

Step 1 : Daily Channel → DC Forecast (Input Table)				
Date	DC	Channel	SKU	Daily_Forecast_Qty
1/11/2025	DC-East	Retail	MR_HAIR_101	500
1/11/2025	DC-East	Amazon	MR_HAIR_101	350
1/11/2025	DC-East	Wholesale	MR_HAIR_101	150
1/11/2025	DC-East	D2C	MR_HAIR_101	100
1/11/2025	DC-Midwest	Retail	MR_HAIR_101	420
1/11/2025	DC-Midwest	Amazon	MR_HAIR_101	280
1/11/2025	DC-Midwest	Wholesale	MR_HAIR_101	120
1/11/2025	DC-Midwest	D2C	MR_HAIR_101	80

... daily rows for the rest
of the month ...

Step 3 : Daily Channel → DC Forecast (Input Table)				
ISO_Week	DC	SKU	Weekly_μ_DC	Weekly_σ_DC
2025-W45	DC-East	MR_HAIR_101	7,700	1,540
2025-W45	DC-Midwest	MR_HAIR_101	6,300	1,260

Step 4: Channel-wise DC View (keeps visibility by channel)					
Date	DC	SKU	Retail_Fcst	Amazon_Fcst	Wholesale_Fcst

1/11/2025	DC-East	MR_HAIR_101	500	350	150
1/11/2025	DC-Midwest	MR_HAIR_101	420	280	120
...

Formula:

```
Daily_Forecast_DC = Retail_Fcst + Amazon_Fcst + Wholesale_Fcst + D2C_Fcst
```

1) Forecast Layer → Aggregate demand to each DC

What changes: instead of store/channel demand only, the DC's demand is the **sum of the channels**!

- Mean demand:

$$\mu_{DC}(t) = \sum_{c \in \{\text{Retail, Amazon, Wholesale, D2C}\}} \mu_c(t)$$

” Ask ChatGPT

- Variability (weekly or daily to match lead time):
 - If you assume independence:

$$\sigma_{DC} = \sqrt{\sum_c \sigma_c^2}$$

- If channels are correlated, include covariances:

$$\sigma_{DC} = \sqrt{\sum_c \sigma_c^2 + 2 \sum_{i < j} \rho_{ij} \sigma_i \sigma_j}$$

(Tip: estimate ρ_{ij} from history; if unknown, use a conservative $\rho \in [0.2, 0.4]$).

Outputs to next layer: μ_{DC} , σ_{DC} per SKU×DC per period.

Forecast Layer → Aggregate demand to each DC

Step 2: Daily DC Aggregation (by DC, all channels)

Date	DC	SKU	Daily_Forecast_DC	Note
1/11/2025	DC-East	MR_HAIR_101	1,100	500+350+150+100
1/11/2025	DC-Midwest	MR_HAIR_101	900	420+280+120+80
...

Formula (semantic):

```
Daily_Forecast_DC = SUMIFS(Daily_Forecast_Qty, by Date, DC, SKU across all Channels)
```

(Implementation examples)

- SQL:

sql

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```
SELECT Date, DC, SKU, SUM(Daily_Forecast_Qty) AS Daily_Forecast_DC
FROM ChannelForecastDaily
GROUP BY Date, DC, SKU;
```

- Pandas:

python

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```
df_dc = df.groupby(['Date', 'DC', 'SKU'], as_index=False)['Daily_Forecast_Qty'].sum()\
    .rename(columns={'Daily_Forecast_Qty': 'Daily_Forecast_DC'})
```

D2C_Fest

Daily_Forecast_DC

100	1,100
80	900
...	...

it serves.



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