TEMS Capacity Manager

Wireless Capacity Planning and Management Solution

Introduction October 2014

The Benefit of Better RAN Capacity Management

"One of the most direct and natural outcomes of improved network monitoring is that the existing equipment can be tuned to be optimally efficient, resulting in a deferral of upgrades and capacity overhauls……Effective monitoring and timely changes and upgrades, which allow the infrastructure to run closer to its rated capacity, can eliminate inefficiency caused by retransmissions, interference or poorly set radio parameters. Many vendors think that they can create between 15% and 30% capital savings for a particular network element by deferring upgrades and new line cards. Assuming just the low end of 15% applies to key core network elements such as the RAN in 3G, the annual CAPEX budget for network capacity is significant. As an example, a European operator with 30 million subs might reduce its €800 million annual budget for CAPEX by €120 million."

Source: ABI Research *Mobile Network Optimization 2011 Research Report*; Eller and Kaul, October 11, 2011.

Wireless Capacity Management is Challenging…

- **In a fast changing world –**

  Capacity Management needs to address:

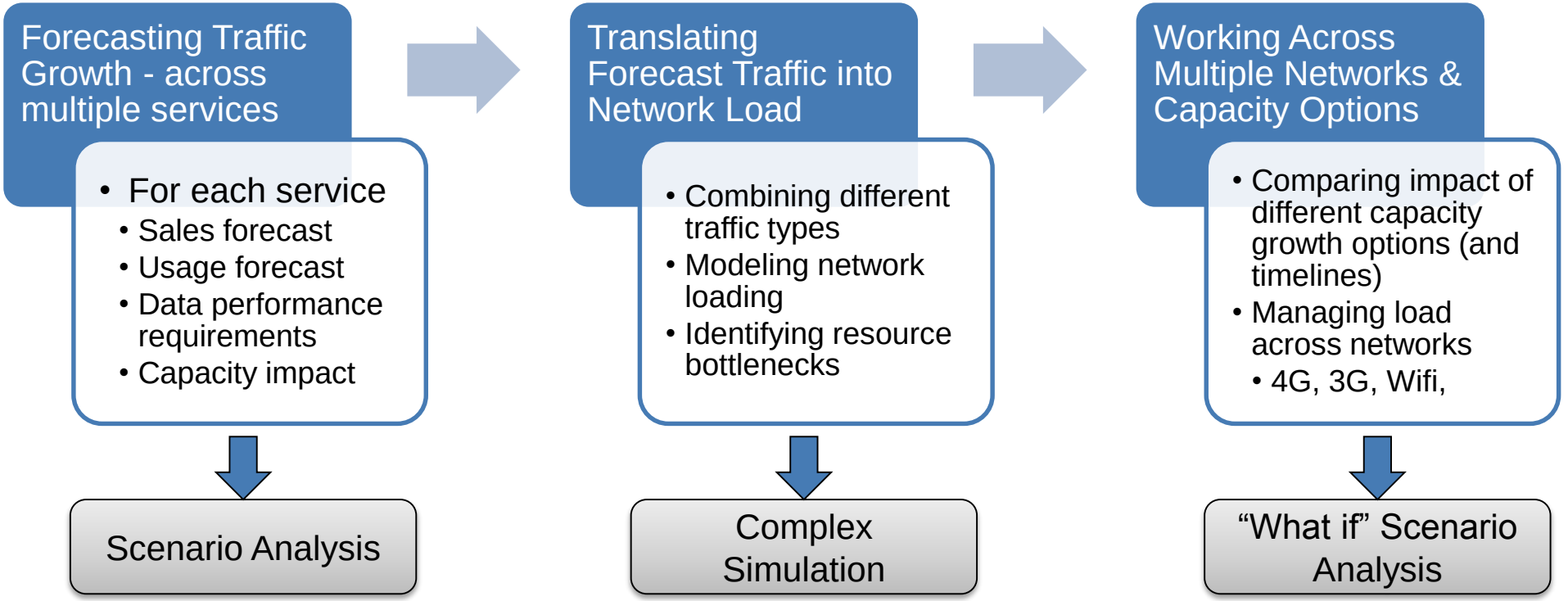
  - Forecast customer growth (scenarios)
  - Impact of new applications and types of data usage
  - QoS requirements (overall and per service)
  - Multiple, layered networks (Hetnets, Wifi etc)
  - Technology migration - spectrum repurposing (2G→3G→4G)
  - Legacy site decommissioning

- **While also seeking to:**
  - Optimize capital expenditure (just in time)
  - Stay ahead of demand
  - Deliver customer satisfaction (QoS per service)

