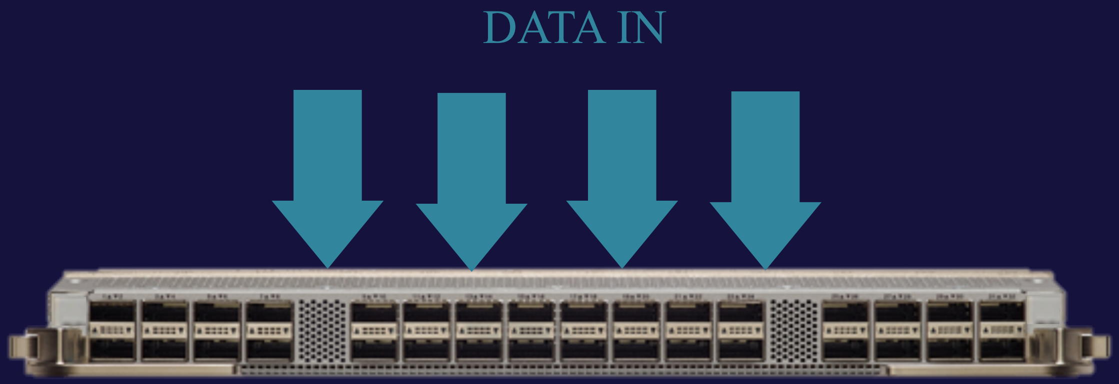
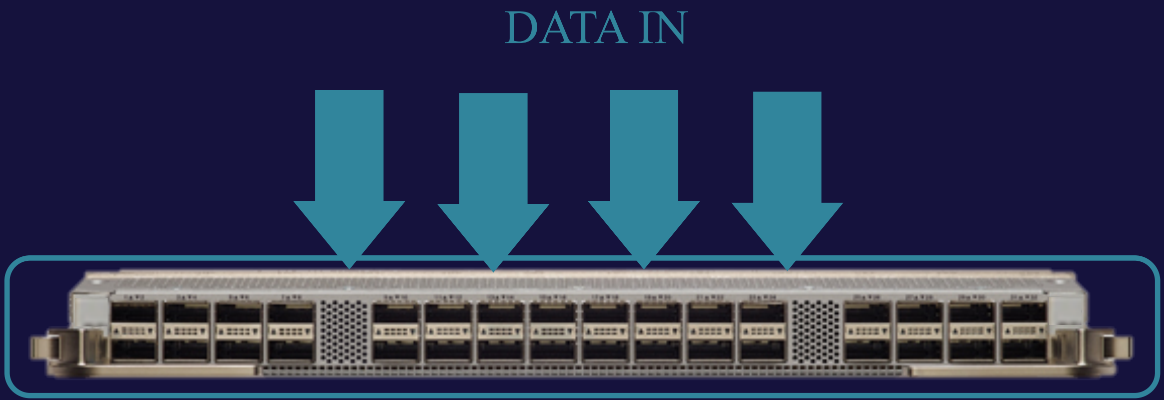
IP SWITCHES

