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Analisis Masalah

Diberikan masalah sebagai berikut:

Suatu perusahaan **Jasa Transportasi Barang** beroperasi untuk mengantarkan muatan besar antar kota. Karena besarnya muatan yang ditransportasikan, setiap kendaraan hanya bisa mengangkut maksimum **SATU** barang dalam sekali pengantaran.
Perusahaan tersebut kemudian ingin membangun sistem perencanaan jalur pengantaran setiap kendaraan.

Buatlah desain Goal Stack Planning untuk mengatur urutan pengiriman **EMPAT BARANG** (B1, B2, B3, B4) yang dilakukan **SATU MOBIL** (M1) dalam **EMPAT KOTA** (K1, K2, K3, K4)
Jika Operasi yang bisa dilakukan oleh kendaraan adalah
LOAD(B,M,K), **UNLOAD(B,M,K)**, dan **TRAVEL(M, K_{asal}, K_{tujuan})** :

Hal yang harus didesain:

- Desain apa saja State yang mungkin ada/dibutuhkan.
  Berikan penjelasan mengenai state tersebut
  - Hint: identitas objek, lokasi barang, lokasi kendaraan, isi kendaraan, dll
- Desain **PRECONDITION, ACTION,** dan **EFFECT** dalam daftar **PAD** untuk setiap operasi

Dengan mobil **M1** saat ini berada di kota **K1**, Lakukan **PENELUSURAN** untuk mendapatkan urutan pengantaran barang jika diketahui kondisi sbb

Barang	Saat ini Berada di	Tujuan Kota
B1	K1	K2
B2	K2	K3
B3	K3	K1
B4	K2	K4

Strategi Penyelesaian Masalah

Tahapan dalam menyelesaikan masalah dengan Goal Stack Planning adalah :

1. Menentukan state yang dibutuhkan.
2. Menentukan operasi dan PAD -nya.
3. Menentukan initial state dan goal state.
4. Melakukan penelusuran untuk mendapatkan goal state menggunakan Goal Stack Planning.
5. Menuliskan hasil akhir dari state yang diperoleh dan kesimpulan solusi yang diperoleh untuk mendapatkan goal state.

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States	Deskripsi
City(K)	Menjelaskan jika sedang berada di kota K
Transport(M)	Menjelaskan tentang kendaraan M yang dipakai
EMPTYTRANSPORT	Kendaraan tidak sedang mengangkut barang/muatan kosong
Item(B)	Menjelaskan barang B sedang diangkut
InCity(B,K)	B berada di kota K
InTransport(B,M)	B berada di kendaraan M
TransportOn(M,K)	Kendaraan M sedang berada di K

Operators					
LOAD(B,M,K)		**UNLOAD(B,M,K)**		**TRAVEL(M,Kasal,Ktujuan)**	
P	Item(B) Transport(M) City(K) InCity(B,K) TransportOn(M,K) EMPTYTRANSPORT	**P**	Item(B) Transport(M) City(K) InTransport(B,M) TransportOn(M,K)	**P**	Transport(M) City(Kasal) City(Ktujuan) TransportOn(M,Kasal)
A	InTransport(B,M)	**A**	InCity(B,K) EMPTYTRANSPORT	**A**	TransportOn(M,Ktujuan)
D	InCity(B,K) EMPTYTRANSPORT	**D**	InTransport(B,M)	**D**	TransportOn(M,Kasal)

Berikut ini adalah state awal dan hasil akhir yang diinginkan :

Initial State
Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B1,K1) InCity(B2,K2) InCity(B3,K3) InCity(B4,K2) TransportOn(M1,K1) EMPTYTRANSPORT

Goal State
InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)

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Melakukan penelusuran untuk mendapatkan goal state dari pengantaran barang.

No	Stack	Current State
1	InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B1,K1) InCity(B2,K2) InCity(B3,K3) InCity(B4,K2) TransportOn(M1,K1) EMPTYTRANSPORT Solution Queue
	bottom	

No	Stack	Current State
2	~~Item(B1)~~ ~~Transport(M1)~~ ~~City(K1)~~ ~~InCity(B1,K1)~~ ~~TransportOn(M1,K1)~~ ~~EMPTYTRANSPORT~~ **LOAD(B1,M1,K1) → masuk ke solution queue** ~~Item(B1)~~ ~~Transport(M1)~~ ~~City(K2)~~ InTransport(B1,M1) TransportOn(M1,K2) **UNLOAD(B1,M1,K2)** InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B1,K1) InCity(B2,K2) InCity(B3,K3) InCity(B4,K2) TransportOn(M1,K1) EMPTYTRANSPORT Solution Queue
	bottom	

