SEMAFOUR

Decision Support System: Operational Network Evolution

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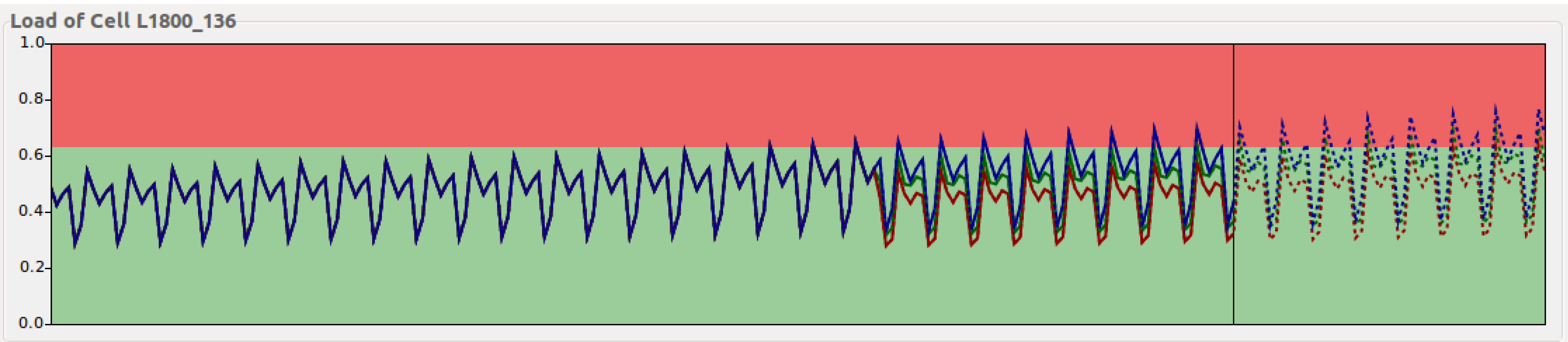
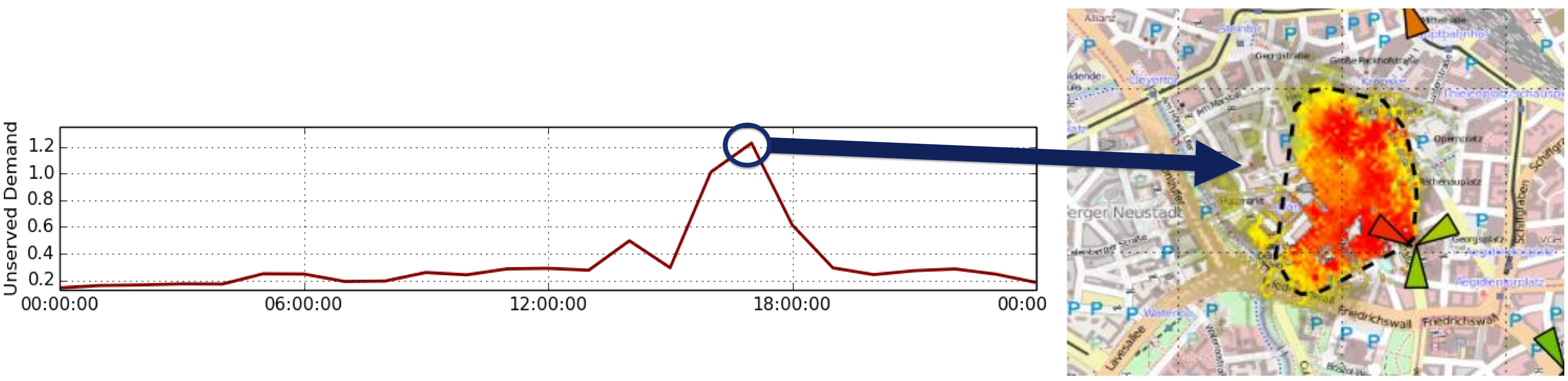
The exposition illustrates a Decision Support System for assisting radio network operators in the day-to-day planning of the network evolution. As an example, an LTE radio network is used. The system improves upon the traditional capacity management process. This process comprises monitoring KPIs, triggering an alert if some threshold is exceeded (for some time), manually identifying update options, and manually assessing those alternatives (often aided by dedicated tools).

