1 Introduction

The latest memo on Ordinator version 0.2.4.

2 Status Update

- Clustering in the strategic model
- Latest system architecture
- Previous priorities
- Project steps going forward

3 Clustering

I am not sure if you remember this Brian but a while back we talked about clustering work orders in the algorithm. I have written it down in my notes that clustering on either **functional location** or **platform location** was the two properties that made the most sense.

I know that this topic was not part of the priorities in the previous memo that I sent out to you, but I had to implement it in the code to submit the paper. I will quickly explain the general idea with only the functional location part. I have based the calculations on figure 3 which is an image that you send Brian:

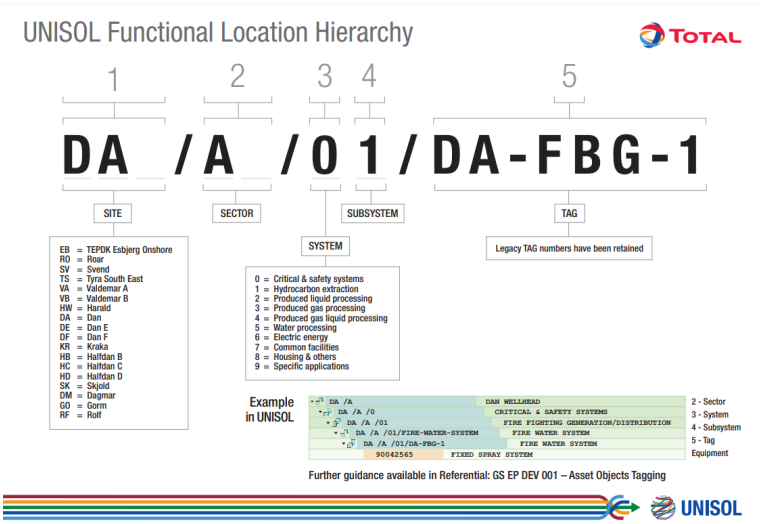

Figure 1: Functional location hierarchy for clustering calculation

In equation 1 a similarity between all the work order based on their functional location as shown below:

$$
\begin{aligned}
&clustering\_value_{wo1,wo2} = \\
&\quad if \;\; SITE_{wo1} \;\; == \;\; SITE_{wo2} \;\; \{+20\} \\
&+ \; if \;\; SECTOR_{wo1} \;\; == \;\; SECTOR_{wo2} \;\; \{+10\} \\
&+ \; if \;\; SYSTEM_{wo1} \;\; == \;\; SYSTEM_{wo2} \;\; \{+10\} \\
&+ \; if \;\; SUBSYSTEM_{wo1} \;\; == \;\; SUBSYSTEM_{wo2} \;\; \{+10\} \\
&+ \; if \;\; TAG_{wo1} \;\; == \;\; TAG_{wo2} \;\; \{+50\}
\end{aligned} \tag{1}
$$

This $clustering\_value_{wo1,wo2}$ in equation 1 is then calculated for all **released** work orders for a given asset that the algorithm in initialized on. In table 3 will now go through a small example to show how this could look like.

Functional Location	Site	Sector	System	Sybsystem	Tag
2100000001	DF	B	3	6	DFBA-FA-4004
2100000002	DF	B	3	6	DFBA-FA-4004
2100000003	DF	B	2	3	DFFA-LIT-500106

Table 1: Functional locations for three different example work orders

Using the data in Table 3 we can calculate the following matrix so similarity between the different work orders.

Work Orders	2100000001	2100000002	2100000003
2100000001	-	100	30
2100000002	100	-	30
2100000003	30	30	-

Table 2: Clustering values between work orders based on functional location. Yellow values are calculated as: 20 + 12 = 30 (SITE and SECTOR), and the green values have been calculated as: 20 + 10 + 10 + 10 + 50 = 100 (SITE, SECTOR, SYSTEM, SUBSYSTEM, and TAG)

To see where this goes into the strategic model, refer to **red** part in the model in Section 6.

