

Outstanding Capabilities of Opus Suite

Xxx Yyy, Systecon Group

Opus Suite
Conference

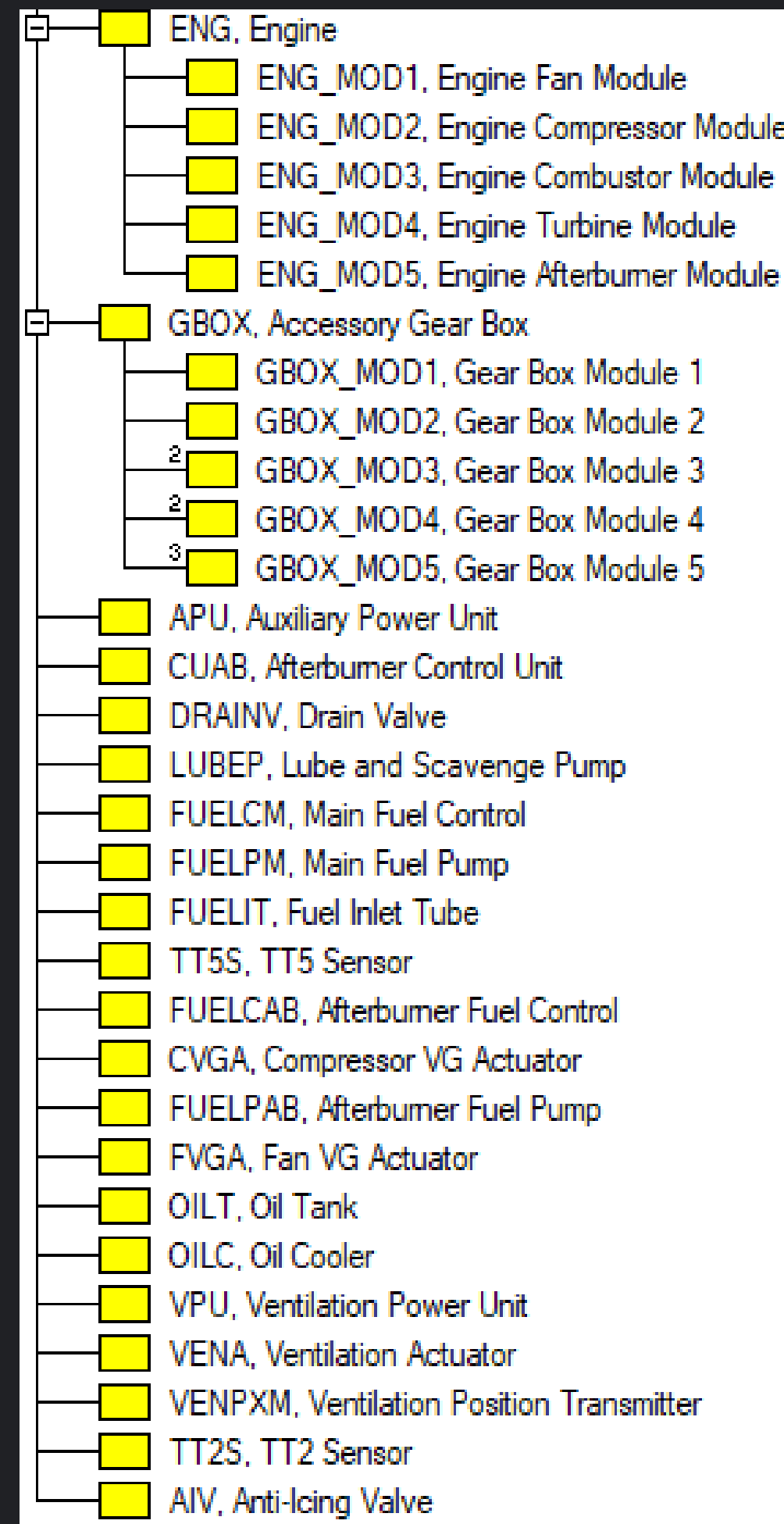
SYDNEY

by Systecon
opus
suite

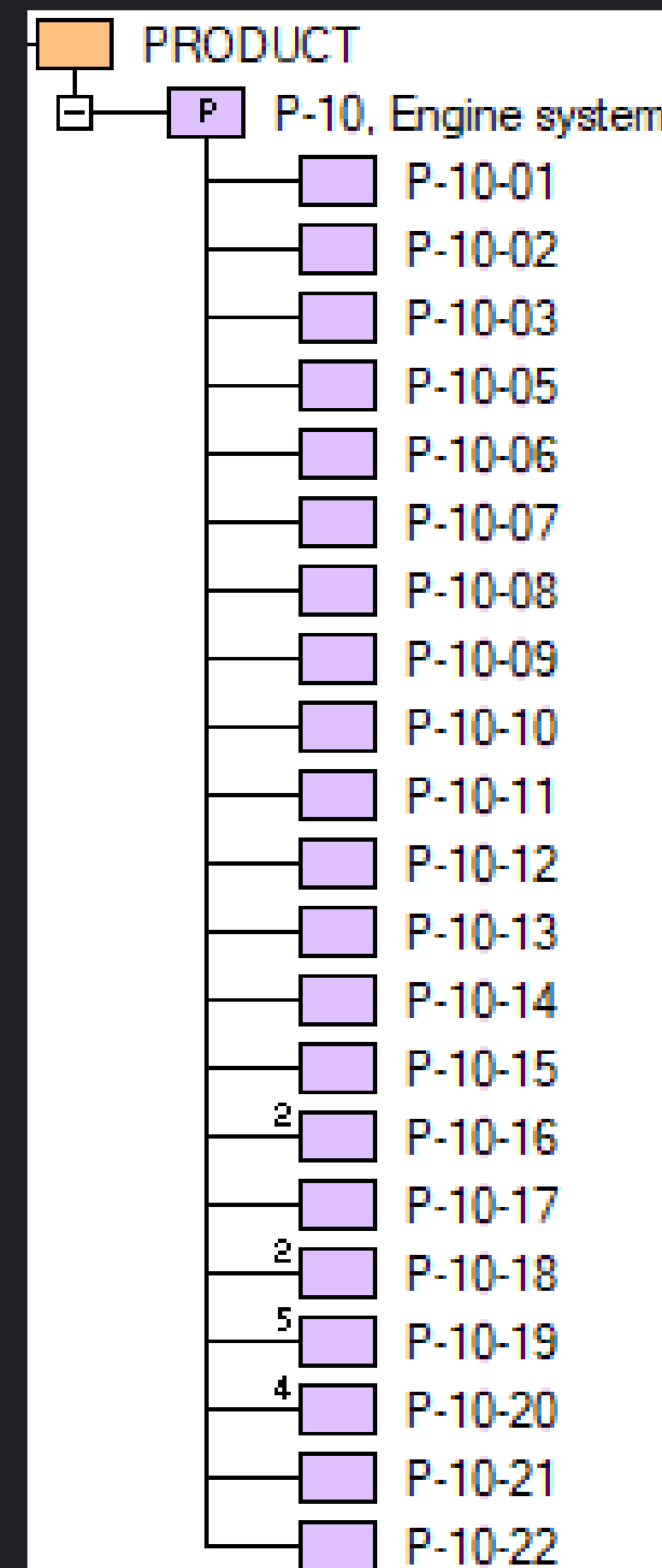
 **Systecon**

Product Breakdown

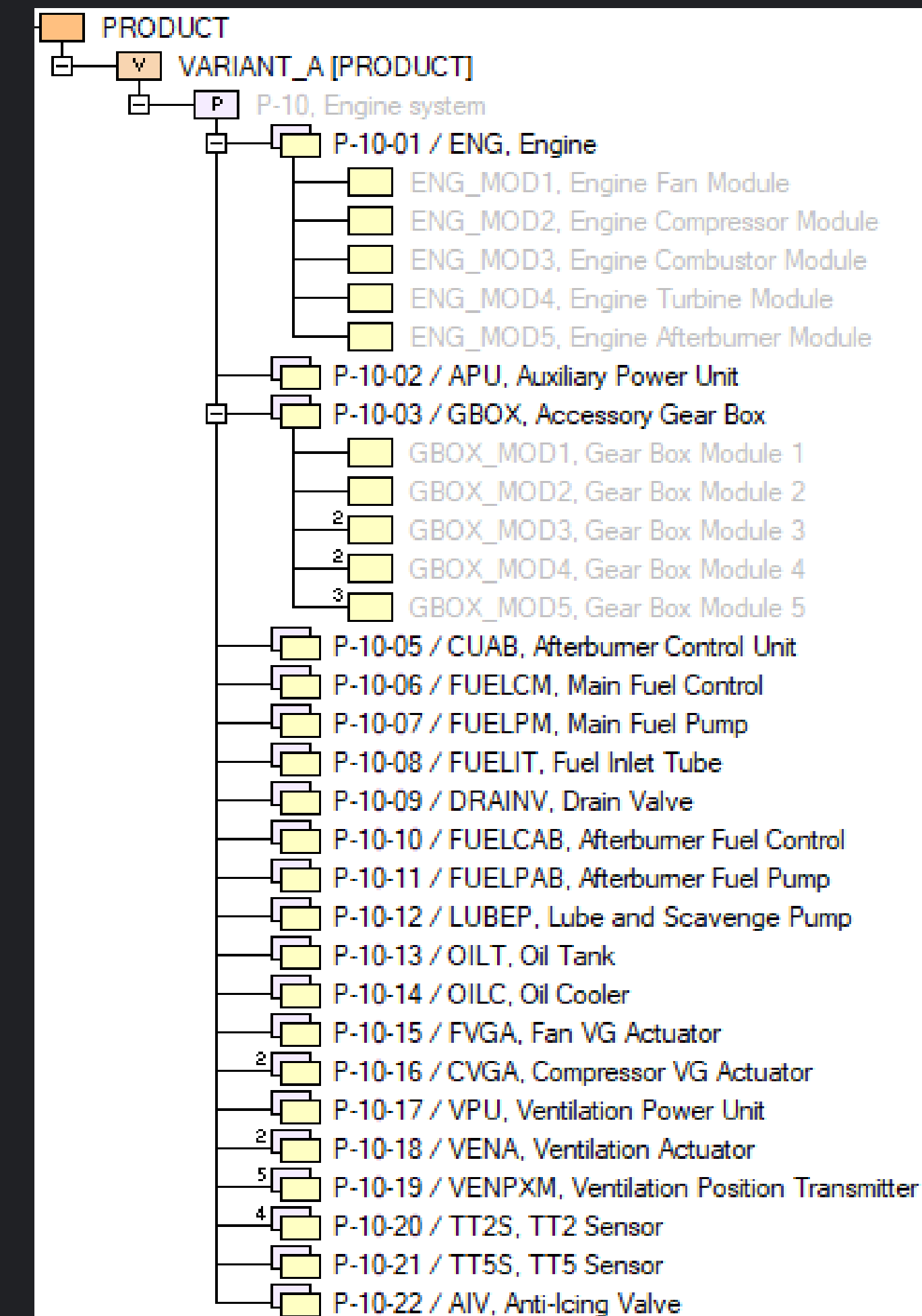
Hardware: *Items*



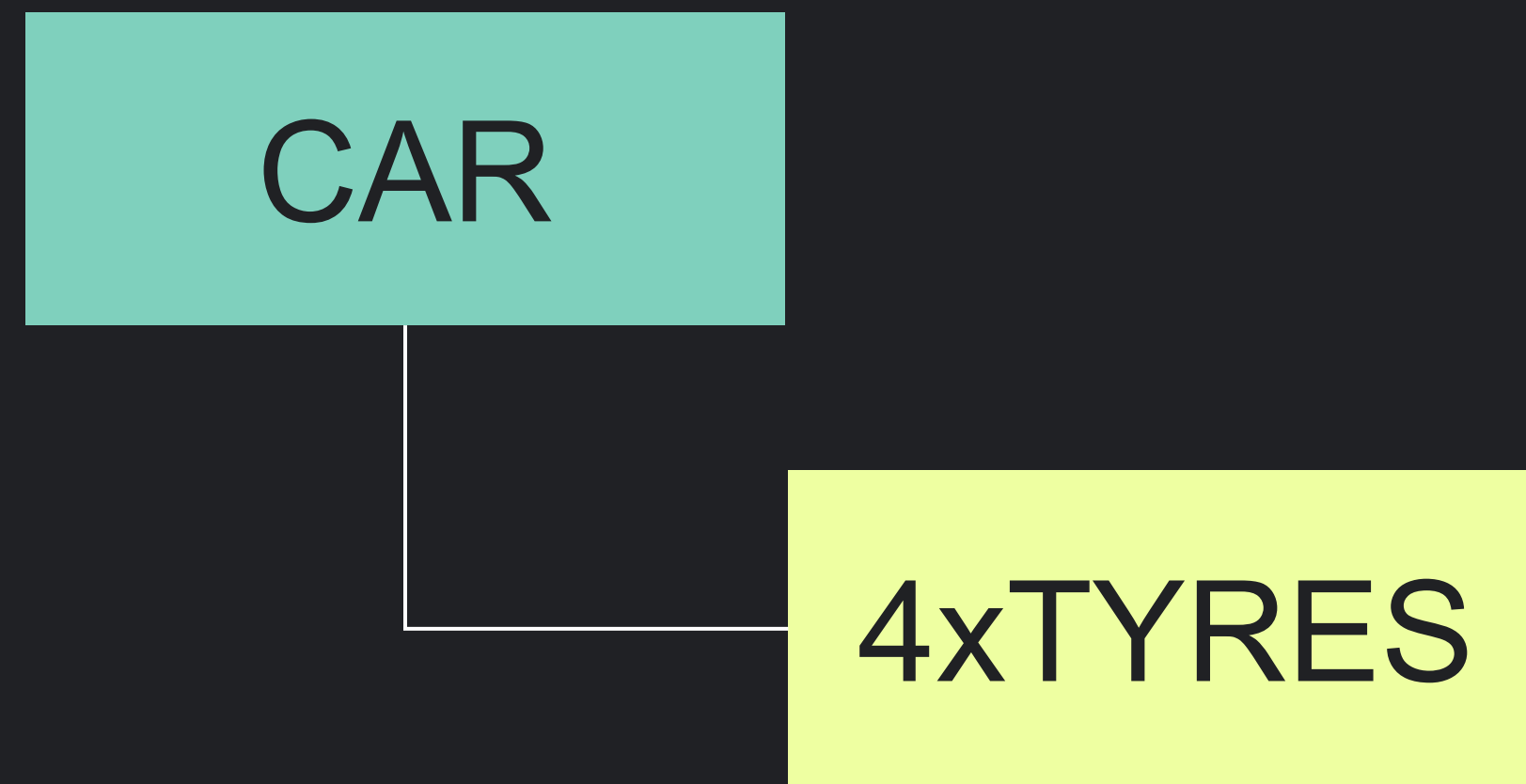
Positions: *Breakdown Elements*



Combination: *Product Realization*



Product Breakdown

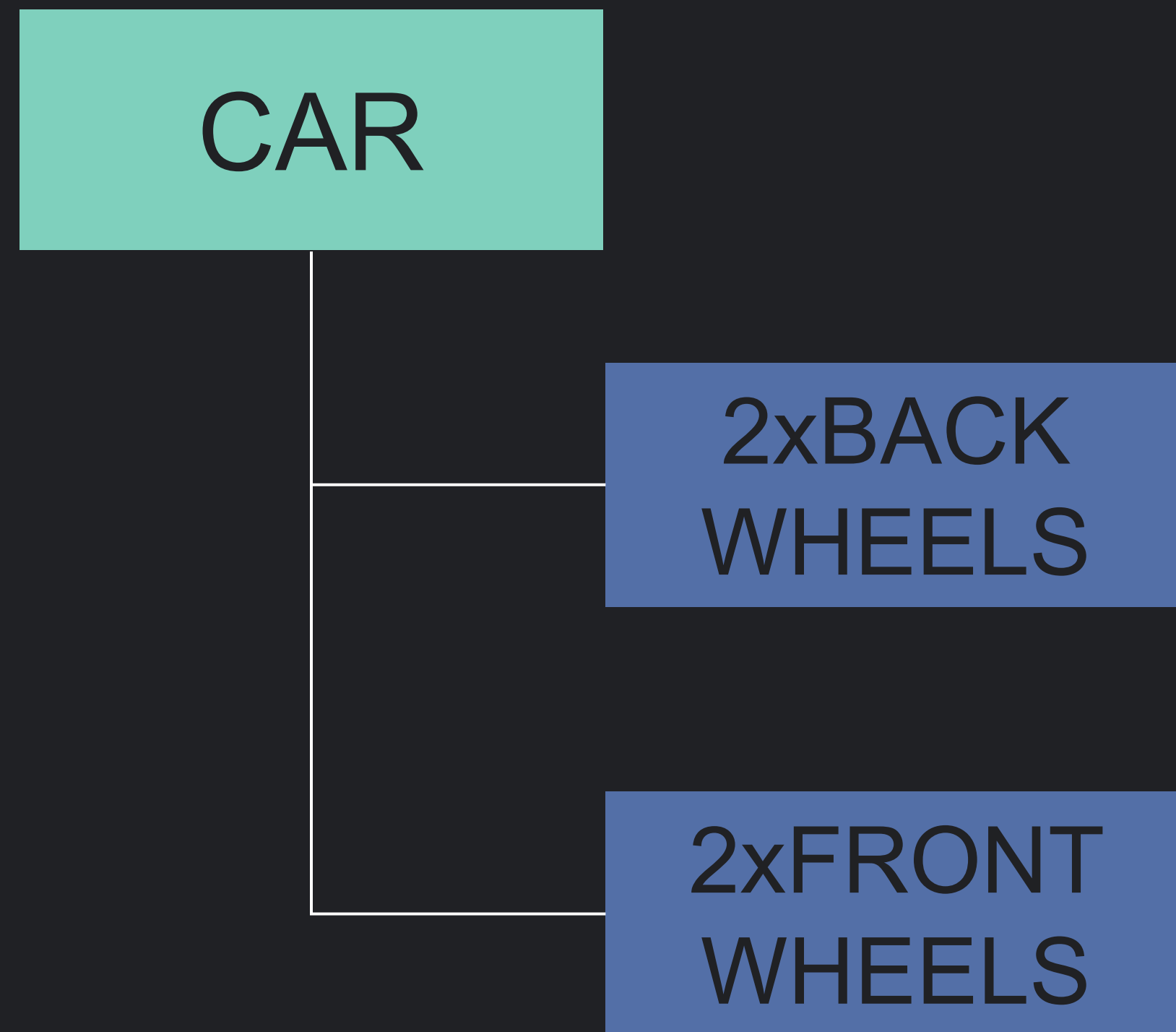


1 flat/year

2 flat/year



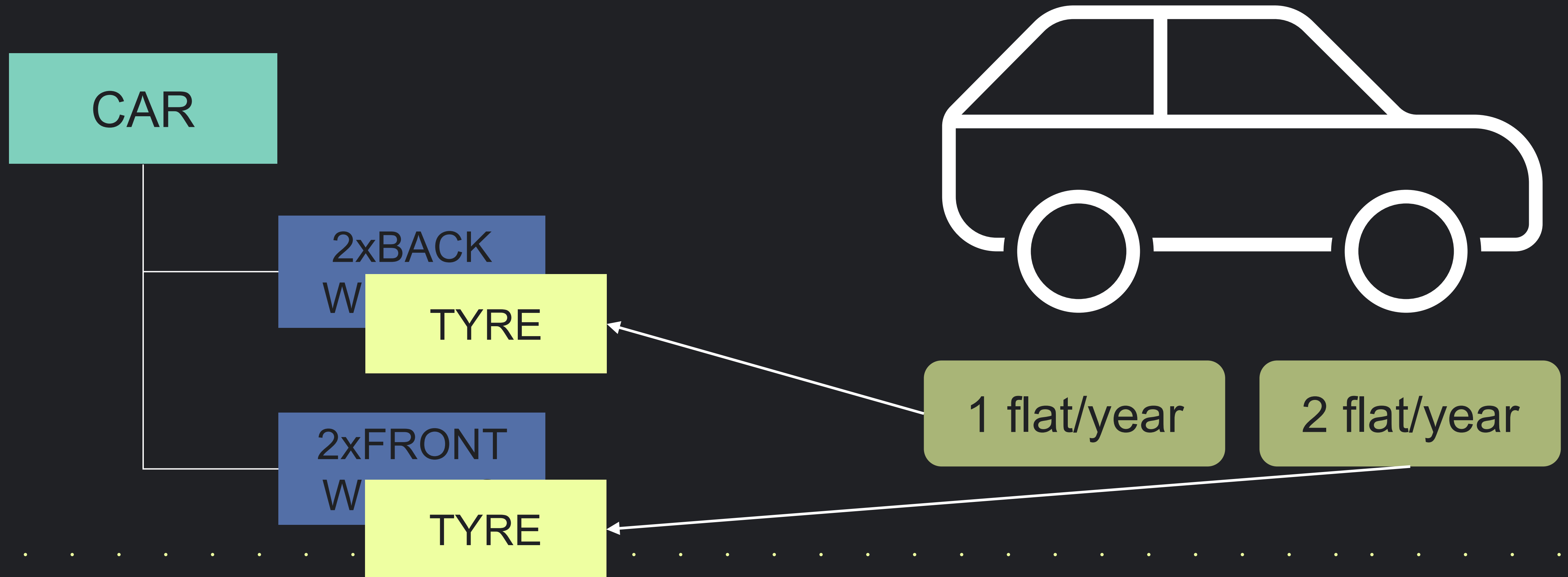
Product Breakdown



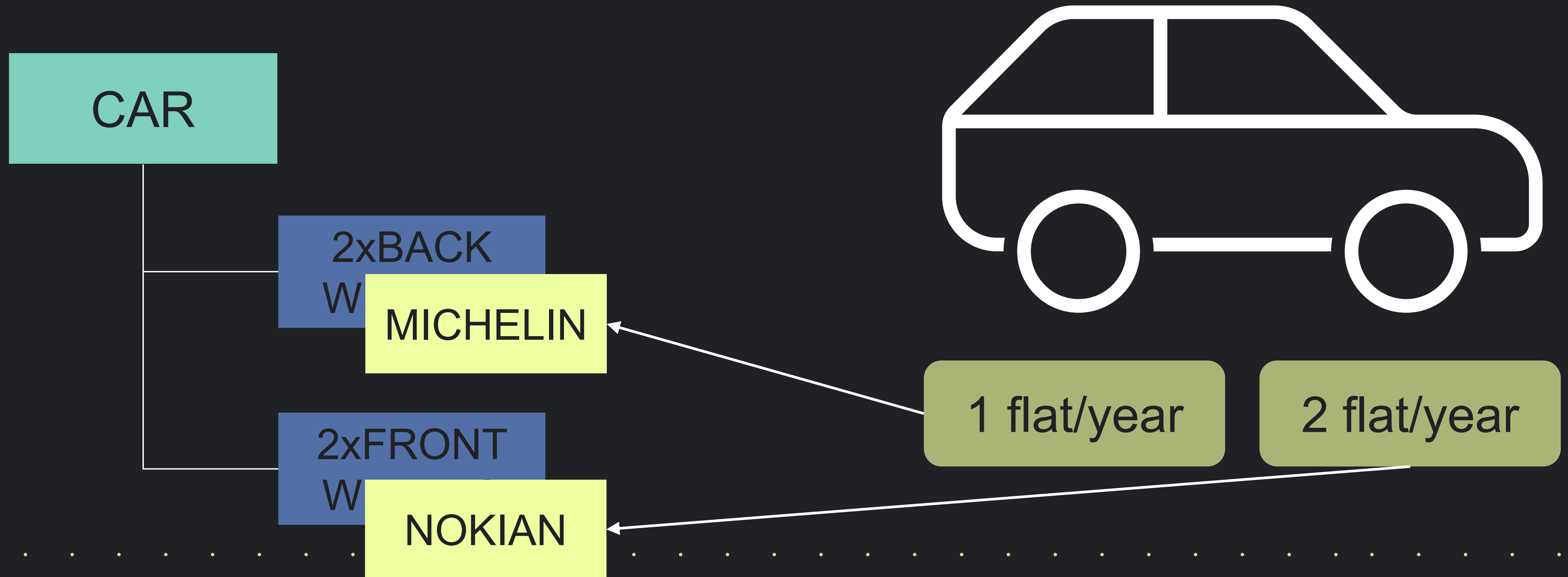
1 flat/year

2 flat/year

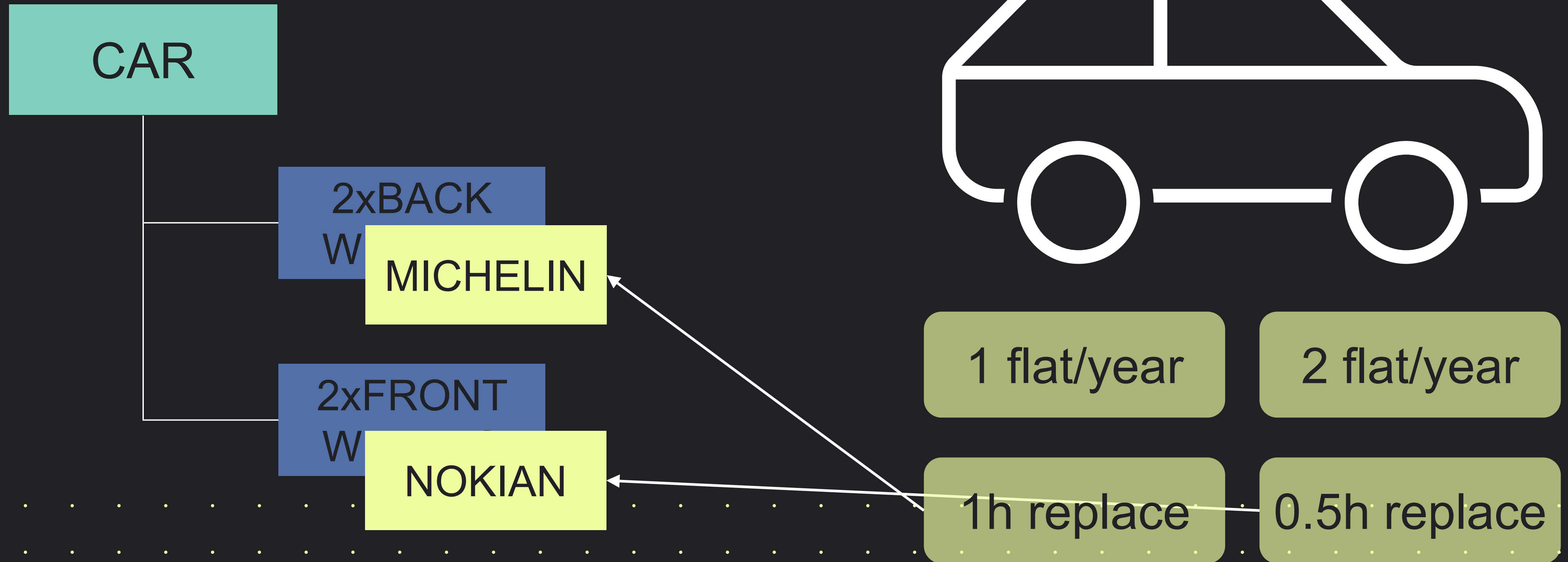
Product Breakdown



Product Breakdown



