

Hubs: Blessing, Bane...or Both?

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Agenda

- Background/History
- Domestic
- International
- Some Economic Nuances

In the “Old Days” (pre-Hub)

- Flights went from origin to destination via intermediate points
- Flights typically flowed in a general direction (east/west; north/south)
- Flights moving in the same direction at similar times connected with each other at major stations

Effective June 1, 1970

(EXCEPT AS NOTED)

WESTBOUND

FLT. NO. →	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y		CITY CODE		F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	F&Y	FLT. NO. ←		
	491	563	467	219	157	409	315	175	195	117	149	319	485	143	79		BOS		537	197	155	381	141	553	91	517	547	323	171	107	561	101	501			
	DC-9	B-727S	B-727	DC-9	B-727S	B-727	B-727S	CV-880	B-131B	B-131B	B-727S	B-727	B-727S	B-131	B-727S		BOS		DC-9	CV-880	B-131	CV-880	B-331	DC-9	B-131B	B-727	DC-9	B-727	B-727S	B-727S	B-727	B-727S	DC-9			
BOS BDL JFK	Originates STL Sun.			Originates PIT Sun.	Originates ORD Sun.	B 8 25					A 10 00 E				Originates IND Sun.		BOS BDL JFK		Daily Except Sun.					Daily Except Sun.	B 7 55					Originates BAL Sun.			BOS BDL JFK			
JFK LGA EWR PHL		B 8 00		B 7 15	Daily Except Sun.	B 8 45					A 9 45 E				B 8 55		JFK LGA EWR PHL		B 8 15	A 8 30 E C P	A 8 30 E C P	A 9 05 E C P	A 9 30 E C P	N 7 00 V	S 9 15		A 10 45 E P L	C 12 00 P L		C 10 30		JFK LGA EWR PHL				
PHL BAL DCA IAD	B 7 59			B 8 45		S 9 00	S 9 45				B 8 05						PHL BAL DCA IAD				RA	RA	RA			C 11 45 L			C 11 55 P L	C 12 00 P L		PHL BAL DCA IAD				
IAD MDT PIT						B/C					B/C						IAD MDT PIT			9 40				S 7 49 8 15 9 03			B/C					IAD MDT PIT				
PIT CLE DTW CMH		B 8 00		S 8 55													PIT CLE DTW CMH		S 9 30				C 10 00 P L			10 53				C 12 00 P L		PIT CLE DTW CMH				
CMH DAY DAY CVG SDF IND								10 25 10 55		10 50			9 55	10 32 11 15		10 49	CMH DAY DAY CVG SDF IND								RA		12 58 1 25 1 51					CMH DAY DAY CVG SDF IND				
IND MIA TPA ATL BNA MDW ORD				9 49	9 29	10 05	10 52	10 42	10 56	11 14	10 52		Q 8 30 9 20 9 50		11 30		IND MIA TPA ATL BNA MDW ORD																IND MIA TPA ATL BNA MDW ORD			
ORD				C 10 30 P L		C 10 35 P S	11 45	11 40	11 45	11 55	Connects Flts 117 195 & 175			10 58	11 22	11 23	ORD							Connects Flts 157 195 & 315			Connects Flts 421 & 431					ORD OMA DSM				
STL	9 04	9 17	9 30	9 30										C 11 30 P L	11 22	11 23	STL		12 24								1 27	1 27	1 15	1 03	1 26	STL TUL OKC MKC				
STL TUL OKC MKC	Q 9 35	10 00	10 00	11 30	Connects Flt. 563				RA	F/Y/K				C 11 30 P L	C 12 00 P L	12 00	STL TUL OKC MKC		Connects Flts 171 & 107							C 2 00 P S	2 00	2 00	2 00	Connects Flts. 171 & 107	Connects Flts. 171 & 107	STL TUL OKC MKC				
MKC ICT AMA DEN							12 20 12 45 1 38 2 05											MKC ICT AMA DEN										RA			2 56		MKC ICT AMA DEN			
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LAX OAK SFO HNL								1 58										LAX OAK SFO HNL																	LAX OAK SFO HNL	
COL. NO. →	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	←
	491	563	467	219	157	409	315	175	195	117	149	319	485	143	79				537	197	155	381	141	553	91	517	547	323	171	107	561	101	501			

Effective June 1, 1970

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→	491	563	467	219	157	409	315	175	195	117	149	319	485	143	79		537	197	155	381	141		553	91	517	547	323	171	107	561	101	501	←			
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IAD MDT PIT				S 8 31		B/C								B/C		IAD MDT PIT										B/C				IAD MDT PIT						
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Connections

- Often required more than one airline, since route authority was constrained by regulation
- More than one connection could be required
- Smaller points had fewer connecting opportunities

Dynamics of the hub

- Most effective when service area around hub is 360 degrees
- Flights operate in 'banks' that arrive and depart in a close timeframe
- An inbound flight from a 'spoke' point has many connecting opportunities







The Result

- In the U.S. domestic market, most trips can be completed with a single connection, even from small cities
- In international markets, vast majority of traffic accommodated on at most three flights/two hubs (“hub to hub”)

Early Hub Usage

- Passenger carriers typically didn't have 'full' route authority at their hubs prior to Deregulation; Delta at Atlanta was probably the closest to a true hub
- FedEx (then Federal Express) began operating in the early 1970s using the hub and spoke concept





John Shelby

FEDERAL
EX

5AA 2635 FE

305

5AA 0311 FE

310

Rank	Location	Rank	Location
1	Atlanta	16	Bangkok
2	Beijing	17	New York (JFK)
3	London (LHR)	18	Singapore
4	Chicago (ORD)	19	Guangzhou
5	Tokyo (HND)	20	Shanghai (PVG)
6	Los Angeles	21	San Francisco
7	Paris (CDG)	22	Phoenix
8	Dallas/Ft Worth	23	Las Vegas
9	Frankfurt	24	Houston
10	Hong Kong	25	Charlotte
11	Denver	26	Miami
12	Jakarta	27	Munich
13	Dubai	28	Kuala Lumpur
14	Amsterdam	29	Rome
15	Madrid	30	Istanbul

Source: Airports Council International, 2011 passenger data

Rank	Location	Rank	Location
1	Atlanta	16	Bangkok
2	Beijing	17	New York (JFK)
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4	Chicago (ORD)	19	Guangzhou
5	Tokyo (HND)	20	Shanghai (PVG)
6	Los Angeles	21	San Francisco
7	Paris (CDG)	22	Phoenix
8	Dallas/Ft Worth	23	Las Vegas
9	Frankfurt	24	Houston
10	Hong Kong	25	Charlotte
11	Denver	26	Miami
12	Jakarta	27	Munich
13	Dubai	28	Kuala Lumpur
14	Amsterdam	29	Rome
15	Madrid	30	Istanbul

Source: Airports Council International, 2011 passenger data

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Principal Hubs: Pre-Deregulation

Hub	Carriers
ATL	DL, EA
DEN	CO, FL, UA
DFW	AA, BN, DL
ORD	AA, TW, UA

Principal Domestic Hubs: Mid-1990s

Hub	Carriers
ATL	DL
CLE	CO
CLT	US
CVG	DL
DEN	UA
DFW	AA, DL
DTW	NW
EWR	CO
IAD	UA
IAH	CO

Hub	Carriers
LAS	HP
MEM	NW
MSP	NW
ORD	AA, UA
PHL	US
PHX	HP (WN?)
PIT	US
SFO	UA
SLC	DL
STL	TW

Principal Domestic Hubs: 2014

Hub	Carriers
ATL	DL
CLE	CO UA
CLT	US AA
CVG	DL
DEN	UA
DFW	AA, DL
DTW	NW DL
EWR	CO UA
IAD	UA
IAH	CO UA

Hub	Carriers
LAS	HP
MEM	NW DL
MSP	NW DL
ORD	AA, UA
PHL	US AA
PHX	HP AA
PIT	US
SFO	UA
SLC	DL
STL	TW

Before and After

- Prior to Deregulation: few hubs, competition at hubs
- After Deregulation: many hubs, competition between hubs
- Competition between hubs produces excess capacity, as each carrier vies for marginal/filler traffic, at increasingly lower yields



**PIEDMONT
AIRLINES**

System Schedule Effective July 1, 1981.



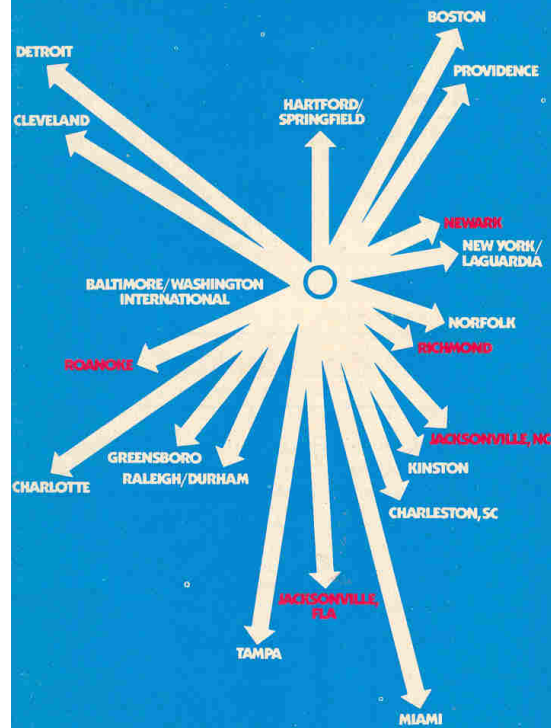
More than 500 times a day, we take off for over 80 cities.



PIEDMONT AIRLINES

System Schedule Effective September 15, 1983.

NEW SPOKES FOR OUR BALTIMORE HUB.

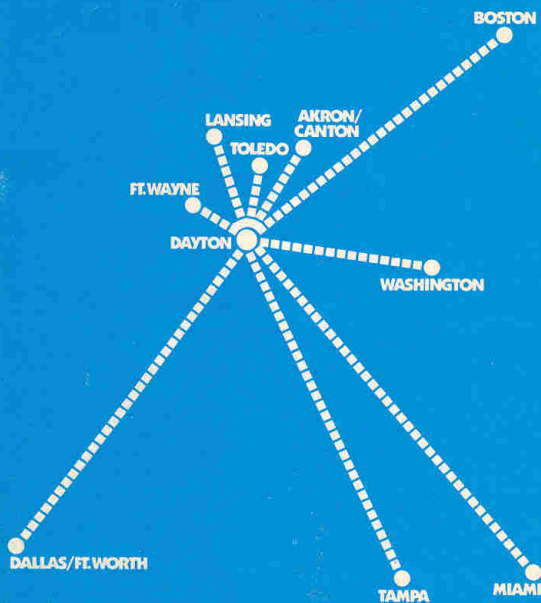




**PIEDMONT
AIRLINES**

System Schedule Effective July 1, 1982.

Introducing Our Newest Hub.



Re-Purposing Former Hubs

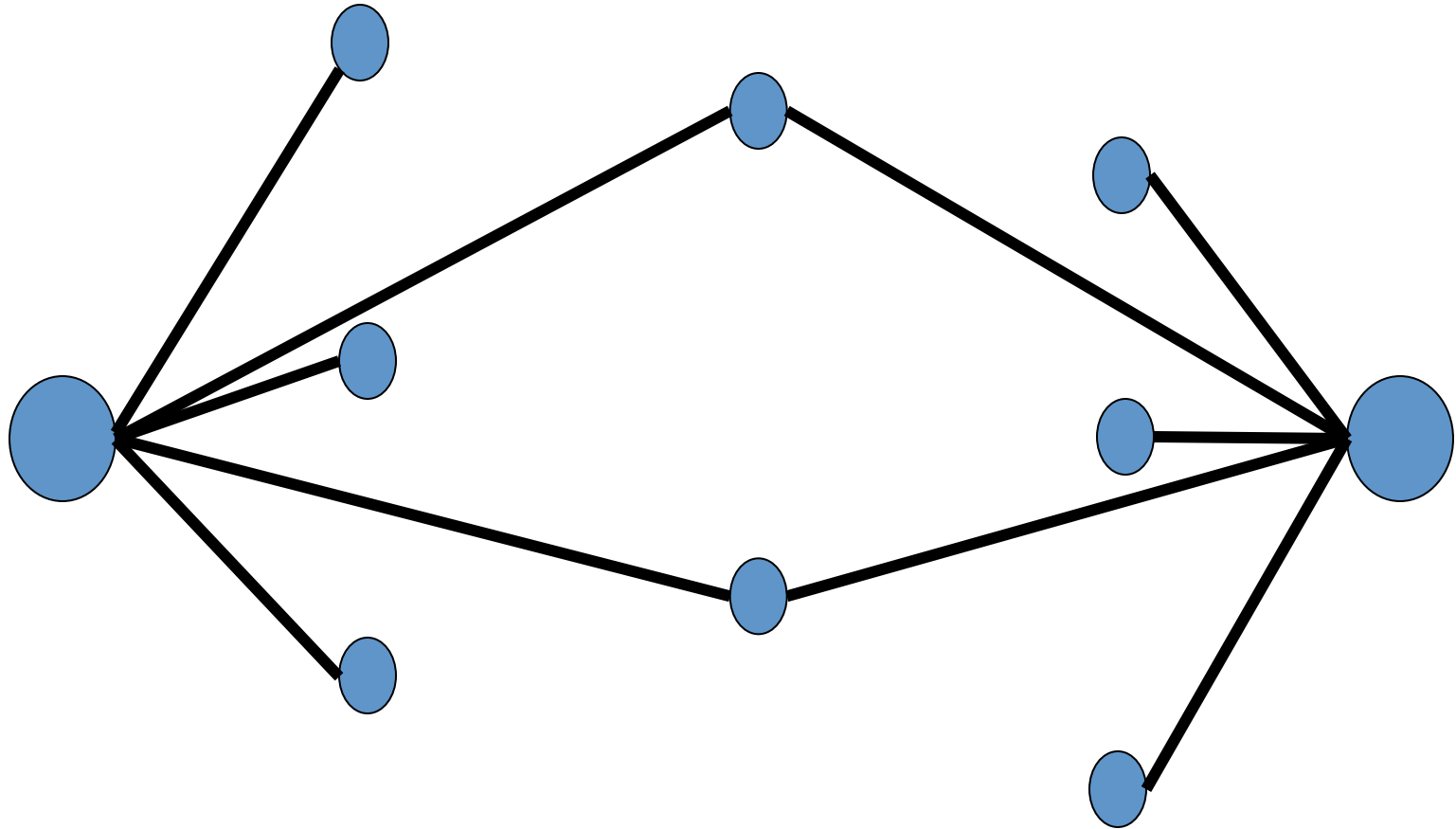
Location	Previous Hub	Current
BWI	US	WN
BNA	AA	WN
MDW	ML	WN
RDU	AA	WN
SJC	AA	WN