4 Latest Architecture

I have updated the system architecture a little bit

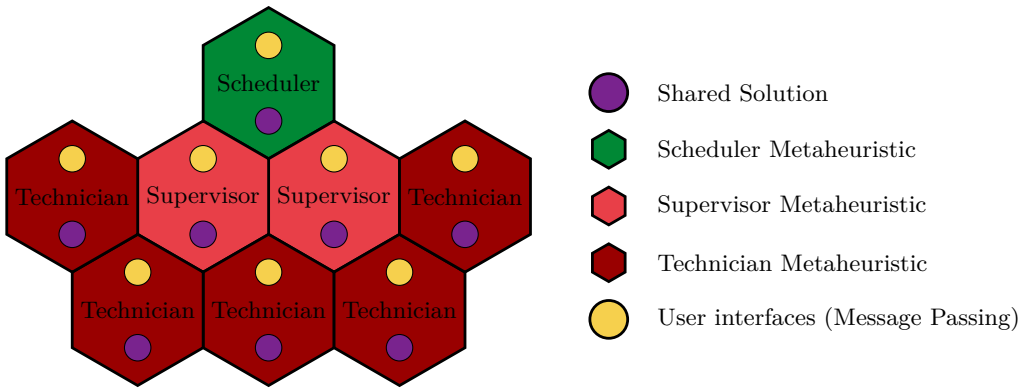

Figure 2: Every algorithm has its own user interface. This means that there will be a view into the system that is unique for each kind of stakeholder.

5 Priorities

Currently my priorities are:

- Backend: Make the tactical algorithm dynamic and functioning respect constraints
- Frontend: Let you manually upload resources
- Frontend: Let you see live updating of the currect resource profile of the schedule that the algorithm is generating.

So questions for you if you disagree with the priorities:

- **What aspects of the program does each of you think should be prioritized now?**
- **I believe that making this program work without any involvement of a offshore supervisor (the person responsible for assigning names to the technicians) will be very difficult. Do you aggee or disagree?**

6 Appendix: Strategic Model

Meta variables:

$$s \in S \tag{2}$$

$$\tau \in [0, \infty] \tag{3}$$

Minimize:

$$+ \sum_{w \in W(\tau)} \sum_{p \in P(\tau)} strategic\_urgency_{wp}(\tau) \cdot \alpha_{wp}(\tau)$$

$$+ \sum_{p \in P(\tau)} \sum_{r \in R(\tau)} strategic\_resource\_penalty \cdot \epsilon_{pr}(\tau)$$

$$- \sum_{p \in P(\tau)} \sum_{w1 \in W(\tau)} \sum_{w2 \in W(\tau)} clustering\_value_{w1,w2} \cdot \alpha_{w1p}(\tau) \cdot \alpha_{w2p}(\tau) \tag{4}$$

Subject to:

$$\sum_{w \in W(\tau)} work\_order\_workload_{wr} \cdot \alpha_{wp}(\tau) \leq \sum_{t \in T(\tau)} \psi_{prt}(\tau) + \epsilon_{pr}(\tau)$$
$$\forall p \in P(\tau) \quad \forall r \in R(\tau) \tag{5}$$

$$\sum_{r \in R(\tau)} \psi_{prt}(\tau) \leq technician\_work_{pt}(\tau, \beta(\tau)) \quad \forall p \in P(\tau) \quad \forall t \in T(\tau) \tag{6}$$

$$\sum_{p \in P(\tau)} \psi_{prt}(\tau) \leq technician\_skills_{rt}(\tau) \quad \forall r \in R(\tau) \quad \forall t \in T(\tau) \tag{7}$$

$$\sum_{w \in W(\tau)} \alpha_{wp}(\tau) = 1 \quad \forall p \in P(\tau) \tag{8}$$

$$\alpha_{wp}(\tau) = 0, \quad if \quad exclude_{wp}(\tau) \quad \forall w \in W(\tau) \quad \forall p \in P(\tau) \tag{9}$$

$$\alpha_{wp}(\tau) = 1, \quad if \quad include_{wp}(\tau) \quad \forall w \in W(\tau) \quad \forall p \in P(\tau) \tag{10}$$

$$\alpha_{wp}(\tau) \in \{0, 1\} \quad \forall w \in W(\tau) \quad \forall p \in P(\tau) \tag{11}$$

$$\psi_{prt}(\tau) \in \mathbb{R}^{+} \quad \forall p \in P(\tau) \quad \forall r \in R(\tau) \quad \forall t \in T(\tau) \tag{12}$$

$$\epsilon_{pr}(\tau) \in \mathbb{R}^{+} \quad \forall p \in P(\tau) \quad \forall r \in R(\tau) \tag{13}$$

Figure 3: Strategic model with the clustering term highlighted. This makes the corresponding algorithm cluster work order across all time periods of the problem.