Product Breakdown



System functionality



Foto: Bezav Mahmod/Försvarmakten

<https://www.forsvarsmakten.se/sv/aktuellt/2021/12/luftvarnssystem-103-patriot-ar-nu-operativt/>



Foto: Bezav Mahmod/Försvarmakten

Broken hydraulic motor

- Functional loss
- Default behavior
- Probability of Functional Loss

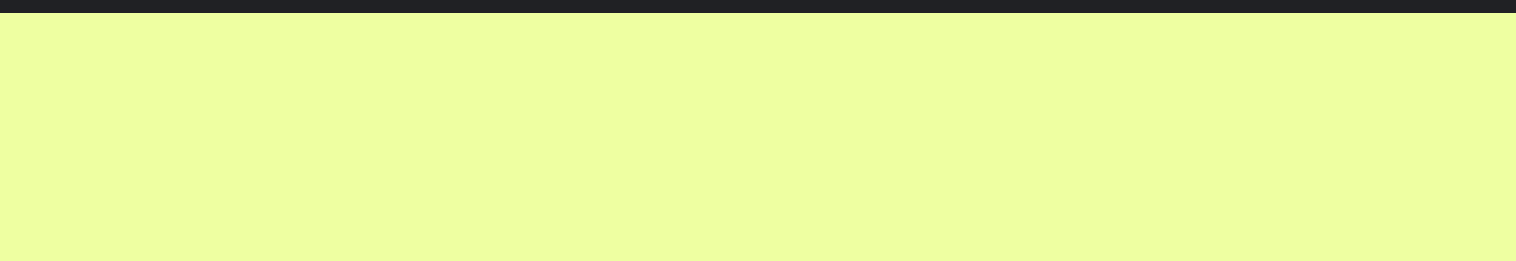




Foto: Bezav Mahmod/Försvarsmakten

<https://www.forsvarsmakten.se/sv/aktuellt/2021/12/luftvarnssystem-103-patriot-ar-nu-operativt/>

Failing APU chip detector

- Time until functional loss
- Fixed or random value
- Operation or calendar





Foto: Bezav Mahmod/Försvarsmakten

<https://www.forsvarsmakten.se/sv/aktuellt/2021/12/luftvarnssystem-103-patriot-ar-nu-operativt/>

