

- * Simulation: imitation the systems using computer.
 - mimic real systems
 - * Real systems, what types of systems simulation is applicable to.
 - * Simulation is very powerful but not accurate
 - * Systems: facility or process, actual or planned, inputs outputs
 - Time - boarder job *
- ↓ Time needed to do something → Waiting time, Queue → initities → to achieve processes.

Q Why do we work with systems?

Study systems → measure, improve, design, control

① adv → unquestionably looking @ the right thing

② dis → system doesn't exist
→ would be disruptive, expensive, dangerous

⚠ Do not ever stop production line.

Models: ← set of assumptions / approximation about how system works.

Adv: - study model instead of real system, usually much easier, faster, cheaper
- can try wide ranging ideas

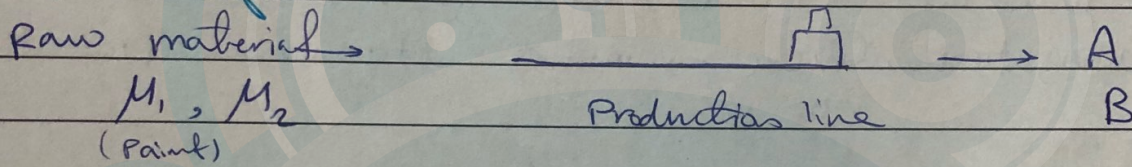
Dis: building model is ~~is~~ ~~dis~~ ~~frustrating~~ instructive

Adv: Model validity.

to improve & measure design a system \Rightarrow A model must be made.

پہلے مالروچ کے ذریعہ اپنا انتخاب کرتے ہیں اور وقت اور پیسے کی حد میں
 Model Adj = wide ranging ideas with model

OK example:



max Profit سے زیادہ سے زیادہ A و B کے پیمانے پر

x_1 : Quantity of A tons

x_2 : Quantity of B tons

2\$ $\rightarrow x_1$ 5\$ $\rightarrow x_2$

$$\text{max profit} = Z = 2x_1 + 5x_2 = Z$$

model assumptions

$$\begin{cases} \text{const 1} & 4x_2 + x_1 \leq 24 \\ \text{const 2} & x_2 \leq 6 \\ & x_1, x_2 \geq 0 \end{cases}$$

مادہ اول
model

24 is a constant value

profit کے لئے $x_1 = 1.5$ اور $x_2 = 6$

اگر فنڈز کم ہوں

اگر صارف کے پاس زیادہ سے زیادہ
 اور اگر صارف کے پاس زیادہ سے زیادہ

- Model : set of assumptions about how system works

- model ~~and~~ validity \Rightarrow model should be an image of the system, & when assumption is made many details are avoided \Rightarrow not realistic anymore

(Low validity) validity ال قلة assumptions ال كثر
ان يجسد system ال الامور وخصي تفاصيل

* Types of models
} physical (iconic) models
} Logical (mathematical) models

physical \rightarrow شئ حقيقي \rightarrow نموذج (ايقوني) \rightarrow داتا *

mathematical model \rightarrow نموذج رياضي \rightarrow داتا *

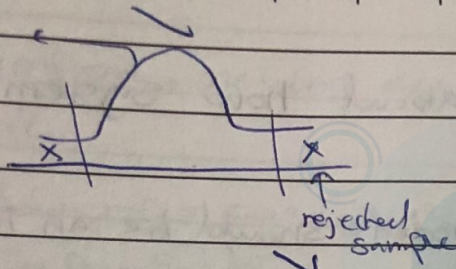
Logical models:

① if model is simple enough \rightarrow use traditional mathematical analysis

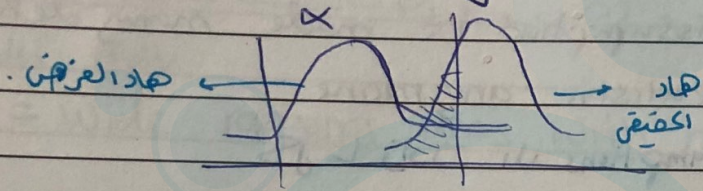
- ① Queuing theory \rightarrow length of line, waiting time
- ② diff equ
- ③ linear programming

② if model is complex \rightarrow can seldom validity \rightarrow
 validity ال قلة \rightarrow داتا
 - Danger of over simplifying assumptions
 - type III error - working on the wrong prob

assump
hypotheses



type 1 error = α = area



type 2 error = β

System A → assum 1 → assum 2 → assum 3 → assum 4 → System B

تغيير النظام System → Type 3 error → validity ↓

* Advantages of simulation

- ① Flexibility
- ② allow uncertainty
- ③ advances in computing cost ratios
- ④ many Adv in simulation software

disadvantages of simulation

- Don't get the exact answers only approximations
- get random output

Kinds of simulation

① static vs Dynamic

الوقت الثابت vs المتغير

↓
المتغير vs الثابت

② continuous vs. discrete change

↓
flow of water

↓
product jobs

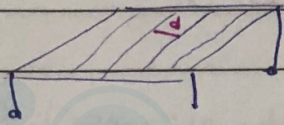
③ Deterministic vs. Stochastic

↓
no variability

↓
uncertainty

Simulation by hand

estimate parameter (Buffon Needle Prob)



تساوی کے قریب

تساوی کے قریب


باب ابرہ و اشہر حسابہ

$$P(\text{needle crosses a line}) = \frac{2l}{\pi d}$$

cross کا مطلب ہے خطوں سے لگتا ہے

$$6/10 = P$$

$$0.6 = \frac{2l}{\pi d}$$

Results  words

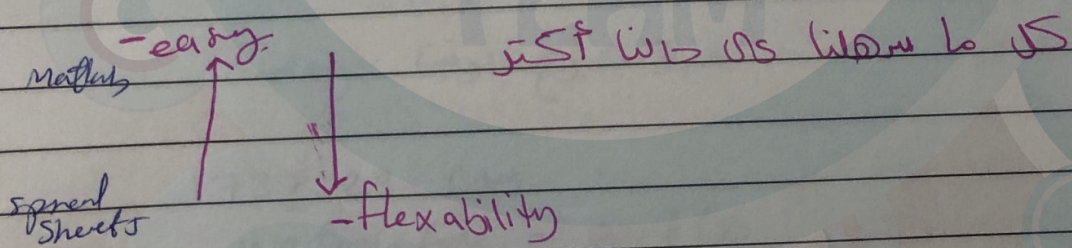
→ estimation, randomness, replication (تکرار) sample size

→ sequential error = you keep running the exp until we get closer result. no progress when the error is so small we stop

→ variance reduction

↳ Matlab is not for coding.

spread sheet → static simple models
Static = time



high level simulation \Rightarrow لچھامریہ ونا ان
ہیک سولہ

word, excel \rightarrow for graphs

* coding from scratch = flexibility \uparrow high

* When simulations are used \rightarrow [کثیرا لاکھ]

simulation لولڈ سسٹمز میں کل
لازم عیب تھیں Queue

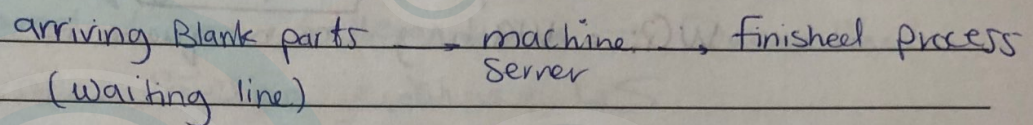
Simulation \rightarrow استعمال کیا آخر
دائما بیس ب mathematical eqns

