

Resultados de la reparación:

a.) Utilizando el primero árbol T1 de cada problema, analizamos en una tabla:

1. La cantidad de fallos que hacemos.
2. El tiempo promedio que tarda en encontrar o no un plan, junto con su desviación estándar.
3. La cantidad de veces que encuentra un plan.
4. El número del planning horizon del árbol.
5. El número de acciones con las que repara el plan.
6. La cantidad de acciones del punto 5. que se encuentran en el punto 4.

b.) Y ver dos ejemplos de tipos de fallo, en los que:

1. Mencionemos el fallo producido: el fallo siempre va a ser que falla una precondition de la siguiente acción.
2. Y mostrar, si la reparación se está produciendo para ejecutar de nuevo la acción que ha fallado o bien una acción posterior.

A continuación están todos los tipos de fallo que tenemos. Yo me inclinaría por el 6.) y el 7.) .

Mañana me dedico ( en las horas de la tarde ) exclusivamente a realizar la parte **a.) Utilizando el primero árbol T1 de cada problema, analizamos en una tabla.**

#### **1.) TIPO DE FALLO 1: NO SE PUEDE TOMAR LA IMAGEN PORQUE EL OBJETIVO1 NO ES VISIBLE DESDE EL WAYPOINT3.**

Quedan tres acciones por ejecutar, en un árbol con una profundidad de 5. Por lo que tenemos un margen de 2 acciones. En este ejemplo, la reparación se hace para ejecutar una acción posterior a la que ha fallado. Es decir:

```
2: (communicate_image_data rover0 general objective1 high_res waypoint3 waypoint0) [1]
3: (sample_rock rover0 rover0store waypoint3) [1]
```

Concretamente, el rover toma la foto del objective1 desde el waypoint0 y regresa al waypoint3 para comunicar los resultados.

```
*****
Rovers - pfile1,
SEARCH TREE=1,
TIME STEP=1
WINDOW=4,
DEPTH=5
*****
```

b) Random failures: by exogenous events

```
= <have_image-rover0-objective1-high_res,not>
= <supports-camera0-high_res,true>
= <calibrated-camera0-rover0,yes>
= <at-rover0,waypoint3>
= <on_board-camera0,rover0>
= <equipped_for_imaging-rover0,yes>
- <visible_from-objective1-waypoint3,true> changed by <visible_from-objective1-waypoint3,false>]
```

Original plan:

; Version LPG-td-1.0

1: (take\_image rover0 waypoint3 objective1 camera0 high\_res) [1]

2: (communicate\_image\_data rover0 general objective1 high\_res waypoint3 waypoint0) [1]

3: (sample\_rock rover0 rover0store waypoint3) [1]

Destiny found: 39 [<status-rover0store,empty>, <can\_traverse-rover0-waypoint3-waypoint1,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <have\_image-rover0-objective1-high\_res,not>, <have\_rock\_analysis-rover0-waypoint3,not>, <supports-camera0-high\_res,true>, <calibrated-camera0-rover0,yes>, <at\_lander-general,waypoint0>, <visible-waypoint3-waypoint0,true>, <at-rover0,waypoint3>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint2-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint2,not>, <on\_board-camera0,rover0>, <can\_traverse-rover0-waypoint1-waypoint2,true>, <equipped\_for\_imaging-rover0,yes>, <visible\_from-objective1-waypoint3,true>, <at\_soil\_sample-waypoint2,yes>, <store\_of-rover0store,rover0>]

Origin found: 262 [<status-rover0store,empty>, <can\_traverse-rover0-waypoint3-waypoint0,true>, <can\_traverse-rover0-waypoint3-waypoint1,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <have\_image-rover0-objective1-high\_res,not>, <have\_rock\_analysis-rover0-waypoint3,not>, <supports-camera0-high\_res,true>, <calibrated-camera0-rover0,yes>, <at\_lander-general,waypoint0>, <visible-waypoint3-waypoint0,true>, <at\_rock\_sample-waypoint3,yes>, <at-rover0,waypoint3>, <visible-waypoint2-waypoint0,true>, <can\_traverse-rover0-waypoint0-waypoint3,true>, <visible\_from-objective1-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint2,not>, <on\_board-camera0,rover0>, <can\_traverse-rover0-waypoint1-waypoint2,true>, <equipped\_for\_imaging-rover0,yes>, <at\_soil\_sample-waypoint2,yes>, <store\_of-rover0store,rover0>]

Repaired plan (RP):

0.0:navigate rover0 waypoint3 waypoint0

1.0:take\_image rover0 waypoint0 objective1 camera0 high\_res

2.0:navigate rover0 waypoint0 waypoint3

3.0:communicate\_image\_data rover0 general objective1 high\_res waypoint3 waypoint0

4.0:sample\_rock rover0 rover0store waypoint3

5.0:drop rover0 rover0store

6.0:navigate rover0 waypoint3 waypoint1

7.0:navigate rover0 waypoint1 waypoint2

8.0:communicate\_rock\_data rover0 general waypoint3 waypoint2 waypoint0

9.0:sample\_soil rover0 rover0store waypoint2

10.0:communicate\_soil\_data rover0 general waypoint2 waypoint2 waypoint0

Search time: 351600.0 ns

## 2.) TIPO DE FALLO 2: FALLOS POSITIVOS.

Se fallos que benefician a la ejecución del plan. En este ejemplo, el rover detecta que la camara ya está calibrada.

