

# UDPP SESAR 1 Step2

## Concept in brief VP730 Demo

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# UDPP Step2 objectives

**Continue to deeply involve the AUs in ATM solutions**

**Step1: slot swapping**

**Give a mean (tool) to the AUs to decrease  
the Cost of the Delay.**

**Re-organize their flights in Hotspot  
Airport congestion -> Holistic (SESAR 2020)**



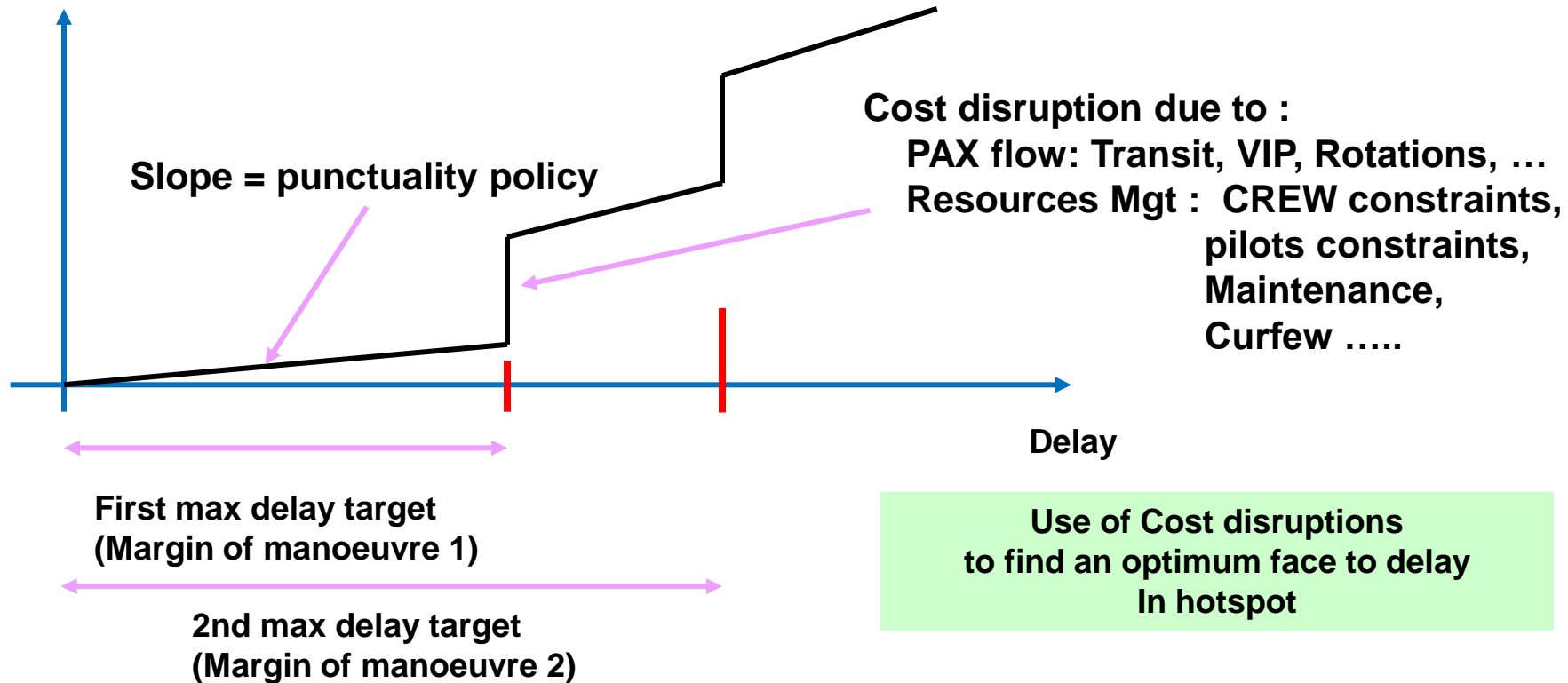
**UDPP Defines prioritisation rules :**

**To apply Equity**

**To limit Coordination**

# Cost of Delay for AU ?

+ Cost of delay on 1 flight



**AU goal: Decrease the Cost of the delay in the hotspot**

### UDPP Step2 Prioritisation:

- **FDA: Fleet Delay Apportionment**
  - Priority values : from 1 (highest) to 9 (lowest) Or B (Baseline).  
Default value = 5
- **SFP: Selective Flight Protection**
  - A binary approach for flights management (Joker)
  - Suspend or Protect Flights according to Operating Index (severity of the Hotspot)

