Evolution and classification of public transportation

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Mid 1800s

Horse-drawn omnibuses

Figure: Omnibus, London[1]

[1] Source: www.transportgeography.org

Early 1800s

Horse-drawn streetcars

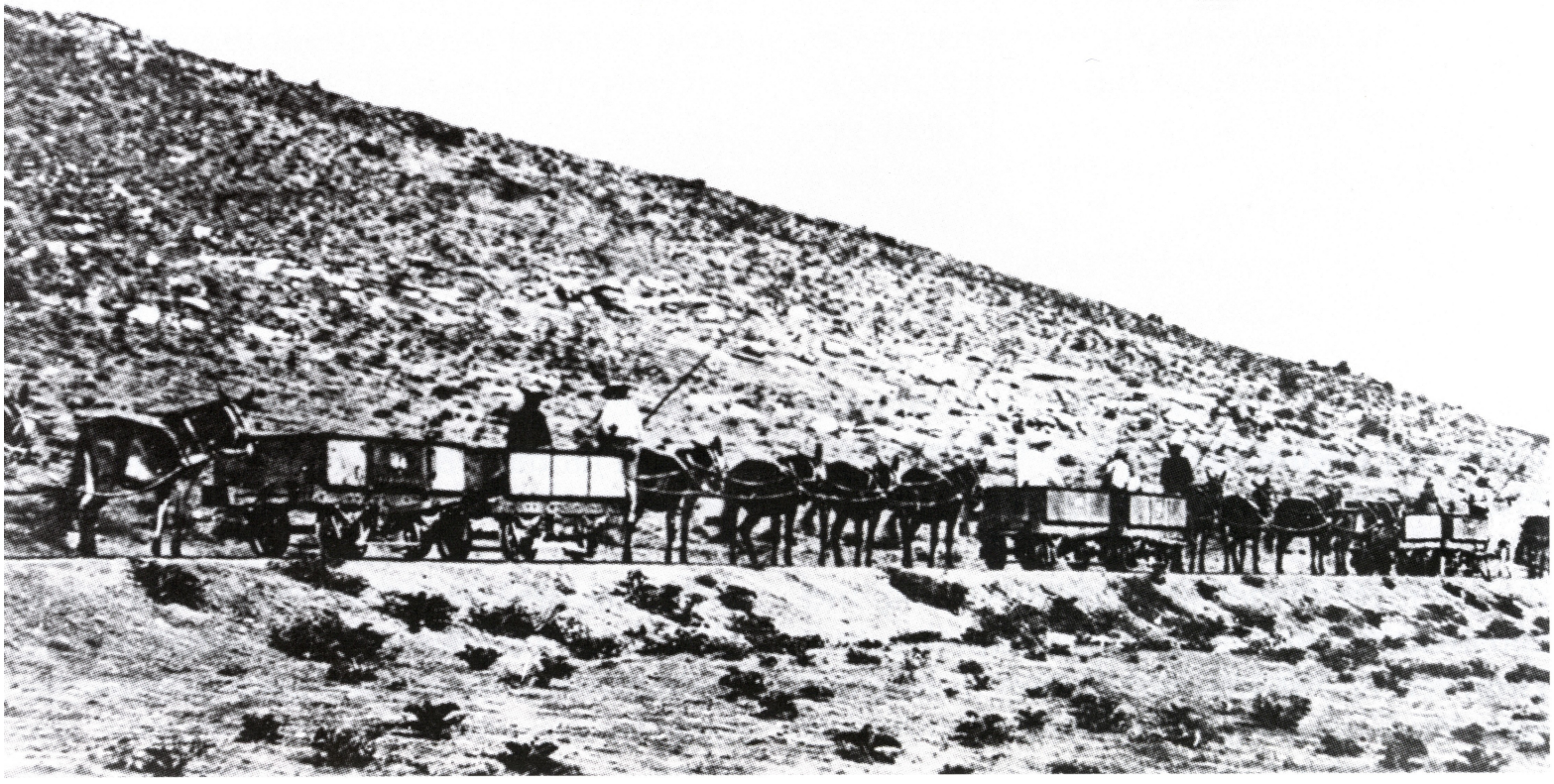

Figure: Namaqualand Railway mule train [2]