1. Receive INFLOWS



IP SWITCHES…

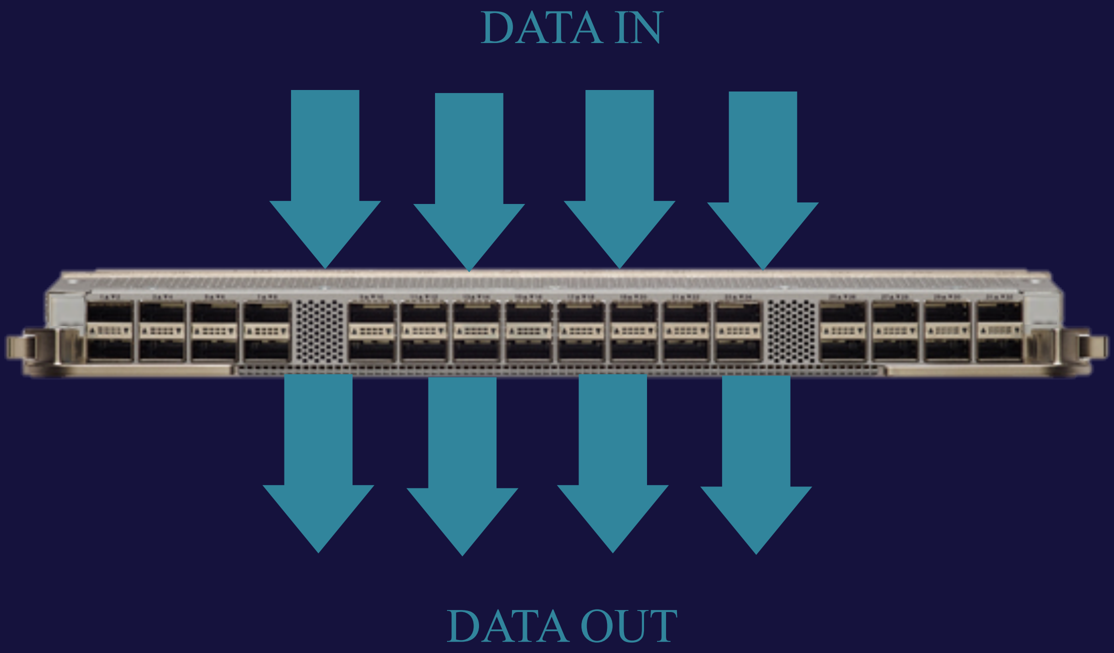
1. Receive INFLOWS



2. BUFFER & Route

IP SWITCHES

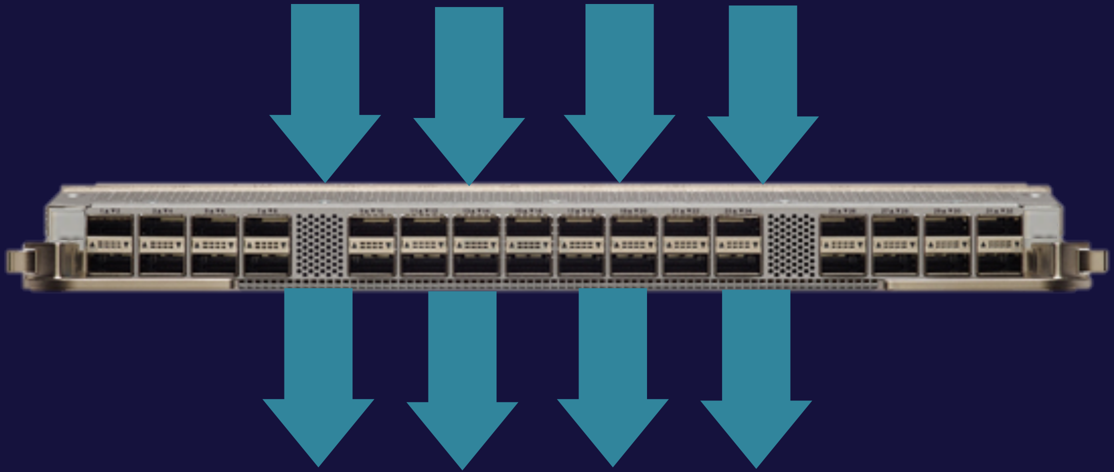
1. Receive INFLOWS
2. BUFFER & Route
3. Transmit OUTFLOWS