- **How are you addressing this now???**

Key Network Capacity Planning and Management Challenges

A) Operational: Right sizing “in time” network capacity investment



B) Strategic: Spectrum utilization and technology migration

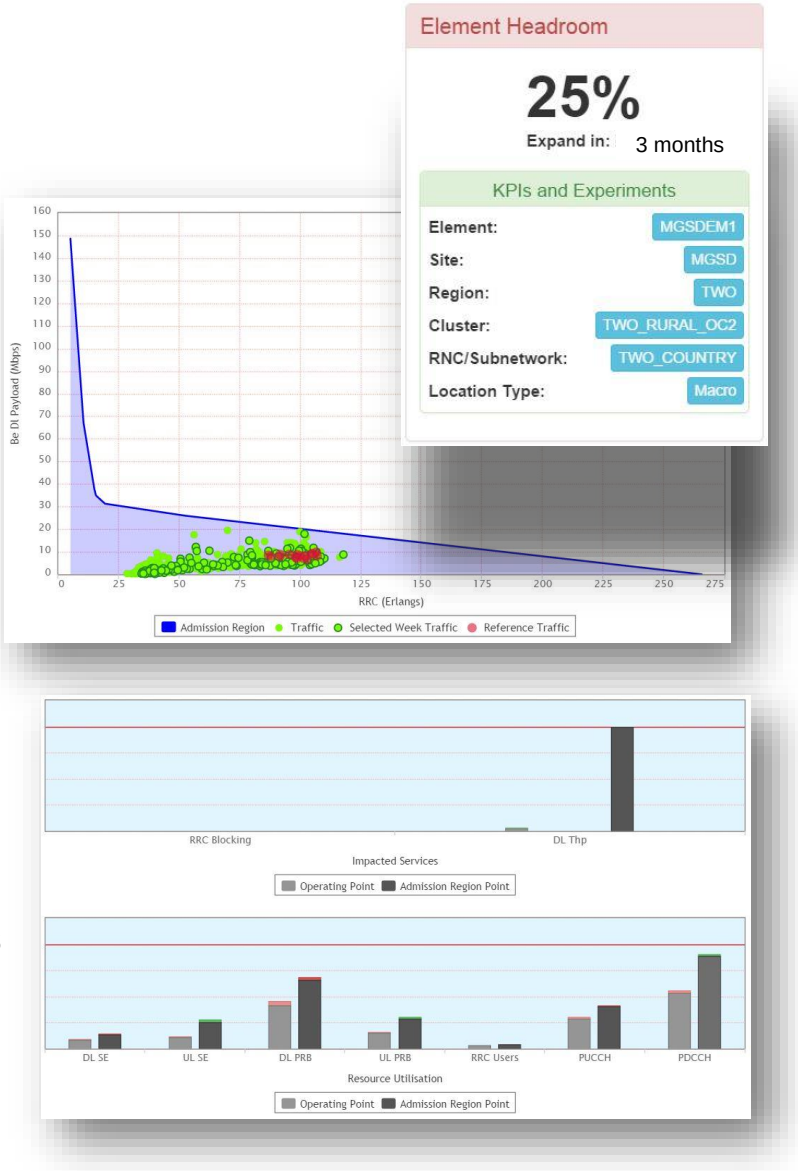
Introducing TEMS Capacity Management Solution

Delivering Optimized Capacity Management

- Tracking network load by service using network OSS data
- Plotting “Headroom” or available capacity based on traffic mix/growth and target user experience KPI’s per service
- Take advantage of “Soft capacity”
- Alerting when cells will reach capacity
- Providing visibility into capacity constraining resources
- Scenario analysis
- Configuration recommendations to maximize capacity from existing network

Enabling Business Decisions

- Enabling just in time capital planning
- Prioritization - Network or regional level “top N” offender lists
- Prioritization – Based on revenue contribution per cell
- Consistent automated and systemized planning across business



Automating and Systemitizing Key Capacity Management Activities

- Designed to help capacity engineers in three key areas:

Providing a single, easy to use web portal for storing, reporting and visualizing all the RAN's service capacity information.

Enabling consistent optimization of soft capacity for LTE networks. Operators can use their current capacity resources up to their optimized limits before investing in CAPEX on new resources.

Delivering just-in-time capacity expansion capability because of its comprehensive approach to forecasting, adaptive modelling and scenario analysis.

Has enabled CAPEX savings of up to 40%

Extremely short payback period on solution investment

Delivering a Comprehensive Approach to Capacity Management

Capacity management that takes multiple factors into account:

- RAN RRM (radio resource management) procedures for the air interface and baseband;
- LTE (and WCDMA HDPA/EUL) uplink/downlink scheduler behaviour;
- ATM connection admission control and flow control procedures on Iub;
- Revenue impact modelling prioritizes expansion based on revenue impact

Calculations for every traffic carrier in the network to determine:

- Overall resource utilization (headroom);
- What network resources are most limiting – and what services are most impacted;
- Forecast traffic growth (per service, per site);
- How long until the per service subscriber experience KPI's begin to be breached;
- Impacted revenue
- Scenario Analyses

Element Level Analysis (User Experience KPIs)

The modeling performed by the software enable dimensioning using per service user experience KPIs (vs traditional *engineering* KPIs).

Resource	Engineering KPI Trigger	User Experience KPI Trigger
DL PRBs	Utilization (%)	Blocking (%) & Average Downlink User Throughput (Mbps)
UL LE	Utilization (%)	Blocking (%) & Average Uplink User Throughput (Mbps)

- Dimensioning to user experience KPIs also makes it easier to provide a consistent user experience across a wide range of different hardware configurations (especially when the effects of soft capacity are considered).

