Airline hub optimization – Screening bank structures to boost hub performance

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G.A.R.S Workshop prior to European Aviation Conference

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FATC serves leading clients across all transportation modes

Selected clients

Aviation

- Passenger transport: Lufthansa, germanwings (Fly high, pay low.), brussels airlines, Austrian (We fly for your smile.), LOT, Saudi Arabian Airlines, SAS
- Airports & ANSPs: Fraport, DFS Deutsche Flugsicherung, Berliner Flughäfen, PPL, Aena
- Suppliers, investors, public authorities: Ministerstwo Infrastruktury (Ministry of Infrastructure), Mubadala Development, DAE, Montagu
- Air Cargo: Lufthansa Cargo, Volga-Dnepr Group, AirBridgeCargo, American Airlines Cargo

Postal & Express delivery

AeroLogic, DHL, Deutsche Post World Net (Mail Express Logistics Finance)

Forwarding & Logistics

DB Schenker, hellmann Worldwide Logistics, Thiel Logistik AG

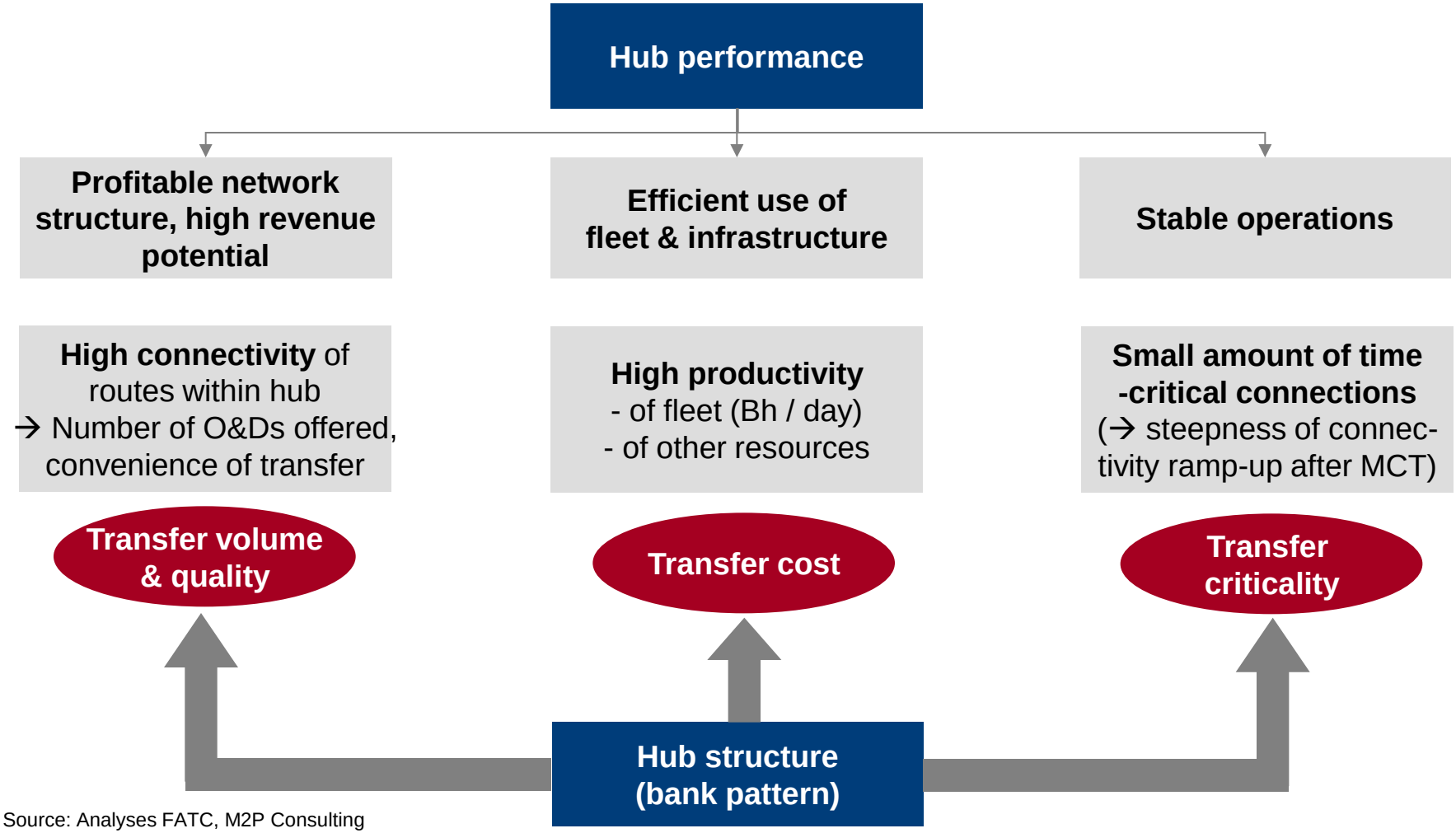
Rail operators

DB Mobility Networks Logistics, DB Bahn, DB Regio AG

Others (e.g., service providers)

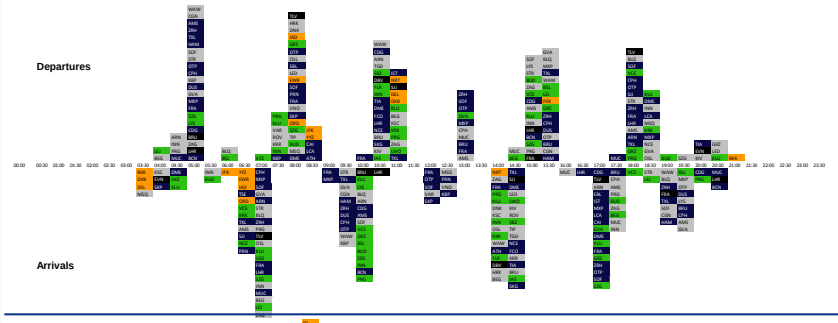
Lufthansa Technik, T-Systems, vodafone

Hub performance is determined by its bank structure – impact on connectivity, fleet productivity, and operational stabillity

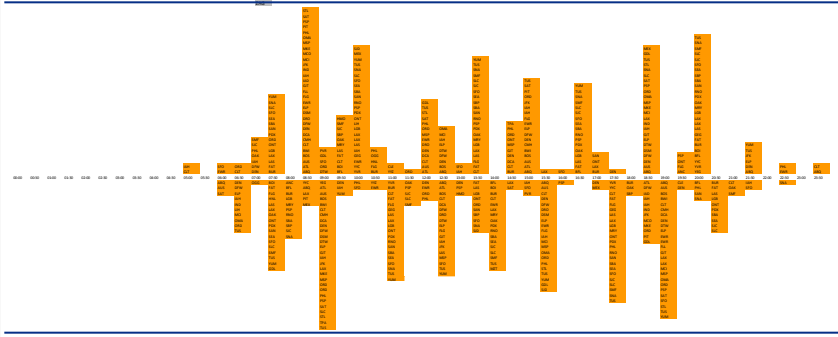


Source: Analyses FATC, M2P Consulting

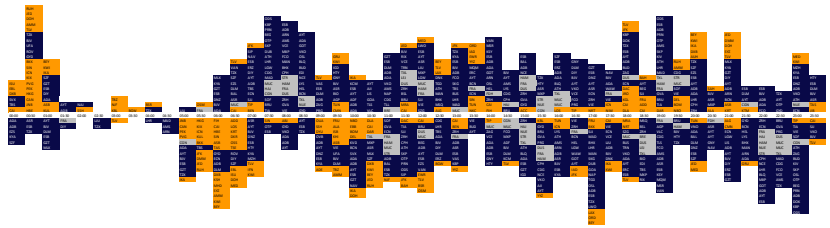
The bank structure of a hub determines the timing and connectivity of inbound and outbound flights – both for short- and long-haul traffic