Broken tow hitch locking system

- No functional loss
- Fixed before next mission



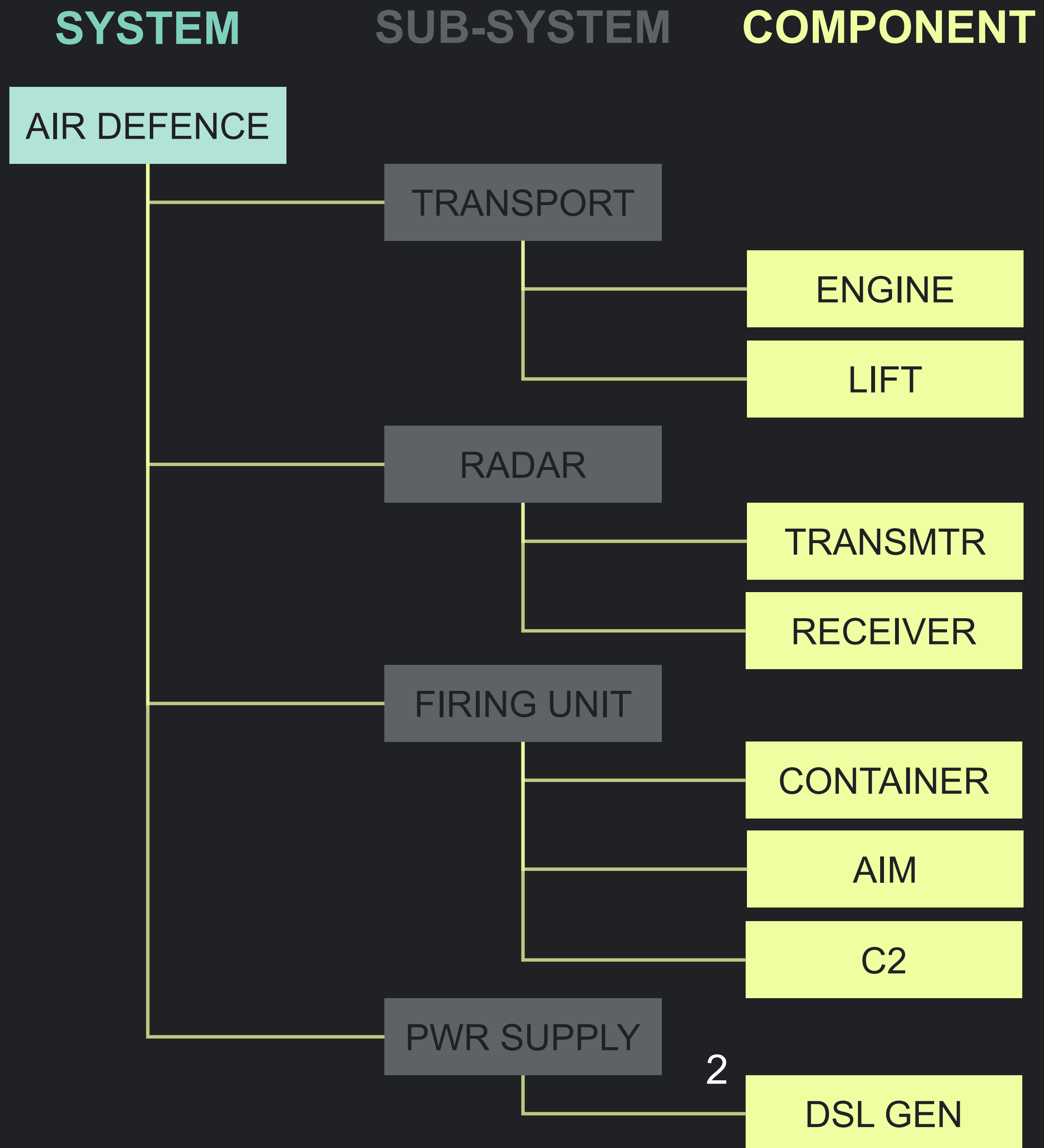


Foto: Bezav Mahmod/Försvarmakten

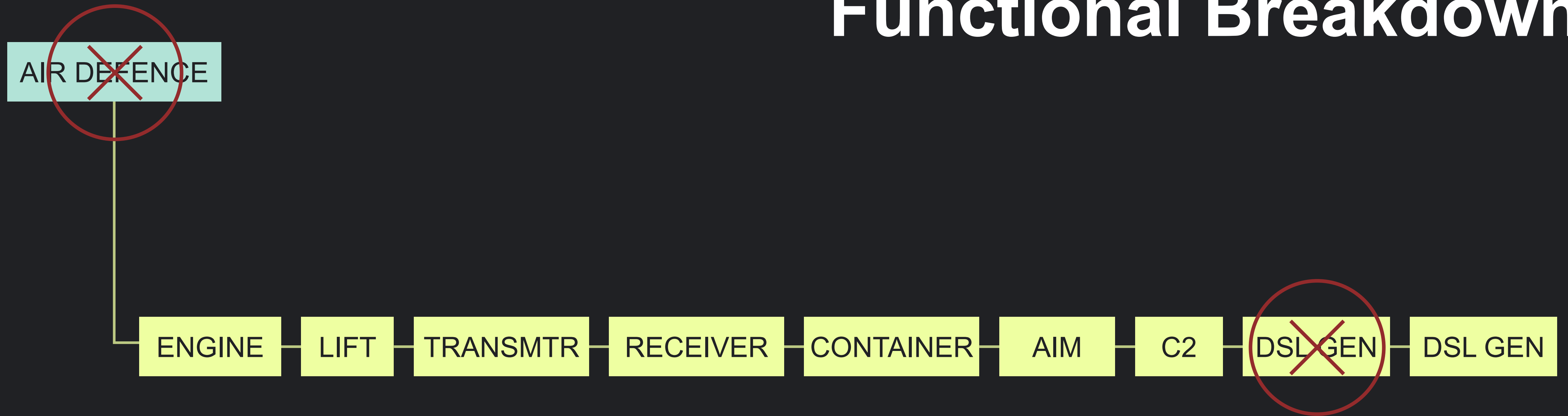
Broken diesel generator

- Functional loss of the component
- Still able to operate

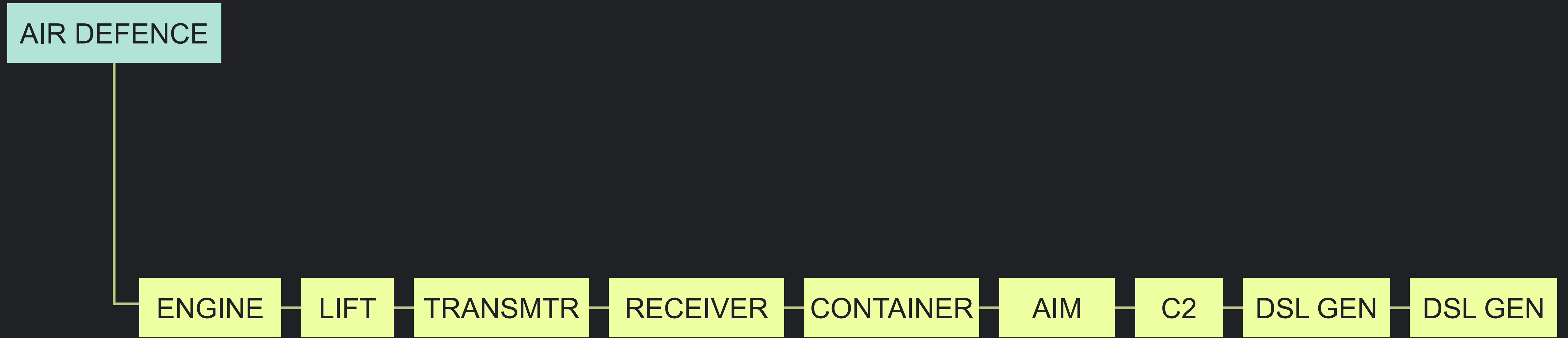
Product Breakdown



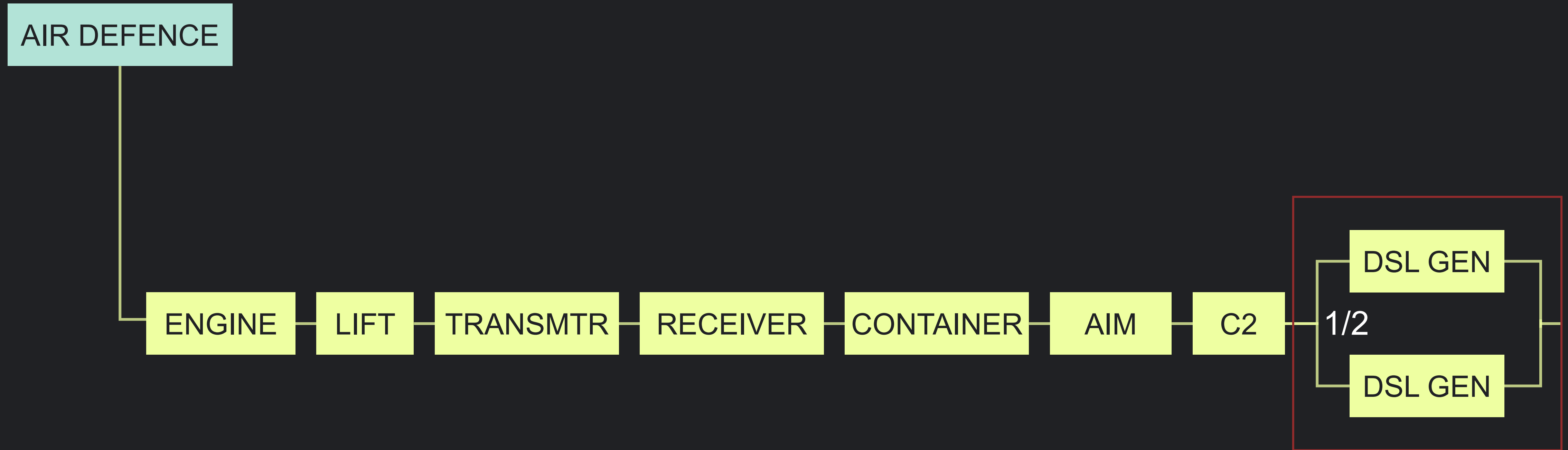