IP SWITCHES

1. Receive INFLOWS
2. BUFFER & Route
3. Transmit OUTFLOWS

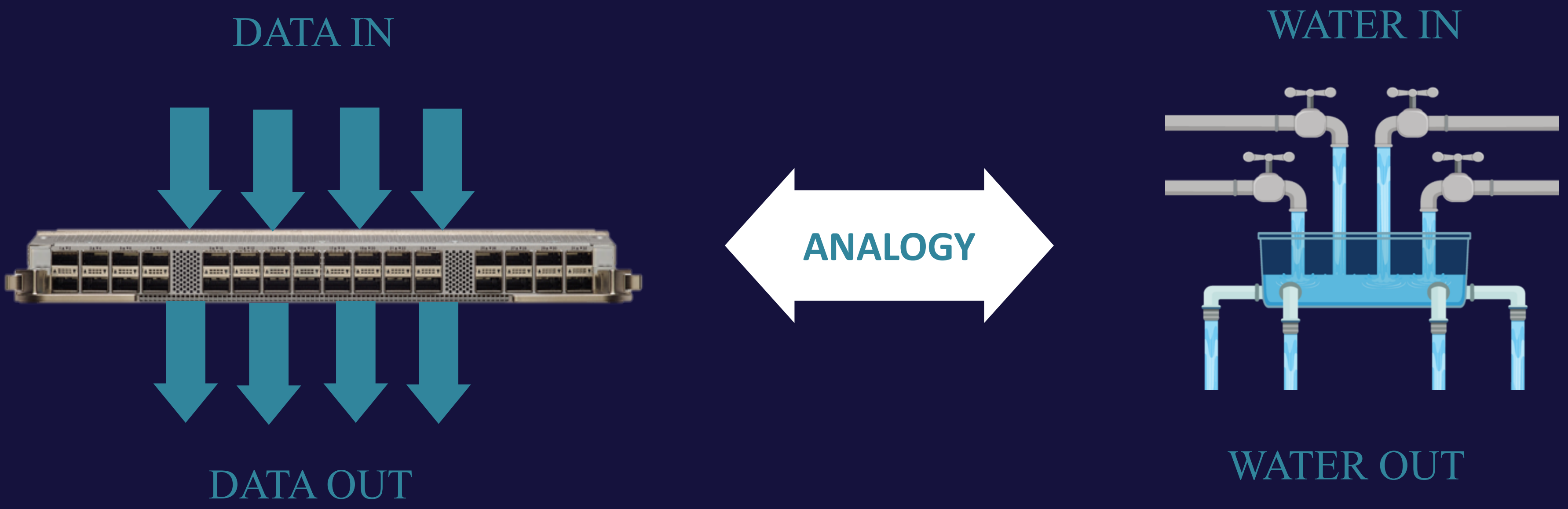
DATA IN



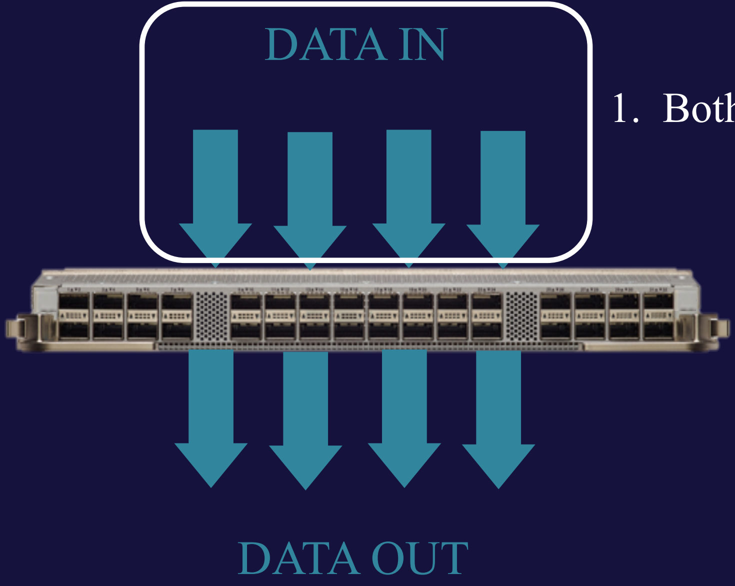
DATA OUT

TRAFFIC SHAPING AFFECTS HOW MUCH **BUFFER** AN IP SWITCH NEEDS

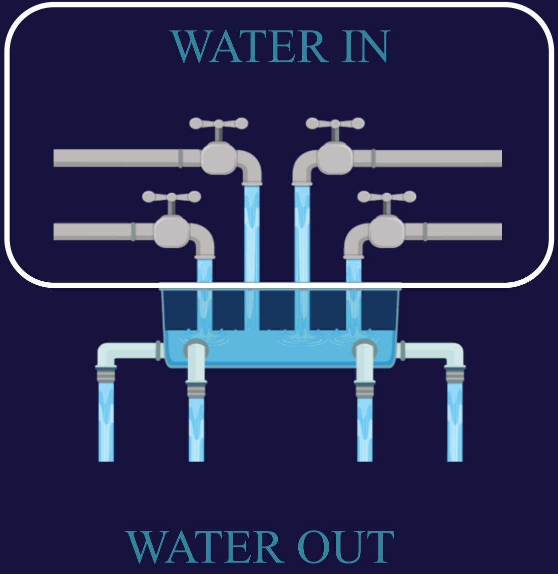
THE PRINCIPLE IS ANALOGOUS TO WATER FLOWING IN & OUT OF A BUCKET



THE PRINCIPLE IS ANALOGOUS TO WATER FLOWING IN & OUT OF A BUCKET



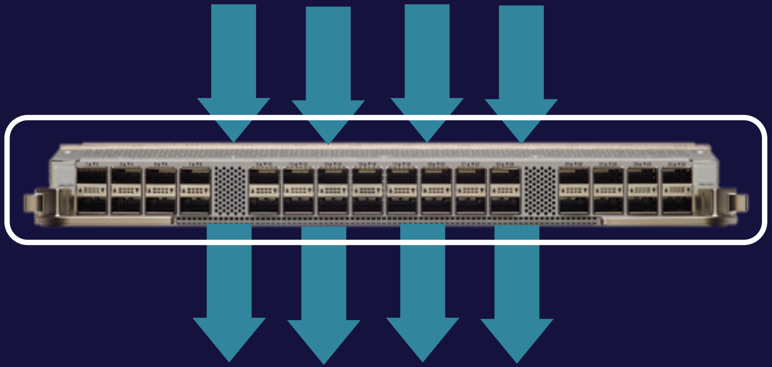
1. Both have INFLOWS



THE PRINCIPLE IS ANALOGOUS TO WATER FLOWING IN & OUT OF A BUCKET

DATA IN

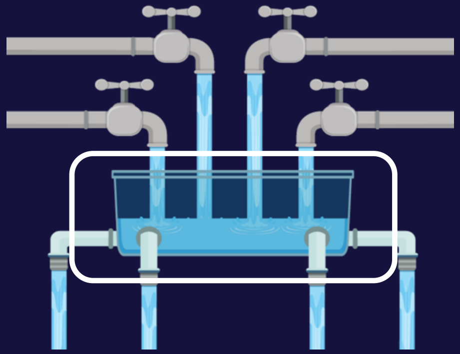
1. Both have INFLOWS



2. Both BUFFER

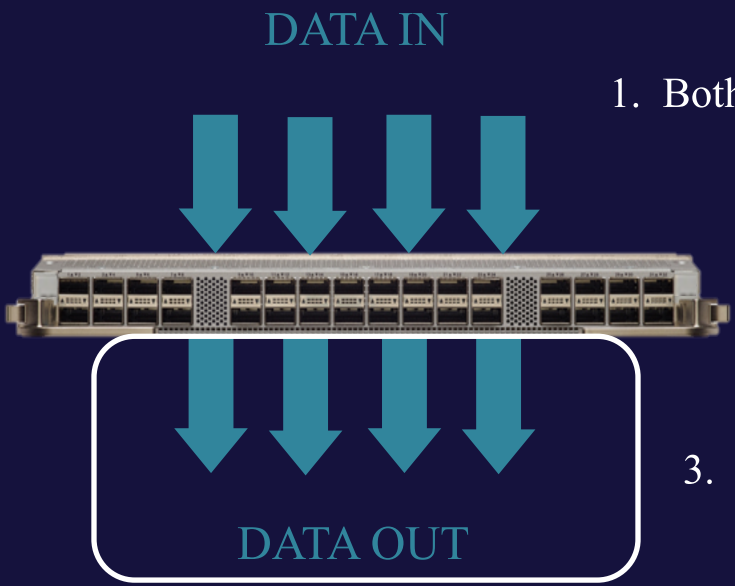
DATA OUT