- **OS-VIE**
- Clearly structured 7 bank model
- Small banks, no overlap



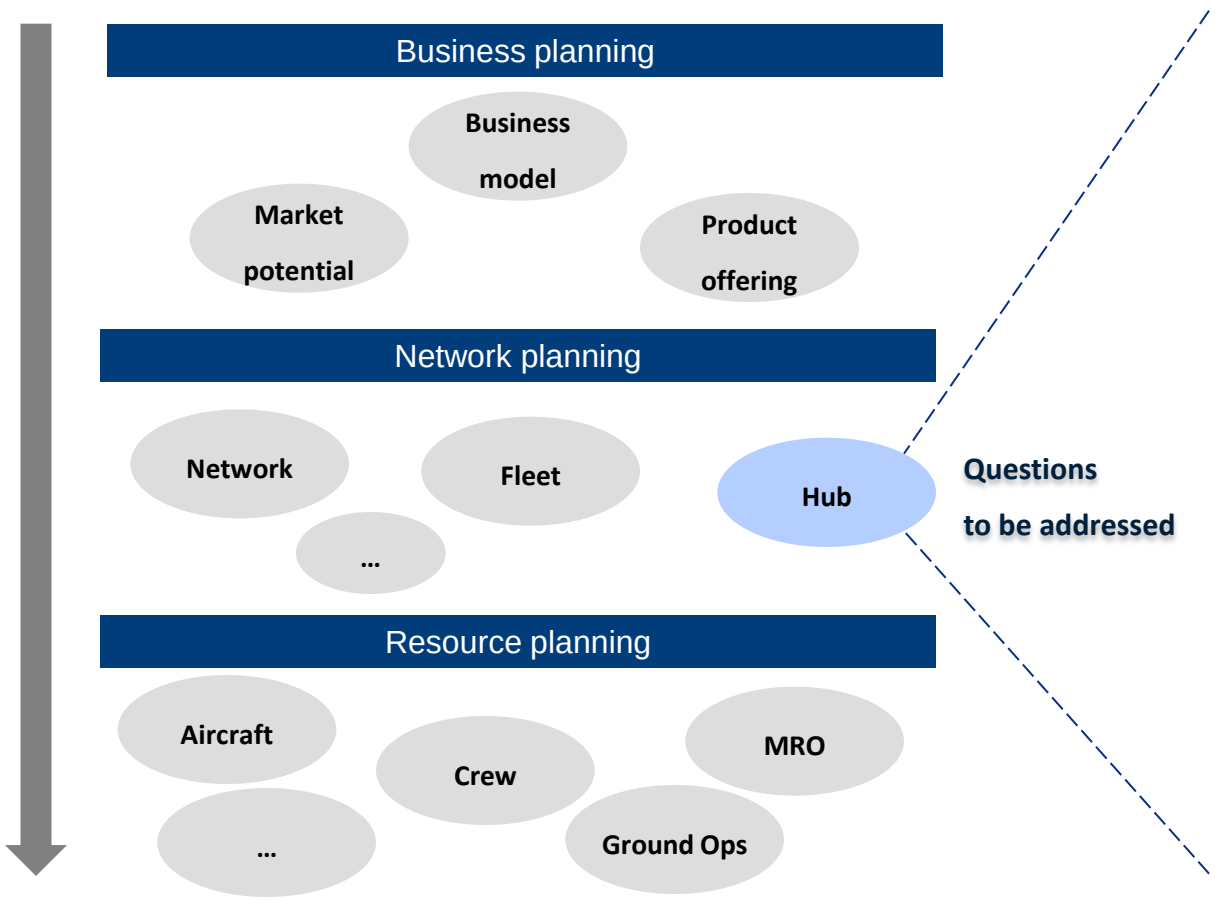
- **US-PHX**
- Rapid banking
- High peaks, constant capacity utilization



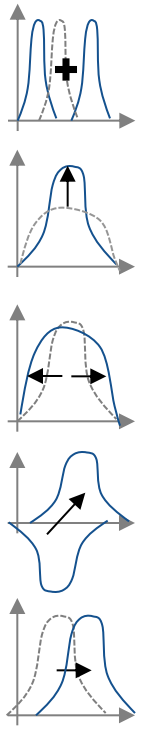
- **TK-IST**
- Random hubbing
- No overall structure maximizing utilization

Source: Analyses FATC, M2P Consulting

The bank structure of a hub influences main performance indicators



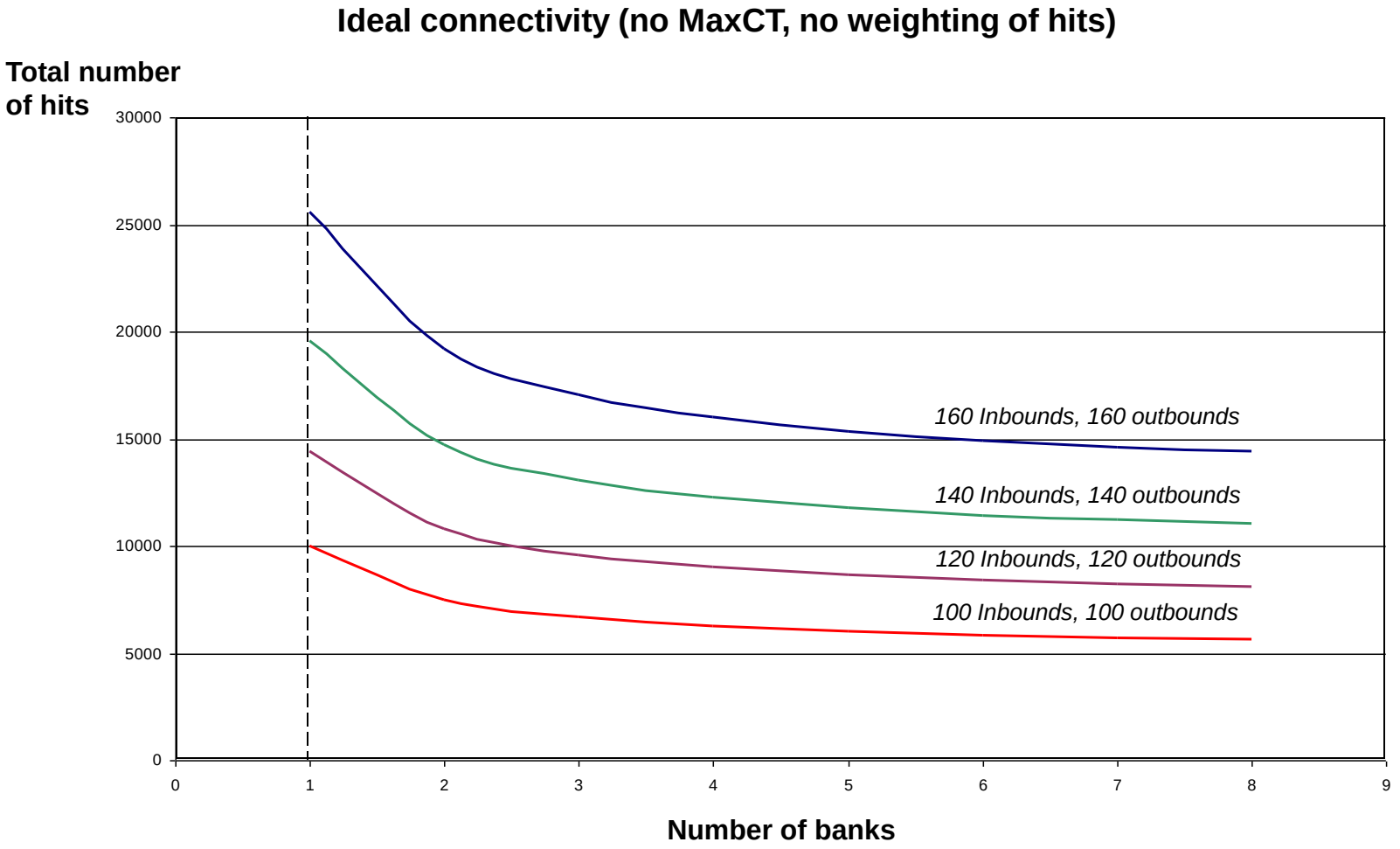
- Number of banks
- Height of banks
- Width of banks
- Amount of overlap
- Positioning of banks
- Further questions



- Is the structure sustainable?
- ….