Functional Breakdown



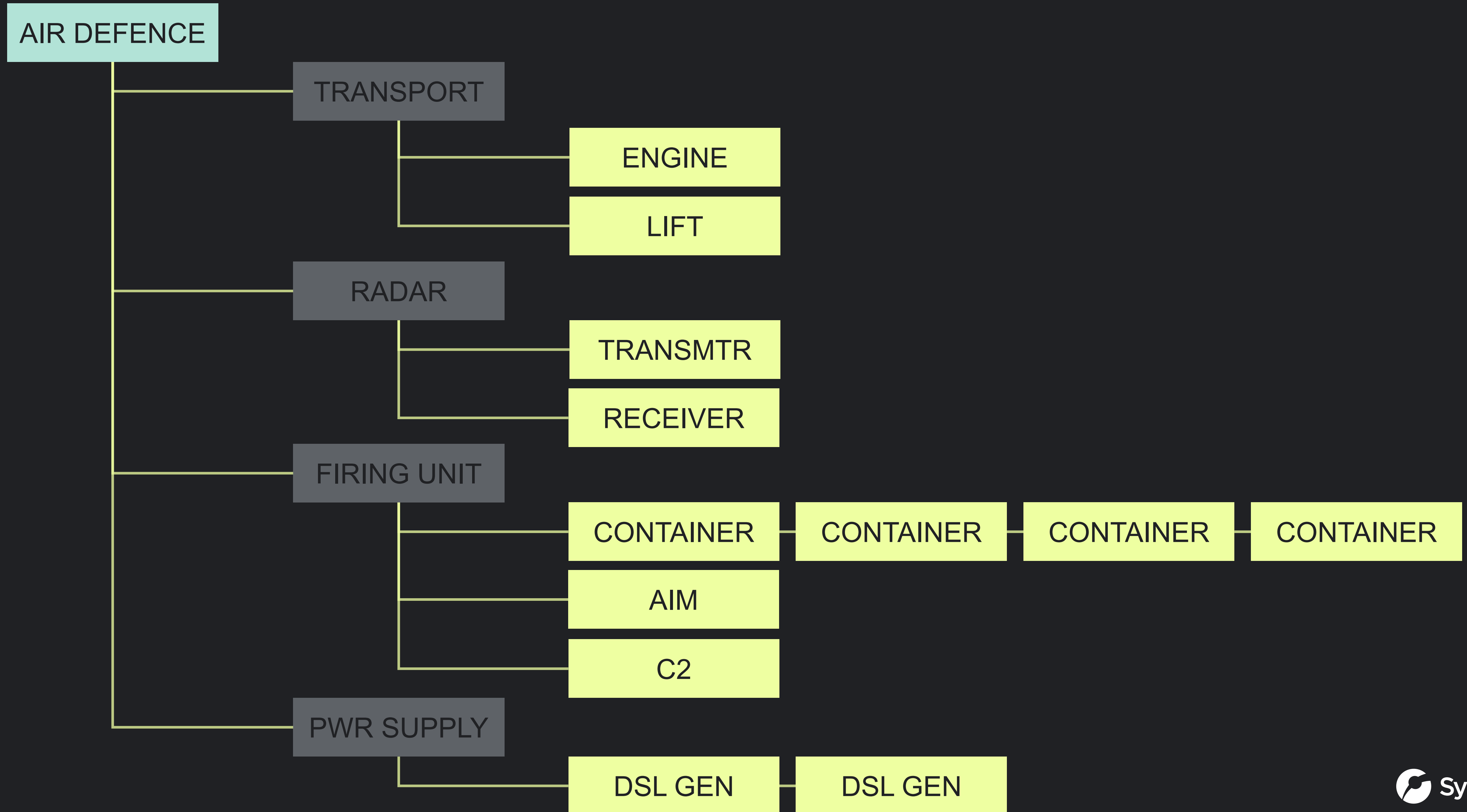
Functional Breakdown



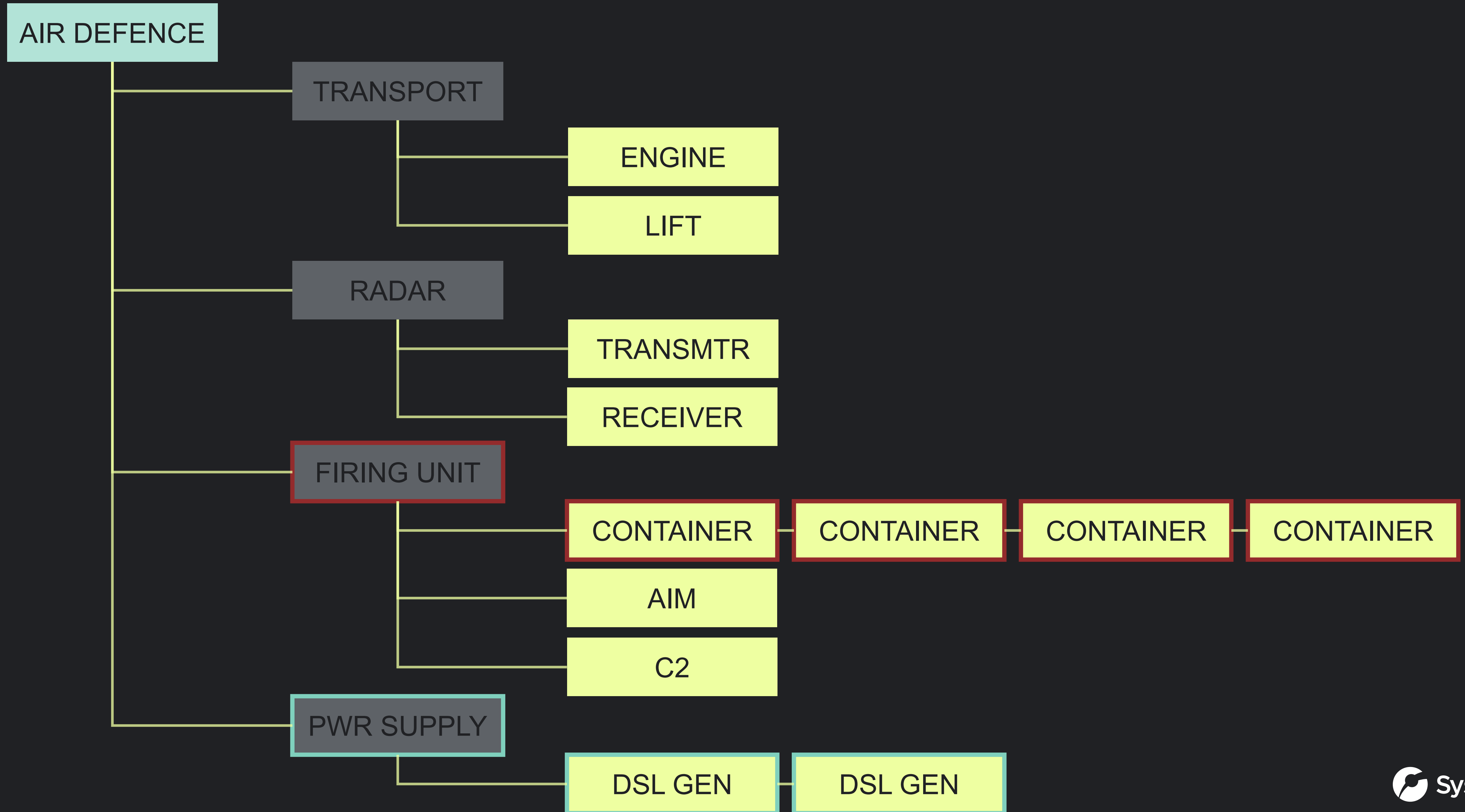
Functional Breakdown



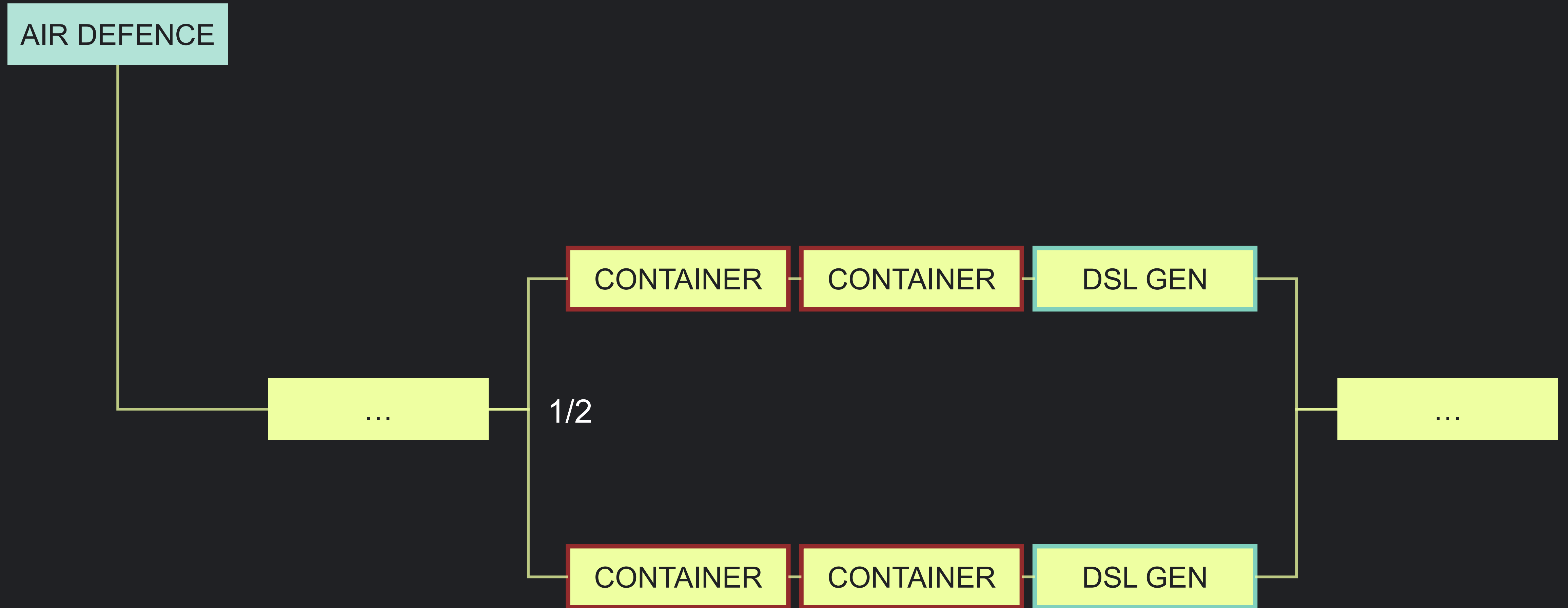
Product Breakdown



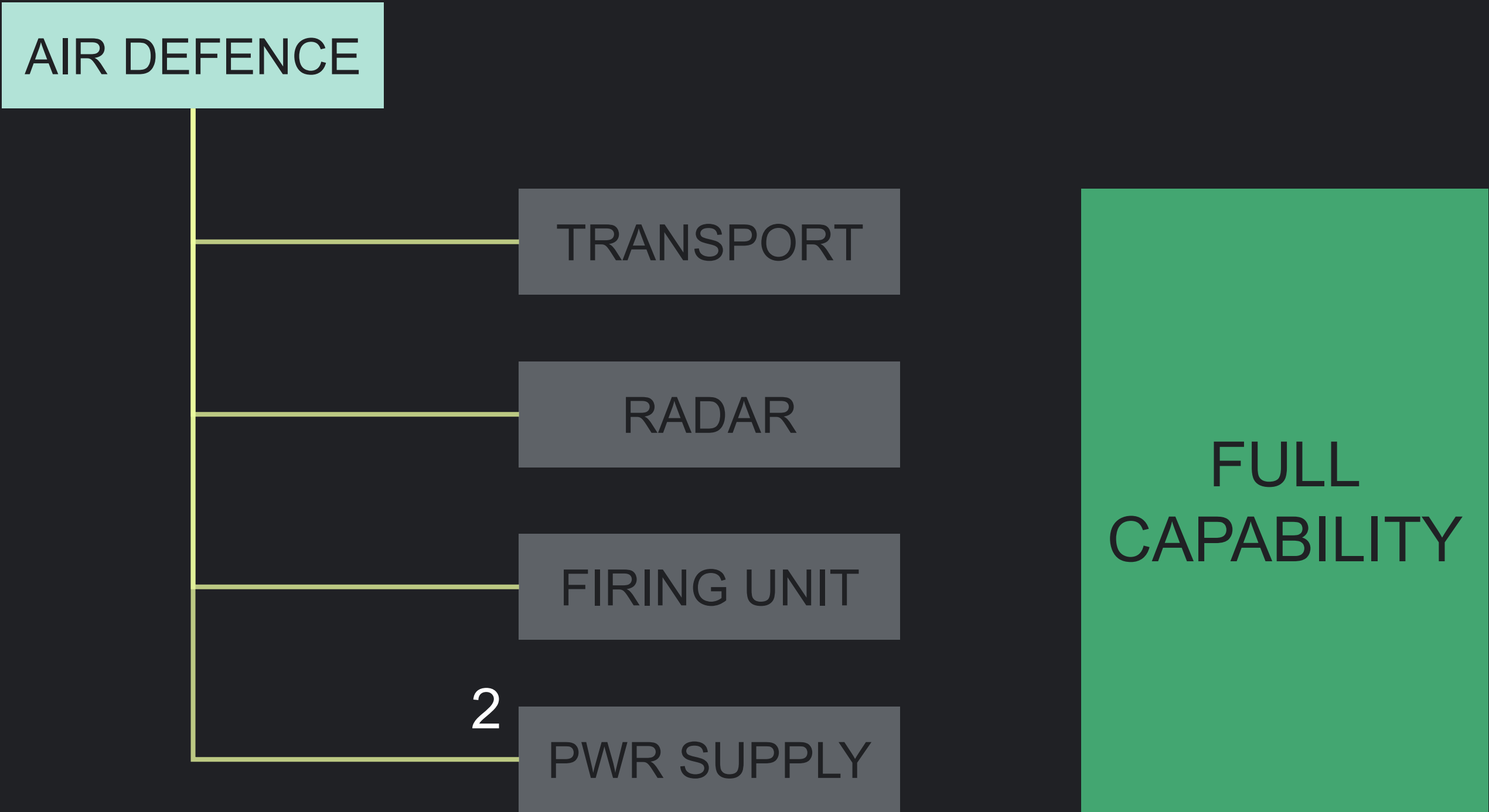
Product Breakdown



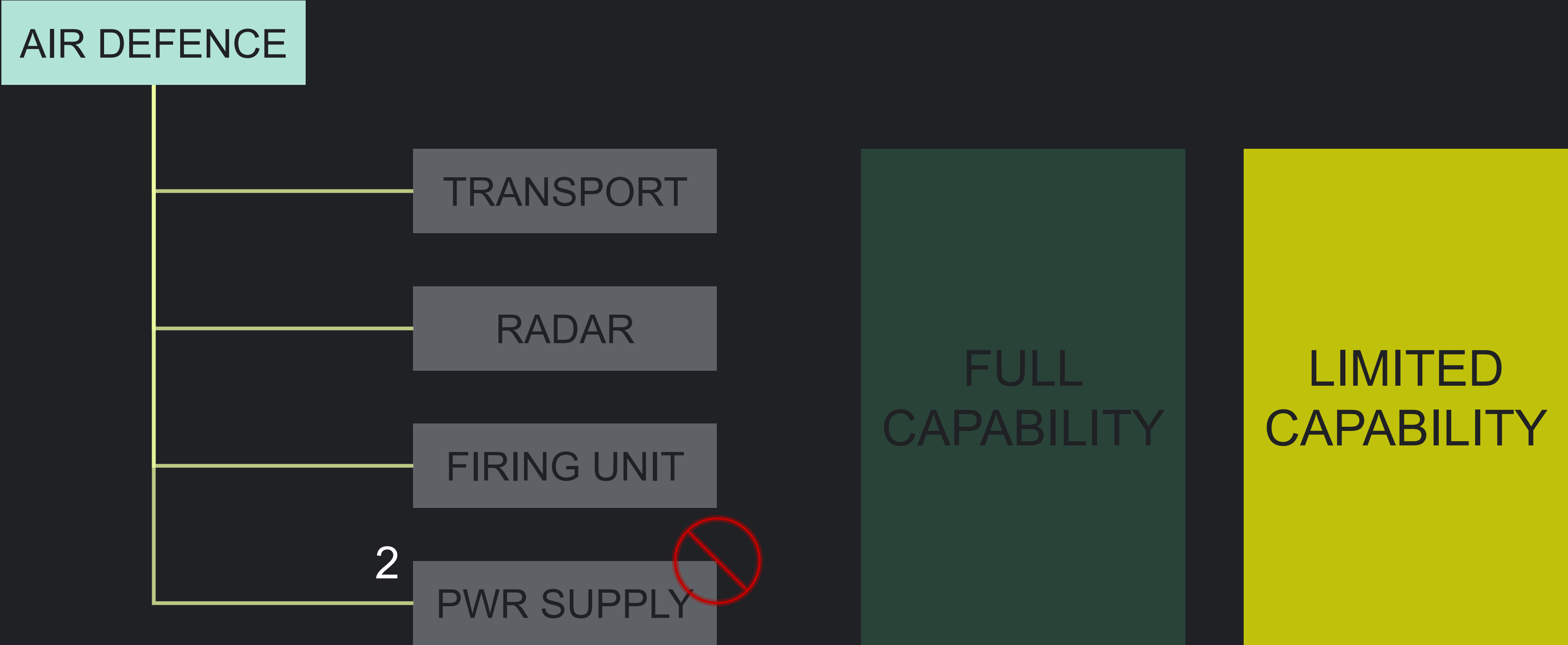
Functional Breakdown



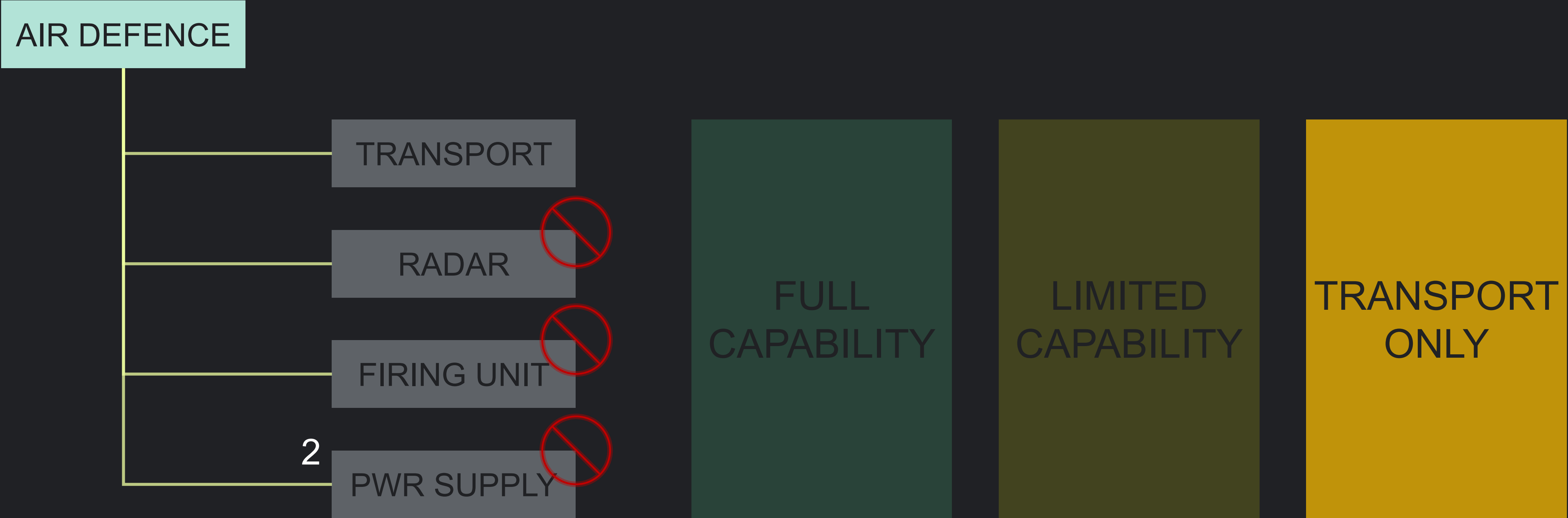
Operational Modes