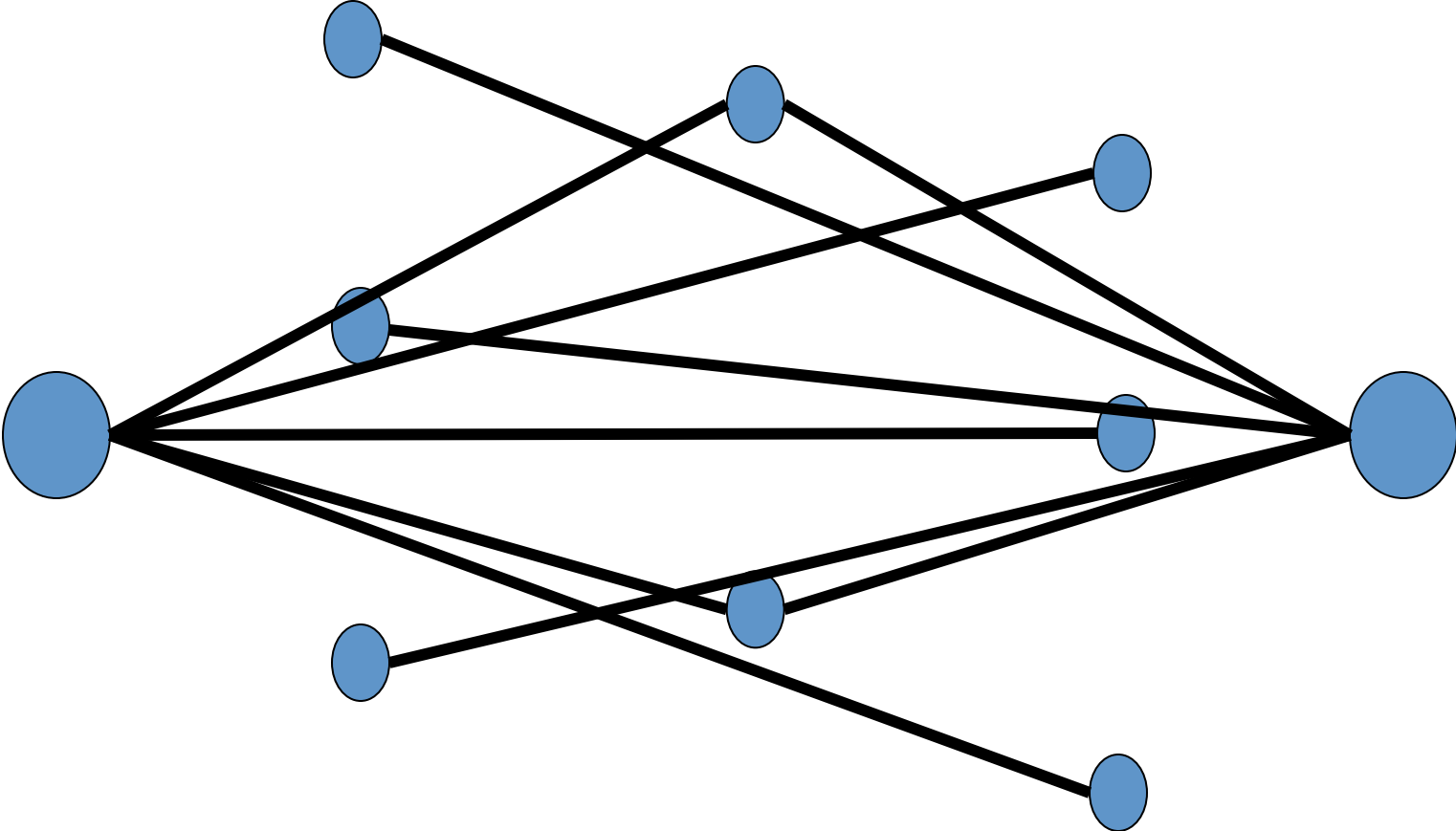


Old Paradigm: Unique Catchment Areas





New Paradigm: Overlapping Catchment Areas















USAIR

USAIR

USAIR

N315AU



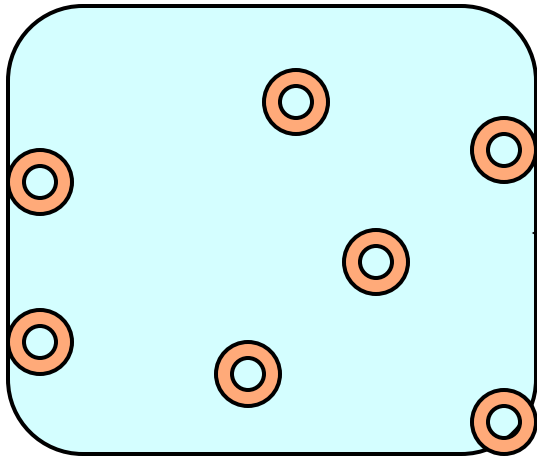
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**Is Flying Over Water More Economic
Than Flying Over Land?**

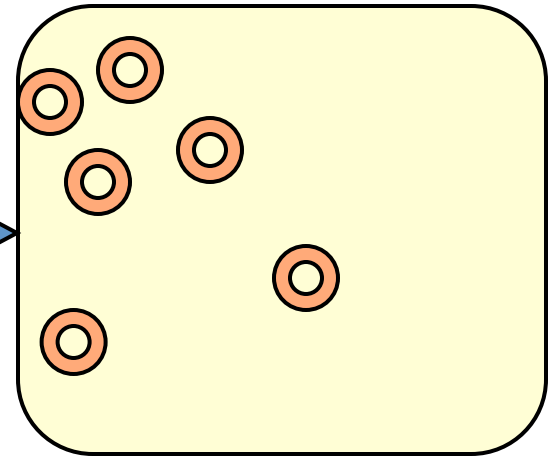
Transatlantic

N. America



Hubs

Europe



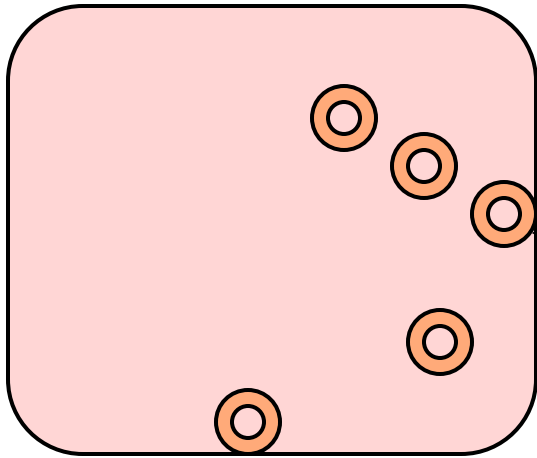
Hubs

No Hubs



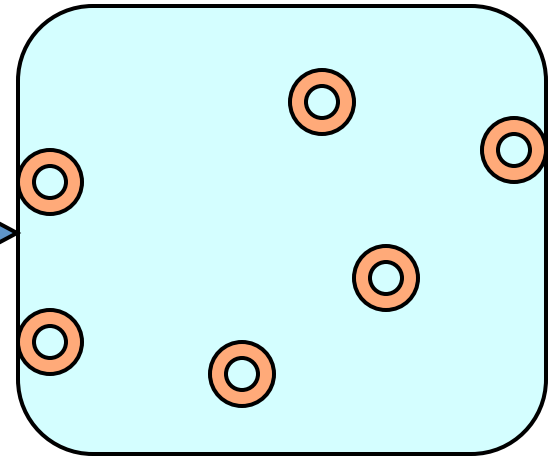
Transpacific

Asia



Hubs

N. America



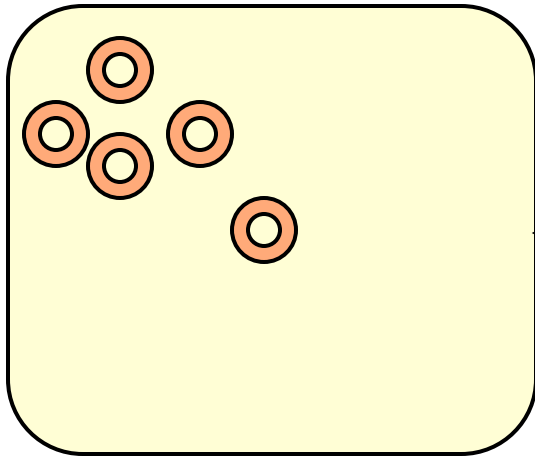
Hubs

No Hubs



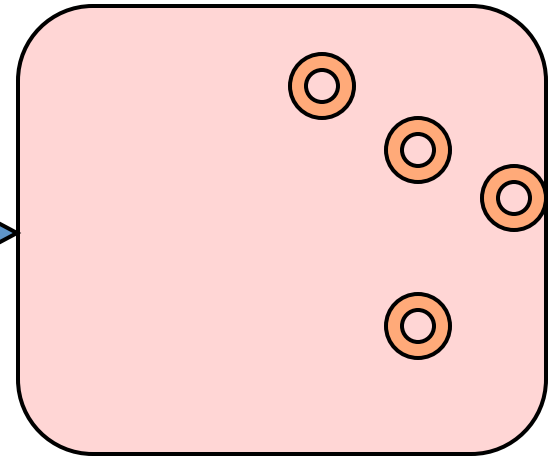
Europe-N. Asia

Europe



Hubs

N. Asia

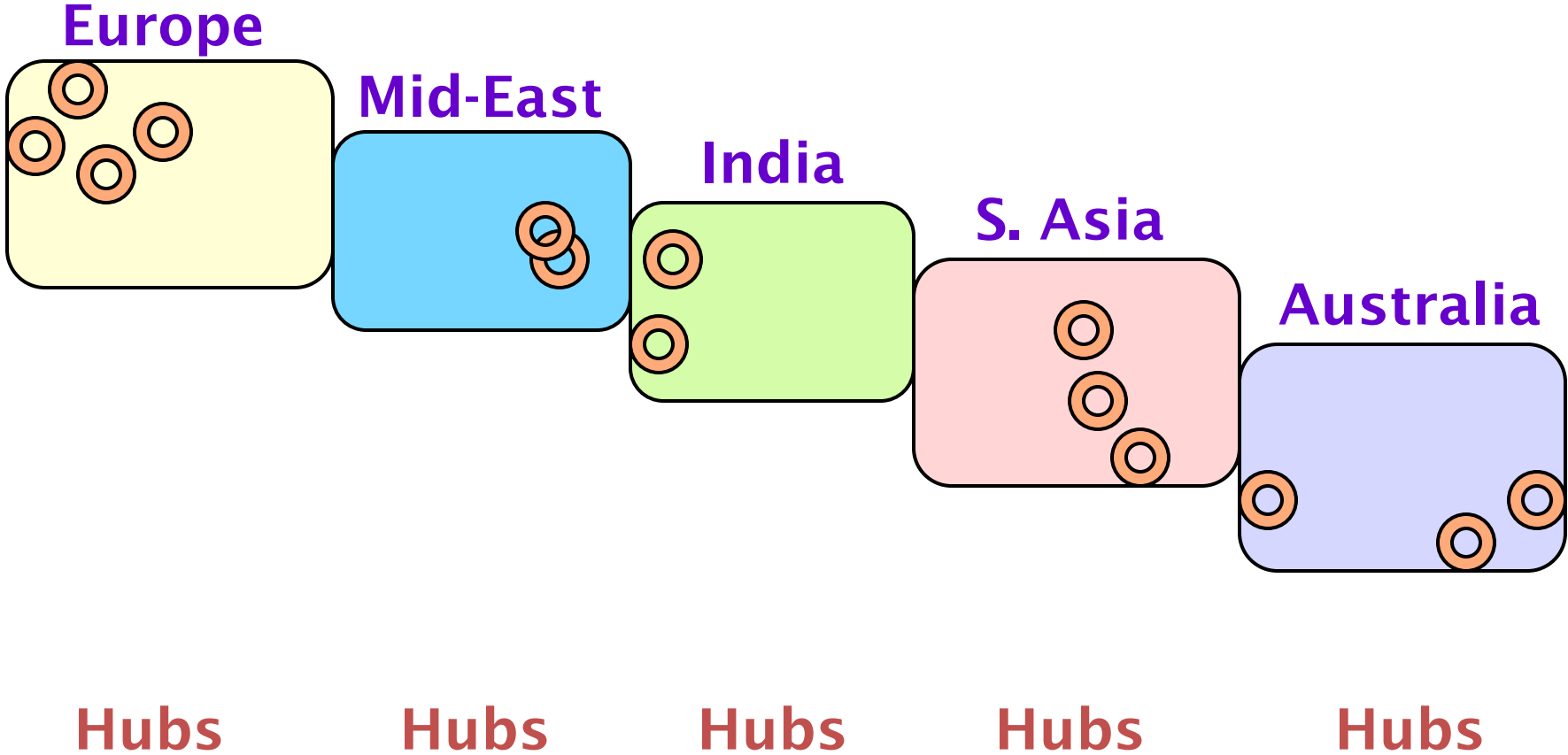


Hubs

No Hubs



Europe-S. Asia/Australia (aka The Gauntlet)



What are Some of the Implications?

