

INFRASTRUCTURE

High quality, extensive infrastructure is a critical building block for supporting globally competitive business activities in all industries. State infrastructure consists of both the physical capital and the technological network needed for efficient use of human, physical, and intellectual resources. Strong infrastructure also enhances the quality of life of residents who use roads, air transportation, utilities, and the Internet every day for work, leisure and

managing daily life. This section benchmarks Ohio against its competitive peers in the availability and quality of its telecommunications, transportation, and other business infrastructure. Two subcategories of benchmarking indicators are used to assess Ohio’s infrastructure competitiveness:

- Technology Infrastructure
- Physical Infrastructure

BENCHMARK RESULTS

Strengths

- + The extent and expanding network of telecommunications infrastructure provides businesses and consumers with competitive choice
- + Four airport hub cities provide access to outside markets
- + Roads are in relatively good condition
- + Well-developed rail freight infrastructure, due to central location
- + Ohio’s businesses and people benefit from low traffic congestion

Neutral Factors

- o Flight service frequency is average, and offers no particular advantages

Weaknesses

- Less extensive highway network

INFRASTRUCTURE Summary of Benchmarking Indicators			
Indicator	Ohio Indicator Value	National Ranking (out of 50)	Benchmark Ranking (out of 16)
Technology Infrastructure			
Number of broadband/high-speed service providers	36	7	6
% of ZIP codes with high-speed service	98.8%	7	3
Total fiber optic cables deployed	1,837,500km	9	7
Total fiber optic cables deployed per 100 people	16.1km	20	8
Number of Abilene Network connectors and participants	11	7	6
Physical Infrastructure			
Number of scheduled flight departures per 1,000 people	30.5	17	8
Number of scheduled direct international flight departures per 1,000 people	2.1	19	12
Number of air traffic hub cities (measured by enplanements)	Ohio offers one large hub in Cincinnati; two medium hubs in Cleveland and Columbus; and one small hub in Dayton		
Highway miles per 1,000 people	3.0mi	37	10
% of highway miles rated in poor condition	2.1%	11	5
% of statewide highway miles with congestion	3.0%	22	4
% of urban highway miles with congestion	6.6%	15	3
% of bridges rated as “structurally deficient” or “functionally obsolete”	25.6%	22	9
Total tons of rail freight carried in state	300.4 tons	7	3
High-tech/R&D space vacancy indicator (from substantial oversupply to substantial shortage), by metro area	Cincinnati: Balanced Market Cleveland: Moderate Oversupply		Columbus: Balanced Market Toledo: Balanced Market
Industrial space (>60,000 sq.f.) vacancy indicator (from substantial oversupply to substantial shortage), by metro area	Cincinnati: Moderate Oversupply Cleveland: Substantial Oversupply		Columbus: Moderate Oversupply Toledo: Moderate Oversupply

Technology Infrastructure

Dramatic advances in telecommunications technologies have been developed, introduced, and rapidly adopted by businesses and households. High demand for faster transmission speeds, video conferencing, telecommuting capabilities, and audio/video transmissions has accompanied the deployment of advanced broadband services carried over high-speed digital and optical lines. During the 1990s, fiber optic cable deployment across the United States grew four-fold, from 7 million miles of fiber in 1991 to over 33 million miles in 2000.

Advanced telecommunications technologies constitute a key element of technology infrastructure in today’s fast-moving economy, which relies on instantaneous transmission of information around the world. The

capacity and level of sophistication of a state’s communications infrastructure have become critical factors in the competitiveness of a state’s companies. To assess the competitiveness of Ohio’s high-tech telecommunications infrastructure, this section examines indicators relating to the supply and penetration of high-speed telecom technologies as well as the extent to which these technologies are being adopted by the state’s businesses.

An extensive telecommunications infrastructure clearly serves as a foundation for any state to attract and retain productive investments. The application of new technologies also can improve the competitiveness of products and services and enhance the quality of life in the state.