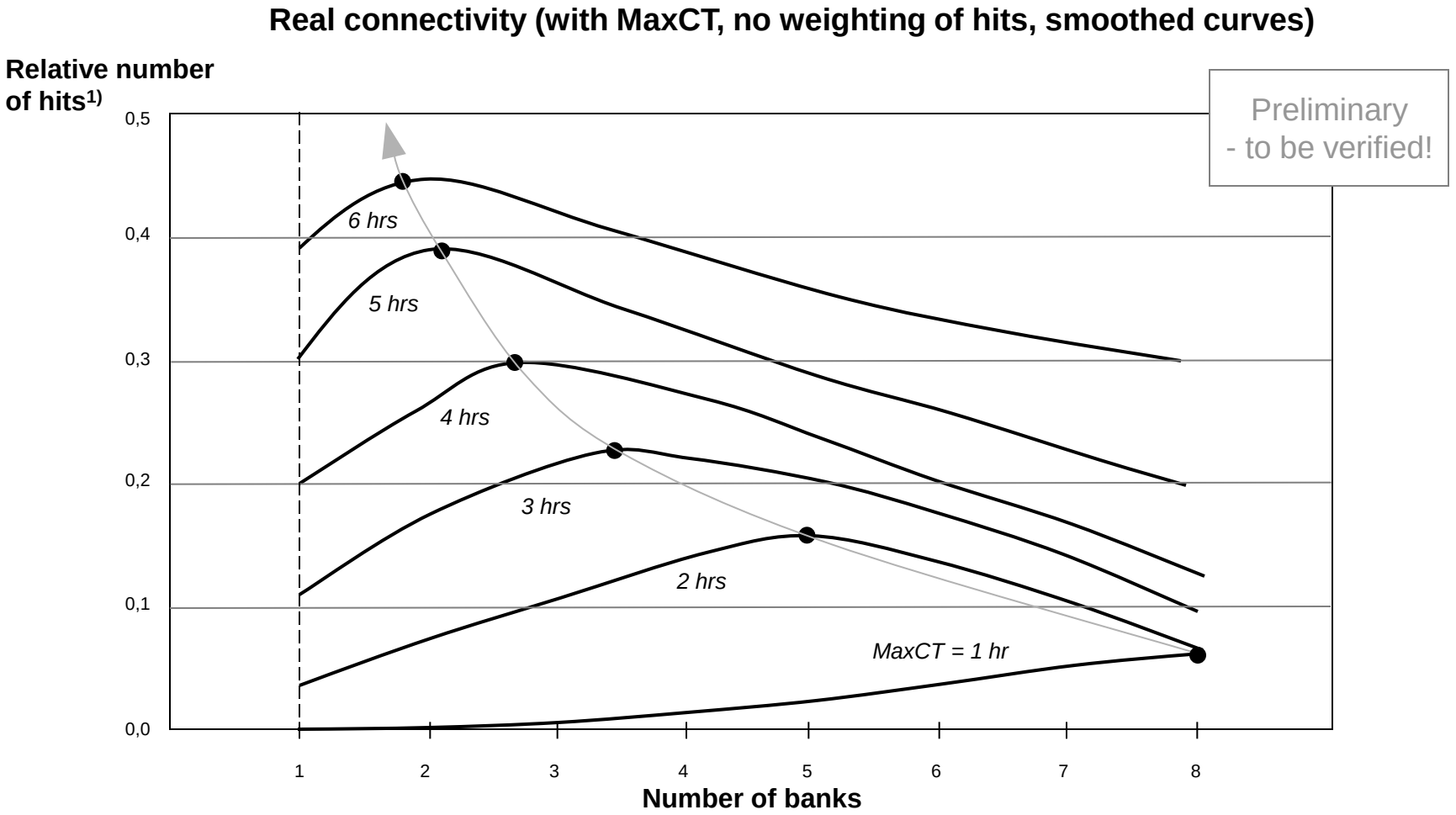
Source: Analyses FATC & M2P Consulting

Ideal connectivity (no MaxCT, no weighting of hits) drops with increasing number of banks



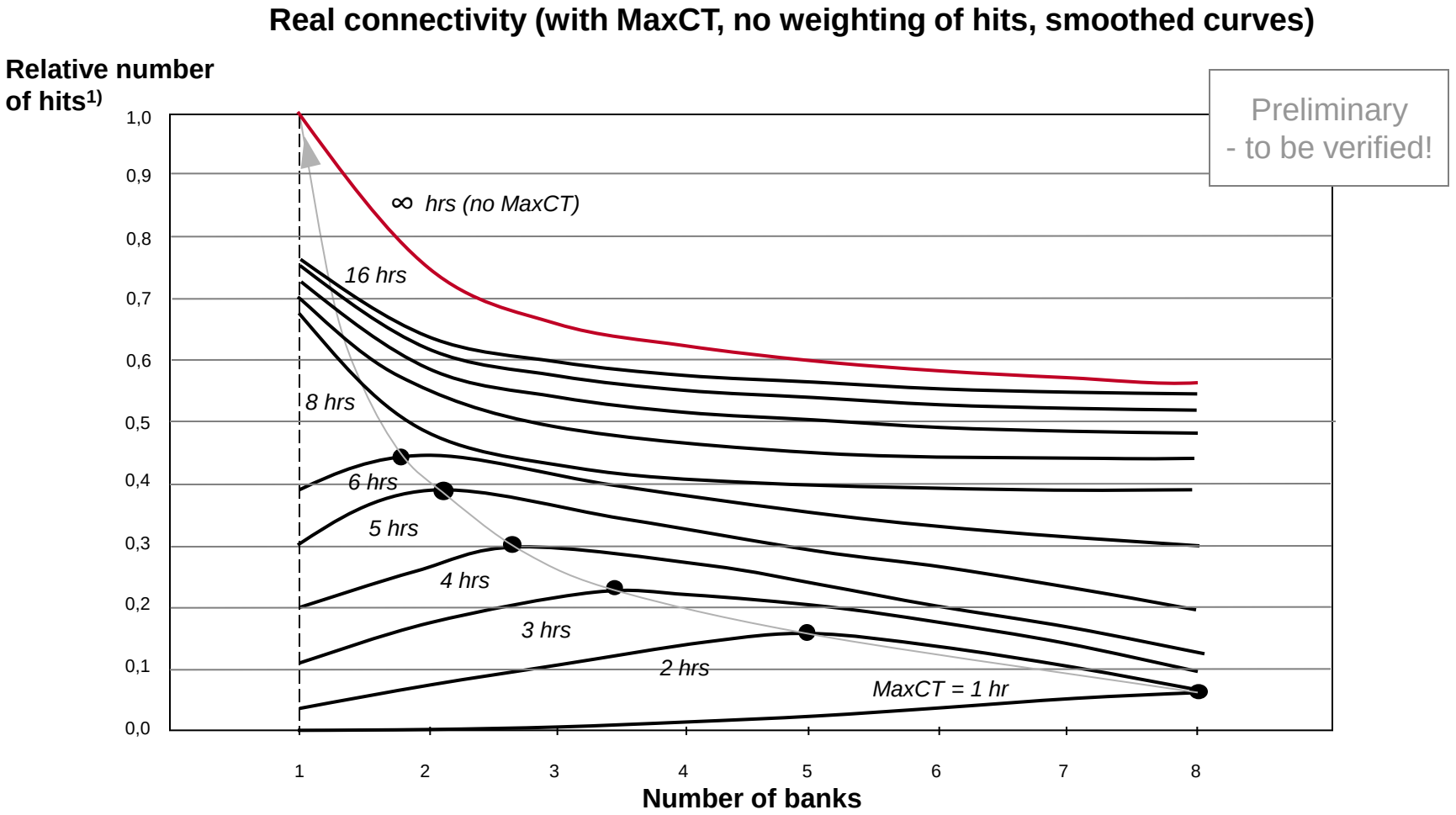
Source: Analyses FATC and M2P Note: Banks assumed to be resemble a sinus function, no overlap between inbound and outbound banks

Real connectivity (with MaxCT) has a maximum, moving to the left with growing MaxCT…