- Short run: continuing bloodbath
- India could also enter the connecting market; probably better off to stick with O&D
- 787/A350 may divert more premium traffic in smaller markets to nonstop
- Development of African hubs may also divert traffic

Alliances

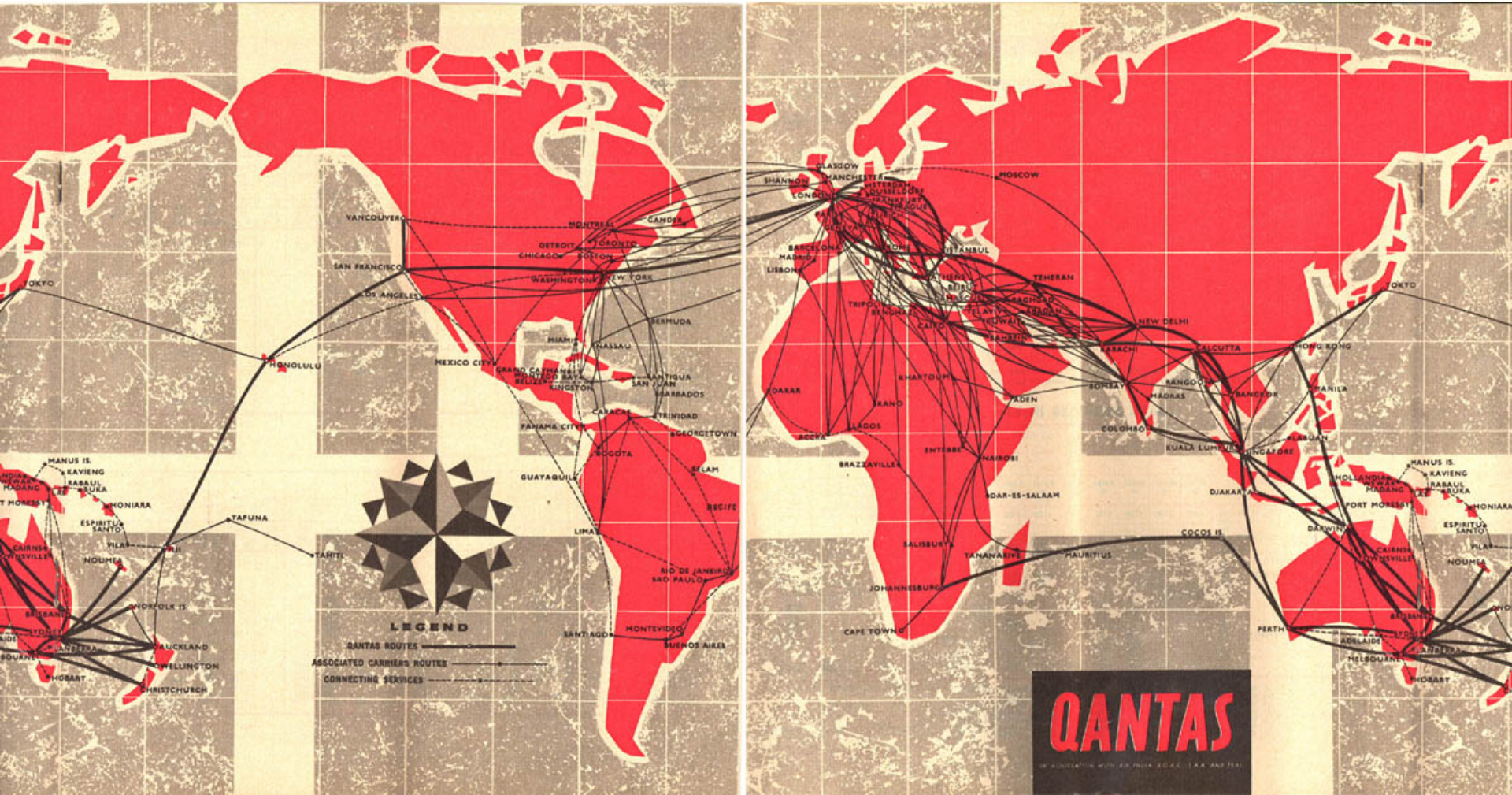


Implications of Alliances

- Alliances permit service to many markets, but constrained by participant route structures
- Primarily a means of gaining additional traffic, particularly in business markets
- May reduce competition
- Still a role for bilateral code-sharing?

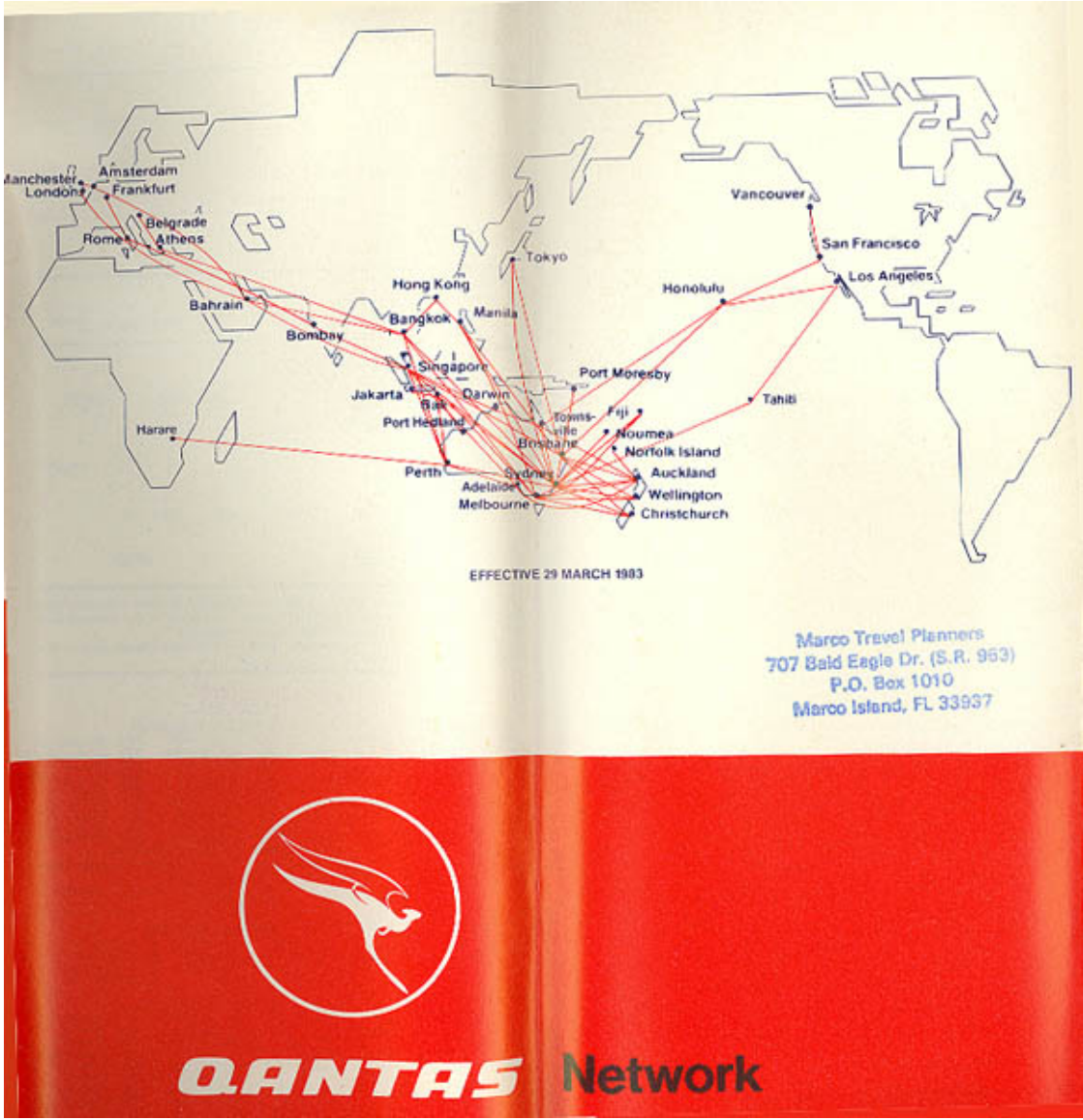


Qantas 1962 Route Structure



Source: airhive.com

Qantas 1983 Route Structure



Source: airhive.com

Alliances



QANTAS + Emirates

The World's Leading Airline Partnership.
Together we're connecting the globe.

Subject to regulatory approval, including from the ACCC

QANTAS-Served Points in Europe at the time of the Emirates partnership

- LHR
- FRA

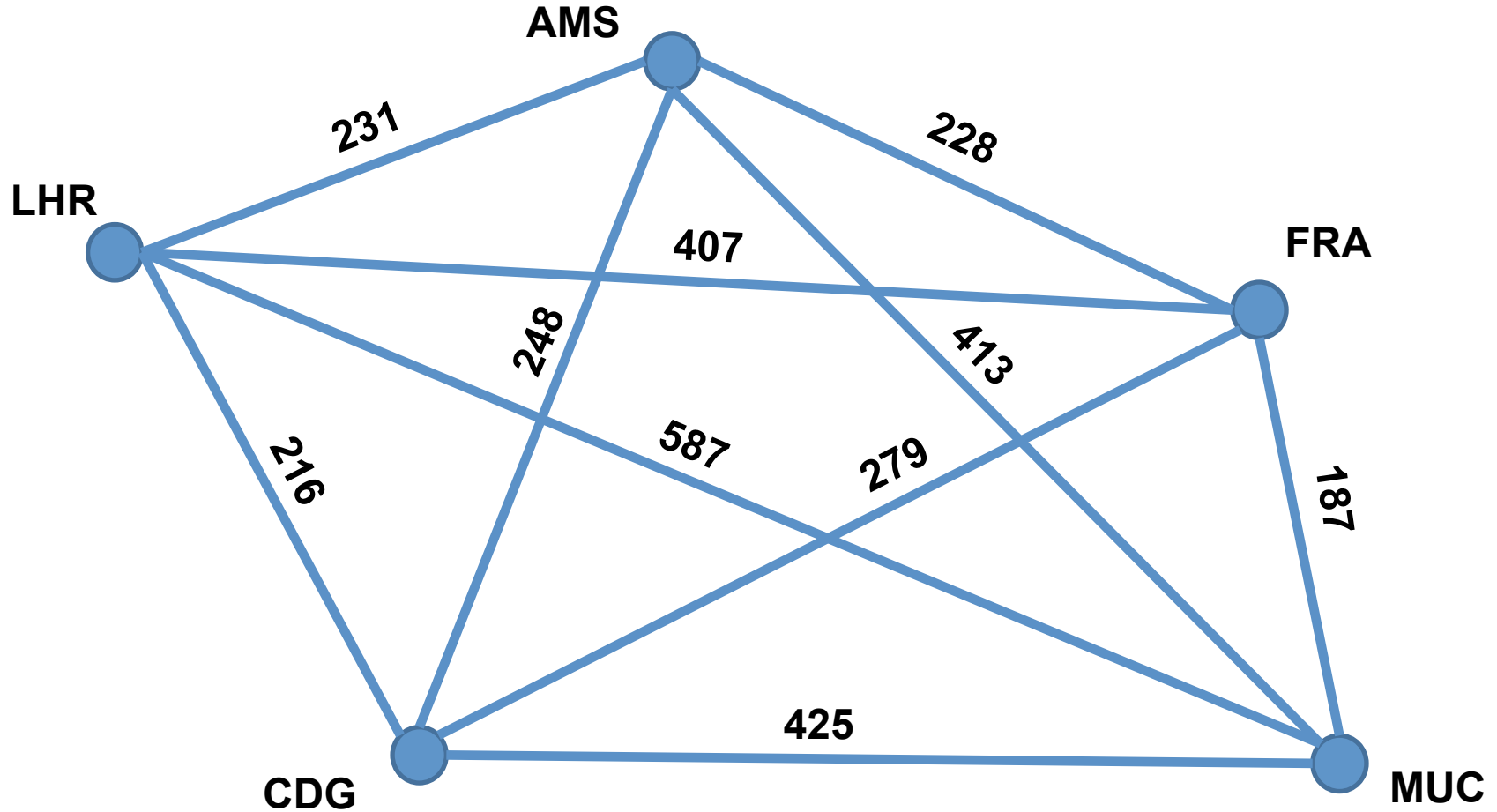
Three Hubs in a Small Area

From/To	Abu Dhabi	Doha	Dubai
Abu Dhabi	-	238	72
Doha	202	-	238
Dubai	72	202	-

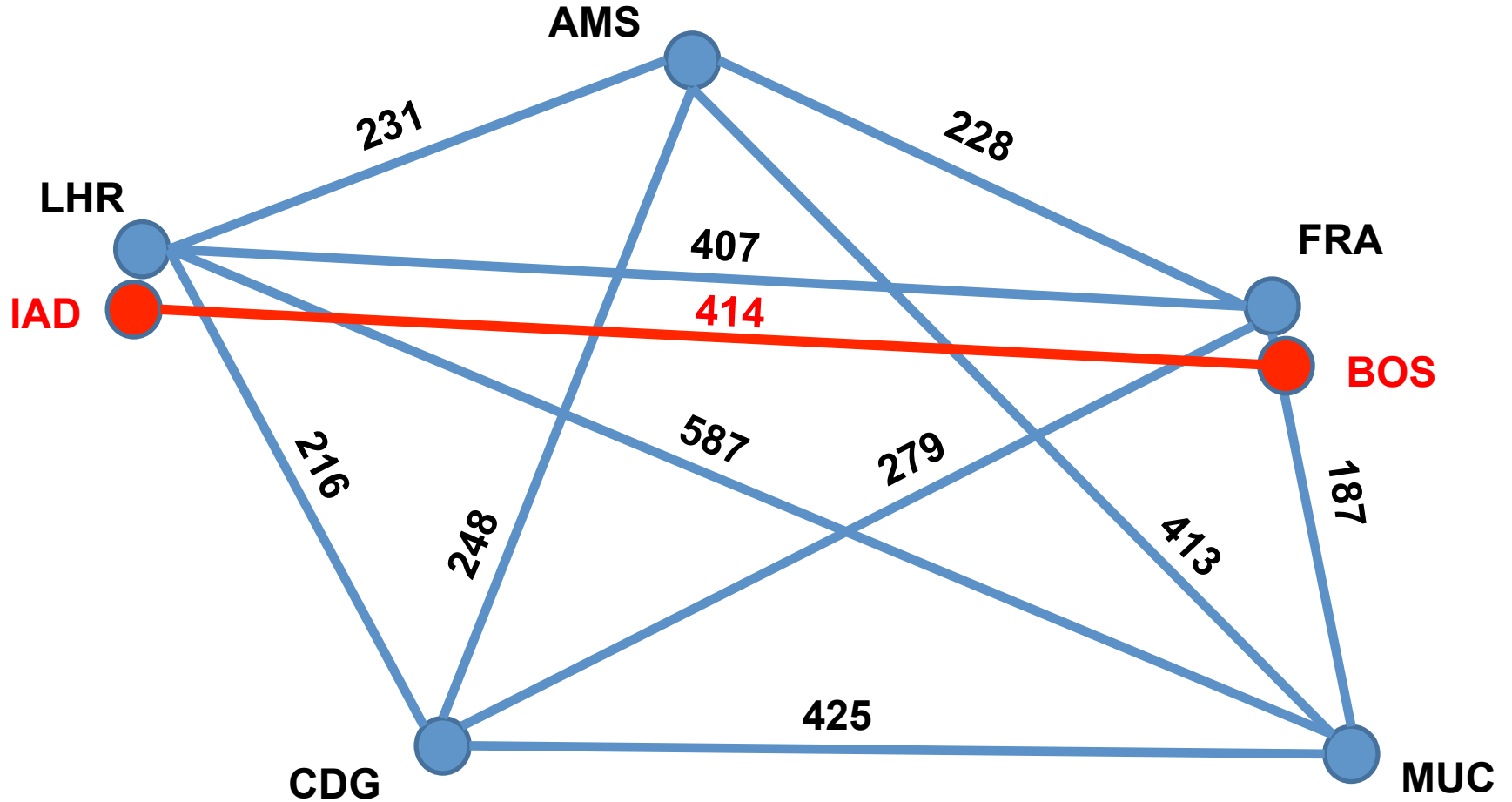
Three Hubs in a Small Area

- All competing for the same long-haul flows
- Modest local markets
- No domestic flow
- Not likely all three can survive, much less prosper...
- One has a significant lead over the others

