**Part 1: Virtual Factory**

Consider a manufacturing facility that works from 9 AM to 5 PM every day and has 3 machines M1, M2 and M3. The idea is to take this information as a data input and convert that into a visual representation as shown in sheet 'VirtualFactory'.

**Part 2: Virtual Production Requirement**

Once the factory is setup virtually then we need to take all the production requirements and individually convert them into a image. For example consider a cycle manufacturing facility that makes a cycle in 3 steps. 1. Weld the frame on machine M1 then color the frame on Machine M2 and then allow X hrs. for the paint to dry and then assemble the rest of the components on machine M3.

In the example given, it takes 4 hrs. on machine M1 to weld the frame, then 8 hrs. on machine M2 to paint the frame and 3 hrs. on machine M3 to assemble the cycle. This information is virtually represented in sheet ‘ProductionRequirement’

**Part 3: Simulation**

The solution we develop is to take the virtual factory setup as the base and then simulate superimposing the virtual production requirement until it meets all the conditions we define.

In this example the requirement is to superimpose the production requirements image until all the yellow blocks have superimposed the bule blocks.

**Please Note:** This is where need to be able to define some rules to defined what is considered a success. In this example the rule is:

* The colored block of virtual production requirement can superimpose the colored block of the virtual factory but the gray can superimpose both colored and gray blocks of the virtual factory.
* The other rule is you cannot break the virtual production requirement image at gray or the intersection of colored and gray block (Hence the output in sheet InfeasibleOutput is not acceptable)
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**Sheet: VirtualFactory**

Input: Working start and end datetime for every day for every machine.

Output: To scale visual representation of this data (In the excel 1 block is 1 hr. but the actual will need to be down to seconds).

The Grey cells are unavailable time and the blue cells are available time.

**Sheet: ProductionRequirements**

Input: The sequence in which the product moves from one machine to another and the time required on each machine.

Output: To scale visual representation of this data.

The yellow cells represent the time on each machine listed in column A and the gray cells represent the break time.

**Sheet: ExpectedOutput**

This sheet shows the expected output based on the rules we have defined above. We take this image output and calculate the start date and end date time for every machine for every step of production.