Standardizing time in the US

Prior to 1850 time in the United States was local, in the same way as it had been in England. A major difference with England is that the larger east-west geographical extent of the US resulted in a larger range of times.

This means that the single uniform system adopted in England would not apply easily in the US. Again the motivations for standarizing time came from increased communications and transportation.

City	Longitude	Time difference from Washington DC
Boston	71.06° W	+24min
Washington DC	77.04° W	0
Chicago	87.63° W	-42min
New Orleans	90.07° W	-52min
Houston	95.37° W	-73min

range of 100min

Demo: ~~American Museum of Na~~ National Museum of American History Timetable

The motivations for standardizing this system originally came from:

1) railroads

2) astronomers

3) entities selling time.

We first consider railroads' interest. Was it for passenger convenience? Were there other reasons?

1 Railroads and time in the United States

In the United States during the first half of the 19th century, there were a multitude of privately owned railroads with overlapping networks. Managing time on these networks was important and there were various reasons why standardizing time might be important.

a) Why might passengers on trains have an interest in using standardized time systems? Without any standardized time system how complicated would rail travel have been?

It would make travel more convenient. There would be no need to verify which time was being used - local or system time.

It would have been slightly more complicated but really not very difficult

* timetables could translate railroad system time to local times

* stations could be equipped with clocks indicating both.

b) Aside from passenger concerns, what other interests would any given railroad company have in a standardized time system?

* Safety of operations - the timing of trains sharing a line would have been crucial

* Management of operations - simply moving trains around would require time co-ordination. This is simpler and more efficient with a standardized system.

c) Suppose that two railroads have systems that barely overlap geographically but do not share the same tracks. Each has its own system of standardizing time on its network. Is it essential from a safety and management perspective that these two systems use the *same* time?

Since the systems are independent there is no need to use the same time.

Each system can just use one time. It doesn't matter which time as long as everyone knows which it is.

Then different systems do not need to share times.

The way in which standardized time developed in the United States is roughly.

Unclear reasons ?? ——▷

1850
* New England Association of Railroad Superintendents adopts uniform time on New England railroads
* Outsource "master clock" service to William Bond (clockmaker)

* Passenger convenience?
* Railroad time not synchronized with local times ——▷

1869-1870 Charles Dowd proposed a system of standardized time that used four time zones across the contiguous U.S.
——▷ indexed to Greenwich 1872

Demo. Riding Rails Map ——▷

* Railroad operations
* Selling time services from observatories ——▷

1870 Samuel Langley (Allegheny Observatory) proposed uniform time services for regions (e.g. all of U.S. east of Mississippi)

Railroads ignore or oppose these - in some locations local times dropped in favor of railroad time.

* Scientific observations ——▷

1870s Cleveland Abbe (scientist) recognizes need for standardized time. Proposes system indexed to Greenwich

⌐▷ government legislation suggested

* Increased pressure from scientists, surveyors, etc. for government action.
* railroads appear left out

—▷

1883 William Allen (railroad official) proposes that railroads settle the question of standard time
* five time zones, identifying meridians, roughly one hour apart

Railroad time formally implemented on 18 November 1883
"day of two noons"

First occasion when the U.S. had a national standardized time system.

Demo: LoC page.

Standard time zones

Proposals for standard time in the U.S. needed two ingredients

1) the number of zones and separation between them.