The system:

A simple processing system

① Describe the model

Process



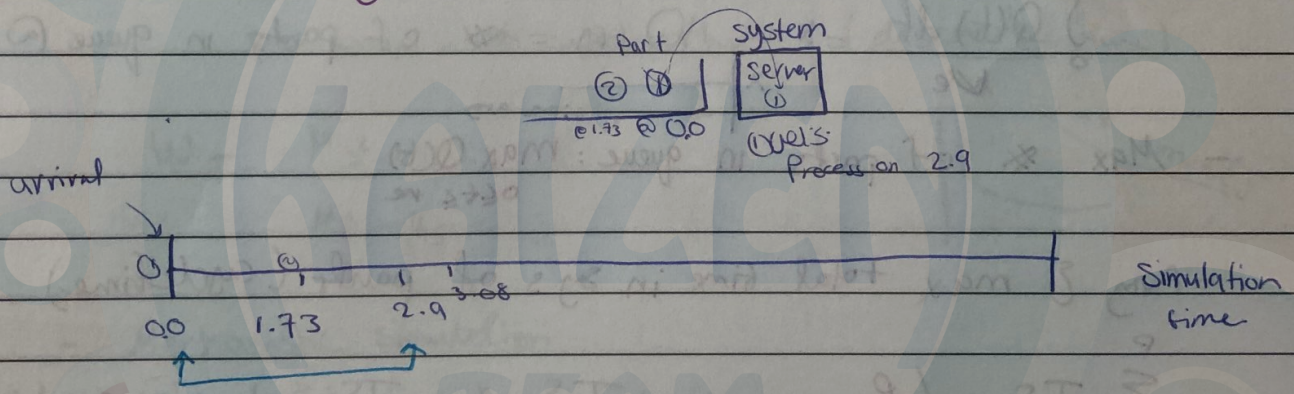
Queueing discipline: FIFO: first in first out

LIFO: last in first out

General info: - estimate expected production

- waiting time in queue, queue length, proportion of time machine is busy

* Goals of study:



مايك بتبرج الوقت coding

بين 1.73 و 2.9

waiting time of part (2)

- Total production of parts over run (P)
- Avg waiting time: of parts in queue

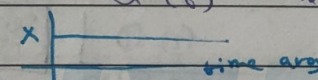
$N = \#$ of parts completing queue wait
 $WQ_i =$ Waiting time in queue of i th part

$$WQ_1 = 0 \quad N \geq 1$$

$$\left(\sum_{i=1}^N WQ_i \right) / N$$

- Max waiting time: $\max_{i=1 \dots N} WQ_i$

- Time avg $\#$ of parts in queue

$$\frac{\int_0^{w_e} Q(t) dt}{w_e} = x \quad Q(t) = \# \text{ of parts in queue @ } t$$


- Max $\#$ of parts in queue: $\max_{0 \leq t \leq w_e} Q(t)$

- Avg $\&$ max total time in sys of parts (cycle-time)

$$\frac{\sum_{i=1}^P TS_i}{P} \quad \max_{i=1 \dots P} TS_i \quad TS_i = \text{time in sys of part } i$$

- Utilization of machine

$$\frac{\int_0^{w_e} B(t) dt}{w_e} \quad B(t) = \begin{cases} 1 & \text{if machine is busy @ } t \\ 0 & \text{if machine is idle @ } t \end{cases}$$

$$\left[\begin{array}{l} \max \text{ of } S = 1 \\ \min \text{ of } S = 0 \end{array} \right]$$

- Educated guessing

- Guessing by base information (Avg interarrival time
avg) by distribution

interarrival time > service time → idle service time.

interarrival time < service time → Queue line

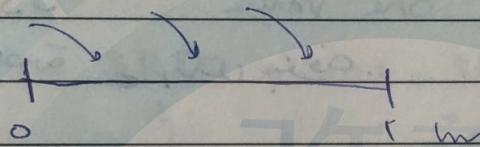
حتى لا يتفجر النظام في ظل الأحمال العالية، يجب أن يكون

until it explodes → if the system is not stable.

- Queuing theory

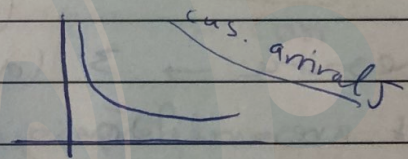
simple model M/M/1 model

M: identical, indep., exponential



Poisson = * customer/hr (discrete time)

$$W_T = \frac{\mu_s^2}{\mu_A - \mu_s}$$



- Mechanistic simulation

التي تصف الأحداث المتتالية

- Pieces of a simulation model

entities:

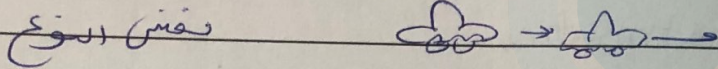
تخريف بالعنصرات.

- signals, orders (players) (changes the status of the system)

- fake entities for modeling tricks.
(as a break down تحليلية)

Entity → realization

(car)



- Attributes

characteristics (صفات) / سمات

local, global variables in C++

Attributes of entity (صفات كيان) لازم تآل (must be)

→ differentiate

→ (like names)

- variables

(متغيرات و قيمه واحده)

one value

قيمة واحدة

مجا الحافظة ← , تآل بتوفه.

- resource

What entities compete for

(سؤال واحد الجواب)

resource → 3 (agents) 3 كيانين في الكيان

(التنافس الكون) ما يتسابق في الموارد (not a resource)

- Queue

Simu on excel sheets

7/11/2020

D → normal inv

$$D = \max(LX, 0)$$

Demand ⇒

$$= \max(\text{norm inv}(\text{rand}(), \text{mean}, \text{std}), 0)$$

(round)

given in the Q

Sold → $\min(\overset{\text{column}}{\$ \text{demand}}, \overset{\text{row}}{-q})$

Scrap → $\max(\overset{\text{row}}{-q}, \overset{\text{column}}{\$D - 0})$

Profit → $\underset{\substack{\text{Retail} \\ \text{Price}}}{\$B\$5} \times \text{Sold} + \underset{\substack{\text{Scrap} \\ \text{Price}}}{\$B\$6} \times \text{Scrap} - \underset{\substack{\text{warehouse} \\ \text{price}}}{\$B\$4} \times (-q)$

Sales revenue
Scrap revenue
- Cost

How

Sold	scrap	profit	Sold	scrap	profit
v_1	v_2	v_3			

Copy Paste

then drag down down.

→ $E(\text{Profit/Day}) = \text{average}(H_1: H_3)$

half width interval ⇒ $t_{n-1, \alpha/2} \frac{s}{\sqrt{n}}$

Profit

histogram for all data.