WATER IN

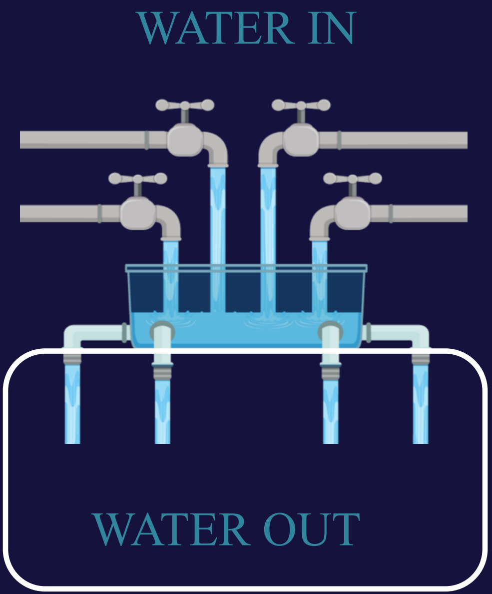


WATER OUT

THE PRINCIPLE IS ANALOGOUS TO WATER FLOWING IN & OUT OF A BUCKET

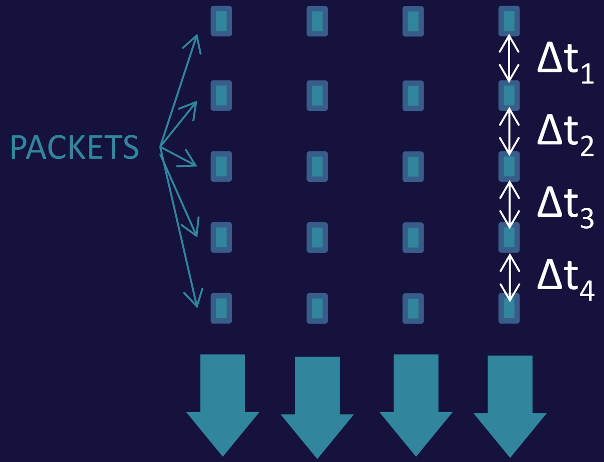


1. Both have INFLOWS
2. Both BUFFER
3. Both have OUTFLOWS



IN THIS ANALOGY…

UNIFORM PACKET SPACING
(NARROW TRAFFIC SHAPE)

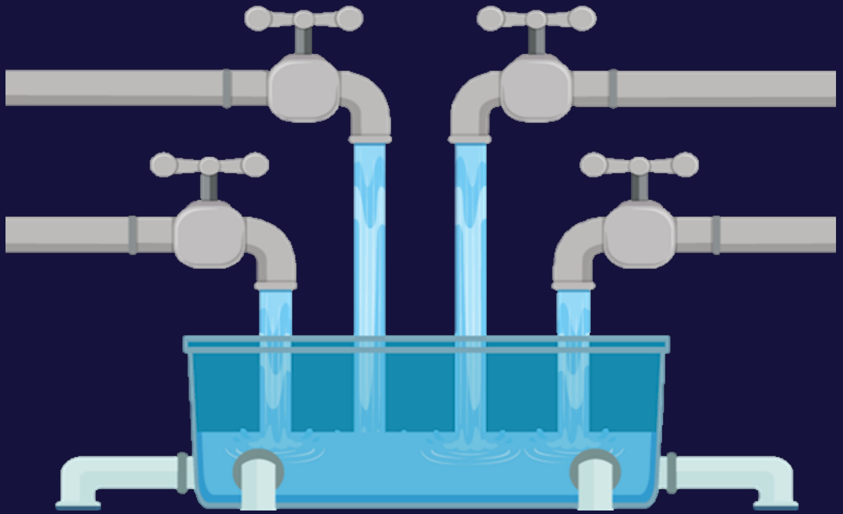


DATA IN

$$\Delta t_1 \approx \Delta t_2 \approx \Delta t_3 \approx \Delta t_4$$

EQUATES TO

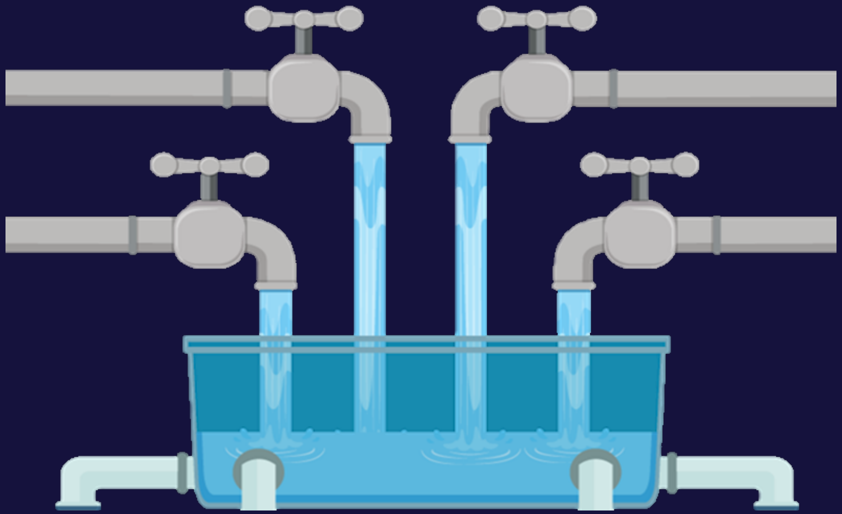
UNIFORM WATER FLOW



WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS UNIFORM

UNIFORM WATER FLOW



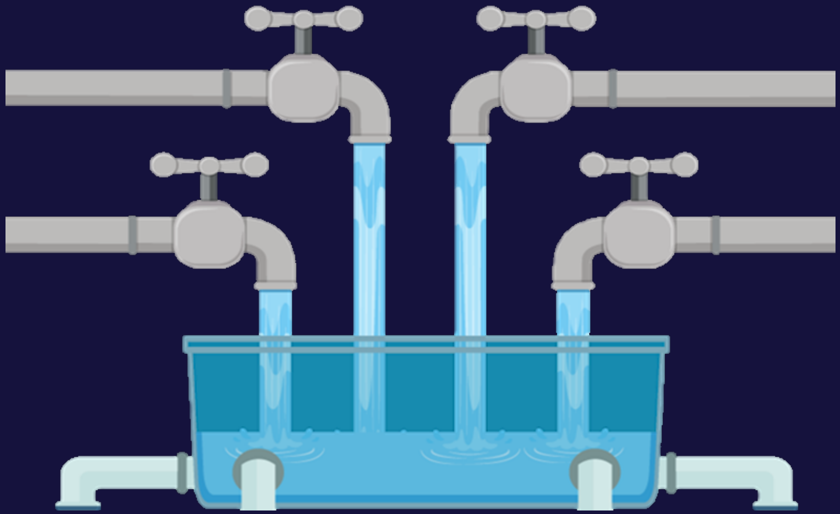
WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS UNIFORM