Western Europe's Hubs are Located in a Relatively Small Area



Putting This in a Different Perspective



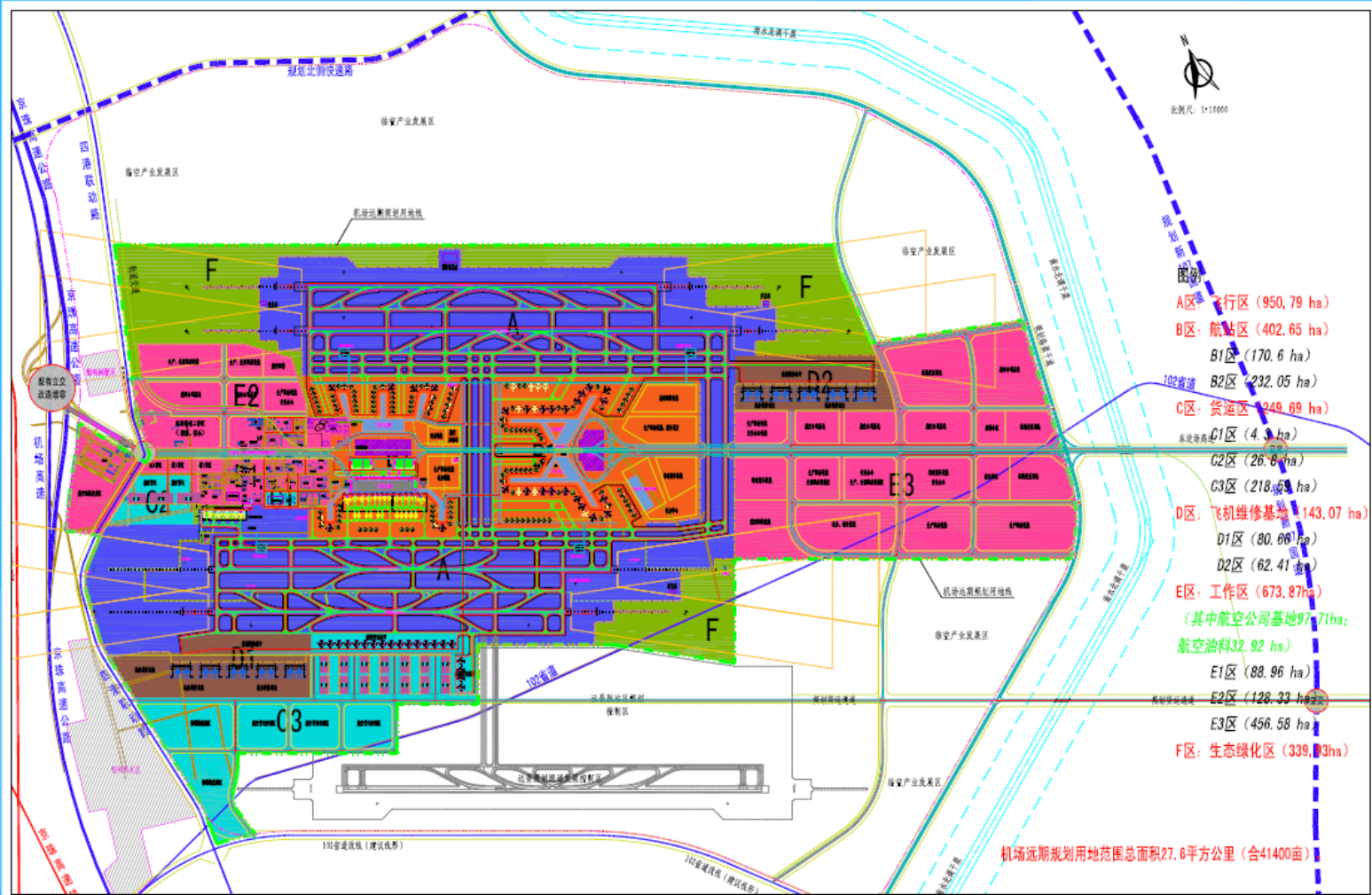
Asia-Proliferation of Hubs

- Northern: Japan, Korea
- China: Beijing, Guangzhou, Hong Kong, Shanghai
- Southeast: Singapore, Bangkok, Kuala Lumpur
- India?

Asia: Can all these be Sustained?

- Chinese hubs have enormous domestic feed potential

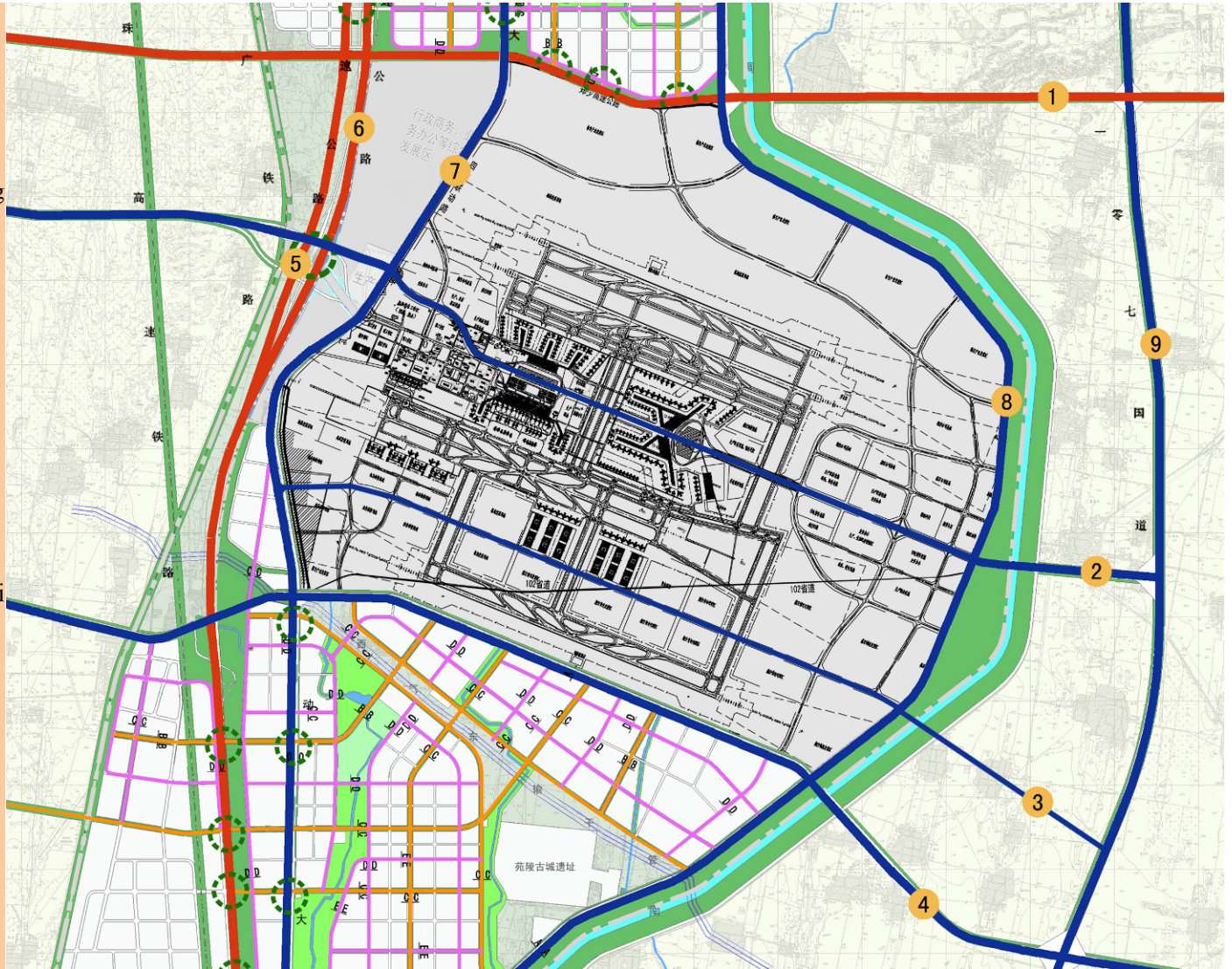
Land Utilization Plan for the Core Area of Zhengzhou Xinzheng International Airport



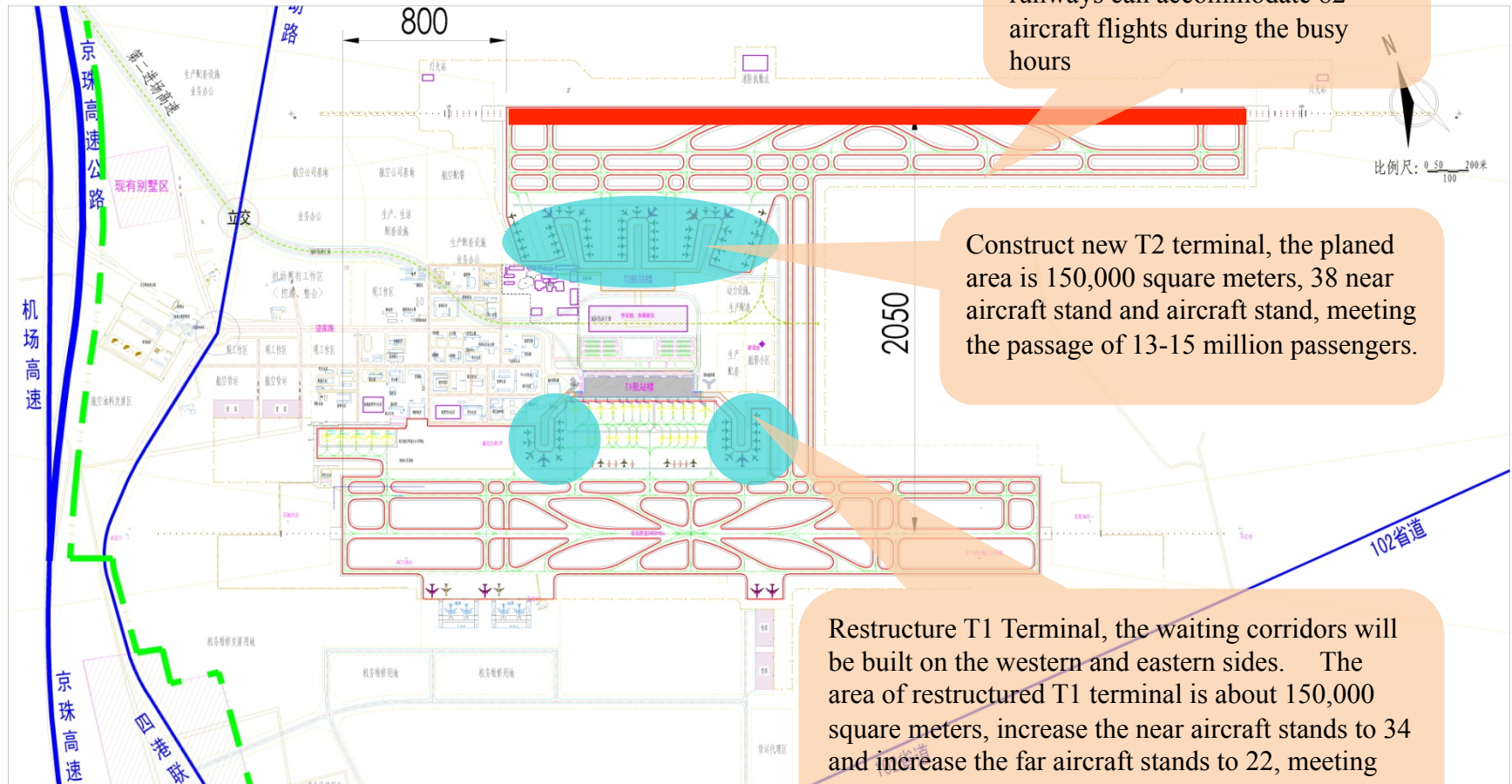
Excellent Highway Access Around the Airport

Traffic Backbone Network of Four Horizontal Lines and Five Vertical Lines :

- ▶ First Horizontal Line: Zhengshao Expressway (Dengfeng—Airport—Shangqiu Expressway)
- ▶ 2nd horizontal line: 2nd Expressway to the Airport
- ▶ 3rd horizontal line: Cargo Passage to the Airport
- ▶ 4th horizontal line: No.102 Provincial Highway
- ▶ First Vertical Line: Expressway to the Airport
- ▶ 2nd Vertical Line: Beijing-Zbuhai Expressway
- ▶ 3rd Vertical Line: Road Linking for Ports
- ▶ 4th Vertical Line: Circle Line of the Airport
- ▶ 5th Vertical Line: New Highway 107