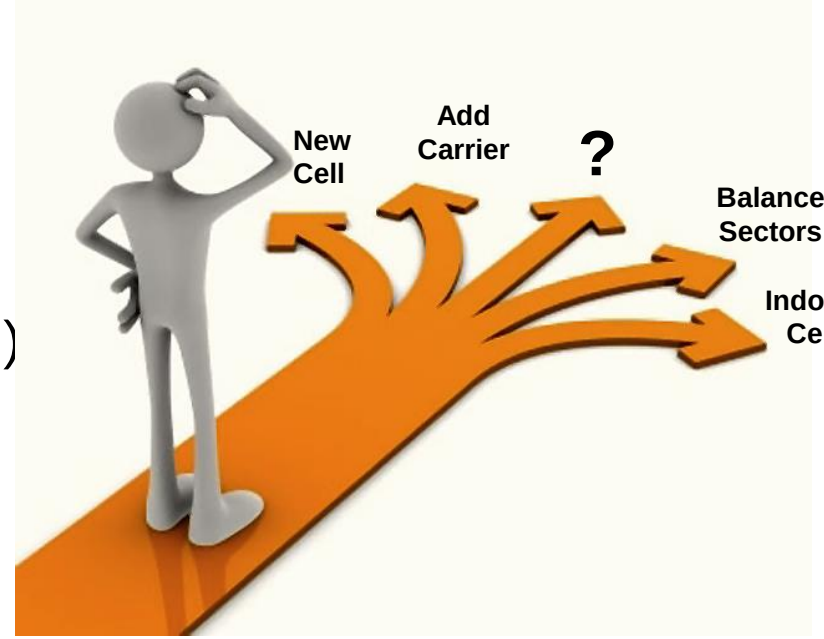
- User experience KPIs consider:
  - The combined utilisation of different network resources and the effect that this has on “per service” session quality
  - Multiple services or applications coexisting in a shared data pipe

Цены и срок поставки уточняйте на сайте www.2test.ru, по телефону: + 7 495 215-57-17 или info@2test.ru

“What-if” Analysis – Evaluating Options

- Perform “what-if” experiments:

- Impact of different per service traffic (growth) loads and different service mix per site
- Explore different configuration changes to identify capacity expansion options
- Plan for special events.



Any combination of configuration changes, environmental changes, KPI changes and traffic changes can be made in each experiment.

Enhancing Capital Efficiency

In a recent case study with a large global Tier 1 MNO Accenture found that

- 66% of total RAN element upgrades were planned on nodes with low saturation risk
- 80% of nodes with high saturation risk were not planned for upgrades

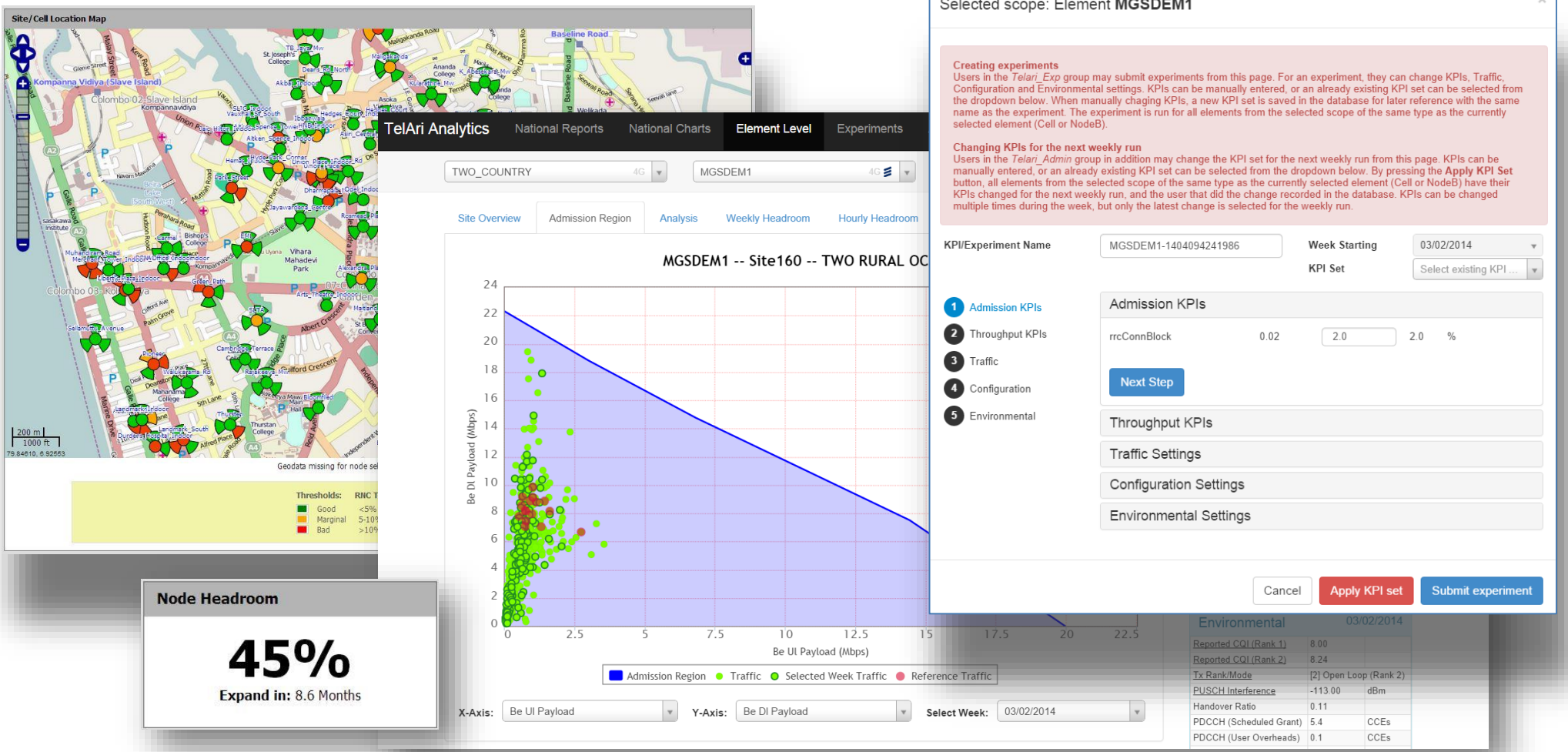
Similarly, Telstra, the leading MNO in Australia performed a case study revealed that:

- 30% of cells are expanded too early using conventional capacity management approaches.
- 30% of cells suffer unacceptable performance for at least 2 months before they are actually expanded.

