TCS Quantum Challenge 2023

Challenge 3 – Optimising Fleet Allocation

Technical - Frequently Asked Questions (FAQ)

Version 1.0

1. **What are the deliverables for each phase (Phase 1 and Phase 2) of the Challenge?**

   Phase 1:

   During this phase the participating teams will be expected to submit and present their proposed approach to solving one or more of the Challenge Statements, along with some results of preliminary experimentation using the approach. The submissions and presentations will be evaluated by a jury panel, and the most promising proposals for each Challenge Statement will be shortlisted for participation in Phase 2.

   Note: In phase 1, code is not required, however participants are welcome to include the same.

   Phase 2:

   During this phase the teams shortlisted at the end of Phase 1 will be expected to implement their solution using quantum hardware/simulators provided and then submit & present their results, learnings and proposed future work. The submissions and presentations will be evaluated by a jury panel, and the best solution to each Challenge Statement, as adjudged by the jury will be declared as the winner.

2. **Is the problem about assigning the individual aircrafts to the given routes (collection of legs) or about finding routes (from legs) and then allocating individual aircraft to those routes?**

The problem is about assigning individual aircrafts to the given flights. Single aircraft may assign to multiple flights in a sequence and that creates the route of that particular aircraft.

3. **What do you mean by DOW on Aircraft sheet, it is that Aircraft will be operational on given day only?**

   Yes. DOW refers the operational days for that aircraft

4. **Aircraft Continuity Constraint at EDI airport for Leg 1 and 2 (E.g. number of arrivals and number of departures at EDI airport does not match in a day with EDI not being Night Base. There are 112 such instances of mismatch out of 2540 flights).**

   In that case, your solution should create an additional flight to return back the aircraft(s) to its night base.

5. **Do we have to allocate all the given routes to aircraft as for some days there are more routes are given than the aircraft available on that day. (E.g. On Day 1 (Monday 4th Dec), 11 Aircrafts are available but there are 15 routes starting between 600-730).**

   You must assign aircrafts to all defined flights (if possible). In some cases, your solution may also need to cancel some appropriate flights. If number of available aircraft is less than number of defined flights then you must introduce delays for some flights in your solution considering the objective and all the constraints.

6. **Number of flights starting from a base are more compared to number of night base aircraft on that base. (E.g. for LGW on 1st Dec around 6 am, 9 Aircrafts are required but only 4 are available at Nightly Base).**

   You must introduce delays and also cancellation for some flights.

7. **How to benchmark quantum solution against the classical solution, as classical solution is different for different classical algorithm. Will the best classical solution be provided by the organizers.**

   No classical solution would be provided from the organizers. Our SMEs will verify your quantum solutions.

8. **Why is Turn time different for Arrival and Departure for an airport? Which Turn time shall we consider? What is the difference between these two Turn times as usually turn time is difference between arrival and departure time for an aircraft type at an airport?**

   Turn time should be same for an airport with respect to a particular aircraft. Turn-time of an airport may different for different aircraft types. You can use the minimum value of the given two turn time for an airport with respect to a particular aircraft type.

9. **Should we assume the 'Turnaround Time' for the airports that has been listed but turnaround time is not provided.**

   Yes, you can assume the turnaround times for those airports.

10. **What is Leg Number in the 'Planned Schedule' sheet?**

    A leg is always a single non-stop flight. Leg number in the planned scheduled is an identification number which refers that the flight is non stop from it's departure to arrival. For short flights are only having one leg, long flights may have two or more legs. The provided data mostly contain short flights only.

11. **Are the operation costs mentioned in the 'Aircrafts' sheet for one single flight, or are they for one entire day (having multiple flights)? One more clarification from the same sheet: Is the aircraft tail column just to indicate the serial number with some convention (meaning we have 5 A319s, 7 A320s, and 4 A321s)?**

The operation cost mentioned in the ‘Aircrafts’ sheet is for one single flight. Aircaft tail number is the identification number of an aircraft.

12. **Say some aircraft has finished it's job for the day by 6 PM. Then should we send it to its night base right after that, or is there any particular time window to send the aircraft back to their night bases? (Framing the question in other way) Should we keep the aircraft in its night base between it's last assigned flight for the day and the next assigned flight of the upcoming day?**

    Please refer question no. 4 for more details. There are some curfew times provided for each of the airports, only at those time windows no aircraft will arrived/departure to or from that airport.

13. **In the 'Aircrafts' sheet, there's a column on maximum allowable flights. I'm guessing that figure is for one day. Or is the maximum number of flights by that aircraft in one week? And, does returning to the night-base count count as one flight?**

    Yes, that figure is for one day. Yes ideally returning to the night-base is also count as one flight.

14. **There are 10 airports given in the 'airport' sheet of the dataset. But in the 'Planned Schedule' sheet, I can't find any flights arriving at or departing from BPS airport.**

    That’s not a problem. You can model your problem with the remaining airports.