[2] Source: Wiki

Late 1800s

Steam-powered trains

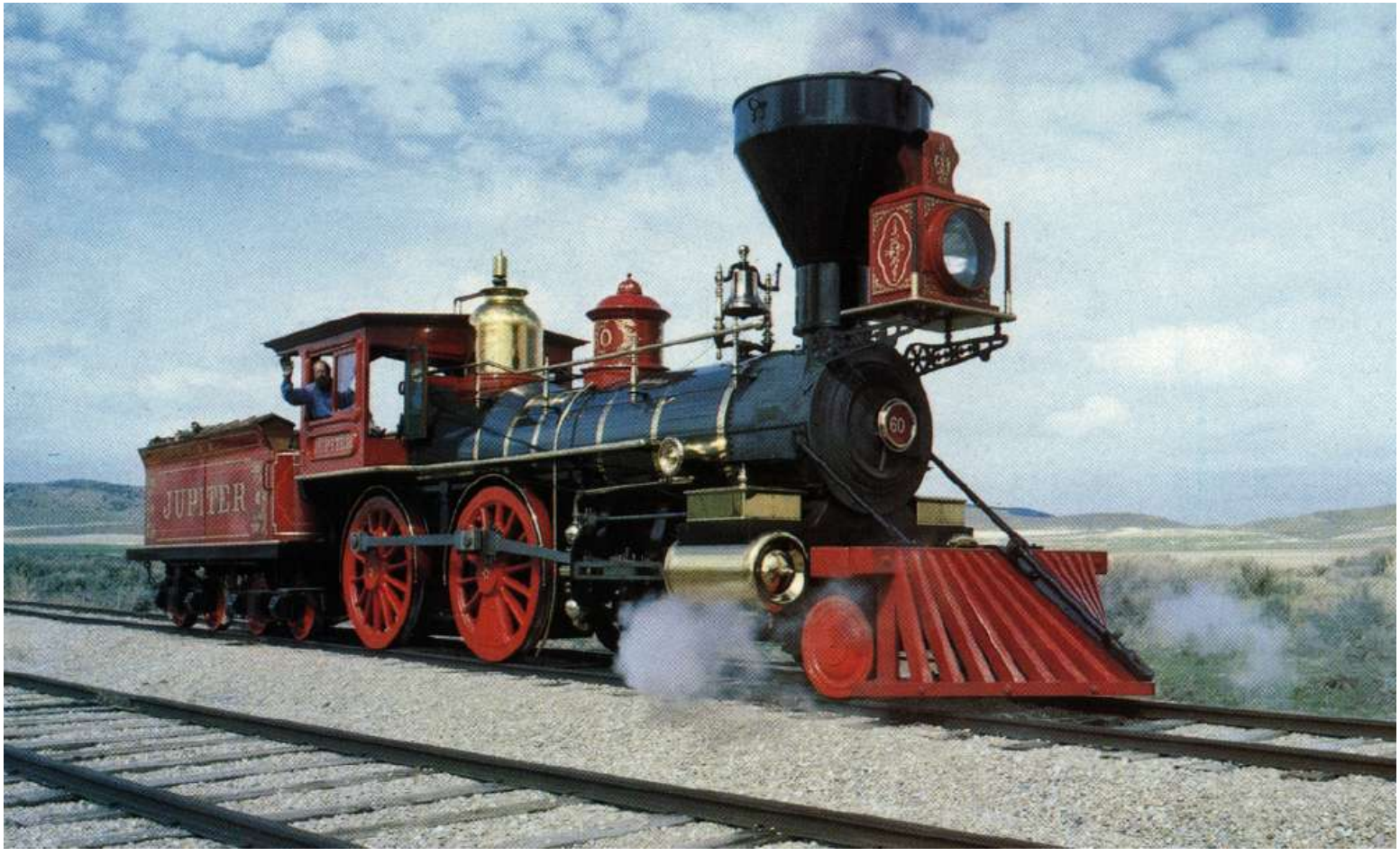

Figure: Steam locomotive CP No. 60 and UP No. 119 - American Type [3]

