

# Beyond Commuter Rail — International Models of Rail and Transit Excellence

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# What is Regional Rail?

Regional rail means public transportation that uses conventional rail tracks, serving cities and their suburbs.

Examples:

- ▶ US: Caltrain, Metra, LIRR
- ▶ German-speaking cities: S-Bahn
- ▶ Paris: RER, Transilien
- ▶ London: commuter rail, Overground, Thameslink, Crossrail
- ▶ Japanese cities: commuter rail

The goal of this talk is to explain why regional rail works better in Europe and Japan, and what the Bay Area could learn from their examples.

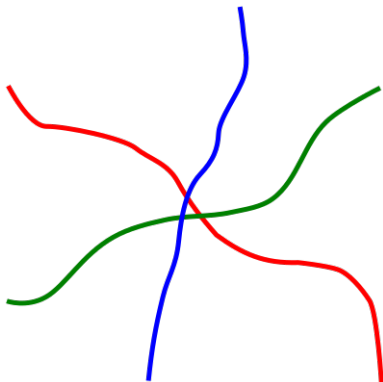
Context: the region is considering major investments (Downtown Extension, second tube) and needs to make sure to build the best transit it can and avoid bad projects.

# Is BART Regional Rail?

Regional rail has several key differences from an urban metro system (examples: New York City Subway, Paris Metro, Washington Metro...). So is BART a metro system or a regional rail system?

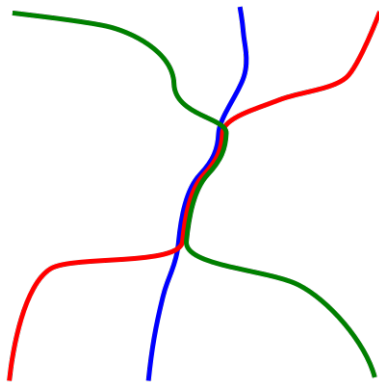
# Route Layout

Urban rail



Several independent lines

Regional rail

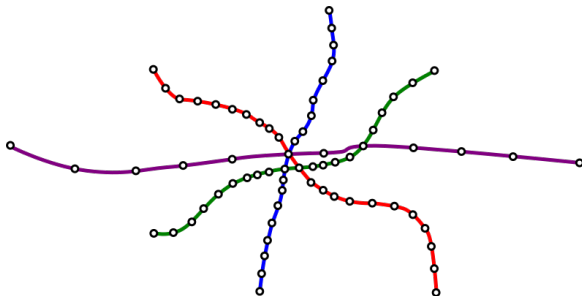


A trunk with branches

BART has the route structure of regional rail.

# Stop Spacing and Extent

Regional rail tends to serve longer-distance trips than urban metros and have wider stops.



BART stops once every 4 km or so, the widest of any metro system, making it more like regional rail.

# Construction Costs and Standards

Regional rail is compatible with mainline trains, to reduce costs:

- ▶ Shared tracks where there's capacity let trains run without spending more money on right-of-way and structures.
- ▶ Some critical mainlines are needed for both regional rail and intercity rail.
- ▶ Lower-demand branches can be single-track.

Here BART is a full metro. So extensions farther out (San Jose, Livermore, SFO, etc.) cost a lot of money for not much ridership.

# What Makes for Good Regional Rail?

Regional rail in Paris, Berlin, and Tokyo aims to provide the same service levels as the subway. This means,

- ▶ Electrification to enable lower costs and higher speed
- ▶ High frequency all day, not just at rush hour
- ▶ Low-cost fare collection: faregates or proof-of-payment, not conductors
- ▶ Local service (a stop every 1-3 km), not just express trains
- ▶ Affordable fares, same as the subway, with free transfers

BART has nearly all of these (exception: fares), but is very expensive to extend. This requires regional extensions to use Caltrain (or other commuter rail networks).



# Where is Caltrain?

Caltrain is investing in modernization... to some extent.