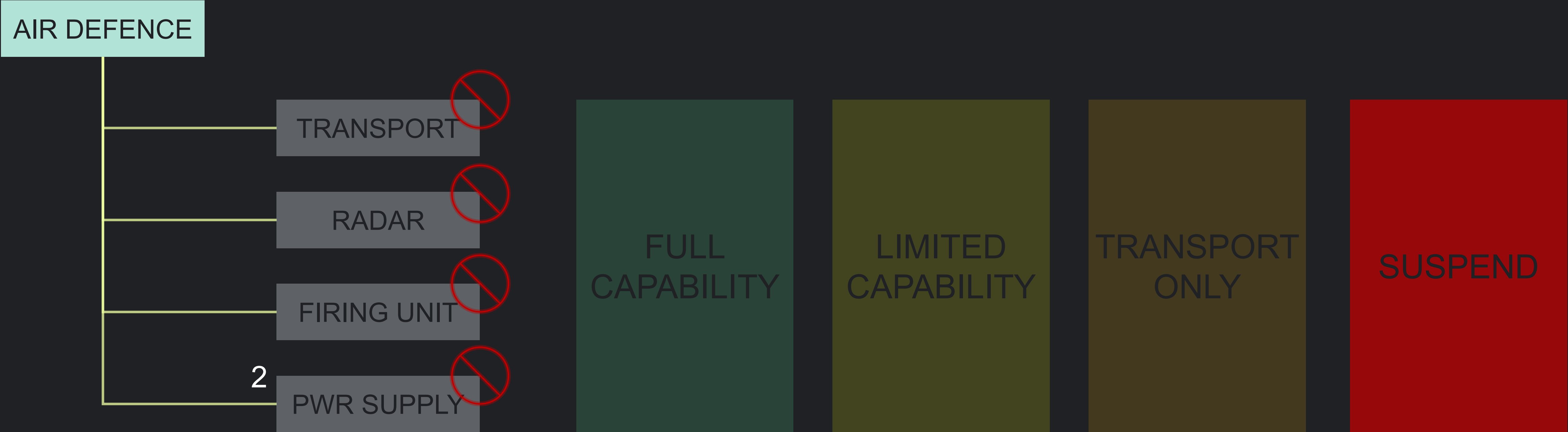
Operational Modes



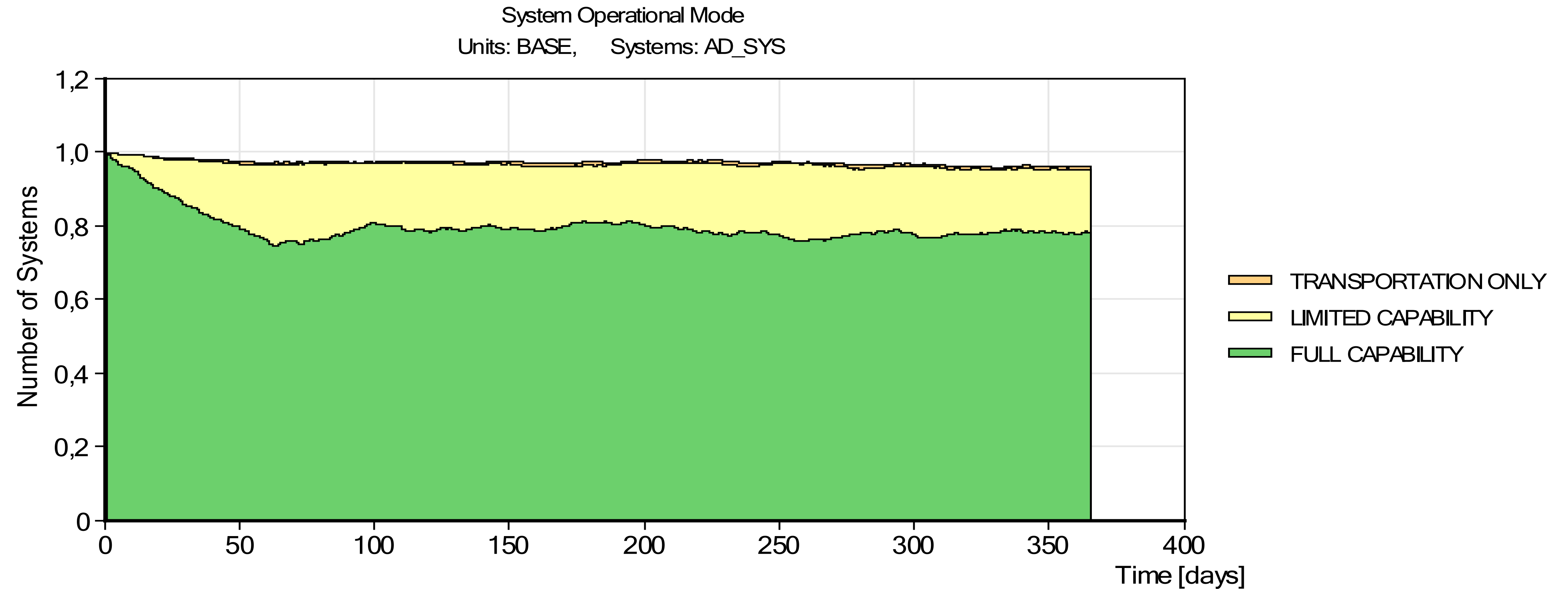
Operational Modes



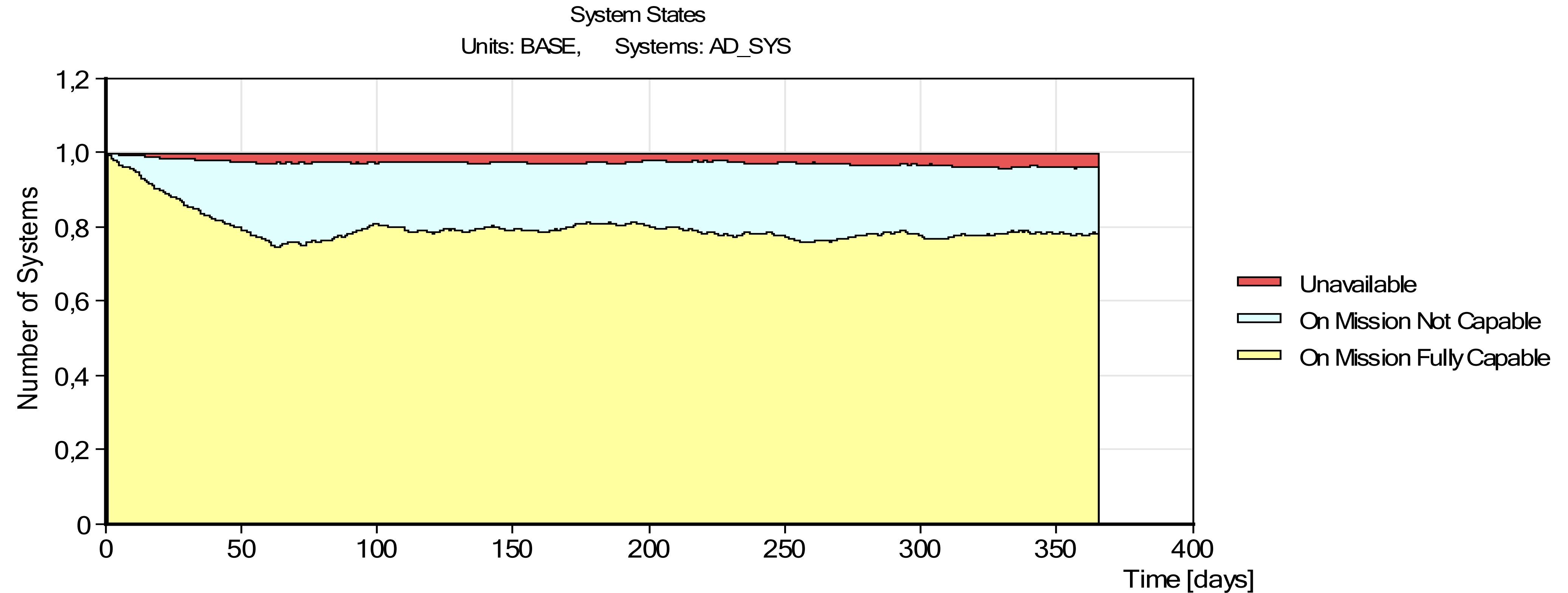
Operational Modes



Operational Modes



Operational Modes



Consumables

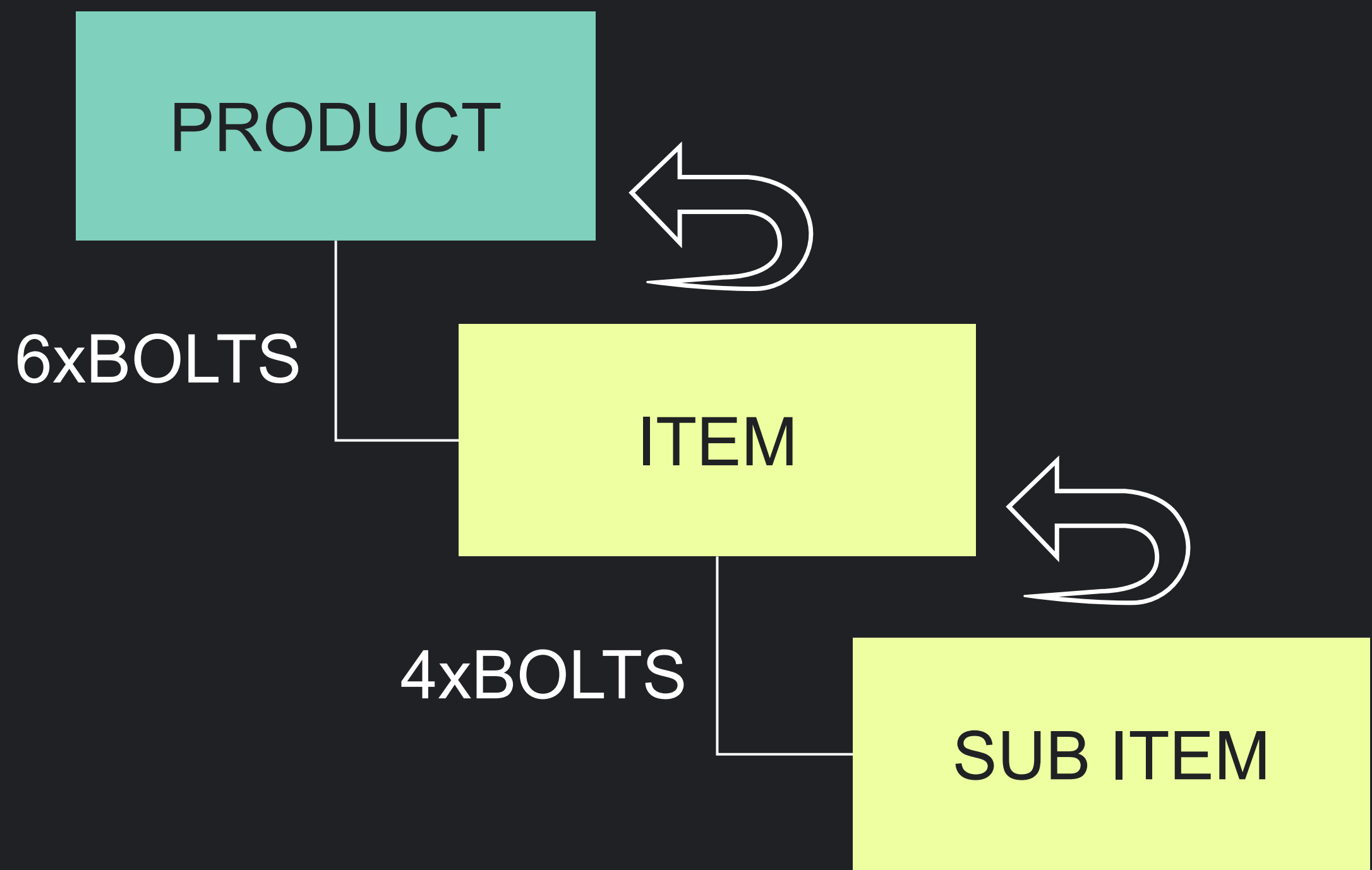
What items should I include?

- Nuts, bolts and gaskets?
- Liquids, grease and oils?

What items affects the availability?