Benchmarking Indicators – Technology Infrastructure	
Supply & Penetration of Broadband/High-Speed Services	1) Number of broadband/high-speed service providers 2) % of ZIP codes with high-speed service
Fiber Optic Cable Deployment	1) Total fiber optic cables deployed in kilometers 2) Total fiber optic cables deployed per 100 people
Next Generation Internet	Number of Abilene Network connectors and participants

Supply and Penetration of Broadband/High-Speed Service

Why are these indicators important?

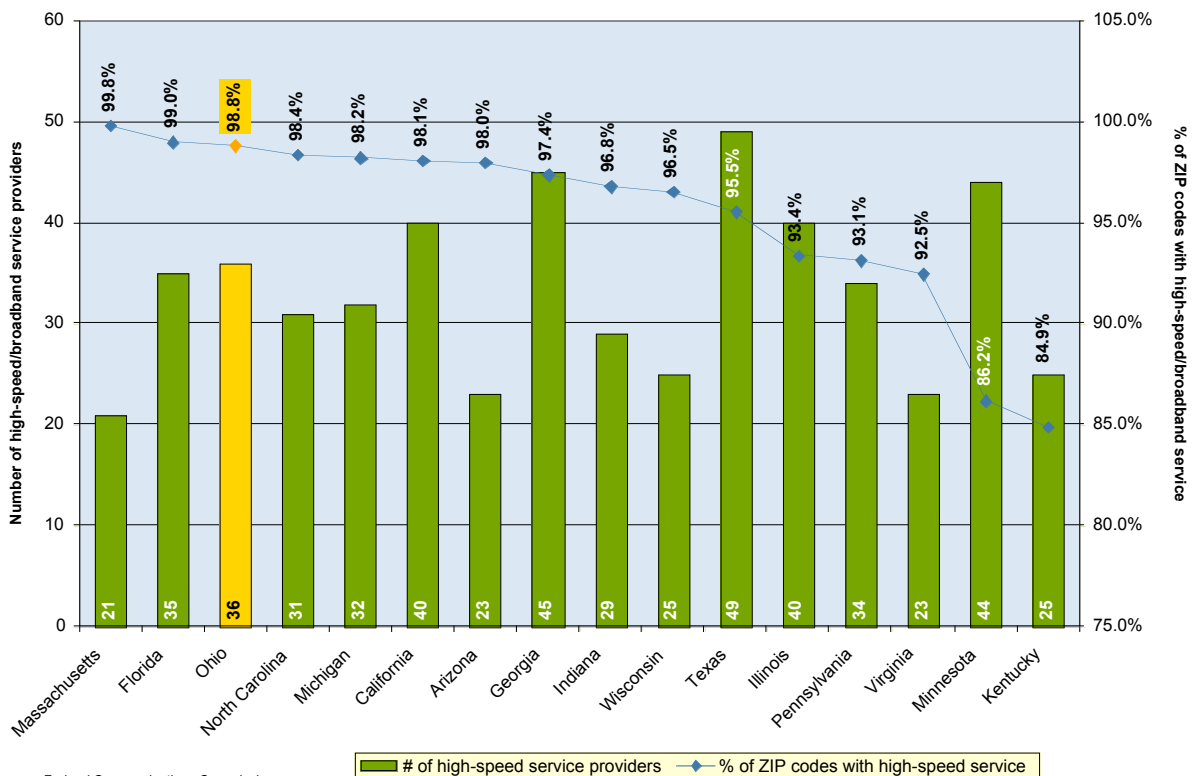
With the Internet increasingly employed as the primary medium for communication, data transmission, research, and other business and personal applications, businesses and households need access to high-speed Internet service. Broadband service is over 25 times faster than a modem connection, and it is critical for accessing the newest Internet technologies, such as audio and video. The supply and geographical coverage of high-speed service in a state are becoming important competitive factors in the digital economy. Currently, high-speed services are provided using a variety of technologies, including ADSL (asymmetric digital subscriber line) services, optical carrier (i.e., fiber), coaxial cable systems (cable modem service), satellite, and other wireline and wireless technologies. These two indicators are good proxy measurements of the supply and penetration of high-speed services. The first indicator measures the *number of broadband/high-speed providers* in each state. Just as important as the number of providers is how accessible these high-speed services are to local communities. The second indicator, the *percentage of ZIP codes with*

high-speed lines, measures the penetration of such services within each state.