All UDPP Concept and features are based on  
Equity

Don't penalize others AU when doing Prioritisation



1. Ration By Effort rules (RBE) (on SFP but also on FDA)
  - First Give (to others), then Get (from others)
2. Sum Baseline delays = Sum UDPP delays (For FDA only)

**SFP and FDA apply these  
Equity Rules**

# UDPP Concept elements: FDA

## **FDA : Fleet Delay Apportionment (with integrated RBE)**

- **AU gives priority to their own flights for delay reapportionment according to the need.**
- **Take proportion of delay on AU Flights according to given priority**
  - $UDelay = \sum (BDelay) * ((Prio * BDelay) / \sum (Prio * BDelay))$
- **Priority values :**
  - **from 1 (highest) to 9 (lowest) given to flights.**
  - **Implicit value is 5: not specifying a priority means giving 5.**
  - **B (Baseline) Priority can be set to ignore flights from FDA calculation (keep baseline delay)**

# UDPP Concept elements : FDA

Hotspot (baseline delay)																			
FDA (proportion of "Delay x Priority")																			
Original	A1	A2	C1	B1	A3	C2	B2	B3	A4	B4		X1			X2	X3		X4	X5
FSFS Seq.	A1		A2		C1		B1		A3	C2	B2	B3	A4	B4	X1	X2	X3	X4	X5
Baseline Delay	0		1		2		3		4	4	4	4	4	4	3	1	1		
Priority			B						9				1						
FDA Seq.	A1	A2	C1	B1					A4	C2	B2	B3	A3	B4	X1	X2	X3		
FDA Delay	0	1	2	3					0	4	4	4	8	4	3	1	1		

$$\text{CoefPrio} = \text{Sum(Dly)} / \text{Sum(Dly*Prio)} = 8 / ((9 \times 4) + (4 \times 1)) = 8/40$$

$$\text{A3 delay} = \text{Prio} \times \text{Dly} \times \text{CoefPrio} = 36 \times 8/40 = 7.2$$

$$\text{A4 delay} = \text{Prio} \times \text{Dly} \times \text{CoefPrio} = 4 \times 8/40 = 0.8$$

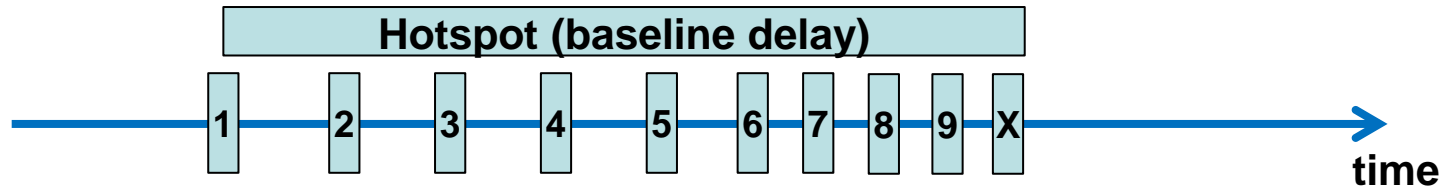
# UDPP Concept elements: SFP

## SFP : Selective Flight Protection

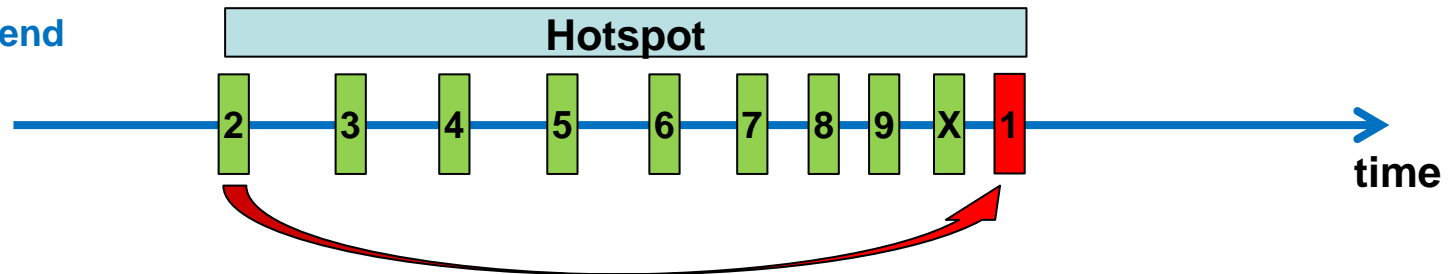
- A binary approach face to big Hotspot
- AU can **Suspend** or **Protect** flights according to the **Operating Index (OI)**
  - **Suspend** = Flight will be push at the end of the Hotspot
  - **Protect** = Flight will be on-time
- OI defines the minimum credit (OC: Operating Credits) a flight need to be Protected (be on-time).