AND

AMOUNT OF WATER ENTERING = AMOUNT OF WATER EXITING

UNIFORM WATER FLOW



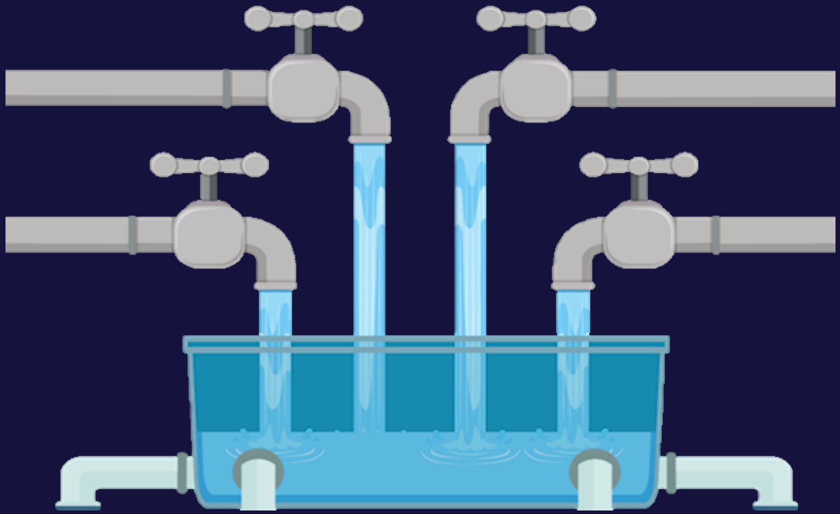
WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS UNIFORM

AND

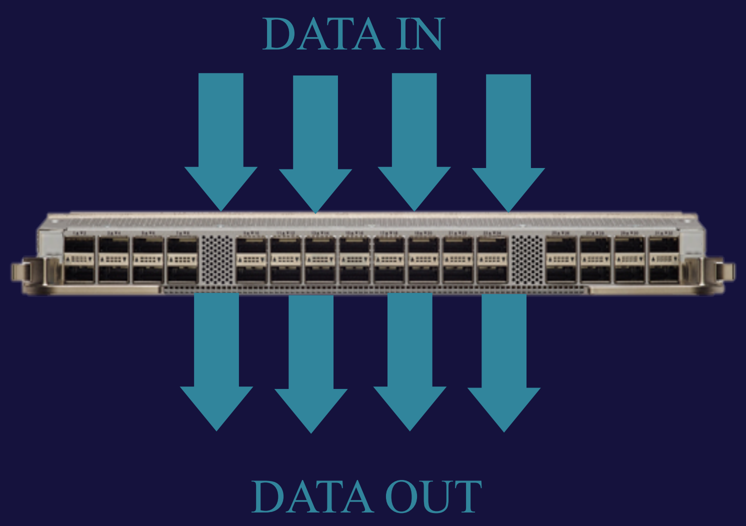
AMOUNT OF WATER ENTERING = AMOUNT OF WATER EXITING

UNIFORM WATER FLOW



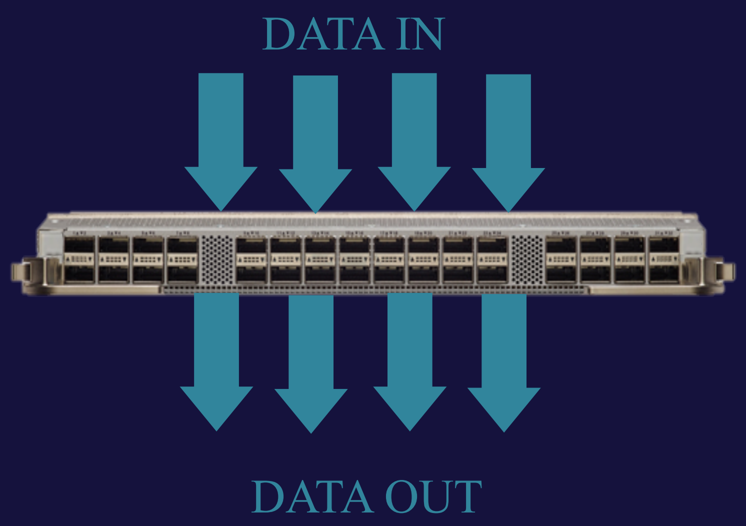
THE BUCKET NEVER OVERFLOWS

WITH AN IP SWITCH…



IF PACKET SPACING IS UNIFORM
(TRAFFIC PROFILE IS VERY NARROW)

WITH AN IP SWITCH…

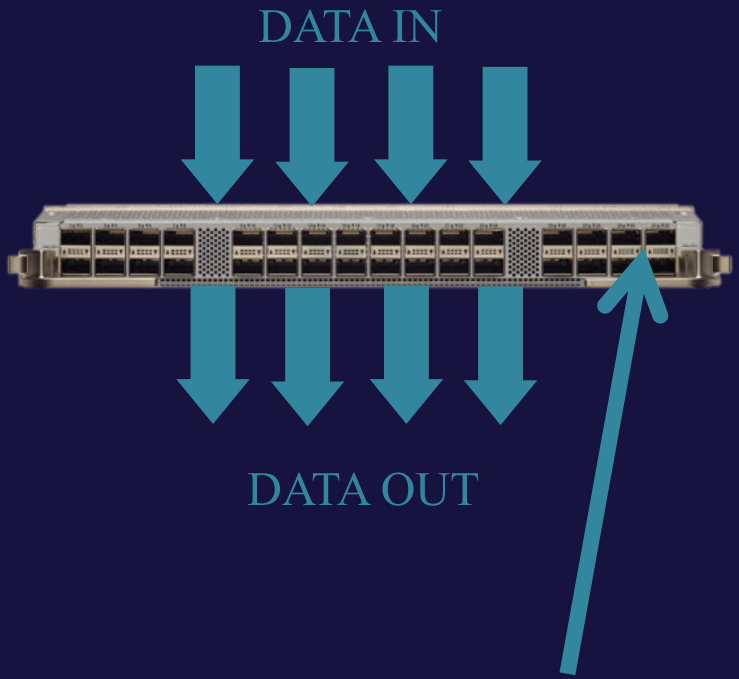


IF PACKET SPACING IS UNIFORM
(TRAFFIC PROFILE IS VERY NARROW)