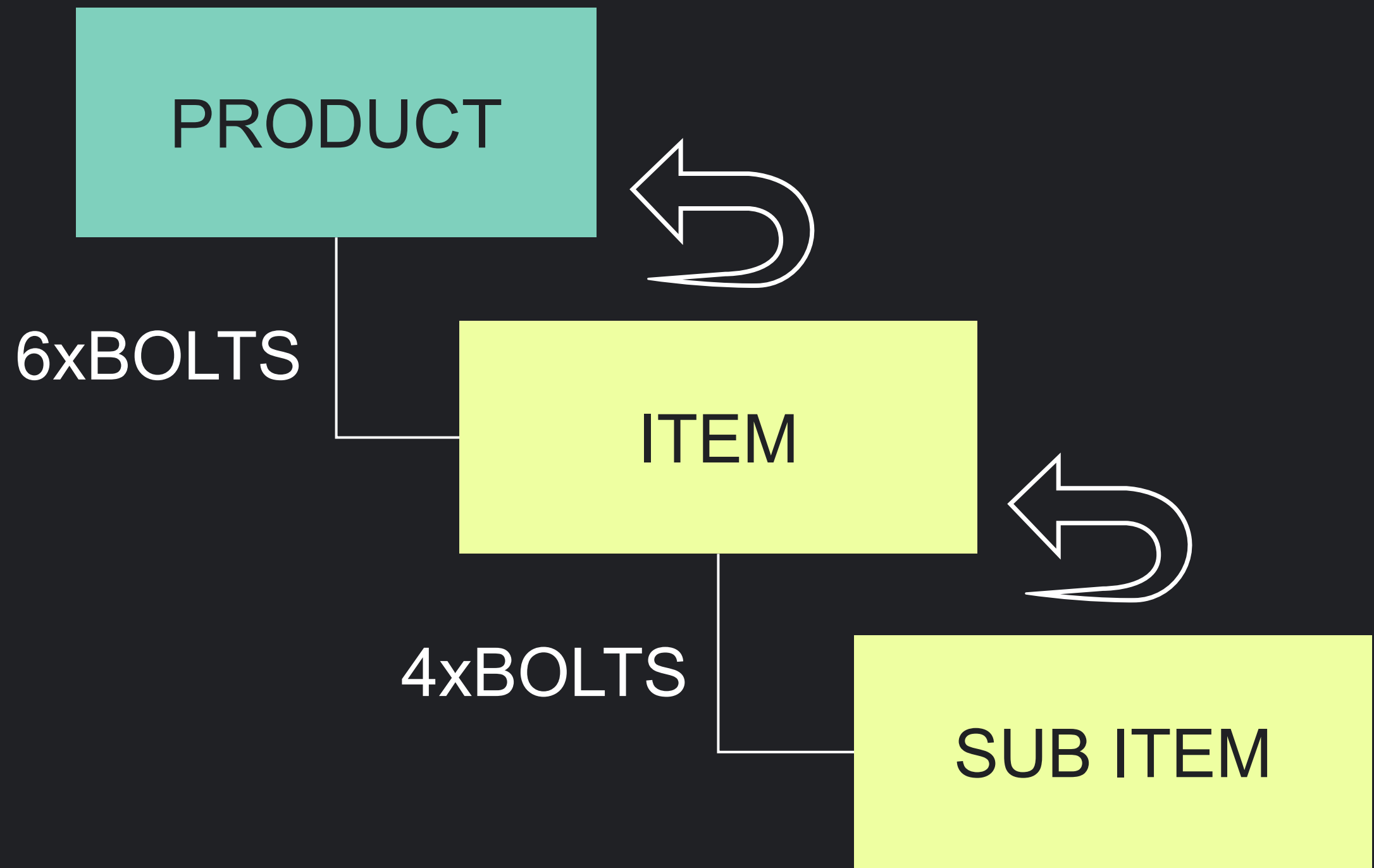
Consumables



INPUT		
Task	Consumable	QTY
REPLACE ITEM	BOLT	0.6
REPLACE SUB	BOLT	0.4



Consumables



RESULTS		
Consumable	CQTY	COST
BOLT	24	360

5 EVENTS PER YEAR
0.6 BOLTS PER EVENT
8 YEARS

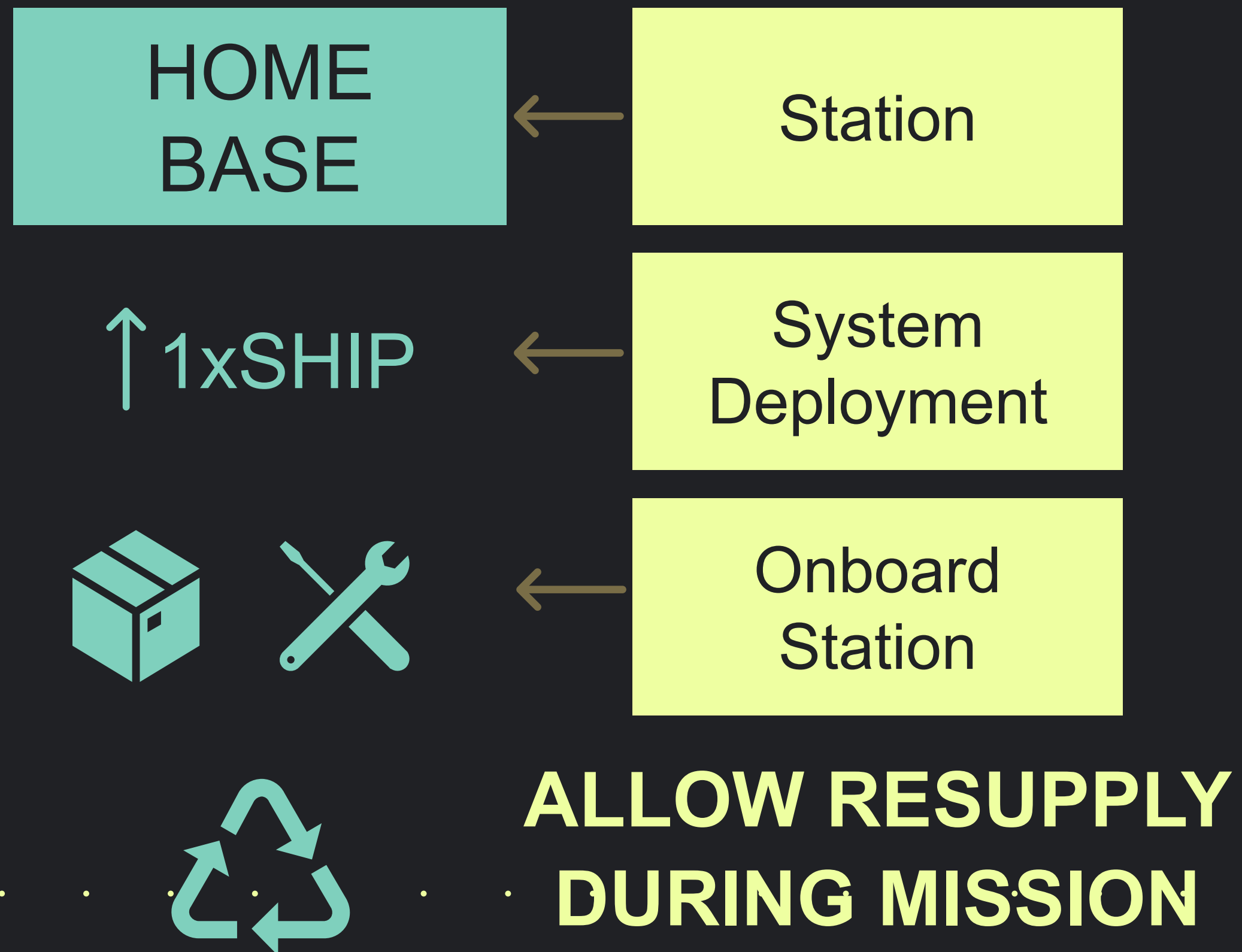
400 CONSUMED
15 EURO/BOLT



Maintenance while in service



Maintenance while in service



Efficient modeling using groups

ITEM A

ITEM B

ITEM C

ITEM D

ITEM E

ITEM F

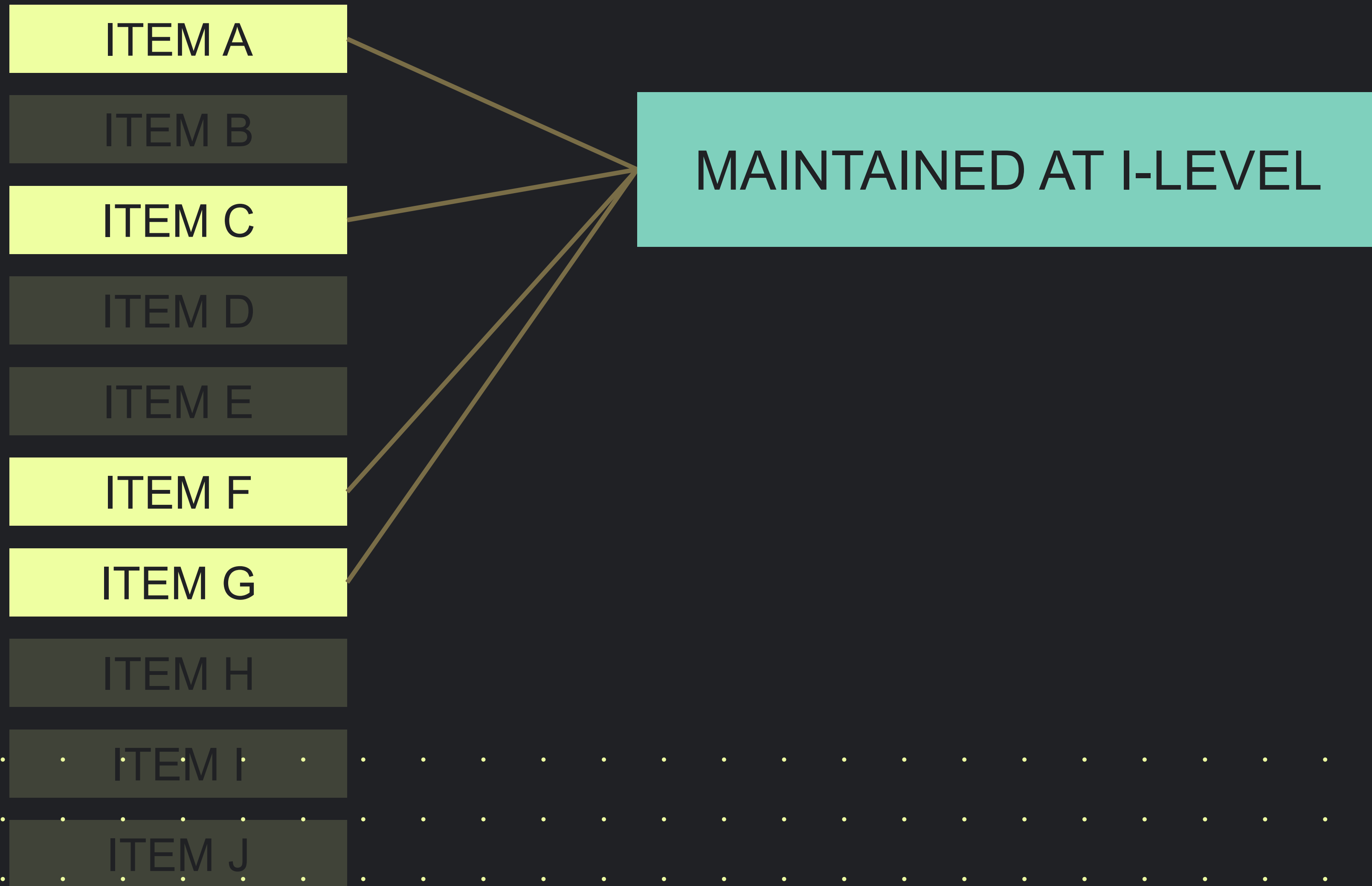
ITEM G

ITEM H

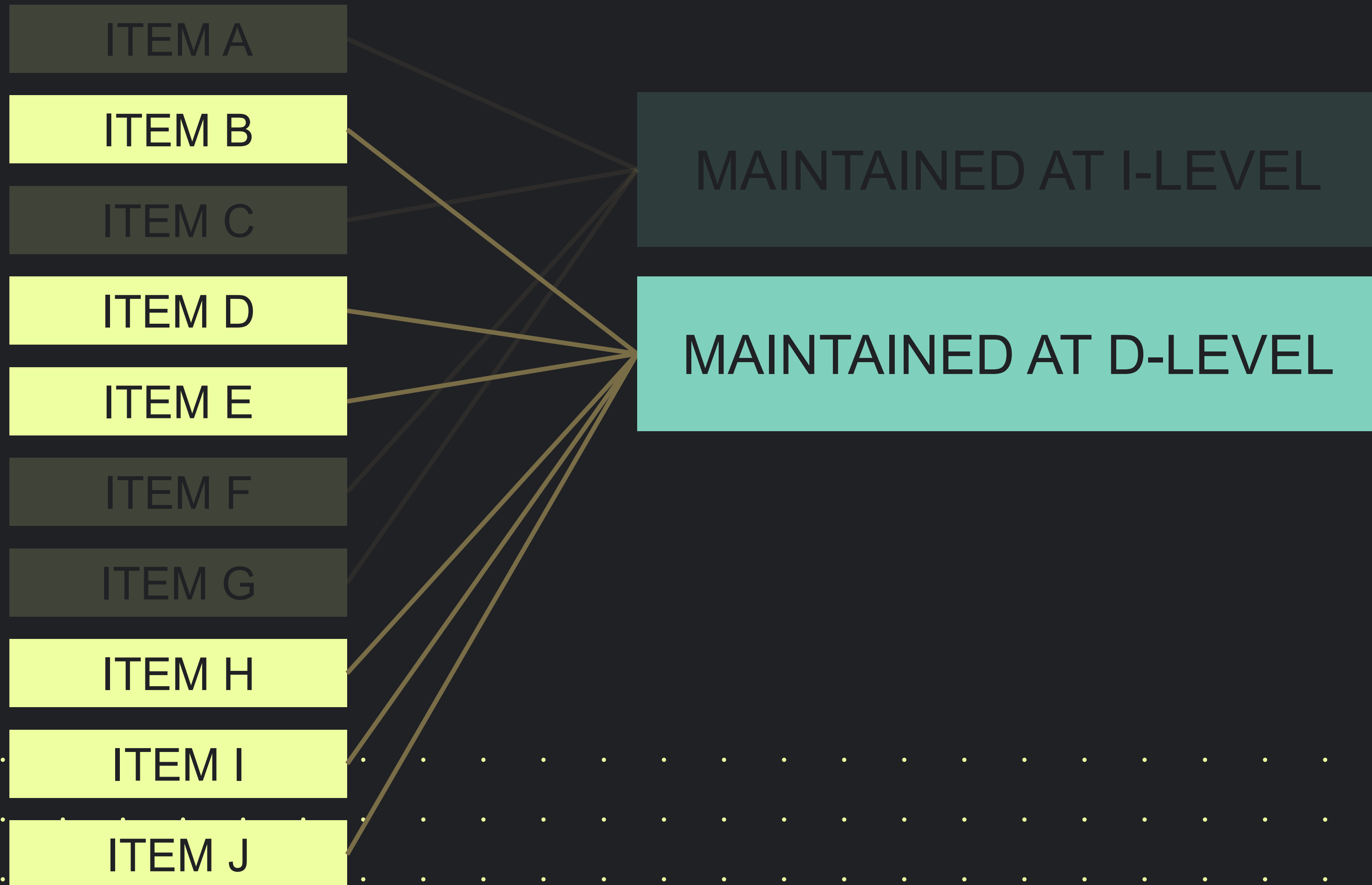
ITEM I

ITEM J

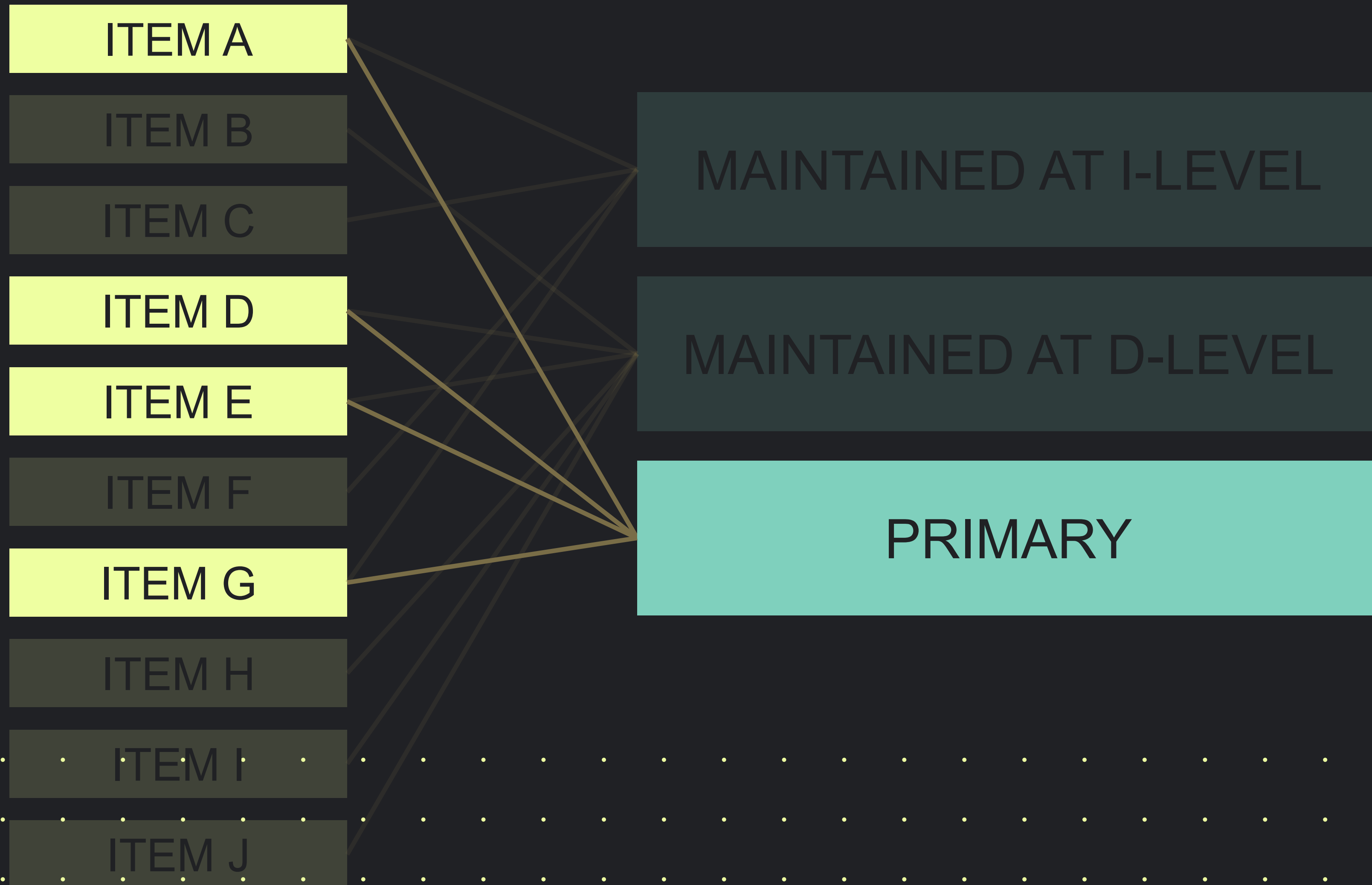
Efficient modeling using groups



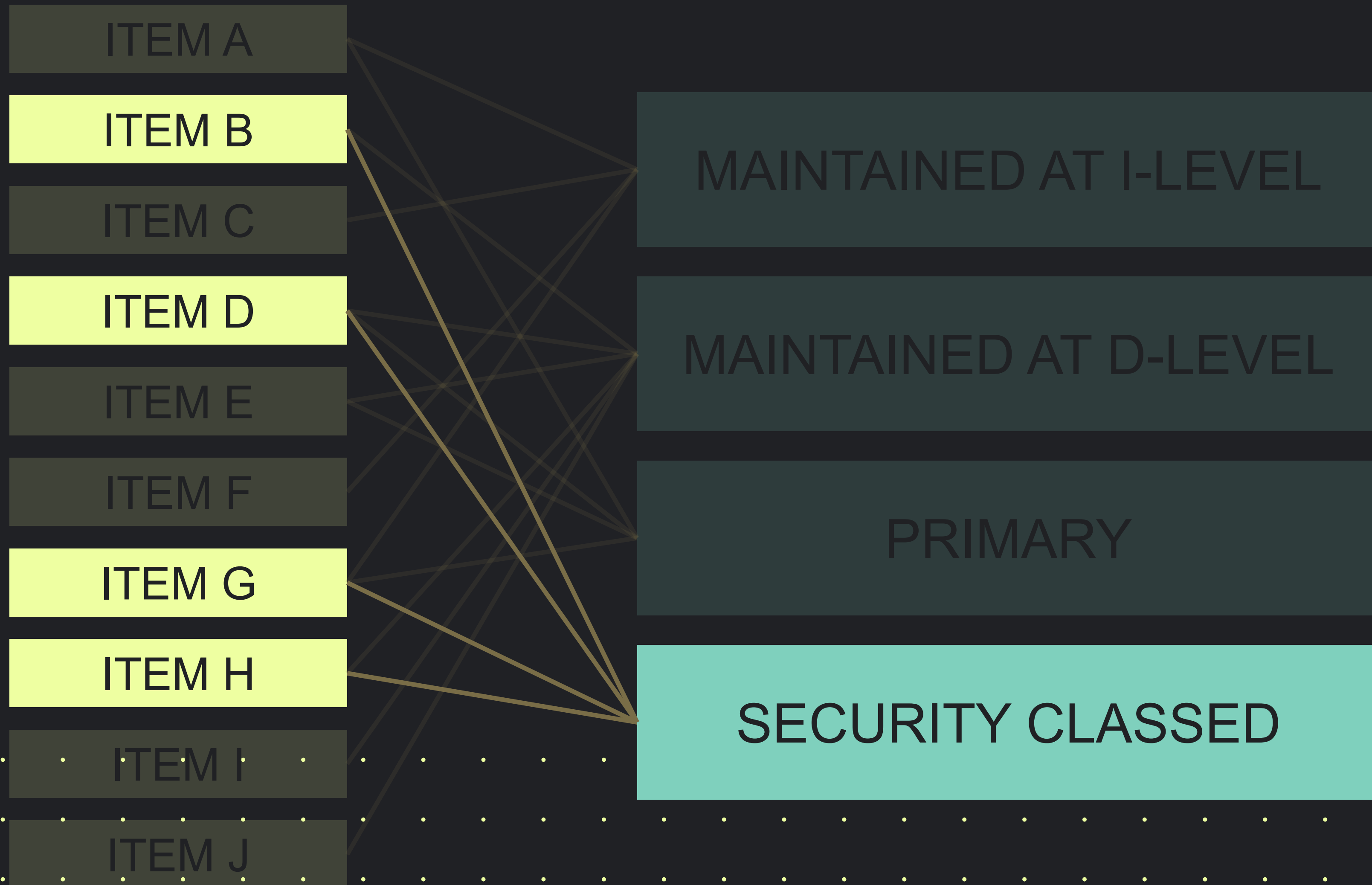
Efficient modeling using groups



Efficient modeling using groups



Efficient modeling using groups



Efficient modeling using groups

GROUP		GROUP CONTENT	
MAINTAINED AT I-LEVEL		ITEM A	ITEM D
		ITEM E	ITEM G
MAINTAINED AT D-LEVEL		ITEM A	ITEM C
		ITEM F	ITEM G
PRIMARY		ITEM B ITEM F ITEM I	ITEM D ITEM H ITEM J
		ITEM B	ITEM D
SECURITY CLASSSED		ITEM G	ITEM H