# UDPP Concept elements : SFP

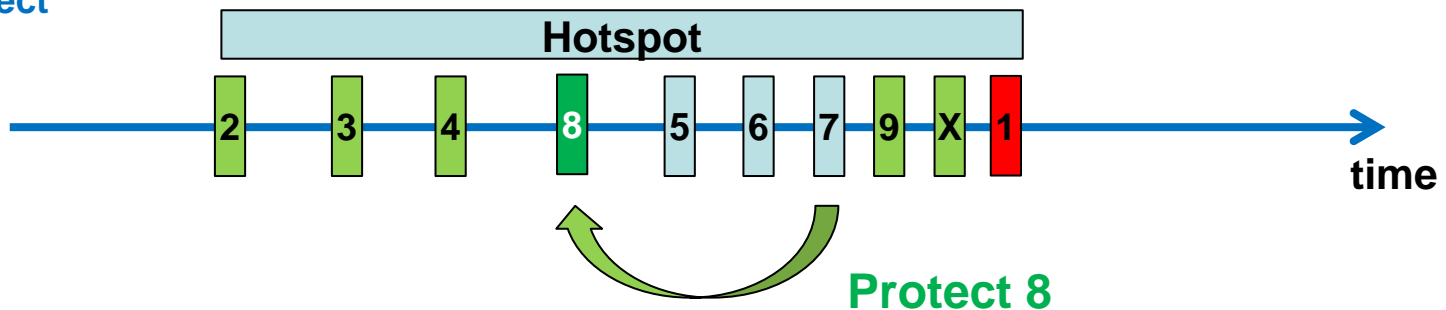


First Suspend



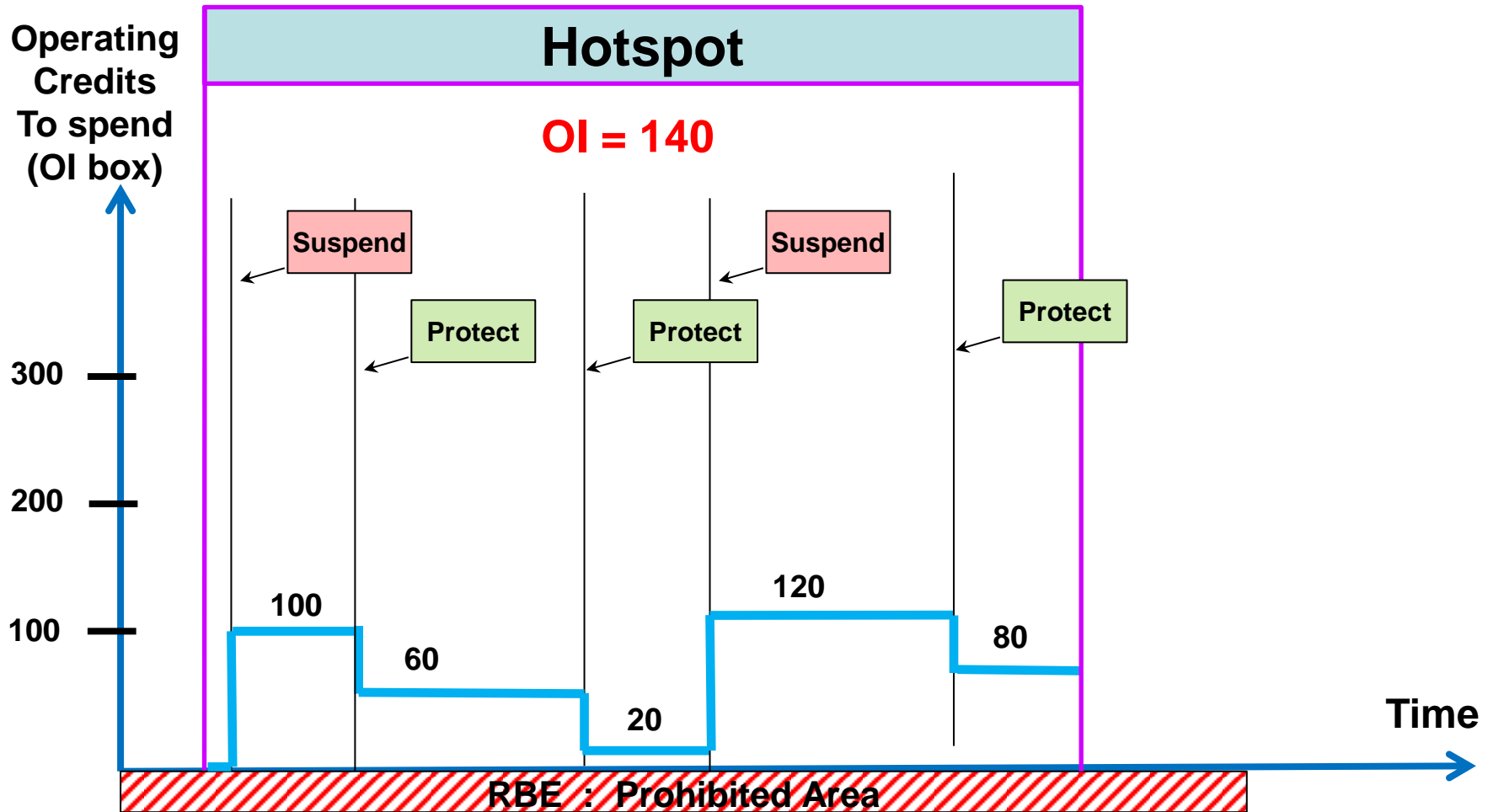
**Suspend 1** Positive impact for all others flights