[3] Source: www.up.com

Late 1800s

Electric trams and cable cars

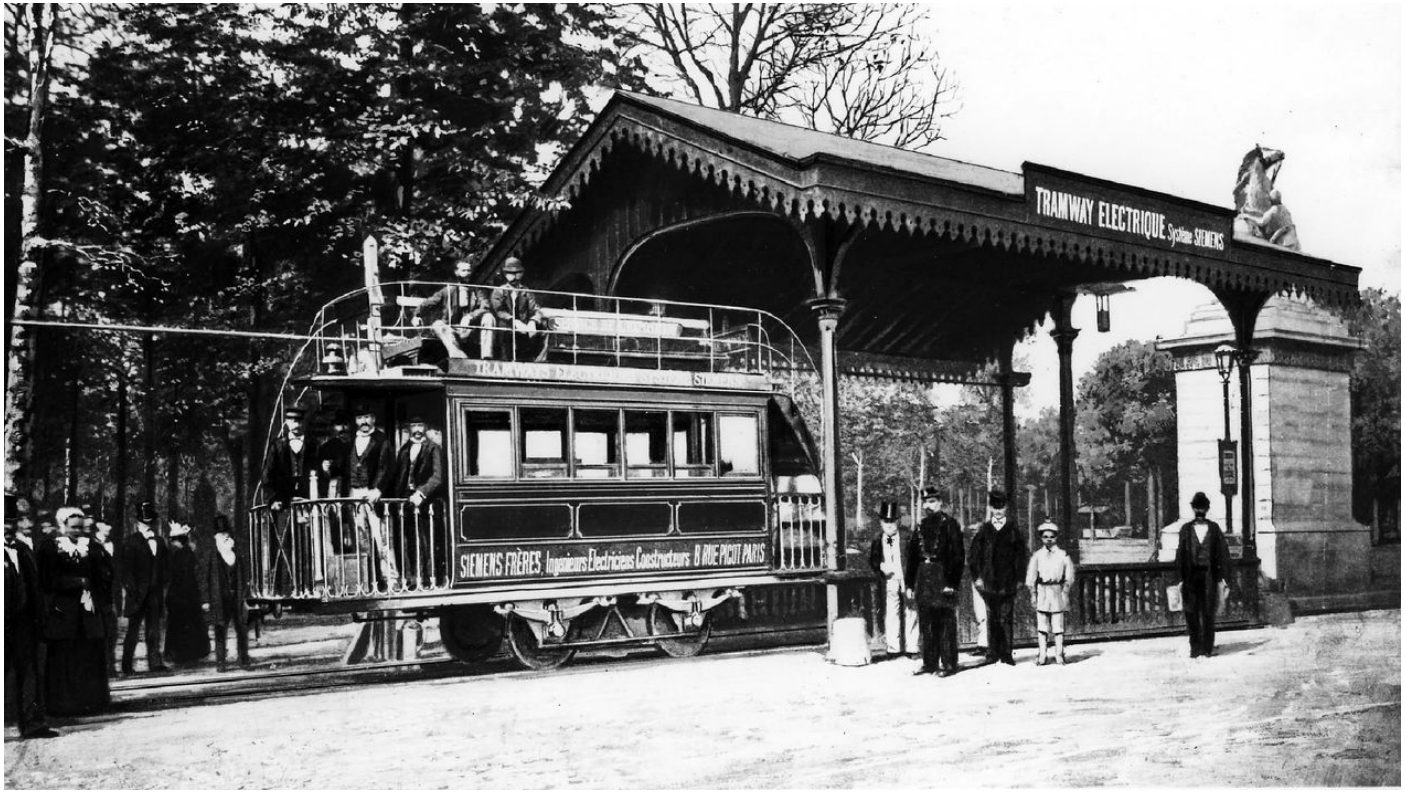

Figure: Electric streetcar, Lichterfelde 1881 [4]