The SEMAFOUR project has developed an *integrated and automated approach* for the timely generation of suitable network expansion suggestions using the following steps:

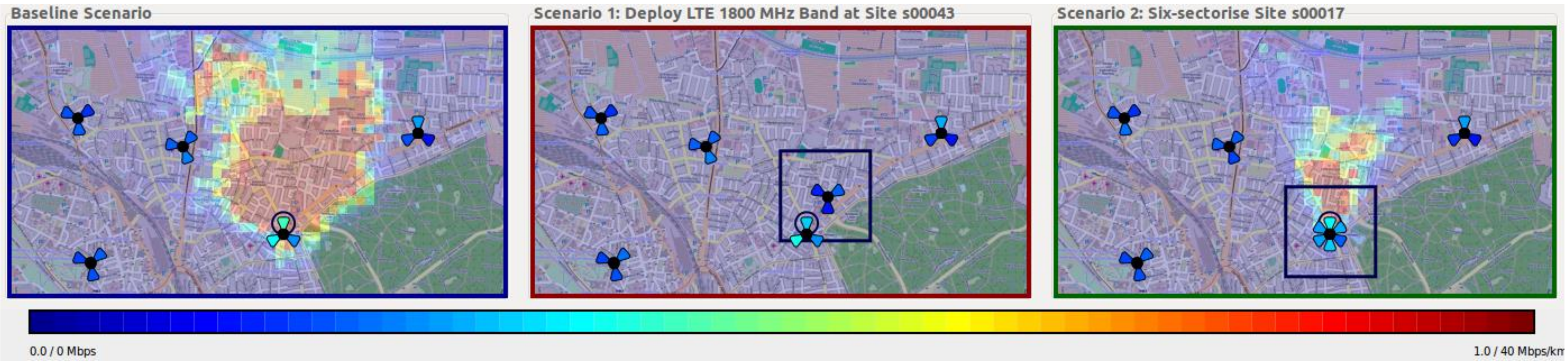
1. **Monitoring** of KPIs related to traffic growth and network performance (as it is common practice in network operations)
2. Cell-specific analysis and **prediction** of traffic growth evolution (using machine learning techniques)



3. **Distributing** forecasted cell-specific traffic demand onto traffic maps (pixel maps). These maps vary with time, and the usage intensity is expected to increase over time
4. Detailed network load and **performance analysis** via network-level simulations for various future points in time
5. **Identification** of performance deficiencies (such as unserved traffic) at the level of cells as well as localized on a map



6. Identification of possible **network upgrades** / expansions in the vicinities of the detected bottlenecks (such options are generated via rule sets, e.g., upgrades from three- to six-sectorized sites or deployment of micro-cells at candidate locations)
7. **Detailed analysis** of alternative upgrade options (optimization alike automatic cell planning) based on several forecasted traffic intensities, again using network-level simulations
8. **Comparison and ranking** of alternatives based on quality or capacity gained, time to next bottleneck, deployment lead time, cost of deployment, or the like



9. **Presentation** of the strongest, sufficiently distinct alternatives to the network engineer including forecasts and analyses

While the models and methods used in most of the individual steps are not genuinely new, but state-of-the-art, their combination and the degree of automation is novel. In addition, the fact that upgrade options are analyzed with respect to several traffic forecasts instead of a few (or just one) is important, as these results form the basis of an automated assessment which is traditionally done by a network engineering expert.

The approach described above is at the core of the presented Decision Support System (DSS) for Operational Network Evolution. The purpose of this DSS is to assist the radio network operator in taking timely and well-informed decisions.

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SEMAFOUR

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