Then Protect



Neutral impact for flights between Baseline 8 and Original Schedule 8  
**Protect 8**  
Positive impact for all the others

# UDPP Concept elements : SFP



**End of the presentation**

**Base on Airport APOC platform (Airbus Defence Space)**

**+**

**Management of Departure and Arrival Sequence**

**With UDPP Prioritisation algorithm and rules**

**+**

**Graphic Interface (FOC oriented) For AUs (5 positions)**

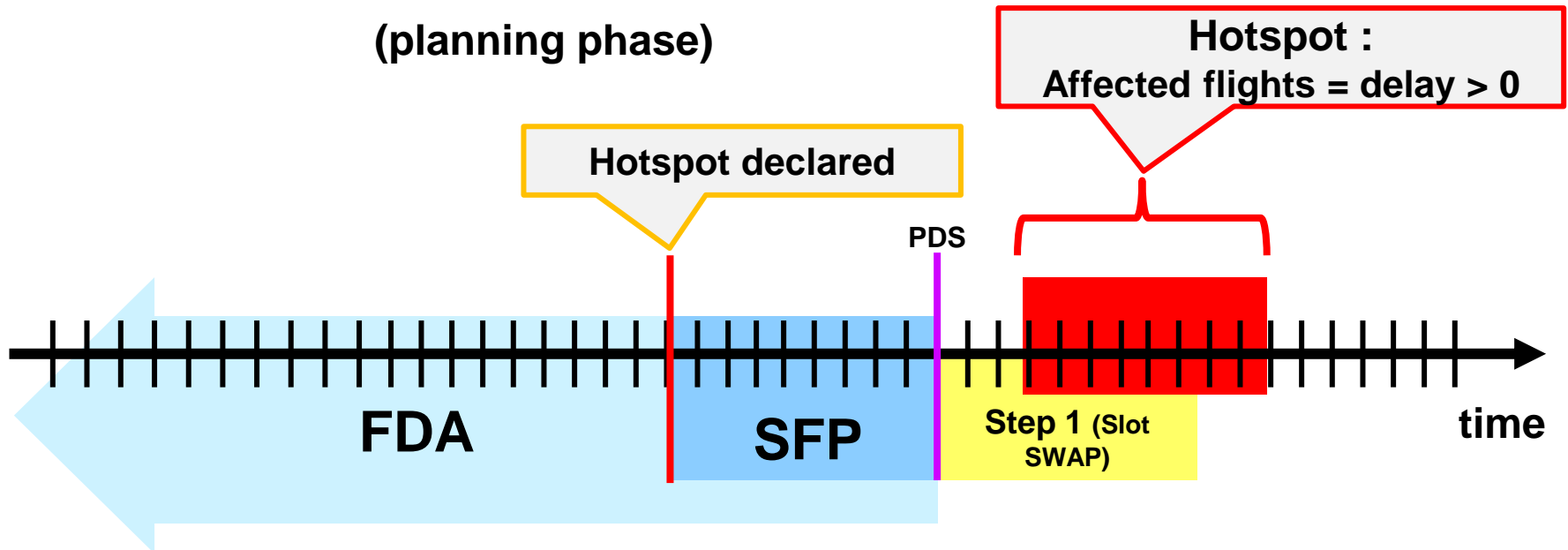