Key Projects - Recent Construction



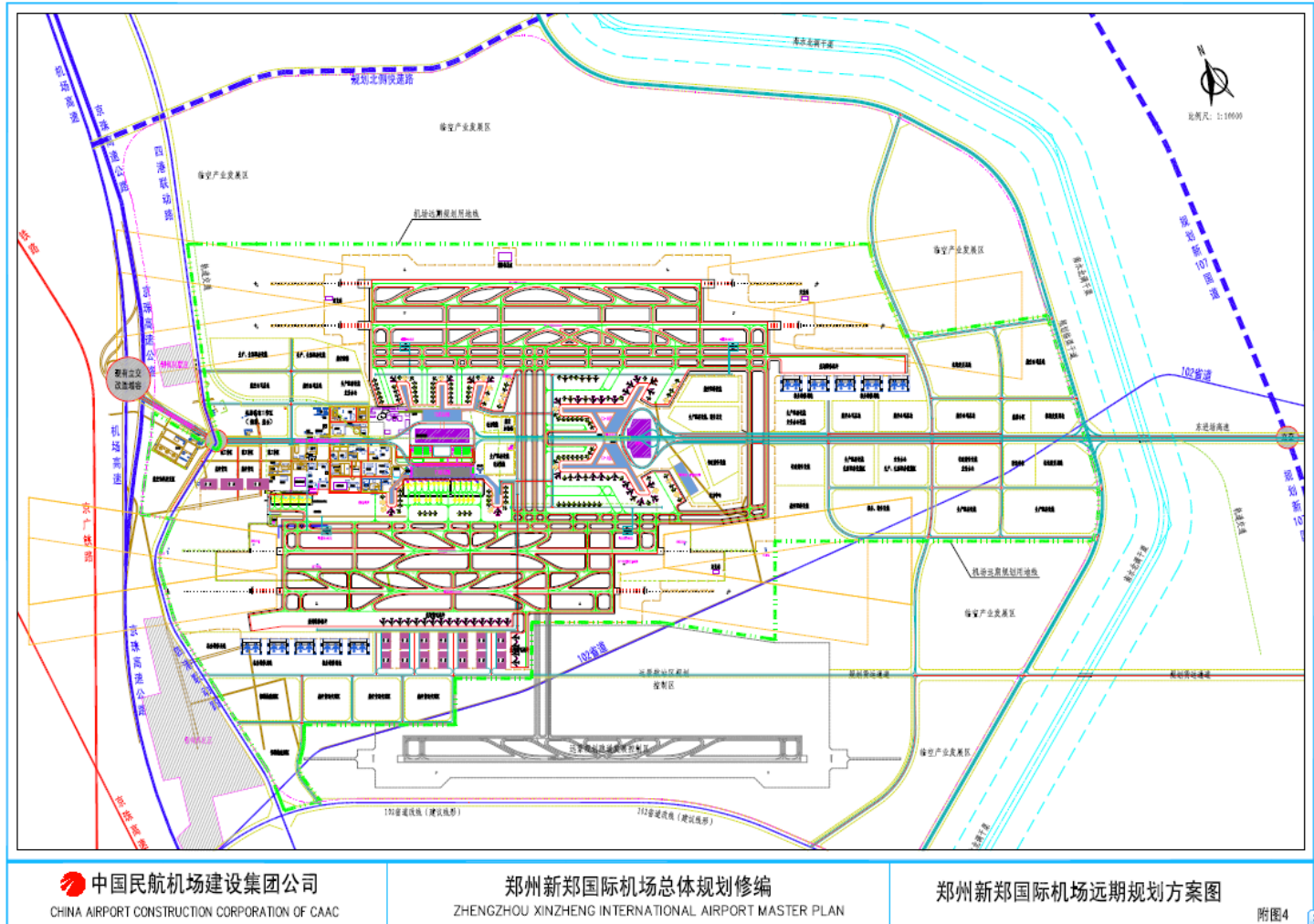
Construct the 2nd F-class 3600-m long-distance runway; the two runways can accommodate 82 aircraft flights during the busy hours

Construct new T2 terminal, the planned area is 150,000 square meters, 38 near aircraft stand and aircraft stand, meeting the passage of 13-15 million passengers.

Restructure T1 Terminal, the waiting corridors will be built on the western and eastern sides. The area of restructured T1 terminal is about 150,000 square meters, increase the near aircraft stands to 34 and increase the far aircraft stands to 22, meeting the traffic of 13-15 million passengers

Long-term Plan for the Airport

- ▶ Two sets of near-distance 4 runways, the distance between the main runways is 2050m
- ▶ The 2nd and 3rd Runway 4F, the existing runway, the 4th runway and reserve the 5th runway
- ▶ 140 aircraft fights during busy hours



Asia: Can all these be Sustained?

- Chinese hubs have enormous domestic feed potential
- Four (including Hong Kong) in a country China's size (and likely the largest economy at some point) probably are not unwarranted
- Key to success: avoid overbuilding on the way up (see U.S.)

Asia: Can all these be Sustained?

- Japanese developing Haneda as full domestic/international hub (Kansai hasn't worked out)
- Incheon nearby, but smaller local market
- Singapore was prototype for non-O&D long-haul hub; can others succeed now (and what happens to Singapore?)

Africa

- East Africa: potential competition between Addis Ababa and Nairobi
- West Africa: Nigeria has largest population, economy but Lagos hasn't developed into a hub yet
- South Africa has domestic feed and major international service, but geography is poor

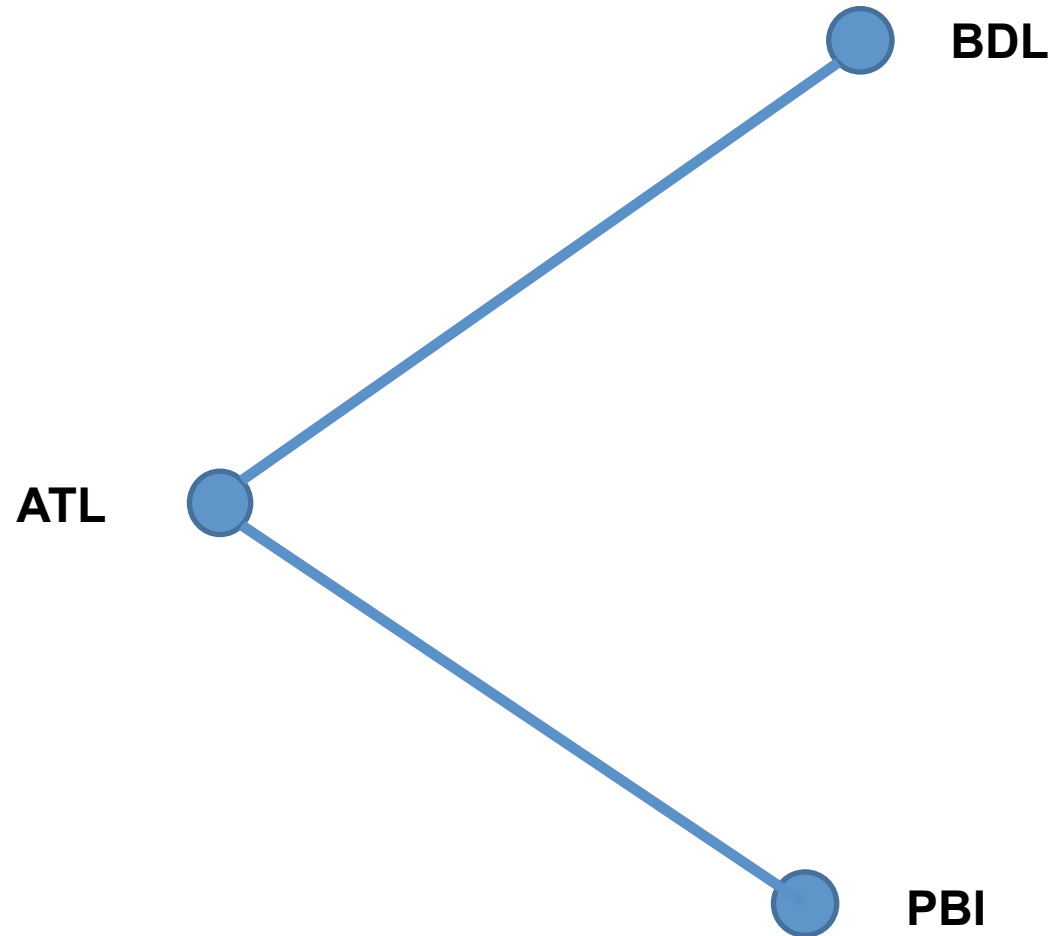
Latin America

- Significant domestic markets in Argentina, Brazil and Colombia; airline situations vary
- Copa has developed north-south Singapore-style hub
- LAN has developed significant international presence from relatively small (population) country

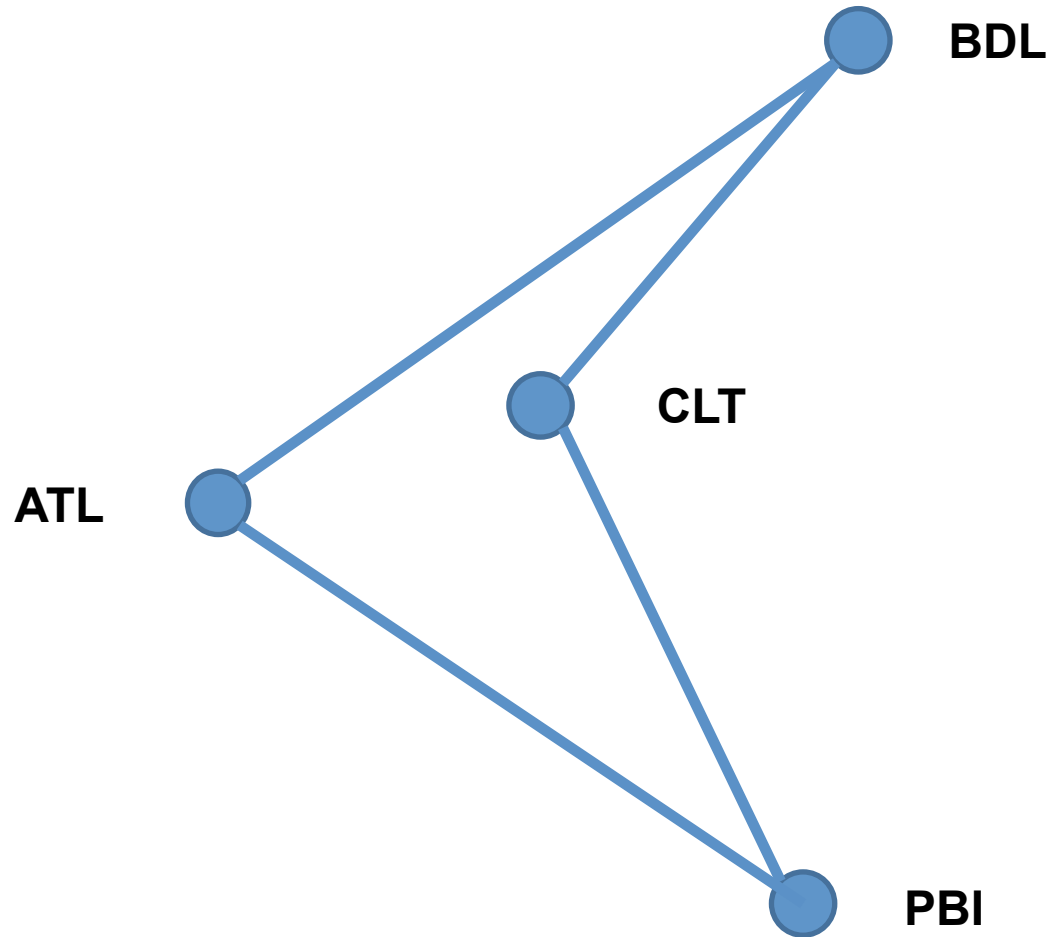
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Hub: Useful When No Nonstop Service



Competition Between Hubs

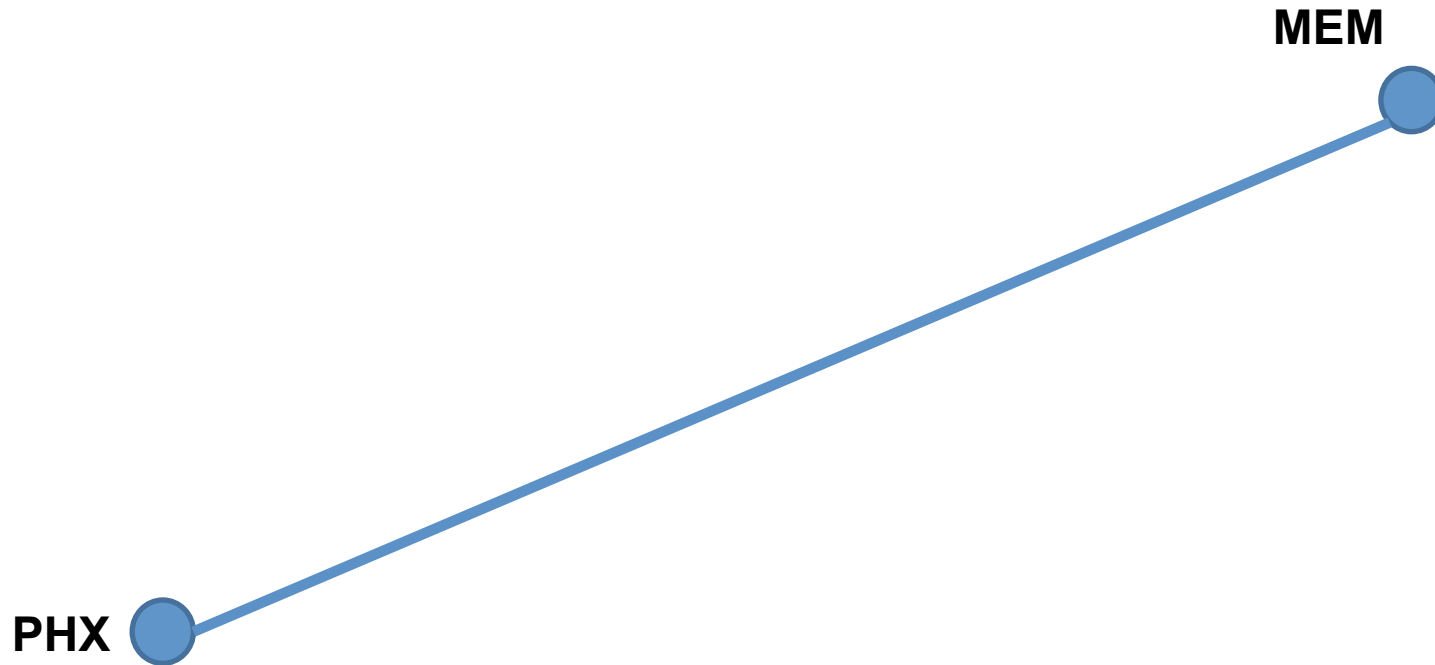


Some Routings are More Efficient

	Distance	% of Nonstop
Nonstop	1138	100%
BDL-ATL-PBI	1410	124%
BDL-CLT-PBI	1239	109%



Hub Elimination...