Where does Ohio stand?

With 36 service providers in the state, Ohio ranks 6th among the benchmarking group and 7th in the entire nation for the number of broadband/high-speed service providers in the state. More importantly, almost the entire state has access to high-speed lines. About 98.8 percent of Ohio’s ZIP codes are covered by high-speed lines, ranking it 3rd among benchmark states, and 7th nationwide. This percentage exceeds those in established high-tech states such as California, Texas, Pennsylvania, and Washington. It should be noted, however, that this survey may be somewhat misleading, since a company may report a ZIP code as having broadband service even though such service may only be available in a small portion of the ZIP code area. Moreover, because it is a proxy measure, this indicator does not provide insight into whether the existing capacity is being used

Number and coverage of broadband/high-speed service providers (2003)



Source: Federal Communications Commission

Fiber Optic Cable Deployment

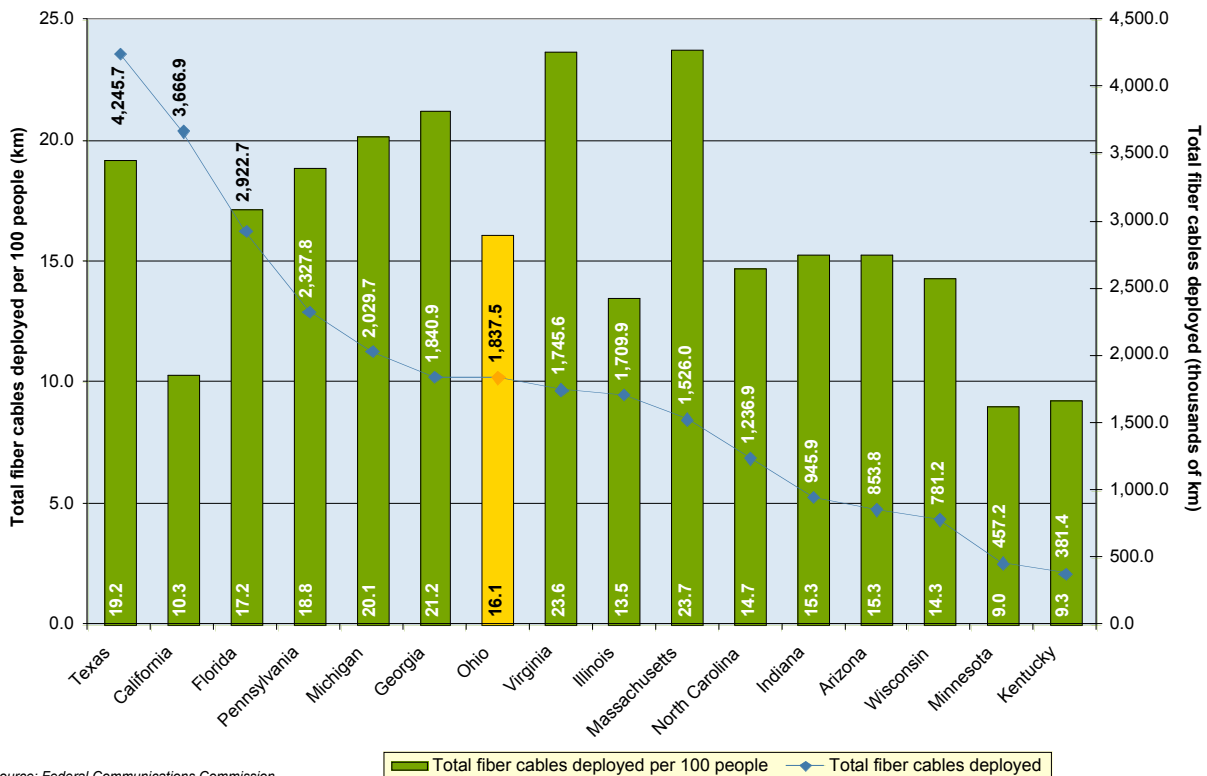
Why is this indicator important?