\*\*\*\*\*

Rovers - pfile1

SEARCH TREE=1

TIME STEP=0

WINDOW=4

DEPTH=5

\*\*\*\*\*

b) Random failures: by exogenous events

= <calibration\_target-camera0,objective1>

- <calibrated-camera0-rover0,not> changed by <calibrated-camera0-rover0,yes>]

= <at-rover0,waypoint3>

= <on\_board-camera0,rover0>

= <equipped\_for\_imaging-rover0,yes>

= <visible\_from-objective1-waypoint3,true>

Original plan:

; Version LPG-td-1.0

0: (calibrate rover0 camera0 objective1 waypoint3) [1]

1: (take\_image rover0 waypoint3 objective1 camera0 high\_res) [1]

2: (communicate\_image\_data rover0 general objective1 high\_res waypoint3 waypoint0) [1]  
3: (sample\_rock rover0 rover0store waypoint3) [1]

Destiny found: 103 [<status-rover0store,empty>, <can\_traverse-rover0-waypoint3-waypoint1,true>, <calibration\_target-camera0,objective1>, <equipped\_for\_soil\_analysis-rover0,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <have\_image-rover0-objective1-high\_res,not>, <have\_rock\_analysis-rover0-waypoint3,not>, <supports-camera0-high\_res,true>, <calibrated-camera0-rover0,not>, <at\_lander-general,waypoint0>, <visible-waypoint3-waypoint0,true>, <at-rover0,waypoint3>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint2-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint2,not>, <on\_board-camera0,rover0>, <can\_traverse-rover0-waypoint1-waypoint2,true>, <equipped\_for\_imaging-rover0,yes>, <visible\_from-objective1-waypoint3,true>, <at\_soil\_sample-waypoint2,yes>, <store\_of-rover0store,rover0>]

Origin found: 39 [<status-rover0store,empty>, <can\_traverse-rover0-waypoint3-waypoint1,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <have\_image-rover0-objective1-high\_res,not>, <have\_rock\_analysis-rover0-waypoint3,not>, <supports-camera0-high\_res,true>, <calibrated-camera0-rover0,yes>, <at\_lander-general,waypoint0>, <visible-waypoint3-waypoint0,true>, <at-rover0,waypoint3>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint2-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint2,not>, <on\_board-camera0,rover0>, <can\_traverse-rover0-waypoint1-waypoint2,true>, <equipped\_for\_imaging-rover0,yes>, <visible\_from-objective1-waypoint3,true>, <at\_soil\_sample-waypoint2,yes>, <store\_of-rover0store,rover0>]

Repaired plan (RP):

0.0:take\_image rover0 waypoint3 objective1 camera0 high\_res  
1.0:communicate\_image\_data rover0 general objective1 high\_res waypoint3 waypoint0  
2.0:sample\_rock rover0 rover0store waypoint3  
3.0:drop rover0 rover0store  
4.0:navigate rover0 waypoint3 waypoint1  
5.0:navigate rover0 waypoint1 waypoint2  
6.0:communicate\_rock\_data rover0 general waypoint3 waypoint2 waypoint0  
7.0:sample\_soil rover0 rover0store waypoint2  
8.0:communicate\_soil\_data rover0 general waypoint2 waypoint2 waypoint0

Search time: 375815.0 ns

### 3.) TIPO DE FALLO 3: due to a hardware failure. The rover's capabilities is broken.

SOLUCION: COLOCAR UN ROVER REPARADOR QUE ESTE EN EL MISMO WAYPOINT3. NO ES MUY REAL ESTE TIPO DE SOLUCIÓN.

\*\*\*\*\*

Rovers - pfile2  
SEARCH TREE=1  
TIME STEP=1  
WINDOW=4  
DEPTH=5  
\*\*\*\*\*

b) Random failures: by exogenous events

= <visible\_from-objective1-waypoint0,true>  
= <calibrated-camera0-rover0,yes>  
= <on\_board-camera0,rover0>  
- <equipped\_for\_imaging-rover0,yes> changed by <equipped\_for\_imaging-rover0,not>  
= <have\_image-rover0-objective1-low\_res,not>  
= <at-rover0,waypoint0>  
= <supports-camera0-low\_res,true>

Original plan:

; Version LPG-td-1.0  
1: (take\_image rover0 waypoint0 objective1 camera0 low\_res) [1]  
2: (communicate\_image\_data rover0 general objective1 low\_res waypoint0 waypoint1) [1]  
3: (sample\_rock rover0 rover0store waypoint0) [1]

Destiny found: 29 [<have\_soil\_analysis-rover0-waypoint0,not>, <visible\_from-objective1-waypoint0,true>, <at\_rock\_sample-waypoint0,yes>, <have\_rock\_analysis-rover0-waypoint0,not>, <equipped\_for\_soil\_analysis-rover0,yes>, <calibrated-camera0-rover0,yes>, <on\_board-camera0-rover0>, <equipped\_for\_imaging-rover0,yes>, <have\_image-rover0-objective1-low\_res,not>, <at-rover0-waypoint0>, <supports-camera0-low\_res,true>, <at\_lander-general,waypoint1>, <at\_soil\_sample-waypoint0,yes>, <status-rover0store,empty>, <equipped\_for\_rock\_analysis-rover0,yes>, <visible-waypoint0-waypoint1,true>, <store\_of-rover0store,rover0>]

No se ha encontrado el origen

Search time: 3207531.0 ns

#### 4.) TIPO DE FALLO 4: CONEXIÓN ENTRE LOS WAYPOINTS - LINKS.

- ROVER CAMBIA DE POSICIÓN.