Data → data analysis → histogram

input → profit (H3:H33)

Bin range → 0.5%

output ~~change~~ → ~~range~~ → ~~fixed~~ → ~~change~~ → ~~output~~

Single server Queue.

- for single server queue, customers arrive one @ a time & served one @ a time, 1st customer arrives @ time zero
- interarrival time here expo dist with $\lambda = .625$ cus/min or $1/\lambda = 1.6$ min → means of inter arrival times.
- service times have a continuous uniform dist between $a = .27$ min & $b = 2.29$ min

E (expected time) → (mean) → $= \frac{(\text{min time} + \text{max time})}{2}$

Service time

$\text{Var}(\text{service time}) = \text{Var}(\text{uniform dist}) = \frac{(b-a)^2}{12}$

steady state expected mean wait in queue = $E(W_q) = \frac{\lambda \text{Var}(s) + E(s)^2}{2(1 - \lambda E(s))}$

Replication

IA S WQ

⊕ ○ ○ → given random value

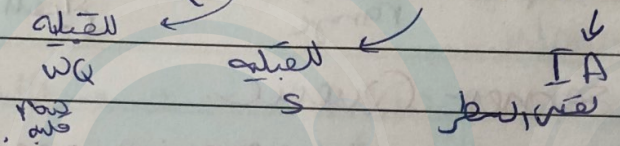
$S = \text{service time} \rightarrow \text{uniform} = a + (b-a)U$
 $= \$B\$5 + (\$B\$6 - \$B\$5) * \text{RAND}()$

②
row

$$IA = \frac{1}{N} \sum_{i=1}^N (S_i + F_i - A_i) \cdot LN(1 - RAND())$$

$$WQ = \max(WQ_{i-1} + S_{i-1} - A_i, 0)$$

$$= \max(G_i + F_i - E_i, 0)$$



تم تعبئة آون ٢ كواحد

نضال كواحد ← copy & paste

cross rep ⇒ Avg WQ

$$= \text{AVERAGE}(S_u, P_u, M_u, J_u, G_u)$$

↓
waiting times

Graph → scatter → right click → ~~control~~ select data
آرشفه

x value → customers (1-50)

y value → WQ

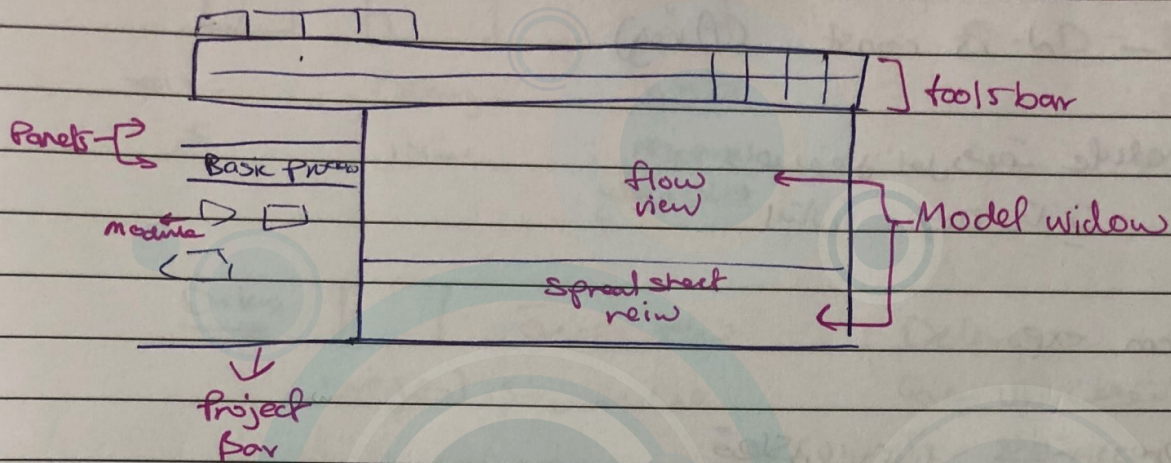
keep adding for the 5 replications @ the same graph

* نضال نوبتين سوا 1 كواحد

add → x → customer 1 and 15
y → starts state (B10 B10)
(مربى)

Study for
Steady State
Five Apple

Arena



ex: Drilling center:

- Three flow chart modules
create, Process, Dispose.
- entries in three data modules
entity, Queue, resource
- Animation objects
 - change pic for entity
 - resource animation
 - 2 dynamic plots
 - some labels, artwork.



Drilling center

arrival process: poisson
service = exponential

Model → entity: parts (pieces of drillings)
Resource: drilling machine

(1)

Create

name: —

visual object

entity type: —

Type (time between arrivals) → expo

random

const

exp

const - n is const (Arey)

Schedule - وادي يوصل اول وقتها
انتان - Duration وقاية

Random expo

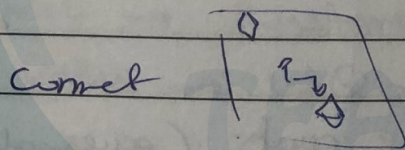
expression - dist - قسائل
الكل

expression - mean ads
units - وحدة

entity per arrival - كل وحدة وادي يوصل
في وادي يوصل

max arrival - stop rules - يوصل للحد
Linkline - وقت السير

First creation - اول entity
في وادي يوصل



Process

Shift + scroll ←
Shift + scroll ↓

navigate - بين وادي

name -

Type - STD

Action - Delay

seize Delay

seize Delay release

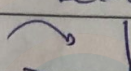
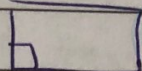
logic بالنسبة لل entity

سو لها نقل

entity

resource

Release



S-D-R

size

Delay:

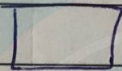
ترداد

حجم

بیشتر

resource
ورای و جابج

Delay



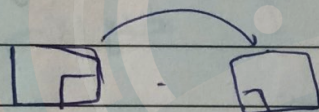
بیشتر حتما

Delay

هر چه بزرگتر باشد

ماتوقف باقی Queue

و بقیه هم منتظر میمانند



ما بقیه من ال دی

S-D

size

Delay

فقط بزرگتر ال

آنیست ال resource

In our Ques

→ target = S-D-R

resource = add → resource name : Drilling machine

unit to size = 1

entity و size

منتهی هم و size

resources

Delay type → triangular

unit minute

allocation → value added

minimum → 1

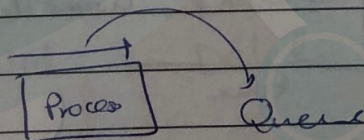
value → 3

max → 6

amount → exp

Semaphore → Triangular

schelle →



Dispose → دمج و تجميع

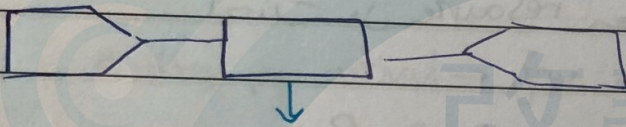
[same لاجل]