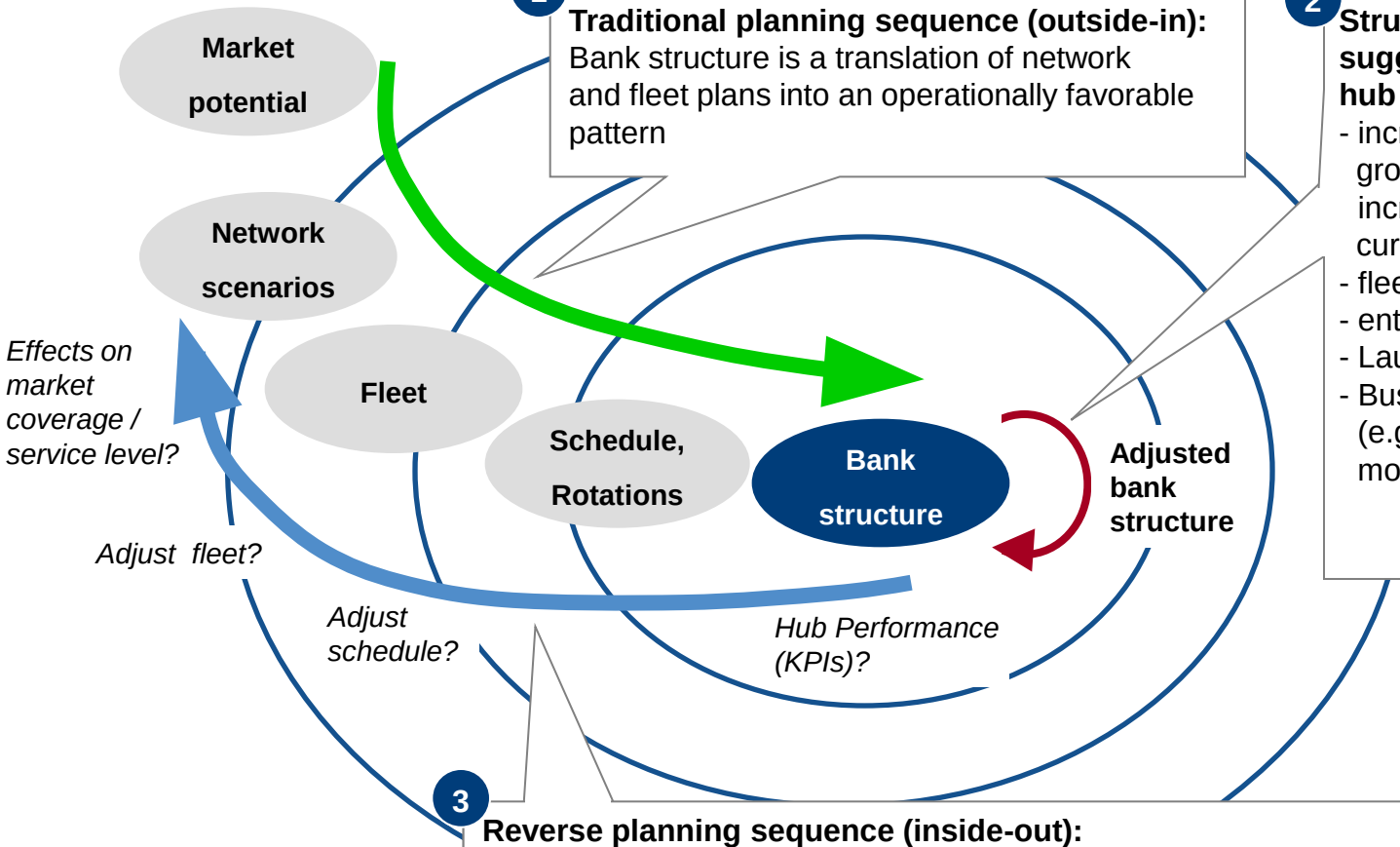
Source: Analyses FATC and M2P Remarks: 1) Relative to ideal maximum number of hits (= inbound flights x outbound flights)

…converging towards the no-MaxCT curve for further increasing MaxCT



Source: Analyses FATC and M2P Remarks: 1) Relative to ideal maximum number of hits (= inbound flights x outbound flights)

A reverse perspective on network planning may add value by analyzing the effects of a hub structure change on network and fleet



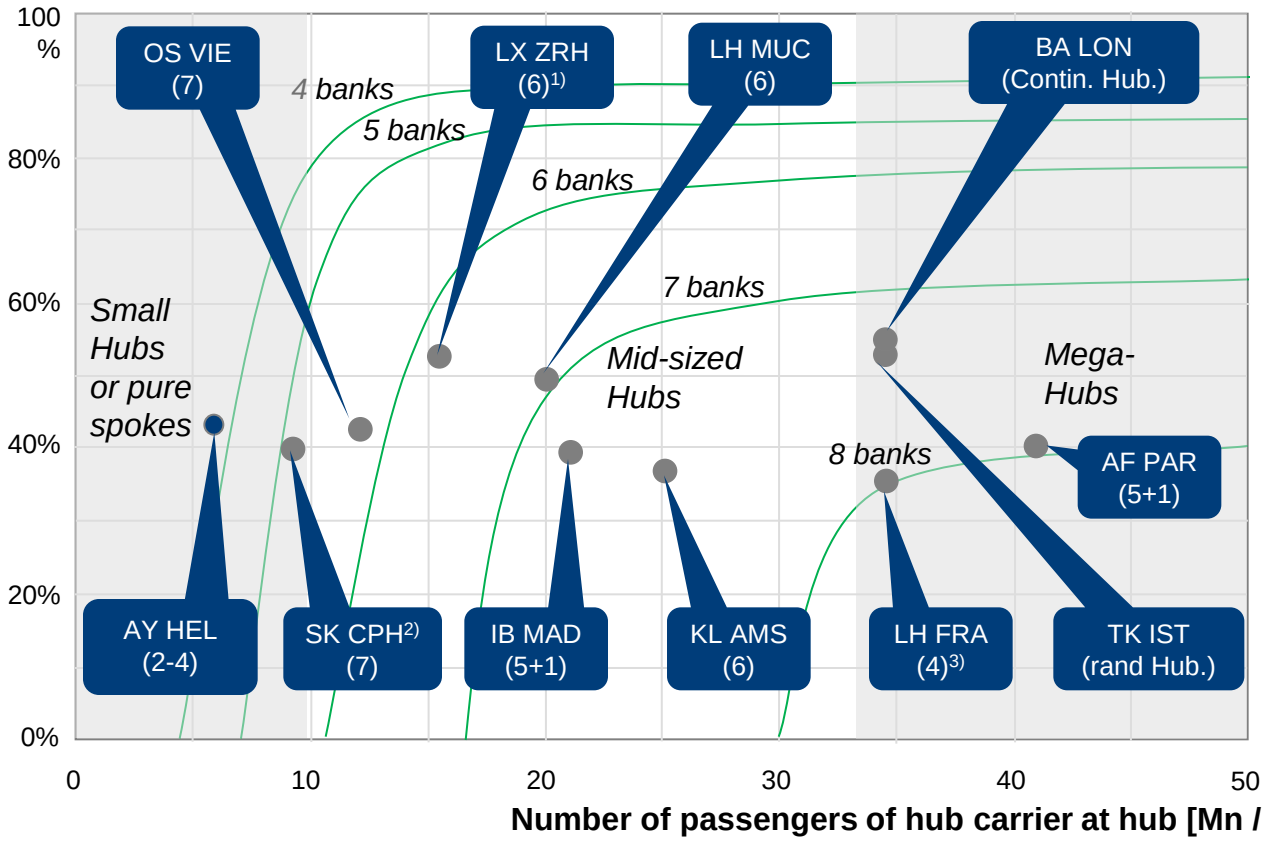
1 **Traditional planning sequence (outside-in):**
Bank structure is a translation of network and fleet plans into an operationally favorable pattern

2 **Structural changes suggesting an adjusted hub bank structure may be:**
- increased / reduced growth prospects increased / reduced curfew period
- fleet roll-over
- entry of new competitor
- Launch of new routes
- Business model adjustment (e.g., more Intercont traffic, more P2P traffic)

3 **Reverse planning sequence (inside-out):**
If fundamental changes suggest a change of bank structure, what is the effect on hub performance (connectivity, productivity, operational viability), network and fleet deployment?