\*\*\*\*\*

Rovers - pfile1  
SEARCH TREE=1  
TIME STEP=2  
WINDOW=4  
DEPTH=5  
\*\*\*\*\*

b) Random failures: by exogenous events

= <visible-waypoint3-waypoint0,true>  
- <at-rover0,waypoint3> changed by <at-rover0,waypoint1>]  
= <at\_lander-general,waypoint0>  
= <have\_image-rover0-objective1-high\_res,yes>

Original plan:

; Version LPG-td-1.0

2: (communicate\_image\_data rover0 general objective1 high\_res waypoint3 waypoint0) [1]

3: (sample\_rock rover0 rover0store waypoint3) [1]

Destiny found: 13 [<can\_traverse-rover0-waypoint1-waypoint2,true>, <have\_soil\_analysis-rover0-waypoint2,not>, <visible-waypoint3-waypoint0,true>, <can\_traverse-rover0-waypoint3-waypoint1,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <at-rover0,waypoint3>, <have\_rock\_analysis-rover0-waypoint3,not>, <visible-waypoint2-waypoint0,true>, <at\_lander-general,waypoint0>, <have\_image-rover0-objective1-high\_res,yes>, <status-rover0store,empty>, <at\_soil\_sample-waypoint2,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <store\_of-rover0store,rover0>, <at\_rock\_sample-waypoint3,yes>]

Origin found: 41 [<can\_traverse-rover0-waypoint1-waypoint3,true>, <can\_traverse-rover0-waypoint1-waypoint2,true>, <have\_soil\_analysis-rover0-waypoint2,not>, <have\_rock\_analysis-rover0-waypoint3,not>, <visible-waypoint2-waypoint0,true>, <at\_lander-general,waypoint0>, <visible-waypoint3-waypoint0,true>, <can\_traverse-rover0-waypoint3-waypoint1,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <status-rover0store,empty>, <have\_image-rover0-objective1-high\_res,yes>, <at\_soil\_sample-waypoint2,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <store\_of-rover0store,rover0>, <at\_rock\_sample-waypoint3,yes>, <at-rover0,waypoint1>]

Repaired plan (RP):

0.0:navigate rover0 waypoint1 waypoint3

1.0:communicate\_image\_data rover0 general objective1 high\_res waypoint3 waypoint0

2.0:sample\_rock rover0 rover0store waypoint3

3.0:drop rover0 rover0store

4.0:navigate rover0 waypoint3 waypoint1

5.0:navigate rover0 waypoint1 waypoint2

6.0:communicate\_rock\_data rover0 general waypoint3 waypoint2 waypoint0

7.0:sample\_soil rover0 rover0store waypoint2

8.0:communicate\_soil\_data rover0 general waypoint2 waypoint2 waypoint0

Search time: 177187.0 ns

#### 5.) TIPO DE FALLO 4: CONEXIÓN ENTRE LOS WAYPOINTS - LINKS.

- ROVER CAMBIA DE POSICIÓN, PERO EN ESTE SE VE COMO REPARA HASTA EL

## NODO RAÍZ. AUNQUE UTILIZA TRES DE LAS MISMAS ACCIONES PERO EN DIFERENTE ORDEN, POR LO TANTO ESTA DIRIGIENDO LA BUSQUEDA AL NODO RAÍZ.

\*\*\*\*\*

Rovers - pfile8  
SEARCH TREE=1  
TIME STEP=0  
WINDOW=4  
DEPTH=5  
\*\*\*\*\*

b) Random failures: by exogenous events

= <can\_traverse-rover3-waypoint3-waypoint0,true>  
- <at-rover3,waypoint3> changed by <at-rover3,waypoint1>]

Original plan:

; Version LPG-td.1.0

0: (navigate rover3 waypoint3 waypoint0) [1]

1: (navigate rover0 waypoint2 waypoint4) [1]

2: (sample\_rock rover0 rover0store waypoint4) [1]

3: (calibrate rover3 camera0 objective1 waypoint0) [1]