AND

AMOUNT OF DATA ENTERING = AMOUNT OF DATA EXITING

WITH AN IP SWITCH…



IF PACKET SPACING IS UNIFORM
(TRAFFIC PROFILE IS VERY NARROW)

AND

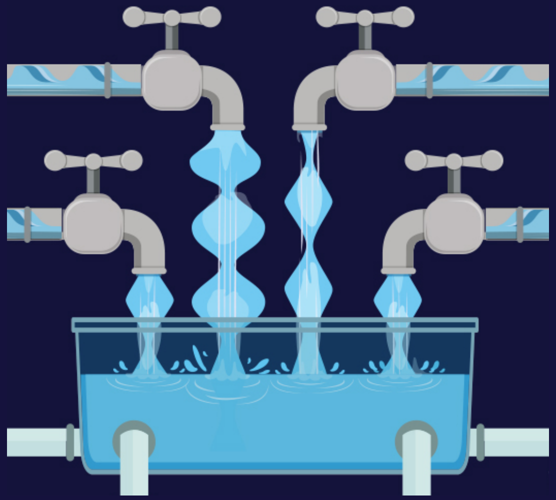
AMOUNT OF DATA ENTERING = AMOUNT OF DATA EXITING

SWITCH MEMORY NEVER OVERFLOWS

WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS "BURSTY"

NON-UNIFORM WATER FLOW



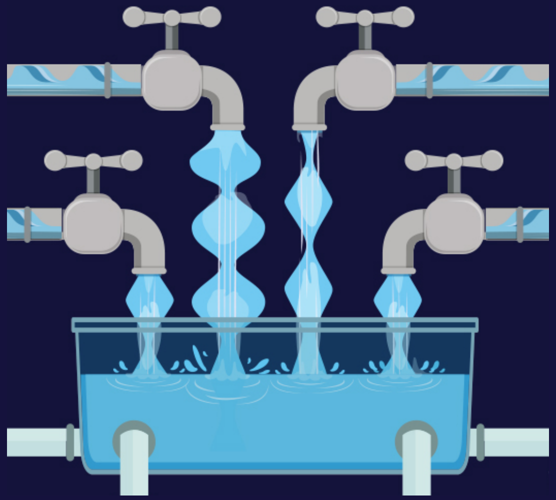
WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS “BURSTY”

AND

AVERAGE AMOUNT OF WATER ENTERING = AVERAGE AMOUNT OF WATER EXITING

NON-UNIFORM WATER FLOW



WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS "BURSTY"

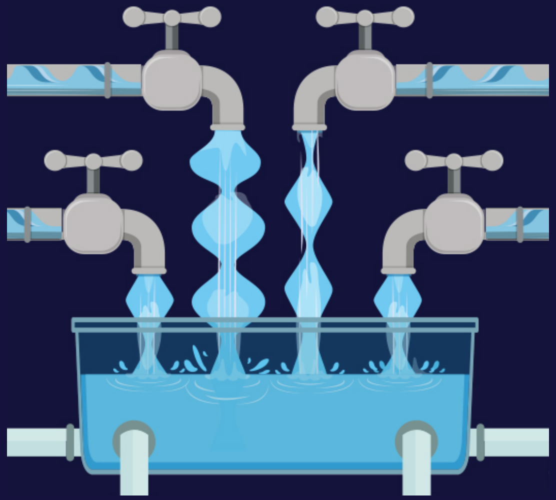
AND

AVERAGE AMOUNT OF WATER ENTERING	=	AVERAGE AMOUNT OF WATER EXITING

THEN WATER LEVEL VARIES…

…AND IF THE BUCKET ISN'T BIG ENOUGH…

<u>NON</u>-UNIFORM WATER FLOW



WITH THE WATER/BUCKET ANALOGY…

IF THE WATER FLOW IS “BURSTY”