Fiber optic cable – which provides higher bandwidth transmissions, at faster speeds and over longer distances than copper wire – is considered the latest and the most high-tech means of providing high-speed connection to the Internet. Notwithstanding a temporary reduction in fiber optic network expansion in the “tech-bust” years of 2001 and 2002, the rapid growth in fiber deployment has resumed in response to the growing demand for broadband services and high-speed Internet access. This indicator, which gauges the *deployment of fiber optic cables* within a state, serves as another proxy measurement of a state’s current and potential capacity to provide the latest high-speed technology to businesses and homes.

Where does Ohio stand?

Ohio ranks in the middle (8th) among the benchmark states for this indicator and ranks 9th among all states. The total number of kilometers of fiber optic cables deployed is affected by the size of the state. As a result, the top ranking peer states tend to be the larger states – Texas, California, and Florida. Other top-ranking states nationwide, such as New Jersey, New York, and Pennsylvania, are not among the largest in terms of land area, but are relatively densely populated and have a dense network of fiber optics to serve that population. Ohio fits in the latter category – in terms of land area, it ranks only 35th in the nation, but it ranks 7th for population, in line with its ranking for fiber cable deployment. The size of Ohio’s fiber network is comparable to those of Michigan, Georgia, Virginia and Illinois, states that are similar in land area and population. Ohio’s kilometers of fiber optic cables grew nearly fivefold (492%) between 1993 and 2003, giving Ohio the 7th highest growth rate among all U.S. states.

Total fiber optic cables deployed, in kilometers (2003)



Source: Federal Communications Commission
Source: Federal Communications

Next Generation Internet

Why is this indicator important?

Led by more than 200 U.S. universities working with industry and government, Internet2[®] develops and deploys advanced network applications and technologies for research and higher education, accelerating the creation of the next generation of the Internet. The Abilene Network is a network of universities and private research labs that connect through an Internet2[®] high-performance backbone network. This network has become the most advanced native IP backbone network available to universities participating in Internet2[®]. The Abilene Network is enabling the development of advanced Internet applications, such as virtual laboratories, digital libraries, distance education, and tele-immersion, as well as the deployment of leading-edge network services to its participants.