Destiny found: 188 [<status-rover3store,empty>, <can\_traverse-rover3-waypoint3-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint4,not>, <visible-waypoint4-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint3,not>, <have\_image-rover1-objective2-low\_res,not>, <calibrated-camera0-rover3,not>, <visible\_from-objective0-waypoint1,true>, <supports-camera1-high\_res,true>, <visible\_from-objective0-waypoint2,true>, <store\_of-rover1store,rover1>, <have\_rock\_analysis-rover0-waypoint4,not>, <visible-waypoint2-waypoint0,true>, <calibrated-camera1-rover3,not>, <at\_rock\_sample-waypoint5,yes>, <at\_rock\_sample-waypoint4,yes>, <calibration\_target-camera0,objective1>, <calibration\_target-camera1,objective0>, <calibration\_target-camera2,objective0>, <supports-camera2-low\_res,true>, <equipped\_for\_soil\_analysis-rover3,yes>, <visible-waypoint3-waypoint0,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <at-rover3,waypoint3>, <at-rover1,waypoint2>, <at-rover0,waypoint2>, <store\_of-rover3store,rover3>, <visible\_from-objective1-waypoint0,true>, <can\_traverse-rover0-waypoint4-waypoint2,true>, <have\_rock\_analysis-rover1-waypoint5,not>, <can\_traverse-rover3-waypoint0-waypoint1,true>, <can\_traverse-rover1-waypoint5-waypoint2,true>, <equipped\_for\_imaging-rover3,yes>, <status-rover1store,empty>, <equipped\_for\_imaging-rover1,yes>, <calibrated-camera2-rover1,not>, <have\_soil\_analysis-rover3-waypoint1,not>, <have\_image-rover3-objective0-low\_res,not>, <supports-camera0-low\_res,true>, <visible-waypoint1-waypoint0,true>, <equipped\_for\_rock\_analysis-rover0,yes>, <equipped\_for\_rock\_analysis-rover1,yes>, <can\_traverse-rover1-waypoint2-waypoint5,true>, <can\_traverse-rover0-waypoint2-waypoint3,true>, <can\_traverse-rover0-waypoint2-waypoint4,true>, <have\_image-rover3-objective0-high\_res,not>, <visible\_from-objective2-waypoint2,true>, <on\_board-camera2,rover1>, <on\_board-camera1,rover3>, <on\_board-camera0,rover3>, <at\_soil\_sample-waypoint3,yes>, <at\_soil\_sample-waypoint4,yes>, <at\_lander-general,waypoint0>, <at\_soil\_sample-waypoint1,yes>, <status-rover0store,empty>, <store\_of-rover0store,rover0>]

Origin found: 190 [<status-rover3store,empty>, <have\_soil\_analysis-rover0-waypoint4,not>, <visible-waypoint4-waypoint0,true>, <have\_soil\_analysis-rover0-waypoint3,not>, <have\_image-rover1-objective2-low\_res,not>, <calibrated-camera0-rover3,not>, <visible\_from-objective0-waypoint1,true>, <supports-camera1-high\_res,true>, <visible\_from-objective0-waypoint2,true>, <store\_of-rover1store,rover1>, <have\_rock\_analysis-rover0-waypoint4,not>, <visible-waypoint2-waypoint0,true>, <calibrated-camera1-rover3,not>, <at\_rock\_sample-waypoint5,yes>, <at\_rock\_sample-waypoint4,yes>, <calibration\_target-camera0,objective1>, <calibration\_target-camera1,objective0>, <calibration\_target-camera2,objective0>, <supports-camera2-low\_res,true>, <equipped\_for\_soil\_analysis-rover3,yes>, <visible-waypoint3-waypoint0,true>, <equipped\_for\_soil\_analysis-rover0,yes>, <at-rover3,waypoint1>, <at-rover1,waypoint2>, <at-rover0,waypoint2>, <store\_of-rover3store,rover3>, <visible\_from-objective1-waypoint0,true>, <can\_traverse-rover0-waypoint4-waypoint2,true>, <have\_rock\_analysis-rover1-waypoint5,not>, <can\_traverse-rover3-waypoint0-waypoint1,true>, <can\_traverse-rover1-waypoint5-waypoint2,true>, <equipped\_for\_imaging-rover3,yes>, <status-rover1store,empty>, <equipped\_for\_imaging-rover1,yes>, <calibrated-camera2-rover1,not>, <have\_soil\_analysis-rover3-waypoint1,not>, <have\_image-rover3-objective0-low\_res,not>, <supports-camera0-low\_res,true>, <can\_traverse-rover3-waypoint1-waypoint0,true>, <visible-waypoint1-waypoint0,true>, <equipped\_for\_rock\_analysis-rover0,yes>, <equipped\_for\_rock\_analysis-rover1,yes>, <can\_traverse-rover1-waypoint2-waypoint5,true>, <can\_traverse-rover0-waypoint2-waypoint3,true>, <can\_traverse-rover0-waypoint2-waypoint4,true>, <have\_image-rover3-objective0-high\_res,not>, <visible\_from-objective2-waypoint2,true>, <on\_board-camera2,rover1>, <on\_board-camera1,rover3>, <on\_board-camera0,rover3>, <at\_soil\_sample-waypoint3,yes>, <at\_soil\_sample-waypoint4,yes>, <at\_lander-general,waypoint0>, <at\_soil\_sample-waypoint1,yes>, <status-rover0store,empty>, <store\_of-rover0store,rover0>]

0: (navigate rover3 waypoint3 waypoint0) [1]

1: (navigate rover0 waypoint2 waypoint4) [1]

2: (sample\_rock rover0 rover0store waypoint4) [1]  
3: (calibrate rover3 camera0 objective1 waypoint0) [1]

Repaired plan (RP):