...Causes Loss of MEM-PHX Nonstop

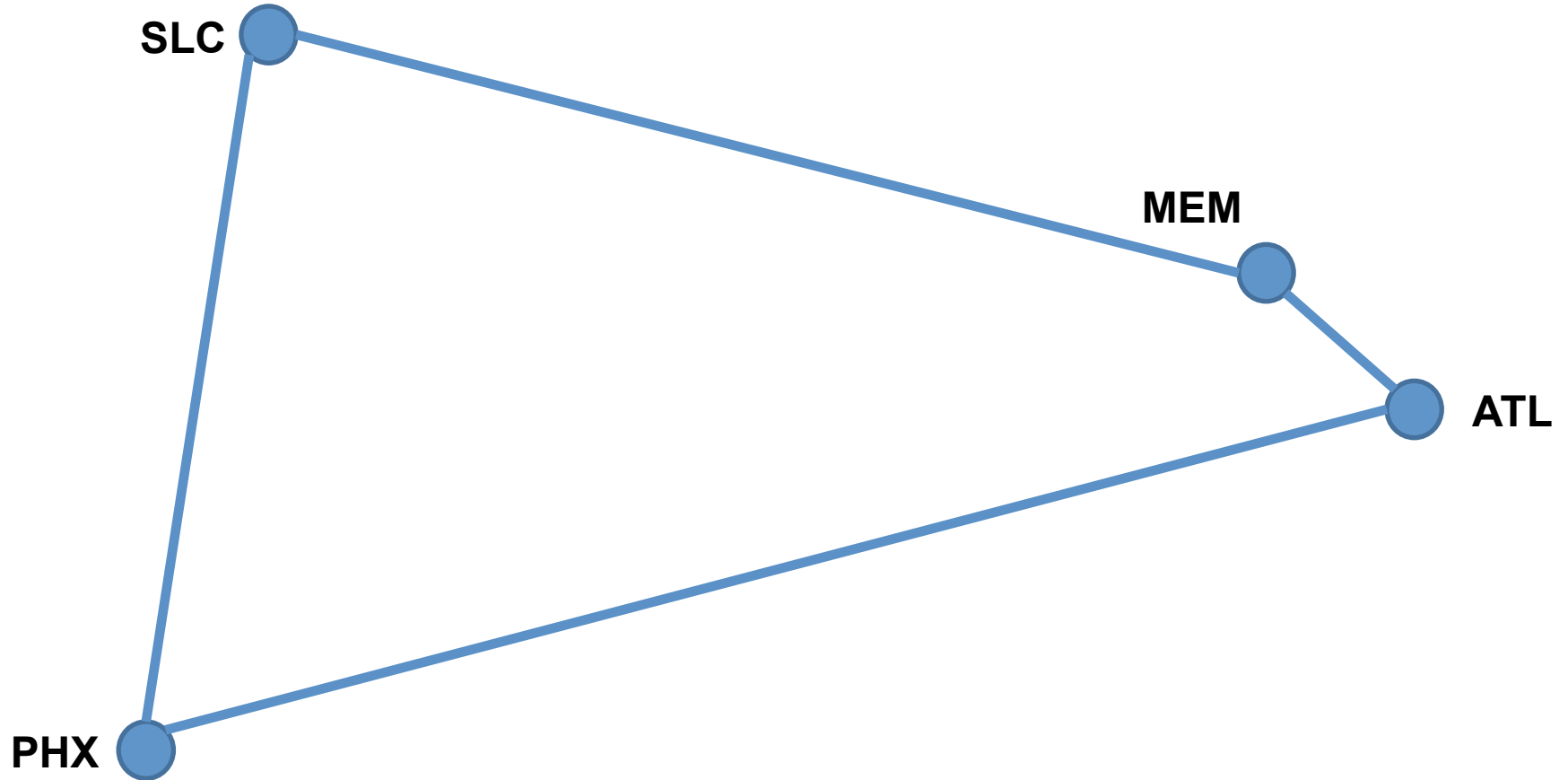
MEM



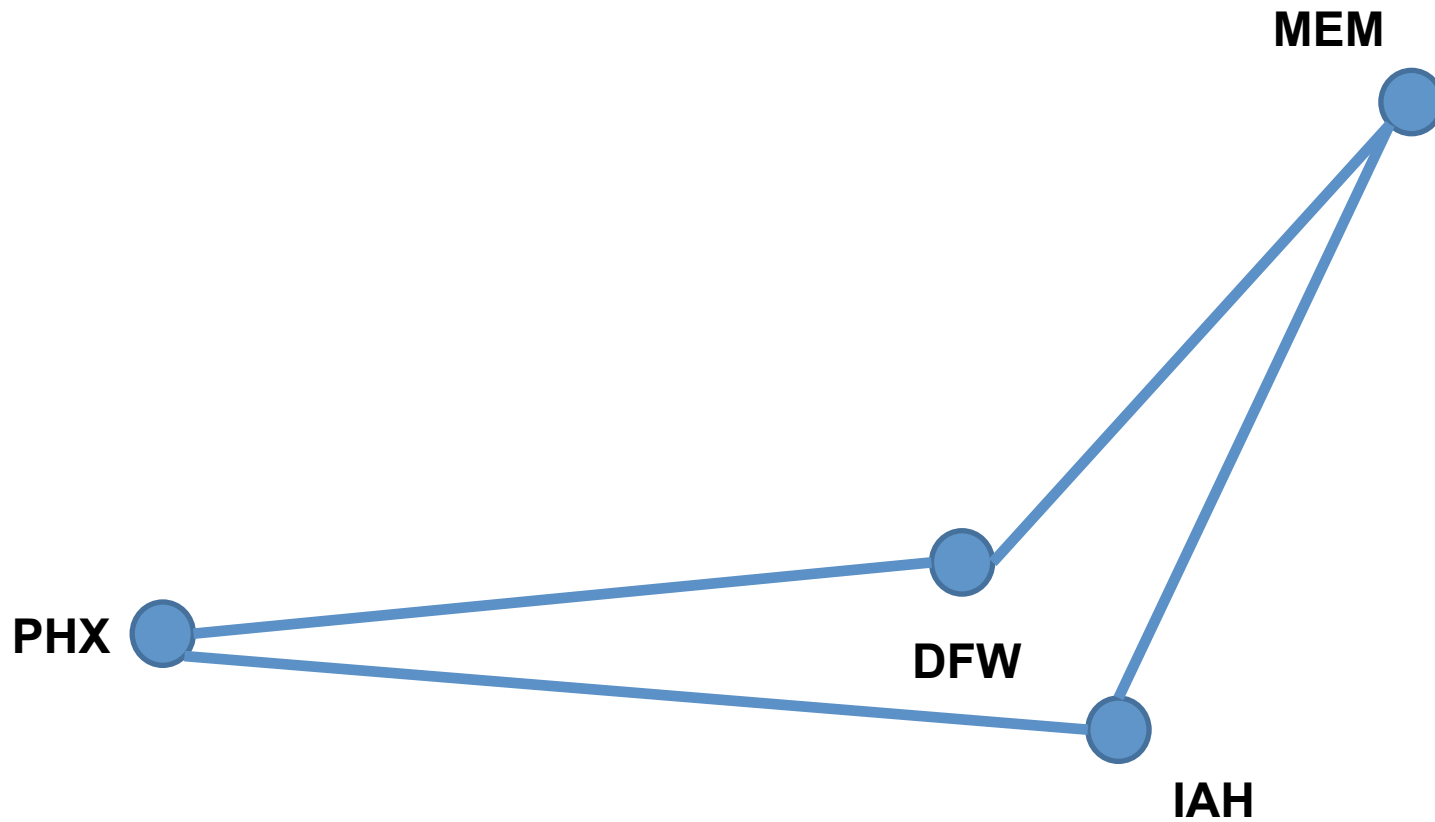
PHX



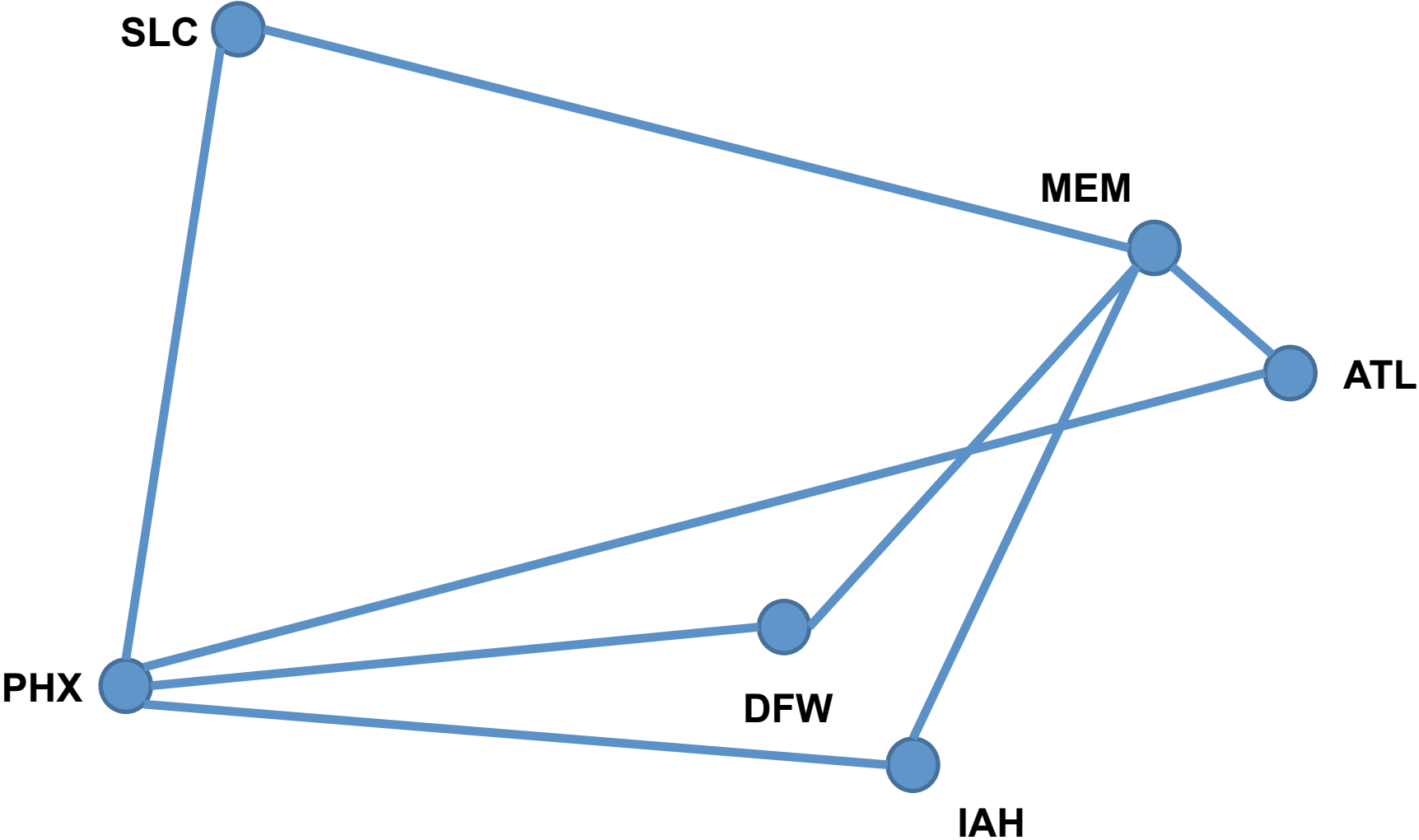
Alternatives for DL to Keep Traffic



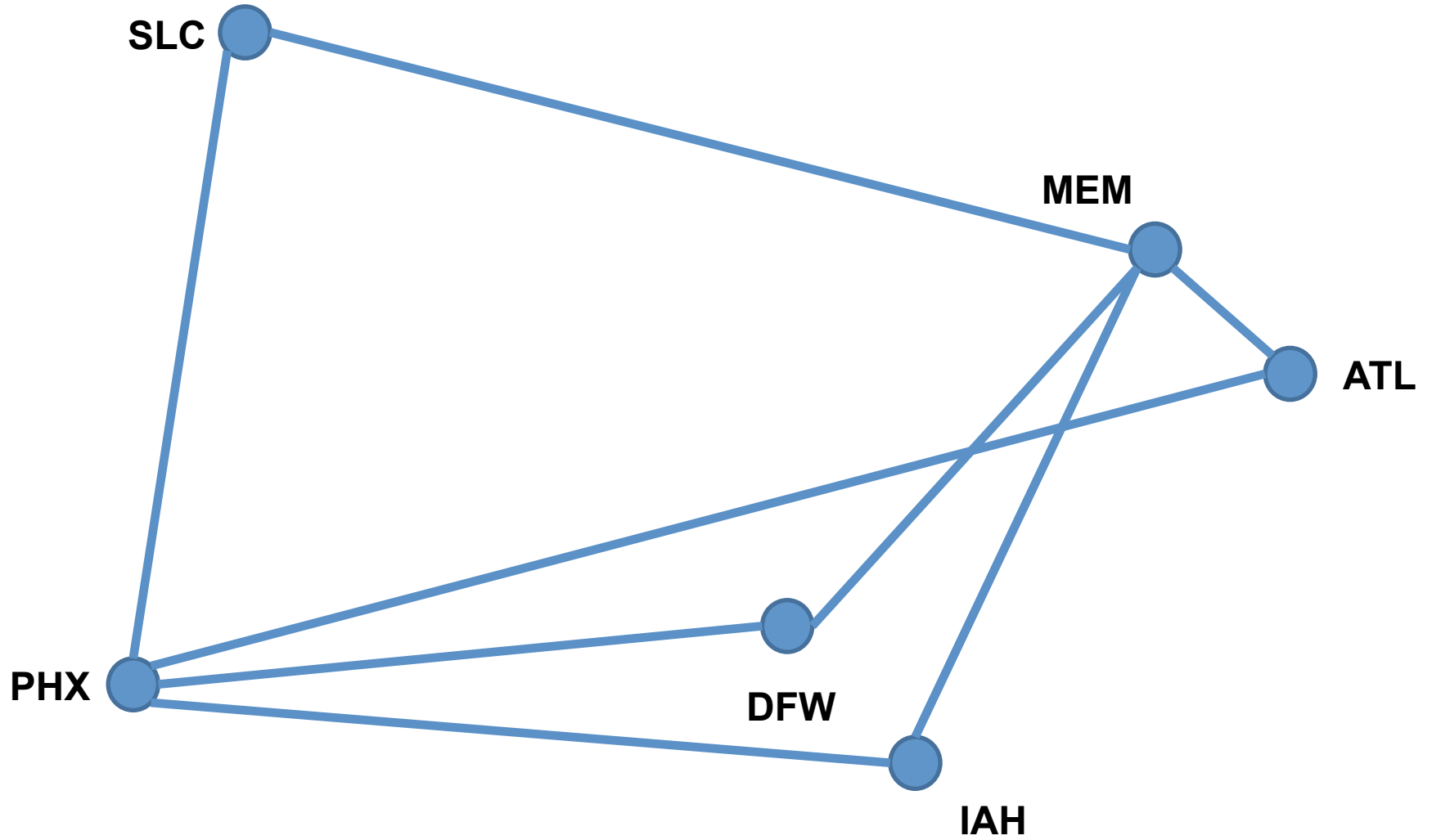
AA, UA Competitive Alternatives



Competitive Routings



Which is the Most Efficient?