Simple operational profiles

Utilization Profile

Identifier	Utilization	Mission rate
PROFILE 1	520	52

EXAMPLES:

Ten hours per week



Simple operational profiles

Utilization Profile

Identifier	Utilization	Mission rate
PROFILE 1	520	52
PROFILE 2	1200	12

EXAMPLES:

Ten hours per week

100 hours per month



Simple operational profiles

Utilization Profile

Identifier	Utilization	Mission rate
PROFILE 1	520	52
PROFILE 2	1200	12
PROFILE 3	4380	3

EXAMPLES:

Ten hours per week

100 hours per month

2 month operation 3 times/year



Simple operational profiles

Utilization Profile

Identifier	Utilization	Mission rate
PROFILE 1	520	52
PROFILE 2	1200	12
PROFILE 3	4380	3

EXAMPLES:

Ten hours per week

100 hours per month

2 month operation 3 times/year

MISSION

MISSION

MISSION

0

2

4

6

8

10

12

months

Simple operational profiles

Utilization Profile

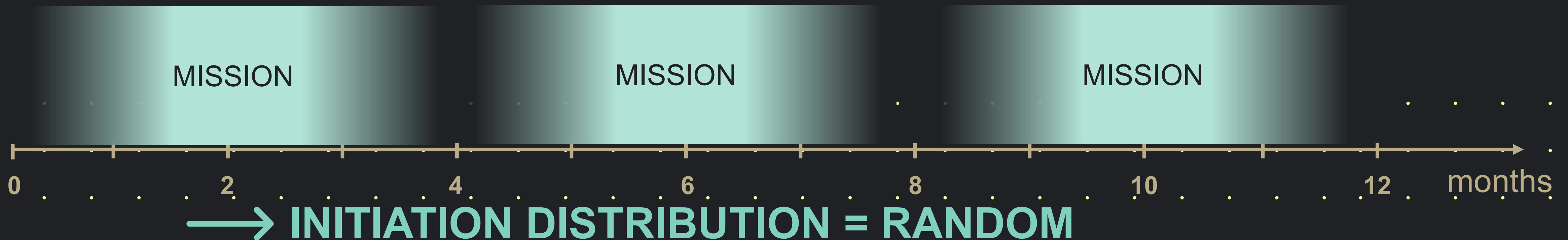
Identifier	Utilization	Mission rate
PROFILE 1	520	52
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EXAMPLES:

Ten hours per week

100 hours per month

2 month operation 3 times/year

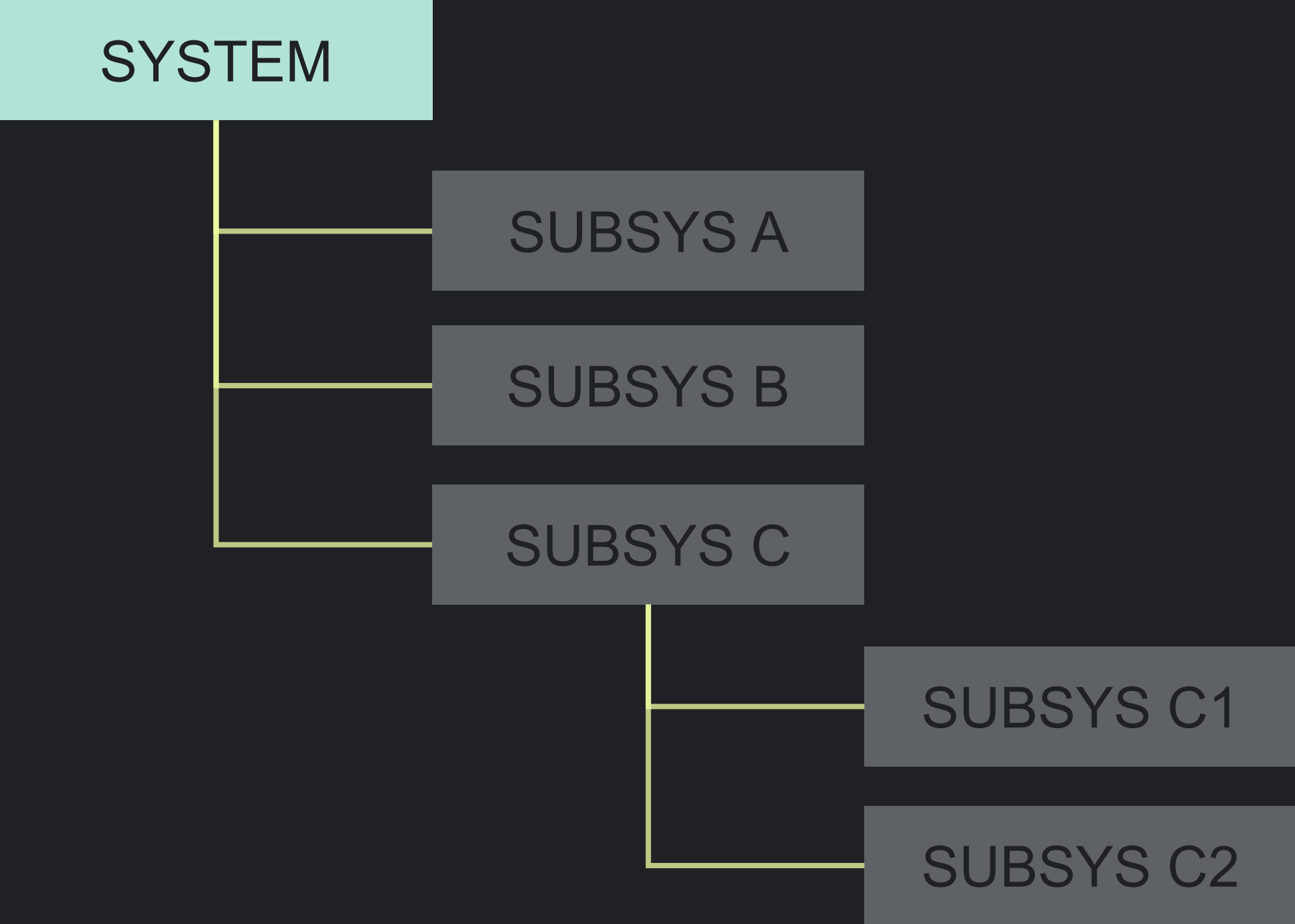


Subsystem modeling

- Model composite systems
- Enhanced Product Breakdown
- Functional Breakdowns
- Operational Modes
- Usage rates
- Results



Subsystem modeling

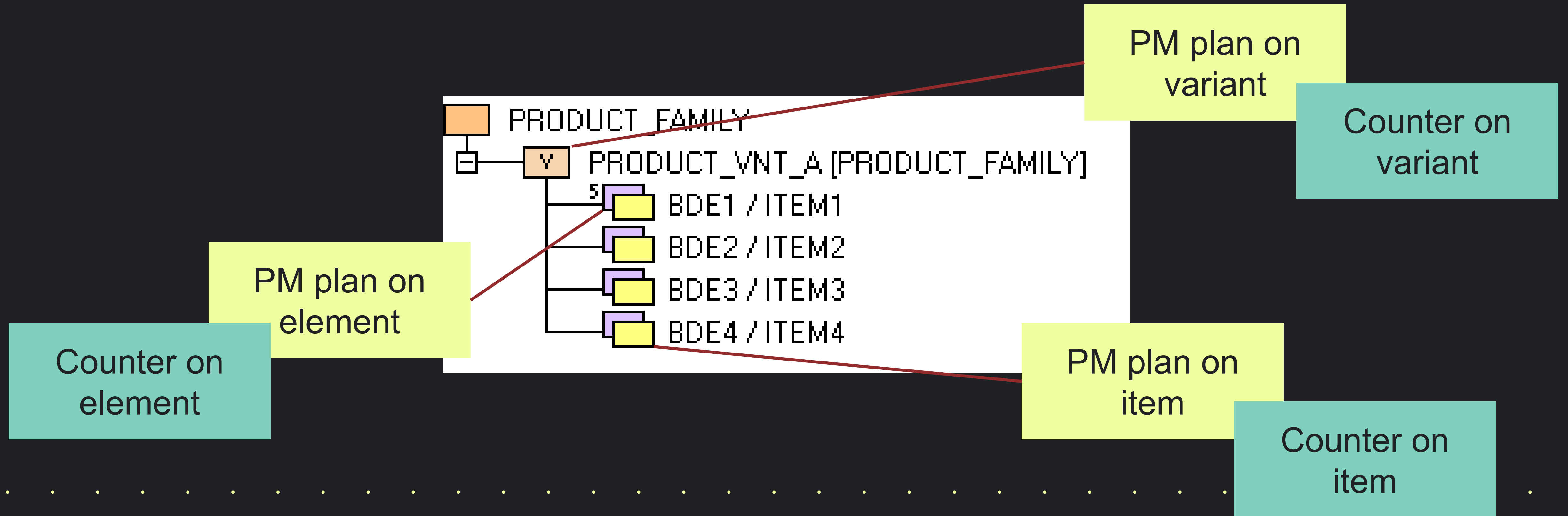


RESULTS		
System ID	Failures	Acc. failures
SUBSYS A	10	10
SUBSYS B	5	5
SUBSYS C	4	8 (4+2+2)
SUBSYS C1	2	2
SUBSYS C2	2	2



Assigning PM plans

Scheduled maintenance



Initial state

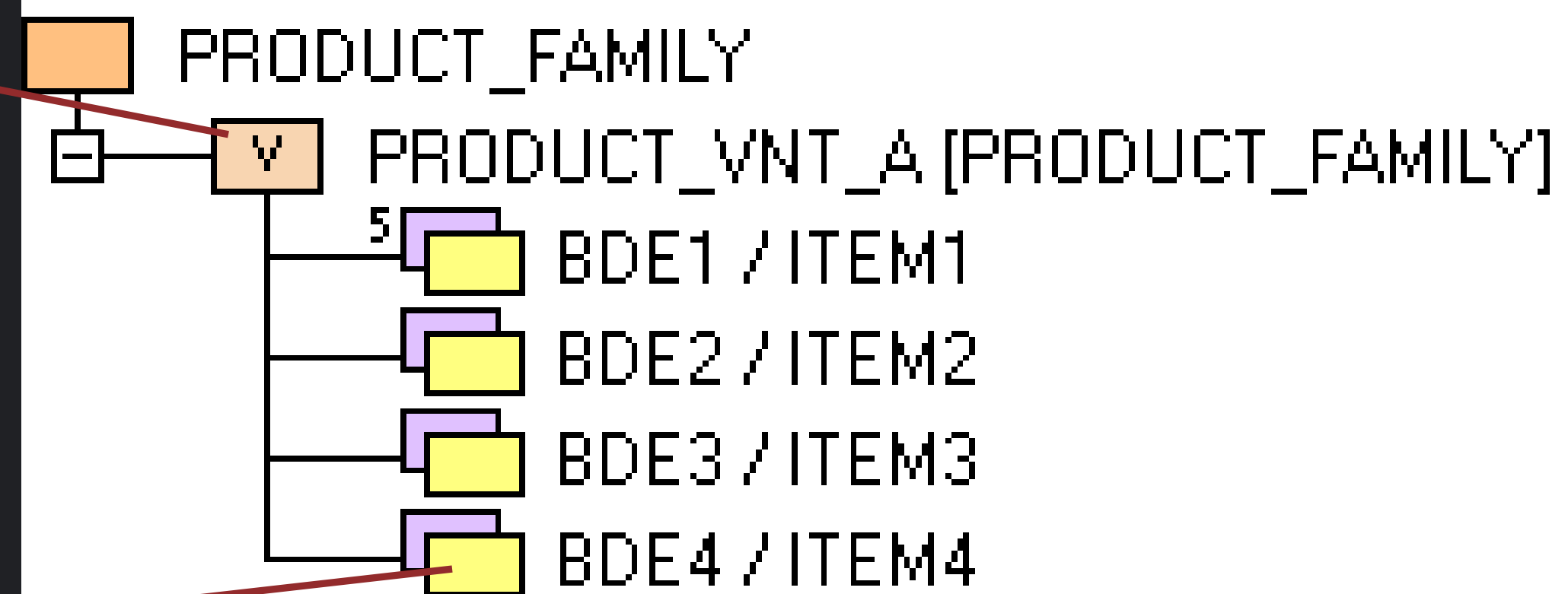
Status at start of the simulation
Given in any operation parameter

System
deployment

Age of deployed
systems

System
realization

Age of
installed items



Stock
allocation

Age of
items in stock

Transfer

Age of
systems/items
transferred in

Time dependent input data

- Task duration
- Failure rate
- Reorder lead time
- Reorder size



Time dependent input data

Modeling
element

Task

Time Dep.
Value ID

Time of
change

Value or
Distribution

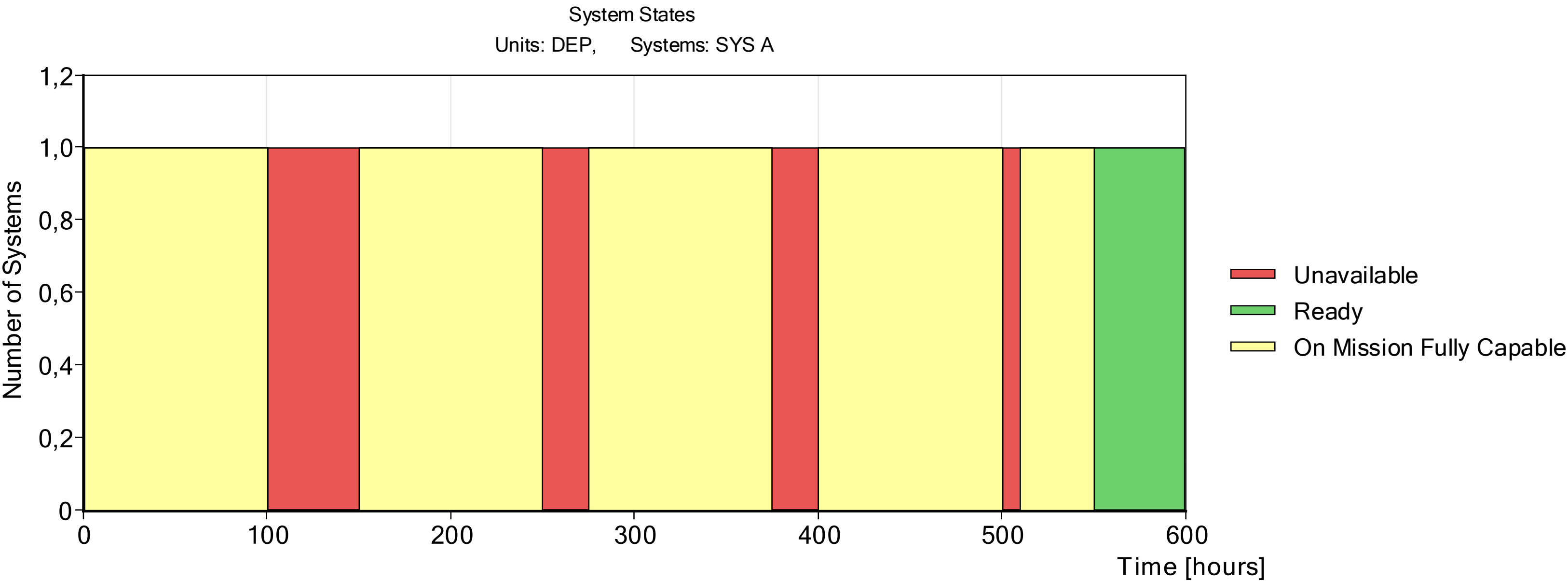
Input
example 1

Overhaul A
(100 OPHRS)