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No	Stack	Current State
3	~~Transport(M1)~~ ~~City(K1)~~ ~~City(K2)~~ ~~TransportOn(M1,K1)~~ **TRAVEL(M1,K1,K2) → masuk ke solution queue** ~~InTransport(B1,M1)~~ TransportOn(M1,K2) **UNLOAD(B1,M1,K2)** InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) ~~InCity(B1,K1)~~ → DELETE InCity(B2,K2) InCity(B3,K3) InCity(B4,K2) TransportOn(M1,K1) ~~EMPTYTRANSPORT~~ → DELETE InTransport(B1,M1) → ADD Solution Queue **LOAD(B1,M1,K1)**
	bottom	

No	Stack	Current State
4	~~TransportOn(M1,K2)~~ **UNLOAD(B1,M1,K2) → masuk ke solution queue** InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B2,K2) InCity(B3,K3) InCity(B4,K2) ~~TransportOn(M1,K1)~~ → DELETE InTransport(B1,M1) TransportOn(M1,K2) → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)**
	bottom	

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No	Stack	Current State
5	~~Item(B2)~~ ~~Transport(M1)~~ ~~City(K2)~~ ~~InCity(B2,K2)~~ ~~TransportOn(M1,K2)~~ ~~EMPTYTRANSPORT~~ **LOAD(B2,M1,K2) → masuk ke solution queue** ~~Item(B2)~~ ~~Transport(M1)~~ ~~City(K3)~~ InTransport(B2,M1) TransportOn(M1,K3) **UNLOAD(B2,M1,K3)** ~~InCity(B1,K2)~~ InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B2,K2) InCity(B3,K3) InCity(B4,K2) ~~InTransport(B1,M1)~~ → DELETE TransportOn(M1,K2) InCity(B1,K2) → ADD EMPTYTRANSPORT → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)**
	bottom	

No	Stack	Current State
6	~~Transport(M1)~~ ~~City(K2)~~ ~~City(K3)~~ ~~TransportOn(M1,K2)~~ **TRAVEL(M1,K2,K3) → masuk ke solution queue** ~~InTransport(B2,M1)~~ TransportOn(M1,K3) **UNLOAD(B2,M1,K3)** InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) ~~InCity(B2,K2)~~ → DELETE InCity(B3,K3) InCity(B4,K2) TransportOn(M1,K2) InCity(B1,K2) ~~EMPTYTRANSPORT~~ → DELETE InTransport(B2,M1) → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)**
	bottom	

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No	Stack	Current State
7	~~TransportOn(M1,K3)~~ **UNLOAD(B2,M1,K3) → masuk ke solution queue** InCity(B2,K3) InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B3,K3) InCity(B4,K2) ~~TransportOn(M1,K2)~~ → DELETE InCity(B1,K2) InTransport(B2,M1) TransportOn(M1,K3) → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)**
	bottom	

No	Stack	Current State
8	~~Item(B3)~~ ~~Transport(M1)~~ ~~City(K3)~~ ~~InCity(B3,K3)~~ ~~TransportOn(M1,K3)~~ ~~EMPTYTRANSPORT~~ **LOAD(B3,M1,K3) → masuk ke solution queue** ~~Item(B3)~~ ~~Transport(M1)~~ ~~City(K1)~~ InTransport(B3,M1) TransportOn(M1,K1) **UNLOAD(B3,M1,K1)** ~~InCity(B2,K3)~~ InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B3,K3) InCity(B4,K2) InCity(B1,K2) ~~InTransport(B2,M1)~~ → DELETE TransportOn(M1,K3) InCity(B2,K3) → ADD EMPTYTRANSPORT → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)**
	bottom	

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No	Stack	Current State
9	~~Transport(M1)~~ ~~City(K3)~~ ~~City(K1)~~ ~~TransportOn(M1,K3)~~ **TRAVEL(M1,K3,K1) → masuk ke solution queue** ~~InTransport(B3,M1)~~ TransportOn(M1,K1) **UNLOAD(B3,M1,K1)** InCity(B3,K1) InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) ~~InCity(B3,K3)~~ → DELETE InCity(B4,K2) InCity(B1,K2) TransportOn(M1,K3) InCity(B2,K3) ~~EMPTYTRANSPORT~~ → DELETE InTransport(B3,M1) → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)**
	bottom	

No	Stack	Current State
10	~~TransportOn(M1,K1)~~	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B4,K2) InCity(B1,K2) ~~TransportOn(M1,K3)~~ → DELETE InCity(B2,K3) InTransport(B3,M1) TransportOn(M1,K1) → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)**

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	UNLOAD(B3,M1,K1) → masuk ke solution queue InCity(B3,K1) InCity(B4,K4)	**LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)**
	bottom	

No	Stack	Current State
11	~~Transport(M1)~~ ~~City(K1)~~ ~~City(K2)~~ ~~TransportOn(M1,K1)~~ **TRAVEL(M1,K1,K2) → masuk ke solution queue** TransportOn(M1,K2) ~~InCity(B3,K1)~~ InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B4,K2) InCity(B1,K2) InCity(B2,K3) ~~InTransport(B3,M1)~~ → DELETE TransportOn(M1,K1) InCity(B3,K1) → ADD ~~EMPTYTRANSPORT~~ → DELETE Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)** **UNLOAD(B3,M1,K1)**
	bottom	