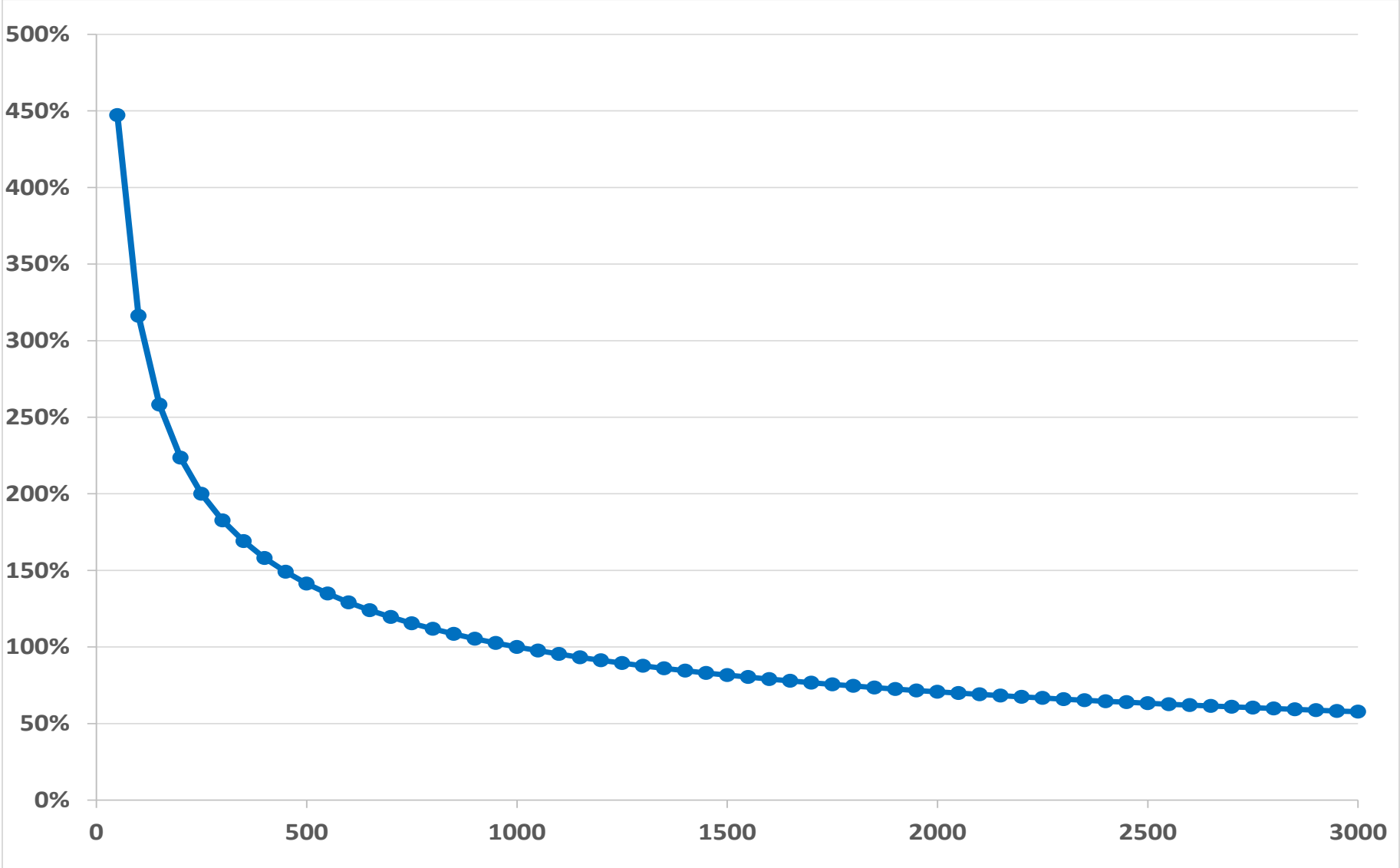
Comparison of Alternatives

Routing	Miles	% of Nonstop
Nonstop	1263	100%
PHX-SLC-MEM	1408	140%
PHX-ATL-MEM	1919	152%
PHX-DFW-MEM	1299	103%
PHX-IAH-MEM	1478	117%

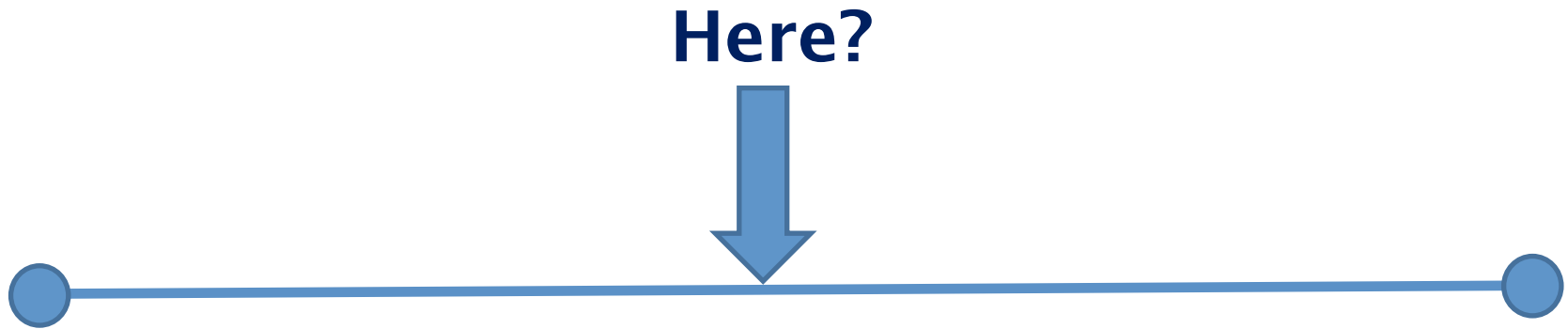
Not So Fast!

- There are significant mileage differences, but
- What about costs?

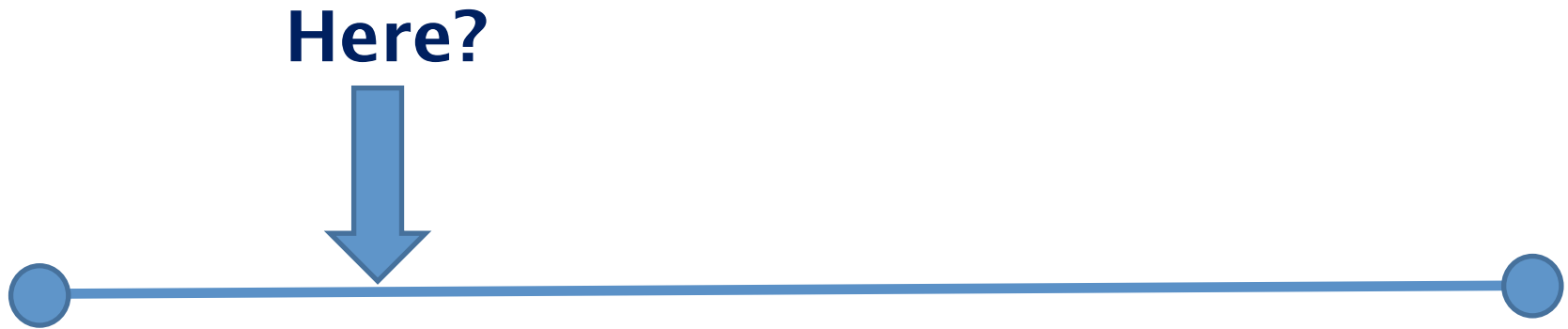
Relative Cost per Mile/ASM: 50-3000 Miles, Indexed to 1000 Mile Segment



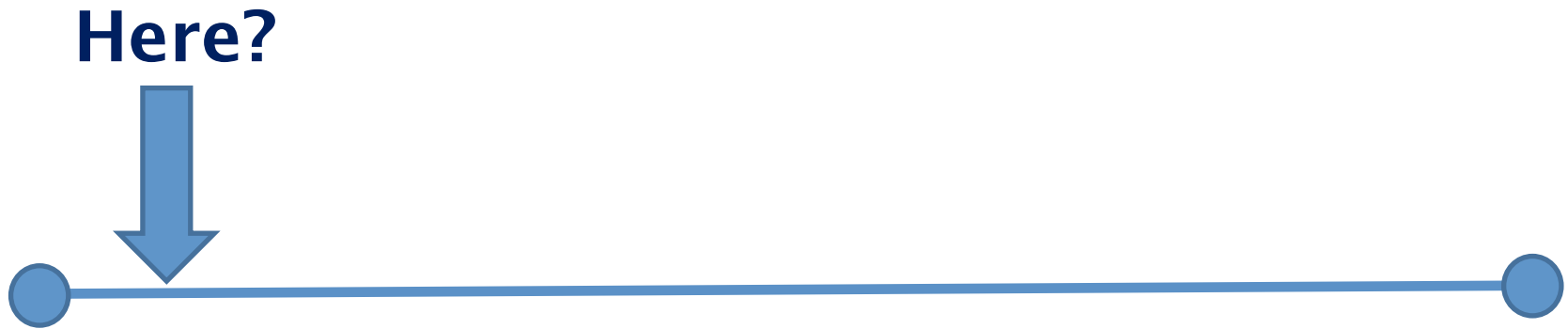
What's the Best Location for the Hub, From a Cost Perspective?



What's the Best Location for the Hub, From a Cost Perspective?



What's the Best Location for the Hub, From a Cost Perspective?



Total Distance: 300 Miles

Segment 1	Segment 2	% of Nonstop Cost
50	250	132%
100	200	139%
150	150	141%

Note: Assumes no circuitry in routing

Total Distance: 500 Miles

Segment 1	Segment 2	% of Nonstop Cost
50	450	126%
100	400	134%
200	300	140%
250	250	141%

Note: Assumes no circuitry in routing

Total Distance: 1000 Miles

Segment 1	Segment 2	% of Nonstop Cost
100	900	126%
200	800	134%
400	600	140%
500	500	141%

Note: Assumes no circuitry in routing

Total Distance: 2000 Miles

Segment 1	Segment 2	% of Nonstop Cost
100	1900	119%
200	1800	126%
400	1600	134%
800	1200	140%
1000	1000	141%

Note: Assumes no circuitry in routing

The (Surprising) Answer:

If no additional distance is added, the combination of a short haul and a long haul has a lower cost than two segments of equal length

The Impact of Additional Mileage; Distance & Cost vs. Nonstop

	Distance	Unit Cost	Total Cost
PHX-MEM	100%	100%	100%
PHX-SLC-MEM	140%	116%	163%
PHX-ATL-MEM	152%	107%	163%
PHX-DFW-MEM	103%	137%	141%
PHX-IAH-MEM	117%	128%	150%

Some Conclusions

- Best to avoid significant extra mileage, especially long backhauls
- In a business where operating margins are generally in single digits, chasing flow traffic with anything other than the most efficient routings needs to be analyzed
- Implications for pricing?

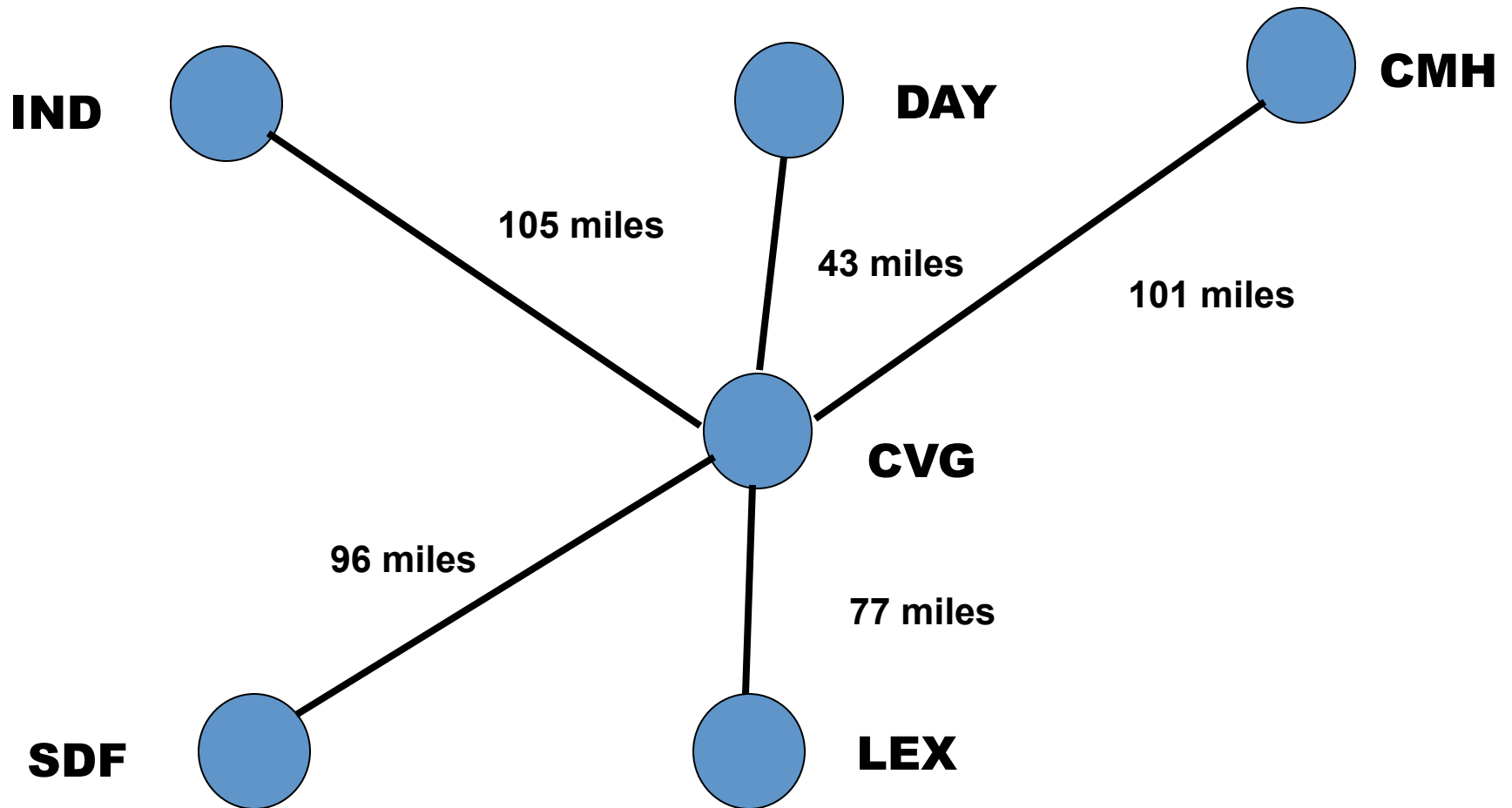
A Conundrum

- Hubs are more costly than point-to-point
- Flow traffic via hubs often have lower fares/yields than nonstop/direct services