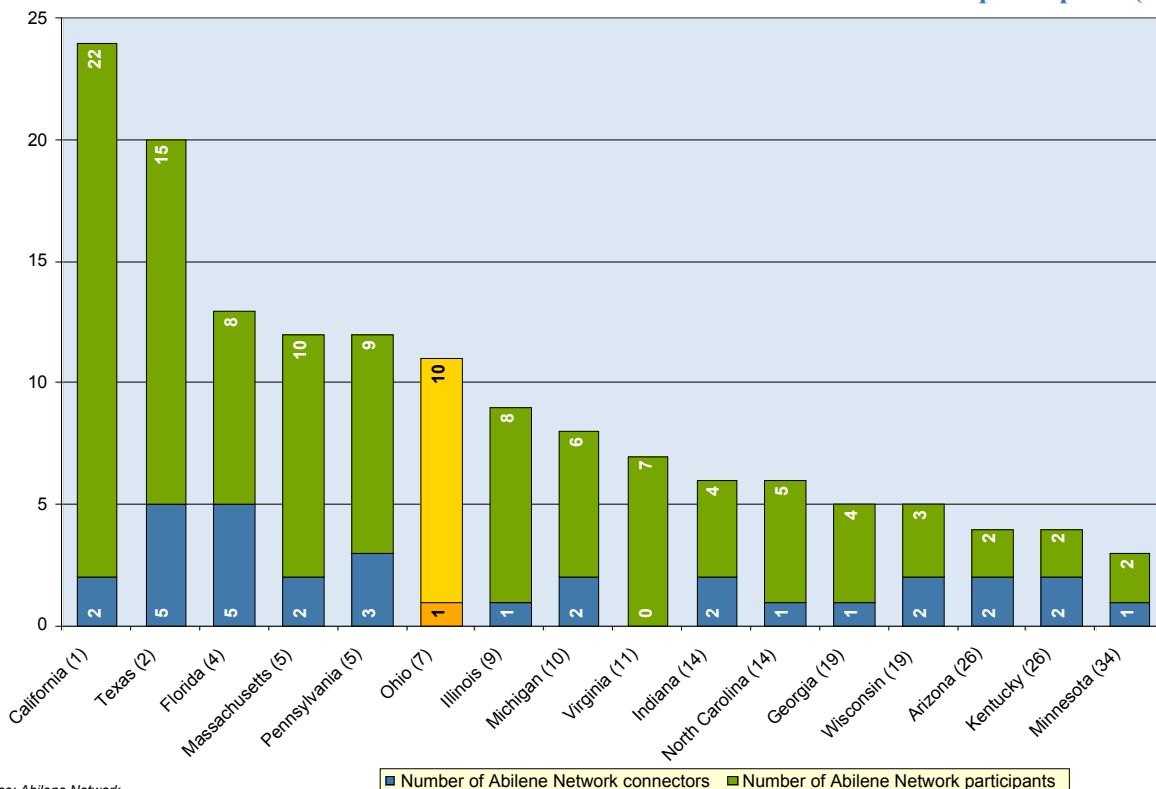
Abilene connectors are research and educational institutions connecting directly to the Abilene network. Abilene connectors may be gigaPoPs, universities, affiliate members or other regional

networks. An *Abilene participant* is any organization that subscribes to or uses Abilene services through a connector, through a direct connection, or through any other route. The *number of Abilene connectors and participants* in each state is used here as a proxy indicator for the future competitiveness of the state's technology infrastructure.

Where does Ohio stand?

With a total of 11 Abilene network participants and connectors, Ohio ranks 7th in the nation and 6th among the benchmark states. While falling well below larger states such as California and Texas, Ohio has more participants in the Abilene network than other states of comparable size and economic activities (such as Florida, Massachusetts, Pennsylvania, and Illinois).

Number of Abilene Network connectors and participants (2004)



Source: Abilene Network

Physical Infrastructure

While a high-tech telecommunications service infrastructure is essential for creating and sustaining competitiveness, businesses also depend on traditional forms of hard infrastructure, including transportation services and basic utilities such as gas and electricity. Transportation linkages are an especially critical component for firms and industries that require operational flexibility and face short “time to market” conditions. Ease of movement into, within, and out of the state is important for the movement of

knowledge-based workers and for the application of just-in-time and supply chain management practices.

This section examines several indicators that describe the availability of air transportation services, as well as the capacity and quality of the state’s highway infrastructure and its rail freight infrastructure. Finally, to describe the availability of appropriate space for business activities, index measures of industrial and high tech/R&D space availability are provided.

Benchmarking Indicators – Physical Infrastructure	
Air Transportation Services	<ul style="list-style-type: none"> 1) Number of scheduled flight departures 2) Number of scheduled direct international flight departures 3) Number of air traffic hub cities
Road Infrastructure & Conditions	<ul style="list-style-type: none"> 1) Highway miles per 1,000 people 2) % of highway miles rated in poor condition 3) % of statewide highway miles and urban highway miles with congestion 4) % of bridges rated as “structurally deficient” or “functionally obsolete”
Rail Infrastructure	Total tons of rail freight carried in state
Industrial & High-Tech/R&D Space Availability	Vacancy indicator, from substantial oversupply to substantial shortage, by metro area

Air Transportation Services

Why are these indicators important?

The availability and convenience of air services are a major consideration for businesses in the modern economy. The importance of face-to-face meetings has not been diminished by improvements in communications linkages. Management executives, marketing personnel and other knowledge workers are constantly on the move, meeting clients and strategic allies, making presentations and sales, upgrading computer systems, negotiating contracts, conducting research and studies, etc., across the country. Air transportation linkages are also critical for the movement of goods, equipment and parts in a very time-sensitive market.