$F_s / \text{run} \rightarrow \text{go} / D$

Run → setup, replication parameters length → 20 min

Basic time → minute

Num of replication → 1



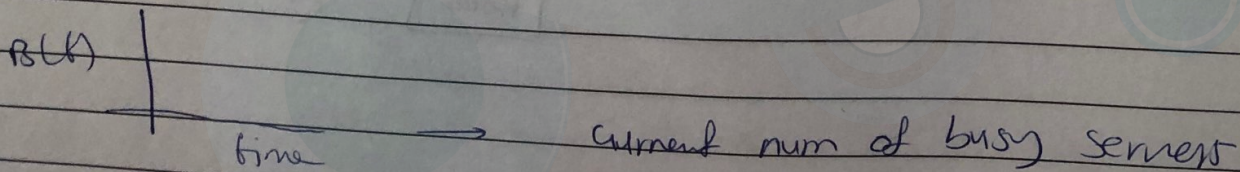
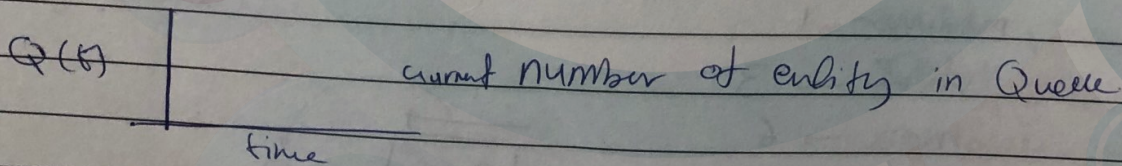
Service (Process)

(Delay) ← Time لاجل
time

الوقت تقيد فترة و دمج

(no time) □ \rightarrow لا وقت

Dynamic plots →



Scale min 0

max 100

major count 10

→ 2 min

auto scroll → لا السهم تكون كبيرة

كل 100 دقيقة ارسمة اقله وسر كلسه بفرصه آخذ

100 دقيقة → false (✓)

auto scroll 2 = 20 (20 length)

false

re

false

y axis → زن صاف

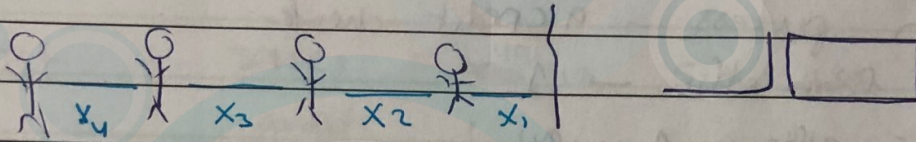
أول تي

Serial vs parallel

17/11/2020

Serial → specialized

Parallel → Generalized



مثال { $\lambda = 4/hr$ arrival → poisson
 $\frac{1}{\lambda} = \frac{1}{4/hr}$ → exp

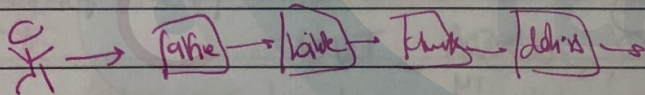
inter arrival time + service time μ بالسيويينا μ
 $\frac{1}{\lambda}$ ↑ exp ↑ exp

Serial → العز ينتقل من محطة لآخرة
 مثال: كل إجراءاته ال ٤

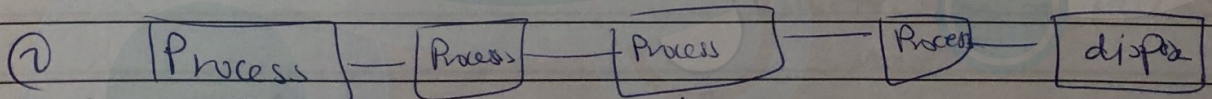
Parallel → كل محطة في محطة كالمثال
 ال ٤ إجراءات مرة واحدة

(A) Series

① entity → create type customer
 Random expo 1-25 hr



1	∞	0
---	----------	---



resource → Alice Betie churros Diner

resamekigzi jipel] process → Basic Process

Alfie → type (fixed capacity)
↓
logically

Click on process → a credit check

add → units from alfie → 1

• 1000 alfie in 1 row

Delay time → servic (time) → expression / m
expo()

من الذاكرة الى الذاكرة expo(1) ps.

* capacity → 805 2 services

Setup → nm → 160 hr (Replication #)

Run → Run control → (batch model)

(check form for
go fs)

How to measure AVN's waiting time? unnamal pros replication

$$WQ_{11} + WQ_{12} + WQ_{13} + WQ_{14} = ve$$

$$AVN = \frac{ve}{4}$$

19/11/2020

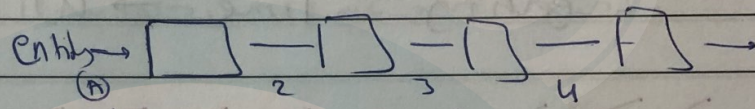
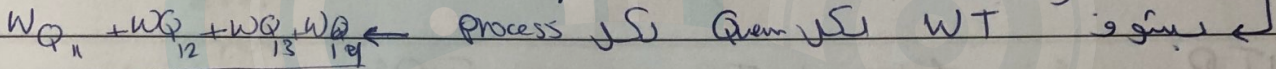
صلى الله عليه وسلم

Service time	system	WIP	Total sp	waiting time	% of operations
		AVG max	AVG max	AVG max	output
Expo	series	1608	1608 27.2	22.2	#.98
	parallel	1608	1608	1608	1608
Const	series	3.491	5.31 11.39	1.31	7.379
	parallel	1			10.2

*series

Category overview

waiting time → queue → time → waiting time



AVG waiting-time for 1

AVG of AVG

117 vs queue, entry, time, wait

$$\frac{WQ_{11} + WQ_{12} + WQ_{13} + WQ_{14} + WQ_{21} + WQ_{22} + WQ_{23} + \dots + WQ_{1174}}{117}$$

*

WT AVG:

unnamed doc → entity → time → wait time = 11.984
AVG

waiting time = 22.273
Max

unnamed doc → entity → time → total time

AVG = 16.083

Max = 27.2

expo كى الوقت

Const

اذا كان جدول

process → Delay-type → Const

بغير

Value = μ = 1 hour

* utilization → unnamed doc → resource → usage

ساعات في يوم 4

- 65.9%

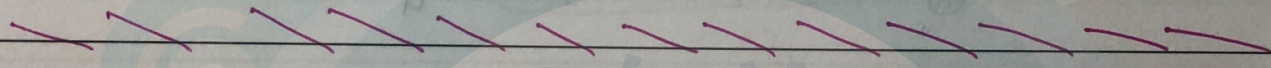
65.3%

64.7%

64.1%

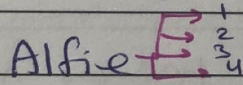
resource في

* WIP → entity → Time → WIP

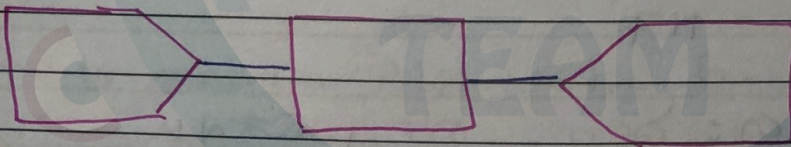
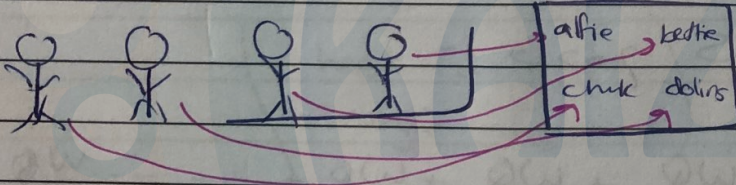