0.0:navigate rover3 waypoint1 waypoint0  
1.0:calibrate rover3 camera0 objective1 waypoint0  
2.0:navigate rover0 waypoint2 waypoint4  
3.0:sample\_rock rover0 rover0store waypoint4  
4.0:navigate rover3 waypoint0 waypoint1  
5.0:sample\_soil rover3 rover3store waypoint1  
6.0:communicate\_soil\_data rover3 general waypoint1 waypoint1 waypoint0  
7.0:communicate\_rock\_data rover0 general waypoint4 waypoint4 waypoint0  
8.0:navigate rover1 waypoint2 waypoint5  
9.0:sample\_rock rover1 rover1store waypoint5  
10.0:navigate rover1 waypoint5 waypoint2  
11.0:communicate\_rock\_data rover1 general waypoint5 waypoint2 waypoint0  
12.0:take\_image rover3 waypoint1 objective0 camera0 low\_res  
13.0:communicate\_image\_data rover3 general objective0 low\_res waypoint1 waypoint0  
14.0:calibrate rover1 camera2 objective0 waypoint2  
15.0:take\_image rover1 waypoint2 objective2 camera2 low\_res  
16.0:communicate\_image\_data rover1 general objective2 low\_res waypoint2 waypoint0  
17.0:calibrate rover3 camera1 objective0 waypoint1  
18.0:take\_image rover3 waypoint1 objective0 camera1 high\_res  
19.0:communicate\_image\_data rover3 general objective0 high\_res waypoint1 waypoint0  
20.0:drop rover0 rover0store  
21.0:sample\_soil rover0 rover0store waypoint4  
22.0:communicate\_soil\_data rover0 general waypoint4 waypoint4 waypoint0  
23.0:navigate rover0 waypoint4 waypoint2  
24.0:navigate rover0 waypoint2 waypoint3  
25.0:drop rover0 rover0store  
26.0:sample\_soil rover0 rover0store waypoint3  
27.0:communicate\_soil\_data rover0 general waypoint3 waypoint3 waypoint0

Search time: 421491.0 ns

## 6.) TIPO DE FALLO 5: ACTION SEEK FOR A ROCKS FOR SOILS

\*\*\*\*\*

Rovers - pfile2  
SEARCH TREE=1  
TIME STEP=3  
WINDOW=4  
DEPTH=5

\*\*\*\*\*

b) Random failures: by exogenous events

- <at\_rock\_sample-waypoint0,yes> changed by <at\_rock\_sample-waypoint0,not>]  
= <have\_rock\_analysis-rover0-waypoint0,not>  
= <communicated\_image\_data-objective1-low\_res,true>  
= <status-rover0store,empty>  
= <equipped\_for\_rock\_analysis-rover0,yes>  
= <store\_of-rover0store,rover0>  
= <at-rover0,waypoint0>

Original plan:

; Version LPG-td-1.0

3: (sample\_rock rover0 rover0store waypoint0) [1]

Destiny found: 1 [<have\_soil\_analysis-rover0-waypoint0,not>, <at\_rock\_sample-waypoint0,yes>, <at\_lander-general,waypoint1>,  
<have\_rock\_analysis-rover0-waypoint0,not>, <communicated\_image\_data-objective1-low\_res,true>, <equipped\_for\_soil\_analysis-  
rover0,yes>, <at\_soil\_sample-waypoint0,yes>, <status-rover0store,empty>, <equipped\_for\_rock\_analysis-rover0,yes>, <store\_of-  
rover0store,rover0>, <visible-waypoint0-waypoint1,true>, <at-rover0,waypoint0>]

Origin found: 7 [<have\_soil\_analysis-rover0-waypoint0,not>, <at\_rock\_sample-waypoint0,not>, <at\_lander-general, waypoint1>, <communicated\_image\_data-objective1-low\_res,true>, <have\_rock\_analysis-rover0-waypoint0,not>, <at\_soil\_sample-waypoint0,yes>, <equipped\_for\_soil\_analysis-rover0,yes>, <status-rover0store,empty>, <more\_rocks-waypoint0,yes>, <equipped\_for\_rock\_analysis-rover0,yes>, <visible-waypoint0-waypoint1,true>, <store\_of-rover0store,rover0>, <at-rover0, waypoint0>]

Repaired plan (RP):

0.0:seek\_rocks rover0 waypoint0  
1.0:sample\_rock rover0 rover0store waypoint0  
2.0:drop rover0 rover0store  
3.0:sample\_soil rover0 rover0store waypoint0  
4.0:communicate\_rock\_data rover0 general waypoint0 waypoint0 waypoint1  
5.0:communicate\_soil\_data rover0 general waypoint0 waypoint0 waypoint1

Search time: 130254.0 ns

## 7.) TIPO DE FALLO 6 - 4: EL ROVER PIERDE LA MUESTRA QUE ACABA DE ANALIZAR.

\*\*\*\*\*

Rovers - pfile6  
SEARCH TREE=1  
TIME STEP=2  
WINDOW=4  
DEPTH=5  
\*\*\*\*\*

b) Random failures: by exogenous events

- <status-rover1store,full> changed by <status-rover1store,empty>]  
= <store\_of-rover1store,rover1>