THE SOLUTION

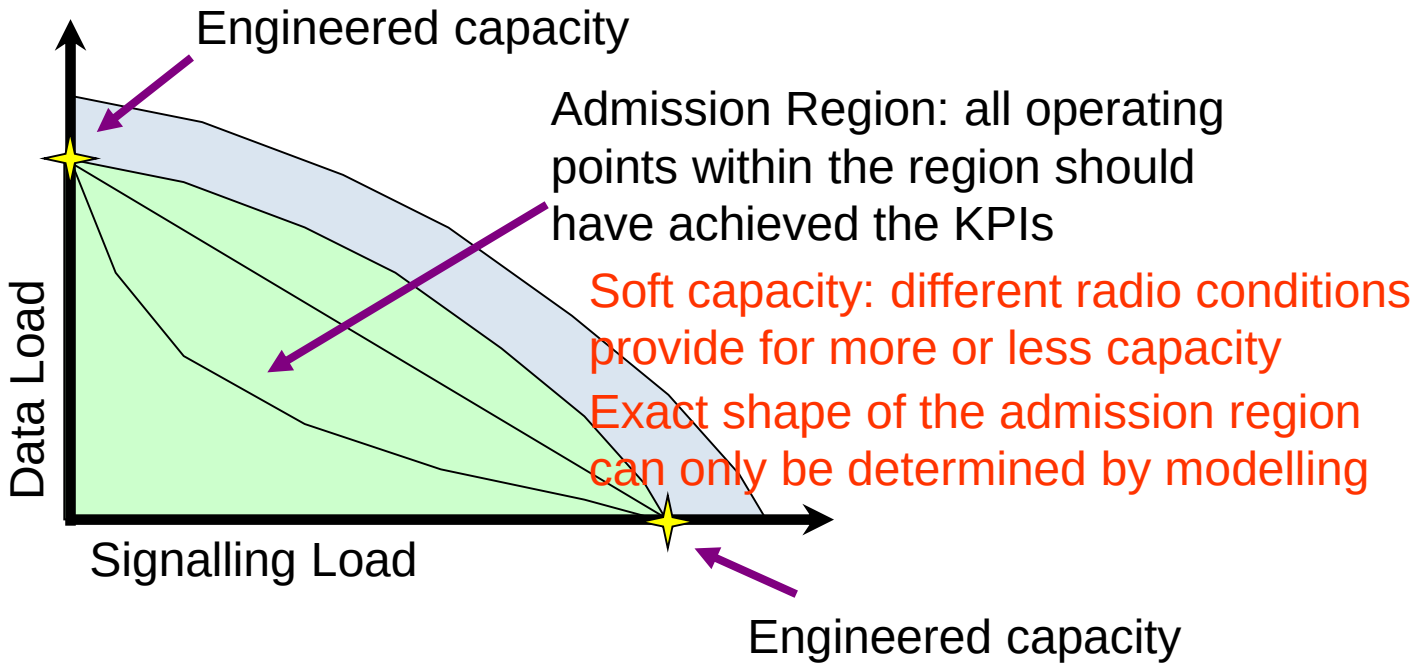
The User Interface

Data and Reports are Accessible via a Web Based Interface.