Source: FATC & M2P

FATC and M2P have developed the „Meta Model“, illustrating the inter-dependency of hub size, local pax share, and favorable bank number



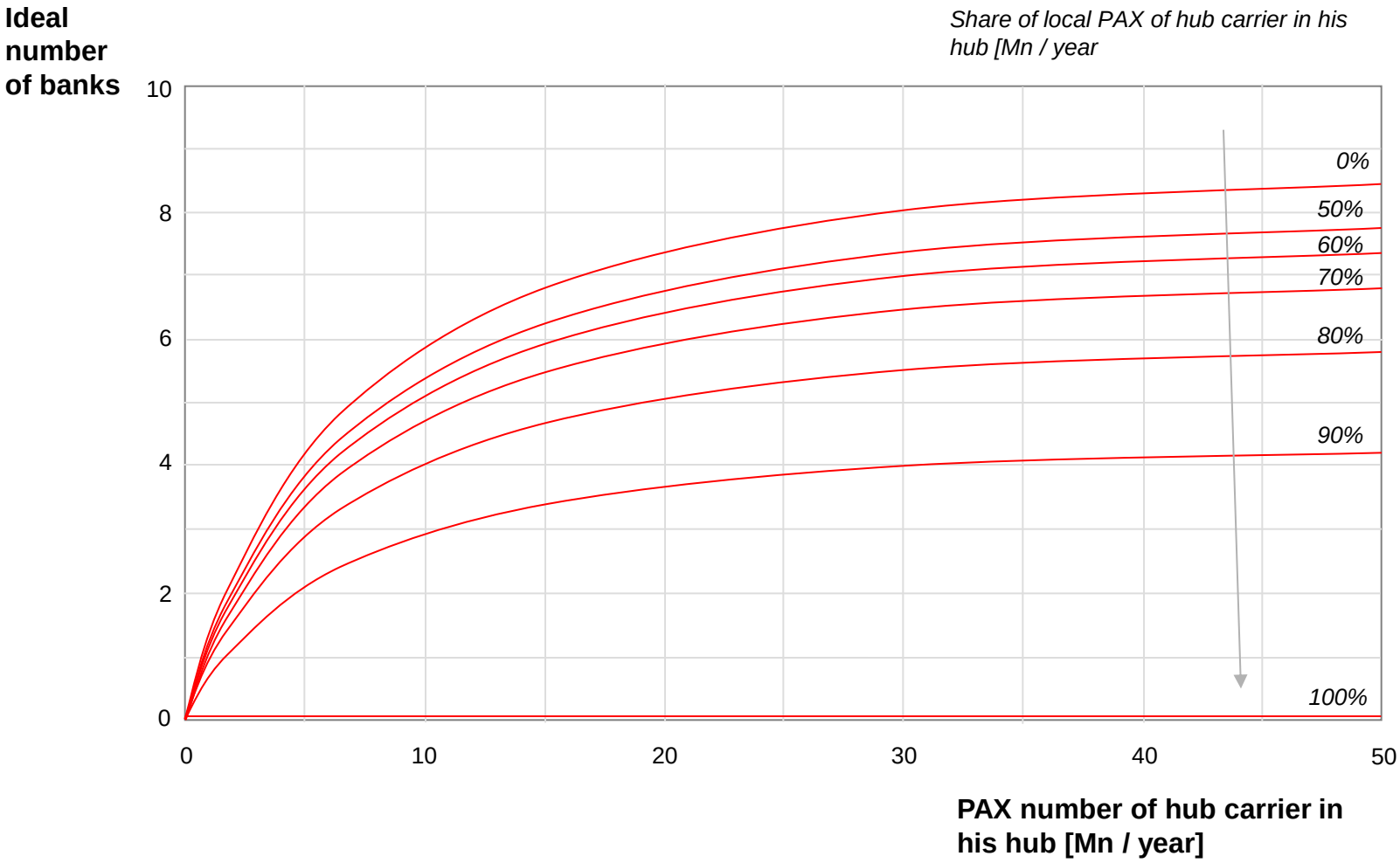
Conceptual

- The Meta-Modell represents a high level top down heuristic illustrating the quality of a bank structure for hubs
- Special effects such as separate Intercont banks or special banks for local pax were not considered
- For medium sized hubs (10…30 M pax of hub carrier), the heuristic indicates optimal bank structures for cont. operations between 5 and 8 banks
- The heuristic cannot be applied for mega hubs on the far right of the framework

Notes: 1) Number of actually operated banks 2) Local pax share estimated 3) Overlapping megabanks
Source: Analysis FATC & M2P, Schedule data 2013

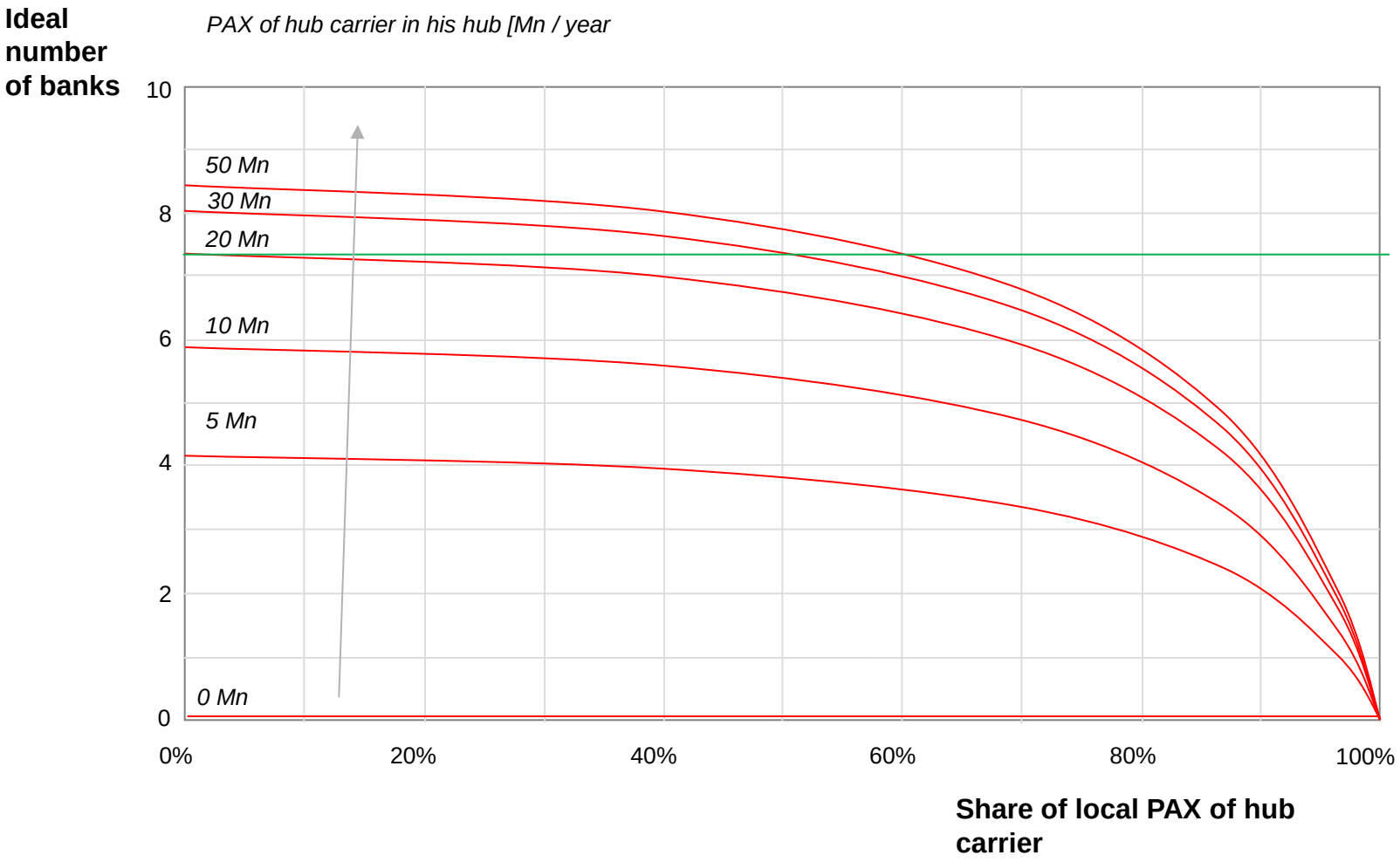
Basic assumption: favourable number of banks increases with overall size (in terms of PAX) of hub…

