

CASE STUDY

PACKET NETWORK CAPACITY

ANALYSIS AND DESIGN

COMMON CORE 2G/3G SGSNS

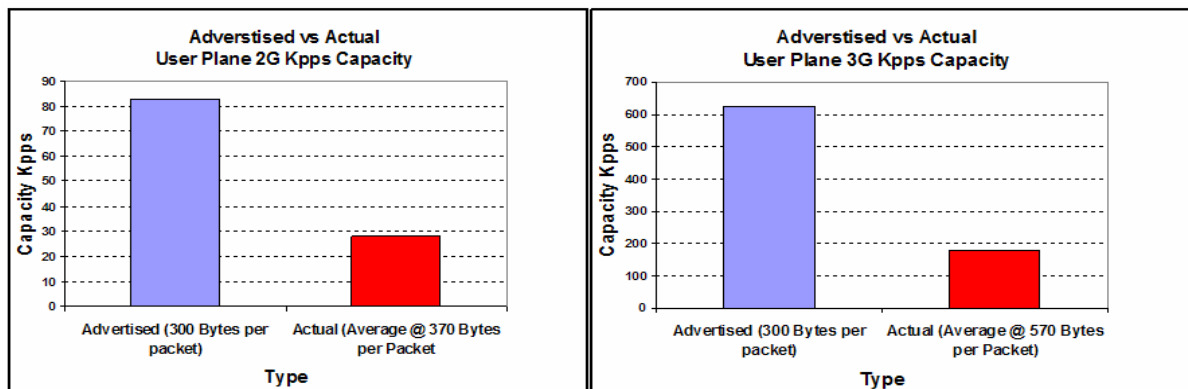
INTRODUCTION

This study was conducted on SGSNs in the heart of London in June 2009. This tier-1 operator had a sudden growth in demand and the data forecast was double the traffic levels in the following 12 months. The operator believed that as per vendor published capacity the SGSNS had ample capacity in the network to take them through to the end of 2010. Cerion was engaged to verify the network capacity status and suggest a capacity plan for 12 months from June 2009 to June 2010. Another challenge was that the Radio network was evolving fast with the introduction of new BSCs, RNCs, increasing number of sites and double the number of E1s increasing pressure on SGSNs. The operator however was quite relaxed due to assurances from the Vendor about published capacity figures.

This immense data growth was bound to have an imminent impact on the accessibility, retainability, integrity and quality of the network due to changing load patterns beyond human predictability. This would result in inaccurate dimensioning and planning, un-optimized LAC/RAC boundaries, imbalanced load and disruptive implementation. Accurate capacity forecasts across SGSNs, right dimensioning of transmission links, dynamic load balancing, precise management of 'what if' scenarios and methodical implementation were critical to control financial drains and improve ROI. An impartial 3rd party view was vital to validate the capital expenditure and provide an optimal design based on projected growth.

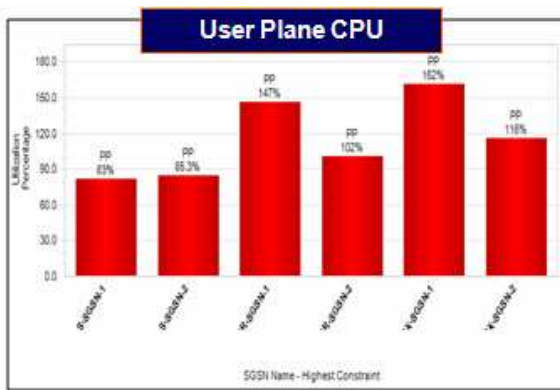
THE ANOMALY

The CPU charecterisation using live measurements from the network proved that the actual capapacity of SGSNs was 60% lesser on 2G and 33% lesser on 3G compared to the advertised vendor capacity. Hence the operator's capacity plans were over optimistic and would have resulted in severe QoS impact and emergency rework.

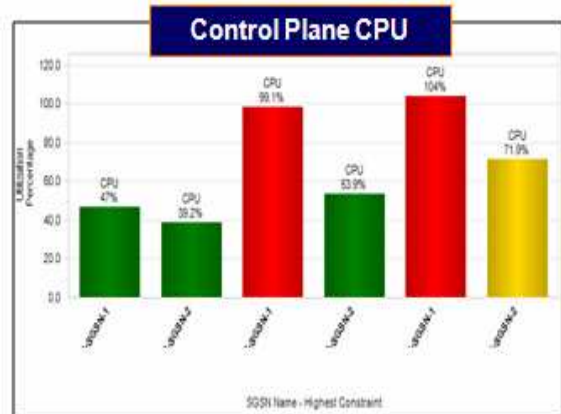


THE IMPACT

As a result of the anomaly the network capacity had to be reassessed and requalified. Cerion consultants analysed the overall system capacity and design to project capacity constraints upto June 2010. Against operator's expectations, all 6 SGSNs in the pilot area were forecasted to be constrained for different resources. Our experience shows that call profiles driven mainly by mobility, play a vital role in the CPU load variations. Operators usually develop a few call profiles based on experience and categorize the elements accordingly. Due to the dynamic nature of call profiles and mobility trends, control plane constricts the user plane capacity hence CPU modeling becomes critical to understanding the actual CPU constraints on a per node basis. Cerion solution individualizes each node by accurately modeling the CPU profile, predicting the user plane and control plane load and translating that into a design that can sustain the predicted load and implementation plan that minimizes disruption to the QoS.