AND

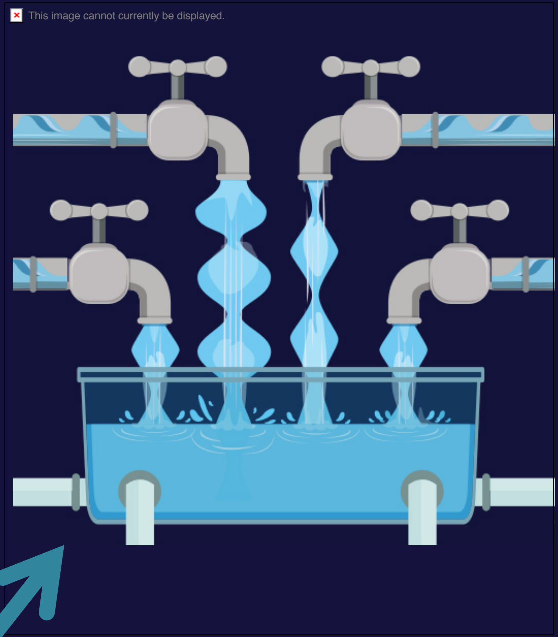
AVERAGE AMOUNT OF WATER ENTERING = AVERAGE AMOUNT OF WATER EXITING

THEN WATER LEVEL VARIES…

…AND IF THE BUCKET ISN’T BIG ENOUGH…

THE BUCKET OVERFLOWS

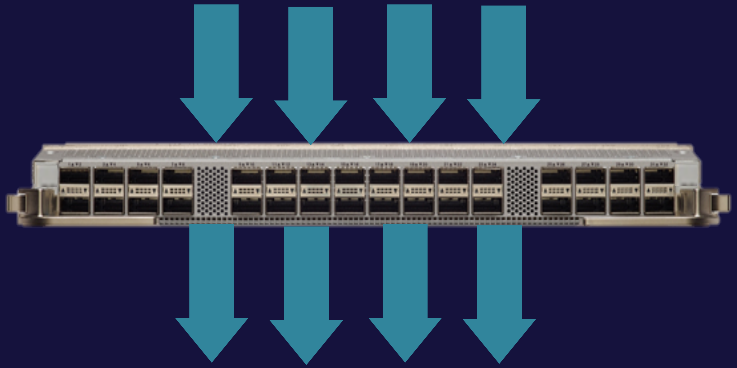
NON-UNIFORM WATER FLOW



WITH AN IP SWITCH…

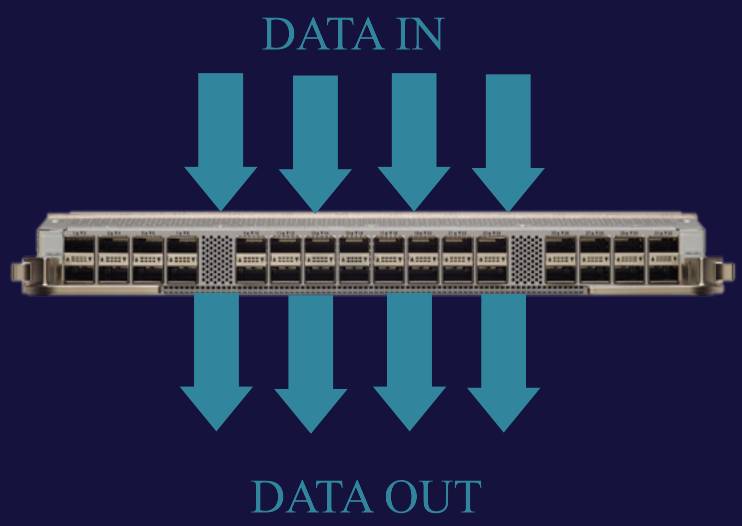
IF PACKET FLOW IS “BURSTY”
(TRAFFIC PROFILE IS WIDE)

DATA IN



DATA OUT

WITH AN IP SWITCH…

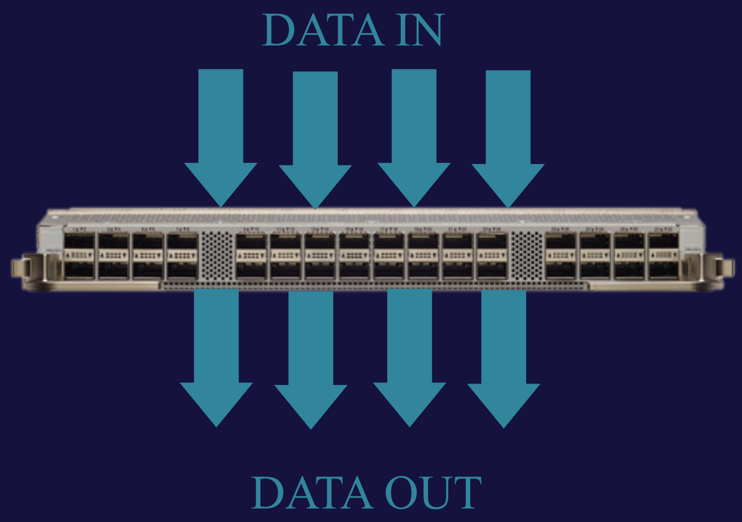


IF PACKET FLOW IS “BURSTY”
(TRAFFIC PROFILE IS WIDE)

AND

AVERAGE AMOUNT OF DATA ENTERING = AVERAGE AMOUNT OF DATA EXITING

WITH AN IP SWITCH…



IF PACKET FLOW IS “BURSTY”
(TRAFFIC PROFILE IS WIDE)