- ▶ Electrification: yes!
- ▶ High off-peak frequency: ???
- ▶ Low-cost fare collection: no, there are still conductors
- ▶ Local service: already here!
- ▶ Fare integration: no

# Organization Before Electronics Before Concrete

Swiss planning slogan: **electronics before concrete**. German activist version: **organization before electronics before concrete**.

Organization: fare and schedule integration, coordination between different agencies. This is free, provided the region sets up incentives for agencies to cooperate rather than fight over budgets and turfs.

Electronics: rolling stock, electrification, signaling. This costs some money, but not much given decent project management.

Concrete: new viaducts and tunnels, grade separations, extra tracks. This costs the most money.

# Peak Investments

Caltrain needs to improve organization in order to increase peak capacity, in conjunction with strategic investments into concrete:

- ▶ Timed overtakes involving local and express trains, with cross-platform transfers (very likely).
- ▶ Timed overtakes between Caltrain and California HSR (already in HSR business plans).
- ▶ High platforms, same as HSR (already planned).
- ▶ Clockface schedule: trains arrive at regular intervals, like every 15 minutes, to simplify scheduling (maybe).

This would permit about 12 trains per hour at the peak in each direction, a third or one half local and the rest express or HSR (credit: Clem Tillier).

# Shared Infrastructure

Regional trains can serve the same platforms as longer-range trains. This means that train stations don't have to be so big. And yet...



Amtrak, ACE, Caltrain, and HSR can share platforms, but haven't coordinated, so current plans call for new HSR platforms.

# Off-Peak Investments

Infrastructure decisions are driven by the peak. But decisions about operations are driven by all-day service needs. What about those?

# Frequency

*Frequency is freedom* —Jarrett Walker

There is a minimum frequency for transit to be useful. The shorter the trip, the more frequent service has to be. On longer-range regional lines like Caltrain, the minimum is a train every 15-30 minutes. But within SF, 5-10 minutes is needed.

RER and Berlin S-Bahn branches have a train every 10-20 minutes. The trunks have a train every 4-5 minutes all day.

Some Tokyo commuter trains have 5-minute frequency until midnight, going 40+ km outside Central Tokyo.

Caltrain is hourly off-peak, so it's not useful for non-commute trips or non-9-to-5 commutes.

# Fare Collection

High frequency requires reducing variable operating costs.

Trains should run with a 1-person crew, a driver, without conductors.

Best practice is POP: roving civilian inspectors (**not cops**) do spot checks for tickets and fine passengers caught without a valid fare. Examples: Germany, Switzerland, RER in suburbs, American light rail.

Faregates can work for extremely busy trains (RER in Paris, Tokyo commuter rail), but cost more than POP everywhere else.

# Variable Operating Costs

On modern lightweight electric trains without conductors, the marginal operating cost in the off-peak is **low**: electricity to power the train, and some portion of driver wage.

Peak-only service requires split shifts for drivers, so the number of people you need to hire to add service on weekday off-peaks is much lower than the number you need at the peak.

Peak-to-off-peak frequency ratios vary between 1 (most Swiss services) and 2 (Tokyo). Caltrain's current ratio is 5.



# What Does Integrated Planning Mean?

Under a regime of full integration, fares are **the same** on all trains and buses within a zone.

Possible exception: HSR trains with guaranteed seats.

Connecting buses should be timed to meet scheduled trains. It's possible even with a 15-minute clockface schedule, let alone a 30-minute one. Reliability matters!

Planning should emphasize connections.

# Fare Integration

In German-speaking cities, tickets are valid inside a zone (e.g. the entire city), on all trains and buses. In Switzerland it even applies to high-speed trains if they make multiple stops in one region (e.g. Zurich Hbf and the airport).

In Paris, monthly tickets cost €75.20 regionwide. Single-ride tickets have fares based on distance; the RER costs the same as the Metro in the city, with free transfers, but in the suburbs, fares may vary.

In Tokyo, there are no free transfers between different railroads. But commuter rail fares are still comparable to subway fares over the same distance.

# Planning Around Free Transfers

Operating costs on trains per km are lower than on buses with the same capacity, so encouraging more rail ridership saves money.