* Parallel

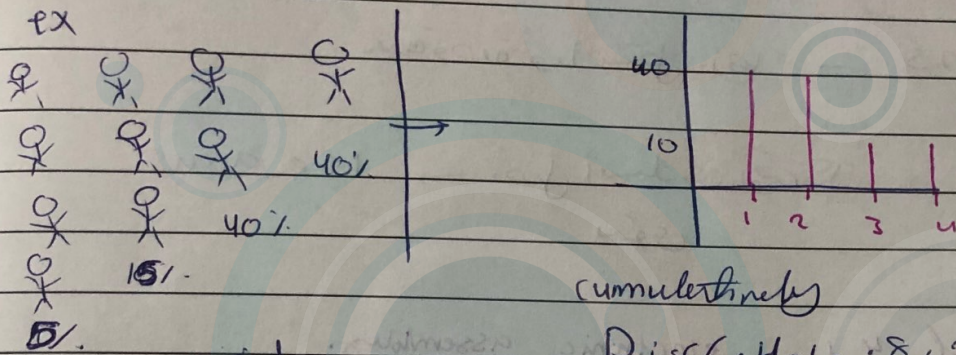
generalized →



بمجرد ان في



create → entity per arrival → right click →
 Build expression → random exp → discrete.



Discrete(.4, 1, .8, 2, .95, 3, 1.0, 4)

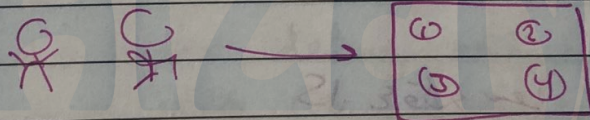
arr, rd
 rate

اعترز أكبر في λ بظواهر λ في λ capacities

1 server ← 1 line only في λ
 with 4 capacities

Resource →

Worker - fixed capacity - 4 capacity



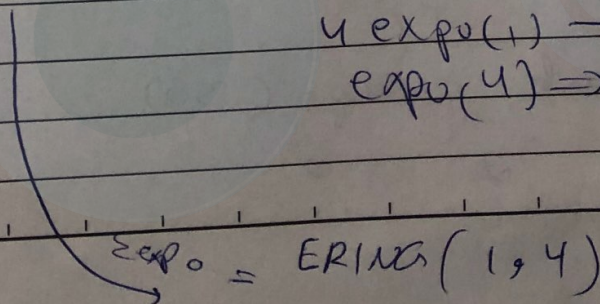
$N=1.25$ $M=1$ كل رقم نفس الترتيب مع

Resource (worker) → units to size/Release: (1)

كل رقم نفس الترتيب مع Box من 1 إلى 4

expression = $\text{expo}(1) + \text{expo}(1) + \text{expo}(1) + \text{expo}(1) \rightarrow \sqrt{\quad}$

$4 \text{ expo}(1) \rightarrow \alpha$
 $\text{expo}(4) \rightarrow \alpha$



② *process()

A → Process 1 (Preparation)_A

B → Process 2 (Preparation)_B

Resources → prep A worker 1 capacity
 prep B worker 2 capacities
 Sealer
 reworker

Process 1 → seize delay release
 resource → prep A worker
 no jobs ← 1

TRIP (1, 4, 8) min

Process 2 → in, via

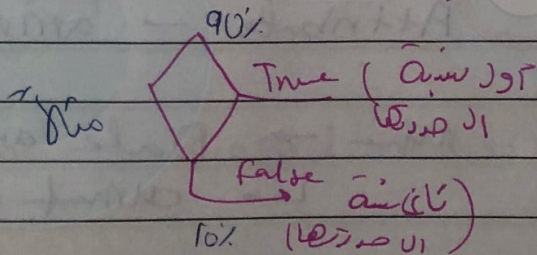
TRIP (3, 5, 10)

* Sealer seize delay release / sealer
 Trip (5, 1, 1.5) ~~trips~~
 no logs lets

* Decide module good or rework

n way - تجزیه 3

2 way - تجزیه 2



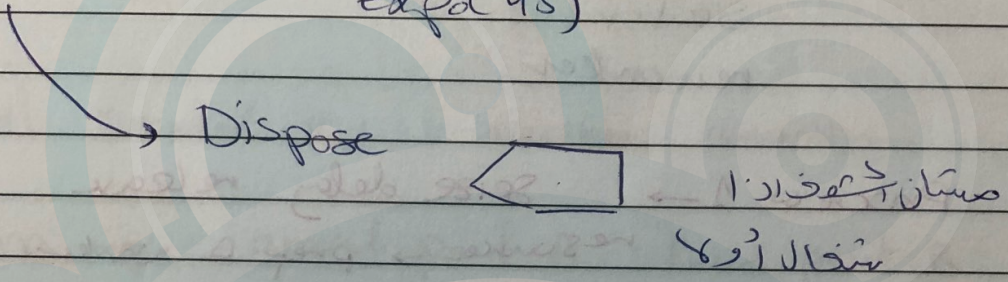
replication length $\rightarrow 32$

29/11/

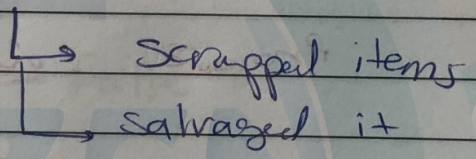
2 way chance / Decide good or bad

9% \rightarrow rework

Process rework \rightarrow seize delay release expd (4s)



Salvage or scrap decide



entity JS \leftarrow distrib \leftarrow assign

assign \rightarrow assign arrival and sealing time

add \rightarrow a attribute \rightarrow sealing time
Tri (1,3,4)

add
aes
bs
Attributes

new value \rightarrow right click \rightarrow build exp
Tri. No space

add \rightarrow Attribute \rightarrow arrival time
no space

new value \rightarrow Date and day
 \rightarrow current time exp.

add₂ → attribute name → arrivalTime → مكان
أصبحت كم نقطة مضافة من وقتها إلى الخزان
الوقت بين

Record 2 → Salvaged item
attribute name = arrival time

* report → user specified
نتائج الـ اونتر

→ Bottle neck → [أكبر مكان ليكون في السير
Queue.]

Part 2 1/12/2020

Bottle neck.

arrival pro → tally → Total time
↳ user specified → internal time

scrap + rework → space
يكون في

count →

بيانات ارقام

{ 625 = { good قد بين
part = { scrap قد بين
rework قد بين

625 → 91% good
 → $0.2 \times 0.09 \times 625 = \text{scrap}$
 → $0.8 \times 0.09 \times 625 = \text{salvage}$

valid
 system → model → implementation → (verification)
 results, output, output

→ Queue → Time → of ashust
 for rework process Queue
 ↳ bottle neck

uptime for sealer → downtime
 8 hours

Rack →

Queue →

Basic process →

* Resource → Type → Based on schedule.