Backup

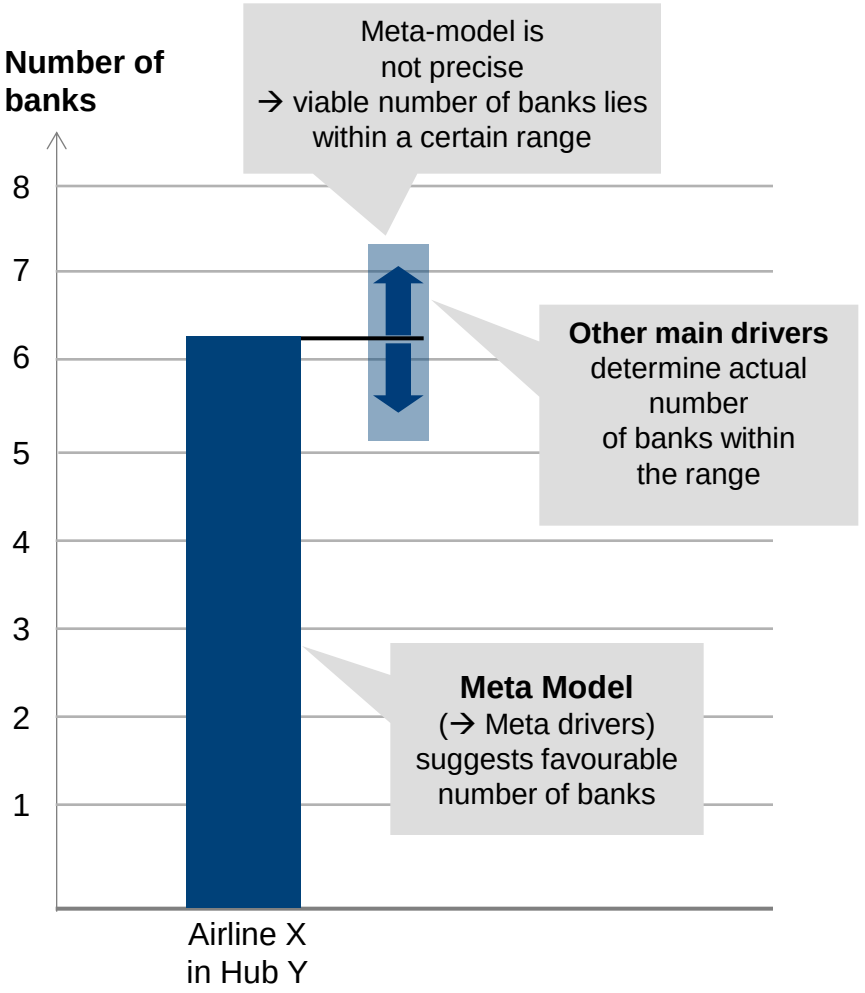


…while it drops with growing share of local passengers

Backup



Hub-specific drivers determine the favourable number of banks – the Meta Model suggest a number plus a certain range



Source: Analyses FATC, M2P Consulting

Fundamental (Meta) drivers

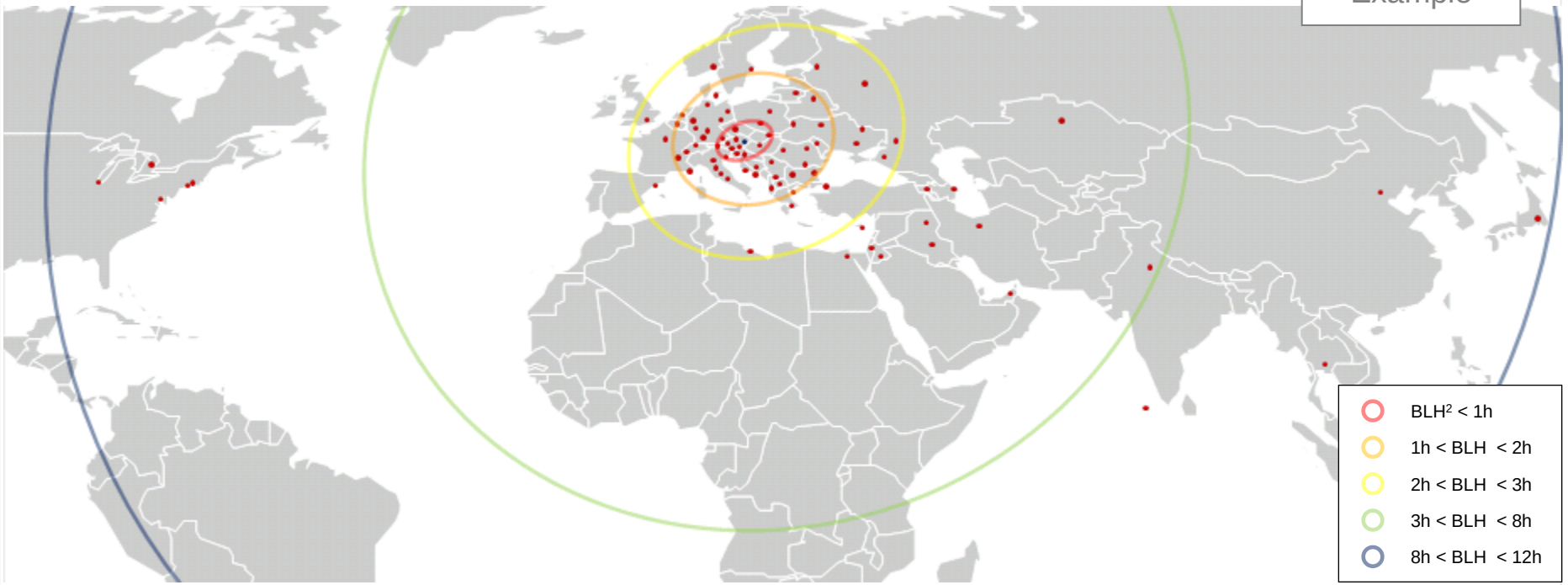
- Size (pax / fleet)
- Local pax share

Other main drivers

- **Geographic location**
- **Destination portfolio**
  - Shape of continental "catchment" area
  - Distribution / spread of distances and roundtrip times
  - Directionality of traffic flows
- **Business model and market approach**
  - Frequency patterns, time-of-day pref.
  - Intercontinental share
  - Business pax share
  - Differentiation / competitive positioning
- **Operational restrictions**
  - Airport infrastructure capacity, slots
  - Operating hours / night curfew
- **Planning philosophy / paradigm**
  - Rotational patterns, bank design

The destination portfolio and network structure of an airline are a crucial input for the design of the hub structure

Example



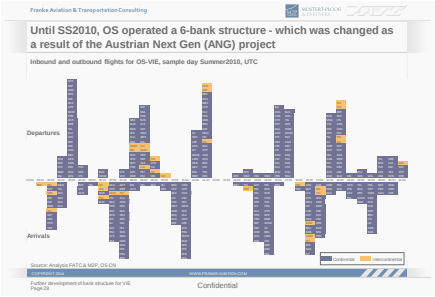
- → Number and geographic position of continental destinations, frequency offered
- → Number and geographic position of intercontinental destinations, frequency offered
- → Deployed fleet
- → Average rountrip time per destination

Source: Analysis FATC & M2P

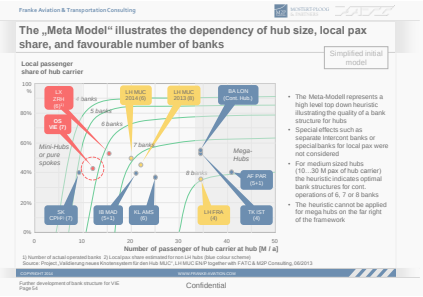
Analytical approach of FATC and M2P accounts for generic and hub-specific drivers – multiple perspectives to identify overall optimum