**+**

**Link with SABRE Prototype for Cost calculation (in US)**

# UDPP Concept availability

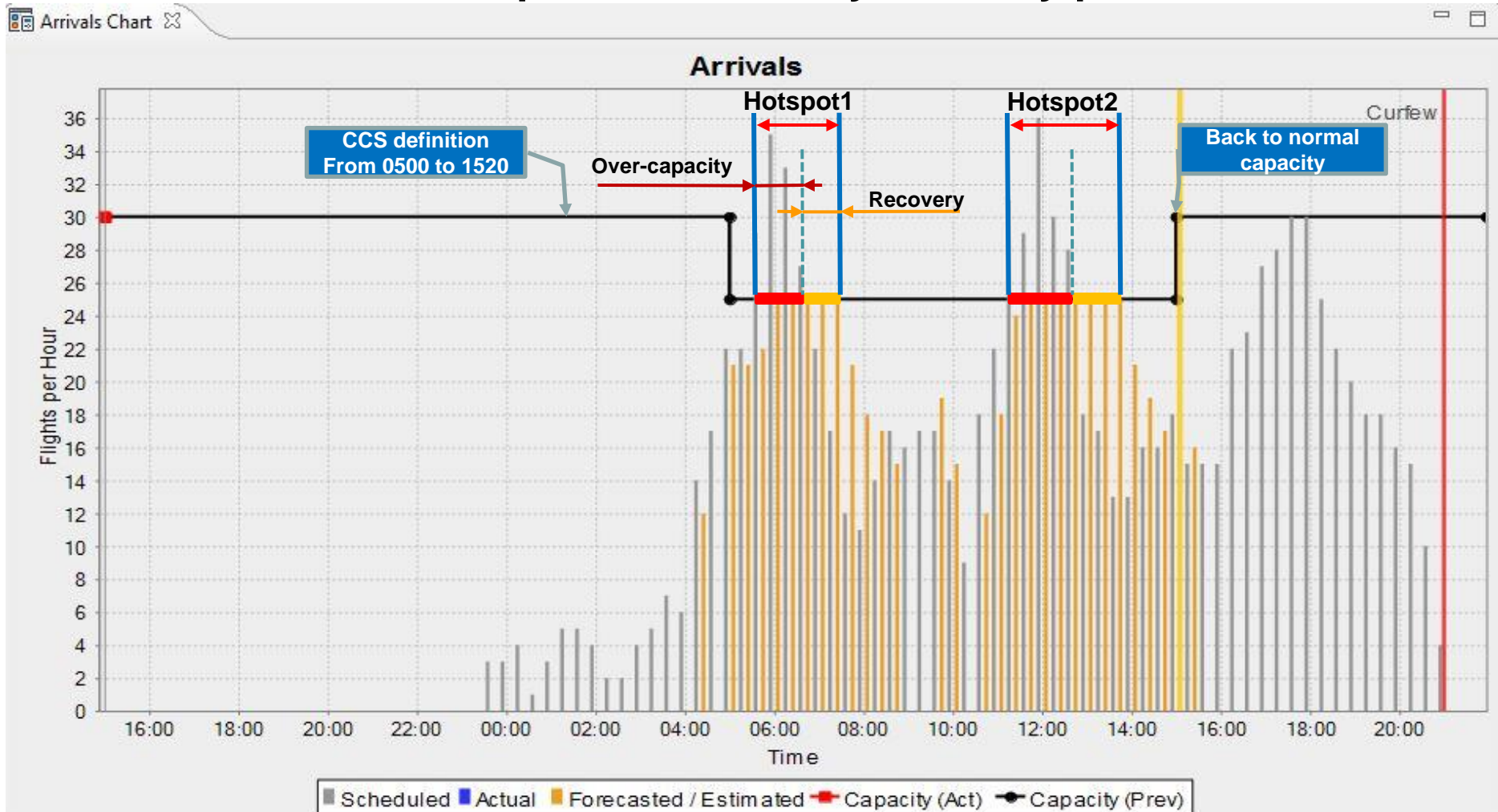
## UDPP Step2

(planning phase)



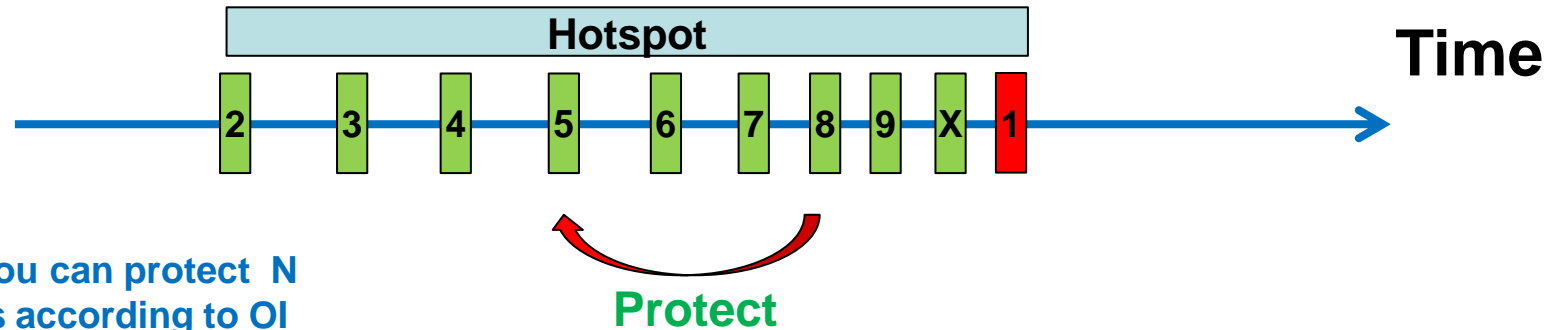
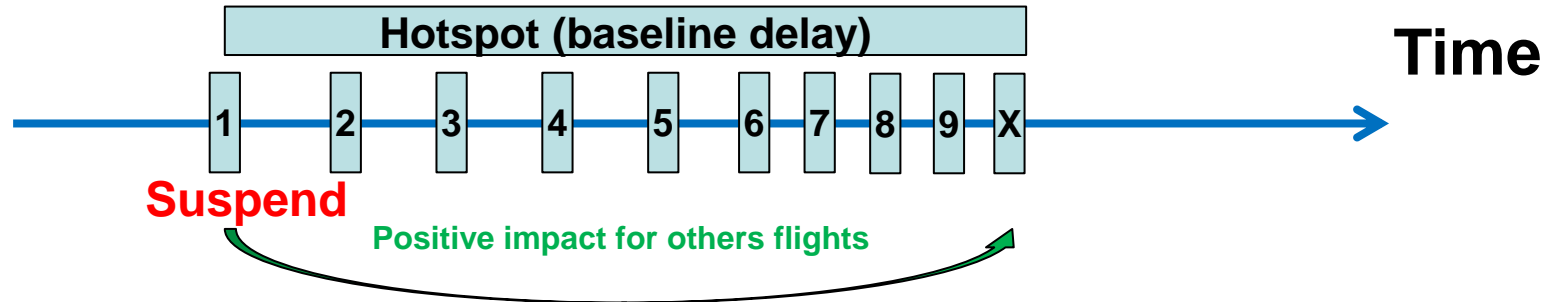
# 2. Terminology 7