The following indicators benchmark Ohio's standing against its peers in three areas:

- The *number of scheduled flights per 1,000 people* indicates the overall flight traffic relative to the population.
- The *number of direct international flights per 1,000 people* shows the connectivity of states' businesses and residents with global markets and clients.
- The *number of hub cities* within a state. "Hub city" here does not mean an "airline hub," but is identified as such by the U.S. Department of

Transportation based on the amount of air passenger traffic that passes through the city.²⁰

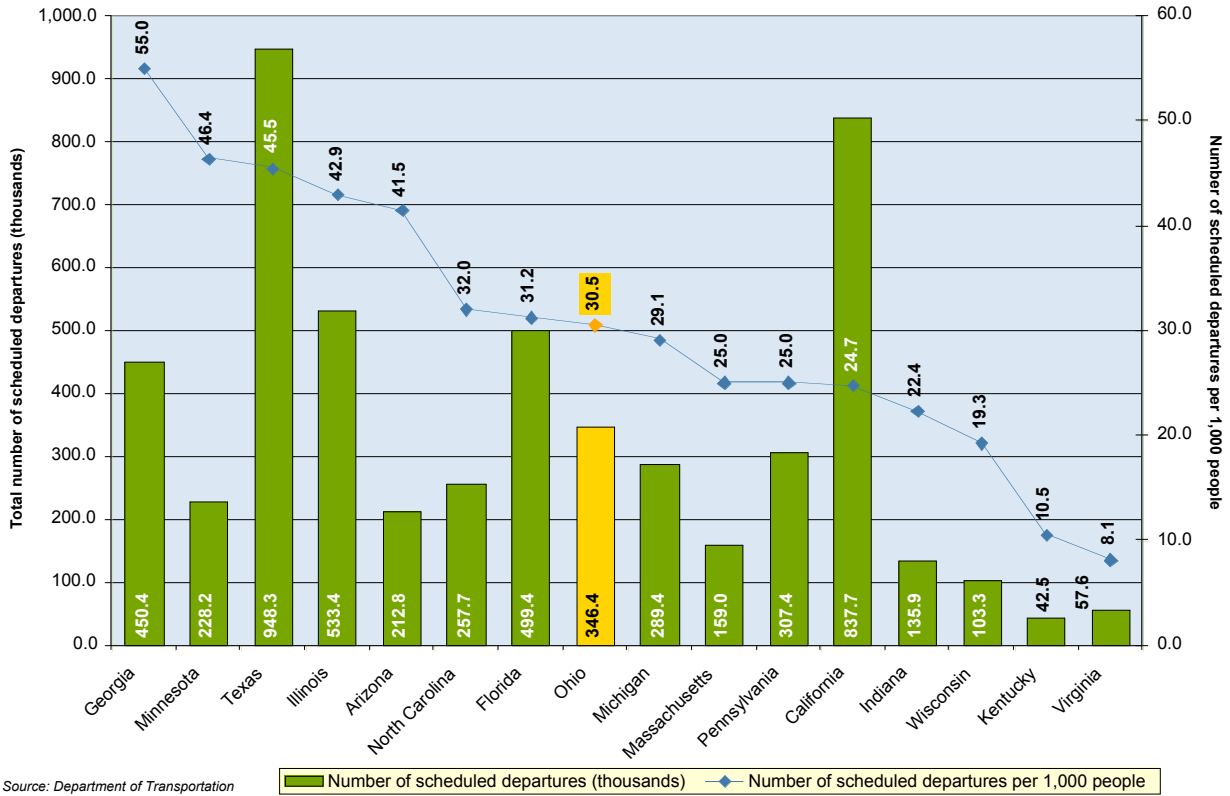
Where does Ohio stand?