Analytical approach

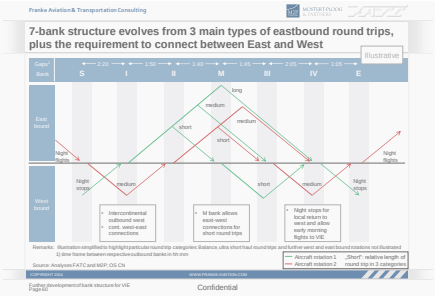
Bank Structure



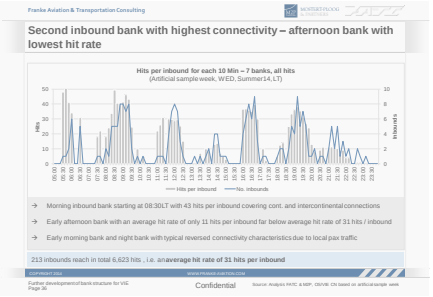
Hub Drivers



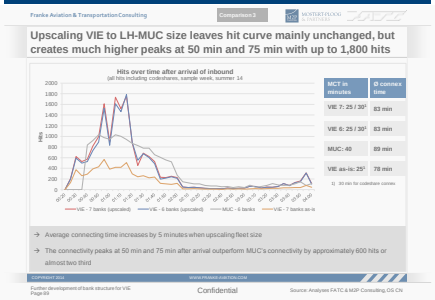
Rotational Patterns



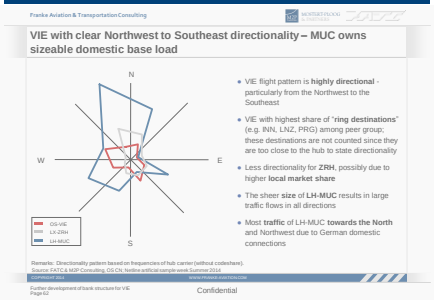
Connectivity



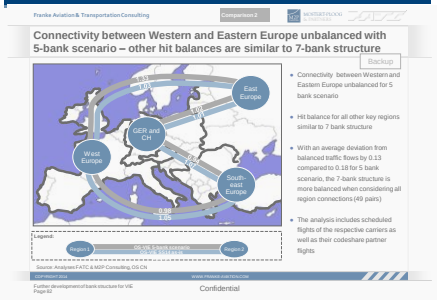
Operational Stability



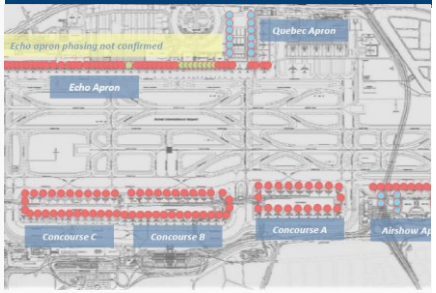
Directionality



Balance of hits



Capacity constraints

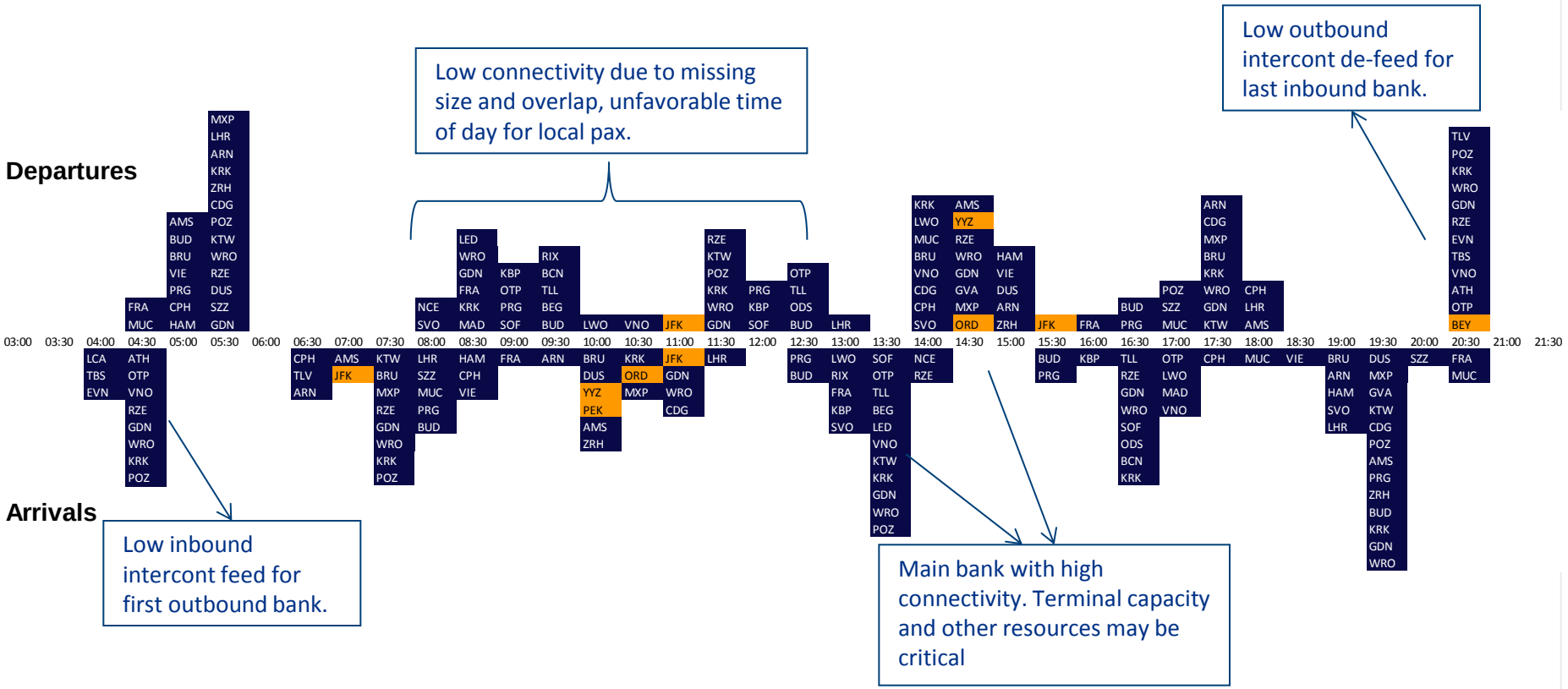


Source: Analysis FATC & M2P

“Wave stacker” tool developed to visualize bank structure and to formulate first hypotheses on weak spots

Analysis example: bank structure

Inbound and outbound flights for sample day Summer2014, UTC

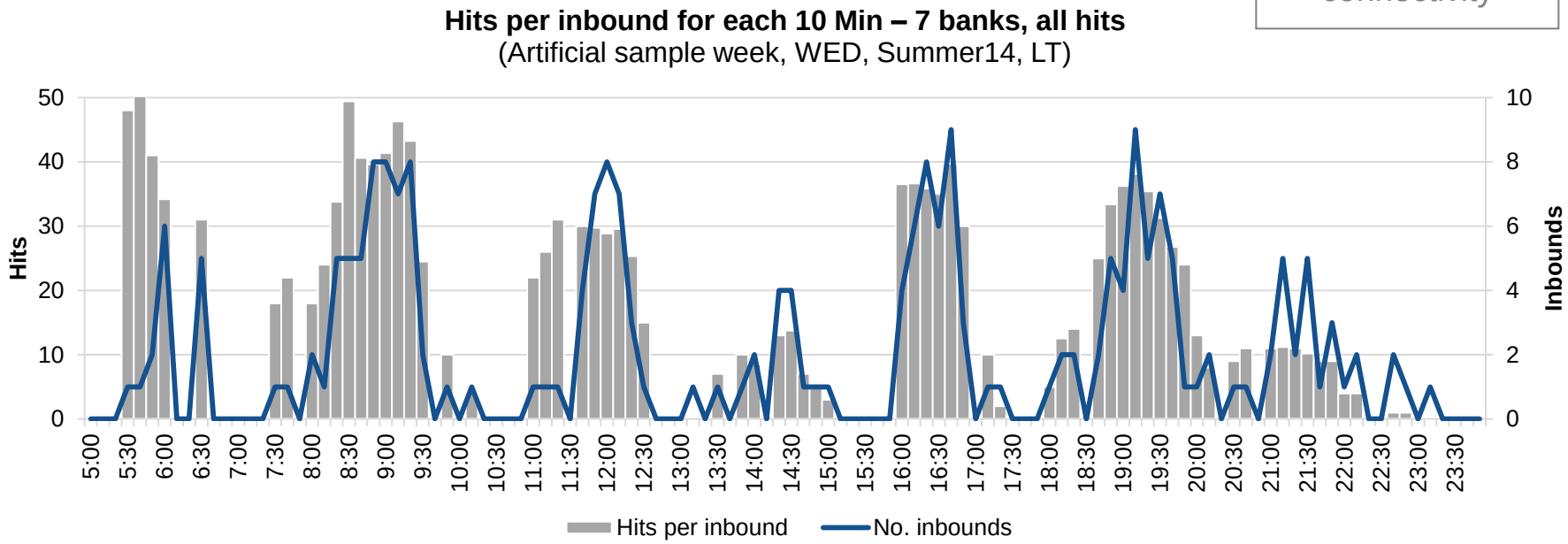


Source: Analyses FATC & M2P Consulting

Source: Analysis FATC & M2P, OS CN, MUC EN/P , ZRHSPLX

Second inbound bank with highest connectivity – afternoon bank with lowest hit rate