With free transfers, it's useful to encourage people to only take the bus as far as the commuter rail station, and transfer.

In Switzerland, it's common for transfers to be timed, even across different operating companies.

In Japan, private railroads run their own connecting buses.

# Timed Transfers

When the trains run on a clockface schedule, it's possible to run buses to connect to them.

Untimed transfers aren't common on trunk routes in transit cities unless the frequency is about a train/bus every 8 minutes or better.

Timed overtakes with HSR, express Caltrain, and local Caltrain make it easier to have a regular schedule for transfer timing.

# Reliability

Timed transfers work best when service planners emphasize **reliability**:

- ▶ Reliable equipment: Caltrain is already purchasing good electric trains
- ▶ High platforms: not yet, but Caltrain is implementing this very gradually
- ▶ Good timetabling: current Transbay Terminal plans involve deliberate conflicts in the throat
- ▶ Bus priority: occasionally mooted but rarely implemented in SM, SC Counties

# Transit-Oriented Development: an Example

The view from Bourg-la-Reine, a middle-class suburb a few km outside of Paris on the RER:



# Transit-Oriented Development: an Example

A satellite photo of the same location:



# Transit-Oriented Development: Some Best Practices

TOD works best when people can **live without a car**. This means that **errand trips can be done on foot** and **work trips can be done on transit**.

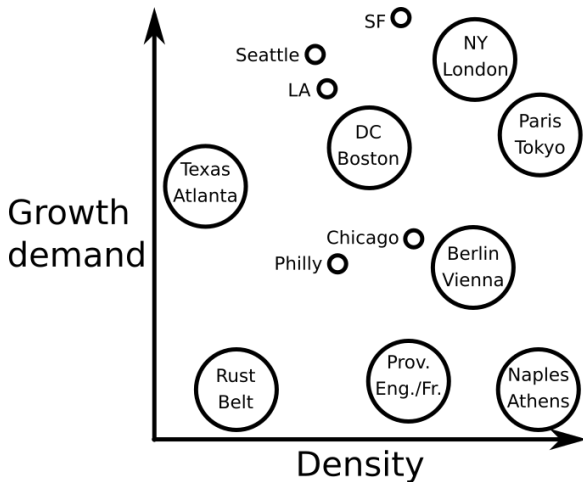
American TOD projects often fail by having too small of a TOD zone around a train station, so local retail, schools, hospitals, restaurants, etc. remain auto-oriented.

AB 2923 (TOD at BART-owned sites, with mixed uses) works best: high density, with mostly but not only residential uses. But the sites may be too small, only a few hundred units at a time.

SB 827 (general upzoning near train stations and frequent buses, residential only) establishes a large TOD zone, but is missing retail.



# TOD and Investment



In the world's richest city, any TOD will fill and grow ridership, so more spending on concrete is justified than in lower-demand cities.

# Lessons for the Bay Area: General Remarks

The region should plan around systemwide integration:

- ▶ Integrate fares and service planning regionwide.
- ▶ Increase off-peak frequency: at worst every 15 minutes in SM County, more service in SF proper.
- ▶ Include Caltrain in the VTA frequent transit plan, potentially every 15 minutes down to San Jose.
- ▶ Plan timed transfers, with investments in reliability on Caltrain-connecting buses.
- ▶ Avoid future mistakes like separate BART and Caltrain San Bruno stations.
- ▶ Reactivate Dumbarton as electrified regional rail (it's near Facebook!).

# Lessons for the Bay Area: Specific Projects

Before embarking on big projects like DTX or the second trans-Bay tube, it's useful to ask,

- ▶ What is the proposed timetable?
- ▶ How does DTX plan to integrate HSR and Caltrain?
- ▶ What is the second tube planned to connect to at either end? New lines? Disentangled East Bay BART lines?
- ▶ Are alignments chosen in a way that maximizes systemwide connectivity? For example: Geary + second tube + DTX can be set up in a way to ease the BART-Transbay Terminal transfer.

Thank you!