Original plan:

; Version LPG-td-1.0  
2: (drop rover1 rover1store) [1]  
3: (communicate\_soil\_data rover1 general waypoint4 waypoint4 waypoint3) [1]

Destiny found: 18 [<at\_rock\_sample-waypoint0,yes>, <visible\_from-objective1-waypoint0,true>, <can\_traverse-rover0-waypoint0-waypoint3,true>, <supports-camera1-low\_res,true>, <can\_traverse-rover0-waypoint0-waypoint2,true>, <have\_rock\_analysis-rover0-waypoint0,not>, <can\_traverse-rover1-waypoint5-waypoint2,true>, <visible-waypoint2-waypoint3,true>, <can\_traverse-rover0-waypoint3-waypoint0,true>, <status-rover1store,full>, <equipped\_for\_imaging-rover0,yes>, <visible\_from-objective0-waypoint0,true>, <store\_of-rover1store,rover1>, <have\_rock\_analysis-rover0-waypoint3,not>, <calibrated-camera1-rover0,not>, <have\_rock\_analysis-rover0-waypoint2,not>, <can\_traverse-rover1-waypoint1-waypoint4,true>, <visible-waypoint4-waypoint3,true>, <visible-waypoint1-waypoint3,true>, <equipped\_for\_rock\_analysis-rover0,yes>, <at\_rock\_sample-waypoint2,yes>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint0-waypoint3,true>, <supports-camera1-colour,true>, <calibration\_target-camera1,objective1>, <equipped\_for\_soil\_analysis-rover1,yes>, <have\_soil\_analysis-rover1-waypoint2,not>, <on\_board-camera1,rover0>, <have\_soil\_analysis-rover1-waypoint5,not>, <have\_soil\_analysis-rover1-waypoint4,yes>, <at-rover1, waypoint4>, <have\_soil\_analysis-rover1-waypoint1,not>, <at-rover0, waypoint0>, <have\_image-rover0-objective1-low\_res,not>, <can\_traverse-rover1-waypoint4-waypoint1,true>, <at\_soil\_sample-waypoint5,yes>, <at\_lander-general, waypoint3>, <have\_image-rover0-objective0-low\_res,not>, <status-rover0store,empty>, <can\_traverse-rover1-waypoint4-waypoint5,true>, <at\_soil\_sample-waypoint1,yes>, <at\_soil\_sample-waypoint2,yes>, <store\_of-rover0store,rover0>, <visible-waypoint5-waypoint3,true>, <have\_image-rover0-objective0-colour,not>]

Origin found: 936:154 [<visible\_from-objective1-waypoint0,true>, <at\_rock\_sample-waypoint0,yes>, <can\_traverse-rover0-waypoint0-waypoint3,true>, <supports-camera1-low\_res,true>, <can\_traverse-rover0-waypoint0-waypoint2,true>, <have\_rock\_analysis-rover0-waypoint0,not>, <can\_traverse-rover0-waypoint3-waypoint0,true>, <visible-waypoint2-waypoint3,true>, <can\_traverse-rover1-waypoint5-waypoint2,true>, <status-rover1store,empty>, <visible\_from-objective0-waypoint0,true>, <equipped\_for\_imaging-rover0,yes>, <store\_of-rover1store,rover1>, <have\_rock\_analysis-rover0-waypoint3,not>, <calibrated-camera1-rover0,not>, <have\_rock\_analysis-rover0-waypoint2,not>, <can\_traverse-rover1-waypoint1-waypoint4,true>, <visible-waypoint4-waypoint3,true>, <visible-waypoint1-waypoint3,true>, <equipped\_for\_rock\_analysis-rover0,yes>, <at\_rock\_sample-waypoint2,yes>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint0-waypoint3,true>, <supports-camera1-colour,true>, <calibration\_target-camera1,objective1>, <can\_traverse-rover1-waypoint3-waypoint4,true>, <equipped\_for\_soil\_analysis-rover1,yes>, <have\_soil\_analysis-rover1-waypoint3,not>, <on\_board-camera1,rover0>, <have\_soil\_analysis-rover1-waypoint2,not>, <have\_soil\_analysis-rover1-waypoint5,not>, <have\_soil\_analysis-rover1-waypoint4,yes>, <at-rover1, waypoint4>, <have\_soil\_analysis-rover1-waypoint1,not>, <have\_image-rover0-objective1-low\_res,not>, <at-rover0, waypoint0>, <can\_traverse-rover1-waypoint4-waypoint3,true>, <at\_soil\_sample-waypoint3,yes>,

<at\_lander-general,waypoint3>, <at\_soil\_sample-waypoint5,yes>, <can\_traverse-rover1-waypoint4-waypoint1,true>, <have\_image-rover0-objective0-low\_res,not>, <at\_soil\_sample-waypoint1,yes>, <can\_traverse-rover1-waypoint4-waypoint5,true>, <status-rover0store,empty>, <at\_soil\_sample-waypoint2,yes>, <visible-waypoint5-waypoint3,true>, <store\_of-rover0store,rover0>, <have\_image-rover0-objective0-colour,not>]

Repaired plan (RP):