[4] Source: www.siemens.com

Early 1900s

Subway systems

Figure: City Hall Station postcard from 1904 [5]

[5] Source: India Today

1920s

Revolution in automobile industry: Introduction of motorbuses

Figure: The first motor bus was started on 15th July 1926 that ran between Afghan Church and Crawford Market, Mumbai. The bus fare for the same journey was four annas. [6]

[6] Source: India Today

Public transportation during World War II

High-levels of ridership

Figure: Londoners slept in the city's Underground for protection during German bombing raids, 1940[7]

[7] Source: www.life.com

1950s

Bus as predominant mode

Figure: Buses in Detroit, Michigan

Public transportation during independence

Figure: Mass migration during partition [8]

[8] Source: www.railpost.in

1950-80s

Expansion of railways

Figure: Old Delhi station[9]

[9]Source: Pinterest

1950-80s

Development of metro systems in many global cities

Figure: NYC Metro[10]

[10] Source: Pinterest

1990s

Light rail transit

Figure: Sydney LRT[11]

[11] Source: Wiki

2000s

High-speed rail

Figure: Bullet train at Linyi North Station in East China[12]

[12] Source: http://en.people.cn/

2010s

Bus rapid transit

Figure: Delhi BRT[13]

[13] Source: India Today

Modal characteristics

One can categorize transit systems based on the following characteristics:

1. Right of way (ROW)
2. Technology
3. Type of service

Right of way

- It refers to the path (way) which transit vehicles can (or have right to) travel
- Based on the degree of separation with other traffic we have three levels:
  - Level I: systems in which transit vehicles operate on surface city streets mixed with other traffic, e.g., bus transport, etc.
  - Level II: systems in which transit vehicles operate on surface streets but enjoys some separation from other modes, e.g., light rail transit (LRT), bus rapid transit (BRT), etc.
  - Level III:systems in which transit vehicle enjoy full separation from other modes, e.g., monorails, subways, metro, commuter rail, etc.
- ROW affects speed and capital/operational costs. Higher the level of separation, more is speed and capital/operational costs.

Technology[14]

1. Support - contact between vehicle and surface
   - rubber tire on concrete
   - steel wheel on steel rail
   - others
2. Guidance - lateral control (what steers the vehicle)
   - steered by driver
   - guided by track
   - others
3. Energy and propulsion
   - diesel internal combustion engine (conventional or clean)
   - compressed natural gas
   - electric motor
   - hybrid
   - others
4. Control - longitudinal
   - manual/visual
   - manual/signal
   - automatic

[14] Taken from MIT Courseware 1.258J

Type of Service

1. Based on whether or not fixed routes/stations are used
2. Express versus rapid versus local transit
3. Scheduled versus flexible transit

A few pictures

(a) City bus[a]

[a]Wiki

(b) Double Decker bus[a]

[a]Economic Times

(c) Articulated bus[a]

[a]Wiki

(a) Trolley bus[a]

[a]Wiki

(b) Tram[a]

[a]Economic Times

(c) BRT[a]

[a]www.madison365.com

A few pictures

(a) LRT[a]

[a]Wiki

(b) Automated guideway[a]

[a]spectra.mhi.com

(c) RRT (metro, subway)[a]

[a]Zeenews

(a) Monorail[a]

[a]Wiki

(b) Commuter rail[a]

[a]metrorailnews.in

(c) Cable cars[a]

[a]www.swarajyamag.com

Figure: Ferry[15]

[15] www.scroll.in

Bus service to London

Figure: [16]

[16] Source: Quora

Bus service to London

Figure: [17]

[17] Read more at https://www.travelandleisure.com/trip-ideas/bus-train/bus-to-london-70-day-18-country-tour

Thank you!