Key to Profitability

- Significant component of local (non-flow) traffic on hub flight segments
- Problem: On truly short hauls, likely to be little local traffic

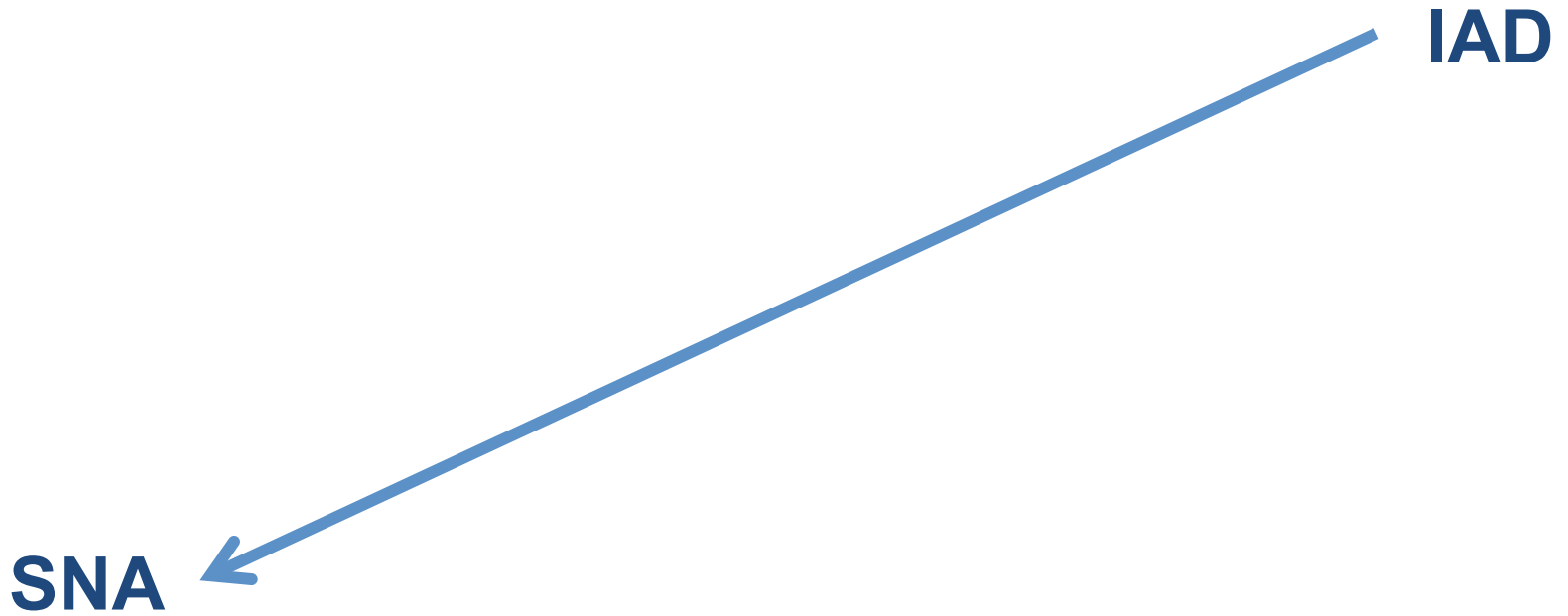
Did This Ever Really Make Sense?



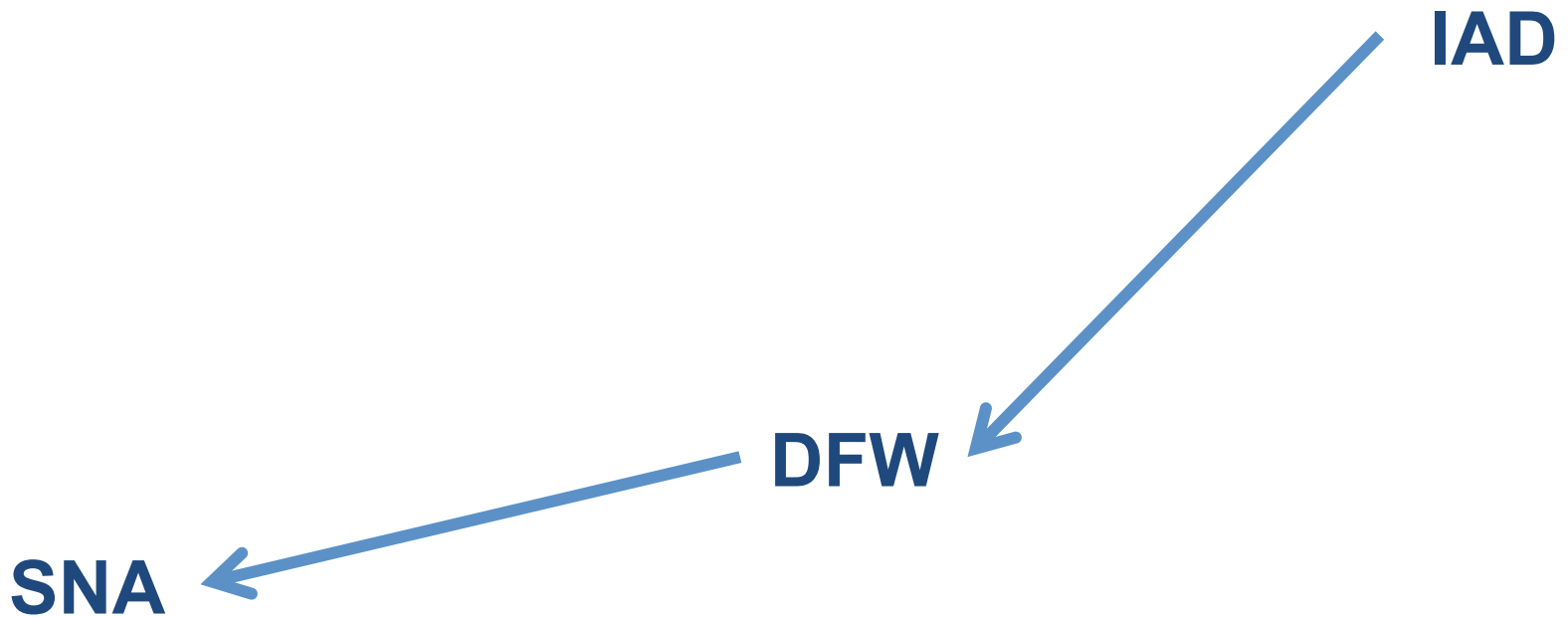
Is the Hub Model Being Misused?

- Circuitry
- Flow traffic pricing
- Hub raiding (regional partners)
- Constraints on hub overflight nonstops

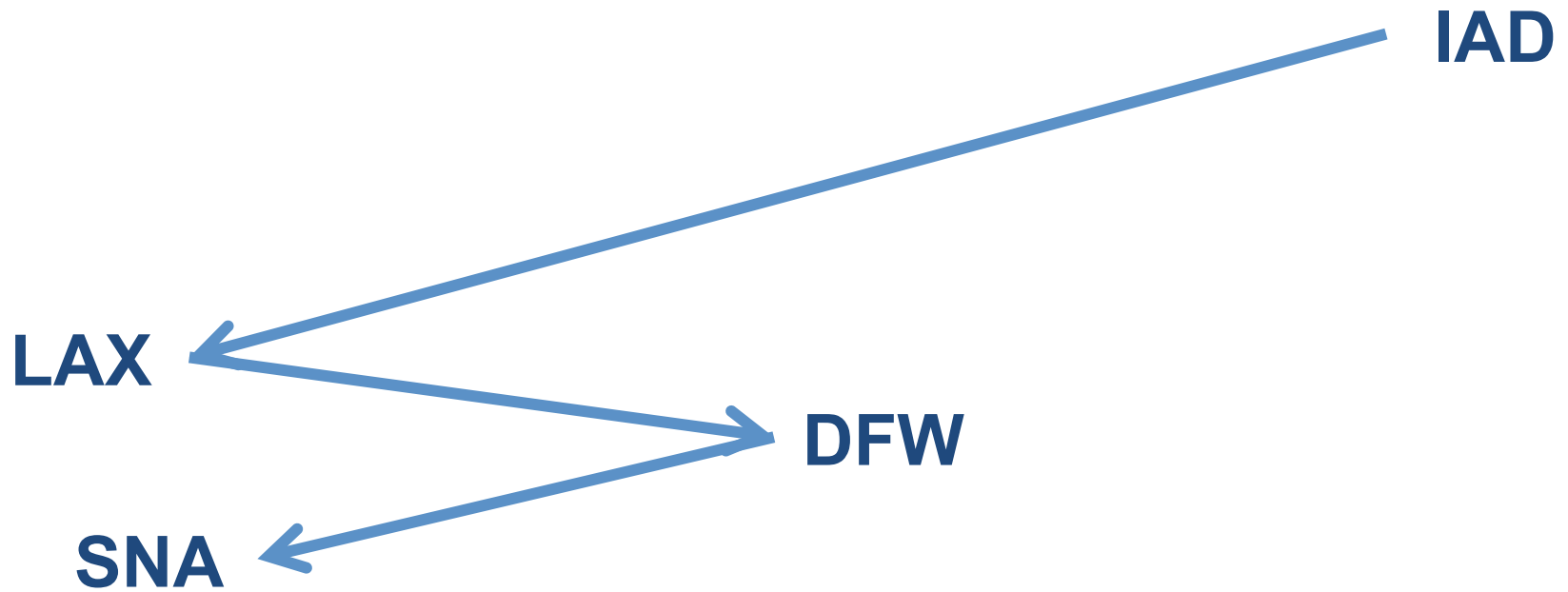
Requested



A Logical Way to Get There



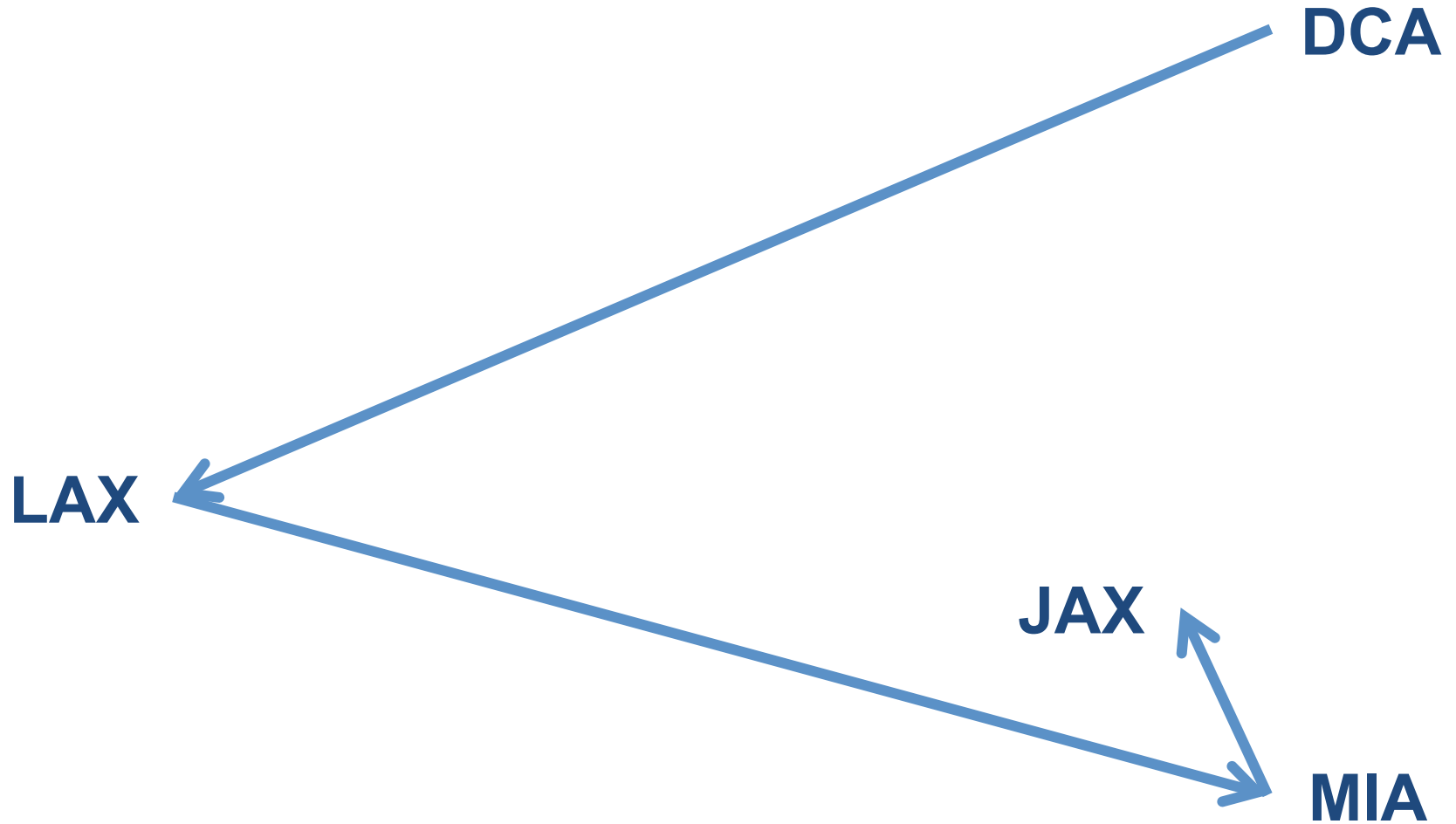
How About this Proposal?



My Expectation for DCA-JAX



What was offered



Is Hub-and-Spoke the Only Way?

- Seemingly, for Legacy carriers
- Point-to-Point (Southwest, JetBlue)
- Specialized markets (Allegiant)
- Business aviation encroachment on premium traffic
- Other?

On Balance

- Hub and spoke is here to stay
- Point-to-point still works nicely, and in the last few decades, has generated better financial results
- May be room for more 'hybrid' route system development
- In any case, need to assess hub economics to produce optimal results

At the End of the Day

- Hub and spoke is an operating model; a tool
- Tools are necessary to run an airline
- Using a tool properly requires knowledge and skill, including when to apply the tool, and when not to
- The tool itself does not guarantee successful results

Hubs: Blessing, Bane...or Both?

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