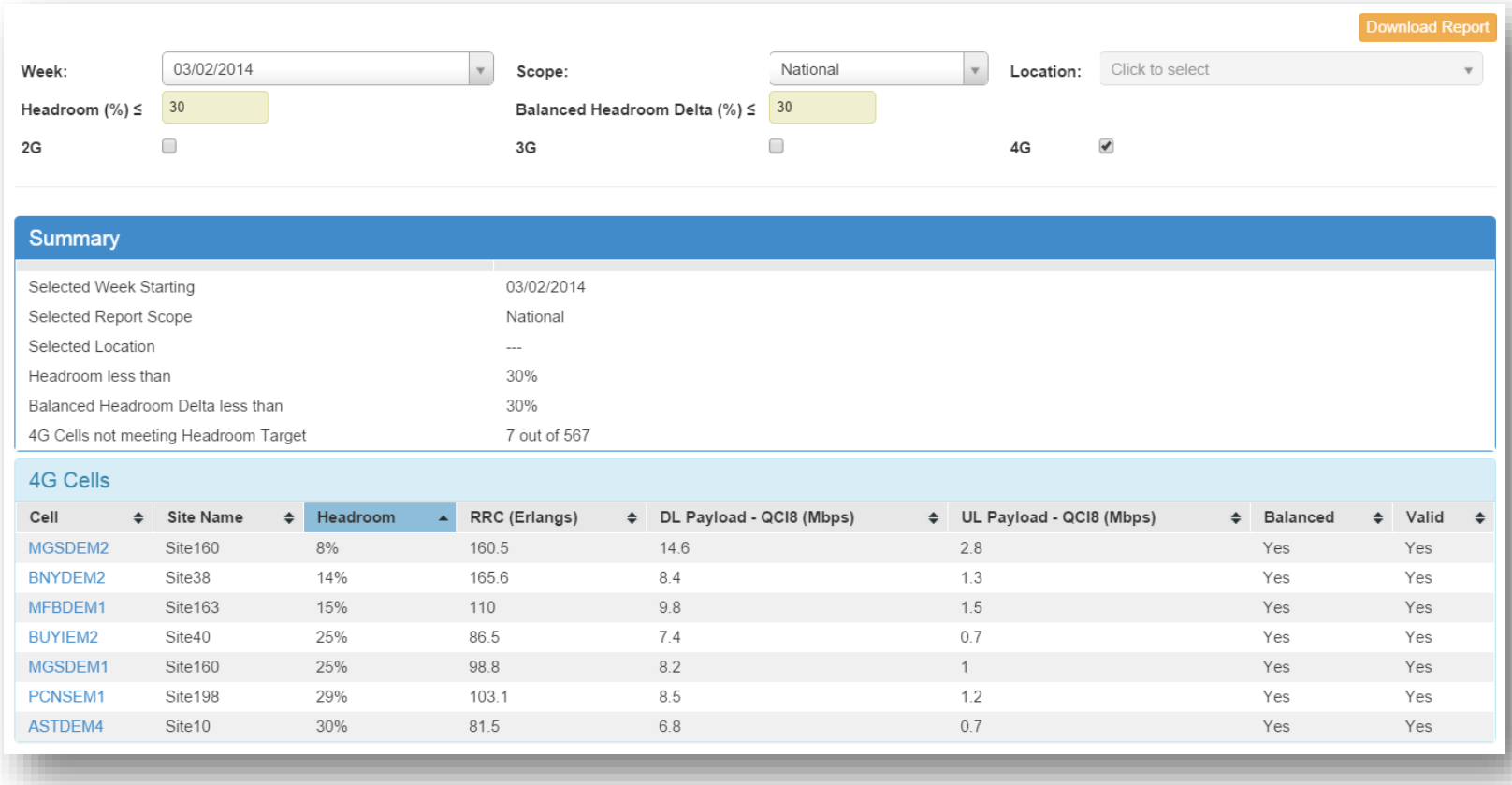
Admission Regions

- System resources are shared dynamically between multiple simultaneous instances of a number of services.
- May apply different KPIs to each service (stringent voice, lax data).



Headroom Report

Generate Reports showing which sites/cells need to be investigated in more detail.



Download Report

Week: 03/02/2014 Scope: National Location: Click to select

Headroom (%) ≤ 30 Balanced Headroom Delta (%) ≤ 30

2G ☐ 3G ☐ 4G ☑

Summary

Selected Week Starting	03/02/2014
Selected Report Scope	National
Selected Location	---
Headroom less than	30%
Balanced Headroom Delta less than	30%
4G Cells not meeting Headroom Target	7 out of 567

4G Cells

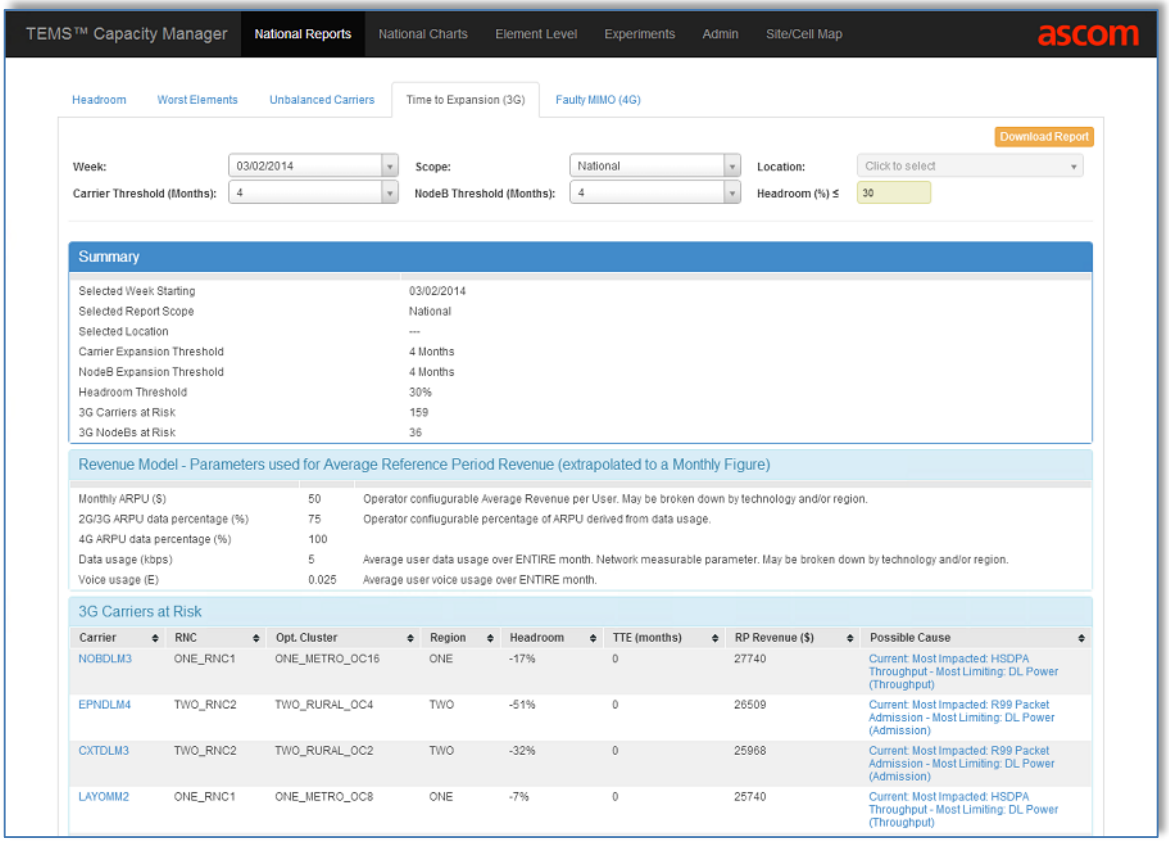
Cell	Site Name	Headroom	RRC (Erlangs)	DL Payload - QCI8 (Mbps)	UL Payload - QCI8 (Mbps)	Balanced	Valid
MGSDEM2	Site160	8%	160.5	14.6	2.8	Yes	Yes
BNYDEM2	Site38	14%	165.6	8.4	1.3	Yes	Yes
MFBDEM1	Site163	15%	110	9.8	1.5	Yes	Yes
BUYIEM2	Site40	25%	86.5	7.4	0.7	Yes	Yes
MGSDEM1	Site160	25%	98.8	8.2	1	Yes	Yes
PCNSEM1	Site198	29%	103.1	8.5	1.2	Yes	Yes
ASTDEM4	Site10	30%	81.5	6.8	0.7	Yes	Yes

Reports can be customized to only include nodes with headroom below a custom threshold, or nodes that are forecast to run out of capacity within a given timeframe.