0.0:navigate rover1 waypoint4 waypoint3  
1.0:sample\_soil rover1 rover1store waypoint3  
2.0:navigate rover1 waypoint3 waypoint4  
3.0:communicate\_soil\_data rover1 general waypoint4 waypoint4 waypoint3  
4.0:drop rover1 rover1store  
5.0:calibrate rover0 camera1 objective1 waypoint0  
6.0:take\_image rover0 waypoint0 objective1 camera1 low\_res  
7.0:calibrate rover0 camera1 objective1 waypoint0  
8.0:communicate\_image\_data rover0 general objective1 low\_res waypoint0 waypoint3  
9.0:sample\_rock rover0 rover0store waypoint0  
10.0:communicate\_rock\_data rover0 general waypoint0 waypoint0 waypoint3  
11.0:drop rover0 rover0store  
12.0:take\_image rover0 waypoint0 objective0 camera1 colour  
13.0:communicate\_image\_data rover0 general objective0 colour waypoint0 waypoint3  
14.0:calibrate rover0 camera1 objective1 waypoint0  
15.0:take\_image rover0 waypoint0 objective0 camera1 low\_res  
16.0:communicate\_image\_data rover0 general objective0 low\_res waypoint0 waypoint3  
17.0:navigate rover1 waypoint4 waypoint1  
18.0:sample\_soil rover1 rover1store waypoint1  
19.0:communicate\_soil\_data rover1 general waypoint1 waypoint1 waypoint3  
20.0:navigate rover1 waypoint1 waypoint4  
21.0:navigate rover1 waypoint4 waypoint5  
22.0:drop rover1 rover1store  
23.0:sample\_soil rover1 rover1store waypoint5  
24.0:communicate\_soil\_data rover1 general waypoint5 waypoint5 waypoint3  
25.0:navigate rover1 waypoint5 waypoint2  
26.0:drop rover1 rover1store  
27.0:sample\_soil rover1 rover1store waypoint2  
28.0:communicate\_soil\_data rover1 general waypoint2 waypoint2 waypoint3  
29.0:navigate rover0 waypoint0 waypoint3  
30.0:sample\_rock rover0 rover0store waypoint3  
31.0:navigate rover0 waypoint3 waypoint0  
32.0:navigate rover0 waypoint0 waypoint2  
33.0:communicate\_rock\_data rover0 general waypoint3 waypoint2 waypoint3  
34.0:drop rover0 rover0store  
35.0:sample\_rock rover0 rover0store waypoint2  
36.0:communicate\_rock\_data rover0 general waypoint2 waypoint2 waypoint3

Search time: 2360356.0 ns

## 8.) TIPO DE FALLO 7-4: EL LANDER NO ES VISIBLE DESDE EL WAYPOINT4.

\*\*\*\*\*

Rovers - pfile6

SEARCH TREE=1

TIME STEP=3

WINDOW=4

DEPTH=5

\*\*\*\*\*

b) Random failures: by exogenous events

- <visible-waypoint4-waypoint3,true> changed by <visible-waypoint4-waypoint3,false>]  
= <have\_soil\_analysis-rover1-waypoint4,yes>  
= <at-rover1,waypoint4>  
= <at\_lander-general,waypoint3>



Original plan:

; Version LPG-td-1.0

3: (communicate\_soil\_data rover1 general waypoint4 waypoint4 waypoint3) [1]

Destiny found: 3 [<visible\_from-objective1-waypoint0,true>, <at\_rock\_sample-waypoint0,yes>, <can\_traverse-rover0-waypoint0-waypoint3,true>, <supports-camera1-low\_res,true>, <can\_traverse-rover0-waypoint0-waypoint2,true>, <have\_rock\_analysis-rover0-waypoint0,not>, <can\_traverse-rover0-waypoint3-waypoint0,true>, <visible-waypoint2-waypoint3,true>, <can\_traverse-rover1-waypoint5-waypoint2,true>, <status-rover1store,empty>, <equipped\_for\_imaging-rover0,yes>, <visible\_from-objective0-waypoint0,true>, <store\_of-rover1store,rover1>, <have\_rock\_analysis-rover0-waypoint3,not>, <calibrated-camera1-rover0,not>, <have\_rock\_analysis-rover0-waypoint2,not>, <can\_traverse-rover1-waypoint1-waypoint4,true>, <visible-waypoint4-waypoint3,true>, <visible-waypoint1-waypoint3,true>, <equipped\_for\_rock\_analysis-rover0,yes>, <at\_rock\_sample-waypoint2,yes>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint0-waypoint3,true>, <supports-camera1-colour,true>, <calibration\_target-camera1,objective1>, <equipped\_for\_soil\_analysis-rover1,yes>, <on\_board-camera1,rover0>, <have\_soil\_analysis-rover1-waypoint2,not>, <have\_soil\_analysis-rover1-waypoint5,not>, <have\_soil\_analysis-rover1-waypoint4,yes>, <at-rover1,waypoint4>, <have\_soil\_analysis-rover1-waypoint1,not>, <have\_image-rover0-objective1-low\_res,not>, <at-rover0,waypoint0>, <at\_lander-general,waypoint3>, <at\_soil\_sample-waypoint5,yes>, <can\_traverse-rover1-waypoint4-waypoint1,true>, <have\_image-rover0-objective0-low\_res,not>, <at\_soil\_sample-waypoint1,yes>, <can\_traverse-rover1-waypoint4-waypoint5,true>, <status-rover0store,empty>, <at\_soil\_sample-waypoint2,yes>, <visible-waypoint5-waypoint3,true>, <store\_of-rover0store,rover0>, <have\_image-rover0-objective0-colour,not>]