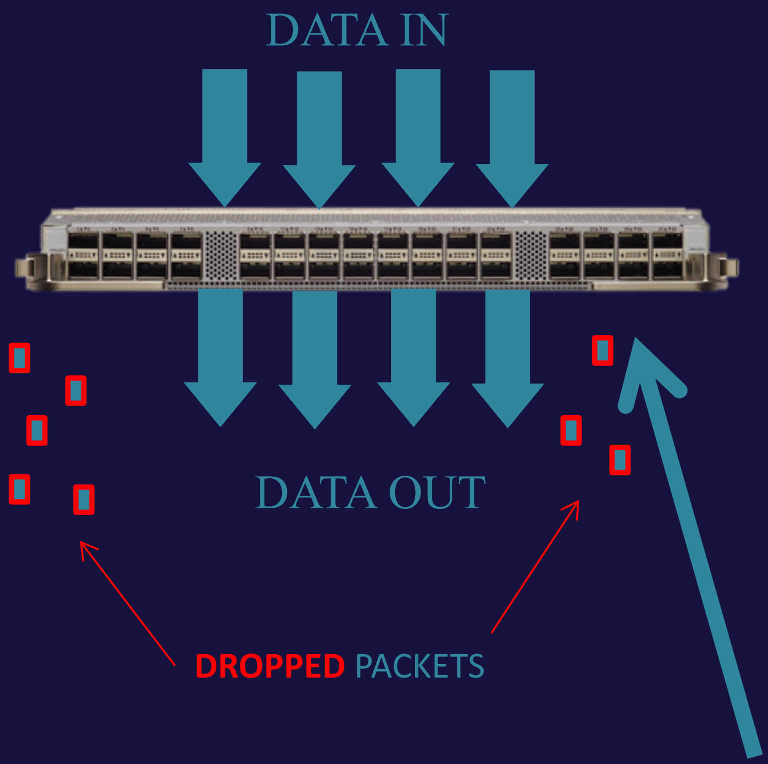
AND

AVERAGE AMOUNT OF DATA ENTERING = AVERAGE AMOUNT OF DATA EXITING

THEN BUFFER LEVEL VARIES…

…AND IF THE SWITCH BUFFER ISN’T BIG ENOUGH…

WITH AN IP SWITCH…



IF PACKET FLOW IS "BURSTY"
(TRAFFIC PROFILE IS WIDE)

AND

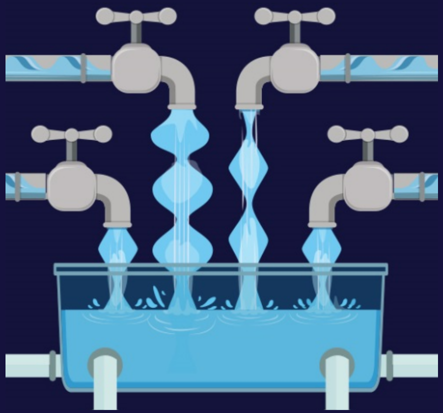
AVERAGE AMOUNT OF DATA ENTERING = AVERAGE AMOUNT OF DATA EXITING

THEN BUFFER LEVEL VARIES…

…AND IF THE SWITCH BUFFER ISN'T BIG ENOUGH…

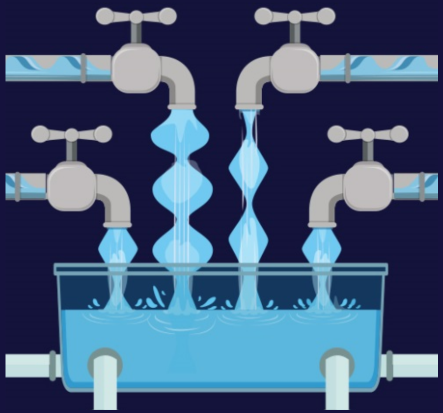
THE BUFFER OVERFLOWS

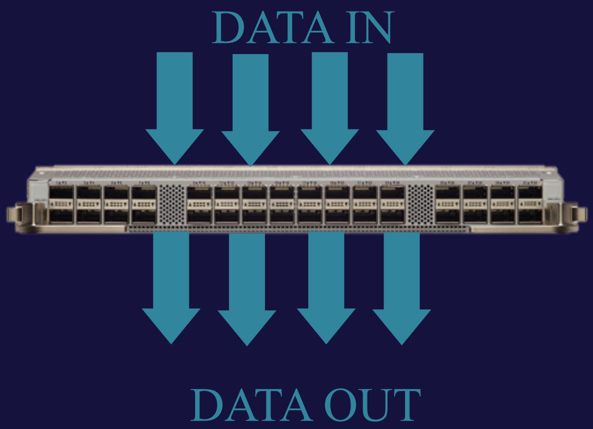
CONCLUSION



AS NON-UNIFORM WATER FLOWS REQUIRE A BIG ENOUGH BUCKET TO ACCOUNT FOR WATER LEVEL VARIATION…

CONCLUSION





AS NON-UNIFORM WATER FLOWS REQUIRE A BIG ENOUGH BUCKET TO ACCOUNT FOR WATER LEVEL VARIATION…

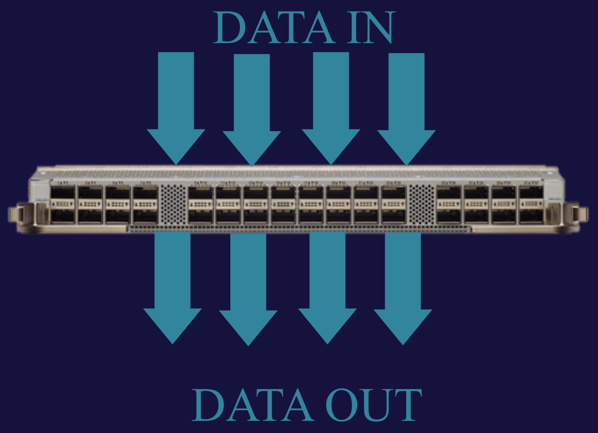
…NON-UNIFORM DATA FLOWS (WIDE TRAFFIC SHAPES) REQUIRE ENOUGH IP SWITCH BUFFER MEMORY TO ACCOUNT FOR DATA LEVEL VARIATION WITHIN THE SWITCH

CONCLUSION

TAKEAWAYS

- SUCH DEEP BUFFER MEMORY SWITCHES ARE AVAILABLE AND CAN BE SPECIFIED WHEN USING SMPTE ST 2110-21 WIDE TRAFFIC SHAPING. A DESIGN WITH WIDE TRAFFIC SHAPING ENABLES AN ALL SOFTWARE SOLUTION AND SUPPORTS THE MOVE TO DEMATERIALIZED FACILITIES

- USING SMPTE ST 2110-21 NARROW TRAFFIC SHAPING MINIMIZES SWITCH MEMORY REQUIRED



…NON-UNIFORM DATA FLOWS (WIDE TRAFFIC SHAPES) REQUIRE ENOUGH IP SWITCH BUFFER MEMORY TO ACCOUNT FOR DATA LEVEL VARIATION WITHIN THE SWITCH