Cerion Optimizer results showed that both control plane and data plane capacity were over estimated by the operator. Being 2G dominated network, the SGSNs were found to be more user plane constrained compared to control plane. The analysis showed that user plane would start hitting the threshold of 80%

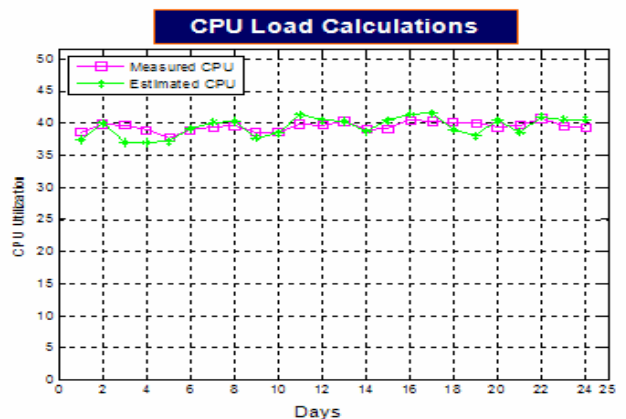


around Feb 2010 against the expected Feb 2011. Not only the total user plane capacity available in the area would be insufficient, the individual SGSNs would also get constrained to varied levels.

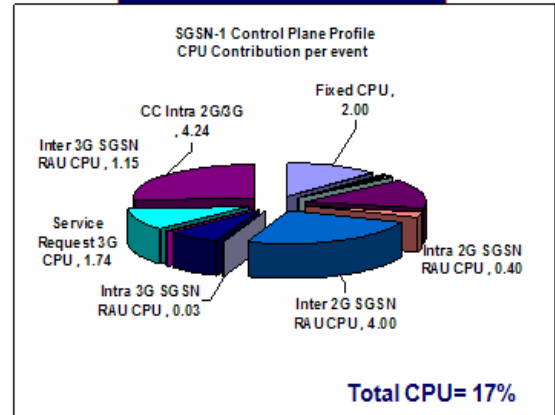
June 2010 projection showed that although the total control plane capacity in the pilot area looked fine, two SGSNs were expected to be severely constrained by control plane traffic.

THE METHOD

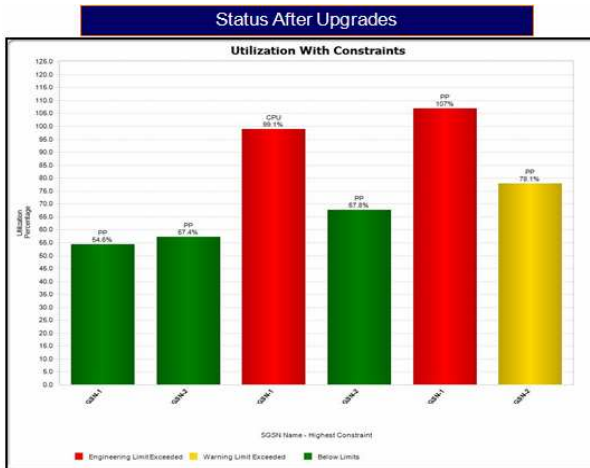
Cerion proprietary algorithms based on Artificial Intelligence calculate the load created by each type of transaction on the CPU. Using the Cerion Optimizer forecasts, the load is then projected for future demand identifying demand Vs capacity along with detailed constraints.



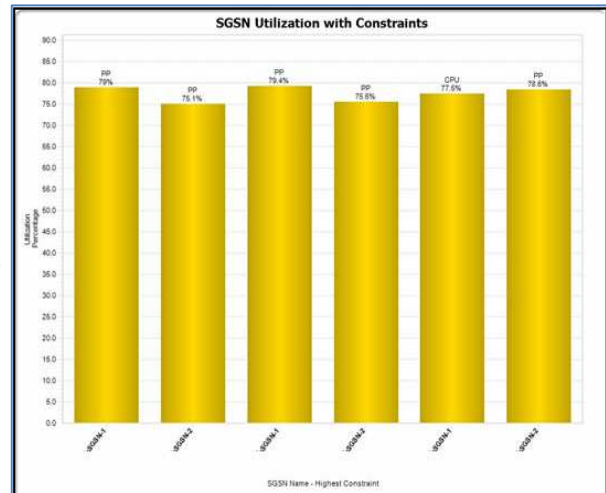
In depth analysis of each signaling type on the SGSN CPU gives an insight into the CPU profile that helps highlight any anomalies in the network design e.g. inappropriate borders, unreasonable inter-SGSN handovers or exceptional loads created by other less demanding transactions. The design can then be changed through quick what if scenarios and CPU load recalculated to assess the impact of changes.



THE SOLUTION



The analysis resulted in identification of the upgrade path and the time of upgrade. It was also identified that even after upgrade of all SGSNs to the next version; two of them will still be constrained for resources.



Cerion Optimizer was then used to balance the load across SGSNs. This resulted in a detailed Node-B, BTS, RNC and BSC re-home plan that optimized the capacity to cater to demand through to the end of 2010.

BUSINESS BENEFITS

- The project delivered capital efficiency improvement equivalent to saving at least one SGSN
- Efficiently simulated multiple real world scenario analysis – e.g. individual SGSN CPU performance
- Substantial Improvements in:
 - Planning Time
 - Results Accuracy
 - Capex and Opex savings
 - QoS impact prediction
 - Process Efficiency