Origin found: 154 [<visible\_from-objective1-waypoint0,true>, <at\_rock\_sample-waypoint0,yes>, <can\_traverse-rover0-waypoint0-waypoint3,true>, <supports-camera1-low\_res,true>, <can\_traverse-rover0-waypoint0-waypoint2,true>, <have\_rock\_analysis-rover0-waypoint0,not>, <can\_traverse-rover0-waypoint3-waypoint0,true>, <visible-waypoint2-waypoint3,true>, <can\_traverse-rover1-waypoint5-waypoint2,true>, <status-rover1store,empty>, <visible\_from-objective0-waypoint0,true>, <equipped\_for\_imaging-rover0,yes>, <store\_of-rover1store,rover1>, <have\_rock\_analysis-rover0-waypoint3,not>, <calibrated-camera1-rover0,not>, <have\_rock\_analysis-rover0-waypoint2,not>, <can\_traverse-rover1-waypoint1-waypoint4,true>, <visible-waypoint1-waypoint3,true>, <equipped\_for\_rock\_analysis-rover0,yes>, <at\_rock\_sample-waypoint2,yes>, <at\_rock\_sample-waypoint3,yes>, <visible-waypoint0-waypoint3,true>, <supports-camera1-colour,true>, <calibration\_target-camera1,objective1>, <equipped\_for\_soil\_analysis-rover1,yes>, <on\_board-camera1,rover0>, <have\_soil\_analysis-rover1-waypoint2,not>, <have\_soil\_analysis-rover1-waypoint5,not>, <have\_soil\_analysis-rover1-waypoint4,yes>, <at-rover1,waypoint4>, <have\_soil\_analysis-rover1-waypoint1,not>, <have\_image-rover0-objective1-low\_res,not>, <at-rover0,waypoint0>, <at\_lander-general,waypoint3>, <at\_soil\_sample-waypoint5,yes>, <can\_traverse-rover1-waypoint4-waypoint1,true>, <have\_image-rover0-objective0-low\_res,not>, <at\_soil\_sample-waypoint1,yes>, <can\_traverse-rover1-waypoint4-waypoint5,true>, <status-rover0store,empty>, <at\_soil\_sample-waypoint2,yes>, <visible-waypoint5-waypoint3,true>, <store\_of-rover0store,rover0>, <have\_image-rover0-objective0-colour,not>]

Repaired plan (RP):

0.0:navigate rover1 waypoint4 waypoint1

1.0:communicate\_soil\_data rover1 general waypoint4 waypoint1 waypoint3

2.0:navigate rover1 waypoint1 waypoint4

3.0:calibrate rover0 camera1 objective1 waypoint0

4.0:take\_image rover0 waypoint0 objective1 camera1 low\_res

5.0:calibrate rover0 camera1 objective1 waypoint0

6.0:communicate\_image\_data rover0 general objective1 low\_res waypoint0 waypoint3

7.0:sample\_rock rover0 rover0store waypoint0

8.0:communicate\_rock\_data rover0 general waypoint0 waypoint0 waypoint3

9.0:drop rover0 rover0store

10.0:take\_image rover0 waypoint0 objective0 camera1 colour

11.0:communicate\_image\_data rover0 general objective0 colour waypoint0 waypoint3

12.0:calibrate rover0 camera1 objective1 waypoint0

13.0:take\_image rover0 waypoint0 objective0 camera1 low\_res

14.0:communicate\_image\_data rover0 general objective0 low\_res waypoint0 waypoint3

15.0:navigate rover1 waypoint4 waypoint1

16.0:sample\_soil rover1 rover1store waypoint1

17.0:communicate\_soil\_data rover1 general waypoint1 waypoint1 waypoint3

18.0:navigate rover1 waypoint1 waypoint4

19.0:navigate rover1 waypoint4 waypoint5

20.0:drop rover1 rover1store

21.0:sample\_soil rover1 rover1store waypoint5

22.0:communicate\_soil\_data rover1 general waypoint5 waypoint5 waypoint3

23.0:navigate rover1 waypoint5 waypoint2

24.0:drop rover1 rover1store

25.0:sample\_soil rover1 rover1store waypoint2

26.0:communicate\_soil\_data rover1 general waypoint2 waypoint2 waypoint3

27.0:navigate rover0 waypoint0 waypoint3

28.0:sample\_rock rover0 rover0store waypoint3

29.0:navigate rover0 waypoint3 waypoint0

30.0:navigate rover0 waypoint0 waypoint2  
31.0:communicate\_rock\_data rover0 general waypoint3 waypoint2 waypoint3  
32.0:drop rover0 rover0store  
33.0:sample\_rock rover0 rover0store waypoint2  
34.0:communicate\_rock\_data rover0 general waypoint2 waypoint2 waypoint3

Search time: 8790153.0 ns