

Claims

1. A communications server apparatus for simulating supply and demand conditions related to a service or asset provision and deriving associated spatio-temporal prediction data, the communications server apparatus comprising a processor and a memory, and being
5 configured, under the control of the processor, to execute instructions stored in the memory to:
 obtain supply and demand data, said supply data comprising service or asset provider location and availability data and said demand data comprising user request data;
 generate, using said supply and demand data, aggregated supply and demand data comprising a plurality of data records associated with a plurality of respective predetermined
10 time periods, each record being representative of an available supply pool of one or more service provider/asset types in one of a plurality of regions, and demand therefor, during the respective predetermined time period;
 generate, using said supply and demand data, probability data for each of said plurality of regions and supply pools in relation to respective predetermined time periods, said
15 probability data comprising probability values representative of a likelihood of demand associated with respective time slot/supply pool/region combinations;
 perform a simulation of supply and demand conditions in said plurality of regions by mapping said aggregated supply and demand data to said probability data in a trained forecasting model and generating prediction data for each of said plurality of regions and supply
20 pools, said prediction data being representative of a probability that a service or asset provider will receive a user request in a specified region within a predetermined period of time; and
 output said prediction data for display on a service or asset provider communications device.
- 25 2. A communications server apparatus according to claim 1, for simulating supply and demand conditions related to a transport service, wherein said demand data comprises user bookings data.
3. The communications server device of claim 1 or claim 2, further comprising a database
30 configured to store live supply and demand data as historical supply and demand data.
4. The communications server apparatus of claim 3, further configured to generate supply pooling logic for mapping a service or asset provider type to a supply pool by deriving one or

more supply pools based on historical supply and demand data obtained from said database, and grouping sets of one or more service or asset provider types into pools representing greatest demand in a region during each of a plurality of predetermined time periods.

- 5 5. The communications device of any of claims 1 to 4, further configured to generate said aggregated supply and demand data by generating sequential data records, each representative of a predetermined time period and comprising data representative of demand during each of a plurality of time slot in relation to specified supply pools.
- 10 6. The communications server apparatus of any of claims 1 to 5, further configured to generate said probability data for each region/supply pool/time period combination by calculating a probability based on supply and demand in the respective region during the respective predetermined time period, adjusted to take account of low supply and/or demand conditions.
- 15 7. The communications server apparatus of claim 6, further configured to calculate a probability for a region/supply pool/time period combination using an adjusted empirical probability calculation for that region/supply pool/time period combination wherein a demand count from another time period for the same region/supply pool is added to the numerator and
- 20 denominator thereof.
8. The communications server apparatus of claim 6 or claim 7, further configured to calculate a probability for a region/supply pool/time period combination using an adjusted empirical probability calculation wherein 1 is added to the denominator thereof.
- 25 9. The communications server of claim 3, further configured to generate a training data set for use in generating said trained forecasting model, said training data set comprising aggregated supply and demand data and probability data derived from historical supply and demand data, stored in said database, for said plurality of regions.
- 30 10. The communications server of claim 9, further configured to periodically update said trained forecasting model with new aggregated supply and demand data and probability data

derived from recent historical supply and demand data, stored in said database, for said plurality of regions.

11. The communications server apparatus of any of the preceding claims, further comprising
5 an API service, and configured to output said predictions data, via said API service, to a said service or asset provider communications device.

12. The communications server apparatus of claim 11, wherein said API service is a heatmap
10 service configured to output said predictions data to said service provider communications device for display thereon as a heatmap representative of the probability of a service provider receiving a booking in one or more of the plurality of regions within a said predetermined time period.

13. A communications server apparatus according to claim 9 or claim 10, further configured
15 to monitor the performance of said forecasting model and to perform a retraining process in respect thereof in the event that said performance drops below a predetermined threshold.

14. A communications server apparatus according to claim 13, wherein said retraining
process comprises determining the aggregated supply and demand data that caused a drop in said performance of the forecasting model, and re-sampling aggregated supply and demand
20 data and probability data including the aggregated supply and demand data that caused a drop in said performance, to generate a new training data set for use in retaining said forecasting model.

15. A method, performed in a service provider apparatus, for simulating supply and demand
25 conditions related to a service or asset provision and deriving associated spatio-temporal prediction data, the method comprising, under control of a processor of the communications server apparatus:

obtaining supply and demand data, said supply data comprising service or asset provider location and availability data and said demand data comprising user request data;

30 generating, using said supply and demand data, aggregated supply and demand data comprising a plurality of data records associated with a plurality of respective predetermined time periods, each record being representative of an available supply pool of one or more

service or asset provider types in one of a plurality of regions, and demand therefor, during the respective predetermined time period;

generating, using said supply and demand data, probability data for each of said plurality of regions and supply pools in relation to respective predetermined time periods, said
5 probability data comprising probability values representative of a likelihood of demand associated with respective time slot/supply pool/region combinations;

performing a simulation of supply and demand conditions in said plurality of regions by mapping said aggregated supply and demand data to said probability data in a trained forecasting model and generating prediction data for each of said plurality of regions and supply
10 pools, said prediction data being representative of a probability that a service or asset provider will receive a user request in a specified region within a predetermined period of time; and
outputting said prediction data for display on a service or asset provider communications device.

15 16. A computer program product comprising instructions for implementing the method of claim 15.

17. A computer program comprising instructions for implementing the method of claim 15.

20 18. A non-transitory storage medium storing instructions which, when executed by a processor, cause the processor to perform the method of claim 15.

19. A communications system for simulating supply and demand conditions related to a service or asset provision and deriving associated spatio-temporal prediction data, at least one
25 user communications device and communications network equipment operable for the communications server apparatus and the at least one user communications device to establish communication with each other therethrough, and at least one service or asset provider communications device and communications network equipment operable for the communications server apparatus and the at least one service provider communications device
30 to establish communication with each other therethrough, the service provider communications device comprising a display for displaying data representative of a plurality of geographical regions, the communications server apparatus comprising a processor and a memory, and being configured, under the control of the processor, to execute instructions stored in the memory to:

- obtain supply and demand data, said supply data comprising service or asset provider location and availability data received from said at least one service or asset provider communications device, and said demand data comprising user request data received from said at least one user communications device;
- 5 generate, using said supply and demand data, aggregated supply and demand data comprising a plurality of data records associated with a plurality of respective predetermined time periods, each record being representative of an available supply pool of one or more service or asset provider types in one of a plurality of regions, and demand therefor, during the respective predetermined time period;
- 10 generate, using said supply and demand data, a probability data for each of said plurality of regions and supply pools in relation to respective predetermined time periods;
- perform a simulation of supply and demand conditions in said plurality of regions by mapping said aggregated supply and demand data to said probability data in a trained forecasting model and generating prediction data for each of said plurality of regions and supply
- 15 pools, said prediction data being representative of a probability that a service or asset provider will receive a user request in a specified region within a predetermined period of time; and
- output prediction data relating to said plurality of regions for display one or more service or asset provider communications device.
- 20 20. The communications system of claim 19, further configured to only output prediction data to service or asset provider communications devices recorded as belonging to one or more service or asset provider types included in the service pool(s) to which said prediction data relates.