Analysis example: connectivity



→ Morning inbound bank starting at 08:30LT covering cont. and intercontinental connections

→ Early afternoon bank with an average hit rate far below average hit rate

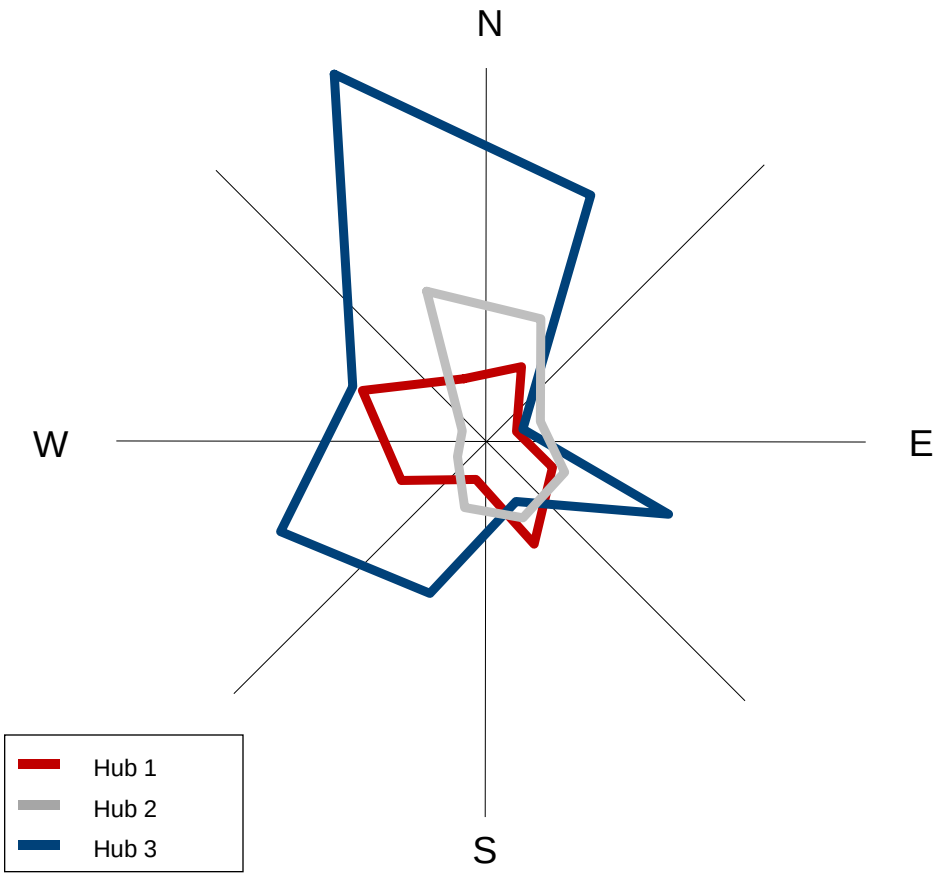
→ Early morning bank and night bank with typical reversed connectivity characteristics due to local pax traffic

Source: Analyses FATC & M2P Consulting

Source: Analysis FATC & M2P, OS/VIE CN based on artificial sample week

Hub 1 and 2 with clear directionality – Hub 3 owns sizeable domestic base load

Analysis example: directionality

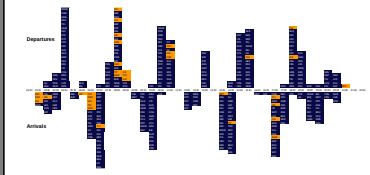
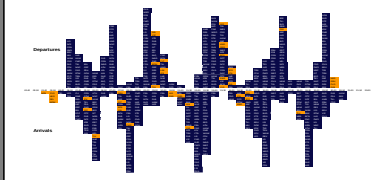
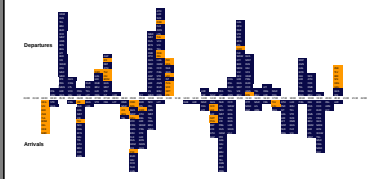
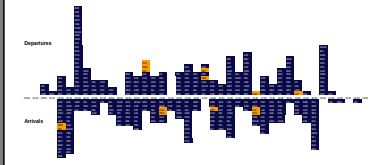
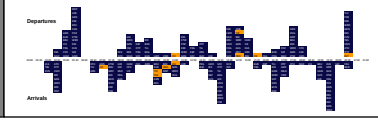


- Flight pattern of **Hub 1** is **highly directional** - particularly from the Northwest to the Southeast
- **Hub 1** with highest share of short-haul destinations; these destinations are not counted since they are too close to the hub to state directionality
- Less directionality for **Hub 2**, possibly due to higher **local market share**
- The sheer **size** of **Hub 3** results in large traffic flows in all directions
- Most **traffic** of **Hub 3 towards the North** and Northwest due to domestic connections

Remarks: Directionality pattern based on frequencies of hub carrier (without codeshare).
Source: FATC & M2P Consulting, artificial sample week Summer 2014

Benchmark: size proves to be main connectivity driver - specific hub conditions also impact performance

Analysis example: benchmarking

Hub (Fleet[1])	Bank structure[2]	Connectivity [hits / inbound]	Productivity[3] [avg. BLHs per day]	Finding
Airline / Hub1 (11/59)		28	13.2 / 8.7	• 2 local pax banks, 4 connex banks, 1 sub bank • Bank structure customised to asymmetric block hours to destinations • Night stops to feed intercontinental outbound
Airline / Hub 2 (26/91)		40	13.6 / 8.4	• 6 banks, large overlap • Priority on optimisation of commercially important connections , all other aspects follow • Domestic shuttle flights
Airline / Hub 3 (28/51)		27	15.5 / 8.6	• 6 banks, medium overlap • Focus on intercontinental feed / defeed • Small continental destination portfolio
Airline / Hub 4 (11/128)		19	n/a	• 6 banks, large overlap • Night stops due to small local market • High number of short haul shuttle flights
Airline / Hub 5 (5/31)		13	n/a	• Not a full-size hub • Half the size of critical mass (estimate) • Domestic feed / de-feed drives complexity

Remarks: 1) Fleet size for SS2014, Wide- and Narrowbody; 2) 30 minutes clustering; 3) 2013 numbers: widebody / narrowbody
Source: Analysis FATC & M2P

Hub screening and bank structure analysis leads to four major results

Product	Content	Result / Benefit
Performance analysis	• Analyze and compare ‘effectiveness’ of an airline’s number of banks	• Transparency and visibility of improvement opportunities
Hub driver analysis	• Assess hub drivers and influence on hub structure • Compare current hub structure with driver characteristics	• Alignment of hub structure with business model, fleet development and external influences
Scenario comparison	• Validate or provide alternative bank structures including route candidates for addition to / removal from network	• Increased connectivity • Quantified comparison
Benchmark study	• Conduct performance analysis within agreed parameter framework • Derive lessons-learned and differences	• Alignment of hub structure with business model, fleet development and external influences

Source: Analyses FATC & M2P Consulting

Thank you very much for your attention!

Contact data

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