Time to Expansion Report: Prioritized by Revenue

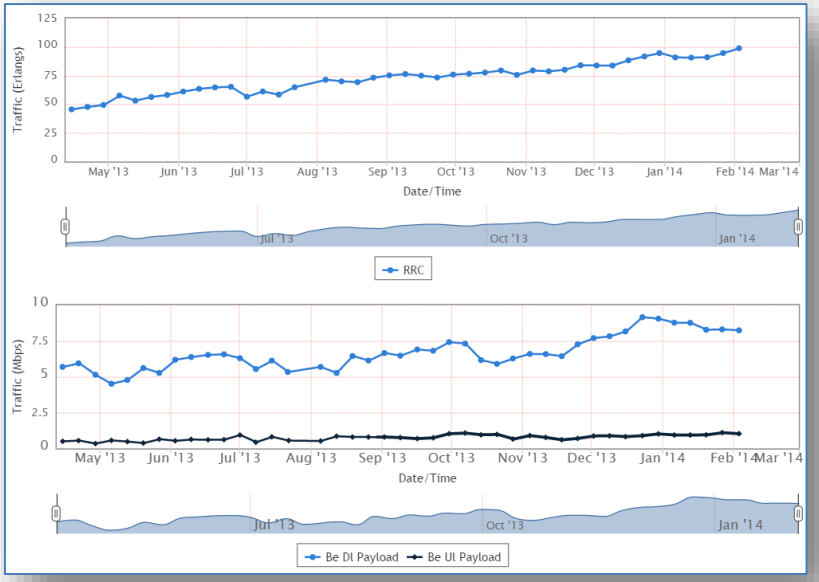
Including revenue per site enables prioritization based on potential revenue impact

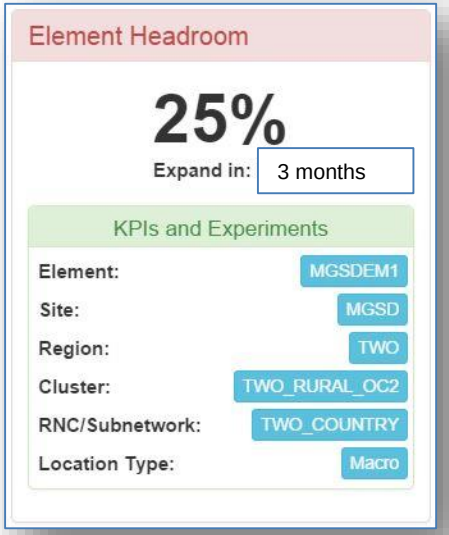
- Revenue per site calculation factors in revenue per MB or Erl per service and traffic mix
- Customizable calculations – so carriers can match their ARPU and way they relate per service traffic to revenue
- Can also be weighted to favor different services – ie support a marketing driven focus on video



Element Level Trending

*Quickly Identify **when** a Cell will run out of Resources*

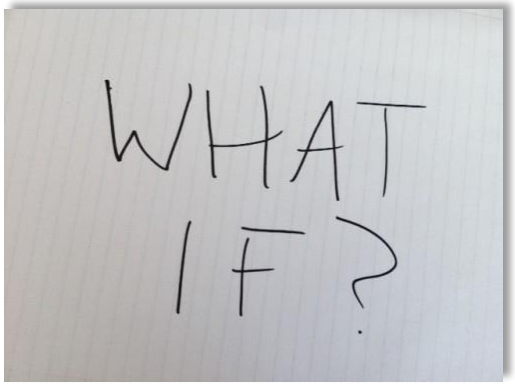




The dashed lines show traffic forecasts for different traffic types. When the dashed line crosses into the red region KPIs are no longer being met.