Schedule Rules

→ preempt (less priority overtake)
 (توقف)

wait → (less priority overtake)
 (توقف)

ignore → (less priority overtake)
 Break

(reduced break)

Resource

Basic pro -

	name	type	Duration
① Schedule →	arrival schedule	capacity	1 → 8
rework schedule →			2 → 8

Uslu & uclijga qur Uslu & uclijga qur

② Resource → rework → schedule name = rework
schedule

Schedule rules wait by default

set up →

hours / day = 16 hr

→ bar → clock - ① variable. Uslu
Uslu

↳ Date or time.

variable → Resource → usage → amount num Schedule

Basic process → failure. ustim

sealer failure → expo(2) → expo(4)

Resource → failure

0 rows → double click

sealer failure lighe

Racks

advanced → statistic → { type
frequency

↓
میان ال رفوف

کلی 10 ← رفوف و اس

← رفوف بزرگ

advanced process → statistic

name: how many racks

type: frequency

type: value

type → ^صresum

expression → build exp → Queue → count num in Queue
→ network process Qum

Collection period: entire replication

Report label: how many racks:

Categories: ^{row 1} const or range → const

value: ~~Items~~

Category option → include

Category name → 0 Rack

row 2

row 2	Range	0	10	1 rack	include
row 3	Range	10	20	2 rack	include
row 4	Range	20	30	3 rack	include
		30	40	4 rack	include.

include (0,10] (10,20]

Run → setup → Project parameters
ادارة الپروجيكت

2/12

racks میزان ادور ۹۵ ال
1. frequencies

2 racks - ادا آوند
95٪ یعنی

animation:

ادما سکتیوال کیو ← برهنه سیتفلر، سیتاج

لوعلت لایو cut ← بطوع الکیو عربیک مع الیلو
paste

بقدرش ارکم الکیو اکثر مناسبه

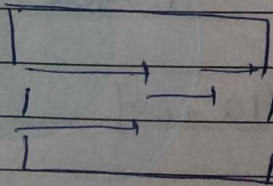
View → named views or P. flag

hot key: m
name: model

hot key: a
name: animation

بقل افتح ال انشائه ال یو اسینا
ونجند الرم بعین کسریه

مناشریه افطار



↳ resource

Prep A worker

idle / busy

لومالیک دی سہولت کے سبب سے

دیپتج نافذہ ال edit و غیر لوہا

seize area

idle busy و غیر ال B

failure و غیر ال sealer افانہ آجر

idle busy failure

reworker → idle, busy و غیر

2 blocks کے سبب سے

دیں

میت

→ متاثرین عندی بظنوا دی ال

→ ہو سکتی جکتی دی ال



→ add points

run → set up → 160 days
replication

double click on racks → points → add 10

double circle → (بالاترين)
Priority

از ايدى ارسام الكود زي مابعد ← بينك اياك

Queue from the bar
نقطة و ايدى
* points

- * Number out of salvage
- (1) num of scrapped out.
- (2) salvage num out
- (3) good num out

*** Stations**

[مناطق]

Blocky ال ال بقولوا entities كيفال

transfer

* Advanced → station

Name and station name could be the same.

name + station name
Station 1 → station of part A arrival
type = station

Station 2 → station of part B arrival

Station 3 → part A
prep
↑
مکان آرایش
پایه prep . پیل

Station of A prep

station of B prep

Sealing + Rework
stations
پس

→ Route

(1) Route A to prep A process

Route time → exp build → random dis
بسیار بصورت تصادفی

Destination type →
Station
Station name = prep A station

Station →
س

Sequence →
multi section

② route B

\bar{N}, \bar{C}

station 11 station 12 }
 وحتا 10 و 11
 خط انتقال به خط انتقال
 Stations join

Report → entity →

↳ transfer time → وقت انتقال بولگ
(non value added)

annual transfer → \sqrt{R} \bar{C} و \bar{N}

* The first thing to do in simu to describe the sys (lay out)

تجزیه و تحلیل

* home work →

(100%)

- fitting times
- distribution
- esh el. statistics
- Statistic test
- kef n3mlha on minitab

8/12/2020
(الجمعة)

Station

توزيعات الاحتمالات

System of discrete probability
(توزيعات الاحتمالات المنفصلة)

Pad → data on interarrival

Tools → input analyzer → new → use existing data

Histogram

↳ fit

↓

fit all. → simple distribution

Window → fit all summary → distribution

لويس (نوع)
 →

→ fit →

توزيع الاحتمالات
dis →

Call center. - create

Name: Create calls

erlin type: call.

Random expo (.857) min

* Three incoming call types (ثلاثة أنواع)

* Resource

L → trunk line → capacity size: 26

record ps: \leftarrow * \leftarrow \leftarrow

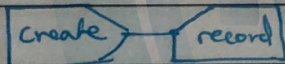
Record. → name: arrived calls

Statistic def: add

type: count

value = 1

counter name: attempted calls.



* Decision →

Resource | is available

Decision is given for

Name: trunk line available.

type: 2 way by condition (if exp) \leftarrow \leftarrow

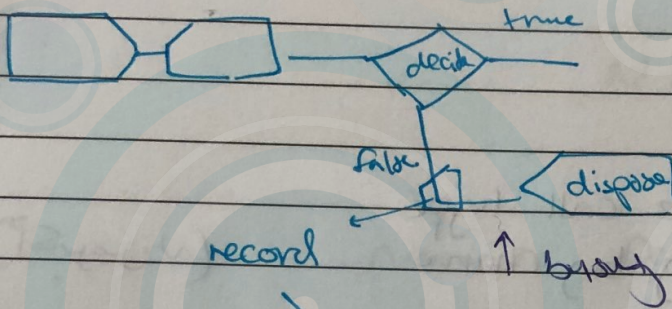
value: Build exp → usage → current num subg

expression

admission

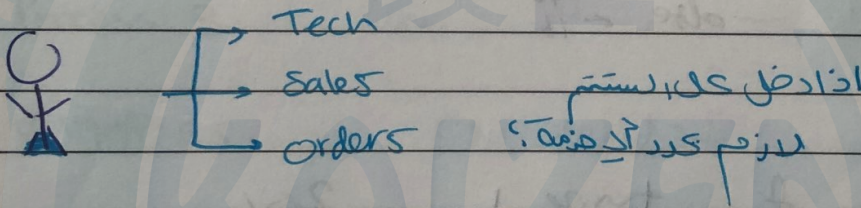
Current exp :

Current num busy < current num scheduled



اضداد لوف استیج

record → name : rejected calls
value : 1



Advanced → process → Delay

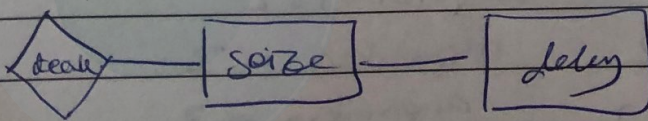
delay → initial recording delay.