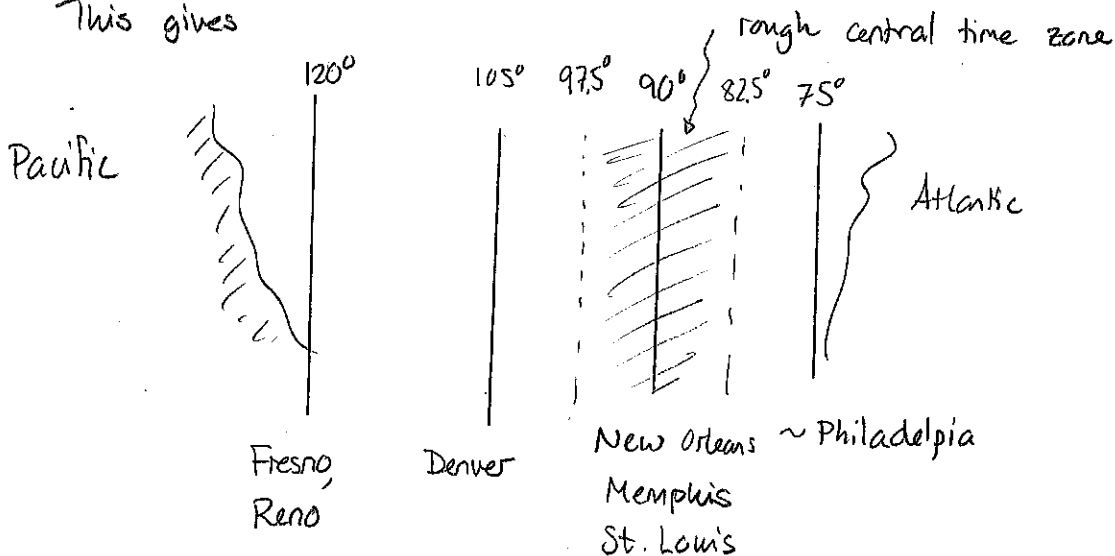2) a meridian on which to anchor the zones

The idea was that each zone should span about one hour, centered on a convenient meridian. Such meridians would be 15° apart. The geographic span of the continental U.S. is 67°W → 125°W $\equiv$ 58°. This gives roughly 4 zones of 15° each.

The meridian on which to anchor this might be one passing through Washington DC. However, it was decided to use the 75° meridian as part of the "anchor" system. This is exactly 5 hours from Greenwich, and this formed the basis for the U.S meridian system. Aside from this the two other considerations were:

1) the local time of any city should not differ by more than 30 minutes from its time zone time.

2) existing political and railroad time boundaries should be considered when setting exact boundaries.

This gives

Pacific

120°   105° 97.5° 90° rough central time zone / 82.5° 75°

Atlantic

Fresno, Reno   Denver   New Orleans ~ Philadelpia
Memphis
St. Louis

The time zones were eventually established as law by the (U.S.) Standard Time Act of 1918.

Communicating standard time

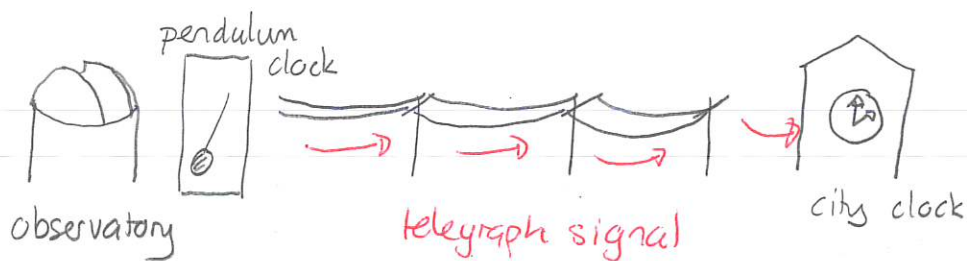How was standard time to be communicated? Early in the 19th century time signals would be communicated locally via:

1) prominent clocks
2) sirens/horns
3) time balls

Demo: Greenwich Time Ball

Such time balls existed on observatories (e.g. Greenwich, USNO). By the later half of the 19th century time signalling was done by electronic means:

1) mechanical clocks were equipped with electric devices to register time.

2) time signals could be transmitted by telegraph

Telegraphs were developed in the 1830s and 1840s in the U.S and by 1860 they spanned to continental U.S.

pendulum clock

observatory   telegraph signal   city clock

Such telegraphic time signals travel very quickly ~ 4.0×10^8 mph

~ 1.2×10^5 mi per second

This would take less than 0.1s to cross the U.S

Separately these were sold as telegraphic time to:

* railroads

* telegraph companies

* local businesses