## CCS, Hotspot, over-delivery recovery period



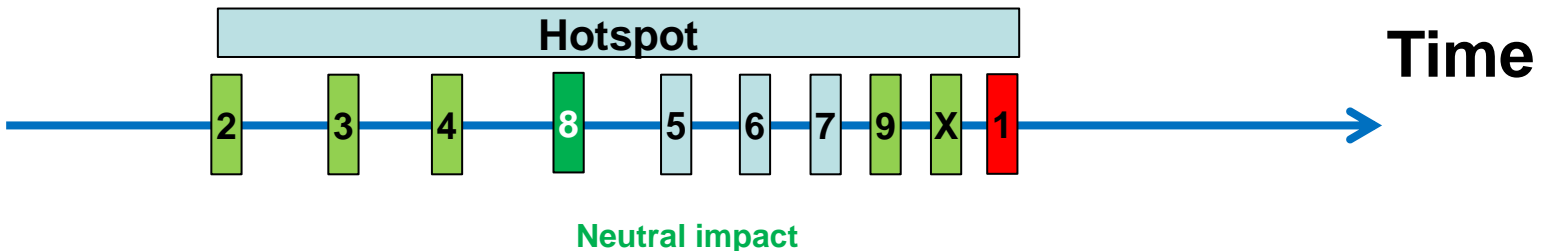
# 3. UDPP Concept elements : SFP

## SFP



Now you can protect N flights according to OI

Negative impact for others flights between Baseline and Original Schedule



The combination of the 2 gives neutral impact for flights between original schedule and baseline time and positive for the others

## Simple Logical Description of The Recovery period, the SFP and the FDA concepts

NB: time values are logical values useful to explain the concept elements  
(not operational values)

Underline colours on results  
indicate impact to other flights  
due to FDA or SFP  
(compare with Baseline Delay)

	Over-capacity period								Recovery period											
Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Original	A1	A2	C1	B1	A3	C2	B2	B3	C3	B4		X1			X2	X3	X4		X5	
FPFS Seq.	A1		A2		C1		B1		A3	C2	B2	B3	C3	B4	X1	X2	X3	X4		X5
Baseline Delay (BD)	0		1		2		3		4	4	4	4	4	4	3	1	1			

**SFP (Flight Protected: Op.Credits = 200 ■ Flight Suspended: Op.Credit=0 ■)**  
In this simple example Op. Index =200

Original	A1	A2	C1	B1	A3	C2	B2	B3	C3	B4		X1		X2	X3		X4		X5
FPFS Seq.	A1		A2		C1		B1		A3	C2	B2	B3	C3	B4	X1	X2	X3	X4	X5
SFP Seq.	A1		C1		A3		B1		C2	B2	B3	C3	B4	X1	X2	X3	A2		
SFP Delay	0		0		0		3		3	3	3	3	3	3	2	0	0	14	

**FDA (proportion of "Delay x Priority" + equity rules to build list)**

Original	A1	A2	C1	B1	A3	C2	B2	B3	A4	B4		X1		X2	X3		X4		X5
FPFS Seq.	A1		A2		C1		B1		A3	C2	B2	B3	A4	B4	X1	X2	X3	X4	X5
Baseline Delay (BD)	0		1		2		3		4	4	4	4	4	4	3	1	1		
Priority	<u>B</u>	<u>B</u>							9				1						
New Delay	0		1		2		3		1.5	4	4	4	4	4	3	1	1		
FDA Seq.	A1		A2		C1		B1		A4	C2	B2	B3	A3	B4	X1	X2	X3		
FDA Delay	0		0		3		2		0	4	4	4	8	4	3	1	1		

Operating Index (OI) is based  
on Hotspot severity

Operating Credits to fly is = or >  
to OI  
Nb of possible promoted flight  
depend on OI  
OI = 120 -> 5 possible flights

Suspended Flights go at the end  
of the recovery period

$$\text{CoeffPrio} = \frac{\text{Sum(Dly)} / \text{Sum(Dly*Prio)}}{8 / ((9 \times 4) + (4 \times 1))} = 8/40$$

$$\text{A3 delay} = \text{Prio} * \text{Dly} * \text{CoeffPrio} = 36 * 8/40 = 7.2$$

$$\text{A4 delay} = 4 * 8/40 = 0.8$$

+ rules for merging All AU flights  
(equity)





# Concept elements on timeline

**CCS declared**  
 (R-MAN is part of the decision)  
 (Baseline Delay, Recovery period  
 OI value ...)

**CCS UDPP solution**  
 Cut-off time  
 (New Schedule: IBT, OBT)

**Q-Mgt**  
 Cut-off time:  
 Optimised sequence

Time →

