of the utilization rates for the 10 minute interval into night and day was made. Day was considered from 8 a.m. to 8 p.m. and the rest is considered as night. Except for 2 assets (5 & 7) all the others showed better utilization during the night.

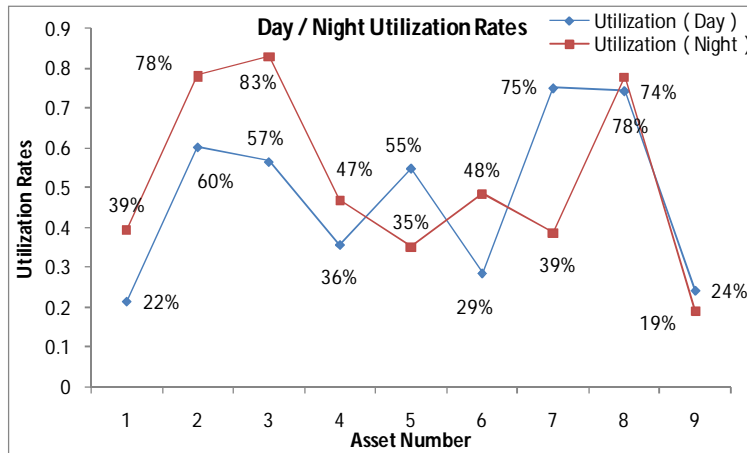


Figure 4: The Utilization rates during day & night (night time efficiency is generally better)

Figure 5 represents the number of FLT's that are active simultaneously at a given time. It was noticed that there are only a few instances where all of the 9 FLT's are used simultaneously. If we wish to have all 9 FLT's commissioned, then the maximum efficiency comes to 53.8 %. Another interesting aspect is that apparently low number of FLT's is used during the latter part of the timeline. This is due to the holiday in the factory premises.

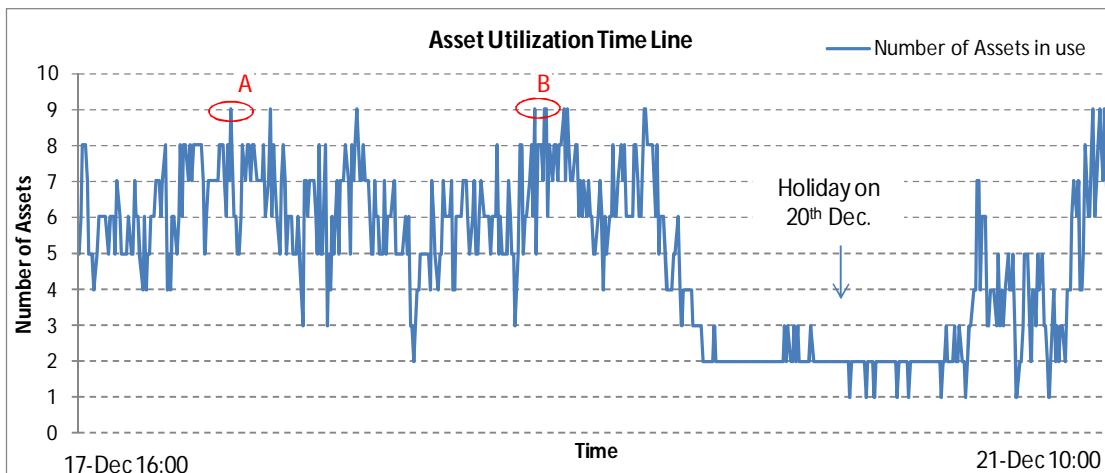


Figure 5: Plot of the number of FLT's used over the tracking period. A number of instances of maximum usage (all 9 FLT's) are seen (Points A, B).

A plot of the cumulative frequency of the number of FLT's used over time (Figure 6) shows a clear bell curve distribution. The graph shows that most of the time, 6 FLT's are active. However, number of assets from 5 to 7 forms the bulk of the usage.