Delay time: UNIF (0.1, 0.6) min

ok

seize ← bs ← delay

مقدار كود استیج



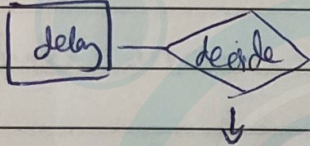
اضداد لوف استیج
كود استیج (MP)
current num scheduled

No resource if ∞ calls are ahead.

seize

seize trunk line

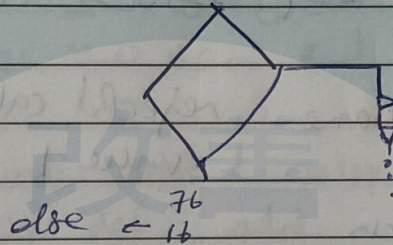
Resource: trunk line units to seize: 1



Name: to determine call type
N way by chance (N آکیرن)

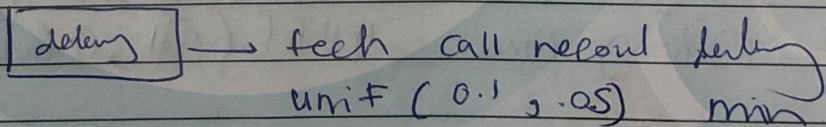
add \rightarrow 76

add \rightarrow 16



Tech support	type	1	25%
	2		34%
	3		41%

تکنیکوں کی فراہمی کے لیے



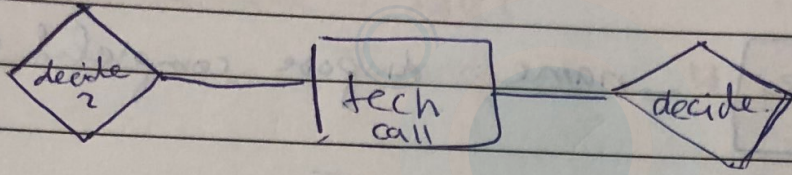
3 Resources

Tech type 1 capacity = 2

Tech type 2 capacity = 3

Tech type 3 capacity = 3

Sales capacity = 4

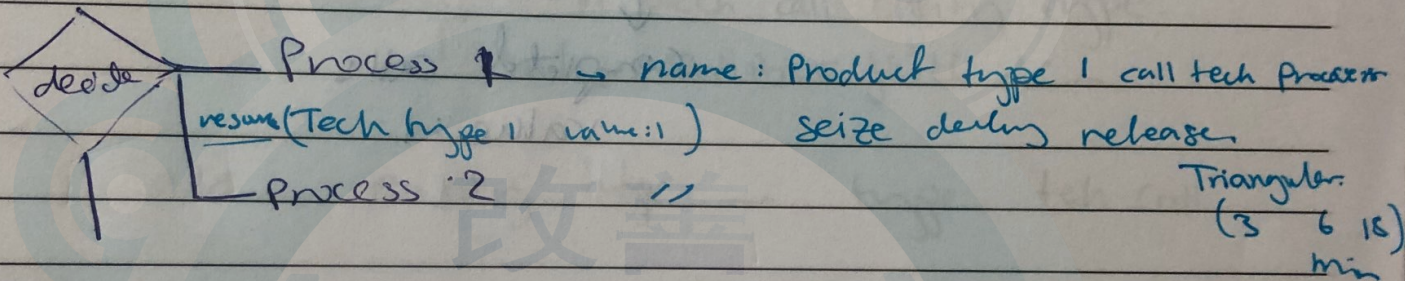


N way chance

25%

34%

name: Determine Product type



Process 3 //

variables → ex: decide

refrence

advanced pro → expression

(1) tech time exp values

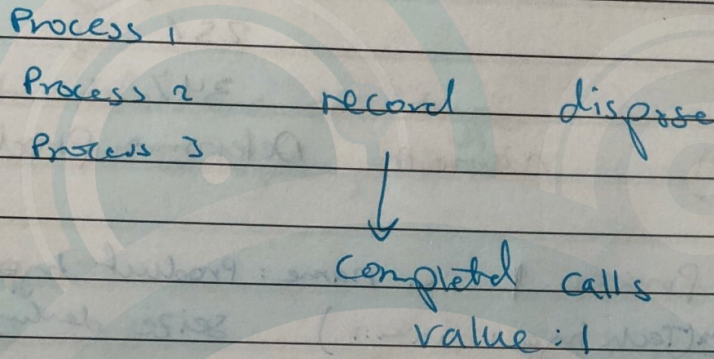
row → TRIA(3, 6, 18)

Process 1 → exp: tech time
or build exp → exp
↳ execution

Process 2 + 3 →
v(B) v(i)

Dispose → name: dispose completed calls

record disposal
 record disposal
 record disposal

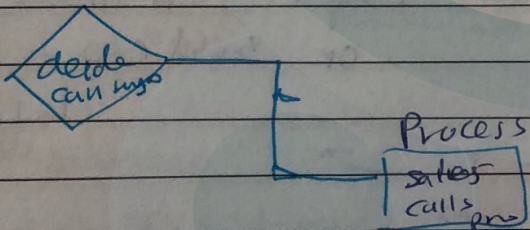


release - record - dispose

✓ license 26

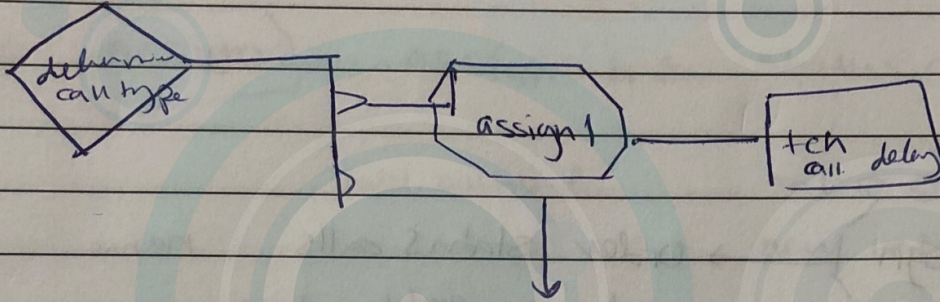
advance → release → release trunk line
 add → trunk line

One queue means 1 process



add Resource → sales

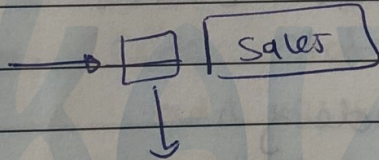
Triangle (4 15 45)