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No	Stack	Current State
12	~~Item(B4)~~ ~~Transport(M1)~~ ~~City(K2)~~ ~~InCity(B4,K2)~~ ~~TransportOn(M1,K2)~~ ~~EMPTYTRANSPORT~~ **LOAD(B4,M1,K2) → masuk ke solution queue** ~~Item(B4)~~ ~~Transport(M1)~~ ~~City(K4)~~ InTransport(B4,M1) TransportOn(M1,K4) **UNLOAD(B4,M1,K4)** InCity(B4,K4)	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B4,K2) TransportOn(M1,K2) InCity(B1,K2) InCity(B2,K3) EMPTYTRANSPORT → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)** **UNLOAD(B3,M1,K1)** **TRAVEL(M1,K1,K2)**
	bottom	

No	Stack	Current State
13	~~Transport(M1)~~ ~~City(K2)~~ ~~City(K4)~~	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) ~~InCity(B4,K2)~~ → DELETE TransportOn(M1,K2) InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) ~~EMPTYTRANSPORT~~ → DELETE InTransport(B4,M1) → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)**

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	~~TransportOn(M1,K2)~~ **TRAVEL(M1,K2,K4) → masuk ke solution queue** ~~InTransport(B4,M1)~~ TransportOn(M1,K4) **UNLOAD(B4,M1,K4)** InCity(B4,K4)	**TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)** **UNLOAD(B3,M1,K1)** **TRAVEL(M1,K1,K2)** **LOAD(B4,M1,K2)**
	bottom	

No	Stack	Current State
14		Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) ~~TransportOn(M1,K2)~~ → DELETE InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) InTransport(B4,M1) TransportOn(M1,K4) → ADD
		Solution Queue
	~~TransportOn(M1,K4)~~ **UNLOAD(B4,M1,K4) → masuk ke solution queue** InCity(B4,K4)	**LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)** **UNLOAD(B3,M1,K1)** **TRAVEL(M1,K1,K2)** **LOAD(B4,M1,K2)** **TRAVEL(M1,K2,K4)**
	bottom	

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No	Stack	Current State
15	~~InCity(B4,K4)~~	Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) ~~InTransport(B4,M1)~~ → DELETE TransportOn(M1,K4) InCity(B4,K4) → ADD EMPTYTRANSPORT → ADD Solution Queue **LOAD(B1,M1,K1)** **TRAVEL(M1,K1,K2)** **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)** **UNLOAD(B3,M1,K1)** **TRAVEL(M1,K1,K2)** **LOAD(B4,M1,K2)** **TRAVEL(M1,K2,K4)** **UNLOAD(B4,M1,K4)**
	bottom	

No	Stack	Current State
16		Transport(M1) Item(B1), Item(B2), Item(B3), Item(B4) City(K1), City(K2), City(K3), City(K4) InCity(B1,K2) InCity(B2,K3) InCity(B3,K1) TransportOn(M1,K4) InCity(B4,K4) EMPTYTRANSPORT Solution Queue **LOAD(B1,M1,K1)**

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		TRAVEL(M1,K1,K2) **UNLOAD(B1,M1,K2)** **LOAD(B2,M1,K2)** **TRAVEL(M1,K2,K3)** **UNLOAD(B2,M1,K3)** **LOAD(B3,M1,K3)** **TRAVEL(M1,K3,K1)** **UNLOAD(B3,M1,K1)** **TRAVEL(M1,K1,K2)** **LOAD(B4,M1,K2)** **TRAVEL(M1,K2,K4)** **UNLOAD(B4,M1,K4)**
	bottom	

Dari hasil penelusuran yang dilakukan maka didapatkan solusi perpindahan barang sebagai berikut:

Solution
LOAD(B1,M1,K1)
TRAVEL(M1,K1,K2)
UNLOAD(B1,M1,K2)
LOAD(B2,M1,K2)
TRAVEL(M1,K2,K3)
UNLOAD(B2,M1,K3)
LOAD(B3,M1,K3)
TRAVEL(M1,K3,K1)
UNLOAD(B3,M1,K1)
TRAVEL(M1,K1,K2)
LOAD(B4,M1,K2)
TRAVEL(M1,K2,K4)
UNLOAD(B4,M1,K4)

Goal State
Transport(M1)
Item(B1), Item(B2), Item(B3), Item(B4)
City(K1), City(K2), City(K3), City(K4)
InCity(B1,K2)
InCity(B2,K3)
InCity(B3,K1)
TransportOn(M1,K4)
InCity(B4,K4)
EMPTYTRANSPORT