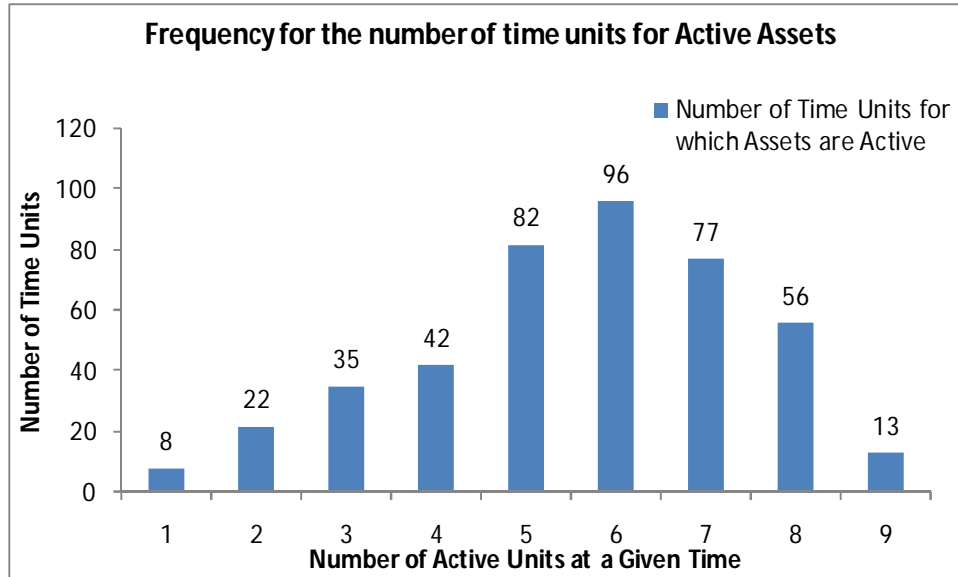


Figure 6: Plot of the cumulative frequency of the number of assets used

Thus, deployment of PervTrack System, even on a pilot scale, reveals interesting information about asset utilization patterns in an organization, i.e., utilization rates of assets during days, during nights, during holidays. It is also possible to find out which assets are getting used maximum, which assets are staying idle most of the time, where is the bottleneck etc. Table 1 shows sample recommendations based on the asset utilization rates as captured by PervTrack System. It is also possible to device feedback-based automatic control software for asset scheduling to achieve optimal asset utilization.

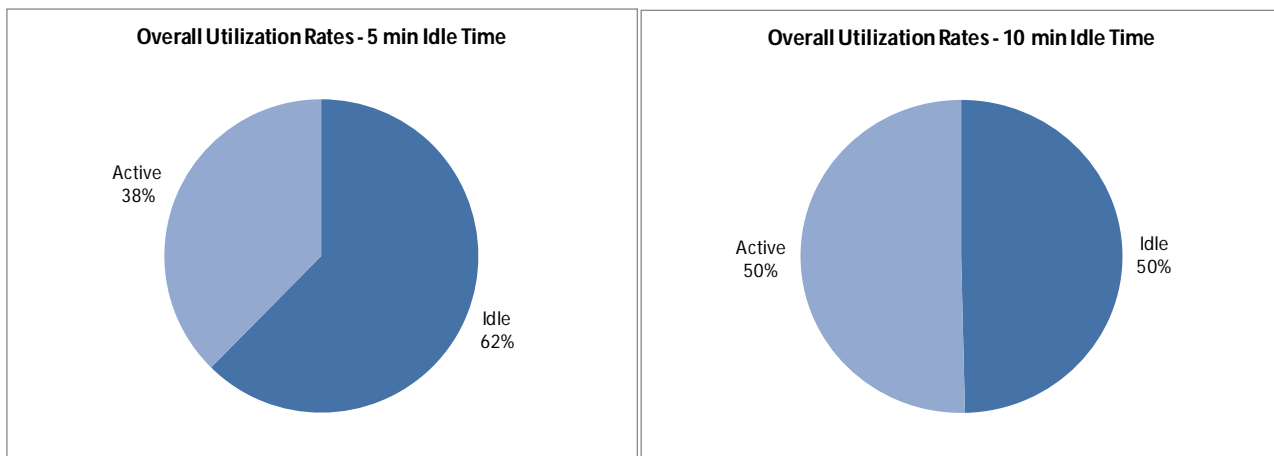


Figure 2. The overall utilization rates for all of the 9 assets.

6 Conclusion & Recommendations

In this case study, we have demonstrated the ability of tracking mobile assets and establishing accurately their utilization rate. Our analysis of the movement of Fork-Lift-Trucks has lead to some insights and recommendations. The average utilization was found to be only 38% and the rates for individual assets varied widely from 14% to 60%. The hugely varying rates for individual assets can be explained as follows. Assets that are in use continue to be used. While those that are inactive, are used only when the number of concurrent jobs increases. This leads to a non uniform wear and tear of the assets which in the long run can lead to larger maintenance costs. The night time utilization was found to be generally higher than the corresponding rates for daytime.

Our recommendations include an optimal deployment of 7 assets instead of 9. This leads to a utilization of 60% with an average slack time of 15 minutes for only 1.2% of the jobs. i.e., If there are 100 jobs catered to, only 1.2 jobs would have to wait on average for 15 minutes while the remaining 98.8 jobs are catered to immediately. This in turn is achieved with just 7 assets. The savings due to this include a direct reduction in the procurement costs of a truck and the long term savings in running costs and maintenance. Thus, by having a lower number of assets cater to the same amount of jobs, we have directly increased the return on investment of the assets. Further, the return from investing the Real Time Tracking System (RTLS) can be estimated easily based simply on the cost of the RTLS system and the cost of the FLT's that are reduced.

Our effort on a small number of assets for a relatively small duration has shown encouraging results and gives the impetus for a large scale analysis and optimization. Our learning and recommendations are summarized in the table below.

Summary of the Insights and the Recommendations

Insight #1	The average utilization rate of the Fork-Lift-Trucks is 38 %.
Insight #2	Most of the time, 6 – 7 trucks are needed. However, there are a few instances where all 9 are needed.
Insight #3	The trucks that are well utilized are so done on a continuous basis. When more trucks are needed, additional trucks are used only for these periods. Thus utilization rates vary greatly and this leads to non-uniform wear & tear.
Insight #4	The night utilization rates are generally better than the day.
Recommendation #1	Use 7 trucks instead of 9, raising the utilization to 60%. Cost of 2 trucks and their running expenses saved, generating immediate ROI for RTLS deployment
Recommendation #2	Rotate the trucks in use on a regular basis for uniform depreciation.

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Thank You.