“What-if” Analysis Use Case: Designing Site Capacity Expansion

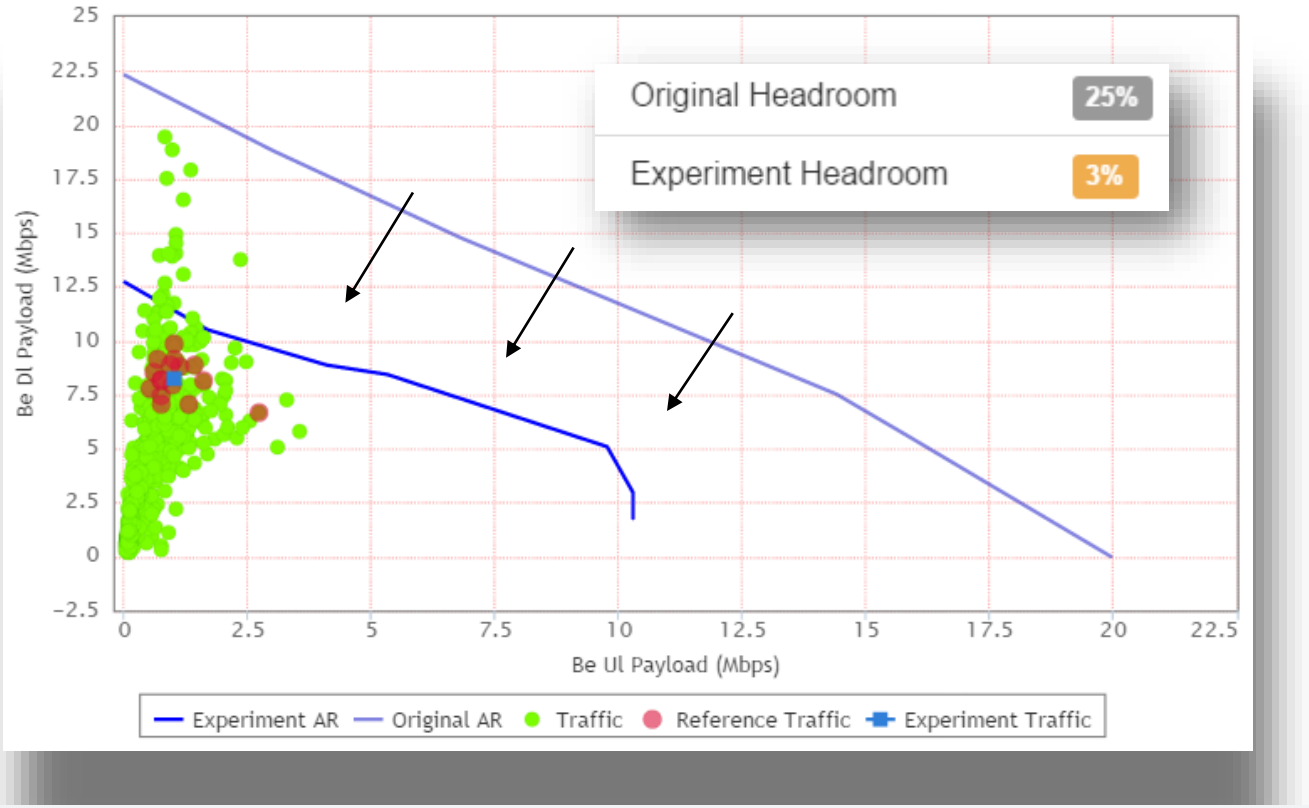
- TEMS Capacity Manager establishes a set of models customised to each cell/site.
- These models can also be used in “what-if” experiments to determine how configuration changes, or different traffic loads will impact per service performance.
    - RAN engineers can use this experimentation capability to investigate how best to remediate a capacity problem.
    - TEMS Capacity Manager will:
        - Identify the constraining resource(s)
        - Allow the engineer to compare solution options by re-running the analysis as if each capacity expansion solution had already been implemented.
    - This capability is also useful for special event planning: experimentation on individual network elements can be performed to understand impact of predicted load



- Any combination of configuration changes, environmental changes, KPI changes and traffic changes can be made in each experiment.

“What-if” Analysis Use Case: Understanding KPI targets vs Capacity

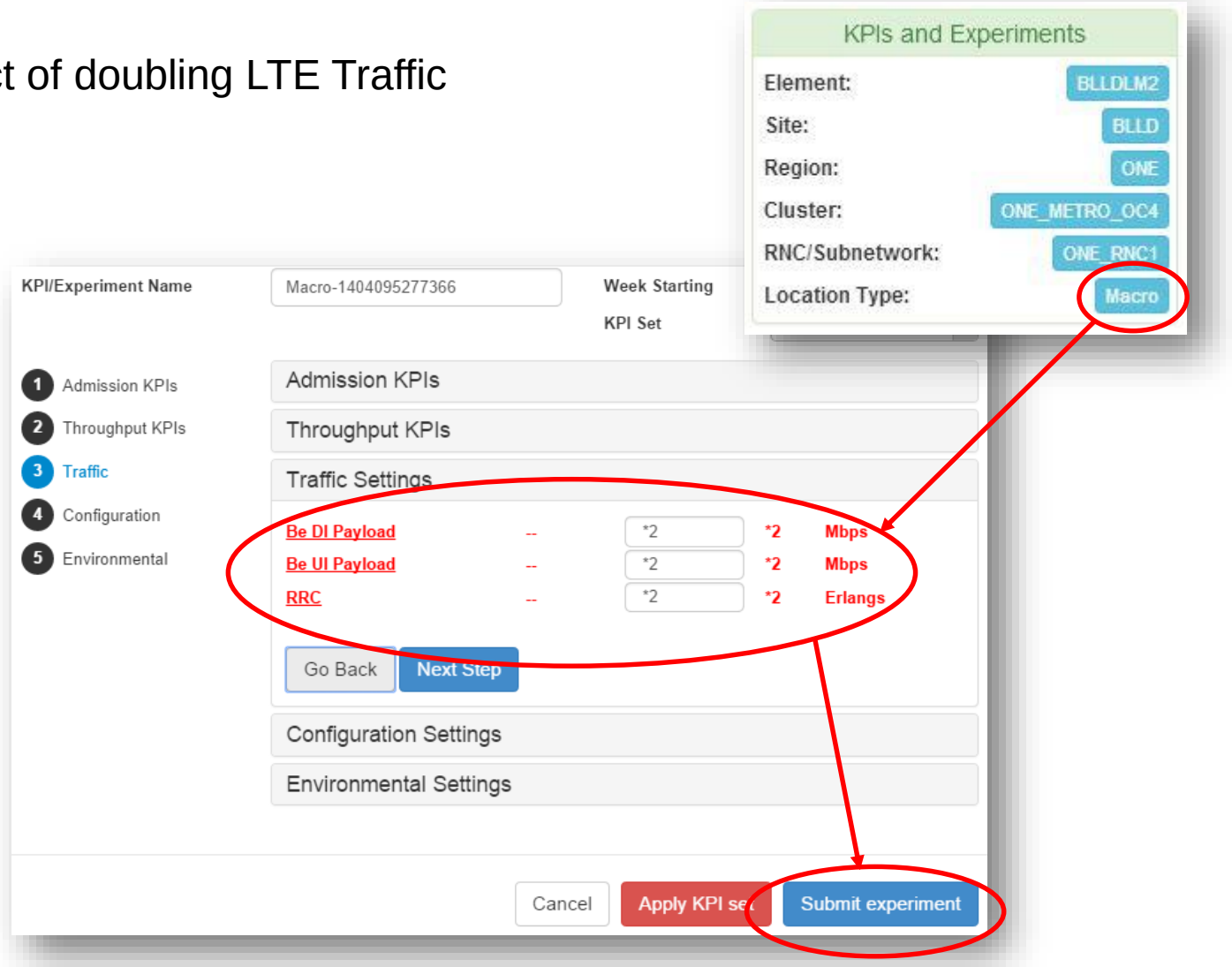
- Example:
- With a median downlink user throughput KPI target of 3 Mbps this LTE Cell is operating with 25% spare capacity for a KPI.
- Modifying the KPI to a 10 Mbps median has a severe impact.