The relatively high number of large-scale cities in Ohio gives rise to an extensive network for air transportation. Ohio offers four airport hub cities. Only a few states possess more – Texas (10), Florida (9), California (7), New York (7), and Hawaii (5) – and all of these are large or geographically disbursed. Most states have one or two hub cities.

Among its benchmarking peers, Ohio's level of air service is average. Ohio ranks 8th among its 16 peers in the number of scheduled flights per capita and ranks 12th in the number of direct international flights. On a national level, Ohio ranks 17th for scheduled flights per capita and 19th for direct international flights per capita.

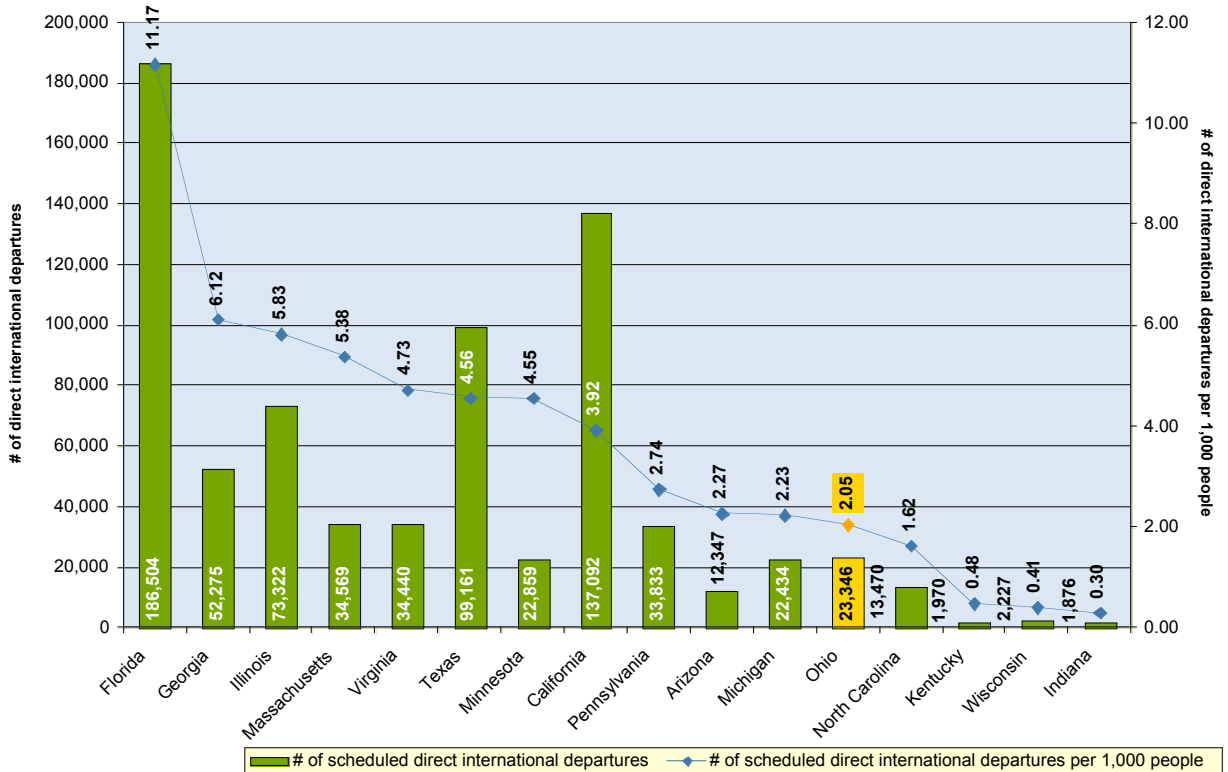
²⁰ A "small air hub" is a community that enplanes 0.05 to 0.249 percent of total enplaned passengers in the United States. A "medium air hub" enplanes 0.25 to 0.99 percent of total enplaned passengers in the United States. A "large air hub" is a community that enplanes over 1 percent of total enplaned passengers in the United States. A hub city may contain more than one airport.

Number of scheduled flights (2000)



Source: Department of Transportation

Number of scheduled direct international flights (2002)



Source: Department of Transportation