assign tech call entity type.
↑
Statistic જેલ્લે ઈલે

add → entity type → type : tech call

add pic → need ball

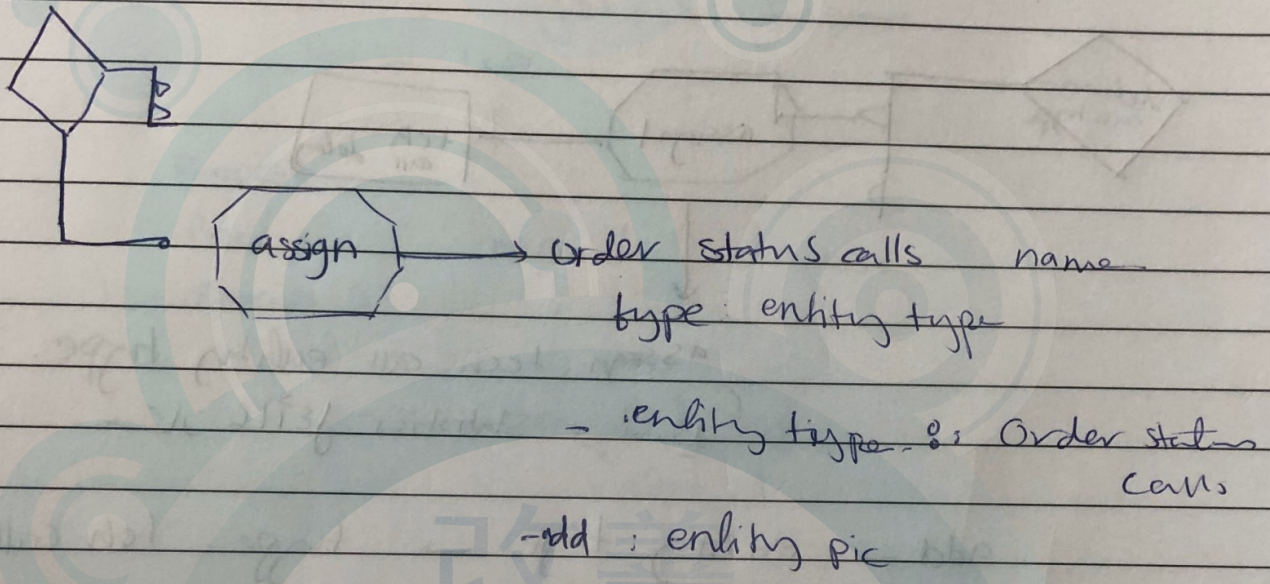
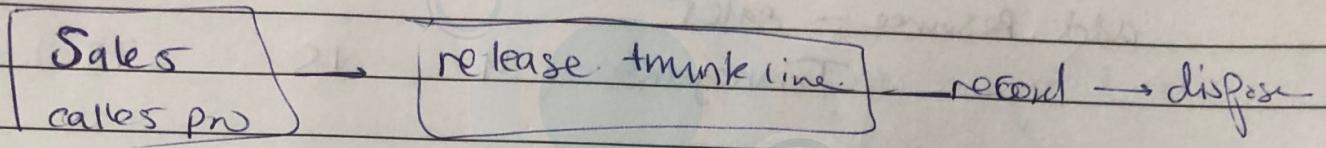


assign → assign sales calls

entity type : sales call.

add pic → blue ball

17/12/2020

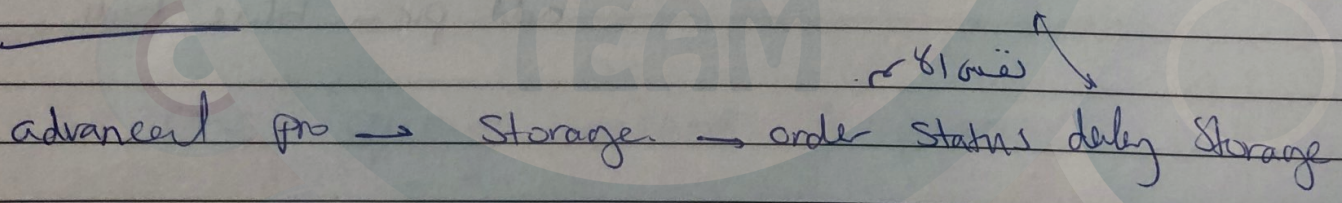


attach → ~~delay~~ blocks → delay

table → order status delay

class → TRIA(2, 3, 4)

Storage ID → order status delay Storage



delay → Decide

Name → no sales person required
85% → time

bnm → Release it

to give priority → put attributes + assign

fake → assign assign order status call priority

add attribute → sales call priority
new value = 1

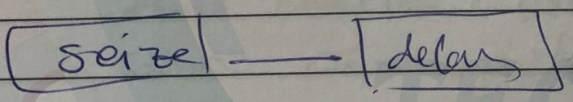
① ← attribute all level

1 is used as priority ①

Priority status seize job

assign → seize → Order status call sales person
↓
add resource sales → 1
Queue type → sales queue

سازمان
دور



the order status conversation
type time = TRIA (2, 3, 4) Min

seize → delay → release name: release order status
Resource name: Sales

Basic pro →

Queues

Sales queue → type: lowest attribute value

attribute name → Sales call priority

Replication length → 10 hr

میان اوقات، انتیٹیز اور اس کی

Basic pro → variable → calls Per Arrival

initial value → 1

create 1 → build exp → variable (entities per arrival)

② Variable 2 → Max Calls

initial value = 999999

رقم کثیر

create → Max Calls (max arrivals) build exp variable

کیف اوقات اور دس → من اس کی اس کے اور اس کے

جو اس کے

8 variable

total: WIP

assign to

Size & Delay

model of

attribute value ← Priority (high to low)
[sales all priority value = 1]

2 queues are sales, circ
Basic pro → Queue → lowest attribute value shared
sales all priority

Part 2
store (circ)
unstore → delay JS

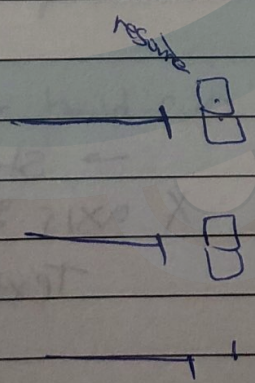
- 1 Store for initial recording delay type: storage
- 2 unstore from initial record type: default

Delay 2
1 → store for order status type: storage
2 unstore " " " type: default

Delay 3
1 → store for tech delay order type: storage
2 unstore " " " " type: default

animation ↓

Queue
at start of



عشان ارجع مربعان ملونه ← واختار اللون
right click → send to back

عشان اضيفه في feat. (A)

Setup / Project parameters → Slip in out
Project description + analyst + name

animation → امسح كل اناكس

query → اناكس اللى
لو بس و ا

query type 1	→	→
query type 2	→	→
query type 3	→	→

Storage → initial recording delay

Plot : add name: function line busy
exp. resource-usage
current num busy: trunk line

→ stairs

X axis : time (mins)

Text : time (mins)

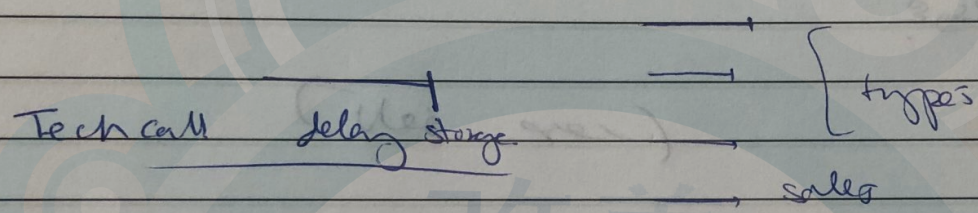
* قبل ان يكون رقمه في الجدول

y axis name -> Busy trunk line
visible

max = 30

major = 2

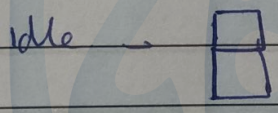
autoscale -> false



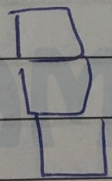
Resource 5

Tech Type 1

2 resources



type 2



idle / busy