“What-if” Analysis Use Case: Predicting Impact of Traffic Growth

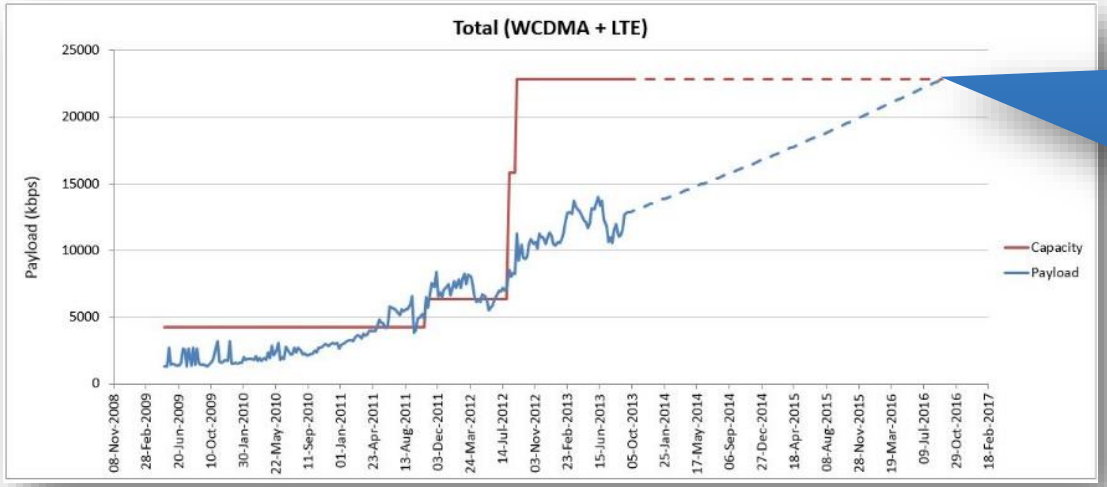
- Example: Model impact of doubling LTE Traffic

- Clicking the submit button will launch experiments of the changed traffic conditions in the unique models for each macro cell in the network.



Identifying the Need for Small Cells, Hetnets, or Re-Farming

- Comparing element level trending (in blue) with spectrum (capacity) availability (in red) allows for a micro layer strategy to be evolved “just in time” and assists in devising spectrum re-farming strategies that can maintain user experience.



When total WCDMA & LTE payload at this site reaches this level, macro layer spectrum will be exhausted. The operator has knowledge of when more spectrum is required and/or when a micro layer capacity offload solution needs to be implemented.

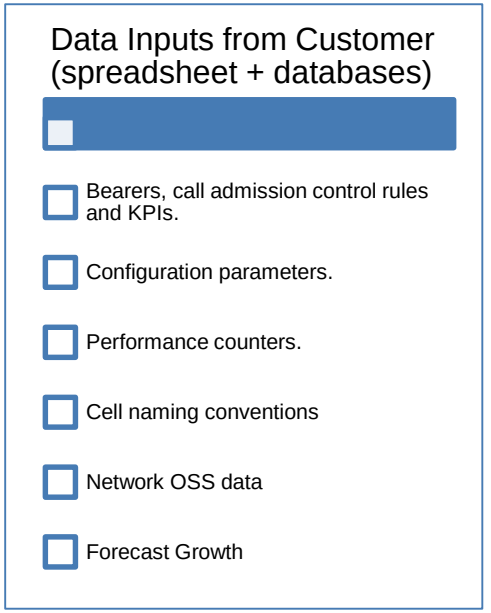
NEXT STEPS

Next Steps - Capacity Audit Project

A capacity audit project on your network using data from one RNC

Providing visibility into the solution functionality and capabilities on your Data

- Carrier Inputs and Commitments:
  - Data inputs →
  - Setup review sessions
  - Scenario analysis review sessions
  - Interaction with the solution
  - Project fee: (can be applied as a credit to solution purchase)
    - Statement of work
    - At cost ~$15-$25k
  - Timeline: ~1-2 mths from Kickoff



Спасибо!

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