OH_A_TAT_VAR

0 Hrs
200 Hrs
400 Hrs

50 Hrs
25 Hrs
10 Hrs



Time dependent input data

Modeling
element

Task

Time Dep.
Value ID

Time of
change

Value or
Distribution

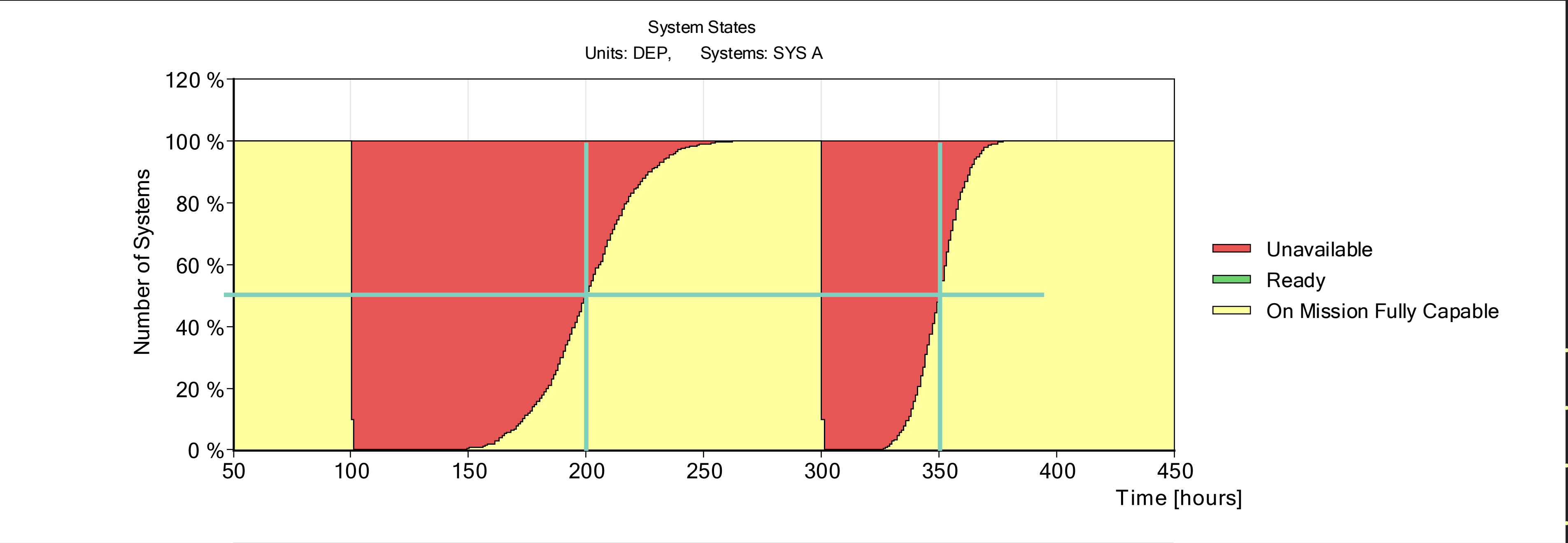
Input
example 2

Rectify A
(at T=100; 300)

RECT A

0; 280

$N(100,20)$;
 $N(50,10)$



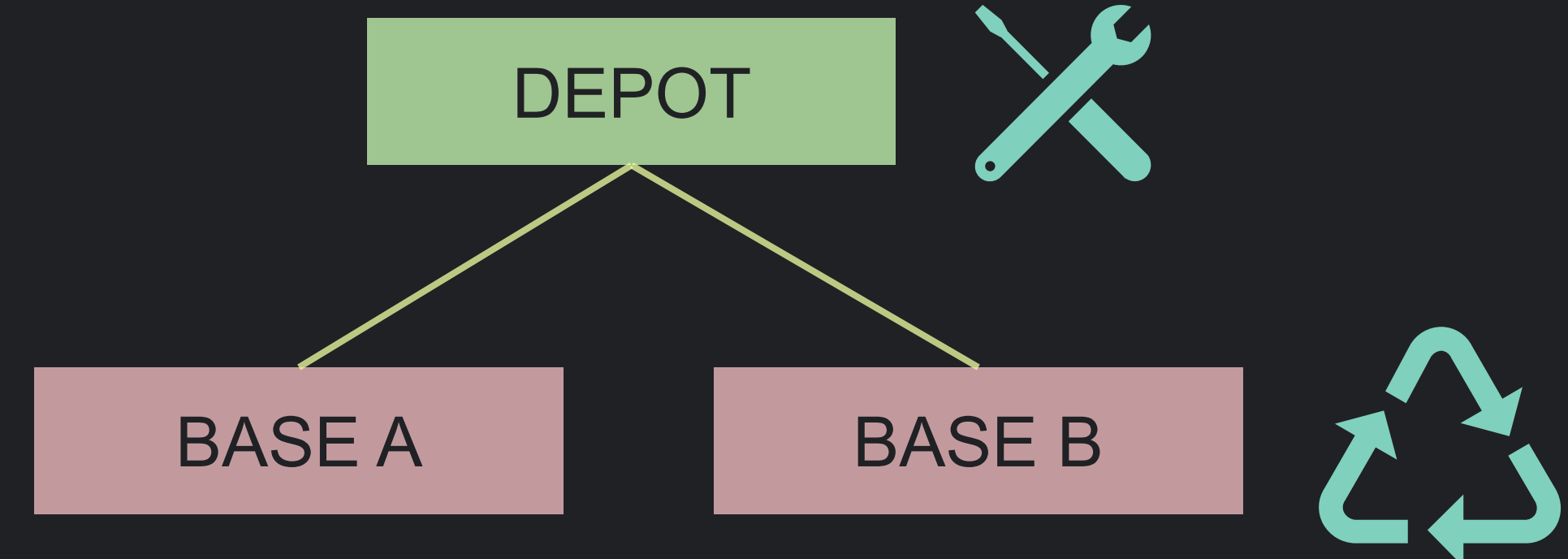
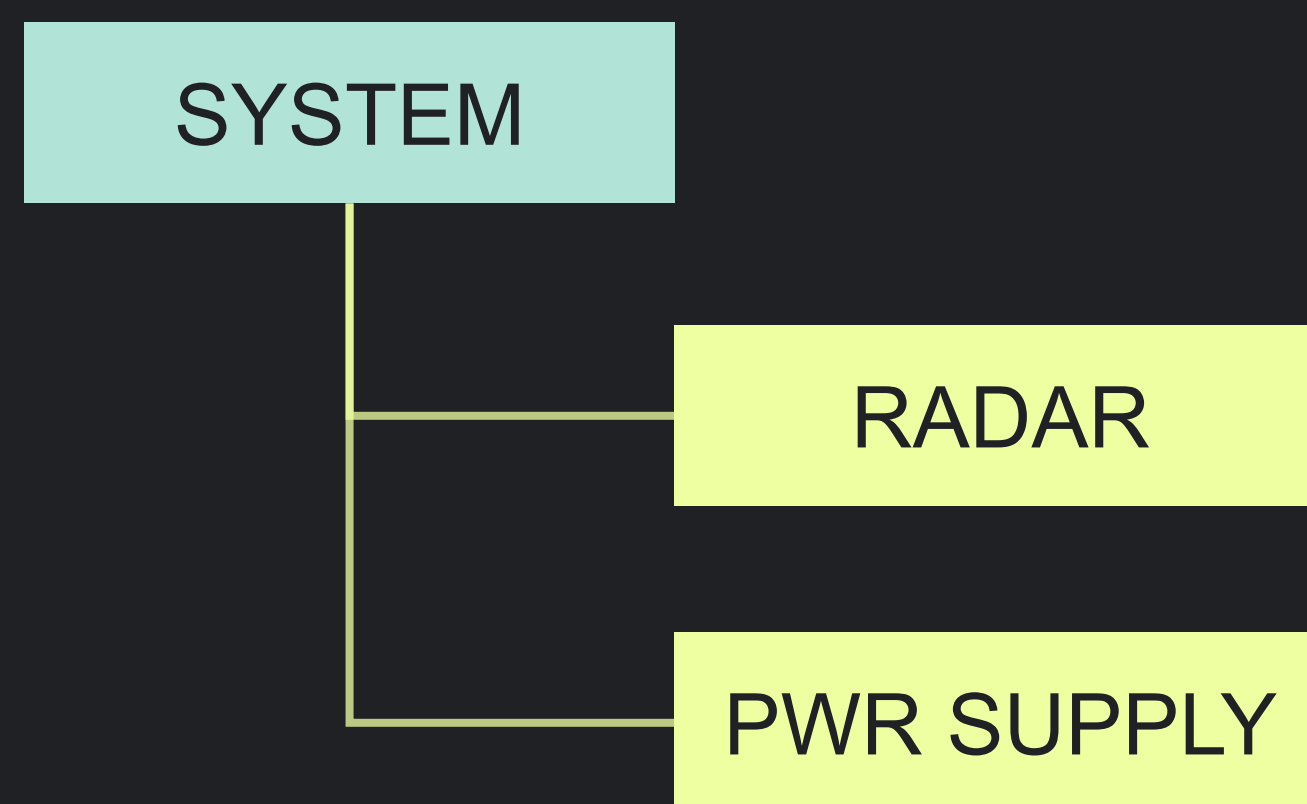
Task results

- Number of tasks completed during simulation
- Shows workload on support organization
- Better understanding of the results
- Better understanding of the model
- Performance initiatives implemented



Task results

Example



Total

Task

System/Item

Station

Event

Time

Total: 12

Replace: 6

Radar: 5

Pwr supply: 1

Base A: 3

Base B: 2

Base A: 1

Failure X: 2

Failure Y: 1

Failure X: 2

Failure Z: 1

T=120: 1

T=202: 1

T=88: 1

T=90: 1

T=176: 1

T=150: 1

T=132: 1

T=214: 1

T=102: 1

T=182: 1

T=100: 1

T=162: 1

Rectify: 6

Radar: 5

Pwr supply: 1

Depot: 5

Depot: 1

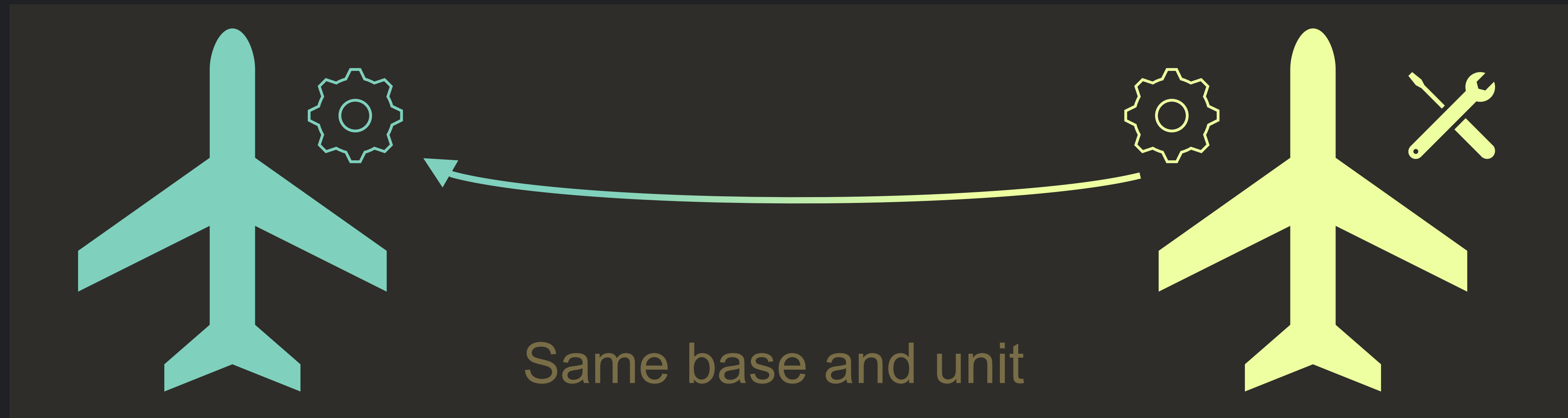
Failure X: 4

Failure Y: 1

Failure Z: 1

Robbing

An attempt to reduce system down time



Robbing replace < Ordinary resupply

Resupply time < Time left



Tutorials

- Functional Breakdowns
 - Functional Configurations
 - FBD Not Following Breakdown Structure
 - Repeated Blocks
- Operational Mode
 - Priorities
 - Downtime Contributors
- Onboard Maintenance
 - At Harbor
 - With Resupply Ship



Tutorials

- Shifts
 - Basics
 - Night Maintenance
- Time Dependent Input Data
- Usage Rates
- Initial Age
- Subsystem Results

Tutorials

- OPUS10 2022.2
 - Demo
 - Modeling Examples
 - Consumables
 - Endurance
 - Events
 - External demands
 - FBD Modeling
 - Item-Dependent Organizations
 - LORA
 - Maintenance
 - Multiple Operation Parameters
 - No Fault Found and Imperfect Failure Localization
 - Parallel replacements
 - Phases
 - Products
 - Resources
 - RST0
 - Self-supported deployments
 - Solution Finder
 - Spare Parts Pooling
 - Subsystem Results
 - Usage Rates

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The OPUS10 model

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 External Demand

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 Item-Dependent Support Organizations

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LORA

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Maintenance

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Reference

Modeling Examples

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This section aims at describing specific functionality and typical logistic scenarios, and how they can be modeled in OPUS10. There are several modeling examples covering basic functionality such as how to model a product and the product breakdown structure, events of type failure or preventive maintenance, and how to model the subsequent maintenance. There are also modeling examples covering more specific and advanced functionality such as the solution finder and LORA.

Input files (*.opi) for all examples used in this section are added during the installation process of OPUS10. The files are added to the *Public Documents* subfolder:
\\Systecon\OPUS10\Demo\Modeling Examples.

A good way to further explore the scenarios described in this section is to run the corresponding input files in OPUS10.

The following examples are available:

- [Accessibility Using Product Replacement Breakdown](#)
- [Consumables](#)
- [Endurance](#)
- [Events](#)
- [External demand](#)
- [FBD Modeling](#)
- [Item-Dependent Support Organizations](#)
- [LORA](#)
- [Maintenance](#)
- [Multiple Operation Parameters](#)
- [No Fault Found and Imperfect Failure Localization](#)
- [Phases](#)
- [Products](#)
- [Replacements performed in parallel](#)
- [Resources](#)
- [Resupply Times in Case of Remote System Repair](#)
- [Self-supported deployment with unscheduled start times](#)
- [Solution Finder](#)
- [Spare Parts Pooling](#)
- [Subsystem Results](#)
- [Task on a Breakdown Element of Subsystem \(or Position\) Type](#)
- [Usage Rates](#)

Thank you.

